



# Aligning Asset Management with Climate Change Adaptation


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# Agenda

- Climate / Weather Impacts Across Canada
- Aligning Asset Management with Climate Adaptation
- Developing an A.M. Program with In-Built Climate Considerations
  - Assess
  - Plan
  - Implement
- Benefits of Asset Management





Sustainable service delivery is the key objective of asset management, and climate change poses a threat to the sustainable delivery of services.

# Climate Change – The Canadian Experience

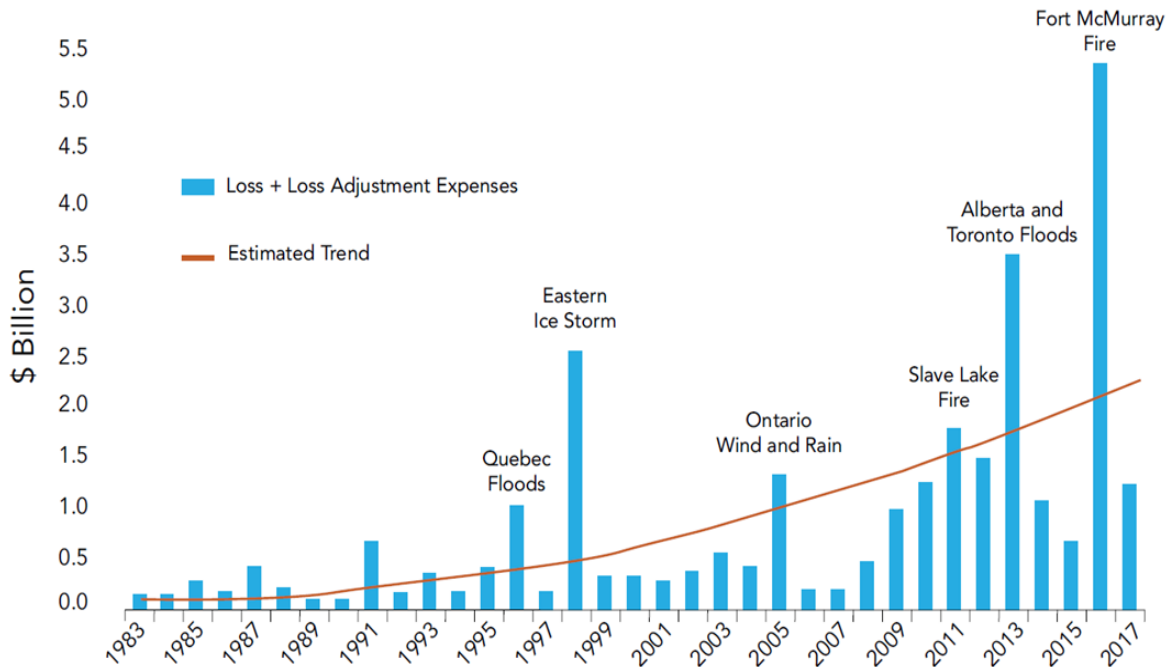
- Canada warming twice as much as the rest of the world
- An extreme once in 20 years event projected to become once in 5 year event by late century under the high emission scenario
- Once in 50 years event projected to occur once in 10 years by late century under a high emission scenario
- Precipitation levels have increased 20% since 1948



# Climate Change & Insured Damage

Total of \$2.4 Billion in 2020

Date (2020)	Top Insured Weather Events	Losses
January	BC Rainstorm	\$42 million
April-May	Fort McMurray Flooding	\$562 million
June	Calgary Hailstorm	\$1.3 billion
July & August	Central and Southern Alberta Storms	\$221 million





## Climate Change

## Annual Mean

Temperature Increase (1948-2016)

1.9°C

Projected Temperature increase by 2100

5.2°C

Precipitation Change (1948-2012)

5% (-9% in winter)

Projected Precipitation Change by 2100

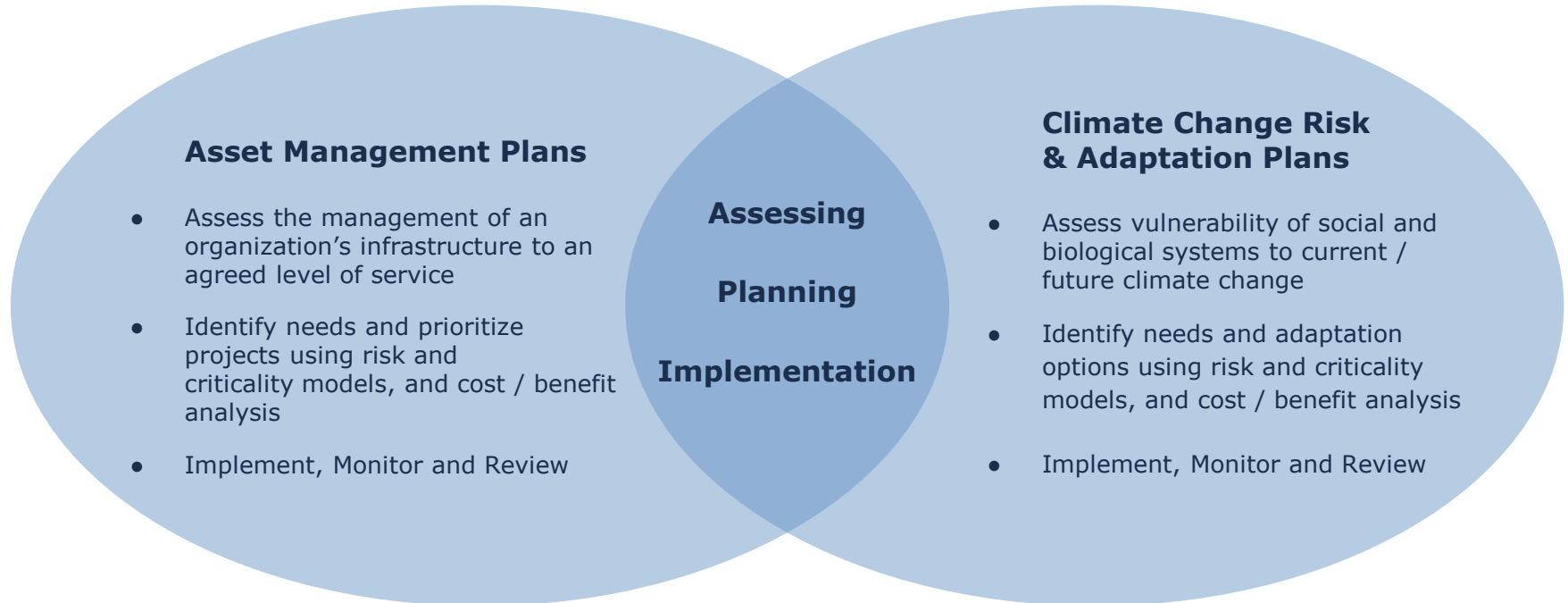
13.8%

Likely to Occur Extreme Events

Drought, Wildfires, Flooding,  
Coastal erosion  
Heavy winds

# Aligning A.M. with Climate Change Adaptation

Planning for sustainable communities



# Types of Climate Change Adaptation Plan

- Community Plan
  - Health / Energy / Food Security / Agriculture
- Corporate Plan
  - Health / Community Services / Public Works
- Individual Sector Specific Plan
  - Health / Agriculture / **Infrastructure**





# Plan vs. Program

- An adaptation plan is a great start
- However, a Plan typically has finite timelines aimed at a specific goal or outcome
- A program will instead achieve a set of enduring behaviours and practices that continue, into the future
- Asset Management as a discipline provides the perfect framework for an adaptation program



# Typical Asset Management Roadmap

## Assess

### A.M. Policy

- A.M. Objectives
- Endorsement

### Governance & Structure

- Roles & Responsibilities
- Internal Structure

### AM Strategy

- Current assessment
- Roadmap for the future

## Plan

### Key Data Initiatives

- Data Gaps
- Collection & Enrichment

### Condition Assessments

- Industry Standard Techniques

### Key A.M. Processes

- Risk Assessment
- Life Cycle Management
- Level of Service

## Implement

### Execute

- AM Plans
- Short / Long Term Budgets

### Monitor and Review

- Benchmarks & KPIs
- Levels of Service

### Communication

- Continual

# Asset Management 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 and/or Environmental staff
  - ▶ Include the Integration of climate change adaptation
- A course of action and/or principles
- Alignment to organizational objectives and goals
  - ▶ Include reference to other plans or policies, and board, executive, or council directives with climate change considerations

# Developing the Asset Management Strategy

## Assess current state

- Analyse Current AM practices
- Include Current Climate Adaptation practices
- Identify key gaps

## Define a practical, achievable future state

- Review best practices
- Identify feasible and impactful changes
- Build consensus for proposed changes

## Develop strategy to reach future state

- Develop a path with targets
- Outline specific initiatives, tasks, and timelines & ownership

# Key Components to Review and Action

(include the climate lens)



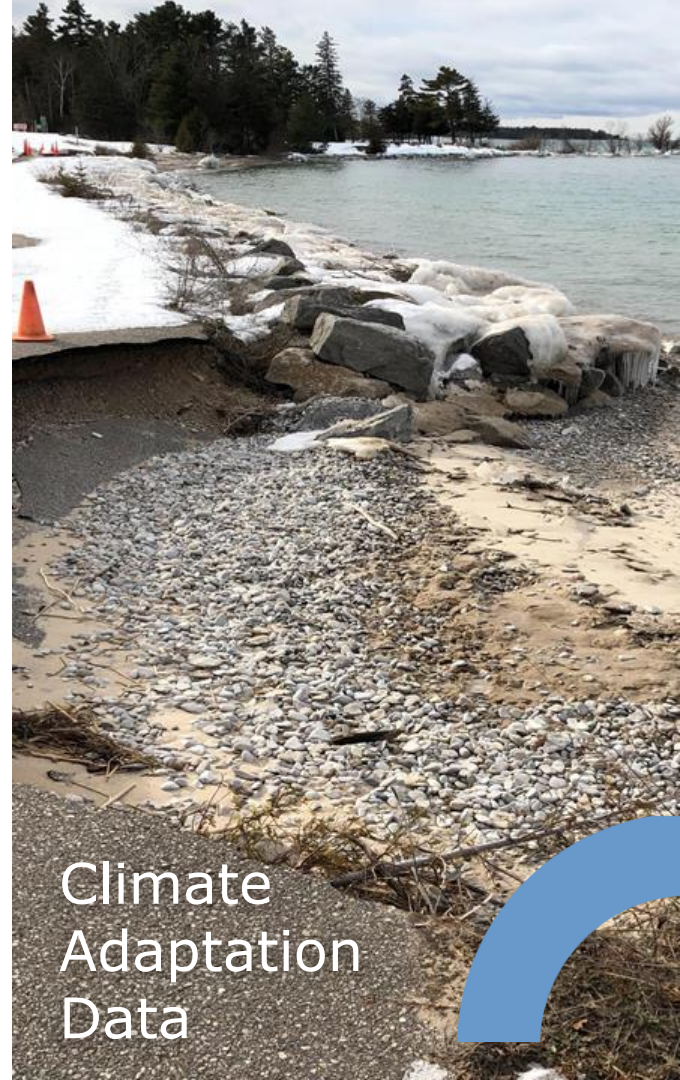
# Asset Data and Information

- Is data centralized or siloed
- Analyze database structures, hierarchies, and industry standardization
- Analyze consistency, completeness & currency
- Analyze costing and valuation data
- Data sharing and associated processes
- What data gap exists (e.g. condition data)
- Analyze data governance & maintenance processes



# Historical Climate Data

- Average temperatures
- Precipitation levels
- Water levels (i.e., ocean, lake, and river levels)



Climate  
Adaptation  
Data

# Extreme Event Analysis

- Past Extreme Events (e.g., flooding, fires, storms)
- Documented geographical impacts
- Documented impacts on infrastructure types
- Overall event costs



Climate  
Adaptation  
Data



# Future Climate Data

- Projected temperatures
- Projected precipitation levels
- Water levels (i.e., ocean, lake, and river levels)
- Likely Reoccurrence of Events and Extreme Events



Climate  
Adaptation  
Data

# Include an Inventory of Natural & Green Infrastructure

What?

- Wetlands / Forests / Aquifers / Parks / Lakes / Rivers / Streams, Urban Trees, etc

Why?

- Provide vital services equivalent to engineered assets
- Often more resilient and adaptable to climate change
- Ultimately can save operating and capital dollars



Climate  
Adaptation  
Data

# Condition Assessment Data

## Condition Assessment Program Analysis

- Type of capture
  - Field check or road patrol
  - Industry Standard Assessments
  - Detailed studies or reports (RNS)
- Cycle of Capture
- Type of Index or reporting format



# AM – The Collection of Asset Performance Data

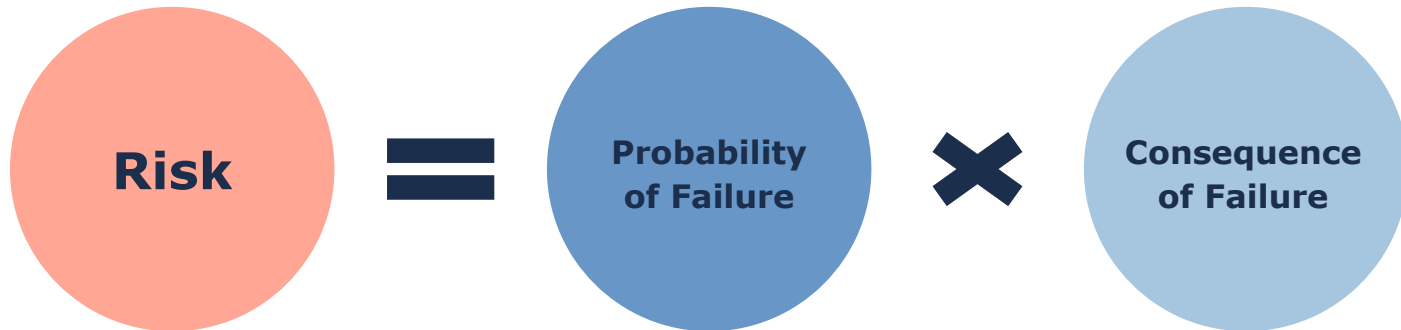
## Incorporating Climate Change Considerations

- No longer just Asset Condition data
- What about Information regarding Exposure, Vulnerability and Resilience to Climate Change
- Other Functional & Capacity related data



# Risk Management

- Use Risk Management processes to prioritize infrastructure projects and programs
- Definition (ISO 31000):
  - “The effect of uncertainty on objectives”



# Probability vs Consequence

## Probability of Failure

- Consumed life
- Condition
  - Age Based
  - Internal Cursory Approach
  - Internal Intermediate Approach
  - Comprehensive Study or Structural Assessment
- Other Contributors to Failure
  - AADT
  - Commercial Traffic
  - Sub Terrain Base

Triple  
Bottom  
Line



## Consequence of Failure

- Economic
- Social
- Environmental
- Operational
- Health & Safety
- Strategic

# Climate Risk Assessment Approach

A typical risk assessment approach takes account of four major conceptual factors in assessing climate change impact and adaptation:

## Exposure

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

## Vulnerability

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

## Resilience

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

## Adaptation

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



# Incorporating Climate Change Considerations

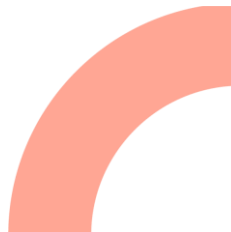
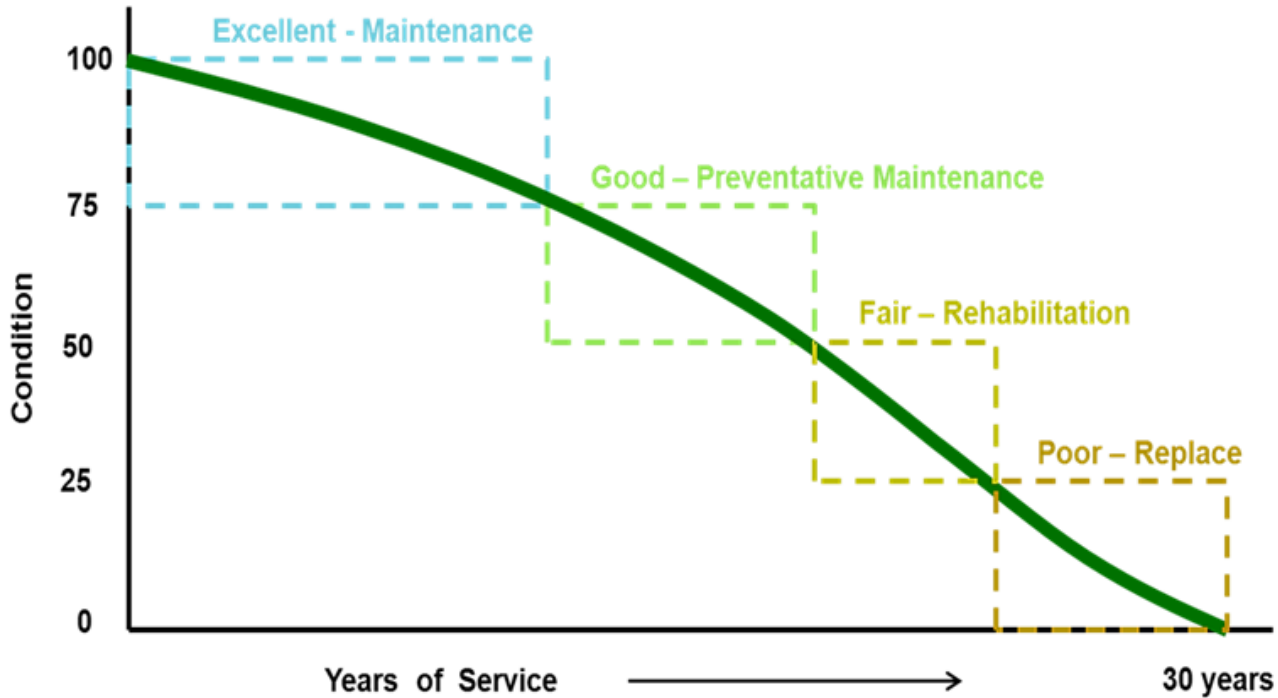
**Risk** = Probability of Failure **X** Consequence of Failure

Exposure & Vulnerability    Resilience & Adaptation





# Life Cycle Management Framework



# Climate Adaptation Considerations

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

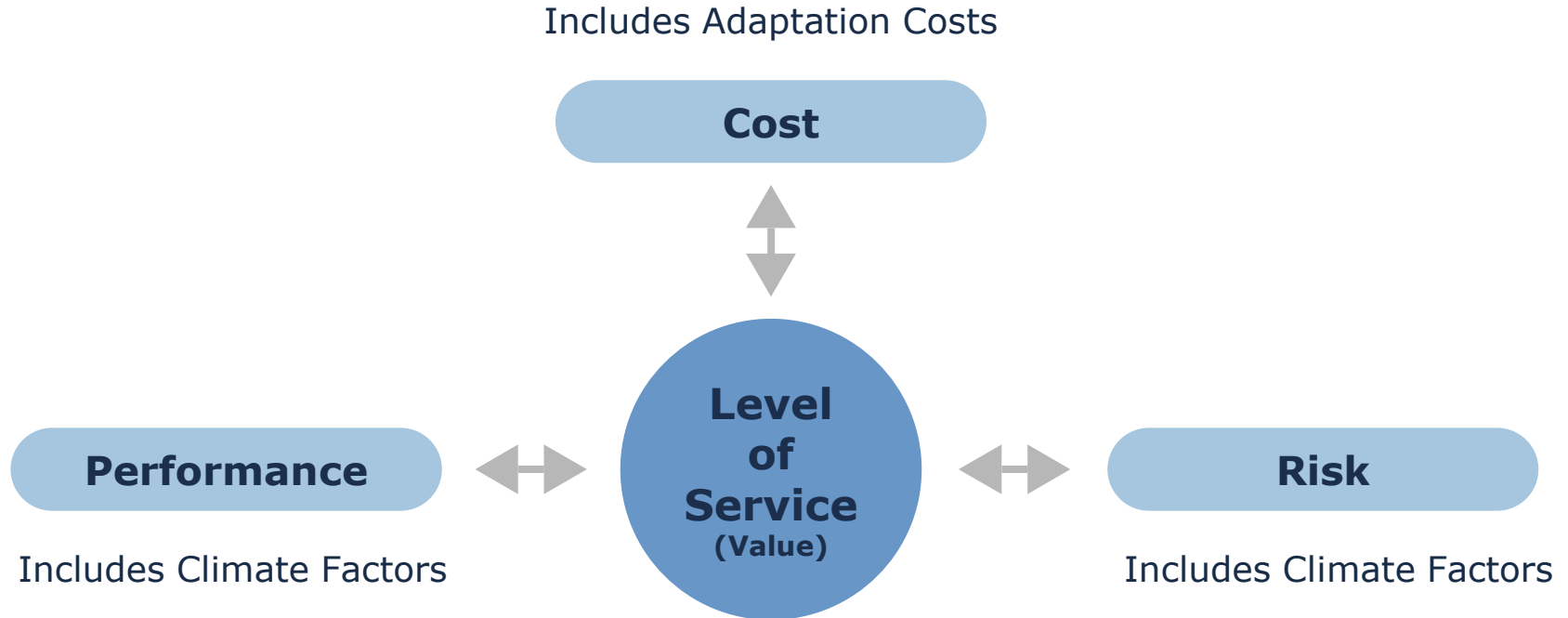
Due to Climate Variability and Extreme Events:

- 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



# Establishing Levels of Service



# Measuring Levels of Service

- Centralized performance measurement program
- Develop a framework for tracking and evaluating levels of service
- Start with high-level service indicators (Cost, Performance, Risk)
  - Work towards technical levels of service

**Cost**

**Performance**

**Risk**

Asset Class	Annual Asset Class Reinvestment Rate	Condition	Risk	Level of Service Trend																														
Road Network	<p>Annual Asset Class Reinvestment Rate</p> <table border="1"> <tr> <th>Rate Type</th> <th>Value</th> </tr> <tr> <td>Current Reinvestment Rate</td> <td>2.21%</td> </tr> <tr> <td>Target Reinvestment Rate</td> <td>3.87%</td> </tr> </table>	Rate Type	Value	Current Reinvestment Rate	2.21%	Target Reinvestment Rate	3.87%	<p>Condition</p> <table border="1"> <tr> <th>Condition</th> <th>Percentage</th> </tr> <tr> <td>Very Good</td> <td>17%</td> </tr> <tr> <td>Good</td> <td>46%</td> </tr> <tr> <td>Fair</td> <td>11%</td> </tr> <tr> <td>Poor</td> <td>4%</td> </tr> <tr> <td>Very Poor</td> <td>21%</td> </tr> </table>	Condition	Percentage	Very Good	17%	Good	46%	Fair	11%	Poor	4%	Very Poor	21%	<p>Risk</p> <table border="1"> <tr> <th>Risk Level</th> <th>Percentage</th> </tr> <tr> <td>Very High</td> <td>2%</td> </tr> <tr> <td>High</td> <td>6%</td> </tr> <tr> <td>Moderate</td> <td>36%</td> </tr> <tr> <td>Low</td> <td>43%</td> </tr> <tr> <td>Very Low</td> <td>13%</td> </tr> </table>	Risk Level	Percentage	Very High	2%	High	6%	Moderate	36%	Low	43%	Very Low	13%	<p>Level of Service Trend</p>
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# Execute

- Financial Strategy:
  - Replacement Cost Quantification
  - Full Life Cycle Cost of Ownership
  - Approved Short- and Long-Term Budgets
  - Defined Levels of Service
- Asset Management Plan
- Continuously, through the AM Program



# Benefits of an Asset Management Program

(including climate considerations)

**V** - ensures assets provide **V**alue to the organization & community

**A** - provides **A**lignment (clear line of sight) & coordinated activities

**L** - ensures **L**eadership and commitment

**U** - ass**U**rance of program development and delivery

**E** - ensures an **E**ffective and **E**fficient Management program across the organization





# Questions?

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