

Asset Management Fundamentals Webinar Series

The Association of Municipalities of Ontario (AMO) entered into an Agreement with FCM to work directly with municipalities to make progress in asset management. AMO engaged Asset Management Ontario (AMONTario) in this initiative.

The initiative is delivered through the Municipal Asset Management Program, which is delivered by the Federation of Canadian Municipalities and funded by the Government of Canada.

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Using Risk Assessments to Identify Local Priorities

February 20, 2020

Today's Objectives

- To illustrate the important role of risk management in asset management
- To discuss the application & integration of risk management from the individual assets to the organization's infrastructure portfolio
 - Understanding risks at all levels of the organization
- To illustrate the use of processes & tools make asset risk management work in your municipality



Prerequisites to Asset Risk Management

 The Association of Municipalities of Ontario's Asset Management Webinar Series progresses through the prerequisites necessary to prepare a municipality to undertake asset risk management:

Webinar #1: *Developing an Asset Management Governance Structure*

 Creates the organizational leadership & stakeholders structure necessary to develop & implement an organizational asset risk management framework



Prerequisites to Asset Risk Management

Webinar #2: Establishing Asset Hierarchy and Performing Data Gap Analysis

 Creates the necessary hierarchal relationship between assets & services & having the right data upon which to conduct integrated risk management at all levels of the organization

Webinar #3: Understanding Levels of Service

 Outlines the relationship between community services, asset levels of service & asset risks in order to provide sustainable service outcomes



Definition: Risk

"Effect of uncertainty on objectives" ISO 31000

- Risk can never be eliminated only managed
- Leadership & Council determines the appetite & tolerance for risk.
 - Are we willing to pursue the objective? (appetite)
 - How much <u>uncertainty</u> are we willing to accept in pursuit of the objective? (tolerance)





Why is Asset Risk Management Important?

- To better understand the state of the infrastructure
- To understand the organization's service & asset vulnerabilities
- To help establish reasonable & sustainable levels of service targets
- To inform contingency plans & emergency standard operating procedures
- To provide evidence for establishing asset priorities



AM Plan vs Capital Plan

Asset Management Plan (should do)

A full plan of <u>all</u> capital requirements to achieve corporate service objectives that includes total asset needs, priorities & costs Capital Plan (can do)

The plan of what is <u>feasible</u> to achieve within the constraints of available resources (human, technical, financial, time)

Asset risk assessments help to prioritize asset management actions within constrained resources



Risk can lead to opportunity!

- Can promote flexible solutions
 - e.g. Accept higher risk of water service interruptions & customer complaints to maintain sustainable water rates

Risk Options	Risks	Opportunities
Extend replacement age of watermains by 10 years	 More breaks/km Higher operating \$ More service interruptions More complaints 	 Reduced capital costs Greater overall savings Maintain sustainable water rates
Provide a discount on water rates to customers who experience an increase in water service interruptions	 Reduced revenues Higher operating \$ Complaints not mitigated 	 The potential capital cost savings substantially offset potential revenue & operating losses Maintain sustainable water rates

Options to Treat Asset Risks

<u>Avoid</u>

- E.g.: Avoid providing the service
 - Generally not an option for public service organizations
- Avoid <u>unrealistic</u> service objectives
 - E.g.: <u>No</u> flooding during intense storms

Accept & Mitigate

- Share
 - Outsource to 3rd party
- Transfer
 - Insurance
- Manage
 - Asset levels of service
 - Incidence response planning & procedures
 - Demand management



Definition: Enterprise Risk Management

"A structured, continuous process across an entire organization to identify, assess and respond to threats and opportunities related to the achievement of objectives"

- ERM is a consistent, objective, evidence-based approach to decide organizational priorities across multiple asset types & services
- ERM includes an organizational framework, policy, governance structure, formal processes & practices



Why adopt an ERM philosophy?

- A municipality is an enterprise of different services, infrastructure & risks
- Therefore, assets & risks should not be evaluated in "silos"
- Staff can begin a successful corporate asset risk management program ahead of implementing full ERM
 - The key is to have consistency in risk assessment processes
 & the use of tools across the entire asset portfolio



Applying an ERM Process to Asset Management

Are the ALOS targets suitable? What are the risks to services due to failing assets?

Assess the

Risks

Objectives The service objectives & Conn & ALC community service expectations to Servi

ID Municipal



Connect related assets & ALOS targets to the Services (per the Asset to Service Hierarchy)

Highest Asset & Service Risks = Highest Asset Priorities

e.g. Replace, upgrade or add assets, change service levels etc.

Plan responses

Prioritize the Assets



The Risk Management Hierarchy



Risk on the Asset Hierarchy



Developing & Implementing Organizational Asset Risk Management



Developing Organizational Risk Management

Strategic

Insights

Tactical

Insights

- Risk management requires the expertise & input of the AM stakeholders:
 - Council
 - Senior leadership
 - Finance
 - Infrastructure & Land Use Planning
 - Engineering
 - Operations
 - Service Providers





In the context of asset risk management:

- Asset criticality = Consequence of failure
- ALOS controls the asset likelihood of failure





Meeting/exceeding ALOS targets = **Acceptable Risk**

The ALOS RISK Relationship







Asset LOS Types

LOS Type	Description	Examples	Planning Outcomes
Condition/ Integrity	Measures that assess the physical state of the asset	Condition indices & severity measures of cracks, collapses, breaks, wear, etc.	Capital projects to rehabilitate or replace assets
Performance/ Functionality	Measures of adequacy, efficiency and appearance	Capacity, speed, volume, size, lighting, temperature, AODA, signage, finishes, change adaptability, backup capacity, etc.	Capital projects that add, upgrade or reconfigure assets



Developing Risk Assessment Measures & Tools

- Consequences should measure impacts to:
 - Health & Safety (both public & employee)
 - Environment
 - Community
 - Finances
 - Reputation



- condition of the asset
- ability to perform adequately
- adequate capacity/backup capacity/resiliency
- The risk assessment measures & tools should be designed to have flexibility to evaluate risk to all asset classes & situations





AMONTario Consequence Table (Part 1)

Consequence Ratings *								
Category & Description			Severity Range					
oulegoly a Description	Very Low Low		Medium	High	Very High			
Health & Safety	1	2	3	4	5			
Includes both the public and municipal staff and considers potential mental and physical injury, illness and loss of life resulting from asset failure, loss or misuse.	 Incident without injury Minor illness No medical attention required 	- Minor injury that requires first aid treatment - Illness	 Injuries or affects to health. Short-term disability Hospitalization for a short period of time. 	 Extensive injuries or affects to health affecting one or more individuals. Possible death of an individual. Long term disabilities Long-term hospitalization required for one or more individuals. 	 Death or multiple deaths Permanent disabilities. Long-term hospitalization required for several or many individuals. 			
Community Services	1	2	3	4	5			
The level and time to which the loss of the asset will affect operation of services to the community and also the potential impact to normal functions within the community.	 Minor interruption of services affecting a few customers Affects on nonessential lasting for up to a few hours. Loss of minor assets for a few hours No impact/change to operating procedures 	 Isolated service interruption/impairment of services Affects on nonessential services for less than 1 day and/or interruption of essential services for up to a few hours Loss of minor assets for up to a day Minor internal correction to operating procedures may be required 	 Moderate local service interruption/impairment of services Affects on nonessential services for several days and/or interruption of essential services for up to 1 day Loss of minor assets for up to a week and/or loss of major assets for up to a day Review and corrections to internal operating procedures are required and internal reports issued 	 Significant widespread interruption/impairment of services Affects on nonessential services for a few weeks and up to several days for essential services. Loss of major assets for several days A significant compliance breach resulting in reviews by external monitoring agencies and corrective orders being issued Major internal corrective actions to operating procedures are required. 	 Major Community/Town/City- wide interruption/impairment of services Affects on nonessential services for several weeks and a week or more for essential services. Loss of major assets for several weeks Major compliance breach resulting in sanctioning or removal of operating licence Prosecution and long-term takeover of operations by external agencies. Extensive internal corrective actions to operating procedures are required. 			



AMONTario Consequence Table (Part 2)

Consequence Ratings *								
Severity Range								
Very Low	Very Low Low		High	Very High				
1	2	3	4	5				
 No or very minor loss that can be refinanced from available capital/operating funds Financing can be authorized without need for Council approval 	 Minor losses requiring refinancing from available capital/operating funds in the approved operating budget or capital budget Financing requires Council approval 	 Moderate losses requiring additional financing from capital reserves and/or refinancing of the approved capital or operating budget possibly resulting in delays or reductions of other approved works. Financing requires Council review of budget commitments and some adjustments to the approved capital or operating budget 	 Major losses requiring significant financing from capital reserves and/or cancellation of approved capital projects or operational works in order to refinance losses Significant refinancing adjustments to the annual capital and/or operating budgets and plans requiring Council approval Some changes in revenue or debt may be incurred to refinance the losses. 	- Extensive losses requiring major financing from the capital reserves and/or project cancellations, reduced operations and multi-year refinancing adjustments to the capital and/or operating budgets and plans. - Changes in revenue and/or debt is required to refinance the losses.				
1	2	3	4	5				
- Very negligible or no impact. - Reversible within 1 week.	- Minor, short-term impact (< 6 months) affecting an isolated area of the environment.	 Moderate, medium-term (< 1 year) impacts affecting a localized area of the environment Potential for some fines 	 Major, long-term (> 1 year) impacts affecting a significant area of the environment Major fines. 	 Serious, long term (> 2 years) or permanent impacts affecting a widespread area of the environment Extensive fines. 				
1	2	3	4	5				
 No media attention No community concern. No changes in public trust and confidence of staff and Council 	 Some social media attention Minor community concern Minor short-term negative opinion and minor loss of public trust and confidence of staff and Council limited to a small group of people. Some complaints to and intervention by a local Councillor 	 Some local Media exposure lasting for several days Some community concern and discussion Short-term negative opinion and some loss of public trust and confidence of staff and Council. Some financial settlements or compensation may be required Council is informed of the issues and is involved in discussions and resolutions. 	 Intense local media exposure and/or some regional-wide exposure lasting several weeks. Significant long-term loss of public trust and confidence in staff and Council Potential for criminal charges against staff or a Council official. Calls for public meetings and/or change of a Senior official. 	 Significant regional or national exposure lasting several days of weeks. Major long-term or permanen changes in public trust and confidence in staff and Council - Criminal charges against the Corporation and staff and/or . Council official(s) Independent public inquiry is necessary. Public outcry for change in Council/Senior Managers. 				
	Very Low 1 - No or very minor loss that can be refinanced from available capital/operating funds - Financing can be authorized without need for Council approval 1 - Very negligible or no impact. - Reversible within 1 week. 1 - No media attention - No community concern. - No changes in public trust and confidence of staff and Council	Very Low Low 1 2 - No or very minor loss that can be refinanced from available capital/operating funds - Minor losses requiring refinancing from available capital/operating funds in the approved operating budget or capital budget - Financing can be authorized without need for Council approval - Minor losses requiring refinancing from available capital/operating budget or capital budget 1 2 - Financing requires Council approval - Financing requires Council approval 1 2 - Very negligible or no impact. - Reversible within 1 week. - Minor, short-term impact (< 6 months) affecting an isolated area of the environment. 1 2 - No media attention - No community concern. - No changes in public trust and confidence of staff and Council - Some social media attention - Minor short-term negative opinion and minor loss of public trust and confidence of staff and Council limited to a small group of people. - Some complaints to and intervention by a local Councillor	Very Low Low Medium 1 2 3 - No or very minor loss that can be refinanced from available capital/operating funds - Minor losses requiring refinancing from available capital/operating funds in the approved operating budget or capital budget - Moderate losses requiring additional financing from capital reserves and/or refinancing from capital resulting in delays or reductions of other approved works. - Financing requires Council approval - Minor, short-term impact (< 6 months) affecting an isolated area of the environment. - Moderate, medium-term (< 1 year) impacts affecting a localized area of the environment - Very negligible or no impact. - Minor, short-term impact (< 6 months) affecting an isolated area of the environment. - Moderate, medium-term (< 1 year) impacts affecting a localized area of the environment - No media attention - No community concern. - Some social media attention - Minor community concern - Minor short-term negative or function and minor loss of public trust and confidence of staff and Council intervention by a local Councillor - Some local Media exposure lasting for several days - Some complaints to and intervention by a local Councillor - Some financial settlements or compensation may be required - Council is informed of the issues and is involved in discussion and resolutions.	Very Low Low Median High 1 2 3 4 - No or very minor loss that can be refinanced from available capital/operating funds - More losses requiring refinancing from available capital/operating budget or capital budget - Moderate losses requiring additional financing from capital reserves and/or refinancing or the approved capital poresity resulting nedays or reductions - Major losses requiring significant financing from capital approved capital operating budget or capital budget - Major losses requiring significant financing from capital approved capital operating budget or capital budget - Major losses requiring significant financing from capital approved capital por capital budget - Major losses requiring significant financing from capital approved capital proved capital proved capital budget - Major losses requiring capital budget - Major losses requiring capital budget - Significant financing adjustments to the approved capital proved capital and/or operating budget - Significant financing capital budget - Significant financing capital and/or operating budget - Significant financing capital budget - Significant financing capital budget - Some changes in revenue or deproved - Major, long-				

* Municipalities may choose to amend ranges and descriptions for each consequence

AMONTario Likelihood Table

MONTario

ASSET MANAGEMENT ONTARIO

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Likelihood	Asset or Asset Class Evaluation ^{1, 2}	Score
Very Unlikely < 10%	Asset or almost all assets: - Very good condition - May be new or almost new (say >80% remaining useful service life ³) OR Failure to meet service requirements is not expected to at least beyond 20 years ⁴ - Functionality/capacity/resiliency meets or exceeds current service requirements - Full back-up systems/capacity in place to fully meet or exceed minimum back-up/emergency requirements - May have adequacy for future demands and/or be resilient to estimated impacts of climate change	1
Unlikely 10% - 30%	Asset or most assets: - Good condition - Greater than half of remaining useful service life (say 60% - 80% ³) OR Failure to meet service requirements possible within 20 years but unlikely with 10 years ⁴ - Functionality/capacity/resiliency fully meets current service requirements - Full back-up systems/capacity in place to meet minimum back-up/emergency requirements	2
Possible 30% - 50%	 Asset or many assets: Fair condition About half or less than half of remaining useful service life (say 40% -60%³) OR Failure to meet service requirements likely within 10 years and possible within 5 years⁴. Functionality/capacity/resiliency meets most minimum service requirements with possible limited/reduced efficiency Partial (>50%) back-up systems/capacity in place to meet minimum back-up/emergency requirements 	3
Likely 50% - 90%	Asset or most assets: - Poor condition - Near end of remaining useful service life (say <40% ³) OR Failure to meet service requirements likely within 5 years and possible within 1 year ⁴ - Functionality/capacity/resiliency periodically below or significantly less than minimum service requirements. - Minimal (between 25% and 50%) back-up systems/capacity in place to meet minimum back- up/emergency requirements	4
Very Likely >90%	Asset or almost all assets: - Very poor condition - At or beyond remaining useful service life and/or failure to meet service requirements very likely within 1 year or possibly failed. - Functionality/capacity/resiliency periodically or completely falls below minimum service requirements - Very little (<25%) or no-back up systems/capacity in place to meet minimum back- up/emergency requirements	5

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Typical Heat Map – Ranking the Risks





The AMONTario Risk Model





5-Step Asset Risk Assessment Process



AMONTARIO ASSET MANAGEMENT ONTARIO

CoF = Consequence of Failure LoF = Likelihood of Failure

The AMONTario Risk Model

Service and Asset Information	Consequences				Likelihoods [*]				Analysis		
Town Water, Sewers & Roads	Health & Safety	Community	Financial	Environment	Reputation	Total Consequence	Target Likelihood (Based on desired ALOS)	Residual (Target) Risk	Current Likelihood (Based on Current ALOS)	Current Risk	Variance from Residual (Target) Risk
3 Pumping Stations (Total 3 Stations)	4	4	3	2	3	16					
Mechanical and electrical systems shall be maintained at no le	ess than a	General Ra	ating of "G	iood" (Cur	rent = Fair)	2	32	3	48	-33.3%
Back up power supply for critical systems - Target ALOS=Fully Meets (Current = 35%/Marginally Meets)						2	32	4	64	-50.0%	
Full back up power generation capacity for critical systems - Ta	arget ALOS	S=Fully Me	ets (Curre	nt= <50%/	Marginall	y Meets)	2	32	4	64	-50.0%
Pumping station (firm) capacity meets MOE "Design Guideline	es for Drin	king-wate	r Systems	-Target AL	OS=Yes (Y	es)	2	32	2	32	0.0%
The condition of the Pumping Station building shall be mainta	ined at a i	minimum	FCI of 10%	(Current l	-CI = 7%)		3	48	3	48	0.0%
Asset Class								35.2		<u>51.2</u>	-31.3%
Pumping Station Properties (Total 3 Properties) 2 2 2 1 2 9						2	27	F	45	40.0%	
The condition of the Pumping Station property shall be maintained at a minimum of "Fair" (Current = Very Poor)						3	27.0	5	45	-40.0%	
2 Feedermans	4	4	3	3	3	17		2/10		-1510	-101070
Feedermains will be replaced after 2 breaks (Current system a	average =1	break)					2	34	3	51	-33.3%
0 breaks (Very Good) - Likelihood = 1							0		0		
1 - 2 breaks (Good)- Likelihood = 2								0		0	
3 breaks (Fair) Likehood = 3							0		0		
4 breaks (Poor) likelihood = 4						0		0			
>4 breaks (Very Poor) Likelihood = 5						0		0			
Asset Class						34.0		51.0	-33.3%		
Sanitary Sewers	3	3	3	3	3	15					
Sanitary sewers will be maintained at a minimum PACP of 3 (Current system average = 4).						2	30	4	60	-50.0%	
Asset Class							30.0		60.0	-50.0%	

Conclusions

- Risk management is a mix of art & science
 - More data more science
 - Less data more art
 - Not always perfect: a gauge of organizational priorities
- Risk is never certain
 - Many, many variables
- Anticipating risk is not perfect!
 - Its about making best efforts to reduce the uncertainties
- Risk is dynamic:
 - Changes with asset age/technology
 - Unforeseen/emerging new threats (e.g. climate change)
- Risk Management advances the discussion from "Where are we?" to "Where do we go?"



Lessons Learned in the Pilot Project

- Many municipalities don't have good data on current & target levels of service to conduct risk assessments
- Municipalities need to expand on the consequences of an asset failure on services (e.g. use community, environment, financial, health & safety, reputation measures)
- Municipalities need to build cross-functional input (finance, public works, legal, planning, senior management) to determine service consequences due to asset failure
- Assets risk needs to be consistent across the different asset classes and across the assets within each asset class
- A formal risk assessment process can seem daunting but will lead to better informed decision-making for Council



Questions?





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