

Asset Management for Sustainable Infrastructure (AMSI) at the University of Calgary

2022 Update

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The AMSI Purpose

- Create a pool of “AM-aware” graduates to meet the demand for Highly Qualified Professionals (HQP) in the Infrastructure Asset Management industry
- Supply university-level, post-graduate training to working professionals seeking to upgrade / refine their skills in emerging topics
- Create academic capacity to support developments in AM theory and policy, assist in standards creation, and complete directed industrial research



BUILDING AN ASSET MANAGEMENT ACADEMIC ECOSYSTEM

Exposure to AM education & career opportunities at undergraduate level through speaking opportunities in other multi-disciplinary courses



Other related courses
Finance, Design, Comp Sci., Etc.

AM-specific course offerings

“Core”

“Specialized”

Open Studies (non-certificate)



WORKING PROFESSIONALS



STUDENTS

Thesis-based graduate students (M.Sc / Ph.D) [2 / 4 years, 4 courses]



Course-based masters students (M.Eng) [10 courses]



Graduate certificate students [4 courses]



Part-time Studies



GUEST LECTURES



CAPSTONE PROJECTS

RESEARCH FACULTY



NEW RESEARCHERS

RESEARCH PROJECTS

3 month (one semester)



Targeted Research Project (~6mo – 1 yr)



Generalized Research (>1 yr)



ADVISORY SUPPORT

Standards Development



Communications / Papers



Committee Administration



TRAINED LABOUR POOL

INDUSTRIAL EXPERTISE
FUNDING SUPPORT

IP / TECHNOLOGY
BODY OF KNOWLEDGE

MATCHING FUNDS

ECONOMIC DEVELOPMENT
SUSTAINABILITY GOALS

INDUSTRIAL PARTNERS



GOVERNMENT FUNDING

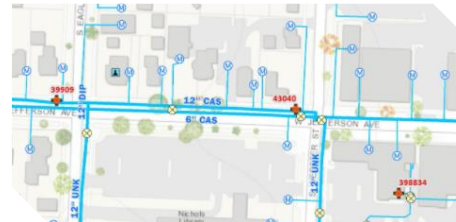
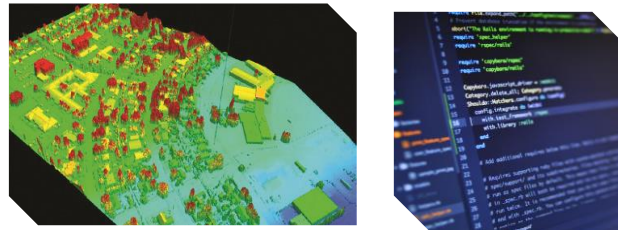
AMSI Areas of Focus

Sensors and Data



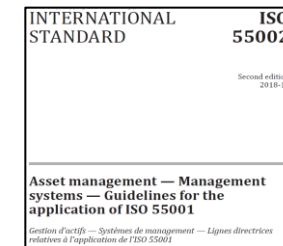
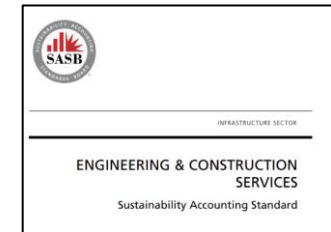
Good data underpins good decision making. A key aspect of AMSI is leveraging emerging sensors and systems (like 3D scanners and Internet-of-Things embedded sensors) to generate massive amounts of high-quality data on the condition and usage of infrastructure systems.

Software and Analytics



Data becomes truly useful when you can turn it into insights. AMSI seeks to optimize risk-weighted full-lifecycle impacts of acquiring and operating infrastructure. Data-driven analytics leverages technologies like machine learning and visualization to make sense of the reams of raw data collected.

Policy and Processes



Policy drives process. Infrastructure exists to serve customers and communities. Policy frameworks establish rules linking service outcomes to technical requirements, while strategic plans and robust processes ensure that activities are properly aligned to stakeholder objectives.

Sample Curriculum

Fundamentals of Asset Management and Sustainability

Currently Available as of Q3 2021

- Rationale for AM
- Role of organizations in service delivery
- Role of assets in supporting service delivery
- Establishing stakeholder values and customer / technical levels-of-service
- Risk management, demand modelling and climate resiliency Asset lifecycle activities
- Designing asset inventory frameworks and establishing asset value and expected life
- Condition assessment and performance monitoring principles
- IAP2 and Stakeholder Engagement
- Sustainable Design, Natural Assets and Envision
- Lifecycle cost modelling and optimization
- Bringing components together in an Asset Management Plan
- Asset management through a First Nations context

Advanced Topics in Asset Management – Strategy and Financial

In progress. Q2 2022 availability

- Tying Asset Management to Strategic Planning through Strategic Asset Management Plans (SAMP)
- Developing Asset Management Policy
- Assessing Asset Management Organizational Readiness and Change Management
- Assessing ISO 55 000 compliance

- Financial reporting basics – income/expense/depreciation/valuation
- PSAB 3150, IFRS and GAAP for asset management
- Accounting for natural assets
- ESG Reporting inc. International Sustainability Standards Board requirements

Database and Software Design for Asset Management

- Database design for Asset Management
- Geographic Information System applications
- Work order management Systems
- Designing performance measurement systems – tying data to outcomes
- Sensors & IoT
- Data Analytics and Machine Learning

Advanced Asset Risk Management

- Risk management process under ISO 31 000
- Failure mode and effects assessment
- Probability and statistics for risk management, Weibull analysis
- Designing asset intervention levels from risk, level-of-service and expected life

Lifecycle Modelling and Reliability ...

ESG considerations in Asset Management Frameworks...

“Fundamentals” Term Project

“Based on the citizen input provided via 311 calls, develop an *asset-backed service* around providing outdoor cooking amenities ...”

Project involved:

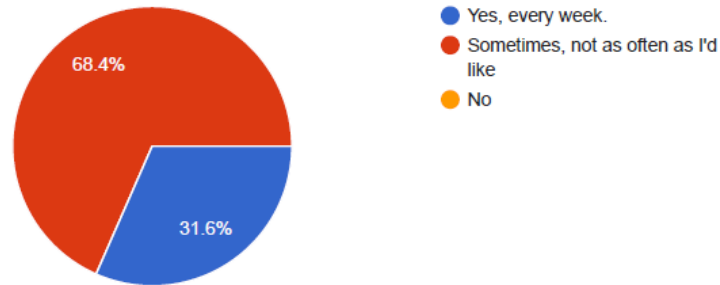
- Reviewing existing solutions in other jurisdictions
- Establishing Levels-of-Service (Customer + Technical) & Demand Modelling
- Defining an appropriate Risk Policy & evaluating critical risks
- Lifecycle Modelling (Acquisition through Disposal)
- AMIS system including inventory + condition inspection



Stakeholder Engagement & LOS

Do you frequently visit the parks around our island?

19 responses



What excites you most about having access to public barbeques (gathering with friends)?

16 responses

convenience

gathering with friend

Finally! I can eat with my friends without my dad hassling me about cleaning his barbeque

Easier to social distance with a big group

Ability to cook outside on a hot day (I live in an apartment without a balcony)

Category	CLOS	Performance Measure(s)
Availability	Grills should be available during park hours	Monitor 311 complaints about issues related to the availability of grills.
Accessibility	By-laws, regulations, and instructions on the usage of grills and fire extinguishers are easily accessible to residents through adequate signage and communication.	Signage is consistent with relevant bi-laws, legislations, and regulations. Signage follows the basic principles of universal design to ensure signage is readable to people with diverse abilities. External review by community stakeholders or an accessibility certification program to confirm language and design is accessible to residents.
Capacity	Grills should be sufficiently large to accommodate groups of up to 25 people per booking. Grills should be cleaned such that they allow simple fire building.	Monitor 311 complaints about issues related to the capacity of grills.

Risk Evaluation

Risk Category	Risk Event	Impact on Service Delivery	Mitigation Measure
Direct External	An upset patron begins regularly dumping garbage in the grill fire box.	If the grills are not kept clean such that they facilitate simple building of fires in the firebox, the capacity customer level of service will not be met.	Hire security for the park. Hire person to remove the garbage. Hire temporary staff to remove the garbage.
	A patron deliberately uses a fuel other than charcoal in the grill.	Using a fuel other than charcoal may result in more rapid wear and tear, which could lead to eventually failing to meet the condition, or function levels of service	Invest in more effective signage.
	Groups larger than 25 people try to access the service.	If too many people try to access the service, this may result in increased wear and tear, as well as safety infractions. Therefore, the condition and safety levels of service	Invest in more effective signage. Hire security for the park.

Value	Likelihood Descriptor	Probability of Occurrence	The statistical probability of occurrence within One year
1	Rare	Highly unlikely to occur.	0.02
2	Unlikely	It will most likely not occur.	0.05
3	Probable	Possible to occur.	0.1
4	Likely	Likely to occur.	0.7
5	Very Likely	Most likely/certain to occur.	0.9

Value	Definition	Budget Impact	Service Outage
1	If the event occurs, it will have little to no impact on achieving the project objectives.	< \$45	Customers experience service outage less than 3 hours.
2	If the event occurs, it will have a minor impact on the effect that the project's objectives will be met just above the minimum acceptable level.	< \$60	Customers experience service outage less than 6 hours.
3	If the event occurs, it will have a moderate impact to the effect that the project's objectives will be met at the minimum acceptable level.	< \$ 840	Customers experience service outage less than 1 week.
4	If the event occurs, it will have a severe impact, and one or more (but not all) project objectives will not be achieved.	< \$ 3 360	Customers experience service outage less than 1 month.
5	If the event occurs, it will have a critical impact, and all the objectives of the project will not be achieved.	> \$ 40 320	Numerous deaths.

Budget & Lifecycle Costing

Table 8: Class D Cost Estimate for Asset Acquisition

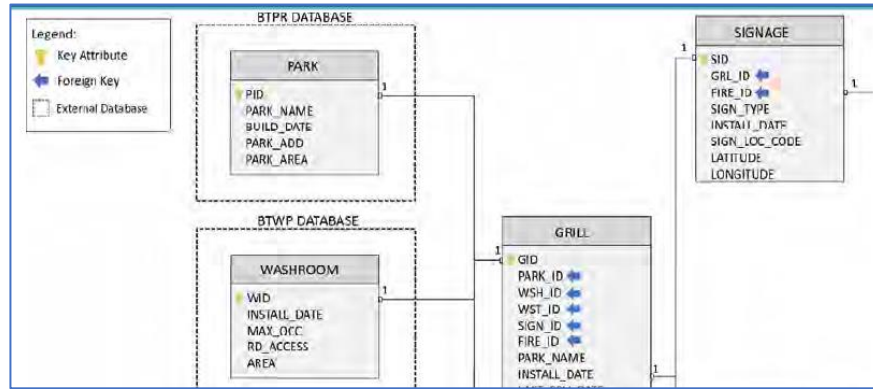
Item	Expected Life	Unit	Quantity	Unit Price	Total Price
Charcoal Barbeque	20 yrs	each	16	\$506	\$8,096
Picnic Table	15 yrs	each	16	\$1,745	\$27,920
Gravel Pad	10 yrs	s.m	64	\$65	\$4,160

Table 9: Yearly Operations and Maintenance Costs

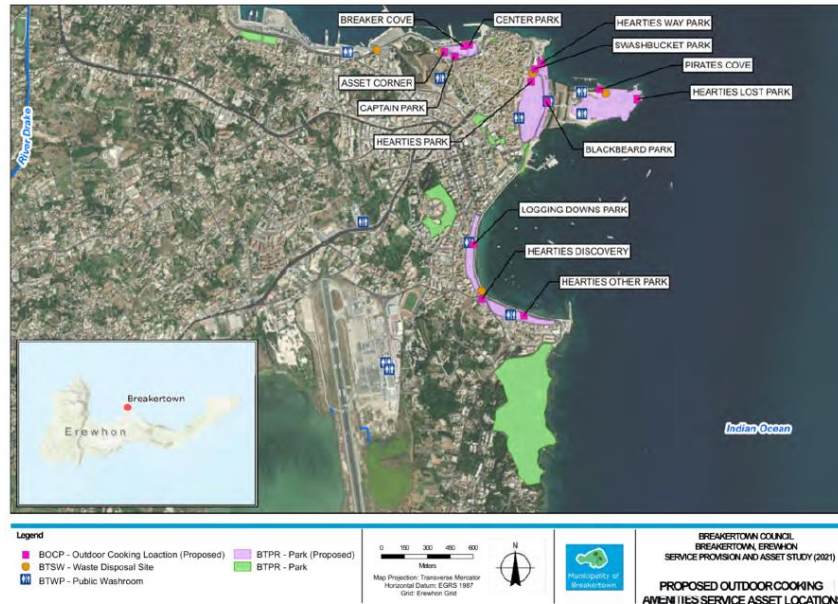
Activity	Unit	Unit Price	Total Price / Year
Park Keeper Wage	0.5hr*16 sites*2 inspections = 16 hours/ year	\$32.50/ hr	\$520
Park Keeper Crew Lead Wage	0.5hr*16 sites*2 inspections = 16 hours/ year	\$42.50/ hr	\$680
Park Personnel Vehicles	2 days per year	\$250/ day	\$500



Asset Management Information System



Component	Meets Goal (5)	(4)	(3)	(2)	Unusable (1)
Grate			0.5cm < Grate Deterioration < 1cm 		
Firebox			Ashes In Grill 		
Firebox			0.5cm < Firebox Deterioration < 1cm 		
Post			Chipped, Coating Loss, Stable 		
Foundation			Chipped, Stable 		



Grill Inspection
<https://arcg.is/1XeCbK>

Fire Extinguisher Inspection
<https://arcg.is/1GHWH>

Signage Inspection

Grill Inspection

Grill ID*

Inspection Date*

Staff Name*

Grate Condition

Firebox Condition

Post Condition

Foundation

Fire Extinguisher Inspection

Extinguisher ID*

Inspection Date*

Staff Name*

Rubber Hose Condition

Rubber Nozzle Condition

Early Condition

Visibility Condition

Signage Inspection

Sign ID*

Inspection Date*

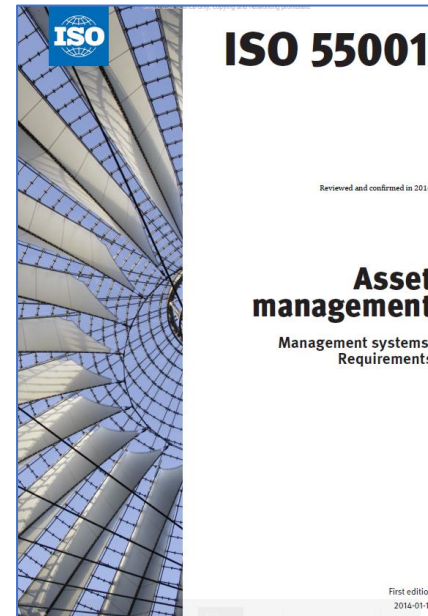
Staff Name*

Sign Post Condition

Foundation Condition

“Strategy and Financial” Projects

- Create an ISO 55000x audit tool
- Audit & Rework an existing AM Policy and SAMP
- Review a series of infrastructure financials & evaluate key sustainability metrics
- Complete an Asset Management Readiness Review



“Strategy & Financial” Course

Need willing volunteers to provide 1-2 hours for students to interview them for the purposes of doing an “Asset Management Readiness Review” per FCM toolkit (and ideally provide some AM-related information!)

Asset Management Readiness Scale Assessment Tool

Contribution to asset management practice



Contribution to asset management practice: By developing this competency, your organization is supporting staff in asset management training, sharing knowledge internally to communicate the benefits of asset management, and participating in external knowledge sharing.

Note: To achieve each level, you must meet every requirement of each level before it.

Current State							Expected Future State	
Outcome areas	Outcomes: Select the outcomes that your organization has achieved.						Current (from left)	Expected
	Level 1	Level 2	Level 3	Level 4	Level 5	Pre-level 1	Select the level you expect to achieve at the end of this project	
A: Training and Development	<input type="checkbox"/> Our AM training and development approach is informal and largely driven by the personal initiative of staff.	<input type="checkbox"/> Our AM training and development requirements are defined by management based on short-term needs.	<input type="checkbox"/> We provide all staff with basic AM awareness training.	<input type="checkbox"/> We define AM knowledge and skill requirements. A training plan is in place for all positions.	<input type="checkbox"/> We train select staff members as internal experts to support the ongoing development of organizational capacity.	Please provide information about how your project activities will help you achieve your expected future state		
	<input type="checkbox"/> Some staff conduct targeted research, seeking out basic information on AM concepts and techniques.	<input type="checkbox"/> Selected staff are trained on basic AM concepts.	<input type="checkbox"/> Some staff undergo training on advanced AM concepts specific to their roles and responsibilities.	<input type="checkbox"/> Council, management and staff receive role-appropriate AM training to establish needed capacity across the organization	<input type="checkbox"/> Proactive, role-based training serves as a support for career development and succession planning.			
Please provide notes that								

Asset Management Maturity Status



Potential Accreditations

“Tested Knowledge” components only – just like engineering / accounting / law / etc. , work experience is needed to actually become a professional!

World Partners in Asset Management

- WPIAM is accepting submissions of university level course series' against the Global Certification Scheme for Certified Practitioner in Asset Management
- Intention is to submit materials for the first two courses and see where we sit

Institute of Asset Management

- “Endorsed Schemes” applies to companies looking to provide asset management training. Not specifically applicable to university education
- However, there is currently an initiative underway for a “Qualifications Recognition” process that would recognize academic courses for a Certificate or Diploma under IAM



Open Studies at the University of Calgary

Working professionals can take these courses! (in-person, online or asynchronous)

“Open Studies” allows approved degree and non-degree holders to take selected university-level courses.

- Deadline for application is July 31
- Transcripts required by Aug 10.

For more info, visit :

<https://www.ucalgary.ca/future-students/open-studies>



University of Calgary Giving Days

April 11-21, 2022

- Donations made to individual initiatives will be matched by the University of Calgary up to \$2 500.
- AMSI is featured this year by the Dept. of Geomatics Engineering, with funds going to pay for teaching assistants and educational materials (standards access, licensing, etc.)
- Considering this as a “grassroots test” to gauge support of AM as an educational initiative
- Watch for communications in the next few weeks and please circulate!



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