



## EFFECTIVE ASSET INVESTMENT WITH VM



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### ***Abstract***

The purpose of this paper is to outline the application of Value Management (VM) by the City of Calgary as a standard business practice to effective infrastructure asset investments.

The municipal services of the City of Calgary are delivered by 33 business units. Most of these services delivered to the citizens include some type of tangible assets. Asset management principles focus on the operations, maintenance, upgrade and refurbishment of existing assets. Primarily focusing on efficiency.

However, when it comes to major upgrades or refurbishments of existing assets, a focus on effectiveness is critical, especially mitigating service or performance risks and gain greater investment value. The concept of value to citizens has always been there in various services. However, there was limited or no structured approach to demonstrate value for informed decision making, option selection and prioritization or for fostering a culture of innovation. For the longest period, the traditional approach to delivering municipal programs and projects was deemed suffice by various asset owning business units as a clear demonstration of value added activity.

In this paper, the authors will draw from two recent case studies and as part of their professional journey, how application of VM demonstrated and delivered value in municipal asset management.

### ***About the Authors***

**Lorin McConnell** is the Leader of Corporate Asset Management at the City of Calgary where he is responsible for the implementation and management of a corporate-wide asset management program and the provision of strategic infrastructure reporting to senior management and Council regarding Calgary's asset investment needs. This influence spans an \$85 Billion infrastructure portfolio and establishes a framework to address Calgary's infrastructure funding gap. Lorin's education includes an MBA which he leveraged for 10 years in the municipal environment including more than 8 at The City of Calgary.

**Mushtaq Rabbi** is an architect, an urban planner and a Certified Value Specialist (CVS®) accredited by SAVE International. He has over 20 years of experience in both private and public sectors. Mushtaq has been with the City of Calgary for 13 years. Currently he is working as a Project Management Consultant with Corporate Project and Asset Management. He is a member of the Board of Value Analysis Canada and involved in promoting, advocating and applying Value Methodology to City's infrastructure investments. He can be reached at [mushtaq.rabbi@calgary.ca](mailto:mushtaq.rabbi@calgary.ca).

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### Context for Asset Management at the City of Calgary

Municipal infrastructure is the foundation for a healthy and vibrant city. This includes City's roads, parks, transit, water and wastewater systems. Despite proactive past investment programs, the City of Calgary is facing a critical challenge that is common to municipalities around the world.

The City of Calgary has experienced record growth in the past decade and a half and this has continued even through a recent economic downturn. Since 2013, The City's infrastructure assets have grown in value from approx. \$60 billion to nearly \$85 billion and is expected to continue to grow. Balancing new, growth-related infrastructure has made it more difficult to maintain and upgrade our existing, aging infrastructure particularly with a shrinking tax base due to economic conditions negatively impacting the business community. While the condition of our municipal assets is rated as being good, on average they were quickly approaching the mid-point of their expected life. Unfortunately, this is the point where maintenance costs quickly accelerate. Further exacerbating the situation is the limited availability of infrastructure funds, cost inflation, increased environmental and safety regulation and increased public service expectations.

These issues have resulted in an infrastructure gap – the funding shortfall required to meet Calgary's infrastructure needs. The infrastructure gap over the next ten years is estimated to be \$5.3 Billion. This number only includes the corporate infrastructure needs identified within the upcoming ten-year envelope.

The City of Calgary has risen to the challenge by developing a proactive policy and strategy to effectively oversee and manage its asset inventory to provide effective municipal service while balancing smart growth with a sustainable quality of life.

Asset management is not a new concept. The private sector has been optimizing the use of limited resources to balance growth and asset maintenance for some time now. The public sector, though, has struggled to quantify and relate both the tangible and intangible benefits of municipal infrastructure and as such concentrated new spending on the expansion of new infrastructure while neglecting ageing assets.

### What is Asset Management?<sup>1</sup>

The City policy defined "Asset Management" as the coordinated activity of an organization to realize value from assets. It encompasses all asset types, tangible and intangible, individual components or complex systems, and all activities involved in the asset's life cycle - everything from initial identification of requirements or opportunities, acquisition/creation, operations or utilization activities, asset stewardship or maintenance responsibilities through to renewal or disposal and any remaining liabilities. Asset management is holistic as it considers the whole picture rather than just individual contributions.

Requirements for effective asset management are identified as:

- **Informed asset investment decisions:** Asset management provides the data and strategy to determine what a municipality has, what shape it's in, and when/if it will need to be replaced. The municipality can then plan for money to be available at the right time, reducing the risk to service-provision.
- **Improved services:** Mature asset management practices give a municipality the ability and justification to focus available funds on the areas that add the most value for citizens or staff.
- **Lifecycle cost awareness:** More than 80% of the true cost of an asset can be attributed to its maintenance, operation and disposal. Using an asset management mindset when budgeting ensures that funds are in place to make full use of the asset once it's created or purchased.
- **Demonstrated accountability:** There is increasing political and regulatory pressure for municipalities to justify their decision-making and demonstrate transparency for spending. Asset management plans

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<sup>1</sup> Administration Policy: Asset Management, Policy number GN-001 (B), ALT report: ALT2016-0829, The City of Calgary

are required at The City, have become a requirement for receiving federal funding, and are becoming a provincial requirement across the country.

The expected outcome from the Asset Management practices is to support the achievement of the Council Priorities through implementation and continuous improvement of asset management practices that will:

- a. Provide Cost Effective and Efficient services.
- b. Manage corporate assets to minimize risk and optimize triple bottom line benefit to citizens.
- c. Deliver quality, accessible and valued services for customers and citizens in a manner that is consistent with the Corporate Customer Service Framework.

The following fundamentals are embedded into The City's asset management practices to ensure maximum value is realized from the asset:

- a. **Value:** Assets exist to provide value to the organization and its stakeholders.
- b. **Alignment:** Asset management translates the organizational objectives into technical and financial decisions, plans and activities.
- c. **Leadership:** Leadership and workplace culture are determinants of realization of value.
- d. **Assurance:** Asset management gives assurance that assets will fulfil their required purpose.

Key Strategies in City's Asset Management:

- Holistic – a comprehensive approach that looks at the “big picture” (i.e. the combined implications of managing all aspects rather than a compartmental approach). This includes the functional interdependencies and contributions of assets within asset systems and the different management of assets across all lifecycle phases.
- Systematic – a methodical approach (i.e. formal, repeatable and consistent) to the management of assets.
- Systemic – asset investment decisions in an asset system context, not just to optimize the individual asset itself.
- Risk-based – managing asset risks associated with attaining levels of service and focusing resources, expenditures and priorities based on risk and associated cost/benefit.
- Optimal – asset investment decisions based on trade-offs between the competing factors of service level (including asset performance), risk and cost.
- Sustainable – a long-term, lifecycle-based approach in estimating asset investment and activities, thus developing effective asset management strategies for the long term.
- Integrated – coordinate the above principles to ensure the delivery of justified services and well-defined outcomes.
- Aligned – ensure that the AM System complements the strategic objectives of The City, as well as other key business systems, legislation and regulation.

### How Asset Investment Tie into Program and Project Delivery?

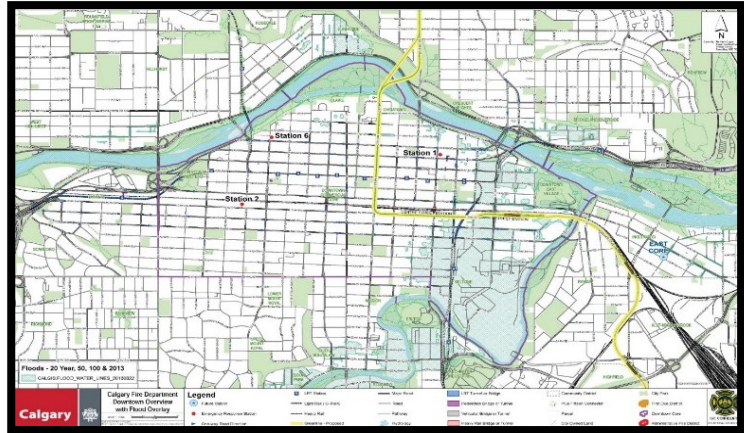
Every business case starts with a program or a project in mind that ties into some type of tangible or intangible assets. Usually these business cases are created to address a current or a potential future problem that impedes on a defined service delivery or to meet or maintain a future level of service to the citizens. The business case also identifies a probable opinion of associated cost to solve the problem. Upon further investigation when the City identifies that several related projects must be undertaken to meet the level of service, then these projects are rolled into a program with expected benefits and an opinion of expected investment is allocated to deliver the program with the related projects within.



In this paper, the authors will share two recent case study examples from the City of Calgary where the structured approach of Value Methodology supported informed decision making for infrastructure asset investments to maintain or enhance the level of service to the citizens of the City.

### Case Study 1: Downtown Fire Infrastructure Asset Investment Strategy (2016)

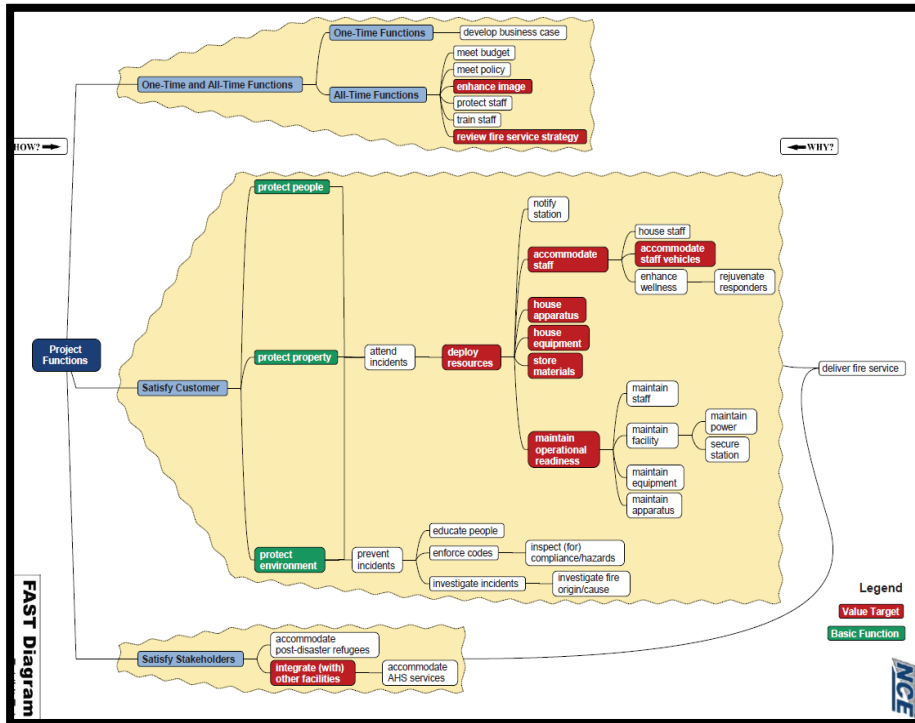
The Calgary Fire Department (CFD) currently provides fire and other emergency services to downtown Calgary from three existing fire stations: Fire Station 1, 2 and 6. Fire stations 1 and 2 have nearly approached the end of their service lives and the 30-year capital plan has identified a need to replace or undertake major renovation of both stations in the 2019-2022 timeframe.



CFD has identified the following with the two stations:

- Fire Station 1- renovate the existing approx. 20,000 sft station to LEED silver standard, remove hazardous waste materials and bring the building to code.
- Fire Station 2 – reconstruct and enlarge the existing station to approx. 20,000 sft by adding apparatus bay to the LEED gold standard, remove hazardous materials and add apparatus.

Temporary swing space would be required to maintain level of service while the stations are under construction. CFD has also acquired land on the east side of downtown for a possible future superstation.



Based on the recommendations from the VM study a business case will be developed for the downtown core capital request. The estimated cost identified for the two projects were at C\$ 64.0M.

A 5 day VM study was conducted with 26 participants including 4 independent specialists. The other 22 participants were selected from all ranks of the CFD and the City of Calgary business units to develop an in depth understanding of the issues and including their creative ideas as part of the solution.

This team generated 192 creative ideas with 11 combined options. Additional analysis allowed to establish two best value alternatives:

- Decentralized model: build four 2-bay satellite stations; sell existing Stations 1 and 2 with land
- Hybrid model: Renovate and expand historic Station 1 to add two stories above the existing four apparatus bay – LEED silver for existing and LEED gold for new; Build two 2-bay satellite stations, sell existing station 2

If the first option is selected it could potentially bring \$2.0M to City coffers and if the second option is selected it would reduce the overall capital investment to \$40.0M. These options were presented to the Fire management for further considerations.

Additional improvement projects were identified as part of this study for the CFD to consider outside of the core issues and challenges.

### Case Study 2: Water Supply Long Range Plan - Risk and Value (2018)

The City of Calgary is growing in population – year 2017 census counted 1.2M people with predicted year 2076 population numbers being 2.2M. The Water Resources Business Unit is updating the 2011 Water Long Range Plan. As part of the WLRP Update, the project team is undertaking reviews of the capacity in terms of

- 2 Water Treatment Plants (Glenmore and Bearspaw) and
- Overall water transmission systems,

to meet the future Typical Day Demand (TDD) and Maximum Day Demand (MDD).

Additionally, the City’s existing planning guideline states that each WTP should provide TDD service if one of the two water treatment plants were shut down or significantly impaired. As it stands, this guideline cannot be achieved by the Glenmore WTP (GMWTP) if the Bearspaw WTP (BPWTP) were to be out of service as the existing capacity of the GMWTP is less than recent year’s TDD.

Following these capacity reviews, planning and implementation of maintenance, optimization, replacement and upgrade programs will be undertaken. The City’s objectives for the VM study is to inform and support decisions made in terms of capital and life cycle expenditures and the overall reliability and functionality of the water system.

The VM team (24 participants) generated 106 ideas. More ideas mean that it is most likely a breakthrough idea would be identified with significant value improvement and risk reduction implications.

Current Plant Capacity			
Asset Base	Firm Capacity	Installed Capacity	Process Capacity
Glenmore WTP	400 MLD	450 MLD	600 MLD
Bearspaw WTP	550 MLD	600 MLD	700 MLD

The City tracks and measures demands through various monitoring methods, recent data shows:	
City Demands	MLD
Average Day Demand (ADD)	500
Typical Day Demand (TDD)	450
Maximum Day Demand (MDD)	765 (June 2017)
The City has plans to undertake several initiatives within the system. These were considered in the 2011 Water Long Range Plan and all VM alternatives were analyzed against this baseline. The initiatives were listed below:	

Asset Base	Upgrades/ New Investments
Glenmore Water Treatment Plant	Minor upgrades (pumps, actiflo filtration) plus optimization of equipment to increase plant output from 400 to 550 MLD
Bearspaw Water Treatment Plant	Minor upgrades and optimization of equipment to increase plant output from 550 to 600 MLD
Transmission Systems	North Calgary servicing strategy: <ul style="list-style-type: none"> <li>- South feeder redundancy</li> <li>- Shaganappi pump station redundancy</li> <li>- Beddington feeder main redundancy</li> <li>- BP high lift pump station upgrade</li> <li>- 10 km feeder main (incl. 3 km tunnel)</li> </ul>

City of Calgary water demands:		
	2017*	2035
Maximum Day Demand (MDD)	800 MLD	1045 MLD
Typical Daily Demand (TDD)	478 MLD	529 MLD
Average Day Demand (ADD at 110% of TDD)	526 MLD	582 MLD
* Winter Seasonal MDD (Oct 2016-Mar 2017) = 500 MLD; Summer Season ADD (Apr-Sep 2017) = 550 MLD		

Top risks to the Calgary water system:

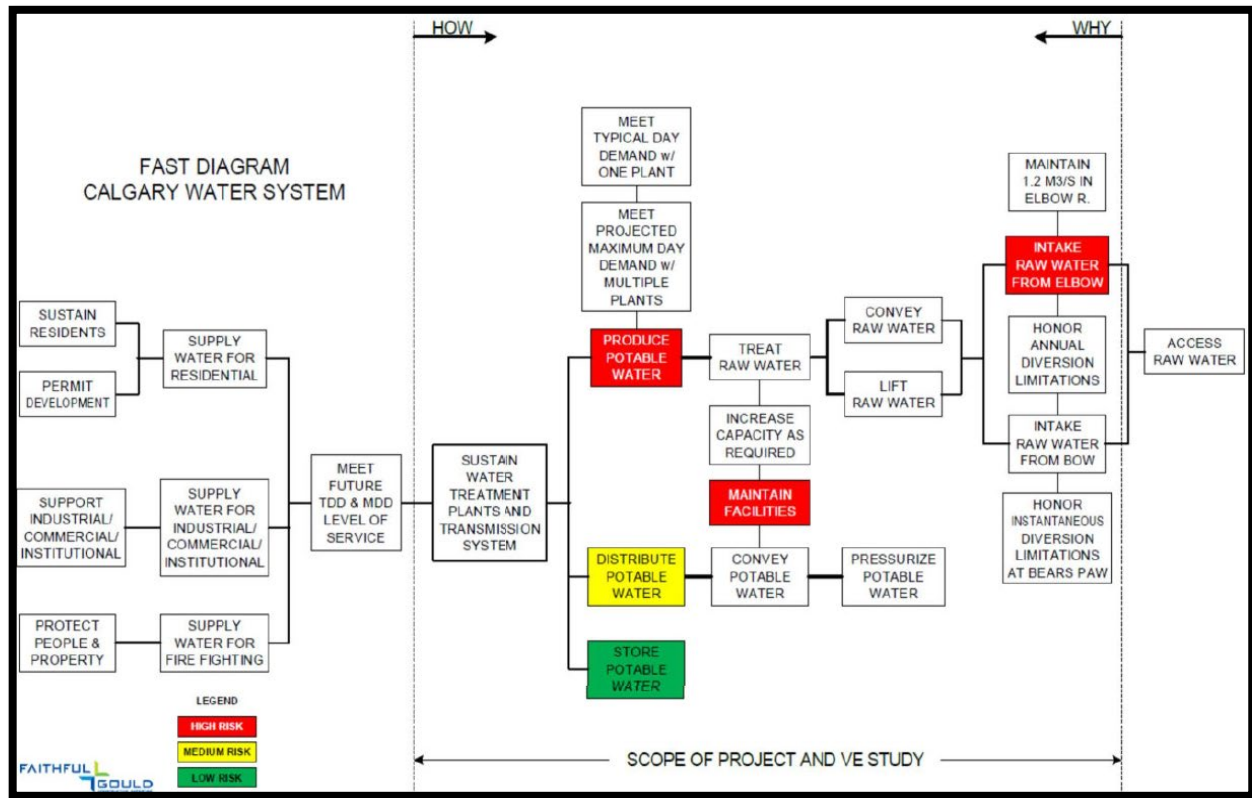
- Spending money in the wrong place
- Ability to supply reliable water
- Supply to support expected population growth
- Missing out on short term opportunities
- Ensuring GM pump station remains operational
- Expanding GM does not reduce many of the high probability risks / impacts
- Increasing GM to 550MLD may not be sustainable in the future due to climate change
- Under estimation of climate change adaptation factor
- Increase of climate change induced events e.g. fire, drought, storms etc.
- Contamination of Bow River results in inability to meet demand
- Ability to take down parts of plant for maintenance
- Delays in decisions on future plant / system upgrades
- Not spending money in right place in short term
- Customer trust
- Operational constraints impact major capital improvements while maintaining supply
- Infrastructure upgrades achieve redundancy & fire protection in most cost-effective manner (with limited funding)
- Structural integrity of the South feeder main

To assess the primary risk exposure, two main operating scenarios were evaluated;

1. The first is a planned capacity outage of one plant assuming that either plant can operate at its installed capacity during the period from October through March (i.e. non-irrigation season).
2. The second scenario is that either plant can operate at installed capacity during an outage of the other plant during a peak demand season.



The collective impact of the VM team 'Recommended Value Alternatives' is a maximum capital cost of \$95.7 M if all compatible value improvement ideas were accepted. These costs, spread over a ten-year action plan, in the opinion of the VM team, would provide the City with a functional, reliable, and cost-effective water system that will meet future TDD and, more importantly, MDD levels of service.



## Lessons Learned

In both the above studies, we experienced that VM has given us within a range of accuracy how best to invest in our current assets by mitigating performance risks while maintaining or enhancing level of service. These studies were undertaken in accordance with SAVE International's Value Methodology Standard and at the appropriate time(s) in the asset life-cycle. Every City service to the citizens of Calgary require some type of infrastructure investment or business process improvement. Function analysis is a powerful technique within VM to generate a large number of alternatives to support these change initiatives. At the City of Calgary there is a tremendous opportunity to increase the application of VM further.

## Future Opportunities

With VM's demonstrated success within the City of Calgary over the past ten years, senior management believes increasing the strategic application of VM will significantly benefit the City's portfolio of capital and operational investment programs and projects related to various asset classes. With the current VM Standard and Guidance documents in place, through additional demonstrated success with VM over the next few years, senior management would consider reducing the threshold for mandatory application of VM from the current C\$25.0 M and adopting VM as an even more widely applied business improvement practice within the organization for enhancing service delivery to the citizens.