PART B

Story Behind the Story of Sustainable Drainage Service Delivery

To introduce the reader to core concepts for sustainable funding of the 'drainage service' in the built environment, this Part B is structured in five sections:

1. ***Context for Applying EAP to Establish the 'Financial Case for Stream Systems'***
2. ***Intergenerational Perspective for a 'Local Government Finance Strategy'***
3. ***'Drainage Service' has two Components: Constructed and Natural***
4. ***Operationalizing EAP within Asset Management***
5. ***Urban Watersheds as Infrastructure Assets***

Figure B1

Integration of Stream Systems into "Asset Management for Sustainable Drainage Service Delivery"

'Continuum of Steps'

Branding logo for
Asset Management for Sustainable Service Delivery: A BC Framework, released December 2014

WHAT is the issue (Ground Zero):
There is no **Asset Management Strategy**. There is an *'unfunded infrastructure (gap, deficit, liability)'*.

SO WHAT can be done (Step One):
Embrace the **BC Framework**. Focus first on constructed assets (pipes & buildings). Implement an *Asset Management Strategy / Program*.

NOW WHAT can we do (Step Two):
Life-cycle approach and **Sustainable Service Delivery** are standard practice for maintenance and management (M&M) of constructed assets.

THEN WHAT will we do (Step Three):
"Twin Pillars" for protection of stream system integrity is standard practice for the drainage service. Apply **EAP, the Ecological Accounting Process,** to quantify *Riparian Deficit* values and establish annual budgets for ongoing stream corridor M&M.

As understanding of the **Local Government Finance Strategy** grows, communities progress incrementally along the Continuum

*At the Partnership's Annual Water Sustainability Workshop held in December 2015, the Chair of Asset Management BC (UBCM's Glen Brown) introduced the Asset Management Continuum in the module titled **Sustainable Service Delivery for Watershed Systems**.*

1. Context for Applying EAP to Establish the 'Financial Case for Stream Systems'

An Introduction to the BC Framework

Released in December 2014 by the Union of BC Municipalities (UBCM) and the Ministry of Municipal Affairs through Asset Management BC, Asset Management for Sustainable Service Delivery: A BC Framework marked the dawn of a new era for local government.

Why the BC Framework is a Game-Changer

The BC Framework establishes expectations; it does not prescribe solutions. It is a game-changer because it redefines the context for deciding how infrastructure is planned, financed, implemented, and maintained. It raises questions about how communities would service urbanizing and redeveloping areas in future.

Most importantly, the BC Framework emphasizes the paramount nature of the **services** that constructed infrastructure assets provide. The BC Framework also shines the spotlight on what the **life-cycle costs** are over time to maintain, renew or replace the assets.

The BC Framework recognizes that one size does not fit all: A top-down and bottom-approach drives implementation of the BC Framework. A vision for a 'new business as usual' has emerged. This vision extends beyond traditional municipal infrastructure to encompass services that nature provides, and the implications for hydrologic integrity and creekshed health.

In 2019, UBCM and the Ministry of Municipal Affairs formalized an expectation that local governments applying for provincial grants would integrate "natural assets" into their asset management processes. **EAP shows them how to do it for stream systems and water assets (such as wetlands) within a creekshed.**

Asset Management Continuum: The BC Framework recognizes that asset management for sustainable service delivery occurs alongside associated evolution in community thinking. Incremental in nature, it is a continuous quality-improvement process. **Figure B1** conceptualizes a local government's "asset management journey" as a continuum of steps, with EAP being Step Three.

A vision for fully integrated and sustainable service delivery in BC

The BC Framework points the way to a holistic and integrated approach to asset management. Nature, and the ecosystem services that it provides, are viewed as a fundamental and integral part of a community's infrastructure system. This is not to suggest that all ecosystem services provide a municipal function. The ultimate vision for fully integrated Sustainable Service Delivery is that communities would protect, preserve, restore, and manage "natural assets" in the same way that they manage their engineered assets.

‘Sustainable Service Delivery’ Explained

Glen Brown coined the term **sustainable service delivery** in 2010 when he was an Executive Director with the Ministry of Municipal Affairs. Formal branding came with release of Asset Management for Sustainable Service Delivery: A BC Framework in December 2014, and rollout in 2015. The emphasis on service is a game-changer for local government infrastructure asset management.

At that time, and thanks to the early work of the then newly formed Asset Management BC, chaired by Glen Brown, local governments were just starting to wrap their minds around the **‘20/80 Rule’** and the implications of the 80% as an unfunded liability.

“My inspiration came from Guy Felio, one of the original gurus of asset management nationally. Guy said, ‘It’s all about the service’, because infrastructure/ assets are worthless IF they do not provide a service.”

“That is what resonated with me. Also, for any asset management approach to be successful, it must not focus on the infrastructure/asset by itself. That way-of-thinking applies to nature and the environment as well.”

- Glen Brown, General Manager, UBCM Victoria

A Synthesis of Three Ideas

The Ministry introduced the term to focus local government attention on two desired outcomes that flow from policy objectives in Living Water Smart, BC’s Water Plan:

> Shift the spotlight from the infrastructure itself to the **service** AND the **level-of-service** that the infrastructure asset provides.
>
> Implement a **life-cycle approach** to asset management AND eliminate the **unfunded gap** for infrastructure replacement.

During a curriculum planning session for a local government workshop organized by the Partnership for Water Sustainability, Glen Brown synthesized three themes – *financial accountability, infrastructure sustainability, service delivery* – into a single easy to remember phrase: Sustainable Service Delivery. The rest is history, as they say.

Avoid the Pain, Be Deliberate, Fund the Plan: Sustainable service delivery is how communities can bridge the gap, or disconnect, between short-term and long-term thinking.

“Waiting for municipal infrastructure to fail means that you are forced into one path. And this is probably the most expensive path. And that is not a sustainable way to run a business or a utility. Plan ahead. Put money aside. Minimize risks. Do not wait until things go wrong. Find the right balance between corrective and preventative action” --- Daniel Horan, Director of Engineering and Public Works, District of Oak Bay.

The 4Cs for Sustainable Service Delivery: Collaboration, Capacity, Culture & Council

"After becoming CAO of Courtenay, BC in 2013, we began exploring how to implement an Asset Management Program at the City. Collaborating with external agencies opened our minds to thinking of AM practices in far broader terms, so that they might be applied in any community, regardless of size," states David Allen.

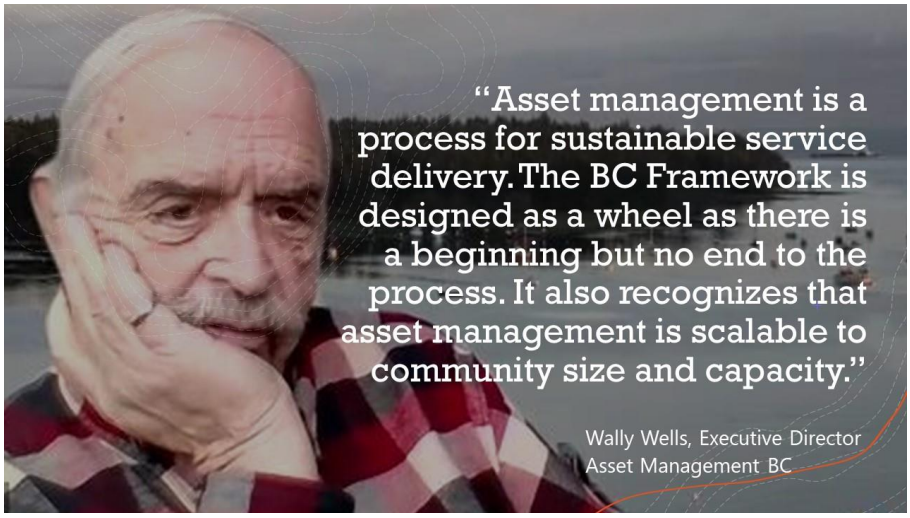
"We didn't realize it, at the time, but it led to us eventually conclude that operationalizing AM would involve four separate, interconnected initiatives that would be the pathway for our journey toward Sustainable Service Delivery: They coalesced into what we locally refer to as *The 4C's - Collaboration, Capacity, Culture, and Council*."

"It is all about building trust between Council and staff, keeping in mind what can realistically be accomplished by an organization, and being clear about the limitations of the current state-of-practice and knowledge and our ability to explain what the numbers mean in that context."

David Allen, Past- Chair (2012-2020)
Asset Management BC Community-of-Practice

"There are many considerations in a local government's budget every year. The questions asked should revolve around service and risk. Are you asking the right questions?"."

-Wally Wells



Adapting Sustainable Service Delivery to Climate Realities

"A constant challenge for planning is not to prevent past events, but instead is to use past experiences to inform and create flexible strategies for the present and the future. Furthermore, this need for flexibility is not restricted to the immediate scope of the problem at hand; but must also consider the broader juggling of evolving local government priorities and service demands," states Robert Hicks.

"This leads to the challenge of assessing problems with sufficient complexity to arrive at flexible and resilient solutions. while at the same time not being overwhelmed and paralyzed by over-analysis. When the climate is changing, an over-arching goal would be to build in resiliency that addresses risk. There is no silver bullet."

"Climate change impacts are risks which can be addressed by aligning asset lifecycles to performance or change thresholds which consider how levels-of-service are likely to deteriorate in response to climate changes impacts. Lifecycles must therefore be considered and re-aligned with the new changing 'normal' conditions."

Robert Hicks
Senior Policy and Process Engineer
City of Vancouver

"The asset management planning and the community planning frameworks resemble each other; planning is planning is planning. Collaboration can strategically and proactively ensure the ongoing essential reliable levels of services."

-Christine Callihoo

"The incorporation of climate change into business as usual is clarified by way of the planning process: Asset Management + Natural Assets + Climate Change Adaptation = Community Resiliency."

Christine Callihoo
Community Climate Resilience / Adaptation Planner

2. Intergenerational Perspective for a 'Local Government Finance Strategy'

Service Delivery & Sustainable Funding

Every local government in British Columbia has aging municipal infrastructure. Currently, the spotlight is on constructed assets (i.e., pipes and buildings). Everyone is challenged with tackling the **infrastructure funding gap** (liability) that grows year-by-year.

The EAP vision is to integrate stream systems into local government asset management processes. But the big picture context for EAP is whether a local government has a strategy for its constructed assets.

This over-arching context is defined by a **local government finance strategy** that produces a Sustainable Funding Plan. "The vision" establishes the reason to embrace EAP. "The plan" is the lynchpin for progressing step-by-step along the Asset Management Continuum.

Success over the long-term depends on local government political commitment to the guiding principles of sustainable service delivery. Next, and with the foregoing as our backdrop, we paint a broad-brush picture of what the **sustainable infrastructure mission** looks like.

Embed a Sustainable Service Delivery Culture

The infrastructure funding gap is a pressing reality, with profound implications for levels of service. It also poses affordability challenges for financing a long-term program of replacement and/or renewal. Once all is said and done, however, the 'sustainable infrastructure mission' has two clear objectives:

Stem the incremental erosion of levels of service in the short-term.

Translate an intergenerational perspective into a life-cycle plan of action for perpetual infrastructure renewal.

The Oak Bay experience, for example, illustrates how to address these objectives: embed a life-cycle lens, along with a sustainable service delivery culture, into the local government finance vision.

It takes courage for a Council or Regional Board to embrace an intergenerational 'Finance Strategy'

To do what is right and necessary to bridge the infrastructure funding gap for constructed assets requires an intergenerational commitment. It takes courage on the part of a Council or Regional Board members to look beyond the short-term, understand what sustainable funding entails over the long-term, and direct staff to get on with the job.

Unless there is a long-term financial vision or strategy for sustainable funding, an incremental erosion of the service levels for constructed assets would inevitably result. This is the local government reality-check for integration of stream systems (natural assets) into asset management plans and annual budgets.

"There is a special type of courage that Council needs to have to say, 'give us the naked truth'. There is not a lot of political up-side to shining a light on infrastructure challenges."

- Christopher Paine, Director of Financial Services, District of Oak Bay

What happens on the land matters to the stream: With all the current talk about integrating natural assets into asset management, we observe that many players either do not know or have a limited appreciation for nature as a system. They focus too much on specific aspects of the system, rather than its interrelated functions.

Land use and drainage servicing practices visibly impact on the **package of ecological services**. The consequences play out as short-circuiting of water balance pathways, erosion and sedimentation within the stream channel, elimination of fish and viable aquatic habitat, and degradation of streamside protection setback zones.

EAP looks at natural assets as a system. It is the system context that must be understood and supported. It is a mistake to focus just on parts of the system. The strength of EAP is in how we look at and value streams as systems and as a land use.

Move from Stop-Gap Remediation to Lasting Restoration: EAP is a leap forward in "addressing the elephant in the room", which is the unfunded liability due to degradation of stream channels and streamside protection areas. An EAP premise is that whole-system action on the landscape would protect stream system integrity.

The goal in having a budget line item for M&M of stream systems would be to move from reactive remediation that is at best stopgap and of limited longevity, to stream enhancement that is effective and lasting.

The **Riparian Deficit** is a new way of defining "loss of riparian integrity". It is an attention-grabber and is explained in **Part E**. The Riparian Deficit is the environmental equivalent of the **Infrastructure Funding Gap (Liability or Deficit)**.

Why communities must focus on 'Service Levels'

District of Oak Bay experience is helpful in gaining perspective on what is involved in building trust and facilitating a process that results in everyone pointing in the right direction strategically. A unique aspect for Oak Bay is that the engineering and finance departments are so much in lockstep on a unified vision for sustainable service delivery.

"In just 3 years, through incremental increases to funding reserves, Council reduced the 100-year gap by $460 million. That's 3 to 4 years of their governance decisions. If they had waited until Chris arrived to develop the financial plan, they'd be $10 million behind just in the current election cycle, let alone how much that translates to over the next 100 years."

-Daniel Horan, Director of Engineering & Public Works, District of Oak Bay

There is no free infrastructure: "Communities that have not embedded sustainable service delivery concepts into their funding structure are playing major catchup. And this is at a cost to the community of foregone investment revenues and debt servicing costs," emphasizes Oak Bay's Christopher Paine.

"In the first phases of a community's development, it feels like you have free infrastructure. When someone moves into a new neighbourhood which has all these wonderful capital services, it feels free because the maintenance costs on those services are so much less than they are at the end of their life cycles."

"We must provide life-cycle information to Council and the community – as to how far we are through the life cycles of assets; what is the cost of replacement; whether we are saving, or not, for that future expense – so that policy makers can provide direction and vision."

"A slow incremental erosion of our capital service levels happens when staff cannot demonstrate the impact in the long-term in a financial way. That is why forward looking long-term financial statements are so important to good decisions. Council is in control. They can choose to accept a slow erosion of service levels and increased risk, or not. But they cannot make that judgement in the absence of information."

"If a community is happy with what it has today, static funding is not going to sustain that. The levels of service are going to decline over time. Unless we increase funding, the negative impacts of system failures are going to be felt by residents," continues Daniel Horan.

"Think about it from a business perspective. Discussion of the service municipalities provide really comes down to whether our customers, our residents, are happy."

"Council and community are always asking questions about why the utility rates are what they are, or why the rates are increasing, what does that get you and so on. Answering these questions comes down to educating them about **levels of service** and their willingness to invest in sustaining a desired level of service."

3. 'Drainage Service' has two Components: Constructed and Natural

Reconnect Hydrology and Stream Ecology by Design, and Restore Stream Integrity

When one thinks about asset management, it is often in the context of municipal infrastructure and how this provides the "water service" or the "sanitary sewer service", and so on. Because the drainage service is the "neglected service", a goal of the EAP program is to focus attention on this foundational concept:

> **Drainage infrastructure and the stream system together constitute the municipal Drainage Service.**

Sustainable Drainage Service Delivery

The statement above can also be used as a guiding principle for operationalizing Asset Management for Sustainable Drainage Service Delivery. Whether constructed or natural, an asset is an asset. And in the built environment, each asset type requires a budget for M&M.

The leap forward implicit in the vision for **"sustainable drainage service delivery"** is recognition of the need for whole-system action on the landscape that would ensure stream system integrity.

Once local governments embrace a guiding philosophy that ecological services and use of land for development are equally important, then the next step is for them to include M&M budgets for stream systems in their Asset Management Budgets. This would begin the process of reconnecting hydrology and stream ecology by design.

Financial case for stream systems: EAP provides communities with a philosophy, pragmatic methodology and metrics to make the financial case for annual investment to prevent degradation and improve the condition of ecological assets that constitute a stream corridor system.

Use of EAP to establish the 'financial case for the stream' would put M&M of stream corridor systems and water assets on an equal footing with constructed assets (municipal infrastructure).

EAP is a land use perspective

The EAP methodology focuses on the historical and current land use practices that have changed landscapes, modified hydrology, and have led to present-day community perceptions of the worth of a stream in a creekshed, and the ecological services the stream system provides.

In a sentence, the essence of EAP is expressed as follows: ***What is the environment that supports the package of ecological services?*** *This is a land use perspective.*

Progressing to Step Three on the 'Continuum of Steps' for Asset Management

Move from Stopgap Remediation to Long-Term Solutions

A goal is to 'get it right', both in the stream channel and on the land draining to the stream.

The challenge in 'getting it right' is to move from stop-gap remediation of problems to long-term restoration of a properly functioning creekshed.

In 2014, three landmark provincial initiatives came to fruition. See below. Together they provide a platform for integrated and coordinated actions.

Introduced on page 15, **Figure B1** is an important communication tool. It illustrates where and how EAP fits into the continuum of steps for restoring stream system integrity. This desired outcome would drive the move from stopgap remediation to long-term solutions.

Continuum of Steps

The asset management journey for a local government is a "continuum of steps" as synthesized below:

- **Step One** – embrace the BC Framework
- **Step Two** – implement Sustainable Service Delivery
- **Step Three** – apply the Ecological Accounting Process

Once the life-cycle approach is standard practice for constructed assets, it would then be much easier to add M&M for stream systems. In Step Three, EAP focuses on the investment of resources already made by many stakeholders, as well as their two-fold aspirations concerning degradation prevention and enhancement of ecological services, respectively.

Benefits to Communities by Designing with Nature: The whole-system approach to protecting stream integrity is founded on the twin pillars of Ecological Accounting and Water Balance Accounting. An implementation plan that reflects the twin pillars would result in multiple desired outcomes:

- **ENHANCE** stream corridors to create high value public assets.
- **AVOID** an unfunded financial liability (by limiting stream erosion, preventing flooding, improving water quality).
- **ADAPT** to a changing climate.
- **REDUCE** life-cycle costs for drainage infrastructure.

Reconnecting hydrology and stream ecology includes adapting to the new climate reality (*longer, drier summers followed by warmer, wetter winters*). This requires effective 'top-down & bottom-up' processes that align and accelerate implementation of reinforcing provincial, regional, and local actions to improve where people live.

The "story behind the story" of the **Asset Management Continuum** as told by Glen Brown is presented next.

Story Behind the Story: "We framed the Asset Management Continuum as a series of three steps, recognizing that most local governments were at Ground Zero in 2015. Our operative phrase was *'as understanding grows'*. We saw this as the key consideration for local governments progressing along the continuum," explains Glen Brown.

"Although it might be possible, we believed it unrealistic to expect anyone to jump directly to Step Three and integrate natural systems into their asset management strategies. We needed a way to illustrate this diagrammatically. This led us to the concept of a continuum."

"The continuum bridges two pieces. One piece is recognition that the asset management process is founded on an incremental approach. The other piece is integration of natural capital, natural assets and watershed systems thinking."

"At the 2015 Water Sustainability Workshop, I explained that implementation of asset management along with the associated evolution of local government thinking is a continuous process, not a discrete task. Some local governments are advanced. Some are just starting out. Our approach is not to dictate or prescribe what to do."

"Over time, capacity and expertise will increase for asset management. We are saying the same thing for integration of natural assets. Local governments, over time, will progress."

"A desired outcome is that they will eventually incorporate natural capital into their asset management processes, and that will recognize the financial value of natural systems."

Watersheds are Infrastructure Assets

Within months of Glen Brown unveiling the Asset Management Continuum, the BC Society of Landscape Architects, invited the Partnership to provide the content for the entire June 2016 issue of Sitelines magazine. Co-authored by Glen Brown and Ray Fung, the last article in the special issue was titled ***Sustainable Service Delivery: Watersheds are infrastructure assets****.*

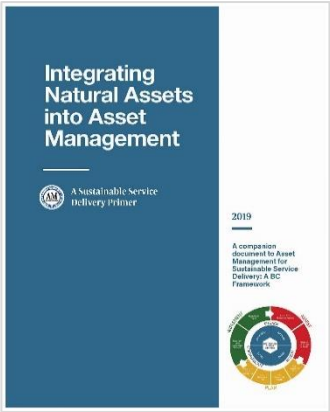
4. Operationalizing EAP within Asset Management

Ecological Services are Core Services

EAP brings a whole-system approach to an understanding of **drainage service** realities. EAP implementation depends on decision-makers understanding that a municipal drainage service has two interconnected components – one is the constructed infrastructure, and the other is the stream system.

There is typically no funding mechanism for stream M&M such as for water and sanitary sewer utilities. Although several local governments in BC do have "stormwater utilities", their main purpose is to fund infrastructure such as pipes and ponds. So, the unfunded M&M liability caused by drainage impacts on stream systems grows over time.

Core services such as utilities, roads, parks, and recreation take up the bulk of a local government budget and are the traditional focus of asset management. Prior to release of the Primer on Integrating Natural Assets with Asset Management in 2019, ecological services were not typically part of the asset management mind-set.



Context for Integration of Stream Systems with Constructed Assets

Released in September 2019 by Asset Management BC, the Primer introduces EAP with this statement:

"Significant strides have been made in natural asset management in British Columbia and across Canada. Several initiatives have built on each other, forming a foundation for local governments to increase their consideration of the potential of natural assets."

Drainage, Recreation, Habitat, and Enjoyment of Property Uses

Ecological services are not intuitively understood by the public, elected representatives, and asset managers. At best, they have been considered as an add-on. To advance uptake of a 'whole-system' way of thinking about the 'drainage service', it helps to define ecological services in terms of drainage, recreation, habitat, and enjoyment of property uses.

Once communities make the mental transition to view ecological services as core local government services, and then look at their budgets differently, the change in mind-set should lead to this question, how can we do things better? This logically leads to the next question:

How do we establish an annual budget for M&M that sustains the 'package of ecological services' in a stream system that humans depend upon for drainage, recreation, habitat, and enjoyment of property uses?

Integration of Stream Systems into 'Sustainable Drainage Service Delivery'

Unless communities measure the effect of impacts, destabilization of stream channels and degradation of riparian assets and streamside protection areas will continue. EAP helps to quantify the unfunded and growing cost (hence liability) to protect, remediate or enhance stream systems in disturbed urban and rural landscapes. **This is the starting point for a life-cycle approach to M&M of the drainage service**.

Budget Line Items: EAP bridges a gap. While local governments have existing tools in the form of policies and legislation for 'maintenance and management' of ecological assets, they have until now lacked a pragmatic methodology and meaningful metrics to incorporate stream systems as line items in Asset Management Budgets.

> **Using numbers generated through application of EAP, local governments have a sound basis for implementing a baseline annual budget for enhancement of the stream system (which is the natural or ecological asset) within a setback zone.**

A Stream is a Land Use: The EAP methodology and metrics recognize the importance of the stream system in the landscape. A stream is a land use because the stream corridor is defined in regulations and has a financial value. EAP uses real numbers from BC Assessment, not hypothetical assumptions, to establish the financial case for the stream corridor system.

Hydrology powers stream ecology. Thus, effective M&M requires an understanding of how water balance pathways connect creekshed hydrology and stream ecology, how changes on the land disconnect them, and how green infrastructure design can reconnect them.

Understanding how hydrology powers stream ecology is the starting point for developing meaningful M&M metrics. Managing the built and natural environments as interconnected systems is a guiding principle.

Over the past six years, a series of "big ideas" emerged during the 3-stage program of testing, refining and mainstreaming EAP. These big ideas are transformative in their implications for local government asset management. They are discussed in **Part C**.

Hydrology Powers Stream Ecology

The flow of rainwater from cloud to stream is comprised of three water balance pathways: ***surface runoff, horizontal shallow interflow****, and* ***deep groundwater****. Yet the latter two are routinely ignored by planners and designers. Time, a critical factor, is also ignored. These omissions lead to stream health plus financial consequences.*

Application of Asset Management Readiness Scale Assessment (AMRS) to EAP

FCM, the Federation of Canadian Municipalities, has developed a spreadsheet tool for evaluating progress by local governments in implementing a life-cycle approach to renewal and replacement of constructed assets. **Table B1** is a simplified version of AMRS. It is included for illustrative purposes.

It is new territory to consider how the **'financial case for stream systems'** would fit into or influence AMRS. The process for understanding how EAP might be applied to AMRS by local governments involved interviews with asset managers.

The Regional District of Nanaimo Board passed this resolution on April 27, 2021:

"That the Millstone River Ecological Accounting Process report be used to inform future Corporate Asset Management Planning."

Local Government Perspectives

Interviews focused on whether and/or how asset managers believed the EAP findings might reasonably fit into or influence AMRS. Conversations revolved around the question of how likely is it that one small study would shift the overall ratings in a 15 x 5 matrix for 5 areas of competency.

Their responses yielded insights into how an EAP case study aligned with and/or fitted into the big picture which is their organization's approach to asset management planning for sustainable service delivery. A selection of quotable quotes is included as **Figure B2**.

"This report has given the RDN, as well as the City of Nanaimo, further insight as we develop our existing framework for the protection and enhancement of our important natural features in our communities, including stream corridors."

Chair Tyler Brown,
Regional District of Nanaimo

Starting Point for Interdepartmental Conversations: The short answer by asset managers is that one small study would not shift the AMRS ratings. However, they said, **EAP does help broaden and balance the asset management conversation**.

This alone achieves the goal of EAP in providing local governments with a methodology and metrics for making the financial case for streams. The intent is that the EAP findings would be used by local governments to establish line items in budgets for M&M of ecological assets in stream corridors.

There is a consensus that Planning and Decision Making is one area of "asset management competency" where an "uptick" would be anticipated as an EAP project outcome. The focus on decision-making is a starting point for inter-departmental conversations that put stream systems and constructed assets on an equal footing. That would be the game-changer.

Figure B2: Local Government Perspectives About EAP

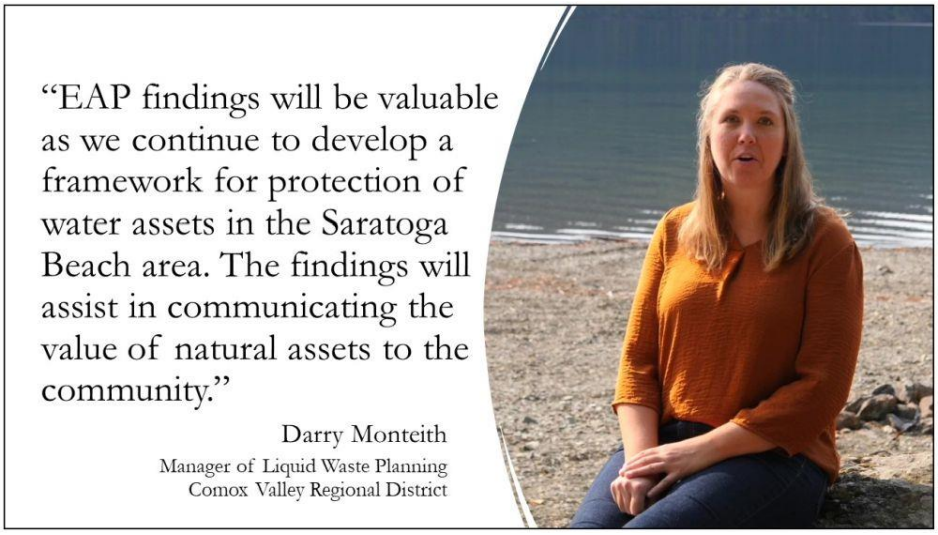


Figure B2: Local Government Perspectives About EAP

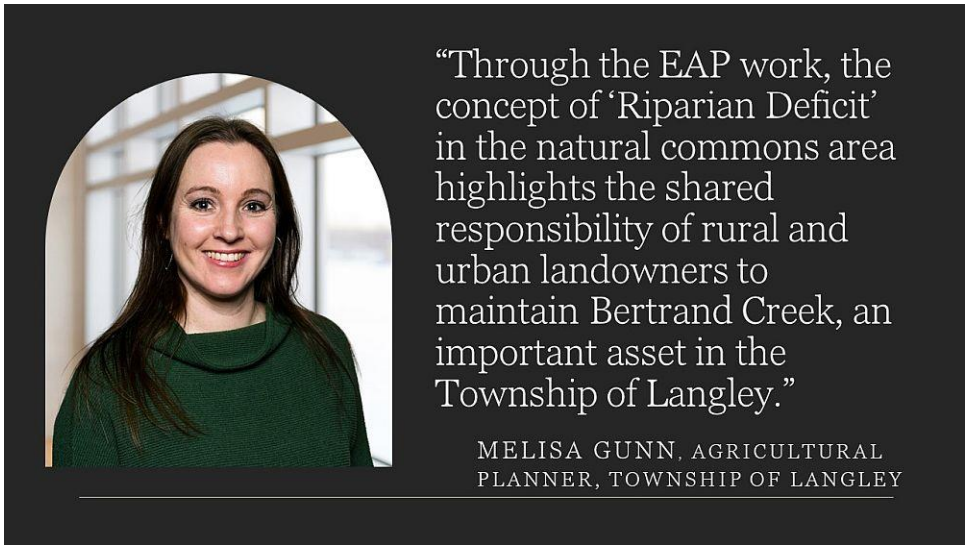


Table B1: FCM Asset Management Readiness Scale Assessment for Constructed Assets (*included for illustrative purposes*)

Competency	Current State	Expected Future State
Policy and Governance	*By developing this competency, the local government is putting in place policies and objectives related to asset management (AM), bringing those policies to life through a strategy and roadmap, and then measuring progress and monitoring implementation over time.*	
A. Policy & Objectives		
B. Strategy & Roadmap	**Intentionally left blank** (typical)	
C. Measurement & Monitoring		
People and Leadership	*By developing this competency, the local government is setting up cross-functional teams with clear accountability and ensuring adequate resourcing and commitment from senior management and elected officials to advance asset management (AM).*	
A. Cross-Functional Teams		
B. Accountability		
C. Resourcing and Commitment		
Data and Information	*By developing this competency, the local government is collecting and using asset data performance data and financial information to support effective AM planning and decision-making.*	
A. Asset Data		
B. Performance Data		
C. Financial Information		
Planning and Decision Making	*By developing this competency, the local government is documenting and standardizing how it sets AM priorities, conducts capital and O&M planning, and decides on budgets.*	
A. Documentation & Standardization		
B. Asset Management Plans		
C. Budgets & Financial Planning		
Contribution to Asset Management Practice	*By developing this competency, the local government is supporting staff in AM training, sharing knowledge internally to communicate the benefits of AM, and participating in external knowledge-sharing.*	
A. Training and Development		
B. Internal Communication & Knowledge-Sharing		
C. External Communication & Knowledge-Sharing		

5. Urban Watersheds as Infrastructure Assets

The New Paradigm

This Section 5 serves as a transition to Part C. It provides historical context for development of EAP.

In November 2015, release of Beyond the Guidebook 2015: Moving Towards "Sustainable Watershed Systems, through Asset Management" launched an educational process to reframe how local governments look at urbanizing watersheds.

The reframing is captured in **Figure B3**. Alignment with the BC Framework is the context. The focus is on the Water Balance Accounting pillar.

Unfunded drainage liability is a driver for action

The Drainage Service is the neglected service. The consequence of neglect is an accumulating financial liability to fund creek channel stabilization and riparian corridor restoration in urban and rural settings.

The urgency of the drainage liability issue spurred the analytical process that linked municipal asset management and stream health as **"cause-and-effect"**, for better of for worse.

Hydrology is the engine that powers ecological services: The three pathways by which rainfall reaches streams --- over the land surface, shallow horizontal interflow through the soil layer, and deep vertical to groundwater --- are **"drainage assets"**. These pathways provide **"water balance services"** that sustain ecological services.

"Sustainable Watershed Systems, through Asset Management" *applies to land uses that local government regulates and is founded on an understanding of how the Water Balance Methodology integrates the Site with the Watershed, Stream, and Groundwater Aquifer*

The Water Balance Methodology is about managing the whole rainfall spectrum and providing benefits to the stream through the wide range of stream needs - from base flow to managing flooding. The Water Balance Methodology bridges all ranges in rainfall and streamflow events.

The Water Balance Methodology incorporates robust and proven calculation techniques and engineering applications to define a watershed and stream as a whole system. In this manner the results can be used to provide a quantitative assessment of both impacts and mitigation effectiveness. It also possible to show benefits that have been long thought as not achievable.

Figure B3 – Creeksheds & Water Balance Services

With release of **Beyond the Guidebook 2015**, an educational goal:

Those who are involved in municipal land use and drainage would understand the vision for.....

"Sustainable Watershed Systems, through Asset Management"

THE NEW PARADIGM –

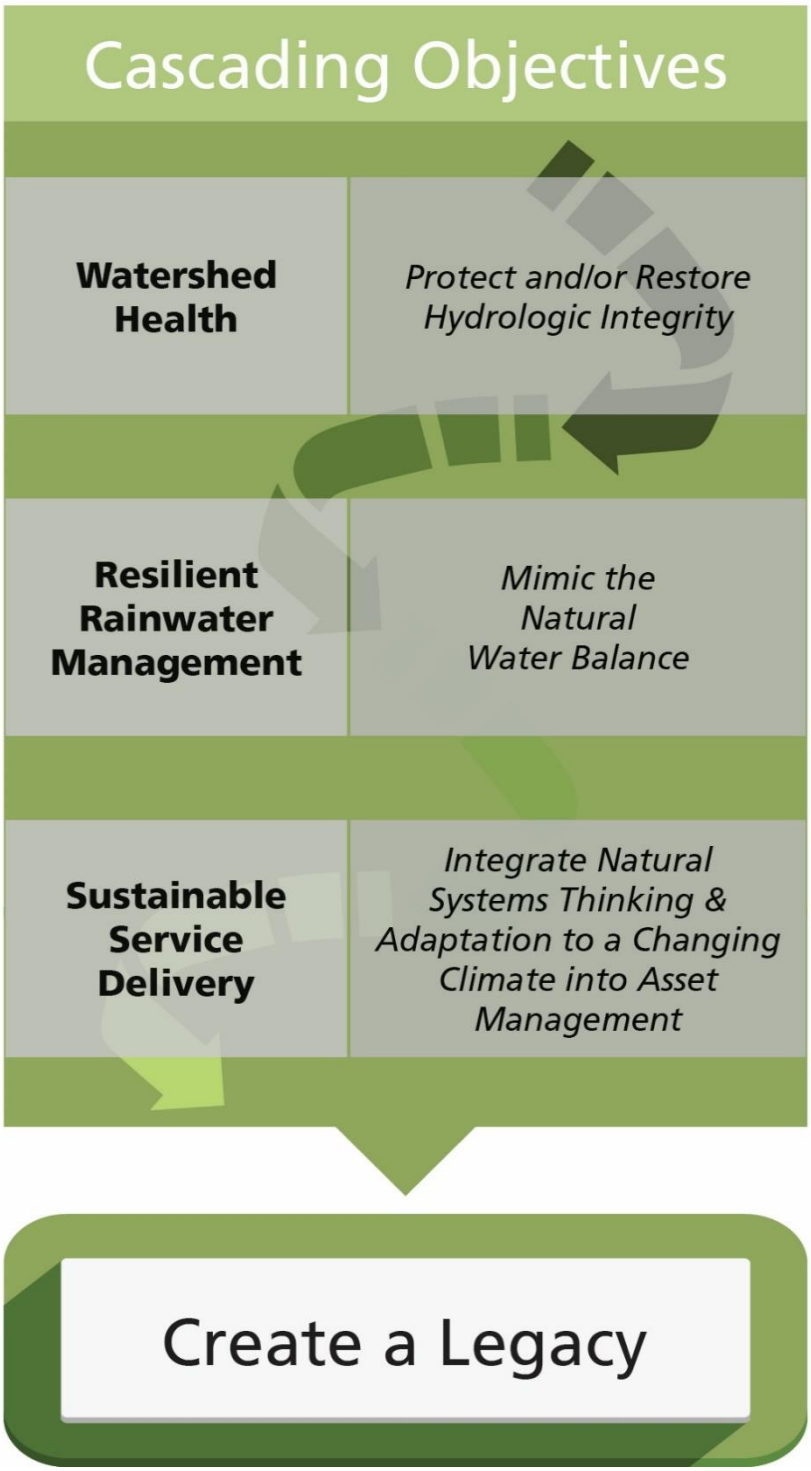
"Creeksheds as Infrastructure Assets"

A creekshed is an **integrated system**.

The **three pathways** by which rainfall reaches streams are 'infrastructure assets'.

The three pathways provide **'water balance services'**.

Figure B4



Cascading Objectives

Figure B4 is the primary branding graphic for Beyond the Guidebook 2015. It illustrates the essence of the three Cascading Objectives for three linked outcomes.

Alignment of efforts – from high level to ground level – is necessary to achieve the **Creekshed Health Goal**, which is defined as:

Implement standards of practice that mimic the natural Water Balance, are affordable and effective, and achieve the desired outcome, which is healthy streams and creeksheds.

Seven years after release of both the BC Framework and Beyond the Guidebook 2015, why and how the three objectives are interconnected is still neither widely known nor fully understood.

Stream health in the built environment is a function of how the landscape is altered by humans. A primary measure is the condition of aquatic ecosystems in stream corridors. Hardening the land surface short-circuits the water cycle. The result: either too much or too little flow in streams. Consequences include expensive fixes in an era when communities are challenged to fund and replace essential infrastructure services.

Sustainable Drainage Service Delivery applies to land uses that local governments regulate and/or can influence.

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