



OAKVILLE

REPORT

COMMUNITY SERVICES COMMITTEE

MEETING DATE: JUNE 18, 2018

FROM: Environmental Policy Department and Development Engineering Department

DATE: May 28, 2018

SUBJECT: Municipal Natural Asset Initiative

LOCATION:

WARD: Town wide

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RECOMMENDATION:

That the report on the *Municipal Natural Asset Initiative* dated May 28, 2018, be received.

KEY FACTS:

The following are key points for consideration with respect to this report:

- The town participated as one of five Canadian municipalities in the Municipal Natural Assets Initiative (MNAI) pilot study to determine the value to the community of stormwater services provided by nature-based ecosystem features.
- The town has strong policy context related to natural resources with numerous strategies supporting environmental sustainability, protection and enhancement, and innovative approaches to deal with the pressures on natural areas.
- The Provincial Policy Statement 2014 encourages green infrastructure approaches to stormwater management.
- The ability to pilot MNAI integrated with ongoing work on asset management and stormwater master planning ensured practical application of pilot outcomes.
- The estimated monetized service provided by a gray infrastructure equivalent for the study area's existing open remnant channel would be \$1.24M for existing conditions and \$1.44M for conditions representing redevelopment and climate variability.
- Other benefits of Municipal Natural Assets (MNA) include: biodiversity, climate resiliency, surface flow mitigation, air quality improvement, human health and wellness among others.
- The results of this pilot provide a better understanding of the stormwater management service and value that natural systems provide across the

town. These MNA systems currently reside in the form of remnant channels, ditches, swales, and watercourses that traverse alongside roads, within parks, natural areas, urban forests and open spaces.

BACKGROUND:

In February 2016, at the Federation of Canadian Municipalities’ Sustainable Communities Conference, an opportunity was introduced to participate in a Municipal Natural Asset Initiative (MNAI) pilot project. The project would assess municipal natural assets (MNA) in terms of the value of the stormwater services they provide. MNA are natural features/elements that provide a ‘service’ to an area or user. In the case of stormwater, natural features can include ditches, swales and watercourses. These natural features (although engineered in some cases) are best described as ‘green’ systems. Green systems provide the ability to move or convey stormwater (much like a pipe system) however these green systems can also offer quality and quantity treatment such as infiltration, flow control/storage, pollutant removal, etc.

The hierarchy of green stormwater systems can be akin to a road network, with local roads providing differing services than an arterial road. In the case of green stormwater systems, swales and ditches provide different services than that of a stream or river. Figure 1 provides a comparative representation of the services provided by different green stormwater systems.

Figure 1: Hierarchy and benefits of stormwater features

Feature	Service Function			
	Treatment	Infiltration	Storage	Conveyance
Swale	Yes	Yes	Yes	Yes
Ditch	Yes	Yes	Yes	Yes
Natural Channel (Includes remnant channels)	Some	Some	Yes	Yes
River	Some	Some	Yes	Yes
Engineered Channel	No	No	Yes	Yes



In contrast, 'gray' or built stormwater infrastructure like pipes and concrete channels, have the main objective of stormwater conveyance. To replicate the service functions like infiltration, flow control/storage, pollutant removal, these gray systems are augmented with online mechanical systems (oil/grit separators), and super-pipes (for flow control) and/or end of pipe elements such as treatment ponds.

In a desire to improve an area's drainage efficiency or the conveyance of stormwater from or through an area, municipalities have (in earlier times) replaced 'green systems' (ditches) with piped or 'gray systems' without augmentation, resulting in the loss of benefits provided by the natural system. Understanding the resulting impact of this action we have improved our approach to stormwater management wherein systems are designed with set quantity and quality controls necessary to protect our natural receiving systems.

That said, some of our older community areas continue to be serviced by 'green or natural systems'. Despite providing a service equal to, or in some cases, better than, 'gray engineered systems' these natural systems tend not to be recognized as an asset with value. In recognition of this, the MNAI developed an approach to valuing natural assets by means of defining the equivalent engineered (grey) assets. While this approach provides an 'equivalency' value on the natural asset, it is recognized that nature assets tend to provide similar services to gray assets but with lower capital and operating costs.

Participation in the pilot was limited. Municipalities were selected based on an evaluation process. The pilot presented the opportunity to engage in ground breaking work, but also offered:

- Financial and technical support in applying a standard methodology;
- Consideration of MNA as a municipal service by assessing function, and
- Carrying out a valuation leading to discussions of integration into policy, asset management and financial processes.

The MNAI team involved Brookes and Associates, the David Suzuki Foundation, Friends of the Greenbelt Foundation, Sustainable Prosperity and the Town of Gibsons, British Columbia. In spring 2016 Oakville was accepted as one of the five pilot municipalities. The other four pilot communities were: Region of Peel/Credit Valley Conservation Authority, City of Naniamo, District of West Vancouver, and City of Grand Forks.

What are MNA?

Municipal Natural Assets are nature-based ecosystem features that provide or could be restored to provide community services such as stormwater management, erosion control, air and water pollution control, among other benefits. MNA are

considered to be green infrastructure that includes natural resources and designed elements such as:

- Creeks, wetlands, forests, parks, fields, open spaces, natural areas;
- Rain gardens, bioswales, urban trees, stormwater ponds; and
- Permeable pavement, green roofs, rain barrels).

MNA Valuation

MNA can be assessed for their capacity and value in providing municipal services to compare to provision of those services via traditional gray infrastructure options such as pipes, storage tanks and oil/grit separators as examples.

Work is underway by several agencies to better define MNA valuation and understanding of ecosystem services. Groups actively working in this field of research and application include: Sustainable Prosperity, Ontario Network for Ecosystem Services, Natural Capital Lab, EcoHealth Ontario and several academic institutions, along with agencies represented on the MNAI team.

Policy Context and Aligned Projects

The MNAI intersects with the province's policies and a number of the town's functional areas. A strong policy context exists, with many completed Council approved strategies and projects underway.

PROVINCE

The Provincial Policy Statement 2014 clearly represents the need for consideration of natural asset policies so that 'healthy, liveable and safe communities are sustained by: promoting development and land use patterns that conserve biodiversity and consider the impacts of a changing climate (Section 1.1.1 (h)); and promoting *green infrastructure* to complement infrastructure. (Section 1.6.2) Green infrastructure means natural and human-made elements that provide ecological and hydrological functions and processes and can include components such as natural heritage features and systems, parklands, stormwater management systems, street trees, urban forests, natural channels, permeable surfaces, and green roofs. (PPS 2014 Definitions) PPS 2014 supports the promotion of sustainable and resilient development that is both protective of and more compatible with the natural environment.

TOWN

Municipal Natural Assets

Livable Oakville includes environmental sustainability in the Mission Statement with a Guiding Principle to preserve, enhance and protect the Town's environmental resources, natural features and areas, natural heritage systems and waterfronts. Stormwater management for quantity and quality control encourages use of

permeable surfaces, soft landscaping and innovative stormwater management strategies in General Policy Section 10.10.

Over the past 13 years the Environmental Strategic Plan, recently updated to become the Environmental Sustainability Plan, and the related Environmental Sustainability Policy (EN-GEN-001-001) have provided a policy framework supporting natural resource protection, restoration and enhancement.

The nearly completed Biodiversity Strategy will provide a more detailed framework to ensure cross-departmental alignment, facilitated partnership and community efforts to support biodiversity and natural area identification, protection, restoration and enhancement.

Over the past decade work to assess, plan and implement actions to manage Oakville's urban forest have included the 2005 UFORE Assessment, the 2008 Urban Forest Strategic Management Plan (UFSMP), the 2012 North Oakville Urban Forest Strategic Management Plan and most recently in 2016 The Growing Livability-A Comprehensive Study of Oakville's Urban Forest (iTree Report). An update to the UFSMP is underway and will align with the overarching Biodiversity Strategy. Oakville's urban forestry work has defined the multiple benefits of forest infrastructure, including improved community health and well-being, reduced air pollution, mitigation of the urban heat island effect, resiliency to climate change and provision of stormwater services. The structural value of Oakville's urban forest is estimated to be \$1.04B and tree canopy is estimated to provide \$2.93M in environmental benefits each year. (iTree, 2016)

Many more initiatives have demonstrated the town's commitment to natural areas including establishing the North Oakville Natural Heritage System, working to enhance the Greenbelt along the urban river systems, and working to protect large areas of greenspace. The town has the highest number of trees planted per 100,000 population at 13,895 within comparator municipalities of Boston, Portland and Melbourne LGA according to the World Council on City Data database.

Asset Management

The town already complies with the Public Sector Accounting Board (PSAB) 3150 and has maintained a complete inventory of engineered (gray) assets since 2008 including stormwater sewer pipes and storage tanks. Asset management has matured with the integration of an asset replacement/repair plan into the Corporate Information System (CIS) and Capital Budget Financial Plan. In 2014 Council approved the Asset Management Policy Statement (A-BMG-004) committing the town to managing infrastructure assets in a strategic, comprehensive, enterprise-wide manner that recognized assets as interrelated components in a unified system. MNA are already represented in the land improvement registry with parks, sports

fields and trails. Trees and woodlots are inventoried. In the environmental network registry at this point engineered (gray) infrastructure is included such as storm sewer pipes, storage elements, pond hardscape features, and minor culverts among other features.

Stormwater Master Planning

Stormwater planning has been improving and evolving over the years.. In 2008 the Town Wide Riverine Flood Study included consideration of climate change impact potential. Other studies of MNA include regular Creek/Shoreline Assessment Studies, Environmental Site Assessments and restoration projects. In 2010 Phase 1 of the Stormwater Master Plan began to update the stormwater sewer system inventory and condition assessment. Phase 2 of this master plan, nearing completion, will determine the effectiveness of the major (overland) and minor (pipes) stormwater management system under existing, redevelopment and climate change scenarios. Figure 2 shows major and minor components of the stormwater system. A report on the SWMP Phase 2 and recommendations for system improvements will be brought to Council in early 2019.

Minor and Major Systems

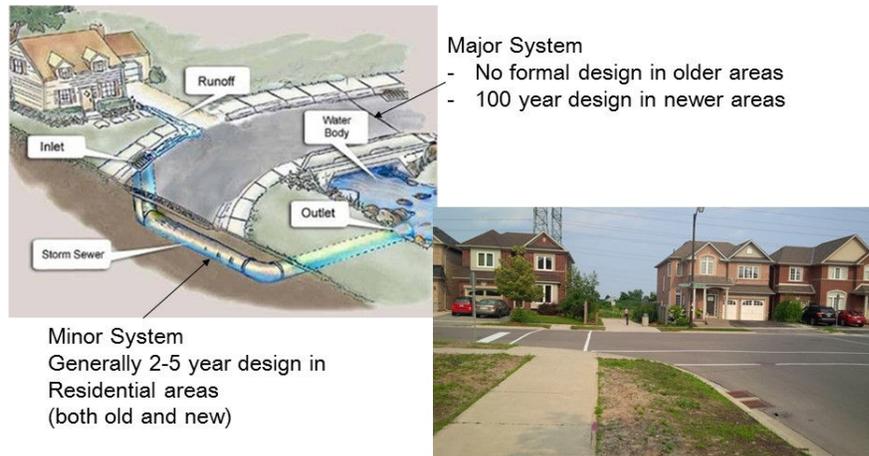


Figure 2: Stormwater major and minor system components.

MNAI Opportunity for Oakville

With strong policy context and work underway that could integrate and benefit from participation in the pilot, staff determined how a project could be scoped to deal with issues specific to Oakville including:

- Ditches, swales and remnant channels (formerly intact channel systems, now altered) are viewed as conveyance systems and not recognized for the

enhanced services that they inherently provide. Alterations such as enclosure or replacement with traditional gray assets should take into consideration a 'like for like' service replacement where it can be demonstrated that the natural asset provides such enhanced service.

- MNA can provide the same SW services to the community as engineered assets, but with lower capital and operating costs and additional potential community benefits, however, the approach to carry out this assessment and valuation was not established to enable consideration within stormwater master planning studies.
- It is recognized that there will be circumstances where engineered or gray assets are appropriate in lieu of natural systems, however these replacements should be designed to best replicate the service provided by the natural system where those services can be defined.

Taking these points into consideration, the town's successful proposal to engage in the MNAI was supported and included:

- Immediate integration with the ongoing SWMP Phase 2 and asset management projects including drawing from existing cross-departmental staff teams.
- Focused scope to assess MNA in an area experiencing redevelopment and climate variability.
- Ability to leverage ongoing stormwater modelling work by consultants working on the SWMP.
- Staff understanding of MNA management, importance of asset management, potential for policy linkages and leadership in environmental sustainability with support at the highest levels.

COMMENT/OPTIONS:

Study Initiation

In Fall 2016 a cross-departmental team was formed drawing staff from: Development Engineering, Environmental Policy, Financial Operations/Asset Management, Financial Planning, Parks and Open Space, Planning. The CAO served as project champion. The SWMP Phase 2 consultant, Wood PLC formerly AMEC Foster Wheeler, integrated necessary pilot components into their work on the Stormwater Master Plan.

Objectives

There were five objectives for the pilot, most important being to establish a financial value for stormwater services provided by natural assets, based on what it would cost to replace the water quality and quantity control provided by natural assets with engineered stormwater infrastructure. Other objectives were to:

- Determine the value of the loss of municipal services created by the conversion of existing natural assets and any corresponding financial risk and/or liability.
- Determine what could be learned from the pilot area to help better prioritize and manage change in other areas of the community.
- Consider different scenarios reflecting land-use intensification and climate variability influences that could affect the value of provided SW service.
- Determine whether the monetization of municipal services could create a basis for new municipal strategies to manage and account for natural assets.

The key natural assets of interest were: remnant channels, ditches/swales, tree canopy and open green spaces that are currently subject to redevelopment pressures and climate variability.

Approach

While projects from each of the municipalities involved in the national MNAI pilot were unique, they all followed a standardized process based on the steps outlined in Figure 3. The milestone process enabled the pilot participants across Canada to share learnings and experiences.

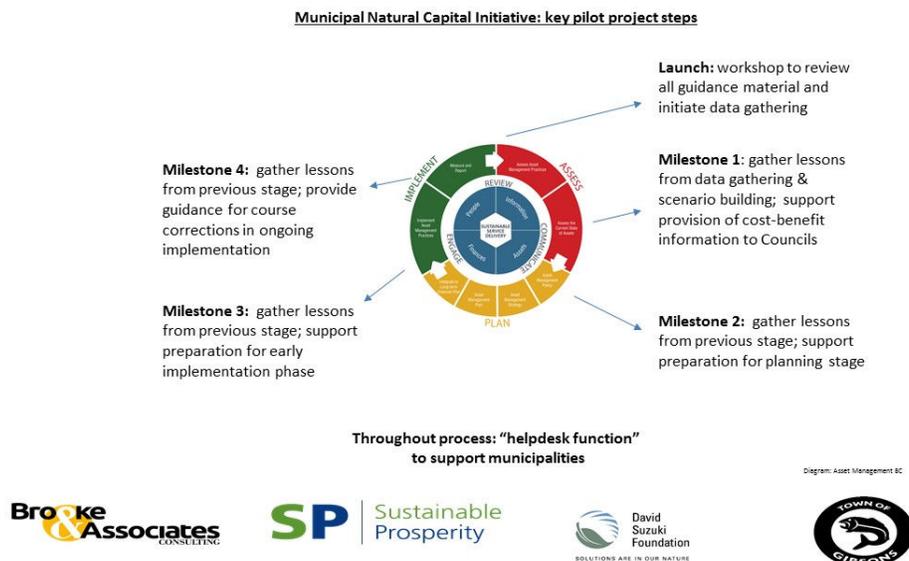


Figure 3: MNAI Pilot Project Approach

The MNAI pilot project wrapped up in the first quarter of 2018 and culminated in discussions on integrating MNA into the asset management system, developing supportive policies and defining next steps.

Study Area

The identified site of interest was the Maplehurst Avenue area, situated centrally south of the QEW bounded roughly by Bridge Road to the north, Rebecca Street to the south, Fourth Line to the east and Mapleview Avenue to the west. The site was chosen as it has a 240+ metre remnant channel draining to the McCraney Creek system and open drainage ditches. Figure 4 shows the study area.



Figure 4: Oakville MNAI Study Area

These older low-density residential areas of town south of the QEW often lack a formal major or overland flow route but due to the low lot coverage, this has not posed an issue in the past. However, the study area is transitioning from housing and amenities with a high level of uncovered or permeable lot area to lots that are predominantly covered with impermeable surfaces that are less able to absorb rainfall. Well-functioning major systems are now considered essential components of an effective stormwater management system related to the growing risks of infill development and climate change.

Field work was conducted across the study area to assess the natural drainage network for stormwater surface water flow conveyance and storage, and groundwater to understand attenuation (recharge/infiltration) services. Figure 5 shows field monitoring locations.



Figure 5: Field investigations included topographic surveying and surface and ground water monitoring to capture dry and wet weather events.

Study Outcomes

A comprehensive technical report was prepared documenting all aspects of the pilot project. Brief study outcomes are presented in this report while detailed findings are being integrated into the SWMP Phase 2 work. The MNAI technical report will be included as an appendix in the SWMP report.

Value of MNA

The analysis applied in the pilot used a replacement cost approach to determine a high-level economic value for the stormwater management services provided by the existing natural drainage network. The network provides a well-defined conveyance function as well as a level of attenuation to reduce peak flows downstream. While the area ditches provide a high level of stormwater quality treatment, the remnant drainage pathway provides primarily conveyance and attenuation functions. These conveyance and attenuation functions were primary considerations in the evaluation of costs to replace the MNA.

Through the study, it was estimated that the monetized service provided by a gray infrastructure equivalent for the current remnant channel would be \$1.24M for

existing conditions and \$1.44M for conditions representing redevelopment and climate variability. This does not include the value of additional benefits that come with MNA's providing other services noted below. Operations, maintenance costs, outreach, education and enforcement are considered to be of a minimal order of magnitude. The net impact of these costs will be assessed further as a next step.

It is noted that in this particular case study, it was recognized that the subject section of remnant drainage pathway had low infiltration and water quality attributes (as one might expect given its hierarchy within the drainage system). The remnant drainage pathway was being primarily relied upon for conveyance and attenuation, attributes which are more readily replicated within traditional engineered systems. This is an important finding given the pressures being experienced within private lands to enclose sections of these remnant drainage pathways. Where it can be demonstrated that these remnant drainage pathways provide little or immeasurable infiltration or water quality treatment, it may be reasonable to enclose sections of the drainage pathway where it can be demonstrated that the primary service function (flow conveyance/attenuation) can be provided and maintained.

Eco-system Benefits

NA provide (supply) ecosystem services that satisfy community needs that go beyond what gray or engineered infrastructure can provide (Figure 6). These non-monetized benefits support Oakville's environmental sustainability and resiliency to climate change impacts:

- Surface water ponding and flow mitigation
- Water quality improvement
- Improvement of stream health
- Increase in groundwater recharge (infiltration)
- Flow control and management
- Erosion Control
- Ecological function
- Biodiversity
- Community well-being
- Access to green space



Figure 6: Community Co-benefits also known as Beneficiary Considerations

Enhanced Staff and Consultant Knowledge Base

Essential staff awareness and understanding of the value, assessment approaches within the SW management and asset management from financial and accounting perspectives were gained through participation in this pilot. Staff and the consultant gained confidence in the methodology applied to evaluating the value of stormwater services within the modelling scenarios and comparison to the equivalent gray infrastructure system. The study consultant indicated that an important outcome was the enhanced experience in applying typical stormwater system assessment tools in innovative ways.

Asset Management Considerations

Through Finance and Asset Management staff involvement, there is the potential for Public Sector Accounting Board (PSAB) standards to better support representation of MNA in asset accounting going forward. The PSAB has established a Discussion Group to consider integrating the municipal function of MNA into their standard practices. Currently there is no standard process to account for MNA management in the asset registry or ability to include replacement values representative of the service provided. As an example replacement of an urban tree is standardized at a small tree cost not reflecting the services of the mature tree being replaced, the value they provide to a municipality and related ongoing operations and maintenance costs.

Contributions to Future Pilots

Feedback from pilot participants was provided on ways to improve the process, how to deal with the challenges of staff resources and constrained budgets, and other issues for future pilot municipalities to consider to support an effective project.

Oakville's experience related to the effectiveness of having support from senior levels and moving forward with a scoped, aligned and practical approach that leveraged ongoing stormwater master planning and asset management work and staff resources. Transferring these experiences will provide a better understanding to future pilots of the importance of having staff and political buy-in, dedicated resources to see the pilot through, and ensuring there will be integration of learnings into 'day-to-day' and strategic policy work.

Through participation in this pilot, Oakville's leadership was highlighted on numerous occasions. Staff and the Mayor have provided presentations and interviews with the media outlining the importance of MNA and looking at innovative ways to better reflect their value to the community. Staff have presented the pilot process and benefits of MNA to groups organized by: the Friends of the Greenbelt Foundation, Federation of Canadian Municipalities Sustainable Cities Conference, Clean Air Partnership and the Green Infrastructure Ontario Coalition.

Key Outcome Summary:

- *A natural system such as a remnant channel or ditch provides a service that goes beyond simply flow conveyance.*
- *The stormwater system relies on MNA for overland conveyance and storage of SW along with other benefits including infiltration that reduce flows.*
- *The value of the municipal stormwater service provided by the 240+ meter remnant channel is in the order of \$1.24M (existing) to \$1.44M (stressed) conditions.*
- *Replacing natural systems with engineered or gray systems that fail to replicate or provide equivalent service, can introduce unnecessary risk and negative environmental impacts.*
- *Evaluating the options of a MNA system and/or gray infrastructure remain an important element in determining the appropriate action ensuring that we have mitigated our risk responsibly.*
- *The value of municipal services provided by the remnant channel is important when assessing proposals that seek to alter these systems.*
- *MNA support multiple and broad community benefits that can be monetized and would improve the cost benefit understanding of NA options to manage stormwater.*

Next Steps

Participation in the MNAI pilot represented an important step in moving not just the town, but municipal practice forward in addressing the value of NA and green infrastructure. This is increasingly important in light of a rapidly changing environment due to variables such as climate change and redevelopment. To continue moving forward to incorporate the results into the town's work a number of cross departmental next steps are recommended.

Stormwater Management Master Plan – Phase 2

The SWMP is being carried out to determine urban flood risk by assessing the existing and needed capacities of the minor (pipes, gray infrastructure) and major (overland flow, e.g. NA's remnant channels, ditches, swales, roadways, ponds, NHS, and more) stormwater management system. Pilot outcomes will inform the SWMP with rationalized NA value especially the understanding that natural assets including ecosystem features such as remnant channels, ditches, swales, creeks and the urban forest, provide essential municipal stormwater management services. These NA, especially on a system-wide basis, provide important conveyance, storage, water quality improvement, cooling, biodiversity, and other services at lower costs than gray infrastructure along with many other benefits noted above.

The SWMP will integrate pilot findings when considering, for example, the value of maintaining or improving the function of a rural road cross section with

ditches/swales versus an urban cross section with buried pipes. The full MNAI Technical report will be included as an appendix to the SWMP.

Policy Framework

Pilot outcomes will be leveraged to develop stormwater management policy including a planning context to reflect stormwater management needs, the value of MNA in providing SW service with additional benefits to deal with the impacts of intensification, and climate variability. A policy framework integrating MNA will ensure the value of municipal services provided by MNA is recognized, protected wherever possible and even potentially restored to achieve the benefits of green infrastructure over gray. Collaboration with other municipal and conservation authority networks are being established to explore opportunities for framing policies and approaches to better support MNA initiatives including community partnerships, outreach and education, Low Impact Development and SW source controls such as bioswales.

MNA such as remnant channels, ditches and swales provide a key service that is relied upon for stormwater management. These assets are in public and private ownership. Policy development will recognize MNA services and benefits and how these services can be better supported through monitoring and maintenance and perhaps protection and enhancement to ensure these services are not compromised, degraded or lost. In cases where the MNA service can be quantified, replacement of like for like can be appropriately entertained. Before this pilot work, there was an incomplete understanding of the potential significance of MNA to provide municipal stormwater services. There is now a better comprehension of the benefits that MNA can provide in mitigating threats such as redevelopment, private landowner actions, and the shift from rural to urban road cross sections.

Integrate findings into town's Asset Management System

The pilot findings will also be integrated into future improvements to account for the value of service provided by MNA and also to better reflect the replacement, operation and maintenance aspects of MNA to support desired municipal service levels. Work is underway to include MNA not currently in the asset management system as green infrastructure. These assets deliver service and value to the town and require monitoring and maintenance to support effective operation and service.

The way MNA can be integrated into the asset management system will require further work since the standard accounting practice for MNA replacement does not reflect the service provided, i.e. a tree replacement cost reflects a small tree that would provide less in terms of municipal services. This consideration of MNA (some not yet inventoried) for their municipal service builds upon the already well-established asset management work.

Knowledge Transfer

MNA in both public and private ownership provide valuable services. Project staff have an improved understanding of the rationalized approach to assessing the municipal stormwater services of MNA. This knowledge will be transferred across departments and also to the public to convey the importance of MNA, the wide variety of services they can deliver, and how they can be integrated into supportive policy and on-the-ground work.

The findings of the five national pilots align with other emerging provincial and federal policies, guidelines and regulatory trends. Stormwater management options are trending towards greater consideration of source control through on lot/on road and Low Impact Development options and less on the traditional end-of-pipe solutions. Through the pilot findings, there is a much clearer understanding of the monetary impacts of MNA loss with respect to stormwater management services and the costs of moving from green to gray infrastructure along with the loss of additional community and environmental benefits.

Summary

The results of this pilot provide a better understanding of the stormwater management service and value of natural systems as they exist today across the town with remnant channels, ditches and other overland flow routes in watercourses, parks, natural areas, urban forests and open spaces, and along roads, in the public and private realm. The magnitude of this system of MNA provides a potentially significantly under-valued municipal service in managing stormwater that is now better defined. The impact of replacing these resilient green infrastructure stormwater management system elements with gray can now be monetized. With this information staff are better able to understand and represent the costs and risks associated when the town's MNA providing stormwater management services are compromised.

CONSIDERATIONS:

(A) PUBLIC

The MNAI pilot project provides better understanding of the value of the community's natural assets to provide municipal stormwater management services. These assets held in both public and private ownership include creeks, remnant channels, ditches, bioswales, open spaces, urban forests and other features.

(B) FINANCIAL

The value of natural assets as green infrastructure components of the stormwater management system have been estimated to be comparable to works exceeding \$1.2M to \$1.4M for conveyance, attenuation, and

infiltration functions without including co-benefits or operations and maintenance costs (expected to be lower order magnitude). This information will be integrated into the Stormwater Master Plan when considering management recommendations and the Asset Management System to improve accountability and represent service function.

(C) IMPACT ON OTHER DEPARTMENTS & USERS

The cross-departmental team facilitated knowledge and awareness transfer that will benefit many departments including Development Engineering, Environmental Policy, Financial Operations/Asset Management, Financial Planning, Parks and Open Space, Roads and Works Operations among others.

(D) CORPORATE AND/OR DEPARTMENT STRATEGIC GOALS

This report addresses the corporate strategic goal to:

- enhance our natural environment
- have environmentally sustainable programs/services
- continuously improve our programs and services
- be innovative in everything we do
- be fiscally sustainable
- be the most livable town in Canada

(E) COMMUNITY SUSTAINABILITY

Consideration of the value of Oakville's natural assets supports the four pillars of sustainability: social, economic, environment and cultural aspects of our community. Better understanding the importance of the town's natural assets in providing cost-effective municipal stormwater services as well as supporting community well-being and environmental sustainability was an important outcome of this work,

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