

NO: R083

COUNCIL DATE: May 3, 2010

REGULAR COUNCIL

TO: **Mayor & Council**

DATE: **April 27, 2010**

FROM: **General Manager, Engineering**

FILE: **5225-00**

XC: **5210-10**

SUBJECT: **Surrey's Innovative Drainage Policies and "Green" Design Standards to be Presented at Provincial and National Events**

RECOMMENDATION

The Engineering Department recommends that Council receive this report as information.

INTENT

The purpose of this report is to advise Council of the Engineering Department's participation in two professional development opportunities.

BACKGROUND

The Association of Professional Engineers and Geoscientists of B.C. (APEGBC) regulates and governs the Engineering and Geoscience professions under the authority of the Engineers and Geoscientists Act. To support its members, APEGBC organizes a variety of professional development seminars each year. In 2010 one such seminar is focussed on developing "green" drainage designs and is to be held on May 19, 2010.

The Canadian Water Resources Association (CWRA) is a national organization of individuals and organizations from the public, private and academic sectors that are committed to raising awareness of the value of water and to promoting responsible and effective water resource management in Canada.

The BC Branch of the CWRA is hosting the 63rd National Conference on June 15 – 18, 2010 in Vancouver. The focus of this conference is to discuss how investments in science, monitoring, and projects can promote effective water management through economically challenging times while moving toward a sustainable future.

Each of the above-referenced associations has recognized the leadership and achievements of the City of Surrey in watershed management, aquatic habitat protection, modeling, analysis, policy development and governance and has requested that the City of Surrey Drainage and Environment staff participate in the above-referenced professional development events.

DISCUSSION

The City has had in place a Natural Drainage Policy for many years. It has consistently encompassed the idea of working with nature. This policy encourages creativity and innovation in the development and use of drainage techniques to manage stormwater runoff. The City has over the year accumulated significant expertise and is recognized as municipal leaders in sustainable drainage at each of the Provincial and National level.

City staff will be presenting a seminar at the May 19, 2010 APEGBC event that will assist other engineers in developing “green” drainage designs. This seminar is designed to have participants learn environmental concepts and features that can be incorporated into projects to meet the needs of environmental approval agencies. Topics to be presented include:

- In-stream complexing through headwall design, material placement, and bank stabilization;
- Fish-friendly mechanical devices such as pump station and flap gate design;
- Project Best Management Practices to address water quality in road widening projects, rain gardens, use of top soil, etc.;
- Building for beaver presence; and
- Practical planting prescriptions.

City staff will be presenting the following technical papers at the CWRA National Conference in Vancouver:

- Protecting Crescent Beach from Climate Change;
- Implementing Sustainable Development Concepts;
- Eugene Creek Diversion: Improving Drainage and Aquatic Habitat Together;
- Riparian Planting for Natural Succession;
- Revitalizing a Neighbourhood through Storm Water Management;
- Boundary Bay Assessment and Monitoring Program;
- The Development of a Strategic Plan for Lowlands Flood Control – Part 1; and
- The Implementation of the Strategic Plan for Lowlands Flood Control – Part 2.

An abstract of each paper is included in Appendix I.

In addition to presenting the papers at the national conference, the City will also be hosting a tour of projects in Surrey. The tour will first take participants from the uplands, where new developments have preserved natural features and where nature has been reinstated in older developments. It will then proceed to the City’s agricultural lowlands where fish-friendly pumps, setback dykes, and in-stream features will be observed and discussed. The final stop on the tour will be Crescent Beach where discussions on climate change and adaption will be the focus.

SUSTAINABILITY CONSIDERATIONS

The City's drainage policies and projects that are the focus of both the APEGBC seminar and the CWRA National Conference highlight the City's support of the Economic and Environmental Pillars of the City's Sustainability Charter through:

- Municipal Outreach, Public Education, and Awareness
- Sustainable Engineering Standards and Practices
- Enhancing the productivity of agricultural lands within the Serpentine and Nicomekl River floodplains;
- Enhancement and Protection of Natural Areas, Fish Habitat and Wildlife Habitat;
- Enhancing the Public Realm;
- Public Education and the Sharing of Information; and
- Minimizing the impacts of development on the natural environment.

CONCLUSION

The City's participation at both the APEGBC seminar on developing "green" infrastructure and the Canadian Water Resources Association's 63rd National Conference highlight the expertise of City staff and the success of the City's drainage policies and projects that support the City's Sustainability Charter.

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CAB/JA/brb/jkb

Appendix I - Abstracts for Canadian Water Resources Association National Conference

Abstracts for Canadian Water Resources Association National Conference

Protecting Crescent Beach from Climate Change - A lot more than just raising dykes

The community of Crescent Beach is situated at the confluence of Boundary Bay and Mud Bay in the City of Surrey, B.C. Over the years, the community has transitioned from seaside cottages to single family residential development, with small pockets of commercial and multi-family land use. The area is surrounded by a dyke system, as topography ranges from 0 to 3 metres above sea level. Climate change, tidal fluctuations, seasonal groundwater fluctuations, land subsidence, redevelopment and densification, and inadequate and aging drainage infrastructure are impacting the community, resulting in poor drainage conditions. The first step to understanding the issues was a detailed assessment of the area and interaction of tides, rainfall, subsidence and rainfall in the community. The surprising results show that raising dykes will not save this community from the rising ocean waters as the threat is from within the dykes, slowly sinking lands, rising groundwater conditions and diminishing infiltration for rainwater storage. Developing a comprehensive community plan with the residents and moving forward with community re-servicing to account for climate change impacts already occurring, will be the focus of the presentation.

Implementing Sustainable Development Concepts

Variable site conditions and desired outcomes are just a couple of factors that affect you, the designer, when you include sustainable development measures for stormwater management into your designs. Your ultimate success is defined in terms of acceptability, cost and performance. We are sharing our observations made between 1999 through to 2010 of the development of drainage sustainability in Surrey, Canada. We are presenting what you can expect in the way of challenges and successes. This presentation is based on the findings of implementing Canada's largest sustainable community and the improvements that are ongoing within the City today; we will tell you how to get your projects approved with sustainable development practices. This information is applicable in every municipality in Canada. We will present details on the simplest and most cost effective techniques that have been proven in Surrey. Requirements for development are changing; come and listen to how you can get ahead of the curve and benefit from the emerging trend. Sustainable development can save you and your client's money, if you know what to look for and how to implement it wisely. More importantly, it will change the way we live.

Eugene Creek Diversion: Improving Drainage and Aquatic Habitat Together

Eugene Creek is located south of Highway 10 and east of 120 Street in the Panorama Ridge area of the City of Surrey. Prior to the Eugene Creek Diversion, the flow pattern of the watershed diverted 149 ha of residential upland flows to Peacock Brook, through the Panorama lowlands, and to the Colebrook Pump Station which discharges to the Serpentine River near Mud Bay. The Panorama lowlands were poorly serviced under this drainage regime with concerns of flooding and high groundwater. Upgrades to the lowland ditches and pump station would be needed to improve drainage in the agricultural lowlands so as to operate within the ADRSA criteria and facilitate sustainable future development of the uplands. As a better alternative, the Eugene Creek Diversion re-directs the upland watershed to the historic lowland portion of the creek system. This lowland Eugene Creek channel experienced minimal flows prior to the Diversion and the outfall was affected by sedimentation. The Diversion consists of 980m of new channel and dykes

and an improved outfall into Mud Bay. The new channel and upgraded outfall provide improved fish passage and in-stream habitat features which are expected to significantly enhance juvenile Coho salmon and Cutthroat trout populations present upstream of the Diversion. The new dyke incorporates a public pathway which links the proposed Metro Vancouver Delta-South Surrey Regional Greenway and to Surrey's Serpentine Greenway. Outfall improvements at Mud Bay create a self-cleaning outlet that has significantly less sedimentation, less maintenance, and fewer disturbances to foreshore habitat.

Riparian Planting for Natural Succession

A major challenge for land use planners is managing our natural areas to protect a diversity of biological values and ecological systems, while at the same time providing opportunities to meet human settlement and development needs in a balanced, sustainable manner. These natural areas also provide valuable "free" ecosystem services such as carbon sequestration, attenuation of flood flows, and bio-filtration. Urban development often requires riparian ecosystem services to be altered in location and function. This poses significant challenges for restoring these areas and ensuring new systems are functioning properly. The complicated nature of these projects can lead to failures that are costly both economically and environmentally. The City of Surrey recognizes these difficulties and is exploring new processes for the restoration of riparian areas, which include a more natural and long term approach. The restoration of natural plant communities and ecological processes in riparian ecosystems is a complex undertaking and typically, prescriptions are included as requirements under DFO authorizations and specify a diverse mix of plants and trees, which are the target species for a mature or later seral stage plant community. This strategy has often proven to be unsuccessful for a number of reasons, including: the site and native soils are not properly prepared to support some of the later seral species; poor quality planting mediums are imported; plant and tree species are not spatially located properly on the site causing interplant competition and poor micro site growing conditions; pioneer or early seral species colonize the site, outcompeting planted species; invasive species are not controlled and outcompete planted species; a short timeline is provided for the establishment of the plant community; soils are not stabilized which can contribute to erosion; and detrimental social factors are not anticipated. The management challenge for restoration projects lies in finding the right balance between allowing natural ecosystem processes to take place while meeting commitments to federal, provincial and municipal governing bodies. This is particularly challenging in urban environments where cumulative effects resulting from intensive land use and development can have potentially lasting and detrimental consequences on sensitive habitats and ecosystems. These challenges can be viewed as an opportunity to incorporate innovative approaches to the management of these areas. The City of Surrey has developed Habitat Restoration Prescriptions (HRP) for Municipal Detention Ponds and Riparian Ecosystems that intends to mimic early seral colonization and through aggressive site management, accelerates the incorporation of plant diversity into the colonized site while excluding invasive species. The development of Habitat Restoration Prescriptions (HRP) is an innovative and progressive approach to site restoration. The concept is logical and follows an evolutionary process; however, it requires a longer term commitment for maintenance and enhancement treatments.

Revitalizing a Neighbourhood through Storm Water Management

Picture a neighbourhood built over 70 years ago, the hub of which is a community park. Over the years, this park has slowly degraded with need of new purpose as the sports fields, equipment, and lawn areas get little use. Within the same neighbourhood is an old drainage system which discharges to a natural ravine setting. The lack of storm water management at the time of

development 70 years ago has led to accelerated creek erosion, closure of headwater tributaries, fish passage limitations, and water quality issues. By merging the needs of community revitalization with improved storm water management, the Robson Park project was created. Community input was instrumental to the project and residents of all ages were engaged throughout the process. The Robson Park project has led to the construction of new fisheries habitat, improved fish passage, water quality ponds, improved riparian habitat, and storm water detention. By using a portion of park land for storm water management, funding was available for new park amenities including a new playground, parking facility, sports fields, walking trails, and picnic areas. The new design also increases site security and limits vandalism by considering view corridors and placement of facilities. The community continues to be involved as the project moves forward. Participation by local organizations in planting, education initiatives and maintenance will help ensure the newly constructed facilities will be respected and cared for in the community.

Boundary Bay Assessment and Monitoring Program

Boundary Bay has been recognized as an "ecologically important area" that encompasses the lower mainland of British Columbia, Canada and Washington State, USA. The Boundary Bay watershed includes the southern portion of the Fraser River delta, the Little Campbell, Nicomekl and Serpentine Rivers and Watershed Creek that discharge into the Bay which has a distinct marine ecosystem. The Boundary Bay Assessment and Monitoring Program (BBAMP) was developed as a means of coordinating individual environmental monitoring under a single comprehensive multifaceted program through a partnership of local government agencies, NGOs and First Nations. A comprehensive fresh and marine water sampling program was designed and implemented in 2009 in the Boundary Bay watershed. The purpose of the BBAMP is to establish baseline measures, assess the current water quality status of the watershed, and identify any seasonal or temporal trends in any of the variables measured that might affect environmental quality. BBAMP data will provide valuable information to guide decision makers, stakeholders, resource managers and elected officials in regard to upland stormwater management, land use, and education and awareness campaigns. Using applicable sampling protocols, over 400 samples were taken from 42 strategically chosen monitoring sites throughout the watershed and bay during the spring and fall sampling periods. Each sampling period consisted of one sample taken per week for five weeks. The core sampling partners coordinated the sampling days so that all samples were collected on the same day in the freshwater environment and the next day in the marine environment, when weather permitted. In situ water quality parameters were measured and samples were submitted for lab analysis. Data analysis is focused on temporal trends per site while looking at a downstream migration of contaminants. Preliminary analysis of the data indicate that most of the parameters monitored in the marine environment were measured either below the detection limit or predominantly met the applicable guidelines. In several instances, concentrations of some metals and fecal coli-forms in the freshwater environment were elevated above the applicable guidelines. Flow modeling of the watershed will be conducted in 2010 to allow for loading and migration studies.

Part 1 - The Development of a Strategic Plan for Lowlands Flood Control

In 1997, the City embarked on an ambitious program to address lowland flooding within the 56.1 square kilometre Serpentine-Nicomekl lowlands. The fundamental cause of flooding in the lowlands is the very small elevation difference between the ground surface of the lowlands and the ocean, and the range of tide levels. As a first step towards the development and implementation of the Strategic Plan for Lowlands Flood Control, two committees were

established. The first was the Technical Liaison Committee and the second was the Stakeholder Steering Committee. The Technical Liaison Committee was comprised of representatives from within the Department of Fisheries and Oceans, the BC Ministry of Agriculture, the BC Ministry of Environment, local Dyking Districts, and neighbouring communities. The Stakeholder Steering Committee was comprised of local area residents who represented the various geographical and agricultural interests in the Serpentine and Nicomekl flood plain. These two committees helped to develop the servicing standards and options to achieve the established standard. With committee consultation and extensive consulting engineering services, the City has implemented a Full Dyke strategy and has been actively planning, designing, and constructing dykes, pump stations, and conveyance improvements within the agricultural lowlands of the Serpentine and Nicomekl Rivers. The original implementation schedule for the Full Dyke strategy including dyke construction, new pump stations, and upgrades to existing pump stations was expected to take 10 years and cost \$40 million (excluding inflation).

Part 2 - The Implementation of a Strategic Plan for Lowlands Flood Control

In 1997, the City embarked on an ambitious program to address lowland flooding within the 56.1 square kilometre Serpentine-Nicomekl lowlands. The fundamental cause of flooding in the lowlands is the very small elevation difference between the ground surface of the lowlands and the ocean, and the range of tide levels. Following the development of the strategic plan, the City has progressed with implementation of the recommended works. The original implementation schedule for the Full Dyke strategy including dyke construction, new pump stations, and upgrades to existing pump stations was expected to take 10 years and cost \$40 million (excluding inflation). To date the City has been actively implementing various components since 1998, at a total cost of \$35 million. In an effort to ensure that no lowland properties have been negatively impacted during the construction period, the City has been diligently modeling the construction conditions to ensure that floodwaters are equitably dispersed between lowland cells through temporary spillways. In addition to equitably distributing floodwaters, the temporary spillways have helped to control river water levels until system constraints were removed. Along the Serpentine River, there were three bridges and one major gas pipeline that prevented the City from fully raising the river level inside the dykes, until they were addressed. Although 10 years have passed, some work remains to be completed. The program has been delayed due to: dyke failures due to the soft soil; shortage of suitable fill material; construction schedule limitations requested by property owners (dust control or other crop related concerns); stakeholder review and signoff (reliance on external agencies for timely reviews and approvals); property acquisition, as a over 200 rights-of-way necessary for construction have been required; and construction cost escalation. Although the Strategic Plan for Lowlands Flood Control is not complete, the program has been able to provide significant benefits to the lowland community. Through the dyking, pump station, and conveyance works already completed, the City has been able to provide greater flood protection against frequent flood events and faster flood relief during significant rainfall events.