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CORPORATE REPORT

NO: **R175** COUNCIL DATE: **July 23, 2012**

REGULAR COUNCIL

TO: **Mayor & Council** DATE: **July 18, 2012**

FROM: **General Manager, Engineering** FILE **4806-913**

SUBJECT: **Update on Fish Habitat Restoration in the Phase I Area of Campbell Heights**

RECOMMENDATION

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

INTENT

The purpose of this report is to provide an update of the fish habitat restoration works that have been completed in the Campbell Heights Phase 1 area and which are being monitored.

BACKGROUND

The development of the Campbell Heights Phase 1 Area, being that area bounded by 20 Avenue to the south, 28 Avenue to the north, 194 Street to the east and 190 Street to the west (as illustrated on the attached Appendix "A"), required that fish habitat be relocated and reconstructed. These works were permitted by Fisheries and Oceans Canada (DFO) under a DFO Authorization. As part of the DFO Authorization, the City is responsible to monitor the effectiveness of the constructed habitat.

In 2008, staff completed a consultation process with the community, the Environmental Advisory Committee (EAC) and local environmental interest groups to review the habitat restoration plan and works. Following the consultation process, an Expert Panel including four Registered Professional Biologists was assembled and tasked with reviewing the public input and the City's construction plans that had been prepared to guide the completion of the habitat works in the Phase 1 area.

The Expert Panel review resulted in a set of recommendations and priorities to complete the Phase 1 area habitat works. Staff followed these recommendations in developing a revised plan to complete Phase 1 area habitat restoration works. Since 2008, the City has been implementing the Campbell Heights Phase 1 Area Habitat Construction Revised Plan in stages.

DISCUSSION

Campbell Heights Phase 1 area presents significant challenges to the restoration of fish habitat. The first set of challenges is attributable to the area's mineralized soils and seasonal fluctuating water table which make it difficult to establish trees and shrubs. The second set of challenges relates to unauthorized human impacts that have caused significant erosion along water channel

banks as well as general disruption in the area. These challenges are being addressed in a methodical and science-based approach. Since the design of the Campbell Heights Phase 1 Area Habitat Construction Revised Plan was completed, City staff along with City contractors and Salmon Habitat and Restoration Program (SHaRP) students have been implementing the Plan (as illustrated in the 'before and after' pictures of the Campbell Heights Phase 1 Restoration Area attached as Appendix "B").

The following is a brief update on the status of the fish habitat construction within the Campbell Heights Phase 1 area.

Channel Construction
All channel improvements have been constructed with the exception of the westerly end of the 26 Avenue channel, which will be completed in 2013. This channel element was not originally part of the Phase 1 development. The lot within which this channel is located has been recently subdivided, which will allow this channel construction project to proceed.

After the initial channel construction, several areas were found to be prone to erosion and slope failures. These failure areas have been managed using various mitigation techniques that include soil socks, willow-waddles, willow staking and other minor rockwork and plantings. Coarse woody debris is also employed to discourage unpermitted trail use along the banks of the channel.

Upland Planting Pockets
All upland planting pockets have been completed. Newly planted areas are maintained with weekly watering during the summer months and invasive plant removal by SHaRP students and City contractors is undertaken as well.

Riparian Plantings
All riparian plantings have been completed. All of the plantings are being managed and monitored according to the long-term monitoring requirements as stipulated in the DFO Authorization.

Access Road Decommissioned
The access road adjacent to the east side of the habitat area has been decommissioned. This area has experienced significant off-road use by vehicles trespassing within the area. Large amounts of coarse woody debris have been imported and found to be very effective in preventing trespassing.

Fish Use and Spawning Platforms
Fish sampling is performed each year to determine the species and distribution of fish in the area. Every year salmonids are found further upstream within the restoration area demonstrating the validity of the restoration works. In 2011, 29 juvenile salmonids were captured within the 194 Street channel as far north as 22 Avenue. During the fall spawning season, 47 adult salmon were observed within the 194 Street channel reaching as far north as 24 Avenue.

Water quality, and in particular water temperature, is the major limiting factor to salmonid distribution within the restoration area. This is especially apparent in the summer months. Growing vegetation (trees and shrubs) on the sides of the channel provides shade, which reduces water heating as well as discourages algae development. Reducing water temperatures increases the ability of water to hold oxygen which is essential for salmonid presence. Such plantings have been undertaken along several sections of the channel.

Community Consultation
Since initiating the construction of the revised plan, staff has hosted an annual site visit of interested parties to the Campbell Heights Phase 1 area to review the restoration works that have been previously completed and the intended work for the current year.

Representatives of the Campbell Heights Expert Review Panel, the Surrey Environmental Partners, the Little Campbell Watershed Society, the Nicomekl Enhancement Society and other environmental stakeholders are invited to take part in the tour to view the progress of works and habitat in the area and the challenges faced within the habitat restoration area.

Fencing and Signage
Trespassing and vandalism continue to be a challenge. To minimize trespassing in the area, the entire westerly edge of the habitat area has been fenced and signed. Due to the mineralized soil, the channel banks are vulnerable to erosion until the riparian plants are established.

Invasive Species and Aquatic Plant Management
The restoration area is prone to invasive species colonization such as blackberry and scotch broom. Each year employees of the Salmon Habitat and Restoration Program (SHaRP) undertake work within the restoration area by removing invasive species and replanting the denuded areas with native vegetation.

Until the native riparian vegetation along the channel shades the channel water, aquatic filamentous algae will continue to grow. Filamentous algae increases solar heating of the water and the decomposing algae uses up dissolved oxygen in the water. Both of these impacts reduce water quality for salmonids. Filamentous algae are removed as required. Over time, as the channel becomes shaded, filamentous algae impacts to water quality will be minimized.

Beaver Management
Beavers have always been active in the Campbell Heights area. Although they are an integral part of a healthy ecosystem, they can present a challenge to restoring riparian areas. Beavers often browse on newly planted vegetation, chew down retained vegetation and trees and block watercourses with dams. When a watercourse is blocked, the water rises and inundates the adjacent vegetation. The vegetation in the inundated area usually dies.

Beavers also block drainage infrastructure such as culverts, sluice gates and weirs, resulting in potential flooding risks. To eliminate these blockages, 'beaver deceiver' devices are constructed, channels are monitored regularly and beaver dams are decommissioned to assist in mitigating the impacts that the dams cause.

Next Steps

Along with annual maintenance activities such as invasive plant management, planting maintenance and access management, SHaRP students and City contractors will be initiating some innovative works for 2012. For example, summer watering will include an injection of moisture control and Microrise. Microrise contains Mycorrhizal fungi which form symbiotic associations with tree roots called mycorrhizae. This symbiosis allows the trees and shrubs to gain access to elements and nutrients in the soil which result in stronger root and plant growth. "Moisture control" is a product dissolved in the water which allows the water to be made available slowly to the plant roots without further percolating through the soil. Both of these adaptive

measures will enable the plants in the mineralized soil to become more drought tolerant during the summer months.

Due to the success of the gravel salmon spawning platforms installed in 2011 downstream of the detention pond, additional gravel salmon spawning platforms are being constructed within the 194 Street Channel upstream of the detention pond in 2012. The gravel spawning platforms add complexity to the restored channel further improving water quality for salmon in the summer months by providing riffles and enabling oxygenation. These platforms also provide spawning substrate in the winter months. The large retained trees within the restoration habitat will be fenced with beaver protection wire to prevent beavers from gnawing on these large trees. Until the newly planted and natural recruitment trees grow, the mature retained trees are critical to the area to provide leaf litter and shading to the restored channel.

To prevent solar heating and to add complexity to the detention pond, log rafts will be constructed and moored in the detention pond. Floating log rafts will be constructed from woody debris and moored to existing coarse woody debris in the detention pond. These log rafts will provide shade in the detention pond, discouraging the formation of filamentous algae thereby improving water quality as well as providing substrate for aquatic insects and amphibians, which are a food source for fish.

SUSTAINABILITY CONSIDERATIONS

The implementation of the Campbell Heights Phase 1 Habitat Construction Revised Plan supports the Environmental Pillar of the City's Sustainability Charter under the following specific scope action items of the Charter:

- EN8: Sustainable Engineering Standards and Practices: by minimizing the environmental impacts caused by development through re-creating the natural drainage environment;

- EN9: Sustainable Land Use Planning Development Practices: by preserving, protecting and enhancing natural habitat; and

- EN12: Enhancement and Protection of Natural Area, Fish Habitat and Wildlife Habitat: by showing environment leadership in the management and development of City-owned lands.

CONCLUSION

The City has undertaken an extensive process of consultation with the community, the EAC and local environmental interest groups regarding habitat compensation and restoration works in the Phase I area of the Campbell Heights Business Park. An Expert Panel reviewed the construction plans and provided recommendations to the City with due regard to comments received by the City from local environmental interest groups and others. A revised habitat restoration plan was developed, based on the recommendations from the Expert Panel. This Plan has been approved by DFO consistent with their original authorization. The revised plan is being implemented. Although there remain challenges to the restoration works, ongoing maintenance and adaptive management is enabling the channels in the area to be restored into effective fish habitat.

Vincent Lalonde, P.Eng.
General Manager, Engineering

JA/SG/brb:kd

Appendix "A": Phase I Area in Campbell Heights
Appendix "B": "Before and After" Photographs of the Campbell Heights Phase 1 Restoration Area

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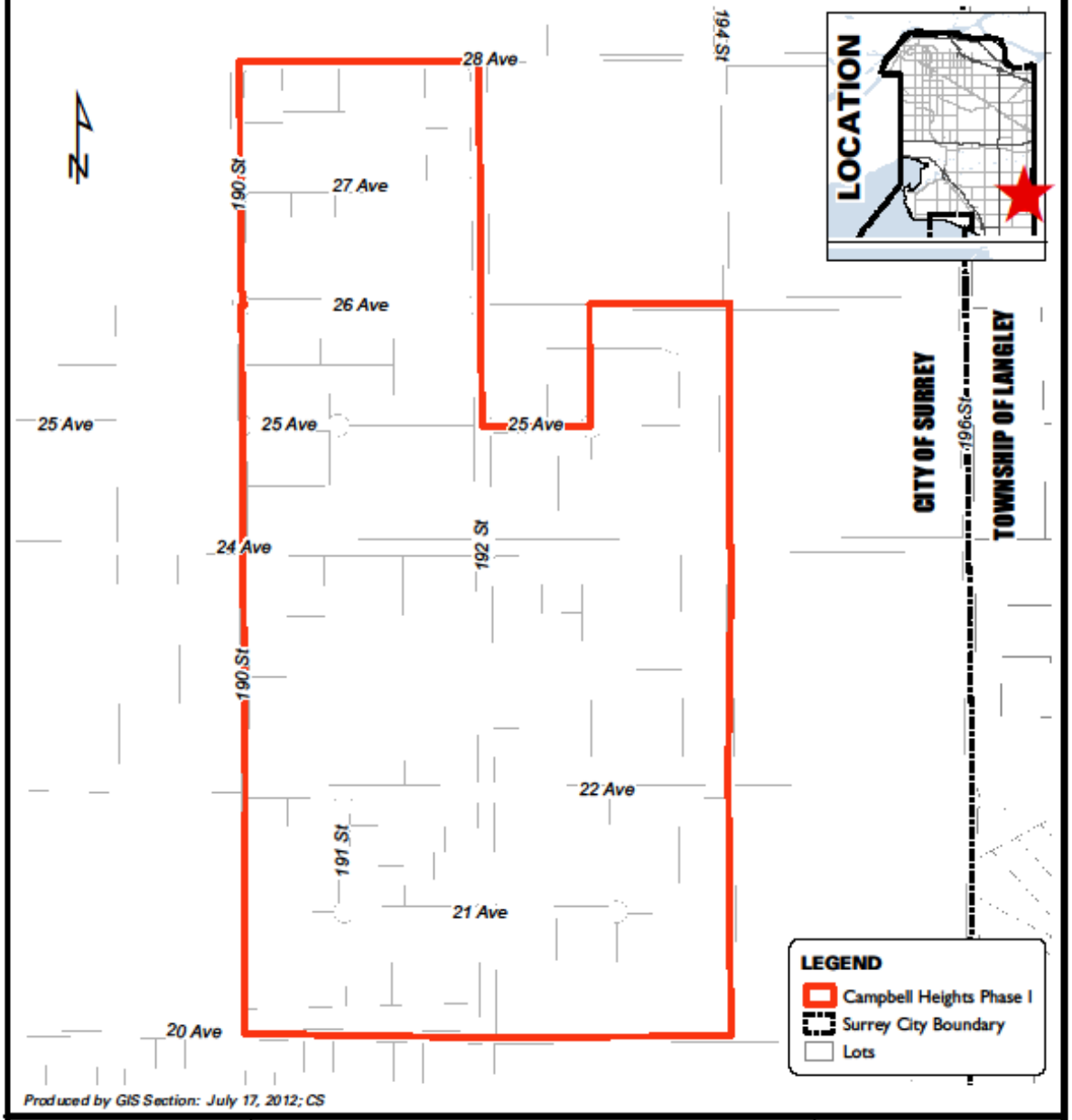
APPENDIX A
SITE MAP



Produced by GIS Section: July 17, 2012; CS

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CAMPBELL HEIGHTS PHASE I

ENGINEERING DEPARTMENT

The data provided is compiled from various sources and IS NOT warranted as to its accuracy or sufficiency by the City of Surrey.
This information is provided for information and convenience purposes only.
Lot sizes, Legal descriptions and encumbrances must be confirmed at the Land Title Office.

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APPENDIX B

194 Street Channel Construction - 2004

Spawning salmon in channel - 2011

Unsanctioned trail-use causing bank erosion - 2010

Coarse woody debris placement discourages trail-use and stabilized bank - 2011

Denbow Soil Sock and willow stakes 2005

Denbow Soil Sock and willow stakes 2012

Upland Planting pocket

SHaRP Students planting

Riparian pond area - 2012

Decommissioned road with 90cm topsoil placed 2009

Decommissioned road with Woody debris and plantings 2012

Decommissioned road with Woody debris and plantings 2012

SHaRP students constructing gravel spawning platform - 2011

Salmon using gravel spawning platform - 2011

Community consultation

Split rail fence delineating habitat restoration area

Unsanctioned trail – 2010

Unsanctioned trail decommissioned - 2011

Filamentous algae

Invasive Broom to be removed

SHaRP students brushing invasive species

Beaver Deceiver installed at detention pond control structure

Beaver dam before removal (2010)

Vegetation impacts due to beaver dam water inundation (2011)

Restoration Comparisons (Then and Now)

194 Street Channel near 21 Avenue Alignment – 2004 (Then)

194 Street Channel near 21 Avenue Alignment – 2012 (Now)

194 Street Channel Floodplain – 2005 (Then)

194 Street Channel Floodplain – 2012 (Now)

194 Street Channel pond north of 22 Avenue – 2005 (Then)

194 Street Channel pond north of 22 Avenue – 2012 (Now)

194 Street Channel Pond north of 24 Avenue – 2005 (Then)

194 Street Channel Pond north of 24 Avenue – 2012 (Now)