SURREY
CITY OF PARKS

Corporate Report

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REGULAR COUNCIL

TO:	**Mayor & Council**	DATE:	**December 13, 2006**
FROM:	**General Manager, Engineering**	FILE:	**5225-17**
SUBJECT:	**Update on Fraser River, Serpentine & Nicomekl Dyke Systems**		

RECOMMENDATIONS

The Engineering Department recommends that Council:

1. Receive this report for information.
2. Advise the Gateway Program of the Fraser River floodplain condition along the Fraser River in Surrey to ensure that flood control and road flooding issues are addressed during the design for the South Fraser Perimeter Road Project.
3. Authorize staff to forward this report to the Provincial & Federal Ministries with jurisdiction for water and flood protection issues and request funding be allocated to flood protection works.

INTENT

To update Council on Surrey's flood protection systems in light of the recent updated analysis of flood levels in the Fraser River.

BACKGROUND

Surrey has a number of dyke systems protecting low areas along many of the river systems and foreshore areas as shown on the attached map in Appendix I. Key flood protection areas include:

- Fraser River – South Westminster dyking area from Bolivar Creek to Elevator Road
- Serpentine River Lowlands
- Nicomekl River Lowlands
- Crescent Beach
- Mud Bay Dyking District
- Colebrook Dyking District

The focus of this report is on the Fraser River flood protection area and the status of the Serpentine Nicomekl Lowland Project. Mud Bay and Colebrook dyking systems have been examined in the Serpentine Nicomekl Lowland Projects. Crescent Beach dykes were upgraded in 1999 to 2000. A brief description of their effectiveness is included.

Fraser River Flood Protection Areas

The lands along Fraser River foreshore area in Surrey have a combination of dykes for flood protection in the west and building elevation requirement in the east. A formal dyke system exists in the South Westminster/Bridgeview area where the dyke runs from the Fraser Port Land at Elevator Road along the CN rail embankment to approximately 132 Street. This dyke protects all the South Westminster area including the Bridgeview community, Pattullo Bridge approach, the industrial lowlands and Fraser Port area to the Delta border.

The remainder of the Fraser River area, east of 132 Street to the Langley border, has no dyke protection. There are pockets of industry along this frontage area where the owners have been informed that they are in a floodplain and were required to build to flood protection levels at time of development.

Fraser River South Westminster Area

The City reviewed the South Westminster dyking system a few years ago. As a result, dyke upgrades in many areas were conducted. Additional works were to be done pending the outcome of the Fraser Basin Council's study on Fraser River Flood Levels recently completed. Some of these additional works were the re-establishment of a formal dyke alignment through Fraser Port lands and new ways to control "gaps" in the dyke under flood conditions.

Fraser River East of 132 Street

This is the undyked area of Surrey. CN Rail owns the land along most of the frontage. Only some pockets of scattered development exist that would be affected by a Fraser River flood. At the current time we ask those residents and industries to build to flood protection levels at time of development. The largest pocket of unprotected lands exists near the intersection of 176 Street and 104 Avenue. In 1999 the City, with the Province, raised 104 Avenue so residents of Barnston Island could have ferry access at higher river levels to facilitate evacuation if required. The whole island is lower than the flood protection levels but is some what protected by dykes around it.

The flood levels at the intersection of 104 Avenue and 176 Street are controlled by the main CNR tracks into the inter-modal yard. The road cannot be raised more in this location due to the tracks.

Serpentine and Nicomekl Flood Protection Project

Significant progress has been made on the implementation of the Serpentine and Nicomekl River Lowlands flood control. The project was adopted in 1997 and included the construction of flood control works along both the Serpentine and Nicomekl Rivers. Some of the key works include dyke upgrades along both river systems, controlled flood spill areas, pump station and conveyance works and working with the local community on integration with agricultural needs.

To date, dyking along the Serpentine River is nearing completion with large areas now completed and the remainder expected to be completed in 2008. Dyking works along the Nicomekl River started in 2005 and are scheduled to be completed in 2009. The Nicomekl system did not require as extensive dyke upgrades as the Serpentine did.

Essential components to the Flood Control Program are the internal pump stations and conveyance ditching. Since 1999, the City has constructed 8 pump stations and many kilometers of new or upgraded conveyance ditching. One new pump station is currently under construction and the final pump station is scheduled to be completed in 2009 along with all final upgrades to existing stations.

Although the full program has yet to be completed, there has been considerable benefits from the works constructed so far. The dyke works completed have helped to eliminate minor flooding previously experienced during frequent rain events, and have helped to reduce the level of flooding during significant rain events. Local pump stations and conveyance works have provided good drainage service to their service areas for a variety of rainfall events as could be seen during the recent rain events where minimal flooding occurred despite a record high rainfall in November.

Mud Bay Dykes

In has some come to our attention that some exposed sections of Mud Bay Dykes along the Nicomekl River are eroding away. We have had a discussion with Mud Bay Dyking District to help them assess the full upgrade requirements and develop a program repair. Since these dykes are mainly eroding from the wave action and protect lands from ocean water level, we believe they should be eligible for Federal/Provincial infrastructure grants or a potential candidate for a future program that needs funding by the Federal and Provincial Governments.

Crescent Beach Flood Protection

In 2000, the dykes along the frontage of Crescent Beach were upgraded to protect the community from high tides, wind surge and wave action. Works included raising and armouring of the foreshore area, sand augmentation and landscaping. Significant compensation works were also constructed in Blackie's Spit to offset the temporary impacts to the environment with the construction works. Some additional works were constructed in 2003 after some damage to the dyke area from a significant storm. Groins were maintained this year as a result of on going storm damage. In 2005/2006, some significant storm surges were experienced in Boundary Bay, which resulted in extensive

property damage in Delta. The Crescent Beach system was able to withstand the surge, protecting the community with only some minor wash-up over the dykes. The shore protection/dyke system installed in Crescent Beach is functioning as intended.

DISCUSSION

New 2006 Lower Fraser River Hydraulic Model

For some years now, the Fraser Basin Council has been looking at the flood levels for the Lower Fraser River area. Flood levels were originally established in the 1960s based on historic floods from 1894 and 1948. However, the validity of these flood levels was being questioned due to significant changes in the Lower Fraser River Basin, as a result of development, floodplain encroachments, new bridges and infrastructure crossings, and to assist with real-time forecasting to communities during a flood event. Consequently, the Fraser Basin Council facilitated a new study on flood levels with funding from various stakeholders.

Surrey staff have been involved with the new study since its inception and have been part of the advisory team from drafting the terms of reference through to the final product. Originally, staff members were only one of two local governments involved; however, as the report relevance and preliminary results could be seen – many more have since joined and helped fund the project.

Within the study, not only were Fraser Flood Freshet conditions examined but also the role tides and storm surges play on the flood levels. In fact, it has been found that storm surges play a more important role in terms of flood control to some local areas than the high water levels of the Fraser River.

Fraser River modeling used the best information and computer modeling techniques available. River soundings were provided by the Coast Guard with Lidar mapping covering the area where soundings were not possible. Velocity measurements were also conducted and all information from existing river level monitoring stations used for calibration purposes.

Some of the key findings of this are:

- Widespread dyke overtopping and dyke failure would occur throughout the region in the event of a reoccurrence of the 1894 flood of record;
- Increased predicted water levels suggest that dykes from Chilliwack and Kent to Surrey and Coquitlam would be overtopped at more than one location;
- The winter storm surge flood, which has a 200-year return period, is estimated at elevation 2.9. Freeboard along portions of Delta and Richmond is not adequate to handle this event; and
- Dyke elevations were derived from a variety of sources; more detailed information is required in vulnerable areas.

For Surrey, the study results can be summarized as follows:

1. *South Westminster Area*

- Current flood elevation and that of the study remained the same. Thus the existing dyke structure, height and property protection levels for the area should be adequate in the design storm of record.
- The City should continue to apply the Provincial flood protection guidelines for this area.

2. *Area east of 132 Street*

- The flood protection level at the Langley border (196 Street) has been raised from an elevation of 5.65m with freeboard to 6.51m with freeboard.
- The change in flood protection levels will have a significant impact on local industries along this alignment; in particular, those located near 104 Avenue and 176 Street.
- The Barnston Island Ferry terminal is more likely to be flooded than believed in the past – the Province/Barnston electoral area needs to examine what it may mean to the residents of the Island and their emergency routes.
- City will need to update our by-laws to reflect elevation changes as established by the Inspector of Dykes for the Province.

Potential Issues from the New Flood Control Elevations

In 2004, the Provincial Government passed control for flood protection to local governments through changes in the Local Government Act, Flood Protection Act, Miscellaneous Statutes Act and Land Titles legislation. One of the key changes that occurred was the Local Government was now entrusted with maintaining flood protection and making decisions on land use and elevations within the floodplain areas. In the past, the Province was the only entity that could vary flood-proofing requirements in floodplain areas; now it is the responsibility of the Local Government.

Some of the issues with Local Government's new role has been in variances. If a property owner wishes to vary flood standards to be different to those in the Provincial guidelines and the local government allows the variance, the Province has said in the legislation that the local government then takes on the liability, should the property flood. In such circumstances, the Province would not provide flood assistance to the property. As such, the City should not allow any variance, even when justified due to soil or building conditions whether in a dyke protected area or outside of one.

Areas most affected by this rule are those in Bridgeview and Crescent Beach. Existing lot sizes and soil structures often do not allow the raising of the new buildings to be, in some cases, 3m higher than existing ground levels.

With the new flood levels proposed by the Province, this issue needs to be highlighted again as areas in Eastern Surrey and communities up the Valley may face considerable

challenges having new construction so much higher than previous levels. The appropriateness of building to higher flood proof levels for areas behind dykes also is questioned when levels are unachievable.

The flood control elevations also have an impact to the South Fraser Perimeter Road project. This project is looking at constructing or reconstructing roads along the Fraser River for a new route for goods transportation from the Golden Ears Bridge and TransCanada Highway through to Highway 91 and Highway 99 in Delta. The road will be subject to flooding in portions along the Fraser River frontage area through Surrey. In times of emergency for flooding, the road will need to be closed and blocked to enable flood protection for the South Westminster area. This is an issue that needs addressing in the final design for the project.

Due to the need to close this road during flood events, it should not be considered as an emergency route and contingency closure and traffic diversion plans should be made by the Province during Fraser River flood periods.

Further Works by Fraser Basin Council and City Staff

Fraser Basin Council is continuing with the review of the flood control levels and needed works by examining conditions required in the watershed to produce an event similar to the 1894 event of record. They are also proposing to work with the Province on dyke upgrades required for communities to meet the revised Fraser River flood control elevations. City staff intend to continue to be involved in the development of policies and additional assessments projects which will lead to revisions in Provincial guidelines and legislation on flood control.

Funding of flood protection works

At the present time, very little funding is provided to Local Governments to construct, operate or maintain flood control works. Most Provincial and Federal funding has been allocated to emergency response and compensation after a flood event. With new analysis showing trends in higher water levels and changes in storm patterns, the chance of more significant events is increased.

The Federal and Provincial Government could potentially save more money by funding preparedness projects or the upgrading and maintenance of existing flood protection works than paying affected parties after a disaster event. Similarly, if the Provincial Governments would assist Local Governments with challenges in applying their guidelines in existing development areas, again more savings could possibly be achieved before a disaster occurs.

It is recommended that the City encourage Provincial and Federal Governments to provide funding for flood control projects and flood control upgrades to enable the protection of citizens and to limit the future impacts to public safety and loss of equity from emergency flood events.

CONCLUSION

The recently completed analysis of the Fraser River flood levels has highlighted the issue of flood protection in the Lower Mainland. While the updated forecast flood levels do not significantly affect the dyked areas of Surrey west of 132 Street, they do affect the areas to the east. This area is currently flood protected by requiring the buildings to be constructed above the flood levels. However, some of the existing buildings are not above the new identified flood levels and this is an issue that will be considered under further work being facilitated by the Fraser Basin Council.

Also highlighted is the need for a new Federal/Provincial Flood Control Program to fund or help fund necessary flood control works. Currently, no such program exists. Changes in land use, river geography, and structures, and climate taken together with improved analysis show that new or upgraded flood protection measures will be needed.

The City is continuing with its Flood Control Program for the Serpentine-Nicomekl Rivers, and this work will be substantially completed by 2009. However, dykes to protect the Colebrook and Mud Bay areas from extreme sea levels will need to be upgraded in the future. This adds to the need for a Federal/Provincial funding program for flood control.

Another key area of concern with regard to flood control legislation and projects are the lack of variance potential on re-development within existing developed areas, even those behind dyked areas. In some areas, this could be a significant hardship to property owners and impacts on adjacent properties.

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VL/CAB/brb:kd2/rdd
Attachment

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