



To: Community Safety Committee

Date: September 19, 2005

From: Robert Gonzalez, P.Eng.
Director, Engineering

File: 10-6045-09-01/2005-Vol
01

Re: Status Report on Dredging and Dykes

Staff Recommendation

That the 2006 Sewerage and Drainage Rates Bylaw include funding of \$5 per utility bill for dyke upgrades.

Robert Gonzalez, P.Eng.
Director, Engineering
(4150)

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ROUTED TO:	CONCURRENCE	CONCURRENCE OF GENERAL MANAGER	
Emergency and Environmental Programs	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>		
Policy Planning	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>		
Budgets	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>		
REVIEWED BY TAG	YES <input checked="" type="checkbox"/> <i>ajs</i>	NO <input type="checkbox"/>	REVIEWED BY CAO
			YES <input checked="" type="checkbox"/> <i>ajs</i>
			NO <input type="checkbox"/>

Staff Report

Origin

Council made the following referral to staff at their meeting held on September 6, 2005.

That staff report to the Community Safety Committee with a general update of the status of the City's emergency plan, including matters such as:

- (1) dredging; and
- (2) dyking, including the east Richmond, midland and west dykes.

This report provides a status update on dredging, dykes, and utility funding, while a separate report will be provided to address the status of the City's emergency plan.

Dredging

Dredging of the Fraser River is required to remove accumulations of granular material in the river channel. The accumulation of granular material is primarily as a result of the annual freshet which normally occurs during the Spring of any given year. It is necessary to remove these accumulations in order to maintain established shipping channels, to mitigate the potential for flooding, and to prevent damage to structures within the river's wetted perimeter.

Until 1998 the Canadian Coast Guard maintained responsibility for dredging of the Lower Fraser River. In 1999, the Fraser Port Authority took over this responsibility to ensure that the potential for flooding for shipping channels to remain open. A one time transfer of approximately \$14 million was made at that time to offset their costs.

The average annual spending for the Fraser Port Authority (FPA) to complete the dredging program is \$3.25 million and their funding is now derived from their overall operating revenue.

Dykes

Dykes are key to preventing inundation in Richmond. In general, the City's dykes are in good condition. Staff continue to be proactive in all aspects of the dyke/flood protection system, are undertaking a number of dyke related activities and have identified a number of opportunities and necessary actions required to maintain and improve the dykes. These actions include:

1. Flood Protection Strategic Plan
2. Dyke Operations and Maintenance
3. Engineering Studies
4. Survey
5. Grants

Details for each activity can be found in Appendix A.

Until recently flood protection requirements and construction levels including dykes were regulated by the Province. This responsibility has now been transferred to the individual municipalities requiring flood protection.

The City operates and maintains an approximate 49-kilometre length of dykes including the West Dyke (sometimes referred to as the Sea Dyke), and the River Dykes (the North Arm Dyke and the South Arm Dyke). At the Boundary Road right-of-way, the City of New Westminster dyke connects to the City's dyke and they maintain ownership, including all operational activities. With the exception of Mitchell Island, the dyke elevations range from approximately 3.5 metres at the West Dyke) to 4.1 metres at the east end which meets or exceeds those minimum elevations established by the Provincial Dyke Authority. There are presently no dykes built to standard on Mitchell Island.

Dyke elevations around Lulu Island are presently at or higher than the 1:200 year flood elevation and are based upon the greatest flood on record, which occurred in 1894. The highest tide on record was recorded at 1.99 metres in the 1940's.

The West Dyke protects the City from potential flooding related to high tides and storms while the River dykes primary function is to protect the City from high river water levels related to the Fraser River freshet. The dykes also provide a recreational function, as there are a number of popular walking trails frequently used by the public.

With the current programs in mind, over the past three years staff have been proactive in undertaking preliminary dyke testing and stability investigations along the Lulu Island dykes to understand potential areas of concern and respective causes. In addition staff have assembled historical information from Provincial Ministries and City's records to provide additional guidance on potential areas of concern.

Unlike the City of New Orleans, which experienced devastating flooding in September 2005, Richmond is not threatened by flooding via hurricanes, but rather has potential to be flooded via the Fraser River freshet or tidal flooding due to potential dyke settlement during a seismic event.

Flood Protection

Staff are working on the City's Flood Protection Strategic Plan, which is scheduled for completion in early 2006. This plan will discuss issues and challenges related to flooding, risks, land use and environmental issues, and various approaches to mitigate flooding such as inland barriers (mid island dyke), and building construction levels.

Building construction levels are as set-out in the Floodplain Management Implementation Policy 7000 adopted by Council on September 11, 1989. Much of the City Centre lies in the exempt area where the minimum building elevation is set at 0.9 metres elevation. A preliminary review of building construction levels indicates that some of the new building construction is lower than the surrounding roads and in some cases very close in elevation to the drainage system. As a result, in the case of a very severe storm where flooding occurs, buildings may experience flooding before the surrounding roads flood.

Staff will be undertaking a review of minimum building construction levels in concert with the Flood Protection Strategic Plan.

Drainage and Dyke Utility

As discussed herein, dyke funding is currently limited to sustain operations, maintenance and survey. It is recommended that staff amend the "Drainage Utility" to add a dyke component and rename the utility to "Drainage and Dyke Utility". The intent is to create a dedicated source of funding for dyke improvements.

Areas of spending considered at this time from a newly created dyke utility include design and construction of structural upgrades to mitigate the impact of a seismic event and new rip rap dyke armouring in various locations around Lulu island. Furthermore dyke utility funding could be used to fund construction of new inland dykes or dyking infrastructure.

Drainage and Dyke Utility Funding

In 2002 Council approved creation of a drainage utility to enable Richmond to replace ageing drainage infrastructure. The plan was to create a drainage utility that would fund \$1.9 million in operating and maintenance costs plus a \$4.85 million replacement program, which would therefore be in the order of \$65 per utility bill. Due to the drainage utility being phased in, the 2006 drainage utility rate will be approximately \$44 per residential taxpayer. The current phasing plan will result in the City reaching the \$65 drainage utility rate in 2008.

Although the City has completed seismic assessments of the Lulu Island dykes in only a few specific locations, it is recognized that some structural upgrades will be required. Appendix B outlines some of the locations of potential concern where structural upgrades to the dykes will be required. The exact nature of upgrading is yet to be determined.

Given the information known to date, staff recommend that annual funding of \$600,000 be established for upgrades to dykes.

Financial Impact

In order to establish \$600,000 in annual funding, the dyking component of the Drainage and Dyke Utility will require an additional \$10 per utility bill. Staff propose that for 2006, an additional \$5 be added to the utility bills and subsequently \$1 be added per year up to the \$10 amount.

To augment the City's funding towards this initiative staff will pursue Provincial and Federal grant funding as the programs and opportunities present themselves.

Conclusion

The City's dykes remain in a generally good condition, while there are areas known to require attention. Amending the current "Drainage Utility" to create a "Drainage and Dyke Utility" will enable staff access to funding to complete improvements known to be required at this time as well as those that may be identified in the future.

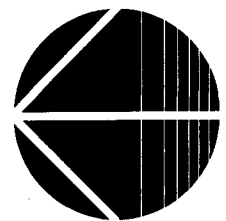
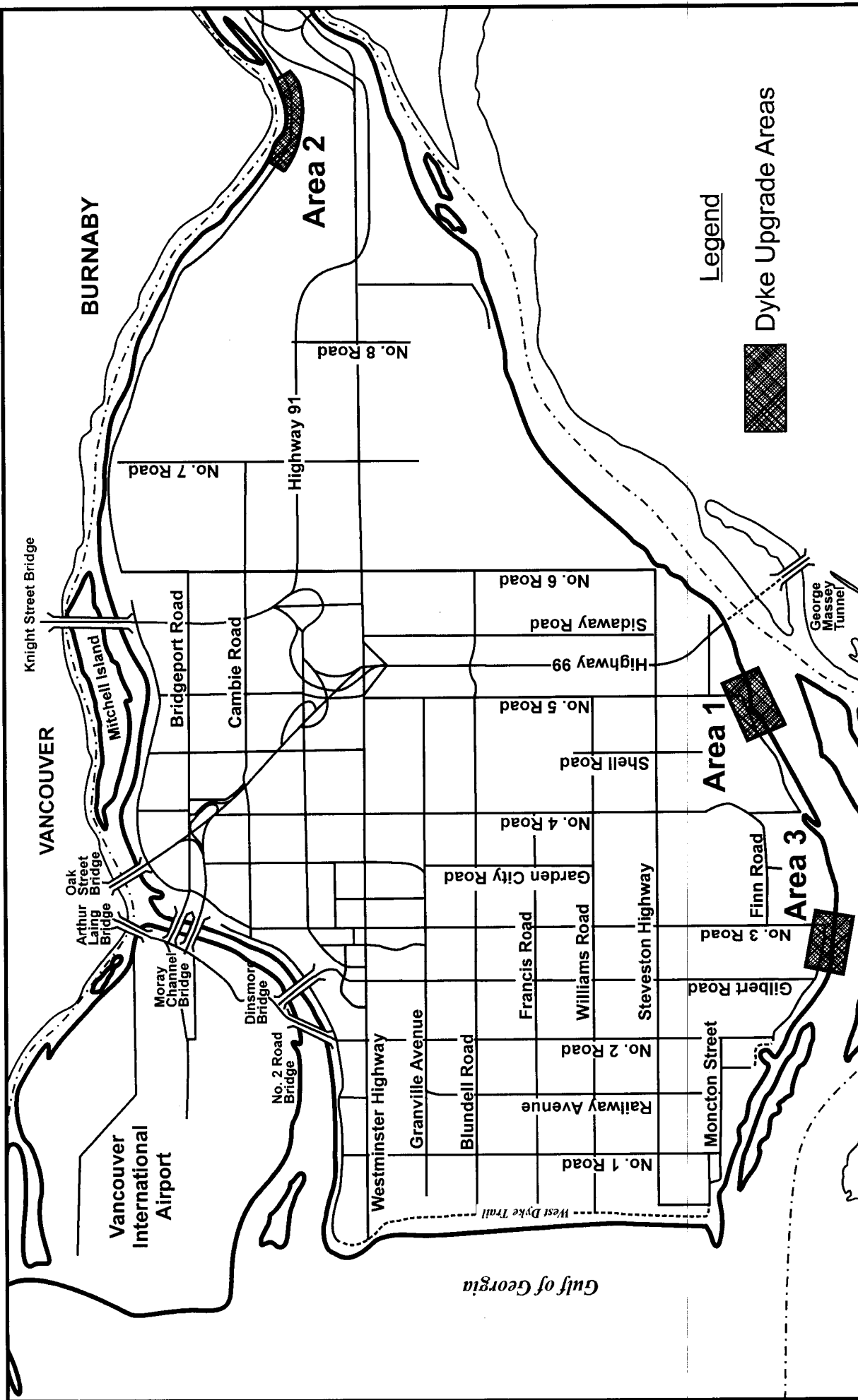
A handwritten signature in black ink, appearing to read "J. Young", enclosed within a hand-drawn oval.

Jim V. Young, P. Eng.

Manager Engineering Design and Construction
(4610)

Appendix A – Ongoing and Future Activities

1. **Flood Protection Strategic Plan** – This plan is anticipated to be completed in early 2006. This plan will provide recommendations on inland barrier such as a mid island dyke, address risks, land use and environmental issues, and building construction levels.
2. **Dyke Operations and Maintenance** - Council has continued to approve funding specifically directed towards the operations and maintenance of the City's dykes. The approved 2005 budget in this regard was \$313,200 and allows staff to complete dyke inspection and repairs as well as vegetation control.
3. **Engineering Studies** - Through various consultants, staff has completed several engineering reports over the past several years dealing with matters ranging from minimum dyke elevations to seismic vulnerability. Staff continues to be proactive in this regard. Findings from the reports completed to date validate that the City's dykes are in good shape, however there are some areas that may be subject to settlements associated with liquefaction during a seismic event. Future reports may yield similar results.
4. **Survey** - Staff complete dyke cross-section surveys on a 5-year rotational basis. Any settlements (or other deficiencies) observed through these surveys are immediately corrected.
5. **Grants** - Staff continue to submit and receive grant funding through the Ministry of Public Safety and Solicitor General Natural Hazards Mitigation Fund, with the most recently received grant being for dyke repair between No. 3 and Gilbert Roads.



Dyke Structural Upgrade Assessment Areas

Original Date: 09/30/05

Revision Date: