City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	March 3, 2007
From:	Robert Gonzalez, P.Eng. Director, Engineering	**File:**	06-2050-20-F2/Vol 01
Re:	**Seismic Upgrades to Fire Hall #2 – Steveston and Fire Hall #6 - Shellmont**		

Staff Recommendation

It is recommended that:

1. The current approved funding for seismic upgrades for Fire Hall #2 - Steveston be transferred and added to Fire Hall #6 - Shellmont.

2. That a new capital project be submitted to the 2008 Capital Program for a new Fire Hall to replace Fire Hall #2- Steveston including investigation of alternative locations.

Robert Gonzalez, P.Eng.
Director, Engineering
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ROUTED TO:	CONCURRENCE		CONCURRENCE OF GENERAL MANAGER	
Budgets	Y ☑ N ☐			
Fire Rescue	Y ☑ N ☐			
REVIEWED BY TAG	YES ☑	NO ☐	REVIEWED BY CAO	YES ☑ NO ☐

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Staff Report

Origin

The Community Safety Building Replacement Program, first supported by Council in 2001, included seismic upgrades (as well as other minor improvements) to Fire Halls #2 - Steveston and #6 - Shellmont rather than replacement. Given that Fire Hall #2, constructed in 1972, and Fire Hall #6, constructed in 1977, were in relatively good condition it was anticipated that seismic upgrades would result in substantial capital savings compared to new fire hall construction, extend their service life, and meet the basic post disaster requirements.

The 2006 and 2007 Capital Programs approved the seismic upgrade projects for Fire Hall #2 – Steveston with a budget of $1,977,586 and for Fire Hall #6 – Shellmont with a budget of $2,080,396. The purpose of this report is to update Council as to the progress and present findings for the projects.

Analysis

The proposed upgrades for both fire halls were driven by the two principal objectives of upgrading the structure to post disaster status and, more recently, to address gender equality. Fire Hall #6 has the added objective of adding a 30 ft. tower for hose drying and training purposes.

Staff retained a consultant team with specific expertise in seismic retrofit projects to assist in arriving at the most appropriate solution in the most cost effective and practical manner. An assessment of the seismic status, geotechnical investigations, implications of the new BC Building Code, and the Facility Condition Index report was initiated for both fire halls. The findings are summarized in Appendix 2.

The geotechnical investigations identified the need for significant soil improvements. Proposals were made for structural modifications to mitigate the seismic deficiencies. The objective is to upgrade the structures to keep it fully functional after a major earthquake. A new BC Building Code was introduced in December 2006, which included upgraded requirements to attain a post disaster building. Since Fire Hall #6 is single storey and partially wood frame, staff proposed that a partial soil improvement would be adequate to keep the hall and in particular the apparatus bays functional. Fire Hall #2 would require the full soil improvement to maintain functionality given its unreinforced masonry construction.

Alternative architectural solutions were developed in conjunction with Richmond Fire Rescue (RFR) to address the gender equality issues. These modifications can be achieved within the existing footprint of Fire Hall #6. However, additional space is required to be added to address the needs at Fire Hall #2 adding to the project cost. A summary description of the proposed upgrades is included in Appendix 1.

Cost Analysis

Cost estimates for each of the various options and proposed upgrades were completed by a Quantity Surveyor.

For Fire Hall #6, due to the cost of soil improvements, especially to the area within the building footprint, two approaches to soil improvements were explored; a full soils improvement under the entire building and full apron area and staff developed a partial soil improvement option where only the area under the major foundation upgrades was included together with the apron to the street. The difference in cost is significant; $750,000 less for partial soil improvement. The option for partial soil improvement at Fire Hall #2 was not considered since the differential settlements were found to be too great considering its masonry construction.

For comparison, staff utilized the cost of a new fire hall consistent with the adopted template:

Fire Hall #2 - Steveston:	renovation with full soil improvements	$3,460,100.
Fire Hall #6 - Shellmont:	renovation with full soil improvements	$3,739,800.
	renovation with partial soil improvements	$2,869,800.

Given the recent completion of the Sea Island and Hamilton fire halls and construction cost escalation since those projects were tendered, the estimated construction cost for a new fire hall is $4,200,000. New construction would include full soil improvements.

The above cost estimates are for construction only. Added to that would be the soft project costs of design, permits, furniture, fittings & equipment, city overheads, and contingencies.

Summary

For Fire Hall #2, although the cost for new construction would be greater than the proposed renovation, the savings would not be as great as originally anticipated and the end product would still be operationally challenged on a substandard sized site. New construction would have the added value of full soils improvements and fully conform to the current BC Building Code for post disaster buildings. Freed from the constraint of an inadequate sized site, a new building on a new site would be designed to reflect an efficient and functional floor plan, and the deficiencies in the existing building such as height clearance within the bays would be corrected. As well, new construction would integrate viable sustainable measures. The benefits of new construction would improve operations and anticipate future needs making it the most effective alternative for Fire Hall #2. Staff therefore recommend that the current proposed upgrades to Fire Hall #2 - Steveston be abandoned and a plan created to replace Fire Hall #2 - Steveston on a new larger site. The intent would be to demolish Fire Hall #2 upon completion of the new fire hall and sell the current site to provide funding towards the purchase of a new site. This will be the subject of a future report and 2008 Capital Project submission for Council consideration.

For Fire Hall #6, it is possible to undertake the building upgrades with a partial soil improvement and still maintain adequate functionality following a seismic event. The site is of adequate size and the building improvements and accommodation of gender issues can be achieved within the existing one-storey footprint. An addition of a 30ft tower is included for hose drying and training purposes and improves the functional and efficiency of operations for Fire Hall #6. Furthermore the scope of building upgrades required to enable post disaster status will substantially extend the building life.

Financial Impact

Total current funding available for Fire Hall #2 is $1,977,586.00 and for Fire Hall #6 is $2,080,396.00. Combined, the available funding is $4,057,982.00 per capital submissions. Actual available funding, given that some design costs have already been incurred, is $3,937,343.50.

Total project cost required to undertake the proposed upgrades to Fire Hall #6 - Shellmont are:

Design	$ 240,000
Construction including soil improvements, a new tower, and construction management	$ 2,869,800
Furnishing Fixtures & Equipment	$ 60,000
Permits	$ 20,000
Temporary Accommodation & moving	$ 200,000
Contingency @ 10%	$ 341,500
City Overheads @ 5%	$ 187,800
Total	$ 3,944,100

If Fire Hall #2 seismic Upgrade project was cancelled and the funding available transferred to Fire Hall #6, this would potentially accommodate the costs for upgrading Fire Hall #6. Staff would make every effort to contain the project costs and adjust the scope of upgrades to reflect the available funding.

This would result in no additional financial impact for 2007.

Conclusion

It is, therefore, recommended that the current proposed upgrades to Fire Hall #2 - Steveston be abandoned and a plan created to replace Fire Hall #2 - Steveston on a new larger site. This will be the subject of a future report and 2008 Capital Project Submission for Council consideration.

It is further recommended to transfer the allocated funding for Fire Hall #2 - Steveston to Fire Hall #6 - Shellmont to proceed with the intended seismic and building upgrades to Fire Hall #6 - Shellmont.

Mary Brunet, MAIBC
Project Manager
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MB:mb

Appendix 1 – Description of Proposed Upgrades

The following includes the highlights of the proposed upgrades but is not an exhaustive scope of work.

Fire Hall #6 - Shellmont

- partial soils improvement
- structural modifications
- building envelope improvement
- diaphragms added to exterior walls and roof
- privacy renovations to dormitory and washrooms
- additional storage
- 30 ft. hose tower
- complete replacement of the air handling system and domestic piping
- a sprinkler system
- proposed electrical upgrades include a new generator
- new fire alarm
- communication system upgrades.

Fire Hall #2 - Steveston

- soils improvements using "stone columns"
- reinforce the masonry structure
- adding floor and roof diaphragms
- building envelope improvement
- shear upgrades to the exterior walls
- installing adequate fire separations at the exits
- redesigned dormitory and washrooms adding floor area
- redesigned entry lobby and stair to conform to BC building code
- introducing fire separations between floors
- complete replacement of the air handling system and of the domestic water piping
- a sprinkler system
- electrical upgrades to include a new generator
- a new fire alarm
- communication system upgrades

The existing apparatus bay doors at 12ft. will restrict the size of vehicles which can use this facility in the future and the proposed seismic mitigation does not specifically address how the overhead doors would function after a seismic event in order to maintain operational functionality.

Appendix 2 - Summary of Findings

	Fire Hall #2 (Steveston)	Fire Hall #6 (Shellmont)
Size	The existing building is 7420 sq.ft. (690m^2) on 2 floors with 3 apparatus bays. The site is 0.59 Acre (0.24ha). The site is considered undersized for fully functional fire hall.	The existing building is 7350 sq.ft. (683 m^2) on a single storey with 3 apparatus bays. The site is 1.01 Acre (0.4ha).
Geotechnical investigations	Identified the potential for significant total and differential settlement in a code level seismic event due to the depth of the liquefiable layer at that location. The levels of differential settle predicted are beyond those that are permitted under BCBC2006	Identified the potential for significant total and differential settlement in a code level seismic event due to the depth of the liquefiable layer at that location.
Structure	Structural analysis reveals that there would be a strong likelihood of building failure and that it would probably not be operational after a major earthquake. The unreinforced masonry would be problematic in a seismic event.	The apparatus bays are steel structure separate from the wood frame of the other quarters. In its current condition the potential for structural failure, particularly in the apparatus bay would render the facility not operational after a major earthquake.
Facility Condition	FCI = 0.09 The existing envelope does not meet current standards. The stack bond masonry and cedar siding have areas requiring replacement. The windows are single glazed. The roofing requires replacement. The existing exit stair is not fire separated and requires upgrading.	FCI = 0.03 The existing envelope does not meet current standards. Areas of the cedar finish requires replacement , the windows throughout are all single glazed and the roofing should be considered for replacement.
Mechanical	The existing air handling is original and is considered to be beyond its normal service. The domestic water system is considered beyond its service life. The equipment has not been seismically restrained. The building is not sprinklered.	The existing air handling is original and is considered to be beyond its normal service life. The domestic water system is considered ready for replacement. The building has not been sprinklered.

Electrical	The existing electrical service is adequate for current needs but would not be sufficient for the future. Upgrades required to the emergency generator, lighting, fire alarm and communications systems.	The size of existing electrical service is adequate for current needs and would be sufficient for the future. The emergency generator is slightly undersized. Most of the lighting has been upgraded as part of an earlier energy refit. The fire alarm system and communications systems should be upgraded.