



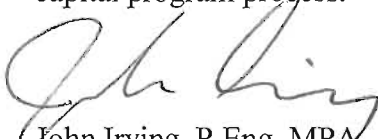
# City of Richmond

## Report to Committee

**To:** Public Works and Transportation Committee      **Date:** August 14, 2013  
**From:** John Irving, P.Eng. MPA      **File:** 10-6060-01/2013-Vol  
 Director, Engineering      01  
**Re:** Ageing Infrastructure Planning - 2013 Update

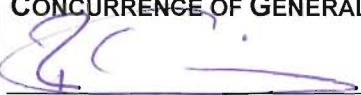

### Staff Recommendation

That staff utilize the attached “Ageing Infrastructure Planning – 2013 Update” report dated August 14, 2013 from the Director, Engineering as input in the annual utility rate review and capital program process.



John Irving, P.Eng. MPA  
 Director, Engineering  
 (604-276-4140)

Att. 5

REPORT CONCURRENCE			
ROUTED TO:	CONCURRENCE	CONCURRENCE OF GENERAL MANAGER	
Finance Division	<input checked="" type="checkbox"/>		
Roads & Construction	<input checked="" type="checkbox"/>		
Sewerage & Drainage	<input checked="" type="checkbox"/>		
Water Services	<input checked="" type="checkbox"/>		
Transportation	<input checked="" type="checkbox"/>		
<b>REVIEWED BY DIRECTORS</b>	INITIALS: DW	<b>REVIEWED BY CAO</b>	INITIALS: 

## Staff Report

### Origin

In July 2001, March 2006 and June 2011 the Engineering Department reported to Council the estimated long-term capital requirements for age-related infrastructure renewal. This report updates those estimates to reflect current inventory, evolving theory on infrastructure service life and changing infrastructure replacement pricing.

### Background

The 2011- 2014 Council Term Goals recognize the need to manage ageing infrastructure and identifies the following related priorities:

- Priority 5.3 – Update the Long-Term Financial Management Strategy (LTFMS) to ensure relevancy and representation of needs relative to growth, *ageing infrastructure*, changing demographics, and other City strategies.
- Priority 11.1 – Continued and improved funding for ageing infrastructure replacement programs at a pace that matches long-term infrastructure deterioration.

This report outlines the current and long-term financial requirements for maintaining and replacing the City's ageing infrastructure.

### Existing Infrastructure

**Table 1** is a summary of the City's inventory of water, sanitary, drainage, and roads infrastructure. The replacement value assumes that infrastructure will be replaced using the existing size or upgraded where current infrastructure does not meet the City's current minimum size requirement.

Staff has reported ageing infrastructure assessments to Council in 2001, 2006 and 2011. The 2001 and 2006 reports to Council identified that infrastructure replacement funding levels were insufficient to maintain existing service levels over the long-term. The 2006 report proposed a number of strategies to address funding shortfalls, and a strategy of gradual rate increases to close the identified funding gaps was adopted. Substantial progress has been made since 2006. Closing the funding gap in the Water utility was an early priority and that gap was closed in 2011. The gap in Drainage funding has been the priority for the last two years and that gap is nearly closed. **Table 2** is a breakdown of funding levels by infrastructure type.

**Table 1: Infrastructure Inventory**

<b>Infrastructure</b>	<b>Total Length</b>	<b>Other Features</b>	<b>Funding Source</b>	<b>Replacement Value (2013 \$)</b>
<b>Water</b>	629 km	12 PRV Chambers 58 Valve Chambers	Water Utility	\$535 M
<b>Sanitary</b>	565 km	152 Pump Stations	Sanitary Utility	\$498 M
<b>Drainage</b>	622 km	39 Pump Stations 43 km Culverts 178 km Watercourse	Drainage Utility	\$1,018 M
<b>Dike</b>	49 km		Drainage Utility	\$200 M
<b>No. 2 Rd Bridge</b>	0.5 km	Excluding abutments	To Be Determined	\$73 M
<b>Road Pavement (non-MRN)</b>	1285 lane km	212,000 sq. m of Parking lot	General Revenue	\$576 M
<b>Total Replacement Value</b>				<b>\$2,900 M</b>

**Table 2: Annual Capital Infrastructure Funding and Reserves**

<b>Infrastructure Type</b>	<b>2013 Funding (2013 \$)</b>	<b>Funding Source</b>	<b>Reserve Balance<sup>1</sup> (Dec 31, 2010)</b>	<b>Reserve Balance<sup>1</sup> (Dec 31, 2012)</b>
<b>Water</b>	\$7.5 M	Water Utility	\$46.4 M	\$41.8 M
<b>Sanitary</b>	\$4.3 M	Sanitary Utility	\$27.7 M	\$33.7 M
<b>Drainage and Dikes</b>	\$8.9 M	Drainage Utility	\$18.2 M	\$27.9 M
<b>Road Paving (non MRN)</b>	\$3.4 M	General Revenue	N/A	N/A
<b>Total</b>	<b>\$24.1 M</b>		<b>\$92.3 M</b>	<b>\$103.4 M</b>

<sup>1</sup> Includes committed funds.

Funding increases for water, sewer, and drainage were achieved through the annual utility rates review process, where infrastructure funding gaps were considered when establishing utility rates. Roads are not part of a utility and the paving budget is funded from the City's General Revenue. Road funding increases are accomplished through the City's capital prioritization process.

Short and long-term infrastructure replacements and upgrades are planned utilizing asset management and capacity models developed for Richmond's extensive water, sanitary, drainage and roadway systems.

## **Analysis**

### Total Replacement Value and Schedule

*Attachments 1 to 4* show estimated infrastructure replacement costs for the City's water, sanitary, drainage, and road infrastructure over the next 75 years. The charts also show the estimated long-term average annual funding levels (in 2013 dollars, excluding inflation) that are required to perpetually replace assets, compared to the current 2013 funding levels. The Funding Requirement Range represents the estimated level of uncertainty in the long-term annual funding levels, which is due to a number of variables including:

- potential overlap between capacity based improvements due to development or climate change;
- variability in the potential service life of the infrastructure;
- variability in the economy and the cost of infrastructure replacement; and
- unanticipated or emergency events that initiate early infrastructure replacement or repairs in excess of operating budget provisions.

Infrastructure replacement costs continue to increase due to inflation, environmental requirements and sanitary and drainage pump station complexity.

### Water

The City is meeting its long-term funding target for water infrastructure replacement. *Attachment 1* predicts a long-term annual water infrastructure funding requirement of \$7.2 million, which is within the current \$7.5 million funding level.

Asbestos cement pipelines make up approximately 50% of the City's watermain inventory and are predicted to require replacement within the next 30 years. During this period replacement costs will exceed the long-term required funding level for a number of years, which will require utilization of reserves and borrowing. In the long-term (75 year horizon), the required funding level will repay debts incurred and allow for continued water infrastructure renewal.

Engineering staff are currently assessing the viability of water pressure management strategies that reduce water pressure during non-peak demand periods. This strategy has potential to extend

watermain service life and attenuate the predicted spike in watermain replacement between 2031 and 2041.

### Sanitary

*Attachment 2* predicts a long-term annual funding requirement of \$6.4 million for the sanitary utility with no identified backlog of replacement needs.

The City has made gains in operational efficiency in the Sewer utility since 2012. Those efficiencies will be presented to Council through the utility budget process with options for consideration.

Sanitary pump stations are becoming larger and more complex as the demands on them increase. Additionally, building pump stations in a built out urban environment creates significant challenges beyond those encountered during green field development, including working in close proximity to existing structures and infrastructure as well as accommodating existing flows during the construction period. As such, cost estimates for replacing the City's 152 sanitary pump stations have increased, which has a corresponding impact on the long-term annual funding requirement.

### Drainage

The City has made significant increases to its drainage utility funding in recent years and is close to meeting its long-term funding target for drainage infrastructure replacement. *Attachment 3* predicts a long-term annual funding requirement of \$10.4 million for the drainage utility.

The estimated costs of replacing the City's drainage pump stations has increased due to the Province enforcing seismic upgrading requirements and the City's need for service level improvements over existing stations. The new pump stations are larger, more powerful and more reliable than the stations they replace, which is a response to changing flood and stormwater risk profiles.

In the last 10 years, the City has rebuilt 11 of its 39 drainage pump stations and has performed significant upgrades on a further 4. Over the next 20 years the remaining Lulu Island drainage pump stations will be rebuilt or receive significant upgrades provided the funding levels are maintained or improved. Since 2010, the City has obtained \$6.8 million of Provincial and Federal grant funding which substantially offset drainage pump station upgrade costs.

### Dikes

The 2008-2031 Richmond Flood Protection Strategy identifies climate change induced sea level rise as a future threat to be mitigated. Staff estimate conventional dike upgrade costs to address the predicted 100 year sea level rise scenario to be between \$200 million to \$300 million. Staff are developing a Dike Master Plan to identify the specific long-term infrastructure needs for flood protection. Phase 1 of the Dike Master Plan was completed earlier this year and addresses a strategy for future dike improvements for Steveston and the Southern West Dike. The Phase 1 plan was endorsed by Council at the regular Council Meeting of April 22, 2013.

Financial requirements will be reported through subsequent ageing infrastructure reports as this information is developed.

### Roads

The non-MRN long-term annual re-paving funding requirement is estimated at \$4.6 million (see *Attachment 4*). This estimate is the same as in 2011. Higher uncertainty exists in this value than those for the utilities as road re-paving is heavily influenced by oil price, which has fluctuated widely in the past seven years. *Attachment 5* documents the fluctuating cost of asphalt paving between 2006 and 2012.

Based on paving prices over the last seven years, re-paving annual funding requirements range between \$4.0 million and \$5.6 million. For long-term planning purposes, staff have assumed that the ebb and flow of asphalt pricing will average out and have utilized the average value of \$4.6 million as the long-term annual funding requirement for re-paving.

### No. 2 Road Bridge

While not included in previous ageing infrastructure reports, the No. 2 Road Bridge is a significant piece of municipal infrastructure with an estimated replacement value of \$73 million. As the No. 2 Road Bridge is situated within the region's Major Road Network (MRN) it is eligible for regional maintenance and replacement funding. The City currently receives regional funding to operate, maintain and rehabilitate the bridge deck, which includes an allowance for re-paving. It does not, however, receive funding to maintain the bridge structure. This is a regional issue that has been a concern since Translink's establishment. Alongside the region's other municipalities, City staff are participating on Translink's Operation, Maintenance and Rehabilitation Sub-Committee to secure adequate bridge maintenance and rehabilitation funding.

Staff are currently performing a detailed assessment of the bridge's condition to identify a long-term maintenance program. Staff will report on bridge condition along with any proposed remediation work later this year. Subsequent rehabilitation funding will be requested through the annual capital budgeting process.

### Required Funding Levels

*Table 3* summarizes current and required annual infrastructure replacement funding levels, in 2013 dollars, as well as the current ageing infrastructure funding gaps. The City has made considerable infrastructure funding gains since initiating its strategy to close the funding gap in 2006.

**Table 3: Infrastructure Funding Levels**

<b>Infrastructure Type</b>	<b>2013 Actual Annual Funding Level</b>	<b>Required Annual Funding Level</b>	<b>Funding Range</b>	<b>Funding Source</b>	<b>Estimated Additional Funding Required</b>
Water	\$7.5 M	\$7.2 M	\$6.4 M - \$9.6 M	Water Utility	No shortfall
Sanitary	\$4.3 M	\$6.4 M	\$5.9 M - \$7.0 M	Sanitary Utility	\$2.1 M
Drainage*	\$8.9 M	\$10.4 M*	\$9.4 M - 11.5 M	Drainage Utility	\$1.5 M
Road Paving (non MRN)	\$3.4 M	\$4.6 M	\$4.0 M - \$5.6 M	General Revenue	\$1.2 M
<b>Totals</b>	<b>\$24.1 M</b>	<b>\$28.6 M</b>			<b>\$4.8 M</b>

\*Long-term dike replacement costs are yet to be determined and are excluded

### Funding Strategies

Adequate annual funding levels will allow the City to implement proactive and sustainable infrastructure replacement programs. The proactive replacement of infrastructure enables the City to smart sequence utility replacement and use competitive bidding to ensure the best value for money. Replacing infrastructure at its time of failure has proven to be considerably more expensive than proactive replacement and is more disruptive to residents, City services and programs.

Closing the current \$4.8 million funding gap is achievable within the next decade or sooner. Putting this amount into rate payer terms, Richmond has approximately 70,000 businesses and households that pay utility rates. Approximately, an annual increase of \$10 to each rate payer would close the gap in 7 years. An annual increase of \$20 to each rate payer would close the gap in 4 years.

Staff have pursued available federal and provincial grants from programs such as the Building Canada Plan and BC's Flood Protection Program and will continue to do so. While grant funding has been helpful over the last few years, as a funding source grants will always be unpredictable and therefore non-sustainable.

Development also facilitates significant infrastructure replacement that has a positive impact on the City's overall ageing infrastructure picture. However, development is subject to external forces such as the economy and does not always coincide with infrastructure that is beyond its useful life. Therefore, development is not considered a sustainable resource for ageing infrastructure replacement.

Staff will evaluate funding options and make a recommendation to Council as part of the annual utility rate review and capital program process. Significant progress has been made over the last decade in closing the funding gap, and continuation on this path will allow the City to effectively mitigate the challenge of ageing infrastructure.

## Financial Impact

None.

## Conclusion

Staff will continue to gather information to better predict infrastructure replacement schedules and funding peaks and will continue to explore new technologies and best practices. Staff will also continue to recommend that the utility funding gaps between current and required funding levels be closed over time through the annual budgeting process. The rate of increase and timeframe to close the funding gaps will be impacted by Metro Vancouver's regional Solid and Liquid Waste Management plans, which are a non-discretionary costs imposed on the City. The funding shortfalls outlined in this report should be considered in conjunction with the City's Long-Term Financial Management Strategy.



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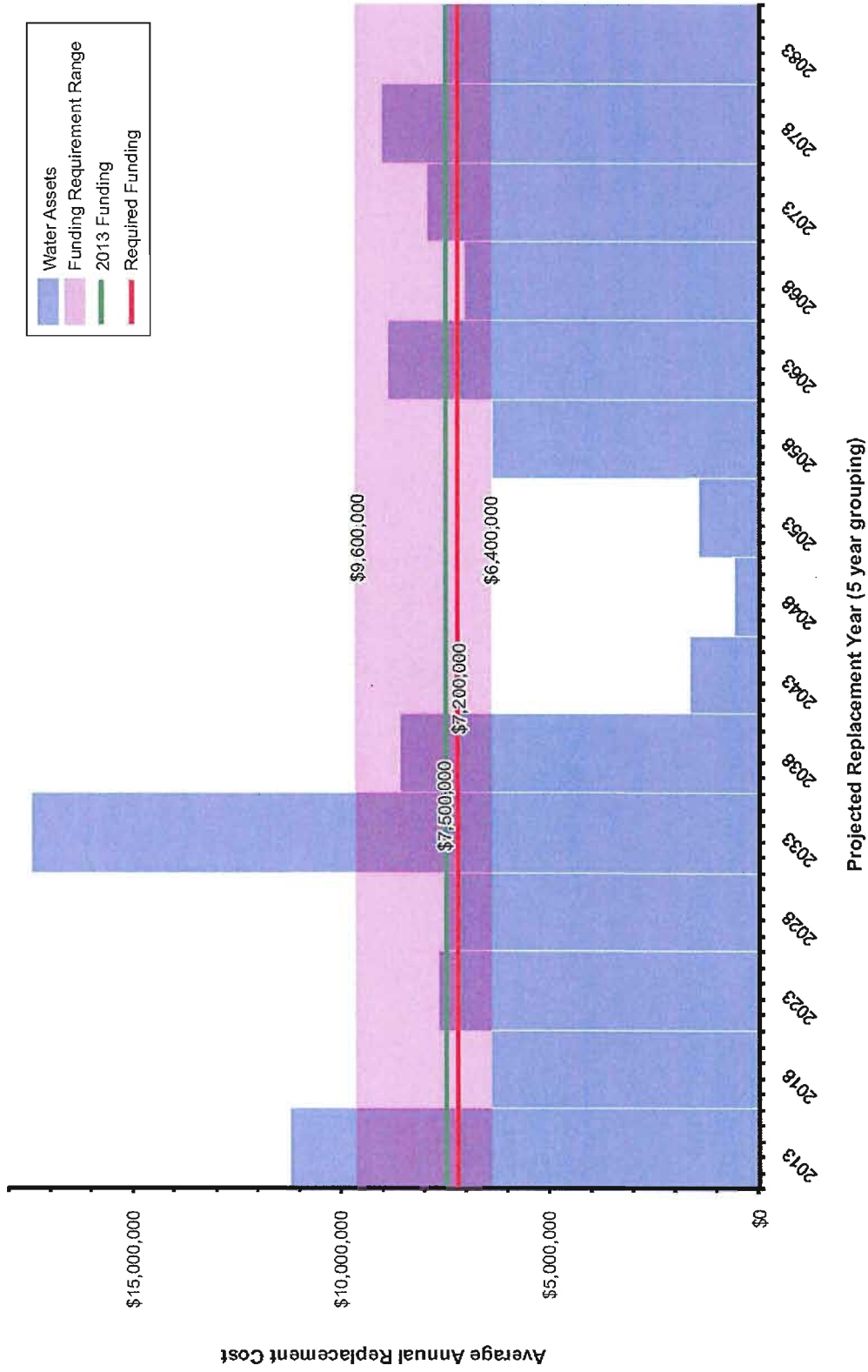
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- Att.1: Ageing Infrastructure Report – Water Assets
- Att.2: Ageing Infrastructure Report – Sanitary Assets
- Att.3: Ageing Infrastructure Report – Drainage Assets
- Att.4: Ageing Infrastructure Report – Non MRN Road Assets
- Att.5: Historical Costs for Capital Paving Program (2006 – 2012)



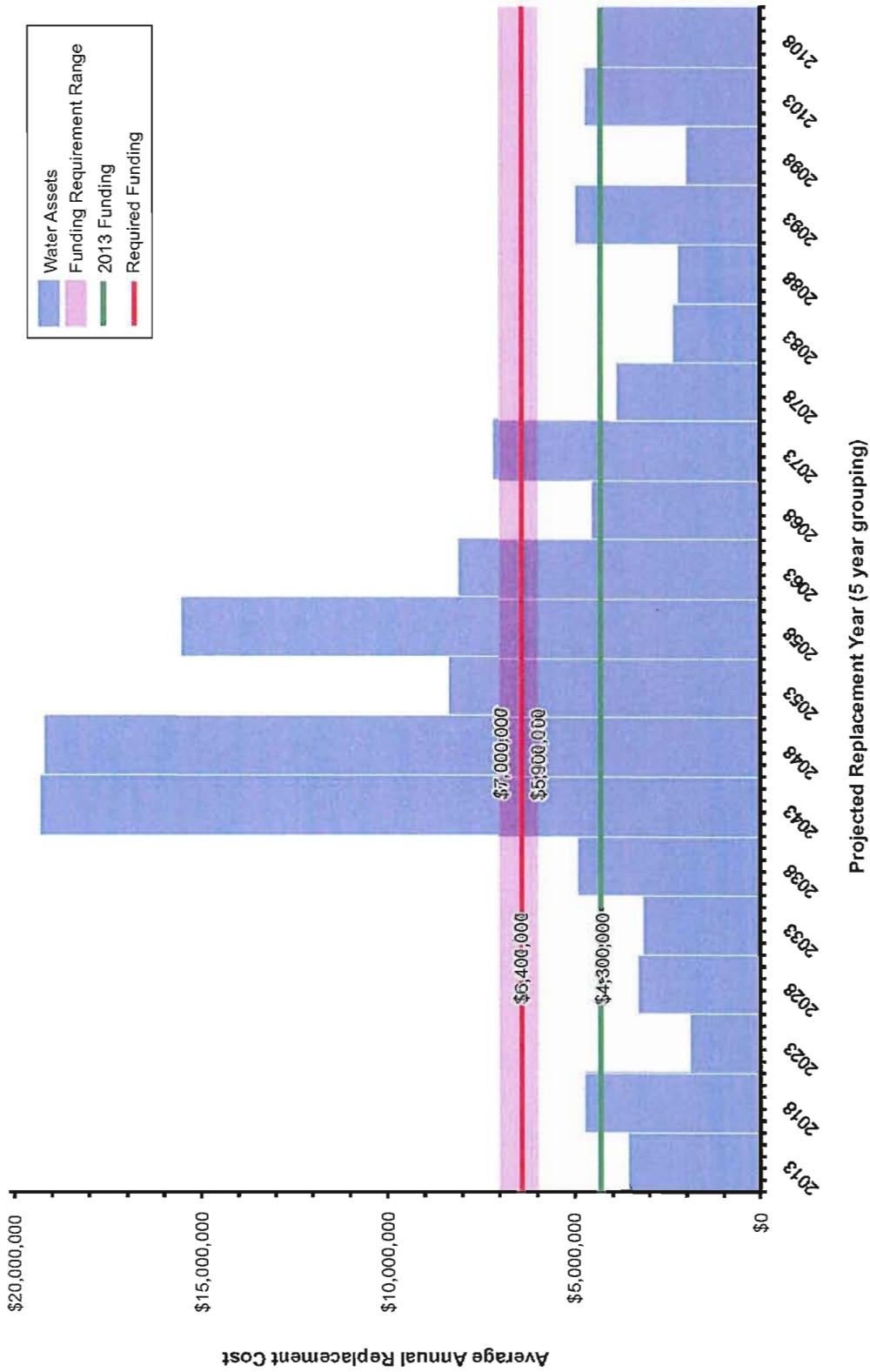
Attachment 1

2013 Ageing Infrastructure Report – Water Assets



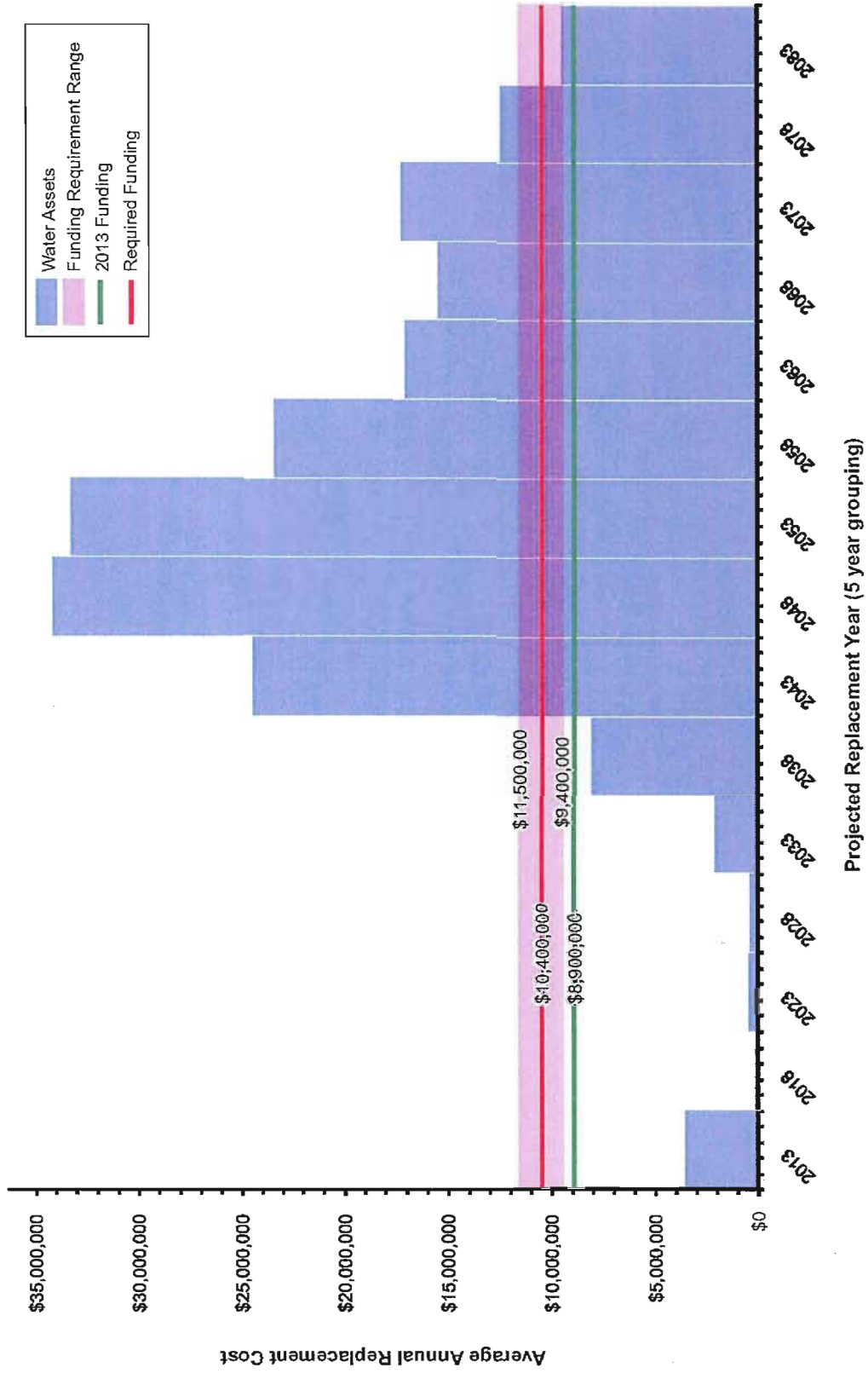
Attachment 2

2013 Ageing Infrastructure Report – Sanitary Assets



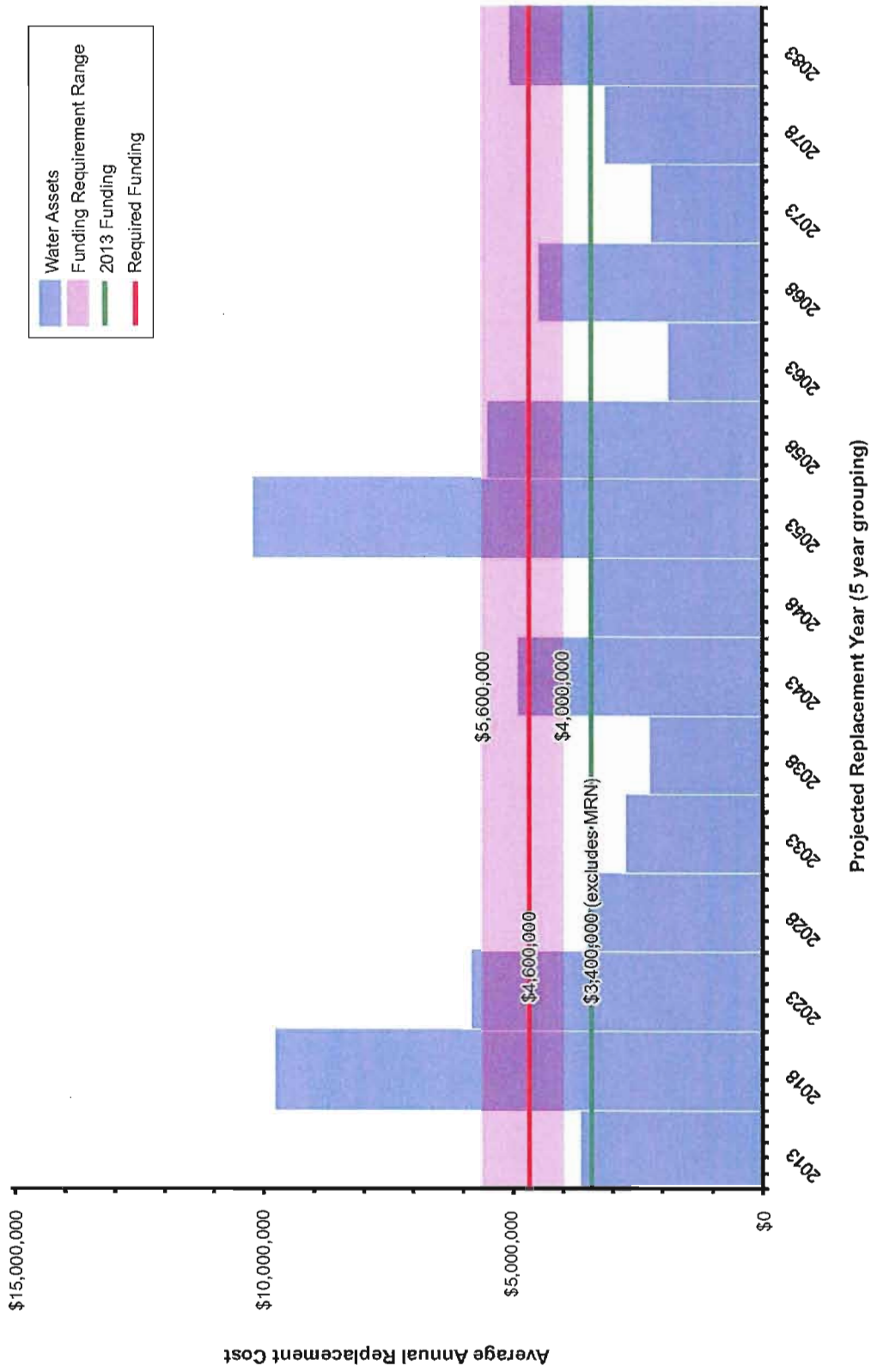
Attachment 3

2013 Ageing Infrastructure Report – Drainage Assets



Attachment 4

2013 Ageing Infrastructure Report – Non-MRN Road Assets



Attachment 5

Historical Costs for Capital Paving Program (2006 - 2012)

