



22 April 2014

Local Government Commission  
PO Box 5362  
WELLINGTON 6145  
NEW ZEALAND

**Attention:**      **Don Mackay**  
Senior Advisor

Dear Mr MacKay

## **Financial Impact of Asbestos Cement Pipe Replacement in the Wellington Region**

### **Introduction**

The Local Government Commission (LGC) has received a proposal from the three Wairarapa district councils to become a unitary authority and a proposal from the Greater Wellington Regional Council for a single Wellington Unitary Authority.

The state of each council's assets and liabilities is likely to be a key concern for the public who may fear that they will shoulder the burden of another council's debt or liabilities. MWH (NZ) Ltd was engaged by LGC to carry out a survey of the eight territorial authorities and the Regional Authority to:-

- provide a summary of the current state of key assets each local authority manages;
- identify the proposed expenditure on key assets, and renewals and replacements identified in Long Term Plans;
- provide a summary of the activities each local council plans to undertake in relation to its key assets in its Long-term Plan;
- identify possible, asset related, issues not reflected in the current Long-term Plans; (and)
- provide an opinion on the reliability of the current Asset Management Plans.

The report titled *Survey – Asset Management Activities Wellington Region Local Authorities – MWH, November 2013* presents the finding of the LGC investigation and identified a significant proportion of the region's piped infrastructure as likely to require substantial replacement within the next 30 years. This will require significant financial commitment as the councils embark on the replacement programme.

Large proportions of the council's water and sewer network are constructed from Asbestos Cement (AC) pipework. The earlier work from MWH identified the extent of the AC and other pipework regarded as 'poor to very poor' and the LGC wish to better understand the extent of the potential financial impact as the various councils plan for this pipeline replacement.

The LGC have requested a best estimate of the 'magnitude of the potential costs across the region' associated with this issue. This letter presents the findings of this investigation.

### **Background**

The figures used for this assessment are taken from the previous MWH work. The summary of the total lengths of water and wastewater pipelines and the percentage of those pipelines that are either AC or in poor to very poor condition was used in determining the magnitude of the potential costs. Table 1 shows a summary of these figures and the original charts extracted from the report are included in Appendix A.

**Table 1 – Water and wastewater pipe lengths**

Asset Owner	Length of Pipework (m)	WATER		WASTEWATER		
		% AC or Poor to very poor	length (m) of poor to very poor	Length of Pipework (m)	% AC or Poor to very poor	length (m) of poor to very poor
Wellington CC	1,245,000	42%	522,900	1,109,000	13%	144,170
Porirua CC	321,000	61%	195,810	403,000	84%	338,520
KCDC	485,000	53%	257,050	348,200	67%	233,294
Upper Hutt CC	279,000	31%	86,490	216,000	70%	151,200
Hutt CC	677,000	58%	392,660	681,000	29%	197,490
Masterton DC	187,800	43%	80,754	170,800	40%	68,320
South Wairarapa	104,000	47%	48,880	68,000	38%	25,840
Carterton DC	48,500	66%	32,010	30,800	44%	13,552

**Renewal and Rehabilitation Costs**

There are a number of variables that affect the pipeline renewal costs, these include;

1. Pipeline diameter – generally the larger the pipe the more expensive to renew;
2. Pipe replacement material;
3. Pipeline location, in increasing order of expense:
  - a. Greenfield site;
  - b. Residential Street/Brownfield site;
  - c. CBD.
4. Pipe criticality. The more critical the pipe is in terms of network serviceability the more contingency or temporary work needs to be provided to maintain levels of service during the replacement;
5. Pipe replacement methodology. Some examples of replacement methods are:
  - a. Open trenching. Open trenching is the more traditional method but may not always be possible due to the disruptive nature of the works;
  - b. Pipe bursting – involves pulling a new pipeline through the old host pipe and bursting the host pipe in the process. This is largely a trenchless method but required some access pits to be created;
  - c. Directional drilling – involves drilling a new line through a new alignment with disturbing large pieces of land. This is preferred for crossing state highways and waterways where traditional excavation would be impossible or expensive;
  - d. Cure in Place Pipework. This involves pulling a resin impregnated felt liner through the host pipe and curing it in place with heat or Ultra Violet light. This can be a lower cost solution for sewer renewal work but does not give a full 80-100 year asset life. New CIPP techniques are being developed for pressure (water) pipeline repairs.

**Council Financial Commitments**

In order to arrive at an order of magnitude of costs for both water and wastewater it would be unreasonable to attribute a single repair cost to the entire network. Therefore a potential network distribution of repair costs for both water and sewer has been created that attempts to factor in the numerous variables affecting cost. For the purpose of this work, the cost repair distribution has been assumed to be consistent for all councils. In reality this is not likely to be the case, it is likely that Wellington City (with a larger CBD) would be expected to have more pipes in the very high price range than some of the smaller districts without a significant CBD. For this reason it is expected that a higher confidence level can be shared in the region wide distribution of repair costs as the district wide distributions may be prone to skew.

**Water**

The potential per meter repair cost for watermain renewals can vary greatly as outlined above. For the purposes of this study a range of \$250 to \$5,000 per meter has been used. This represents the difference between small diameter greenfield site works and large diameter watermain renewals in the CBD.

Appendix B details the assumed repair cost distribution across each network and this has been used to determine the magnitude of watermain costs. Using this distribution, the following costs have been determined as shown in Table 2.

**Table 2: Order of Magnitude of Costs for Watermain repairs to AC and 'Poor to Very Poor' condition.**

Summary Table	Potential Repair Cost (\$M)	Population	Potential Repair Cost/person
Wellington City Council	288	200,100	\$1,400
Porirua City Council	108	53,000	\$2,000
Kāpiti Coast District Council	141	49,351	\$2,900
Upper Hutt City Council	48	42,000	\$1,100
Hutt City Council	216	103,000	\$2,100
Masterton District Council	44	23,500	\$1,900
South Wairarapa District Council	27	9,300	\$2,900
Carterton District Council	26	7,800	\$3,300
<b>Total Repair Cost</b>	<b>801</b>		

Given the level of accuracy expected and the assumptions required in this investigation, it would be reasonable to assume that this approximation method would have an accuracy of -10% to +30% meaning the order of magnitude costs for the region to repair the AC watermain and watermain in 'poor to very poor condition' is \$728M to \$1,041M.

#### Wastewater

The potential per meter repair cost for wastewater renewals can also vary greatly as presented. For the purposes of this study a range of \$250 to \$7,500 per meter has been used. As with water assets, this represents the difference between small diameter greenfield site work and large diameter sewer renewals in the CBD.

The assumed repair cost distribution across each network is presented in Appendix B. Using this distribution, the following costs have been determined as shown in Table 3.

**Table 3: Order of Magnitude of Costs for Wastewater repairs to AC and 'Poor to Very Poor' condition.**

Summary Table	Potential Repair Cost (\$M)	Population	Potential Repair Cost/person
Wellington City Council	161	200,100	\$800
Porirua City Council	379	53,000	\$7,200
Kāpiti Coast District Council	261	49,351	\$5,300
Upper Hutt City Council	169	42,000	\$4,000
Hutt City Council	221	103,000	\$2,100
Masterton District Council	76	23,500	\$3,200
South Wairarapa District Council	29	9,300	\$3,100
Carterton District Council	34	7,800	\$4,400
<b>Total Repair Cost</b>	<b>1,191</b>		

With a similar level of accuracy of -10% to +30%, the order of magnitude costs for the region to repair the AC wastewater pipelines and wastewater pipelines in 'poor to very poor' condition is \$1,082M to \$1,548M.

Appendix C shows a consolidated repair cost table for all districts.

### **Canterbury Earthquake Lessons**

There have been numerous papers presenting lessons learnt from the Canterbury Earthquake sequence.

Investigations have been completed into the performance of the water distribution network as a result of the three significant earthquakes Mw 7.1 September 4, 2010, Mw 6.2 February 22, 2011, and MW 6.0 June 13, 2011. Repair rates for AC and cast iron CI pipelines are similar for all earthquakes and approximately 4 to 5 times larger than polyvinyl chloride PVC pipeline repair rates, which are in turn 2 to 4 times greater than those for modified PVC (MPVC) pipelines.<sup>1</sup>

Ductile pipes (e.g. modern PVC-U and others) with rubber ring joints provide an acceptable and cost effective option for most repairs and renewal/replacement works for all but the most critical of the water supply and sewage pipelines, particularly in areas that do not have a high risk of lateral spreading. The older, brittle, pipe materials e.g. ceramic (earthenware), cast iron, AC and small diameter concrete pipes have performed poorly in areas affected by liquefaction. Lateral spreading and pipe stream crossings were a cause of failure.<sup>2</sup>

### **Assumptions/limitations**

The following assumptions have been made to arrive at these repair costs:

1. For simplicity, the pipe repair cost distribution is the same for all councils within the region. This is not likely to be the case in reality with cities having varying topography and urban densities. Wellington City has a larger CBD than any other city therefore may have more pipes in the higher cost repair bracket;
2. Only AC and 'poor to very poor' pipework has been included, this does not take into account the other pipework that may be nearing the end of its useful life but not fall into either category;
3. That the network condition is generally well understood so that the figures in Tables 1:10 and 1.11 in Appendix A are reasonably accurate;
4. The costs include all on-costs.
5. These desktop repair cost estimates have been reached from applying current repair cost ranges to the network lengths identified in previous LGC reports. To get a more reliable estimate it is suggested that contact is made with the relevant local authorities to confirm their understanding of local repair rates and network asset condition.
6. MWH would like to discuss with the LGC how these estimates might be publicised or used in further work so that the limitations can be acknowledged.

This assessment has determined an order of magnitude cost for the regions councils to replace the existing water and wastewater AC pipework and pipework considered to be in 'poor to very poor' condition. The approach has determined that these costs could vary between \$728M to \$1,041M for the water assets and \$1,082M to \$1,548M for wastewater assets.

We hope that this provides LGC with a useful guide to assist with the wider investigations. Should you require any clarification on anything raised please do not hesitate to contact David Hogg on (04) 381 5764.

Yours sincerely



David Hogg  
**Group Manager Water & Waste**  
**MWH New Zealand Limited**

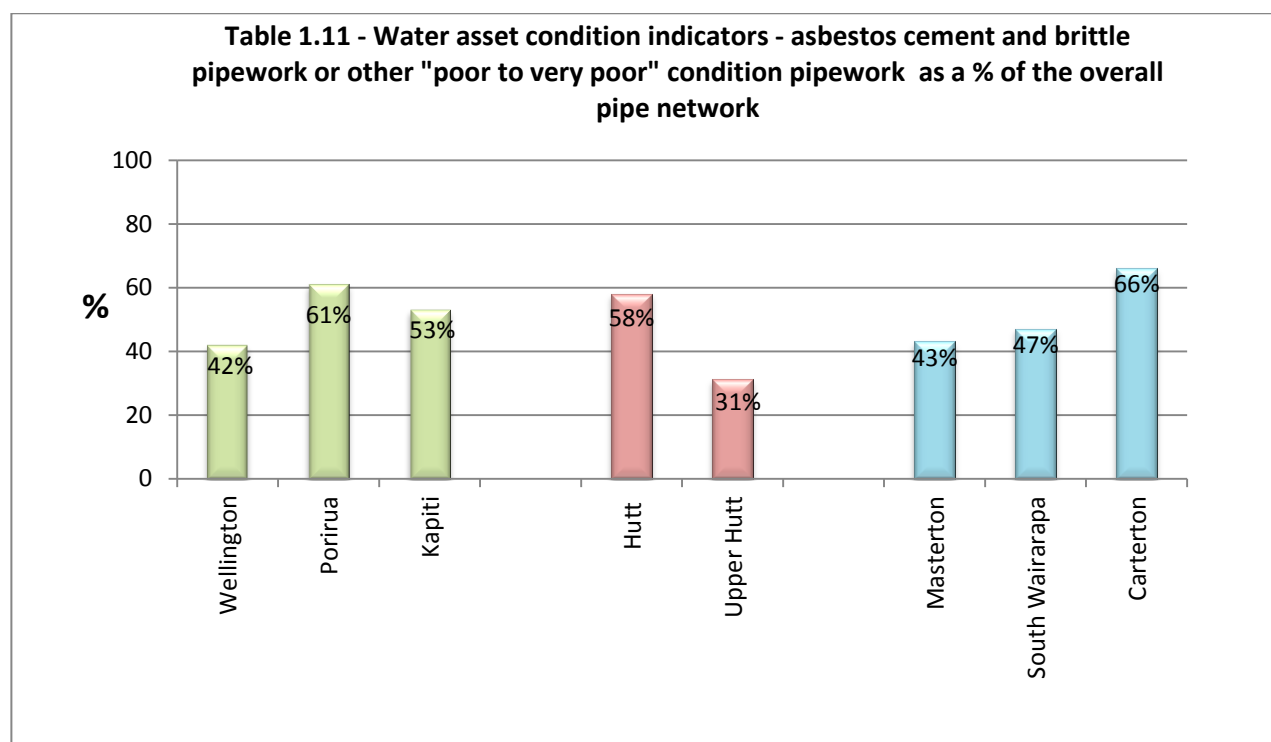
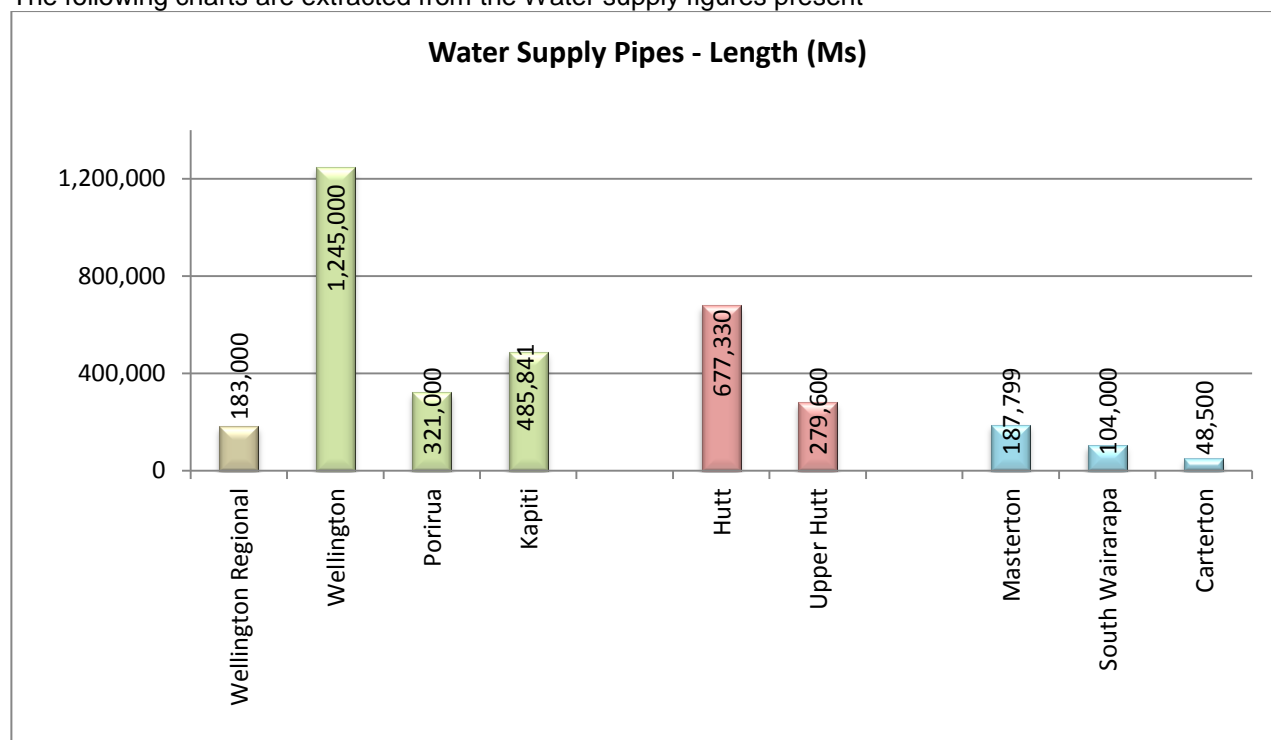
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<sup>1</sup> T.D. O'Rourke, S.-S Jeon, S. Toprak M. Cubrinovski J. K. Jung, Underground Lifeline System Performance during the Canterbury Earthquake Sequence. (2012).

<sup>2</sup> J Black Earthquake Damage to Buried Pipelines,, Paper to INGENUIM Conference 2012.

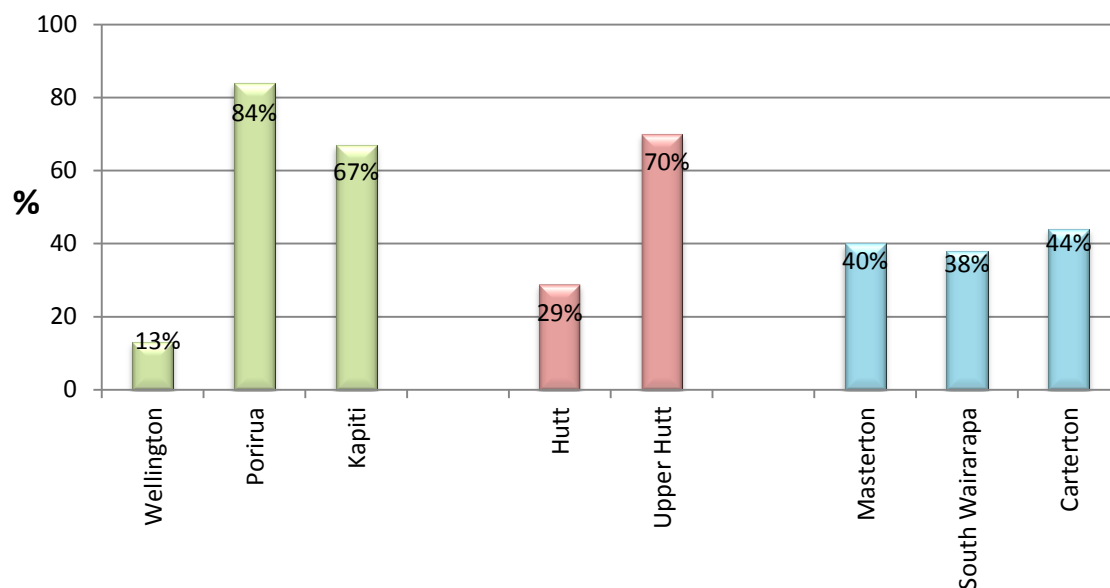
## APPENDIX A

The following charts are extracted from the Water supply figures present

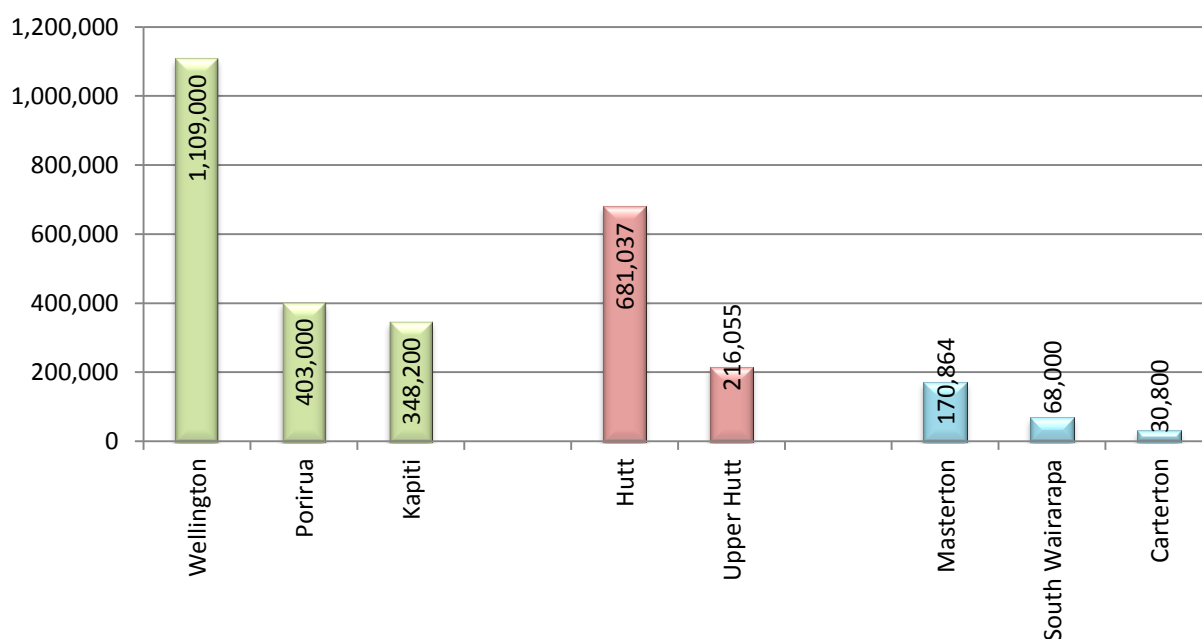


The following charts are extracted from the Wastewater figures present

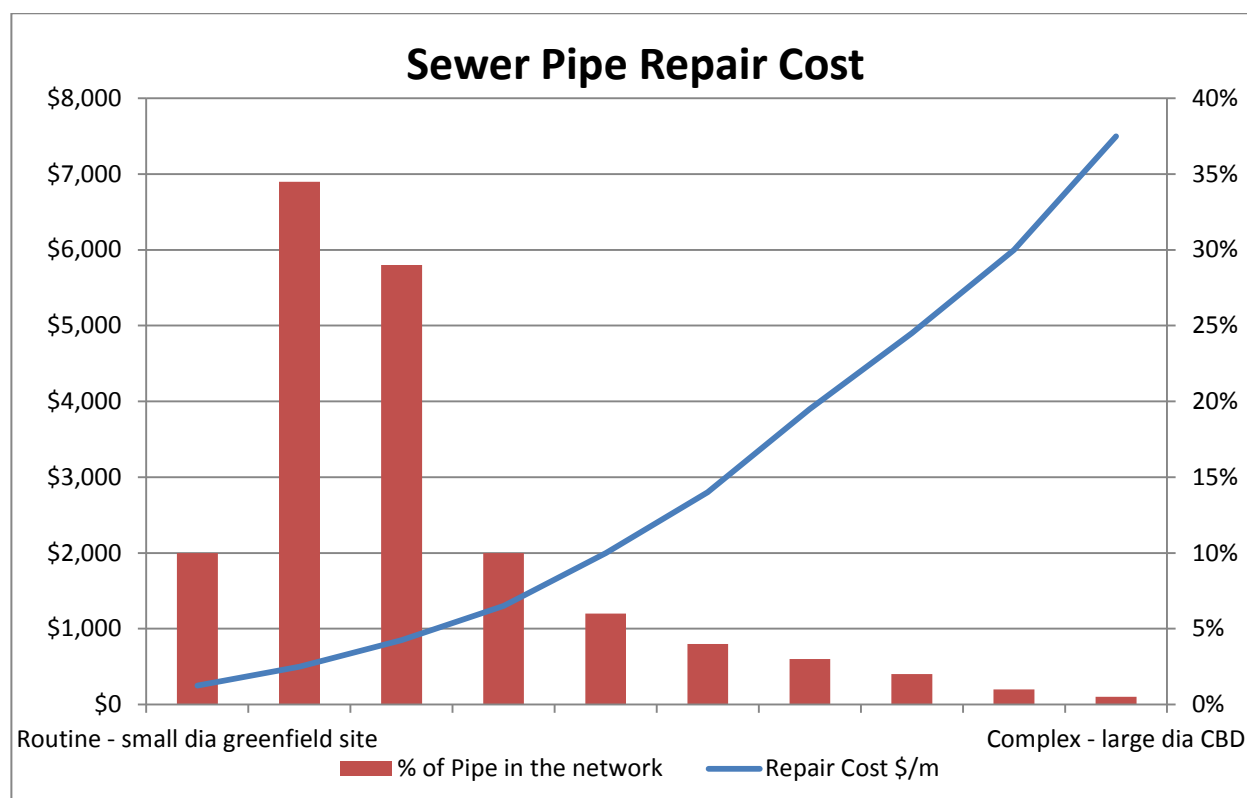
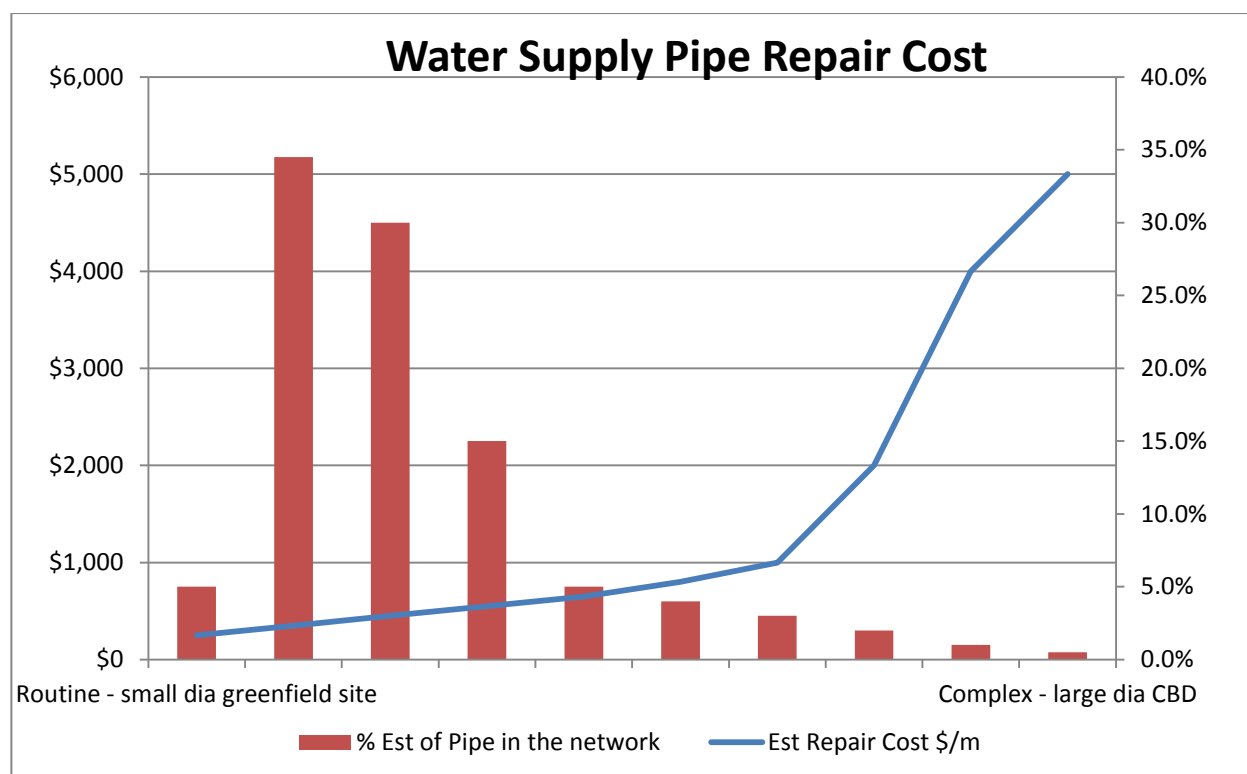
**Table 1.10 - Wastewater asset condition indicators - asbestos cement pipework or other "poor to very poor" condition pipework as a % of the overall network**



**Wastewater Pipes - Length (Ms)**



## APPENDIX B



## APPENDIX C:

**Table 4: Consolidated Repair Cost per District**

Summary Table	Population	Water		Wastewater		Total				
		Potential Repair Cost (\$M)	Potential Repair Cost/person	Potential Repair Cost (\$M)	Potential Repair Cost/person	Potential Repair Cost (\$M)	Potential Repair Cost/person	Range/Person (-10% +30%)		
Wellington City Council	200,100	288	\$1,400	161	\$800	449	\$2,200	\$2,000	-	\$2,860
Porirua City Council	53,000	108	\$2,000	379	\$7,200	487	\$9,200	\$8,364	-	\$11,960
Kāpiti Coast District Council	49,351	141	\$2,900	261	\$5,300	402	\$8,200	\$7,455	-	\$10,660
Upper Hutt City Council	42,000	48	\$1,100	169	\$4,000	217	\$5,100	\$4,636	-	\$6,630
Hutt City Council	103,000	216	\$2,100	221	\$2,100	437	\$4,200	\$3,818	-	\$5,460
Masterton District Council	23,500	44	\$1,900	76	\$3,200	120	\$5,100	\$4,636	-	\$6,630
South Wairarapa District Council	9,300	27	\$2,900	29	\$3,100	56	\$6,000	\$5,455	-	\$7,800
Carterton District Council	7,800	26	\$3,300	34	\$4,400	60	\$7,700	\$7,000	-	\$10,010
<b>Total Repair Cost</b>		<b>801</b>		<b>1,191</b>		<b>1992</b>				