

Lessons learned from one of New Zealand's most challenging civil engineering projects: rebuilding the earthquake damaged pipes, roads, bridges and retaining walls in the city of Christchurch 2011 - 2016.

Evaluation of Whole of Life Costs for Rebuild Option Evaluation (Calculating Spreadsheet)

Story: Evaluation of Alternative Rebuild Options

Theme: Governance and Decision Making

A pdf of a spreadsheet tool used by designers to undertake a whole of life evaluation of rebuild options.

This document has been provided as an example of a tool that might be useful for other organisations undertaking complex disaster recovery or infrastructure rebuild programmes.

For more information about this document, visit www.scirtlearninglegacy.org.nz



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Total Project Cost Estimate

Updated - Martin Dwyer (8/05/14) with correction to calculation of P&G within Construction Allowances
 Changes from the last updates in red

Ref	Item	Unit	Average Cost/Unit	Comments	Option 0 - Direct Repair or Replacement of Existing Gravity System (not IDS compliant)		Option 1 - Renewal with Complete Enhanced Gravity System (IDS compliant)		Option 2 - Renewal with Complete Pressure Sewer System		Option 3 - Renewal with Complete Vacuum Sewer System		Option 4 - Mixed System	
					No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
1 Construction Estimate														
Res Ref	Repairs to Gravity													
GR	GS: Minor works to small pump station	No.	15000	Specific assessment required	Design to review cost before using rate	0	-	-	-	-	-	-	-	-
GR	GS: Minor works to large pump station	No.	50000	Specific assessment required	Design to review cost before using rate	0	-	-	-	-	-	-	-	-
GR	GS: Major works to small pump station	No.	150000	Specific assessment required	Design to review cost before using rate	0	-	-	-	-	-	-	-	-
GR	GS: Major works to large pump station	No.	500000	Specific assessment required	Design to review cost before using rate	0	-	-	-	-	-	-	-	-
GR	GS: Dig up repair 0m to 1.5m deep	No.	4,000	Per repair (up to 6m)	Assume average of 2 repairs per pipe	0	-	4	16,000	-	-	-	-	-
GR	GS: Dig up repair 1.5m to 2.5m deep	No.	10,000	Per repair (up to 6m)	Assume average of 2 repairs per pipe	0	-	4	40,000	-	-	-	-	-
GR	GS: Dig up repair 2.5m to 3.5m deep	No.	14,000	Per repair (up to 6m)	Assume average of 2 repairs per pipe	0	-	-	-	-	-	-	-	-
GR	GS: Dig up repair 3.5m to 5m deep	No.	20,000	Per repair (up to 6m)	Assume average of 2 repairs per pipe	0	-	-	-	-	-	-	-	-
GR	GS: Dig up repair >5m deep	No.	25,000	Per repair (up to 6m)	Assume average of 2 repairs per pipe	0	-	-	-	-	-	-	-	-
GR	GS: Dig up repair to lateral in berm	No.	3,000	-	-	0	-	-	-	-	-	-	-	-
GR	GS: Rehab. MH 0m to 1.5m deep	No.	1,000	-	This is approx 1/3 new build cost	0	-	-	-	-	-	-	-	-
GR	GS: Rehab. MH 1.5m to 2.5m deep	No.	1,250	-	This is approx 1/3 new build cost	0	-	-	-	-	-	-	-	-
GR	GS: Rehab. MH 2.5m to 3.5m deep	No.	1,500	-	This is approx 1/3 new build cost	0	-	-	-	-	-	-	-	-
GR	GS: Rehab. MH 3.5m to 5m deep	No.	1,750	-	This is approx 1/3 new build cost	0	-	-	-	-	-	-	-	-
GR	GS: Rehab. MH >5m deep	No.	2,000	-	This is approx 1/3 new build cost	0	-	-	-	-	-	-	-	-
GR	GS: Flush tank (new)	No.	10,000	-	-	0	-	-	-	-	-	-	-	-
GR	GS: Flush tank (upgrd)	No.	3,000	-	-	0	-	-	-	-	-	-	-	-
GR	GS: Patch repair DN150	No.	3,900	Does not include for over put	Includes allowance for cleaning and lateral	0	-	-	-	-	-	-	-	-
GR	GS: Patch repair DN225	No.	4,100	Does not include for over put	Includes allowance for cleaning and lateral	0	-	-	-	-	-	-	-	-
GR	GS: Patch repair DN300	No.	5,000	Does not include for over put	Includes allowance for cleaning and lateral	0	-	-	-	-	-	-	-	-
GR	GS: Patch repair DN375	No.	6,000	Does not include for over put	Includes allowance for cleaning and lateral	0	-	-	-	-	-	-	-	-
GR	GS: Patch repair DN450	No.	6,550	Does not include for over put	Includes allowance for cleaning and lateral	0	-	-	-	-	-	-	-	-
GL	GS: Reline gravity sewer DN150	m	225	Does not include for over pumping	-	0	-	522	117,450	-	-	-	-	-
GL	GS: Reline gravity sewer DN225	m	250	Does not include for over pumping	-	0	-	-	-	-	-	-	-	-
GL	GS: Reline trunk sewer DN300	m	480	Does not include for over pumping	-	0	-	-	-	-	-	-	-	-
GL	GS: Reline trunk sewer DN375	m	700	Does not include for over pumping	-	0	-	-	-	-	-	-	-	-
GL	GS: Reline trunk sewer DN450	m	800	Does not include for over pumping	-	0	-	-	-	-	-	-	-	-
GL	GS: Reline trunk sewer DN525	m	1,450	Does not include for over pumping	-	0	-	-	-	-	-	-	-	-
GL	GS: Reline trunk sewer DN675	m	1,550	Does not include for over pumping	-	0	-	-	-	-	-	-	-	-
GL	GS: Reline trunk sewer DN875	m	1,650	Does not include for over pumping	-	0	-	-	-	-	-	-	-	-
GL	GS: Reline trunk sewer DN1075	m	1,800	Does not include for over pumping	-	0	-	-	-	-	-	-	-	-
GL	GS: Additional CCTV to check pipes for lining	m	60	CCTV inspection rate	-	0	-	522	31,320	-	-	-	-	-
GL	GS: Lateral opening (post lining)	No.	500	Does not include for over put	Opening of lined pipes at all lateral locations	0	-	-	-	-	-	-	-	-
GL	GS: Lateral lining DN100	No.	4,000	Does not include for over put	For laterals in reamed pipes. Includes junction box at boundary	0	-	50	200,000	-	-	-	-	-
GL	GS: Lateral connection repair DN150/100	No.	1,600	Does not include for over pumping	-	0	-	-	-	-	-	-	-	-
GL	GS: Lateral connection repair DN400/100	No.	4,000	Does not include for over pumping	-	0	-	-	-	-	-	-	-	-
GL	GS: Over pumping using temporary (diaphragm) pump	Day	1,000	Apply to any trenchless work that requires over pumping	-	0	-	-	-	-	-	-	-	-
Enhanced Gravity														
PS	GS: Low lift pump station < 15 l/s	No.	150,000	-	-	0	-	2	300,000	-	-	-	-	-
PS	GS: Conventional pump station 10 l/s	No.	450,000	-	-	0	-	2	900,000	-	-	-	-	-
PS	GS: Conventional pump station 20 l/s	No.	600,000	-	-	0	-	1	600,000	-	-	-	-	-
PS	GS: Conventional pump station 40 l/s	No.	800,000	-	-	0	-	-	-	-	-	-	-	-
PS	GS: Conventional pump station 60 l/s	No.	1,000,000	-	-	0	-	-	-	-	-	-	-	-
PS	GS: Conventional pump station 80 l/s	No.	1,200,000	-	-	0	-	-	-	-	-	-	-	-
PS	GS: Conventional pump station land purchase	LS	-	Land purchase for pump station	Designer to review land purchase costs with CCC property team	0	-	-	-	-	-	-	-	-
G	GS: Collector Sewer DN150 PVC 0m to 1.5m deep	m	240	For works in road	Laid in same trench as man	0	-	-	-	-	-	-	-	-
G	GS: DN150 PVC 0m to 1.5m deep	m	420	For works in road	-	0	-	1291	800,420	-	-	-	-	-
G	GS: DN150 PVC 1.5m to 2.5m deep	m	1,100	For works in road	-	0	-	1448	1,592,800	-	-	-	-	-
G	GS: DN150 PVC 2.5m to 3.5m deep	m	1,400	For works in road	-	0	-	586	820,400	-	-	-	-	-
G	GS: DN150 PVC 3.5m to 5m deep	m	3,200	Includes for sheet pile	Not normally laid at this depth - review with TOC team	0	-	188	601,600	-	-	-	-	-
G	GS: DN175 PVC 0m to 1.5m deep	m	540	For works in road	-	0	-	-	-	-	-	-	-	-
G	GS: DN175 PVC 1.5m to 2.5m deep	m	1,100	For works in road	-	0	-	-	-	-	-	-	-	-
G	GS: DN175 PVC 2.5m to 3.5m deep	m	1,400	For works in road	-	0	-	-	-	-	-	-	-	-
G	GS: DN175 PVC 3.5m to 5m deep	m	3,200	Includes for sheet pile	Not normally laid at this depth - review with TOC team	0	-	-	-	-	-	-	-	-
G	GS: DN225 PVC 0m to 1.5m deep	m	700	For works in road	-	0	-	-	-	-	-	-	-	-
G	GS: DN225 PVC 1.5m to 2.5m deep	m	1,150	For works in road	-	0	-	220	253,000	-	-	-	-	-
G	GS: DN225 PVC 2.5m to 3.5m deep	m	1,450	For works in road	-	0	-	192	278,400	-	-	-	-	-
G	GS: DN225 PVC 3.5m to 5m deep	m	3,300	Includes for sheet pile	Not normally laid at this depth - review with TOC team	0	-	-	-	-	-	-	-	-
G	GS: DN300 PVC 0m to 1.5m deep	m	850	For works in road	-	0	-	-	-	-	-	-	-	-
G	GS: DN300 PVC 1.5m to 2.5m deep	m	1,300	For works in road	-	0	-	-	-	-	-	-	-	-
G	GS: DN300 PVC 2.5m to 3.5m deep	m	1,700	For works in road	-	0	-	-	-	-	-	-	-	-
G	GS: DN300 PVC 3.5m to 5m deep	m	3,550	Includes for sheet pile	Not normally laid at this depth - review with TOC team	0	-	-	-	-	-	-	-	-
G	GS: DN375 PVC 0m to 1.5m deep	m	1,050	-	-	0	-	-	-	-	-	-	-	-
G	GS: DN375 PVC 1.5m to 2.5m deep	m	1,500	-	-	0	-	-	-	-	-	-	-	-
G	GS: DN375 PVC 2.5m to 3.5m deep	m	1,750	-	-	0	-	-	-	-	-	-	-	-
G	GS: DN375 PVC 3.5m to 5m deep	m	3,600	Includes for sheet pile	Not normally laid at this depth - review with TOC team	0	-	-	-	-	-	-	-	-
G	GS: Manhole 0m to 1.5m deep	No.	4,500	-	-	0	-	16	72,000	-	-	-	-	-
G	GS: Manhole 1.5m to 2.5m deep	No.	4,500	-	-	0	-	26	169,200	-	-	-	-	-
G	GS: Manhole 2.5m to 3.5m deep	No.	8,700	-	-	0	-	17	147,900	-	-	-	-	-
G	GS: Manhole 3.5m to 5m deep	No.	17,000	Includes for sheet pile	Not normally laid at this depth - review with TOC team	0	-	4	68,000	-	-	-	-	-
G	GS: Lateral to property DN100	m	280	Estimate an average length per property (typically approx 10m)	-	0	-	4512	1,263,360	-	-	-	-	-
PS	GS: Pressure main DN110 PE	m	300	-	-	0	-	-	-	-	-	-	-	-
PS	GS: Pressure main DN125 PE	m	310	-	-	0	-	-	-	-	-	-	-	-
PS	GS: Pressure main DN160 PE	m	340	-	-	0	-	1660	564,400	-	-	-	-	-
PS	GS: Pressure main DN200 PE	m	360	-	-	0	-	-	-	-	-	-	-	-
PS	GS: Pressure main DN250 PE	m	400	-	-	0	-	-	-	-	-	-	-	-
G	GS: Connection of pressure main to existing sewer system	No.	2,000	-	-	0	-	-	-	-	-	-	-	-
G	GS: Shear piling pipe 3.5m to 5.0m	m	1,500	Extra-over, per m of trench.	For use in peat ground - review with TOC team	0	-	188	282,000	-	-	-	-	-
G	GS: DN150 PVC 0m to 1.5m deep collector sewer	m	500	in berm	Not usual. Collector normally laid above main along road centreline	0	-	987	493,500	-	-	-	-	-
Decommission														
NA	GS: Decommission sewer DN150	m	20	Grout with flowable fill	Flowable fill, refer to IDS Part 6. Not all pipes <=300mm diameter need to	0	-	2120	42,400	2500	50,000	2500	50,000	-
NA	GS: Decommission sewer DN225	m	25	Grout with flowable fill	Flowable fill, refer to IDS Part 6. Not all pipes <=300mm diameter need to	0	-	0	0	2000	50,000	2000	50,000	-
NA	GS: Decommission sewer DN300	m	50	Grout with flowable fill	Flowable fill, refer to IDS Part 6. Not all pipes <=300mm diameter need to	0	-	0	0	-	-	-	-	-
NA	GS: Decommission sewer DN375	m	80	Grout with flowable fill	Flowable fill, refer to IDS Part 6	0	-	1500	120,000	1500	120,000	1500	120,000	-
NA	GS: Decommission sewer DN450	m	115	Grout with flowable fill	Flowable fill, refer to IDS Part 6	0	-	0	0	-	-	-	-	-
NA	GS: Decommission sewer DN525	m	158	Grout with flowable fill	Flowable fill, refer to IDS Part 6	0	-	0	0	-	-	-	-	-
NA	GS: Decommission sewer DN675	m	200	Grout with flowable fill	Flowable fill, refer to IDS Part 6	0	-	0	0	-	-	-	-	-
NA	GS: Decommission manhole	No.	750	Remove top/break walls APES	-	0	-	63	47,250	119	89,250	119	89,250	-
Pressure Sewer														
P	PS: Simplex pump unit (one pump)	No.	8,000	-	-	0	-	-	-	682	5,456,000	-	-	-
P	PS: Duplex pump unit (one pump)	No.	12,500	-	-	0	-	-	-	-	-	-	-	-
P	PS: Duplex pump unit (two pumps)	No.	15,000	-	-	0	-	-	-	-	-	-	-	-
P	PS: Quad pump unit (two pumps)	No.	18,000	-	-	0	-	-	-	-	-	-	-	-
P	PS: Quad pump unit (four pumps)	No.	24,000	-	-	0	-	-	-	-	-	-	-	-
P	PS: Trafficable installation	No.	3,000	-	-	0	-	-	-	-	-	-	-	-
P	PS: Direct electrical connection (Chon)	No.	5,000	-	-	0	-	-	-	-	-	-	-	-

Pump/lift Stations
Pressure Pits
Vacuum component
Vacuum Stations
Valve Pits
Items not subject to resilience

Total - check (should equal zero)

#DIV/0!	3,969,488.83	-	-	#DIV/0!
#DIV/0!	-	16,330,347.23	-	#DIV/0!
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#DIV/0!	-	-	6,746,512.91	#DIV/0!
#DIV/0!	462,345.33	658,215.69	669,195.10	#DIV/0!
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