

Appendix 15
Estimated costs of dams

BROWN HILL KESWICK CREEK STORMWATER PROJECT



BROWN HILL CREEK DAM COST ESTIMATE FOR EARTH DAM (OPTION 1) AT SITE No 1

ITEM	DESCRIPTION	COSTPLAN QTYs AND COST			COMMENTS	
		QUANTITY	RATE	AMOUNT		
CONTRACT WORKS COSTS						
1	Preliminaries and overheads					
1.1	Establishment including contractors onsite overheads	item		\$1,788,101	includes mobilisation, supervision, insurances and fees, site accommodation, preparation of Project management plans etc.	
1.2	Testing	item	1	\$534,000	\$534,000	Including geotechnical, Level one supervision and the supply and installation of dam monitoring equipment
1.3	Environmental controls	item	1	\$284,900	\$284,900	including dust and sediment testing, auditing and associated testing requirements
1.4	Survey Setout and abuilding	item	1	\$364,320	\$364,320	
1.5	Traffic and pedestrian management	item	1	\$438,595	\$438,595	Includes signage, temporary pavements and diversions, traffic management crews, signage, plans and audits etc.
1.6	Temporary and project fencing	m	400	\$70	\$28,000	
1.7	Temporary construction access tracks and hardstands	item	1	\$168,454	\$168,454	
	Subtotal Section 1				\$3,606,370	
2	Clearing and Earthworks preparation					
2.1	Clearing and Grubbing	m2	6000	\$4.50	\$27,000	
2.2	Protection of Trees	Item	1	\$18,000	\$18,000	Numerous major trees to protect
2.3	Surface stripping to 0.5m deep	m3	2559	\$15.85	\$40,560	Assume not rock, Separate into materials stockpiles onsite. Topsoil and general fill
2.4	Excavation to MW rock	m3	4104	\$38.65	\$158,620	Load and cart to offsite dump, opportunity to reuse as fill, assume 2m cut under dam footprint
2.5	Coffer dam upstream	item	1	\$24,000.00	\$24,000	compacted clays
2.6	e/o for trench excavation in rock for primary spillway pipe	m3	1000	\$240.00	\$240,000	
	Subtotal Section 2				\$508,180	
3	Foundation grouting works					
3.1	Mob and bench preparation for grout curtain	item	1	\$60,000	\$60,000	
3.2	Drill and grout "grout curtain" beneath dam floor	m2	120	\$1,650	\$198,000	assume average 6m deep
	Subtotal Section 3				\$258,000	
4	Drainage structures and culverts					
4.1	RC Inlet structure	item	1	\$48,000	\$48,000	assume 20m3 structure
4.2	RC upstream headwall	item	1	\$9,600	\$9,600	assume 4m3 structure
4.3	RC downstream headwall	item	1	\$24,000	\$24,000	assume 10m3 structure
4.4	Low level outlet pipe, 300 HDPE	m	120	\$450	\$54,000	
4.5	High-level Outlet pipe, 1350 RCP	m	150	\$3,741	\$561,150	Assume 1350 class 4 RCP RRJ in concrete
4.6	Trash screens, grilles and walkways etc., HDG	tonnes	3	\$15,000	\$45,000	
	Subtotal Section 4				\$741,750	
5	Dam construction					
5.1 Flanks						
1	Beaching for rock lined section	m3	1750	\$111	\$194,775	600mm minus rock , assume 600mm thick on upstream face
2	Transition layer 1	m3	3800	\$89	\$338,200	
3	Transition layer 2	m3	4900	\$84	\$409,150	
4	Gravel fill	m3	22000	\$61	\$1,347,500	
5	Filter	m3	520	\$70	\$36,400	
6	Armour rock	m3	5300	\$106	\$561,800	
7	Cement stabilised crushed rock within armour voids	m3	2700	\$229	\$617,625	
5.2 Core wall						
1	Concrete core wall	m3	530	\$1,800	\$954,000	1m at base. 500mm at top
2	Concrete backfill on spillway crest	m3	250	\$1,200	\$300,000	
3						
	Subtotal Section 5				\$4,759,450	
6	Reinstatement and finishing works					
6.1	Fill beneath road realignment for ramps to new levels	m3	3000	\$56	\$168,000	Assume imported QW fill
6.2	RW's adjacent to relocated roadway required	m2	200	\$650	\$130,000	assume 300LM average height of 2m
6.3	Stormwater drainage for relocated road section	item	1	\$34,000	\$34,000	plug cost
6.4	Road realignment sub and base course to carriageways and shoulders	m2	1700	\$43	\$73,100	assume 400mm deep crushed rock granular and shoulders, 170LM x 10m wide
6.5	Asphaltic concrete surfacing to road realignment	m2	1360	\$25	\$33,402	assume 40/10 AC
6.6	Kerb and gutter to new road edges	m	340	\$48	\$16,320	
6.7	Armco railing to dam edge of road	m	170	\$165.71	\$28,170	including structure transitions
6.8	Footpath to provide connectivity to walking trails	m	600	\$225	\$135,000	Assume 30AC10 on granular base, 3m wide extend 250m in each direction
6.9	Match in adjacent to residential properties, ramps, fencing etc.	item	1	\$36,000	\$36,000	
6.1	Road reconstruction works (outside of immediate boundary)	m2	15400	\$40.70	\$626,780	Existing access road substandard, Allow to P+R 50mm x 2.2 KM x 7m wide
6.11	Road widening works, protuberances etc.	m3	1540	\$95	\$146,300	assume 10% of total
6.12	Existing narrow bridge reconstruction to facilitate 2 lanes and shared path	item	1	\$340,000	\$340,000	12m of 4.2*2.1 RCBC, may require new single span12m x m wide bridge. Issue with OH wires
6.13	Landscaping	m2	15000	\$11.00	\$165,000	Respread stripped topsoil over slab and hydro seed
6.14	Detailed landscaping, tube stock and advanced trees etc.	item	1	\$120,000	\$120,000	
6.15	Landscaping establishment and 2 season maintenance	item	1	\$30,000	\$30,000	
6.16	Hard scaping , path rerouting , interpretive signage , furniture etc.	item	1	\$50,000	\$50,000	
6.17	Fencing to site	m	460	\$35	\$16,100	
6.18	Site clean-up and demobilisation	item	1	\$140,000	\$140,000	
	Subtotal Section 6				\$2,132,072	
SUBTOTAL 1 - 6						
					\$12,161,921	
7	Contractors Offsite OH and Margin					
7.1	Offsite OH and Margin	%	10%	\$12,161,921	\$1,216,192	allowance for offsite OH and profit
TOTAL CONSTRUCTION COSTS						
					\$13,378,114	
8	CLIENT COSTS					
8.1	Existing services identification and alteration works	%	2%	\$13,378,114	\$267,562	
8.2	Project Planning works	%	4%	\$13,378,114	\$535,125	
8.3	Investigations and design	%	11%	\$13,378,114	\$1,404,702	Including design verification works
8.4	Project and contract management	%	10%	\$13,378,114	\$1,337,811	
8.5	Community engagement and liaison	%	2%	\$13,378,114	\$267,562	

8.6	Land acquisition					EXCLUDED FROM THIS ESTIMATE
TOTAL CLIENT COSTS					\$3,812,762	
BASE PROJECT COST					\$17,190,876	
9	RISK AND OPPORTUNITY					
9.1	Inherent Risk	%	12%	\$17,190,876	\$2,062,905	This is the uncertainties in the known or planned scope of the project. These are risks due to unmeasured items and are conditional, i.e. they may or may not happen. Note ; Contingent Risk does not cover changes to the project objectives
9.2	Contingent Risk	%	20%	\$17,190,876	\$3,438,175	
TOTAL RISK ALLOCATION					\$5,501,080	
TOTAL ESTIMATE PROJECT COST					\$22,691,956	
TOTAL					\$22.7	(million rounded)
IMPORTANT NOTES						
1	Excludes GST					
2	Costs are current as at Q2, 2014 and excludes escalation					
3	Based on SMEC Preliminary concept design report dated November 2013					
4	This option excludes Gabion trailing structures and architectural fill that may be required					
5	Excludes Land acquisition costs (if applicable)					
6	Excludes associated downstream works required					



BROWN HILL KESWICK CREEK STORMWATER PROJECT

BROWN HILL CREEK DAM CONCEPT ESTIMATE FOR RCC DAM (OPTION 2) AT SITE No 1

ITEM	DESCRIPTION	COSTPLAN QTYS AND COST			COMMENTS	
		QUANTITY	RATE	AMOUNT		
CONTRACT WORKS COSTS						
1	Preliminaries and overheads					
1.1	Establishment including contractors onsite overheads	item		\$1,673,518	includes mobilisation, supervision, insurances and fees, site accommodation, preparation of Project management plans etc.	
1.2	Testing	item	1	\$480,000	\$480,000	Including geotechnical, Level one supervision and the supply and installation of dam monitoring equipment
1.3	Environmental controls	item	1	\$259,000	\$259,000	including dust and sediment testing, auditing and associated testing requirements
1.4	Survey Setout and abuilding	item	1	\$331,200	\$331,200	
1.5	Traffic and pedestrian management	item	1	\$438,595	\$438,595	Includes signage, temporary diversions traffic management crews, audits etc.
1.6	Temporary and project fencing	m	400	\$70	\$28,000	
1.7	Temporary access tracks and hardstands	item	1	\$168,454	\$168,454	
	Subtotal Section 1			\$3,378,767	0.254886359	
2	Clearing and Earthworks preparation					
2.1	Clearing and Grubbing	m2	6000	\$4.50	\$27,000	
2.2	Protection of Trees	Item	1	\$18,000	\$18,000	Numerous major trees to protect
2.3	Surface stripping to 0.5m deep	m3	2559	\$15.85	\$40,560	Assume not rock, Separate into materials stockpiles onsite. Topsoil and general fill
2.4	Excavation to MW rock	m3	4104	\$38.65	\$158,620	Load and cart to offsite dump, perhaps opportunity to reuse as fill, assume 2m cut under dam footprint
2.5	Coffer dam upstream	item	1	\$24,000.00	\$24,000	compacted clays
2.6	e/o for trench excavation in rock for primary spillway pipe	m3	1000	\$240.00	\$240,000	
	Subtotal Section 2			\$508,180		
3	Foundation grouting works					
3.1	Mob and bench preparation for grout curtain	item	1	\$60,000	\$60,000	
3.2	Drill and grout "grout curtain " beneath dam floor	m2	120	\$1,650	\$198,000	assume average 6m deep
	Subtotal Section 3			\$258,000		
4	Drainage structures and culverts					
4.1	RC Inlet structure	item	1	\$48,000	\$48,000	assume 20m3 structure
4.2	RC upstream headwall	item	1	\$9,600	\$9,600	assume 4m3 structure
4.3	RC downstream headwall	item	1	\$24,000	\$24,000	assume 10m3 structure
4.4	Low level outlet pipe, 300 HDPE	m	120	\$450	\$54,000	
4.5	High-level Outlet pipe, 1350 RCP	m	120	\$3,741	\$448,920	Assume 1350 class 4 RCP RRJ in CLSM concrete
4.6	Trash screens, grilles and walkways etc., HDG	tonnes	3	\$15,000	\$45,000	
	Subtotal Section 4			\$629,520		
5	Structure					
5.1	Roller Compacted concrete (Form, supply place and cure)	m3	5769	\$422	\$2,434,698	
5.2	Installation of pressure relief drains	item	1	\$36,000	\$36,000	
5.3	FRPS downstream dissipator slab 0.5m thick	m3	1434	\$735	\$1,053,990	assume 0.5m thick, Reo @ 80 KG/m3
	Subtotal Section 5			\$3,524,688		
6	Reinstatement and finishing works					
6.1	Backfill front face of structure	m3	480	\$420	\$201,600	assume RCC
6.2	Provide rock beaching for downstream zone of dissipator slab	m3	370	\$111	\$41,181	0.6 m deep at toe of concrete dissipator slab
6.3	Fill beneath road realignment for ramps to new levels	m3	3000	\$56	\$168,000	Assume imported QW fill
6.4	RW's adjacent to relocated roadway required	m2	200	\$650	\$130,000	assume 300LM average height of 2m
6.5	Stormwater drainage for relocated road section	item	1	\$34,000	\$34,000	plug cost
6.6	Road realignment sub and base course to carriageways and shoulders	m2	1700	\$43	\$73,100	assume 400mm deep crushed rock granular and shoulders, 170LM x 10m wide
6.7	Asphaltic concrete surfacing to road realignment	m2	1360	\$25	\$33,402	assume 40/10 AC
6.8	Kerb and gutter to new road edges	m	340	\$48	\$16,320	
6.9	Armco railing to dam edge of road	m	170	\$165.71	\$28,170	including structure transitions
6.10	Footpath to provide connectivity to walking trails	m	500	\$225	\$112,500	Assume 30AC10 on granular base, 3m wide extend 250m in each direction
6.11	Match in adjacent to residential properties, ramps, fencing etc.	item	1	\$36,000	\$36,000	
6.12	Road reconstruction works (outside of immediate boundary)	m2	15400	\$40.70	\$626,780	Existing access road substandard, Allow to P+R 50mm x 2.2 KM x 7m wide
6.13	Road widening works, protuberances etc.	m3	1540	\$95	\$146,300	assume 10% of total
6.14	Existing narrow bridge reconstruction to facilitate 2 lanes and shared path	item	1	\$340,000	\$340,000	12m of 4.2*2.1 RCBC, may require new single span12m x m wide bridge. Issue with OH wires
6.15	Landscaping	m2	5000	\$11.00	\$55,000	Respread stripped topsoil over slab and hydro seed
6.16	Detailed landscaping, tube stock and advanced trees etc.	item	1	\$60,000	\$60,000	
6.17	Landscaping establishment and 2 season maintenance	item	1	\$30,000	\$30,000	
6.18	Hard scaping , path rerouting , interpretive signage , furniture etc.	item	1	\$50,000	\$50,000	
6.19	Fencing to site	m	340	\$135	\$45,900	
6.20	Site clean-up and demobilisation	item	1	\$110,000	\$110,000	
	Subtotal Section 6			\$2,182,353		
	SUBTOTAL 1 - 6			\$10,637,407	\$8,476,789	
7	Contractors Offsite OH and Margin					



BROWN HILL KESWICK CREEK STORMWATER PROJECT

BROWN HILL CREEK DAM CONCEPT ESTIMATE FOR RCC DAM (OPTION 2) AT SITE No 1

ITEM	DESCRIPTION	COSTPLAN QTYS AND COST			COMMENTS	
		QUANTITY	RATE	AMOUNT		
7.1	Offsite OH and Margin	%	12%	\$10,637,407	\$1,276,489	allowance for offsite OH and profit
TOTAL CONSTRUCTION COSTS					\$11,913,896	
8	CLIENT COSTS					
8.1	Existing services identification and alteration works	%	2%	\$11,913,896	\$238,278	
8.2	Project Planning works	%	4%	\$11,913,896	\$476,556	
8.3	Investigations and design	%	12%	\$11,913,896	\$1,429,668	Including design verification works
8.4	Project and contract management	%	10%	\$11,913,896	\$1,191,390	
8.5	Community engagement and liaison	%	2%	\$11,913,896	\$238,278	
8.6	Land acquisition					EXCLUDED FROM THIS ESTIMATE
TOTAL CLIENT COSTS					\$3,574,169	
BASE PROJECT COST					\$15,488,065	
9	RISK AND OPPORTUNITY					
9.1	Inherent Risk	%	15%	\$15,488,065	\$2,385,162	This is the uncertainties in the known or planned scope of the project. These are risks due to unmeasured items and are conditional, i.e. they may or may not happen. Note ; Contingent Risk does not cover changes to the project objectives
9.2	Contingent Risk	%	20%	\$15,488,065	\$3,097,613	
TOTAL RISK ALLOCATION					\$5,482,775	
TOTAL ESTIMATE PROJECT COST					\$20,970,840	
TOTAL					\$21.0	(million rounded)

IMPORTANT NOTES	
1	Excludes GST
2	Costs are current as at Q2, 2014 and excludes escalation
3	Based on SMEC Preliminary concept design report dated November 2013
4	This option excludes Gabion trailing structures and architectural fill that may be required
5	Excludes Land acquisition costs (if applicable)
6	Excludes associated downstream works required

EXTRA OVER TO CONSTRUCT ARCHITECTURAL FILL ON DOWNSTREAM MATTER

ITEM	DESCRIPTION	COSTPLAN QTYS AND COST			COMMENTS	
		QUANTITY	RATE	AMOUNT		
10	Contractor additional DC's					
10.1	Gabion structures	m3	1865	\$300.00	\$559,500	
10.2	Rock fill on front face	m4	7101	\$78.50	\$557,429	
10.3	Earth filling on rear face	m3	4797	\$48.00	\$230,256	
10.4	Additional EV, Topsoil and Landscaping	m2	2000	\$35.00	\$70,000	
10.5	Additional formwork to step base slab	item	1	\$338,400	\$338,400	
Subtotal					\$1,755,585	
Oncosts						
10.6	Contractors Indirects, overhead and profit	%	17.00%	\$1,755,585	\$298,449	
10.7	Additional Client costs	%	12.00%	\$2,054,034	\$246,484	
10.8	Additional Risk allocation	%	35.00%	\$2,300,518	\$805,181	
TOTAL EXTRA OVER FOR ARCHITECTURAL FILL =					\$3,105,699	
TOTAL INCLUDING ARCHITECTURAL FILL					\$24.1	(million rounded)

BROWN HILL KESWICK CREEK STORMWATER PROJECT



BROWN HILL CREEK DAM COST ESTIMATE FOR RCC DAM (OPTION 2) AT SITE No 2

ITEM	DESCRIPTION	COSTPLAN QTY'S AND COST			COMMENTS	
		QUANTITY	RATE	AMOUNT		
CONTRACT WORKS COSTS						
1	Preliminaries and overheads					
1.1	Establishment including contractors onsite overheads	item		\$2,246,425	includes mobilisation, supervision, insurances and fees, site accommodation, preparation of Project management plans etc.	
1.2	Testing	item	1	\$590,400	\$590,400	Including geotechnical, Level one supervision and the supply and installation of dam monitoring equipment
1.3	Environmental controls	item	1	\$323,750	\$323,750	including dust and sediment testing, auditing and associated testing requirements
1.4	Survey Setout and abutting	item	1	\$420,624	\$420,624	
1.5	Traffic and pedestrian management	item	1	\$337,381	\$337,381	Includes signage, temporary diversions traffic management crews, audits etc.
1.6	Temporary and project fencing	m	400	\$25	\$10,000	
1.7	Temporary access tracks and hardstands	item	1	\$224,000	\$224,000	Will require access across and up cheek channel , creek crossing and fencing
	Subtotal Section 1				\$4,152,580	
2	Clearing and Earthworks preparation					
2.1	Clearing and Grubbing	m2	9000	\$1.50	\$13,500	
2.2	Protection of Trees	Item	1	\$8,000	\$8,000	
2.3	Surface stripping to 0.5m deep	m3	4550	\$15.85	\$72,118	Assume not rock, Separate into materials stockpiles onsite. Topsoil and general fill
2.4	Excavation to MW rock	m3	6340	\$38.65	\$245,041	Load and cart to offsite dump, opportunity to reuse as fill, assume 2m cut under dam footprint
2.5	Coffer dam upstream	item	1	\$28,000.00	\$28,000	use clays
2.6	e/o for trench excavation in rock for primary spillway pipe	m3	1700	\$240.00	\$408,000	assumed rock
	Subtotal Section 2				\$774,659	
3	Foundation grouting works					
3.1	Mob and bench preparation for grout curtain	item	1	\$60,000	\$60,000	
3.2	Drill and grout "grout curtain " beneath dam floor	m2	240	\$1,650	\$396,000	assume average 6m deep x 40m wide
	Subtotal Section 3				\$456,000	
4	Drainage structures and culverts					
4.1	RC Inlet structure	item	1	\$48,000	\$48,000	assume 20m3 structure
4.2	RC upstream headwall	item	1	\$9,600	\$9,600	assume 4m3 structure
4.3	RC downstream headwall	item	1	\$24,000	\$24,000	assume 10m3 structure
4.4	Low level outlet pipe, 300 HDPE	m	150	\$450	\$67,500	
4.5	High-level Outlet pipe, 1350 RCP	m	140	\$3,741	\$523,740	Assume 1350 class 4 RCP RRJ in concrete
4.6	Trash screens, grilles and walkways etc., HDG	tonnes	3	\$15,000	\$45,000	
	Subtotal Section 4				\$717,840	
5	Structure					
5.1	Roller Compacted concrete (Form, supply place and cure)	m3	16759	\$332	\$5,569,183	
5.2	Installation of pressure relief drains	item	1	\$48,000	\$48,000	
5.3	FRPS downstream dissipator slab 0.5m thick	m3	2050	\$735	\$1,506,750	assume 0.5m thick, Reo @ 80 KG/m3
	Subtotal Section 5				\$7,123,933	
6	Reinstatement and finishing works					
6.1	Backfill front face of structure	m3	720	\$420	\$302,400	assume RCC
6.2	Provide rock beaching for downstream zone of dissipator slab	m3	1000	\$111	\$111,300	0.6 m deep at toe of concrete dissipator slab
6.12	Road reconstruction works (outside of immediate boundary)	m2	22400	\$40.70	\$911,680	Existing access road substandard, Allow to P+R 50mm x 3.2 KM x 7m wide
6.13	Road widening works, protuberances etc.	m3	2240	\$95	\$212,800	assume 10% of total
6.14	Existing narrow bridge reconstruction to facilitate 2 lanes and shared path	item	1	\$340,000	\$340,000	12m of 4.2'x1 RCBC, may require new single span12m x m wide bridge. Issue with OH wires
6.15	Landscaping	m2	10000	\$11.00	\$110,000	Respread stripped topsoil over slab and hydro seed
6.16	Detailed landscaping, tube stock and advanced trees etc.	item	1	\$25,000	\$25,000	token for this option as pasture
6.17	Landscaping establishment and 2 season maintenance	item	1	\$30,000	\$30,000	
6.19	Fencing to site	m	500	\$25	\$12,500	
6.20	Site clean-up and demobilisation	item	1	\$180,000	\$180,000	
	Subtotal Section 6				\$2,235,680	
	SUBTOTAL 1 - 6				\$15,460,692	
7	Contractors Offsite OH and Margin					
7.1	Offsite OH and Margin	%	10%	\$15,460,692	\$1,546,069	allowance for offsite OH and profit
	TOTAL CONSTRUCTION COSTS				\$17,006,761	
8	CLIENT COSTS					
8.1	Existing services identification and alteration works	%	1%	\$17,006,761	\$85,034	
8.2	Project Planning works	%	3%	\$17,006,761	\$510,203	
8.3	Investigations and design	%	9%	\$17,006,761	\$1,530,608	Including design verification works
8.4	Project and contract management	%	10%	\$17,006,761	\$1,700,676	
8.5	Community engagement and liaison	%	2%	\$17,006,761	\$340,135	
8.6	Land acquisition					EXCLUDED FROM THIS ESTIMATE
	TOTAL CLIENT COSTS				\$4,166,656	
	BASE PROJECT COST				\$21,173,418	
9	RISK AND OPPORTUNITY					
9.1	Inherent Risk	%	15%	\$21,173,418	\$3,176,013	This is the uncertainties in the known or planned scope of the project.
9.2	Contingent Risk	%	20%	\$21,173,418	\$4,234,684	These are risks due to unmeasured items and are conditional, i.e. they may or may not happen. Note ; Contingent Risk does not cover changes to the project objectives
	TOTAL RISK ALLOCATION				\$7,410,696	
	TOTAL ESTIMATE PROJECT COST				\$28,584,114	
	TOTAL				\$28.6	(million rounded)

IMPORTANT NOTES					
1	Excludes GST				
2	Costs are current as at Q2, 2014 and excludes escalation				
3	Based on SMEC Preliminary concept design report dated November 2013				
4	This option excludes Gabion trailing structures and architectural fill that may be required				
5	Excludes Land acquisition costs (if applicable)				
6	Excludes associated downstream works required				