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TO Nichola Keningale  
Queensland Rail

CC

FROM Greg Rogos

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**TOOWOOMBA RANGE RAILWAY REMEDIAL SLOPE STABILISATION ESTIMATE:  
CH 142.63 TO CH 142.81 & CH 144.50 TO CH 144.85KM**

## 1.0 BASIS OF COST ESTIMATE

This memo presents a preliminary Schedule of Quantities for the Toowoomba Range railway slope remediation design and develops a Schedule of Rates to provide a construction cost estimate for the works. The review does not comment on design optimisation, nor does it factor in contingency for site-specific constructability issues.

Equipment selection, site welfare facilities, construction materials and productivity rates used for this cost estimate are based on supplier quotations and recent regional project experience gained for civil earthworks and drainage works associated with slope remediation.

The present cost estimate has been prepared based on manual quantity take-offs from design drawings therefore it should be considered accurate to within  $\pm 20\%$ .

## 2.0 PROJECT SCHEDULE

Estimated project duration from mobilisation to demobilisation is:

- CH 142 – 7 weeks
- CH 144 – 20 weeks

Within this project schedule it is estimated that the period of construction activities which will require track decommissioning is:

- CH 142 – 6 weeks
- CH 144 – 17 weeks

## 3.0 SCHEDULE OF RATES

To develop a preliminary Schedule of Quantities and Schedule of Rates, Golder undertook the following:

- Volume and quantity estimates based on Issued for Tender design drawings, including cross-sections of remedial slope design.
- For the purpose of volume and quantity estimation, the total chainage along the rail embankment requiring remedial slope stabilisation has been set at:
  - CH 142 – 100 metres
  - CH 144 – 300 metres



- An assessment of the activities required to complete the tasks outlined in the Schedule of Quantities.
- Market research and quotations from suppliers for the procurement of critical materials required for remedial works.

Prices submitted by suppliers are summarised in the table below.

Description	Supplier	Unit Rate
Rock Fill <sup>(1)</sup>		(screened 500 – 100mm) \$ 35.50/ tonne <sup>(2)</sup> (shot rock 500 – 40mm) \$ 25.50/ tonne <sup>(3)</sup>
Capping layer (Type 2) <sup>(1)</sup>		\$ 42.50/ tonne
Concrete (32 MPa)		\$260.00/ m <sup>3</sup>
Geotextile (Bidim A44 or equivalent)		\$ 4.00/ m <sup>2</sup>

**Notes:**

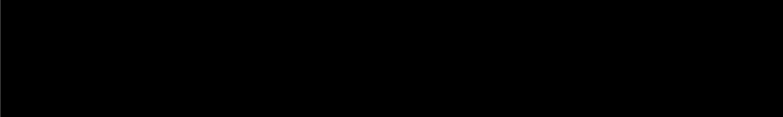
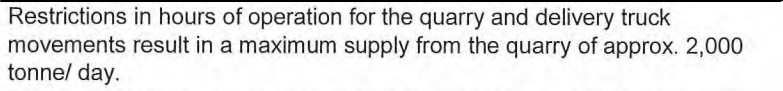
1. Material delivered to Spring Bluff Station laydown yard using truck and trailers (max payload 25 tonne).
2. Meets design specification.
3. Shot rock, no screening. Would require PSD testing to confirm if meets design specification.

#### 4.0 DESCRIPTION OF CONSTRUCTION ACTIVITIES

A brief description of material, equipment, plant, labour and time required for each activity to complete the construction activities outlined in the Schedule of Quantities is provided in the table below.

Item	Description	Activities Description
1	Non-recurring preliminaries - Site mobilisation - Site demobilisation	<ul style="list-style-type: none"> <li>■ Mobilisation to site from local supplier (Toowoomba-based) of the following has been included (Item 1.1): <ul style="list-style-type: none"> <li>■ 5x 40 tonne articulated dump trucks</li> <li>■ 2x excavators – 30 tonne &amp; 45 tonne</li> <li>■ Excavator 25 tonne long reach</li> <li>■ Loader 20 tonne</li> <li>■ Dozer (D6)</li> <li>■ Grader (12H)</li> <li>■ Backhoe</li> <li>■ Compactor 45 tonne</li> <li>■ Roller 15 tonne pad-foot</li> <li>■ Roller 15 tonne smooth</li> <li>■ 5T bobcat or pozi-track</li> <li>■ Articulated water cart</li> <li>■ Service truck</li> </ul> </li> <li>■ Allowance for all items listed in Item 1 – Site Mobilisation has been included for site demobilisation on completion of the project. (Item 1.2)</li> <li>■ Additional items of plant will be required but should not require transport to site i.e., body trucks, water carts, etc.</li> <li>■ Site amenities will be sourced locally and will require transporting to site. The following amenities have been included in our cost estimate and will be required for the duration of the site works: <ul style="list-style-type: none"> <li>■ Site offices</li> </ul> </li> </ul>

Item	Description	Activities Description
		<ul style="list-style-type: none"> <li>■ Crib room</li> <li>■ Toilet block</li> <li>■ Septic tank</li> <li>■ Office</li> <li>■ Generator</li> </ul>
2	Provision of site access and laydown areas	<ul style="list-style-type: none"> <li>■ All-weather access track construction will be required at each site in order for earthworks plant to remove spoil material from the embankment and import rock fill. An estimate of 100 m total length access is required at each site. Allowance has been made for import of road base course material (total approximately 250 mm thickness). Subgrade material is expected to be sourced locally. (Item 2.1)</li> <li>■ Due to the limited capacity to supply of quarry materials to site (maximum 2,000 tonne/ day), a laydown yard/ stockpile area will be required at Spring Bluff Station (and possibly Holmes Station). A significant stockpile of rock fill is required prior to commencement of placement so that supply will not be a limiting factor to the rate of placement. (Item 2.2)</li> </ul>
3	Site preparation	<ul style="list-style-type: none"> <li>■ Due to the steep terrain and unstable slopes, we envisage felling of trees and clearing of vegetation will be required prior to bulk earthworks. (Item 3.1)</li> <li>■ Felled trees will be mulched for later use in reinstatement of temporary access tracks and laydown/ stockpile areas. (Item 3.2)</li> <li>■ Low-height vegetation can be removed during bulk excavation operations.</li> <li>■ Allowance for topsoil stripped down to approx. 300 mm depth using an excavator and dozer. (Item 3.3)</li> <li>■ Topsoil will be carted to designated stockpiles along the rail corridor (short haul less than 500 m).</li> </ul>
4	Excavations	<ul style="list-style-type: none"> <li>■ Volume estimates of slope material to be removed are based on cross-sections areas manually taken off Issued for Tender drawings. (Item 4.1)</li> <li>■ A density of 2.0 tonne/ m<sup>3</sup> has been adopted for in-situ scree and slope material to be excavated.</li> <li>■ Excavation will commence immediately after track infrastructure has been decommissioned and removed and will be occur as a top-down sequence.</li> <li>■ Due to restricted site condition, steep terrain, unstable slope material and single lane traffic flow to spoil stockpile areas we envisage excavation will be a slower process than normal bulk earthwork excavation. To complete the task a maximum excavation rate of 2,500 m<sup>3</sup> (5,000 tonne/ day) has been adopted: <ul style="list-style-type: none"> <li>■ CH 142 – approx. 25 days will be required to excavate 50,000 m<sup>3</sup></li> <li>■ CH 144 – approx. 60 days will be required to excavate 150,000 m<sup>3</sup></li> </ul> </li> <li>■ Material will be carted to designated stockpiles along the rail corridor (short haul less than 1,000 m).</li> <li>■ To form the key trench for the rock fill an allowance for excavation in rock has been made (Item 4.2). If present, rock will be either ripped or broken up using a rock hammer/ excavator.</li> <li>■ No allowance for rock excavation for form batter slopes has been included.</li> </ul>

Item	Description	Activities Description
5	Embankment earthworks - Geotextile - Rock fill	<ul style="list-style-type: none"> <li>■ After completion of excavation works foundation preparation will include installation of drainage and a geotextile layer. It should be noted that this task will be undertaken concurrently with the placement of rock fill. (Item 5.1)</li> <li>■ A density of 1.6 tonne/ m3 has been adopted for placed igneous rock fill material. (Item 5.2):</li> <li>■ Due to restricted site condition, steep terrain, and single lane traffic flow from the rock fill stockpile area (Spring Bluff Station and/or Holmes Station) to the spoil stockpile areas we envisage placement will be a slower process than normal rock fill placement.</li> <li>■ To complete the task a maximum placement rate of 2,000 m<sup>3</sup> (3,200 tonne/ day) has been adopted:                         <ul style="list-style-type: none"> <li>■ CH 142: Haul distance of 3.3 km along the rail corridor, approx. 15 days will be required to place 30,000 m<sup>3</sup></li> <li>■ CH 144: Haul distance of 1.4 km along the rail corridor, approx. 60 days will be required to place 130,000 m<sup>3</sup></li> </ul> </li> <li>■ Final trimming and shaping will occur concurrently with rock fill placement.</li> </ul>
6	Rail foundations	<ul style="list-style-type: none"> <li>■ After completion of rock fill placement, the track foundation will be reconstructed. Foundation preparation will include installation of a geotextile layer overlying the rock fill. (Item 6.1)</li> <li>■ A 1.0 m minimum thickness capping layer will be constructed with QR approved Type 2 material. (Item 6.2)</li> </ul>
7	Drainage	<ul style="list-style-type: none"> <li>■ After completion of excavation works, foundation preparation will include installation of a geotextile layer and drainage pipework. It should be noted that this task will be undertaken concurrently with the placement of rock fill.</li> <li>■ Drainage pipes will be oriented longitudinal to the excavated embankment face and spaced approximately 5 m apart. (Item 7.1)</li> <li>■ Discharge from pipework at the rockfill/ natural slope interface will be directed into prefabricated concrete step-waterways to discharge down-gradient. (Item 7.2)</li> <li>■ Up to four under-rail culverts at each site has been budgeted. These will be precast concrete pipes bedded in stabilised backfill. (Item 7.3 &amp; 7.4)</li> <li>■ It is proposed that discharge from these culverts is directed down-gradient and away from the rock-fill embankment face via HDPE pipework or HDPE open channels. (included in Item 7.3)</li> <li>■ Concrete-lined table drains will be constructed at the interface between the base of rock cutting and the up-slope embankment crest. These table drains will feed into under-rail culverts. (Item 7.5)</li> </ul>
8	Quarry products	<ul style="list-style-type: none"> <li>■ </li> <li>■ </li> <li>■ Restrictions in hours of operation for the quarry and delivery truck movements result in a maximum supply from the quarry of approx. 2,000 tonne/ day.</li> <li>■ Proposed stockpile site is at Spring Bluff Station, located 1.4 km from CH 144 and 3.3 km from CH 142.  If remedial works at both sites were to be undertaken concurrently, a second stockpile site could be located at Holmes Station, located 2.8 km from CH 142 along rail corridor access road.</li> <li>■ The prices provided are considered to be within the range of standard industry.</li> </ul>

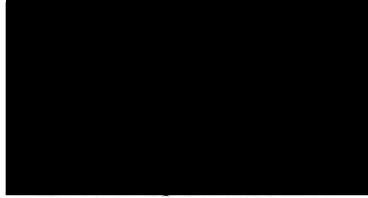
Item	Description	Activities Description
		<ul style="list-style-type: none"> <li>■ Prices were provided per tonne and the following density ratios have been adopted for conversion to tonne/ dollar per cubic metre.               <ul style="list-style-type: none"> <li>■ 1.5 tonne per m<sup>3</sup> of placed rock fill</li> <li>■ 2.0 tonne per m<sup>3</sup> of compacted capping layer</li> </ul> </li> </ul>
9	Quality assurance, inspection and testing	<ul style="list-style-type: none"> <li>■ Nominal testing on rock fill and QR approved Type 2 capping layer to ensure conformance with Technical Specification. (9.1)</li> </ul>
10	Project / site management	<ul style="list-style-type: none"> <li>■ Estimated project duration is 7 weeks (CH 142) and 20 weeks (CH 144) from mobilisation to demobilisation.</li> <li>■ Within this project duration it is estimated that the period of construction activities which will require track decommissioning is 6 weeks (CH 142) and 17 weeks (CH 144).</li> <li>■ The recurring overheads have been calculated based on this timeframe.</li> <li>■ The following non-recurring overheads have been allowed for (Item 10.1):               <ul style="list-style-type: none"> <li>■ Head Office support (incl. insurances &amp; guarantees)</li> <li>■ Planning and preparation of site plans including Safety Management Plan, Traffic Management Plan, Environmental Management Plan, Water Management Plan, etc.</li> <li>■ Project close out documentation including As Built Drawings, etc).</li> </ul> </li> <li>■ The following recurring overheads have been allowed for (Item 10.2):               <ul style="list-style-type: none"> <li>■ General project management and administration support i.e. document development, record keeping, etc.</li> <li>■ Site-based personnel (Engineering, QA, Supervision)</li> <li>■ Site health, safety and environmental management implementation.</li> <li>■ Construction engineering, quality assurance and testing, including management of Inspection and Test Reports during construction.</li> <li>■ Allowance for pre-construction survey, set out for construction activities and ongoing survey on a weekly basis has been included.</li> <li>■ Amenities hire and up keep.</li> <li>■ Site vehicles (4WDs and general transportation).</li> <li>■ Wet weather mitigation measures (incl. dewatering).</li> </ul> </li> </ul>

## 5.0 EXCLUSIONS

The following activities and/or associated costs have not been included in the cost calculations:

- Track and sleeper removal, ballast stockpiling, track and sleeper replacement and tamping.
- Management of track possession by others.
- No allowance for nightshift setup and penalty rates.
- No allowance for wet weather delays and standby costs.
- No allowance for multiple mobilisations to site of selected equipment has been included
- No allowance for compensation associated with works on privately-owned land outside rail easement.
- No allowance for accommodation and travel allowances, assume local (Toowoomba-based) contractor.
- Cost estimate does not include third party project management fees and third party quality assurance.

- Cost estimate does not include any contingency and is based on direct experience in carrying out similar type of works.



Principal Project Manager



Attachments: A1 - Schedule of Quantities - CH 142.63 to CH 142.81 KM  
A2 - Schedule of Quantities - CH 144.50 to CH 144.85 KM



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**Attachment A1 - Schedule of Quantities - CH 142.63 to CH 142.81 KM**

Toowoomba Range Railway: Schedule of Quantities - CH 142.63 to CH 142.81 KM					
Item	Description	Unit	Quantity	Unit Rate (\$)	Amount (\$)
<b>1</b>	<b>Non-recurring preliminaries / demob.</b>				
1.1	Contractor's establishment on-site (welfare facilities, equip mobilisation)	L.S.	1	\$ 30,000.00	\$30,000
1.2	Demobilisation and site clean-up	L.S.	1	\$ 15,000.00	\$15,000
<b>2</b>	<b>Site access and laydown area</b>				
2.1	Access track repair and maintenance, slope access ramps	L.S.	1	\$ 10,000.00	\$10,000
2.2	Laydown area establishment	L.S.	1	\$ 5,000.00	\$5,000
<b>3</b>	<b>Site preparation</b>				
3.1	Clearing and grubbing	m2	4,000	\$ 10.00	\$40,000
3.2	Vegetation mulching	L.S.	1	\$ 10,000.00	\$10,000
3.3	Stripping and stockpiling topsoil	m2	4,000	\$ 5.00	\$20,000
<b>4</b>	<b>Excavations</b>				
4.1	Bulk earthworks (rippable)	m3	50,000	\$ 12.00	\$600,000
4.2	Bulk earthworks (non rippable) PC allowance	m3	200	\$ 50.00	\$10,000
<b>5</b>	<b>Embankment earthworks</b>				
5.1	Supply and install geotextile (Bidim A34 or equivalent) over in-situ foundation	m2	6,500	\$ 6.00	\$39,000
5.2	Haul, place and compact rock fill	m3	30,000	\$ 20.00	\$600,000
<b>6</b>	<b>Rail foundation</b>				
6.1	Supply and install geotextile (Bidim A34 or equivalent) beneath capping layer	m2	1,200	\$ 6.00	\$7,200
6.2	Haul and place Type 2 capping layer	m3	1,000	\$ 20.00	\$20,000
<b>7</b>	<b>Drainage</b>				
7.1	Supply and install DN 150 Agridrain, 20mm gravel and geotextile blanket	m	1,000	\$ 20.00	\$20,000
7.2	Concrete lined drop structures (connecting 150mm dia Agridrain)	m	100	\$ 200.00	\$20,000
7.3	Under rail culverts 450mm dia (at CH 142.63, 142.68 & 142.75)	m	50	\$ 1,000.00	\$50,000
7.4	Under rail culvert headwalls for 450mm dia (at CH 142.63, 142.68 & 142.75)	ea	6	\$ 2,500.00	\$15,000
7.5	Concrete lined table drains	m	50	\$ 200.00	\$10,000
<b>8</b>	<b>Quarry products</b>				
8.1	Rock fill (supplied to laydown yard at Spring Bluff rail station)	tonne	50,000	\$ 30.00	\$1,500,000
8.2	Capping layer (type 2)	tonne	2,000	\$ 40.00	\$80,000
<b>9</b>	<b>Quality Assurance, Inspection and Testing</b>				
9.1	Quality assurance, inspection and testing	L.S.	1	\$ 20,000.00	\$20,000
<b>10</b>	<b>Project / site management</b>				
10.1	Non recurring	L.S.	1	\$ 60,000.00	\$60,000
10.2	Recurring	wk	8	\$ 40,000.00	\$320,000
					\$3,501,200
				GST	\$350,120
				<b>TOTAL</b>	<b>\$3,851,320.00</b>



**Attachment A2 - Schedule of Quantities - CH 144.50 to CH 144.85 KM**

Toowoomba Range Railway: Schedule of Quantities - CH 144.50 to CH 144.85 KM					
Item	Description	Unit	Quantity	Unit Rate (\$)	Amount (\$)
<b>1</b>	<b>Non-recurring preliminaries / demob.</b>				
1.1	Contractor's establishment on-site (welfare facilities, equip mobilisation)	L.S.	1	\$ 50,000.00	\$50,000
1.2	Demobilisation and site clean-up	L.S.	1	\$ 30,000.00	\$30,000
<b>2</b>	<b>Site access and laydown area</b>				
2.1	Access track repair and maintenance, slope access ramps	L.S.	1	\$ 20,000.00	\$20,000
2.2	Laydown area establishment	L.S.	1	\$ 5,000.00	\$5,000
<b>3</b>	<b>Site preparation</b>				
3.1	Clearing and grubbing	m2	12,000	\$ 10.00	\$120,000
3.2	Vegetation mulching	L.S.	1	\$ 20,000.00	\$20,000
3.3	Stripping and stockpiling topsoil	m2	12,000	\$ 5.00	\$60,000
<b>4</b>	<b>Excavations</b>				
4.1	Bulk earthworks (rippable)	m3	150,000	\$ 12.00	\$1,800,000
4.2	Bulk earthworks (non rippable) PC allowance	m3	500	\$ 50.00	\$25,000
<b>5</b>	<b>Embankment earthworks</b>				
5.1	Supply and install geotextile (Bidim A34 or equivalent) over in-situ foundation	m2	15,000	\$ 6.00	\$90,000
5.2	Haul, place and compact rock fill	m3	130,000	\$ 20.00	\$2,600,000
<b>6</b>	<b>Rail foundation</b>				
6.1	Supply and install geotextile (Bidim A34 or equivalent) beneath capping layer	m2	3,600	\$ 6.00	\$21,600
6.2	Haul and place Type 2 capping layer	m3	3,000	\$ 20.00	\$60,000
<b>7</b>	<b>Drainage</b>				
7.1	Supply and install DN 150 Agridrain, 20mm gravel and geotextile blanket	m	3,000	\$ 20.00	\$60,000
7.2	Concrete lined drop structures (connecting 150mm dia Agridrain)	m	100	\$ 200.00	\$20,000
7.3	Under rail culverts 600mm dia (at CH 144.56, 144.62, 144.73, 144.92)	m	80	\$ 1,500.00	\$120,000
7.4	Under rail culvert headwalls for 600mm dia (at CH 144.56, 144.62, 144.73, 144.92)	ea	8	\$ 2,500.00	\$20,000
7.5	Concrete lined table drains	m	300	\$ 200.00	\$60,000
<b>8</b>	<b>Quarry products</b>				
8.1	Rock fill (supplied to laydown yard at Spring Bluff rail station)	tonne	210,000	\$ 30.00	\$6,300,000
8.2	Capping layer (type 2)	tonne	6,000	\$ 40.00	\$240,000
<b>9</b>	<b>Quality Assurance, Inspection and Testing</b>				
9.1	Quality assurance, inspection and testing	L.S.	1	\$ 40,000.00	\$40,000
<b>10</b>	<b>Project / site management</b>				
10.1	Non recurring	L.S.	1	\$ 60,000.00	\$60,000
10.2	Recurring	wk	16	\$ 40,000.00	\$640,000
					\$12,461,600
					GST \$1,246,160
					<b>TOTAL \$13,707,760.00</b>



