

Tinwald Corridor Improvements

Construction

Expected construction 2022-2024
 Intersection improvements including shared paths, road and rail crossings

	Units	Emissions Factor Unit	Sources and notes
Do Intervention			
Material Quantities Estimate			
Construction Fuel Use			
Diesel	17,084 L	0.0027 tCO2e/L	MfE 2020
Construction Materials			
Concrete	131 tonnes	0.11 tCO2e/tonne	AECOM derived factor (See assumptions below)
Steel	20 tonnes	2.85 tCO2e/tonne	MfE 2020
Road Surface			
Crushed rock or recycled material	- tonnes	0.0032 tCO2e/tonne	IS Calculator NZ v2.0
Gravel	54,948 tonnes	0.0182 tCO2e/tonne	IS Calculator NZ v2.0
Bitumen	- tonnes	0.3966 tCO2e/tonne	IS Calculator NZ v2.0
Asphalt	6,362 tonnes	0.0542 tCO2e/tonne	IS Calculator NZ v2.0
Project Breakdown Total	1,461 tonnes of CO2e		
Calculated Emissions			
Best estimate of calculated emissions	1,461 tonnes of CO2e		

Assumptions

Emissions for construction have been calculated from data provided by Waka Kotahi for this project. When possible assumptions have been made in a consistent manner to ensure comparability. Refer to construction schedule worksheet for indicative schedule of quantities of concrete, steel, aggregates, gravels and fuels used during construction. Based on previous research for Waka Kotahi, only emissions from the largest emission sources from construction of infrastructure projects have been estimated (concrete, steel, aggregates, asphalt, materials and works related to bridge abutments have been included where relevant). Fuel used in the construction is assumed to be 2 litres of diesel for every m3 of earth works (AECOM derived fuel-use ratio). The following were not included in the estimate: fuel used in quarrying activity; emissions from the transportation of construction materials to/from site.

Emission factors are sourced from MfE's 2020 Guide (see link below) where appropriate, or from the ISCA-IS Calculator v2.0. <https://environment.govt.nz/publications/measuring-emissions-detailed-guide-2020/>
 The ISCA-IS Calculator v2.0 is available for ISCA members at <https://www.isca.org.au/Tools-and-Resources>
 The emission factor for concrete is based on MfE 2020 and ISCA guidance and is based on a standard concrete mix.

Tinwald Corridor Improvements Construction Schedule

Source: Detailed Business Case Estimate, contained in Tinwald Corridor Improvements SSBC, GHD, 23 June 2021

Contract No. 3613 Schedule of Prices					Material Unit	Material Unit	Material Unit	Material Unit	Material Unit	Assumptions/ Notes
Code	Description	Unit	Quantity	Concrete	Steel	Asphalt	Aggregates	Fuel		
1 Preliminary and General										N/A
1.1	Preliminary and General	Preliminary and	1							N/A
2 Traffic Management and Temporary Works										N/A
2.1	Preparation of Temporary Traffic Management plans	Traffic Manager	1							N/A
2.2	Implementation of Temporary Traffic Management plans	Traffic Manager	1							N/A
2.3	Supply and install New intersection layout signs	Traffic Manager	1							N/A
2.4	Supply and install construction information signs	Traffic Manager	1							N/A
3 Site clearing										N/A
3.1	General Site Clearance	Earthworks	1							N/A
3.2	Removal and disposal of existing fence	Earthworks	10							Excluded as likely to immaterial based on previous research for Waka Kotahi.
3.3	Removal of existing pedestrian refuge (including kerb)	Earthworks	4							Excluded as likely to immaterial based on previous research for Waka Kotahi.
3.4	Removal of existing signs	Earthworks	1							Excluded as likely to immaterial based on previous research for Waka Kotahi.
3.5	Removal of existing kerb and channel	Earthworks	550							Excluded as likely to immaterial based on previous research for Waka Kotahi.
3.6	Removal of existing concrete (footpath and vehicle crossings)	Earthworks	240					240 l		Assume 0.5m depth and 2l/m3 earthworks moved
3.7	Strip and remove existing bituminous surface (footpath and carriageway) (Nominal 50mm depth)	Earthworks	7290					7290 l		Assume 0.5m depth and 2l/m3 earthworks moved
4 Service Relocation/Protection										N/A
4.1	Service trenching	Service Relocati	60							Assume 0.5m depth and 0.5m width at l/m3 earth moved
4.2	Service potholing and protection	Service Relocati	1					30 l		N/A
4.3	Relocation of survey marks	Service Relocati	1							N/A
4.4	Service lid height adjustment	Service Relocati	5							N/A
4.5	NZTA cost of all local authority and utility companies (after cost share) and contractors on costs	Service Relocati	1							N/A
4.6	Temporary works associated with utility services	Service Relocati	1							N/A
4.7	Relocate powerpole	Service Relocati	2							N/A
5 Earthworks										N/A
5.1	Remove Topsoil from Earthworks Areas and Stockpile (200mm nominal depth)	Earthworks	322							N/A
5.2	Cut to waste - Signalised intersection and approaches	Earthworks	2580					844 l		2l/m3
5.3	Cut to waste - Viaduct	Earthworks	20					5160 l		2l/m3
5.4	Cut to waste - McMurdo/Graham	Earthworks	300					40 l		2l/m3
5.5	Cut to waste - McMurdo/Agnes	Earthworks	470					600 l		2l/m3
5.6	Cut to stockpile - Contaminated material (Provisional Item)	Earthworks	220					940 l		2l/m3
5.7	Disposal - Contaminated material (Provisional Item)	Earthworks	220					440 l		2l/m3
5.8	Filling of contaminated material with AP65 material (Provisional Item)	Earthworks	220					440 l		2l/m3
5.9	Undercut unsuitable material (Provisional Item)	Earthworks	50					100 l		2l/m3
5.1	Filling of unsuitable foundations with 300mm AP65 material (Provisional Item)	Earthworks	50					100 l		2l/m3
5.11	Screen topsoil and spread from stockpile to batters, shoulders, landscape areas and drainage areas (200 mm nominal depth)	Landscaping	260							2l/m3
5.12	Import screened topsoil and spread to batters, shoulders, landscape areas and drainage areas (200 mm nominal depth) (Provisional Quantity)	Landscaping	50					520 l		2l/m3
5.13	Hydroseed grass to berms	Landscaping	1300					100 l		2l/m3 N/A
6 Drainage										N/A
6.1	New kerb and flat channel (to detail CCC SD 601), including 430 mm compacted depth of CCC AP65/Pitrun sub-basecourse below and 300 mm behind face of kerb (to detail CCC SD 625)	Drainage	470	47 t	0.8836 t					Calculation provided by AECOM quantity surveyor 19/07/21
6.2	New kerb and flat channel - hand-boxed and poured (to detail CCC SD 601), including 430 mm compacted depth of CCC AP65/Pitrun sub-basecourse below and 300 mm behind face of kerb (to detail CCC SD 625)	Drainage	30	3 t	0.05664 t					Calculation provided by AECOM quantity surveyor 19/07/21
6.3	Extend 450mm RCP culvert on the south side of Lagmhor Road (10m)	Drainage	1	1.125 t						Assumed 0.45m width and 0.1m depth. Concrete at 2.5l/m3
	and install new w-beam barrier (15 metres) and reconstruct wingwalls		1							11.3kg/m (https://www.cspacific.co.nz/)
6.4	Extend 450mm RCP culvert on the north side of Lagmhor Road (3m)	Drainage	1	0.3375 t						Assumed 0.45m width and 0.1m depth. Concrete at 2.5l/m4
	and construct w-beam barrier (15 metres) and reconstruct wingwalls		1							11.3kg/m (https://www.cspacific.co.nz/)
6.5	Supply and Install single sump	Drainage	2	1.02 t	0.18 t					Calculation provided by AECOM quantity surveyor 19/07/21
6.6	Supply and install 300 mm diameter stormwater culvert/pipe	Drainage	1	1.9 t	0.38 t					Calculation provided by AECOM quantity surveyor 19/07/21
6.7	Shape pipe outlet and scour protection	Drainage	2							N/A
6.8	Relocate existing swale	Drainage	20							N/A
7 Pavement and Surfacing										N/A
7.1	Saw Cut Existing Pavement	Pavement and Surfacing	190							N/A
7.2	Trim, compact and maintain subgrade surface - Signalised intersection and approaches	Pavement and Surfacing	5260							N/A
7.3	Trim, compact and maintain subgrade surface - McMurdo/Graham	Pavement and Surfacing	550							N/A
7.4	Trim, compact and maintain subgrade surface - McMurdo/Agnes	Pavement and Surfacing	920							N/A
7.5	Supply and Place 50 mm NZTA M/10 SMA 10 Wearing Course - Signalised intersection and approaches	Pavement and Surfacing	5260				394.5 t			1.5l/m3
7.6	Supply and Place 50 mm NZTA M/10 SMA 10 Wearing Course - McMurdo/Graham	Pavement and Surfacing	550				41.25 t			1.5l/m3
7.7	Supply and Place 50 mm NZTA M/10 SMA 10 Wearing Course - McMurdo/Agnes	Pavement and Surfacing	920				69 t			1.5l/m3
7.8	Supply and Place 40 mm NZTA M/10 AC10 Wearing Course	Pavement and Surfacing	560				33.6 t			1.5l/m3
7.9	Supply and Place NZTA M/10 AC20 Asphalt layer (90 mm) - Signalised intersection and approaches	Pavement and Surfacing	5260				710.1 t			1.5l/m3
7.1	Supply and Place NZTA M/10 AC14HF High Fatigue Asphalt layer (50 mm) - Signalised intersection and approaches	Pavement and Surfacing	5260				394.5 t			1.5l/m3
7.11	Supply and place AP65 subbase (260 mm) stabilised to 200 mm depth with 4% cement - Signalised intersection and SH1 approaches	Pavement and Surfacing	2690				807 t			1.5l/m3
7.12	Supply and place AP65 subbase (260 mm) - Signalised intersection approaches (Lagmhor Road and Agnes Street Approaches)	Pavement and Surfacing	2570				1002.3 t			1.5l/m3
7.13	Supply and place TNZ M/4 AP40 basecourse (150 mm) McMurdo/Graham	Pavement and Surfacing	550				123.75 t			1.5l/m3
7.14	Supply and place TNZ M/4 AP40 basecourse (150 mm) - McMurdo/Agnes	Pavement and Surfacing	920				207 t			1.5l/m3
7.15	Supply and install road pavers including subbase and basecourse to CCC SD633	Pavement and Surfacing	140	52.5 t						Assuming 0.15m depth at 2.5l/m3
7.16	150mm x 250mm concrete separating strip with 2 D12 bars (to CCC detail 634)	Pavement and Surfacing	60	0.5625 t						2.5l/m3
7.17	Temporary pavement repair works at Compton Crossing - Strip bituminous surface, Supply and Place Two Coat Grade 3/5 chipseal,	Pavement and Surfacing	900							Assuming 0.1m deep and 1.5l/m3
	TNZ M/4 AP40 basecourse (150 mm),		900				135 t			1.5l/m3
	AP65 subbase (260 mm)		900				202.5 t			1.5l/m3
7.18	Temporary pavement repair works at Grahams/SH1 - Strip bituminous surface, Supply and Place 40 mm NZTA M/10 AC14 Wearing Course	Pavement and Surfacing	900				351 t			1.5l/m3
	TNZ M/4 AP40 basecourse (150 mm),		900				54 t			1.5l/m3
	AP65 subbase (260 mm)		900				202.5 t			1.5l/m3
			900				351 t			1.5l/m3



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Contract No. 3613 Schedule of Prices				Material Unit	Material Unit	Material Unit	Material Unit	Material Unit	Assumptions/ Notes
Code	Description	Unit	Quantity	Concrete t or m3	Steel t or m3	Asphalt t or m3	Aggregates t or m3	Fuel l or kg	
7.19	Cut to waste - temporary pavement repair works	Pavement and Surfacing	m3	740		1110 t			1.5t/m3
8	Traffic Services								
8.1	NZTA M/4 AP40 basecourse under islands	Pavement and Surfacing	m3	20		30 t			Assuming 0.1m deep and 1.5t/m3 Likely to be immaterial based on previous research for Waka Kotahi
8.2	Mountable median kerb	Traffic Services	m	130					Likely to be immaterial based on previous research for Waka Kotahi
8.3	Construct median island nose	Traffic Services	ea	8					
8.4	Median Island Infill (Trim and Compact, supply and lay 50 mm	Traffic Services	m2	50		3.75 t			1.5t/m3
	supply and construct 100 mm depth 20 MPa concrete with "Autumn Tone" or similar coloured stretcher bond pattern pressed in. Sawcuts in concrete to be maximum 3m spacing.		m2	50	12.5				Concrete at 2.5t/m3
8.5	Hazard pedestrian tactile pavers (including islands and footpath areas)	Traffic Services	ea	170	5.7375				Size 300mm x 300mm x 150mm. Concrete at 2.5t/m3
8.6	Hazard cyclist tactile pavers (including islands and footpath areas)	Traffic Services	ea	63	2.12625				Size 300mm x 300mm x 150mm. Concrete at 2.5t/m4
8.7	Directional tactile pavers (including islands and footpath areas)	Traffic Services	ea	98	3.3075				Size 300mm x 300mm x 150mm. Concrete at 2.5t/m5
8.8	Cycle/Pedestrian hold rails (including Islands)	Traffic Services	ea	8					Likely to be immaterial based on previous research for Waka Kotahi
8.9	Remove line marking - Yellow limit line	Traffic Services	m	25					N/A
8.1	Remove line marking - Yellow no passing	Traffic Services	m	210					N/A
8.11	Remove line marking - Yellow no parking lines	Traffic Services	m	20					N/A
8.12	Remove line marking - 100mm white lines	Traffic Services	m	6140					N/A
8.13	Remove line marking - 100mm continuity lines	Traffic Services	m	470					N/A
8.14	Remove line marking - Pedestrian crossing diamond	Traffic Services	ea	1					N/A
8.15	Remove line marking - Pedestrian crossing lines (300mm)	Traffic Services	m	33					N/A
8.16	Remove line marking - White limit line	Traffic Services	m	6					N/A
8.17	Remove line marking - Arrows	Traffic Services	ea	3					N/A
8.18	Remove line marking - Diagonal bars - 600mm wide	Traffic Services	m	470					N/A
8.19	Remove line marking - Cycle symbols	Traffic Services	ea	43					N/A
8.2	Remove line marking - Give way triangle	Traffic Services	ea	1					N/A
8.21	Supply and install 100 mm white lines	Traffic Services	m	6160					N/A
8.22	Supply and install continuity lines	Traffic Services	m	1046					N/A
8.23	Supply and install yellow no passing line	Traffic Services	m	571					N/A
8.24	Supply and install yellow no parking lines	Traffic Services	m	785					N/A
8.25	Supply and install yellow no stopping hatch	Traffic Services	m2	140					N/A
8.26	Supply and install 600 mm white (Diagonal bars angle 2:1)	Traffic Services	m	930					N/A
8.27	Supply and install Give Way limit line - 300 mm wide white continuous.	Traffic Services	m	80					N/A
8.28	Supply and install Stop limit line - 300 mm wide yellow continuous.	Traffic Services	m	24					N/A
8.29	Supply and install Give Way triangle - white.	Traffic Services	ea	1					N/A
8.3	Supply and apply green epoxy or polyurethane based surfacing (with approved aggregates to attain specified skid resistance).	Traffic Services	m2	910					N/A
8.31	Supply and install white Pedestrian/Cycle symbol to road/path	Traffic Services	LS	1					N/A
8.32	Supply and install RRPM's - White	Traffic Services	LS	1					N/A
8.33	Supply and install Kerb Top Markers - Red mono directional	Traffic Services	ea	30					N/A
8.34	Supply and install Kerb Top Markers - Yellow mono directional	Traffic Services	ea	15					N/A
8.35	Supply and install RG-26 - Cycle / path sign with supplementary 'Begins' / 'ends'	Traffic Services	ea	8					N/A
8.36	Supply and install directional signage	Traffic Services	ea	3					N/A
8.36	Rail 'clear crossing' VMS sign	Traffic Services	ea	1					N/A
9	Traffic signals								
9.1	Site establishment, disestablishment and keeping the site clean and tidy for the duration of the contract.	Traffic Services	LS	1					N/A
9.2	Potholing for services prior to the installation of the Pole sockets and foundations to confirm positions - including scala data	Traffic Services	ea	10					N/A
9.3	Supply and install Type 1 poles, including supply and install traffic signal pole socket and foundation	Traffic Services	ea	7					N/A
9.4	Supply and install Type 2 combined CCTV and Traffic Signal pole, including supply and install traffic signal pole socket and foundation	Traffic Services	ea	1					N/A
9.5	Supply and install Type 7 Joint Use Mast Arm (JUMA) and foundation	Traffic Services	ea	2					N/A
9.6	Supply and install 3-100mm diameter PVC ducts (including trenching and backfilling)	Traffic Services	m	60					N/A
9.7	Supply and install 100mm duct between each pole and the nearest Access Chamber	Traffic Services	m	50					N/A
9.8	Supply and install 50mm duct from each KJB to the nearest Access Chamber	Traffic Services	m	10					N/A
9.9	Supply and install - 600mm diameter chambers with round lightweight cast iron lids.	Traffic Services	ea	4					N/A
9.1	Supply and install multicore cabling	Traffic Services	m	250					N/A
9.11	Supply and install loopfeeder cable from the controller cabinet	Traffic Services	m	240					N/A
9.12	Supply and install in clearway junction boxes and access.	Traffic Services	ea	6					N/A
9.13	Supply and install a controller base	Traffic Services	ea	1					N/A
9.14	Supply, install and terminate a power cable into the controller cabinet including a Demarcation Pillar.	Traffic Services	ea	1					N/A
9.15	Labeling of all cables.	Traffic Services	LS	1					N/A
9.16	Supply and install pole top termination assemblies (including upper and lower mounting hardware).	Traffic Services	ea	4					N/A
9.17	Supply and install mast pole termination boxes complete with terminals.	Traffic Services	ea	4					N/A
9.18	Supply and install traffic signal controller complete with cabinet, load rack, fittings etc	Traffic Services	ea	1					N/A
9.19	Supply and install personality card and bench test prior to installation	Traffic Services	ea	1					N/A
9.2	Supply and install two aspect LED pedestrian lanterns complete with	Traffic Services	ea	4					N/A
9.21	Supply and install three aspect LED cycle lanterns complete with	Traffic Services	ea	4					N/A
9.22	Supply and install 200mm three aspect LED lanterns complete with	Traffic Services	ea	4					N/A
9.23	Supply and install 200mm six aspect LED lanterns complete with	Traffic Services	ea	2					N/A
9.24	Supply and install 300mm three aspect LED lanterns complete with	Traffic Services	ea	2					N/A
9.25	Supply and install 300mm six aspect LED lanterns complete with	Traffic Services	ea	4					N/A
9.26	Supply and install a CCTV communication cable	Traffic Services	ea	1					N/A
9.27	Supply and installation of an approved CCTV camera	Traffic Services	ea	1					N/A
9.28	Allowance for managing the nominated subcontractor	Traffic Services	LS	1					N/A
9.29	Supply and install pedestrian/cycle push button and call accept	Traffic Services	ea	4					N/A
9.3	Supply and install SCATS detector loops including terminations at the	Traffic Services	ea	10					N/A
9.31	Supply and install pedestrian detector cameras on poles.	Traffic Services	ea	4					N/A
9.32	Painting of all poles.	Traffic Services	ea	10					N/A
9.33	Commissioning and hand testing including maintenance of complete	Traffic Services	LS	1					N/A
9.34	Arrange and pay for all permits necessary for the completion of the	Traffic Services	LS	1					N/A
10	Landscaping & Urban design								
10.1	New footpath construction, including battens and asphaltic concrete	Landscaping	m2	925		138.75 t			Assume 0.1m depth. 1.5t/m3 Likely to be immaterial based on previous research for Waka Kotahi
10.2	Vehicle cutdowns (extra over item for kerb and channel)	Traffic Services	m	10					Likely to be immaterial based on previous research for Waka Kotahi
10.3	Pedestrian cut down (extra over item for kerb and channel)	Traffic Services	m	40					Likely to be immaterial based on previous research for Waka Kotahi
10.4	Cycle ramp (extra over item for kerb and channel)	Traffic Services	m	150					Likely to be immaterial based on previous research for Waka Kotahi
10.5	Supply and install new post and rail fencing (1.2m)	Landscaping	m	198					Estimate provided by AECOM quantity surveyor 19/07/21

PROACTIVELY RELEASED BY WAKA MINISTRY OF TRANSPORT

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Contract No. 3613					Material		Material		Material		Material		Material		Assumptions/ Notes
Schedule of Prices					Concrete	Unit	Steel	Unit	Asphalt	Unit	Aggregates	Unit	Fuel	Unit	
Code	Description		Unit	Quantity	t or m3	t or m3	t or m3	t or m3	t or m3	t or m3	t or m3	t or m3	t or m3	t or m3	
10.6	Supply and install gate	Landscaping	ea	1											Likely to be immaterial based on previous research for Waka Kotahi
10.7	Urban design to head walls and subway	Landscaping	LS	1											N/A
10	Street lighting														
10.2	Supply and install street lighting including luminaires and	Traffic Services	ea	4		3 t									Estimate provided by AECOM quantity surveyor 19/07/21
11	Extraordinary Construction Costs														
11.1	Energy site property works - on site signage, minor landscaping changes, relocation of access, increase hard stand area at the rear of the site, new workshop doors, and off-forecourt pump relocation	Extraordinary Construction Costs	LS	1											Calculation
11.2	Alluvial Restaurant, Tinwald Motel, Tinwald Tavern, Liquorland property works	Extraordinary Construction Costs	LS	1											N/A
12	Rail crossing upgrade														
12.1	Controlled level crossing automatic gates (one)	Traffic Services	LS	1											N/A
12.2	KiwiRail new FLBs and barrier arms (widening of Lagmhor Road)	Traffic Services	LS	1											N/A
12.3	KiwiRail VeloSTRAIL across Lagmhor Road	Traffic Services	LS	1											N/A
12.4	KiwiRail signalling to relocate train detection sensors	Traffic Services	LS	1											N/A
12.5	KiwiRail professional services (design)	Traffic Services	LS	1											N/A
Total					131 t	20 t	6,362 t	- t	17,084 t						

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