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Transport

Volume 2 Chapter 13

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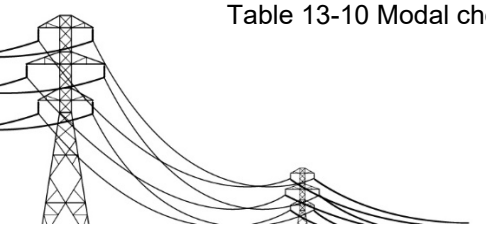

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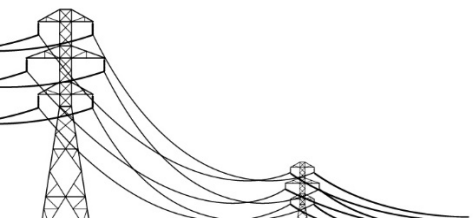


13. Transport

13.1 Introduction

13.1.1 Project overview

The Project involves the construction and operation of approximately 1,060 km of extra high voltage overhead electricity transmission line that will extend from Mount Isa to the Powerlink transmission network, via a new connection point near Woodstock, south of Townsville.

The Project involves construction of seven new substations at Woodstock, Flinders (Hughenden), Dajarra Road (Cloncurry), Mount Isa, Selwyn, Cannington Mine and Phosphate Hill Mine.

The CopperString transmission network is divided into the following eight sections as shown in Figure 13-1.

1. Woodstock Substation
2. Renewable Energy Hub
3. CopperString Core
4. Mount Isa Augmentation
5. Southern Connection
6. Cannington Connection
7. Phosphate Hill Connection
8. Kennedy Connection (option).

13.1.2 Objectives

The objective of this chapter is to address the transport and infrastructure requirements associated with the construction and operation of the Project. During construction and operation, the Project aims to meet the following key objectives.

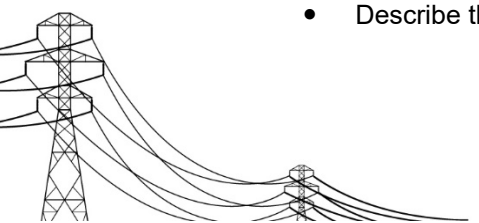
- Maintenance of the safety and efficiency of all affected transport modes for the Project workforce and other transport system users
- Avoidance and/or mitigation of impacts to the condition and operation of existing and planned transport infrastructure
- Impact mitigation works are compatible with transport infrastructure planning.

13.1.3 Purpose of chapter

This chapter provides an overview of the existing environment, methodology for assessing impacts, and relates directly to Sections 12.60 through 12.67 of the Terms of Reference (ToR) relevant to transport. A table cross referencing the ToR is provided in Volume 3 Appendix A Terms of reference and cross-reference table.

The scope of this chapter is defined by the following:

- Describe the existing transport network (Section 13.3)
- Describe the transport tasks (Section 13.4)
- Describe the potential impacts (Section 13.5)

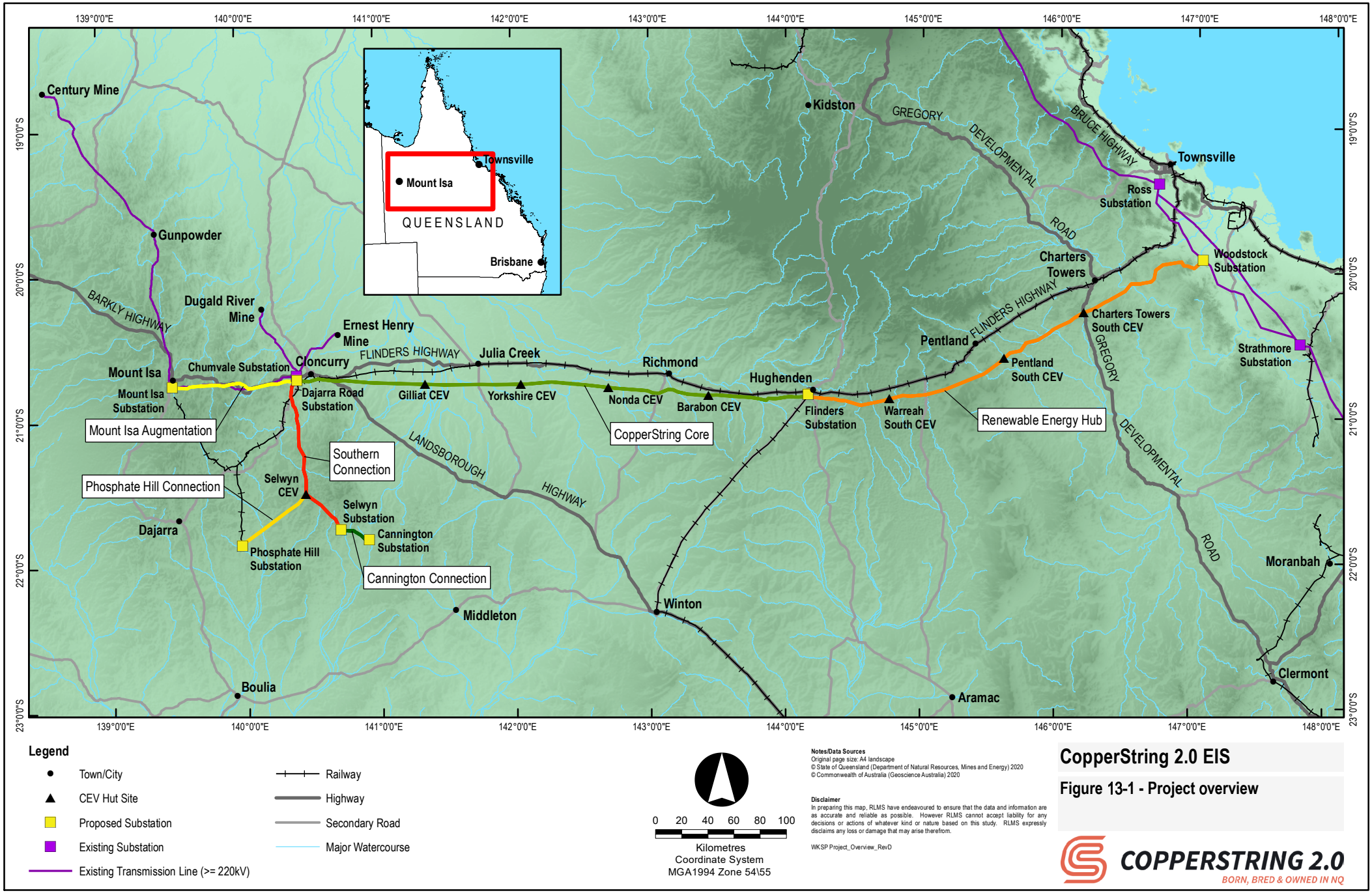


- Propose measures to mitigate (Section 13.5.4)

13.1.4 Defined terms

The following are a list of defined terms utilised throughout this chapter:

- **'Corridor selection'**: The baseline investigation corridor of the transmission line (a nominal 1,060 km long corridor). The corridor selection is 120 m wide from Woodstock to Dajarra Road, and 60 m wide from Dajarra Road to Mount Isa, Dajarra Road to Selwyn, and Selwyn to Phosphate Hill and Cannington. The 4 km long section of the corridor selection from Dajarra Road Substation to Chumvale Substation is 60 m wide and a 3 km long section from Dajarra Road Substation to the Dugald River 220 kV overhead line is 80 m wide.
- **'Study area'**: As defined by individual technical studies in the methodology section or by default the 5 km wide study corridor defined in the Initial Advice Statement and referred to in the Environmental Impact Statement (EIS) ToR.
- **'Project area**: The 120 m, 80 m or 60 m wide easement and associated infrastructure (including laydown areas, substations, CEV huts, access tracks, brake and winch sites and construction camps) and works referred to in the EIS ToR (these include off-easement components).



Legend

- Town/City
- CEV Hut Site
- Proposed Substation
- Existing Substation
- Existing Transmission Line (>= 220kV)
- Railway
- Highway
- Secondary Road
- Major Watercourse

0 20 40 60 80 100

Kilometres

Coordinate System
MGA1994 Zone 54\55

Notes/Data Sources
Original page size: A4 landscape
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Disclaimer
In preparing this map, RLMS have endeavoured to ensure that the data and information are as accurate and reliable as possible. However RLMS cannot accept liability for any decisions or actions of whatever kind or nature based on this study. RLMS expressly disclaims any loss or damage that may arise therefrom.

WKSP Project_Overview_RevD

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Figure 13-1 - Project overview

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13.2 Methodology

13.2.1 Study area

The study area includes all the major State Controlled Roads (SCRs) Local Government Roads (LGR) and Private Roads (PR) that may be required to access the corridor selection. This includes all intersections and rail crossing. Additionally, air and sea networks that may be utilised for the transportation of materials, equipment and workforce are included in the assessment.

13.2.2 Data sources

The following data were used as part of this chapter:

- Volume 3 Appendix X Transport Impact Assessment
- Department of Transport and Roads (Average Annual Daily Traffic Report)
- RLMS, 2010. CopperString Draft Environmental Impact Statement, Volume 2 Chapter 11 – Transport.
- AMSTEC (2011). CopperString 1.0 EIS, Volume 3 Appendix 19 Technical Report Traffic. Report prepared for CopperString

13.2.3 Assessment method

Volume 3 Appendix X Transport Impact Assessment outlines the desktop and field inspection undertaken during February and March 2020 to identify the existing transport environment that may be utilised to access the corridor selection. The existing environment is summarised in Section 13.3, this includes road, rail, air and sea transport networks. Section 13.5 provides the potential impacts to all transport networks and associated mitigation measures to inform transport management.

13.2.4 Legislative context and standards

Legislation relevant to transport includes:

- Queensland *Transport Infrastructure Act 1994*. (TI Act)

  This act is the Department of Transport and Main Roads (DTMR) primary legislation and sets out the powers DTMR has in relation to managing the SCR network

- Queensland *Transport Operations (Road Use Management) Act, 1995.*

  This act provides for the management of vehicles and road uses, and provides guidelines for traffic control devices and approvals for temporary and permanent road closures.

- *Impact Assessment Guidelines and Infrastructure agreements- local government policies- Local Government Act 1993.*

13.3 Existing environment

A detailed description of the existing environment is provided in Volume 3 Appendix X Transport impact assessment, Section 2. The field investigation involved an assessment of the existing condition of potential access roads and intersections that may service the Project.

13.3.1 Road transport network

State controlled roads and local roads

The major SCRs servicing the Project include the Flinders and Barkly Highways, both of which are managed by DTMR. SCRs have four administrative classifications as follows:

- National highway
- State strategic road
- Regional road
- District road.

Local roads fall under the jurisdiction of the relevant local government councils and play a functional role in the movement of traffic at a local level.

The SCRs and LG roads that would be utilised by and provide access to the Project area during construction and operation are identified in Table 13-1 and Table 13-2.

Table 13-1 Summary of state controlled roads

DTMR Road ID	Location	Classification	Route Capacity
841	Townsville Port Road	National Highway	Type 2 road trains
14A-14E	Flinders Highway	National Highway	Type 2 road trains
15A	Barkly Highway	National Highway	Type 2 road trains
13H	Landsborough Highway	National Highway	Type 2 road trains
98B	Gregory Developmental Road	State Strategic Road	Type 2 road trains
99C	Kennedy Developmental Road	Regional Road	Type 2 road trains
89A	Burke Developmental Road	Regional Road	Type 2 road trains
93E-93F	Diamantina Developmental Road	Regional Road	Type 2 road trains
5407	Burdekin Falls Dam Road	District Road	Type 2 road trains
5703	Torrens Creek Aramac Road	District Road	Type 2 road trains
5701	Hughenden Muttaburra Road	District Road	Type 2 road trains
5803	Richmond Winton Road	District Road	Type 2 road trains
5807	Julia Creek Kynuna Road	District Road	Type 2 road trains

DTMR Road ID	Location	Classification	Route Capacity
7708	Cloncurry Dajarra Road	District Road	Type 2 road trains

Table 13-2 Summary of LG controlled roads providing access to the corridor selection

LGA	Road	LGA	Road
Charters Towers	Cardington Road	Richmond	Maxwelton Kynuna Road
	Silver Valley Road	McKinlay	Minamere Road
	Lornesleigh Road		Nelia Road
	Cameron Downs Road		Proa Road
	Broughton Road		Ardbrin Road
	Millchester Road		Yorkshire Road
	Bluff Road		McKinlay Gilliat Road
	Mountain View Road		Ivellen Road
	Rocky Creek Road		Oorindi McKinlay Road
	Mount Leyshon Road	Cloncurry	Toolebuc McKinlay Road
	Trafalgar Road		Round Oak Road
	Charters Towers Mirtna Road		Andrew Daniels Road
	Braceborough Road		Roxmere Road
	Red Road		Malbon Selwyn Road
	Homestead Lascelles Road		Selwyn Toolebuc Road
	Helenslee Road		Selwyn Chatsworth Road
	Laidlow Crossing		Duchess Chatsworth Road
	Paterson Street		Chatsworth Phosphate Road
	Longton Road		Duchess Phosphate Hill Road
	Lauderdale Road		Monument Dajarra Road
	Lyons Creek Road		Mount Frosty Road
Flinders	Penrice Cotonvale Road		East Leichardt Road
	Prairie Muttaburra Road	Mount Isa	Mount Isa Duchess Road
	Redcliffe Road		Twenty-Third Avenue
	Mowbray Street		Camooweal Street
	Thornhill Tamworth Road		
	Marathon Stamford Road		
	Barabon Terranburby Road		

Intersection condition assessment

A review was undertaken of all intersections that may be used during the construction and operation of the Project. The review was used to indicate whether the intersections are suitable for use or whether upgrades are required to achieve a level of usability during the Project. A summary of the intersections along SCRs that would require additional works is provided in Table 13-3.

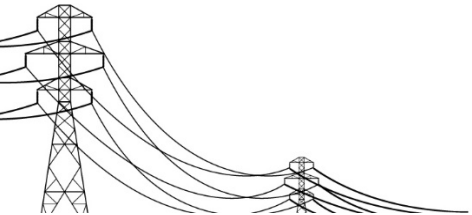


Table 13-3 SCR additional intersection works

DTMR Road ID	Location	Further Investigation Required	Improvements Required	Total
14A	Flinders Highway	0	1	1
14B	Flinders Highway	1	6	6
14C	Flinders Highway	2	3	4
14D	Flinders Highway	1	6	7
14E	Flinders Highway	1	2	3
15A	Barkly Highway	10	1	11
5407	Burdekin Falls Dam Road	1	1	1
98B	Gregory Developmental Road	1	0	1
5703	Torrens Creek Aramac Road	0	0	0
5701	Hughenden Muttaburra Road	0	0	0
99C	Kennedy Developmental Road	1	2	3
5803	Richmond Winton Road	0	1	1
5807	Julia Creek Kynuna Road	0	0	0
89A	Burke Developmental Road	0	0	0
13H	Landsborough Highway	1	1	1
7708	Cloncurry Dajarra Road	4	2	4
7709	Mount Isa Duchess Road	0	0	0
93E	Diamantina Developmental Road	0	1	1
93F	Diamantina Developmental Road	0	0	0

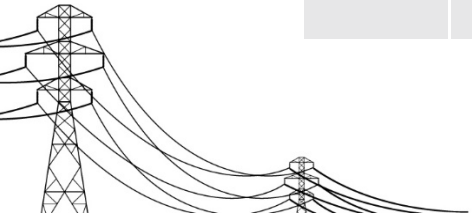
Traffic

Traffic information has been supplied by DTMR for SCRs that may be utilised during the Project construction and operation. The distribution of heavy and light vehicles for each road segment is outlined in Table 13-4. The following information was extracted from the 2019 Average Annual Daily Traffic (AADT) segment reports details are found in Volume 3 Appendix X Transport impact assessment.

Table 13-4 AADT information for State controlled roads

DTMR Road ID	Location	Start Chainage (km)	End Chainage (km)	Light	Heavy	Total*
841	Townsville Port Road	0	7.34	1,999	820	2,820
		7.34	7.81	2,774	1,062	3,836
14A	Flinders Highway Townsville - Charters Towers	0.00	2.47	1,194	770	1,967
		2.47	9.42	4,426	1,659	6,086
		9.42	122.11	1,924	547	2,471
		122.11	124.93	1,475	576	2,052
		124.93	126.15	2,199	639	2,839
14B	Flinders Highway Charters Towers - Hughenden	0.00	3.48	2,119	502	2,621
		3.48	61.79	794	349	1,139
		61.79	139.72	390	289	679
		139.72	244.79	390	180	569
		244.79	247.29	459	255	714

DTMR Road ID	Location	Start Chainage (km)	End Chainage (km)	Light	Heavy	Total*
14C	Flinders Highway Hughenden - Richmond	0.00	114.83	311	198	506
14D	Flinders Highway Richmond - Julia Creek	0.00	149.31	249	207	454
14E	Flinders Highway Julia Creek - Cloncurry	0.00	3.60	346	199	545
		3.60	24.50	107	94	200
		24.50	123.03	231	186	417
		123.03	134.32	545	381	926
		134.32	136.31	777	257	1,037
		136.31	136.83	2,824	274	3,097
15A	Barkly Highway Cloncurry - Mount Isa	0.00	2.05	949	408	1,357
		2.05	114.05	595	356	953
		114.05	120.55	766	325	1,091
15B	Barkly Highway Mount Isa - Camooweal	0.00	0.67	7,302	2,173	9,476
		0.67	7.28	2,779	519	3,298
13H	Landsborough Highway Cloncurry - Kynuna	0.00	166.18	249	95	343
		166.18	169.18	219	152	373
7708	Cloncurry - Dajarra	0.00	100.60	41	29	69
		100.60	169.08	11	4	18
5407	Burdekin Falls Dam Road	0.00	39.35	148	47	197
		39.35	121.06	47	11	61
98B	Gregory Developmental Road Belyando Crossing - Charters Towers	0.00	142.78	338	175	516
		142.78	193.19	679	84	762
5703	Aramac – Torrens Creek Road	0	124.86	35	13	49
		124.86	246.76	32	26	57
5701	Hughenden - Muttaburra	0.00	158.53	48	13	65
		158.53	204.98	27	5	36
99C	Kennedy Developmental Road The Lynd – Hughenden	0	2.44	675	114	789
		2.44	117.06	104	49	155
		117.06	214.64	101	51	154
5803	Richmond - Winton	0.00	100.32	33	19	52
		100.32	144.52	8	4	13
5807	Julia Creek - Kynuna	0.00	112.37	20	13	34
93E	Diamantina Developmental Road Boulia - Dajarra	0.00	87.56	71	31	103
		87.56	146.49	47	16	65
		146.49	146.89	62	21	82
93F	Diamantina Developmental Road Dajarra - Mount Isa	0.00	33.97	68	26	96
		33.97	132.10	48	21	73
		132.10	149.94	365	129	495
		149.94	153.36	3,779	438	4,216



DTMR Road ID	Location	Start Chainage (km)	End Chainage (km)	Light	Heavy	Total*
7709	Mount Isa – Duchess Road	0	2.38	7,702	733	8,435
		2.38	4.72	250	43	293

**Note: The AADT values reported are converted to whole numbers, thus occasional inaccuracies exist due to rounding. These inaccuracies are statistically insignificant.*

13.3.2 Rail transport network

The Mount Isa rail system is the critical link from the North West Minerals Province (NWMP) to the Port of Townsville (POT), commencing at Stuart on the North Coast Line. The system extends across 1032 kilometres of single, narrow gauge track (Queensland Rail, 2017), and incorporates the balloon loops at Yurbi, Phosphate Hill and Mount Isa.

The supplier of rail Mount Isa rail system is Queensland Rail and freight transport operators are Pacific National, Aurizon and Linfox. Freight traffic shares the system with the “Inlander” passenger rail service that runs two weekly return services between Mount Isa and Townsville along with cattle trains.

The level railway crossings within the road network likely to be traversed by construction traffic were assessed during the site inspection undertaken by GHD. A total of 45 level railway crossings were inspected. The following level rail crossings include:

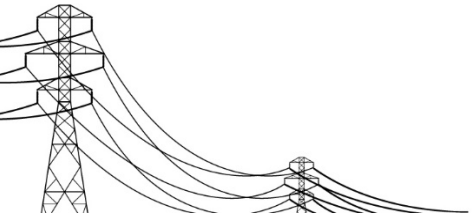
- 18 along SCRs
- 24 along LGRs
- 3 along PRs

In addition to the visual inspection, the storage length was measured for various LGRs that consist of a level crossing proximate to a SCR. The storage lengths are summarised in Table 13-5 below. It is important to note that only select LGR intersections proximate to a SCR, where storage length may be of concern, are included in the following assessment.

Table 13-5 Storage length

Rail ID	Storage Road	Intersecting Road	Approximate Storage Length (m)
LG Rail 02	Braceborough Road	Flinders Highway 14B	30
LG Rail 03	Red Road	Flinders Highway 14B	30
LG Rail 04	Laidlow Crossing	Flinders Highway 14B	35
LG Rail 07	Road	Flinders Highway 14B	35
LG Rail 08	Cotonvale Penrice Road	Flinders Highway 14B	85
LG Rail 09	Prairie Muttaburra Road	Flinders Highway 14B	30
LG Rail 10	Kennedy Energy Park Access Track	Flinders Highway 14B	70
LG Rail 11	Thornhill Tamworth Road	Flinders Highway 14C	35
LG Rail 14	Road	Flinders Highway 14C	30
LG Rail 22	Duchess Chatsworth Road	Duchess Phosphate Hill Road	70

It is recommended that a traffic plan be supplied to Queensland Rail detailing the traffic volumes expected to traverse level rail crossings, the frequency and period of operation. This should include peak traffic volumes, such as daily workforce movements in addition to heavy, over dimensional vehicles that will cross rail structures including level crossings.



13.3.3 Sea transport facilities

The POT would be the primary location for imported, machinery, equipment and materials from overseas. The POT is the main export and import port for the Northern Statistical Division and the Mount Isa section of the North West Statistical division. The POT has eight operational berths, equipped with bulk handling facilities including pipelines for oil, gas, chemicals and molasses, ship loaders for sugar and metal concentrates, cranes for containers, metals, nickel ore and break-bulk cargo. The POT services the north-east and north-west minerals provinces that contain copper, zinc, lead, phosphate and magnetite. The POT's total tonnage during 2018/2019 was seven mega tonnes and 56,575 total container movements.

General cargo shipping services calling at Townsville are shown in Table 13-6.

Table 13-6 Container and break bulk shipping lines calling Townsville

Shipping Company	Origin/Destination
ANL Container Line	Indonesia, PNG
Kyowa Shipping	South Korea, PNG, Japan
Mariana Express Lines	China, PNG, Taiwan, Australia
Swire Shipping	Taiwan, China, Japan, South Korea, India, Thailand, Vietnam, Philippines, Malaysia, Indonesia, Singapore, Bangladesh, Pakistan, Sweden, Netherlands, Germany, UK, Belgium, France, Italy, Spain

13.3.4 Air transport facilities

There is a range of charter operators that are available for fly-in operations ex-Townsville, Cairns and Brisbane. Airports in the study region are as below in Table 13-7. Services and weekly seat numbers as of July 2020 are listed in Table 13-8.

Table 13-7 Airports in the study region

Airport	Length (m)	Width (m)
Boulia	1274	30
Cannington Station Airport	1200	26
Cloncurry	2000	30
Hughenden	1644	30
Julia Creek	1402	30
Pentland - Charters Towers	1737	30
Phosphate Hill (Monument Airport)	1900	30
Richmond	1524	30
Townsville	2438	45
Trepell Airport	1799	30
Winton	1402	30

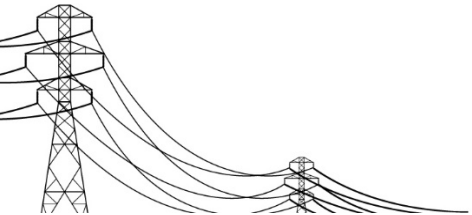


Table 13-8 Charter services to mines within proximity to the Project

Origin	Route	Service Providers	Weekly Flights	Weekly Seat No's
Century	Ex-Cairns	Alliance Airlines	3	300
Cloncurry	Ex-Cairns	Alliance Airlines	1	100
	Ex-Townsville	Alliance Airlines / Qantas	9	700
	Ex-Brisbane	Alliance Airlines	2	200
Mount Isa	Ex-Townsville	Qantas / Alliance Airlines	2	130
	Ex-Cairns	REX	6	198
	Ex-Brisbane	Qantas / Alliance Airlines	8	1298
Phosphate Hill (The Monument Airport)	Ex-Townsville	Alliance Airlines	4	400
Trepell	Ex-Townsville	Alliance Airlines	7	700
	Ex-Cairns	Alliance Airlines	2	200
	Ex-Brisbane	Alliance Airlines	3	300

13.3.5 Proposed transport infrastructure

Northern and North West Regions for the 2019-20 to 2022-23 period as part of the Queensland Transport and Roads Investment Program (QTRIP). Table 13-9 outlines road projects proposed within the study area, with indicative total cost of $1 million and over.

Additionally, government stimulus funding may include projects that are not captured in Table 13-9 due to the nature of the Project delivery timeframes or the projects not yet being scoped at time the time of writing.

Table 13-9 DTMR Queensland transport and roads investment program (projects > $1 million)

Road	Description of works	Indicative total cost
Flinders Highway (in Townsville City Council)	Woodstock – Giru Road intersection/construct overtaking lanes	$6 m
Flinders Highway (in Charters Towers Regional Council)	Undertake transport project planning/Rehabilitate pavement	$22.65 m
Flinders Highway (in Richmond City Council)	Undertake transport project planning/Rehabilitate bridges and culverts	$3.56 m
Gregory Developmental Road (in Charters Towers Regional Council)	Widen and seal/Rehabilitate and widen	$51.2 m
Barkly Highway (in Mount Isa City Council)	Improve intersections	$8.27 m
Aramac Torrens Creek Road	Construct to sealed standard	$2.06 m
Cloncurry Dajarra Road	Construct to sealed standard	$3 m
Note: Northern Region Investment Program 2019-20 to 2022-23. Note: North West Region Investment Program 2019-20 to 2022-23. Note: Can include some amounts already spent.		

13.4 Transport tasks

A detailed description of the transport task and traffic routes is provided in Volume 3 Appendix X Transport impact assessment, Section 3. An overview of transport is summarised in Table 13-14.

13.4.1 Modal choice

Due to the structure of the Project, point to point service is considered more favourable than line haul transport. Transportation of materials via rail involves intermodal transport to Project sites via road. Due to the time inefficiencies and costs associated with rail and intermodal transportation, the modal choice for the Project will be road. Advantages and disadvantages of each transport mode are compared in Table 13-10.

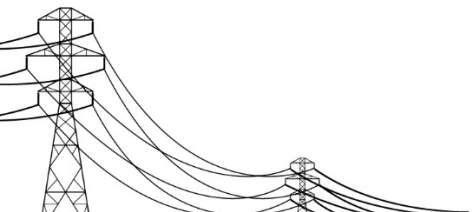
Table 13-10 Modal choice

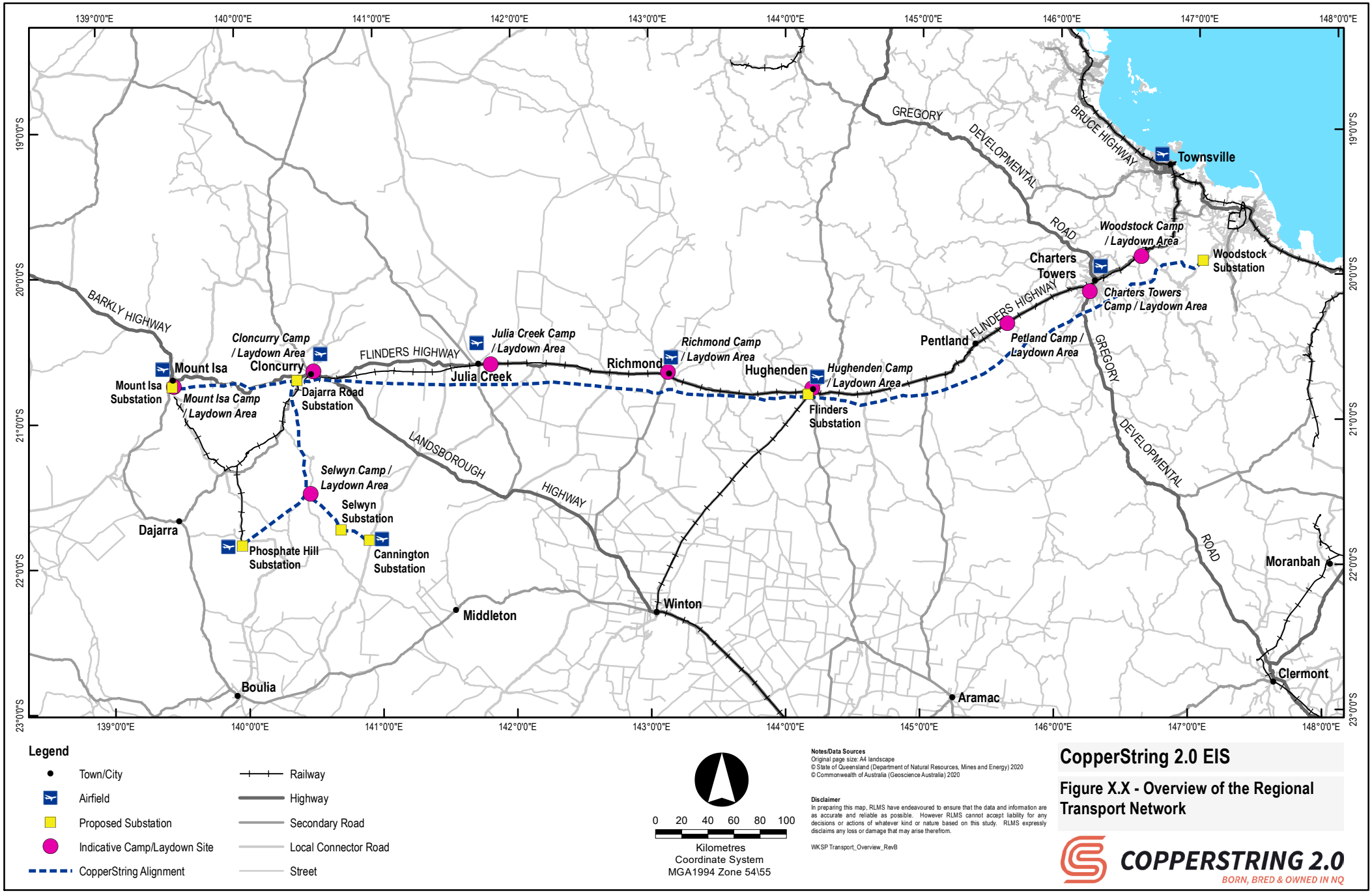
Mode	Advantages	Disadvantage
Rail	Reduces interaction between heavy vehicles and road users Reduces impact on road infrastructure Reduces carbon footprint of transport Bulk freight commodities over long distances Access if seasonal conditions result in road closure for any prolonged or unexpected periods	Intermodal transport required to transport from rail to road Significant funding required to construct rail sidings Transit times difficult to manage due to intermodal connection between road and rail Capacity guarantee uncertain due to rail contract obligations for bulk mineral movements or train schedules
Road	Direct transport (point to point) more suited to the Project Faster transit times and more defined certainty of delivery to meet the construction program Efficiencies for shorter distance freight Capacity guarantees could be written into contracts and trucks can be positioned from other locations to meet demands	Increased traffic on state controlled and local government roads Increased impact on road infrastructure

13.4.2 Transport of materials

The Project is divided into 13 construction zones based. Each of the 13 would have at least one laydown area proximate to the construction zone, co-located with the camps, as shown in Figure 13-2. Substation sites will serve as the laydown areas for the construction of substations.

Traffic movements generated by the Project will predominantly occur during the construction period. Increased demand on transport infrastructure is anticipated between 2021 and 2024 due to the construction of transmission lines, substations, camps and associated workforce movements. The traffic generated during the construction of the Project has been separated into the activities outlined in Volume 3 Appendix X Transport impact assessment, Section 3. Key transport tasks that generate larger volumes of heavy vehicle movements originating in Townsville, including foundation tower and worker camp construction movements, are summarised below.





Legend

- Town/City
- Airfield
- Proposed Substation
- Indicative Camp/Laydown Site
- CopperString Alignment
- Railway
- Highway
- Secondary Road
- Local Connector Road
- Street

0 20 40 60 80 100
Kilometres
Coordinate System
MGA1994 Zone 54\55

Notes/Data Sources
Original page size: A4 landscape
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WKSP Transport_Overview_RevB

CopperString 2.0 EIS

Figure X.X - Overview of the Regional Transport Network

COPPERSTRING 2.0
BORN, BRED & OWNED IN NQ

Foundations

The foundations for each tower comprise of four concrete piles and reinforcing steel. The foundation sizes vary throughout the corridor section due to the supporting soil conditions and tower sizes. Concrete transport would be localised within each construction zone. Concrete for substation and tower footings would be sourced from existing and mobile batching plants proximate to laydown areas for each construction zone.

The concrete for the foundations would be transported between batching plants and tower locations using concrete agitator trucks, with a capacity of 5.6 m^3. It is proposed that the aggregate required will be sourced within the region/locally, pending further discussions with key stakeholders. However, Hughenden, Richmond and Julia Creek (black soil areas) will likely need to source aggregate from Charters Towers/Pentland or Cloncurry. Type 2 road trains with a capacity of 70 tonne will be used to haul the reinforcement and cement additives, generating additional movements along the Flinders and Barkly Highways.

The following transport movements are projected for each construction zone. The movements have been separated into localised movements (i.e. within each construction zone) and movements that originate from the POT (including reinforcement movements). It should be noted that the average weekly movements outlined in Table 13-11 are based on outbound (one way) movements for the duration of the activity.

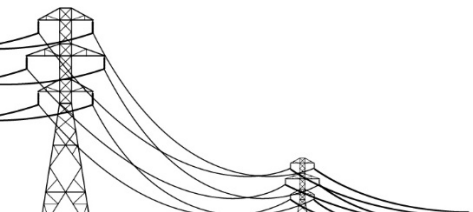
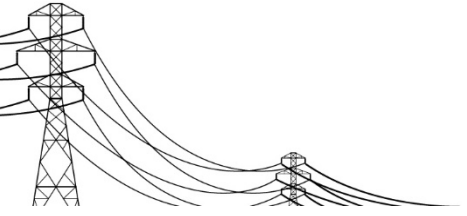


Table 13-11 Foundation construction movements

Construction zone	Concrete Required (m3)	Aggregate Required (tonne)	Cement Required (tonne)	Concrete Truck Movements2	Road train movements (Aggregate)3	Road train movements (Cement)3	Reinforcement Movements	Period (weeks) 1	Local average weekly movements	DTMR average weekly movements
Woodstock	4,877	7,315	1,756	871	105	26	66	8.0	123	13
Charters Towers	11,231	16,847	4,043	2,006	241	58	152	13.0	174	17
Pentland	21,650	32,475	7,794	3,867	464	112	293	32.0	136	14
Hughenden (east)	13,891	20,837	5,001	2,481	298	72	188	13.0	214	21
Hughenden (west)	16,795	25,192	6,046	3,000	360	87	110	10.0	336	20
Richmond	43,209	64,813	15,555	7,716	926	223	283	18.0	481	29
Julia Creek	47,331	70,997	17,039	8,453	1,015	244	310	19.0	499	30
Cloncurry (east)	21,986	32,979	7,915	3,927	472	114	144	17.0	259	16
Cloncurry (west)	8,719	13,079	3,139	1,557	187	45	118	12.0	146	14
Mount Isa	8,719	13,079	3,139	1,557	187	45	118	8.0	219	21
Cloncurry (south)	15,739	23,608	5,666	2,811	338	81	213	14.0	226	22
Selwyn (to Cannington)	2,809	4,213	1,011	502	61	15	149	6.0	95	28
Selwyn (to Phosphate Hill)	2,809	4,213	1,011	502	61	15	149	11.0	52	16

[1] *Note: Tower foundation construction only*
[2] *Note: Concrete agitator trucks, 5.6 m^3 capacity*
[3] *Note: Type 2 Road trains, 70 tonne capacity*



Towers

The construction materials for each tower includes the steel for the lattice towers, conductors, insulators and optical ground wires (OPGW). The materials will be transported in shipping containers to the POT via sea, before being relocated to the devanning location. The steel supplies will be distributed to the respective laydown area for each construction zone via Type 2 road trains along the Flinders Highway and Barkly Highway, then along the access roads to the laydown areas. It is anticipated that the Type 2 road trains will have a capacity of 70 tonne. The tower sizes vary throughout the corridor selection based on the transmission line voltage and conductor arrangement.

The following transport movements are projected for each construction zone. It should be noted that the average weekly movements outlined in Table 13-12 are based on outbound movements only for the duration of the activity.

Table 13-12 Tower construction movements

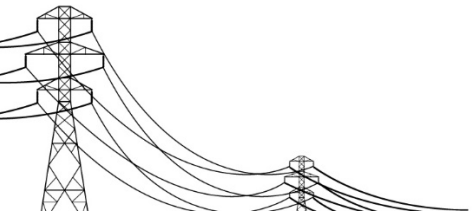
Construction Zone	Construction material (tonne)		Road train movements	Period (weeks)[1]	Average weekly movements[2]
	Steel	Conductor/Cable			
Woodstock	1,650	738.42	57	6.0	10
Charters Towers	3,800	1,715.04	131	14.0	10
Pentland	7,325	3,310.98	251	33.0	8
Hughenden (east)	4,700	2,119.98	162	13.0	13
Hughenden (west)	2,750	1,238.64	95	9.0	11
Richmond	7,075	3,191.88	243	19.0	13
Julia Creek	7,750	3,501.54	266	19.0	14
Cloncurry (east)	3,600	1,619.76	124	17.0	8
Cloncurry (west)	2,714	1,191	97	13.0	8
Mount Isa	2,714	1,191	97	9.0	11
Cloncurry (south)	4,899	1,139.4	158	16.0	10
Selwyn (to Cannington)	2,980	446.04	100	8.0	13
Selwyn (to Phosphate Hill)	2,980	446.04	100	8.0	13

[1] *Note: Tower construction only*

[2] *Note: Type 2 Road trains, 70 tonne capacity*

Worker camps

For the duration of operation, workforce personnel will require transportation to camp sites and to construction zones. It is envisaged that a combination of Fly-In Fly-Out (FIFO) and Bus-In Bus-Out (BIBO) will be operated for workforce deployment from Townsville. Workforce movements will be localised within each construction zone, via a combination of buses and four wheel drive (4WD) vehicles, suitable for the access roads and conditions, as illustrated in Figure 13-3.



Workforce construction camps will be established in 9 locations within the construction zones. Construction camp demountable units would be transported from Townsville prior to construction.

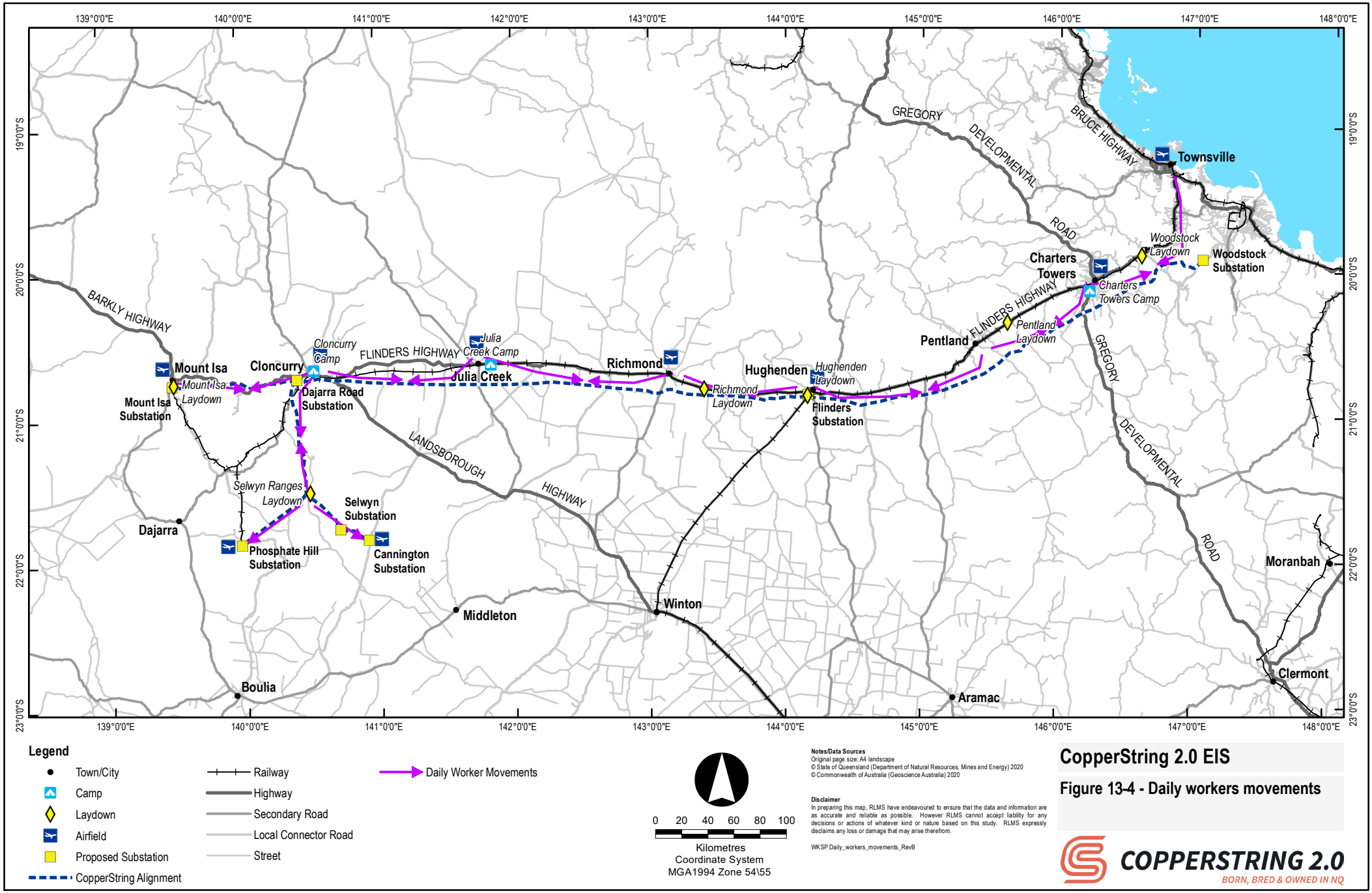
As the Project would be delivered in a staged process, accommodation demountable units will be constructed to service workforce demand. Demountable units for each construction camp may be transferred to subsequent construction zones to accommodate peak work forces. At the completion of the Project the demountable units and camp material would be returned to Townsville.

A demountable is required at a rate of one unit per four workforce personnel, with additional for each site office, kitchen mess and other facilities. Each demountable, including associated establishment equipment such as plumbing and electrical fixtures, will be transported in one semi-trailer movement. The semi-trailer movements outlined in Table 13-13 are anticipated for the construction and demobilisation of each camp, similar to construction movements the weekly movements area based on outbound only.

Table 13-13 Camp construction movements

Location of accommoda-tion	Peak Work-force	Demountable units required	Construc-tion Period (Weeks)	Average weekly move-ments[1]	Demobilisation Period (Weeks)	Average weekly move-ments[1]
Woodstock	111	50	6	9	12	5
Charters Towers	129	55	15	4	13	5
Pentland	204	73	18	5	13	6
Hughenden	261	88	17	6	13	7
Richmond	227	79	17	5	13	7
Julia Creek	204	73	17	5	13	6
Cloncurry	266	89	15	6	12	8
Mount Isa	182	68	17	4	13	6
Selwyn	204	73	19	4	9	9

[1] *Note: Semi-trailer movements*



Notes/Data Sources
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WKSP Daily_workers_movements_RevB

CopperString 2.0 EIS

Figure 13-4 - Daily workers movements

COPPERSTRING 2.0
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13.4.3 Transport movements

On the basis of the information presented in the sections above, the estimated traffic generated for each construction zone is outlined in Table 13-14. It should be noted that the following movements are based on outbound (one way) movements only.

Table 13-14 Estimated total vehicle movements

Construction Zone	Heavy Vehicles				Total Heavy Move-ments	Light Vehicle Move-ments	Total Move-ments
	Type 2 Road Train	Semi-Trailer	Concrete Truck	Bus			
Woodstock	380	4,142	1,376	260	6,158	4,564	10,722
Charters Towers	592	575	2,015	364	3,546	2,384	5,930
Pentland	1,060	950	3,872	468	6,350	10,380	16,730
Hughenden	1,331	2,820	5,979	1,196	1,1326	18,958	30,284
Richmond	1,533	710	7,722	312	10,277	7,494	17,771
Julia Creek	1,583	1,008	8,455	364	11,410	7,820	19,230
Cloncurry	2,125	3,181	8,805	1,820	15,931	31,606	47,537
Mount Isa	567	2,330	2,056	676	5,629	4,712	10,341
Selwyn	756	2,846	1,505	0	5,107	2,688	7,795
Cannington	15	1,560	120	0	1,695	0	1,695
Phosphate Hill	15	1,560	120	0	1,695	0	1,695

13.5 Impact assessment mitigation measures

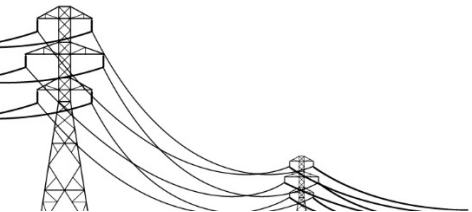
13.5.1 Design Response

During the design phase of the Project, impacts to the transport networks can minimised by locating construction facilities close the corridor selection. By placing construction camps, concrete facilities and laydown areas within proximity to the corridor selection this will reduce the need for localised movements on LG and PR roads. The final construction route selection can also reduce the potential impact of the Project on roads. Selecting the most appropriate route should be completed with consultation with DTMR, communication with DTMR has already commenced.

13.5.2 Construction

Air service impacts

The impact to air services is considered negligible due to the level of air services and availability based on demand. Existing charter companies such as Alliance Airlines currently operate regionally, while competing passenger services, operated by Qantas, Virgin Australia and REX Regional Express, also have capacity to meet travel additional demands. As such, it is anticipated that the proposed workforce movements should adequately be catered for by airlines that currently operate within the region. Workforce movements shall be a combination of FIFO and BIBO. A summary of the identified impacts and the associated activities are summarised in Table 13-16. A rating has been applied for both the unmitigated risk of each activity in addition to the mitigated risk (i.e. assuming the adoption of strategies presented in Table 13-15).



Sea transport impacts

The majority of materials would be imported though POT via shipping containers before being transported to the devanning area and dispatched to the respective construction zones. However, it is anticipated that the container movement associated with the Project will have a negligible impact on POT, due to ongoing expansion works aimed to increase the capacity of importing and exporting goods. The regular scheduled shipping lines are expected to allow sufficient capacity for the estimated material volumes incurred for the Project duration. Ongoing communication and planning with POT shall be required to ensure berth reservation and workforce management. Over dimensional loads, such as substation transformers, will need to be declared to POT to ensure berth space is available. Height restrictions will need to be considered when planning the transport of materials and equipment. A summary of the identified impacts and the associated activities are summarised in Table 13-16. A rating has been applied for both the unmitigated risk of each activity in addition to the mitigated risk (i.e. assuming the adoption of strategies presented in Table 13-15).

Road impacts

The traffic generated by the construction of the Project may impact the safety and functioning of SCRs and LGRs. Volume 3 Appendix X Transport impact assessment summarises the traffic impact assessment undertaken, in accordance with DTMR Guide to Traffic Impact Assessment, 2018 (GTIA). The main impacts from Project traffic and road use are associated with the large volumes of increased heavy and light vehicles. Impacts include an increased potential for accidents and accelerated degradation of pavements. A summary of the identified impacts and the associated activities are summarised in Table 13-16. A rating has been applied for both the unmitigated risk of each activity in addition to the mitigated risk (i.e. assuming the adoption of strategies presented in Table 13-15).

Rail network impacts

There are no impacts on the loading of the network, as all material and equipment shall be delivered via road. However, level railway crossings will be traversed by the Project traffic. Level railway crossings with short storage lengths may be impacted if multiple heavy vehicles area required to queue, this could impact intersecting roads. Further investigations should include traffic data and assessment of queuing distance in order to demonstrate sufficient clearance between each level crossing and adjacent intersections, to allow the maximum vehicle used in operation to queue. It is recommended that a traffic plan be supplied to Queensland Rail detailing the traffic volumes expected to traverse level rail crossings, the frequency and period of operation. This should include peak traffic volumes, such as daily workforce movements in addition to heavy, over dimensional vehicles that will cross rail structures including level crossings.

In addition to the traffic plan, the proposed construction routes, traffic volumes and vehicle details will be used to inform the Australian Level Crossing Assessment Model (ALCAM) assessments. The ALCAM assessment will identify any upgrades required for each railway level crossing impacted, in accordance with Section 2.2 of the Guide to Development in a Transport Environment: Rail.

A summary of the identified impacts and the associated activities are summarised in Table 13-16. A rating has been applied for both the unmitigated risk of each activity in addition to the mitigated risk (i.e. assuming the adoption of strategies presented in Table 13-15).

13.5.3 Operation

During the operational phase, it is anticipated that traffic movements generated will be minimal, primarily comprising of service vehicles undertaking general maintenance and inspections. As

such, the service vehicle required onsite would include light vehicles and light rigid trucks. Thus, traffic volumes developed by the Project are anticipated to be low, with minimal impact to the road infrastructure. The number of workforce personnel onsite will be minimal, therefore workforce movements will not require further traffic management.

If large scale refurbishments to any structures are required, such as replacement of substation components, it would likely require oversized vehicles similar to those operating during the construction. The transport infrastructure established during the construction phase should still be sufficient, therefore, communication with relevant stakeholders shall be required to undertake the works.

13.5.4 Summary of potential mitigation and management measures

The following Table 13-15 summarises mitigation measures associated with the impacts discussed above and summarised in Table 13-16.

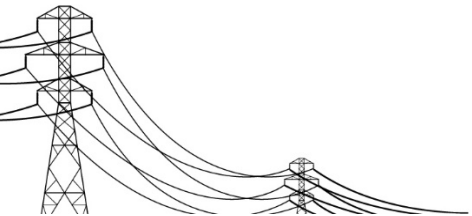


Table 13-15 Summary of mitigation measures for associated transport impacts

Timing	Mitigation and Management Measures
Pre-construction	Assessment of flight schedules and cost prior to construction commencement
	Using a combination of FIFO and BIBO workforce travel
	Workforce will primarily live on site in construction camps
	Placement of access tracks to allow vehicle movements over numerous roads
	Liaise with the POT • Berth availability • Height restrictions
	Liaise with local governments
	Construction Contractor(s) to develop traffic management and road use plans, specific to phase and work fronts
	Traffic plan shall be submitted to Queensland Rail, detailing expected traffic volumes, frequency and period of operation
	Improving/implementing advanced warning and visibility of intersections through approach signage, reduced speed zones or chevrons
	Intersection may require widening for safe turning, additional investigations and a road safety audit shall be undertaken to determine the extent of widening works warranted.
Construction	Inductions of all Construction Contractor personnel, including: • Safe driving practices • Working near roads • Working near railway corridors
	CopperString vehicles are equipped with a UHF radio to enable communications between heavy vehicles operating within an area.
	Schedule movements to avoid existing larger volume and heavy vehicle movement periods, including: • Avoid peak holiday times • School bus peak times (7:30 am to 9 am and 2:30 pm to 4:30 pm)
	Communication with Tourist Information Centres to advise visitors of the Project activities
	Personnel shall use PPE including high visibility vest and use of warning signs
	Rehabilitation of road pavements at the completion of construction

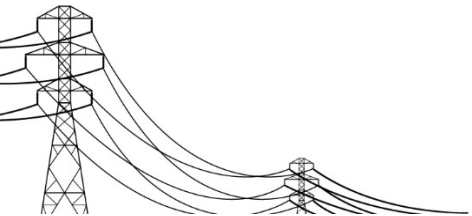
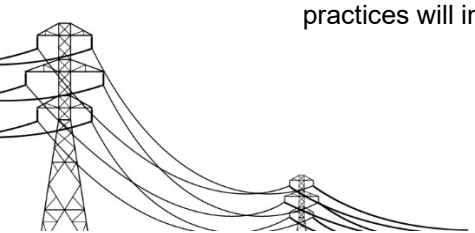


Table 13-16 Summary of potential transport impacts and associated risk ratings for the construction phase

Activity	Associated Potential Impacts	Unmitigated Risk rating	Mitigated Risk rating
Additional workforce travelling to work fronts	Increased use of air services (FIFO workers – business as usual)	Low	Low
Importation of international procured equipment and materials	Increased import density at Townsville Port	Low	Low
Heavy vehicle road delivery of machinery, equipment, material and light vehicle for workforce travel	Greater volume on local and state controlled roads	Low	Low
	Increased traffic on local roads and access roads- minor disruptions to local communities	Low	Low
	Increased accident risk during railway track crossing works or when turning at intersections	Mod	Low
	Delays to existing traffic during construction of crossings of or in close proximity to existing rail alignments/roads.	Low	Low
	Accidents with other uses especially tourist (unfamiliar) and school buses (often stopping and unaccompanied children)	Low	Low
	Accelerate degradation to pavement surfaces, risk to the safety to all road users and increase maintenance for controlling Local Governments	Low	Low
Over dimensional loads	Heavy Vehicle Permits and pilots to provide safe delivery of large plant	Mod	Low
School zones	Construction traffic movements to allow for school zones during normal school operational hours.	Low	Low
Working near roads	Safety risk for personnel	Mod	Low (*)

(*) – As business as usual practices the Contractor's Workplace Health and Safety management practices will implement the required safe working arrangements



13.6 Conclusion

It is recognised that traffic generated, largely comprises of heavy vehicles for haulage of materials. As such, it is anticipated that the traffic associated with the Project construction will likely impact road link capacity, access and frontage, pavement and intersection delays. The heavy vehicle movements projected along SCRs that intersect the Flinders and Barkly Highway will typically extend short distances, before intersecting with the Project corridor selection. However, these impacts are restricted to the construction phase of the Project.

Many of the impacts associated with transport can be mitigated and managed by effective planning with DTMR, Local Government councils and Queensland Rail. Road has been selected as the modal choice as it provides point to point transport and so there will no impacts on rail loadings. Restrictions on the movement of legal loads within the Project network will be specified by DTMR, allowing the contractor to plan construction routes and schedules. There will also be limited impacts on sea and air transport networks as both POT and air services have the capacity to support the additional import loads and workforce respectively.

After construction is completed and the Project enters the operational phase there will be minimal impacts to traffic. A small workforce with will operate the operational and maintenance phase comprising predominantly of service vehicles undertaking maintenance and inspections.

Commitments identified in this chapter for the management of transport risks associated with the Project include:

- Development of traffic management plan
- Development of road use management plan
- CuString and their technical service partners and Construction Contractors are committed to obtaining all relevant approvals, including all necessary environmental approvals, prior to the commencement of construction and complying with all required approvals for the Project.

As this assessment is largely based on assumptions, it is anticipated that the proposed routes and traffic distributions will be refined within the detailed design and pre-construction procurement phases of the Project. Prior to the commencement of construction, routes and haulage vehicles will be confirmed in order to undertake further detailed analysis and more accurately ascertain the transport impacts highlighted in the TIA. The TIA will be updated accordingly to reflect the impacts and include appropriate mitigation measures, in accordance with the DTMR GTIA. It is anticipated that an approval or staged approval will be granted, prior to construction commencing in 2021.

Volume 3 Appendix X Transport impact assessment details the need for further investigations intersections with SCR.