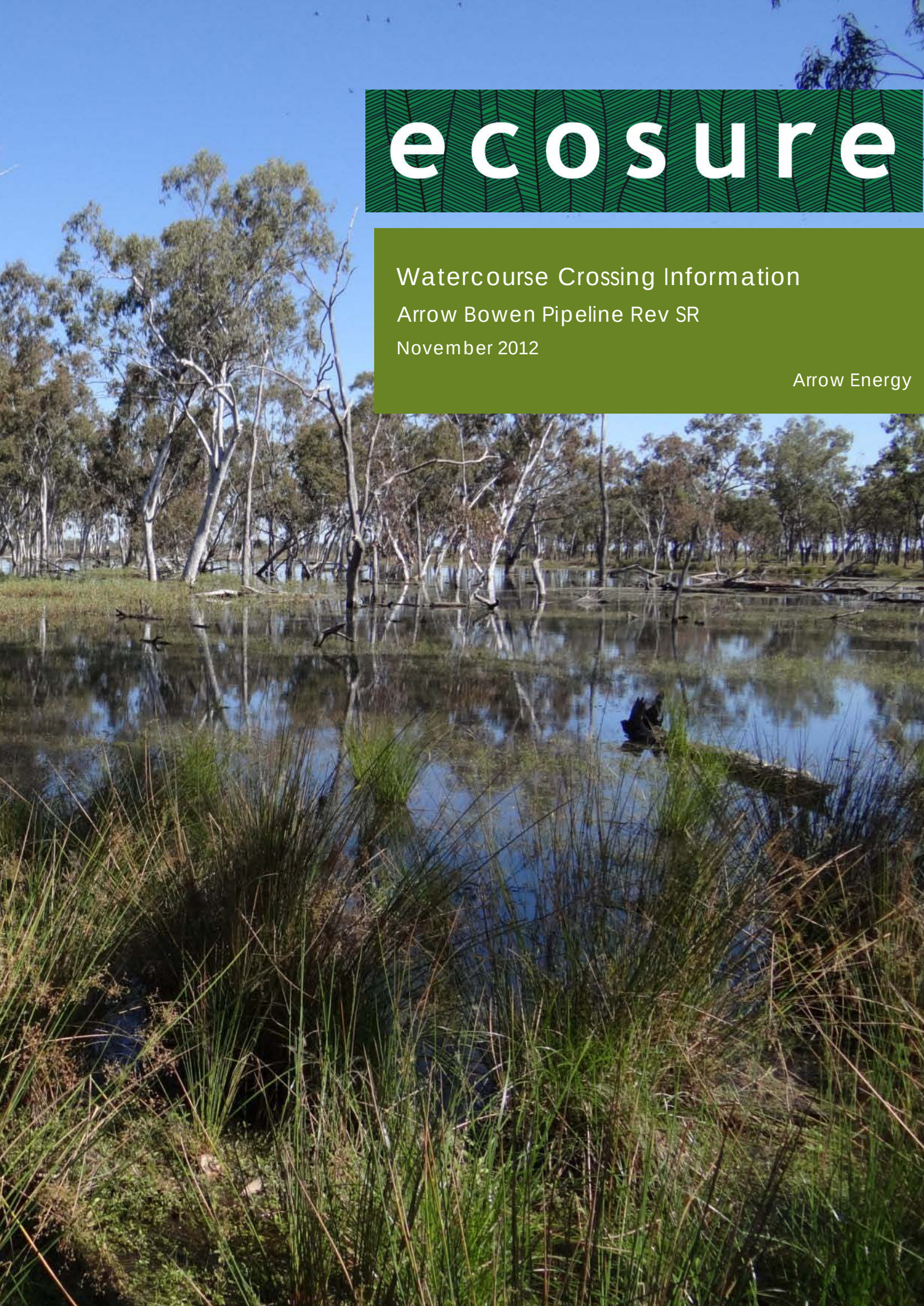

ecosure

Watercourse Crossing Information

Arrow Bowen Pipeline Rev SR

November 2012

Arrow Energy

Introduction

Ecosure was engaged by Arrow Energy Pty Ltd (Arrow) to update a watercourse assessment for the proposed Arrow Bowen Pipeline (ABP), running from gas fields in the Moranbah region to the coast at Gladstone. The ABP is approximately 600 km in length, and includes several lateral and header sections. AECOM (2011) prepared a previous watercourse report for revision D of the proposed alignment.

This letter report provides supplementary ecological information for water crossings along the proposed alignment produced for the Supplementary Environmental Impact Statement (Revision SR alignment). This alignment includes a revised alignment in the vicinity of Rockhampton, which utilises the Stanwell Gladstone Infrastructure Corridor (SGIC).

The Revision SR alignment includes the following components:

- The Arrow Bowen mainline runs approximately 475.4 km from a point about 18 km north-west of Glenden to a junction with the proposed Arrow Surat Pipeline about 22 km west of Gladstone. The Revision SR alignment excludes the section of the mainline from KP 374.5 to 416.7, which now utilises an alternative route that joins the northern portion of the Stanwell Gladstone Infrastructure Corridor (SGIC) west of Rockhampton near Nine Mile Road. Without the SGIC section, the mainline is 433.3 km.
- The Nine Mile / SGIC route alignment is a proposed 43.9 km deviation to the east of the mainline and includes the following sections:
    - The Nine Mile Road section connects the ABP at KP 374.5 to the SGIC infrastructure corridor, and extends 14.6 km from a point 21 km west of Rockhampton to a point 10 km west of Rockhampton.
    - the section within the SGIC, which extends 29.3 km from a point 10 km west of Rockhampton to a point 31 km south of Rockhampton.
- The Elphinstone lateral line (EL - also known as the header line), runs approximately 52 km from a point about 25 km south-east of Glenden to the mainline about 28 km east of Moranbah
- The Saraji lateral line (SL) runs approximately 26 km from a point about 11 km east of Peak Downs Mine to the mainline about 35 km east of Peak Downs Mine
- The Dysart lateral line (DL) runs approximately 33 km from a point about 15 km west of Dysart to the mainline about 43 km east of Dysart.

Methods

Watercourse surveys were conducted during flora surveys undertaken by AECOM (15 June to 4 July 2011, 30 August to 10 September 2011 and 10 to 19 April 2012) and Ecosure (6 to 17 August 2012).

Watercourse crossings assessed in this report contained one or more of the following criteria:

- stream order of 4 or above
- remnant vegetation mapped by Queensland Herbarium
- significant band of riparian vegetation visible in satellite imagery
- open water visible in satellite imagery.

However, not all crossings matching these criteria could be assessed. For example, some crossings were recently changed with the recent Revision SR alignment and have not yet been surveyed. Other crossings could not be accessed due to landholder constraints.

Watercourse features considered during investigations included:

- physical structure of watercourses (number of channels, width and composition of stream bed, height, slope and composition of banks, location relative to stream bends)
- presence and visual condition of water (presence of pools, runs and riffles, seasonality of flow, turbidity, salinity)
- in-stream and riparian vegetation (aquatic, marine and riparian species)
- presence of flora species listed as Endangered, Vulnerable or Near Threatened (EVNT) under state or federal legislation
- presence of aquatic fauna
- in-stream and riparian habitat features (snags, rocks, habitat trees, dead stag trees,
- signs of degradation (clearing, weeds, dieback, erosion, fire or flood damage)
- mapping of Wetland Protection Areas and Wetland Management Areas by the Queensland Department of Environment and Heritage Protection.

At watercourse crossing points where constraints were identified, survey teams attempted to locate an alternative crossing point which reduced or avoided constraints.

The location of each watercourse is provided as a kilometre point (KP), which is the distance in kilometres from the upstream (northern / western) end of the pipeline. All KPs are relative to the Revision SR line. For alternative crossing points that are not on the Rev SR line, locations are given as a distance and direction from the line. The following prefixes are used for kilometre points to differentiate the different lines: Arrow Bowen Pipeline mainline (KP), Nine Mile / SGIC option (NM), Elphinstone Lateral (EL), Saraji Lateral (SL) and Dysart Lateral (DL).

Results

Water crossings for the main line and SGIC are presented in **Table 1** and lateral and header crossings are presented in **Table 2**. Photographs of watercourse crossings are provided in **Plate 1** to **Plate 77**.

Provided mitigation measures are put in place, most watercourses assessed in this report can be crossed using conventional open cut techniques without significant impacts on ecological values. At some crossings, an alternative nearby crossing point could be identified that reduced potential impacts (e.g. existing clearing, less steep banks, smaller channel, less permanent water, fewer large trees). In these instances, the crossing table provides details of the original crossing point and a proposed alternative crossing point. There are also some sites that are presented with more than one alternative crossing point.

Fitzroy River (KP 318.9) is a large watercourse which had a 50 m wide flowing channel in June 2011. While it is feasible to use open cut methods at the proposed crossing, Horizontal Directional Drilling (HDD) is recommended to minimise ecological impacts during construction and reduce rehabilitation requirements. Other significant crossings for which alternative techniques may be considered include crossings of the Isaac River (KP 233.1), Inkerman Creek (KP 428.9), Twelve Mile Creek, (KP 437.5) and Raglan Creek (KP 445.4).

Several watercourse crossing sites contained black ironbox (*Eucalyptus raveretiana*), which is listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and the Queensland *Nature Conservation Act* 1992 (NC Act). At the majority of these watercourses, including Two Mile Creek (KP 348.5), Louisa Creek (KP 356.9) and Deep Creek (KP 372.2), black ironbox can be avoided by utilising existing gaps at an alternative nearby crossing point. At Limestone Creek (KP 370.1), three alternative crossings (with gaps of 20 m or more) were identified at various distances to the south east of the original crossing point. The closest alternate (about 10 m south-west contained large blue gums, while the other alternates (about 460 and 550 m south-west) had less mature vegetation with lower habitat values. At Lion Creek (NM 8.8), four alternative crossings were identified to the west and east of the original crossing, with gaps ranging from 20 to 35 m.

Marine vegetation was recorded at Inkerman Creek (KP 428.9) and Raglan Creek (KP 445.4). Further investigations may be considered to locate alternative upstream crossings without marine vegetation. HDD techniques may also be used to avoid impacts on marine communities.

Waterholes were present at numerous watercourse crossings. Waterholes at Endrick Creek (KP 285.6), Larcom Creek (KP 474.9) and the Isaac River (SL 19.3), and wetlands on the Saraji lateral (south of SL 7.9 and SL 10.8) are likely to be permanent or semi-permanent, based on the presence of aquatic flora and fauna and / or landholder knowledge. Alternative crossing points have been nominated for these watercourses, where possible.

Weeds are prevalent on many watercourse crossings. A weed management plan should be developed to address hygiene, control and monitoring of weed infestations along the

pipeline route.

Evidence of erosion was observed at numerous watercourse crossings. A sediment and erosion control plan should be developed to minimise erosion and sediment loss during construction and promote rapid effective rehabilitation of watercourse crossings. Whenever possible, construction should be undertaken during the dry season. Streambank and gully erosion were particularly severe at the crossings of Eaglefield Creek (KP 28.3) and Carborough Creek (EL 28.3). Investigations into alternative crossing locations may be considered for these watercourses.

The revision SR crossings of some watercourses could not be surveyed, either due to recent alignment changes or access restrictions. These include:

- Isaac River (western deviation to west of KP 171)
- Bora Creek (KP 244.3)
- Gavial Creek (NM 28)
- Bob's Creek / Casuarina Creek (NM 39.5)
- Twelve Mile Creek (KP 437.5)
- Spring Creek (EL 34.6).

Table 1 Descriptions of water crossings along the proposed main alignment (Note: Upstream/ downstream refers to direction of gas flow)

Water course	Stream Order	Survey point	Crossing Method	KP (Rev SR)	Salinity	Seasonality	Stream Flow	Water Condition	In-stream Habitat	Bed Width (m)	EVNT*	Aquatic Vegetation	Aquatic Fauna / Habitat	Bank Type	Bank Slope	Bank Height (m)	Riparian Vegetation	Constraints / Why Alternate Preferred
Suttor Creek	5	CF-54-J	Open cut	KP 12.3	**Rev SR Crossing Point**									Upstream bank				Suitable crossing point. Avoid large trees bearing hollows and stags where possible.
					Fresh	Perennial / Seasonal	Pool	Clear	Shallows, Deep open water, Snags, Standing dead timber	25	Wetland Management Area			Earth	Gentle	2	11.3.25	
														Downstream bank				
														Earth	Gentle	2	11.3.25	
Eaglefield Creek	2	JW-86-S	Open cut	0.4 km W of KP 28.3	**Previous Crossing Point**									Upstream bank				Not a suitable crossing point due to steep eroding stream banks.
					Fresh	Intermittent	Dry			30		Emergent Woody, Fringing Woody		Sandy/ Rocky	Steep	12	11.9.9	
														Downstream bank				
														Sandy/ Rocky	Steep	12	11.9.9	
		JW-85-S		KP 28.3	**Rev SR Crossing Point**									Upstream bank				Approximately 400 m east of original crossing. Steep eroding stream banks.
					Fresh	Intermittent	Dry			50		Emergent Woody, Fringing Woody		Sandy/ Rocky	Steep	12	11.9.9	
														Downstream bank				
														Sandy/ Rocky	Steep	12	11.9.9	
		JW-87-S	Open cut	0.8 km W of KP 28.3	**Potential Alternate Crossing Point**									Upstream bank				Move line approximately 800 m west to a more suitable crossing point. Geotechnical investigations recommended.
					Fresh	Intermittent	Dry			50		Emergent Woody, Fringing Woody		Sandy/ Rocky	Moderate / Gentle	12	11.9.9	
														Downstream bank				
														Sandy/ Rocky	Moderate / Gentle	12	11.9.9	
Isaac River	5	JW_41_J	Open cut	0.2 km SW of KP 50.4	**Previous Crossing Point**									Upstream bank				Large remnant *E. tereticornis* located to north-west.
					Fresh	Intermittent	Pool	Clear	Shallows, Snags, Standing dead timber	25	Wetland Management Area			Earth, Sandy	Gentle	3	11.3.25	
														Downstream bank				
														Earth, Sandy	Moderate	4	11.3.25	
		LV-23-A		KP 50.4	**Rev SR Crossing Point**									Upstream bank				Large remnant *E. tereticornis* with hollows
					Fresh	Intermittent	Run, riffle	Turbid	Shallows, Snags	50	Wetland Management Area			Sandy	Moderate	15	11.3.25	
														Downstream bank				
														Sandy	Moderate	15	11.3.25	
		LV-24-A		50 m SW of KP 50.4	**Potential Alternate Crossing Point**									Upstream bank				Move approximately 60 m south-west to avoid large remnant trees.
					Fresh	Intermittent	Run, riffle	Turbid	Shallows, Snags	50	Wetland Management Area			Sandy	Moderate	10	11.3.25	
														Downstream bank				
														Sandy	Moderate	10	11.3.25	
Twelve Mile Gully	3	CL-76-J	Open cut	2 km W of KP 59.8	**Previous Crossing Point**									Upstream bank				Suitable crossing point. Line moved for non-aquatic reasons (mining tenements,
					Fresh	Intermittent	Dry			5	Wetland Management			Sandy	Steep	1.5	11.3.25	
														Downstream bank				

Water course	Stream Order	Survey point	Crossing Method	KP (Rev SR)	Salinity	Seasonality	Stream Flow	Water Condition	In-stream Habitat	Bed Width (m)	EVNT*	Aquatic Vegetation	Aquatic Fauna / Habitat	Bank Type	Bank Slope	Bank Height (m)	Riparian Vegetation	Constraints / Why Alternate Preferred
											Area			Earth, Sandy	Steep	1.5	11.3.25	EVNT terrestrial flora)
	2	LV-19-A		KP 59.8	**Rev SR Crossing Point**									Upstream bank				EVNT flora (*Desmodium macrocarpum*) growing to south
					Fresh	Intermittent	Pool	Clear	Shallows, Snags	2	Wetland Management Area			Earth	Gentle	1	Non-rem	
														Downstream bank				
														Earth	Gentle	1	Non-rem	
	2	LV-20-A		85 m E of KP 59.8	**Potential Alternate Crossing Point**									Upstream bank				Move 85 m to east to avoid EVNT flora
					Fresh	Intermittent	Pool	Clear	Shallows, Snags	2	Wetland Management Area			Earth	Gentle	1	Non-rem	
														Downstream bank				
														Earth	Gentle	1	Non-rem	
Hat Creek/ Teviot Brook	4	CL-49_S		2.3 km SW of KP 68.0	**Previous Crossing Point**									Upstream bank				Steep eroded cliff on southern bank. Line moved to avoid mining tenements.
					Fresh	Intermittent	Pool	Clear	Shallows, Snags, Rocks	10				Earth/ Sandy	Gentle	3	11.3.25	
														Downstream bank				
														Earth	Cliff	8	11.5.3	
		LV-06-A	Open cut	KP 68.0	**Rev SR Crossing Point**									Upstream bank				Four channels, some with steep bends. Steep banks with some bank erosion.
					Fresh	Intermittent	Run	Clear	Shallows, Snags	10 x 4	Wetland Management Area			Sandy	Steep	6	11.3.25	
														Downstream bank				
														Sandy	Steep	6	11.3.25	
		LV-07-A		100 m W of KP 68.0	**Potential Alternate Crossing Point**									Upstream bank				Move 100 m west. Only one channel, no bank erosion.
					Fresh	Intermittent	Run	Clear	Shallows, Snags	10	Wetland Management Area			Sandy	Steep	6	11.3.25	
														Downstream bank				
														Sandy	Steep	6	11.3.25	
North Creek	4	JW-46-S	Open cut	KP 104.5	**Rev SR Crossing Point**									Upstream bank				Large habitat trees.
					Fresh	Seasonal	Pool	Turbid	Shallows, Deep Open Water, Snags	7	Wetland Management Area			Earth	Moderate	10	11.3.25	
														Downstream bank				
														Earth	Moderate	10	11.3.25	
		JW-47-S		25 m E of KP 104.5	**Potential Alternate Crossing Point**									Upstream bank				Move line 25 m east into existing gap.
					Fresh	Seasonal	Pool	Turbid	Shallows, Deep Open Water, Snags	7	Wetland Management Area			Earth	Moderate	10	11.3.25	
														Downstream bank				
														Earth	Moderate	10	11.3.25	
North Creek (south crossing)	4	CL-25-S	Open cut	KP 108.6	**Rev SR Crossing Point**									Upstream bank				Suitable crossing point.
					Fresh	Seasonal	Run, Riffle	Clear	Shallows	12				Sandy	Moderate	4	11.3.25	
														Downstream bank				
														Sandy	Moderate	4	11.3.25	
North Creek Tributary	2	CL-53-J	Open cut	KP 109.4	**Rev SR Crossing Point**									Upstream bank				Two channels approximately 15-20 m apart. Suitable crossing point. Avoid large trees
					Fresh	Intermittent	Dry			5				Earth	Steep	4	11.3.3	
														Downstream bank				

Water course	Stream Order	Survey point	Crossing Method	KP (Rev SR)	Salinity	Seasonality	Stream Flow	Water Condition	In-stream Habitat	Bed Width (m)	EVNT*	Aquatic Vegetation	Aquatic Fauna / Habitat	Bank Type	Bank Slope	Bank Height (m)	Riparian Vegetation	Constraints / Why Alternate Preferred
														Earth	Steep	4	11.3.3	where possible and utilise existing clearing / thin vegetation.
Isaac River tributary	2	CL-22-S	Open cut	4.7 km W of KP 164	**Previous Crossing Point (no Rev SR Crossing Point as flows into Isaac River to west)**									Upstream bank				Riparian vegetation. Large blue gums. This watercourse does not cross the Rev SR line.
					Fresh	Intermittent	Dry			5		Emergent Woody		Earth	Gentle	0.5	11.3.25/ 11.3.4	
														Downstream bank				
														Earth	Gentle	0.5	11.3.25/ 11.3.4	
		CL-23-S		4.9 km W of KP 164	**Potential Alternate Crossing Point**									Upstream bank				Move line approximately 200 m west to avoid remnant vegetation.
					Fresh	Intermittent	Dry			5		Emergent Woody		Earth	Gentle	0.5	Non-remnant	
														Downstream bank				
														Earth	Gentle	0.5	Non-remnant	
Isaac River	6	CF-28-J		9 km W of KP 171	**Previous Crossing Point**									Upstream bank				Large remnant trees.
					Fresh	Seasonal	Run	Clear	Shallows	30				Earth	Moderate	8	11.3.25	
														Downstream bank				
														Earth	Moderate	8	11.3.25	
			Open cut		**Rev SR Crossing Point**									Upstream bank				Not surveyed as no site access. Line moved to west to avoid mining tenements and cropping land.
					-	-	-	-	-	-								
														Downstream bank				
		AH-33-A		10 km W of KP 171.5	**Potential Alternate Crossing Point**									Upstream bank				Suitable crossing point. Some medium-sized trees.
					Fresh	Seasonal	Pool, run	Clear	Shallows, snags	40				Sandy	Steep	8	11.3.25	
														Downstream bank				
														Sandy	Steep	8	11.3.25	
Stephens Creek / Blackburn Creek	6	CF-26-J	Open cut	10 km W of KP 178.0	**Previous Crossing Point (no Rev SR Crossing Point as flows into Isaac River to west)**									Upstream bank				Suitable crossing point, within existing clearing. Ensure line is well north of EVNT. Line moved south-west to avoid cropping land.
					Fresh	Intermittent	Pool	Clear, Algae	Snags, Shallows	20	*Eucalyptus raveretiana* to south-east; Wetland Management Area			Earth	Steep	10	11.3.2	
														Downstream bank				
														Earth	Gentle	10	11.3.2	
					Rev SR Crossing Point									Upstream bank				Does not cross Rev SR line. Line moved to west to avoid mining tenements and cropping land.
					-	-	-	-	-	-	-							
														Downstream bank				
		AH-43-A		13 km W of KP 181.0	**Potential Alternate Crossing Point**									Upstream bank				Existing 50m gap between large trees. Aligns with fenceline on north side.
					Fresh	Intermittent	Pool	Turbid	Shallows	6				Earth	Steep	14	11.3.25	
														Downstream bank				
														Earth	Steep	14	11.3.25	

Water course	Stream Order	Survey point	Crossing Method	KP (Rev SR)	Salinity	Seasonality	Stream Flow	Water Condition	In-stream Habitat	Bed Width (m)	EVNT*	Aquatic Vegetation	Aquatic Fauna / Habitat	Bank Type	Bank Slope	Bank Height (m)	Riparian Vegetation	Constraints / Why Alternate Preferred
Sandy Gully	2	CF-25-J	Open cut	KP 196.5	**Rev SR Crossing Point**									Upstream bank				Suitable crossing point.
					Fresh	Seasonal	Dry			12				Sandy	Gentle	0.2	HVR	
														Downstream bank				
														Sandy	Gentle	0.2	HVR	
Isaac River	8	CL-20-J	HDD	200 m N of KP 233.1	**Previous Crossing Point (REV SR Crossing Point Not Surveyed as HDD proposed)**									Upstream bank				Large remnant trees. Gully heading north-west.
					Fresh	Seasonal	Pool, Run	Clear	Islands, Shallows, Snags, Rocks	50	Wetland Management Area			Earth	Moderate	6.5	11.3.25	
														Downstream bank				
														Earth	Moderate	6.5	11.3.25	
		CL-21-J		200 m N of KP 233.2	**Potential Alternate Crossing Point**									Upstream bank				Move 50 m east to avoid gully and large trees.
					Fresh	Seasonal	Pool, Run	Clear	Islands, Shallows, Snags, Rocks	50	Wetland Management Area			Earth	Moderate	6.5	11.3.25	
														Downstream bank				
														Earth	Moderate	6.5	11.3.25	
Clarke Creek	7	CL-87-S	Open cut	KP 237.5	**Rev SR Crossing Point**									Upstream bank				Suitable crossing point.
					Fresh	Intermittent	Dry, Pool	Clear	Island, Shallows, Snags	8	Wetland Management Area	Fringing Woody		Earth	Gentle	6	11.3.3	
														Downstream bank				
														Earth	Gentle	6	11.3.3	
Stockyard Creek	4	LV-40-A		KP 238.7	**Rev SR Crossing Point**									Upstream bank				On creek bend.
					Fresh	Seasonal	Pool	Clear	Shallows, Snags	15	Wetland Management Area	Emergent non-woody		Earth	Steep	10	11.3.25	
														Earth	Steep	10	11.3.25	
		LV-41-A		50 m W of KP 238.7	**Potential Alternate Crossing Point**									Upstream bank				Move 50 m west to avoid bend.
					Fresh	Seasonal	Pool	Clear	Shallows, Snags	15	Wetland Management Area	Emergent non-woody		Earth	Steep	10	11.3.25	
														Downstream bank				
														Earth	Steep	10	11.3.25	
Bora Creek	4	JW-24-J	Open cut	0.6 km SW of KP 244.3	**Previous Crossing Point (Rev SR crossing point not surveyed)**									Upstream bank				Suitable crossing point. Avoid large remnant trees and stags.
					Fresh	Intermittent	Pool, Dry	Clear	Shallows, Snags, Standing dead timber	8	Wetland Management Area		Freshwater mussels	Earth	Steep	8	11.3.25	
														Downstream bank				
														Earth	Moderate	8	11.3.25	
Clive Creek	4	LV-42-A	Open cut	KP 248.0	**Rev SR Crossing Point**									Upstream bank				Good crossing point as few large trees. Degraded creek, very weedy, dieback.
					Fresh	Intermittent	Pool	Clear	Shallows, Snags	10	Wetland Management Area			Earth, Sandy	Gentle	9	11.3.25	
														Downstream bank				
														Earth, Sandy	Gentle	9	11.3.25	
Mackenzie River Tributary	2	CL-15-S	Open cut	180 m SW of KP 260.6	**Previous Crossing Point**									Upstream bank				Riparian vegetation, including vine thicket species.
					Fresh	Intermittent	Dry, Pool	Clear	Shallows, Snags, Rocks	5		Emergent Woody		Earth	Gentle	2	11.3.25	
														Downstream bank				
														Earth	Steep	3	11.3.25	

Water course	Stream Order	Survey point	Crossing Method	KP (Rev SR)	Salinity	Seasonality	Stream Flow	Water Condition	In-stream Habitat	Bed Width (m)	EVNT*	Aquatic Vegetation	Aquatic Fauna / Habitat	Bank Type	Bank Slope	Bank Height (m)	Riparian Vegetation	Constraints / Why Alternate Preferred
		CL-16-S		KP 260.6	**Rev SR Crossing Point**									Upstream bank				Move line approximately 180 m north-east to a thinner band of vegetation.
					Fresh	Intermittent	Dry, Pool	Clear	Shallows, Snags, Rocks	5		Emergent Woody		Earth	Moderate	2	11.3.25	
														Downstream bank				
														Earth	Moderate	2	11.3.25	
Pluto Creek	3	CF-24-J	Open cut	KP 274.9	**Rev SR Crossing Point**									Upstream bank				Suitable crossing point.
					Fresh	Seasonal	Pool	Algae	Shallows	8			Fish	Earth			11.3.25	
														Downstream bank				
														Earth			11.3.25	
Apis Creek	5	CF-62-J	Open cut	KP 283.4	**Rev SR Crossing Point**									Upstream bank				Good crossing point. Degraded creek, abundant weeds, evidence of flooding and erosion.
					Fresh	Seasonal	Pool	Clear	Shallows, Snags	10			Fish	Earth	Steep	5	11.3.3	
														Downstream bank				
														Earth	Gentle	6	Non-remnant	
Endrick Creek	4	CF-63-J	Open cut	KP 284.6	**Rev SR Crossing Point**									Upstream bank				Natural waterhole.
					Fresh	Perennial	Pool	Clear	Deep open water, Snags	8		Submerged	Spangled perch	Earth	Moderate	3	11.3.25	
														Downstream bank				
														Earth	Steep	3	11.3.25	
		CF-64-J		80 m N of KP 284.6	**Potential Alternate Crossing Point**									Upstream bank				Move 90 m north to avoid natural waterhole.
					Fresh	Seasonal	Pool	Clear	Shallows	6				Earth	Steep	4	11.3.25	
														Downstream bank				
														Earth	Steep	3	11.3.25	
Endrick Creek Tributary (west)	3	CF-65-J	Open cut	KP 285.6	**Rev SR Crossing Point**									Upstream bank				Suitable crossing point.
					Fresh	Seasonal	Run	Clear, Algae	Shallows, Rocks	3		Emergent Woody		Earth, Rocky	Gentle	2	11.3.25	
														Downstream bank				
														Earth, Rocky	Gentle	2	11.3.25	
Endrick Creek Tributary (east)	3	CF-66-J	Open cut	KP 288.3	**Rev SR Crossing Point**									Upstream bank				Remnant vegetation.
					Fresh	Intermittent	Run	Clear	Shallows, Snags, Standing dead timber	6				Earth	Steep	3	11.3.25	
														Downstream bank				
														Earth	Steep	4	11.3.25	
		CF-67-J		200 m W of KP 288.3	**Potential Alternate Crossing Point**									Upstream bank				Move 200 m west into clearing to avoid remnant vegetation.
					Fresh	Intermittent	Run	Clear	Shallows, Snags, Standing dead timber	6				Earth	Gentle	3	Non-remnant	
														Downstream bank				
														Earth	Gentle	3	Non-remnant	
Develin Creek	4	CL-12-J	Open cut	KP 302.3	**Rev SR Crossing Point**									Upstream bank				Suitable crossing point. Avoid vine thicket to
					Fresh	Intermittent	Riffle	Clear	Shallows,	10				Earth	Steep	6	11.3.25	

Water course	Stream Order	Survey point	Crossing Method	KP (Rev SR)	Salinity	Seasonality	Stream Flow	Water Condition	In-stream Habitat	Bed Width (m)	EVNT*	Aquatic Vegetation	Aquatic Fauna / Habitat	Bank Type	Bank Slope	Bank Height (m)	Riparian Vegetation	Constraints / Why Alternate Preferred
									Snags, Rocks					Downstream bank				south and pool to north.
														Earth	Steep	9	11.3.25	
Fitzroy River	9	CL-09-J	HDD	KP 318.9	**Rev SR Crossing Point**									Upstream bank				Suitable crossing point. Evidence of major flooding.
					Fresh	Perennial	Run	Turbid	Deep open water, Snags, Standing dead timber	100			Wood ducks	Sandy	Moderate	10	11.3.25	
														Downstream bank				
														Sandy	Moderate	20	HVR	
Ten Mile Creek	3	CL-16-J	Open cut	200 m NW of KP 331.5	**Previous Crossing Point**									Upstream bank				High value regrowth (HVR) of endangered vegetation community.
					Fresh	Seasonal	Pool	Clear	Deep open water, Snags	10				Earth	Moderate	4	HVR 11.3.1	
														Downstream bank				
														Earth	Moderate	4	HVR 11.3.1	
		CL-17-J		KP 331.5	**Rev SR Crossing Point**									Upstream bank				Move 200 m south-east to existing clearing to avoid HVR.
					Fresh	Seasonal	Pool	Clear	Deep open water, Snags	10		Floating		Earth	Steep	4	Non-remnant (cleared)	
														Downstream bank				
														Earth	Steep	4	Non-remnant (cleared)	
Eight Mile Creek Tributary	2	CL-13-S	Open cut	KP 335.4	**Rev SR Crossing Point**									Upstream bank				Riparian vegetation, cell grazing paddock.
					Fresh	Intermittent	Pool	Turbid	Shallows, Snags	4		Emergent Woody		Earth	Steep	1	HVR	
														Downstream bank				
														Earth	Steep	1	HVR	
		CL-14-S		300 m N of KP 335.4	**Alternate Crossing Point**									Upstream bank				Move line approximately 300 m north where there is less vegetation and to avoid cell grazing paddock.
					Fresh	Intermittent	Pool	Turbid	Shallows, Snags	4		Emergent Woody		Earth	Steep	1	Non-remnant	
														Downstream bank				
														Earth	Steep	1	Non-remnant	
Two Mile Creek	4	JW-23-J, JW-23a-J to JW-23b-J	Open cut	KP 348.5	**Rev SR Crossing Point**									Upstream bank				Suitable crossing point, but use existing 40 m gap to avoid EVNT.
					Fresh	Intermittent	Pool	Clear	Islands, Deep open water, Snags, Standing dead timber	4	*Eucalyptus raveretiana;* Wetland Management Area			Earth	Gentle	3	11.3.25	
														Downstream bank				
														Earth	Steep	5	11.3.25	
Louisa Creek	4	CF-19-J		400 m E of KP 356.9	**Previous Crossing Point**									Upstream bank				Creek degraded by weeds and erosion. Some large *E. tereticornis* with hollows. Permanent pool.
					Fresh	Permanent	Pool	Clear	Deep open water, Standing dead timber	30	Wetland Management Area	Emergent Non-woody		Earth	Steep	5	Non-remnant (cleared)	
														Downstream bank				
														Earth	Steep	5	Non-	

Water course	Stream Order	Survey point	Crossing Method	KP (Rev SR)	Salinity	Seasonality	Stream Flow	Water Condition	In-stream Habitat	Bed Width (m)	EVNT*	Aquatic Vegetation	Aquatic Fauna / Habitat	Bank Type	Bank Slope	Bank Height (m)	Riparian Vegetation	Constraints / Why Alternate Preferred
																	remnant (cleared)	
		LV-46-A		KP 356.9	**Rev SR Crossing Point**									Upstream bank				400 m W of original crossing. Creek degraded by weeds and fire. Only intermittent flow.
					Fresh	Intermittent	Pool, riffle	Clear	Shallows	10	Wetland Management Area	Floating, Emergent Non-woody		Earth	Gentle	4	Non-remnant (cleared)	
														Downstream bank				
														Earth	Gentle	4	Non-remnant (cleared)	
Limestone Creek	5	CL-10-S to CL-11-S	Open cut	10 m S of KP 370.1	**Rev SR Crossing Point**									Upstream bank				Potential crossing point 10 m south-west of Rev SR line. 20 m gap between *Euc. raveretiana* trees. Large blue gums present.
					Fresh	Seasonal	Run, Rifle	Turbid	Island, Shallows, Snags, Rocks	15	*Eucalyptus raveretiana*			Earth	Moderate	6	11.3.25	
														Downstream bank				
														Earth	Moderate	6	11.3.25	
		CL-08-S		460 m SW of KP 370.1	**Potential Alternate Crossing Point (1)**									Upstream bank				Potential crossing point 460 m south-west into a 25 m gap.
					Fresh	Seasonal	Run, Rifle	Turbid	Island, Shallows, Snags, Rocks	15	*Eucalyptus raveretiana*			Earth	Moderate	6	11.3.25	
														Downstream bank				
														Earth	Steep	6	11.3.25	
		CL-06-S to CL-07-S		550 m SW of KP 370.1	**Potential Alternate Crossing Point (2)**									Upstream bank				Potential crossing point 550 m south-west to a 20 m gap. This option would avoid low-lying country with seeps.
					Fresh	Seasonal	Run, Rifle	Turbid	Island, Shallows, Snags, Rocks	15	*Eucalyptus raveretiana*			Earth	Moderate	6	11.3.25	
														Downstream bank				
														Earth	Moderate	6	11.3.25	
Deep Creek	3	JW-17-J	Open cut	KP 372.2	**Rev SR Crossing Point**									Upstream bank				*Eucalyptus raveretiana* present.
					Fresh	Intermittent	Run	Clear	Islands, Shallows, Snags, Rocks, Standing dead timber	5	*Eucalyptus raveretiana*			Earth	Steep	3.5	11.3.25	
														Downstream bank				
														Earth	Moderate	2.5	11.3.25	
		KW-18-J to JW-19-J		50 m E of KP 372.2	**Potential Alternate Crossing Point (1)**									Upstream bank				Move 50 m east into 18 m existing clearing to avoid *Eucalyptus raveretiana*.
					Fresh	Intermittent	Run	Clear	Shallows, Snags	5	*Eucalyptus raveretiana*			Earth	Moderate	3	11.3.25	
														Downstream bank				
														Earth	Steep	4	11.3.25	
		LV-55-A		370 m W of KP 372.2	**Potential Alternate Crossing Point (2)**									Upstream bank				Move 370 m west to use existing 35 m gap between *Eucalyptus raveretiana*
					Fresh	Dry			Snags, Rocks	5	*Eucalyptus raveretiana*			Earth	Gentle	3	11.3.25	
														Downstream bank				
														Earth	Steep	5	11.3.25	
Black Gin Creek	3	AH-61-A	Open cut	NM 2.1	**Rev SR Crossing Point**									Upstream bank				Windmill. Contour banks to south-east of creek.
					Fresh	Intermittent	Dry		Snags	4				Earth	Steep	6	HVR (11.3.25)	

Water course	Stream Order	Survey point	Crossing Method	KP (Rev SR)	Salinity	Seasonality	Stream Flow	Water Condition	In-stream Habitat	Bed Width (m)	EVNT*	Aquatic Vegetation	Aquatic Fauna / Habitat	Bank Type	Bank Slope	Bank Height (m)	Riparian Vegetation	Constraints / Why Alternate Preferred
														Downstream bank				
														Earth	Moderate	6	HVR (11.3.25)	
		AH-62-A		200 m NE of NM 2.1	**Potential Alternate Crossing Point**									Upstream bank				Move 160 m north-east (downstream) to avoid windmill and contour banks.
					Fresh	Intermittent	Dry		Snags	6				Earth	Steep	5	HVR (11.3.25)	
														Downstream bank				
														Earth	Steep	5	HVR (11.3.25)	
Lion Creek	4	AH-63-A	Open cut	NM 8.8	**Rev SR Crossing Point**									Upstream bank				*Eucalyptus raveretiana* present.
					Fresh	Intermittent	Dry		Snags	15	*Eucalyptus raveretiana*; Wetland Management Area			Earth	Steep	4	11.3.25	
														Downstream bank				
														Earth	Steep	4	11.3.25	
		AH-68-A to AH-69-A		90 m E of NM 8.8	**Potential Alternate Crossing Point (East 1)**									Upstream bank				25 m gap approximately 90 m east of the original crossing.
					Fresh	Intermittent	Dry		Snags	15	*Eucalyptus raveretiana*; Wetland Management Area			Earth	Steep	4	11.3.25	
														Downstream bank				
														Earth	Steep	4	11.3.25	
		AH-74-A to AH-75-A		560 m E of NM 8.8	**Potential Alternate Crossing Point (East 2)**									Upstream bank				35 m gap approximately 560 m east of the original crossing.
					Fresh	Intermittent	Dry		Snags	15	*Eucalyptus raveretiana*; Wetland Management Area			Earth	Steep	4	11.3.25	
														Downstream bank				
														Earth	Steep	4	11.3.25	
		AH-66-A to AH-67-A		180 m W of NM 8.8	**Potential Alternate Crossing Point (West 1)**									Upstream bank				20 m gap approximately 180 m west of the original crossing.
					Fresh	Intermittent	Dry		Snags	15	*Eucalyptus raveretiana*; Wetland Management Area			Earth	Steep	4	11.3.25	
														Downstream bank				
														Earth	Steep	4	11.3.25	
		AH-64-A to AH-65-A		360 m W of NM 8.8	**Potential Alternate Crossing Point (West 2)**									Upstream bank				20 m gap approximately 360 m west of the original crossing.
					Fresh	Intermittent	Dry		Snags	15	*Eucalyptus raveretiana*; Wetland Management Area			Earth	Steep	4	11.3.25	
														Downstream bank				
														Earth	Steep	4	11.3.25	
Gavial Creek	3	JW-10-J	Open cut	9.3km south of NM 28	**Previous Crossing Point (Rev SR crossing point not surveyed)**									Upstream bank				Suitable crossing point. Avoid large remnant trees where possible.
					Fresh	Intermittent	Pool, Run, Riffle, Cascade	Clear	Shallows, Snags, Rocks	5				Earth	Moderate	4	11.3.25	
														Downstream bank				
														Earth	Moderate	4	11.3.25	
Bob's Creek / Casuarina Creek	4	JW-08-J	Open cut	2km SW of NM 39.5	**Previous Crossing Point (Rev SR crossing point not surveyed)**									Upstream bank				Suitable crossing point. Avoid large remnant trees where possible.
					Fresh	Intermittent	Pool, Run,	Clear	Shallows, Rocks,	7		Submerged		Earth	Steep	8	11.3.25	
														Downstream bank				

Water course	Stream Order	Survey point	Crossing Method	KP (Rev SR)	Salinity	Seasonality	Stream Flow	Water Condition	In-stream Habitat	Bed Width (m)	EVNT*	Aquatic Vegetation	Aquatic Fauna / Habitat	Bank Type	Bank Slope	Bank Height (m)	Riparian Vegetation	Constraints / Why Alternate Preferred
							Cascade		Standing dead timber					Earth	Moderate	8	11.3.25	
Oakey Creek	4	JW-11-J	Open cut	KP 418.6	**Rev SR Crossing Point**									Upstream bank				Suitable crossing point.
					Fresh	Intermittent	Run, Riffle	Clear, Algae	Shallows	3		Submerged	Rainbow Fish and Spangled Perch	Earth	Moderate	4	11.3.25	
														Downstream bank				
														Earth	Moderate	3	11.3.25	
Inkerman Creek	5	CL-08-J	HDD	KP 428.9	**Rev SR Crossing Point**									Upstream bank				Tidal, mangroves. Possibly avoid marine vegetation by moving alignment 2.5 km to west, but requires further survey.
					Saline	Perennial	Run	Turbid	Mud flats, Shallows, Snags, Rocks, Standing dead timber	20	Marine vegetation, Wetland Management Area	Emergent Woody, Emergent Non-woody	Some fish, waterbirds, oysters, crab holes, mudskippers	Earth	Gentle	3	11.1.4	
														Downstream bank				
														Earth	Steep	3	11.1.4	
Twelve Mile Creek	4	CF-10-J	HDD	300 m S of KP 437.5	**Previous Crossing Point (Rev SR crossing point not surveyed)**									Upstream bank				Suitable crossing point, but deep open water present.
					Fresh	Perennial / Seasonal	Pool	Clear	Deep open water, Shallows	15	Wetland Management Area	Floating, Submerged, Emergent Non-woody	Fish	Earth	Gentle	1.5	HVR-OC	
														Downstream bank				
														Earth	Gentle	0.5	HVR-OC	
Horrigan Creek	4	CF-07-J	Open cut	KP 444.3	**Rev SR Crossing Point**									Upstream bank				Suitable crossing point, although ensure line crosses at right angle. Evidence of erosion and flooding.
					Fresh	Perennial / Seasonal	Pool	Clear, Algae	Shallows	20-25		Floating, Emergent Woody, Emergent Non-woody	Fish	Earth	Gentle	0.5	HVR	
														Downstream bank				
														Earth	Gentle	0.5	HVR	
Raglan Creek	6	JW-04-J	HDD	KP 445.4	**Rev SR Crossing Point**									Upstream bank				Mangroves east of creek. Saltwater couch / saltmarsh to west of creek.
					Brackish	Perennial	Run	Turbid		35-75	Marine vegetation, Wetland Management Area	Emergent Woody		Earth	Gentle	1.5	HVR	
														Downstream bank				
														Earth	Gentle	0.5	11.1.4	
		JW-05-J		40 m NE of KP 445.4	**Potential Alternate Crossing Point (1)**									Upstream bank				Potential crossing point 40 m north-east into existing clearing. Further studies are required to minimise impacts to WMA.
					Brackish	Perennial	Run	Turbid		35-75	Marine vegetation, Wetland Management Area	Emergent Woody		Earth	Gentle	1.5	Non-remnant (cleared)	
														Downstream bank				
														Earth	Gentle	0.5	11.1.4	
		JW-04-S		250 m SW of KP 445.4	**Potential Alternate Crossing Point (2)**									Upstream bank				Potential crossing point 250 m south-west to reduce area of marine vegetation along line. Further studies are required to minimise impacts to WMA.
					Brackish	Perennial	Run	Turbid		35-75	Marine vegetation, Wetland Management Area	Emergent Woody		Earth	Gentle	1.5	Non-remnant (cleared)	
														Downstream bank				
														Earth	Gentle	0.5	11.1.4	

Water course	Stream Order	Survey point	Crossing Method	KP (Rev SR)	Salinity	Seasonality	Stream Flow	Water Condition	In-stream Habitat	Bed Width (m)	EVNT*	Aquatic Vegetation	Aquatic Fauna / Habitat	Bank Type	Bank Slope	Bank Height (m)	Riparian Vegetation	Constraints / Why Alternate Preferred
Larcom Creek	3	CL-01-S	Open cut	KP 474.9	**Rev SR Crossing Point**									Upstream bank				Large permanent waterhole.
					Fresh	Perennial	Pool	Clear	Shallows, Deep Open Water, Snags	30		Floating, Emergent Woody, Emergent Non-woody		Earth	Moderate	5	HVR	
														Downstream bank				
														Earth	Gentle	4	HVR	
		CL-03-S		120 m N of KP 474.9	**Potential Alternate Crossing Point (1)**									Upstream bank				Potential crossing point 120 m to north (just upstream of permanent waterhole).
					Fresh	Seasonal	Run	Clear	Shallows, Snags	4		Fringing Woody, Emergent Woody		Earth	Gentle	4	HVR	
														Downstream bank				
														Earth	Gentle	4	HVR	
		CL-02-S		300 m NE of KP 474.9	**Potential Alternate Crossing Point (2)**									Upstream bank				Potential crossing point 300 m to north-east (well upstream of permanent waterhole).
					Fresh	Intermittent	Run	Clear	Shallows, Snags	4		Fringing Woody, Emergent Woody		Earth	Gentle	4	HVR	
														Downstream bank				
														Earth	Gentle	4	HVR	

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Table 2 Descriptions of water crossings along the proposed lateral and header lines (Note: Upstream / downstream refers to direction of gas flow)

Elphinstone Lateral

Water course	Stream order	Waypoint	KP (Rev SR)	Crossing method	Salinity	Seasonality	Stream Flow	Water Condition	Instream Habitat	Bed width (m)	EVNT*	Aquatic vegetation	Aquatic fauna/ habitat	Bank type	Bank slope	Bank height (m)	Riparian vegetation	Constraints / why alternate preferred
Walker Creek	3	JW-38-J	EL 8.3	Open cut	**Rev SR Crossing Point**									**Upstream bank**				Suitable crossing point. Stay south of large *E. tereticornis* habitat trees, as well as gully of tributary stream to the north-east.
					Fresh	Seasonal	Dry			8	Wetland Management Area			Sandy	Moderate	4	11.3.25	
														Downstream bank				
														Sandy	Moderate	4	11.3.25	
Walker Creek	3	JW-39-J	EL 11.8	Open cut	**Rev SR Crossing Point**									**Upstream bank**				Suitable crossing point. Severe bank erosion.
					Fresh	Seasonal	Dry, Pool	Clear	Snags	10	Wetland Management Area			Sandy	Moderate	4	11.3.25	
														Downstream bank				
														Sandy	Moderate	4	11.3.25	
Carborough Creek	4	CL-75-S	EL 28.3	Open cut	**Rev SR Crossing Point**									**Upstream bank**				Crossing near sharp bend and small sandstone cliff. Extensive gully erosion around creek. Further geotechnical and ecological investigation recommended.
					Fresh	Intermittent	Pool	Clear	Shallows, Snags, Rocks	20		Fringing		Earth, Sandy, Rocky	Steep, Cliff	8	11.3.25	
														Downstream bank				
														Earth, Sandy	Gentle	5	11.3.25	
Spring Creek	2	JW-35-J	100 m E of EL 34.6	Open cut	**Previous Crossing Point (Rev SR crossing point not surveyed)**									**Upstream bank**				Suitable crossing point. Use existing cleared area and avoid large trees.
					Fresh	Intermittent	Dry			10				Sandy	Gentle	0.015	11.3.25	
														Downstream bank				
														Sandy	Gentle	0.5	11.3.25	
Thirty Mile Creek	2	JW-36-J	70 m E of EL 36.9	Open cut	**Previous Crossing Point**									**Upstream bank**				Large remnant trees.
					Fresh	Intermittent	Dry			15				Sandy	Gentle	0.3	11.3.25b	
														Downstream bank				
														Sandy	Gentle	0.3	11.3.25b	
		JW-37-J	EL 36.9		**Rev SR Crossing Point**									**Upstream bank**				Move 70 m west to avoid remnant vegetation.
					Fresh	Intermittent	Dry			15				Sandy	Gentle	0.3	Non-remnant (cleared)	
														Downstream bank				
														Sandy	Gentle	0.3	Non-remnant (cleared)	

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Saraji Lateral

Water course	Stream order	Waypoint	KP (Rev SR)	Crossing method	Salinity	Seasonality	Stream Flow	Water Condition	Instream Habitat	Bed width (m)	EVNT*	Aquatic vegetation	Aquatic fauna/ habitat	Bank type	Bank slope	Bank height (m)	Riparian vegetation	Constraints / why alternate preferred
Ripstone Creek	3	CL-71-J	SL 6.5	Open cut	**Rev SR Crossing Point**									**Upstream bank**				Suitable crossing point. Avoid large trees with hollows.
					Fresh	Intermittent	Pool	Clear	Shallows, Snags	7				Earth, Sandy	Steep	5	11.3.25	
														Downstream bank				
														Earth, Sandy	Steep	5	11.3.25	
Unnamed Wetland, near Ripstone Creek	N/ A	CL-70-J	380 m S of SL 7.9	N/ A	**Previous Crossing Point**									**Upstream bank**				Natural deep waterhole.
					Fresh	Perennial	Pool	Clear	Deep open water, Snags, Standing dead timber	100	Cotton pygmy goose (*Nettapus coromandelianus*); Wetland Management Area	Submerged, Floating, Emergent Woody, Emergent Non-woody	Flock of cotton pygmy geese, abundant other birdlife, freshwater turtles	Earth	Gentle	1	11.3.27b / 11.3.25	
														Downstream bank				
														Earth	Gentle	1	11.3.27b	
			SL 7.9		**Rev SR Crossing Point**									**Upstream bank**				Move 380 m north to avoid natural waterhole and remnant vegetation.
					Woodland									Non-remnant (cleared)				
														Downstream bank				
														Non-remnant (cleared)				
Unnamed Wetland, near Ripstone Creek	N/ A	CL-35-J	850 m SE of SL 10.8	N/ A	**Previous Crossing Point**									**Upstream bank**				Wooded Swamp.
					Fresh	Seasonal	Pool	Clear	Shallows, Snags		Wetland Protection Area	Emergent Woody, Emergent Non-Woody	Abundant birdlife	N/ A			11.3.27b	
														Downstream bank				
														N/ A			11.3.27b	
		CL-72-J	SL 10.8		**Rev SR Crossing Point**									**Upstream bank**				Move 850 m north-west to avoid swamp and wetland vegetation.
					Woodland									11.5.3				
														Downstream bank				
														11.5.3				
Isaac River	6	CL-28-J	SL 19.3	Open cut	**Rev SR Crossing Point**									**Upstream bank**				Natural waterhole. Large trees and stags
					Fresh	Seasonal	Pool	Clear	Shallows, Snags	70	Wetland Management Area			Earth, Sandy	Moderate	6	11.3.25	
														Downstream bank				
														Earth, Sandy	Moderate	8	11.3.25	
		CL-29-J	120 m SE of SL 19.3		**Potential Alternate Crossing Point**									**Upstream bank**				Move 120 m south-east (downstream) to avoid natural waterhole. Fewer large trees. Avoid large trees and stags
					Fresh	Intermittent	Pool	Clear	Shallows, Snags	70	Wetland Management Area			Earth	Moderate	6	11.3.25	
														Downstream bank				
														Earth, Sandy	Moderate	8	11.3.25	

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Dysart Lateral

Water course	Stream order	Waypoint	KP (Rev SR)	Crossing method	Salinity	Seasonality	Stream Flow	Water Condition	Instream Habitat	Bed width (m)	EVNT*	Aquatic vegetation	Aquatic fauna/ habitat	Bank type	Bank slope	Bank height (m)	Riparian vegetation	Constraints / why alternate preferred
Blackburn Creek	6	CF-46-J	90m S of DL 17.1	Open cut	**Previous Crossing Point (Rev SR crossing point not surveyed)**									**Upstream bank**				Suitable crossing point. Disturbed creek, weedy, evidence of flooding. Road parallel and to the north. Avoid large trees if possible.
					Fresh	Seasonal	Pool	Clear	Shallows, Snags	7	Wetland Management Area			Earth	Steep	10	11.3.25	
														Downstream bank				
														Earth	Steep	10	11.3.25	

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HVR: High Value Regrowth (as mapped by DERM). WPA: Wetland Protection Area. WMA: Wetland Management Area.

Watercourse Photographs

Photographs of crossing points on the main alignment are presented in Plates 1 to 63, while Plates 64 to 77 illustrate lateral and header crossings.

Plate 1: Suttor Creek – Rev SR Crossing (KP 12.3)

Plate 2: Eaglefield Creek – Previous Crossing (0.4 km West of KP 28.3)

Plate 3: Eaglefield Creek – Rev SR Crossing (KP 28.3)

Plate 4: Eaglefield Creek – Alternate Crossing (0.8 km west of KP 28.3)

Plate 5: Isaac River– Rev SR Crossing (KP 50.4)

Plate 6: Twelve Mile Gully– Rev SR Crossing (KP 59.8)

Plate 7: Hat Creek/Teviot Brook – Previous Crossing (2.5 km west of KP 69.4)

Plate 8: Hat Creek/Teviot Brook – Rev SR Crossing (KP 68.0)

Plate 9: Hat Creek/Teviot Brook Creek – Alternate Crossing (100 m west of KP 68.0)

Plate 10: North Creek – Rev SR Crossing (KP 104.5)

Plate 11: North Creek – Alternate Crossing (25 m east of KP 104.5)

Plate 12: North Creek (south crossing) – Rev SR Crossing (KP 108.6)

Plate 13: North Creek Tributary – Rev SR Crossing (KP 109.4)

Plate 14: Isaac River Tributary– Rev SR Crossing (4.7 km west of KP 164)

Plate 15: Isaac River – Previous Crossing (9 km west of KP 171)

Plate 16: Isaac River– Alternate Crossing (10 km west of KP 171.5)

Plate 17: Stephens Creek / Blackburn Creek – Previous Crossing (10 km west of KP 178)

Plate 18: Stephens Creek / Blackburn Creek – Alternate Crossing (13 km west of KP 181)

Plate 19: Sandy Gully– Rev SR Crossing (KP 196.5)

Plate 20: Isaac River – Previous Crossing (200 m north of KP 233.1)

Plate 21: Clarke Creek – Rev SR Crossing (KP 237.5)

Plate 22: Stockyard Creek – Rev SR Crossing (KP 238.7)

Plate 23: Stockyard Creek – Alternate Crossing (50 m west of KP 238.7)

Plate 24: Bora Creek – Previous Crossing (0.6 km south-west of KP 244.3)

Plate 25: Clive Creek – Rev SR Crossing (KP 248)

Plate 26: Mackenzie River Tributary – Previous Crossing (180 m south-west of KP 260.6)

Plate 27: Mackenzie River Tributary – Rev SR Crossing (KP 260.6)

Plate 28: Pluto Creek – Rev SR Crossing (KP 274.9)

Plate 29: Apis Creek – Rev SR Crossing (KP 283.4)

Plate 30: Endrick Creek – Rev SR Crossing (KP 284.6)

Plate 31: Endrick Creek – Alternate Crossing (80 m North of KP 284.6)

Plate 32: Endrick Creek tributary (west) – Rev SR Crossing (KP 285.6)

Plate 33: Endrick Creek tributary(east) – Rev SR Crossing (KP 288.3)

Plate 34: Endrick Creek tributary (east) – Alternate Crossing (200m west of KP 288.3)

Plate 35: Develin Creek – Rev SR Crossing (KP 302.3)

Plate 36: Fitzroy River – Rev SR Crossing (KP 318.9)

Plate 37: Ten Mile Creek – Previous Crossing (200m north-west of KP 331.5)

Plate 38: Ten Mile Creek – Rev SR Crossing (KP 331.5)

Plate 39: Eight Mile Creek Tributary – Rev SR Crossing (KP 335.4)

Plate 40: Eight Mile Creek Tributary – Alternate Crossing (300m north of KP 335.4)

Plate 41: Two Mile Creek – Rev SR Crossing (KP 348.5)

Plate 42: Louisa Creek – Previous Crossing (400 m East of KP 356.9)

Plate 43: Louisa Creek – Rev SR Crossing (KP 356.9)

Plate 44: Limestone Creek – Rev SR Crossing (10 m south of KP 370.3)

Plate 45: Limestone Creek – Alternate Crossing (1) (460 m south-west of KP 370.1)

Plate 46: Limestone Creek – Alternate Crossing (2) (550 m south-west of KP 370.1)

Plate 47: Deep Creek – Rev SR Crossing (KP 372.2)

Plate 48: Deep Creek – Alternate Crossing (1) (50 m east of KP 372.2)

Plate 49: Deep Creek – Alternate Crossing (2) (370 m west of KP 372.2)

Plate 50: Black Gin Creek – Rev SR Crossing (NM 2.1)

Plate 51: Black Gin Creek – Alternate Crossing (200 m north-east of NM 2.1)

Plate 52: Lion Creek – Rev SR Crossing (NM 8.8)

Plate 53: Gavial Creek – Previous Crossing (9.3km south of NM 28)

Plate 54: Bob's / Casuarina Creek – Previous Crossing (2km SW of NM 39.5)

Plate 55: Oakey Creek – Rev SR Crossing (KP 418.6)

Plate 56: Inkerman Creek – Rev SR Crossing (KP 428.9)

Plate 57: Twelve Mile Creek – Previous Crossing (300m south of KP 437.5)

Plate 58: Horrigan Creek – Rev SR Crossing (KP 444.3)

Plate 59: Raglan Creek – Rev SR Crossing (KP 445.4)

Plate 60: Raglan Creek – Alternate Crossing (1) (40m north-east of KP 445.4)

Plate 61: Raglan Creek – Alternate Crossing (2) (250 m south-west of KP 445.4)

Plate 62: Larcom Creek – Rev SR Crossing (KP 474.9)

Plate 63: Larcom Creek – Alternate Crossing (2) (300 m north-east of KP 474.9)

Plate 64: Walker Creek – Rev SR Crossing (EL 8.3)

Plate 65: Walker Creek – Rev SR Crossing (EL 11.8)

Plate 66: Carborough Creek – Rev SR Crossing (EL 28.3)

Plate 67: Spring Creek – Previous Crossing (100 m east of EL 34.6)

Plate 68: Thirty Mile Creek – Previous Crossing (70 m east of EL 36.9)

Plate 69: Thirty Mile Creek – Rev SR Crossing (EL 36.9)

Plate 70: Ripstone Creek – Rev SR Crossing (SL 6.5)

Plate 71: Unnamed wetland near Ripstone Creek (Vermont Park) – Previous Crossing (380 m south of SL 7.9)

Plate 72: Unnamed wetland near Ripstone Creek (Vermont Park) – Rev SR Crossing (SL 7.9)

Plate 73: Unnamed wetland (Vermont Park) – Previous Crossing (850 m SE of SL 10.8)

Plate 74: Woodland (Vermont Park) – Rev SR Crossing (SL 10.8)

Plate 75: Isaac River – Rev SR Crossing (SL 19.3)

Plate 76: Isaac River – Alternate Crossing (120m south-east of SL 19.3)

Plate 77: Blackburn Creek – Previous Crossing (90m south of DL17.1)

Revision History

Revision number	Revision date	Details	Prepared by	Reviewed by	Approved by
00	04/10/2012	Draft - Watercourse Crossing Information for Arrow Bowen Pipeline Rev SR	Con Lokkers Principal Scientist	Alan House Principal Scientist	Scott Hetherington Regional Manager
01	19/10/12	Draft - Arrow review	Carissa Free, Senior Scientist	Con Lokkers Principal Scientist	Alan House Principal Scientist
00	16/11/12	Final - Watercourse Crossing Information for Arrow Bowen Pipeline Rev SR -	Carissa Free, Senior Scientist	Con Lokkers Principal Scientist	Alan House Principal Scientist

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