



## **Appendix I Waterway Assessments**

## Waterway and Wetland Assessment:

### Assessment Type and Methodology

#### *Waterways*

Waterways and drainage features were walked and captured by GPS. Photo points and aquatic features were noted at certain points along and near the crossing points. Additional crossing sections were noted that were not mapped as fisheries waterways but still would meet the definition under the Queensland Department of Agriculture and Fisheries (DAF) definition as exhibiting at least one of the following attributes:

- Defined bed and banks – The bed and banks need to be continuous upstream and downstream of the site rather than isolated and broken sections of a depression;
- An extended, if non-permanent, period of flow – Flow must continue beyond the duration of a rain event and have some reliability attached to rainfall. There is a need to distinguish between channels that funnel immediate localised rainfall, and waterways where flow has arisen from an upstream catchment;
- Flow adequacy – The flow needs to be sufficient to sustain basic ecological processes and habitats, and to maintain biodiversity within or across the feature. The adequacy of the flow depends on the ecological function of the channel e.g., waterways that connect to fish habitat like a wetland or waterhole may only need infrequent and short duration flows to provide connectivity for fish; and
- Fish habitat at, or upstream of, the site – Most instream features provide habitat for fish under adequate flow conditions or, in the case of pools, during dry periods. Therefore, it is important to have some knowledge of the fish species for the site and their habitat use, particularly in headwater streams. Periodic connectivity to upstream and off stream fish habitats are also considered fish habitat.

Assessment of thirty-seven (37) waterway locations within the Project area were conducted using the four criteria above along with any other distinguishable features. Waterway assessment locations are shown in Figure 1.

#### *Wetlands*

The Queensland Wetland Definition and Delineation Guideline Part A: A guide to existing wetland definitions and the application of the Queensland Wetlands Program definition is used to identify whether a site should be considered wetland according to the definition. The Guideline provides a four-step process for applying the Program's Wetland Definition. This process involves:

- Knowing and understanding the definition;
- Planning the investigation of a potential features;
- Conducting the investigation and recording information; and
- Applying the wetland decision tree.

Four factors are considered in defining what is and is not a wetland; hydrology, flora and fauna, soils, and non-biotic features. In order to be considered a wetland under the definition the water body must meet criteria for the hydrology factor and at least one of the other factors.

The Aquatic Biodiversity Assessment Mapping Method (AquaBAMM) is a decision support tool that is predominantly used to compare sites within a catchment or geographic area using four measure categories – low, medium, high or very high. Assessment is carried out using a mix of diagnostic assessment (field surveys, broadscale mapping, etc.) and

expert opinion. An assessment was carried out against key criterion using values identified through site specific surveys and review of publicly available information. Based on the data and interpretation from experienced scientists a measurement of low, medium, high and very high has been attributed for each of the criteria. An overall assessment has been provided using an average of all of the criteria.

Refer to Appendix H of the Preliminary Documentation for survey locations.

### **Waterway Overview**

A number of mapped waterways intercept the Project area (refer to Figure 1), including the Serpentine Lagoon wetland. These waterways were investigated as part of the ecology surveys and are described with photos provided in Table 3 below.

### **Waterway and Wetland Crossings**

Open excavation will be used for waterway crossings. Waterway and wetland crossing works will be scheduled during the drier periods but temporary water diversion may still be required, and water will have to be pumped out of the trench. Reno mattresses are to be installed to protect the pipe, reinstate the natural surface over the excavated and backfilled pipe trench, handle higher water velocities and scour protection along water bodies.

The external water pipeline will be crossing waterbodies along the following chainages:

- Waterway 5 (WW5) – Between CH 3770 and CH 3800 – Refer to drawing 2372 in Appendix C of the Preliminary Documentation.
- Waterway 6 (WW6) – Between CH 6020 and CH 6100 – Refer to drawing 2373 in Appendix C of the Preliminary Documentation.
- Waterway Y (WWY) and Waterway 7 (WW7) – Between CH 6200 and CH 6320 – Refer to drawing 2374 in Appendix C of the Preliminary Documentation.
- Waterway X (WWX) – Between CH 8560 and CH 8680 – Refer to drawing 2375 in Appendix C of the Preliminary Documentation.
- Waterway 2 (WW2) – Between CH 8920 and CH 9020 – Refer to drawing 2376 in Appendix C of the Preliminary Documentation.
- Waterway U (WWU) – Between CH 10480 and CH 10580 – Refer to drawing 2377 in Appendix C of the Preliminary Documentation.
- Waterway 4 (WW4) and Waterway 13 (WW13) – Between CH 12280 and CH 12340 – Refer to drawing 2378 in Appendix C of the Preliminary Documentation.

See Figure 1 and Table 3 for locations, descriptions and photos of these waterways.

### Wetland Construction Methods

Open trenching of Serpentine Lagoon is proposed as illustrated by the following drawings:

- Drawing 2310 in Appendix C of the Preliminary Documentation;
- Drawing 2360 in Appendix C of the Preliminary Documentation; and
- Drawing 2372 in Appendix C of the Preliminary Documentation.

The CEMP includes further measures regarding construction in the Serpentine Lagoon, refer to Appendix N of the Preliminary Documentation.

The construction corridor across Serpentine Lagoon will be from the fence line to the headwall along Woodstock Giru Road. Two boreholes were drilled, one on each side of the wetland in the verge of Woodstock Giru Rd, i.e., BH107 and

BH108. Firmer stronger clay to 2 m depth over hard residual borderline sandy clay / clayey sand to depths of 7 m and 5.2 m respectively were encountered.

A Fauna and Flora spotter will inspect the area to identify any habitat of concern and recommend mitigation measures to be undertaken to minimise the ecological impact. The pipeline will have a minimum of 1m cover under the bed.

The pipeline embedment material will be wrapped in geotextile material, with the pipeline protected against flowing water and erosion by the inclusion of a reno mattress of 300 mm thickness, anchored into the soil at a minimum of 1.5 m. A 300 mm thick overlay of native topsoil will be spread over the reno mattress to allow natural establishment of the wetland. No bends will be installed under the crossing to avoid construction of concrete thrust and anchor blocks.

Construction vehicle movement Right of Way (ROW) will be limited, and all waste and spoil will be discarded away from the wetland. The disturbance level will be kept to a minimum with construction ROW limited between the property fence line to the road.

#### ROW clearance and operation:

The following will be employed in the ROW:

- Limit the reno mattress to the area as shown on the design drawings (see drawings 2360 and 2372 to 2378 in Appendix C of the Preliminary Documentation);
- Limit construction equipment operating in wetland areas to that needed to clear the construction ROW, dig the trench, install the pipeline, backfill the trench, and restore the construction ROW;
- Cut vegetation just above ground level, leaving existing root systems in place, and remove cuts from the wetland for disposal;
- Do not use rock or soil imported from outside the wetland, other than that needed for the embedment material and reno mattress construction;
- If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, use low-ground-weight construction equipment, or operate normal equipment on prefabricated equipment mats, or terra mats;
- Do not cut trees outside of the approved construction work area to obtain timber for riprap or equipment mats;
- Remove all project-related material used to support equipment on the construction ROW upon completion of construction;
- Return all wetland banks to preconstruction contours or to a stable angle of repose as approved by the geotechnical engineer.

#### Temporary Sediment Control:

The following temporary sediment control measures will be employed:

- Install sediment barriers across the entire construction ROW at all wetland crossings where necessary to prevent sediment flow into the wetland. Removable sediment barriers can be removed during actual construction, but must be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent; and
- Where wetlands are adjacent to the construction ROW and the ROW slopes toward the wetland, install sediment barriers along the edge of the ROW as necessary to contain spoil and prevent sediment flow into the wetland. These sediment barriers should be removed during the ROW clean-up following pipeline installation.

#### Trench Dewatering:

Temporary groundwater monitoring bores were installed to 6m depth, with respective groundwater depths measured at 4.91 m and 5.18 m. With Serpentine Lagoon and other waterway works scheduled to be constructed during the dry season, groundwater pumping is not anticipated. The following measures will be completed, if required:

- If required, any flowing water will be collected in temporary berms and diverted around the construction area.
- Dewater the trench (either on or off the construction ROW) in a manner that does not cause erosion and does not result in heavily silt laden water flowing into any wetland. Remove the dewatering structures as soon as possible after the completion of dewatering activities.

**Restoration:**

Soil removed from the waterway should be used to backfill and recreate the natural surface of the waterway to utilise any seed bank within the soil to aid in rehabilitation. Soil preparation and testing is recommended to ensure optimal conditions for vegetation establishment and reduction of erosion.

There are multiple restoration techniques for stabilising waterway beds and banks, with the optimal method being dependant on the slope of the bank, type of waterway and location of waterway bends of the waterway at the rehabilitation site.

Along waterways with gentle slopes, stabilisation of the bed and banks is likely to be most appropriate with plantings of grasses and wetland sedges (e.g., see WW7 in Table 3). However, the planting of woody shrubs and trees are also important for the reduction of lateral flows (Witheridge, 2017). Early restoration and revegetation are important for avoiding substantial erosion with the onset of the wet season.

Along waterways with steeper slopes, jute erosion control mats (mesh) and coir or jute geo logs may be required to aid in the stabilisation of the bank and toe, particularly where the use of rocks is not appropriate. The mesh can be anchored using rocks and woody debris.

The use of rocks and/or woody debris with planted vegetation may be appropriate along waterway banks with clay beds (Witheridge, 2017; 2021), whereas stabilisation using vegetation alone may be more appropriate along waterways with sand and gravel beds. In situations where only vegetation is to be used, stiff grasses and sedges are recommended for toe stabilisation, so that water flow will be withstood (Witheridge, 2017).

Restoration of all waterways should be completed before the onset of the wet season. Flora species recorded in waterways in the Project area that could be used for the revegetation of banks and beds, where necessary, are listed in Table 1 below.

**Table 1 Flora species recorded in waterways within the Project area**

Classification	Species Name	Common Name
Cyperus	<i>Cyperus gracilis</i>	Slender sedge
	<i>Cyperus difformis</i>	Variable flat sedge
Eleocharis spp. (DES 2013)	<i>E. equisetina</i>	Horsetail spike-rush
	<i>E. dulcis</i>	Water chestnut
	<i>E. geniculata</i>	Bent spike-rush
	<i>E. nuda</i>	-
	<i>E. philippinensis</i>	-
	<i>E. setifolia setifolia</i>	-
	<i>E. spiralis</i>	-
	<i>E. sundaica</i>	-
-	<i>Ludwigia octovalvis</i>	Mexican primrose-willow

Classification	Species Name	Common Name
-	<i>Lophostemon grandiflorus</i>	Northern swamp mahogany
Melaleuca	<i>Melaleuca leucadendra</i>	Weeping paperbark
Eremophila	<i>Eremophila mitchellii</i>	False sandalwood
-	<i>Atalaya hemiglauca</i>	Whitewood
<i>Senna spp</i> (DES 2013)	<i>S. aciphylla</i>	Sprawling cassia
	<i>S. coronilloides</i>	Brigalow cassia
	<i>S. gaudichaudii</i>	Gaudichaud's senna
<i>Acacia spp.</i> (DES 2013)	<i>A. aulacocarpa</i>	New Guinea wattle
	<i>A. auriculiformis</i>	Auri
	<i>A. calyculata</i>	-
	<i>A. crassicaarpa</i>	Northern wattle
	<i>A. disparrima disparrima</i>	Southern salwood
	<i>A. excelsa</i>	Ironwood
	<i>A. fasciculifera</i>	Scrub ironbark
	<i>A. flavescens</i>	Red wattle
	<i>A. hemsleyi</i>	-
	<i>A. holosericea</i>	Silver Leaf Wattle
	<i>A. jackesiana</i>	Betsy's wattle
	<i>A. julifera julifera</i>	-
	<i>A. leptocarpa</i>	North coast wattle
	<i>A. leptostachya</i>	Townsville wattle
	<i>A. mangium</i>	Hickory Wattle
	<i>A. multisiliqua</i>	-
	<i>A. nesophila</i>	-
	<i>A. oraria</i>	Coastal wattle
	<i>A. oswaldii</i>	Umbrella wattle
	<i>A. polystachya</i>	-
	<i>A. salicina</i>	Cooba
	<i>A. sericophylla</i>	Desert dogwood
	<i>A. simsii</i>	Heathlands wattle
	<i>A. spirorbis solandri</i>	Wattle
	<i>A. tephрина</i>	Boree
	<i>A. umbellate</i>	-
	<i>A. victoriae</i>	Bramble wattle
<i>A. whitei</i>	-	
<i>Corymbia spp.</i>	<i>Corymbia clarksoniana</i>	Clarkson's bloodwood
	<i>Corymbia tessellaris</i>	Carbeen

Classification	Species Name	Common Name
	<i>Corymbia intermedia</i>	Pink bloodwood
	<i>Corymbia dallachiana</i>	Dallachy's ghost gum
Eucalyptus spp.	<i>Eucalyptus crebra</i>	Narrow-leaved ironbark
	<i>Eucalyptus platyphylla</i>	Poplar gum

In addition to these species, stabilisation of the banks with locally native sedges and grasses may prove as an effective way to provide additional stabilisation in the short-term, however hydro-mulching may not be appropriate if heavy rainfall is likely before significant vegetation establishment along the waterway (Wetheridge 2017). Use of native groundcover species in the restoration will also be important for reducing the likelihood of weed incursion, particularly given the prevalence of weeds at some sites. Plantings used in the revegetation of waterways will be of local provenance.

### Potential Implications

ESCP will be prepared in line with standard industry practices for the construction of trench and fill pipeline installation. All waterway crossings will include reno mattresses to ensure bank stabilisation and minimise erosion. Suitable treatments will be designed and installed to ensure downstream water quality impacts are minimised. All potential impacts are expected to be minimal and temporary during clearing and construction only. The impact area will be rehabilitated according to the rehabilitation methodology as described in Section 6 of the Preliminary Documentation.

### Waterway Management Measures

The objectives of management measures relevant to waterways and watercourses include:

- Compliance with legal and other requirements (i.e., permits, licences and approval conditions);
- Environmental harm to aquatic habitats, flora and fauna is minimised;
- Sedimentation is minimised;
- The risk of erosion to river beds and water flow is minimised;
- Disturbed land is to be returned to previous pre-construction condition,
- Environmental performance and compliance are monitored;
- Ensure all staff are aware of the environmentally friendly sensitive features on-site.

The mitigation and management measures proposed in Table 2 will be implemented.

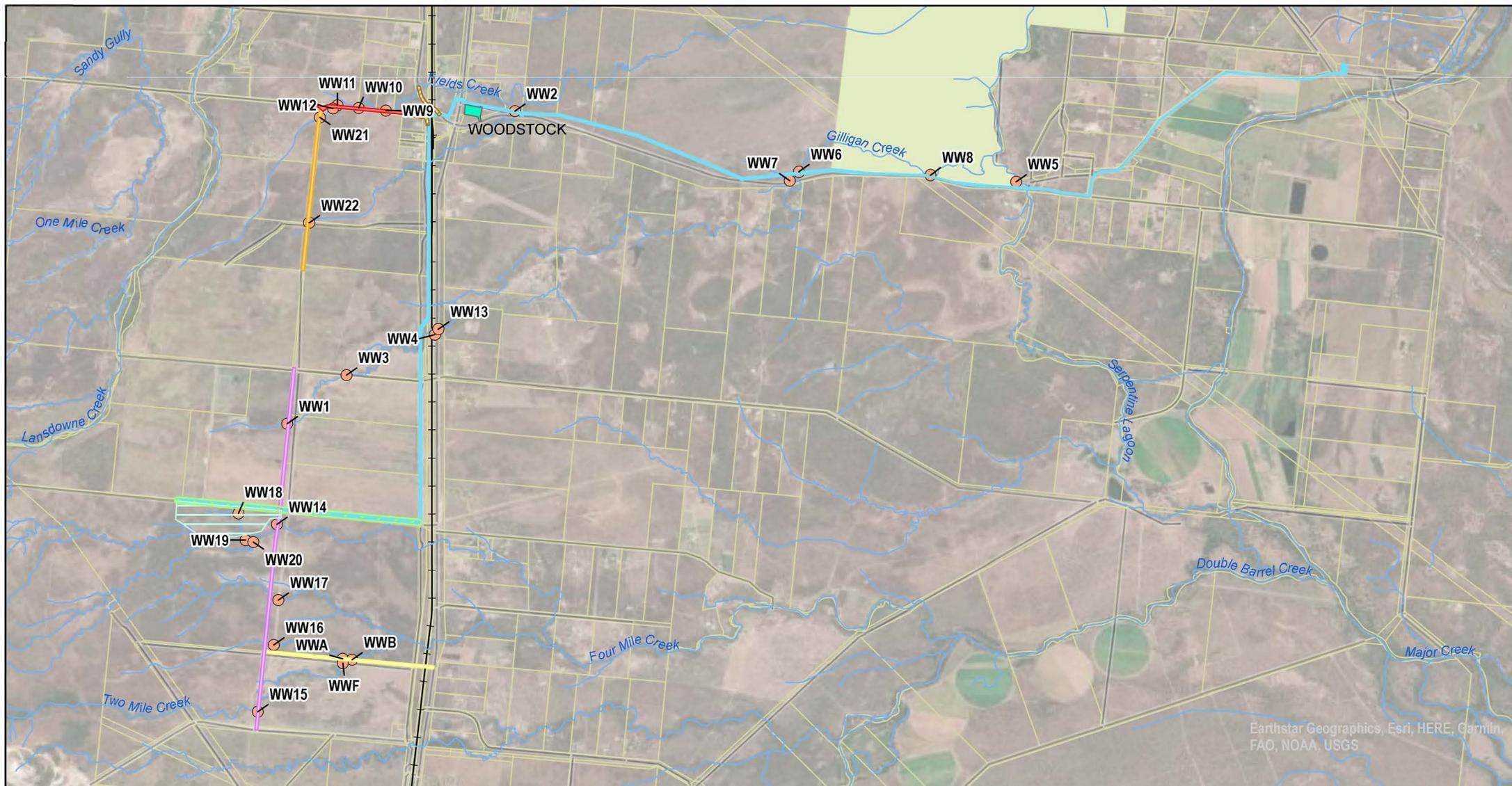
**Table 2 Waterway Objectives and Management Measures**

No. (as per CEMP)	Action	Milestone / Performance / Completion Criteria
W1	Impacts to aquatic habitat will be minimised by locating ancillary works outside the waterway where possible and restoring original bed and banks conditions following construction.	To be enforced daily during construction works.
W2	Watercourse crossings have been located at established crossing points on existing access tracks, where possible.	To be enforced daily during construction works.
W3	Duration of in-stream works will be minimised to reduce the potential for sedimentation.	To be enforced daily during construction works.

No. (as per CEMP)	Action	Milestone / Performance / Completion Criteria
W4	Weather conditions will be monitored during the construction stage and temporary controls will be established during extreme weather events.	To be enforced daily during construction works.
W5	Construction equipment is to be maintained to minimise risk of spill or leakage.	Monitored weekly.
W6	All refuelling facilities, or storage facilities for hydrocarbons and chemicals will be in appropriately designed sites and comply with Australian Standards (e.g., AS 1940: The storage and handling of flammable and combustible liquids).	To be enforced daily. Monitoring weekly.
W7	All refuelling facilities, or storage facilities for hydrocarbons and chemicals will be stored within bunded areas with a storage capacity of 110% of the storage vessel. Bunding will have floors and walls lined with impermeable material. These areas must be adequately protected from rainfall and stormwater.	To be enforced daily. Monitoring weekly Monitored immediately after rainfall events.
W8	Refuelling will not take place within 50 m of a watercourse.	To be enforced daily.
W9	Refuelling and major maintenance work will be undertaken at predetermined locations away from watercourses and in a manner that prevents spillages.	To be enforced daily.
W10	Spill control materials such as booms and absorbent materials will be maintained on site, commensurate with the types and volumes of materials in use, and in place where hazardous materials are stored or used.	To be enforced daily.
W11	Ensure pipeline trenching near watercourses/waterways is sufficient to avoid exposure of the pipeline as a result of river bed erosion and interference with the flow of water.	To be enforced daily.
W12	Store waste prior to transport and disposal off-site (including general waste and hazardous waste) in designated areas away of waterways/watercourses as per the relevant Australian Standards, as required.	To be enforced daily.
W13	Ancillary works will be located outside waterways and wetlands.	To be enforced daily.
W14	Original bed and banks conditions will be reinstated following construction.	Upon completion of construction works.
W15	Duration of instream works will be minimised to reduce the potential for sedimentation.	To be enforced daily.
W16	Should groundwater be encountered during construction works, works will cease until further examination occurs	To be enforced daily.

No. (as per CEMP)	Action	Milestone / Performance / Completion Criteria
W17	Develop and implement a certified ESCP and associated monitoring to mitigate the potential impacts.	Prior to construction.
W18	Where required to undertake works within drainage channels, works should not commence during times of elevated flows. Where possible schedule works in low or no flow periods and ensure that all bed and banks are stabilised prior to the onset of the wet season.	To be enforced daily.
W19	Construction methodology to avoid prolonged open excavations, i.e., suction intake and drainage channel areas, which may accumulate groundwater or surface water	To be enforced daily.
W20	Earthworks, particularly within the wetland and or drainage paths are to be conducted to maintain the hydraulic capacity and minimise potential impacts to upstream or downstream.	To be enforced daily.
W21	Potentially hazardous and flammable substances/ liquids will be stored in accordance with relevant Australian standards (AS1940), <i>Work Health and Safety Act 2011</i> and National Occupational Health and Safety Commission (NOHSC) 'Approved Criteria for the Storage and Handling of Flammable and Combustible Liquids' and in predetermined locations away from watercourses.	To be enforced daily.
W22	Structures and realignments have been designed to minimise changes to flow velocities.	To be enforced daily.
W23	Clearing areas to be minimised to only the extent required.	To be enforced daily.
W24	The construction of culverts and structures will be programmed during periods of low flow, where possible.	To be enforced daily.
W25	Where dry beds are required for the construction of culverts, salvage of fish and aquatic fauna will be undertaken in accordance with the DAF Fish Salvage Guidelines.	To be enforced daily.
W26	Site construction personnel will complete inductions and spill kits will be available to all personnel in the event of a spill or leak.	To be enforced prior to construction/visitation on site.
G1	Environmental awareness training aimed at ecological issues as part of site induction.	To be completed as part of induction training prior to construction and operation for all staff.
W28	During any works around waterways/water courses water quality will need to be monitored. Downstream turbidity will need to be maintained at comparable levels to upstream turbidity. Water samples are to be tested onsite by a calibrated water quality meter.	To be completed as part of induction training prior to construction and operation for all staff.
W29	All temporary erosion and sediment control structures are to be removed post-construction works.	Completed upon finish of works.

No. (as per CEMP)	Action	Milestone / Performance / Completion Criteria
W30	Rehabilitation of any disturbed ground due to temporary construction infrastructure will be conducted progressively as soon as construction activities are complete.	Completed upon finish of works throughout construction.
L2	Erosion and sediment control devices are to be installed and monitored as per the certified Erosion and Sediment Control Plan (ESCP).	Sediment control mechanisms to be inspected weekly during construction and operation.
L3	Sediment and erosion control measures to prevent soil loss will be developed consistent with the International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control (BPESC) documents	Sediment control mechanisms to be inspected weekly during construction and operation.
L4	Inspect erosion and sediment control devices during construction and immediately after rainfall events to ensure good working order.	Sediment control mechanisms to be inspected weekly during construction and operation.
L5	Management of runoff will be of particular focus to limit environmental impact to watercourses.	Regular monitoring of dust control measures during adverse weather conditions.
G2	Vehicle washdown procedures.  Wash-down areas will be clearly marked to prevent contaminated water from leaching into soils or flowing into nearby watercourses.	To be enforced daily.

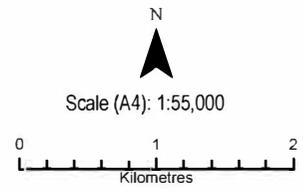


Earthstar Geographics, Esri, HERE, Garmin, FAO, NOAA, USGS

### Figure 1 Waterways Assessment Locations

#### Legend

- Waterway ID
- Watercourse
- Jones Road Intersection Upgrade
- Jones Road to Flinders Highway Upgrade
- No Name Road (north)
- No Name Road (south)
- Bidwilli Road
- Unnamed Road
- Water Infrastructure Network
- Storage Dam and Internal Pump Station
- Site Laydown Area
- Rail Network
- Existing Roads
- Cadastre (DCDB)
- Serpentine Lagoon Nature Refuge



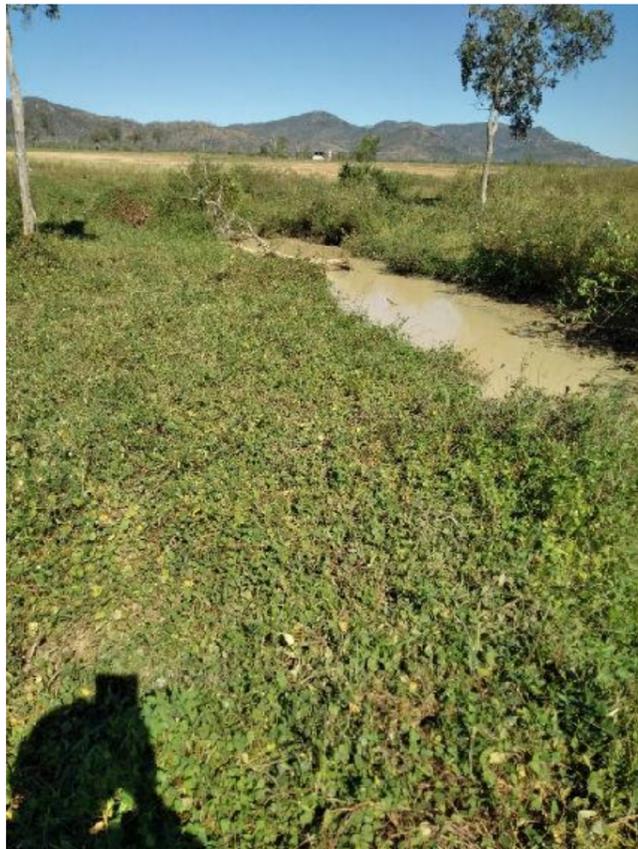
Date: 26/06/2023  
 Author: EMH  
 DISCLAIMER  
 CDM Smith has endeavoured to ensure accuracy and completeness of the data. CDM Smith assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.



**Table 3 Waterways Assessments**

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW1	146.822446	-19.622741	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 8m in width</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Pooled water at the crossing point at the time of survey.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Crossing point had pooling water at the time of survey. This pooling water would provide adequate habitat to sustain basic ecological function at the time of survey</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Pooling of turbid water at the survey site would provide adequate, albeit poor fish habitat.</li> </ul>	Area is void of any timbered vegetation. Groundcover is thick with <i>Senna spp.</i>

WW1 Photos – Photos taken 31/03/2022

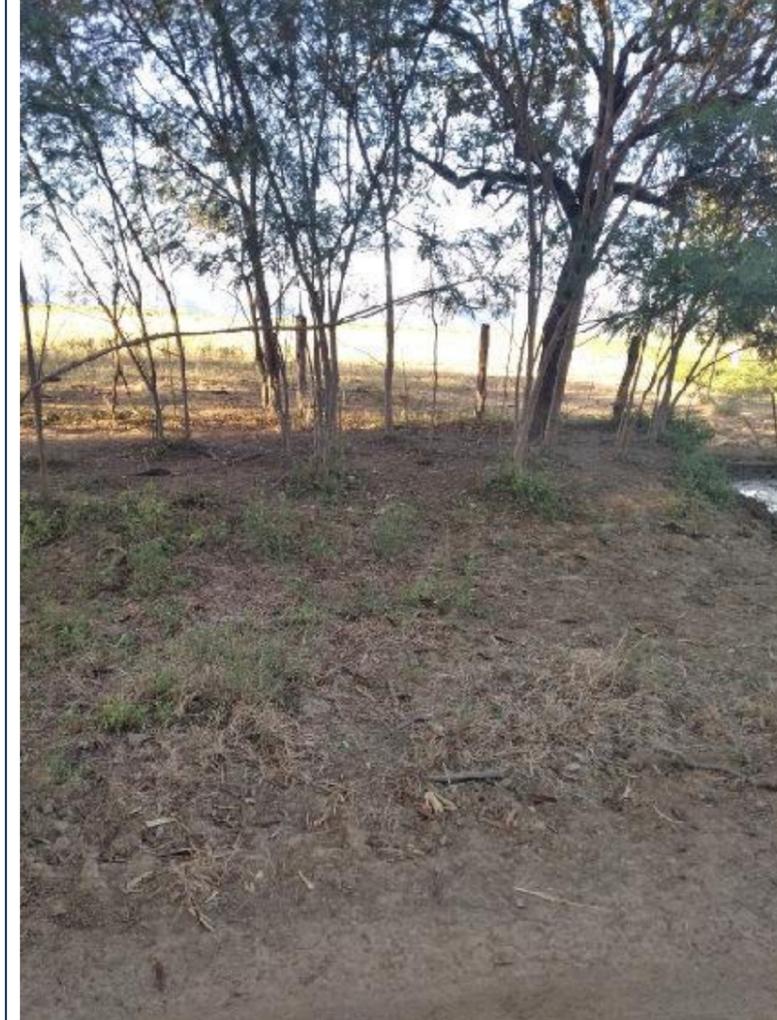


Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
<b>WW2</b> (Refer to drawings 2376 in Appendix C of the Preliminary Documentation)	146.84386	-19.593542	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 2m in width</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- No water was present during the time of survey. Vegetation species found near bed and banks were not wetland indicator species suggesting the drainage channel has been dry for a long period of time.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- No flow - Crossing point was dry and showed no signs of recent water flow with no wetland water indicator species being found. Bed and bank features show no sign of sediment deposition, alluding to lack of flows over a long period.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- No - Upstream and downstream habitats are similar to that of the crossing point. No water pools or wetland indicator species could be found. No deposition of silt or sand bed was located in the watercourse. This portrays a long dry period with no signs of fish habitat.</li> </ul>	Drainage feature Area dominated by <i>Leucaena sp.</i>
WW2 Photos – Photos taken 01/04/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					
WW3	146.828003	-19.618186	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Top of bank to top of bank of bank is estimated to be 8m. Waterway has been dissected by Ghost Gum Road. Any flows would have to sheet flow over the unformed road. Defined bed and bank features are present either side of the road.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Pooled water would suggest that extended periods of flow would occur at this site.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potentially – pooled water would suggest that flow adequacy would exist. However, with the damming of the waterway from the unformed Ghost Gum Road this cannot be hypothesised with any great certainty.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – Waterway is located in the upper reaches of Gilligan Creek which ultimately flows into Serpentine Lagoon. Suitable fish habitat therefore is noted directly upstream of this survey point.</li> </ul>	Road transects the waterway, no culverts noted.

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			

WW3 Photos – Photos taken 31/03/2022



Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
<b>WW4</b> (Refer to drawing 2378 in Appendix C of the Preliminary Documentation)	146.836332	-19.614398	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is present and is estimated at 8m from top of bank to top of bank</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- No - at the time of survey the area was dry. However, evidence of downstream deposition was found through sandy bed features.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potentially – due to extremely dry conditions no signs of flow were seen during the survey. However, sand bed deposition does allude to seasonal flow occurring during the wet season.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – Waterway is the upper reaches of Gilligan creek which ultimately flows into Serpentine Lagoon. Suitable fish habitat therefore is noted directly upstream of this survey point</li> </ul>	Drainage feature <i>Leucaena sp.</i> Dominated banks
WW4 Photos – Photos Taken 26/05/2022					

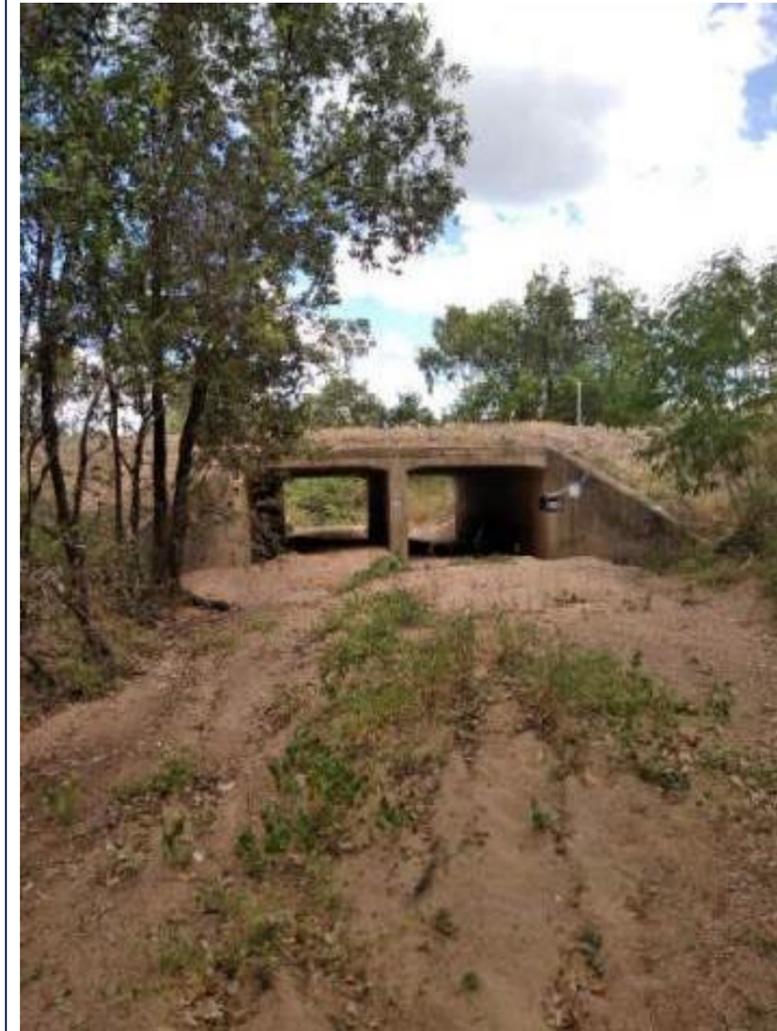
Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
<b>WW5</b> (Refer to drawing 2372 in Appendix C of the Preliminary Documentation)	146.891013	-19.600119	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is present, approximately 15m in distance</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment, the crossing area was dry. Both upstream and downstream of the crossing point water permeance was noted. This suggest that flow occurs beyond the initial rain period with adequate structure to allow for water conveyance.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At time of assessment there was no flow at the point of assessment. Fringing vegetation indicates that the creek would be wet at least on a semi permeant basis.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Upstream of the crossing point a large lagoon is present which would provide suitable fish habitat.</li> </ul>	Site exhibited traditional woody wetland indicator species near and adjacent to the survey point.
WW5 Photos – Photos taken 30/03/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					
<b>WW6</b> (Refer to drawing 2373 in Appendix C of the Preliminary Documentation)	146.870588	-19.599207	Drainage Feature	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is estimated to be 8m in width at the point of the water pipeline crossing</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of survey, the area was dry. However, evidence of downstream deposition was found through a sandy bed feature.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Due to extremely dry conditions no signs of flow were seen during the survey. However, sand bed deposition does allude to times for peak flow and movement during the wet season</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Gilligan creek ultimately flows into Serpentine Lagoon. Suitable fish habitat therefore is noted directly upstream of this survey point.</li> </ul>	<p>Steep batters at intervals, approximately 1 in 2 slopes. Bed completely devoid of vegetation. Bed mostly comprised of coarse sand.</p>

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			

WW6 Photos – Photos taken 28/03/2022



Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
<b>WW7</b> (Refer to drawing 2374 in Appendix C of the Preliminary Documentation)	146.869722	-19.600019	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 6.5m in width.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- No water was present during the time of survey. Vegetation species found near bed and banks were not wetland indicator species suggesting the channel remains dry for extended periods.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Crossing point had significant erosional evidence at time of survey showing that a significant volume of water has flowed through the area in the recent past.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Upstream and downstream habitats are similar to that of the crossing point. No water pools or wetland indicator species could be found.</li> </ul>	Area dominated by <i>Stylosanthes scabra</i> .
WW7 Photos – Photos taken 26/05/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					
WW8	146.882962	-19.599509	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 6m in width</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Water was present within the waterway at the time of survey. Vegetation observed on low banks showed evidence of recent water flow.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Water was present within the waterway at the time of survey.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes - the waterway connects upstream to a large body of water in Serpentine Lagoon.</li> </ul>	<i>Lophostemon grandiflorus</i> located on waterway banks.
WW8 Photos – Photos taken 26/05/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW9	146.831717	-19.593497	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- No clearly defined banks discernible.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Potentially – pooled water upstream and downstream of the location would suggest that flow exists. However, alteration of the waterway at multiple locations to form dammed areas for agricultural use as visible in arial imagery may affect the period of flow.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potentially – pooled water upstream and downstream of the location would suggest that flow adequacy would exist.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – pooled water is visible on arial imagery both upstream and downstream of the surveyed location.</li> </ul>	<i>Cyperus sp.</i> present.
WW9 Photos – Photos taken 26/05/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					
<b>WW10</b>	146.829152	-19.59325	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- No – roadside depression with no defined banks or wetland indicator species present</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Potentially - at the time of survey the sand substrate was waterlogged.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- No – no signs of flow were seen during the survey.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – a farm dam is located upstream of the survey location, and a substantial body of pooled water was noted within the waterway located adjacent.</li> </ul>	Wetland indicator species absent from road reserve.

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW10 Photos – Photos taken 26/05/2022					
					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW11	146.827147	-19.5930	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- No – roadside depression with no defined banks except immediately adjacent to where a culvert crossing has been installed under Jones Road.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Yes - at the time of assessment the pooled water was present adjacent to the culvert crossing. Both upstream and downstream of the crossing point water permanence was noted. This suggests that flow occurs beyond the initial rain period with adequate structure to allow for water conveyance.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potentially - at time of assessment there was no flow at the point of assessment. Fringing vegetation indicates that the creek would be wet at least on a semi-permanent basis.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes - upstream of the crossing point a farm dam is present which would provide suitable fish habitat.</li> </ul>	<p><i>Ludwigia octovalvis</i>, a wetland indicator species was noted at the survey location.</p>
WW11 Photos – Photos taken 26/05/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				 	
WW12	146.826725	-19.59329	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- No – roadside depression with no defined banks except immediately adjacent to where a culvert crossing has been installed under Jones Road.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Yes - At the time of assessment the pooled water was present adjacent to the culvert crossing and along the boundary of lot 101 on EP1666. Water permanence was noted both upstream and downstream, suggesting that flow occurs beyond the initial rain period with adequate structure to allow for water conveyance.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potentially - At time of assessment there was no flow at the point of assessment. Fringing vegetation indicates that the creek would be wet at least on a semi-permanent basis.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Upstream of the crossing point a farm dam is present which would provide suitable fish habitat.</li> </ul>	<p><i>Ludwigia octovalvis</i>, and <i>Eleocharis sp.</i> which are wetland indicators were extensively present at the boundary between the road reserve and lot 101 on EP1666.</p>

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW12 Photos – Photos taken 26/05/2022					
					
<b>WW13</b> (Refer to drawing 2378 in Appendix C of the Preliminary Documentation)	146.836657	-19.613873	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 6m in width</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment, the pooled water was present adjacent to the culvert crossing</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At time of assessment there was no flow at the point of assessment. Evidence of sediment deposition is present.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- No - WW13 is a short (558m) tributary of Gilligan creek extending with 395m of dry creek bed upstream of the survey location.</li> </ul>	<p><i>Ludwigia octovalvis</i>, a wetland indicator species was noted at the survey location.</p>
WW13 Photos – Photos taken 26/05/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					
<b>WW14</b>	146.82148	-19.632125	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 12m in width.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment pools of water were visible along the waterway.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment there was no flow. Evidence of sediment deposition is present.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – Pools of water were visible both up and downstream of the survey location at the time of observation.</li> </ul>	<p><i>Lophostemon grandiflorus</i> fringing waterway. Evidence of cattle accessing waterway.</p>

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW14 – Photos taken 26/05/2022					
					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW15	146.819665	-19.649601	Drainage feature	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 12m in width.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment pools of water were visible along the waterway although water was not flowing.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment there was no flow. Evidence of sediment erosion and deposition is present.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – Pools of water were visible both up and downstream of the survey location at the time of observation.</li> </ul>	<i>Lophostemon grandiflorus</i> and <i>Leucaena</i> fringing waterway.
WW15 – Photos taken 26/05/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					

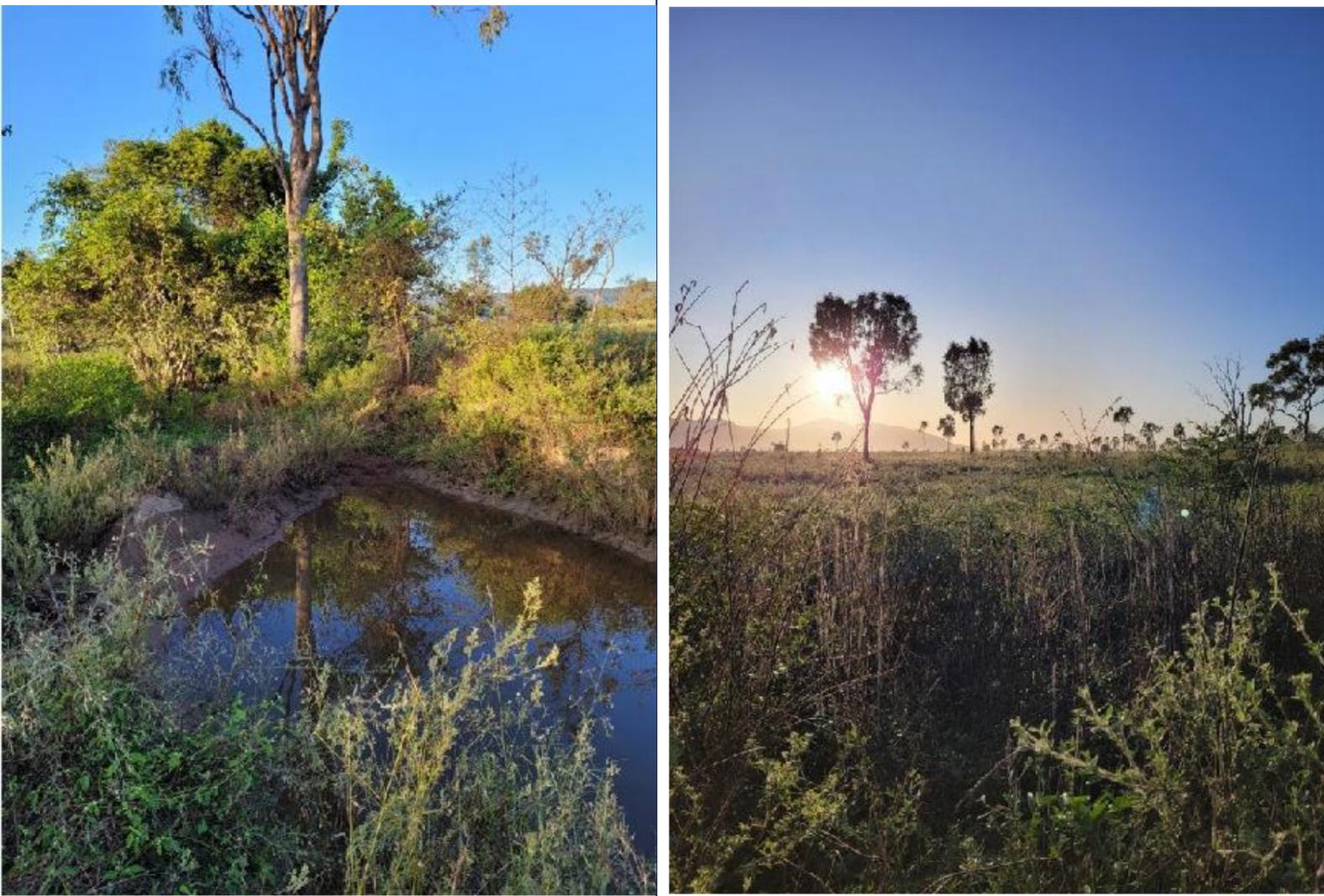
Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW16	146.821179	-19.643381	Drainage feature	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 8m in width.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment pools of water were visible along the waterway although water was not flowing. Evident raising of the roadway above the bed level of the waterway is expected to adversely affect water flow.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At time of assessment there was no flow at the point of assessment. Pooling water and evidence of sediment deposition is present.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – Pools of water were visible both up and downstream of the survey location at the time of observation.</li> </ul>	<p><i>Corymbia clarksoniana, Eucalyptus crebra and Stylosanthes scabra</i> fringing waterway.</p>
WW16 – Photos taken 26/05/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW17	146.821609	-19.639182	Drainage feature	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 7m in width.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment pools of water were visible along the waterway although water was not flowing. Evident raising of the roadway above the bed level has caused pooling upstream of the roadway, reducing waterflow.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At time of assessment there was no flow at the point of assessment. Pooling water and evidence of sediment deposition is present.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – Pools of water were visible both up and downstream of the survey location at the time of observation.</li> </ul>	<i>Lophostemon grandiflorus</i> growing in waterway.
WW17 – Photos taken 26/05/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features	
	Longitude	Latitude				
						

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW18	146.817842	-19.631102	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 5m in width.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment pools of water were visible along the waterway although water was not flowing.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At time of assessment there was no flow at the point of assessment. Evidence of sediment deposition is present.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – Pools of water were visible both up and downstream of the survey location at the time of observation.</li> </ul>	Area dominated by <i>Stylosanthes scabra</i> .
WW18 – Photos taken 27/05/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW19	146.818511	-19.633603	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 5m width</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment, a deep pool of water was present at the assessment location, although flow was not evident.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At time of assessment there was no flow at the point of assessment. Steep waterway banks indicate sufficient periodic flow to produce erosional activity.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- A substantial pool of water was present at the assessment site. Pools of water were also recorded downstream at WW20.</li> </ul>	<p><i>Lophostemon grandiflorus</i>, <i>Acacia sp.</i> and <i>Cryptostegia grandiflora</i> (Indian rubber vine) fringing waterway. Steep waterway banks.</p>

WW19– Photos taken 23/05/2022



Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW20	146.819245	-19.633788	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 8m.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment pools of water were visible immediately either side of the assessment point.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At time of assessment there was no flow at the point of assessment. Pooling water and evidence of sediment deposition is present.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – Pools of water were visible both up and downstream of the survey location at the time of observation.</li> </ul>	<p><i>Lophostemon grandiflorus</i> growing along waterway banks. Evidence of cattle crossing of waterway.</p>

WW20 – Photos taken 23/05/2022



Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WW21	146.825489	-19.594135	Unmapped	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- No defined bed or banks were evident at the time of traversing the site either upstream or downstream.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Unlikely – No flow was observed during either assessment period, however the landholder indicated that seasonal flow occurs from the dam located on Lot 80 E124325, through Lot 14 E124325 to the dam located on Lot 101 EP1666 during the wettest months at period of high rainfall.</li> <li>- Flows between farm dam on Lot 80 E124325 and link with the farm dam at WW21. A review of historical aerial imagery has not identified any water connections between these dams indicating that connection likely only occurs during periods of high and intense rainfall. This path is more representative of overland flow during high intensity rain events that funnels immediate rainfall and it therefore not considered to meet this criteria.</li> <li>- Culverts will be included as part of design to allow overland flow during high rainfall events from the farms dams to pass under the road.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Unlikely – Only overland flow is likely during high rainfall events. At time of assessment there was no flow at the point of assessment, with landholder observations indicate that periods of flow occur between private farm dams. No erosion or sediment deposition was observed. Culverts will be included as part of design to allow overland flow from the farms dams to pass under the temporary/permanent road.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Unlikely – farm dam at WW21 is a private water source and will not be affected by the development of the LEIP. Overland flow paths near this location and between farm dams do not provide fish habitat with vegetation characterised by pasture grass and legume species.</li> </ul>	Vegetation characterised by pasture grass and legume species.
WW21 Photos – Photos taken 26/05/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					
WW22	146.824499	-19.603952	Drainage feature	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined bed or banks are not in evidence</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment, no water or waterlogging of soil was observable. Vegetation species observed in the vicinity were not wetland indicator species suggesting the area remains dry for extended periods.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- No erosion, sediment deposition or other evidence of flow was observable.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- No water pooling or other evidence of fish habitat were observable on-ground or from available areal imagery. The waterway, as mapped extends a distance of less than 250m upstream of the observation point.</li> </ul>	Vegetation dominated by <i>Chloris virgata</i>
WW22 Photos – Photos taken 31/03/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				 	
WWA	146.827636 E	-19.644679	Drainage feature	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 13 m in width between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment, no water was present.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment, the North West bank showed significant erosional evidence at time of survey indicating that a significant volume of water has flowed through the area in the recent past</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Possibly - No water pools were observed in the vicinity however multiple wetland indicator species were present at the observation point and upstream.</li> </ul>	<p>Vegetation species found near bed and banks were included <i>Lophostemon grandifloras</i>, <i>Cyperus gracilis</i> and <i>Melaleuca sp.</i>, <i>Corymbia tessellaris</i> and Indian rubber vine.</p>

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
WWA Photos - Photos taken 10/10/2022					
					
WWB	146.828531 E	-19.644767	Drainage feature	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 3m high from lowest point of bed and 14m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment, no water was present.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment erosional evidence was present around large tree roots at time of survey indicating that a significant volume of water has flowed through the area in the recent past.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Possibly - No water pools were observed in the vicinity however multiple wetland indicator species were present at the observation point and upstream.</li> </ul>	<p>Drainage feature</p> <p><i>Lophostemon grandiflorus</i> and <i>Melaleuca sp.</i> located on waterway banks.</p>
WWB Photos - Photos taken 10/10/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					
WWF	146.827662 E	-19.645087	Drainage feature	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 1.6m high from lowest point of bed and 13m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment pooled water upstream and downstream of the location would suggest that flow exists. However, alteration of the waterway at multiple locations to form dammed areas for agricultural use as visible in arial imagery may affect the period of flow</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment pooled water upstream and downstream of the location would suggest that flow adequacy would exist.</li> </ul> <p><u>Fish habitat:</u></p> <p>Possibly - No water pools were observed in the vicinity however multiple wetland indicator species were present at the observation point and upstream.</p>	<p><i>Lophostemon grandifloras</i>, Indian rubber vine and <i>Melaleuca sp.</i> located on waterway banks. Vehicle track crossing located directly adjacent to observation point.</p>
WWF Photos - Photos taken 10/10/2022					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
					
WWFA	146.835667	-19.598920	Drainage feature	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 40 cm high from lowest point of bed and 9 m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment, water was to an approximate depth of 20 cm.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- At the time of assessment strong flow was observed. A deposit of brown coloured sediment was observed and water was turbid. Additionally, evidence of erosion with uprooted grass was also observed.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – A significant quantity of flowing water was present at the time of assessment</li> </ul>	<p><i>Lantana camara, Ziziphus mauritiana, Hyparrhenia rufa and Megathyrsus maximus</i></p>
WWFA photos – Photos taken 08/02/2023					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				<p style="text-align: center;">Downstream:</p> 	<p style="text-align: center;">Upstream:</p> 
<b>WWFB</b>	146.847051	-19.593886	Not shown on mapping	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 25 cm high from lowest point of bed and 3.5 m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Potentially – water to an approximate depth of 20 cm was present during time of survey. Waterway became indistinct and was observed as a contained pond with moderately clear water.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potential – Flow was not evident at the time of survey low observed.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – water was present and small (&lt;2.5cm) fish were observed.</li> </ul>	<p><i>Marsilea mutica, Ludwigia octovalvis, Cyperus spp.</i></p>
WWFB photos – Photos taken 08/02/2023					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				<p>Downstream:</p> 	<p>Upstream:</p> 
WWFC	146.868612	-19.599558	Unmapped feature	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 50 cm high from lowest point of bed and 3 m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Water was present during time of assessment.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Flow was observed at time of assessment. Sediment deposits varied with fine silt and clay and rocks up to 4 cm diameter in areas of stronger flow. Water was slightly tannin stained/yellow coloured. Erosion was evident on the banks.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – water was present and small fish were observed.</li> </ul>	<p>There were wetland indicator species.</p> <p>Vegetation species found near bed and banks included: <i>Lantana camara</i>, <i>Corymbia dallachiana</i>, <i>Corymbia platyphylla</i>, <i>Eremophila mitchellii</i>, <i>Stylosanthes scabra</i> &amp; <i>Cryptostegia grandiflora</i>.</p>
WWFC photos – Photos taken 08/02/2023					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				<p>Downstream:</p> 	<p>Upstream:</p> 
WWFD	146.872544	-19.599183	Not shown on mapping	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 40 cm high from lowest point of bed and 3 m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Water was present during time of assessment, to an approximate depth of 30 cm.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- slow flow was observed at time of survey. There were deposits of fine silt. Water was slightly tannin stained.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – water was present and small fish were observed.</li> </ul>	<p>Vegetation species found near bed and banks included <i>Megathyrsus maximus</i>, <i>Cryptostegia grandiflora</i>, <i>Corymbia dallachiana</i>, <i>Corymbia platyphylla</i>, <i>Echinochloa sp.</i> and <i>Marsilea mutica</i></p>
WWFD photos – Photos taken 08/02/2023					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				<p style="text-align: center;">Downstream:</p> 	<p style="text-align: center;">Upstream:</p> 
WWFE	146.898486	-19.599165	Not shown on mapping	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 50 cm high from lowest point of bed and 15 m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Water was present during time of assessment, to an approximate depth of 20 cm. Water was slightly tannin stained.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Yes – no flow was observed at time of survey but snags were observed to 40cm.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – water was present and small fish were observed.</li> </ul>	Vegetation species found near bed and banks included <i>Melaleuca sp.</i> , <i>Cyperus sp.</i> and <i>Juncus sp.</i>
WWFE photos – Photos taken 08/02/2023					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				<p>Downstream:</p> 	<p>Upstream:</p> 
WWFF	146.853653	-19.595488	Not shown on mapping	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- No – A waterway bed and bank was not clearly defined.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Potentially – an artificial drain may contribute to water movement. Water to a depth of 2.5cm was present with a clay substrate.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potentially – flow was not evident at the time of observation.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – water was present and small fish were observed.</li> </ul>	<p>Vegetation species found near bed and banks included <i>Cyperus sp.</i>, <i>Ludwigia octovalvis</i>, <i>Marsilea mutica</i> and <i>Eclipta prostrata</i></p>
WWFF photos – Photos taken 08/02/2023					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				<p>Downstream:</p> 	<p>Upstream:</p> 
<b>WWM1</b>	146.834649	-19.591056	Unmapped feature	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Yes – Culvert under road. Defined top of bank is approximately 50 cm deep from top of bank and 5 m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Potentially – fringing grasses were fattened in the direction of flow.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potential – Water pooled downstream of assessment point location, on opposite side of road.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – small fish were observed in pooled water upstream of the assessment location, at WWM2.</li> </ul>	<p><i>Ludwigia ocovalvis</i> and <i>Alternanthera denticulata</i> in channel.</p> <p><i>Echinochloa muricata</i> and <i>Paspalum conjugatum</i> present along banks.</p>
WWM1 photos – Photos taken 02/03/2023					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features	
	Longitude	Latitude				
				<p>Downstream:</p> 	<p>Upstream:</p> 	
<b>WWM2</b>	146.834852	-19.591923	Not shown on mapping	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 1 m deep from top of bank and 8 m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Potentially – Pooled, tannin stained water to approximately 30cm in depth was present at the time of assessment.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potential – sediment deposition of clay.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – small fish were observed in pooled water at the time of assessment. An empty Bi-valve shell was observed at the assessment location.</li> </ul>	<p>Dominated by <i>Ziziphus mauritiana</i> and <i>Cryptostegia grandiflora</i>.</p> <p><i>Cyperus sp.</i> and <i>Bolboschoenus sp.</i> were observed on waters edge.</p>	
WWM2 photos – Photos taken 02/03/2023						

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				<p>Downstream:</p> 	<p>Upstream:</p> 
<b>WWM3</b>	146.835029	-19.592211	Not shown on mapping	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 80 cm deep from top of bank and 5.5 m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Potentially – Pooled water with algal growth to a depth of 30cm.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potential – sediment deposition of clay.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – pooled water was observed upstream of the assessment location, at WWM4.</li> </ul>	<p><i>Leucas lavandulifolia</i> and <i>Ziziphus mauritiana</i> present within water channel.</p> <p>Channel fringed by mixed grass species.</p>
WWM3 photos – Photos taken 02/03/2023					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				<p>Downstream:</p> 	<p>Upstream:</p> 
<b>WWM4</b>	146.835192	-19.59246	Not shown on mapping	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 70 cm deep from top of bank and 4.5 m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Potentially – Pooled water to 10cm depth.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potential – sediment deposition of clay.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Potentially - Waterway bed and banks become undefined within 5m upstream of assessment location.</li> </ul>	<p><i>Eclipta prostrata, Ludwigia octovalvis</i> and algal growth present in channel.</p> <p><i>Clitoria ternatea, Cryptostegia grandiflora</i> and <i>Heteropogon contortus</i> fringing channel.</p>
WWM4 photos – Photos taken 02/03/2023					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				<p>Downstream:</p> 	<p>Upstream:</p> 
WWM5	146.8354	-19.592812	Not shown on mapping	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Defined top of bank is approximately 50 cm deep from top of bank and 8.55 m wide between top banks.</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Potential – No evidence of flow in the form of vegetation snags or bank erosion, defined channel persist and clay deposition present in channel.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potential – sediment deposition of clay.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – small fish were observed in pooled water upstream of the assessment location, at WWM2.</li> </ul>	<i>Alternanthera denticulate</i> growing amongst low grass cover.
WWM5 photos – Photos taken 02/03/2023					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
				<p>Downstream:</p> 	<p>Upstream:</p> 
<b>WWM6</b>	146.834762	-19.591324	Not shown on mapping	<p><u>Bed and banks:</u></p> <ul style="list-style-type: none"> <li>- Yes - Defined top of bank is approximately 1.2 m deep</li> </ul> <p><u>Period of flow:</u></p> <ul style="list-style-type: none"> <li>- Potentially – pooled water present at time of survey.</li> </ul> <p><u>Flow adequacy:</u></p> <ul style="list-style-type: none"> <li>- Potentially – sediment deposition of clay.</li> </ul> <p><u>Fish habitat:</u></p> <ul style="list-style-type: none"> <li>- Yes – pooled water present at time of survey.</li> </ul>	<p><i>Marsilea mutica, Alternanthera denticulata, Potamogeton tricarinatus and Nymphoides crenata</i> growing in water pool.</p> <p><i>Ludwigia octovalvis, Alternanthera denticulata, Clitoria ternatea, Cyperus sp, and Heteropogon contortus</i> dominated mixed grasses present on banks.</p>
WWM6 photos – Photos taken 02/03/2023					

Survey Reference(s)	GPS		Water Act Classification	Field Survey Summary	Distinguishable Features
	Longitude	Latitude			
	Downstream:			Upstream:	
					

## References

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