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BIALA WIND FARM, CROOKWELL, NSW – ASSESSMENT OF TRENCHING ACTIVITIES

Dear Robbie

1.0 INTRODUCTION

1.1 General

Newtricity Developments Pty Ltd (Developments Biala) commissioned Golder Associates Pty Ltd (Golder) to undertake a site walkover to support the planning application for the proposed Biala Wind Farm (BWF) in New South Wales. The proposed windfarm requires the construction of a transmission line cable trench to connect the BWF to the nearby Grabben Gullen substation approximately 15 km to the east.

During the community consultation for the project, concern was raised regarding the potential impact that the proposed trenching may have on the Gurrundah Creek and two inferred springs approximately 12 km east of the BWF. The site walkover therefore was focused on this area (the site).

1.2 Objective

The objective for the site walkover were to provide an assessment of whether:

- the transmission line cable trench could drain / cut off the nearby springs; and
- trenching through Gurrundah creek will have any long-term implications for the creek or downstream water features which are potentially fed by it.

1.3 Scope of Work

The scope of work included:

- A site visit to gain a general understanding of the site topography and investigate the nature of the springs and creek; and
- Prepare a letter presenting the outcomes of the site walkover and an assessment of potential impact that the trenching work may have on the springs and creek.

2.0 BACKGROUD

2.1 Site Location

The proposed transmission line cable trench traverses approximately 15 km eastward from the propose BWF to the Gullen Wind Farm Substation. The outline of the proposed transmission line and the location of the site walkover is in Figure 1.

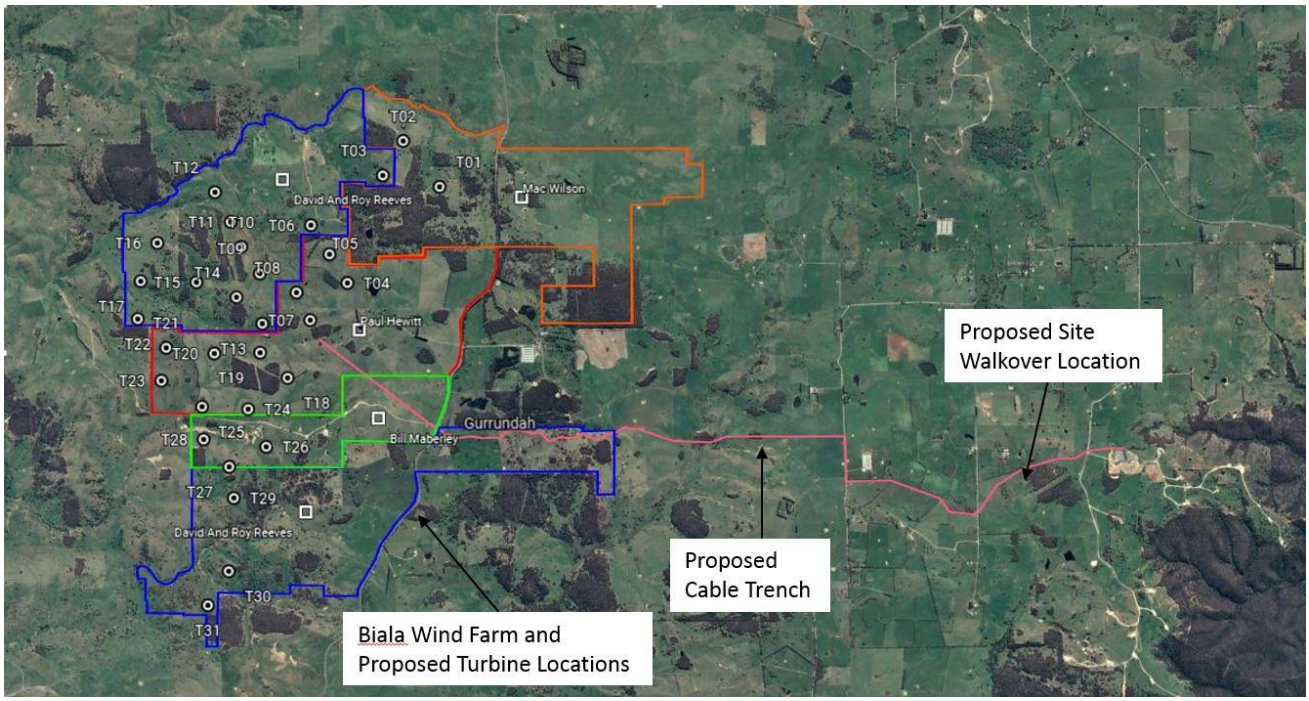


Figure 1: Biala Wind Farm Location and Cable Trench Transect

The proposed site walkover is roughly 12 km to the east of the BWF at the location where the cable trench crosses the Gurrundah Creek and is adjacent to two inferred spring locations.

2.2 Site Features

The site walkover area is shown on Figure 2. Due to landholder restrictions, Golder was unable to access either of the two springs during the site visit.

We note that the term spring implies that they are resulting from groundwater discharge. As this has not been established, the springs are further referred as “ponds” in this document.

The ponds, Pond 1 and Pond 2, are to the north of the fence (black line in Figure 2). Pond 1 is approximately 10 – 15 m north of the fence (shown in grey) and Pond 2 is roughly 20 – 25 m north of the fence. The proposed alignment of the trench is shown in purple. It is understood the trench can be placed within a 20 m wide area designated for the cable trench known as the ‘disturbance zone’. The disturbance zone has a northern edge along the fence line and can extend 20 m south of the fence (shown in grey and white dashed line). The Gurrundah Creek flows north- south directions and blocked by a permanent dam that is approximately 2.5 m in height.

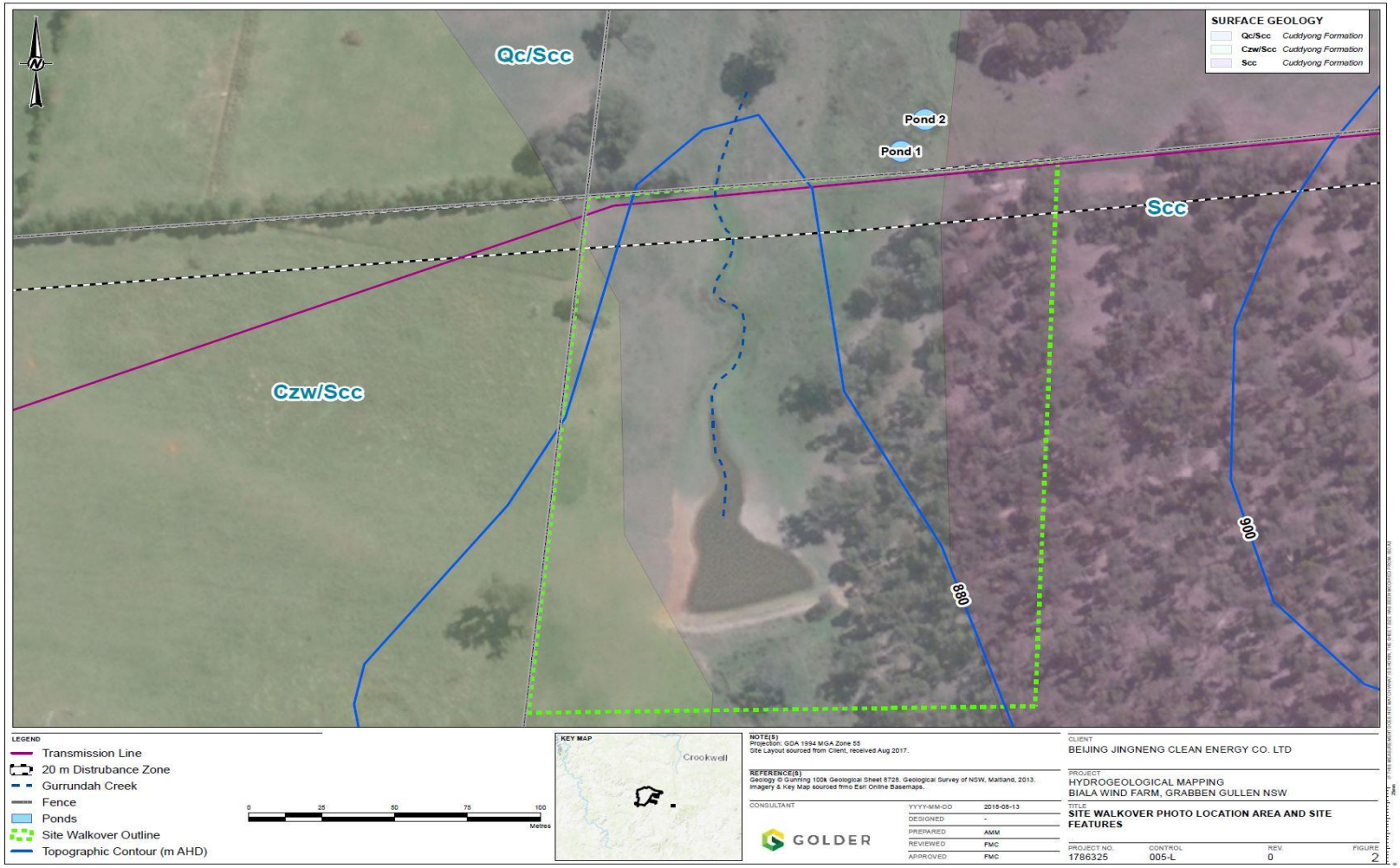


Figure 2: Site Walkover Area and Site Features

2.3 Geology

The 1:100,000 scale Geological Series Map of Gunning (Sheet 8728 Second Edition) indicates that within the walkover area, the proposed trenching occurs within variants of the Cuddyong Formation which include the following (from left to right in Figure 2)

Cainozoic age Volcanics (Czw/Scc). This unit is described as *"Alkali olivine basalt and basanite, doleritic in part, locally with high concentration of ultramafic xenoliths overlying siltstone".*

- Quaternary aged colluvial sediments (Qc/Scc). This unit is described as *"Colluvial gravel, sand and silt overlying siltstone".*
- Silurian Aged Siltstone (Scc). This unit is described as "Siltstone, phyllite, black siltstone quartzose and minor volcaniclastic sandstone, quartzite and muscovite".

Topographic contours show the site gently dipping towards the Gurrundah Creek (blue dashed line) with the topography ranging between 880 meters above height datum (m AHD) to 900 m AHD. The south draining Gurrundah Creek flows through the colluvial layer (Qc/Scc). The ponds are adjacent to the inferred contact between the Quaternary-aged colluvial gravel (Qc/Scc) and the Silurian-aged siltstone.

2.4 Trench Specifics

The trench comprises of four power cables which influences the size and depth of the overall proposed trenching works. Developments Biala indicated to Golder that it is appropriate for the cables to be under the water table if necessary. Four cables are to be fitted into the single trench, each requiring a two meter offset as shown in Figure 3.

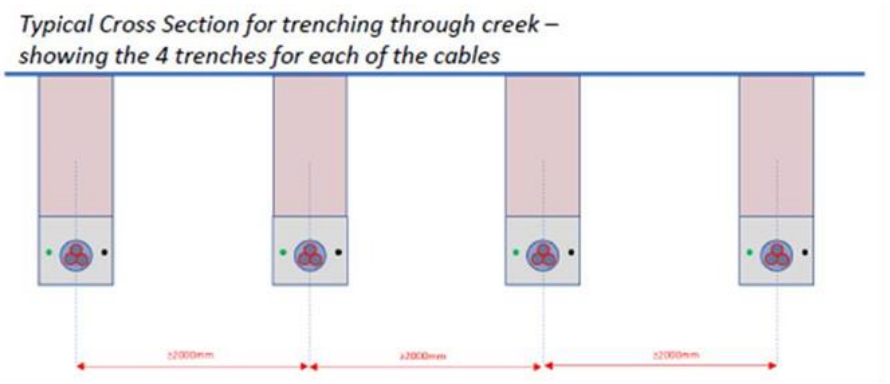


Figure 3: Trench Cross Section Specs (provided by Developments Biala)

It is understood that based on these specifications, the entire trench to install the transmission line will need to be approximately 8 m in width and between about 0.95 and 1.4 m deep. Golder understands from Developments Biala that the trenching will be undertaken by a company that specialises in equipment that trenches, lays, and backfills the trench in a single pass. Therefore, it is understood that the time when the excavation is open is minimised.

3.0 SITE VISIT OBSERVATIONS

The site walk-over was conducted during a half day visit by a hydrogeologist on 19 July 2018. It consisted of taking photos and field notes.

Current restrictions relating to land access meant that access to the site of the ponds was prohibited. In addition, a topographic survey could not be provided to Golder. The assessment is therefore visual with

distances and heights as approximations and is only concerned with the general gradient between the ponds, the creek, and the trench line.

The photos are located in Appendix A of the report. The location of key photos and their direction is plotted on Figure 4.

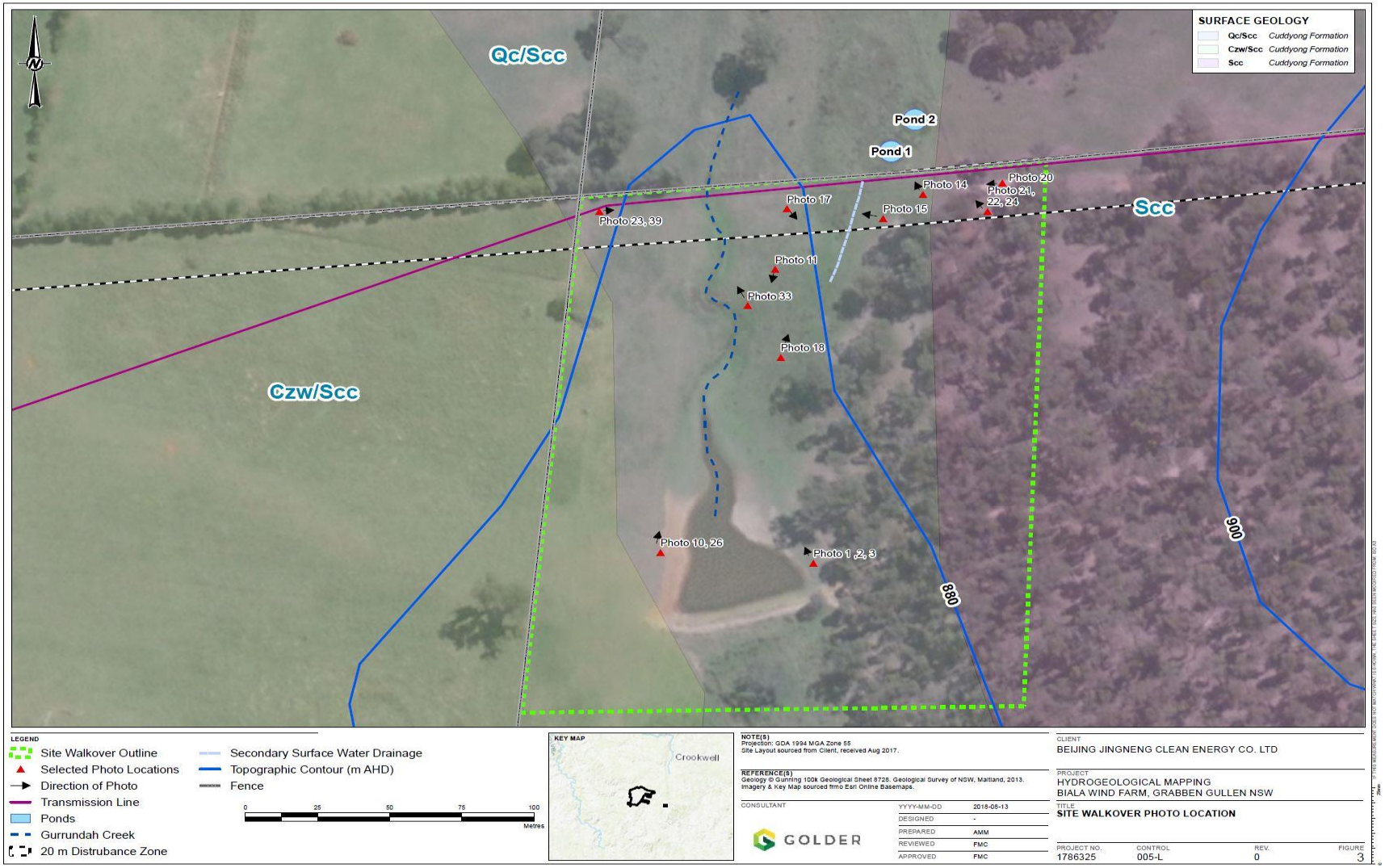


Figure 4: Site Walkover Photo Locations

Based on the above field work, the following was indicated:

Site Drainage:

- The walkover area gently slopes towards the Gurrundah Creek. A small surface drainage feature roughly 15 m south of Pond 1 was also observed.
- Topography slopes are slightly steeper on the western side of the creek than on the eastern side.

Vegetation:

- Adjacent to the Gurrundah Creek, vegetation cover is sparse, likely due to land clearing activities and grazing by cattle.
- Further away from the Gurrundah Creek, there are a number of trees on the western side, indicating the potential for a shallow water table in this area.

Pond locations:

- Pond 1 and Pond 2 occur as surface depressions within a generally flat area. The ponds are of similar size, are round and roughly 2.0 m in diameter. An embankment separates the two ponds which may be artificial.
- Based on site visit and field photos it is estimated the top of water levels in Pond 1 and Pond 2 are roughly 1.0 m and 1.2 m below ground level (m bgl) respectively.

Gurrundah Creek:

- The flow of the Gurrundah Creek is restricted by a number of barriers, creating a number of small reservoirs to the north and south of the disturbance zone. The dam roughly 80 m to the south of the disturbance zone was observed during the site visit. The dam wall was roughly 2.5 m in height. Water flow was not observed to the south of the barrier.
- Water flow along the Gurrandah Creek was intermittent, with some areas ponding and was no more than 0.2 m deep within the centre of the channel.

Overall, the site walkover confirmed that the topographic gradient in the area as gently draining from north to south, towards Gurrundah Creek. Although this would need to be confirmed by groundwater and surface water elevation data, it is anticipated that groundwater would also generally flow in the same direction as the topographic gradient, i.e. in a southerly direction.

4.0 IMPACT OF TRENCHING

A review of the potential impacts resulting from the trenching activities is provided hereafter. We note that where groundwater levels are lower than the proposed maximum trench depth, impacts on the groundwater from the trenching would be negligible.

4.1.1 Short Term Impacts

On Ponds

Providing that the groundwater level is higher than the base depth of the trench and the soil lithology is permeable enough, there is a potential for groundwater to be drained by the trench if it is left open. However, our understanding as communicated to us by Developments Biala is that the trenching methodology shall ensure that the time that the trench is left open is minimised i.e. simultaneous trenching and filling therefore we would expect the short term impacts to be limited.

On Gurrundah Creek

There is potential for some temporary increased groundwater inflow into the trench if it is left open however the short term impacts will be limited by ensuring the trenching methodology minimises the time the trench is left open.

4.1.2 Long Term Impacts

On Ponds

Providing that the trench backfill is the same or less permeable than the native soils, it is unlikely that the water level of the ponds will be reduced in the long term as a result of the trenching.

On Gurrundah Creek

Golder understands from Developments Biala that where the trenches cross wet terrain (such as across the creek) it is likely that a backfill material of lower permeability than the surrounding natural soils will be used to enhance the long term stability of the trench. Since it is assumed that groundwater flows from north to south, the west to east trench may provide some form of barrier to groundwater flow in the long term, should the depth to groundwater be above the trench depth. This may result in wetter ground conditions upstream of the trenching due to increased water levels in the area.

5.0 RECOMMENDATIONS

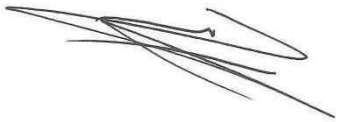
Golder recommends it is prudent for Developments Biala to do the following to help monitor and mitigate the impact of the trenching activities (provided access to the springs is granted by the landowners:

- Prior to trenching
  - installation of ground water monitoring points between the disturbance zone and the property boundary to ascertain or monitor groundwater levels within the area.
  - Conduct a survey of the water levels within the two ponds, the Gurrundah Creek, and the installed groundwater monitoring points.
  - Regular (say every 2 months) water level monitoring prior to construction. It is recommended that monitoring commence at least 2 months prior to construction (such that at least 2 monitoring cycles are undertaken).
- During trenching
  - Trenching to be undertaken by simultaneous trenching and filling.
  - Level of water in ponds to be monitored.
  - If open trenches are required, trenches to be monitored for volume of water flowing
  - Trenches to be left open for the minimum possible time period
- Post trenching
  - Level of water in ponds and installed monitoring points to be monitored.
  - Monitoring of the ponds and the installed monitoring points should be conducted at approximately 2 month intervals and continue for up to 12 months following completion of the trenching work.

6.0 IMPORTANT INFORMATION

Your attention is drawn to the document titled - “Important Information Relating to this Report”, which is included in Appendix E of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

Golder Associates Pty Ltd



Andrew Minard
Hydrogeologist

Federic Cosme
Principal Hydrogeologist

AMM - DBA/FMC/amm

Attachments: Appendix A – Field Photos
Appendix B – Field Notes
Appendix C – Limitations

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SITE INSPECTION PHOTOS

Golder carried out a site visit to assess the potential impact trenching activities may have on the Gurrundah Creek, two inferred spring locations, and drainage patterns. The site inspection included taking field photos, which are included in Table A below:

Table A: Selected Field Photos

Photo Number	Brief Description and direction	Photographs
1	South of the reservoir – looking north west	
2	South of the reservoir – looking north west. Artificial dam impeding flow of Gurrundah Creek roughly 100m south of proposed trench	

Photo Number	Brief Description and direction	Photographs
3	Location of the reservoir, looking west. Barrier is approximately 2.0 - 2.5 m in height, 3.0 – 4.0 m in width, and 50 – 60 m in length	
10	Western side of the Gurrundah Creek – looking north. Gently sloping topography with little vegetation on the western side. No vegetation cover suggest the water level approached up to a 0.5 m in height.	

Photo Number	Brief Description and direction	Photographs
11	Gurrundah Creek – looking south. Photo taken adjacent to where trenching would across the Gurrundah Creek would occur. Almost dry, with intermittent flow	
14	Two Ponds (inferred spring locations) – looking northwest. Within 20 m disturbance zone Pond 1 on the left, pond 2 on the right. Estimated top of water in pond 1 is 1.0 m below surface level at this location	

Photo Number	Brief Description and direction	Photographs
15	10 – 15 directly south of Pond 1 – looking west – Within the 20 m disturbance zone Appearance of possible surface water drainage feature, draining to the south. Increased vegetation cover to the north of the fence.	
17	Approximately 10 m south from the fence – looking south east Within the 20 m disturbance zone. Slight green vegetation suggest localised drainage to the south	

Photo Number	Brief Description and direction	Photographs
20	Approximately 40 m to the east of the ponds – looking west Within the 20 m disturbance zone.	
21	Approximately 30 m to the east of the pond 1 – looking north west Within 20 m disturbance zone. Surface level between pond 1 where trenching would occur are relatively the same.	

Photo Number	Brief Description and direction	Photographs
22	Approximately 20 m to the east of the pond 1 – looking north Observing Pond 2. Barrier between Pond 1 and Pond 2 Surface topography gently slopes to the south west.	
23	Approximately 40 m to the west of the creek – looking east Within the 20 m disturbance zone. Topography gently sloping to the east in this location	

Photo Number	Brief Description and direction	Photographs
24	Approximately 40 m to the west of the creek – looking south east Within the 20 m disturbance zone. Topography gently sloping to the east in this location	
26	Western side of the Gurrundah Creek – looking north. Gently sloping topography towards the creek with evidence of slight drainage.	

Photo Number	Brief Description and direction	Photographs
33	Western side of the Gurrundah Creek, roughly 25 m south of the disturbance zone – looking north west. Low Creek levels with discontinuous flow and slight ponding.	

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