Our Ref C20005

Contact Paul Broadhurst

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Shire of Collie
87 Throssell Street
Collie WA 6225

For the attention of Katya Tripp

Dear Katya,

RE: MINNINUP POOL TOURISM PROJECT – SERVICING REPORT

River Engineering Pty Ltd (River) have been engaged by the Shire of Collie (Client) to investigate the extent of works to be undertaken to provide service connections to the proposed Minninup Pool Camp Grounds and Eco Cabins (site) located within Reserve 23606, R34343 which is zoned Parks and Recreation.

The site investigation took place on the 9 April 2020 and together with Dial Before You Dig information and information provided by the Client and liaison with Services Authorities, the following report was written to identify the possible work that needs to take place.

1 INTRODUCTION

1.1 Purpose

The purpose of this report is to identify and outline the conceptual design of services infrastructure to the proposed Camp Ground and Eco Cabin development located at Minninup Pool Reserve, Minninup Road, Collie.

1.2 Scope of Report

The scope of this Service Report includes the following:

- Existing site conditions
- Water supply
- Sewer options
- Site power supply
- Power distribution infrastructure

This report is intended to be a high-level conceptual overview of the required services, particularly focused on spatial requirements and infrastructure provisions.

This report does not include assessment of required services to the Day Use area, internal services or any other area outside the Camp Ground and Eco Cabin lease.

2 SITE

The site is located in Collie, WA, bordered by Mungalup Rd to the north, Minninup Rd to the east, and the Collie River to the south.

The site boundary is marked by the red lines in Figure 1 below.

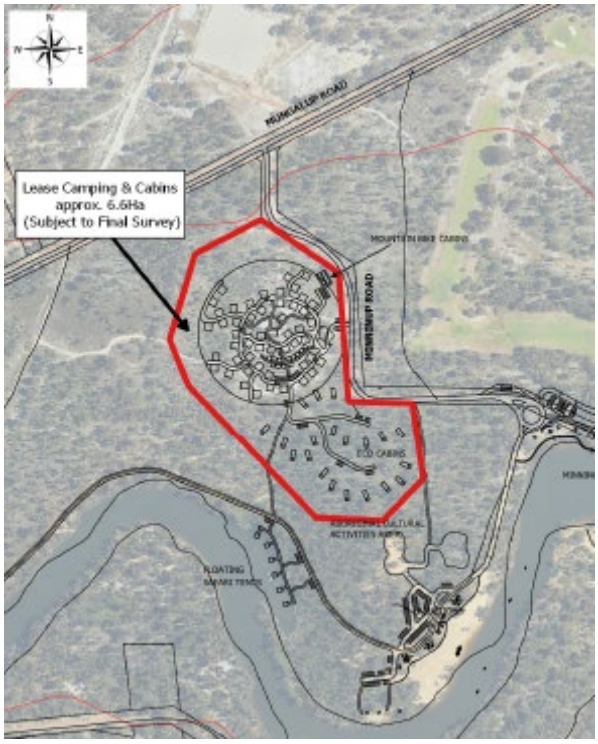

Figure 1 Site Location

3 DEVELOPMENT AREA

River have assessed the proposed development within the Camping and Cabins lease area. The following has been used in the preliminary assessment of the required services infrastructure: -

Camp Grounds

- 50 off camping sites (assumed to be powered)
- 8 off motel style units
- 12 off camping bays (assumed to be powered)
- Reception/Manager's residence
- Ablutions block
- Kitchen block

Eco Cabins

- 20-off Cabins (assumed to be powered)

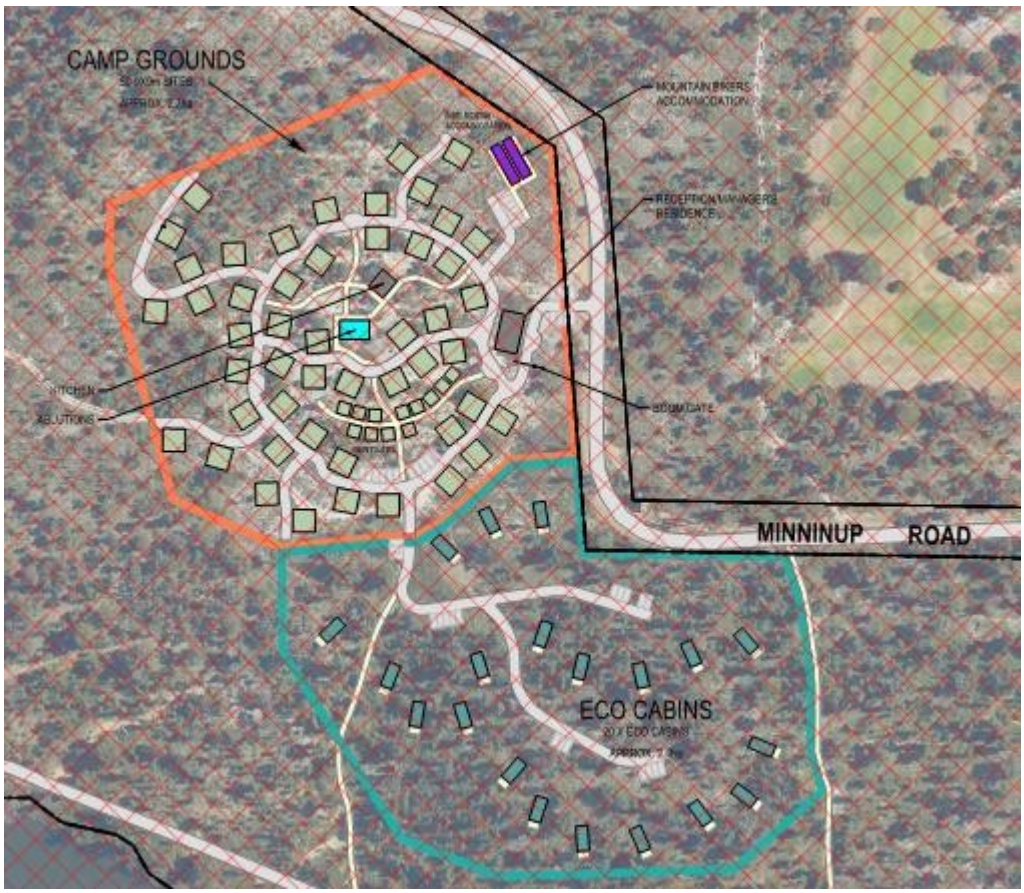

Figure 2 Layout of proposed development

4 SERVICING

4.1 Water and Sewer Supply

4.1.1 Current Situation

The site does not have a water and sewer connection.

4.1.2 Water and Sewer Headworks Options

The water demand for the site will determine the not just the water meter size but also the resultant headworks charges for water and sewer. For this project there will be two options investigated based on the size of the water meter.

The flowrates shown in Table 1 below is an estimate of the water demand for the Camp Ground and Eco Cabins erring on the conservative side. The peak flowrate of 3.32 litres/sec (or 199.20 litres/minute) will result in a restricted 50mm water meter which is capable of delivering 180 to 200 litres/min.

This 50mm water meter subsequently results in a headwork charge of nine (9) Single Residential Equivalent (SRE) water costs and twenty five (25) SRE wastewater costs. At the moment the water SRE is $2,469 and the wastewater SRE is $3,110 resulting in a headworks cost as follows;

(9 x $2,469) + (25 x $3,110) = $99,971 headworks charge for a 50mm water meter.

Alternatively, there is an option for reducing the water meter size down to 40mm which will capable of delivering 80 to 102 litres/min. In order to achieve this reduced flowrate the peak factor (currently

shown as 6 time the average flow in Table 1 below) will need to be reduced to 3 times the average flow. This can be achieved by providing a water storage tank on the site together with a booster pump which will buffer the peak flowrate.

This 40mm water meter subsequently results in a headwork charge of four (4) SRE water costs and six (6) SRE wastewater costs. Based on the current headworks costs this will result in the following;

(4 x $2,469) + (6 x $3,110) = $28,536 headworks charge for a 40mm water meter.

The cost estimate for water and sewer will be combined and provide the following options;

- Option 1 – 50mm water meter
- Option 2 – 40mm water meter

4.1.3 Water Demand

Table 1 below is an estimate of the water demand for the Camp Ground and Eco Cabins. The peak flowrate of 3.32 litres/sec is based on a peak factor of 6 times the average daily flowrate of 0.55 litres/sec resulting in a 50mm water meter.

This peak factor can be reduced to 3 times the average daily flowrate giving a peak flowrate of 1.65 litres/sec which will enable the water meter to be reduced to 40mm, however, additional infrastructure will be required to achieve this reduction.

Item	Description	Quantity	Persons/Unit	Flow/Person (litres/day)	Amount (litres/day)
1	Caravan bays	50	3	170	25,500
2	Eco-cabins	20	4	170	13,600
3	Motel style units	8	2	170	2,720
4	Camping bay	12	3	170	5,100
5	Managers residence	1	4	200	800
6	Office	1	4	30	120
		Total Daily Flowrate (litres/day)			47,840
		Total Daily Flowrate (litres/sec)			0.55
		Peak Factor			6
		Peak Flowrate (litres/sec)			3.32
	Notes				
a	The above figures are based on a 100% occupancy rate.				

Table 1 Water Demand

4.1.4 Connection Point

The Water Corporation has advised that the preferred connection point to the Water Corporations water reticulation system shall be the existing water reticulation pipe at the intersection of Mungalup Road and Atkinson Street South (refer to Figure 3 below).

There will be a requirement to install approximately 1,000m of DN100 PVC water pipe and it is recommended that this pipe should run on the northern side of Mungalup Road so there will only be two road crossings being Mungalup Road and Atkinson Street South (refer to Figure 3 below).

The Water Corporation has also advised that the pressure at the proposed water meter will be in the range of 80 to 89m head due to the site contour. It is recommended that a pressure reducing valve is installed at the site to reduce this pressure down to <60m head and subsequently reduce the impact to appliances such as hot water systems, dishwashers, etc.

Figure 3 – Water Alignment

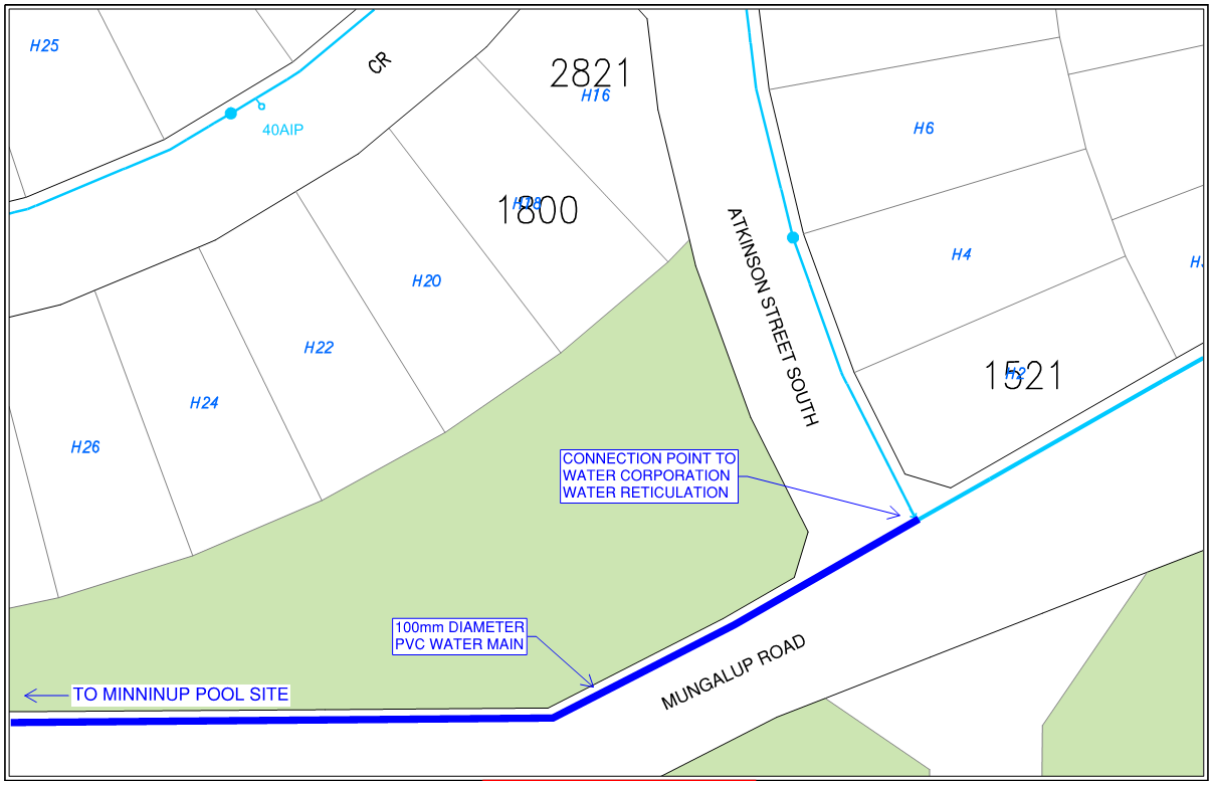

Figure 4 Water Connection Point

4.1.5 Wastewater Flowrate

The flowrates shown in Table 2 below is an estimate of the wastewater flowrates for the Camp Ground and Eco Cabins. The flowrates have been taken from the Department of Health Supplement to Regulation 29 and Schedule 9 – Wastewater system loading rates.

Item	Description	Quantity	Persons/Unit	Flow/Person (litres/day)	Flow/Dwelling (litres/day)	Amount (litres/day)
1	Caravan bays	50	3	140		21,000
2	Eco-cabins	20			564	11,280
3	Motel style units	8	2	140		2,240
4	Camping bay	12	2.5	140		4,200
5	Managers residence	1			761	761
6	Office	1	4	30		120
			Total Daily Flowrate (litres/day)			39,601
			Total Daily Flowrate (litres/sec)			0.46
			Peak Factor			4.00
			Peak Flowrate (litres/sec)			1.83
	Notes					
a	The above figures are based on a 100% occupancy rate.					
b	The peak factor is less than the water peak factor due to storage within the system which will					
	buffer the peak factor.					

Table 2 Wastewater Flowrates

4.1.6 Sewer Disposal Options

Due to the sites proximity to the Collie River it is not recommended to install a septic tank or an Aerobic Treatment Unit (ATU) as the area for disposal of final effluent falls within the river flood area which will subsequently contaminate the river. This could be achieved by placing fill around the disposal area, however, to achieve this there will then be a need to place a considerable amount of clean fill on the

site and a pump station will then be required to pump the sewage up to the septic tank or ATU making this option high in capital cost, high in operational cost and still pose a risk to the environment.

The only feasible option is to install a private pump station and pressure main which shall run to the Water Corporations sewerage network in Collie.

The Water Corporation have confirmed that the private pump station can discharge in access chamber 0663 which is located in the Public Open Space (POS) behind house 18 Telfer Crescent (refer to Figure 6 for the pressure main connection point).

It should be noted that the Water Corporation will not allow a flowrate above 2.5 litres/sec into this access chamber. Even at the 2.5 litres/sec the Water Corporations system modelling falls slightly outside the design standard depth of flow in the downstream DN150 pipework from access chamber 0663. This depth of flow will not result in the pipe flowing full and the Water Corporation has agreed that this will be acceptable in this case.

The pressure main from the private pump station shall be a DN63 in order for the scouring velocities within the pipe to be achieved. The length of the pressure main will be approximately 1,200m in order for the pump station to be located within the centre of Camp Ground and Eco Cabins to reduce the lengths of internal gravity sewer within the site which subsequently reduces the depth of the sewer (refer to Figure 5 below).

During the detailed design phase of this system the connection point into the Water Corporation's access chamber will need to consider a boundary trap to the two existing junctions. The pump station design will also need to consider flood levels and the possibility of flotation so a structural engineer will need to be involved to ensure the pump station has sufficient ballast.

Figure 5 Proposed sewer Pressure Main Alignment

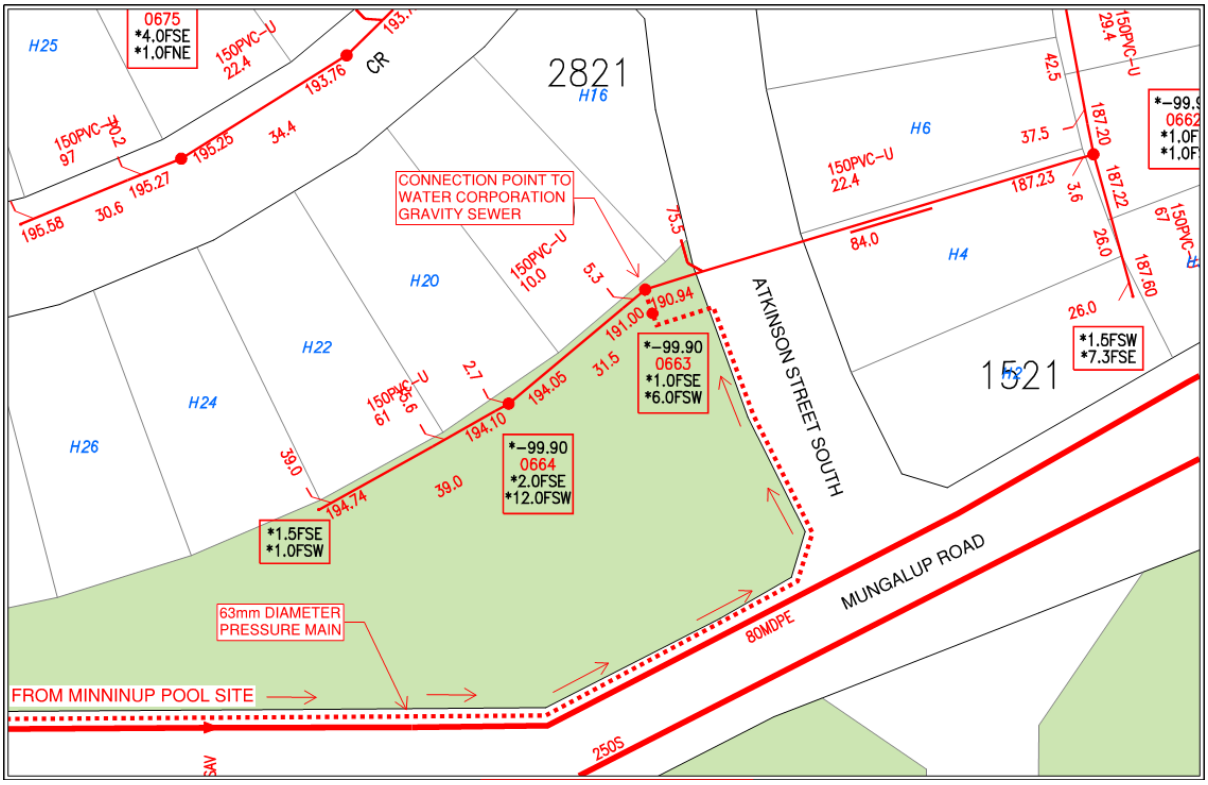

Figure 6 Pressure Main Connection Point

4.2 Power and Communications Supply

4.2.1 Maximum Demand

A preliminary assessment of the camp ground and Eco cabin maximum demand has been undertaken, based upon AS3000 and AS3001 as follows: -

- Assume 1-off 15 Amp socket-outlet for light-duty loads to each proposed tent site (12-off in total).
- Assume 1-off 15 Amp socket outlet for heavy-duty loads including air-conditioning to each proposed camping site (50-off in total).
- Assume 1-off 15 Amp socket-outlet for light-duty loads to each proposed Eco cabin (20-off in total).

The estimated maximum demand load is shown below in Table 3.

Load Type	Comment	Formula	Estimated Load (Amps)	
Socket outlets for tent sites (light duty loads)	6 Amps per point	= (6 x 12)/3	24	Amps three phase
Socket outlets for Eco cabins (light duty loads)	36 Amps plus 4 Amps for the 7th and each successive point	= (36 + (4 x 14))/3	31	Amps three phase
Socket outlets for camping sites (heavy duty loads)	60 Amps plus 6 Amps for the 7th and each successive point	=(60 + (6 x 43))/3	106	Amps three phase
Reception/Manager's residence	Modular building		32	Amps three phase
Ablutions block	6-off 3.6kW hot water units		52.5	Amps three phase
Mountain biker's accommodation	Modular building		15	Amps three phase
Camp kitchen	Modular building		45	Amps three phase
Total			**306**	**Amps three phase**

Table 3 Estimated Maximum Power Demand Load

4.2.2 Existing Site Western Power Infrastructure

Western Power transmission (33kV – 330kV) and distribution (1kV – 33kV) aerial power cabling reticulates across the Crown land, adjacent to an existing access road, as indicated below on Figure 7 and Image 1.

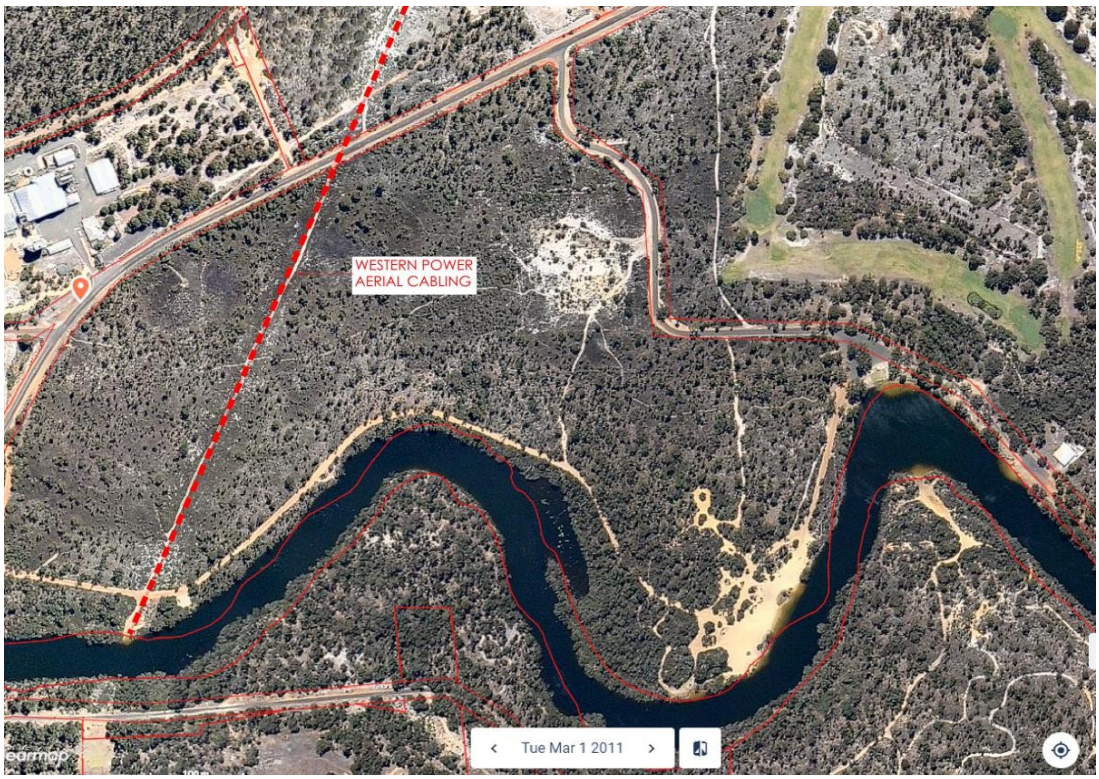

Figure 7 Western Power Aerial Cabling

Image 1: Existing Western Power Aerial Cabling

Based upon visual inspection and Dial Before You Dig drawings, there do not appear to be any existing Western Power points of supply (either pillars or substations) within the site.

4.2.3 Existing Site Power Distribution Infrastructure

The area of crown land indicated above does not contain any existing power distribution infrastructure.

4.2.4 Existing Telecommunications

Existing telecommunications conduits and pits reticulate down Minninup Road, and terminate at a network authority telecommunications pit, located adjacent to the proposed Day Use area. These services are indicated in the Dial Before You Dig information depicted below.

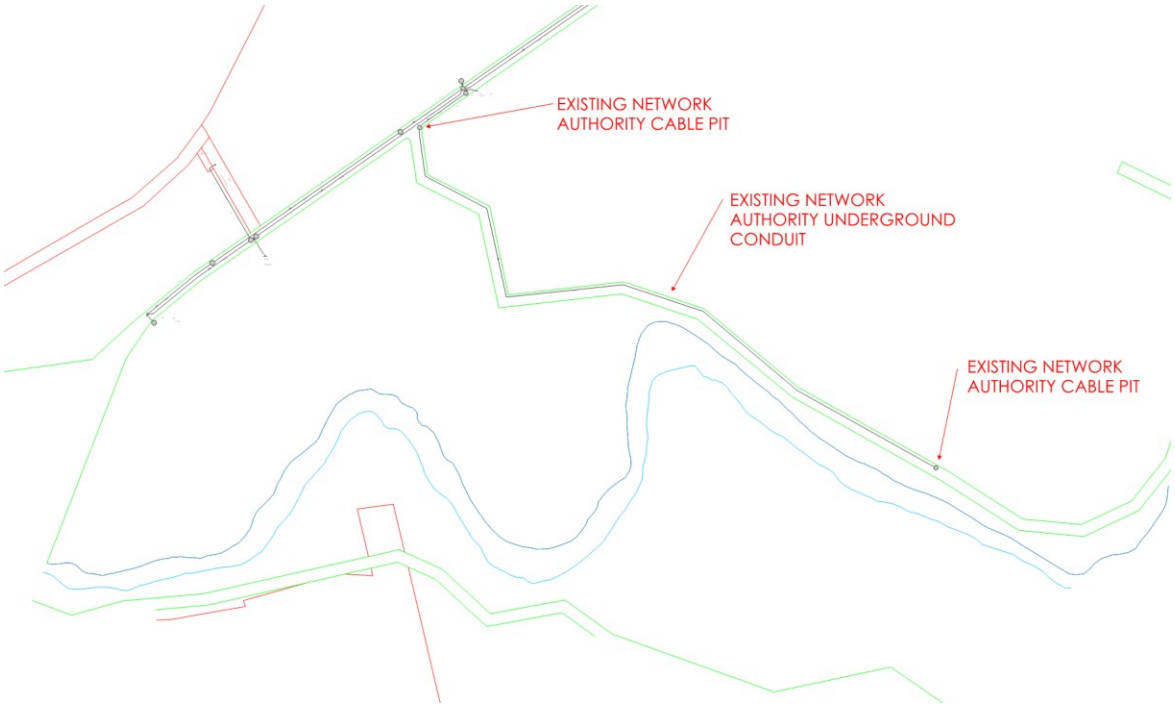

Figure 8 Existing Telecommunication Supply

4.2.5 Existing Site Communications Infrastructure

The area of crown land indicated above does not contain any existing Customer communications infrastructure.

4.3 PROPOSED ELECTRICAL SERVICES

4.3.1 Proposed Site Power Supply

The estimated maximum demand of the camping ground development (220kVA / 306 Amps three phase) requires a low voltage point of supply to be provided relatively close to the camping ground, to minimise the losses inherent in cabling a large low voltage load over a long distance, i.e. volt drop and impedance. The low voltage conductor circuit lengths will be required to be kept as short as possible.

In order to provide a low voltage power supply, the following options have been considered.

Option 1 – Western Power Sole Use Substation

For a customer load which is located a long distance (more than 30m) into the customer's site, Western Power may provide a Sole Use Substation. This is a substation which is completely dedicated to the customer's site, and does not have outgoing low voltage street feeds like a District Type Substation arrangement.

The main components of the installation are indicated on Figure 9 below, and summarised as follows:

- Western Power high voltage switchgear (indicated in yellow) will be required to be positioned adjacent to the Western Power distribution power lines.
- Underground high voltage cabling (indicated in green) will be required to be provided from the Western Power high voltage switchgear, to the Western Power sole use substation.
- A Western Power sole use substation (indicated in orange) will be required to be provided near to the Camping Ground area.
- A Site Main Switchboard (SMSB) (indicated in blue) containing authority master metering, will be required to be provided adjacent to the substation

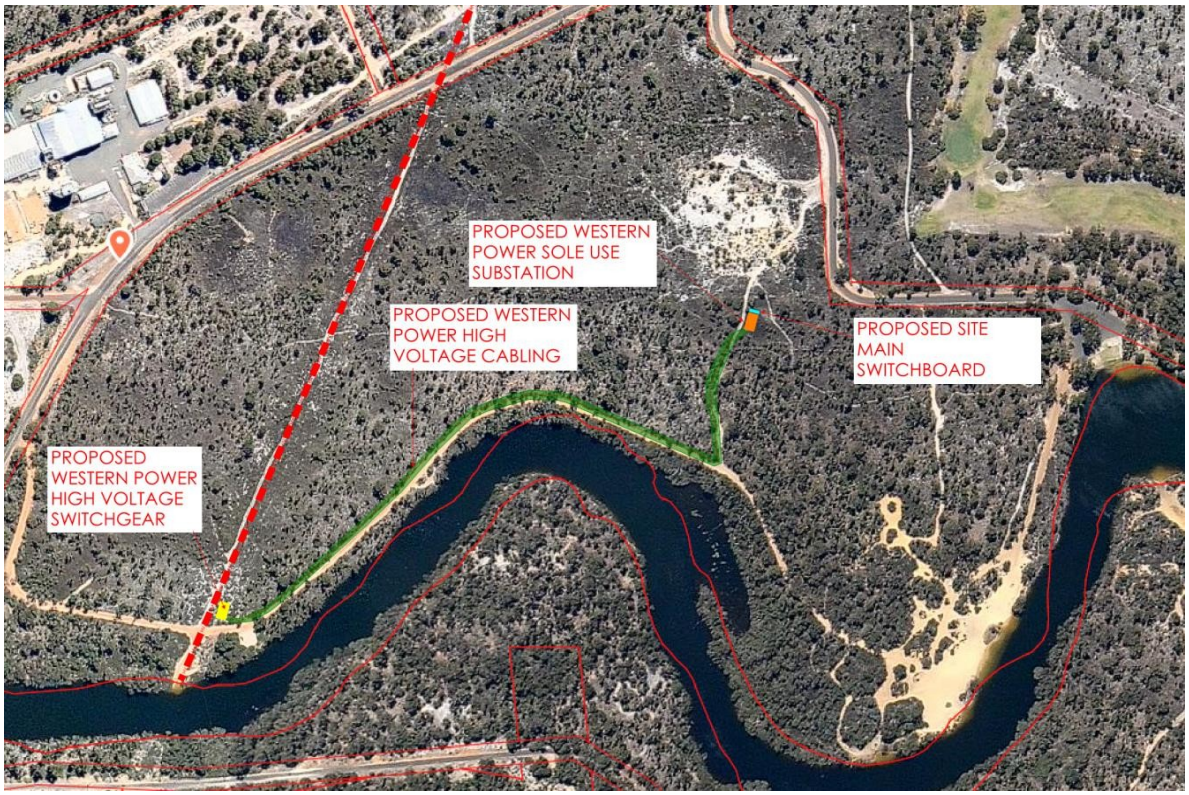

Figure 9 Western Power Sole Use Substation Option

In order to facilitate the Western Power cabling along the route shown in green, the Customer will be required to provide 150mm diameter conduit, buried at a depth of 750mm underground to the top of the conduit, with cable pulling pits positioned every 60-70m.

The Spatial requirements for each of the above components are further described below.

High Voltage Switchgear

The Western Power high voltage switchgear requires 1m deep clear and level sand pad to be prepared, measuring 4500mm x 3000mm. While requiring access from the roadway, the substation site will be required to be protected from vehicles via non-metallic bollards.

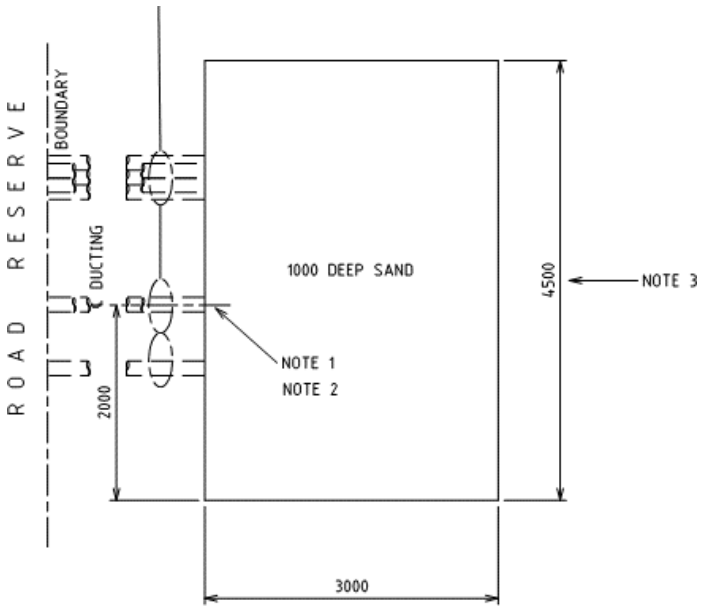

Figure 10 Western Power High Voltage Switchgear

Sole Use Substation

The Western Power sole use substation requires 1m deep clear and level sand pad to be prepared, measuring 3600mm x 3600mm. While requiring access from the roadway, the substation site will be required to be protected from vehicles via non-metallic bollards.

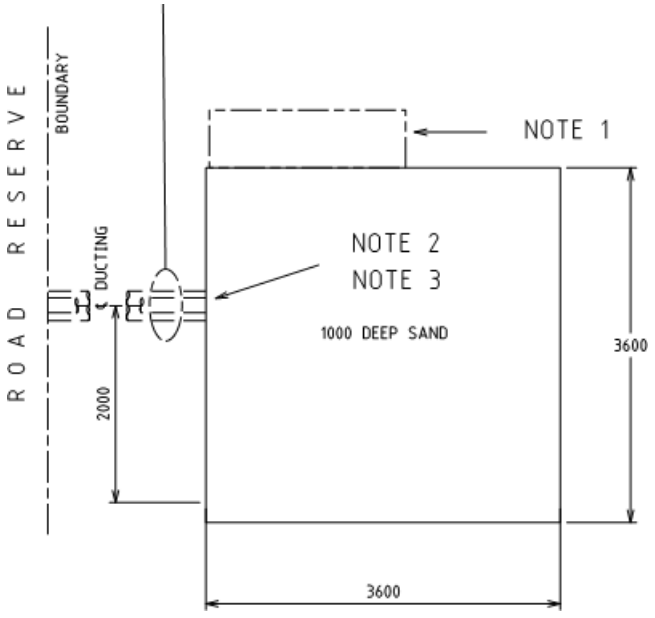

Figure 11 Western Power Sole Use Substation

Note 1 – the Site Main Swtichboard must be located contiguous with the substation.

The substation must be located clear of the following services: -

- The fire risk zone associated with a substation, to protect the transformer from fire risk, is 6m, therefore no building may be positioned any closer than 6m from a substation.
- No fire hydrant may be positioned within 10m of a substation.

- No telecommunications pit may be positioned within 15m of a substation.
- The substation footprint must be clear of all other services, including but not limited to any underground water, sewer or gas piping.

The advantages of Option 1 are as follows: -

- Installation and ongoing maintenance of the high voltage installation will be undertaken by Western Power. The customer will be required to prepare the substation sites, and provide the underground conduits for the high voltage cabling. This means that maintenance and replacement costs for the infrastructure are borne by Western Power.
- Low voltage power supply can be provided from the Site Main Switchboard to service the Camp Grounds, the Eco Cabins, and in future also to the Floating Safari Tents.
- Low voltage circuit lengths are minimised, thus reducing installation costs.

The disadvantages of Option 1 are as follows: -

- The infrastructure will be limited in terms of future extension, for example for the proposed Day Use area. While low voltage will be available at the Camp Ground, the limitations on low voltage cabling means that future extension of power will be limited to areas within a few hundred metres of the substation location.
- Headworks costs associated with the works are likely to be very high, given the extensive scope of works required to be undertaken by Western Power, i.e. the high voltage cabling works.

Option 2 – Customer Owned Substation

For a customer site which requires a high voltage supply, Western Power will provide a High Voltage Substation point of connection and high voltage metering unit only.

The main components of the installation are indicated on Figure 12 below, as follows: -

- Western Power high voltage switchgear and metering unit (indicated in yellow) will be required to be positioned adjacent to the Western Power distribution power lines.
- Customer Owned underground high voltage cabling (indicated in green) will be required to be provided from the Western Power high voltage switchgear, to the Customer Owned High Voltage Switchgear.
- Customer Owned High Voltage Switchgear (indicated in pink) will be required to be provided in order to facilitate future extension of the high voltage network to future stages of development.
- Customer owned underground high voltage cabling (indicated in red) will be required to be provided from the Customer Owned High Voltage Switchgear to the Customer Owned Substation.
- A Customer Owned substation (indicated in orange) will be required to be provided near to the Camping Ground area.
- A Site Main Switchboard (SMSB) (indicated in blue) will be required to be provided adjacent to the substation.

Figure 12 Customer Owned Substation

The Spatial requirements for each for the above components are further described below.

<u>High voltage substation</u>

The Western Power high voltage substation requires 1m deep clear and level sand pad to be prepared, measuring 5500mm x 6200mm. While requiring access from the roadway, the substation site will be required to be protected from vehicles via non-metallic bollards.

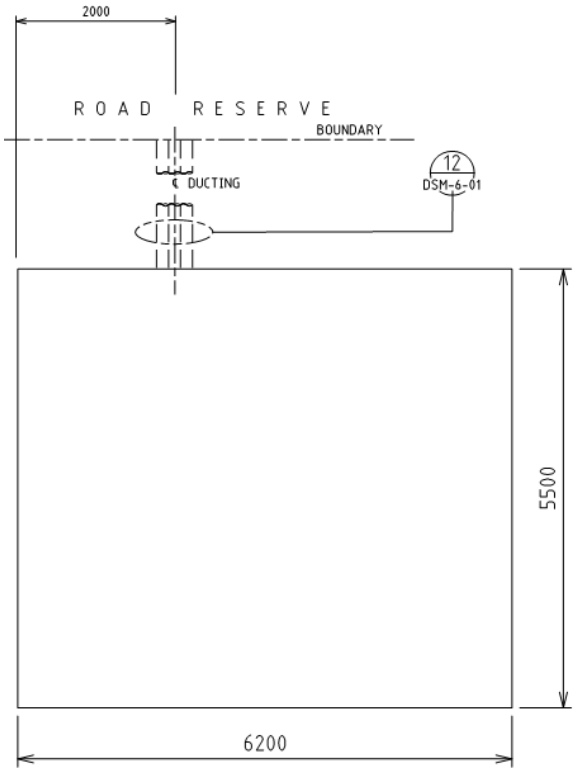

Figure 13 Western Power High Voltage Substation

Customer Owned High Voltage Switchgear

The Customer owned high voltage switchgear requires 1m deep clear and level sand pad to be prepared, measuring 4500mm x 3000mm. While requiring access from the roadway, the substation site will be required to be protected from vehicles via non-metallic bollards.

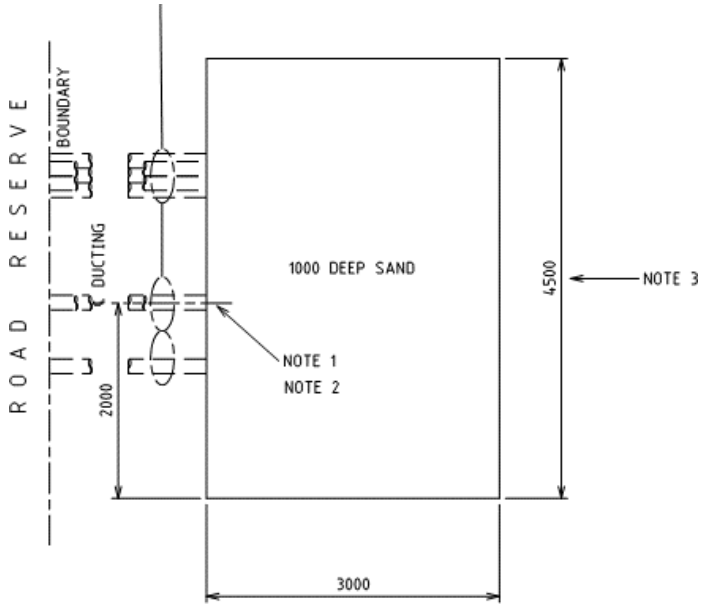

Figure 14 Customer Owned High Voltage Substation

Customer Owned Substation

The Customer owned substation requires a clear site to be prepared, measuring a minimum of 3600mm x 3600mm. While requiring access from the roadway, the substation site will be required to be protected from vehicles via non-metallic bollards. The substation will be required to be designed to contain the oil from the transformer and prevent spillage to the surrounding land.

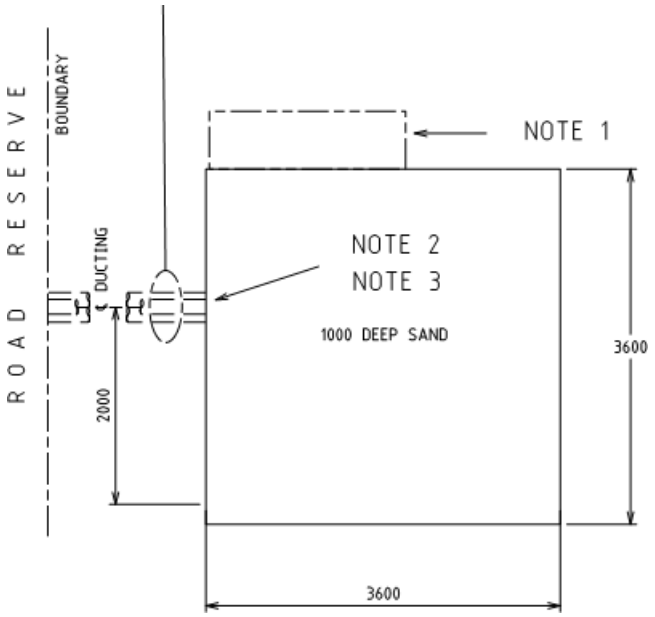

Figure 15 Customer Owned Substation

Note 1 – the customer's Site Main Switchboard is required to be positioned contiguous with the substation.

The advantages of Option 2 are as follows: -

- Headworks costs may be reduced compared to Option 1, as Western Power are not required to provide and maintain the same quantity of infrastructure. (Note this will be required to be confirmed by Western Power through a Feasibility Study process).
- By providing high voltage switchgear as shown above in pink, the infrastructure will be able to be extended in future by provision of additional high voltage cabling. As high voltage cabling can reticulate over large distances with minimal losses, the network can be extended many hundreds of meters to support further development such as the Day Use area and beyond.
- The low voltage circuit lengths are minimised, thus reducing installation costs.

The disadvantages of Option 2 are as follows: -

- The customer is responsible for supply, installation and ongoing maintenance of the privately owned switchgear, high voltage cabling and transformer.
- Preparation of the substation site for the Customer owned transformer will be more extensive than Option 1, as the Customer is required to ensure that any oil leakage is fully contained, and does not contaminate the surrounding area.

4.3.2 Site Main Switchboard

A new ground mounted free standing Site Main Switchboard (SMSB) will be required, contiguous with the low voltage point of supply.

The SMSB will contain master metering equipment, and will provide power supply via underground submain cabling to low voltage distribution boards throughout the camping area development.

4.3.3 Standby Power Supply

Standby power supply provided by diesel generator is not deemed necessary.

4.4 EXTRA LOW VOLTAGE SERVICES

4.4.1 Telecommunications Service Provider Space

In order to allow for telecommunications services, space for service provider equipment will be required to be allowed. This is recommended to be within the Reception/Manager's Residence close to Minninup Road. A space measuring 900mm wide x 500mm deep is recommended to be allowed.

From the Manager's Residence, underground NBN and Telstra-compliant conduits will be required to be provided out to the site boundary adjacent Minninup Road.

This will ensure the development is future proofed for communications.

Figure 16 Proposed Communications

4.5 Gas

There is no reticulated gas infrastructure available within the area.

5 COST ESTIMATES

5.1 Water and Sewer

5.1.1 Option 1 – 50mm Water Meter & Sewer Pumping Station

Cost Estimate		
Item	Description	Estimated Costs
1	**Consultancy Fees**	
1.1	Survey	$5,000.00
1.2	Geotechnical Investigation	$10,000.00
1.3	Civil engineering, design drawings and documentation, obtain construction prices and contract administration through the construction period	$50,000.00
1.4	Structural engineer for pump station wet well	$5,000.00
	Sub-Total	**$70,000.00**
2	**Water and Sewer Construction Costs**	
2.1	Water Reticulation (approx. 1,000m)	$240,000.00
2.2	Sewer Pump Station and Pressure Main (approx. 1,200m)	$280,000.00
2.3	Contingency (10% of construction cost)	$50,000.00
	Sub-Total	**$570,000.00**
3	**Other Fees**	
3.1	Water and sewer headworks	$100,000.00
	Sub-Total	**$100,000.00**
	Grand Total (excl GST)	**$740,000.00**

5.1.2 Option 2 – 40mm Water Meter & Sewer Pumping Station

Cost Estimate		
Item	Description	Estimated Costs
1	**Consultancy Fees**	
1.1	Survey	$5,000.00
1.2	Geotechnical Investigation	$10,000.00
1.3	Civil engineering, design drawings and documentation, obtain construction prices and contract administration through the construction period	$55,000.00
1.4	Structural engineer for pump station wet well	$5,000.00

	Sub-Total	**$75,000.00**
2	**Water and Sewer Construction Costs**	
2.1	Water Reticulation (approx. 1,000m)	$240,000.00
2.2	Water Storage Tank and Booster Set	$50,000.00
2.3	Sewer Pump Station and Pressure Main (approx. 1,200m)	$280,000.00
2.4	Contingency (10% of construction cost)	$60,000.00
	Sub-Total	**$630,000.00**
3	**Other Fees**	
3.1	Water and sewer headworks	$29,000.00
	Sub-Total	**$29,000.00**
	Grand Total (excl GST)	**$734,000.00**

5.2 Power and Communications

5.2.1 Option 1 – Western Power Sole Use Substation

Cost Estimate		
Item	Description	Estimated Costs
1	**Consultancy Fees**	
1.1	Electrical and communication consultant	$10,000.00
	Sub-Total	**$10,000.00**
2	**Power and Communications Construction Costs**	
2.1	Provision of conduits (660m) and cable pits for underground high voltage cabling including trenching	$78,000.00
2.2	Builders work for preparation of substation sites	$5,000.00
2.3	Provision of main site switchboard	$40,000.00
2.4	Western Power charges for infrastructure – provision of underground high voltage cabling (660m)	$56,000.00
	Sub-Total	**$179,000.00**
3	**Other Fees**	
3.1	Western Power headworks	$105,000.00
	Sub-Total	**$105,000.00**
	Grand Total (excl GST)	**$294,000.00**

5.2.2 Option 2 – High Voltage Supply

Cost Estimate		
Item	Description	Estimated Costs
1	**Consultancy Fees**	
1.1	Electrical and communication consultant	$20,000.00
	Sub-Total	**$20,000.00**
2	**Power and Communications Construction Costs**	
2.1	Provision of conduits (660m) and cable pits for underground high voltage cabling including trenching	$78,000.00
	Provision of underground high voltage cabling (660m)	$56,000.00
2.2	Builders work for preparation of substation sites	$10,000.00
	Provision of HV switchgear	$30,000.00
	Provision of HV/LV transformer	$35,000.00
2.3	Provision of main site switchboard	$40,000.00
2.4	High voltage submission to Western Power	$12,000.00
	Sub-Total	**$261,000.00**
3	**Other Fees**	
3.1	Western Power headworks	$50,000.00
	Sub-Total	**$50,000.00**
	Grand Total (excl GST)	**$331,000.00**

5.3 Exclusions

The estimated costs listed above exclude: -

- GST.
- Escalation.
- Internal servicing and development costs.
- Environmental costs.
- The cost estimates do not include for all the low voltage power supplies from the SMSB to the campgrounds.
- The cost estimates do not include provision of any services to the Day Use area.
- The costs above do not include Western Power application ($495), Design Fee ($3,000 - $7,000) and Feasibility Study ($3,000 - $5,000) costs, which will be equally applicable to either Option above.

5.4 Clarifications

- Indicative Western Power headworks costs are based on published Western Power rates (https://westernpower.com.au/industry/distribution-low-voltage-connection- scheme-dlvcs/). Final costs will need to be confirmed by Western Power through a Feasibility Study process. Due to the extensive works to be undertaken by Western Power, final charges may be higher than the published rates.
- Costs for provision of Customer Owned High Voltage Switchgear are for one switchgear unit only. To add a second switchgear unit to enable future extension of the HV network to the Day Use area will be an additional $30,000.

If you require further discussion on this project please do not hesitate to contact me.

Yours Faithfully

Paul Broadhurst
Project Director
for **River Engineering Pty Ltd**