XEROS PICCOLO
CONSULTING ENGINEERS

STORMWATER MANAGEMENT REPORT

PROPOSED BOMEN BESS

BAVIN ROAD, BOMEN NSW 2650

CLIENT:	NGH CONSULTING
XEROS PICCOLO PROJECT NO.:	230799
REVISION:	C – FOR APPROVAL
DATE:	19 DECEMBER 2025

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Revision Number	Date	Description	Author	Checked By	Approved By	Signed
Revision A	13 December 2024	Issued for Review	S. Xeros	A. Xeros	A. Xeros	
Revision B	20 December 2024	Issued for Approval	S. Xeros	A. Xeros	A. Xeros	
Revision C	19 December 2025	Issued for Approval	S. Xeros	S. Xeros	S. Xeros	

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1 INTRODUCTION

1.1 BACKGROUND

Xeros Piccolo Consulting Engineers was engaged by NGH Consulting to undertake a Stormwater Management Assessment and Report for a proposed Batter Energy Storage System (BESS) in Bomen, north of Wagga Wagga NSW. The locality is shown in Figure 1. The development consists of a new BESS system adjacent to an existing substation, with the BESS to be located on a new constructed pad, and an access road from Bavin Road to the BESS site to be provided. This report outlines the results of the stormwater assessment and proposed measures to manage the stormwater for this development.

This report to be read in conjunction with the Drawings (ref. no. 230799) by Xeros Piccolo.

Figure 1 – Site locality plan

1.2 REQUIREMENTS

This site is located within the Wagga Wagga Special Activation Precinct (SAP), and therefore the requirements for stormwater management are outlined in in the Wagga Wagga SAP Delivery Plan, and in particular Performance Criteria PC19, and PC21 (refer Chapter 6 of the Delivery Plan).

1.3 CONTACTS

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2 STORMWATER MANAGEMENT PLAN

2.1 GENERAL

The proposed Stormwater Management Plan consists of measures to manage stormwater quantity and quality from the development to meet the relevant Performance Criteria. As shown on the Drawings, the stormwater management at the BESS site will generally consist of:

- An upstream earthen cut-off drain and bank, to direct upstream flows around the development site
- Internal drains, pits, and pipes throughout the development area to capture and direct runoff through the site in a controlled manner, to the on-site detention basin
- A proposed on-site detention basin to reduce peak flow from the site to pre-developed flow rates. The basin will have a low-level outlet pipe as well as high-level overflow spillway, and an infiltration bed
- Open drains and culverts along and under the access road to manage local runoff adjacent to the road

Further details are provided in the following sections of this report.

2.2 STORMWATER QUANTITY MANAGEMENT

To achieve the requirements outlined in Performance Criteria PC19, a preliminary stormwater design has been developed, including for the BESS site and for the access road from Bavin Road.

2.2.1 BESS Site

An extract from the Drawings is provided in Figure 2, showing the proposed stormwater management for the BESS site.

To direct upstream catchment flows around the development site, an upstream cut-off drain and bank will be provided. These flows will be directed to a level spreader device, which acts to return concentrated flows back to sheet flow following the natural fall of land and to allow further natural infiltration.

Within the BESS Site, a system of drains, pits, and pipes will capture and direct runoff to an on-site detention basin. The catchment area included is approximately 2.6 ha, as shown on the Drawings.

To determine the size and spatial requirements for the basin, a DRAINS model was developed, using the Initial Loss – Continuing Loss (IL-CL) hydrological model, as recommended in Australian Rainfall and Runoff (ARR 2019). The IL-CL parameters were obtained from the ARR Datua Hub, including pre-burst rainfall. The parameters used are provided Table 1 below.

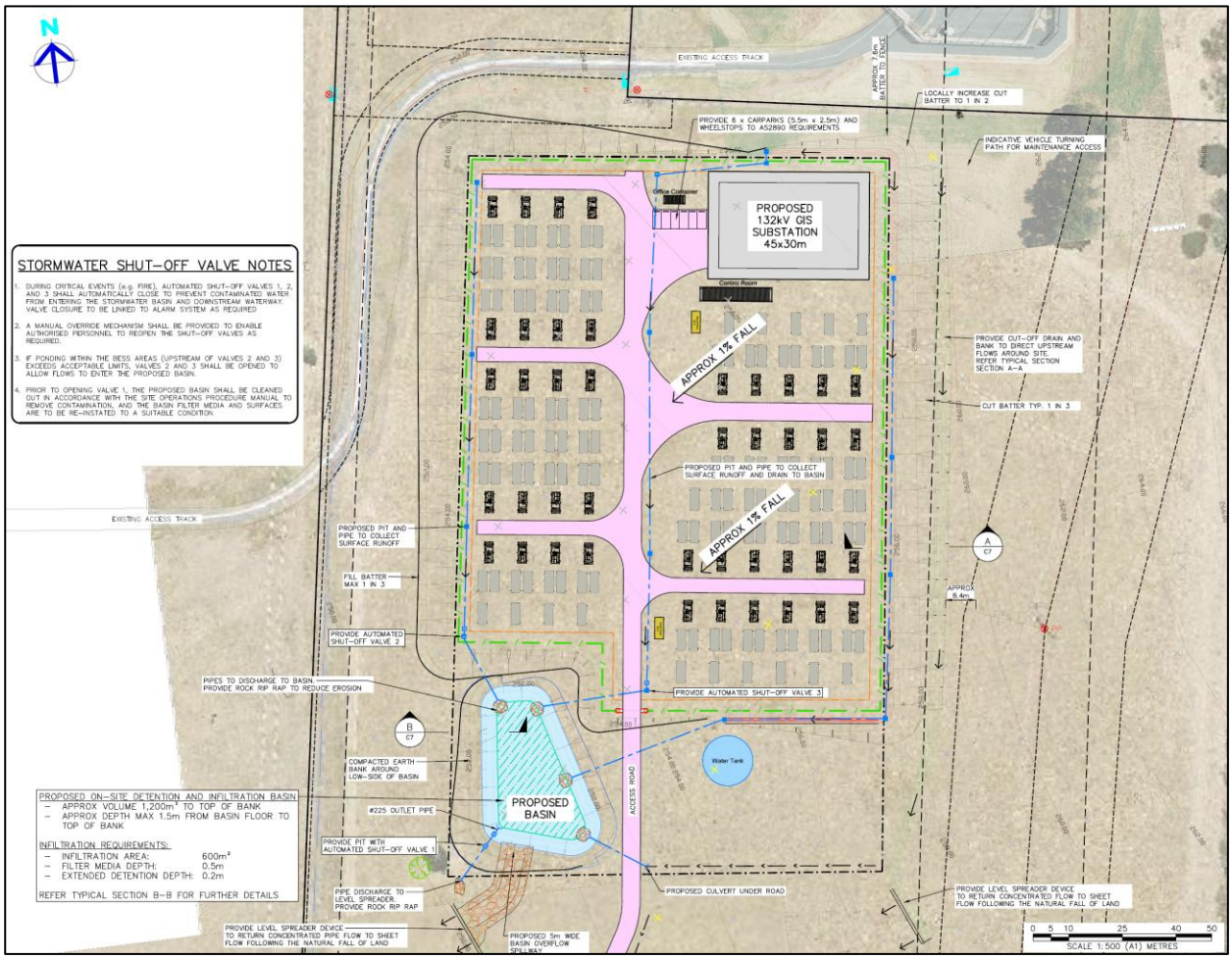

Figure 2 – BESS Stormwater Management

Table 1: IL-CL Model Parameters

AREA	LOSS
Initial Loss – Impervious Areas	0 mm
Continuing Loss – Impervious Areas	0 mm/h
Initial Loss – Pervious Areas	26 mm
Continuing Loss – Pervious Areas	1.84 mm/h*

**The continuing loss for pervious areas has been determined by multiplying the value provided on the ARR Data Hub by 0.4, as recommended on the NSW Specific Tab of the ARR Data*

Using the DRAINS model, pre- and post-developed flow rates were calculated for a range of storm recurrences, and for durations from 5 minute to 24-hours, and the on-site detention basin outlet and volume were sized to ensure post-developed flow rates from site were at or below pre-developed rates. The basin details are outlined in Table 2 below.

Table 2: On-Site Detention Basin Details

PARAMETER	VALUE
Top of Bank RL	252.1 m AHD
Basin Invert RL	250.60 m AHD to top of filtration bed 250.80 m AHD to top of extended detention zone
Low Level Outlet Arrangement	225 mm pipe outlet at invert RL 250.80 m AHD With grated pit internal overflow, top RL 251.45 m AHD, with 300 mm pipe downstream
High-Level Outlet – Overflow Weir	5 m wide trapezoidal weir at RL 251.80 m AHD
Storage Volume (to top of bank)	1,200 m^3
1% AEP Water Level	251.77 m AHD
Freeboard in 1% AEP Event (to top of bank)	330 mm

The calculated flow rates for various storm events are shown in Table 3 below, which show that the post-developed flow rates are all lower than the pre-developed rates. Based on this, the requirements of PC21 have been achieved, and water quality management for the proposed development is considered acceptable and in accordance with Delivery Plan requirements.

Table 3: Peak Flow Rates from BESS Site

STORM EVENT	PRE-DEVELOPED FLOW RATE	POST-DEVELOPED FLOW RATE
0.2EY (5-year)	217 L/s	125 L/s
10% AEP (10-year)	286 L/s	207 L/s
5% AEP (20-year)	352 L/s	208 L/s
2% AEP (50-year)	428 L/s	246 L/s
1% AEP (100-year)	505 L/s	404 L/s

2.2.2 Access Road

Generally, stormwater management along the proposed access road will consist of the formation of shallow, vegetated open drains on the uphill side of the road to direct runoff to culverts under the road. These culverts will discharge to a suitable level spreader devices, to return runoff to sheet flow conditions. Rock rip rap will be provided at the culvert outlets and at other critical

locations in the open drain, to reduce potential erosion. No kerb is proposed, allowing maximum infiltration into the open drains to minimise stormwater runoff.

2.3 STORMWATER QUALITY MANAGEMENT

To achieve the requirements outlined in Performance Criteria PC21, water quality modelling using MUSIC was undertaken for the BESS site to achieve the load reduction targets shown in Table 4. A Technical Memorandum by Dryside Engineering outlining the water quality modelling and assessment undertaken is provided as Attachment A for further information.

Table 4: Stormwater Quality Load Reduction Targets

POLLUTENT	TARGET REDUCTION
Total Suspended Solids	80%
Total Phosphorus	60%
Total Nitrogen	45%
Gross Pollutants	70%

To achieve these targets, an infiltration basin is required, and will be incorporated into the base of on-site detention basin. The infiltration basin parameters are as follows:

- Infiltration Area: 600m^2
- Filter Media Depth: 0.5m
- Extended Detention Depth: 0.2m (i.e. surface is 0.2m below the outlet pipe)

Based on the above, the requirements of PC21 have been achieved, and water quality management for the proposed development is considered acceptable and in accordance with Delivery Plan requirements.

3 CONCLUSION

A stormwater management assessment has been undertaken for the proposed Bomen BESS development to assess the water quantity and quality impacts for the development, to develop a design to manage these, and to confirm conformance with the Wagga Wagga SAP Delivery Plan Performance Requirements PC19 and 21.

It is concluded that the proposed stormwater management measures as shown on the Drawings are acceptable and meet the Delivery Plan requirements and objectives with respect to stormwater management.

ATTACHMENT A: WATER QUALITY TECHNICAL MEMORANDUM

Water Quality Assessment Technical Memorandum by Dryside Engineering.

To	Saxon Piccolo	From	Ed Henty
Company	Xeros Piccolo	Title	Principal Engineer
CC	-	Date	14/11/24
Project	Bomen BESS		
Subject	Water Quality Modelling (V01)		

1. Introduction

1.1. Background

Dryside Engineering (DSE) were engaged to size and model water quality infrastructure for a proposed Battery Energy Storage System (BESS) in Bomen, just north of Wagga, which is inside the Wagga Special Activation Precinct (SAP).

The water quality modelling is to demonstrate that the proposed BESS can meet Performance Criteria 21 in the SAP which is to:

Protect, maintain and restore water quality and waterway health through the design and management of the stormwater and wastewater management systems

The Water quality treatment is to meet the pollution load reduction targets outlined in Table 1-1.

Table 1-1 – Acceptable Solution A21.2 Pollution Load Reduction Targets

Pollutant	Target Reduction
Total Suspended Solids	80%
Total Phosphorus	60%
Total Nitrogen	45%
Gross Pollutants	70%

2. Water Quality Modelling

2.1. MUSIC Modelling

The MUSIC model (Model for Urban Stormwater Improvement Conceptualisation) Version 6.4.0 has been used to design and size the treatment train required to meet the targets outlined in Table 1.1. The following parameters have been used in the model:

- **Rainfall and Evaporation –** Rainfall and evaporation data for Wagga Wagga has been used as it is the closest location with relevant (and long enough pluvio data). The data range used was 1989 to 2009.
- **Rainfall Runoff Parameters –** 50% for the site which takes into account batteries and the gravel ground surface
- **Catchment Size –** 1.92ha
- **Treatment –** Infiltration Basin in the base of the detention basin:
  - Infiltration area – 600m^2
  - Filter Media Depth – 0.5m
  - Extended Detention Depth – 0.2m (i.e. surface is 0.2m below the outlet pipe)
- **Model Set Up –** Refer to Figure 2-1

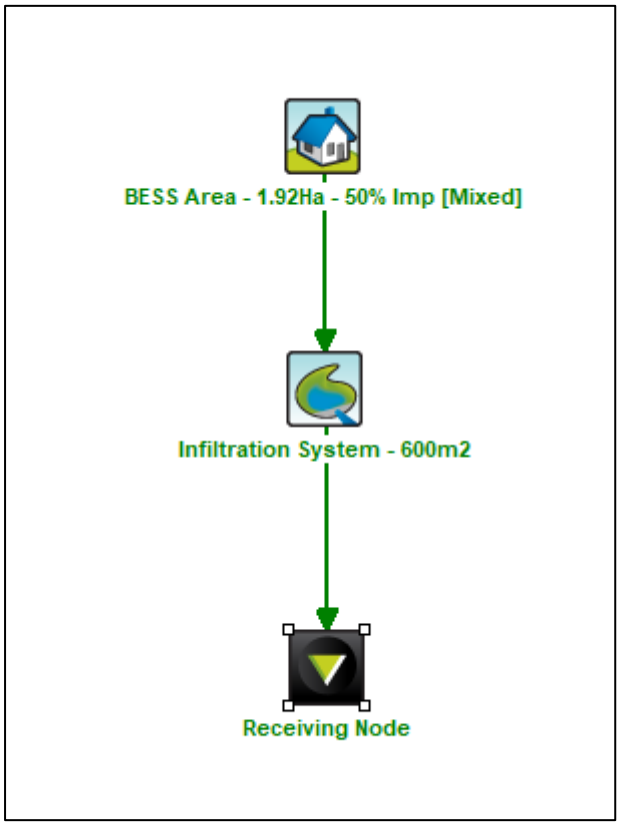

Figure 2-1: MUSIC Model Set Up

Table 2-1 – MUSIC Modelling Results

	Sources	Residual Load	% Reduction
Flow (ML/yr)	4.3	2.28	47.1
Total Suspended Solids (kg/yr)	888	176	80.1
Total Phosphorus (kg/yr)	1.8	0.438	75.7
Total Nitrogen (kg/yr)	12.2	4.56	62.7
Gross Pollutants (kg/yr)	185	17.4	90.6

3. Conclusion

The water quality infrastructure sized for the BESS meets Performance Criteria 21 in the SAP.

4. Contact

If you would like to discuss this memo, please contact:

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