Cumulus Engineering
FLOOD RISK SPECIALISTS

Cumulus Engineering Pty. Ltd.
www.cumuluseng.com.au
ABN 63 661 813 869

23/09/2024

Sarah Hillis
Principal Consultant
NGH Consulting
35 Kincaid Street
Wagga Wagga NSW

Flood Statement: Battery Energy Storage System, Bulluss Drive, Moree

Dear Sarah,

Cumulus Engineering has provided a Flood Statement for the proposed Battery Energy Storage System (BESS) located at Bulluss Drive, Moree (herein referred to as the 'subject site').

The purpose of this statement is to fulfill performance criteria outlined in the Moree Special Activation Precinct (SAP) with respect to flood risk Management, assessing the impact of any filling of land located within the Moree Flood Planning Area.

1 Background

The proposed development (as illustrated in Figure 1-1) involves the construction of a BESS consisting of inverters, battery containers and transformers (outlined in detail within the Scoping Report: Moree BESS (NGH, 2024)) as well as associated infrastructure including the following:

- Bulk earthworks across the site assuming an average depth of 1 metre ensuring a fall from east to west as per existing topography.
- Infill of former borrow pit located at the north-western corner of the site.
- Concrete foundations and pad footings for the buildings and structures
- Construction laydown area and internal access roads and tracks.
- Stormwater drainage infrastructure including new detention basin of approximately 800 cubic metres located on the northeast corner of the site.
- On-site car parking.
- Construction of an Operations and Maintenance building

As aforementioned, the site is located within the Moree SAP with a portion of the site located within the Probable Maximum Flood (PMF) extent. As outlined within the SAP Master Plan, development located within the precinct must fulfill the following performance criteria in regard to Flood Risk Management:

(A) *The performance criteria for peak flow is detention of post development flows to match the pre-development peak flow up to and including the 1 in 100 AEP flood event with climate change.*

(B) Development must generally occur outside of the flood planning area unless it can be demonstrated that risks can be suitably managed.

(C) Development must be sited, designed and located to avoid or mitigate the flood risk to people, property and infrastructure such that:

i. development is to provide on-site detention to control flood flows up to the 1 in 100 AEP event.

ii. precinct-wide infrastructure will generally use regional detention basins to manage flooding events.

(D) Development must be sited, designed and located to avoid or mitigate the flood risk to people, property and infrastructure such that:

i. Flood risks are managed through site specific built form and design.

ii. Sensitive, vulnerable and critical uses are avoided in the flood plain.

This statement aims to address Flood Risk Management Performance Criteria (B) from the Moree SAP Master Plan.

1.1 Sources of Data

The following sources of flood data were received for the site and used to form this flood statement:

- Flooding and Water Cycle Management Report and Mapping (Arcadis, 2021)
- Moree Flood Study Update Report and Mapping (WMS Engineering, 2020)
- Moree Plains Shire Local Flood Plan (NSW SES, 2012)
- Review of Moree and Environs Flood Study/Floodplain Risk Management Study and Plan Volume I - Flood Study Report (WRM, 2017)

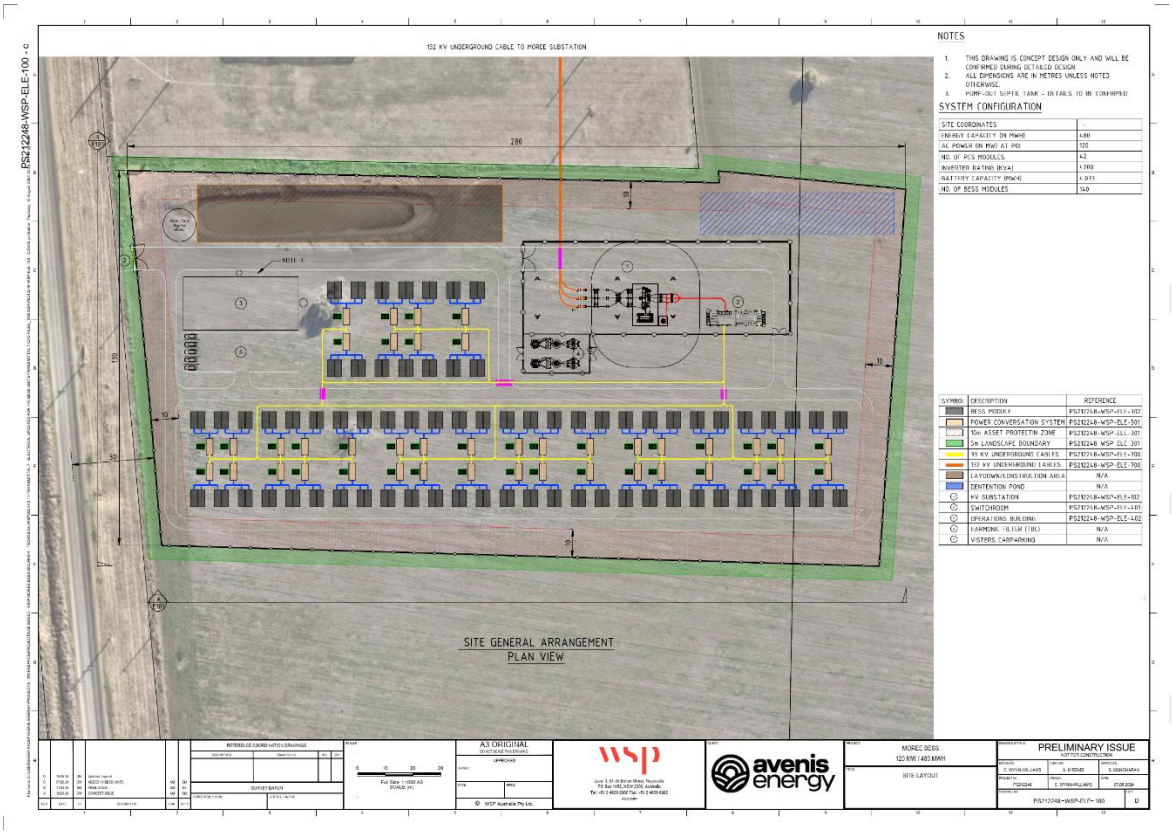

FIGURE 1-1 OVERALL SITE PLAN (WSP, 2024)

2 Flood Risk Assessment

2.1 Flood Behaviour

Based on sources of flood data for the township of Moree, the available data shows that:

- Based on the mapping provided within the 2021 report, the north-east corner of the broader site is subject to inundation in the 1% AEP event with depths of up to 500mm – 1000mm as illustrated in Figure 2-1 and estimated based on PDF mapping within the report. The remainder of the site is flood-free in the 1% AEP event aside from some ponding in the existing dam on the northwestern boundary of the site. The BESS site itself, aside from the dam, is flood-free in the 1% AEP event. The area subject to inundation in the 1% AEP event makes up less than 10% of the broader site with all proposed infrastructure for the BESS located outside of the flood extents.
- Similar flood behaviour is observed in the 0.5% AEP Climate Change scenario and Probable Maximum Flood (illustrated in Figure 2-2) events respectively with the northwestern corner of the site inundated at the location of the existing dam with the remainder of the site remaining flood-free. The results show that even under extreme flood conditions the majority of the site is flood-free.
- Hazard mapping for the 1% AEP event provided within the 2021 report as illustrated in Figure 2-3 indicates some high hazard within the existing dam which is generally attributable to the high depths at this location. Some areas of low to moderate hazard are located in the northeastern corner of the broader site. All areas of vehicular and pedestrian movement remain hazard free in the 1% AEP event.
- Safe access and egress is available from the site during the 1% AEP and PMF events including flood free access to the nearby Moree Airport which is located 1 km south-west of the site as well as the Police Community Youth Centre (PCYC) located on Boston Street approximately 1.8 kilometres north west of the site which is the closest SES nominated evacuation centre as per evacuation instructions outlined in the 2012 Local Flood Plan.
- The site is not within the floodplain of the major rivers in the area such as the Gwydir or Mehi Rivers, with only the northeastern corner of the broader site located within flood fringe hydraulic categorisation zones as illustrated in Figure 2-4.
- Overall flood risk at the site is considered low with flood risk specifically at the location of the proposed BESS infrastructure is considered negligible.

2.2 Potential Impacts to Flooding

Based on flood data outlined in the 2017, 2020 and 2021 studies, it is considered that there would be no adverse impacts to flooding at the site based on the following:

- Only a small portion of the site is subject to inundation with the majority of the site flood-free in even extreme flood events.
- Locations of proposed infrastructure associated with the BESS is considered flood-free in even extreme flood events with the exception of the existing dam (to be removed) where some ponding is evident within flood mapping in the 2021 report.
- The provision of a detention basin within the design ensures that any additional stormwater run-off arising as a result of the development and/or removal of the existing dam will be appropriately managed and there will be no adverse impacts to downstream properties. Additionally, it is proposed that the detention basin would cater for the same isolated area of inundation during a PMF event as the existing dam.

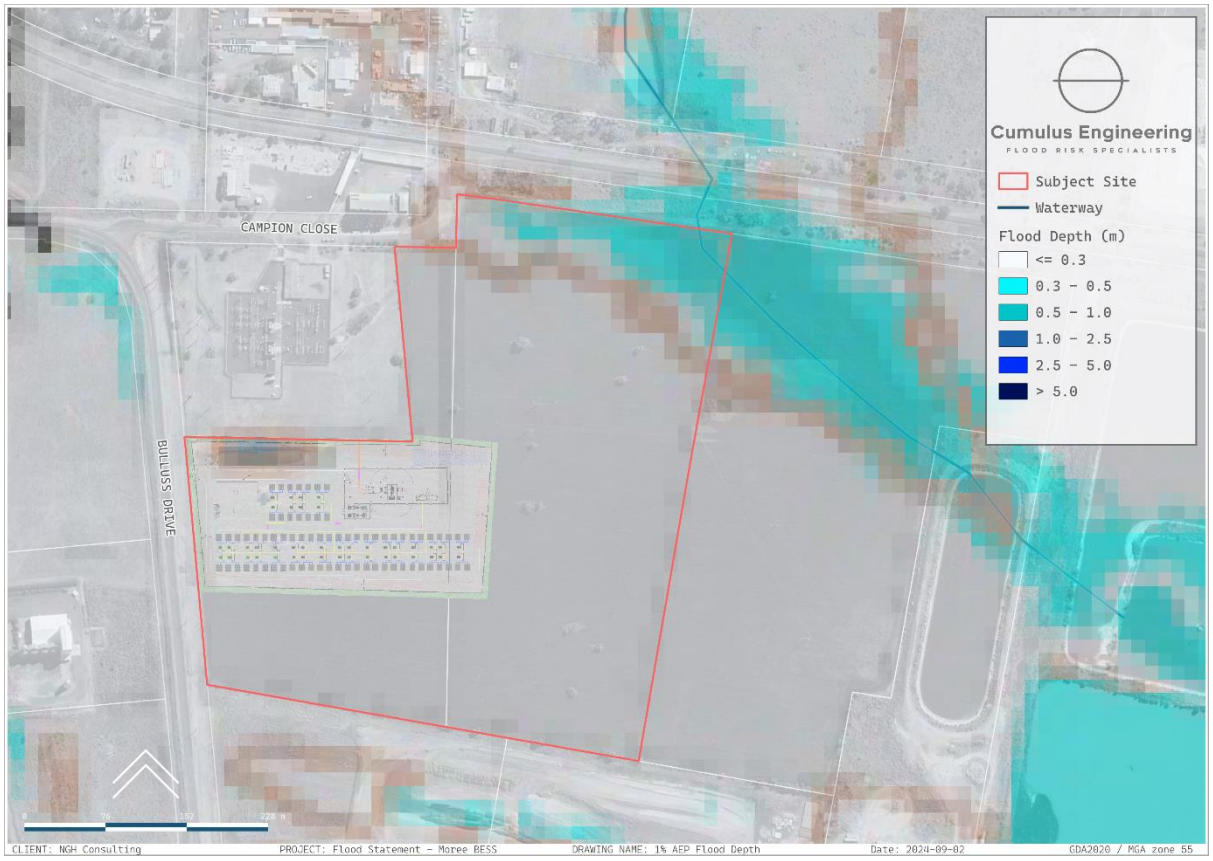

FIGURE 2-1 1% AEP PEAK FLOOD DEPTHS (ARCADIS, 2021)

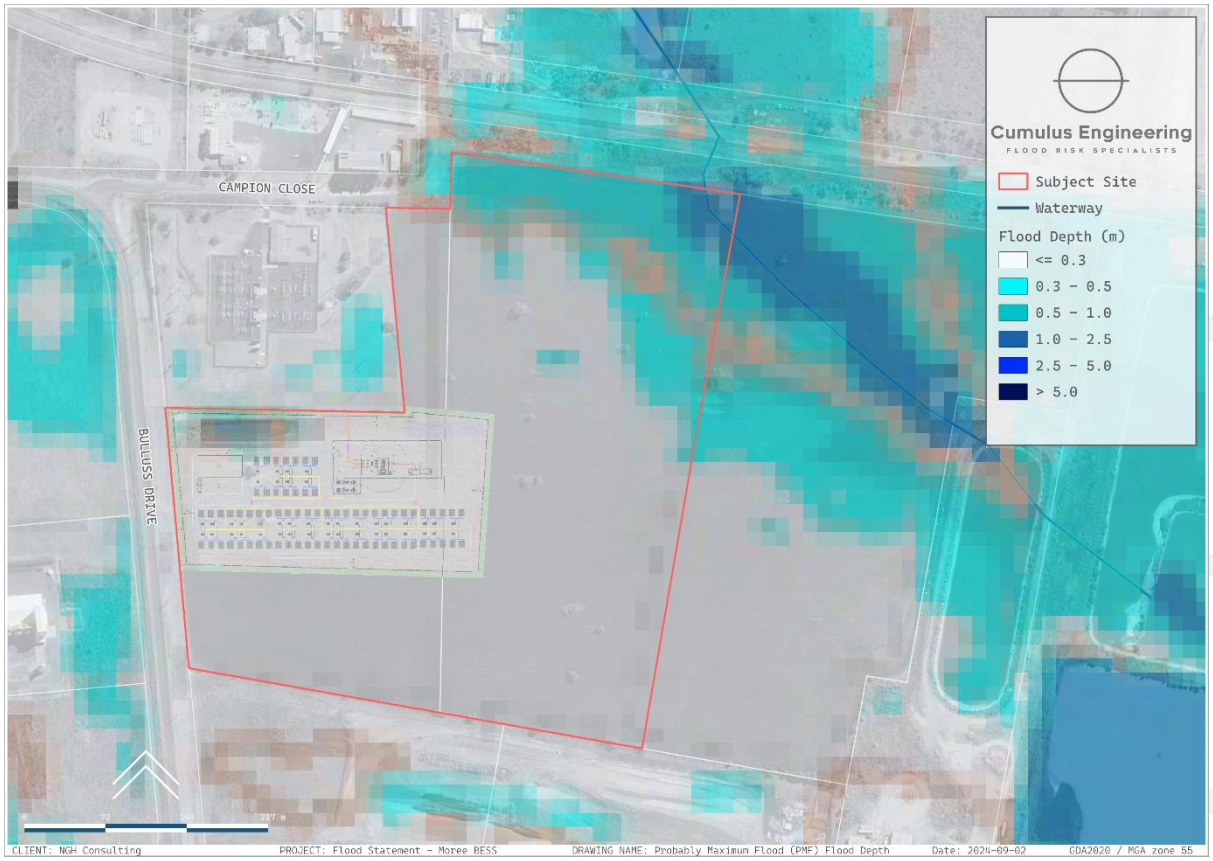

FIGURE 2-2 PROBABLE MAXIMUM FLOOD (PMF) (ARCADIS, 2021)

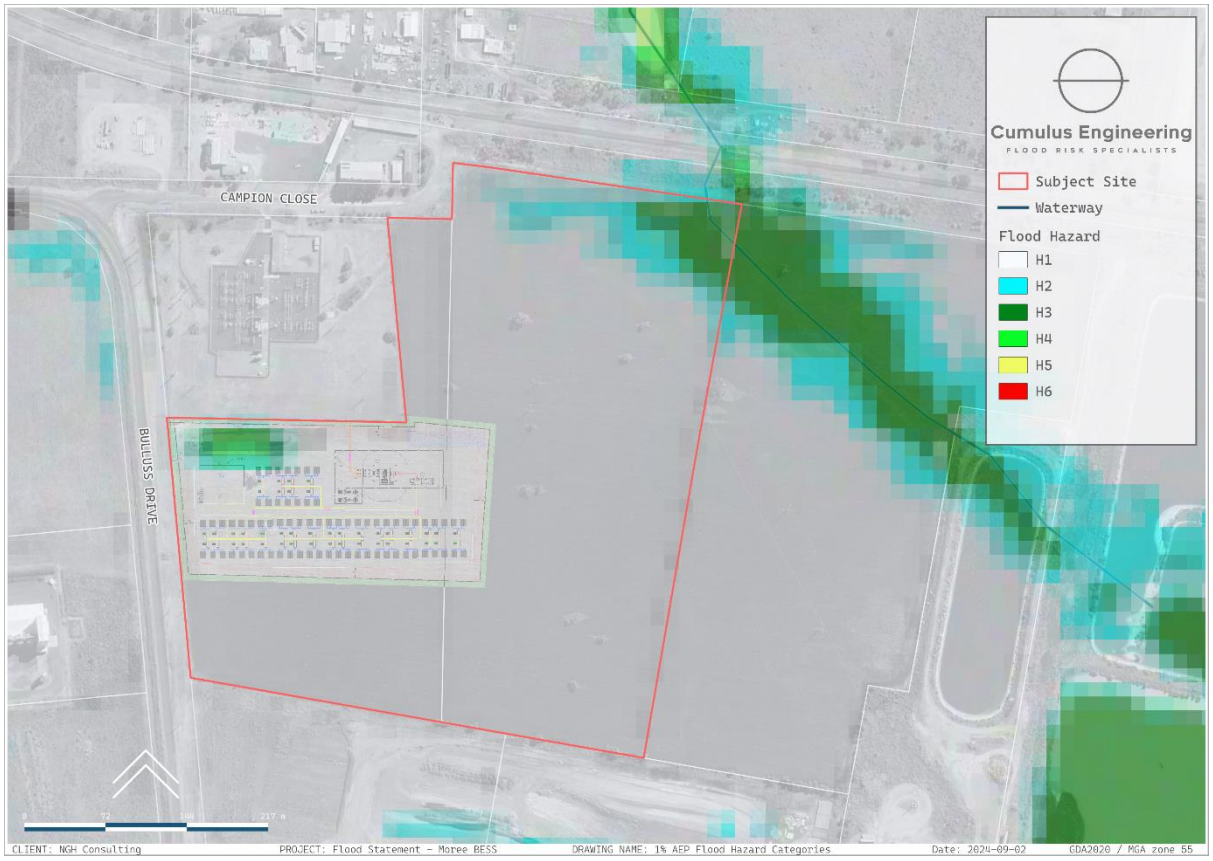

FIGURE 2-3 1% AEP FLOOD HAZARD (AEM CATEGORIES) (ARCADIS, 2021)

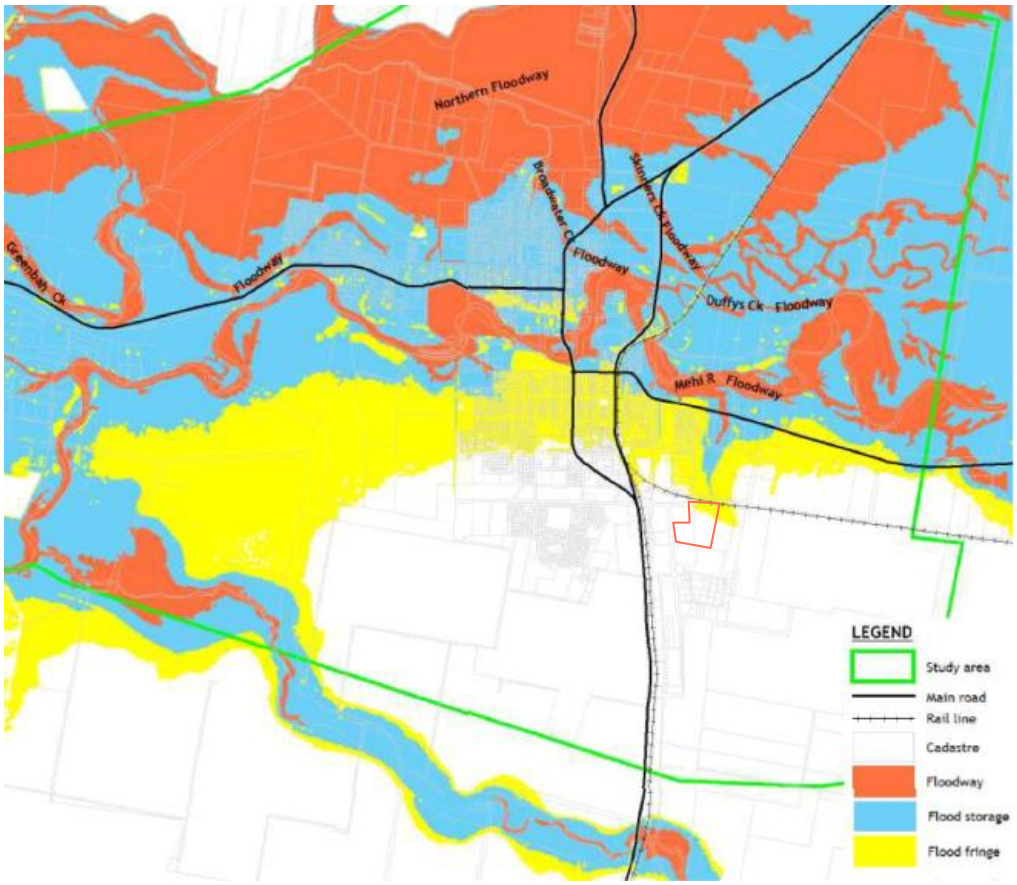

FIGURE 2-4 HYDRAULIC CATEGORIES (WRM, 2017)

2.3 Site Evacuation

As outlined in Section 2.2, safe access and egress is available for the site for events up to PMF event where access to SES nominated evacuation centres located at Moree Airport and the Police Community Youth Centre (PCYC) is maintained throughout all events with only a small portion of the site subject to inundation with the majority of the site flood-free in even extreme flood events.

Additionally, as the site is located above the estimated mainstream flood levels from the Gwydir River, any inundation at or around the site is due to local overland flows which are generally the result of shorter duration storm events meaning that if the site or access is impacted it will be for relatively short durations (i.e. less than 24 hours).

Based on the access and egress, extent of inundation of the site and anticipated time of inundation for the area, it is not recommended that a flood emergency response plan is required for the site.

3 Conclusions & Recommendations

Cumulus Engineering have prepared a Flood Statement for proposed Battery Energy Storage System (BESS) located at Bulluss Drive, Moree.

The statement is based on a desktop assessment of the flood data available for the site as well as provided development layout and relevant background material. Based on the assessment it is concluded that the proposed development, which includes filling of the site, will not adversely impact flood behaviour. The development is considered appropriate with consideration for the flood risk at the site and in the site vicinity. Based on information available, a flood emergency response plan is not deemed to be required for the site.

Please do not hesitate to contact us if you have any questions regarding this statement.

Many thanks,

Julian Skipworth
Director & Principal Engineer
0404 631 712
julian.skipworth@cumuluseng.com.au

Sarah Hollis
Director & Senior Engineer
0420 579 233
sarah.hollis@cumuluseng.com.au