Flood Risk Report

5MW Solar Energy Facility
574 Hendys Road, Numurkah

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Introduction

This report is provided in response to the application requirements for development in the Floodway Overlay, as set out at Clause 44.03-4 of the Moira Planning Scheme. The proposal is for a 5MW solar facility that will occupy approximately 15.8ha of the 21.68ha site. The eastern portion of the site is affected by flooding during a 100-year ARI flood event; thus, is within the Floodway and Land Subject to Inundation Overlays.

Key factors in consideration of flooding constraints on the land include:

- Pre-application advice was sought from the Goulburn Broken Catchment Management Authority's Statutory Planning and Floodplain Manager, where the following was confirmed:
    - The 1% AEP flood level for site's location is 108.41m AHD. A majority of the site's existing surface is above this level, therefore not subject to inundation. The lowest-lying land is in the north-eastern corner of the proposed site, where flood depths would be in the order of 0.4 metres deep.
    - Flood conveyance across the site is "inactive flow", therefore the proposed facility - consisting of solar panel arrays, componentry and fences - should not impede flood conveyance across the site or flood storage in the floodplain.

- The above was confirmed in the Goulburn Broken CMA's referral response that stated:

  Pursuant to section 56 of the Planning and Environment Act 1987, the Goulburn Broken CMA **does not object** to the proposal **subject to the following conditions**:

  1. The finished floor level of the proposed housings of electrical equipment including switchboards, inverters, and the like, must be constructed at least 300 millimetres above the 1% AEP flood level of 108.41 metres AHD, i.e. 108.71 metres AHD.
  2. The lowest part of the solar panels at the "MAX TILT" position must be 300 millimetres above the 1% AEP flood level of 108.41 metres AHD, i.e. 108.71 metres AHD.

- In subsequent discussions with the Floodplain Manager, it was agreed that – in consideration of the solar panels being weather-proof and not causing any risk to electrical safety or equipment damage, that the lowest part of the solar panels at "max tilt" could be set to the 1% AEP flood level i.e. 108.41m AHD.
- This means that panels in the north-east corner of the site will be required to be constructed with an approximate ground clearance of 0.4m, rather than the typical 0.3 metres.
- The Floodplain Manager is willing to confirm this via an amended referral response, upon being referred an amended application.

Application Requirements for land within the Floodway Overlay

The western portion of the subject site is partially affected by the Floodway Overlay (FO) and Land Subject to Inundation Overlay (LSIO), as shown on the image over page.
Clause 44.03-4 of the Moira Planning Scheme states:

If a local floodplain development plan for the area has not been incorporated into this scheme, an application must be accompanied by a flood risk report to the satisfaction of the responsible authority, which must consider the following, where applicable:

- *The Municipal Planning Strategy and the Planning Policy Framework.*

- *The existing use and development of the land.*
- *Whether the proposed use or development could be located on flood-free land or land with a lesser flood hazard outside this overlay.*
- *The susceptibility of the development to flooding and flood damage.*
- *The potential flood risk to life, health and safety associated with the development. Flood risk factors to consider include:*
  - *The frequency, duration, extent, depth and velocity of flooding of the site and accessway.*
  - *The flood warning time available.*
  - *The danger to the occupants of the development, other floodplain residents and emergency personnel if the site or accessway is flooded.*
- *The effect of the development on redirecting or obstructing floodwater, stormwater or drainage water and the effect of the development on reducing flood storage and increasing flood levels and flow velocities.*
- *The effects of the development on river health values including wetlands, natural habitat, stream stability, erosion, environmental flows, water quality and sites of scientific significance.*

An application must be accompanied by any information specified in a schedule to this overlay.

These are responded to – as appropriate to the proposed solar facility – in the following subsections.

Overlay Map. Floodway Overlay and Land Subject to Inundation Overlay on Subject Site

Existing Site Conditions

The proposed solar energy facility is to be built on land that fronts onto Naring Hall Road.

The land is currently addressed as 574 Hendys Road, Numurkah, as it was previously part of a larger property. The proposal relates to **Lot 2 on PS613623U, *only,*** that has an area of 21.68 hectares and a frontage of approximately 450 metres to Naring Hall Road along its southern boundary and a depth of 414 metres along its western boundary and 554 metres along its eastern boundary.

The subject land is largely open, cleared land, with the exception of one (1) row of planted vegetation and a few scattered remnant trees near the northern boundary and in the south eastern corner of the land. The property has been laser graded with a fall from west to east for flood irrigation from a farm channel along the western property boundary. See the "Contour Survey & Feature Plan" by Onleys irrigation surveyors, attached herewith for details of topography and existing features on the site.

Proposed Solar Energy Facility

The proposed facility will occupy approximately 15.8ha of the 21.68ha site, as shown on the Site Plan by Green Gold Energy (Proj No. 574; Rev. K). The remaining land outside the facility's compound fence - mostly along the eastern and northern boundaries – will remain "as is". The facility has been designed on the land in consideration of natural and built features, including existing native vegetation, topography and farm infrastructure; as well as in consideration of the design and siting considerations in the *Solar Energy Facilities - Design & Development Guideline, August 2019* and the *CFA Guidelines for Renewable Energy Installations, February 2019.*

Within the constraints of land's area and the amount of land required for the proposed facility; and in consideration of the abovementioned guidelines and existing site features, the facility has been designed to utilise the flood free land and minimise development within the floodway.

All electrical componentry (inverter, substation, etc.) has been positioned on flood-free land. The solar panels are weather-proof and all associated electrical contacts and mechanisms (including solar-tracking motors) are all at least two metres above ground, effectively eliminating any risk to electrical safety or equipment damage due to flood.

The site is unmanned during its operating life, other than periodical maintenance. Accordingly, there is no danger to occupants or workers. Similarly, it is considered that there would be no need for emergency personnel to access the site due to flood.

Flood Characteristics

We are advised by Goulburn Broken Catchment Management Authority's Statutory Planning and Floodplain Manager that flood conveyance across the site is considered as "inactive".

The site is located approximately 1km north of the Muckatah depression – a series of active overland flow paths that convey surface water and flood flows generally east to west, towards the Broken Creek. We are advised that the subject land does not form part of this active flow path, but rather, it accommodates surface drainage and/or flood water storage during a major event. To this end, we are advised that flood velocity would be very low, as the land would be subject to a "very slow" inundation over an extended time. Accordingly, warning time to flooding and rate that water would rise would both be lengthy.

The extent and depth of flooding under 1% AEP event is shown on Figure 1 (over page). It shows that the eastern part of the proposed site would be inundated by 0-0.3m, and very small sections in the north east and south east corners of the facility would be inundated by 0.3-0.5m of flood water during a 1% AEP event.

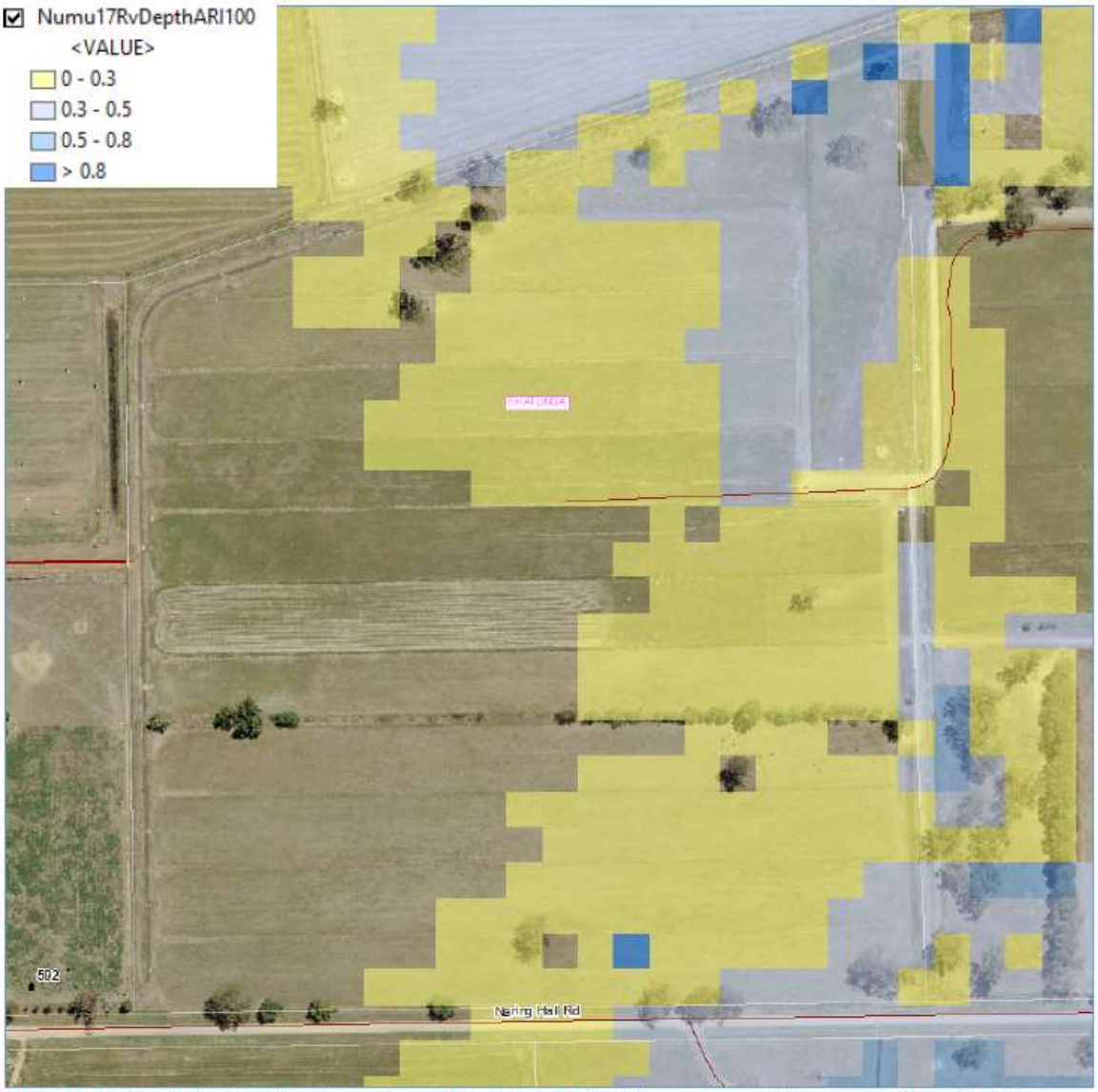

Figure 1: Flood Depth Mapping (Numurkah Floodplain Management Study and Plan, 2017)

Conclusion

The proposed facility has been through a thorough design process, with regard to flood risk, including pre-application consultation with the Floodplain Manager. It has been confirmed that the proposed facility - consisting of solar panel arrays, componentry and fences:

- will not impede flood conveyance across the floodplain.
- will not unduly impact on flood storage in the floodplain.

Accordingly, the proposed facility will not affect the floodplain by redirecting or obstructing floodwater or drainage nor should inundation on the land pose an unacceptable risk to the facility's equipment and componentry.