



## APPENDIX K    AMENDED FLOOD IMPACT ASSESSMENT



# ATHENA ENERGY AUSTRALIA (HOLDINGS) PTY LTD

Bendemeer Solar Farm Amended Project

Flood Impact Assessment

NC3007-002-REP-001-4

4 APRIL 2025



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# 1. INTRODUCTION

This Amended Flood Impact Assessment (FIA) has been prepared for the Bendemeer Solar Farm (the Project) for Athena Energy Australia (Holdings) Pty Ltd (Applicant).

This report supports a State Significant Development (SSD) Development Consent approval under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979* (SSD-36651552).

## 1.1 Background

The Bendemeer Solar Farm Environmental Impact Statement (EIS) was submitted to the then NSW Department of Planning and Environment (DPE); now Department of Planning, Housing and Infrastructure (DPHI)) and publicly exhibited between 27 July 2023 and 23 August 2023. Following the public exhibition of the EIS, a total of 244 submissions relating to the Project EIS were received from government agencies, local council, organisations and members of the public. A Submissions Report has been prepared to respond to matters raised in these submissions and agency advice, as well as an Amendment Report to assess impacts associated with the amended Project.

The FIA submitted with the Project EIS was prepared by Northrop Consulting Engineers (Northrop) and considered the existing flood regimes for a range of design storm events including less frequent events (i.e. the 0.5% and 0.2% Annual Exceedance Probability (AEP) events), as proxies for climate change, as well as the Probable Maximum Flood (PMF) to provide an understanding of the full range of flood behaviour and inform flood emergency planning. Northrop also modelled the full range of storm events for the developed Project scenario to assess changes in local flood regimes and inform Project design. The FIA submitted with the Project EIS was prepared to satisfy the Secretary's Environmental Assessment Requirements (SEARs) and associated agency advice relating to flooding.

This Amended Project FIA has been prepared to assess the changes in local flood regimes associated with the amended Project layout and considers only the 5% AEP, 1% AEP and the PMF for the developed Amended Project while the FIA submitted with the Project EIS also considered the 0.2% AEP and 0.5% AEP as climate change proxy scenarios in addition to the 5% AEP, 1% AEP and the PMF events. Additional modelling of the 0.2% and 0.5% AEP was not undertaken for the amended project as the potential impacts of climate change have already been assessed, were deemed to have negligible influence associated with the EIS Project design and accepted by relevant agencies (i.e. no agency submissions received). The flood modelling undertaken by Engeny for this Amended Project FIA was completed using the flood model and methodology developed by Northrop for the FIA submitted with the Project EIS. This FIA provides comparisons of the developed scenario flood regimes predicted by modelling with the existing flood regimes and Project flood regimes predicted by modelling undertaken by Northrop for the FIA submitted with the Project EIS as well as an assessment of impacts to satisfy the SEARs and associated agency advice.

The flood modelling presented in this Amended Project FIA is based on a draft Amended Project layout design from November 2023 (referred to as Modelled Amended Layout hereinafter). Since then, the design has been slightly amended to retain additional areas of vegetation, reducing the area allocated for PV solar panels, compared to the November 2023 design (Figure 1.2). This is referred to as the Amended Layout hereinafter.

While the Amended Layout design is considered in this Amended Project FIA, the flood modelling has not been updated, as the design changes are not considered to materially alter the flood impacts when compared to those predicted based on modelling of the Modelled Amended Layout (November 2023) design. The anticipated changes to flood behaviour (considered to be negligible) associated with the Amended Layout design are discussed further in Section 3.2.

## 1.2 SEARs and Agency Advice

Table 1.1 and Table 1.2 present the SEARs and Biodiversity, Conservation and Science Directorate (BCS) assessment requirements respectively relevant to flooding and where the SEARs or BCS assessment requirements have been addressed in this FIA.

**TABLE 1.1: FLOOD RELATED SECRETARYS ENVIRONMENTAL ASSESSMENT REQUIREMENTS**

| Requirement                                                                                                                                                                                                                                                                                                                                                               | Where addressed in this FIA |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Land – including: <ul style="list-style-type: none"> <li>An assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including:               <ul style="list-style-type: none"> <li>flood prone land, Crown lands, transmission infrastructure; mining, quarries, mineral or petroleum rights.</li> </ul> </li> </ul> | Section 3.2 and 5           |
| Water - including: <ul style="list-style-type: none"> <li>An assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources and measures proposed to monitor, reduce and mitigate these impacts.</li> </ul>                                                                                                          | Section 3.2 and 5           |

**TABLE 1.2: BCS REQUIREMENTS**

| Requirement                                                                                                                                                                                                                                                                                     | Where addressed in this FIA                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| 10. The EIS must map the following features relevant to flooding as describes in the Floodplain Development Manual 2005 including:                                                                                                                                                              |                                                                                                              |
| a. Flood prone land;                                                                                                                                                                                                                                                                            | Appendices A, B and C                                                                                        |
| b. Flood planning area, the area below the flood planning level;                                                                                                                                                                                                                                | Refer to Table 10 of <i>Flood Impact Assessment for Bendemeer Solar Farm</i> , (Northrop, 2023) (Appendix D) |
| c. Hydraulic categorisation (floodways and flood storage areas);                                                                                                                                                                                                                                |                                                                                                              |
| d. Flood hazard.                                                                                                                                                                                                                                                                                | Appendices A, B and C                                                                                        |
| 11. The EIS must describe the flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 5% Annual Exceedance Probability (AEP), 1% AEP, flood levels and the probable maximum flood, or an equivalent extreme event.              | Section 2, 3 and Appendices A, B and C                                                                       |
| 12. The EIS must model the effect of the proposed project (including fill) on the flood behaviour under the following scenarios:                                                                                                                                                                |                                                                                                              |
| a. Current flood behaviour for a range of design events. This includes the 0.5% and 0.2% AEP year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to under the climate change scenario across the climate change. | Refer to Section 1.1 <i>Flood Impact Assessment for Bendemeer Solar Farm</i> , (Northrop, 2023) (Appendix D) |
| 13. Modelling in the EIS must consider and document:                                                                                                                                                                                                                                            |                                                                                                              |

| Requirement                                                                                                                                                                                                                                                                         | Where addressed in this FIA                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| a. Existing council flood studies in the area and examine consistency to the flood behaviour documented in these studies.                                                                                                                                                           | Refer to <i>Flood Impact Assessment for Bendemeer Solar Farm</i> , (Northrop, 2023)<br>(Appendix D) |
| b. The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood, or an equivalent                                                                                                                                             | Section 3 and Appendices A, B and C                                                                 |
| c. Impacts of the development on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazard categories and hydraulic categories.                      | Section 3.2 and 5                                                                                   |
| d. Relevant provisions of the NSW Floodplain Development Manual 2005.                                                                                                                                                                                                               | Refer to <i>Flood Impact Assessment for Bendemeer Solar Farm</i> , (Northrop, 2023)<br>(Appendix D) |
| 14. The EIS must assess the impacts on the proposed project on flood behaviour, including:                                                                                                                                                                                          |                                                                                                     |
| a. Whether there will be detrimental increases in the potential flood affection of other properties, assets and infrastructure.                                                                                                                                                     | Section 3.2 and 5                                                                                   |
| b. Consistency with Council flood plain risk management plans.                                                                                                                                                                                                                      | Refer to <i>Flood Impact Assessment for Bendemeer Solar Farm</i> , (Northrop, 2023)<br>(Appendix D) |
| c. Consistency with any Rural Floodplain Management Plans                                                                                                                                                                                                                           |                                                                                                     |
| d. Compatibility with the flood hazard of the land.                                                                                                                                                                                                                                 |                                                                                                     |
| e. Compatibility of the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land.                                                                                                                                                         |                                                                                                     |
| f. Whether there will be direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.                                                                                                      |                                                                                                     |
| g. Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the NSW SES and Council.                                                                                                     |                                                                                                     |
| h. Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the NSW SES and Council.                                                                                                                           |                                                                                                     |
| i. Emergency management, evacuation and access, and contingency measures for the development considering the full range of flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with the NSW SES and Council. |                                                                                                     |
| j. Any impacts the development may have on the social and economic costs to the community as a consequence of flooding.                                                                                                                                                             |                                                                                                     |

## 1.3 Amended Project Overview

### 1.3.1 Project Description

The Project is situated about 1.8 kilometres (km) east of the Bendemeer town centre, represented by the Bendemeer Hotel, and is located 46 km (by road) north-east of the Tamworth Post Office to the Project access. The Project is located within the New England Renewable Energy Zone (REZ), in the Tamworth Regional Council Local Government Area (LGA) in the New England Region of NSW (refer to Figure 1.1). The Project Area extends across an area of approximately 606.9 hectares (ha), over three freehold land parcels, on land that is predominately used for agricultural activities.

The Project will involve the construction, operation and decommissioning of a photovoltaic (PV) solar farm, Battery Energy Storage System (BESS) and associated infrastructure. The Project includes:

- Solar Arrays with a Capacity of approximately 255 megawatts (MW) Direct Current (DC) and registered connection capacity of 200 MW Alternating Current (AC);
- BESS with a capacity of up to 150 MW / 300 MWh;
- Electricity infrastructure:
  - Power Conversion Units (PCU) housing up to 60 inverters;
  - One 33/330 kV collector substation and associated internal structures;
  - Switching station;
  - Electrical reticulation infrastructure including underground and overhead 330 kV cables;
  - Direct grid connection to existing 330 kV line 85 Armidale-Tamworth Transmission line;
- On-site permanent supporting infrastructure:
  - Site access road, entry and internal access roads;
  - Operations and Maintenance (O&M) Facility including control room, meeting facilities, storage facilities, SCADA facilities, workshop, parking, ablutions buildings, septic, static water supply, waste management facilities, lighting and maintenance facility, fencing and asset protection zones;
- Off-site supporting infrastructure:
  - Tamworth waste and wastewater disposal facilities;
  - Existing public road network; and
- 24 hours a day, seven days per week operation with up to 15 Full Time Equivalent (FTE) personnel.

The Amended Layout (November 2024) is shown in Figure 1.2 and the Modelled Amended Layout (November 2023) (the layout that was modelled to produce the results presented in this FIA) is shown in Figure 1.3. Table 1.3 provides a comparison between the Project as presented in the EIS and the revised amended Project, as relevant to this assessment. The amended Project description and summary address the matters raised in submissions of the Project EIS and outcomes of ongoing engagement with the community, government agencies, landowners, and other stakeholders.

**TABLE 1.3: AMENDED PROJECT SUMMARY**

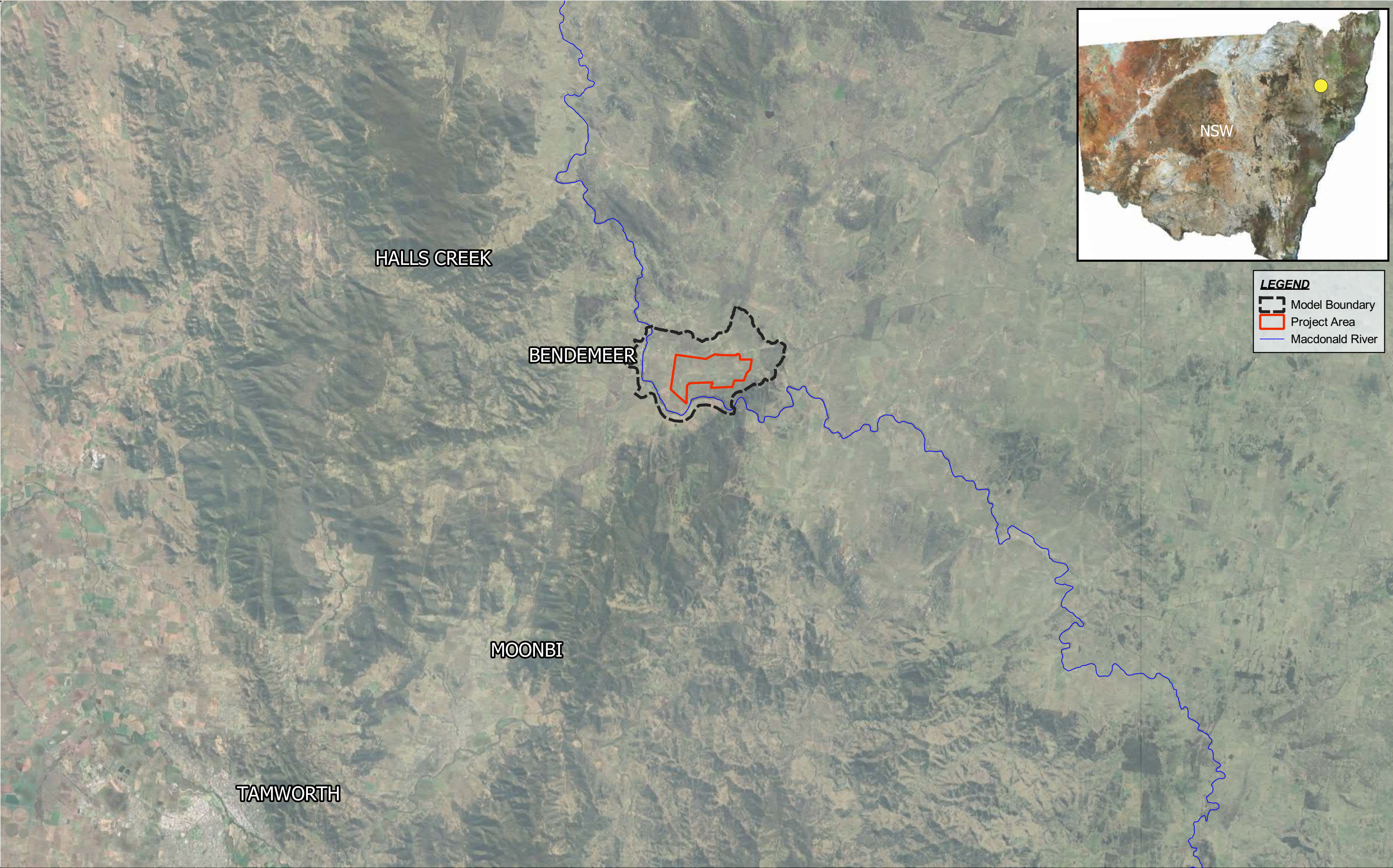
| Project Elements      | EIS Project                                                                                                                                                                                                                 | Amended Project                                                                                                                                                                                                      | Difference between EIS and Amended Project                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project Area          | <ul style="list-style-type: none"> <li>606.4 ha</li> </ul>                                                                                                                                                                  | <ul style="list-style-type: none"> <li>606.9 ha</li> </ul>                                                                                                                                                           | <ul style="list-style-type: none"> <li>Negligible (0.08% increase)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         |
| Disturbance Footprint | <ul style="list-style-type: none"> <li>476.6 ha</li> </ul>                                                                                                                                                                  | <ul style="list-style-type: none"> <li>369.2 ha</li> </ul>                                                                                                                                                           | <ul style="list-style-type: none"> <li>Reduction by 107.4 ha (23%)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         |
| Solar Arrays          | <ul style="list-style-type: none"> <li>280 MW DC</li> <li>430,000 PV modules</li> <li>350.8 ha</li> <li>4.2 m panel height</li> </ul>                                                                                       | <ul style="list-style-type: none"> <li>255 MW DC</li> <li>354,330 PV modules</li> <li>301.0 ha</li> <li>2.66 m panel height</li> </ul>                                                                               | <ul style="list-style-type: none"> <li>DC Capacity reduced by 25 MW (9%)</li> <li>PV modules reduced by 75,670 modules (18%)</li> <li>Area reduced by 49.8 ha (14%)</li> <li>Panel height reduced by 1.54 m</li> </ul>                                                                                                                                                                                                                                                |
| BESS                  | <ul style="list-style-type: none"> <li>150 MW/ 300 MWh</li> <li>3.2 ha</li> <li>120 BESS units</li> <li>LFP or NMC battery technology</li> <li>Lot 2 DP 1211502</li> <li>4 m high noise walls in the BESS Layout</li> </ul> | <ul style="list-style-type: none"> <li>150 MW/ 300 MWh</li> <li>1.9 ha</li> <li>264 BESS units</li> <li>LFP battery technology</li> <li>Lot 2 DP 1211502</li> <li>4 m high noise walls in the BESS Layout</li> </ul> | <ul style="list-style-type: none"> <li>No change in capacity</li> <li>Area reduced by 1.3 ha (41%)</li> <li>BESS make and model refined with individual BESS units of a smaller MWh capacity selected for the amended project. Due to the smaller capacity of the BESS, the number of BESS units increased by 144 (120%)</li> <li>Commitment to LFP battery technology</li> <li>No change in location</li> <li>No change in noise walls mitigation measure</li> </ul> |

| Project Elements                       | EIS Project                                                                                                                                                                                                                                                                                                                     | Amended Project                                                                                                                                                                                                                                                                                                 | Difference between EIS and Amended Project                                                                                                                                                                                                        |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Solar PV Power Conversion Units (PCU)  | <ul style="list-style-type: none"> <li>60 PCUs housing up to 60 inverters (within main solar area)</li> <li>Lots 1, 2 and 3 of DP 1211502</li> <li>3.5 m high noise walls for 14 inverters within solar array area</li> </ul>                                                                                                   | <ul style="list-style-type: none"> <li>60 PCUs housing up to 60 inverters (within main solar area)</li> <li>Lots 1, 2 and 3 of DP 1211502</li> <li>3.5 m high noise walls for 28 inverters within solar array area</li> <li>Noise attenuation kits for all 60 inverters within solar array area</li> </ul>      | <ul style="list-style-type: none"> <li>No change in number of PCUs or inverters (within main solar area)</li> <li>Construction of noise walls for 14 additional inverters</li> <li>Addition of noise attenuation kits to all inverters</li> </ul> |
| Inverters                              | <ul style="list-style-type: none"> <li>40 inverters within BESS with noise attenuation kits</li> </ul>                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>44 inverters within BESS with noise attenuation kits</li> </ul>                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>Inverters increased by 4 units (10%) due to refinement in BESS and inverter proposed makes and models and to achieve National Electricity Rule compliance at the proposed 150 MW capacity</li> </ul>       |
| Substation and Switching station       | <ul style="list-style-type: none"> <li>200 MW AC registered capacity</li> <li>One 33/330 kV collector substation and associated structures</li> <li>330 kV switching station</li> <li>2.9 ha</li> </ul>                                                                                                                         | <ul style="list-style-type: none"> <li>200 MW AC registered capacity</li> <li>One 33/330 kV collector substation and associated structures</li> <li>330 kV switching station</li> <li>2.37 ha</li> <li>6 m high noise walls around the substation transformers</li> </ul>                                       | <ul style="list-style-type: none"> <li>No change in AC registered capacity</li> <li>Reduced by 0.53 ha (18%) and slightly relocated 25 m further east</li> <li>Addition of 6 m high noise walls around the substation transformers</li> </ul>     |
| Electrical Reticulation Infrastructure | <ul style="list-style-type: none"> <li>Internal underground high-voltage (HV) cables between solar arrays, BESS and transformers and overhead 330 kV conductors</li> <li>Approximately 100 m distance between the switching station and existing 330 kV line</li> <li>Direct grid connection to existing 330 kV line</li> </ul> | <ul style="list-style-type: none"> <li>Internal underground HV cables between solar arrays, BESS and transformers and overhead 330 kV conductors</li> <li>Approximately 48 m distance between the switching station and existing 330 kV line</li> <li>Direct grid connection to existing 330 kV line</li> </ul> | <ul style="list-style-type: none"> <li>No change</li> </ul>                                                                                                                                                                                       |
|                                        | Site access road, entry and internal roads                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                   |

| Project Elements                                      | EIS Project                                                                                                                                                                                                                                                                                                                                                | Amended Project                                                                                                                                                                                                                                                                                                                                                                                                  | Difference between EIS and Amended Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| On-site Infrastructure      Permanent      Supporting | <ul style="list-style-type: none"> <li>APZ of minimum 10 m (PV modules), 17 m (BESS and Substation) and 12 m (associated infrastructure)</li> <li>Internal roads 29.7 ha<br/>Perimeter and internal roads up to 6m wide, aligned on APZs and/or existing farm or other access tracks, where possible</li> <li>Site access via B56 Oxley Highway</li> </ul> | <ul style="list-style-type: none"> <li>APZ of minimum 10 m (PV modules), 12-31 m (BESS, Substation and associated infrastructure)</li> <li>Internal roads 13.48 ha<br/>Perimeter and internal roads up to 6m wide, aligned on APZs and/or existing farm or other access tracks, where possible</li> <li>Site access via B56 Oxley Highway, with internal roads realigned to avoid existing vegetation</li> </ul> | <ul style="list-style-type: none"> <li>No change in APZ minimum for PV modules</li> <li>Allowance for a minimum 12-31 m APZ width for BESS, Substation and associated infrastructure based on surrounding vegetation categorisation, including slight disturbance footprint adjustment to accommodate minimum 31 m APZ adjacent to some areas of the BESS</li> <li>Internal roads reduced by 16.22 ha (55%)</li> <li>No change in maximum road width</li> <li>Minor (~10 m) adjustment of site access road location</li> </ul> |
|                                                       | Operations and Maintenance (O&M) Facility                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                       | <ul style="list-style-type: none"> <li>Located within the construction compound and laydown area, to the north of the substation and BESS compound</li> <li>0.65 ha</li> <li>12 m APZ</li> <li>100 kL static water tank</li> </ul>                                                                                                                         | <ul style="list-style-type: none"> <li>Located within the substation and BESS compound</li> <li>0.91 ha</li> <li>12-31 m APZ</li> <li>2 x 100 kL static water tanks</li> </ul>                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Relocated south of existing transmission line</li> <li>Area increased by 0.26 ha (40%)</li> <li>Adjustment of APZ width based on vegetation adjacent to the new location</li> <li>Addition of a static water tank, with total volume increased by 100 kL (100%)</li> </ul>                                                                                                                                                                                                              |
| <b>Construction</b>                                   |                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Construction Duration                                 | <ul style="list-style-type: none"> <li>Approximately 18 months</li> </ul>                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Approximately 18 months</li> </ul>                                                                                                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>No change in duration</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Construction Workforce                                | <ul style="list-style-type: none"> <li>Peak workforce of approximately 307 Full Time Equivalent (FTE) (some additional contractor personnel) and average annual workforce of 260 FTE for the peak 12-month of construction of the Project</li> </ul>                                                                                                       | <ul style="list-style-type: none"> <li>Peak workforce of approximately 307 FTE (some additional contractor personnel) and average annual workforce of 250 FTE for the peak 12-month of construction of the Project</li> </ul>                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>10 FTE reduction for peak 12-month average annual workforce (4%)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                             |

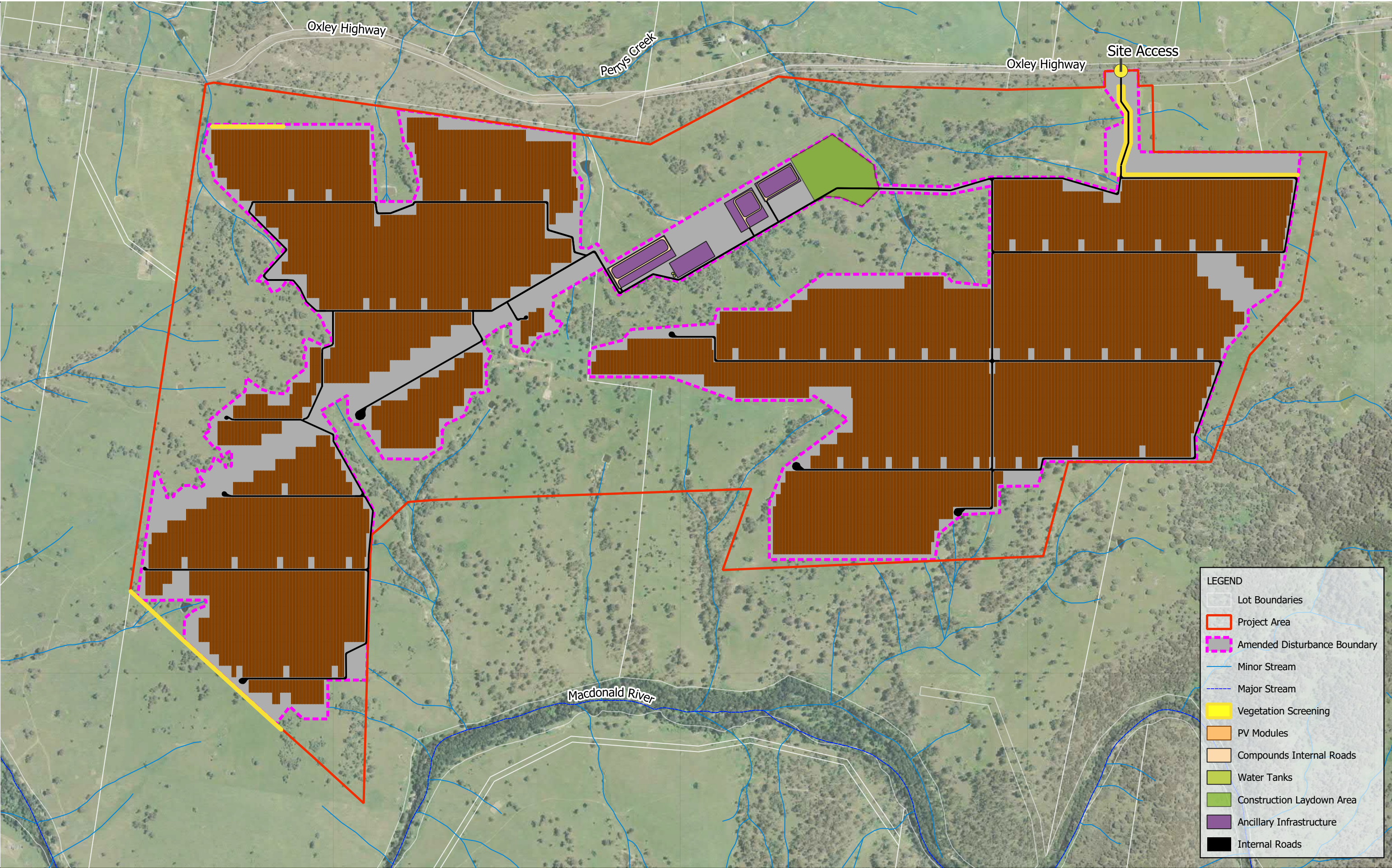
| Project Elements                 | EIS Project                                                                                                                                                                                                                                                                                                                        | Amended Project                                                                                                                                                                                                                                                                                                                                                                                     | Difference between EIS and Amended Project                                                                                                                                                                                                                                                      |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| On-site Temporary Infrastructure | <ul style="list-style-type: none"> <li>Construction compound and laydown area located north of existing transmission line</li> <li>11.6 ha</li> </ul>                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Construction compound and laydown area located to south of existing transmission line</li> <li>4.8 ha</li> </ul>                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>Relocated south of existing transmission line</li> <li>Area reduced by 6.8 ha (59%)</li> </ul>                                                                                                                                                           |
| Services and Utilities           | <ul style="list-style-type: none"> <li>Adjustment, protection or relocation of existing utilities</li> </ul>                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>Adjustment, protection or relocation of existing utilities</li> </ul>                                                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>No change</li> </ul>                                                                                                                                                                                                                                     |
| Ancillary Activities             | <ul style="list-style-type: none"> <li>Import of external gravel, aggregate and sand to site for on-site construction use</li> </ul>                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>Import of external gravel, aggregate and sand to site for on-site construction use</li> </ul>                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>No change</li> </ul>                                                                                                                                                                                                                                     |
| Traffic and Transport Route      | <ul style="list-style-type: none"> <li>Main equipment deliveries via Port of Newcastle or Port of Brisbane</li> <li>62 heavy vehicles and 48 light vehicles movements per day during peak construction</li> <li>Associated external road upgrades (also used for operational maintenance or decommissioning activities)</li> </ul> | <ul style="list-style-type: none"> <li>Main equipment deliveries via Port of Newcastle or Port of Brisbane or Port of Melbourne</li> <li>94 heavy vehicles and 76 light vehicles movements per day during peak construction with an additional 36 shuttle bus movements</li> <li>Associated external road upgrades (also used for operational maintenance or decommissioning activities)</li> </ul> | <ul style="list-style-type: none"> <li>Port of Melbourne may also be used for deliveries of Project equipment</li> <li>During peak construction increase in daily heavy vehicle movements by 32 (52%) and light vehicles by 28 (58%)</li> <li>No upgrades to external roads required</li> </ul> |
| <b>Operations</b>                |                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                 |
| Duration                         | <ul style="list-style-type: none"> <li>Development Consent in perpetuity</li> <li>Infrastructure life minimum of 30 years</li> </ul>                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>Development Consent in perpetuity</li> <li>Infrastructure life minimum of 30 years</li> </ul>                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>No change</li> </ul>                                                                                                                                                                                                                                     |
| Hours of Operation               | <ul style="list-style-type: none"> <li>24 hours a day, seven days a week</li> </ul>                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>24 hours a day, seven days a week</li> </ul>                                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>No change</li> </ul>                                                                                                                                                                                                                                     |
| Operational Workforce            | <ul style="list-style-type: none"> <li>Approximately 15 FTE</li> </ul>                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>Approximately 15 FTE</li> </ul>                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>No change</li> </ul>                                                                                                                                                                                                                                     |





|   |             |            |                                                                                                            |    |         |            |                                                                                                                                                                                               |                                                                                                                                                                                                                                                     |                                                                                                                    |                                                                                                                 |                      |
|---|-------------|------------|------------------------------------------------------------------------------------------------------------|----|---------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------|
| R | DETAILS     | DATE       | © COPYRIGHT Engeny<br>This drawing is confidential and shall only be used for the purpose of this project. |    |         |            | <div></div> <div><div>04</div><div>8</div> km</div> <div>SCALE - 1:177,295<br/>GDA94 / MGA zone 56</div> | <div>DISCLAIMER</div> <div>Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.</div> | <div></div> <div>ENGENY</div> | <div></div> <div>ERM</div> | <b>Figure 1.1</b>    |
| 0 | Final Issue | 01-04-2025 |                                                                                                            |    |         |            |                                                                                                                                                                                               |                                                                                                                                                                                                                                                     |                                                                                                                    |                                                                                                                 | Bendemeer Solar Farm |
|   |             |            | DRAWN                                                                                                      | GC | CHECKED | LV         |                                                                                                                                                                                               |                                                                                                                                                                                                                                                     |                                                                                                                    |                                                                                                                 | Project Locality     |
|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |                                                                                                                                                                                               |                                                                                                                                                                                                                                                     |                                                                                                                    |                                                                                                                 |                      |
|   |             |            | NOTES:                                                                                                     |    |         |            |                                                                                                                                                                                               |                                                                                                                                                                                                                                                     |                                                                                                                    |                                                                                                                 |                      |
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LEGEND

Lot Boundaries

Project Area

Amended Disturbance Boundary

Minor Stream

Major Stream

Vegetation Screening

PV Modules

Compounds Internal Roads

Water Tanks

Construction Laydown Area

Ancillary Infrastructure

Internal Roads

| R | DETAILS     | DATE       |
|---|-------------|------------|
| 0 | Final Issue | 01-04-2025 |
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| DRAWN                                                                                                      | LV  | CHECKED | CB         |
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N

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SCALE - 1:12,000  
GDA94 / MGA zone 56

DISCLAIMER  
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Figure 1.2

Bendemeer Solar Farm

Amended Layout (November 2024)

Dwg Ref.

BNTL00206\_0026-FIG-001-0





LEGEND

Lot Boundaries

Project Area

Modelled Amended Disturbance Boundary

Minor Stream

Major Stream

Vegetation Screening

PV Modules

Compounds Internal Roads

Water Tanks

Construction Laydown Area

Ancillary Infrastructure

Internal Roads

| R | DETAILS     | DATE       |
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| 0 | Final Issue | 03-04-2025 |
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| DRAWN                                                                                                      | LV  | CHECKED | CB         |
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N

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0.3

0.6 km

SCALE - 1:12,000  
GDA94 / MGA zone 56

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Figure 1.3

Bendemeer Solar Farm

Modelled Amended Layout (November 2023)

Dwg Ref:

BNTL00206\_0026-FIG-002-0



### 1.3.2 Project Area and Catchment Overview

The Project Area is contained within three lots (Lots 1, 2 and 3 of DP 1211502, located within the Macdonald River catchment and ranges in elevation from 838 mAHD to 951 mAHD at an average slope of 5.5% (Northrop, 2023). The northern portion of the Project Area drains to Perrys Creek (either directly or via a number of minor unnamed tributaries of Perrys Creek) which flows from east to west through and outside of the Project Area and into the Macdonald River to the north of Bendemeer while the southern portion drains to Macdonald River via a number of unnamed tributaries of the river. Site access is off the Oxley Highway which is located along the northern boundary of the Project Area.

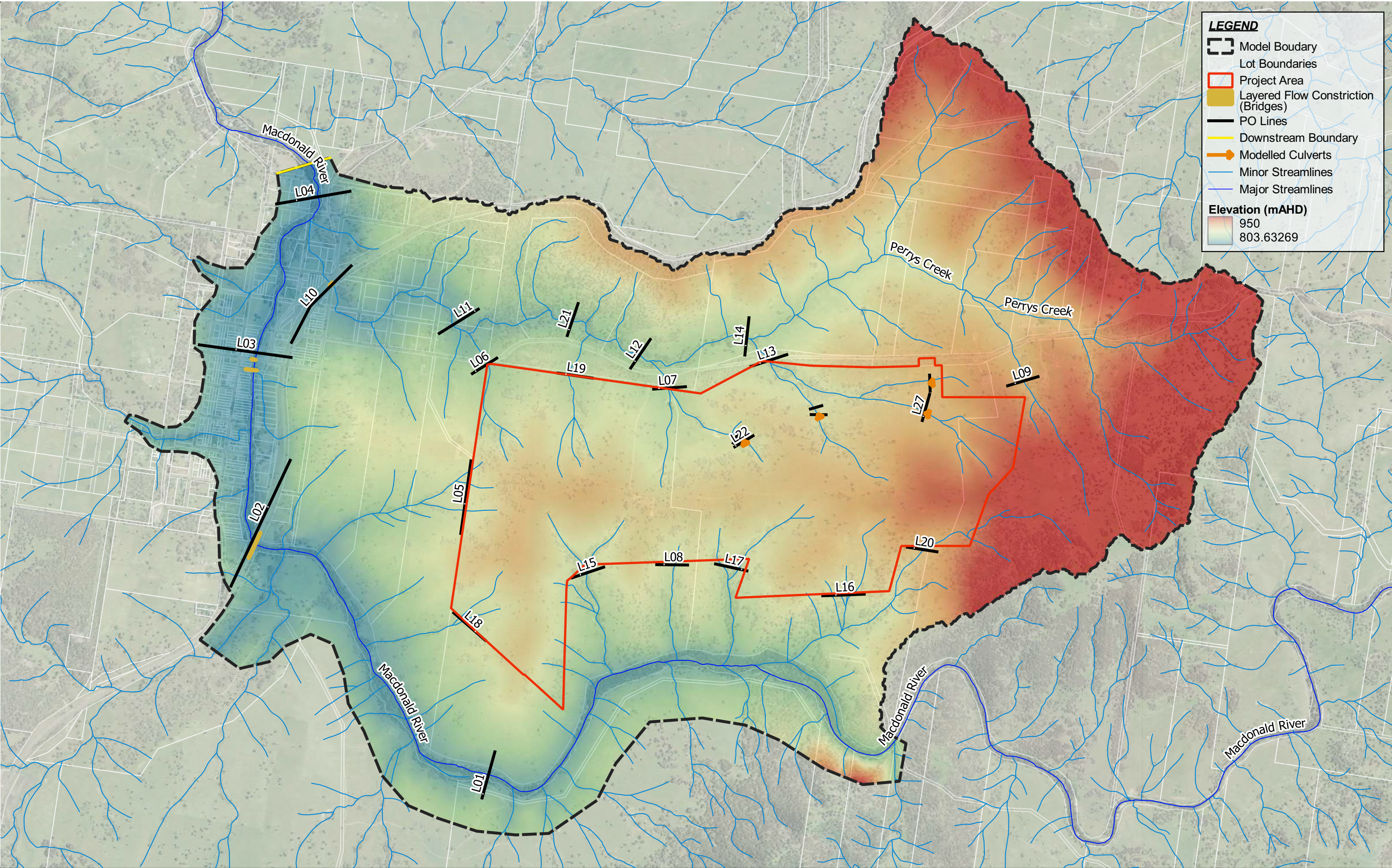
At present, the Project Area is predominantly covered by native and non-native grassland with some scattered trees. All watercourses within the Project Area are ephemeral and there are a number of farm dams within the Project Area to harvest runoff for agricultural purposes.

Figure 1.4 shows the catchment area covered by the flood model (i.e. the model domain) for which the downstream boundary is the McDonald River. The model domain catchment characteristics are presented in Table 1.4.

**TABLE 1.4: MODEL DOMAIN CATCHMENT CHARACTERISTICS**

| Characteristic    | Value/Description                                                                            |
|-------------------|----------------------------------------------------------------------------------------------|
| Total Area        | 2,362 ha                                                                                     |
| Average Elevation | 889 mAHD                                                                                     |
| Highest Elevation | 1,078 mAHD                                                                                   |
| Lowest Elevation  | 803 mAHD                                                                                     |
| Average Slope     | 7%                                                                                           |
| Land use          | Native or non-Native Grassland, Pastures, Low Density Residential (Bendemeer Village), Rural |





|   |             |            |                                                                                                            |    |         |            |                                                             |                                                                                                                                                                                                                                             |  |  |                                                                                |
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| R | DETAILS     | DATE       | © COPYRIGHT Engeny<br>This drawing is confidential and shall only be used for the purpose of this project. |    |         |            | <br>0 0.6 1.2 km<br>SCALE - 1:25,000<br>GDA94 / MGA zone 56 | <p>DISCLAIMER</p> <p>Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.</p> |  |  | <p><b>Figure 1.4</b></p> <p>Bendemeer Solar Farm</p> <p>Flood Model Domain</p> |
| 0 | Final Issue | 01-04-2025 | DRAWN                                                                                                      | GC | CHECKED | LV         |                                                             |                                                                                                                                                                                                                                             |  |  |                                                                                |
|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |                                                             |                                                                                                                                                                                                                                             |  |  |                                                                                |
|   |             |            | NOTES:                                                                                                     |    |         |            |                                                             |                                                                                                                                                                                                                                             |  |  |                                                                                |
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|   |             |            |                                                                                                            |    |         |            |                                                             |                                                                                                                                                                                                                                             |  |  |                                                                                |



## 2. MODELLING METHODOLOGY

As indicated in Section 1.1 this FIA has utilised the flood model developed by Northrop for the FIA submitted with the Project EIS. The existing flood model was developed in TUFLOW and has been updated to incorporate the amended Project design for the purpose of modelling the developed Project scenario.

Engeny understands that there were no submissions with respect to the FIA submitted with the Project EIS or the modelling methodology adopted in the FIA submitted with the Project EIS and as such, the same modelling methodology has been applied for this FIA. Table 2.1 provides an overview of the modelling methodology. For further detail on the methodology and parameter values applied in the flood model, refer to the FIA submitted with the Project EIS contained in Appendix D.

**TABLE 2.1: FLOOD MODELLING OVERVIEW**

| Model Element                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topography and Model Extent              | Refer to Section 1.1, Figure 1.2 and Appendix D.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Hydrology                                | <p>Given the Project location which does not have any significant watercourses draining into the Project Area, an approach with application of rainfall to a two dimensional grid was adopted (Rainfall-on-Grid) for the Project Area.</p> <p>Macdonald River upstream inflow hydrographs sourced from the Bendemeer Flood Study (Tamworth Regional Council 2012) were applied for Macdonald River.</p> <p>Initial loss, continuing loss, pre-burst and storm burst rainfall portions of the entire storm event were accounted for in accordance with the Australian Rainfall and Runoff (AR&amp;R) 2019 guidelines.</p> <p>Rainfall and losses were sourced from the Bureau of Meteorology (BOM) AR&amp;R 2019 Data Hub. Modelled continuing losses were reduced as recommended in the Office of Environment and Heritage (OEH) guidelines for un-calibrated models within NSW.</p> |
| Grid Size, Sampling Method and Time Step | A grid cell size of 2 m with a 1 second timestep was adopted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Boundary Conditions                      | <p>Inflows into the two-dimensional model were produced by the Rainfall-on-Grid hydrology as described above. In addition, upstream inflow hydrographs and downstream water levels sourced from the Bendemeer Flood Study (Tamworth Regional Council 2012) were modelled for Macdonald River.</p> <p>The downstream model boundary was set at the Macdonald River downstream of the town of Bendemeer, approximately 400 m downstream of Merino Street.</p> <p>A bank full tailwater condition with a fixed water elevation of 808 mAHD (approximately 4 m water depth in the river channel) was applied at the downstream model boundary.</p>                                                                                                                                                                                                                                       |
| Hydraulic Roughness                      | <p>Surface roughness was based on a review of hydraulic literature, recent aerial photography and consistent with the values used in the Bendemeer Flood Study (Tamworth Regional Council 2012). The following land uses were adopted for the Project Area for the developed scenario:</p> <ul style="list-style-type: none"> <li>• Site access road – Sealed Road/Gravel.</li> <li>• Internal tracks – Gravel.</li> <li>• PV array – Maintained Grass Cover.</li> <li>• Vegetation screen – Dense Vegetation (per Bendemeer Solar Farm, LVIA).</li> <li>• Substation, BESS compound, operational and maintenance facility – Hardstand.</li> <li>• Ancillary material handling area – Gravel.</li> </ul>                                                                                                                                                                             |

| Model Element                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Critical Duration                       | <p>Critical storm durations for the Project Area were determined in accordance with AR&amp;R 2019 guidelines as follows as part of the FIA submitted with the Project EIS by Northrop.</p> <p>Model runs were completed for a durations ranging from 10 minutes to 12 hours for each of the 5%, 1% AEP storm events. Similarly, durations from 15 minutes to 6 hours were modelled to for the PMF flood event local catchment flooding. Each event duration was run for the 10 temporal patterns provided by Australian Rainfall and Runoff (AR&amp;R) for the East Coast South (NSW) division. From these runs, the median result of the ten temporal patterns for each duration was selected, and the maximum of these median results was used to determine predicted peak water levels at the site.</p> <p>The two-dimensional TUFLOW modelling indicates the following storm durations are critical for the Project Area:</p> <ul style="list-style-type: none"> <li>• 5% AEP – 30 minutes, temporal pattern 8.</li> <li>• 1% AEP – 25 minutes, temporal pattern 4.</li> <li>• PMF – 15 minutes.</li> </ul> |
| Hydraulic Structures and Infrastructure | <p>Existing bridges were included in the TUFLOW model as a layered flow constriction by using elevation shapes and energy losses. 100% blockage factor was adopted for off-site road culverts and below ground pipe drainage in the model. On-site culverts have been incorporated into the model (on-site culverts not included in the modelling for the FIA submitted with the Project EIS) within the proposed development area, with no blockage applied. It is assumed that these culverts will be sized to convey 1% AEP flows during detailed design. This is considered a conservative approach for assessing impacts downstream of the Project, i.e. inclusion of the on-site culverts without blockage reduces on-site stormwater detention resulting in higher flows downstream of the Project.</p> <p>Buildings were incorporated into the model based on proposed building footprints provided by the Applicant and included an allowance for freeboard.</p>                                                                                                                                       |

## 3. RESULTS AND DISCUSSION

### 3.1 Existing Scenario Flood Behaviour

Appendix A contains mapping of flood depth, velocity and hazard category (Figures A.1 to A.9) for the following flood modelling results for the existing scenario (i.e. with the Project Area undeveloped) for the 5% and 1% AEP and PMF storm events.

The modelling results for the existing scenario are consistent with those presented in the flood assessment prepared by Northrop (2023) that was submitted with the Project EIS and show:

- Oxley Highway is flooded from local catchment run-off in the existing case for the 5% AEP.
- Flooding is generally confined to the drainage channels for the 5% and 1% AEP storm events.
- Higher flood hazard category areas are generally confined to drainage channels for the 5% AEP and the broader drainage corridor for the larger storm events.

### 3.2 Developed Scenario Flood Behaviour

Appendix B contains mapping flood depth, velocity and hazard category (Figures B.1 to B.9) for the following flood modelling results for the developed scenario (i.e. with the Project Area developed as per the amended Project layout) for the 5% and 1% AEP and PMF storm events.

Appendix C contains mapping (Figures C.1 to C.9) showing the changes in flood depths, velocities and hazard category associated with the developed scenario when compared to the existing scenario for the 5% and 1% AEP and PMF storm events. Table 3.1 present comparisons of peak flows at the flow reporting locations indicated in Figure 1.4 between:

- Existing scenario and developed Modelled Amended Project scenario.
- EIS Project layout scenario and the Modelled Amended Project scenario.

The Modelled Amended Layout Disturbance Footprints and the Amended Layout Disturbance Footprints are shown on all figures presented in Appendices B and C.

As highlighted in Section 1.1, the below results are based on flood modelling undertaken for a Modelled Amended Layout design developed in November 2023. Since then, the design has been revised to retain additional vegetation, removing a portion of the proposed solar arrays. The overall reduction in disturbance area, between the Modelled Amended Layout and Amended Layout, due to the retained vegetation is approximately 20 ha. The modelling was not updated to reflect these changes as it is expected to have only minor impacts on the modelled flood results and is considered that it will result in a slight reduction in downstream impacts in some areas.

The results presented in Appendix C indicate that the placement of PV solar panels typically increases flood depths and velocities in areas downstream of the Project Boundary. The increase in flood depths and velocities is likely due to the concentrated flows from PV panels. The areas under the panels do not receive direct rainfall, so runoff is concentrated immediately downstream of the panels, reducing infiltration beneath them and increasing runoff downstream. For all modelled events, these increases in downstream flooding are primarily contained within the banks of adjacent watercourses. With the updated design, reducing the area of proposed PV solar panels and disturbance by approximately 20 ha and retaining existing land use in this area, it is anticipated that any measurable changes to the results would likely show a reduction in downstream impacts.

As the overall disturbance area (~370 ha) remains much larger than the additional retained vegetation (~20 ha), the overall changes in flood impacts are anticipated to be minimal and mostly likely reduced. Therefore, the flood results presented in Appendices B and C are considered representative of a conservative design assessment and remain suitable for adoption in this Amended Project FIA.



**TABLE 3.1: PEAK FLOWS AT REPORTING LOCATIONS (5% AND 1% AEP EVENTS) – COMPARISONS OF EXISTING, EIS PROJECT AND MODELLED AMENDED PROJECT**

| Reporting Location | Existing (m³/s) |        | EIS Project Developed (m³/s) |        | Modelled Amended Project Developed (m³/s) |        | Difference (m³/s) – Modelled Amended Project minus Existing |        | Difference % - Modelled Amended Project vs Existing |        | Difference (m³/s) – Modelled Amended Project minus EIS Project |        | Difference % - Modelled Amended Project vs EIS Project |        |
|--------------------|-----------------|--------|------------------------------|--------|-------------------------------------------|--------|-------------------------------------------------------------|--------|-----------------------------------------------------|--------|----------------------------------------------------------------|--------|--------------------------------------------------------|--------|
|                    | 5% AEP          | 1% AEP | 5% AEP                       | 1% AEP | 5% AEP                                    | 1% AEP | 5% AEP                                                      | 1% AEP | 5% AEP                                              | 1% AEP | 5% AEP                                                         | 1% AEP | 5% AEP                                                 | 1% AEP |
| L05                | 4.8             | 9.1    | 4.9                          | 9.9    | 4.9                                       | 9.8    | 0.1                                                         | 0.7    | 2.0%                                                | 7.1%   | 0.0                                                            | -0.1   | 0.0%                                                   | -1.0%  |
| L06                | 6.8             | 13.0   | 7.2                          | 14.2   | 7.2                                       | 13.9   | 0.4                                                         | 0.9    | 5.6%                                                | 6.5%   | 0.0                                                            | -0.3   | 0.0%                                                   | -2.2%  |
| L07                | 10.2            | 20.8   | 12.6                         | 25.2   | 11.9                                      | 22.8   | 1.7                                                         | 2.0    | 14.3%                                               | 8.8%   | -0.7                                                           | -2.4   | -5.9%                                                  | -10.5% |
| L08                | 3.1             | 6.0    | 3.1                          | 6.0    | 3.1                                       | 6.0    | 0.0                                                         | 0.0    | 0.0%                                                | 0.0%   | 0.0                                                            | 0.0    | 0.0%                                                   | 0.0%   |
| L09                | 7.2             | 13.4   | 7.2                          | 13.5   | 7.2                                       | 13.4   | 0.0                                                         | 0.0    | 0.0%                                                | 0.0%   | 0.0                                                            | -0.1   | 0.0%                                                   | -0.7%  |
| L11                | 76.1            | 143.2  | 76.4                         | 143.3  | 77.4                                      | 145.0  | 1.3                                                         | 1.8    | 1.7%                                                | 1.2%   | 1.0                                                            | 1.7    | 1.3%                                                   | 1.2%   |
| L12                | 79.3            | 150.9  | 79.0                         | 150.1  | 79.9                                      | 151.7  | 0.6                                                         | 0.8    | 0.8%                                                | 0.5%   | 0.9                                                            | 1.6    | 1.1%                                                   | 1.1%   |
| L13                | 17.4            | 35.1   | 22.2                         | 39.9   | 23.2                                      | 40.7   | 5.8                                                         | 5.6    | 25.0%                                               | 13.8%  | 1.0                                                            | 0.8    | 4.3%                                                   | 2.0%   |
| L14                | 77.3            | 146.9  | 77.2                         | 146.4  | 77.4                                      | 147.2  | 0.1                                                         | 0.3    | 0.1%                                                | 0.2%   | 0.2                                                            | 0.8    | 0.3%                                                   | 0.5%   |
| L15                | 8.0             | 15.9   | 15.9                         | 16.2   | 8.0                                       | 16.0   | 0.0                                                         | 0.1    | 0.0%                                                | 0.6%   | -7.9                                                           | -0.2   | -98.8%                                                 | -1.3%  |
| L16                | 5.5             | 10.1   | 10.1                         | 11.4   | 6.2                                       | 11.5   | 0.7                                                         | 1.4    | 11.3%                                               | 12.2%  | -3.9                                                           | 0.1    | -62.9%                                                 | 0.9%   |
| L17                | 9.2             | 17.4   | 17.4                         | 19.1   | 10.2                                      | 19.3   | 1.0                                                         | 1.9    | 9.8%                                                | 9.8%   | -7.2                                                           | 0.2    | -70.6%                                                 | 1.0%   |
| L18                | 4.8             | 9.3    | 4.9                          | 9.7    | 5.2                                       | 10.0   | 0.4                                                         | 0.7    | 7.7%                                                | 7.0%   | 0.3                                                            | 0.3    | 5.8%                                                   | 3.0%   |
| L19                | 7.2             | 13.6   | 7.7                          | 14.8   | 8.1                                       | 15.2   | 0.9                                                         | 1.6    | 11.1%                                               | 10.5%  | 0.4                                                            | 0.4    | 4.9%                                                   | 2.6%   |
| L20                | 9.5             | 18.2   | 9.5                          | 18.1   | 9.4                                       | 18.1   | -0.1                                                        | -0.1   | -1.1%                                               | -0.6%  | -0.1                                                           | 0.0    | -1.1%                                                  | 0.0%   |
| L21                | 78.7            | 148.9  | 78.5                         | 148.2  | 79.4                                      | 149.8  | 0.7                                                         | 0.9    | 0.9%                                                | 0.6%   | 0.9                                                            | 1.6    | 1.1%                                                   | 1.1%   |

The developed scenario flood modelling results within the Project Area for the Modelled Amended Project layout are generally consistent with those for the EIS Project layout and indicate:

- Generally minor increase in flood depths (typically <0.10 m) and velocities (typically <0.5 m/s) within the Project Area for the 5% and 1% AEP storm events (refer to Northrop report and Figures C.1, C.2, C.4 and C.5).
- Areas of afflux (increase in flood depth) and inundation associated with some of the Modelled Amended Project infrastructure including the BESS, substation, switchyard and access roads (refer to Figures C.1, C.2, C.4 and C.5. These areas of inundation and afflux will be mitigated with diversion drains, appropriately sized culverts and scour protection that will be incorporated into the detailed Project design.

The developed scenario flood modelling results outside of the Project Area for the Modelled Amended Project layout are generally consistent with those for the EIS Project layout and indicate:

- Flood depth and velocity increases (typically <0.10 m and <0.5 m/s respectively) for the 5% and 1% AEP storm events are generally minor and confined to drainage channels (refer to Northrop report and Figures C.1, C.2, C.4 and C.5).
- Flood velocities within drainage channels for the 5% and 1% AEP storm events of up to 4 m/s (refer to Figures B.2 and B.5). These velocities are consistent with those predicted for the existing undeveloped scenario.
- Flood depth increase on the Oxley Highway of up to 60 mm for the 1% AEP storm event (refer to Figure C.2). Given the Oxley Highway is not trafficable under the existing scenario for the 1% AEP, this increase to flood depth is not considered to be a significant impact. This increase in depth is marginally higher than that of 50 mm predicted for the EIS Project layout and is considered to be a consequence of increased flows associated with modelling of upslope culverts within the Project Area without blockage (refer to Table 2.1).

Peak flow increases associated with the Modelled Amended Project scenario are generally consistent with those for the EIS Project scenario (refer to Northrop report and Figures C.4, C.5 and C.6).



## 4. MITIGATION MEASURES AND RECOMMENDATIONS

No flood mitigation measures are considered necessary for areas outside of the Project Area. While there is an increase in the depth of flooding on the Oxley Highway for the 1% AEP, given the Oxley Highway is not trafficable under the existing scenario for the 1% AEP, this increase to flood depth it is considered to be a negligible change in impact.

As noted in Section 3.2, flood modelling indicates areas of afflux and inundation within the Project Area associated with some of the Modelled Amended Project infrastructure. It is considered that the incorporation of diversion drains, appropriately sized culverts and scour protection into the detailed project design will mitigate any issues associated with inundation and afflux. Diversion drains, culverts and scour protection should be designed to convey peak flows, be structurally sound and non-erosive in storm events up to and including the 1% AEP.

The recommendations made in the FIA submitted with the Project EIS by Northrop are considered to remain valid for the Amended Project layout. Following are the Northrop recommendations:

### **PV Array**

*An approximately 100mm maintained grass cover is recommended for the solar array area. The grassed areas will reduce the likelihood of erosion from concentrated flow from PV panels during rainfall events.*

*We recommend consideration is given to lowering the risk to property through appropriate location of the panels and supporting infrastructure. This is to be considered during detailed design and there are feasible options to achieve this including regrading of the terrain and inclusion of stormwater infrastructure.*

### **Finished Floor Level**

*Finished floor level for all habitable buildings within the Project Area such as office and control rooms should be at a minimum above 1% AEP flood level + 500mm freeboard. The operator may choose a different higher standard based on their risk appetite. Recommended finished floor level for other non-habitable facilities is 1% AEP flood level + 300mm freeboard.*

*This applies to all buildings on-site. There are several design responses as to how this can be achieved for the BESS and compound area including diversions, culverts, and flood protection walls. Finished floor levels and arrangements for how this is to be achieved to be determined during the detailed design phase.*

### **Flood Emergency**

*If significant rainfall is predicted, we recommend early evacuation of the site during work hours and that consideration be given to advising staff and visitors not to attend site until the hazard has passed if outside work hours.*

*It is not recommended to egress the Project Area during flood events as the Oxley Highway is currently compromised by flood waters in the 5% AEP – refer to Figure B1-3 of Appendix B. The storage of potable water and non-perishable food items on-site is recommended should refuge be required as an option of last resort. The modelling indicates the site and highway overtopping locations are impacted by local catchment flooding with critical durations less than one hour. In these events, the time of isolation on-site is likely to be less than six hours.*

*This emergency response strategy reflects the recommendations outlined in the Draft Shelter in Place Guideline (NSW DPE, 2023).*

## 5. CONCLUSION

This Amended Project FIA has been prepared to assess the changes in local flood regimes associated with the Amended Project design (November 2024) and considers only the 5% AEP, 1% AEP and the PMF for the developed Amended Project. The flood modelling undertaken by Engeny for this Amended Project FIA was completed using the flood model and methodology developed by Northrop for the FIA submitted with the Project EIS and was based on the November 2023 Modelled Amended Project design.

Additional modelling of the 0.2% and 0.5% AEP was not undertaken for the Amended Project as the potential impacts of climate change have already been assessed, were deemed to have negligible influence associated with the EIS Project design, were accepted by relevant agencies (i.e. no agency submissions received) and it is considered that any potential impacts would be reduced.

It is considered that the Amended Project will result in on-site and off-site flooding impacts that are consistent with the EIS Project design. It is also considered that the Amended Project will not have a significant adverse impact on on-site and off-site flood regimes.



## 6. REFERENCES

*Flood Impact Assessment for Bendemeer Solar Farm*, Northrop Consulting Engineers, 2023

## 7. QUALIFICATIONS

- (a) In preparing this document, including all relevant calculation and modelling, Engeny Australia Pty Ltd (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.
- (b) Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.
- (c) Engeny reserves the right to review and amend any aspect of the works performed including any opinions and recommendations from the works included or referred to in the works if:
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  - (ii) Engeny considers it prudent to revise any aspect of the works in light of any information which becomes known to it after the date of submission.
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- (f) This Report does not provide legal advice.

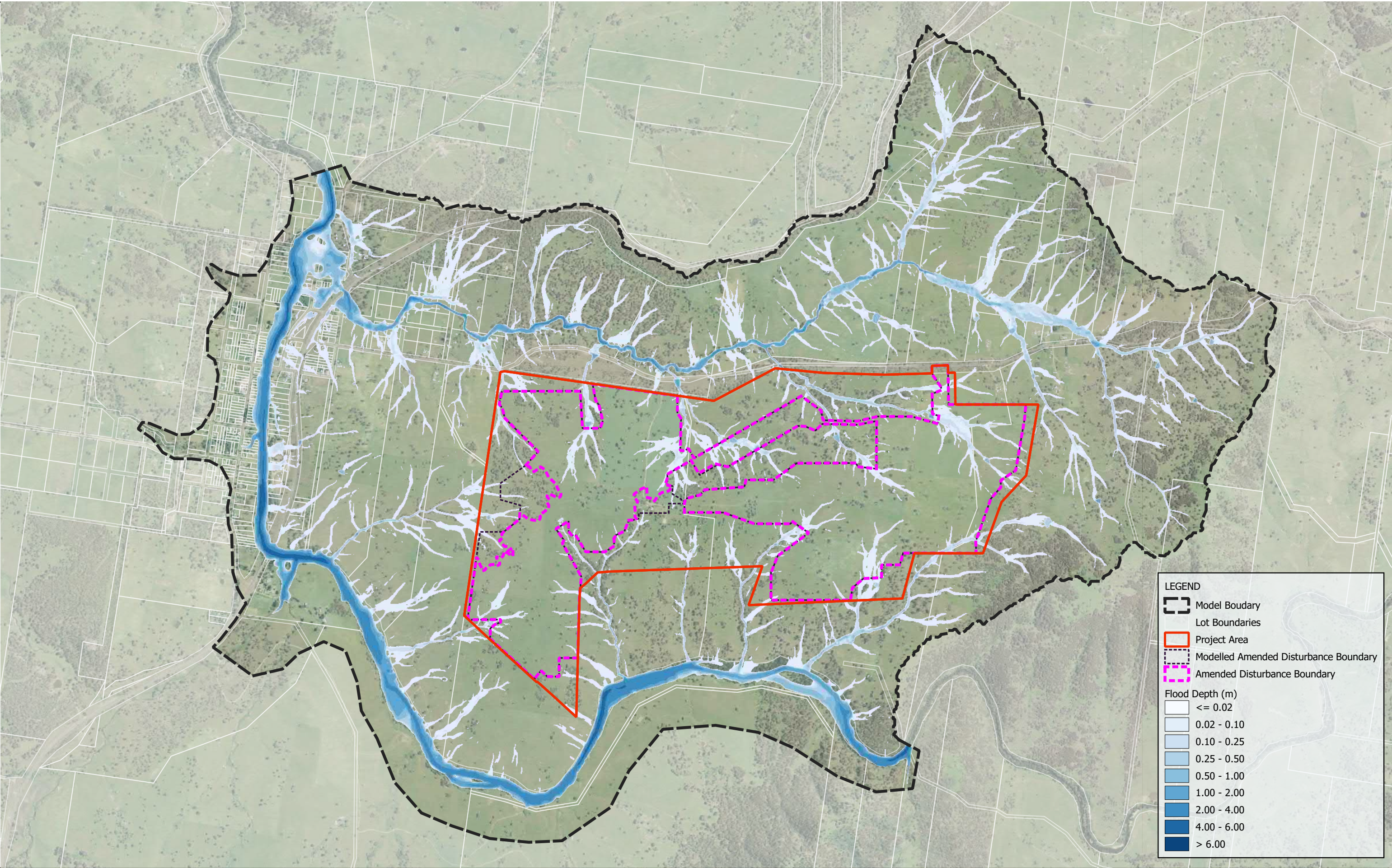


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# APPENDIX A - EXISTING SCENARIO FLOOD BEHAVIOUR







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0 0.6 1.2 km

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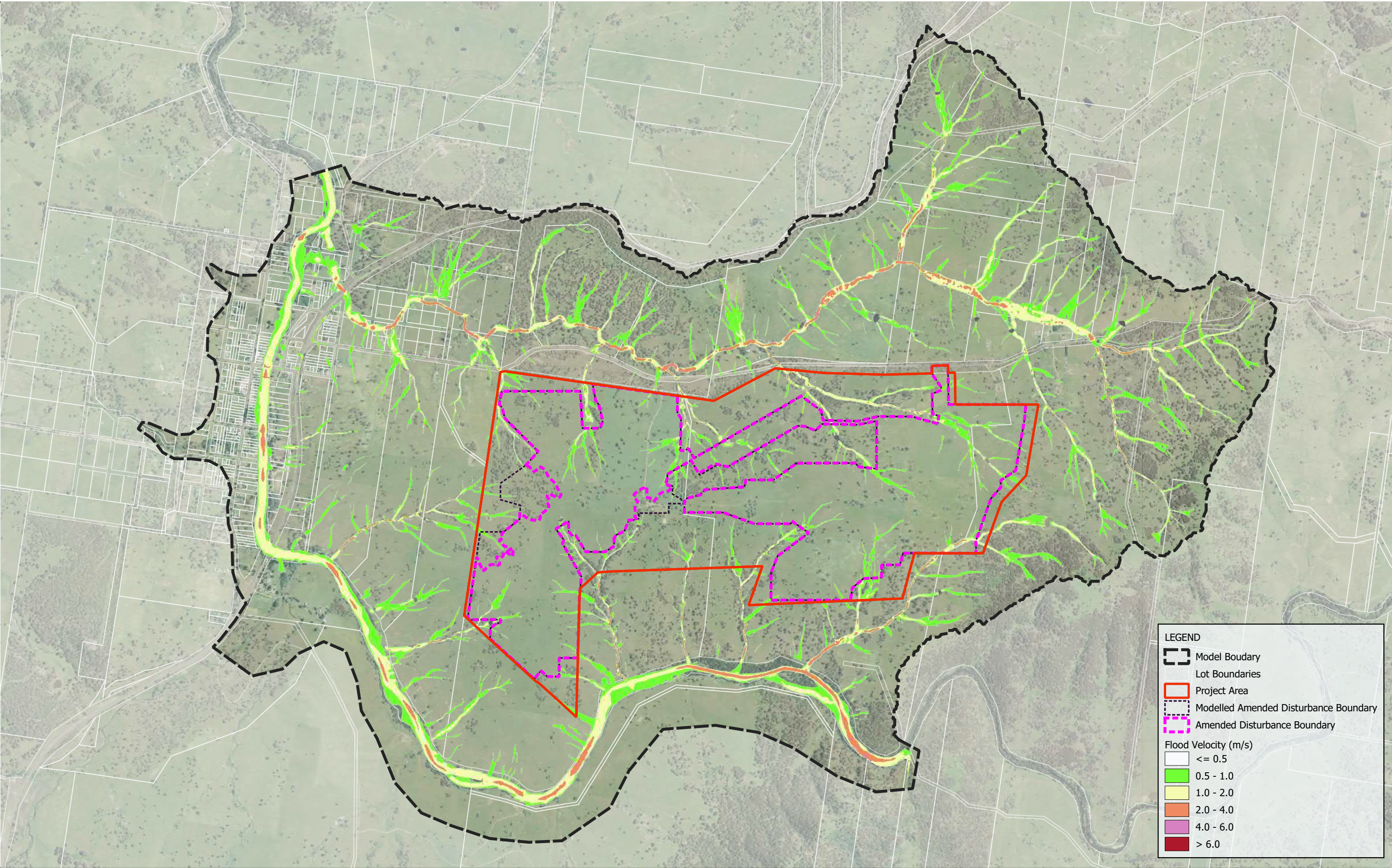
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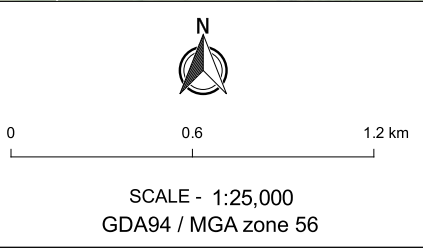
**Figure A.1.**  
Bendemeer Solar Farm  
Existing Conditions: Flood Depth - 5% AEP

Drp Ref.





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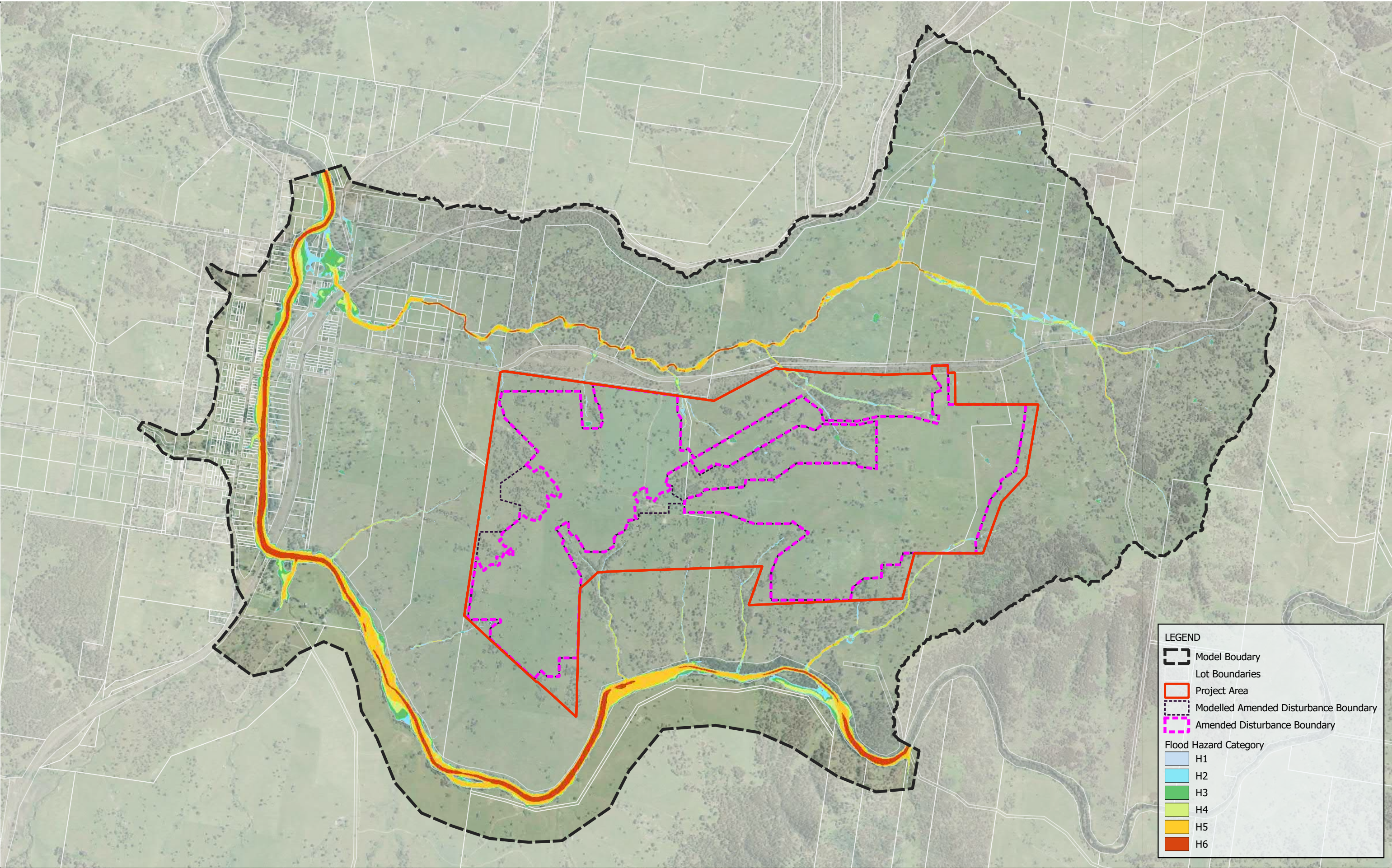


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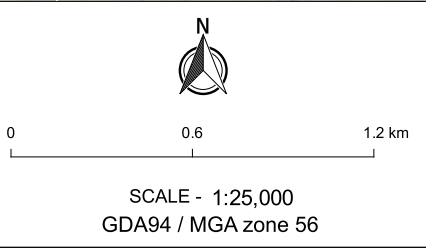


**Figure A.2.**  
Bendemeer Solar Farm  
Existing Conditions: Flood Velocity - 5% AEP  
Drp Ref.





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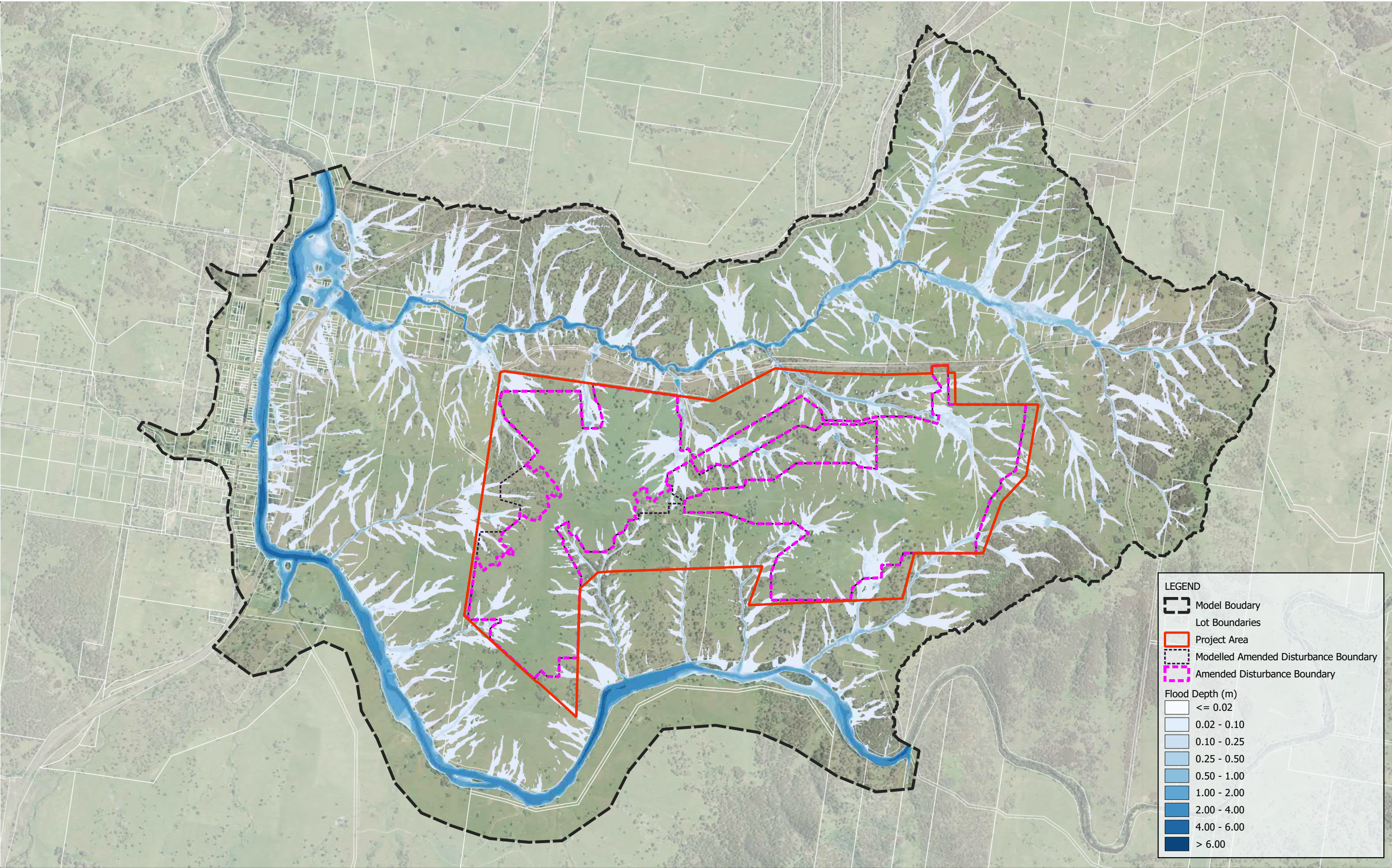


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**Figure A.3.**  
Bendemeer Solar Farm  
Existing Conditions: Flood Hazard - 5% AEP





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0 0.6 1.2 km

SCALE - 1:25,000  
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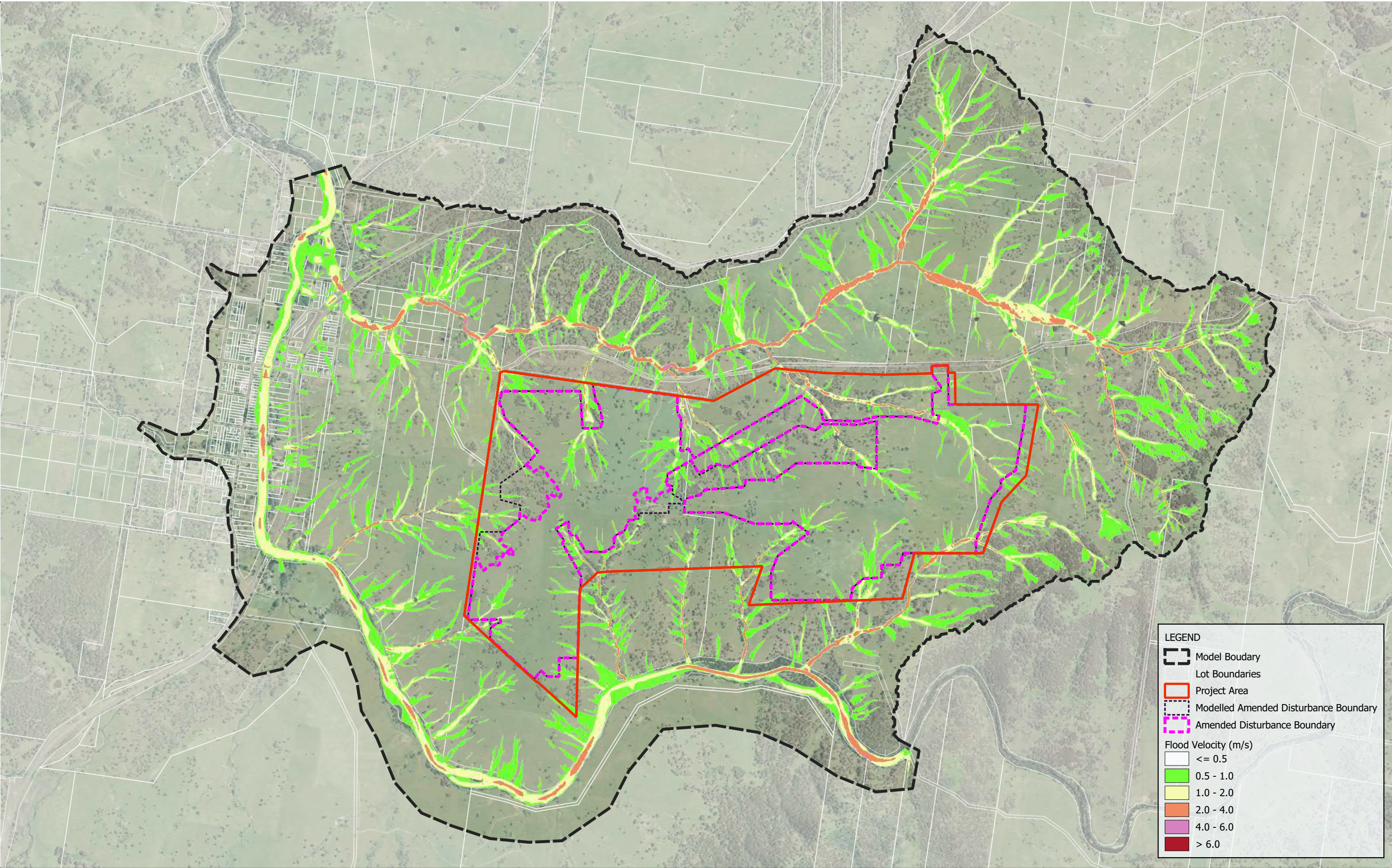
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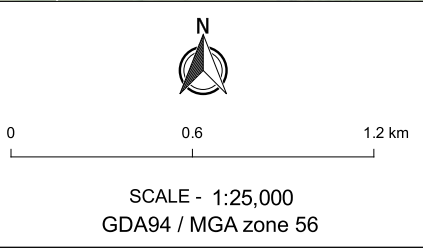
**Figure A.4.**  
Bendemeer Solar Farm  
Existing Conditions: Flood Depth - 1% AEP

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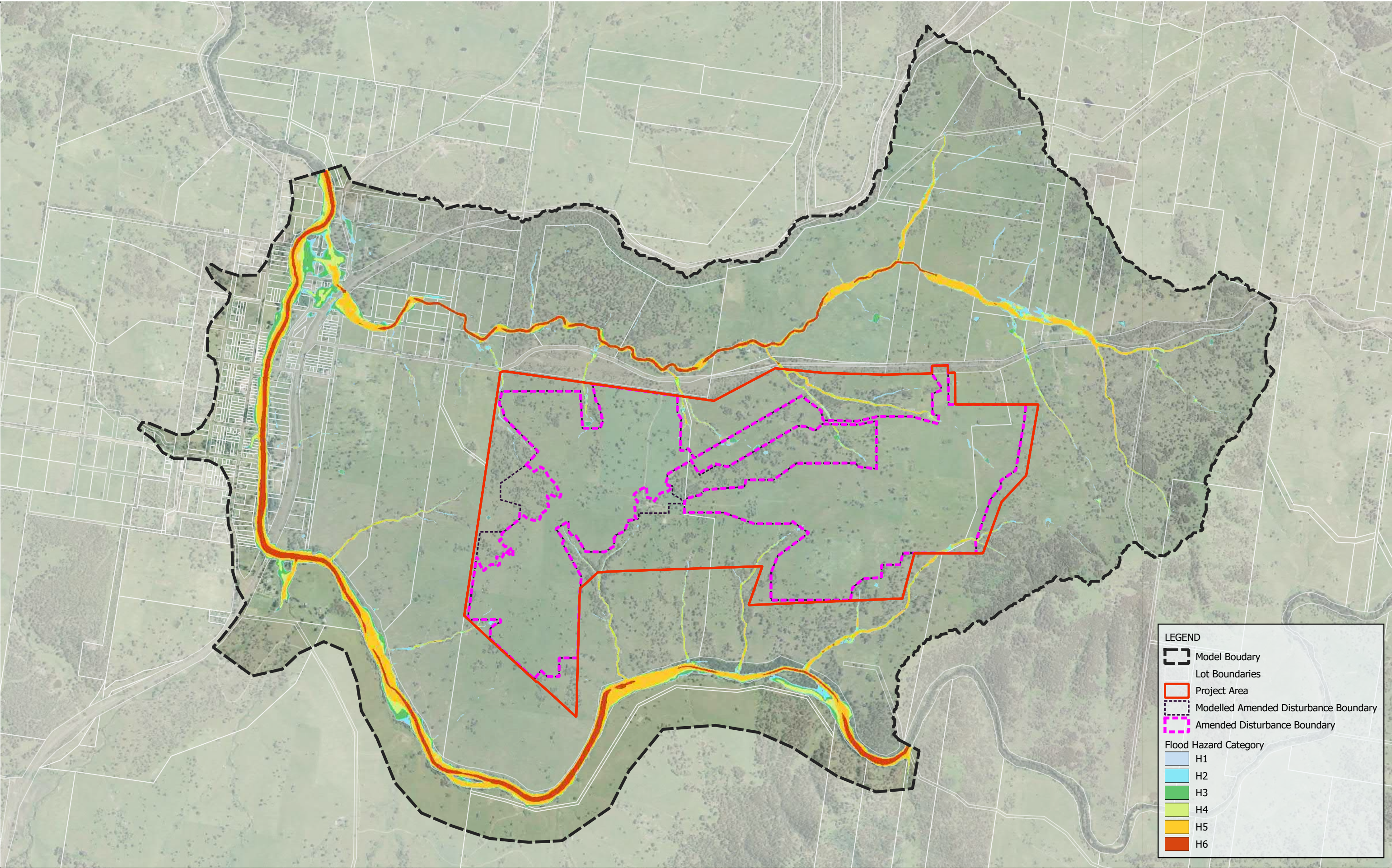


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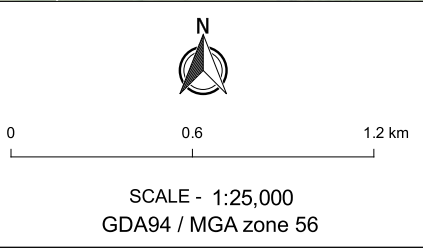


**Figure A.5.**  
Bendemeer Solar Farm  
Existing Conditions: Flood Velocity - 1% AEP





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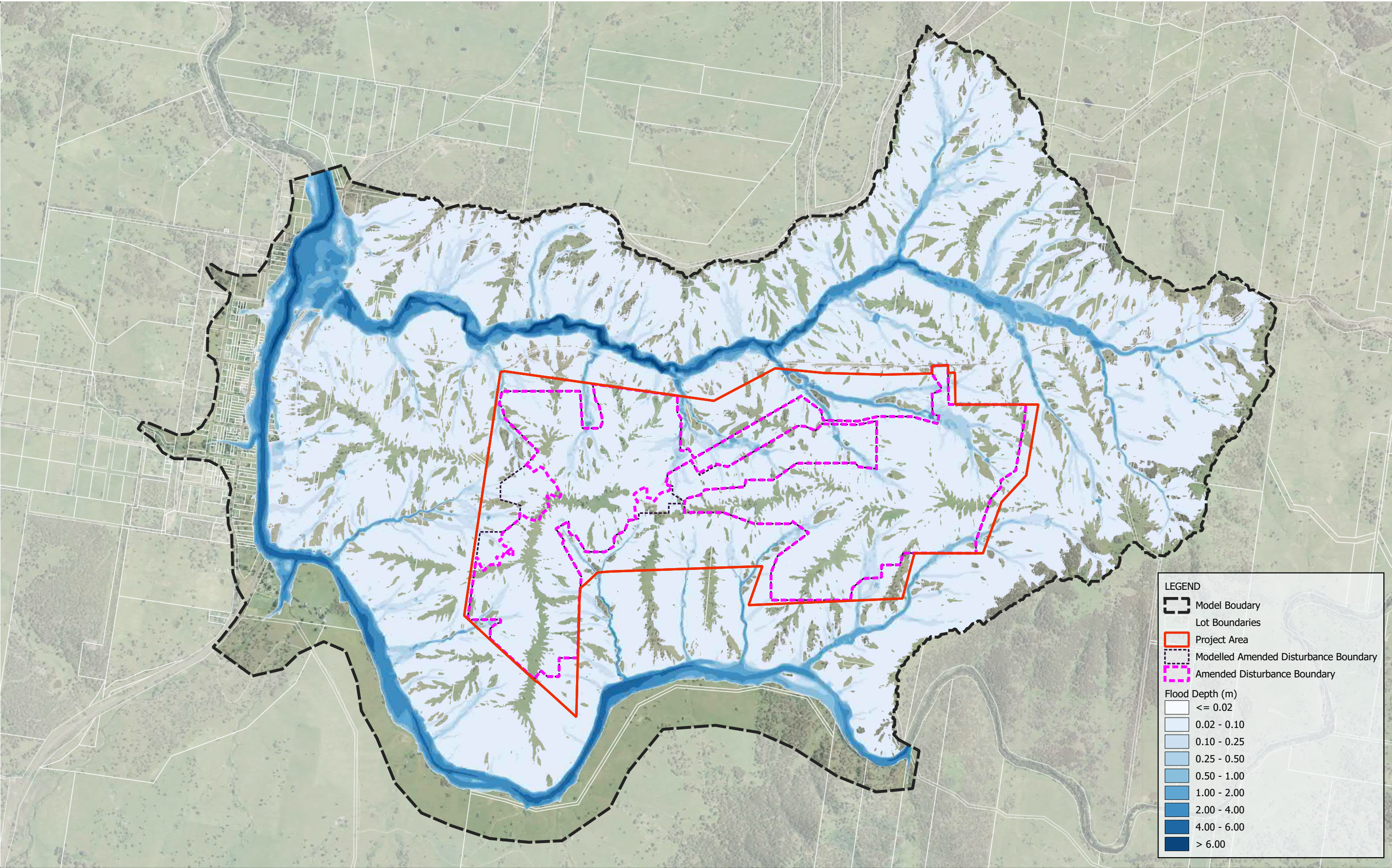
**Figure A.6.**

Bendemeer Solar Farm

Existing Conditions: Flood Hazard - 1% AEP

Drp Ref.





LEGEND

Model Boudary

Lot Boundaries

Flood Depth (m)

&lt;= 0.02

0.02 - 0.10

0.10 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 4.00

4.00 - 6.00

&gt; 6.00

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km

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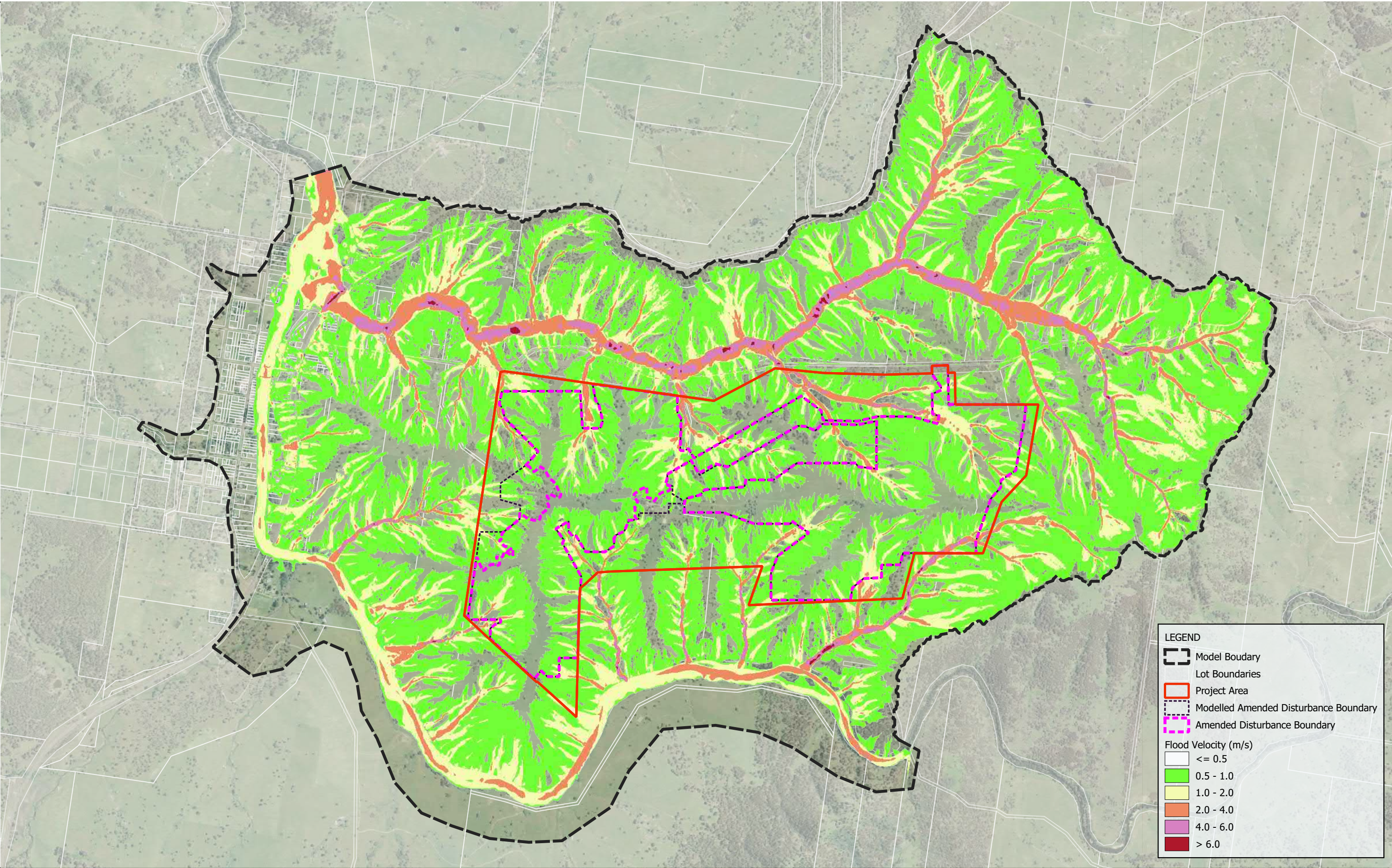
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**Figure A.7.**  
Bendemeer Solar Farm  
Existing Conditions: Flood Depth - PMF

Dwg Ref.





**LEGEND**

- Model Boudary
- Lot Boundaries
- Project Area
- Modelled Amended Disturbance Boundary
- Amended Disturbance Boundary

Flood Velocity (m/s)

- <= 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 4.0
- 4.0 - 6.0
- > 6.0

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0 0.6 1.2 km  
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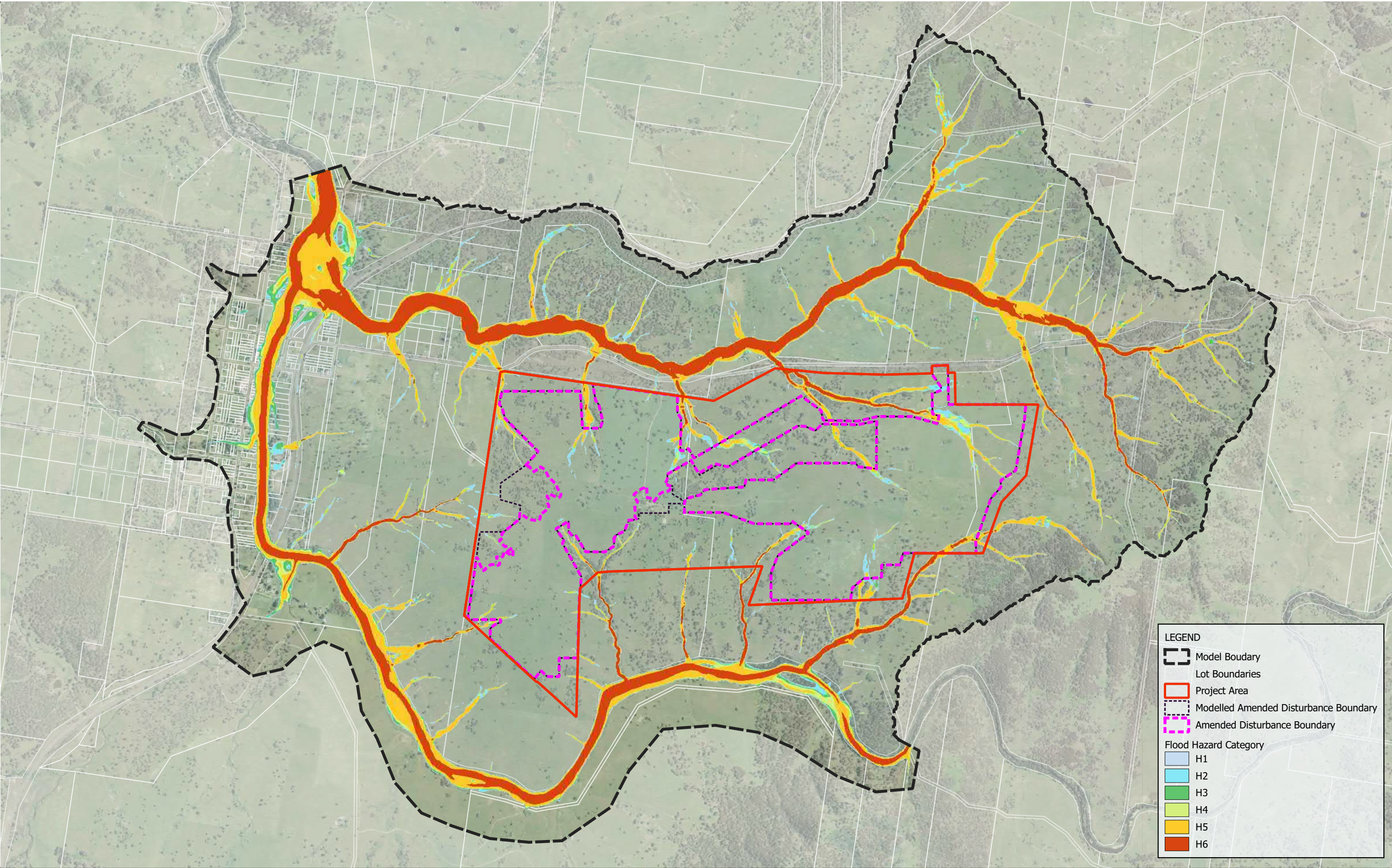
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**Figure A.8.**  
Bendemeer Solar Farm  
Existing Conditions: Flood Velocity - PMF  
Drp Ref.





**LEGEND**

Model Boudary  
Lot Boundaries  
Project Area  
Modelled Amended Disturbance Boundary  
Amended Disturbance Boundary

Flood Hazard Category

|    |
|----|
| H1 |
| H2 |
| H3 |
| H4 |
| H5 |
| H6 |

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0 0.6 1.2 km  
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**Figure A.9.**  
Bendemeer Solar Farm  
Existing Conditions: Flood Hazard - PMF  
Dwg Ref.

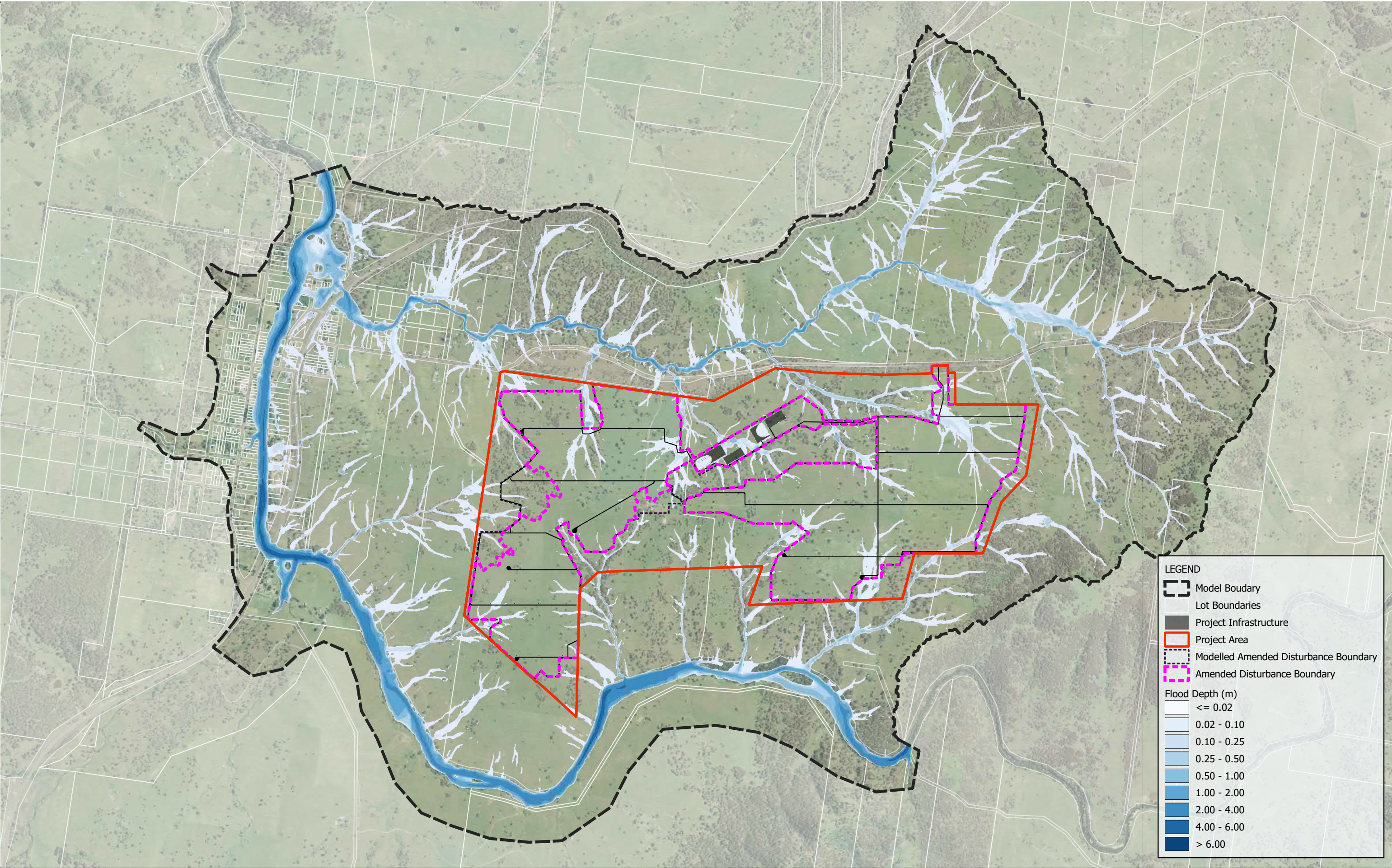


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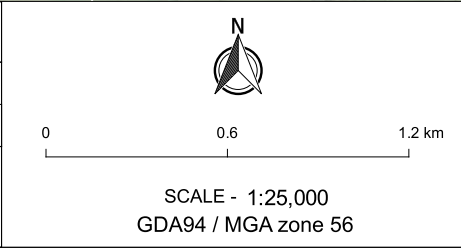
# APPENDIX B – DEVELOPED SCENARIO FLOOD BEHAVIOUR







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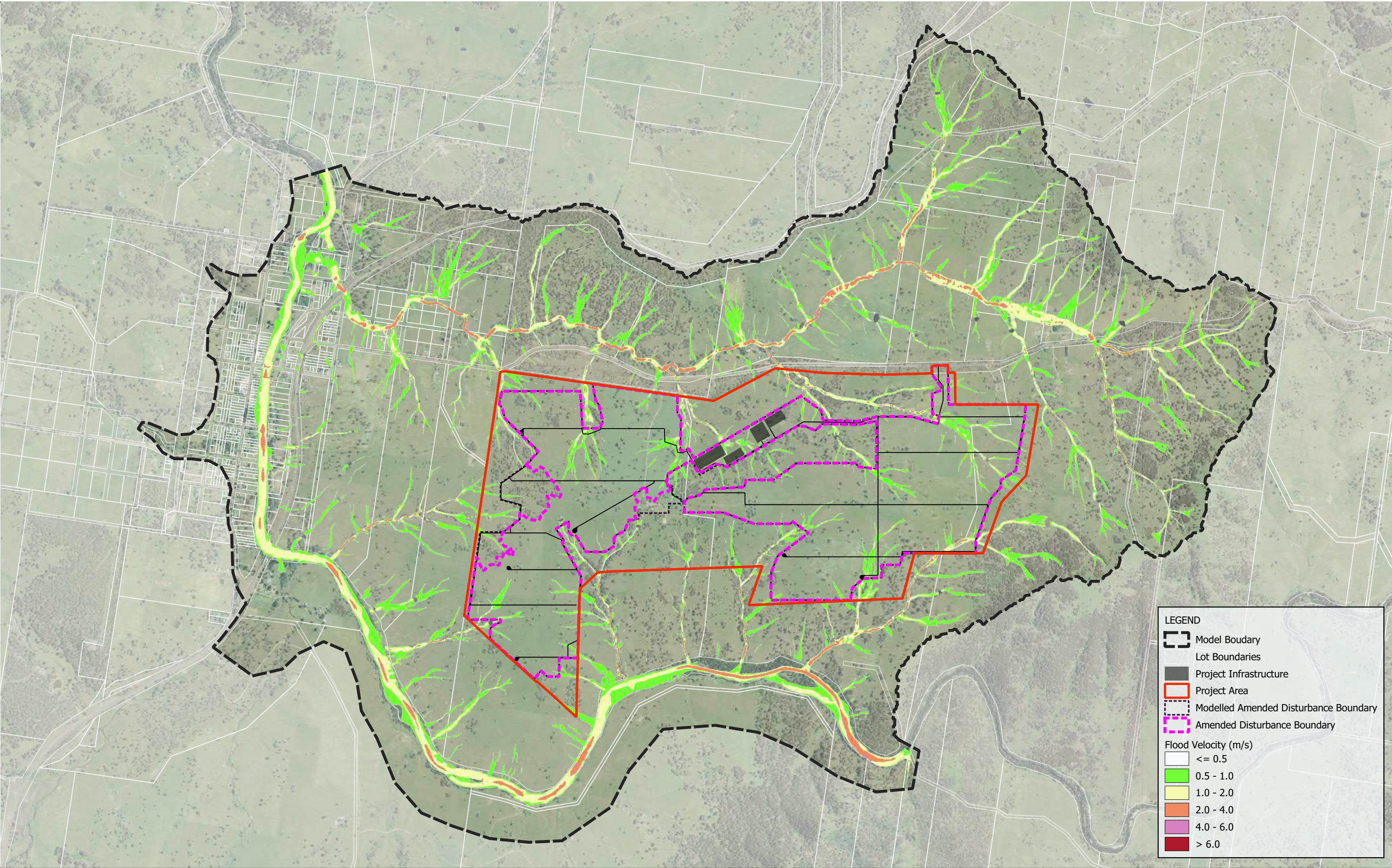


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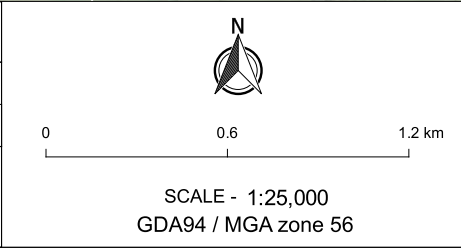


**Figure B.1.**  
Bendemeer Solar Farm  
Developed Conditions: Flood Depth - 5% AEP  
Dwg Ref.





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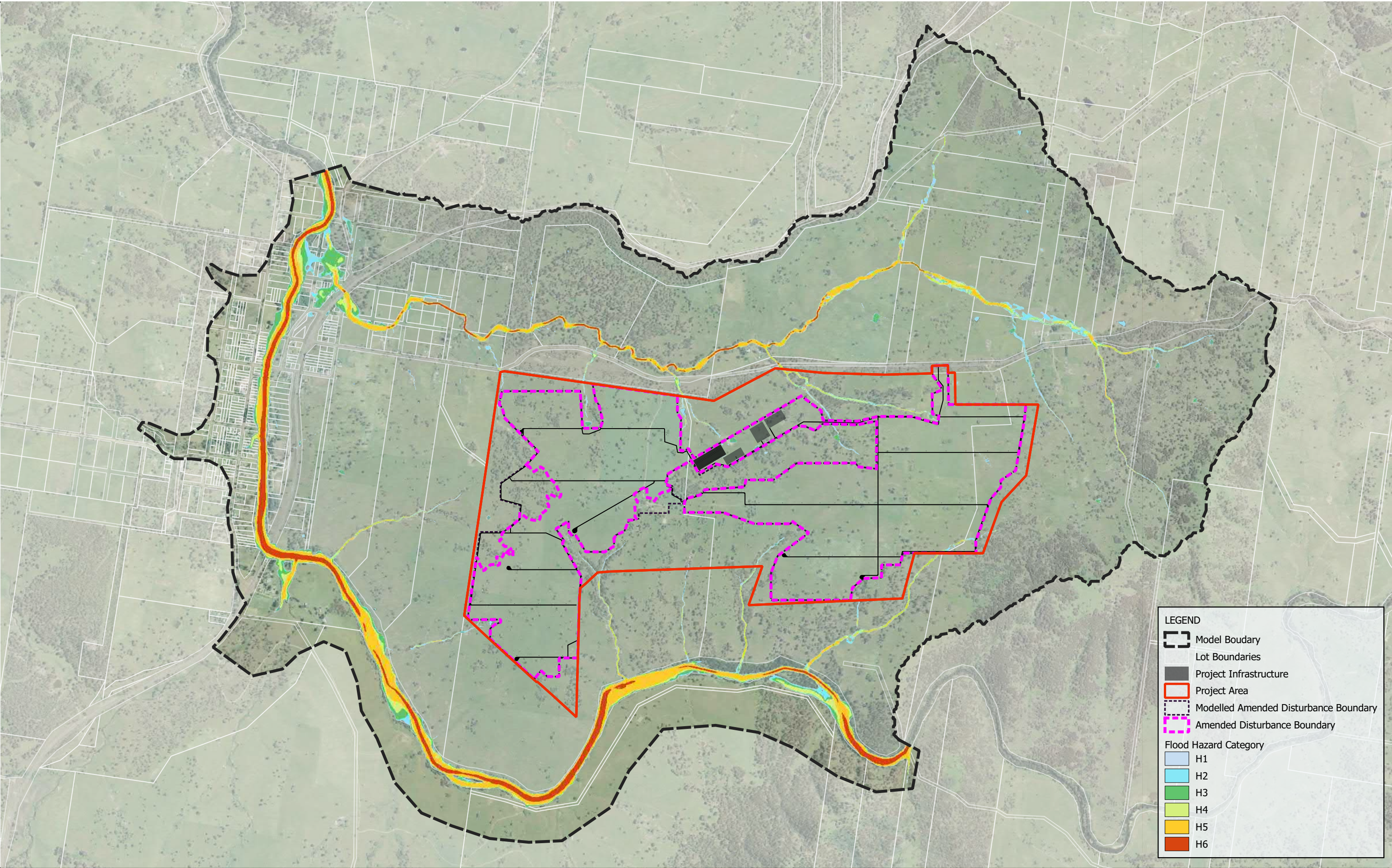


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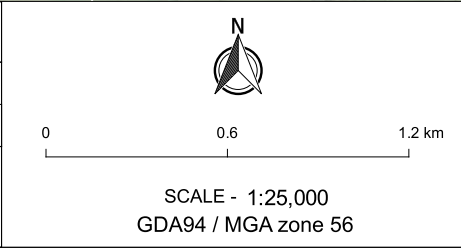


**Figure B.2.**  
Bendemeer Solar Farm  
Developed Conditions: Flood Velocity - 5% AEP  
Drp Ref.





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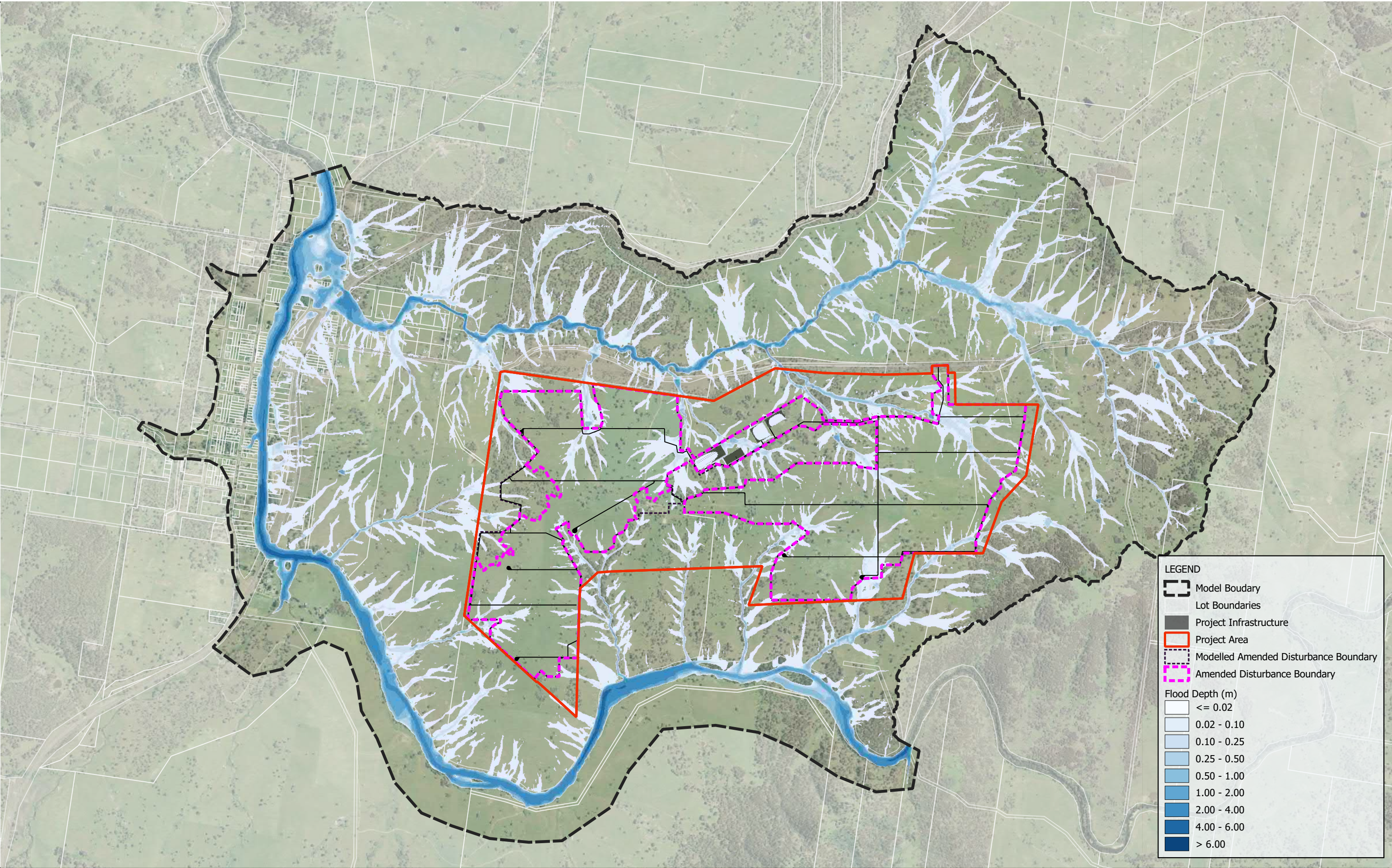


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**Figure B.3.**  
Bendemeer Solar Farm  
Developed Conditions: Flood Hazard - 5% AEP  
Dwg Ref.





**LEGEND**

- Model Boudary
- Lot Boundaries
- Project Infrastructure
- Project Area
- Modelled Amended Disturbance Boundary
- Amended Disturbance Boundary

**Flood Depth (m)**

- ≤ 0.02
- 0.02 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 4.00
- 4.00 - 6.00
- > 6.00

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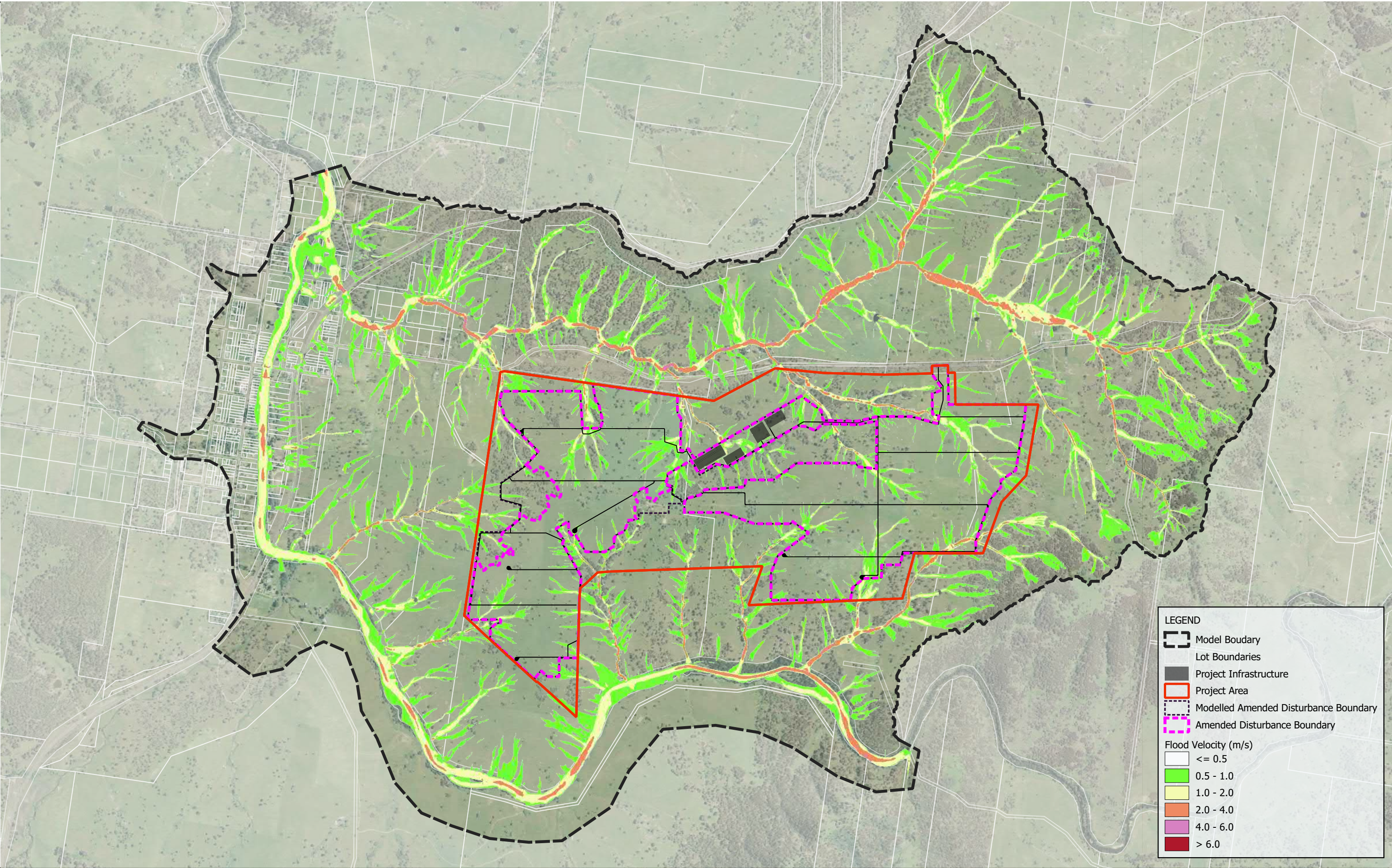
  
0 0.6 1.2 km  
SCALE - 1:25,000  
GDA94 / MGA zone 56

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**Figure B.4.**  
Bendemeer Solar Farm  
Developed Conditions: Flood Depth - 1% AEP  
Dwg Ref.





**LEGEND**

- Model Boudary
- Lot Boundaries
- Project Infrastructure
- Project Area
- Modelled Amended Disturbance Boundary
- Amended Disturbance Boundary

**Flood Velocity (m/s)**

- <= 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 4.0
- 4.0 - 6.0
- > 6.0

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| 0 | Final Issue | 01-04-2025 | DRAWN                                                                                                      | GC | CHECKED | LV         |
|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |
|   |             |            | NOTES:                                                                                                     |    |         |            |
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0 0.6 1.2 km

SCALE - 1:25,000  
GDA94 / MGA zone 56

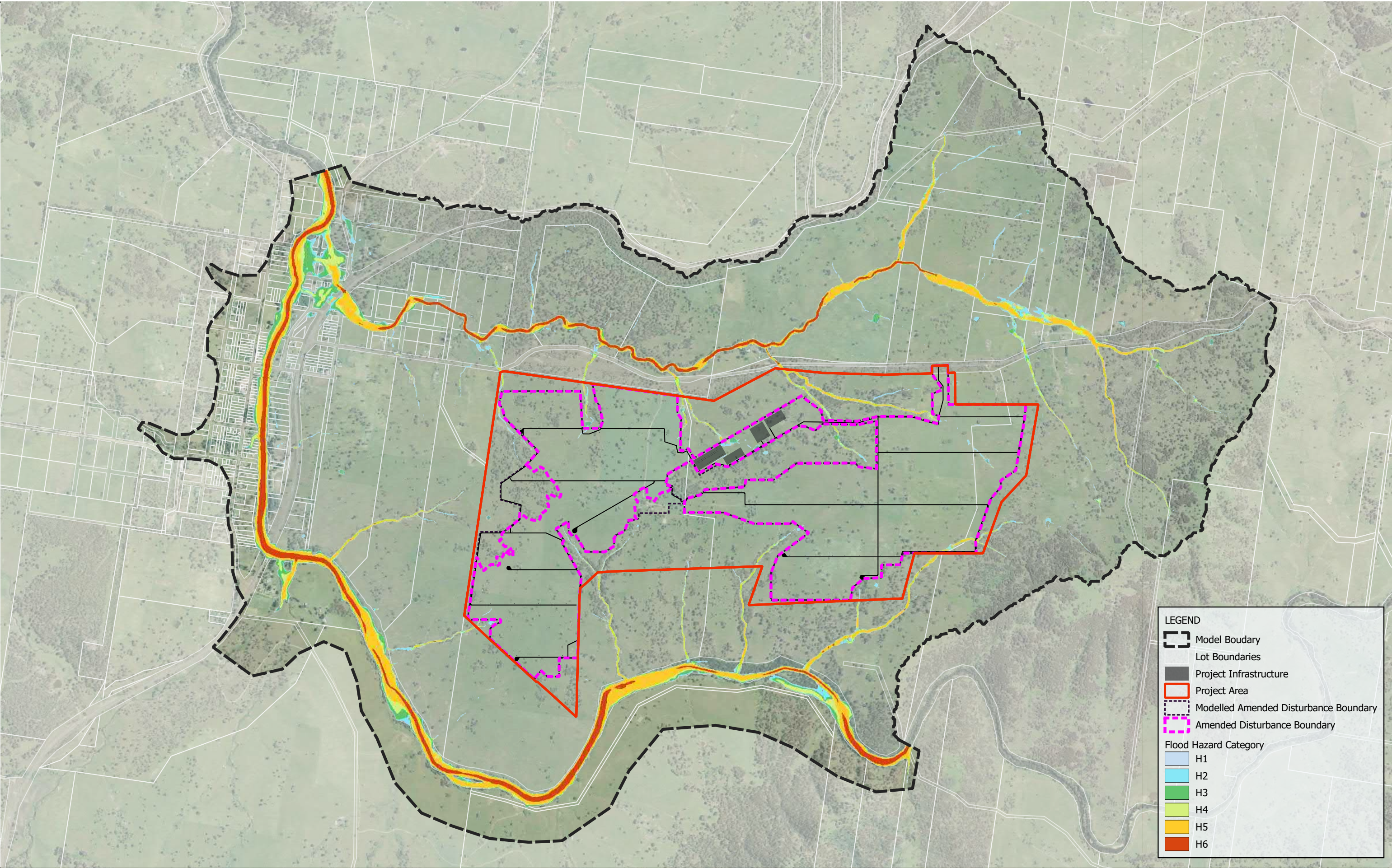
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**Figure B.5.**  
Bendemeer Solar Farm  
Developed Conditions: Flood Velocity - 1% AEP

Drp Ref.





LEGEND

- Model Boudary
- Lot Boundaries
- Project Infrastructure
- Project Area
- Modelled Amended Disturbance Boundary
- Amended Disturbance Boundary

Flood Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

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| 0 | Final Issue | 01-04-2025 | DRAWN                                                                                                      | GC | CHECKED | LV         |
|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |
|   |             |            | NOTES:                                                                                                     |    |         |            |
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0 0.6 1.2 km

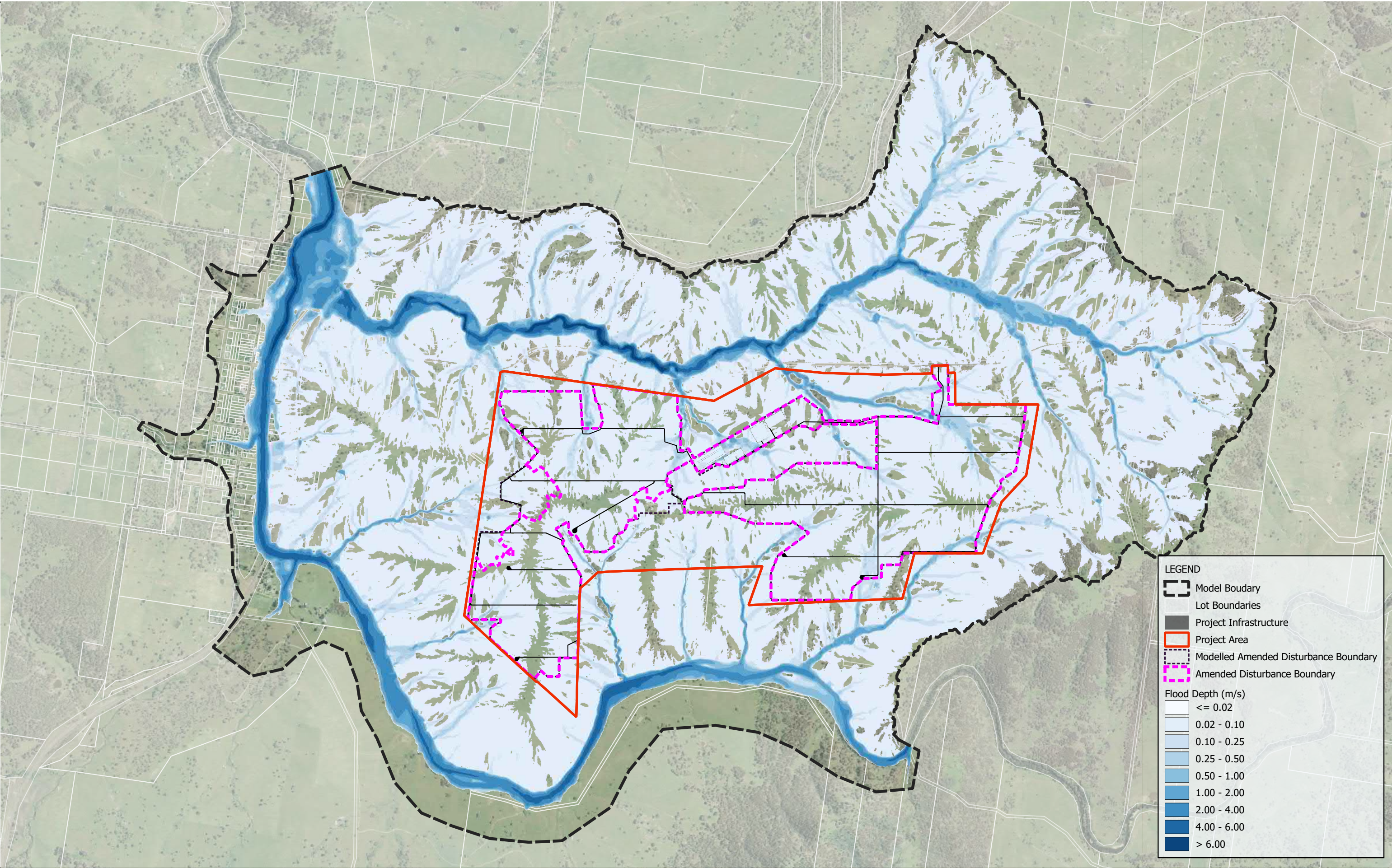
SCALE - 1:25,000  
GDA94 / MGA zone 56

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**Figure B.6.**  
Bendemeer Solar Farm  
Developed Conditions: Flood Hazard - 1% AEP





**LEGEND**

- Model Boudary
- Lot Boundaries
- Project Infrastructure
- Project Area
- Modelled Amended Disturbance Boundary
- Amended Disturbance Boundary

**Flood Depth (m/s)**

- ≤ 0.02
- 0.02 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 4.00
- 4.00 - 6.00
- > 6.00

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| 0 | Final Issue | 01-04-2025 | DRAWN                                                                                                      | GC | CHECKED | LV         |
|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |
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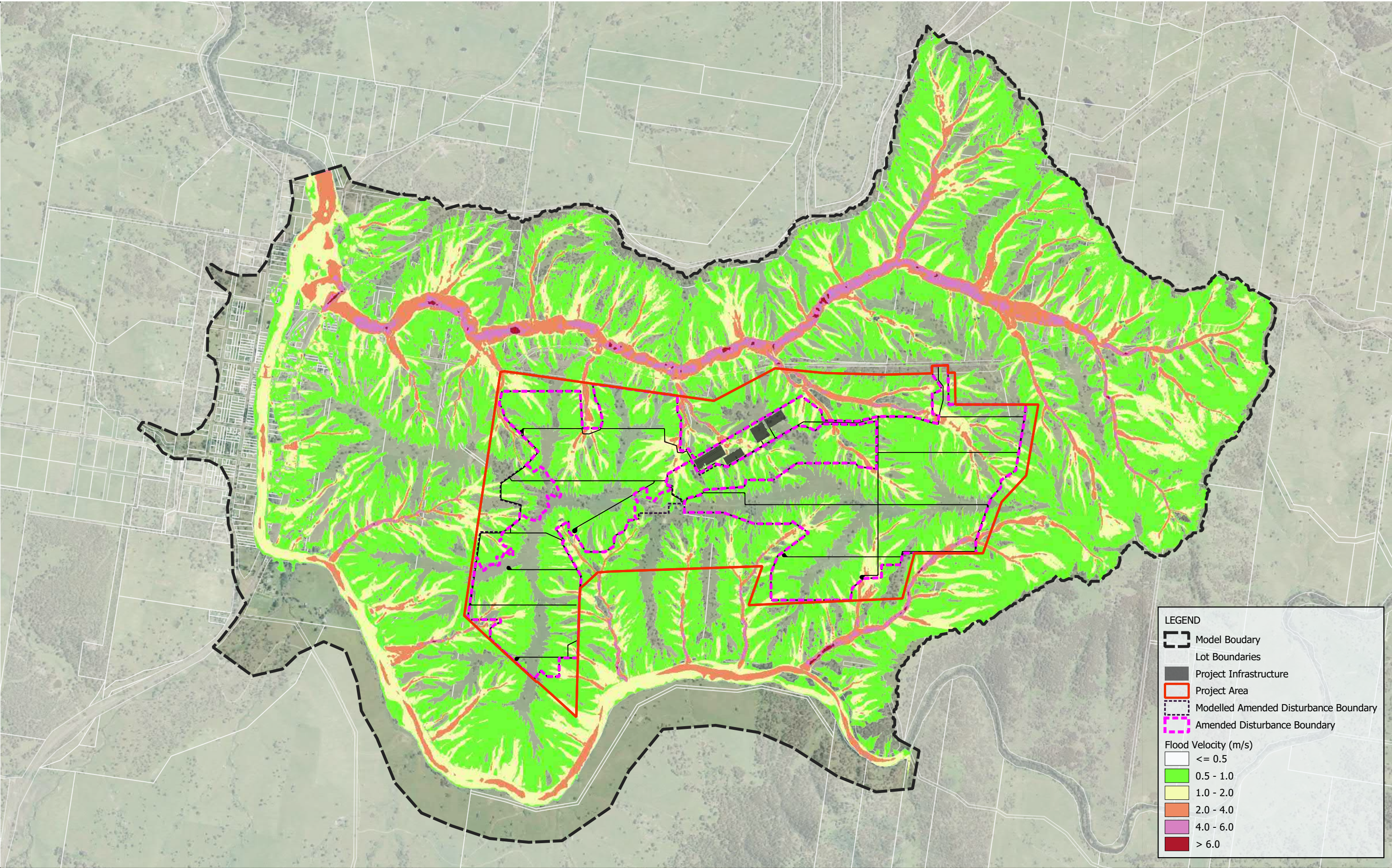
  
0 0.6 1.2 km  
SCALE - 1:25,000  
GDA94 / MGA zone 56

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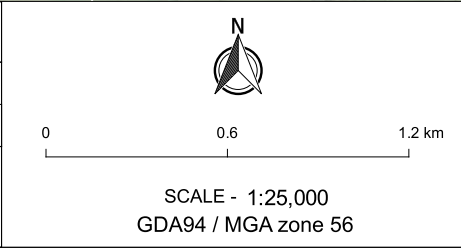
 

**Figure B.7.**  
Bendemeer Solar Farm  
Developed Conditions: Flood Depth - PMF  
Dwg Ref.





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|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |
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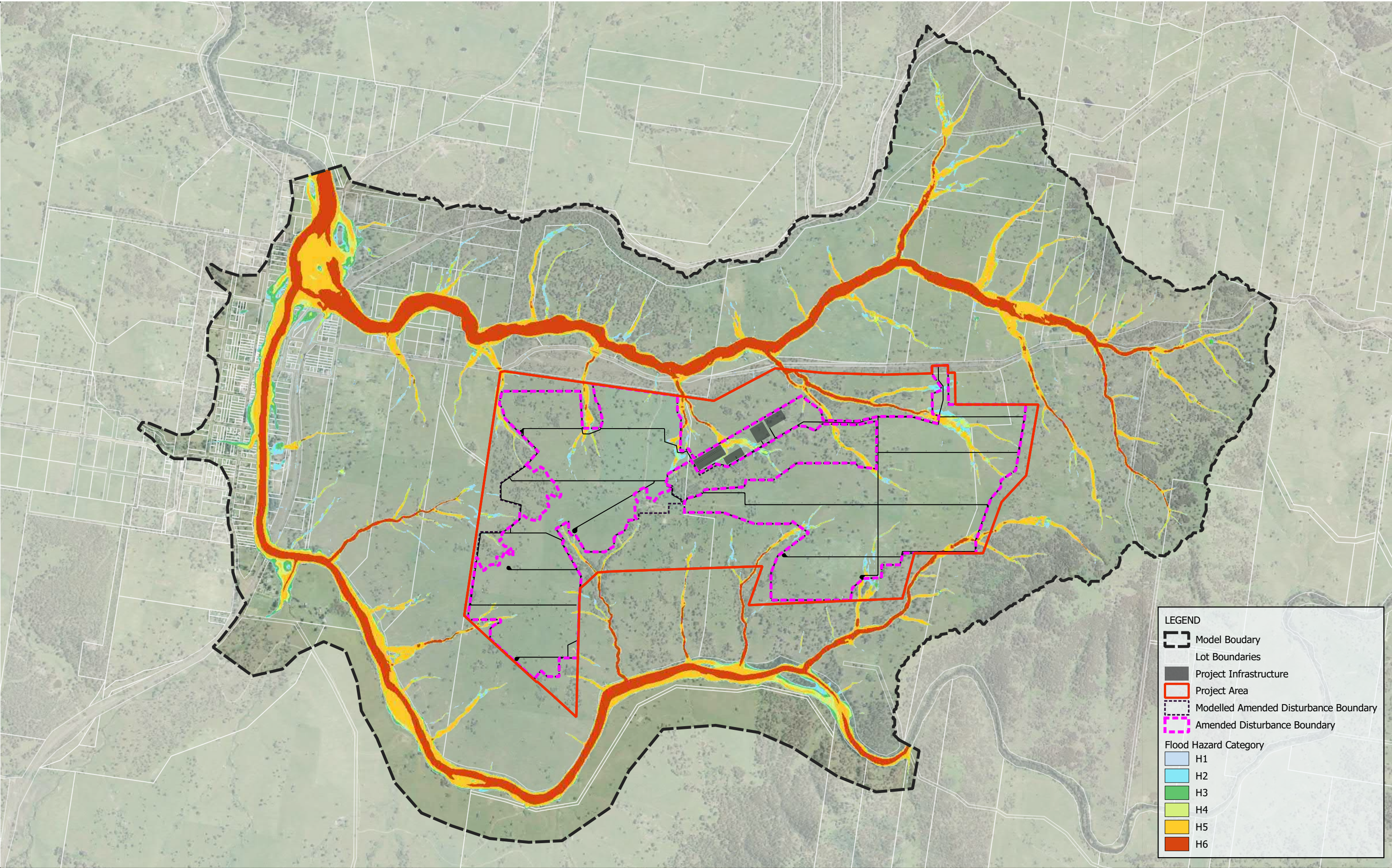


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**Figure B.8.**  
Bendemeer Solar Farm  
Developed Conditions: Flood Velocity - PMF





LEGEND

- Model Boudary
- Lot Boundaries
- Project Infrastructure
- Project Area
- Modelled Amended Disturbance Boundary
- Amended Disturbance Boundary

Flood Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

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| 0 | Final Issue | 01-04-2025 | DRAWN                                                                                                      | GC | CHECKED | LV         |
|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |
|   | NOTES:      |            |                                                                                                            |    |         |            |
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0 0.6 1.2 km

SCALE - 1:25,000  
GDA94 / MGA zone 56

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**Figure B.9.**  
Bendemeer Solar Farm  
Developed Conditions: Flood Hazard - PMF

Orig Ref.

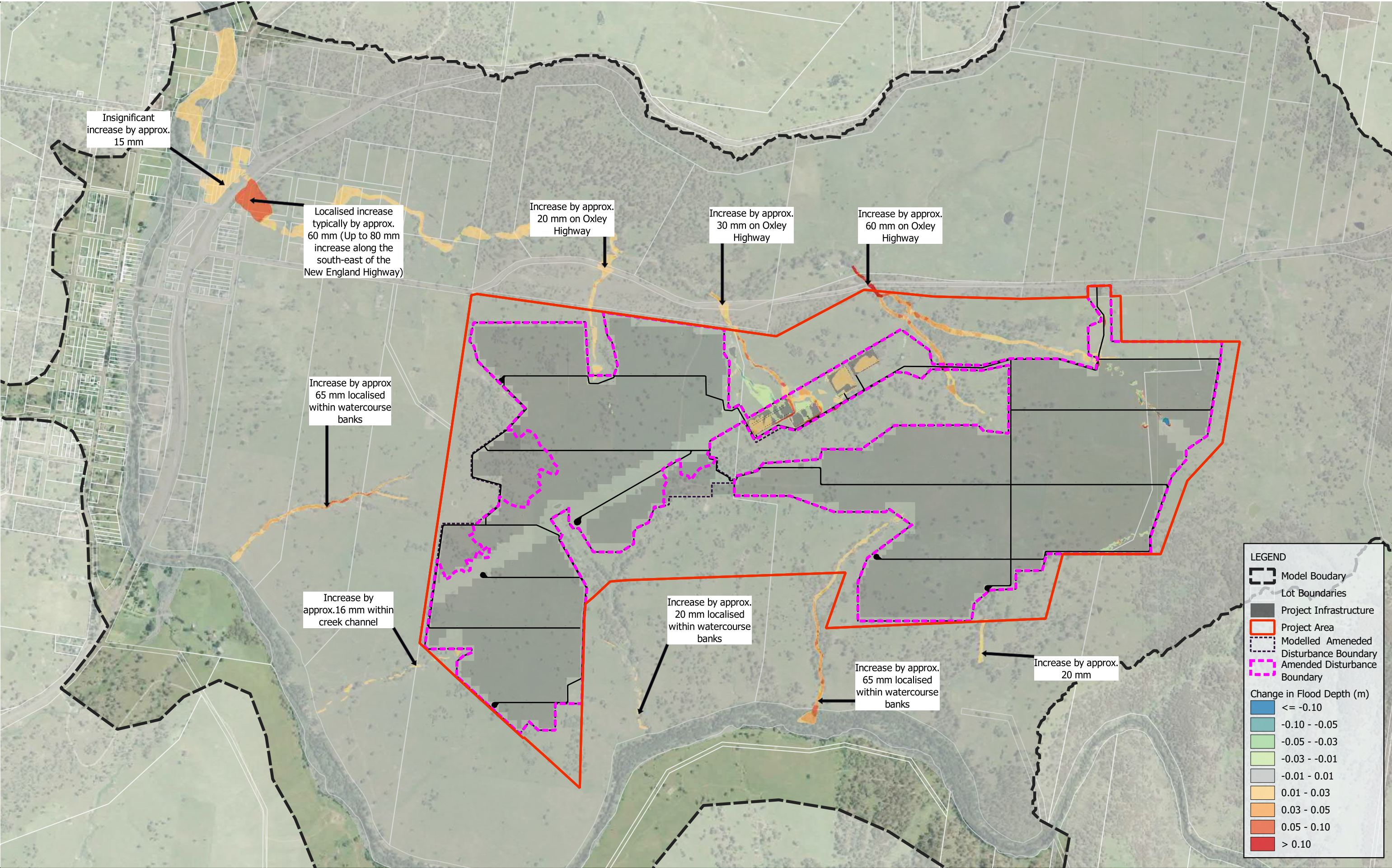


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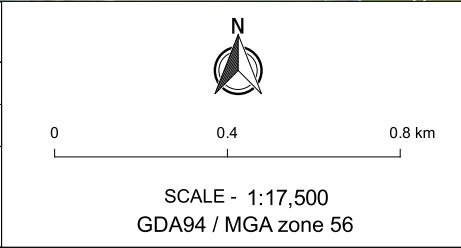
# APPENDIX C – DEVELOPED MINUS EXISTING







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|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |
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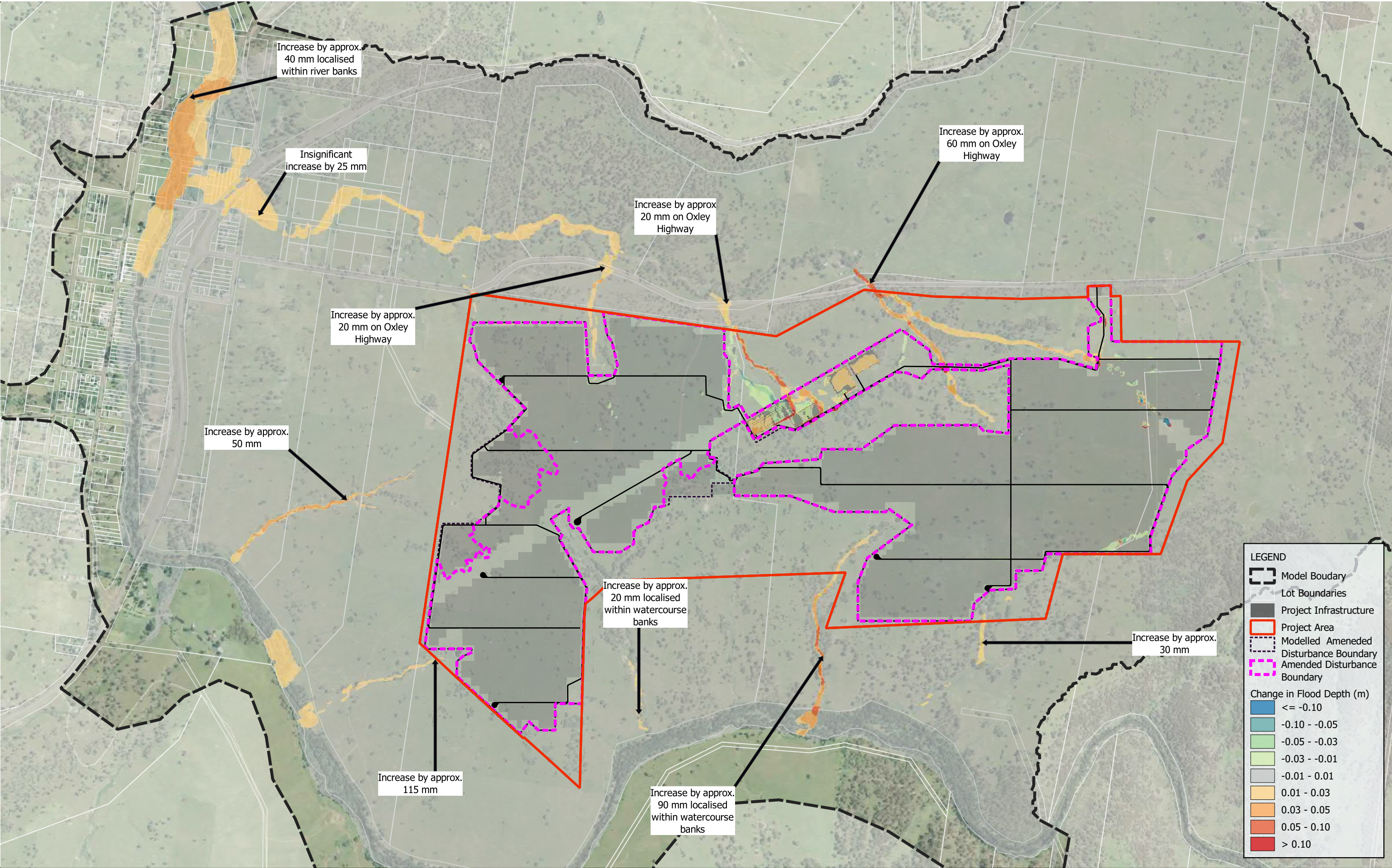


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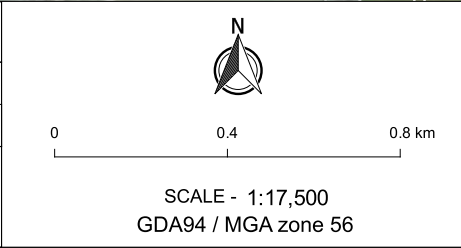


**Figure C.1.**  
Bendemeer Solar Farm  
Developed minus Existing: Flood Depth - 5% AEP  
Dwg Ref.





|   |             |            |                                                                                                            |    |         |            |
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| 0 | Final Issue | 01-04-2025 | DRAWN                                                                                                      | GC | CHECKED | LV         |
|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |
|   | NOTES:      |            |                                                                                                            |    |         |            |
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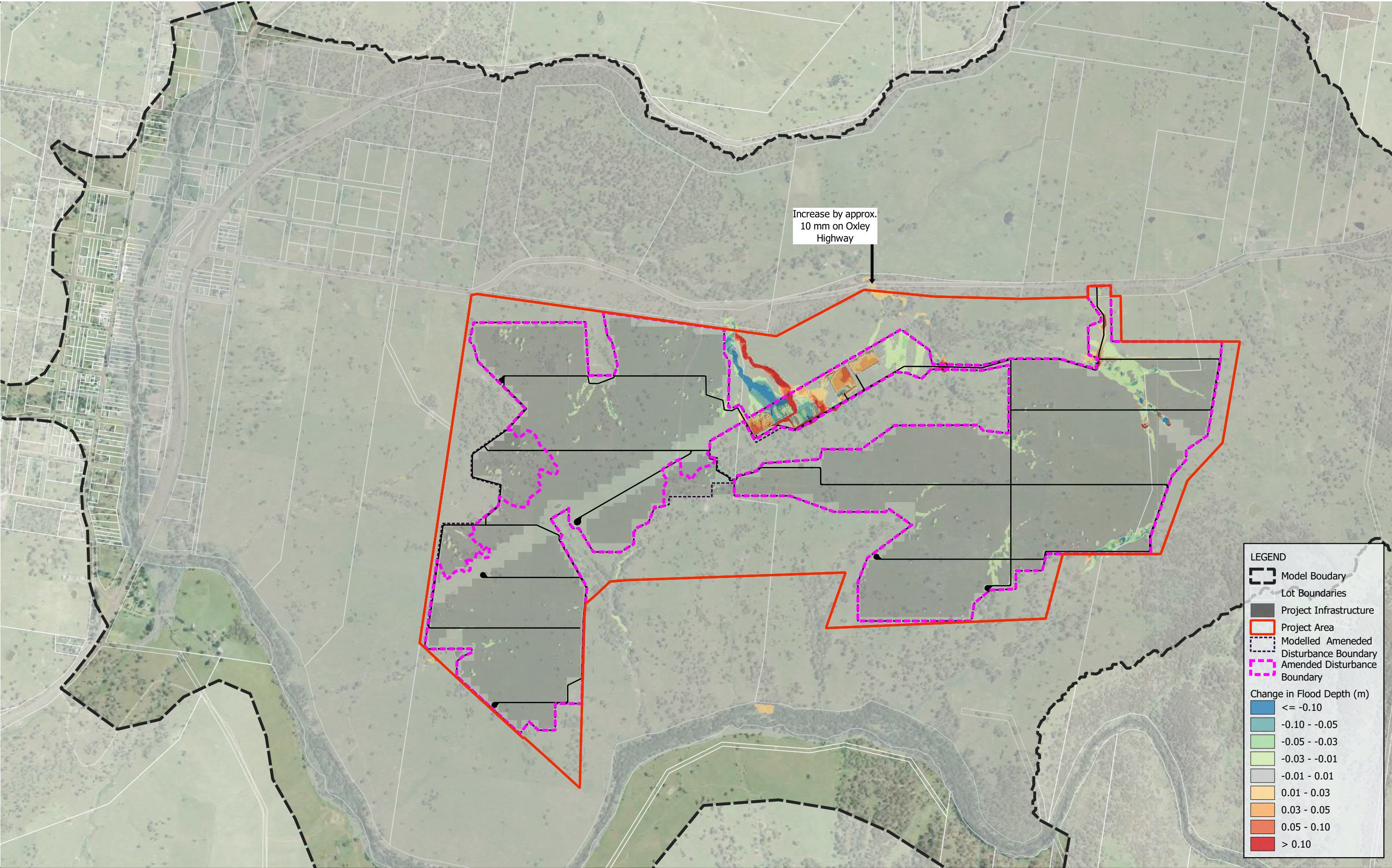


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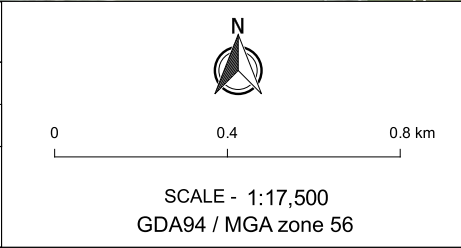
**Figure C.2.**  
Bendemeer Solar Farm  
Developed minus Existing: Flood Depth - 1% AEP  
Drp Ref.





| R | DETAILS     | DATE       |
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| 0 | Final Issue | 01-04-2025 |
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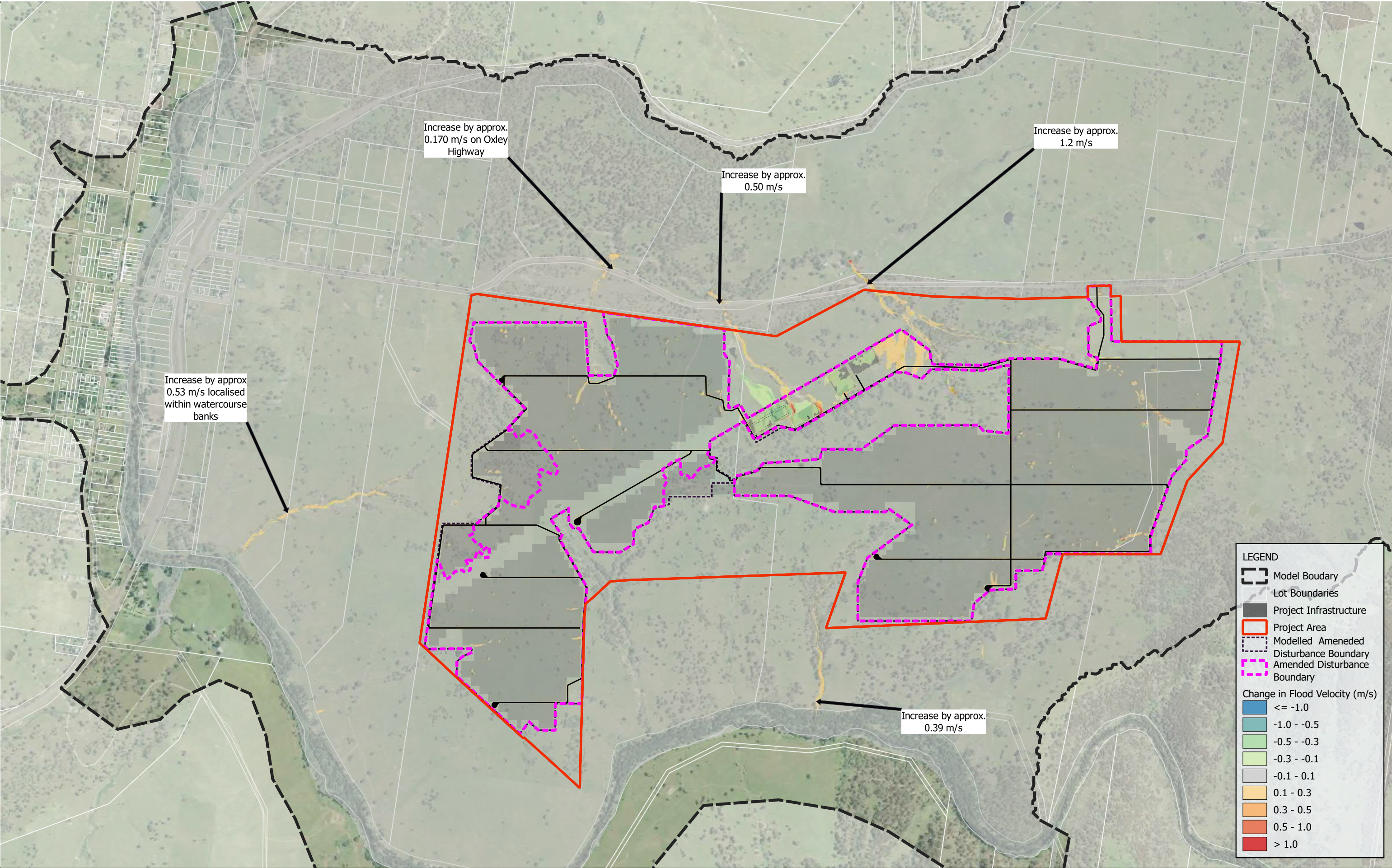
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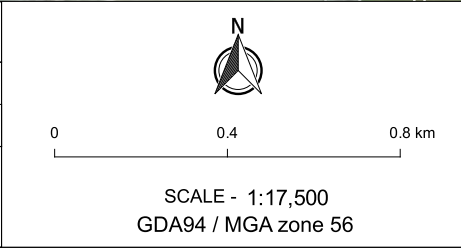
**Figure C.3.**  
Bendemeer Solar Farm  
Developed minus Existing: Flood Depth - PMF

Drp Ref.





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|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |
|   |             |            | NOTES:                                                                                                     |    |         |            |
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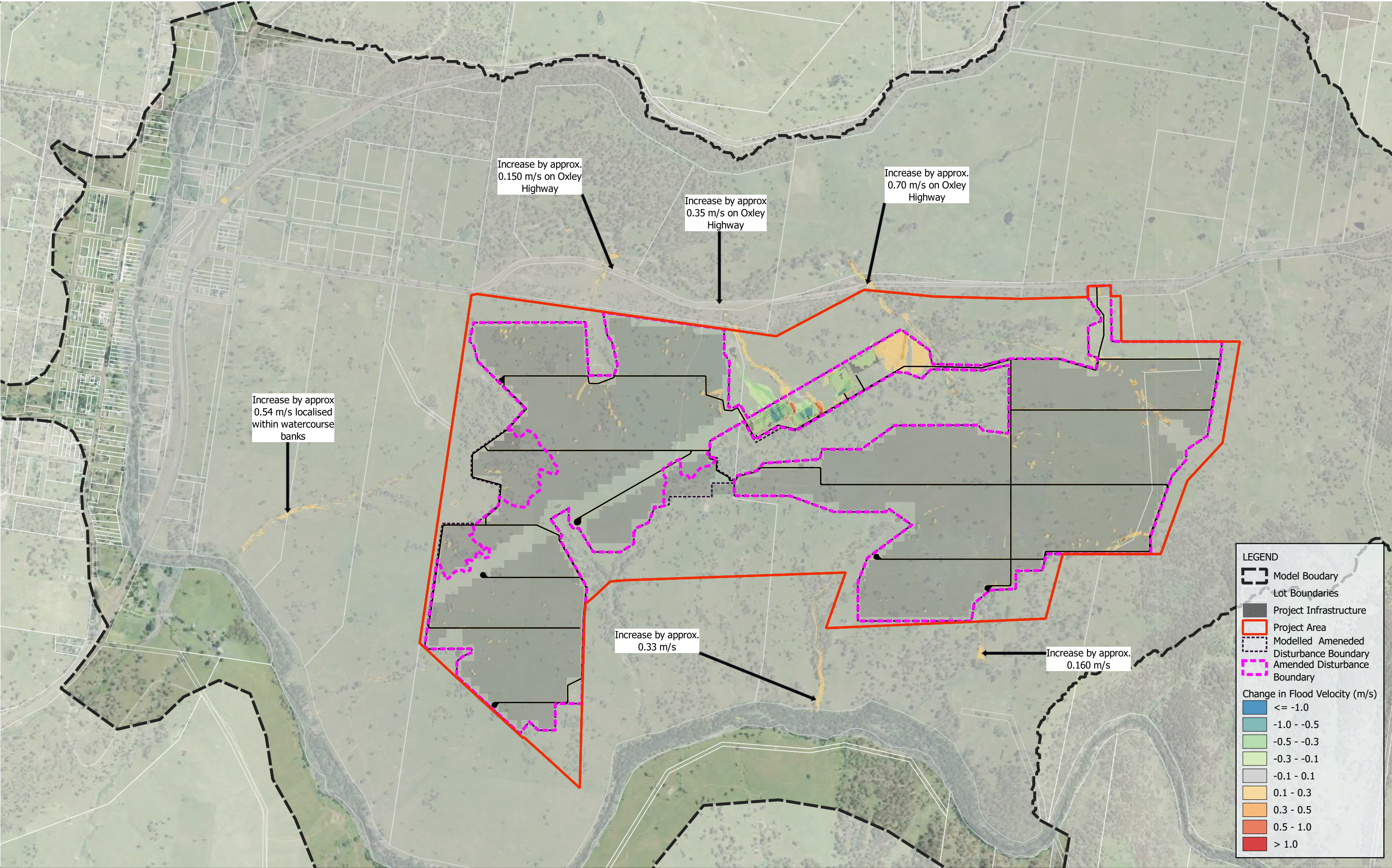


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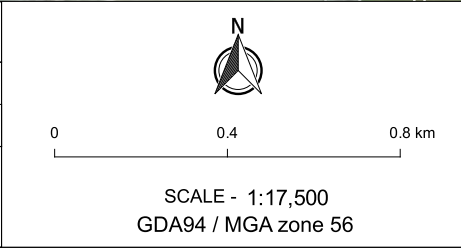


**Figure C.4.**  
Bendemeer Solar Farm  
Developed minus Existing: Flood Velocity - 5% AEP





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| 0 | Final Issue | 01-04-2025 | DRAWN                                                                                                      | GC | CHECKED | LV         |
|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |
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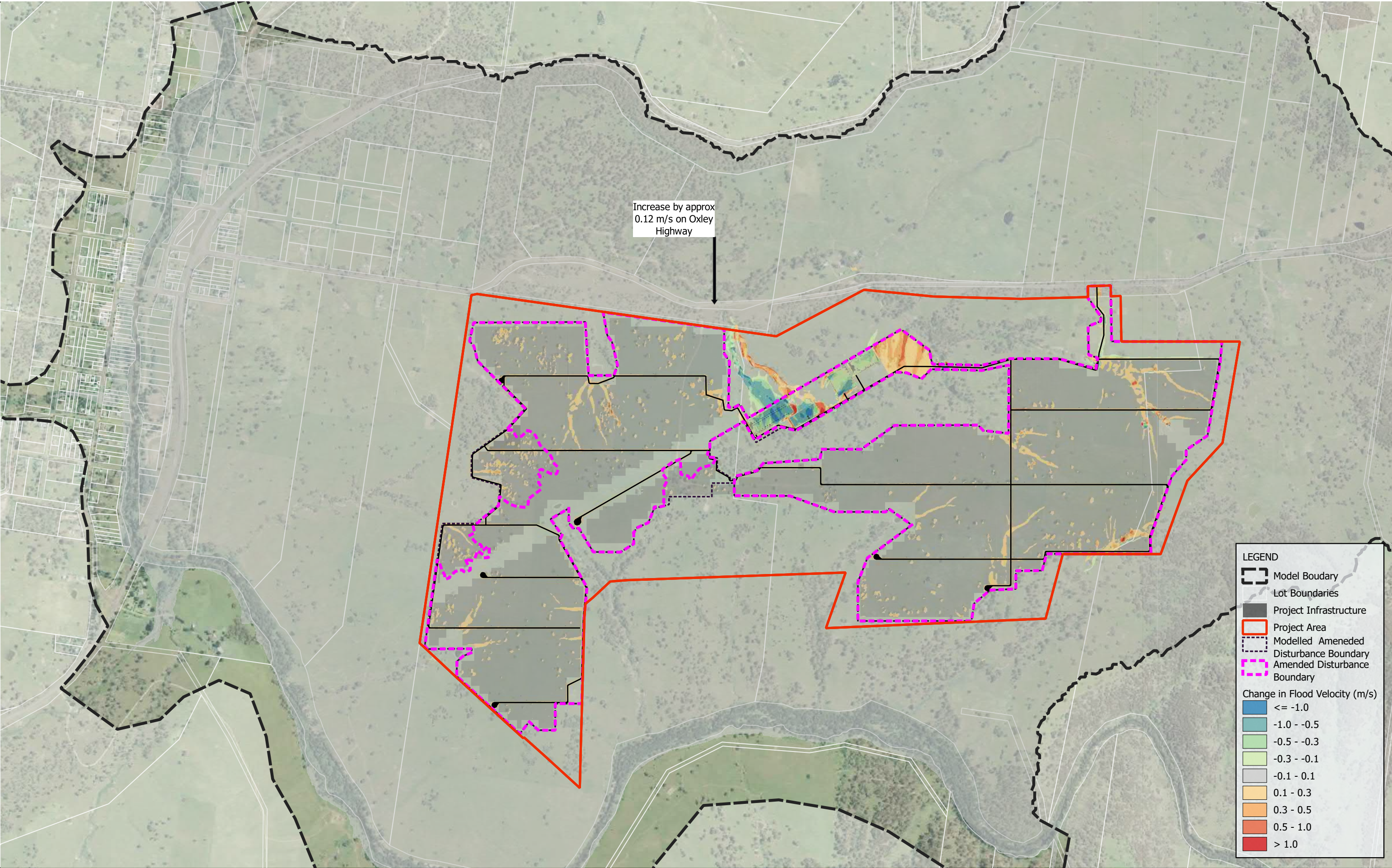
**Figure C.5.**

Bendemeer Solar Farm

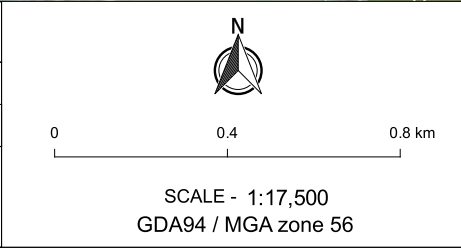
Developed minus Existing: Flood Velocity - 1% AEP

Drp Ref.





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|   |             |            | APPROVED                                                                                                   | CB | DATE    | 01-04-2025 |
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**Figure C.6.**  
Bendemeer Solar Farm  
Developed minus Existing: Flood Velocity - PMF



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## APPENDIX D – NORTHROP FIA





Refer to Flood Impact Assessment for Bendemeer Solar Farm (Reference: NL211066-00 / 5 July 2023 / Revision G), as presented as Appendix N - Hydrology Assessment to the EIS (SSD-36651552)