



Flood Impact Assessment

30-May-2025
Cobbora Solar Farm
Doc No. 60734058_RP_WR_002

Flood Impact Assessment

Client: Pacific Partnerships Pty Ltd

ABN: 85 601 328 741

Prepared by

AECOM Australia Pty Ltd

Turrbal and Jagera Country, Level 8, 540 Wickham Street, PO Box 1307, Fortitude Valley QLD 4006, Australia

T +61 1800 868 654 www.aecom.com

ABN 20 093 846 925

30-May-2025

Job No.: 60734058

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1.0 Introduction

Cobbora Solar Farm Pty Ltd, in its capacity as trustee for the Cobbora Solar Farm Trust (a wholly owned subsidiary of Pacific Partnerships Pty Ltd) is seeking development consent to construct, operate and decommission the Cobbora Solar Farm in the central west region of New South Wales (NSW).

The solar farm would be a large-scale solar photovoltaic (PV) generation facility with a battery energy storage system (BESS) and associated infrastructure for its management and connection to the national electricity market (NEM) (the Project). The Project would be located near Cobbora, approximately 20 kilometres (km) south-west of the township of Dunedoo and 55 km east of Dubbo in Central West NSW (the Project Area).

The previous proponent, Marble Energy Pty Ltd (Marble Energy), commissioned AECOM Australia Pty Ltd (AECOM) to undertake a flood impact assessment in 2022 (AECOM, 2022). AECOM issued an initial flood assessment to Marble Energy to estimate the extent of flooding across the Project Area resulting from 20%, 1% and 0.01% Annual Exceedance Probability (AEP) design storm events in the Sandy Creek and Laheys Creek catchment, and to analyse the impact on the local catchment flood response to the Project.

In 2024, Pacific Partnerships commissioned AECOM to revise the previous flood impact assessment based on the amended Project Area, which includes removing the southernmost portion, and project information since 2022. The southernmost portion was removed due to Energyco acquiring the land for the construction of the Elong Elong Energy Hub. Utilising the hydrological and hydraulic models from the flood assessment previously undertaken by AECOM in 2022, discussed in Section 2.0, AECOM updated the post-development condition to determine the updated impact on the local catchment for the 20%, 1% and 0.01% AEP design storm events.

This report summarises the methodology, key model inputs and updates, assumptions, assessment results, mitigation measurements and erosion and sediment control. Flood results for baseline, post-development and changes between post-development and baseline scenarios are provided in Appendix A.

1.1 Project Overview

The Project would connect to the Central West Orana (CWO) Renewable Energy Zone (REZ) grid infrastructure via up to four onsite grid substations, connecting to the Elong Elong Energy Hub.

Key features of the Project would include:

- Construction and operation of a 700 MW (AC) solar farm
- Installation of a 400 MW / 1600 MWh BESS
- Installation of up to three substations connecting the solar farm to the Elong Elong Energy Hub (four potential substation locations have been assessed in the Project EIS, which will be reduced during detailed design).
- Supporting facilities and infrastructure, including internal roads, upgrades to external access roads (if required), underground and overhead cabling, waterway crossings, staff office, meeting facilities, operations and control room, workshop, amenities, temporary accommodation, car parking, storage facilities, fencing, and landscaping.

1.2 Project Area

The Project Area is approximately 3,000 hectares in size and spans two local government areas (LGAs): Warrumbungle Shire Council and Dubbo Regional Council. Within these LGAs the Site also spans two suburbs: Elong Elong and Cobbora, though is predominantly located within the suburb of Cobbora. To the north the Project Area is bordered by the Golden Highway and to the east by Spring Ridge Road. The Project Area is zoned Primary Production (RU1) under both the *Dubbo Regional Local Environmental Plan 2022* (Dubbo Regional LEP) and the *Warrumbungle Local Environmental Plan 2013* (Warrumbungle LEP). There is also a small area that is not zoned under either of the LEPs.

Land within the Project Area is characterised by undulating mostly cleared land used primarily for sheep and cattle grazing or dry land cropping. The Project Area is largely clear of canopy vegetation, with some scattered trees and rows of trees along fence lines. Rural land surrounds the Project Area with residential premises located at varying distances.

A figure showing the Project Area location is presented on Figure 1-1.

1.3 Development footprint

The Development Footprint covers approximately 1,600 ha of land, which would be occupied by the solar farm and associated infrastructure (including access tracks and temporary construction support areas) within the Project Area. This area was identified through eliminating land which is subject to environmental constraints (for example, areas with native vegetation present, Aboriginal heritage sensitivities or areas subject to flooding).

1.4 Purpose of the Report

1.4.1 Assessment Objectives and Methodology

The primary objectives of the updated flood assessment are to assess the:

- Potential surface water impact arising from the Project.
- Potential extents of flooding at the Project Area.

The specific methodology adopted for the flood assessment was developed during the previous flood assessment (AECOM, 2022), hereafter referred to as the '2022 Assessment', according to the general principles described in Australian Rainfall and Runoff (2019), and includes the following key steps:

1. Development of rainfall estimates for the Annual Exceedance Probability (AEP) levels of 20%, 1% and 0.01%.
2. Development and parameterisation of a hydrological model to estimate the magnitude of flows and rainfall events occurring in response to the rainfall AEP events analysed.
3. Development of a two-dimensional (2D) hydraulic model for a model extent containing the Cobbora Solar Farm Project Area.
4. Analysis of the baseline flooding condition, based on the understood and assumed current conditions of the Project area (herein referred to as the baseline model).
5. Iteration and reanalysis of the baseline hydraulic model to represent the proposed Project elements (herein referred to as the post-development model).
6. Compare and interrogate the differences between the baseline and development models to estimate the potential impact of the Project upon local waterways and drainage paths.

As part of the 2022 Assessment, all the key steps have been undertaken and outcomes discussed in the flood assessment report. Based on the latest project updates i.e. improved LiDAR data, revised project boundary, latest site footprint including solar array envelope, construction laydown areas, internal roads, creek crossings, BESS and substation locations, etc. this assessment reassessed the baseline flooding condition as per Step 4 above, incorporated the latest project updates into the hydraulic model generated in the 2022 Assessment and reassessed the flood impacts, Step 5, and compared the difference between the baseline and post-development model, Step 6.

The assessment focuses on the analysis of the flooding resulting from rainfall and runoff generated over the Project Area and upstream catchments. The Talbragar River, located downstream of the Project Area and Golden Highway (to the north), may have the potential to impact the northern extent of the Project Area in severe flood conditions. This aspect of flooding has not been assessed as it was not part of the project scope.

1.4.2 Report Structure

This report is structured as follows:

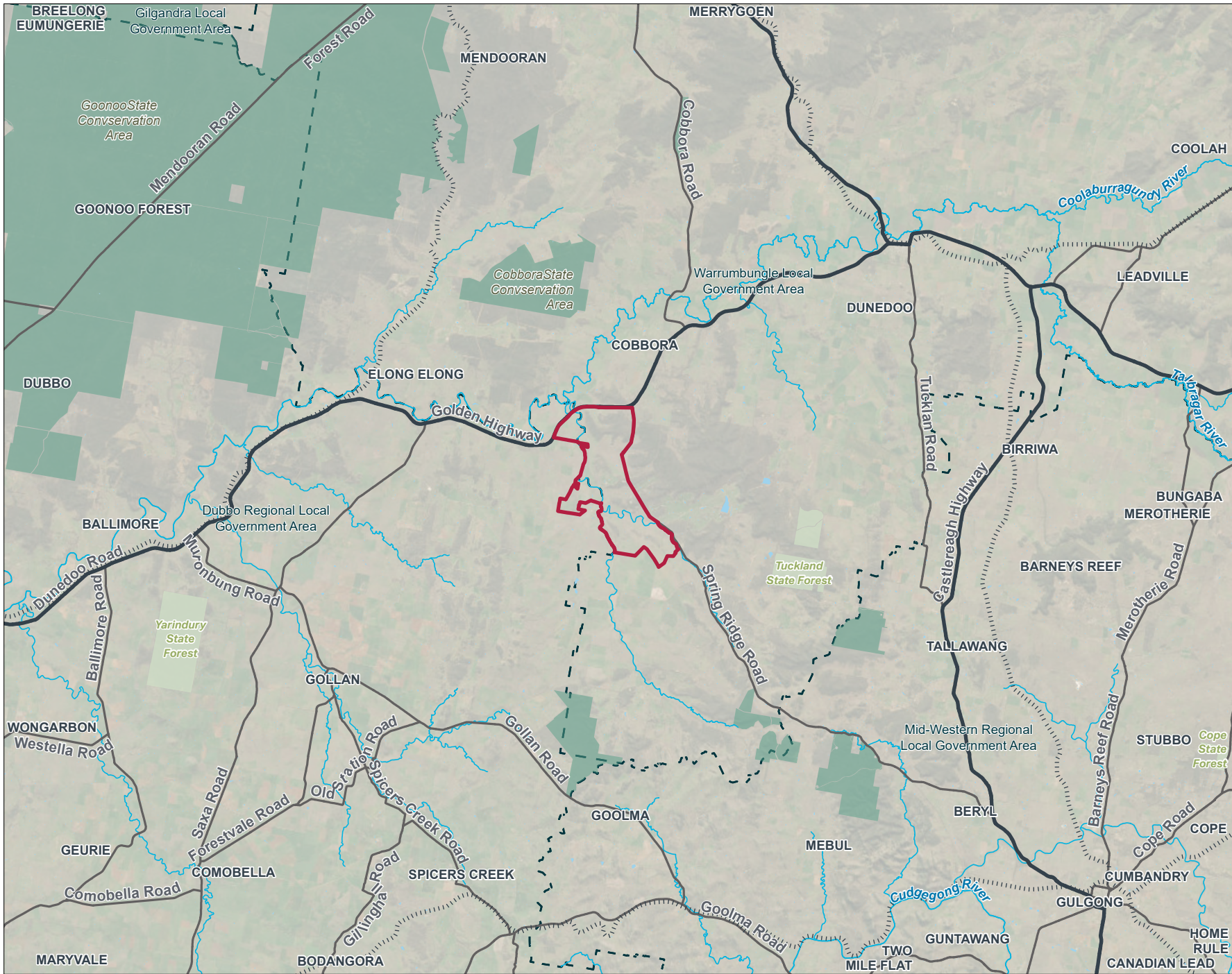
- Section 1.0 describes the project overview, site description, project area, purpose and structure of the report.
- The summarised hydrological setting, hydrological model development, hydraulic model development and results from the previous (2022) flood assessment are outlined in Section 2.0.
- Section 3.0 outlines the updates to the existing hydraulic model based on the latest provided information.
- The outcomes of the hydrological and hydraulic model process and impacts on the project are presented in Section 4.0.
- Section 5.0 provides an overview of erosion and sediment control processes, risks and high-level mitigation measures.
- The potential impact of the project, current assessment gaps, and recommendations are summarised in Section 7.0.
- Section 8.0 lists the consulted references.

1.5 Secretary's Environmental Assessment Requirements

SEARs for the Project were issued on 11 November 2021, with the latest update issued on 07 November 2024. The SEARs presented in Table 1-1 have informed the preparation of this Flood Impact Assessment.

Table 1-1 SEARs – Flood risk

Relevant SEARs	
Flood risk	Where addressed
• An assessment of the likely impacts of the development (including flooding and flood modelling, if required) on surface water and groundwater resources (including Sandy Creek and Laheys Creek traversing the site and surrounding watercourses, drainage channels, wetlands, riparian land, farm dams, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts having regard to the Solar Guideline;	Refer Section 4.0 and Appendix A
• Assessing the impacts of the development, including any changes to flood risk and overland flows on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required	Refer Section 4.0 and Appendix A
• A description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (Landcom 2004) and Managing Urban Stormwater: Soils and construction - Volume 2A manual (Landcom, 2008).	Refer Section 5.0



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Legend

- Project Area
- Local government area
- State forest
- National parks and reserves
- Waterbody
- Watercourses
- Motorway
- Main road
- Railway



FIGURE 1-1: LOCALITY MAP AND REGIONAL CONTEXT

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2.0 Previous (2022) Flood Assessment

The 2022 flood assessment report assessed the previous Project Area, prior to removal of the southernmost portion.

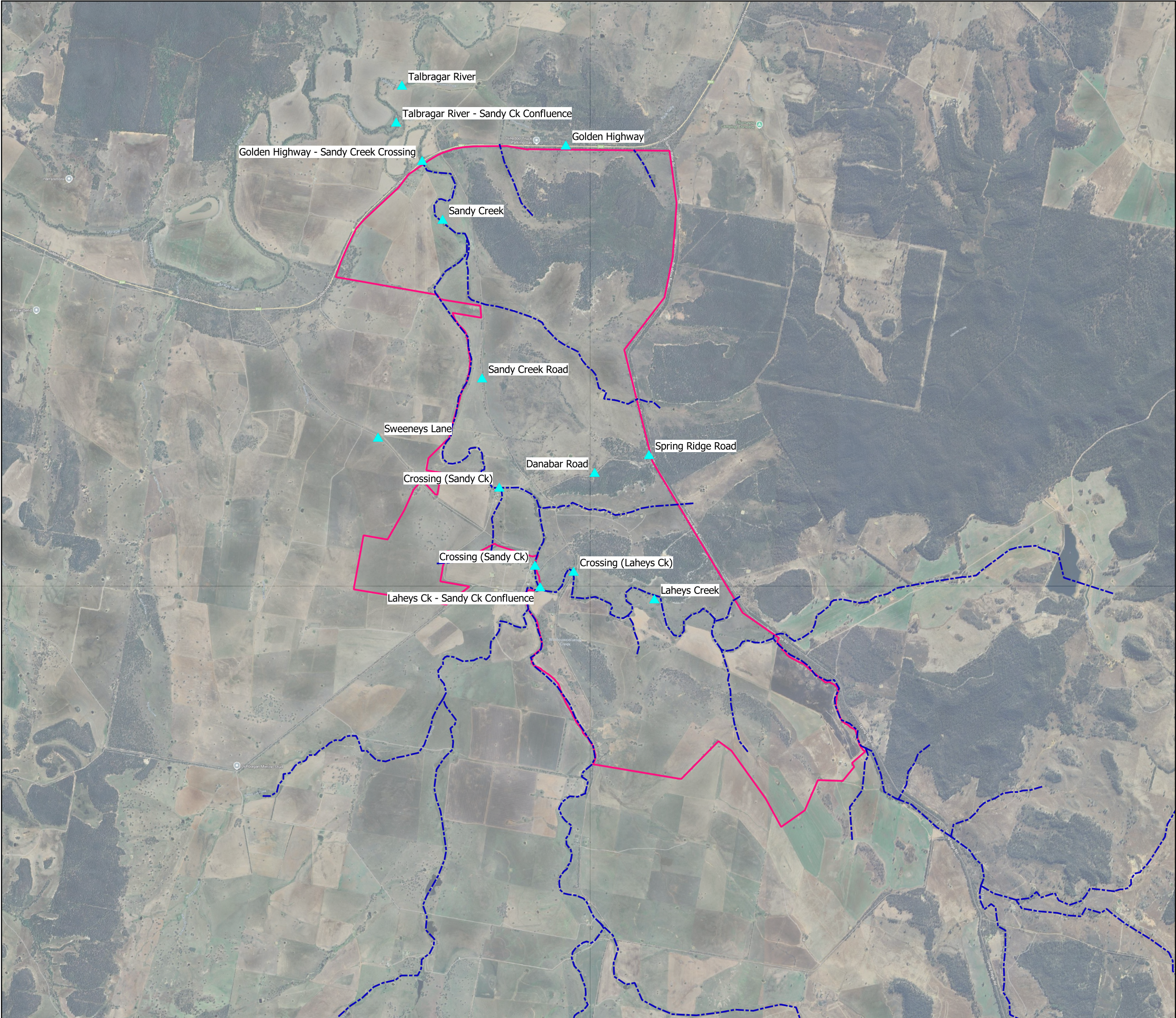
2.1 Hydrological Setting

Key existing features of the surface water environment in and around the Project Area that are relevant to the flooding assessment are listed in Table 2-1 and shown on Figure 2-1.

Table 2-1 Key Features

Name	Description
Talbragar River	Perennial stream which flows along the northern limit of the Project Area. The Talbragar River comprises the immediate receiving environment beyond the Project Area. The river is located north of the Golden Highway and features a significant adjacent floodplain.
Sandy Creek	Sandy Creek is an ephemeral stream which flows northwards through the Project Area. The creek is variably wide (20 m-50 m). The profile of the creek is generally meandering within an adjacent flood plain of significant width. The gradient of Sandy Creek within the Project Area is approximately 0.33%. In the Project Area the creek is generally lined by a thin stand of adjacent trees and vegetation. Sandy Creek is traversed by several road features, including: • Golden Highway bridge crossing • Minor road crossing (accessed by Sandy Creek Road) • Sweeneys Lane. Sandy Creek terminates at the confluence point with Talbragar River, north of the Golden Highway.
Laheys Creek	Laheys Creek is an ephemeral stream, which flows generally north and west, terminating where it joins with Sandy Creek within the Project Area. The profile of Laheys Creek is generally 5-25 m wide. Similar to Sandy Creek, the path of the creek is generally meandering, and is lined by a thin stand of trees. The gradient of Laheys Creek is generally low (approximately 0.25%).
Golden Highway	Located at the northern extent of the Project Area, the Golden Highway comprises a primary access route.
Sandy Creek Road	Sandy Creek Road runs generally parallel to Sandy Creek on the eastern side and is an unpaved road that transits the Project Area.
Spring Ridge Road	Spring Ridge Road is a paved road lined by vegetation (trees), which generally runs along the eastern border of the Project Area.

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DATUM GDA 1994, PROJECTION MGA ZONE 55
0 1 2 3 km

1:50,000 (when printed at A3)

LEGEND

- Points of Interest
- Project Area Boundary
- Delineated Streampaths

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Cobbora Solar Project
Site Features

PROJECT ID	60680887
CREATED BY	else
LAST MODIFIED	2025-03-05T12:54:15.439
VERSION	A

2.1.1 Terrain and Imagery

To inform the Baseline Flood Modelling Assessment scope of work, publicly available terrain data was sourced from the ELVIS Topographic Program (Geoscience Australia, accessed 2022). Two datasets were obtained:

- COBBORA, 2 km x 2 km, 1 metre Resolution Digital Elevation Model Metadata (December, 2015)
- COBBORA, 2 km x 2 km, 5 metre resolution Digital Elevation Model Metadata (August, 2012)

For the 2022 Assessment, the 1 m resolution data (2015) was utilised where coverage was available, only covering approx. 40% of the Project Area. In all other locations where 1 m coverage wasn't available, the 5 m data (2012) was adopted.

2.1.2 Land Use

Land use within the catchment generally comprises:

- Agricultural pasture

The primary land use within the catchment is agriculture, with pasture generally evident throughout the catchment. The catchment, particularly upstream of the Project Area, features numerous farm dams, which are constructed in-line in drainage paths, or hydraulically downstream of overland flow areas, capturing runoff from localised areas.

- Ephemeral creeks

Waterways generally comprise ephemeral creeks and associated tributaries. Limited widths of creek vegetation remain in association with creek waterways. These creeks are generally meandering within a wider floodplain and show some evidence of erosion in drainage paths (based on available imagery). Waterways are generally free of major obstructions, except for the rural roads that traverse the profile.

- Some areas of dense vegetation are present within the Project Area, however these are generally located away from the creek and tributary systems.

Overall, the land use is considered reasonably typical of the central New South Wales Region.

2.1.3 Hydrological Characteristics

Based upon the available data, the hydrology of the Project Area is characterised as follows:

- Upper Catchment and Hillsides

The upper slopes of the wider catchment are expected to exhibit overland (sheet) flow progressing to concentrated flow within gullies in response to rainfall events. Some attenuation of flow is expected to occur within numerous farm dams located within the Project Area. Gullies are intermittently disrupted by road crossings (particularly Spring Ridge Road) with ponding upstream of these locations expected during rainfall events.

- Sandy Creek and Laheys Creek

These creek systems exhibit concentrated flows, with inundation of adjacent floodplains occurring in response to rarer rainfall events. A significant amount of floodplain storage is associated with these creek systems, with attenuation of flows occurring in the floodplain storage within the Project Area.

- Golden Highway and Sandy Creek Crossing

This crossing forms a constriction resulting in water ponding to the south in response to significant rainfall events. Overtopping of the Golden Highway is not generally expected, except during very rare rainfall events, when the floodplain storage associated with Laheys Creek and Sandy Creek is overwhelmed.

2.1.4 Rainfall

The adopted rainfall estimates are depicted in Figure 2-2 and were developed as follows:

- Intensity-frequency-duration (IFD) data were obtained from the Bureau of Meteorology's IFD program (2016), for common to rare event probabilities
- The Probable Maximum Precipitation (PMP) event, which is an extreme rainfall event, was estimated utilising the:
 - Generalised Short Duration Method (BOM, 2003) for short duration events
 - Generalised Tropical Storm Method Revised (BOM, 2004) for long duration events.
- Rainfall estimates were interpolated between the BOM and PMP estimates at the 0.01% AEP level, using the Siriwardena and Weinmann method (Refer Australian Rainfall and Runoff, 2019).

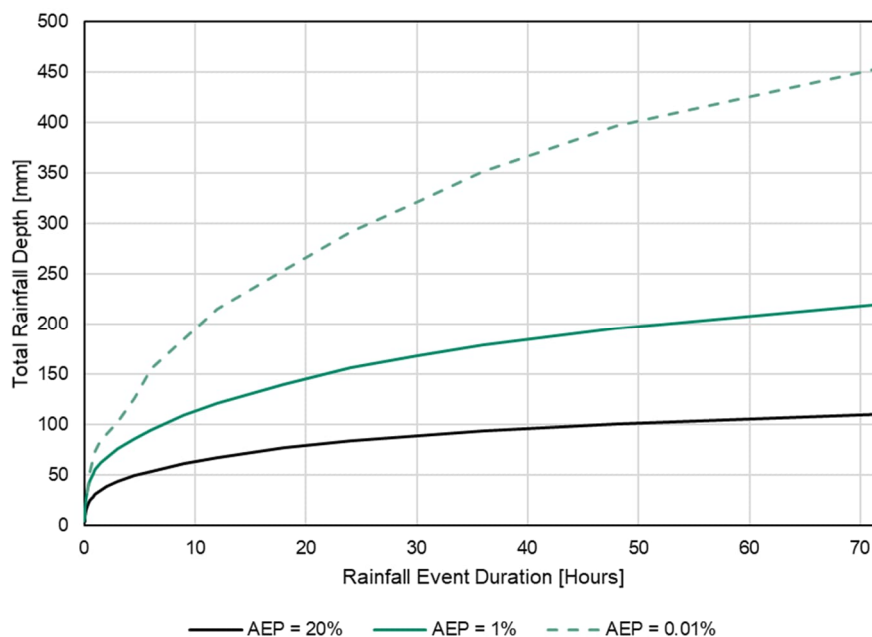


Figure 2-2 Total rainfall estimates

Temporal patterns were obtained from the Australian Rainfall & Runoff Online Data Hub. Ten patterns were available for each rainfall AEP and duration. The hydrological response to the rainfall events was analysed using an approach known as temporal pattern ensembling, whereby all 10 temporal patterns are analysed. A representative temporal pattern, which was modelled to create median flows in the Project Area, was adopted for further analysis.

Areal reduction factors (ARFs), for the 20% and 1% rainfall events, were developed in accordance with the Australian Rainfall & Runoff (2019) Podgers et al Method for the Central NSW region. PMP estimates developed included areal reduction as outlined in the GSDM Guideline (BOM, 2003) and the GTSMR Guideline (BOM, 2004). Estimates for the 0.01% rainfall event, which were interpolated between the BOM IFD and PMP estimates, therefore implicitly include areal reduction.

2.2 Hydrological Model Development

A hydrological model was developed using the RORB routing program.

2.2.1 Catchment Delineation

Delineation of the hydrological areas that report flows via the Project Area was completed, utilising the following data:

- 1 m, and 5 m terrain data sets (refer Section 2.1.1)

- Australian Hydraulic Geo-Fabric (AHGF) layers, depicting mapped and unmapped waterways (Geoscience Australia, accessed 2022).

The delineated hydrological scheme, featuring sub-catchments and stream-paths for the Project Area and upstream catchments, is shown in Figure 2-3.

2.2.2 Model Parameters

Key hydrological parameters were adopted in accordance with Australian Rainfall and Runoff (2019) Online Data Hub, considering the NSW specific approach. The NSW specific approach specifies an initial and continuing loss approach depending on the availability of calibration data for the study, and regional Flood Frequency Analysis (FFA) data available. For the purposes of this assessment, the hydrological model is considered 'uncalibrated', and relevant FFA data proximate to the site location are not available, therefore 'Approach 5' was adopted with the key parameters summarised in Table 2-2.

Table 2-2 RORB Parameters

Parameter	Units	Value / Approach
Initial Loss (IL)	mm	Varies, adopted according to the NSW approach for initial losses, hierarchy 5 – neutral probability storm burst initial loss adopted.
Continuing Loss (CL)	mm/hr	0.6 mm/hr Adopted according to the NSW approach
Linearity 'm' Exponent	n/a	0.8 – default RORB value
Storage Parameter (k _c)	n/a	Storage parameters were varied between the default RORB value, and the Eastern NSW equation.
Areal Reduction Factor (ARF)	n/a	Adopted according to Australian Rainfall and Runoff.

2.2.3 Rainfall Events

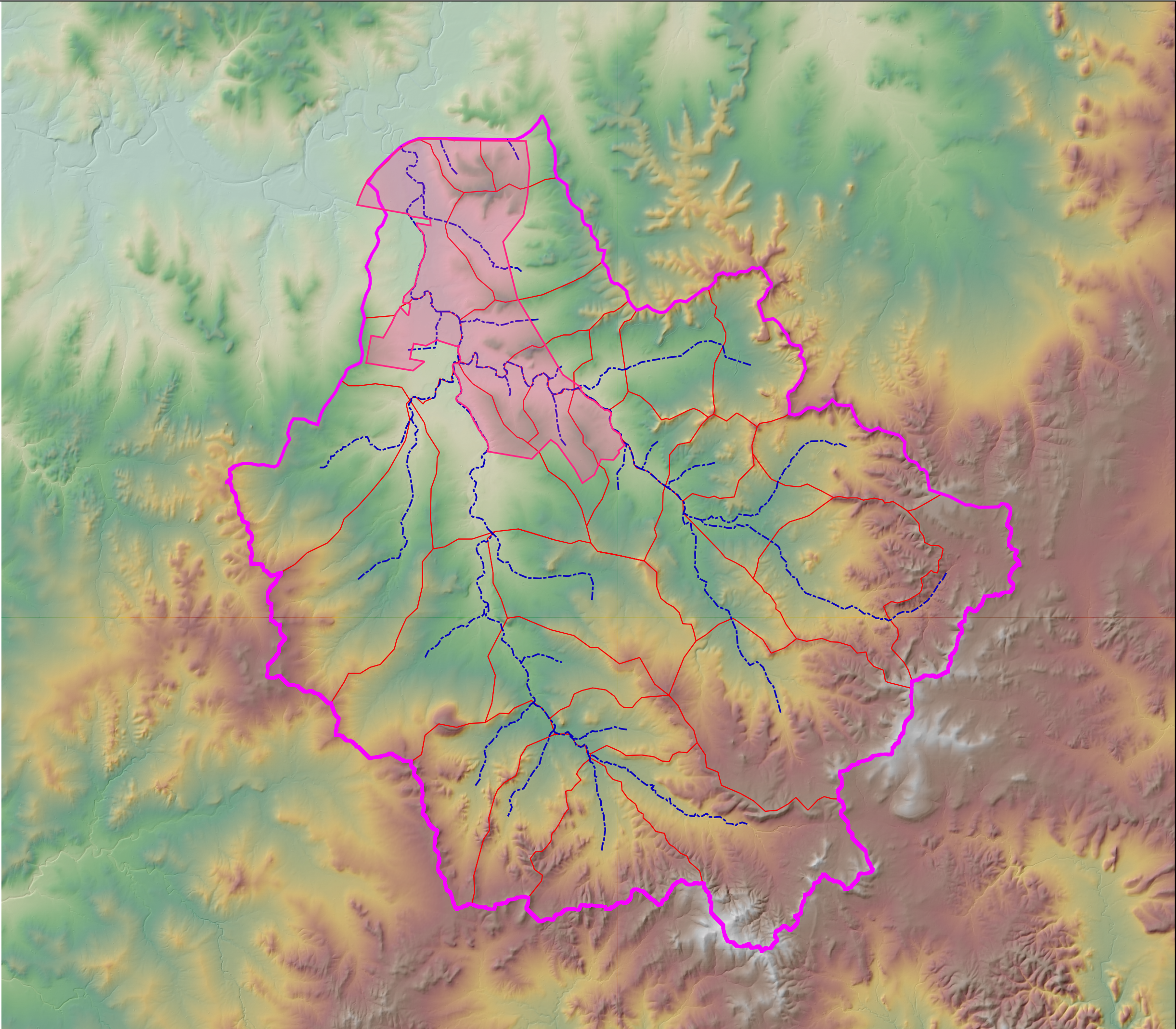
A total of 540 rainfall events were analysed within the hydrological model, considering the following input parameters:

- AEP 20%, 1% and 0.01%
- Durations 3, 6, 12, 18, 24 and 36-hour rainfall events
- Temporal Patterns Ten patterns per AEP and duration
- Storage Parameters (k_c) Default RORB Parameter, Eastern NSW Parameter and Average of Default RORB and Eastern NSW Parameter

2.2.4 Results

The hydrological model outcomes were reviewed and analysed, with the greatest peak discharge rate generally reflecting a rainfall duration between 6 hours and 18 hours. It was decided to analyse several rainfall event durations (6 hours, 12 hours and 18 hours) within the hydraulic model to ensure the peak water level condition across the Project Area was captured.

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DATUM GDA 1994, PROJECTION MGA ZONE 55

0 1 2 3 4 5 6 km

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LEGEND

-  Project Area Boundary
-  Delineated Streampaths
-  Total Catchment Area
-  Hydrological Sub-Catchments

Terrain Elevation (m)

-  640
-  340

Cobbara Solar Project
Catchment Delineation and
Streampaths

PROJECT ID	60734058
CREATED BY	else
LAST MODIFIED	2025-02-21T14:52:33.035
VERSION	A

2.3 Hydraulic Model Development

To model the surface water response of the Project Area to the modelled hydrological inflows, a hydraulic model was developed during the 2022 Assessment using the TUFLOW software package. Primary model parameters are listed in Table 2-3.

Table 2-3 TUFLOW parameters

Aspect	Value
TUFLOW Version	2020-10-AD
Solver	2D HPC / GPU approach
Grid Size	10 m grid with sub-grid-sampling (SGS) enabled to capture sub-10 m detail available within the available terrain.

The hydrological events selected for analysis in the hydraulic model are listed in Table 2-4.

Table 2-4 Hydraulic model - analysed scenarios

Scenario	Rainfall event (AEP)	Duration (Hrs)
A1	20%	6
A2		12
A3		18
B1	1%	6
B2		12
B3		18
C1	0.01%	6
C2		12
C3		18
S1 Increased Rainfall Sensitivity (+10%)	1%	12
S2 Decreased Rainfall Sensitivity (-10%)	1%,	12
S3 Modified Tail-water condition.	1%	12

Sensitivity analyses were developed considering:

- Uncertainty in the hydrological flow rates due to the uncalibrated development of the hydrological model
- Uncertainty in the hydrological flow rates due to the potential of climate change impacts upon rainfall intensity
- The potential of the downstream boundary condition (Talbragar River) to impact the flow rates of water exiting the Sandy Creek domain.

2.3.1 Domain

The TUFLOW hydraulic domain was developed to provide suitable resolution over the Project Area, and to be compatible with the developed hydrological model. The model domain is shown in Figure 2-4.

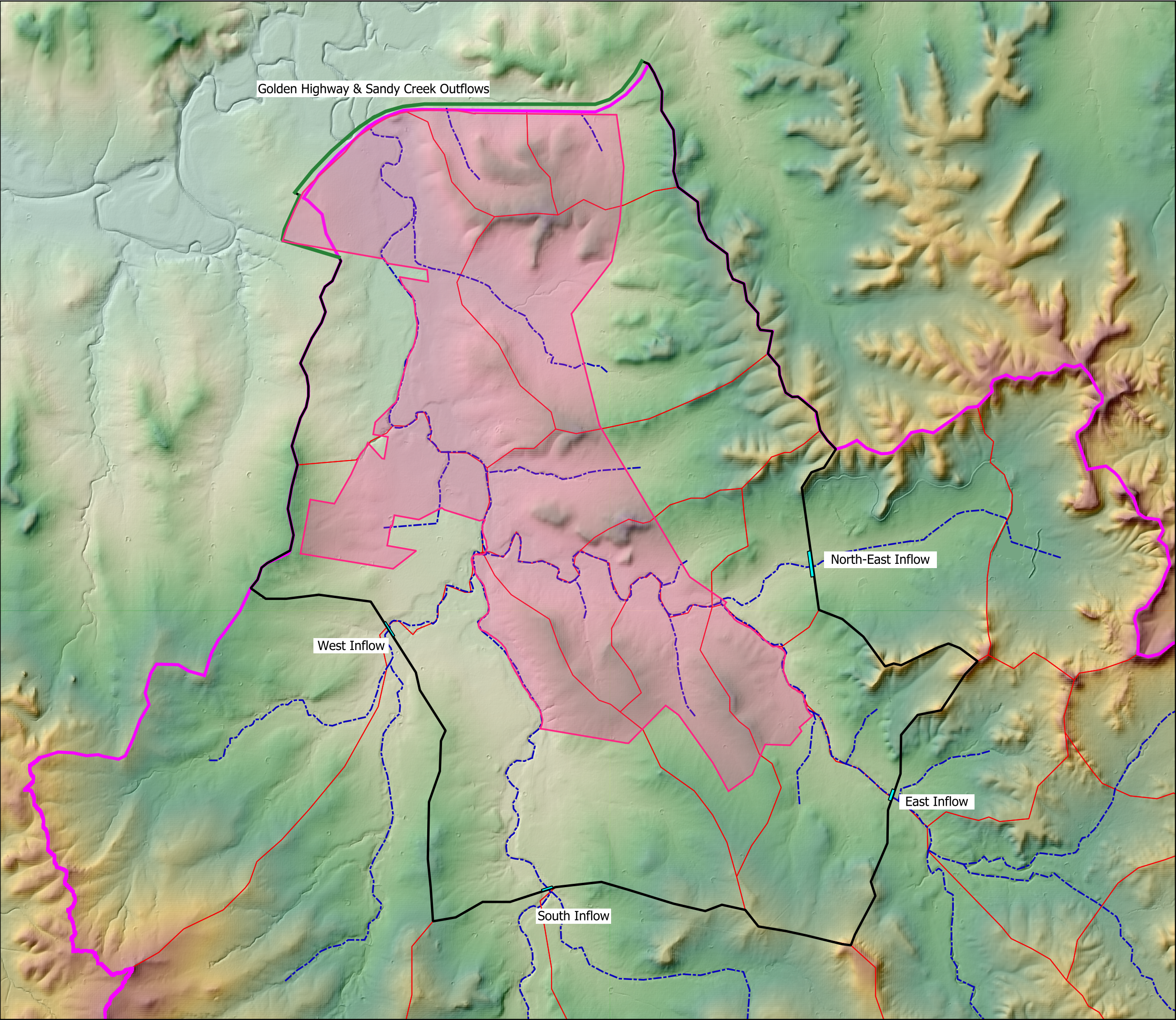
2.3.2 Boundary conditions

Boundary conditions define inflow and outflow locations within the hydraulic model domain. Inflow and outflow boundary conditions were parameterised within the hydraulic model extent (refer Figure 2-4) listed in Table 2-5.

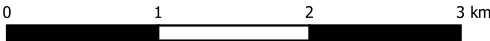
Table 2-5 Boundary Conditions

Name	Type	Boundary condition
West	Inflow	Concentrated inflow from tributary or creek, modelled as a 2d Source Area input.
South	Inflow	
East	Inflow	
North-east	Inflow	
Direct rainfall (Pervious)	Direct Rainfall	Utilised across the hydraulic model domain to input rainfall, considering the available initial and continuing loss approach described in Section 2.2.2
Direct rainfall (Impervious)	Direct Rainfall	Utilised across the hydraulic model domain to input rainfall, for impervious surfaces. No rainfall losses considered.
Sandy Creek North of Golden Highway	Outflow	Applied as a normal flow outflow boundary, utilising a hydraulic gradient of 1%. this boundary condition removes water from the hydraulic domain immediately north of the Golden Highway – Sandy Creek bridge crossing.
Terrain North of Golden Highway	Outflow	Applied as a normal flow outflow boundary, utilising a hydraulic gradient of 5%. This boundary removes water that overtops the Golden Highway, away from the Sandy Creek crossing.

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DATUM GDA 1994, PROJECTION MGA ZONE 55



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LEGEND

- Project Area Boundary
- Delineated Streampaths
- Total Catchment Area
- Hydrological Sub-Catchments
- Hydraulic Model Domain
- Outflow Boundary Condition
- Inflow Boundary Conditions

Terrain Elevation (m)



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Cobbara Solar Project
Hydraulic Model Domain

PROJECT ID	60734058
CREATED BY	else
LAST MODIFIED	2025-02-21T15:07:55.926
VERSION	A

2.3.3 Roughness

The hydraulic model Manning's 'n' roughness, which is a measure of frictional response to water flow, was applied within the model domain according to land use category. The Manning's 'n' values were adopted from available industry guidance, and comprise typical values, and are listed in Table 2-6.

Table 2-6 Manning's 'n' roughness

Classification	Description	Value
Pasture	Agricultural areas	0.03
Roads	Spring Ridge Road, Sandy Creek Road, Sweeneys Lane and Golden Highway	0.022
Dense vegetation	Heavily vegetated areas such as the exclusion areas, predominantly comprising trees	0.07
Adjacent vegetation	Thin stand of vegetation associated with Sandy Creek and Laheys Creek	0.035
Sparse vegetation	Medium density vegetation, predominantly comprising bushes and trees	0.05
Waterways	Profile of Sandy Creek and Laheys Creek	0.055

The locations of the applied roughness layers are depicted in Figure 2-5, noting that areas which are not shown were assigned the default roughness value corresponding to 'pasture'.

2.3.4 Existing crossings

Creek crossings occurring within the hydraulic model domain were identified. Crossings that were implemented within the hydraulic domain are listed in Table 2-7.

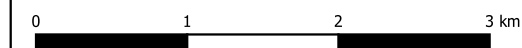
Table 2-7 Crossings

Name	Description	Model Treatment
Golden Highway – Sandy Creek crossing	60 m wide span bridge, comprised of 6 individual segments.	This crossing was modelled assuming structural hydraulic details for the bridge, as follows: • Guardrails of 1.0 m height • Bridge deck level of 351.5 mAHD assumed* • Bridge deck thickness of 0.8 m assumed • 6 x 600 mm diameter circular piers were assumed.
Sandy Creek crossings Laheys Creek crossings	A review of available imagery suggests that minor rural roads and access ways traverse the Sandy and Laheys Creek inverts. However, limited data is currently available to precisely characterise these crossings.	The crossings were assumed to create a hydraulic obstruction, modelled as a 1 m-deep obstruction to in-line creek flow.

* Based on airborne LiDAR carried out in 2015 and 2022

[illegible]

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 Hydraulic Model Domain
 Project Area Boundary

-  2 - Roads
-  3 - Dense Vegetation
-  4 - Creek Vegetation
-  5 - Sparse Vegetation
-  6 - Creek Profiles

Cobbora Solar Project Hydraulic Model Roughness

PROJECT ID	60734058
CREATED BY	else
LAST MODIFIED	2025-02-21T15:22:27.893
VERSION	A

A3 size

Given the lack of available data, the model treatments were conservatively developed. Other crossings in the model domain have the potential to impact the results, however no data were available to consider them for baseline model development.

2.3.5 Developed Case Modifications

The Project is described in the Environmental Impact Statement (AECOM, 2025). An indicative profile view and block layout arrangement are reproduced in Figure 2-6 and Figure 2-7, respectively.

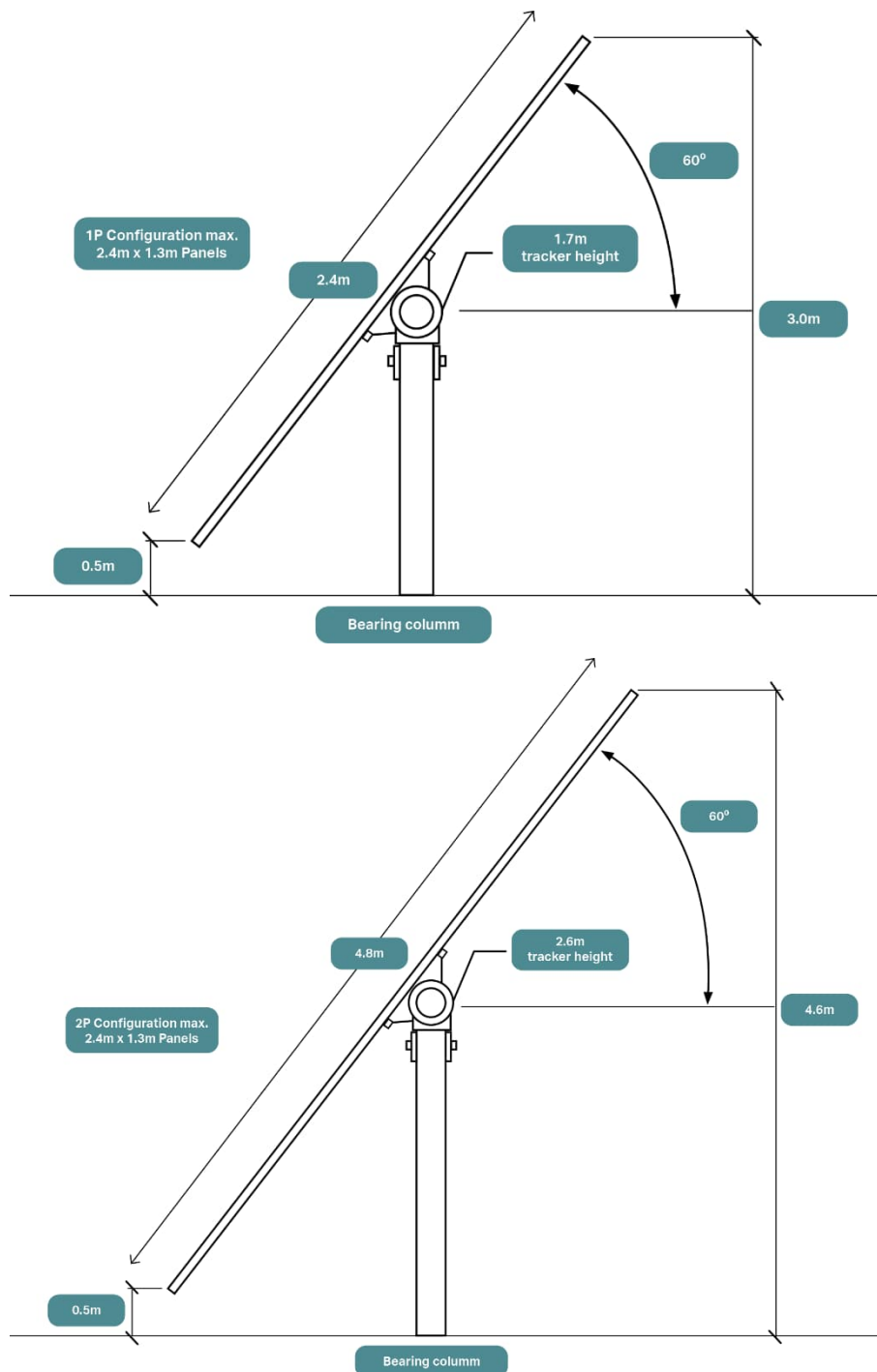


Figure 2-6 Indicative panel profile view. TOP: 1P configuration; BOTTOM: 2P configuration

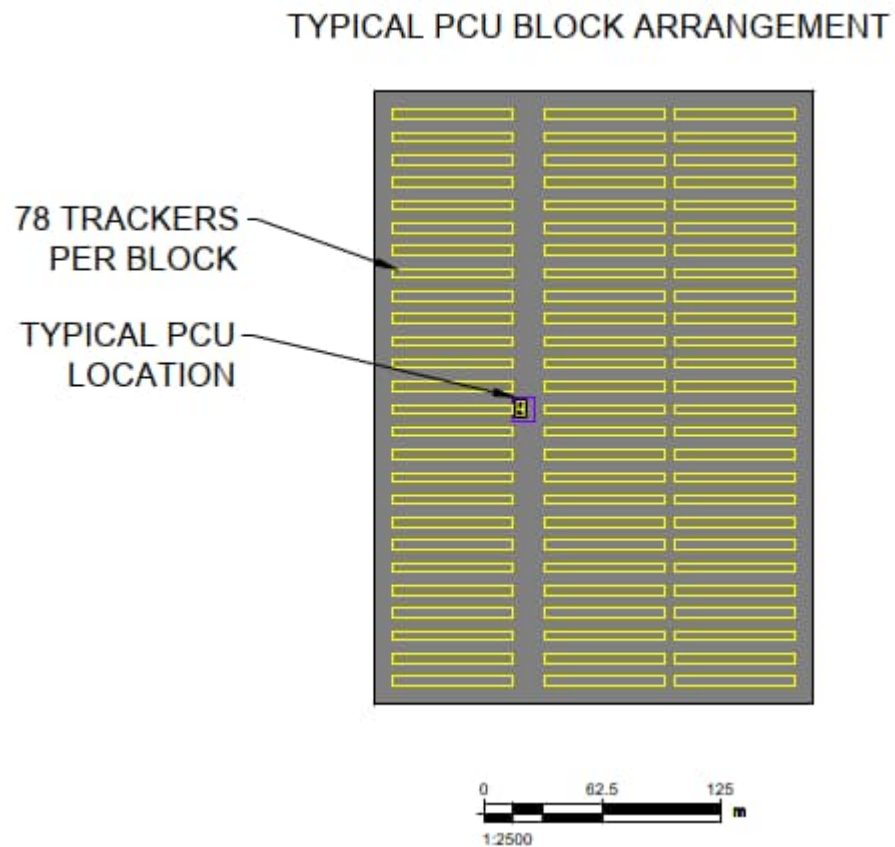
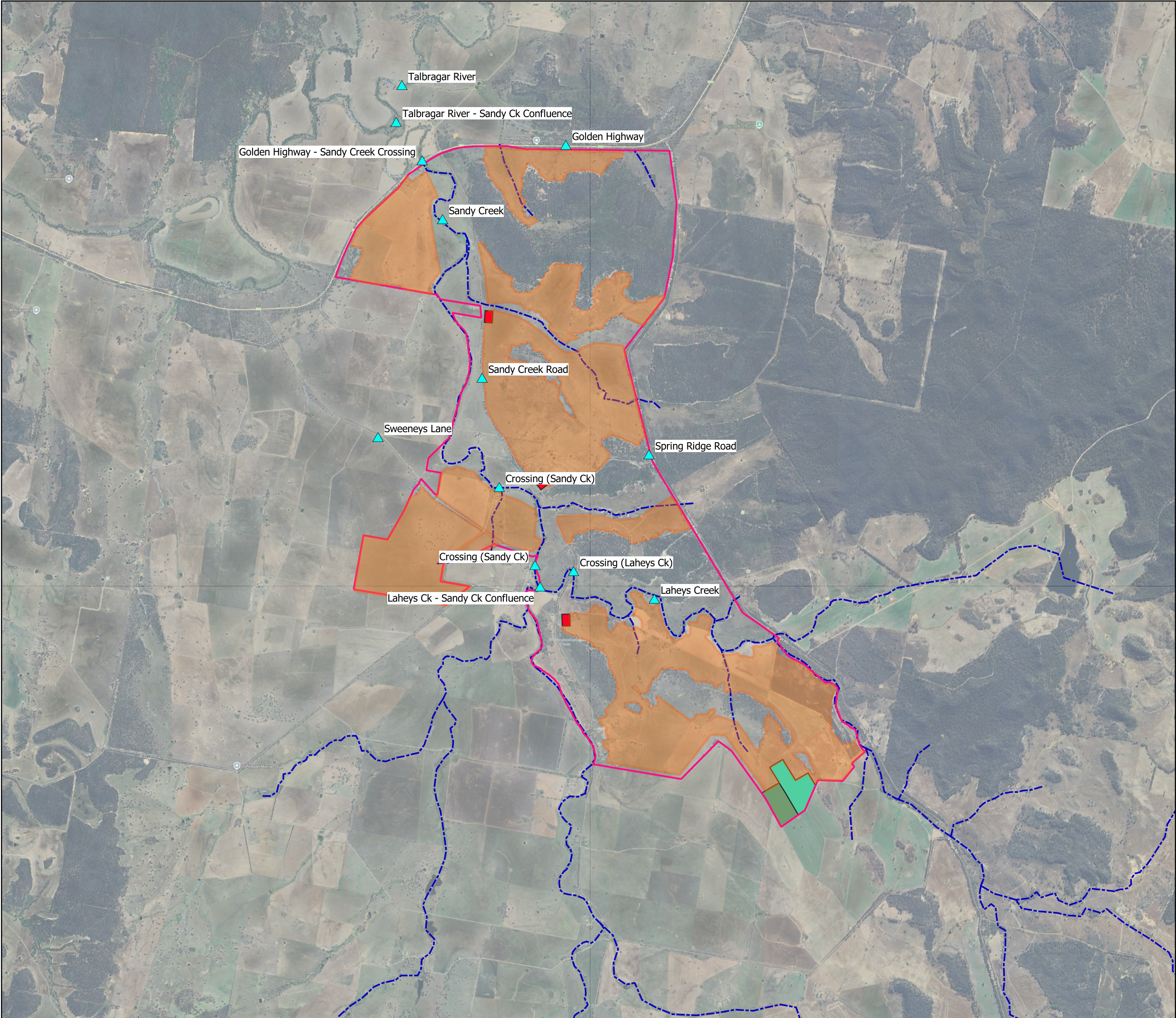


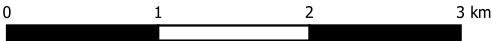
Figure 2-7 Indicative typical panel layout

A maximum developable area, representing the maximum possible extent of solar photovoltaic panels was developed as part of the 2022 flood assessment, and was conservatively adopted. The maximum developable areas are shown in Figure 2-8.

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- Legend
- Secondary substations
 - Main substation
 - BESS 400 MW
 - Stream Paths
 - Project Area boundary
 - Point of interest
 - Solar Array Area

Cobbara Solar Project
Solar Array Development Footprint

PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T14:04:32.406
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2.4 Previous (2022) Assessment Model Results

Model results for each AEP level (20%, 1% and 0.01%) have been post-processed to produce maximum results across different rainfall event durations, to indicate the maximum conditions reached. The model results indicate that generally, the 12-hour duration run is the critical duration event with respect to modelled flood level / inundation. The results from this assessment indicated the following changes:

- 20% AEP Events result in minor increases in flood depth (typically less than 1 mm). Some areas have higher increases, offset by equivalent decreases in immediately adjacent locations. The overall flood response of the Laheys Creek and Sandy Creek system is generally unchanged.
- 1% AEP Events result in minor, local increases in flood depth of up to approximately 3 mm, offset by minor decreases in immediately adjacent locations. Some areas associated with internal road features exhibit increased depth and depth velocity product, particularly within the lower reaches of Sandy Creek, however the overall change is small. The overall flood response of the Laheys Creek and Sandy Creek system, in terms of flood extent, is unchanged.
- 0.01% AEP Events result in minor, local increases in flood depth of up to approximately 5 mm, offset by minor decreases in immediately adjacent locations. Some areas associated with internal road features exhibit increased depth and depth velocity product, particularly within the reaches of Sandy Creek and Laheys Creek, however the overall change is small.

The Golden Highway - Sandy Creek crossing, and the area immediately upstream, exhibit an increased flood depth, of some 100-200 mm. The mapped depth velocity product indicates that the additional floodwaters have resulted in minor alternating changes to the erosivity of flows, however the overall average erosivity is unchanged. It is noted that the 0.01% AEP event represents a very rare to extreme flood event, with the impacts considered minor overall.

- The sensitivity analyses showed no appreciable difference in results with respect to the adopted parameters. The lack of sensitivity to these parameters was considered to be a function of the following:
 - Overland flow paths generally experience shallow (sheet) flow and would be expected to be relatively insensitive to changes in roughness.
 - The downstream boundary condition of the model is effectively formed by the Golden Highway - Sandy Creek crossing, which limits the flow from Sandy Creek to Talbragar River in rare to extreme rainfall events (i.e. less frequent than 1% AEP).

3.0 Hydraulic Model Updates

3.1 Baseline Case

The following updates were incorporated into the latest hydraulic model to reflect current conditions and the latest design developments and arrangements.

3.1.1 Terrain and Imagery

An Airborne LiDAR and Imagery Survey was carried out between the 25th August 2022 and the 10th October 2022 over a 33 km² area, as shown in Figure 3-1. A 1 metre Resolution Digital Elevation Model Metadata was provided as part of this assessment which covered the total Project Area for better resolution in capturing the minor drainage paths and waterways. The survey achieved a vertical accuracy of 7.5 cm and horizontal accuracy of 40 cm.

3.1.2 Culvert Crossings

The culvert crossings as shown in Figure 3-2 and Table 3-1 were identified within the hydraulic model extents. Table 3-1 describes the details of each structure and includes a picture of the structure. The dimensions for each structure and picture were taken by the Proponent during the week of 18 October 2024. This table also contains the recommended hydraulic modelling approach for each structure.

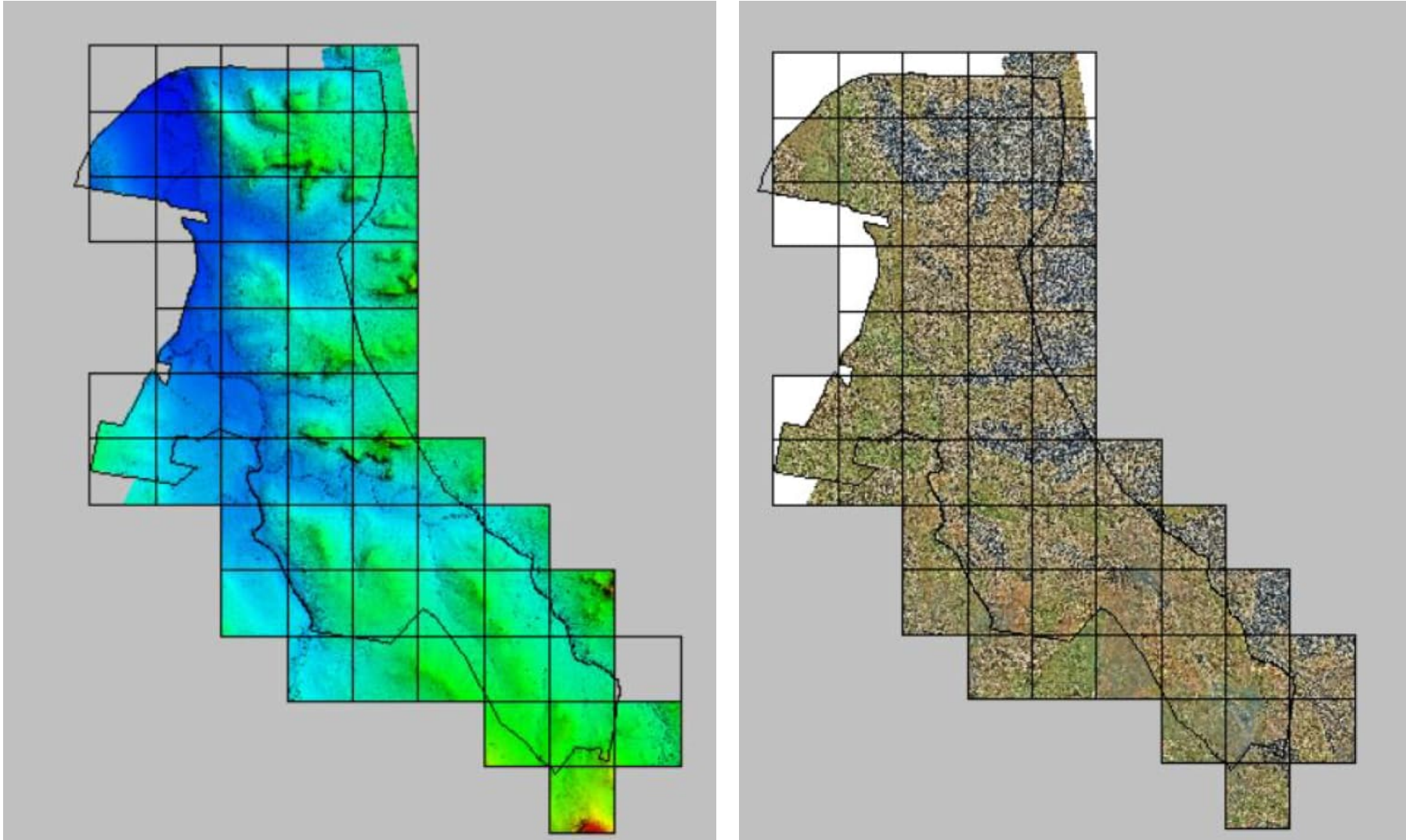


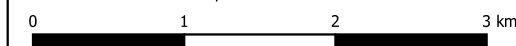
Figure 3-1 LEFT: LiDAR survey, RIGHT: Ortho Tiles

This aerial map displays a rural landscape with a pink boundary line and blue dashed lines representing water features. Key locations marked include:

- Golden Highway Span Bridge
- Spring Ridge Road Crossing 1
- Sweeney Ln Minor Crossing
- Sandy Creek Crossing
- Minor Crossing
- Spring Ridge Road Crossing 2
- Sweeneys Lane Crossing
- Sandy Creek and Sandy Ck Rd Crossing
- Blackheath Ck and Spring Ridge Rd
- Sandy Creek
- Blackheath Creek
- Lahys Creek



DATUM GDA 1994, PROJECTION MGA ZONE 55



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○ Creek Crossing
 □ Project Area Boundary
 - - - Stream Paths

Cobbora Solar Project Creek Crossing Locations

PROJECT ID	60680887
CREATED BY	else
LAST MODIFIED	2025-03-05T13:38:43.380
VERSION	A

A3 size

Table 3-1 Culvert Crossing Locations - Description

Crossing Name	Type	Dimensions	Photo	Hydraulic Modelling Approach
Spring Ridge Road Crossing 1	3 x pipe culverts. Concrete	950mm ND		Culvert crossings were included in the baseline and post-developed scenarios, but no blockage assessment was undertaken at this stage of the Project.
Spring Ridge Road Crossing 2	3 x pipe culverts. Concrete	1,100mm ND		Culvert crossings were included in the baseline and post-developed scenarios, but no blockage assessment was undertaken at this stage of the Project.

Crossing Name	Type	Dimensions	Photo	Hydraulic Modelling Approach
Blackheath Ck and Spring Ridge Rd	4 x pipe culverts. Concrete	1,250mm ND		Culvert crossings were included in the baseline and post-developed scenarios, but no blockage assessment was undertaken at this stage of the Project.
Sweeneys Lane Crossing	Concrete crossing	-		Levels along the top of concrete slab included in model at a 5m spacing.

Crossing Name	Type	Dimensions	Photo	Hydraulic Modelling Approach
Sweeneys Lane Minor Crossing	Single corrugated steel pipe	500mm ND		Pipe has limited hydraulic capacity, and excluded from the hydraulic model as it is not expected to significantly affect the hydraulic results.
Sandy Creek Crossing	-	-		Levels along the top of crossing included in model at a 5m spacing.

Crossing Name	Type	Dimensions	Photo	Hydraulic Modelling Approach
Sandy Creek Minor Crossing	Concrete crossing	-		Levels along the top of crossing included in model at a 5m spacing.
Golden Highway Span Bridge	Assumed 60 m wide span bridge, comprised of six individual segments.			Photo extracted from Google Street-View. The hydraulic model has included this bridge with the assumed dimensions and depths.

3.2 Future Development Case

The revised solar array development footprint is shown in Figure 3-4. Based on the previous flood assessment (AECOM, 2022), the solar array area covered an area of approximately 20.49 km², with the revised solar array area now covering an area of approximately 14.46 km² as shown in Figure 3-4.

The flood impact assessment considers the impacts to the Project during construction, operation and decommissioning phases. For the purpose of this assessment, AECOM has conservatively considered the maximum envelope of all the activities. The maximum envelope for the future development case includes the following features and is shown in Figure 3-5. The location, extent and configuration of these features are yet to be finalised.

- BESS consisting of a series of storage cabinets fully integrated with lithium iron phosphate battery technology, liquid cooling system, battery management system (BMS) and fire suppression system, as shown in Figure 3-3.
- Internal access and construction roads are expected to be required to facilitate access to the various solar photovoltaic panel locations. Two road widths, 6 m and 12 m, were proposed.
- Based on the latest access roads, three creek crossing structures were confirmed by the Proponent at the following locations, shown in Figure 3-5:
 - Sandy Creek Crossing
 - Laheys Creek Crossing
 - Sweeneys Lane Crossing

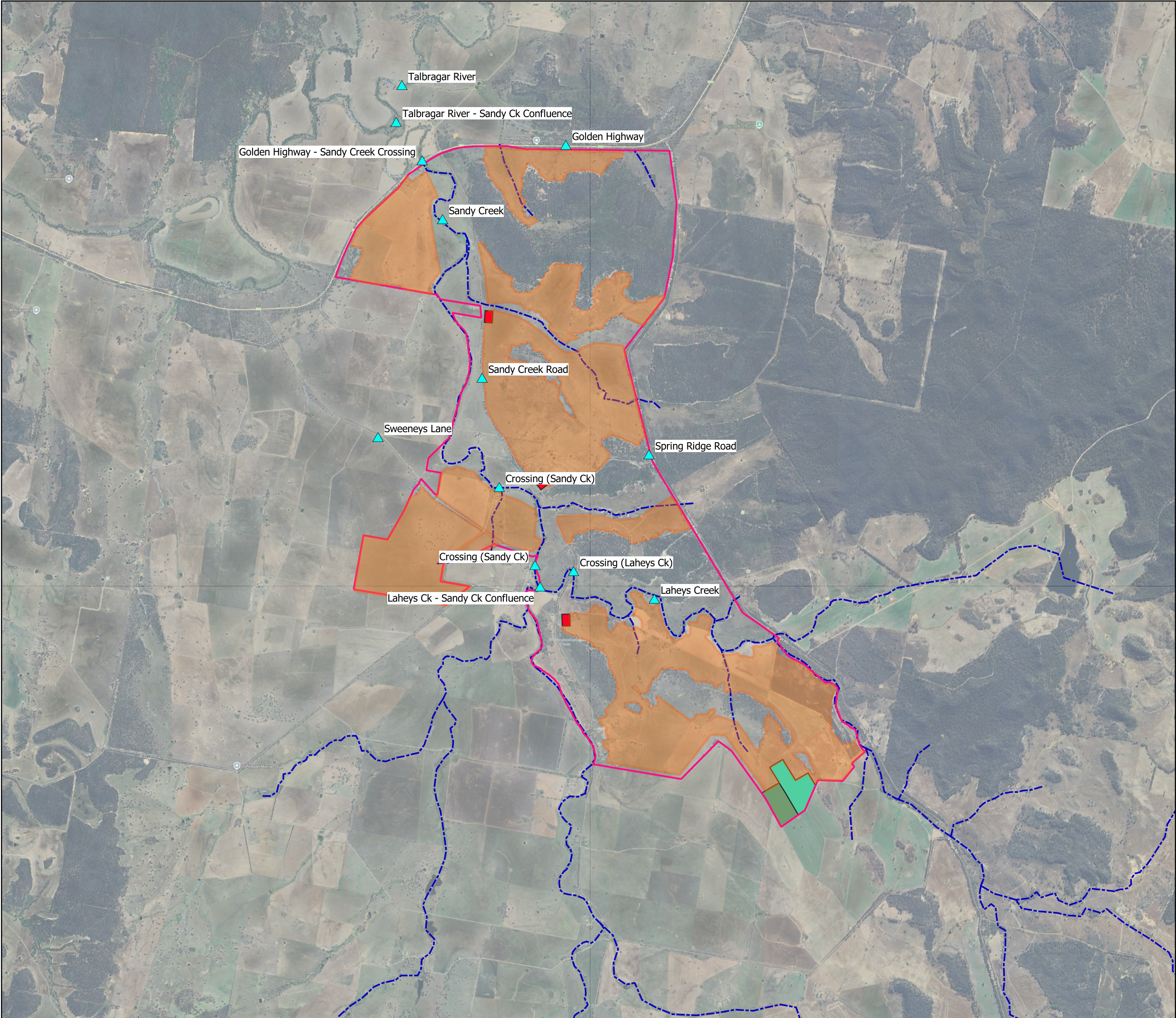
At the time of this report, the type of structure across the creeks has not been finalised, with the following two options being considered. Sketches for each of the envisioned structures are shown in Figure 3-6, including dimensions:

- Steel kit bridge
- Pre-cast concrete bridge

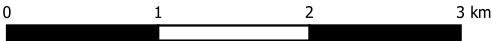


Figure 3-3 Electrical storage array at solar power plant stock photo (iStockphoto, 2025)

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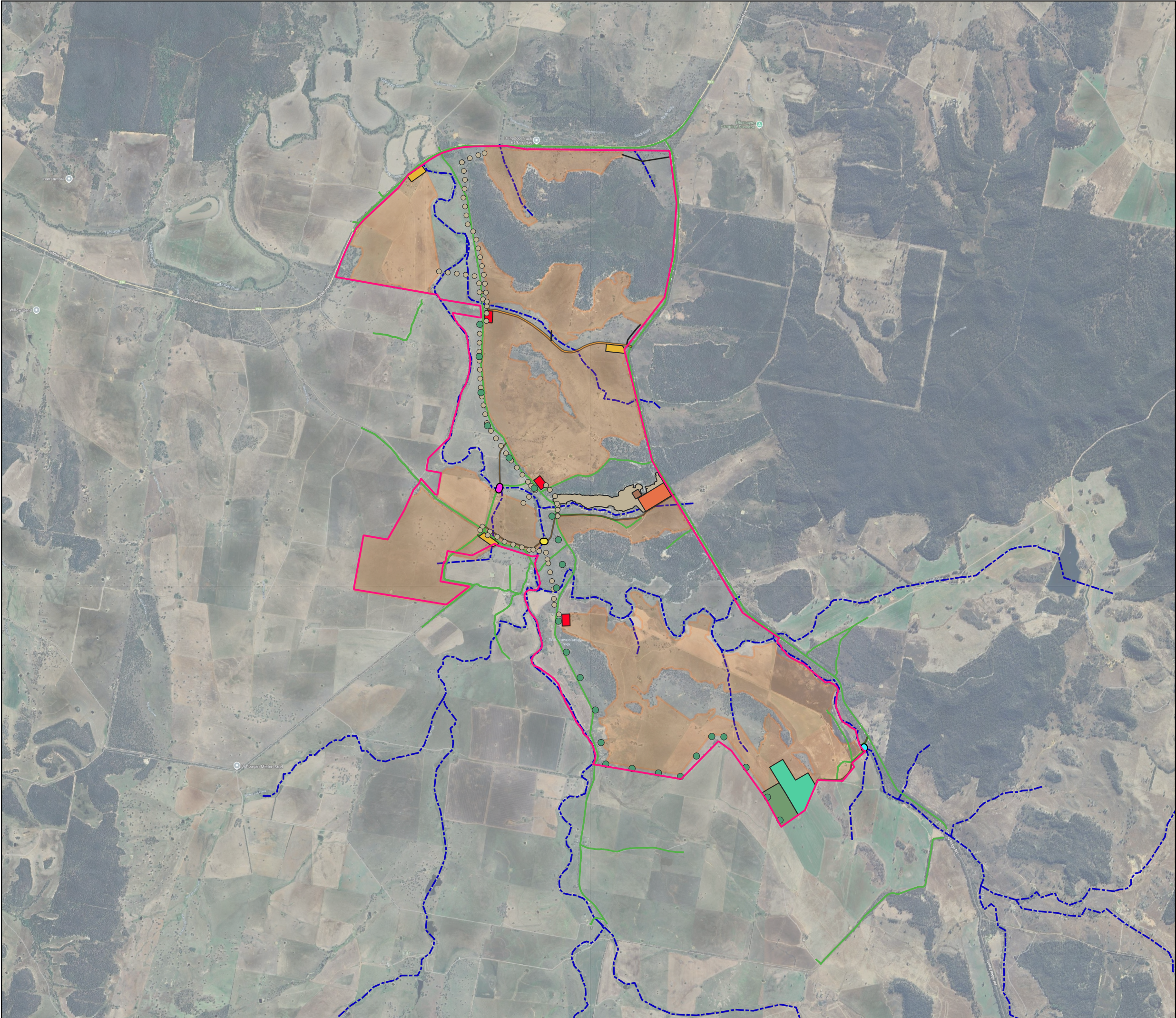
- Legend
- Secondary substations
 - Main substation
 - BESS 400 MW
 - Stream Paths
 - Project Area boundary
 - Point of interest
 - Solar Array Area

Cobbara Solar Project
Solar Array Development Footprint

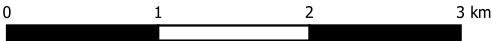
PROJECT ID
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VERSION

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Legend

Project Area boundary

Future Developed Infrastructure

330kV_Towers

33kV_Poles

BESS 400MW

Main Substation

Secondary Substations

Helipoint

Accomodation Camp

Construction Area - Main

Construction Areas

Creek Crossings

Sandy Creek Crossing

Lahey Creek Crossing

Sweeney Lane Crossing

Access Roads

Roads 6m

Roads 12m

Existing Roads

Solar Array Area

Hydrology

Stream Paths

Cobbora Solar Project
Future Developed Case

PROJECT ID 60734058
CREATED BY priyam.awotar
LAST MODIFIED 2025-02-21T14:05:33.564
VERSION A

Map
1

A3 size

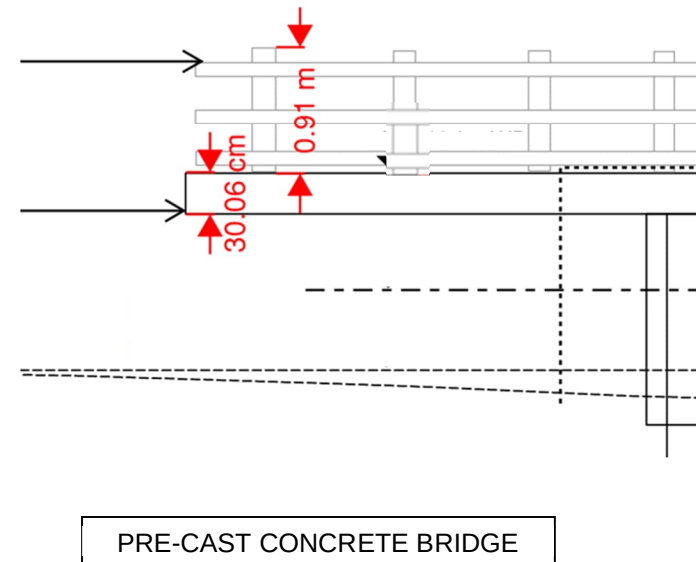
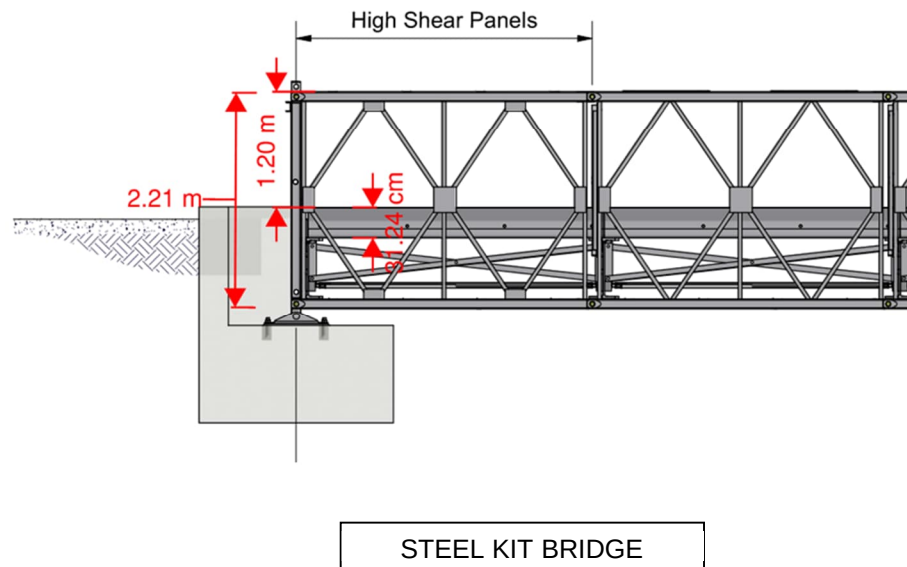


Figure 3-6 Typical bridge structure types

The proponent, for the purpose of this assessment, indicated that the three bridge structures are planned to span the entire width of the creek i.e. no piers will be located within the creek extents. The deck levels for each bridge structure are also to be assumed to tie into the natural ground level at each respective creek embankment. Based on the deck level assumption, the maximum bridge opening height (measured from the surveyed creek invert and bridge obvert level) for each structure is as follows:

- Sandy Creek Crossing: 1.93 m
 - Sweeneys Lane Crossing: 2.13 m
 - Lahey Creek Crossing: 1.64 m
- Main and secondary substation locations have been identified with access provided to these locations.
 - The main construction area and laydown with smaller anticipated construction areas have been proposed for the construction period.
 - It is expected that sufficient parking spaces would be provided to accommodate a mix of light vehicles, buses and construction-related plant and machinery. Parking facilities would be reduced by the use of shuttle buses transporting workers, limiting the number of vehicles required on-site.
 - The proposed locations for the 33 kV and 330 kV towers are also shown in Figure 3-5.

The proposed development footprint has the potential to result in hydrological and hydraulic changes as outlined in Table 3-2.

Table 3-2 Potential impact of proposed infrastructure

Aspect	Hydrological changes	Hydraulic changes	Model representation
Solar photovoltaic panels	The panels may result in a change to the surface conditions within the Development Footprint. Compared to the baseline surface condition (generally pasture), panels are impervious, with panels resulting in minor concentration of flows, whereby rainfall contacting panels is concentrated to a margin adjacent to each panel.	The panels may affect the hydraulic roughness of the land underlying the panels, by reducing the growth of vegetation. The difference was considered to be minor in hydraulic terms.	The solar panel development footprint was assumed to be 25% impervious, to represent the change in imperviousness. Roughness changes to the solar panel development footprint were not modelled, as the difference was considered to be minor in hydraulic terms.
BESS and main and secondary substations	Compared to the baseline surface condition (pasture), the BESS and substations are expected to comprise surface conditions consisting of: • Impervious (for battery units) • Hardstand (for other areas)	The BESS and substations are expected to be located away from concentrated flow areas. Accordingly, the BESS and substations may result in minor rerouting and disruption of shallow flow, with the overall expected impact to be minor.	The BESS and substations were presented in the hydraulic model as a decrease in Manning roughness from the existing vegetated state, even though it is expected to be a minor area overall. The BESS and secondary substations are located out of concentrated flow conditions while the main substation is located within a concentrated flowpath. It is envisioned the substations and BESS will be on raised pads once the design has been finalised. As these pads were not incorporated in the hydraulic model at the time of the report, it is envisioned that potential impacts might arise due to the raised pads on the main substation location. These impacts might include flowpath diversions due to the pad locations and/or concentrated flow around the pads increasing the risk to erosion and/or sedimentation.
Internal road development	Minor disruption of the flow is expected.		The roads were presented as a decrease in Manning roughness from the existing vegetated state with all roads assumed to be at ground level as no final road levels were available.
Bridge structures across creeks	Disruption of the flow is expected, anticipated to increase the ponding extents upstream.		The bridge structure deck levels at 5m spacing were presented in the hydraulic model with the adopted bridge loss parameters summarised in

Aspect	Hydrological changes	Hydraulic changes	Model representation
			Table 3-3. The impact of the bridge structures is expected to delay or reduce the rate of runoff reporting downstream of each crossing, resulting in lessened or unchanged flood impact. Increases in ponding extents upstream of bridge structures may occur.
Main and smaller construction camp sites and laydown areas	Minor changes in imperviousness are expected in areas where construction camps and laydown areas are established. Hydraulic changes are expected to be minimal as the camps and laydown areas will not be established within existing drainage paths. The overall impact is also expected to be temporary, with features removed after the construction phase.		Based on the proposed arrangement, the construction camps and laydown areas were modelled as decrease in Manning roughness from the existing vegetated state with the impact expected to be minor.
Accommodation camp, helipad and parking facilities	Minor increase in potential runoff from rainfall falling over the extents of these facilities.		Similarly, these facilities have been modelled by decreasing the Manning roughness, expected to have a minor impact.
33 kV poles and 330 kV towers	Extremely minor increase in potential runoff due to the footprint of these towers.		The footprint of these towers and poles have been included as an decrease in Manning roughness, however, due to the size of the footprint of the infrastructure, extremely minor if any impact will be observed.

Table 3-3 Adopted bridge modelling parameters

Model Parameter	Sandy Creek Crossing		Sweeneys Lane Crossing		Lahey Creek Crossing	
	Steel Kit	Pre-cast Concrete	Steel Kit	Pre-cast Concrete	Steel Kit	Pre-cast Concrete
Soffit RL* ¹ (m)	359.75	359.75	362.25	362.25	388.34	388.34
Invert Level* ¹ (m)	357.82	357.82	360.12	360.12	386.70	386.70
Layer 1 %Blockage	50	18	38	4	46	0
Layer 1 FLC	0	0	0	0	0	0
Layer 2 Depth	0.31	0.31	0.31	0.31	0.31	0.31
Layer 2 %Blockage	100	100	100	100	100	100

Model Parameter	Sandy Creek Crossing		Sweeneys Lane Crossing		Lahey Creek Crossing	
	Steel Kit	Pre-cast Concrete	Steel Kit	Pre-cast Concrete	Steel Kit	Pre-cast Concrete
Layer 2 FLC	1.6	1.6	1.6	1.6	1.6	1.6
Layer 3 Depth	1.2	0.91	1.2	0.91	1.2	0.91
Layer 3 Blockage	30	90	30	90	30	90
Layer 3 FLC	0	0	0	0	0	0

*1 – Level reported at bridge structure centre

4.0 Model Results

The model results have been post-processed to produce maximum results across different rainfall event durations for each AEP event (20%, 1%, and 0.01%) to indicate the maximum conditions reached. The model results indicate that generally, the 12-hour duration run is the critical duration event with respect to the modelled flood level/inundation.

4.1 Mapped results

Model results were mapped for the following parameters:

- Maximum flood depth (m) modelled during the event durations analysed.
- Maximum depth velocity product (m^2/s) modelled during the event durations analysed, which is a measure of flow intensity and scouring/erosive potential of flows.

Model results are attached in Appendix A for the results listed in Table 4-1.

Table 4-1 Mapped Results

Scenario	AEP	Map	
		Maximum modelled flow depth	Maximum depth velocity product
Baseline	20%	A1	A2
	1%	B1	B2
	0.01%	C1	C2
Post-Development: <i>Scenario 1 – Steel Kit Bridge</i>	20%	D1	D2
	1%	E1	E2
	0.01%	F1	F2
Post-Development: <i>Scenario 2 – Precast Concrete Bridge</i>	20%	G1	G2
	1%	H1	H2
	0.01%	I1	I2
Impact Maps (Post-Development Less Baseline): <i>Scenario 1 – Steel Kit Bridge</i>	20%	J1	J2
	1%	K1	K2
	0.01%	L1	L2
Impact Maps (Post-Development Less Baseline): <i>Scenario 2 – Precast Concrete Bridge</i>	20%	M1	M2
	1%	N1	N2
	0.01%	O1	O2
Impact Maps <i>Steel Kit Bridge Less Precast Concrete Bridge</i>	1%	P1	P2

4.2 Baseline results

The baseline modelling results indicate that the Project Area is subject to the following general flood responses:

- The upper catchments of Sandy Creek and Laheys Creek are subject to generally shallow, distributed flow paths. The flows in these areas are generally low (<0.1 m) and exhibit low velocity.

Erosion and scour are not expected but are dependent on the overland flow conditions i.e. land use cover.

- Laheys Creek and the upper reaches of Sandy Creek are subject to moderate flow depths (generally less than 3 m) and flows are modelled to inundate adjacent floodplains
- The lower reaches of Sandy Creek, where the waterway approaches the Golden Highway, are subject to wider floodplain responses, with deeper ponding of water evident
- The Golden Highway Sandy Creek bridge crossing forms a hydraulic boundary and contributes to significant ponding depths to the south i.e. upstream of the Golden Highway.

Specific outcomes at key locations are listed in Table 4-2.

Table 4-2 Baseline flood results – typical values

Location	Aspect	Annual Exceedance Probability (AEP)		
		20%	1%	0.01%
Golden Highway – Sandy Creek Crossing	Description	Flow is contained to the crossing. Adjacent upstream floodplains are modelled to experience mild inundation.	Flow is generally contained to the crossing. Adjacent upstream floodplains are modelled to inundate.	Flow rate exceeds the capacity of the crossing, with inundation of upstream areas evident. Minor overtopping of the highway is modelled to occur.
	Depth (m)	3 m	4.5 m	5.5 m
	Depth velocity product (m ² /s)	6 m ² /s	7.5 m ² /s	10 m ² /s
Sandy Creek	Description	Minor inundation of adjacent floodplains. Floodplain is approximately 400 m wide (on average)	Moderate inundation of adjacent floodplains. Flows exhibit erosive intensities. Floodplain is approximately 475 m wide (on average)	Major inundation of adjacent floodplains. Flows are very erosive. Floodplain is approximately 550 m wide (on average)
	Depth (m)	3.2 m	4 m	5 m
	Depth velocity product (m ² /s)	5.4 m ² /s	9.2 m ² /s	12 m ² /s
Laheys Creek	Description	Minor inundation of adjacent floodplain. Floodplain is approximately 200 m wide (on average).	Moderate inundation of adjacent floodplain. Floodplain is approximately 300 m wide (on average)	Major inundation of adjacent floodplain. Floodplain is approximately 350 m wide (on average)
	Depth (m)	2.5 m	3 m	4.5 m
	Depth velocity product (m ² /s)	4.1 m ² /s	5.5 m ² /s	7.2 m ² /s
Overland Flow Areas	Description	Minor overland flow depths. Generally not sufficient to comprise erosive flow.	Moderate overland flow depths. Generally not sufficient to comprise erosive flow.	Moderate overland flow depths. Generally not sufficient to comprise erosive flow.
	Depth (m)	0.05 m	0.1 m	0.2 m

Location	Aspect	Annual Exceedance Probability (AEP)		
		20%	1%	0.01%
	Depth velocity product (m ² /s)	0.01 m ² /s	0.05 m ² /s	0.1 m ² /s
BESS	Description	Flow path along the western boundary of BESS is characterised by moderate flow depth and non-erosive flow.	Moderate overland flow depth in the flow path along the western boundary of BESS. Areas of bare soil are observed and are at risk of erosion/scouring.	Moderate overland flow depth in the flow path along the western boundary of BESS. Areas of bare soil are observed and are at risk of erosion/scouring.
	Depth (m)	0.21 m	0.34 m	0.51 m
	Depth velocity product (m ² /s)	0.20 m ² /s	0.50 m ² /s	0.88 m ² /s
Main Substation	Description	Flow path along eastern boundary comprises of moderate flow depths and non-erosive flow. Minor overland flow paths observed across the footprint, flowing in a northerly direction	Flow path along eastern boundary comprises of moderate flow depths and non-erosive flow. Minor overland flow paths observed across the footprint, flowing in a northerly direction	Moderate overland flow path along eastern boundary comprising of moderate erosive flow risk.
	Depth (m)	0.18 m	0.28 m	0.4 m
	Depth velocity product (m ² /s)	0.088 m ² /s	0.29 m ² /s	0.52 m ² /s
Secondary Substations along Sandy Creek Road - northern secondary substation	Description	Moderate overland flow depth along the northern footprint boundary, comprising of non-erosive flow.	Moderate overland flow depth along the northern footprint boundary, comprising of non-erosive flow.	Moderate overland flow depth along the northern footprint boundary comprises moderate erosive flow risk.
	Depth (m)	0.2 m	0.25 m	0.55 m
	Depth velocity product (m ² /s)	0.08 m ² /s	0.22 m ² /s	0.60 m ² /s

Location	Aspect	Annual Exceedance Probability (AEP)		
		20%	1%	0.01%
Secondary Substations along Sandy Creek Road - central secondary substation	Description	Minor overland flow depth across the northern section of the footprint into the farm dam located within the substation footprint. Non-erosive flows across the footprint.	Minor overland flow depth across the northern section of the footprint into the farm dam located within the substation footprint. Non-erosive flows across the footprint.	Minor overland flow depth across the northern section of the footprint into the farm dam located within the substation footprint. Non-erosive flows across the footprint.
	Depth (m)	0.02 m	0.03 m	0.04 m
	Depth velocity product (m ² /s)	0.02 m ² /s	0.02 m ² /s	0.05 m ² /s
Secondary Substations along Sandy Creek Road - northern southern substation	Description	Minor overland flow depth flowing across the centre of the substation footprint from south to north, comprising non-erosive flows.	Minor overland flow depth flowing across the centre of the substation footprint from south to north, comprising non-erosive flows.	Moderate overland flow depth along eastern footprint boundary, comprising low erosive flow risk. Areas of bare soil were observed and are at higher risk of erosion.
	Depth (m)	0.02 m	0.03 m	0.05 m
	Depth velocity product (m ² /s)	0.01 m ² /s	0.02 m ² /s	0.03 m ² /s
Main Construction Area	Description	The majority of the footprint has dry or very shallow flow depths, while along the south-eastern footprint, moderate flow depths are experienced. Due to the grass cover along this section, non-erosive flows are anticipated.	The majority of the footprint experiences overland flow less than 0.025 m in depth, with the south-eastern corner experiencing depths up to 0.24m. Due to the grass cover along this section, non-erosive flows are anticipated.	The majority of the footprint experiences overland flow less than 0.03 m in depth, with the south-eastern corner experiencing depths up to 0.5 m with a moderate to high erosive flow risk.
	Depth (m)	0.14 m	0.24 m	0.50 m
	Depth velocity product (m ² /s)	0.16 m ² /s	0.24 m ² /s	0.92 m ² /s
Laydown Areas - Eastern laydown area located along Spring Ridge Road	Description	Minor overland flow depth across the northern section of the footprint, comprising non-erosive flows	Moderate overland flow depth along the northern footprint boundary, comprising non-erosive flow.	Moderate overland flow depth along the northern footprint boundary, comprising moderate erosive flow risk.

Location	Aspect	Annual Exceedance Probability (AEP)		
		20%	1%	0.01%
	Depth (m)	0.08 m	0.15 m	0.22 m
	Depth velocity product (m ² /s)	0.08 m ² /s	0.13 m ² /s	0.42 m ² /s
Laydown Areas - Northern laydown area located along the Golden Highway	Description	A large portion of the footprint is inundated by flood depths exceeding 0.1m, with the eastern section, due to the close proximity of Sandy Creek, experiencing flow depths up to 0.95m. Similarly, a large portion of the footprint has a DV product less than 0.1m ² /s, while the eastern section has a DV product up to 0.59m ² /s associated with a moderate erosive flow risk.	More than 90% of the footprint experiences flow depths exceeding 0.2m, with the eastern section experiencing 1.6m. The majority of the flow across the footprint has a DV product less than 0.5m ² /s, while the eastern portion experiences a value of 1.7m ² /s and a high risk of erosion.	The entire footprint experiences a flow depth of more than 0.4m, with the eastern portion up to 3.1m. The majority of the site experiences a DV product of less than 0.7m ² /s, while the eastern portion experiences a value of up to 4.62m ² /s with a high risk of erosion.
	Depth (m)	0.95 m	1.60 m	3.10 m
	Depth velocity product (m ² /s)	0.59 m ² /s	0.13 m ² /s	4.62 m ² /s
Accommodation Camp	Description	The majority of the footprint is dry or has very shallow flow depths, while along the south-western footprint, moderate flow depths are experienced. Due to the grass cover along this section, non-erosive flows are anticipated.	The majority of the footprint experiences overland flow less than 0.035 m in depth, with the south-western corner experiencing depths up to 0.32m. Due to the grass cover along this section, non-erosive flows are anticipated	The majority of the footprint experiences overland flow less than 0.04 m in depth, with the south-western corner experiencing depths up to 0.50 m, characterised as being moderate to highly erosive.
	Depth (m)	0.23 m	0.32 m	0.50 m
	Depth velocity product (m ² /s)	0.26 m ² /s	0.45 m ² /s	1.02 m ² /s

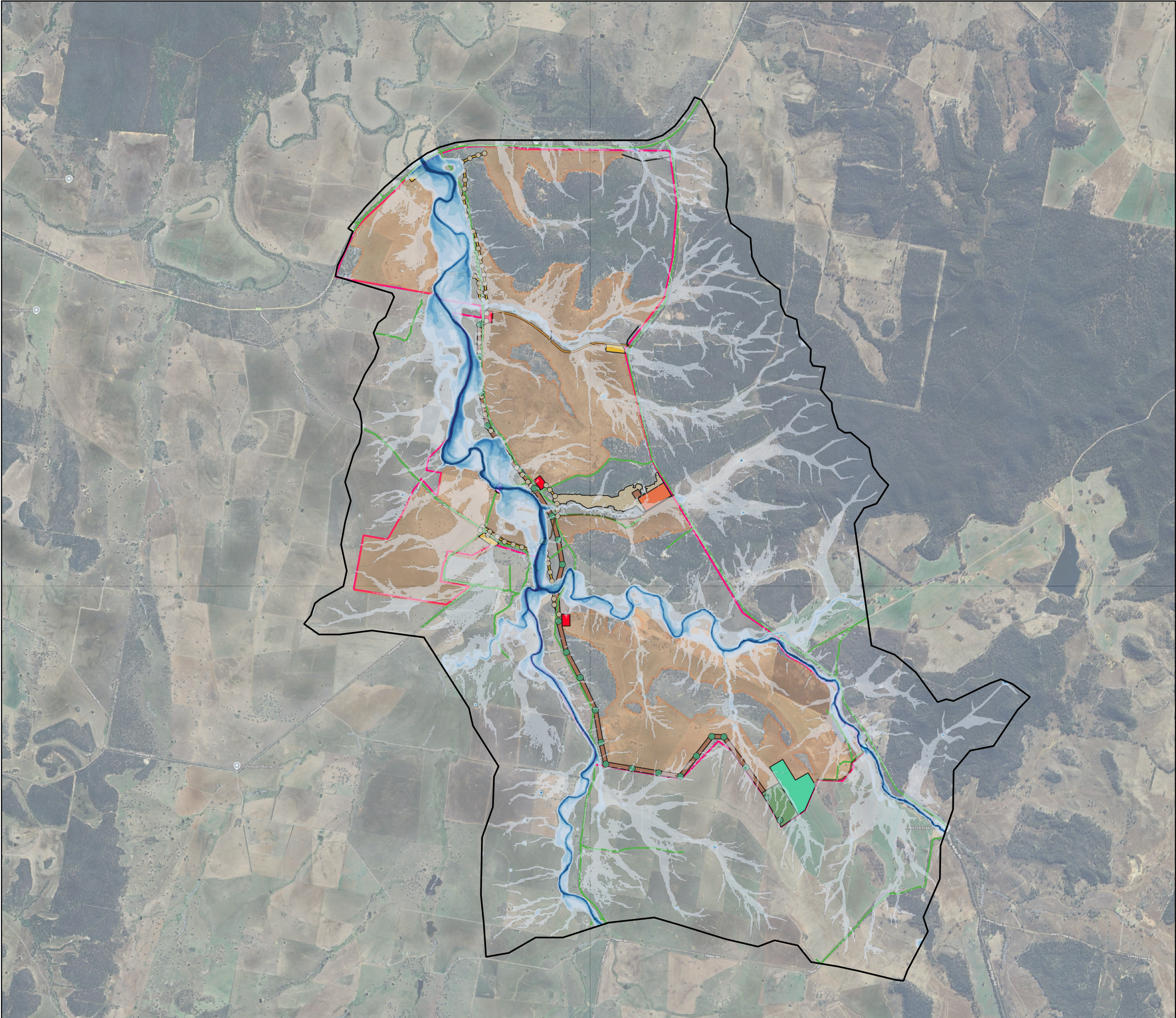
4.3 Post-Development results

Appendix A, Map D1 to I2, shows the post-development model results. The change between the post-development and baseline conditions is shown in Appendix A, Map J1 to P2.

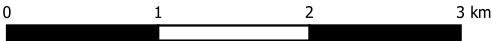
Detailed post-development flood peak results for the 1% AEP storm event for the precast concrete bridge scenario, including the future infrastructure overlaid on the maps, are shown in Figure 4-1 to Figure 4-5. This section describes the impact of the post-development scenarios on the results at the following locations:

- Golden Highway
- Creek crossings, including:
 - Sandy Creek Crossing
 - Lahey Creek Crossing
 - Sweeneys Lane Crossing
- Battery energy storage system
- Main substation
- Main construction area
- Accommodation camp
- Incremental impact across floodplain.

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DATUM GDA 1994, PROJECTION MGA ZONE 55



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Legend

Project Area boundary

Future Developed Infrastructure

330kV_Towers

330kV easement

33kV_Poles

33kV easement

BESS 400MW

Main Substation

Secondary Substations

Helipoint

Accomodation Camp

Construction Area - Main

Construction Areas

Creek Crossings

Sandy Creek Crossing

Lahey Creek Crossing

Sweeney Lane Crossing

Access Roads

Roads 6m

Roads 12m

Existing Roads

Solar Array Area

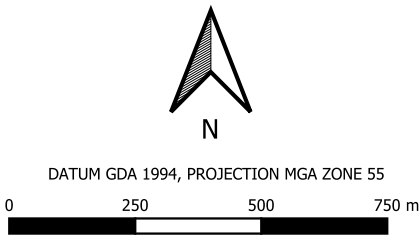
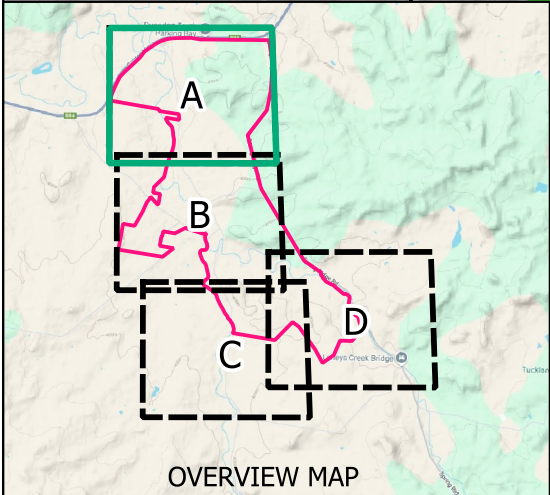
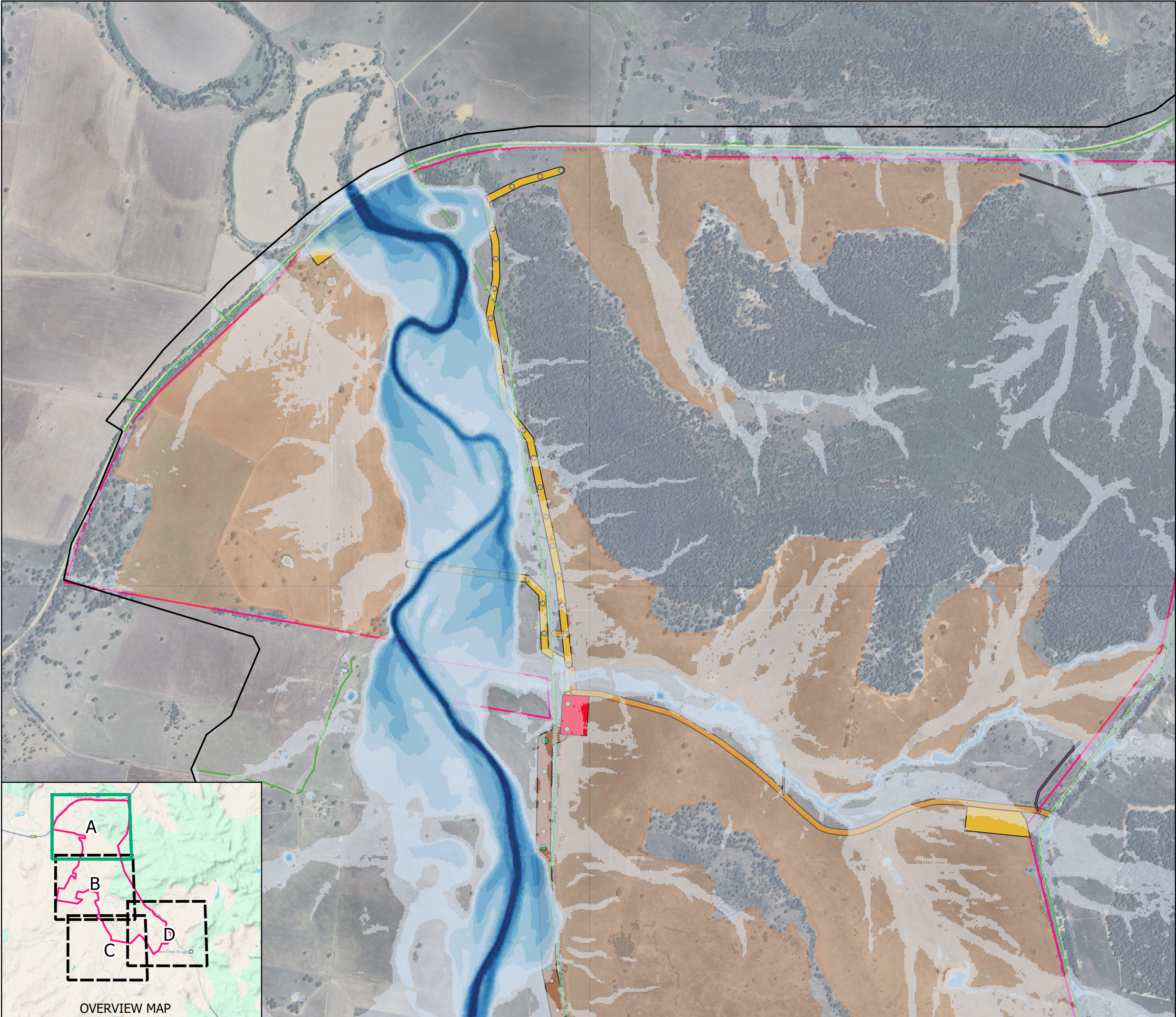
Cobbora Solar Project
Future Developed Case & 1% AEP Storm
Event - Peak Flood Depths
Post Development - PC Concrete Bridge
Overview Map

PROJECT ID 60734058
CREATED BY ELSE
LAST MODIFIED 2025-05-14T16:08:33.030
VERSION A

Map
1

A3 size

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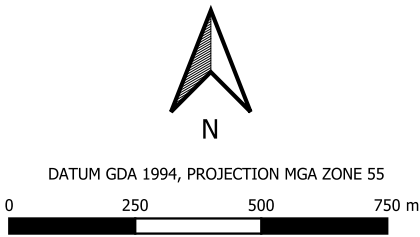
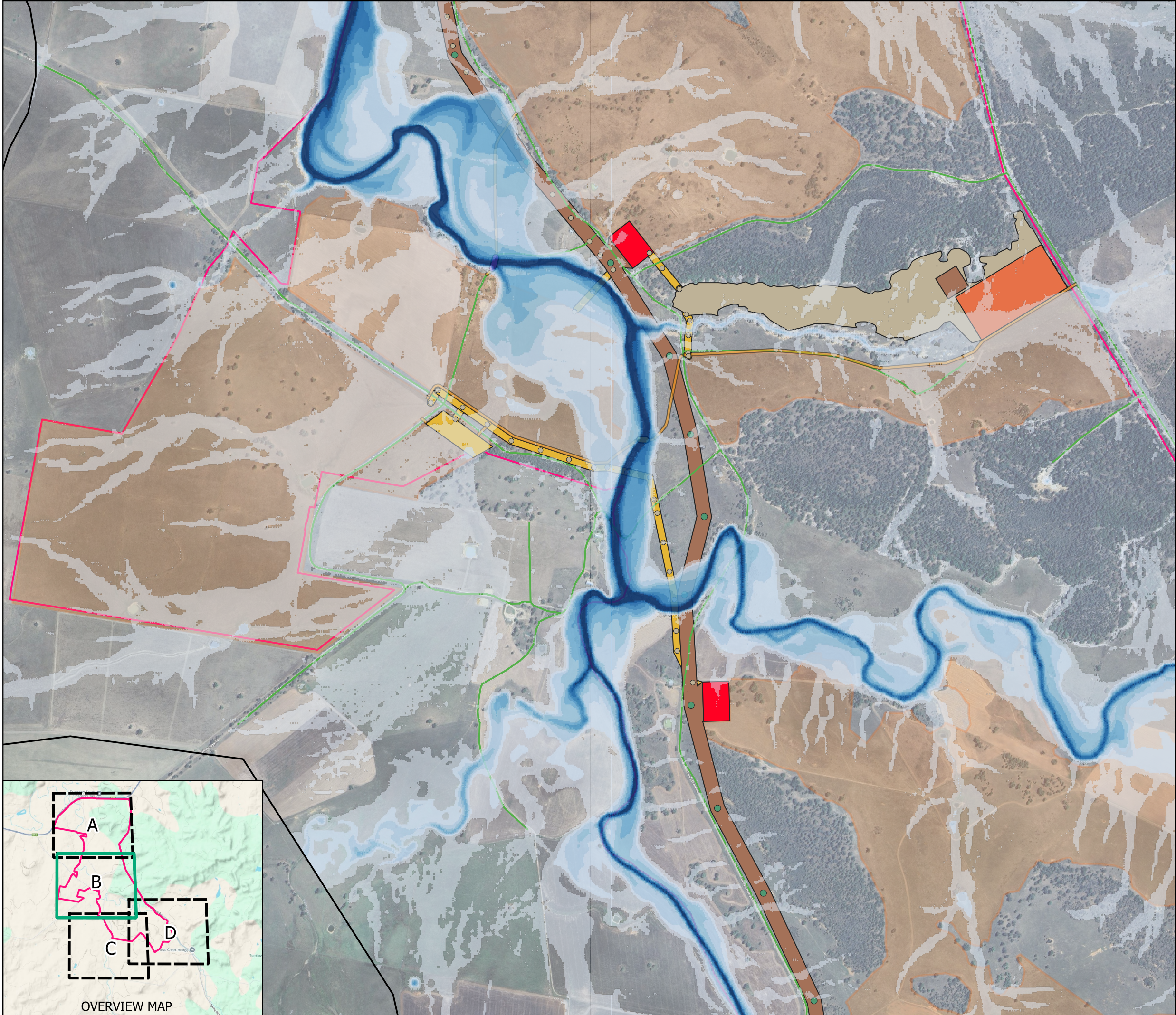
- Legend
- Hydraulic Model Extents
 - Project Area boundary
 - Future Developed Infrastructure
 - 330kV_Towers
 - 330kV Easement
 - 33kV_Poles
 - 33kV Easement
 - Secondary substations
 - Construction Areas
 - Access Roads
 - Roads 6m
 - Roads 12m
 - Existing Roads
 - Solar array area
 - Peak Flood Depth (m)
 - <= 0.0
 - 0.0 - 0.3
 - 0.3 - 0.6
 - 0.6 - 0.9
 - 0.9 - 1.2
 - 1.2 - 1.5
 - 1.5 - 1.8
 - 1.8 - 2.1
 - 2.1 - 2.4
 - 2.4 - 2.7
 - > 2.7

Cobbora Solar Project
Future Developed Case & 1% AEP Storm
Event - Peak Flood Depths
Post Development - PC Concrete Bridge
Inset Map A

PROJECT ID 60734058
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VERSION A

Map
1

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- Legend
- Hydraulic Model Extents
 - Project Area boundary
 - Future Developed Infrastructure
 - 330kV_Towers
 - 330kV Easement
 - 33kV_Poles
 - 33kV Easement
 - Secondary substations
 - Helipoint
 - Accommodation camp
 - Construction Area - Main
 - Construction Areas
 - Creek Crossings
 - Sandy Creek Crossing
 - Sweeney Lane Crossing
 - Access Roads
 - Roads 12m
 - Existing Roads
 - Solar array area

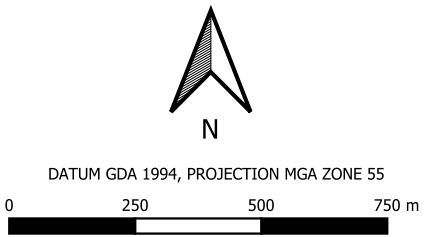
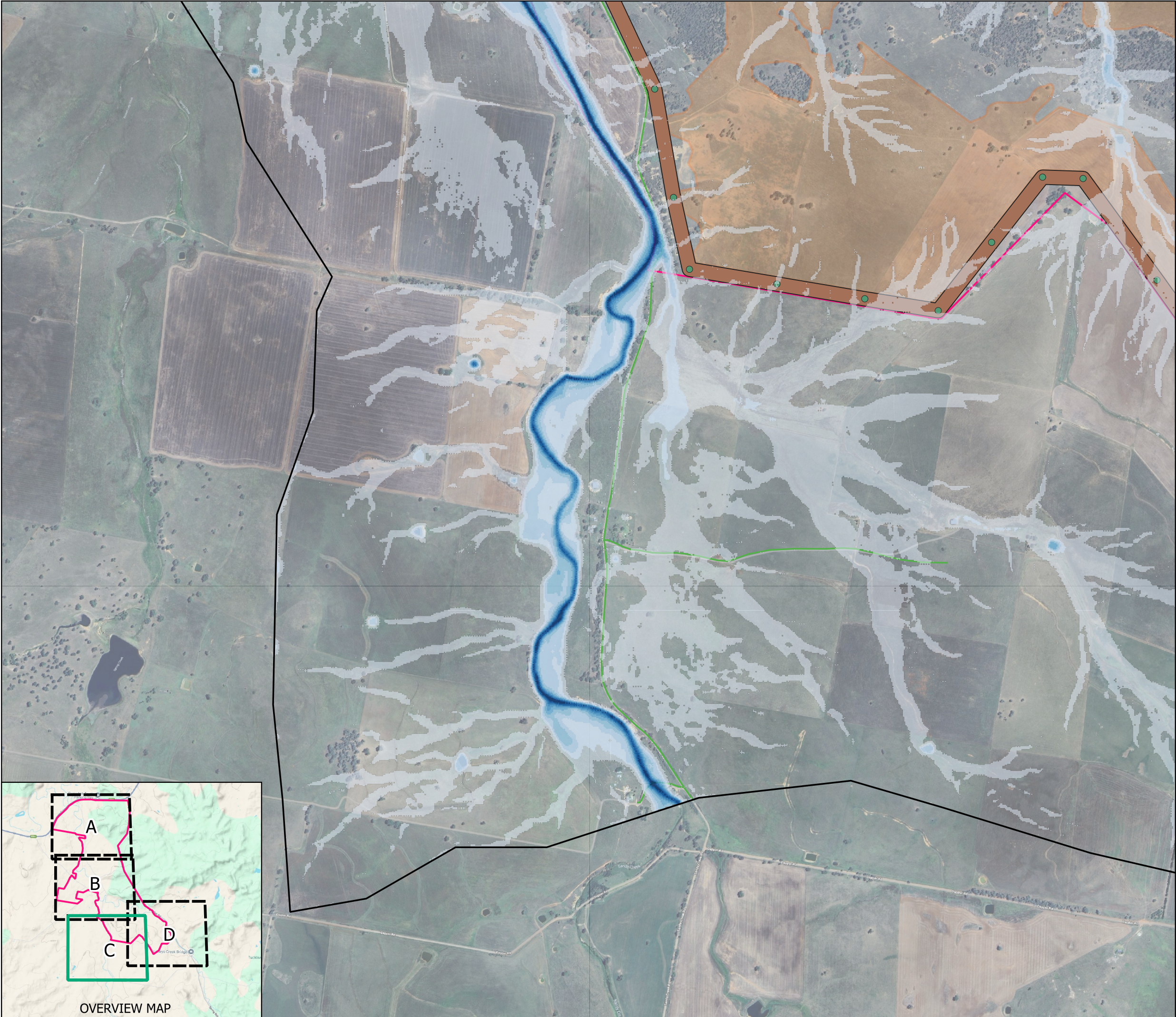
- Peak Flood Depth (m)
- <= 0.0
 - 0.0 - 0.3
 - 0.3 - 0.6
 - 0.6 - 0.9
 - 0.9 - 1.2
 - 1.2 - 1.5
 - 1.5 - 1.8
 - 1.8 - 2.1
 - 2.1 - 2.4
 - 2.4 - 2.7
 - > 2.7

Cobbora Solar Project
Future Developed Case & 1% AEP Storm
Event - Peak Flood Depths
Post Development - PC Concrete Bridge
Inset Map B

PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

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- Legend
- Hydraulic Model Extents
 - Project Area boundary
 - Future Developed Infrastructure
 - 330kV_Towers
 - 330kV Easement
 - Existing Roads
 - Solar array area
 - Peak Flood Depth (m)
 - ≤ 0.0
 - 0.0 - 0.3
 - 0.3 - 0.6
 - 0.6 - 0.9
 - 0.9 - 1.2
 - 1.2 - 1.5
 - 1.5 - 1.8
 - 1.8 - 2.1
 - 2.1 - 2.4
 - 2.4 - 2.7
 - > 2.7

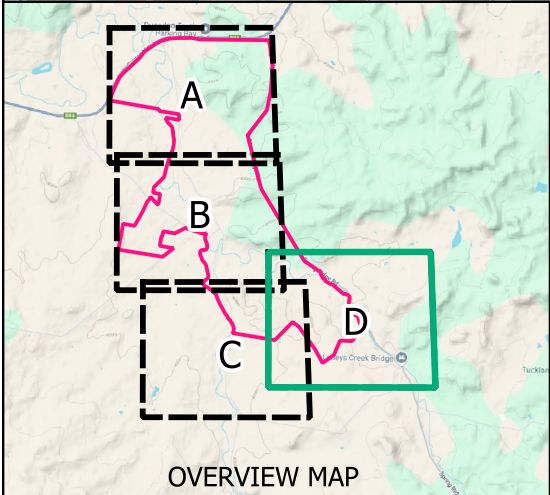
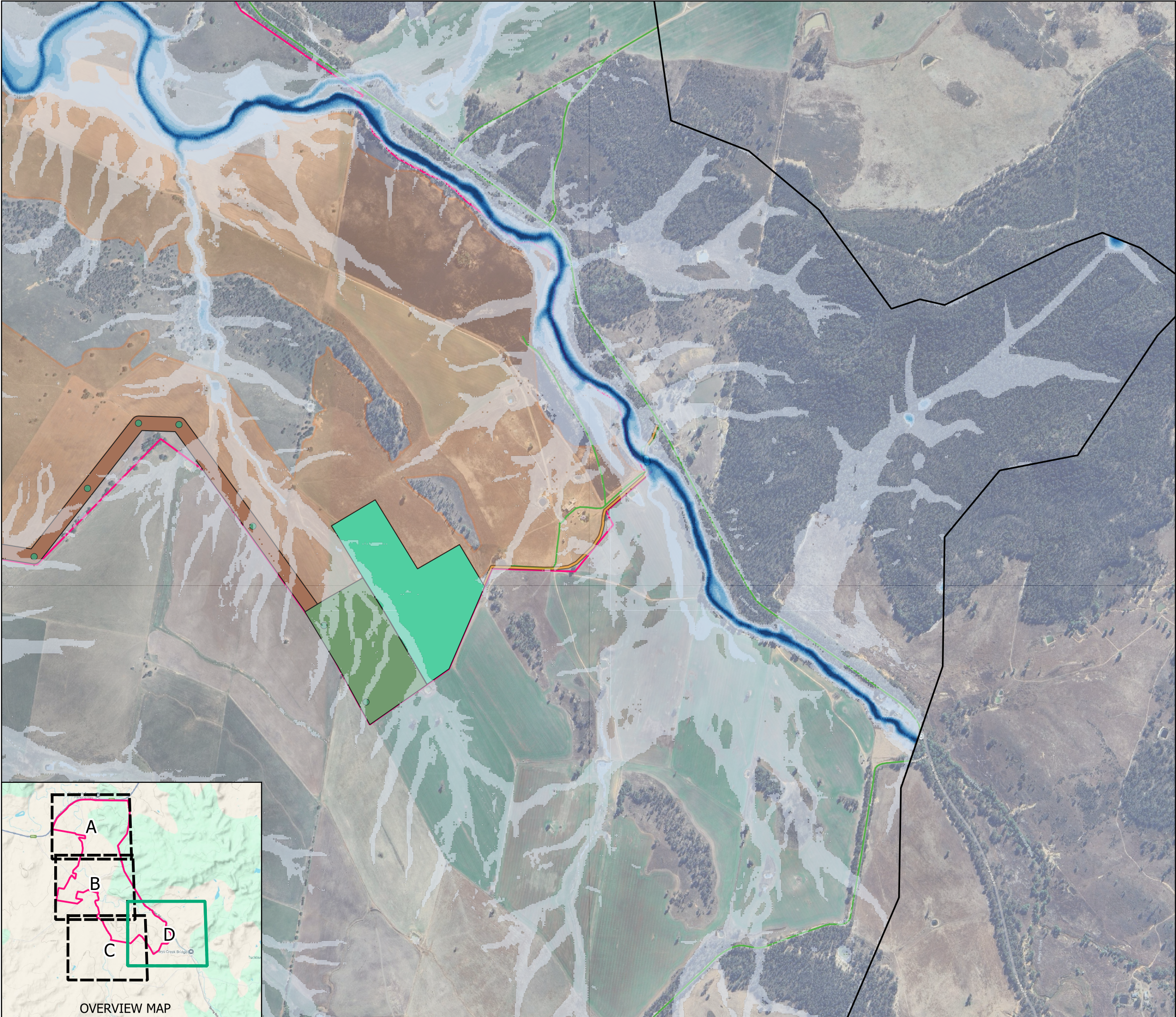
Cobbora Solar Project
Future Developed Case & 1% AEP Storm
Event - Peak Flood Depths
Post Development - PC Concrete Bridge
Inset Map C

PROJECT ID 60734058
CREATED BY ELSE
LAST MODIFIED 2025-05-14T16:21:50.958
VERSION A

Map
1

A3 size

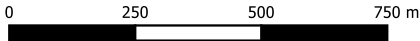
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:15,000 (when printed at A3)

Legend

Hydraulic Model Extents

Project Area boundary

Future Developed Infrastructure

330kV_Towers

330kV Easement

BESS 400MW

Main substation

Creek Crossings

Lahey Creek Crossing

Access Roads

Roads 12m

Existing Roads

Solar array area

Peak Flood Depth (m)

<= 0.0

0.0 - 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

> 2.7

Cobbora Solar Project
Future Developed Case & 1% AEP Storm
Event - Peak Flood Depths
Post Development - PC Concrete Bridge
Inset Map D

PROJECT ID 60734058
CREATED BY ELSE
LAST MODIFIED 2025-05-14T16:23:32.401
VERSION A

Map
1

A3 size

4.3.1 Golden Highway

The flood response at the Golden Highway - Sandy Creek crossing is described in Table 4-3.

Table 4-3 Golden Highway - Sandy Creek crossing results

Flood event AEP	Golden Highway - Sandy Creek bridge crossing*		
	Baseline	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
20%	Maximum flood level of 348.85 mAHD was modelled, with negligible differences (flood depth differ by less than 3mm and velocity by less than 0.01m/s) between baseline and post-development scenarios. The modelled flood depth is below the assumed bridge obvert level.		
1%	Maximum flood level of 349.69 mAHD was modelled, with negligible differences (flood depth differ by less than 2mm and velocity by less than 0.005m/s) between baseline and post-development scenarios. The modelled flood depth is below the assumed bridge obvert level.		
0.01%	Maximum flood level of 351.03 mAHD was modelled, with negligible differences (flood depth differ by less than 2mm and velocity by less than 0.005m/s) between baseline and post-development scenarios. The modelled flood depths are above the assumed bridge obvert level, but below the assumed bridge deck level.		

*The bridge crossing elevation was assumed at 351.5 mAHD, with the obvert level assumed at 350.7 mAHD.

No significant differences are observed through the Golden Highway structure between the baseline and two post-development scenarios as evident from Table 4-3. Slight increases in water levels for the post-development scenarios would not impact the Golden Highway structure by increasing the risk of being overtopped during more frequent events.

4.3.2 Creek Crossings

4.3.2.1 Sandy Creek Crossing

The hydraulic results for the Sandy Creek Crossing are summarised in Table 4-4.

Differences are observed at the Sandy Creek crossing between the baseline and two post-development scenarios. Increases in water levels for the post-development scenarios are noticed with the bridge structure being overtopped during all three simulated AEP events. It is to be noted, the creek does not have sufficient capacity to contain the 20% AEP event during the baseline case i.e. without a crossing structure and spreads across the floodplain at a width of 400m at this location. Velocity increases through the structure are also noted.

Table 4-4 Sandy Creek crossing hydraulic results

Flood event AEP	Sandy Creek Crossing	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
20% AEP:		
Afflux – Flood Depth	Increase in water level of approx. 48 mm, upstream of the bridge	Increase in water level of approx. 50 mm, upstream of the bridge
Afflux – DxV Product	Velocity through the bridge increases by approx. 1.5 m/s, causing the DxV product to increase	Velocity through the bridge increases by approx. 1.2 m/s, causing the DxV product to increase
General Comments	Bridge is overtopped by approx. 1.3 m	Bridge is overtopped by approx. 1.3 m
1% AEP:		
Afflux – Flood Depth	Increase in water level of approx. 85 mm, upstream of the bridge with	Increase in water level of approx. 100 mm, upstream of the bridge

Flood event AEP	Sandy Creek Crossing	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
	a slight reduction in the depth across the upstream floodplain (approx. 15mm)	with a slight reduction in the depth across the upstream floodplain (approx. 15mm)
Afflux – DxV Product	Velocity through the bridge increases by approx. 1.5 m/s, causing the DxV product to increase	Velocity through the bridge increases by approx. 1.5 m/s, causing the DxV product to increase
General Comments	Bridge is overtopped by approx. 1.6 m	Bridge is overtopped by approx. 1.65 m
0.01% AEP:		
Afflux – Flood Depth	Increase in water level of approx. 175 mm, upstream of the bridge with a slight reduction in the depth across the upstream floodplain (approx. 20mm)	Increase in water level of approx. 150 mm, upstream of the bridge with a slight reduction in the depth across the upstream floodplain (approx. 20mm)
Afflux – DxV Product	Velocity through the bridge increases by approx. 1.65 m/s, causing the DxV product to increase	Velocity through the bridge increases by approx. 1.65 m/s, causing the DxV product to increase
General Comments	Bridge is overtopped by approx. 2.4 m	Bridge is overtopped by approx. 2.38 m

4.3.2.2 Sweeneys Lane Crossing

The flood results for the Sweeneys Lane Crossing are summarised in Table 4-5.

The 20% AEP flood is not contained within the Sandy Creek extents, overflowing into the floodplain with of width of 150m at the proposed crossing location, noting this section is one of the narrower and confined sections of Sandy Creek. Increases in water levels for the post-development scenarios are noticed with the bridge structure being overtopped during all three simulated AEP events. Due to the creek being narrower at this section of Sandy Creek, the overtopping depths across the bridge structures are more than those observed at the Sandy Creek crossing further downstream. Velocity increases are also observed as the flow passes through the structure. Minor differences are observed between the various bridge structure scenario options.

Table 4-5 Sweeneys Creek crossing hydraulic results

Flood event AEP	Sweeneys Lane Crossing	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
20% AEP:		
Afflux – Flood Depth	Increase in water level of approx. 85 mm, upstream of bridge. Increases in water level along the western approach road to the structure are also observed.	Increase in water level of approx. 85 mm, upstream of bridge. Increases in water level along the western approach road to the structure are also observed.
Afflux – DxV Product	Velocity through the bridge increases by approx. 0.65 m/s, causing the DxV product to increase	Velocity through the bridge increases by approx. 0.45 m/s, causing the DxV product to increase
General Comments	Bridge is overtopped (approx. 2.0 m)	Bridge is overtopped (approx. 2.0 m)

Flood event AEP	Sweeneys Lane Crossing	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
1% AEP:		
Afflux – Flood Depth	Increase in water level of approx. 95 mm, upstream of bridge. Increases in water level along the western approach road to the structure are also observed	Increase in water level of approx. 100 mm, upstream of bridge. Increases in water level along the western approach road to the structure are also observed
Afflux – DxV Product	Velocity through the bridge increases by approx. 0.45 m/s, causing the DxV product to increase	Velocity through the bridge increases by approx. 0.3 m/s, causing the DxV product to increase
General Comments	Bridge is overtopped (approx. 2.55 m)	Bridge is overtopped (approx. 2.6 m)
0.01% AEP:		
Afflux – Flood Depth	Increase in water level of approx. 115 mm, upstream of bridge. Increases in water level along the western approach road to the structure are also observed	Increase in water level of approx. 120 mm, upstream of bridge. Increases in water level along the western approach road to the structure are also observed
Afflux – DxV Product	Velocity through the bridge increases by approx. 0.35 m/s, causing the DxV product to increase	Velocity through the bridge increases by approx. 0.32 m/s, causing the DxV product to increase
General Comments	Bridge is overtopped (approx. 3.35 m)	Bridge is overtopped (approx. 3.4 m)

4.3.2.3 Laheys Creek Crossing

The results for the Laheys Creek Crossing are summarised in Table 4-6.

Similar to Sandy Creek, discussed in Sections 4.3.2.1 and 4.3.2.2, Laheys Creek doesn't have sufficient capacity within the creek to convey the 20% AEP event and exceeds its banks, inundating the floodplain at this section of the creek by more than 250m. No major differences are observed between the two post-development scenarios with increases in both flood water levels and velocities observed in both scenarios compared to the baseline scenarios. The crossing is overtopped during all three scenarios.

Table 4-6 Laheys Creek crossing hydraulic results

Flood event AEP	Laheys Creek Crossing	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
20% AEP:		
Afflux – Flood Depth	Increase in water level of approx. 105 mm, upstream of bridge	Increase in water level of approx. 105 mm, upstream of bridge
Afflux – DxV Product	Velocity through the bridge increases by approx. 1.4 m/s, causing the DxV product to increase	Velocity through the bridge increases by approx. 1.2 m/s, causing the DxV product to increase
General Comments	Bridge is overtopped (approx. 0.95 m)	Bridge is overtopped (approx. 0.95 m)

Flood event AEP	Laheys Creek Crossing	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
1% AEP:		
Afflux – Flood Depth	Increase in water level of approx. 85 mm, upstream of bridge.	Increase in water level of approx. 85 mm, upstream of bridge.
Afflux – DxV Product	Velocity through the bridge increases by approx. 1.05 m/s, causing the DxV product to increase	Velocity through the bridge increases by approx. 0.85 m/s, causing the DxV product to increase
General Comments	Bridge is overtopped (approx. 1.6 m)	Bridge is overtopped (approx. 1.6 m)
0.01% AEP:		
Afflux – Flood Depth	Increase in water level of approx. 130 mm, upstream of bridge	Increase in water level of approx. 130 mm, upstream of bridge
Afflux – DxV Product	Velocity through the bridge increases by approx. 0.70 m/s, causing the DxV product to increase	Velocity through the bridge increases by approx. 0.7 m/s, causing the DxV product to increase
General Comments	Bridge is overtopped (approx. 2.1 m)	Bridge is overtopped (approx. 2.1 m)

4.3.3 Battery energy storage system (BESS)

The flood results across the proposed footprint for the BESS are summarised in Table 4-7. No differences in the results were observed between the two post-development scenarios.

The overland flow across the footprint only has a minor reduction in flow depth, while a decrease of up to 130mm is observed for the 0.01% AEP event along the defined watercourse located towards the western boundary of the BESS. A slight increase in the DxV product is observed during all three AEP events, noting that along the watercourse, a moderate to high risk of erosion persists.

Table 4-7 BESS hydraulic results

Flood event AEP	BESS	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
20% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 10 mm (depth of flow equal to 4mm) while along the watercourse along the western boundary, up to 86 mm (maximum depth of flow equal to 0.21m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.1m/s) while along the watercourse along the western boundary, up to 0.6m/s, causing the DxV product to increase slightly to 0.22m ² /s.	
General Comments	Minor reduction in flow depths and slight increase in DxV product due to an increase in flow velocities.	
1% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 15 mm while along the watercourse along the western boundary, up to 98 mm (maximum depth of flow equal to 0.28m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.13m/s) while along the watercourse along the western boundary, up to 0.6m/s, causing the DxV product to increase slightly to 0.57 m ² /s.	

Flood event AEP	BESS	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
General Comments	Minor reduction in flow depths and slight increase in DxV product due to an increase in flow velocities.	
0.01% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 2~5 mm while along the watercourse along the western boundary, up to 130 mm (maximum depth of flow equal to 0.45m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.3m/s) while along the watercourse along the western boundary, up to 0.8m/s, causing the DxV product to increase slightly to 1.03 m²/s.	
General Comments	Minor reduction in flow depths and slight increase in DxV product due to an increase in flow velocities.	

4.3.4 Main Substation

The flood results across the proposed footprint for the main substation are summarised in Table 4-8. No differences in the results were observed between the two post-development scenarios.

A minor reduction in the flow depth for the overland flow across the footprint is observed, while a maximum decrease of 102 mm is determined for the 0.01% AEP event located along the defined watercourse towards the eastern boundary of the substation. Slight increases in the DxV products across all three AEP events are observed, characterised with moderate erosive risk.

Table 4-8 Main substation hydraulic results

Flood event AEP	Main Substation	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
20% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 10 mm while along the watercourse along the north-eastern boundary, up to 27 mm (maximum depth of flow equal to 0.15m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.1m/s) while along the watercourse along the north-eastern boundary, up to 0.2m/s, causing the DxV product to increase slightly to 0.094m ² /s.	
General Comments	Minor reduction in flow depths and slight increase in DxV product due to an increase in flow velocities.	
1% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 15 mm while along the watercourse along the north-eastern boundary, up to 80 mm (maximum depth of flow equal to 0.24m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.27m/s) while along the watercourse along the north-eastern boundary, up to 0.48m/s, causing the DxV product to increase slightly to 0.32m ² /s.	
General Comments	Minor reduction in flow depths and slight increase in DxV product due to an increase in flow velocities.	
0.01% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 18 mm while along the watercourse along the north-eastern boundary, up to 102 mm (maximum depth of flow equal to 0.35m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.3m/s) while along the watercourse along the north-eastern boundary, up to 0.65m/s, causing the DxV product to increase slightly to 0.59m ² /s.	

Flood event AEP	Main Substation	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
General Comments	Minor reduction in flow depths and slight increase in DxV product due to an increase in flow velocities.	

4.3.5 Main Construction Area

No differences in the results were observed between the two post-development scenarios. The flood results across the main construction area boundary are summarised in Table 4-9.

The overland flow across the footprint only has a minor reduction in flow depth. A decrease of up to 55mm is observed for the 0.01% AEP event along the defined watercourse located towards the south-eastern boundary of the main construction area. A slight increase in the DxV product is observed during all three AEP events, noting that along the watercourse, a moderate to high risk of erosion persists, dependent on the ground cover.

Table 4-9 Main construction area

Flood event AEP	Main Construction Area	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
20% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 5~7 mm while along the watercourse along the south-eastern boundary, up to 44 mm (maximum depth of flow equal to 0.13m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.045m/s) while along the watercourse along the south-eastern boundary, up to 0.15m/s, causing the DxV product to increase slightly to 0.17m ² /s.	
General Comments	Minor reduction in flow depths and slight increase in DxV product due to an increase in flow velocities.	
1% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 8~10 mm while along the watercourse along the south-eastern boundary, up to 30 mm (maximum depth of flow equal to 0.23m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.07m/s) while along the watercourse along the south-eastern boundary, up to 0.18m/s, causing the DxV product to increase slightly to 0.25m ² /s.	
General Comments	Minor reduction in flow depths and slight increase in DxV product due to an increase in flow velocities.	
0.01% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 10~13 mm while along the watercourse along the south-eastern boundary, up to 55 mm (maximum depth of flow equal to 0.49m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.1m/s) while along the watercourse along the south-eastern boundary, up to 0.23m/s, causing the DxV product to increase slightly to 0.94m ² /s.	
General Comments	Minor reduction in flow depths and slight increase in DxV product due to an increase in flow velocities.	

4.3.6 Accommodation Camp

The flood results across the proposed footprint for the accommodation camp are summarised in Table 4-10. No differences in the results were observed between the two post-development scenarios.

A minor reduction in the flow depth for the overland flow across the footprint is observed, while a maximum decrease of 47 mm is observed for the 0.01% AEP event located along the defined watercourse towards the south-western boundary of the substation. Slight increases in the DxV products across all three AEP events are observed, characterised with moderate to high erosive risk, dependent on the respective AEP event.

Table 4-10 Accommodation camp results

Flood event AEP	Accommodation Camp	
	Post-Development: Scenario 1 – Steel Kit Bridge	Post-Development: Scenario 2 – Precast Concrete Bridge
20% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 3~5 mm while along the watercourse along the south-western boundary, up to 35 mm (maximum depth of flow equal to 0.21m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.045m/s) while along the watercourse along the south-western boundary, up to 0.22m/s, causing the DxV product to increase slightly to 0.27m ² /s.	
General Comments	Minor reduction in flow depths and slight increase in DxV product due to an increase in flow velocities.	
1% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 5~7 mm while along the watercourse along the south-western boundary, up to 37 mm (maximum depth of flow equal to 0.30m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.05m/s) while along the watercourse along the south-western boundary, up to 0.29m/s, causing the DxV product to increase slightly to 0.50m ² /s.	
General Comments	Minor reduction in flow depths and slight increase in DxV product due to an increase in flow velocities.	
0.01% AEP:		
Afflux – Flood Depth	Reduction in water level across most of the footprint of approx. 9~11 mm while along the watercourse along the south-western boundary, up to 47 mm (maximum depth of flow equal to 0.49m).	
Afflux – DxV Product	Minor increase in overland flow velocity across the footprint (approx. 0.08m/s) while along the watercourse along the south-western boundary, up to 0.39m/s, causing the DxV product to increase slightly to 1.13m ² /s.	
General Comments	Minor reduction in flow depths and an increase in the DxV product due to an increase in flow velocities.	

4.3.7 Incremental Impact across floodplain

Within the floodplains and catchment areas, the model results indicate slight decreases in flood depth across the areas allocated for solar panel arrays, internal roads and construction works due to the decrease in roughness. These areas also observe minor to no changes in the depth velocity product, resulting in minor alternating changes to the erosivity of flows.

5.0 Design considerations

At this stage, precise details and arrangements for several elements of the Project have not been finalised. The project will undergo a detailed design phase prior to construction to further mitigate and manage environmental and planning risks. General design consideration to consider during future stages for the various infrastructure for the future developed case, as shown in Figure 3-5, are summarised in Table 5-1. It is imperative to holistically consider the flood and drainage impacts of the Project. The design consideration should therefore be read considering the project components and limitations as listed in Section 7.0.

Table 5-1 General design considerations

Infrastructure Type	Design considerations
Internal and access roads	- Promote quick runoff from the road through various options, such as the road crossfall and constructed material - Install side ditches and cross-drains to accommodate and convey flow - Elevated road embankments where the roads are located in flood-prone areas and/or to ensure the appropriate AEP flood immunity is achieved - Regularly clear debris from drains and culverts through the development of a road maintenance plan - Use flood-resilient surfacing on roads to withstand submersion and/or overtopping of roads
Parking facility	- Slope parking lots to drainage inlets or swales. - Install stormwater pipelines with inlet grates and pits to allow rapid water egress. - Prevent pollutants from entering storm drains with the use of appropriate litter and debris traps and grids. - Use raised or tiered parking platforms where feasible. - Mark flood-prone sections with appropriate signage and install barriers during flood events. - Utilise drainage trenches to control water accumulation and convey overland flow paths around the parking facilities
BESS and main and secondary substations	- BESS and substations platforms to be elevated above flood levels (applicable AEP event to be determined). - Use permanent levees, berms, or deployable flood barriers to protect the substation from floodwaters. - Install perimeter drains, sump pumps, and/or stormwater detention basins to manage water flow and prevent flooding. - Raise critical electrical infrastructure above flood levels. - Establish a clear flood response plan, including staff roles, shutdown procedures, and emergency evacuation routes dependent on the various AEP events, nearby topography (close proximity to higher ground) and road condition.
Construction camp and laydown areas	- Grade the site to direct runoff away from work areas - Utilise drainage trenches to control water accumulation and convey water away from infrastructure - Store materials and equipment on raised platforms or pallets - Use weather forecasts and alerts from trusted advisories, such as the Bureau of Meteorology (BOM), to plan and anticipate storm events - Develop evacuation procedures and equipment protection strategies

Infrastructure Type	Design considerations
Site office and buildings	- Place site offices and buildings on stilts, raised pads, or mounds. - Install sandbags or portable barriers during storms to convey flow away from infrastructure. - Position electrical systems and IT infrastructure above expected flood levels.
Overhead electrical infrastructure	- Raise pole foundations above known flood levels. - Use concrete footings and deep pile reinforced pole foundations resistant to washout. - Install proper drainage measurements around pole bases to redirect water. - Use corrosion-resistant materials or coatings. - Conduct regular inspections, particularly after heavy rains, for leaning poles or exposed foundations and attend to any damage. - Implement vegetation management plans to maintain clear zones around infrastructure and prevent debris build-up during floods.

6.0 Erosion and Sediment Control

This section summarises Erosion and Sediment Control (ESC) considerations for the Project, to address SEARs.

6.1 General Principles

The Project involves a distributed layout across the large Project Area. Accordingly, the implementation of erosion and sediment control practices across the Project Area is a key environmental risk mitigation approach.

The Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004), commonly referred to as the “Blue Book”, outlines the guidelines to help mitigate the impacts on land disturbance activities on soil, landforms and receiving waters. This guideline outlines the development, implementation, instatement and monitoring requirements for Erosion and Sediment Control Plans (ESCPs), which are typically developed by Certified Professionals in Erosion and Sediment Control (CPESCs).

Best practice management of sites involves both erosion and sediment control measures, executed via an ESCP.

6.2 Identified Risks

The modelling completed for the Project Area has identified changes in flow conditions, predominantly at the following locations (refer Appendix A: Maps J1, J2, K1, K2, M1, M2, N1 and N2):

- Localised increases at the existing drainage paths, and
- Creek crossing locations.

Additionally, the ultimate development of infrastructure areas (such as the carpark and BESS) is likely to require the installation of local perimeter diversion drain works and internal drainage paths, which have the potential to create concentrated flow conditions.

These locations have the potential to result in erosion risks, which require mitigation and management procedures.

The Project has the following potential risks associated with ESC as outlined in Table 6-1.

Table 6-1 Identified Erosion and Sediment Risks

Phase	Risks	Overall Mitigation Strategy
Construction Period	- Disturbance of soils, vegetation over the proposed infrastructure areas (panel areas, BESS, carpark area). - Disturbances to existing watercourses, during construction of creek crossings*. - Disturbance of temporary construction areas, such as laydowns. - Increased traffic within the site area.	- Minimise the potential for temporary site works to mobilise sediment. - Capture sediment generated from construction activities. - Construction of a site which minimises the potential for sediment mobilisation and decreases the risk of erodibility.
Site Operation	- Maintenance and management of stormwater network features, such as any upgraded roads associated crossing drainage paths, and minor diversion drain features associated with infrastructure areas (such as the BESS). - Minimise and manage ongoing ESC risks posed by site vehicles. - Minimise and manage ongoing ESC risks posed by panels, such as dusting and erosion beneath panels.	- Monitor drainage paths associated with panel areas during the project duration - Minimise erosion and sediment issues across the project duration.
Decommissioning	- Sediment erosion risks associated with removal of panel and infrastructure areas. - Sediment mobilisation associated with revegetation areas. - Increased traffic within the site area.	Manage erosion risks until a stable, non-eroding rehabilitated condition is achieved.

* The proponent confirmed, at the time of this report, no bridge pier, columns or abutments are to be located within the creeks, thereby assuming construction of these structures will commence from both sides of the creek.

6.3 Design Aspects

The following aspects are recommendations to reduce the potential to generate and mobilise sediment:

- Access tracks, hardstand areas and carpark developments are proposed to be formed with a suitable pavement material, that is generally stable to dusting effects.
- Stormwater drains (such as perimeter diversions) required for infrastructure areas (such as the BESS, carpark, etc). Outlets of stormwater drains may result in concentrated flow will require outlet works, such as rock armoured pads, to mitigate erosion potential.
- Appropriate construction methodology during bridge construction stage to ensure no or minimised disruptions to the respective watercourses.

6.4 Construction ESCP

The key risks associated with ESC arise during the construction phase, related to the initial disturbance of the Development Footprint, in particular:

- Establishment of carpark, and any access tracks and road upgrades required
- Establishment of infrastructure areas (substations and BESS) and panel areas
- Temporary development of laydown and construction areas, and subsequent removal, especially during the construction of the bridges.

The EPC contractor is proposed to enact a Construction ESCP prepared consistent with the “Blue Book” (Landcom, 2004).

Typical measures may include:

- Development of ESC sequencing, such that erosion and sediment control measures are instated prior to any significant construction works
- Implementation of ESC devices, such as silt fencing, sediment traps, stormwater drains and other measures
- Dust suppression whenever necessary.

6.5 Site Operations ESCP

The ongoing management of the Project would operate according to an ESCP developed for the Project lifecycle.

Ongoing ESC management may include:

- Management of the stormwater network, including ongoing inspection, monitoring and if necessary, remediation. The stormwater network is expected to comprise:
 - Perimeter diversion drains associated with infrastructure areas (i.e. Carpark, BESS, substations, etc.)
 - Local drains for infrastructure areas
- Management of access track surfaces, and solar panel area extents.
- Monitoring of drainage paths in proximity to site infrastructure, bridge structures, and remedial works, if required.

6.6 Decommissioning

Decommissioning of the Project would operate according to an ESCP specific to the decommissioning and rehabilitation program. The execution of the ESCP would depend upon the parties involved in the decommissioning program, which is likely to involve an EPC contractor.

7.0 Conclusion

7.1 Baseline Flood Conditions

Baseline flood conditions can be summarised as follows:

- **Flooding along and adjacent to main watercourses, including Golden Highway, Sandy Creek and Laheys Creek:** Flow depths vary from 2.5 m and 5 m for the range of events modelled (20% AEP to 0.01% AEP), with depth velocity product results ranging from 4.1 m²/s and 10 m²/s.
- **Flooding along Northern Laydown area near Golden Highway:** This area is affected by flooding from Sandy Creek, with flood depths varying between approximately 1 m and 3 m and depth velocity products from 0.6 m²/s and 4.6 m²/s for the 20% and 0.01% AEP events, respectively.

- **All other areas, including BESS, main substation, secondary substations, main construction area, eastern laydown area along Spring Ridge Road, and accommodation camp:** These areas are all affected by overland flowpath flooding only. Flood depths even in an extreme 0.01% AEP event are limited to approximately 0.5 m, with depth velocity products limited to less than 0.1 m²/s.

7.2 Post-Development Hydraulic Impact

No significant differences in water level (afflux of 2–3 mm) or velocity (less than 0.01 m/s) were observed through the Golden Highway structure between the baseline and post-development scenarios.

The overall change in flooding conditions at the three creek crossing locations (Sandy, Sweeneys Lane and Laheys Creeks) is considered minor, relative to the baseline condition. During the three AEP events analysed, affluxes of 50–175 mm are present upstream of the respective bridge structure creek crossings, as described in Section 4.3.2. These three bridges were overtopped in all three AEP events (20%, 1% and 0.01% AEP) and will be non-trafficable during these conditions.

The water levels across the BESS footprint reduced by between 2 mm and 15 mm between the post-developed and baseline scenarios, dependent on the respective AEP, while along the defined water course towards the western boundary of the BESS, the levels reduced by between 86 mm and 130 mm. A maximum flow depth of 0.45 m was observed along this watercourse. The respective DxV product across all AEP events increased with a maximum increase of 0.25 m²/s during the 0.01% AEP event. The flow is characterised as being non-erosive during the 20% AEP event, and becoming moderate to highly erosive during the rare events.

Similar observations to the BESS footprint are made across the main substation footprint, with the water levels reducing by between 10 mm and 18 mm across the overland flow paths and between 27 mm and 102 mm along the watercourse towards the north-eastern boundary. The flow is also characterised by being non-erosive to moderately erosive, depending on the AEP event, as only slight increases in the DxV product are noted.

Due to the main construction area and accommodation camp being located directly adjacent to one another, the same defined watercourse flows along the southern boundary of both footprints. Therefore, similar observations are made in that the water levels reduced by no more than 13 mm across both footprints, and only a slight increase in the DxV products is observed (maximum value of 0.11 m²/s). The flow is characterised as non-erosive during the frequent AEP event and moderately to highly erosive during the rare AEP events.

7.3 Assessment gaps and future works

7.3.1 Project components

As mentioned in Section 5.0, precise details and arrangements for several elements of the Project have not been finalised and will undergo a detailed design phase prior to construction to further mitigate and manage environmental and planning risks. To holistically consider the flood and drainage impacts of the Project, the following recommendations for future works are listed in Table 7-1. Notwithstanding, the expected impact under the development case, compared to the baseline case is likely to be low.

Table 7-1 Future works

Aspect	Gap	Future Work
Bridge Structures - Creek Crossings	Only indicative footprint was available while the detailed design is still to be finalised i.e. no arrangements. Assumptions are as outlined in Section 3.2.	Type and details of bridge structure and vertical and horizontal alignment to be considered during detailed design. Carry out a bridge scour assessment as part of the bridge design.
Internal roads	Indicative footprint of roads available, but horizontal and vertical alignment details are yet to be finalised.	Crossing and drainage design are to be considered during detailed design. To mitigate the potential impact of any crossings, future detailed design of roads is

Aspect	Gap	Future Work
		to consider an appropriate erosion mitigation design, as described in “Blue Book” (Landcom, 2004). Erosion and Sediment Control Aspects are discussed in Section 5.0
Parking facility	Indicative footprint available without arrangements.	Local impacts to be assessed in the detailed design process for drainage and diversion design.
BESS and main and secondary substations	Indicative footprint available without arrangements.	As discussed in Section 4.3.2.3, the main substation is located within a concentrated flow path with flow depths less than 350mm during the 1% AEP event. The impacts from the raised pads are to be assessed in the detailed design process for drainage and diversion design to account for possible erosion and/or sedimentation and flowpath diversion.
Construction camp and laydown areas	Indicative footprint available but no arrangements available.	The potential impacts associated with the construction period is to include an <i>Erosion and Sediment Control Plan</i> as outlined in the “Blue Book” (Landcom, 2004).
General flood risk management	Indicative footprints available without horizontal and vertical alignments and arrangements.	Flood-prone areas require a comprehensive, site-specific evacuation plan that prioritises human safety while also protecting critical infrastructure where possible during the detailed design stage.

7.3.2 Talbragar River flooding

Inundation resulting from the Talbragar River, which may have the potential to propagate towards the Project Area via the Sandy Creek – Golden Highway bridge crossing, and other drainage elements, was not assessed.

Flooding of the Talbragar River may have the potential to affect the northern-most portion of the Project Area. Flooding of the Talbragar River was not assessed, as the Project is extremely unlikely to result in any impacts outside the Project Area during a flood from this source when considering the backflow nature of flooding and the elevated position of the proposed solar panels.

7.4 Limitations

The model results presented reflect the resolution and development approach of the assessment. The principal objective of the study is to develop a flood assessment suitable for analysing the potential impact arising from the Project. Accordingly, the results feature some limitations as follows:

- Road and minor crossing features are represented to various extents, and the vertical accuracy error of the datasets is moderate. Accordingly, actual conditions at the Project Area may vary, with some impact on the produced flood results.
- Bridge structures along creek crossings are presented based on the best available data at the time of this report, as no horizontal or vertical alignments or final design of the structures have been finalised. Only indicative details of the two bridge structure types were available, with instructions from the proponent to assume the bridge deck levels are to tie into the natural ground level at each respective creek embankment and that no piers or columns will be located within the creek i.e. clear span across the creeks. A scour assessment at each bridge structure was not included in the scope and is to be undertaken as part of the detailed design stage once the final bridge structure design options and alignments have been finalised.

- Detailed modelling of the Talbragar River was not completed, and inundation due to the Talbragar River was not assessed. While concurrent flooding of the Talbragar River and the Sandy Creek/Laheys Creek system is plausible, backflow from the Talbragar River is expected to have low velocities and minimal interaction with infrastructure, making its inclusion in the study unnecessary.

Land use, catchment conditions, and infrastructure data (e.g., bridges, culverts) have been assumed to be correctly represented based on available datasets at the time of the study. The flood assessment results depict the extent and depth of flooding due to design storm events occurring within the Sandy Creek and Laheys Creek catchments (i.e., south of Golden Highway). Flood extents presented in this study are based on model outputs and should be interpreted as indicative rather than absolute representations of flood behaviour. The models used in this study represent the best available engineering practices but are inherently simplified representations of real-world flood processes.

8.0 Reference List

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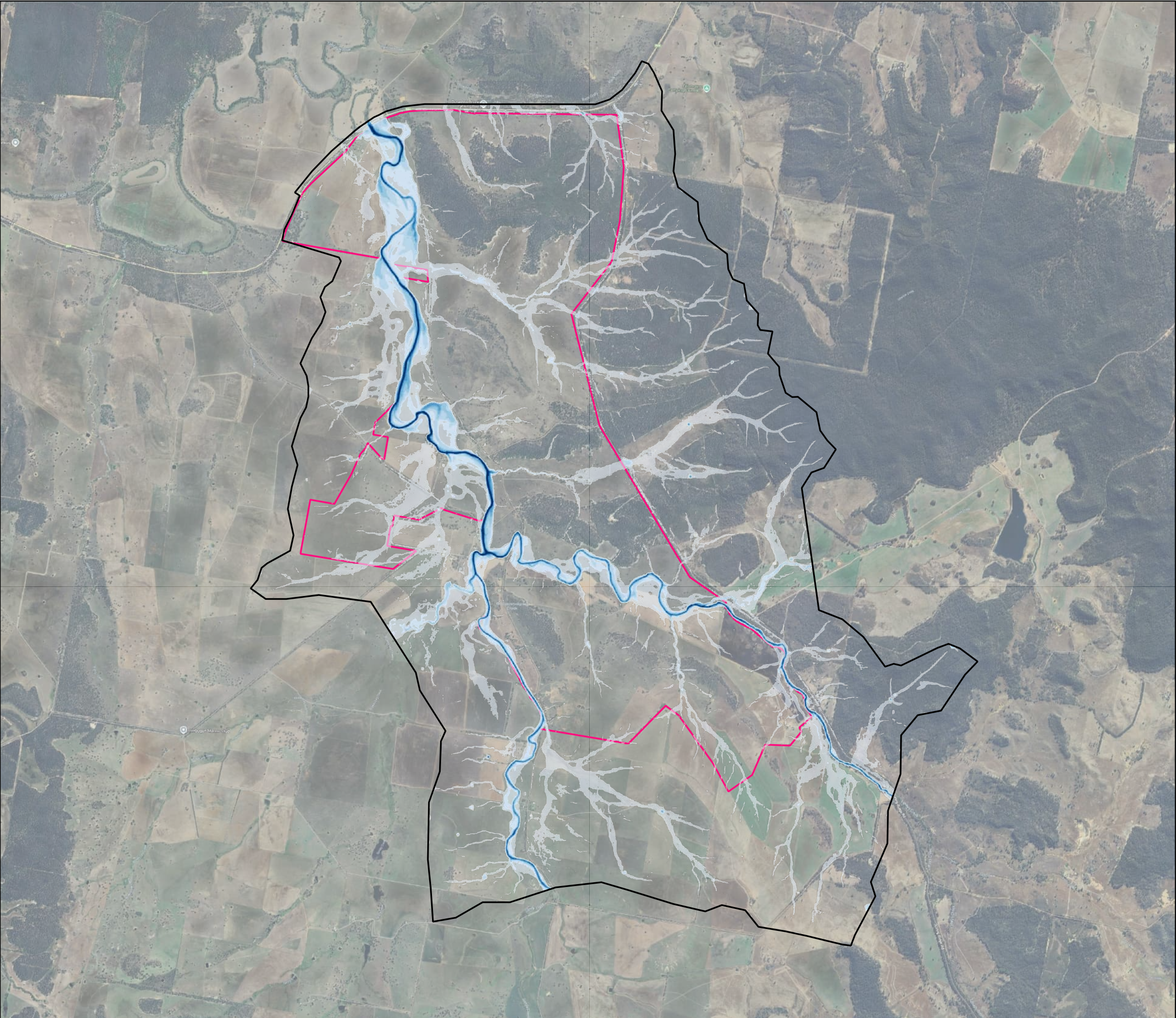
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Appendix A

Mapped Results

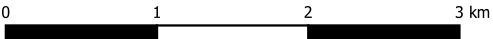
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LEGEND

- Project Area Boundary
- Hydraulic Model Extents

Peak Flood Depth (m)

- ≤ 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- 1.2 - 1.5
- 1.5 - 1.8
- 1.8 - 2.1
- 2.1 - 2.4
- 2.4 - 2.7
- > 2.7

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Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Baseline 20% AEP Storm Event

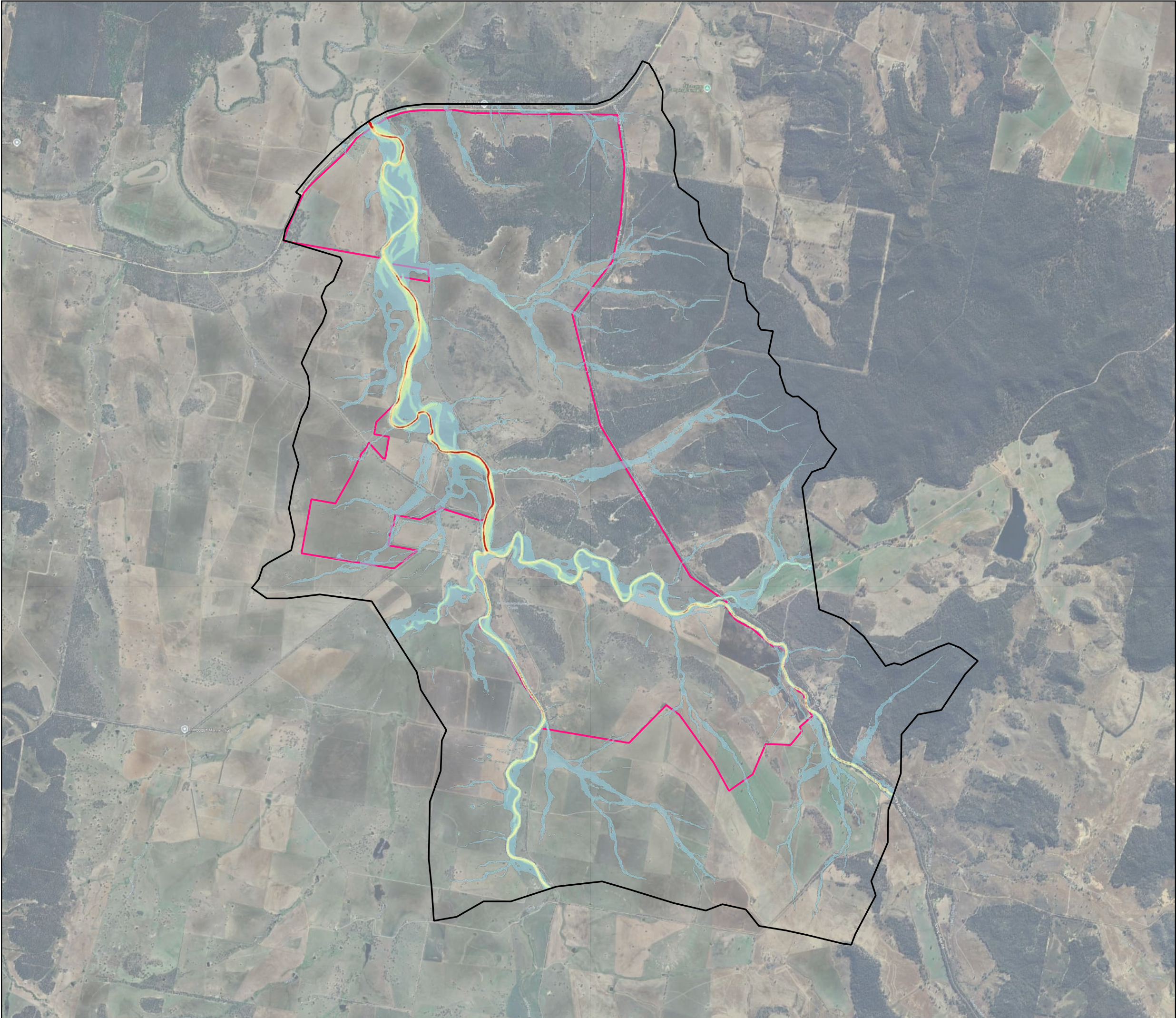
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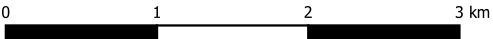
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LEGEND

Project Area Boundary

Hydraulic Model Extents

Peak Depth Velocity Product (m2/s)

<= 0.5

0.5 - 1.0

1.0 - 2.0

2.0 - 3.0

3.0 - 4.0

4.0 - 5.0

> 5.0

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Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Baseline 20% AEP Storm Event

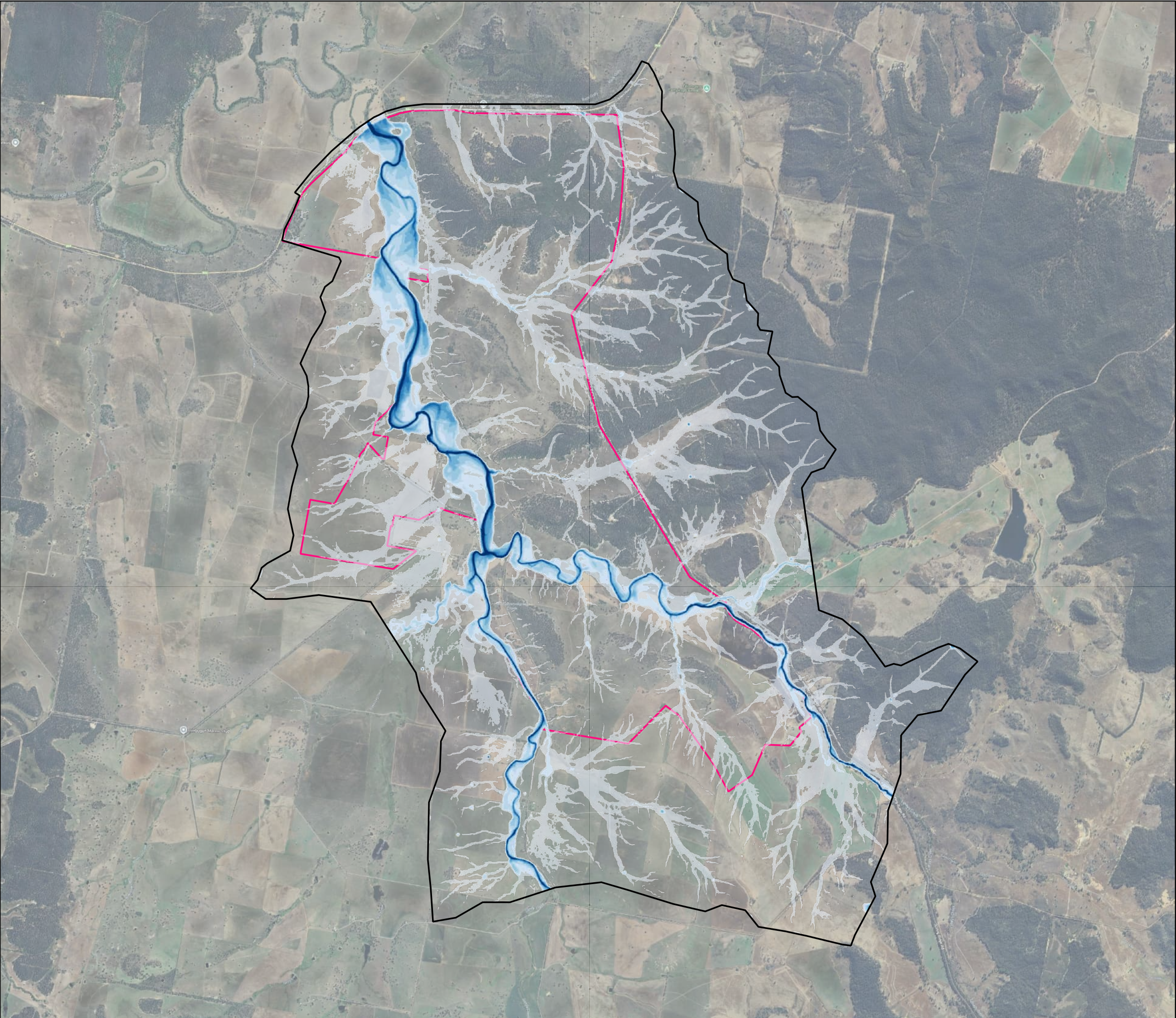
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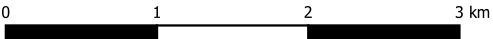
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LEGEND

-  Project Area boundary
-  Hydraulic Model Extents

Peak Flood Depth (m)

-  ≤ 0.3
-  0.3 - 0.6
-  0.6 - 0.9
-  0.9 - 1.2
-  1.2 - 1.5
-  1.5 - 1.8
-  1.8 - 2.1
-  2.1 - 2.4
-  2.4 - 2.7
-  > 2.7

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Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Baseline 1% AEP Storm Event

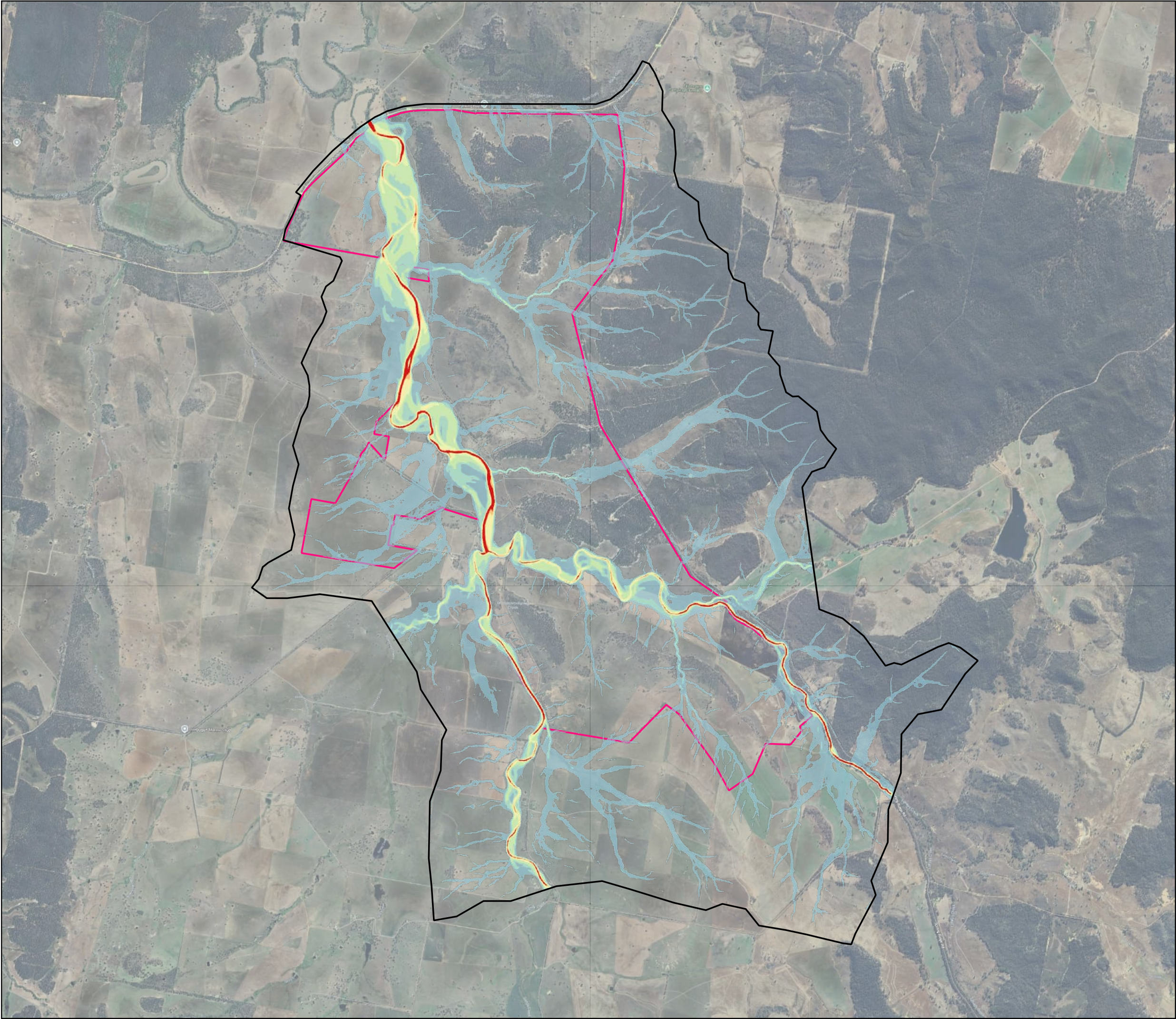
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- LEGEND
- Project Area boundary
 - Hydraulic Model Extents
- Peak Depth Velocity Product (m2/s)
- ≤ 0.5
 - 0.5 - 1.0
 - 1.0 - 2.0
 - 2.0 - 3.0
 - 3.0 - 4.0
 - 4.0 - 5.0
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Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Baseline 1% AEP Storm Event

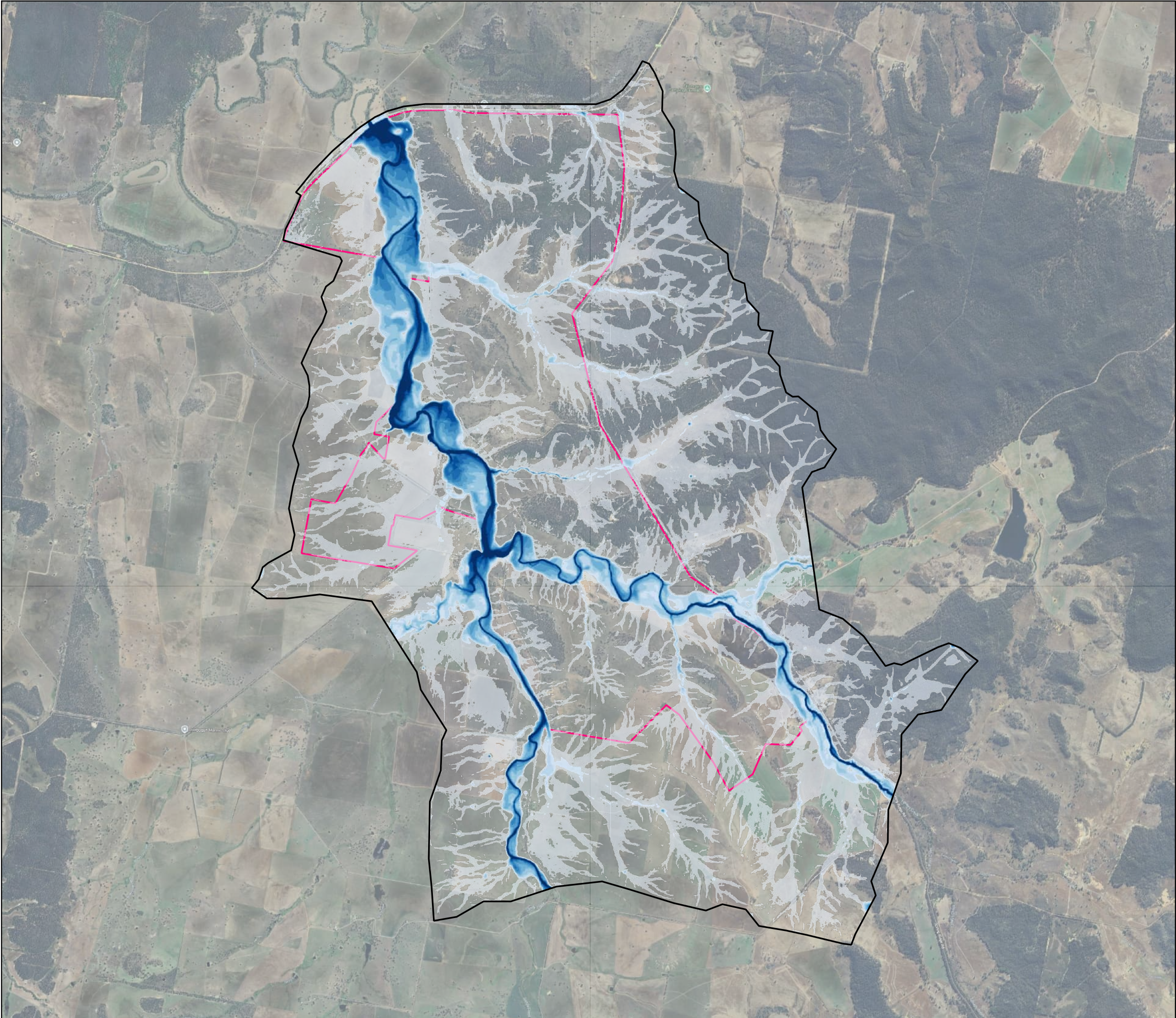
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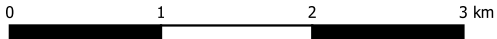


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LEGEND

-  Project Area boundary
-  Hydraulic Model Extents

Peak Flood Depth (m)

-  ≤ 0.3
-  0.3 - 0.6
-  0.6 - 0.9
-  0.9 - 1.2
-  1.2 - 1.5
-  1.5 - 1.8
-  1.8 - 2.1
-  2.1 - 2.4
-  2.4 - 2.7
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Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Baseline 0.01% AEP Storm Event

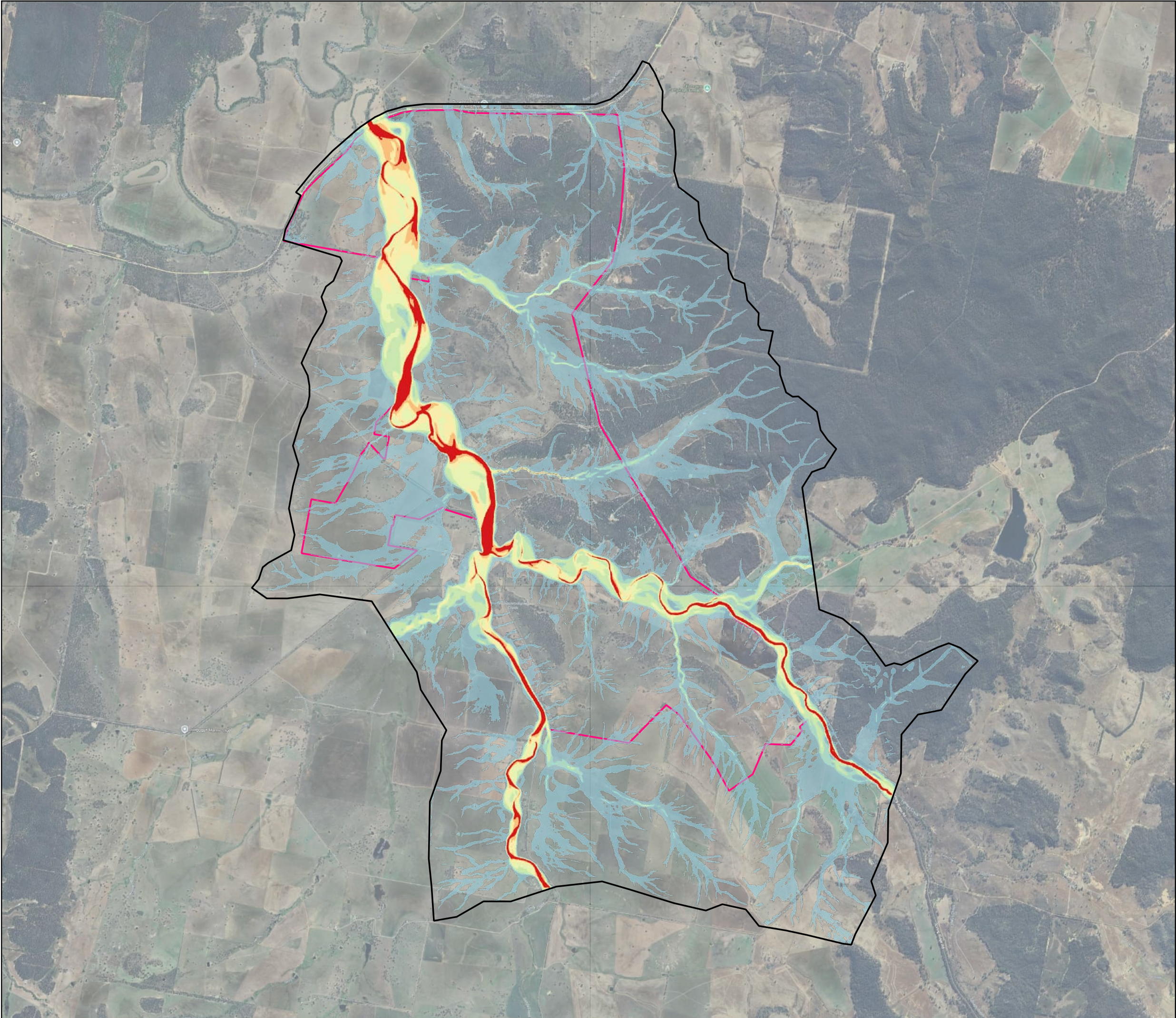
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0 1 2 3 km

1:50,000 (when printed at A3)

LEGEND

- Project Area boundary
- Hydraulic Model Extents
- Peak Depth Velocity Product (m2/s)
 - ≤ 0.5
 - 0.5 - 1.0
 - 1.0 - 2.0
 - 2.0 - 3.0
 - 3.0 - 4.0
 - 4.0 - 5.0
 - > 5.0

Attribution of Sources: © 2025, Google Satellite

Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Baseline 0.01% AEP Storm Event

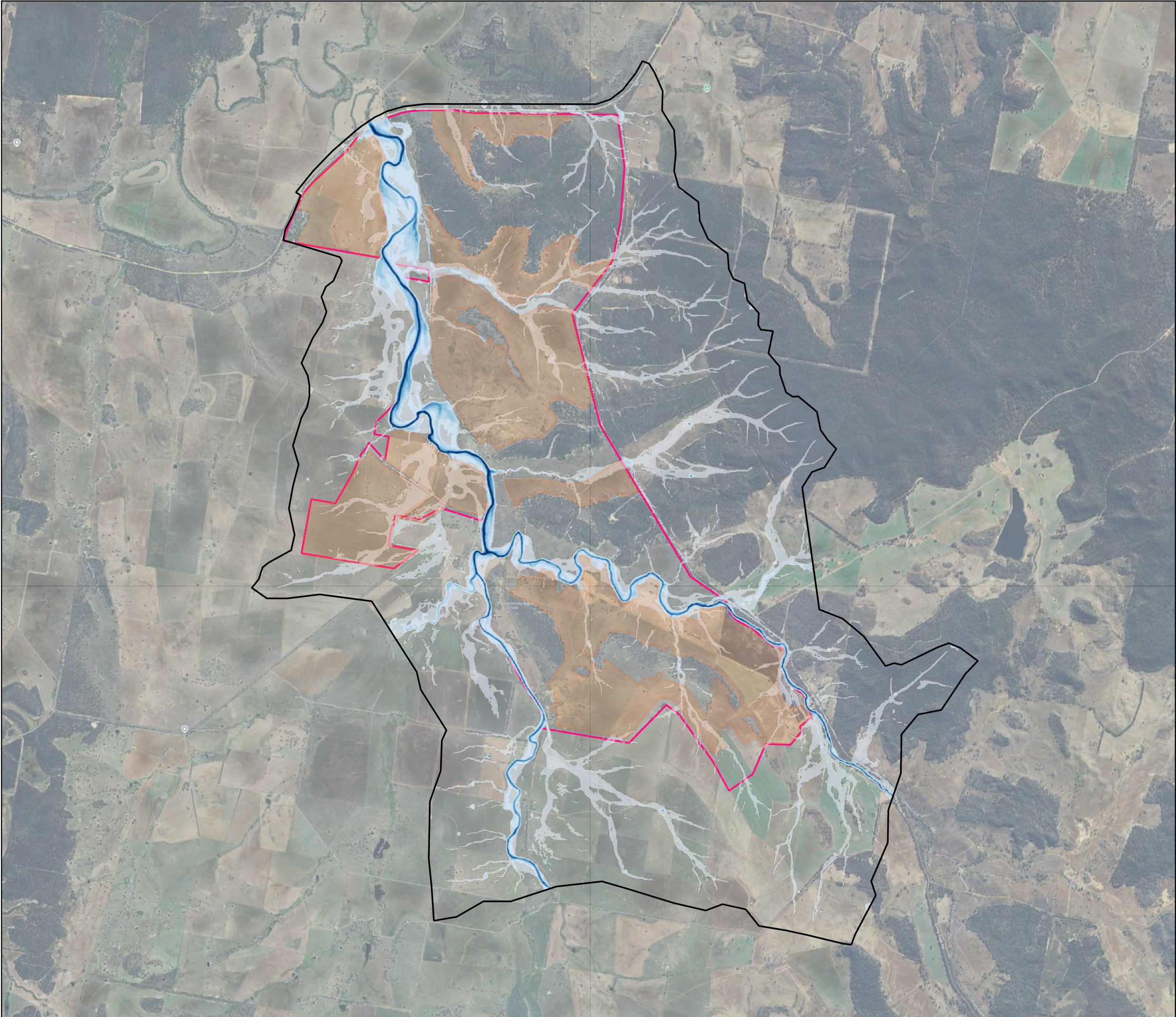
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T14:26:19.143
A

Map
C2

A3 size

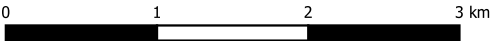
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

- Project Area boundary
- Solar Array Area
- Hydraulic Model Extents

Peak Flood Depth (m)

- <= 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- 1.2 - 1.5
- 1.5 - 1.8
- 1.8 - 2.1
- 2.1 - 2.4
- 2.4 - 2.7
- > 2.7

Attribution of Sources: © 2025, Google Satellite

Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Post Development - Steel Kit Bridge
20% AEP Storm Event

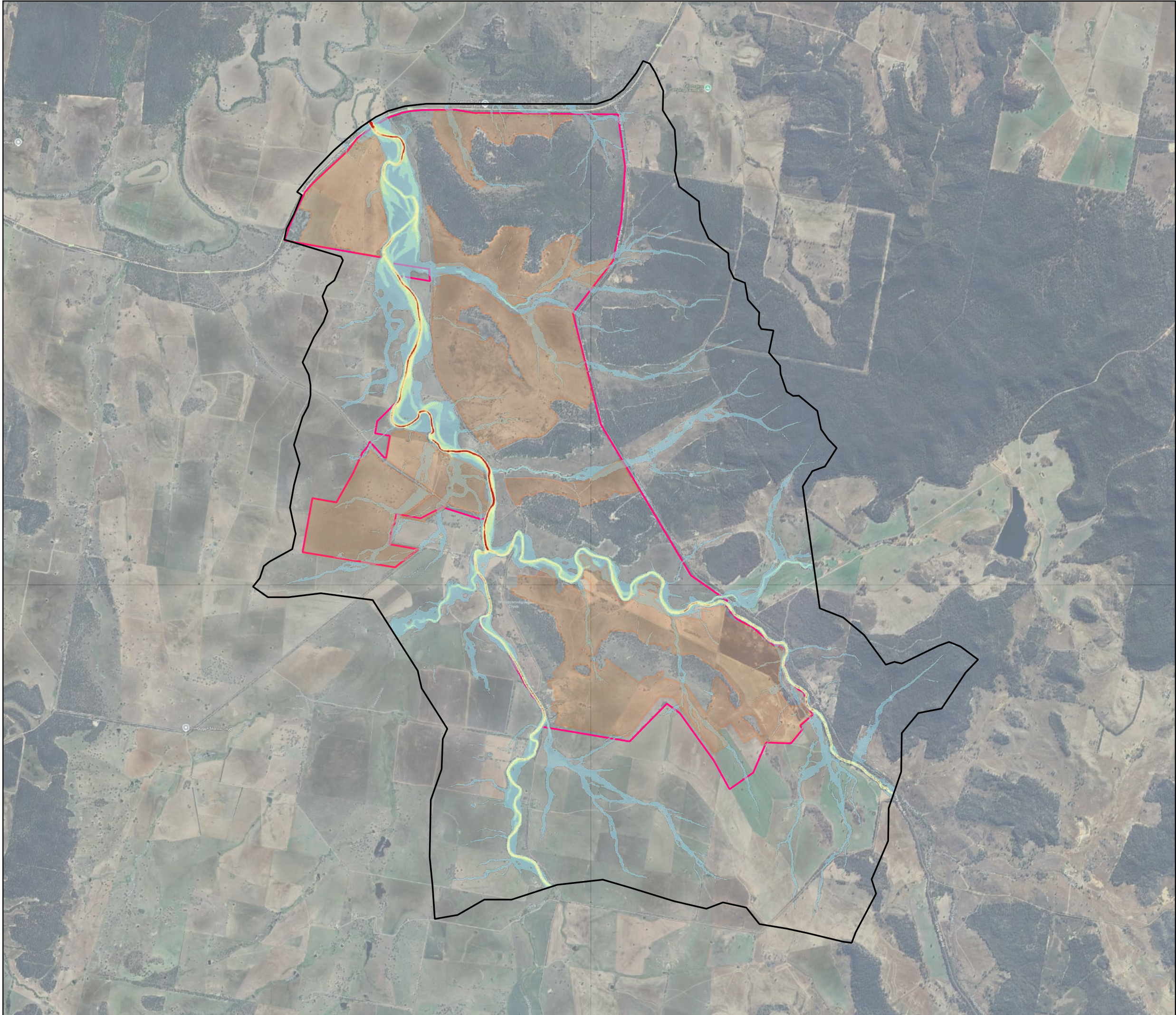
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T14:35:36.723
A

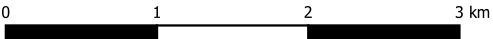
Map
D1

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

- LEGEND
- Project Area boundary
 - Solar Array Area
 - Hydraulic Model Extents
 - Peak Depth Velocity Product (m2/s)
 - <= 0.5
 - 0.5 - 1.0
 - 1.0 - 2.0
 - 2.0 - 3.0
 - 3.0 - 4.0
 - 4.0 - 5.0
 - > 5.0

Attribution of Sources: © 2025, Google Satellite

Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Post Development - Steel Kit Bridge
20% AEP Storm Event

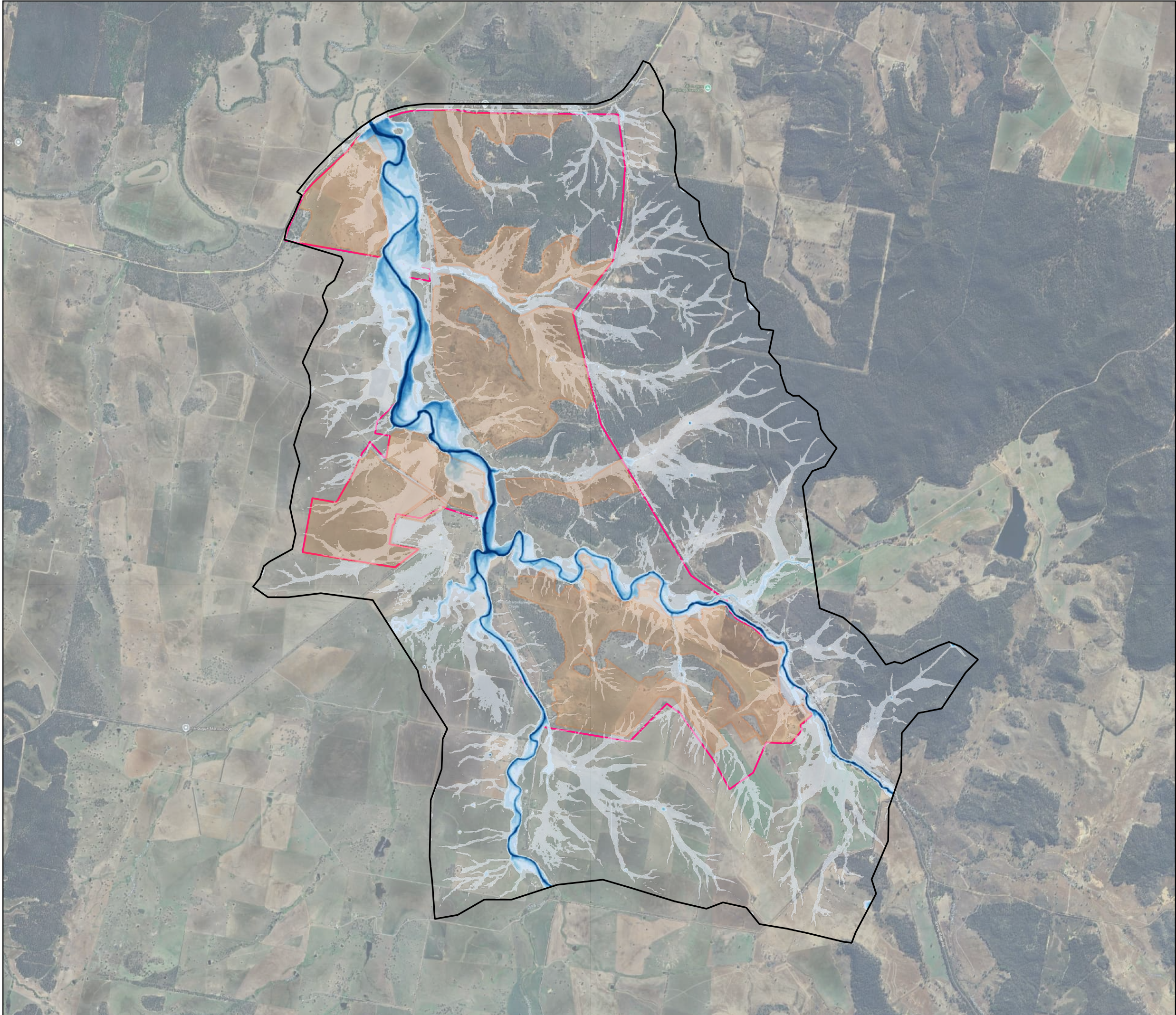
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T14:33:51.354
A

Map
D2

A3 size

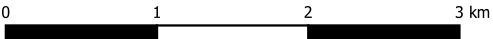
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

- Project Area boundary
- Solar Array Area
- Hydraulic Model Extents

Peak Flood Depth (m)

- ≤ 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- 1.2 - 1.5
- 1.5 - 1.8
- 1.8 - 2.1
- 2.1 - 2.4
- 2.4 - 2.7
- > 2.7

Attribution of Sources: © 2025, Google Satellite

Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Post Development - Steel Kit Bridge
1% AEP Storm Event

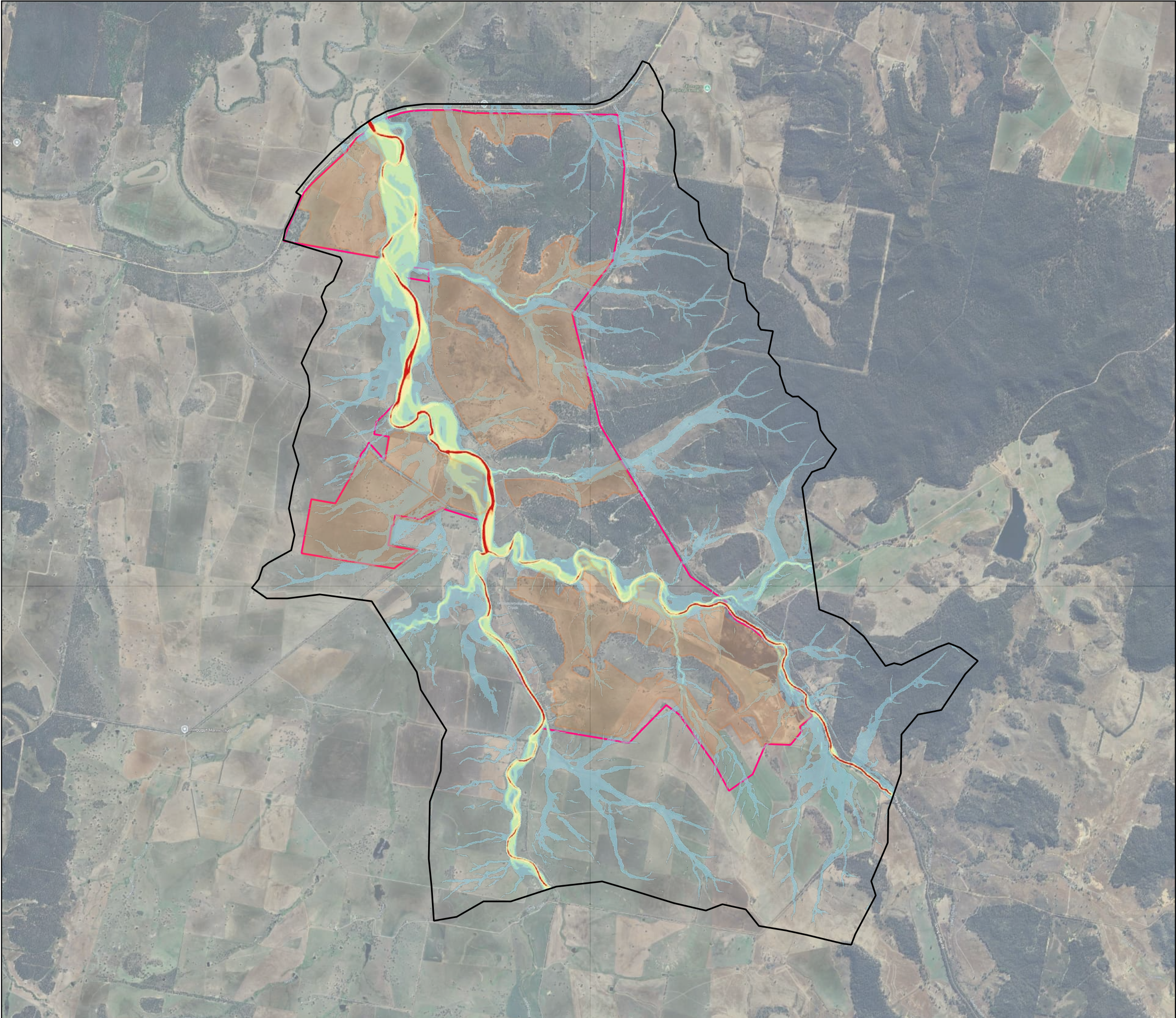
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T16:04:00.667
A

Map
E1

A3 size

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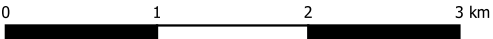


AECOM



N

DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

 Solar Array Area

 Hydraulic Model Extents

Peak Depth Velocity Product (m2/s)

 ≤ 0.0

 0.0 - 0.5

 0.5 - 1.0

 1.0 - 2.0

 2.0 - 3.0

 3.0 - 4.0

 4.0 - 5.0

 > 5.0

Attribution of Sources: © 2025, Google Satellite

Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Post Development - Steel Kit Bridge
1% AEP Storm Event

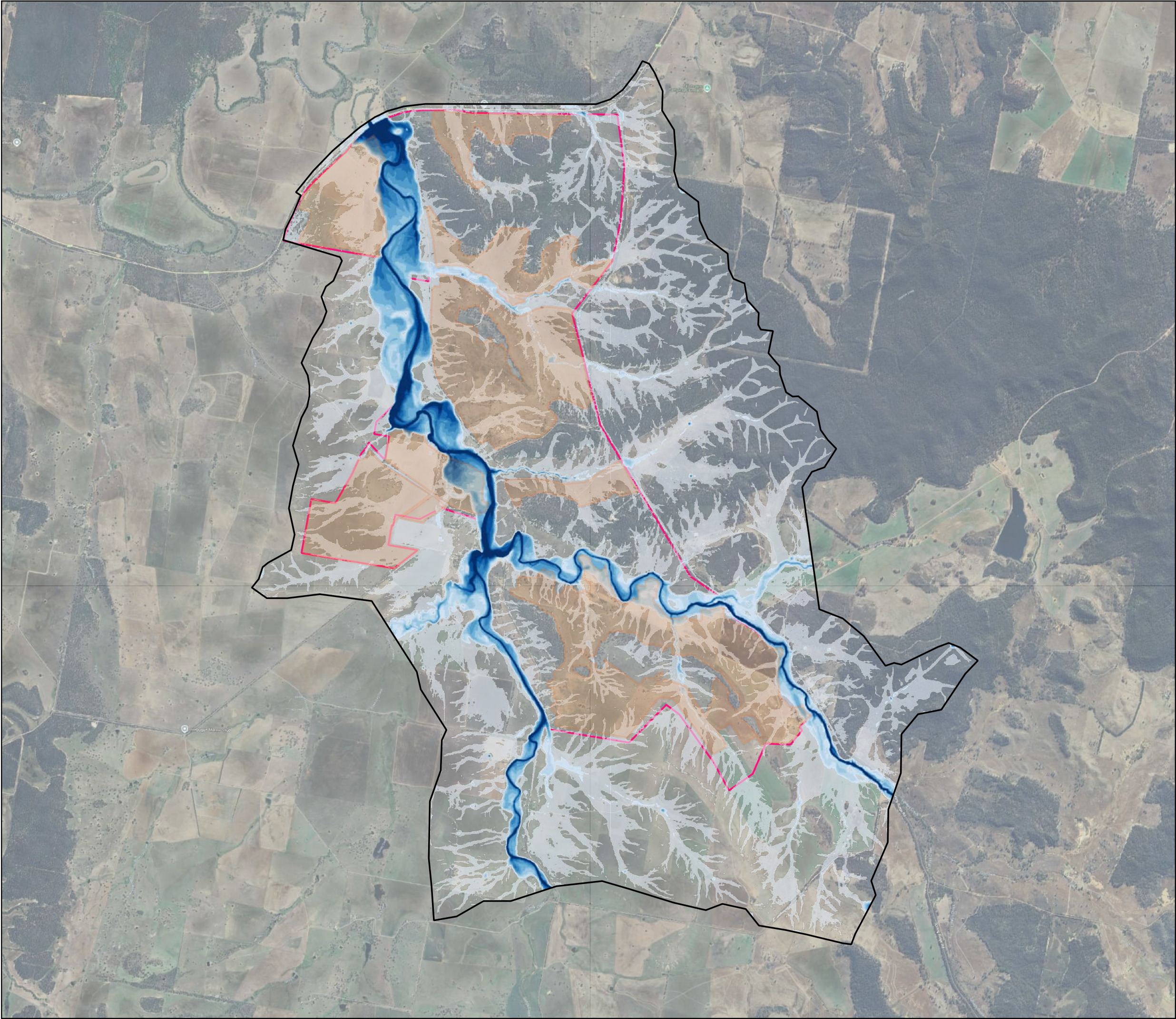
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60680887
priyam.awotar
2025-02-21T15:01:42.156
A

Map
E2

A3 size

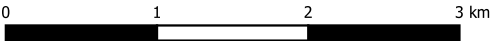
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

- Project Area boundary
- Solar Array Area
- Hydraulic Model Extents

Peak Flood Depth (m)

- <= 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- 1.2 - 1.5
- 1.5 - 1.8
- 1.8 - 2.1
- 2.1 - 2.4
- 2.4 - 2.7
- > 2.7

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Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Post Development - Steel Kit Bridge
0.01% AEP Storm Event

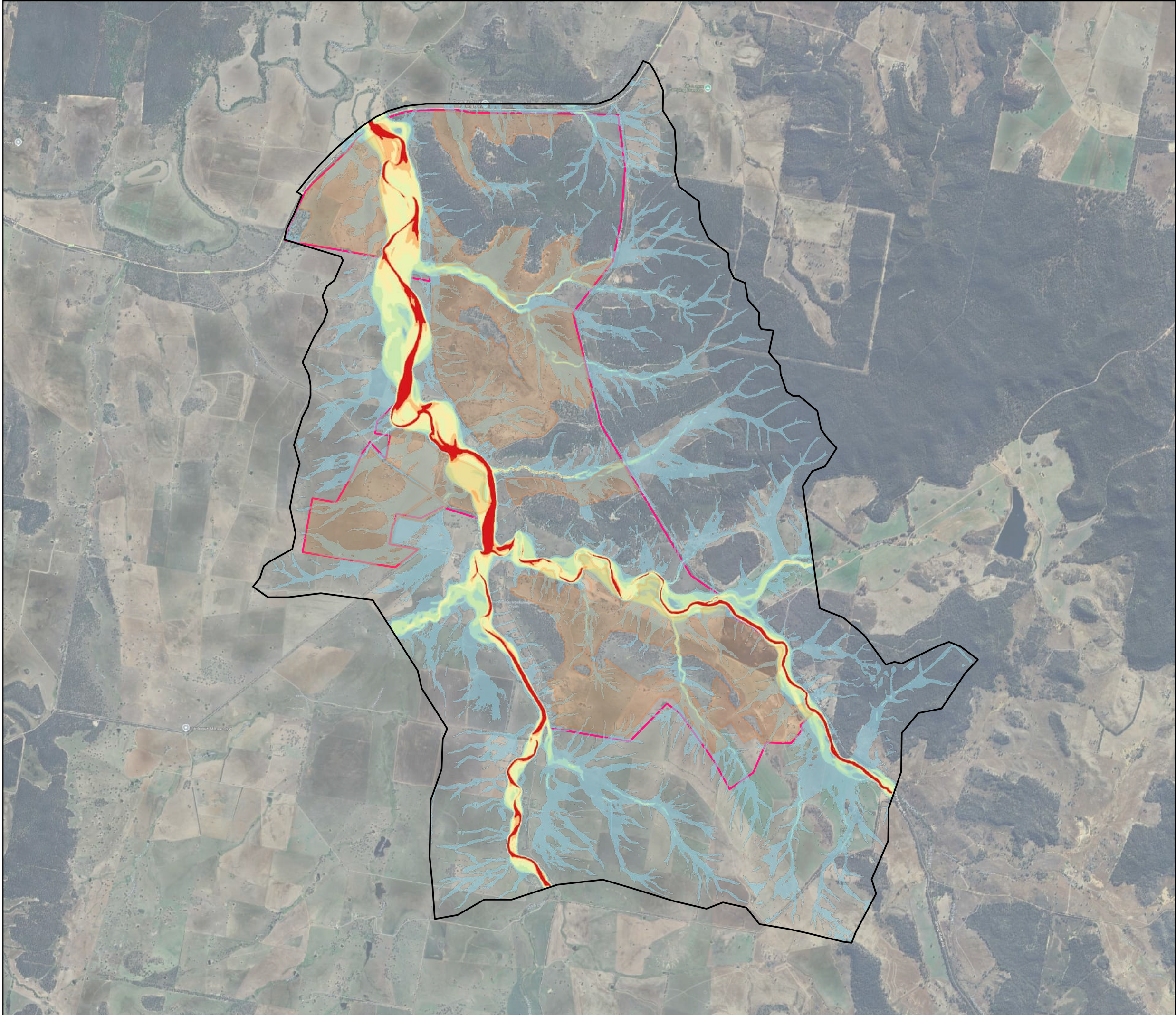
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T15:03:07.088
A

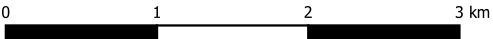
Map
F1

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

Project Area boundary

Solar Array Area

Hydraulic Model Extents

Peak Depth Velocity Product (m2/s)

<= 0.5

0.5 - 1.0

1.0 - 2.0

2.0 - 3.0

3.0 - 4.0

4.0 - 5.0

> 5.0

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Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Post Development - Steel Kit Bridge
0.01% AEP Storm Event

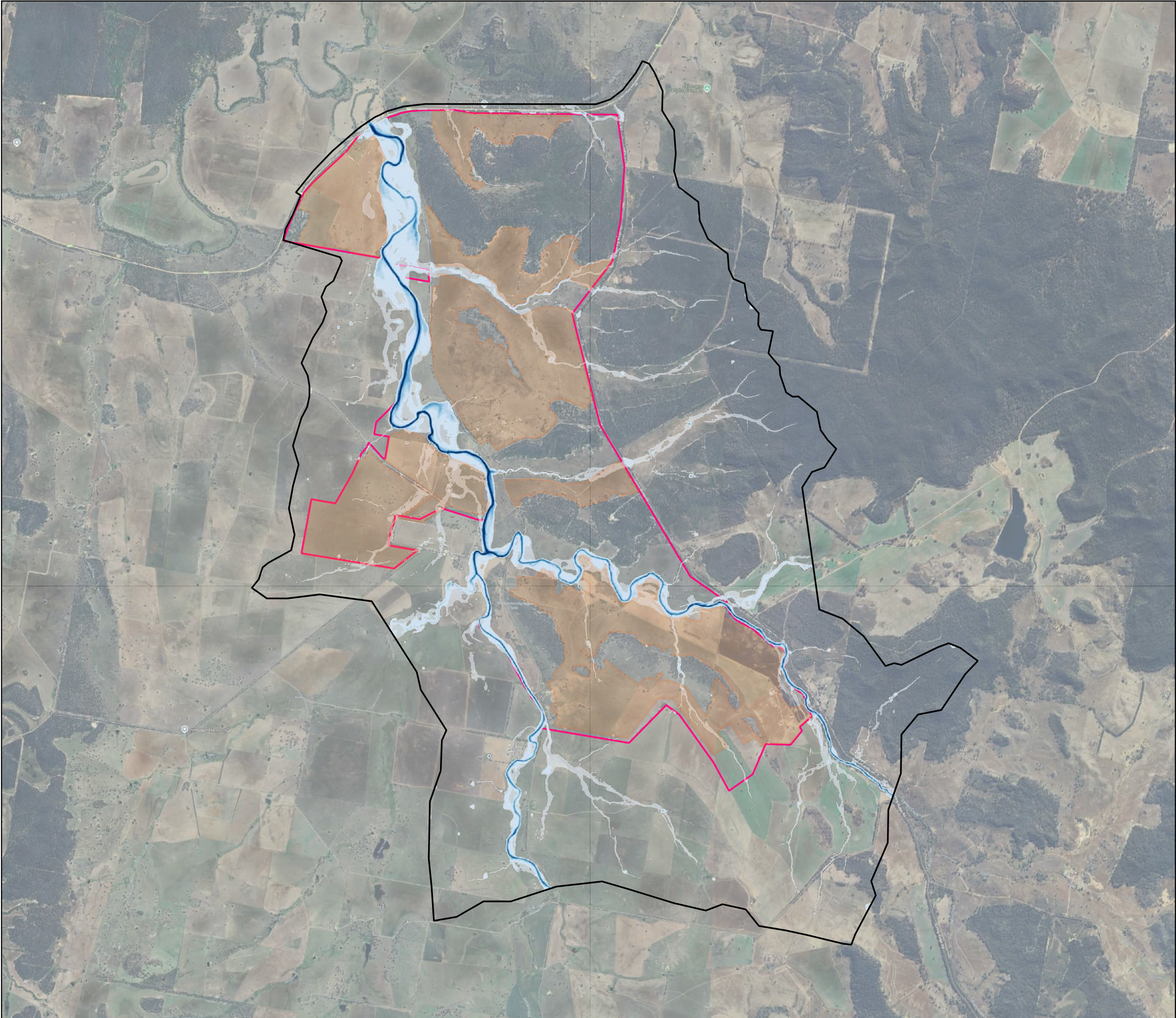
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T15:06:44.668
A

Map
F2

A3 size

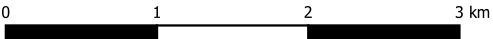
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

- LEGEND
- Project Area boundary
 - Solar Array Area
 - Hydraulic Model Extents

- Peak Flood Depth (m)
- <= 0.3
 - 0.3 - 0.8
 - 0.8 - 1.1
 - 1.1 - 1.4
 - 1.4 - 1.6
 - 1.6 - 1.9
 - 1.9 - 2.2
 - 2.2 - 2.5
 - 2.5 - 2.7
 - > 2.7

Attribution of Sources: © 2025, Google Satellite

Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Post Development - Precast Concrete
Bridge
20% AEP Storm Event

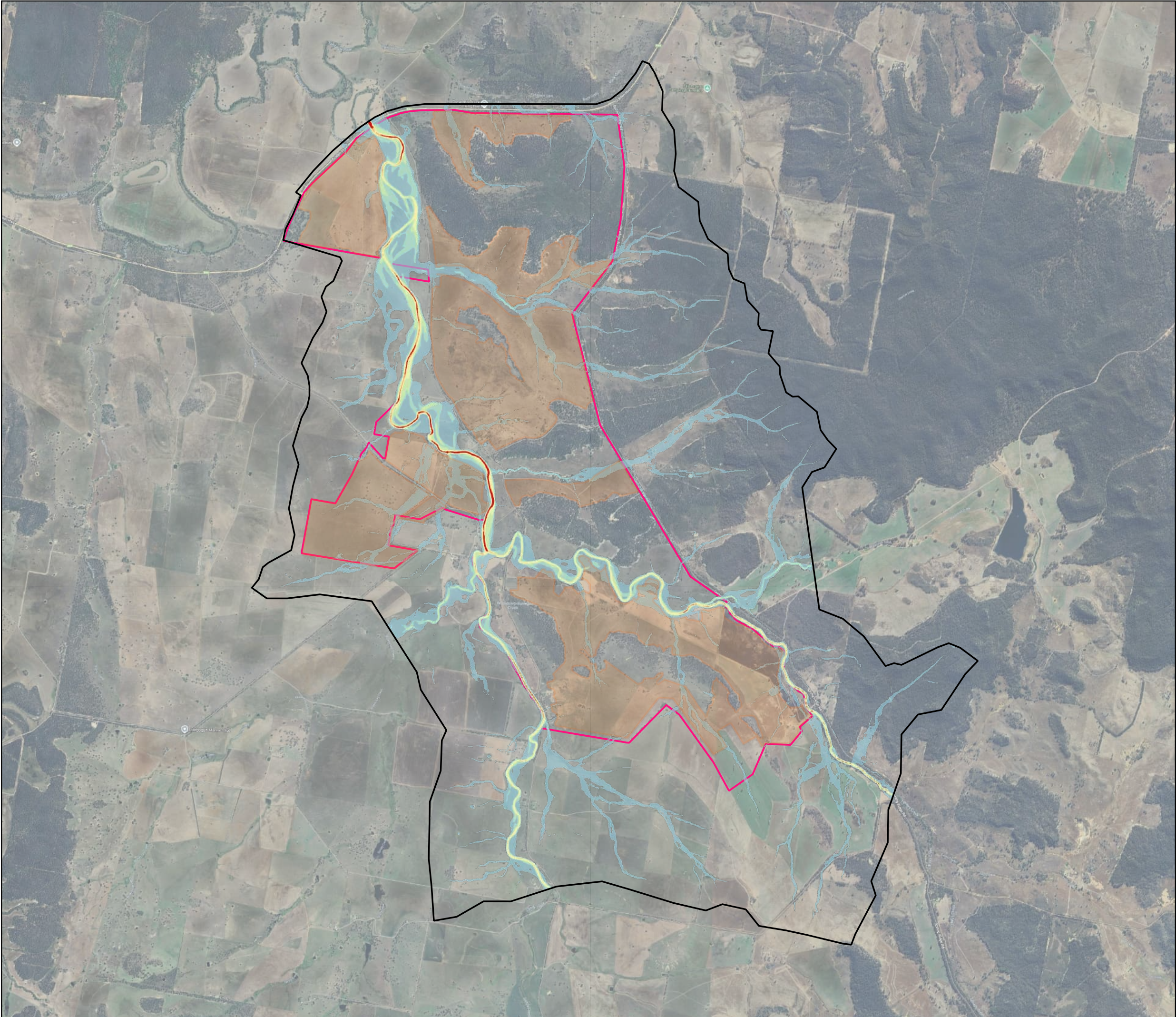
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T15:08:11.215
A

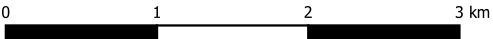
Map
G1

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

- LEGEND
- Project Area boundary
 - Solar Array Area
 - Hydraulic Model Extents
- Peak Depth Velocity Product (m2/s)
- <= 0.5
 - 0.5 - 1.0
 - 1.0 - 2.0
 - 2.0 - 3.0
 - 3.0 - 4.0
 - 4.0 - 5.0
 - > 5.0

Attribution of Sources: © 2025, Google Satellite

Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Post Development - Precast Concrete
Bridge
20% AEP Storm Event

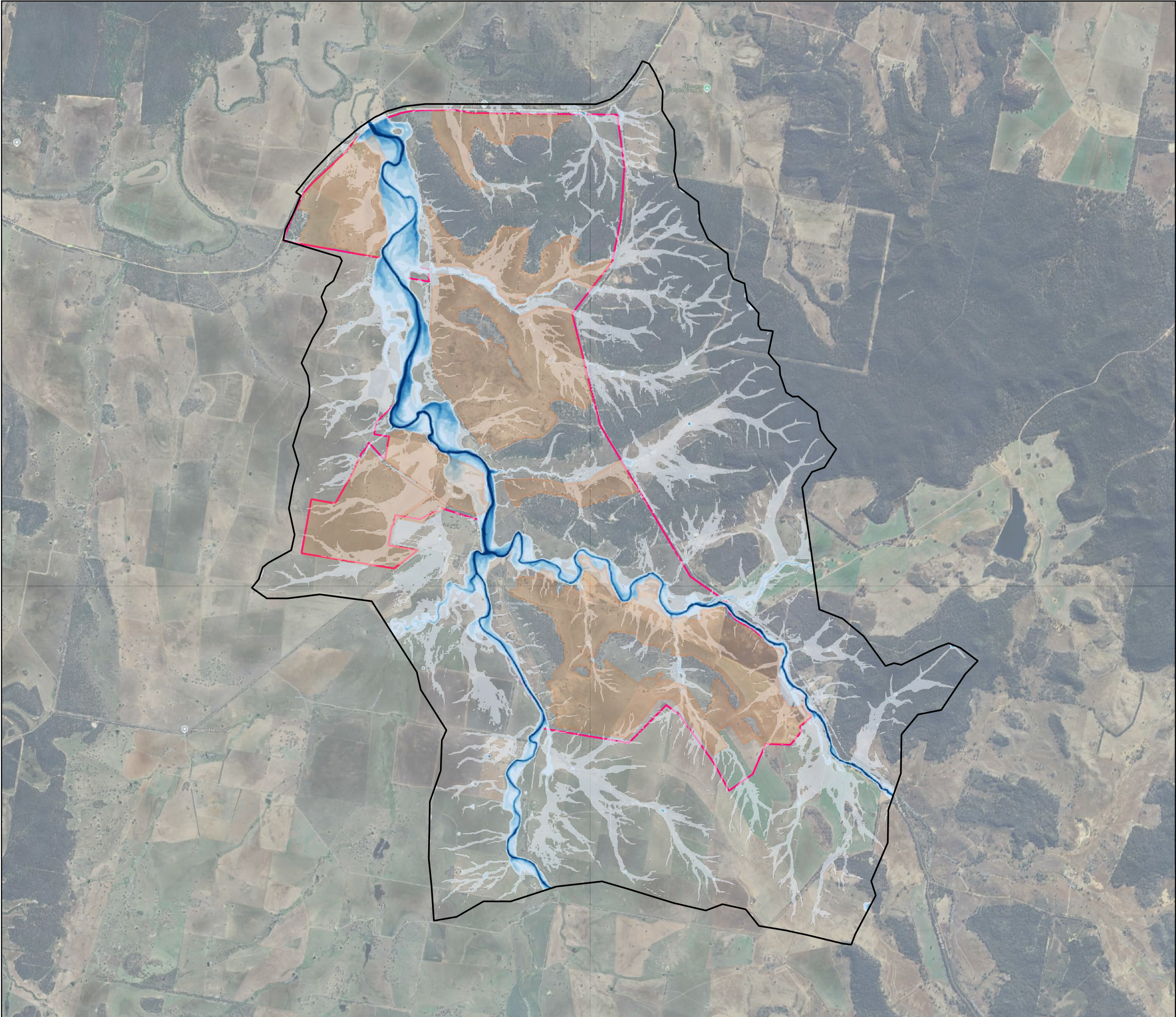
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T15:10:02.599
A

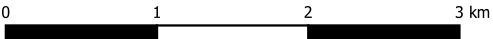
Map
G2

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

- LEGEND
- Solar Array Area
 - Hydraulic Model Extents
- Peak Flood Depth (m)
- ≤ 0.3
 - 0.3 - 0.6
 - 0.6 - 0.9
 - 0.9 - 1.2
 - 1.2 - 1.5
 - 1.5 - 1.8
 - 1.8 - 2.1
 - 2.1 - 2.4
 - 2.4 - 2.7
 - > 2.7

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Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Post Development - Precast Concrete
Bridge
1% AEP Storm Event

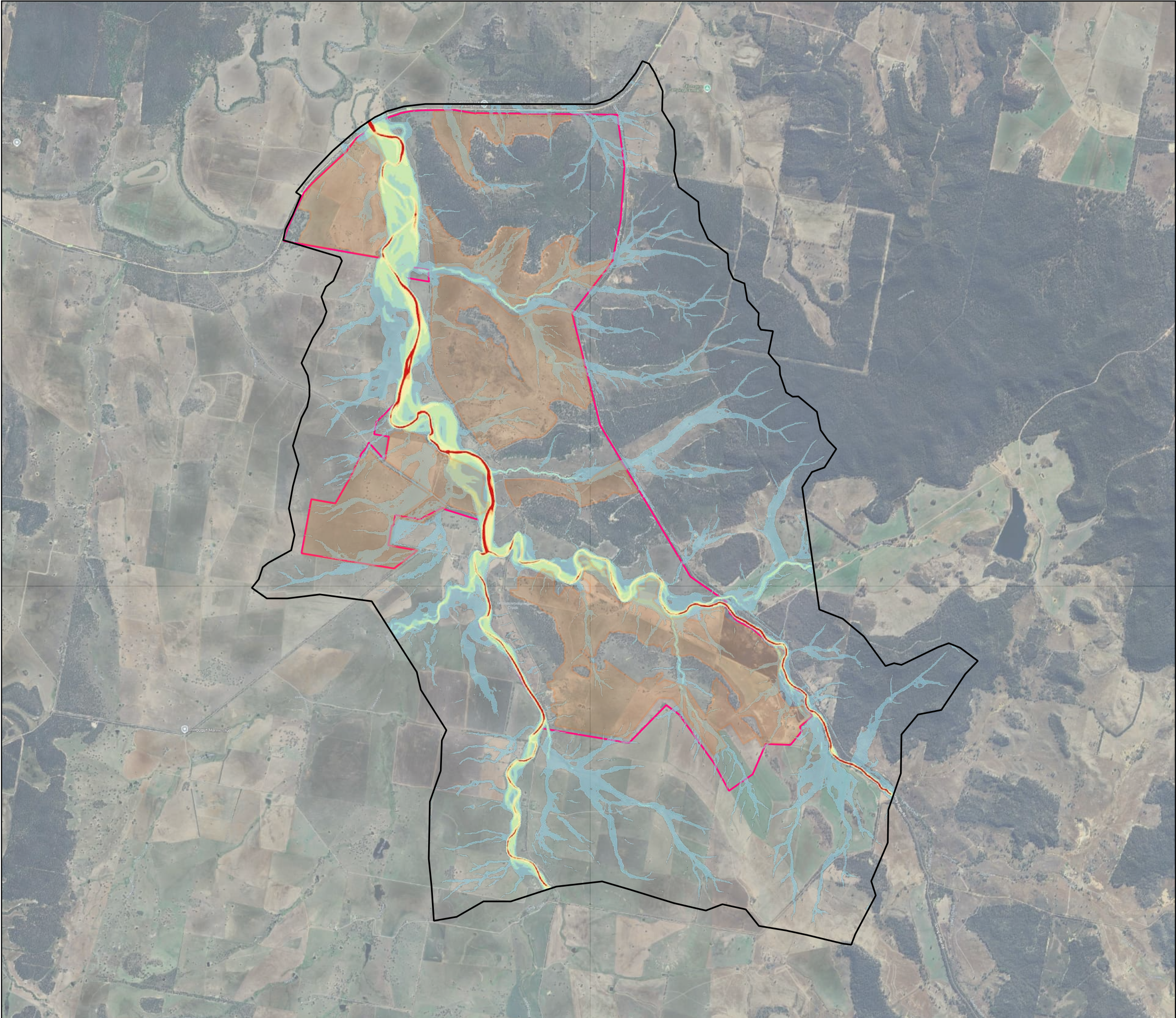
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T16:04:52.546
A

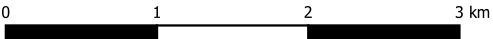
Map
H1

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

Project Area boundary

Solar Array Area

Hydraulic Model Extents

Peak Depth Velocity Product (m2/s)

≤ 0.5

0.5 - 1.0

1.0 - 2.0

2.0 - 3.0

3.0 - 4.0

4.0 - 5.0

> 5.0

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Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Post Development - Precast Concrete
Bridge
1% AEP Storm Event

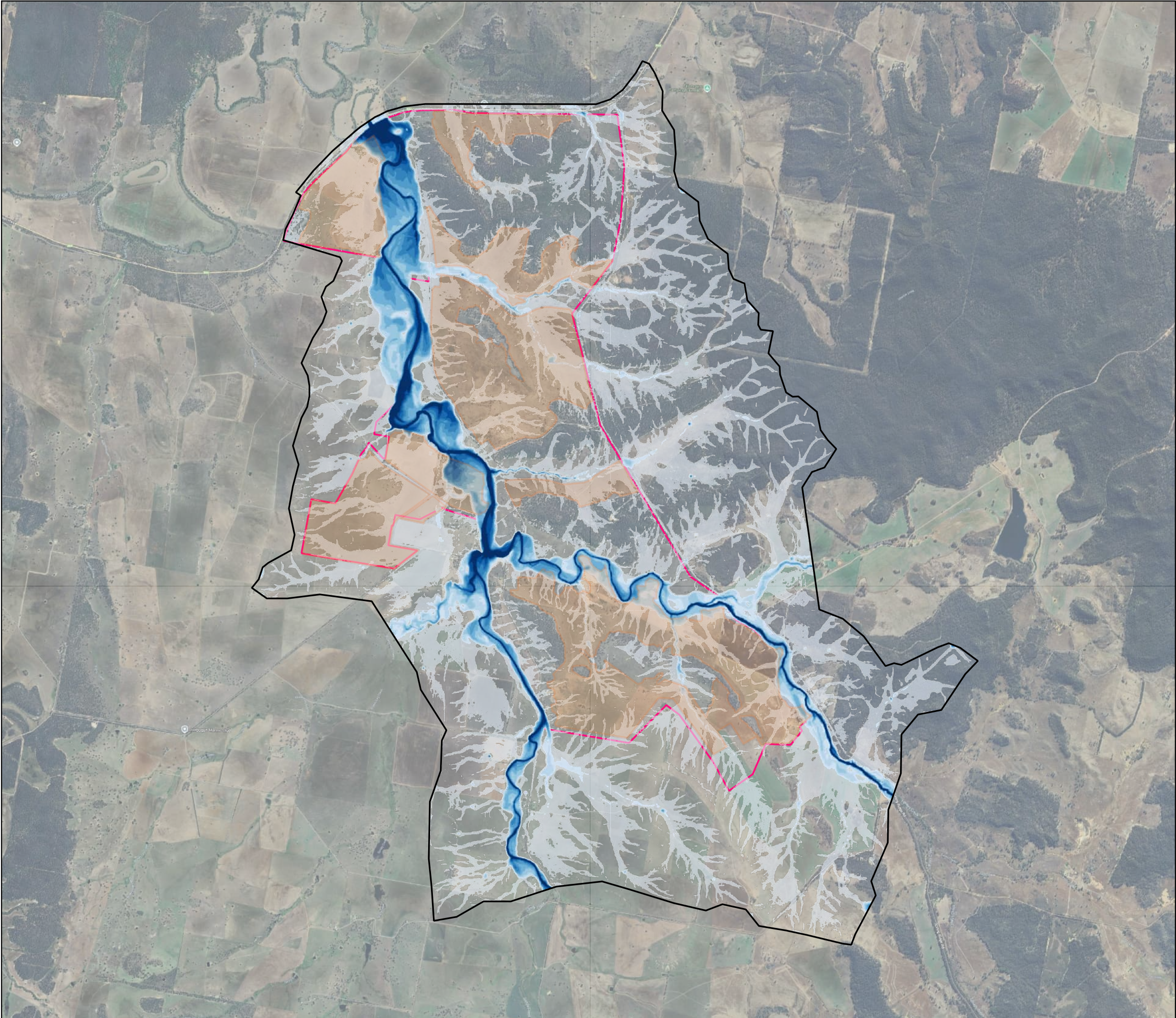
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T15:14:13.562
A

Map
H2

A3 size

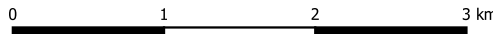
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

- Project Area boundary
- Solar Array Area
- Hydraulic Model Extents

Peak Flood Depth (m)

- <= 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- 1.2 - 1.5
- 1.5 - 1.8
- 1.8 - 2.1
- 2.1 - 2.4
- 2.4 - 2.7
- > 2.7

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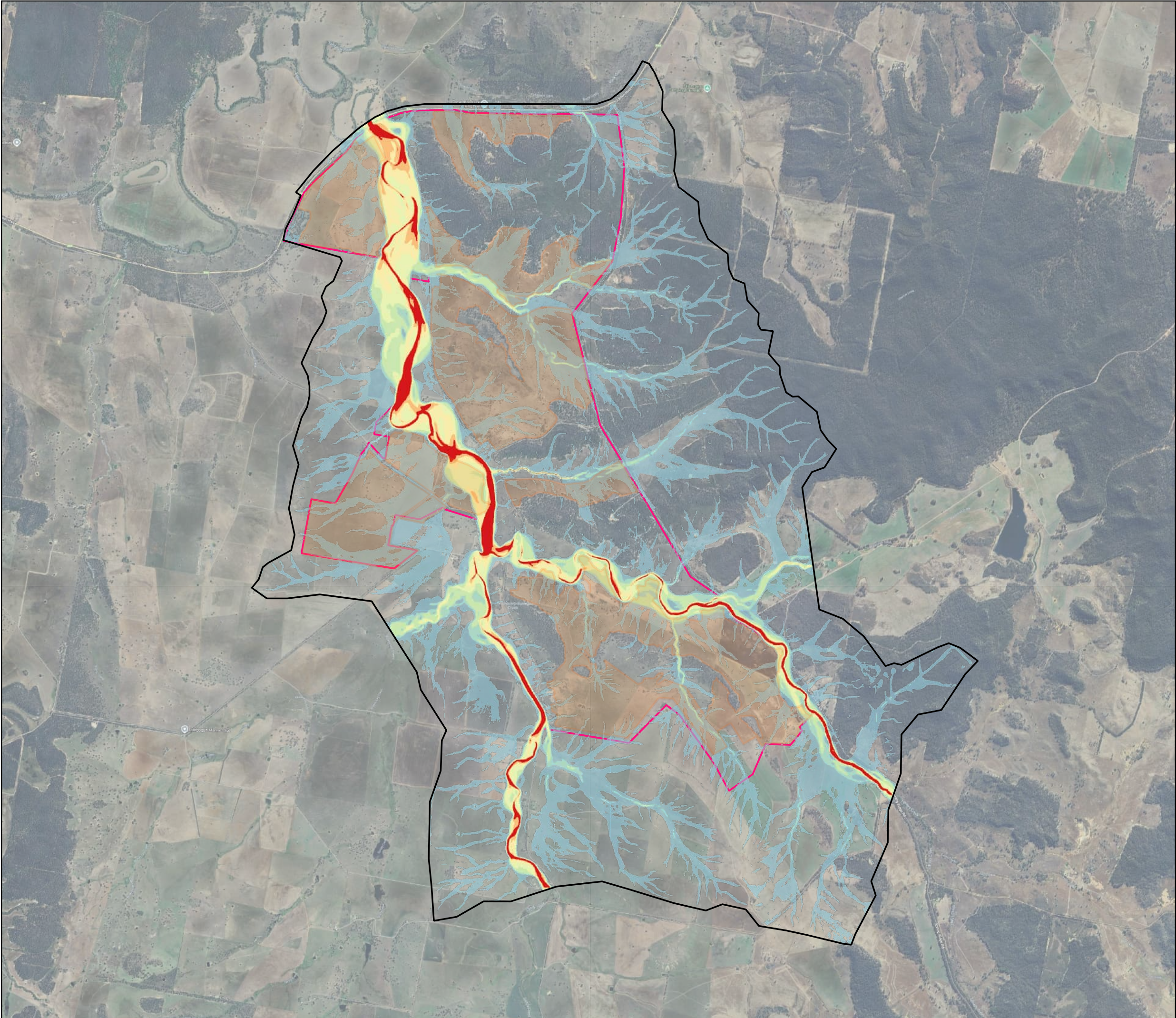
Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Post Development - Precast Concrete
Bridge
0.01% AEP Storm Event

PROJECT ID 60734058
CREATED BY priyam.awotar
LAST MODIFIED 2025-02-21T15:15:01.950
VERSION A

Map
I1

A3 size

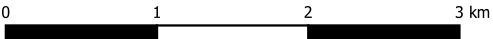
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

Solar Array Area

Hydraulic Model Extents

Peak Depth Velocity Product (m2/s)

≤ 0.5

0.5 - 1.0

1.0 - 2.0

2.0 - 3.0

3.0 - 4.0

4.0 - 5.0

> 5.0

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Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Post Development - Precast Concrete
Bridge
0.01% AEP Storm Event

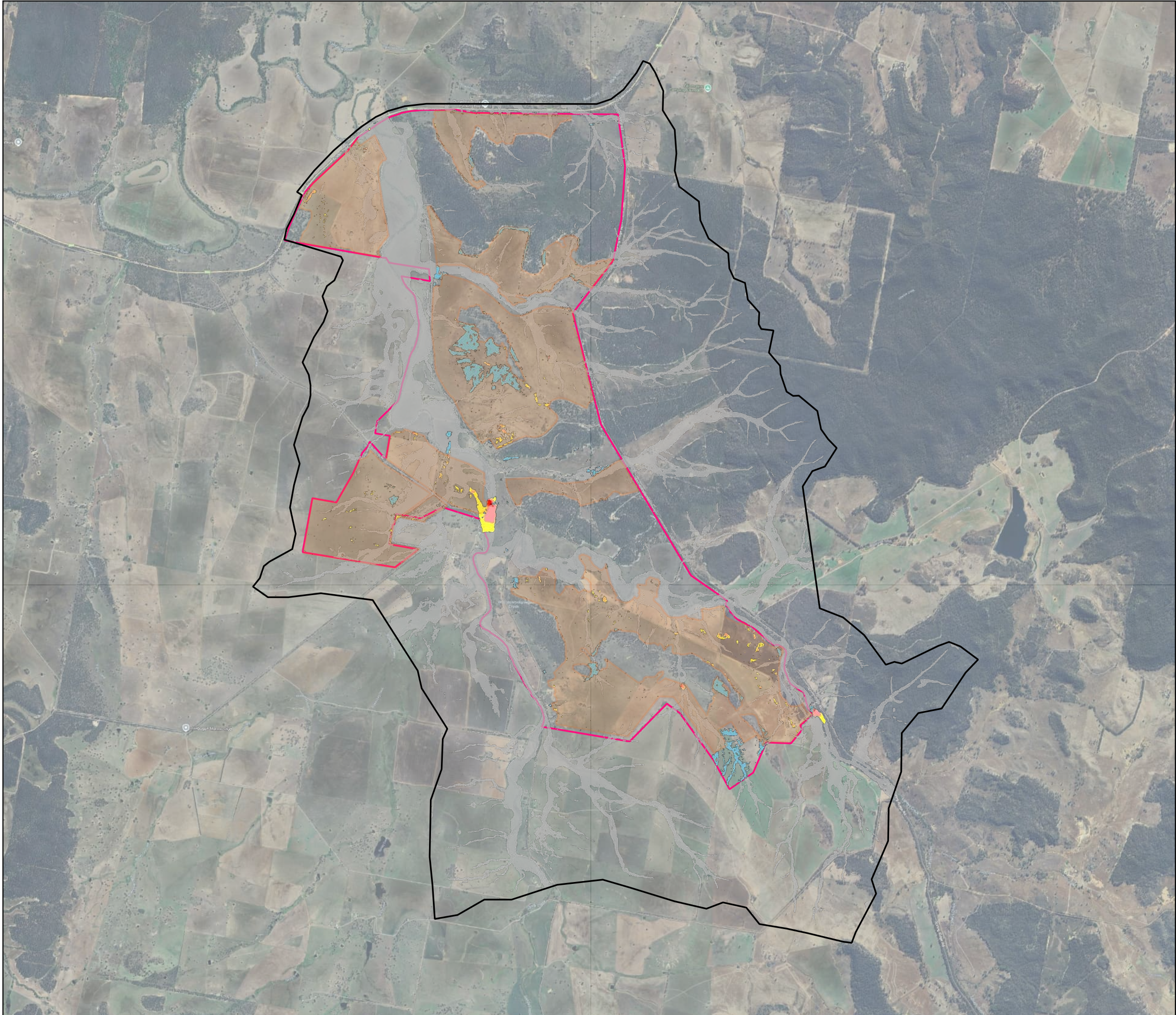
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T16:05:21.407
A

Map
12

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55

0 1 2 3 km

1:50,000 (when printed at A3)

LEGEND

 Project Area boundary

 Solar Array Area

 Hydraulic Model Extents

Afflux (Post Development less Baseline) (m)

 ≤ -0.01

 $-0.01 - 0.01$

 $0.01 - 0.02$

 $0.02 - 0.05$

 $0.05 - 0.10$

 $0.10 - 0.20$

 > 0.20

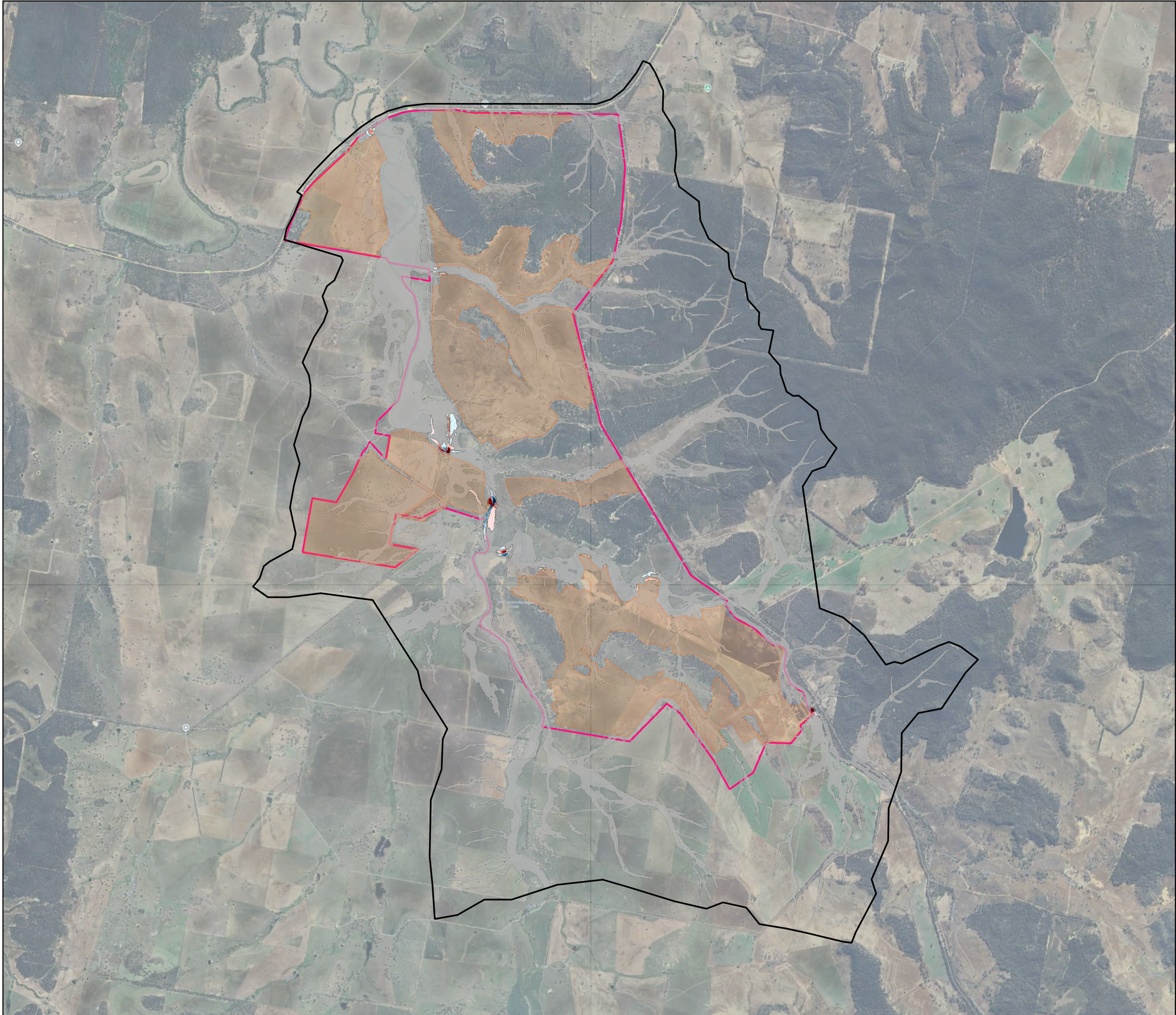
Attribution of Sources: © 2025, Google Satellite

Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Afflux (Post Development (Steel Kit Bridge) -
Baseline)
20% AEP Storm Event

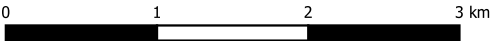
PROJECT ID	60734058	Map J1
CREATED BY	priyam.awotar	
LAST MODIFIED	2025-02-21T15:19:18.278	
VERSION	A	

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

Project Area boundary

Solar Array Area

Hydraulic Model Extents

Afflux DxV (Post Development less Baseline)
(m2/s)

<= -0.13

-0.13 - -0.11

-0.11 - -0.09

-0.09 - -0.07

-0.07 - -0.05

-0.05 - -0.03

-0.03 - -0.01

-0.01 - 0.01

0.01 - 0.03

0.03 - 0.05

0.05 - 0.07

0.07 - 0.09

0.09 - 0.11

0.11 - 0.13

> 0.13

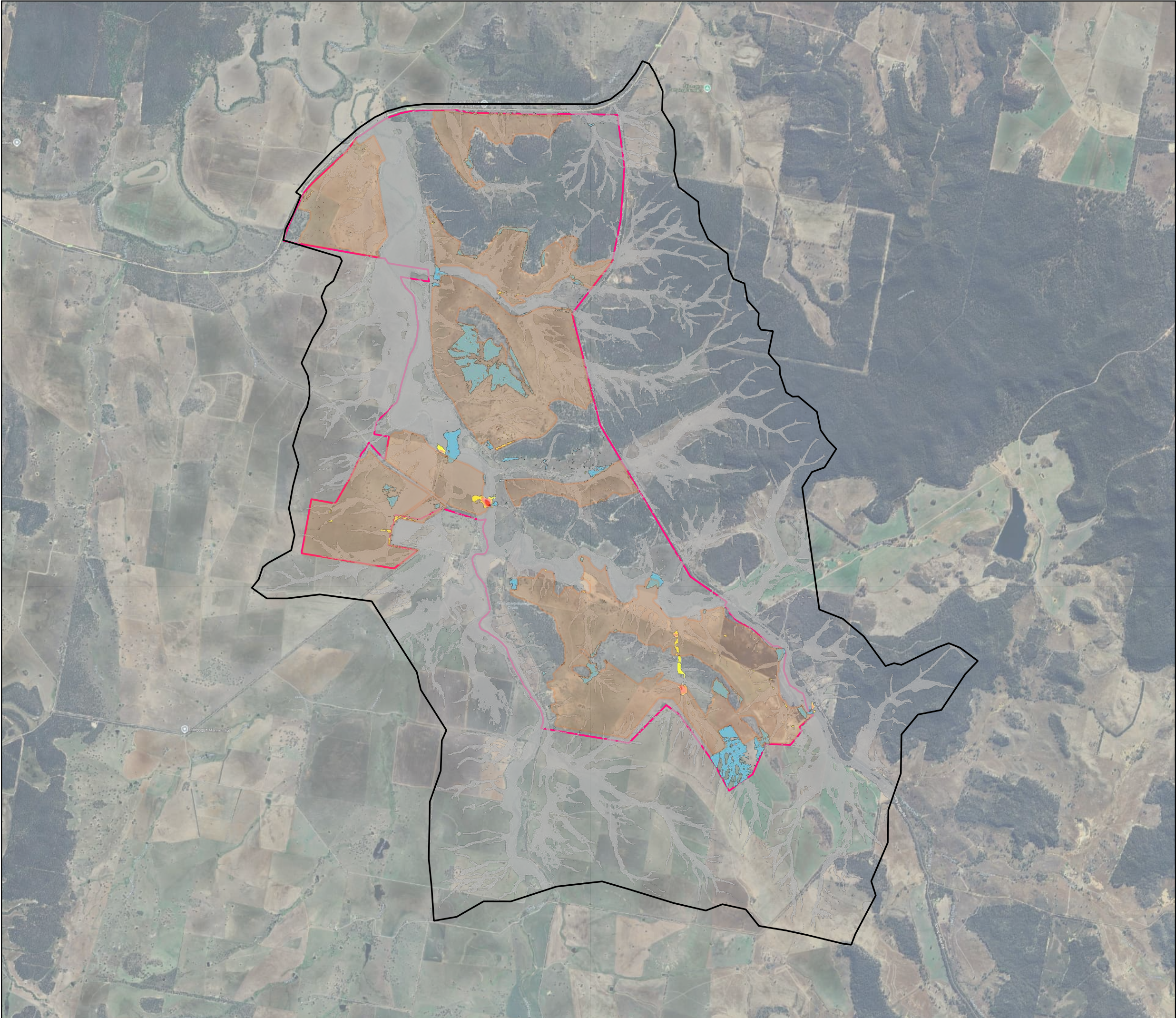
Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Afflux (Post Development (Steel Kit Bridge) -
Baseline)
20% AEP Storm Event

PROJECT ID 60734058
CREATED BY priyam.awotar
LAST MODIFIED 2025-02-21T15:20:15.905
VERSION A

Map
J2

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55

0 1 2 3 km

1:50,000 (when printed at A3)

LEGEND

Solar Array Area

Hydraulic Model Extents

Afflux (Post Development less Baseline) (m)

≤ -0.01

$-0.01 - 0.01$

$0.01 - 0.02$

$0.02 - 0.05$

$0.05 - 0.10$

$0.10 - 0.20$

> 0.20

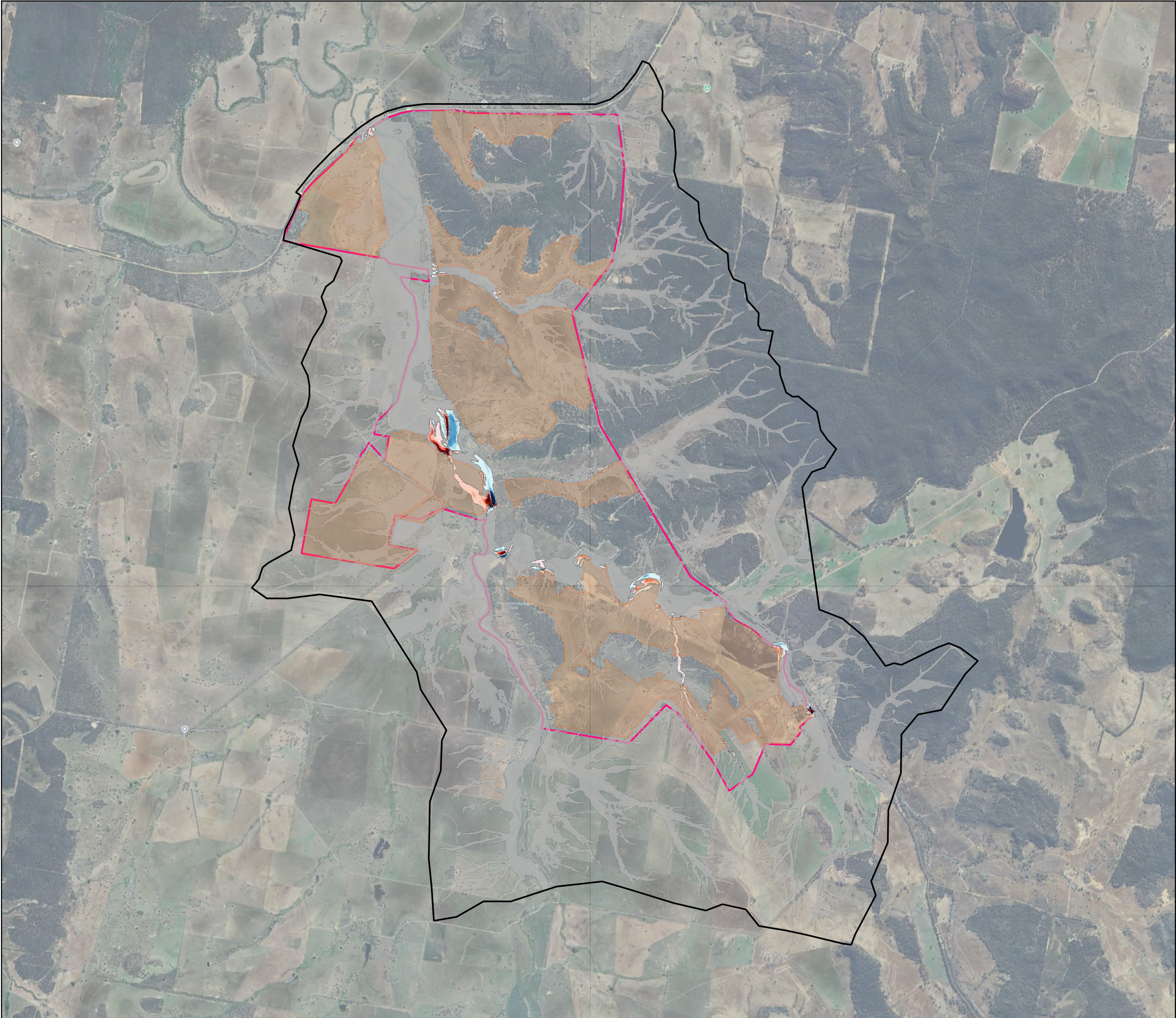
Attribution of Sources: © 2025, Google Satellite

Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Afflux (Post Development (Steel Kit Bridge) -
Baseline)
1% AEP Storm Event

PROJECT ID	60734058	Map K1
CREATED BY	priyam.awotar	
LAST MODIFIED	2025-02-21T16:05:50.022	
VERSION	A	

A3 size

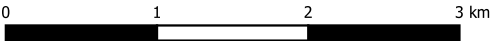
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

Project Area boundary

Solar Array Area

Hydraulic Model Extents

Afflux DxV (Post Development less Baseline)
(m2/s)

<= -0.13

-0.13 - -0.11

-0.11 - -0.09

-0.09 - -0.07

-0.07 - -0.05

-0.05 - -0.03

-0.03 - -0.01

-0.01 - 0.01

0.01 - 0.03

0.03 - 0.05

0.05 - 0.07

0.07 - 0.09

0.09 - 0.11

0.11 - 0.13

> 0.13

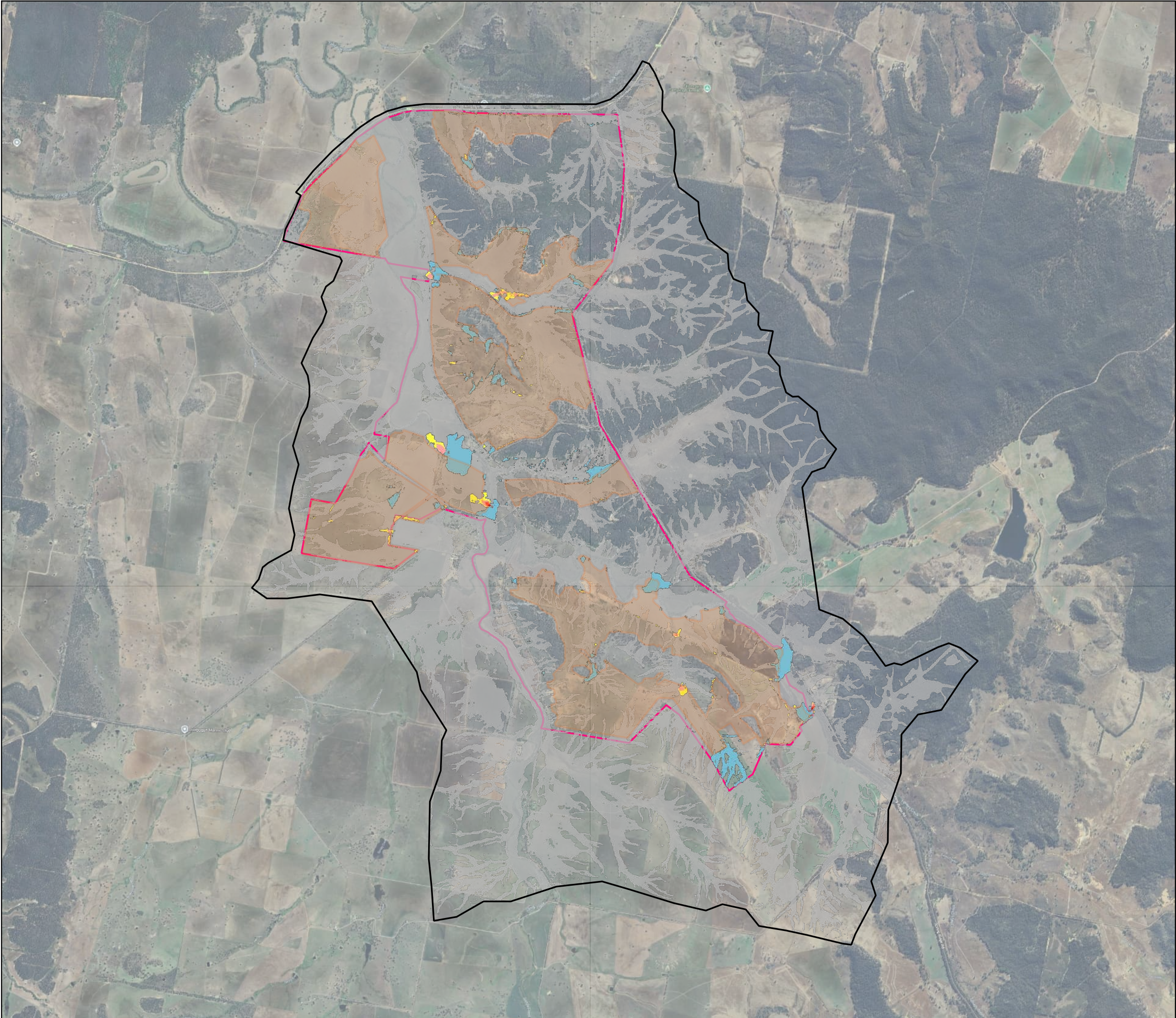
Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Afflux (Post Development (Steel Kit Bridge) -
Baseline)
1% AEP Storm Event

PROJECT ID 60734058
CREATED BY priyam.awotar
LAST MODIFIED 2025-02-21T15:24:12.412
VERSION A

Map
K2

A3 size

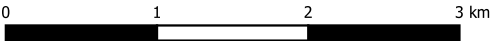
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

Project Area boundary

Solar Array Area

Hydraulic Model Extents

Afflux (Post Development less Baseline) (m)

<= -0.01

-0.01 - 0.01

0.01 - 0.02

0.02 - 0.05

0.05 - 0.10

0.10 - 0.20

> 0.20

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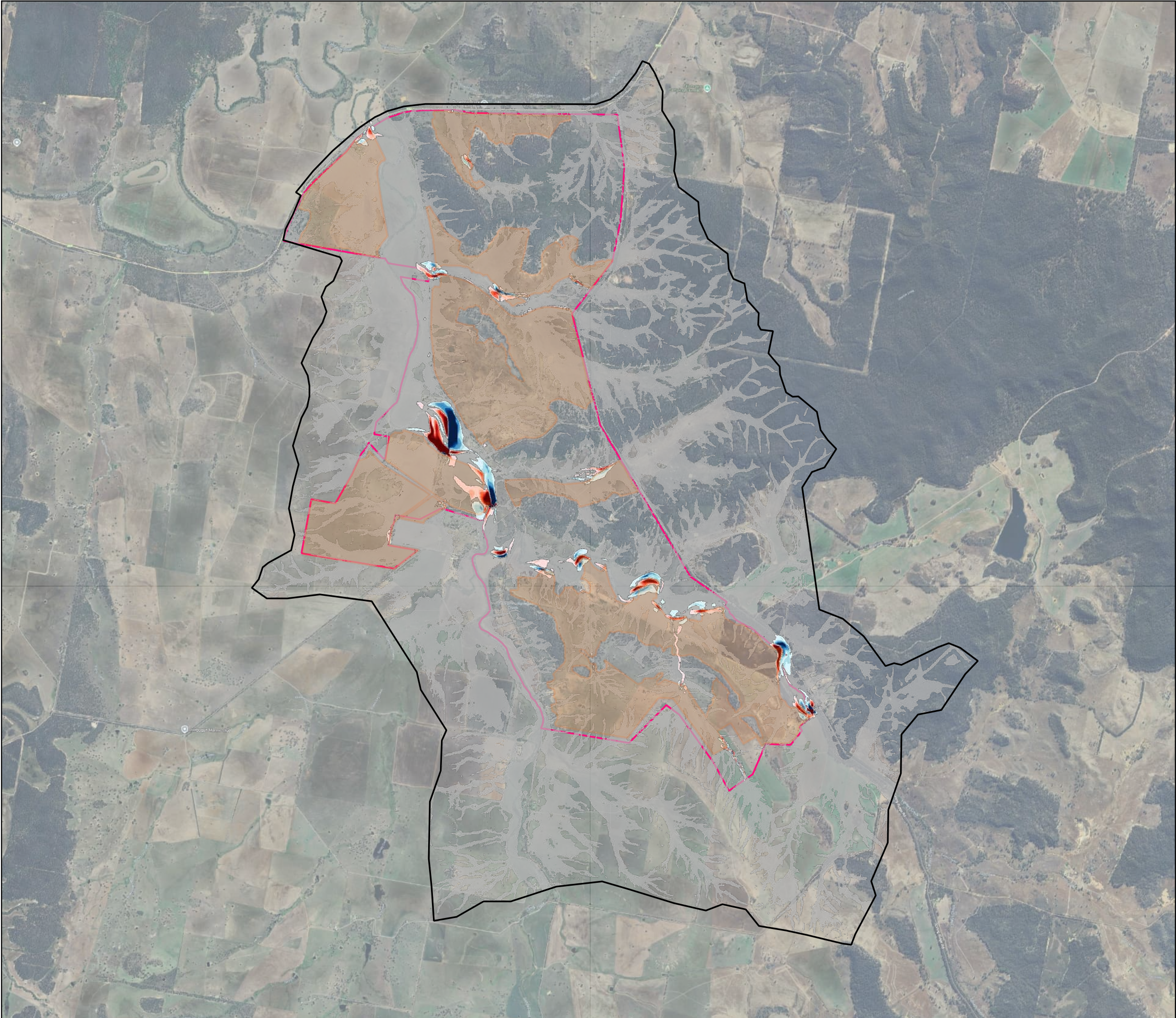
Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Afflux (Post Development (Steel Kit Bridge) -
Baseline)
0.01% AEP Storm Event

PROJECT ID 60734058
CREATED BY priyam.awotar
LAST MODIFIED 2025-02-21T15:26:12.929
VERSION A

Map
L1

A3 size

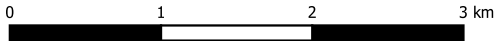
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

Project Area boundary

Solar Array Area

Hydraulic Model Extents

Afflux DxV (Post Development less Baseline)
(m2/s)

<= -0.13

-0.13 - -0.11

-0.11 - -0.09

-0.09 - -0.07

-0.07 - -0.05

-0.05 - -0.03

-0.03 - -0.01

-0.01 - 0.01

0.01 - 0.03

0.03 - 0.05

0.05 - 0.07

0.07 - 0.09

0.09 - 0.11

0.11 - 0.13

> 0.13

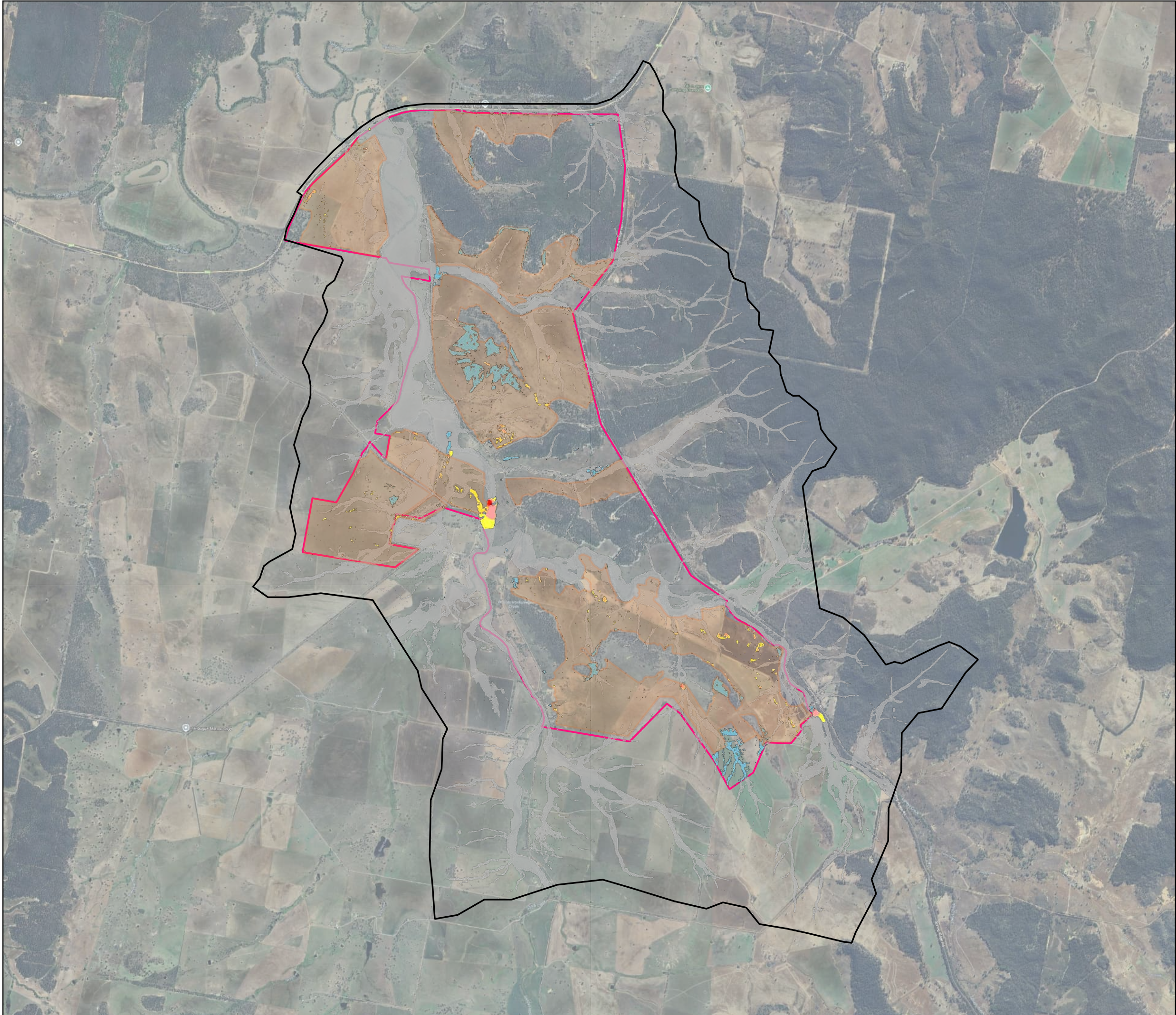
Cobbara Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Afflux (Post Development (Steel Kit Bridge) -
Baseline)
0.01% AEP Storm Event

PROJECT ID 60734058
CREATED BY priyam.awotar
LAST MODIFIED 2025-02-21T15:27:09.714
VERSION A

Map
L2

A3 size

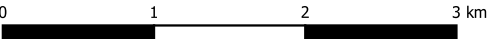
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

- Project Area boundary
- Solar Array Area
- Hydraulic Model Extents

Afflux (Post Development less Baseline) (m)

- ≤ -0.01
- 0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- > 0.20

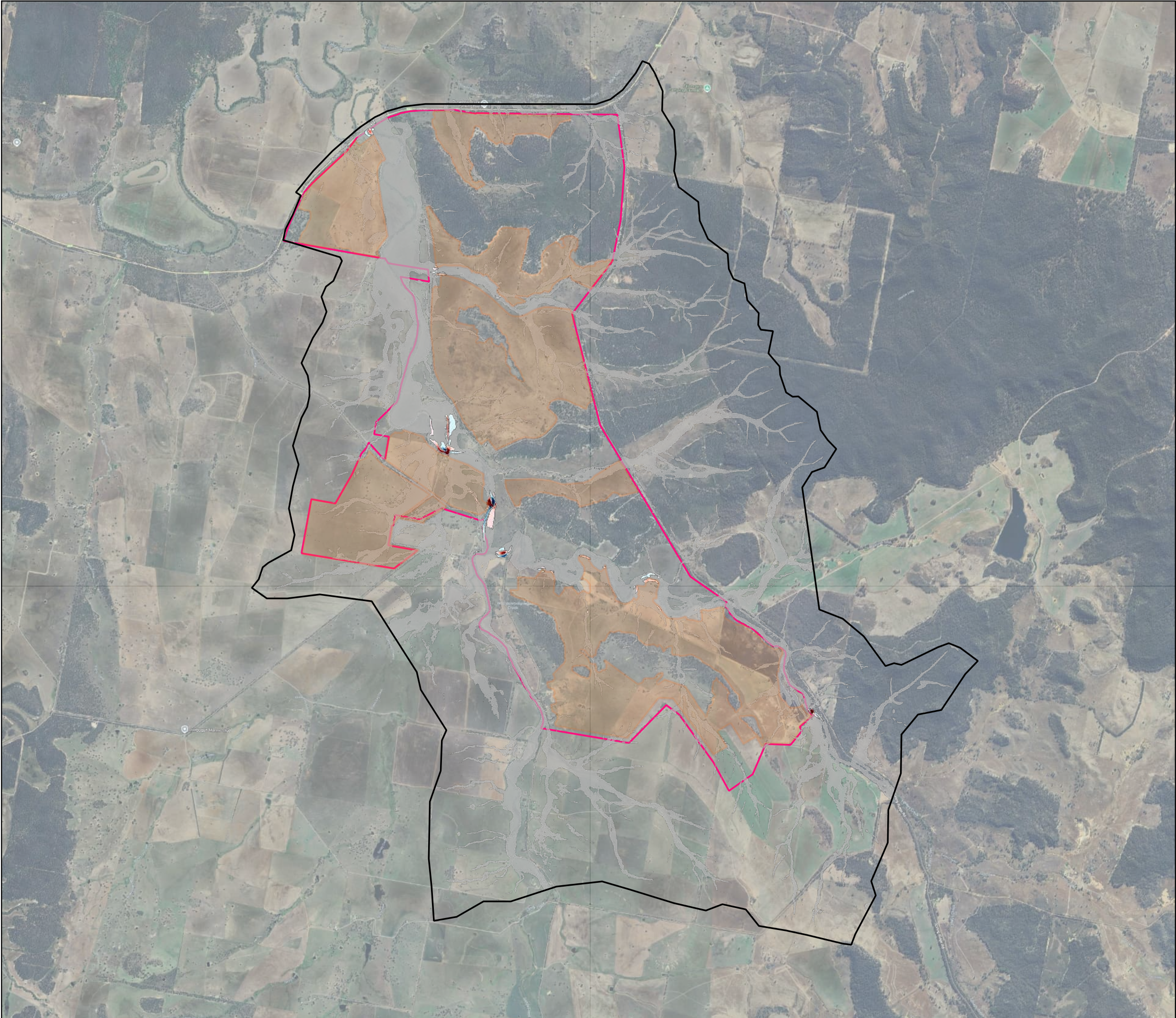
Attribution of Sources: © 2025, Google Satellite

Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Afflux (Post Development (Precast Concrete Bridge) - Baseline)
20% AEP Storm Event

PROJECT ID	60734058	Map M1
CREATED BY	priyam.awotar	
LAST MODIFIED	2025-02-21T15:28:06.505	
VERSION	A	

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55

0 1 2 3 km

1:50,000 (when printed at A3)

LEGEND

Project Area boundary

Solar Array Area

Hydraulic Model Extents

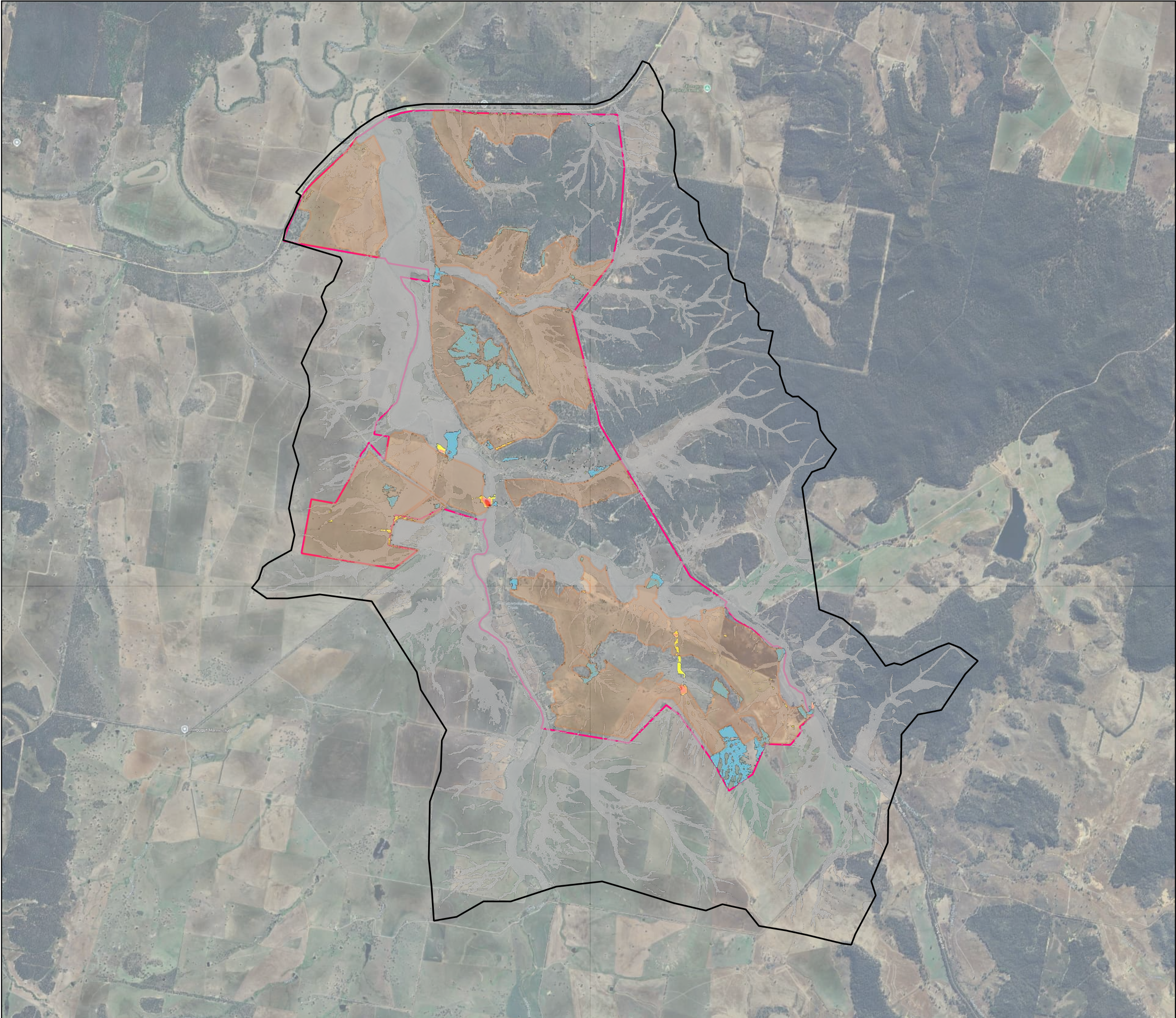
Afflux (DxV) (Post Development less Baseline) (m2/s)

	<= -0.13
	-0.13 - -0.11
	-0.11 - -0.09
	-0.09 - -0.07
	-0.07 - -0.05
	-0.05 - -0.03
	-0.03 - -0.01
	-0.01 - 0.01
	0.01 - 0.03
	0.03 - 0.05
	0.05 - 0.07
	0.07 - 0.09
	0.09 - 0.11
	0.11 - 0.13
	> 0.13

Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Afflux (Post Development (Precast Concrete Bridge) - Baseline)
20% AEP Storm Event

PROJECT ID	60734058	Map M2
CREATED BY	priyam.awotar	
LAST MODIFIED	2025-02-21T15:29:35.743	
VERSION	A	

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DATUM GDA 1994, PROJECTION MGA ZONE 55

0 1 2 3 km

1:50,000 (when printed at A3)

- LEGEND
- Project Area boundary
 - Solar Array Area
 - Hydraulic Model Extents
- Afflux (Post Development less Baseline) (m)
- <= -0.01
 - 0.01 - 0.01
 - 0.01 - 0.02
 - 0.02 - 0.05
 - 0.05 - 0.10
 - 0.10 - 0.20
 - > 0.20

Attribution of Sources: © 2025, Google Satellite

Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Afflux (Post Development (Precast Concrete Bridge) - Baseline)
1% AEP Storm Event

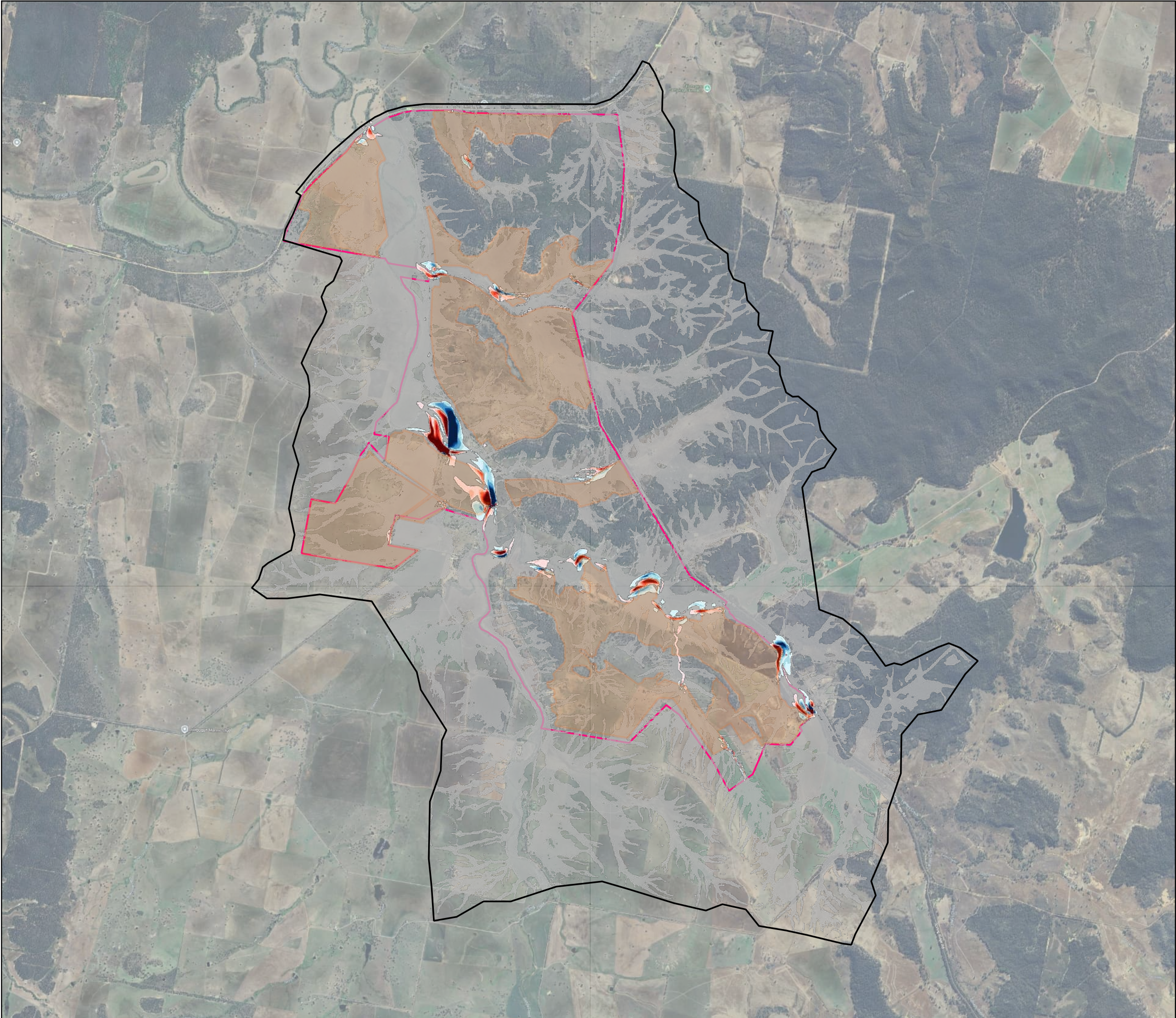
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T16:06:17.841
A

Map
N1

A3 size

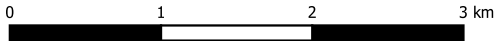
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

Project Area boundary

Solar Array Area

Hydraulic Model Extents

Afflux DxV (Post Development less Baseline)
(m2/s)

<= -0.13

-0.13 - -0.11

-0.11 - -0.09

-0.09 - -0.07

-0.07 - -0.05

-0.05 - -0.03

-0.03 - -0.01

-0.01 - 0.01

0.01 - 0.03

0.03 - 0.05

0.05 - 0.07

0.07 - 0.09

0.09 - 0.11

0.11 - 0.13

> 0.13

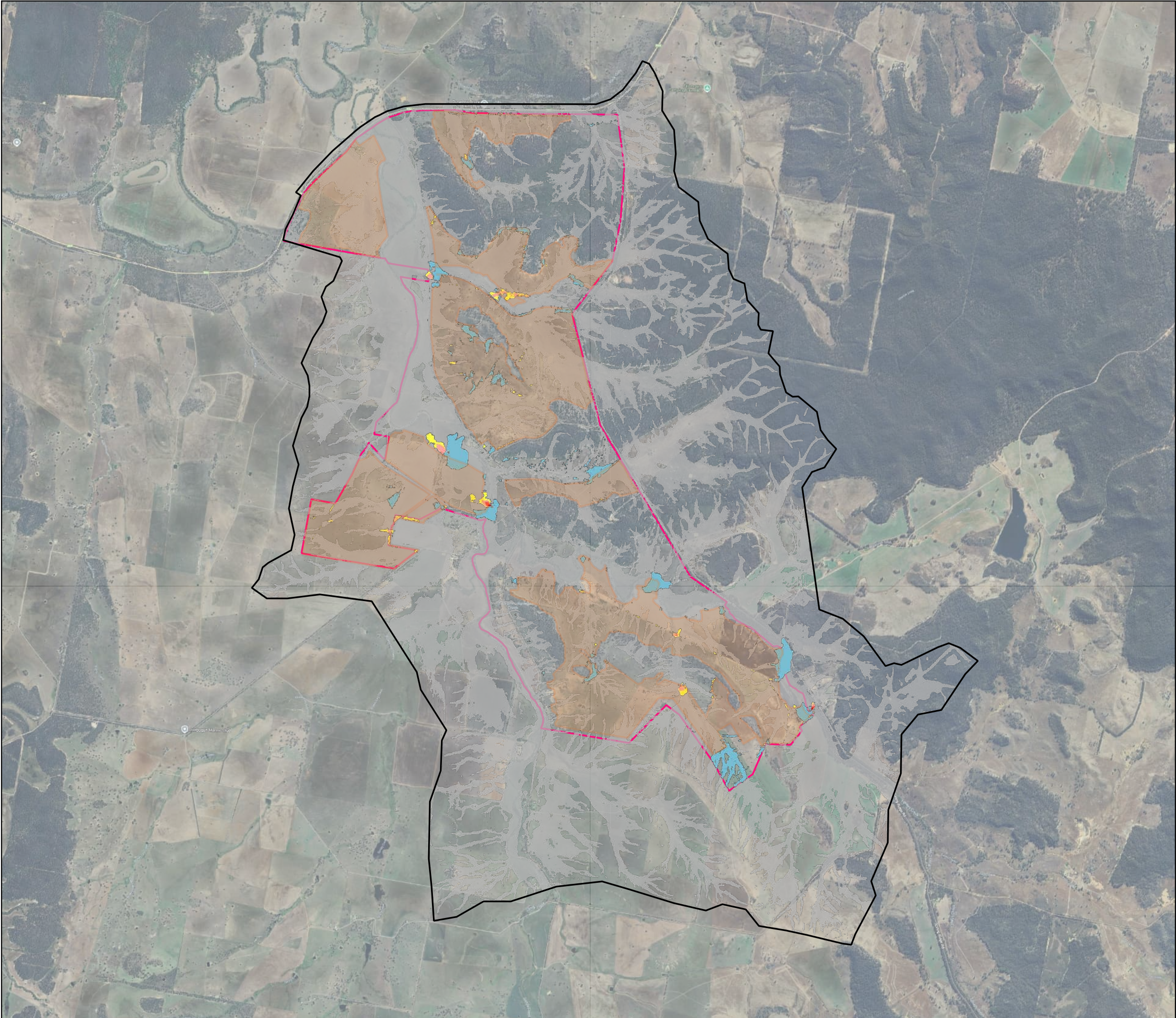
Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Afflux (Post Development (Precast Concrete
Bridge) - Baseline)
1% AEP Storm Event

PROJECT ID 60734058
CREATED BY priyam.awotar
LAST MODIFIED 2025-02-21T16:06:40.681
VERSION A

Map
N2

A3 size

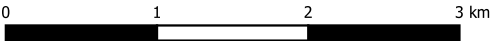
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DATUM GDA 1994, PROJECTION MGA ZONE 55



1:50,000 (when printed at A3)

LEGEND

 Project Area boundary

 Solar Array Area

 Hydraulic Model Extents

Afflux (Post Development less Baseline) (m)

 ≤ -0.01

 $-0.01 - 0.01$

 $0.01 - 0.02$

 $0.02 - 0.05$

 $0.05 - 0.10$

 $0.10 - 0.20$

 > 0.20

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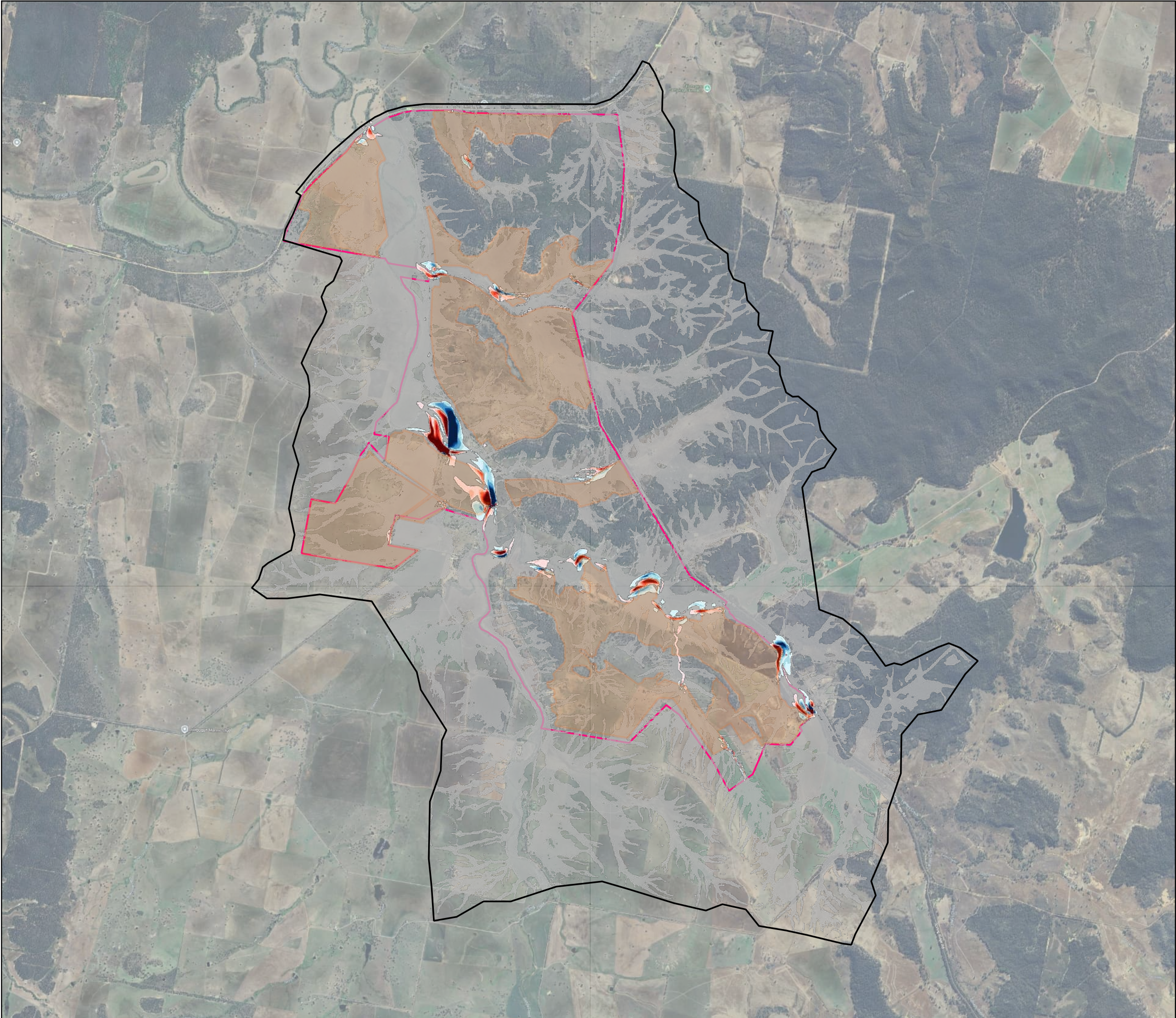
Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Afflux (Post Development (Precast Concrete
Bridge) - Baseline)
0.01% AEP Storm Event

PROJECT ID 60734058
CREATED BY priyam.awotar
LAST MODIFIED 2025-02-21T15:36:02.858
VERSION A

Map
O1

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55

0 1 2 3 km

1:50,000 (when printed at A3)

LEGEND

Project Area boundary

Solar Array Area

Hydraulic Model Extents

Afflux DxV (Post Development less Baseline)
(m2/s)

	<= -0.13
	-0.13 - -0.11
	-0.11 - -0.09
	-0.09 - -0.07
	-0.07 - -0.05
	-0.05 - -0.03
	-0.03 - -0.01
	-0.01 - 0.01
	0.01 - 0.03
	0.03 - 0.05
	0.05 - 0.07
	0.07 - 0.09
	0.09 - 0.11
	0.11 - 0.13
	> 0.13

Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Afflux (Post Development (Precast Concrete
Bridge) - Baseline)
0.01% AEP Storm Event

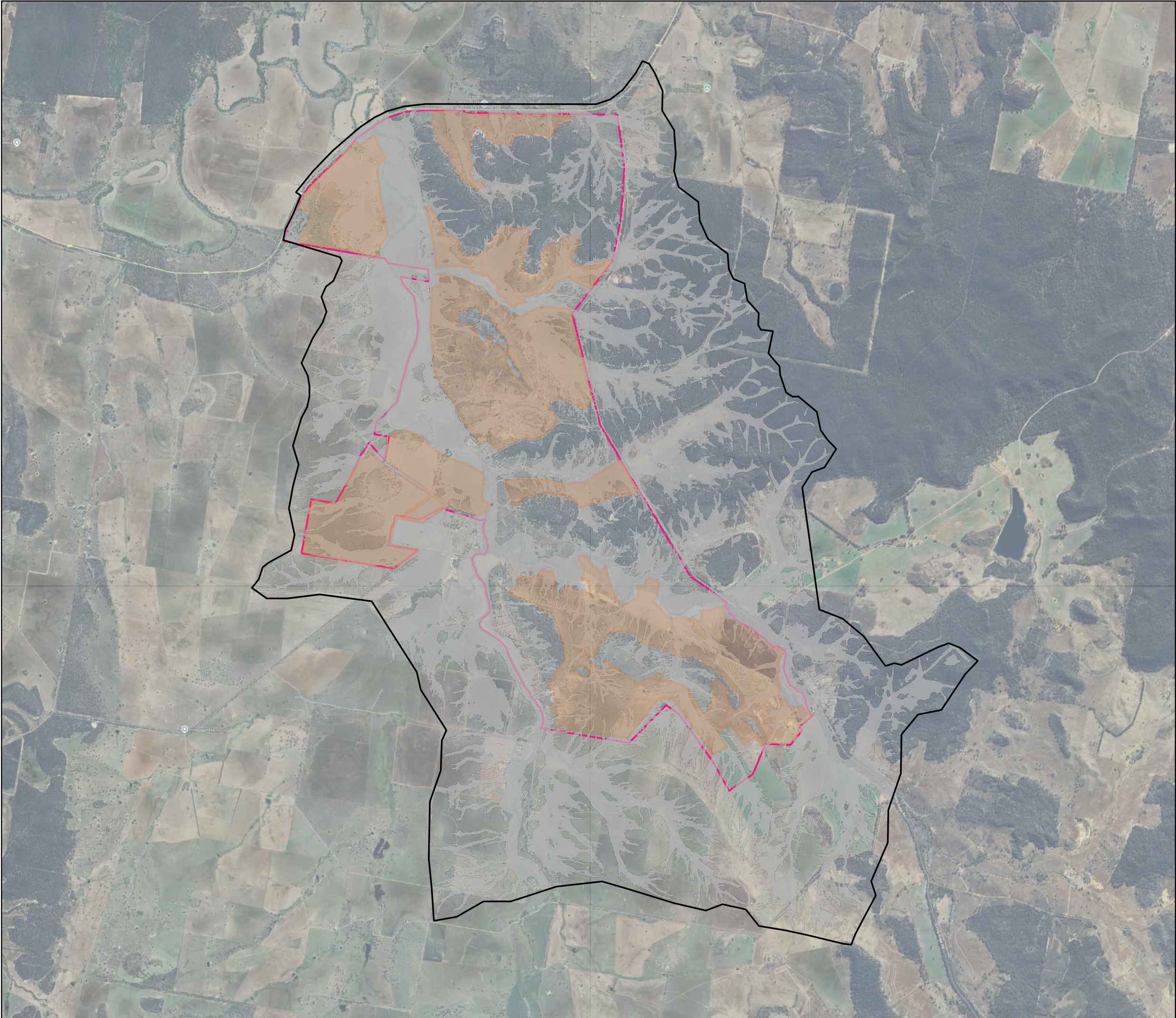
PROJECT ID
CREATED BY
LAST MODIFIED
VERSION

60734058
priyam.awotar
2025-02-21T15:38:00.897
A

Map
O2

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55

0 1 2 3 km

1:50,000 (when printed at A3)

LEGEND

 Project Area boundary

 Solar Array Area

 Hydraulic Model Extents

Afflux (Steel Kit Bridge less Precast concrete bridge (m))

 <= -0.01

 -0.01 - 0.01

 0.01 - 0.02

 0.02 - 0.05

 0.05 - 0.10

 0.10 - 0.20

 > 0.20

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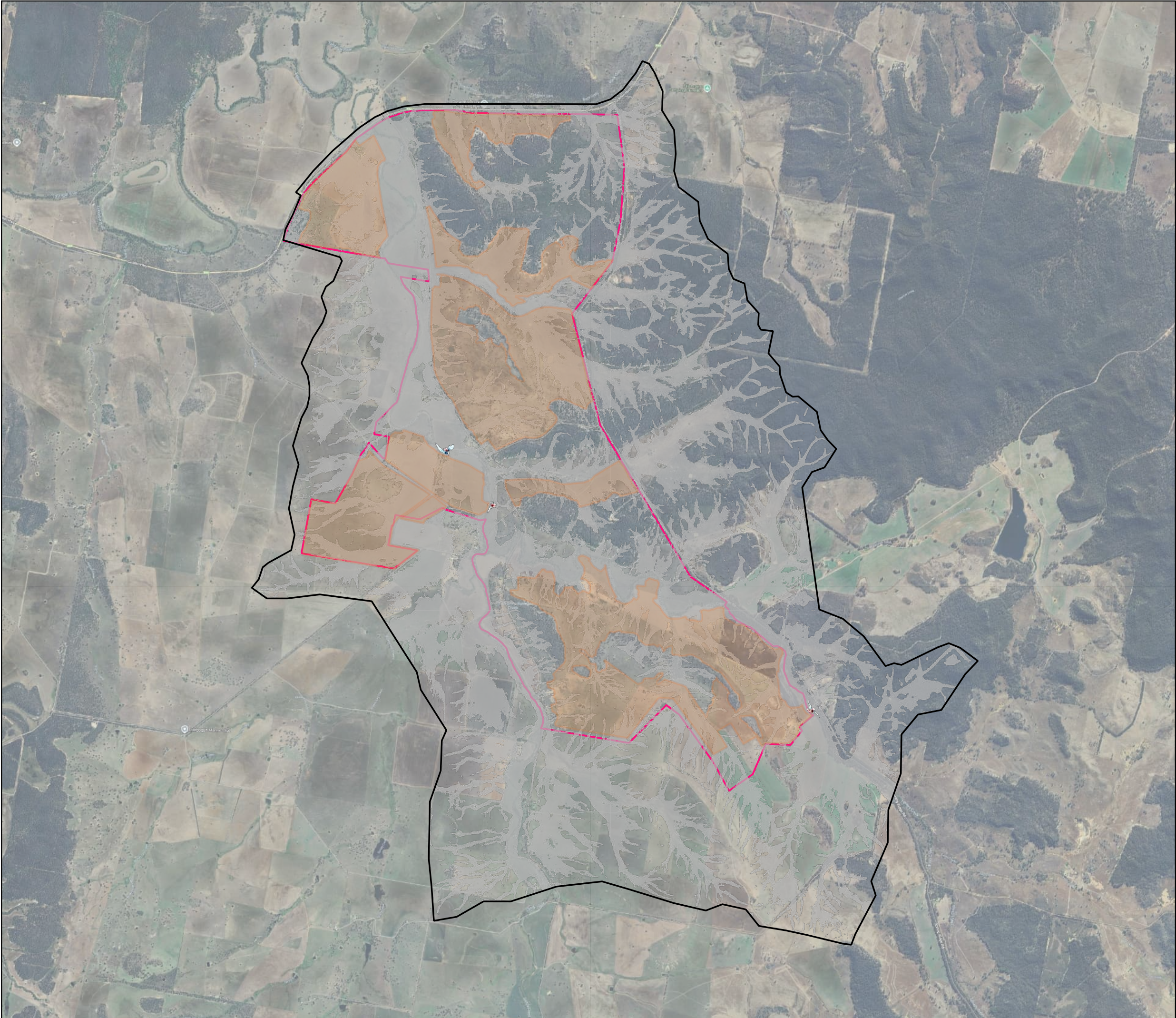
Cobbora Solar Project
Hydraulic Model Results
Peak Flood Depths
Afflux (Post Development (Steel Kit bridge less Precast Concrete Bridge)
1% AEP Storm Event

PROJECT ID 60734058
CREATED BY priyam.awotar
LAST MODIFIED 2025-02-21T15:48:30.026
VERSION A

Map
P1

A3 size

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DATUM GDA 1994, PROJECTION MGA ZONE 55

0 1 2 3 km

1:50,000 (when printed at A3)

LEGEND

Project Area boundary

Solar Array Area

Hydraulic Model Extents

Afflux DxV (Steel Kit Bridge less Precast Concrete Bridge) (m2/s)

	<= -0.13
	-0.13 - -0.11
	-0.11 - -0.09
	-0.09 - -0.07
	-0.07 - -0.05
	-0.05 - -0.03
	-0.03 - -0.01
	-0.01 - 0.01
	0.01 - 0.03
	0.03 - 0.05
	0.05 - 0.07
	0.07 - 0.09
	0.09 - 0.11
	0.11 - 0.13
	> 0.13

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Cobbora Solar Project
Hydraulic Model Results
Peak Depth by Velocity
Afflux (Post Development (Steel Kit bridge less Precast Concrete Bridge)
1% AEP Storm Event

PROJECT ID	60734058	Map p2
CREATED BY	priyam.awotar	
LAST MODIFIED	2025-02-21T15:54:46.719	
VERSION	A	