



Summary Report

Edenhope Flood Investigation

West Wimmera Shire Council

27 September 2026



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ACKNOWLEDGEMENT OF COUNTRY

The Board and employees of Water Technology acknowledge and respect the Aboriginal and Torres Strait Islander Peoples as the Traditional Custodians of Country throughout Australia. We specifically acknowledge the Traditional Custodians of the land on which our offices reside and where we undertake our work.

We respect the knowledge, skills and lived experiences of Aboriginal and Torres Strait Islander Peoples, who we continue to learn from and collaborate with. We also extend our respect to all First Nations Peoples, their cultures and to their Elders, past and present.



Artwork by Maurice Goolagong 2023. This piece was commissioned by Water Technology and visualises the important connections we have to water, and the cultural significance of journeys taken by traditional custodians of our land to meeting places, where communities connect with each other around waterways.

The symbolism in the artwork includes:

- Seven circles representing each of the States and Territories in Australia where we do our work
- Blue dots between each circle representing the waterways that connect us
- The animals that rely on healthy waterways for their home
- Black and white dots representing all the different communities that we visit in our work
- Hands that are for the people we help on our journey



27 September 2026

Edwin Irvine
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Via email: EdwinIrvine@westwimmera.vic.gov.au

Dear Edwin

Edenhope Flood Investigation

Please see the attached Edenhope Flood Investigation Summary Report. The Edenhope and Apsley Flood Investigation reporting was separated into two components for the later stages of the project and final deliverables. These components covered the Edenhope and Apsley townships separately. This report documents a summary of the deliverables completed for Edenhope.

Water Technology would specifically like to thank Wimmera CMA, West Wimmera Shire Council and the Edenhope community members who gave their time to provide their personal observations of flooding and provide feedback on the flood modelling.

Strong contributions from stakeholders and community members have resulted in improved outcomes from this study, which will assist with flood related land use planning, floodplain risk management, flood emergency response and raising community awareness of individual flood risk.

Yours sincerely

Ben Hughes
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WATER TECHNOLOGY PTY LTD



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1 INTRODUCTION

1.1 Overview

Water Technology was commissioned by West Wimmera Shire Council (WWSC) to undertake the Edenhope Flood Investigation. The Edenhope township is within West Wimmera Shire Council, located in Victoria's Wimmera region, approximately 100 km southwest of Horsham. Edenhope is also within the Wimmera Catchment Management Authority (CMA) management area and the Millicent Coast drainage basin. Edenhope has around 1,000 residents, located on the banks of Lake Wallace.

Edenhope is known to be prone to stormwater inundation, with events recorded in 1971, 1973, 1975, 1981, 1991, 1993, 2011, 2016 and 2022. Edenhope is at risk from overland flow from a series of local undefined waterways and wetlands located to the southeast.

There is no current flood study for Edenhope and current flood risk information is based on information from Wimmera Catchment Management Authority (Wimmera CMA), Council, Victoria State Emergency Service (VICSES) and the Wimmera Wetland Hydrology Investigation completed by Water Technology in 2019.

This study has produced reliable flood intelligence for use in emergency management situations and assessed the current flood impact/exposure in terms of annual average damages caused by flooding. It has also produced planning scheme overlays for inclusion in the West Wimmera Shire Council planning scheme.

This report is one of a series documenting the outcomes of the Edenhope Flood Investigation, the Data Collation, Model Development and Calibration Report (R01), Design Modelling Report (R02A), and Flood Intelligence Report & Municipal Flood Emergency Plan (R03A) are combined with the Apsley Flood Investigation (completed parallel with the Edenhope Flood Investigation), with the remaining reporting outputs focusing on Edenhope. Each reporting stage is shown below:

- R01 – Data Collation, Model Development and Calibration Report.
- R02A – Design Modelling Report.
- R03A – Flood Intelligence Report & Municipal Flood Emergency Plan (MFEP) Documentation.
- **R04A – Final Summary Report – This report.**

Note: Version A indicates Edenhope and version B indicates Apsley.

1.2 Study Area

Edenhope is located within western Victoria. Its location with respect to western Victoria is shown in Figure 1-1, with the study area for Edenhope in Figure 1-2. As discussed in Section 1.1, the major surface water feature in proximity to Edenhope is Lake Wallace. Flows into Lake Wallace and through Edenhope are from the south and east, through a series of wetlands, then via Back Swamp.

1.3 Previous reporting (and context)

This report follows R01 to R03A and summarises the completed project. This summary report does not delve into technical detail, instead, it focuses on project outputs and deliverables produced by the study. Readers will be directed to individual reports should additional information be required. The chapters and sections of this report broadly follow the previous reporting from R01 to R03A, with a summary of the key points in each detailed report. No assessment of structural mitigation options was undertaken for Edenhope, given the lack of above floor flooding. It is anticipated that the modelling will be used to assist with general drainage upgrades as they occur over time.

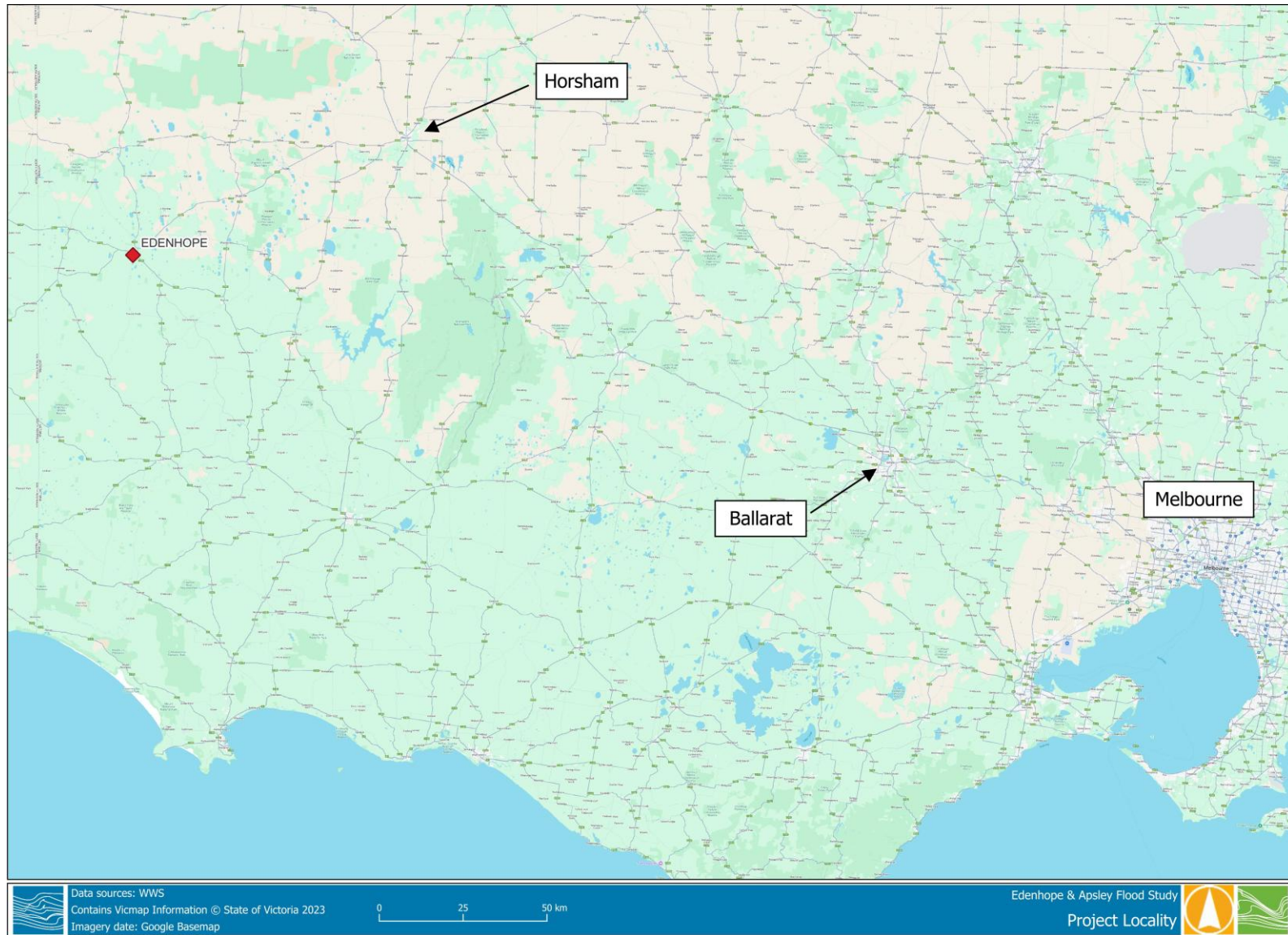


Figure 1-1 Edenhope with respect to western Victoria

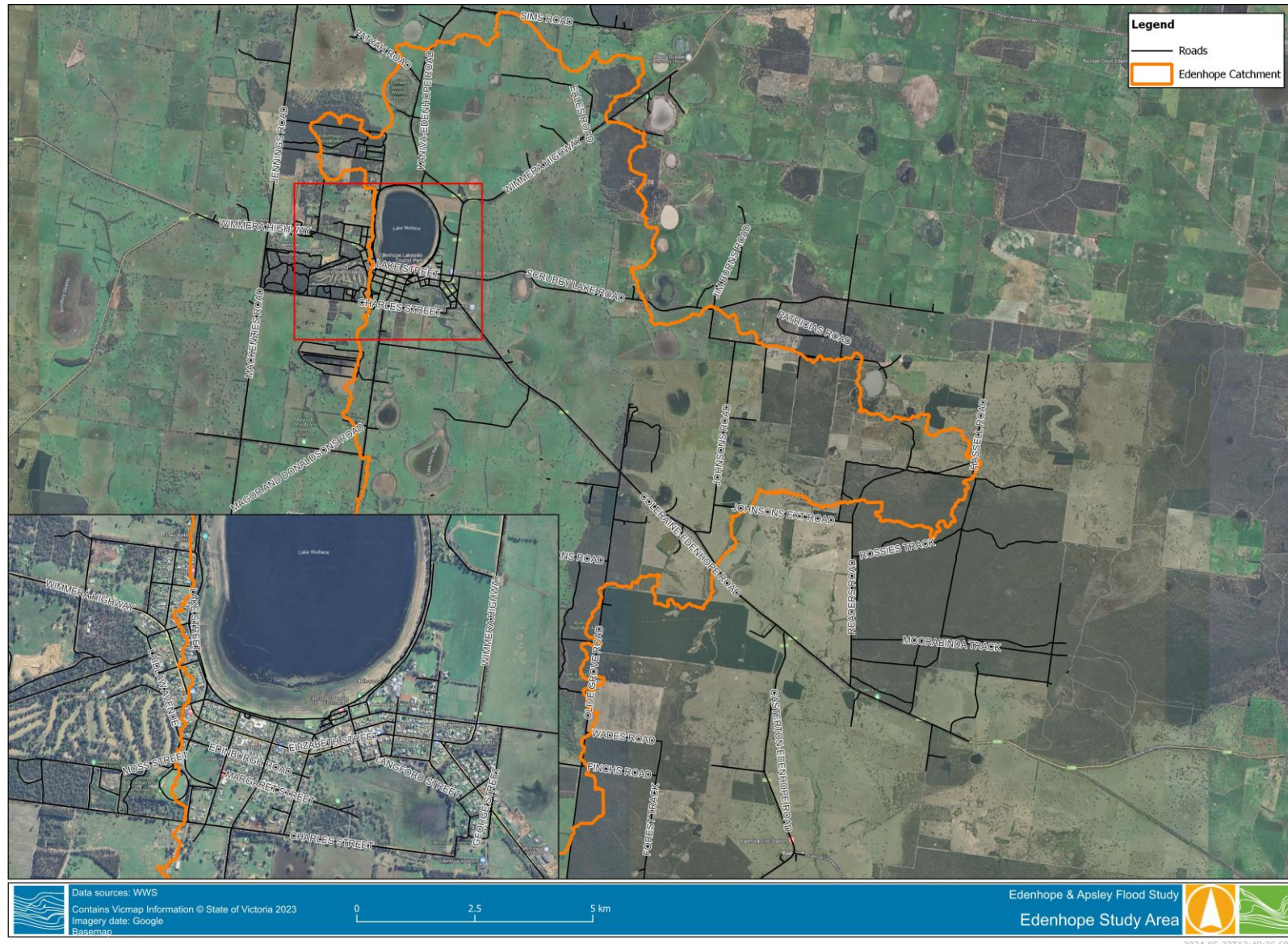


Figure 1-2 Edenhope Study Area



2 DATA COLLATION, MODEL DEVELOPMENT AND CALIBRATION

2.1 Overview

The Data Collation, Model Development and Calibration (R01) describe the collation and review of available data relevant to flooding, and the hydraulic model development and calibration in Edenhope. The following sections summarise the data used in this project.

2.2 Data Collation

Streamflow Data

There are no active or non-active streamflow gauges within the study area or in any adjoining catchments.

Storage Data

There is one major water storage across the study area:

- Lake Wallace, within Edenhope

There is limited recorded water level information available for Lake Wallace, but it does have opportunistic water level records or observed dates when the lake was either empty, full or overflowing. Most of this record has been extracted from newspaper articles/photos.

Examples of this record is shown in Figure 2-1 and Figure 2-2.



Figure 2-1 Edenhope – Lake Wallace flood record



Figure 2-2 Edenhope – Lake Wallace Overflow Record

Rainfall Data

Daily rainfall and sub daily rainfall data are available for Edenhope, for Edenhope at the Edenhope Airport gauge (079099). This is the closest gauge to the study area.

Drainage Infrastructure

Edenhope has township scale stormwater infrastructure, including open roadside drainage and bridges/culverts under roads. The infrastructure system is well developed with an interconnected pipe and pit network.

Topography Data

The project was primarily based on the Wimmera CMA LiDAR dataset (2006). The Wimmera CMA LiDAR covered the entirety of Edenhope and most of the contributing catchments. Areas not covered by the Wimmera CMA LiDAR adopted the VicMap 10m DEM. While the LiDAR was the primary source of topographic information, the model topography was further refined where more accurate or appropriate data was available.

These adjustments included the removal of water from storages, works known to have been undertaken, adjustments at bridges and culverts, and reinforced breaklines along roadways and levees.

A summary of the study area topography development is shown in Figure 2-3.

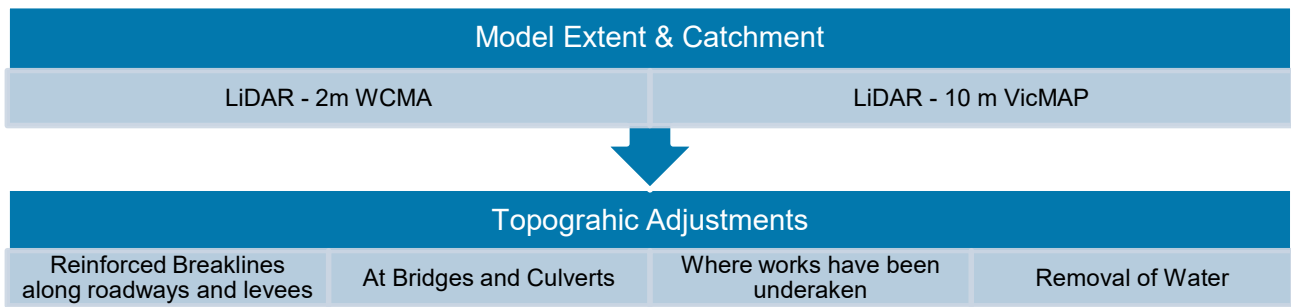


Figure 2-3 Model Topography Methodology

Community Consultation

Two community consultation sessions were held in Edenhope to form part of the data collation aspect of the project. During the initial community consultation, there was little information gained on prior flood events within Edenhope. A history of flooding within the township, as well as insights into flood behaviour within the township were provided, enabling community perspective on inundation mechanisms, consequences and drainage issues to be provided.

2.3 Model Development

This section summarises the modelling methodology for Edenhope.

2.3.1 Catchment Analysis

2.3.1.1 Catchment and Characteristics

Edenhope has a unique catchment, with several depressions located upstream of the township scattered throughout the catchment. The size of the depressions varies, with some relatively shallow and others covering a significant area.

The identified catchments and topography for Edenhope cover 98 km² in area. The catchments have significantly more storage than other catchments in Victoria. The actual area contributing to runoff is dependent upon the upstream wetland connectivity, with many potential semi-terminal depressions located within the catchments of both townships.

2.3.1.2 Historic Events

There is no stream gauges located within the catchment of interest, as such, historic flood events have been identified based upon local rainfall gauges, Lake Wallace water level records and consultation with the community.

2.3.1.3 Antecedent Conditions

As discussed, the Edenhope catchment contains multiple depressions creating a series of swamps, wetlands and lakes, all of which provide significant catchment storage. Many of these depressions are ephemeral, only experiencing pooling water in periods of prolonged rainfall. The complex connectivity of these wetlands influences flood behaviour and the levels within Back Swamp, Edenhope and Lake Wallace. If the catchment wetlands are full at the time of a large rainfall event, flooding is significantly more likely. If these wetlands are empty, it is likely that large rainfall events will fill them. It should be noted that historically, western Victoria has been subject to wet periods, i.e. late 2010/early 2011 and 2022. The likelihood of a large rainfall event occurring is not independent of the catchment wetlands being full.



2.3.2 Hydraulic Modelling

2.3.2.1 Model Extent and Structure

The Edenhope hydraulic model was developed in the TUFLOW HPC hydraulic modelling software.

The model adopted a 1D/2D Rain-on-Grid (RoG) approach, with directly applied rainfall to the upstream catchment. This modelling approach provided a better understanding of overland flow and drainage paths through the township and within the upstream catchment. RoG was considered more appropriate than a standard runoff routing model due to the complex natural upstream storages. As this investigation covered both stormwater and riverine flooding, rainfall was applied in two areas varying the Areal Reduction Factor (ARF).

The model adopted an outflow boundary downstream of Lake Wallace, as water spills into a constructed channel. The outflow boundary adopted a water level vs flow (stage-discharge) curve calculated from the topography. The influence of the boundary was controlled by the two upstream lakes, which both act as a natural control to upstream flooding.

2.3.2.2 Model Topography

The model topography was represented in a varying resolution (using Quadtree), with a cell size of 12 m outside of the township and 3 m within the township and across the local catchment. The ability for the resultant model grid to capture finer details was supported by Sub-Grid-Sampling (SGS) of the underlying topography datasets, which was based on detailed 2 m LiDAR.

The topography of the catchment and catchment wetlands is shown in Figure 2-4.

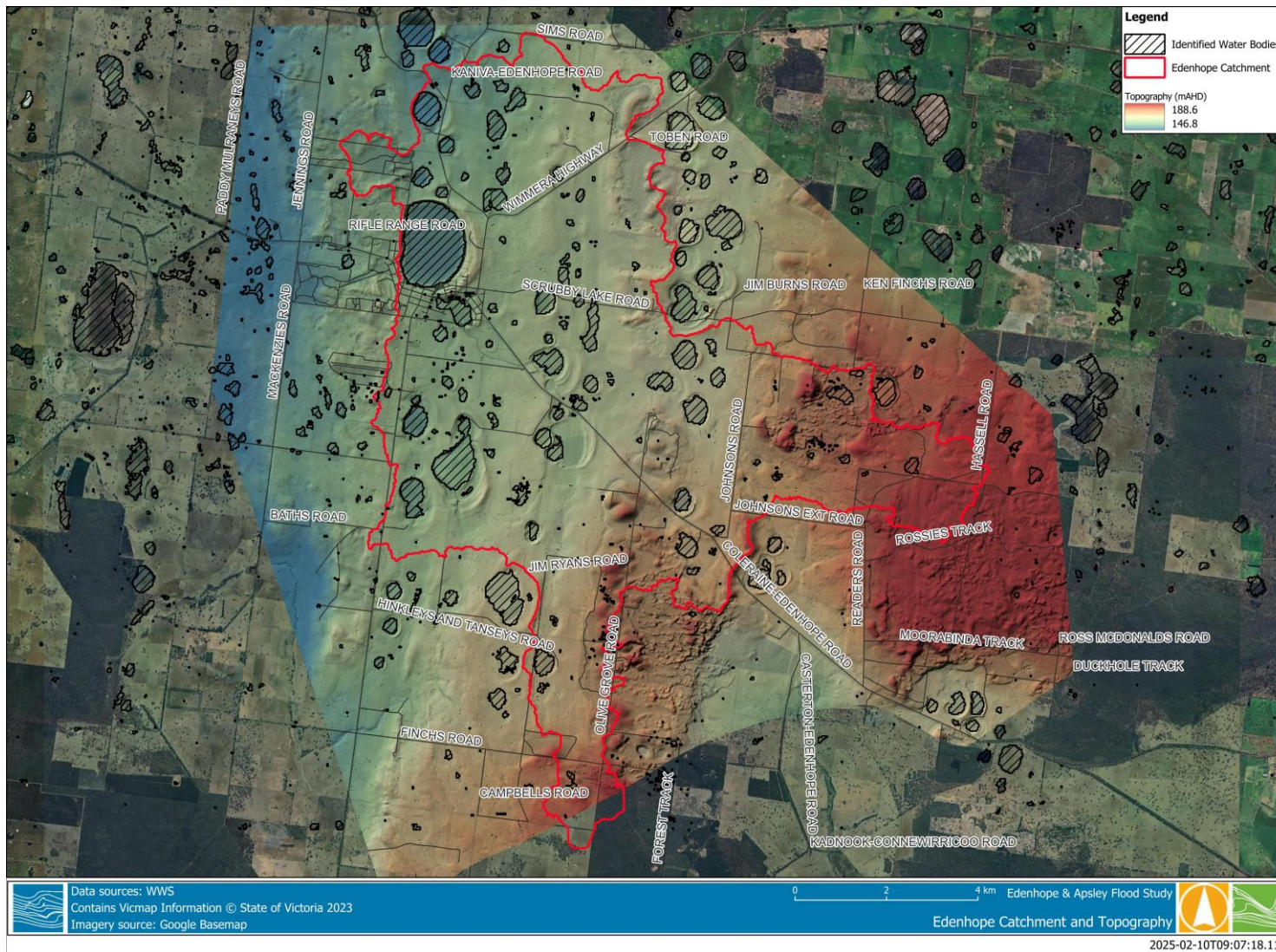


Figure 2-4 Edenhope catchment, wetlands and topography



2.3.2.3 Model Roughness

Surface roughness was represented using Manning's 'n'. The adopted Manning's 'n' values are presented in Table 2-1 and shown spatially in Figure 2-5.

Table 2-1 Land Use Manning's 'n' Roughness values

Material	Manning's 'n' value
Rural Residential	0.1
Pasture	0.04
Dense Vegetation	0.095
Waterway Channel	0.03
Roadway (Paved)	0.025
Roadway (Unpaved)	0.035
Lake / Swamp / Wetland	0.05

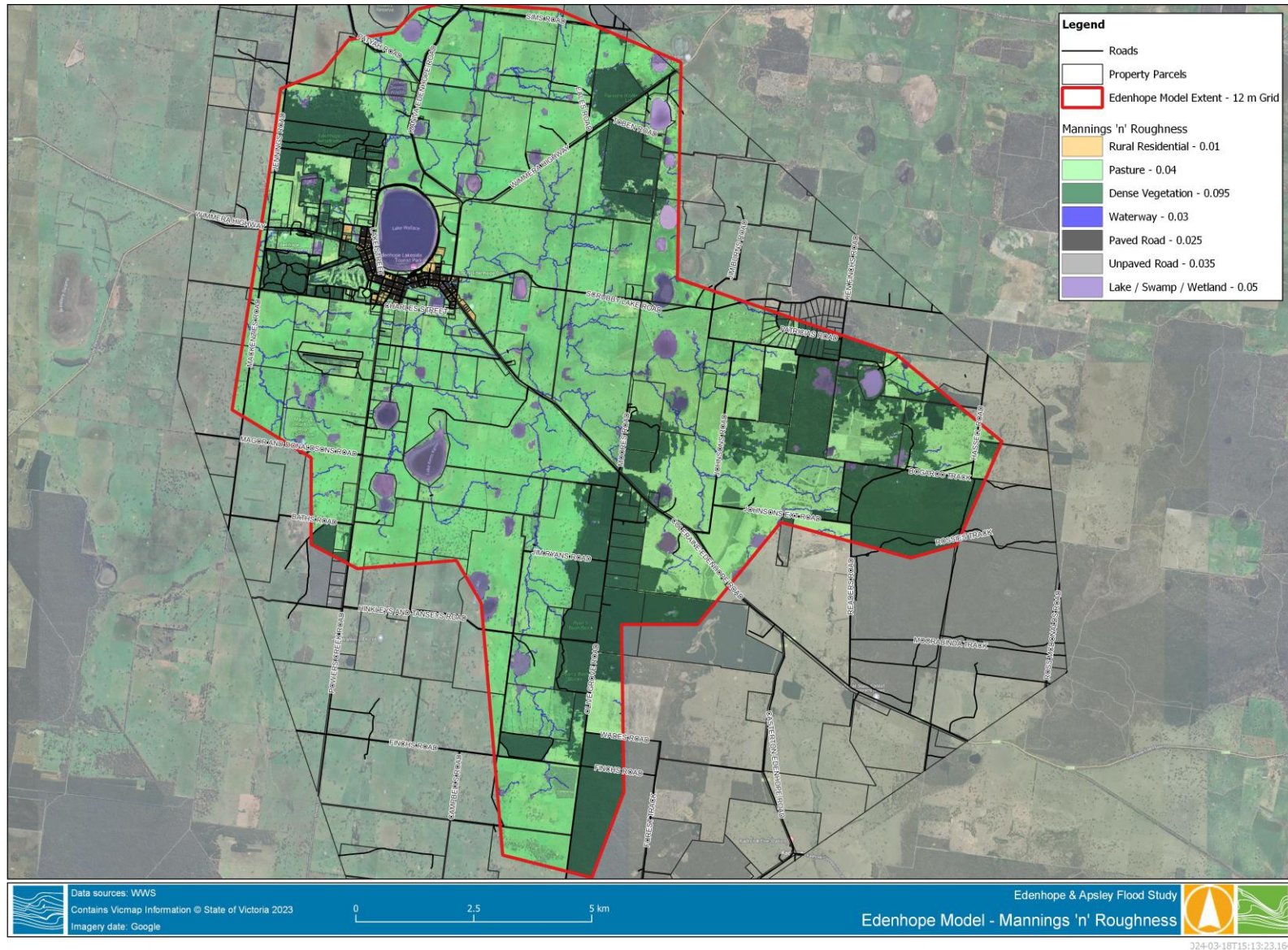


Figure 2-5 Edenhope – Model Roughness



2.3.2.4 Model Structures

The drainage infrastructure in Edenhope consists of open drains, pipes and pits. The major drainage network (pits and pipes) was provided by WWSC, with the invert levels estimated based on the topography, incorporating a standard cover. Additional culvert measurements were obtained during the site visit.

In total, the Edenhope model incorporated 211 pipes, 150 pits and 5 bridges. Upstream of the township where flow paths intercepted the roadways crossing was artificially removed to ensure connectivity. The blockage from the roads was incorporated by applying additional bridge structures at these locations.

2.3.2.5 Rainfall Losses

The empirical method of Initial Loss (IL) and Continuing Loss (CL) was adopted for this flood investigation, and it is the recommended procedure in the Australian Rainfall Runoff guidelines. These losses have been determined based on a regression analysis of 11 catchments within Region 3, using soil moisture in winter, design rainfall and the soil storage as variables to calculate IL and CL.

The adopted losses for Edenhope are provided in Table 2-2. While this method is appropriate for many catchments, the Edenhope catchments are expected to have significantly higher retention losses given the catchment storage.

Table 2-2 Edenhope Infiltration Loss Values

	Initial Loss (mm)	Continuing Loss (mm/hr)
ARR Recommendation	21	4.8

2.4 Model Calibration

2.4.1 Overview

As there was minimal information regarding flooding within Edenhope that could be used to verify hydraulic model results. As discussed in Section 1, the flood modelling and mapping of Edenhope was carried out concurrently with the same technical assessment being undertaken for Apsley. During community consultation for Apsley significantly greater observations of flooding were provided by the community, with the modelling matching these observations through adjustment of parameters. Given the well calibrated Apsley model, the Edenhope model adopted the same parameters as those determined for Apsley. This was considered adequate given the lack of specific observations within Edenhope and the similarities between the catchments.

The January 2011 event was modelled iteratively in the Apsley TUFLOW model. Calibration of the model had three primary variables, which included:

- Rainfall infiltration losses
- Antecedent conditions - note will also influence rainfall losses
- Mannings 'n' roughness values

Further details regarding the model calibration can be found in R02A.

2.4.2 Modelled Event & Scenarios

As flooding within Apsley and Edenhope is expected to be heavily reliant upon upstream antecedent conditions, the following scenarios and events were modelled:

- Scenario 1 - January 12th event to pre-wet the catchment, followed by January 14th event.



- Scenario 2 – January 14th event, adopting a dry upstream catchment.
- Scenario 3 – January 14th event, adopting a wet catchment (DEA 1% Return Frequency – Figure 3-4).

The adopted losses values were also adjusted to each of the event dates. More details can be found in R01 report, the Data Collation, Model Development and Calibration Report

2.4.3 Results & Discussions

Figure 2-6 shows the modelled flood depth for the January 2011 event in Edenhope. As there is little information available or obtained for the consequences of the January 2011 event within Edenhope, the ability for this investigation to assess the accuracy of the results presented is limited.

However, based upon the flood modelling results and scenarios run, it is evident that flooding from the upstream catchment within the township is heavily controlled by the topography. The primary flow path is controlled by the natural swamp upstream of Edenhope Lions Park (Back Swamp), with little impact to surrounding areas. Therefore, it is expected that residents in the town are likely more impacted but shorter intense events where the local stormwater network is exceeded.

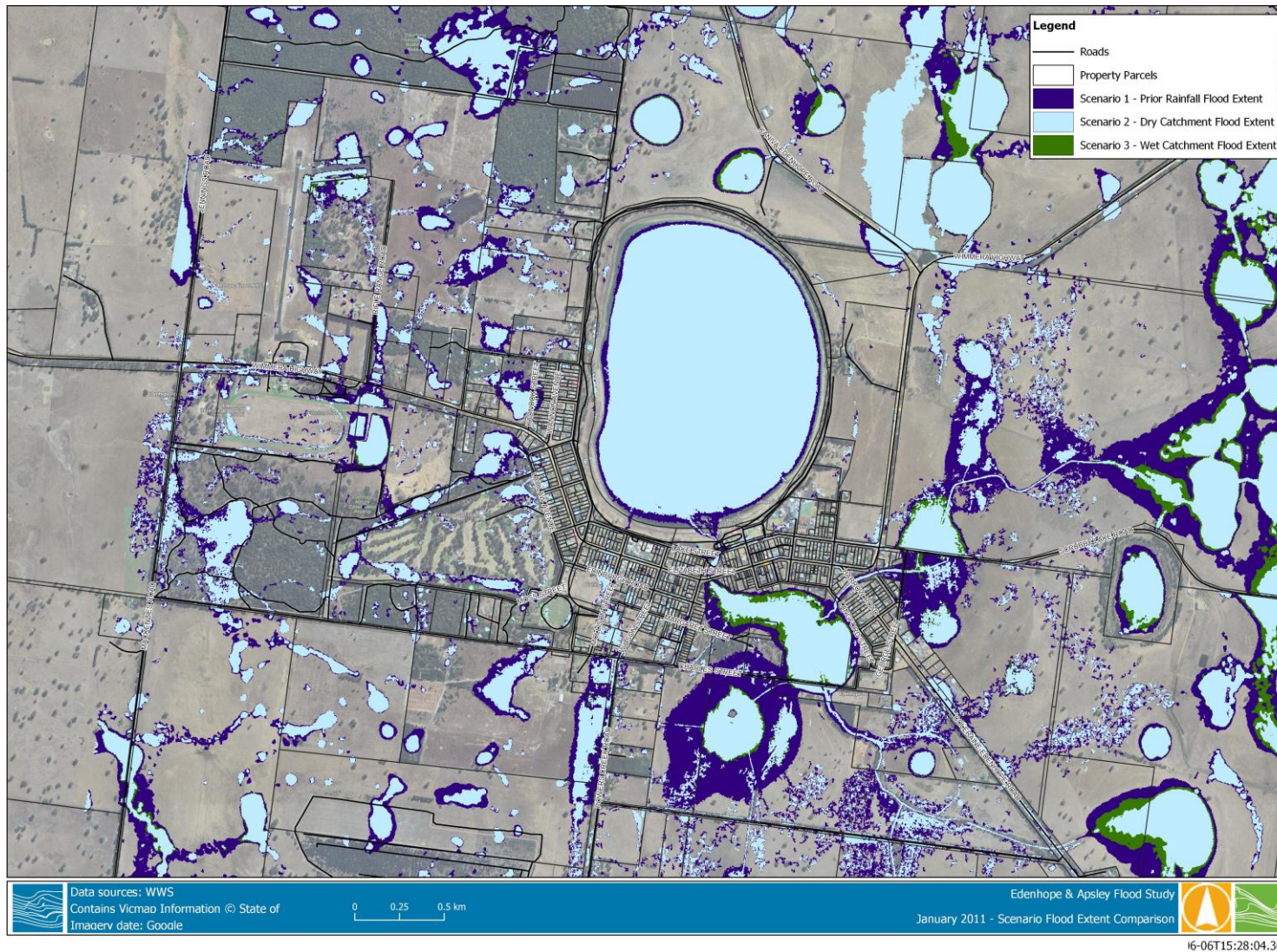


Figure 2-6 Edenhope Flood Extent Comparison between Scenarios for January 2011 event



3 DESIGN MODELLING

This section details the design modelling and sensitivity testing for Edenhope. Further detail can be found in the Design Modelling Report (R02A).

3.1 Adopted Parameters for Design Modelling

The adopted design parameters closely aligned with those determined during the January 2011 model calibration. The adopted parameter values were as follows:

- Antecedent conditions – 90th percentile initial water level
- Rainfall losses and pre-burst –
 - Initial Loss - 21mm.
 - Continuing Loss - 4.8 mm /hr.
 - 75th percentile pre-burst rainfall.
- Roughness coefficient – see Table 2-1.
- Critical durations – see Table 3-1.

Table 3-1 Finalised critical durations at key catchment locations

	AEP	Critical Duration
Edenhope township	1%	1 hour
	10%	1.5 hours
Upstream flow path	1%	12 hours
	10%	9 hours

3.2 Sensitivity Analysis

Model sensitivity testing was conducted adjusting the models initial water level, rainfall infiltration and storm duration. The parameter adjustment adopted the following methodology:

- **Initial Water** – a single run for the 10% and 1% AEP events was completed considering a range of starting water levels in the upstream wetlands to understand their sensitivity to flooding.
- **Rainfall Losses** – a single run for the 10% and 1% AEP events was modelled adopting half the losses adopted to understand its impact.
- **Pre-Burst** – Testing of rainfall pre-burst was similar to testing of initial water levels. Contributing the the volume of runoff within the model.
- **Critical Storm Durations**
 - *Temporal Patterns* – all 10 temporal patterns were run for the 10% and 1% AEP events for both short duration and long duration events. Front, middle and rear loaded temporal patterns were modelled for the remaining AEPs.
 - *Durations* – for all design modelling a single temporal pattern was run for all durations to identify their respective critical duration/s.



The Edenhope model show limited sensitivity to antecedent conditions, rainfall losses and pre-burst, roughness coefficient, and critical storm duration. For the 10% and 1% AEP event, the initial water level was not shown to be influential on results in the township and upstream flow path.

Rainfall losses/pre-burst and roughness coefficients had some impacts on the overall flood level results, with the changes in water level visible at around the depression/storages. However, has little influence on the overall flood extent and along flow paths within Edenhope.

The parameter testing determined the adopted pre-burst values enabled a conservative flood mapping approach. These values combined with the roughness values calibrated to the recent flood event resulted in a reasonable approach to the parameter value adoption for the design modelling.

3.3 Design Flood Mapping

Figure 3-1 and Figure 3-2 show the flood depths and hazards for 1% AEP flood event, and Figure 3-3 and Figure 3-4 show a zoomed in perspective of Edenhope for the same flood event.



Figure 3-1 Broad extent - 1% AEP flood depth with water surface elevation contours

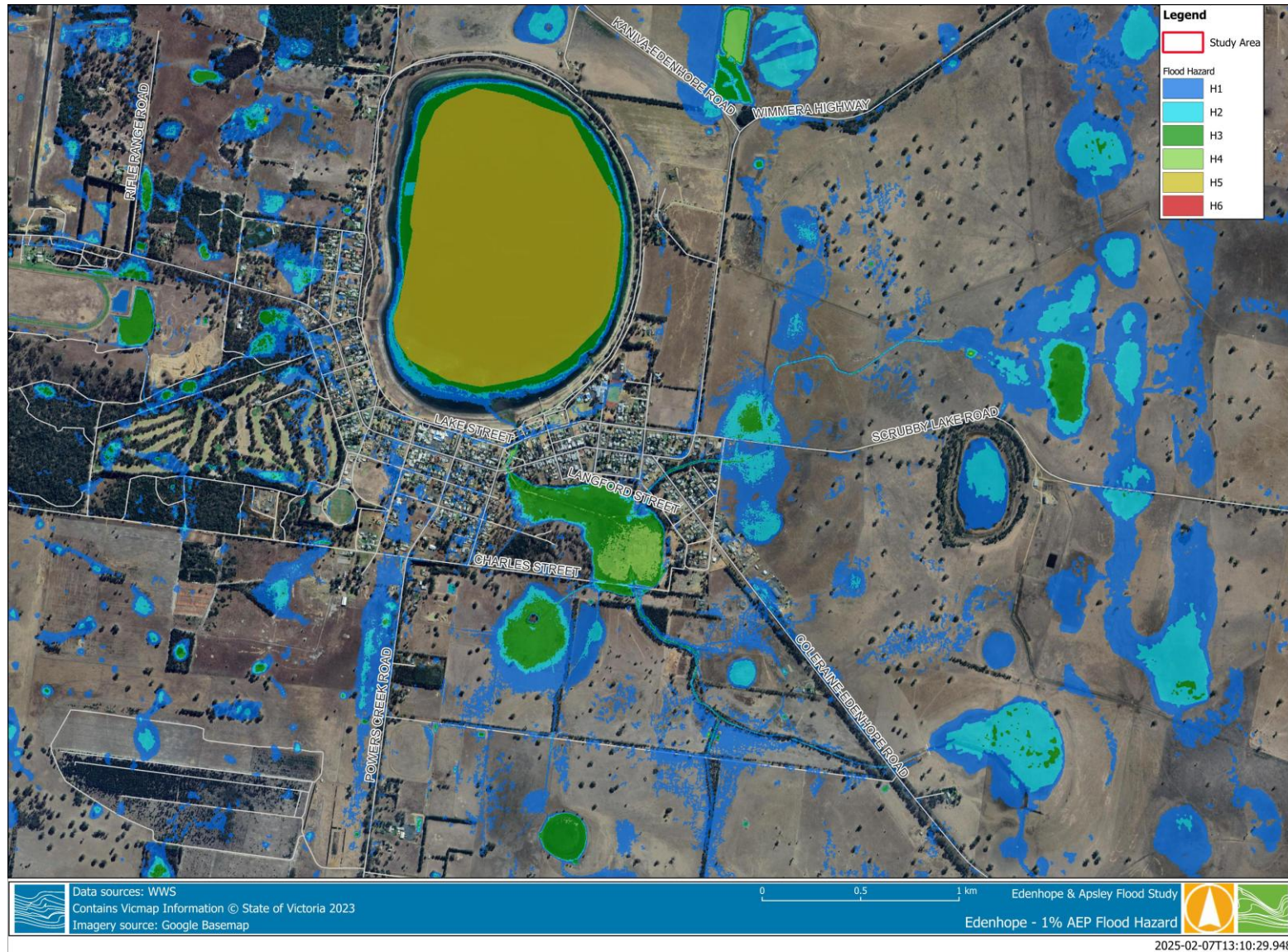


Figure 3-2 Broad extent - 1% AEP Flood Hazard



Figure 3-3 Zoomed into Edenhope - 1% AEP flood depth with 1m water surface elevation contours



Figure 3-4 Zoomed to Edenhope - 1% AEP Flood Hazard



4 FLOOD INTELLIGENCE

4.1 Overview

In line with the project brief, the following flood intelligence products were produced:

- Summary table of flood behaviour, impacts, roads, and property inundated, details can be found in the Edenhope Flood Intelligence Report (R03A).
- Average flood peak travel time estimation, see Section 4.2.
- “Flood/No Flood” tool, providing a rough link between observed rainfall and flood magnitude, see Section 4.3.
- Flash flooding monitoring capability.
- “Flood Intelligence Card”, describing the key flooding consequence across the study area for each design event, details can be found in R03A.

The flood impacts summary table, flood peak travel estimates, and Flood/No Flood tool have been reproduced herein for reference.

4.2 Flood peak travel time

Definitive information on the time it takes flash flooding (i.e. resulting from heavy rainfall associated with severe weather or thunderstorm activity) to develop (i.e. to arrive at a location) following the start of heavy rain and the time it takes for the maximum water depth/extent to be reached is not available.

However, **the timing of inundation for the bulk of Edenhope is likely to be short: less than 60 minutes**. The timing of inundation post rainfall along the largest flow path into Lake Wallace, via Back Swamp is longer. This generally requires sustained rainfall.

Table 4-1 Timing of Peak Flow

From	To	Typical travel time	Comments	Duration of inundation
North-Eastern Catchment				
Start of rainfall (catchment)	Start of inundation in Edenhope	1 hour	Timing depends on rainfall pattern	Generally <40 hours
Southern catchment				
Start of rainfall (catchment)	Start of inundation in Edenhope	1 hour	Timing depends on rainfall pattern	Generally <20 hours
Lake Wallace				
Start of rainfall (catchment)	Start of Water Rising in Lake Wallace	1 hour	Timing depends on rainfall pattern	Generally <20 hours

4.3 Flood/No Flood tool

The Intensity Frequency Duration (IFD) design rainfall data used in the development of the Edenhope Flood Investigation can be utilised along with forecast and observed rainfall data as an early warning tool. The data can be used to identify the likely magnitude of flooding and resulting consequences based on the predicted rainfall depths of an event. The flood/no flood tool is presented in Figure 4-1.

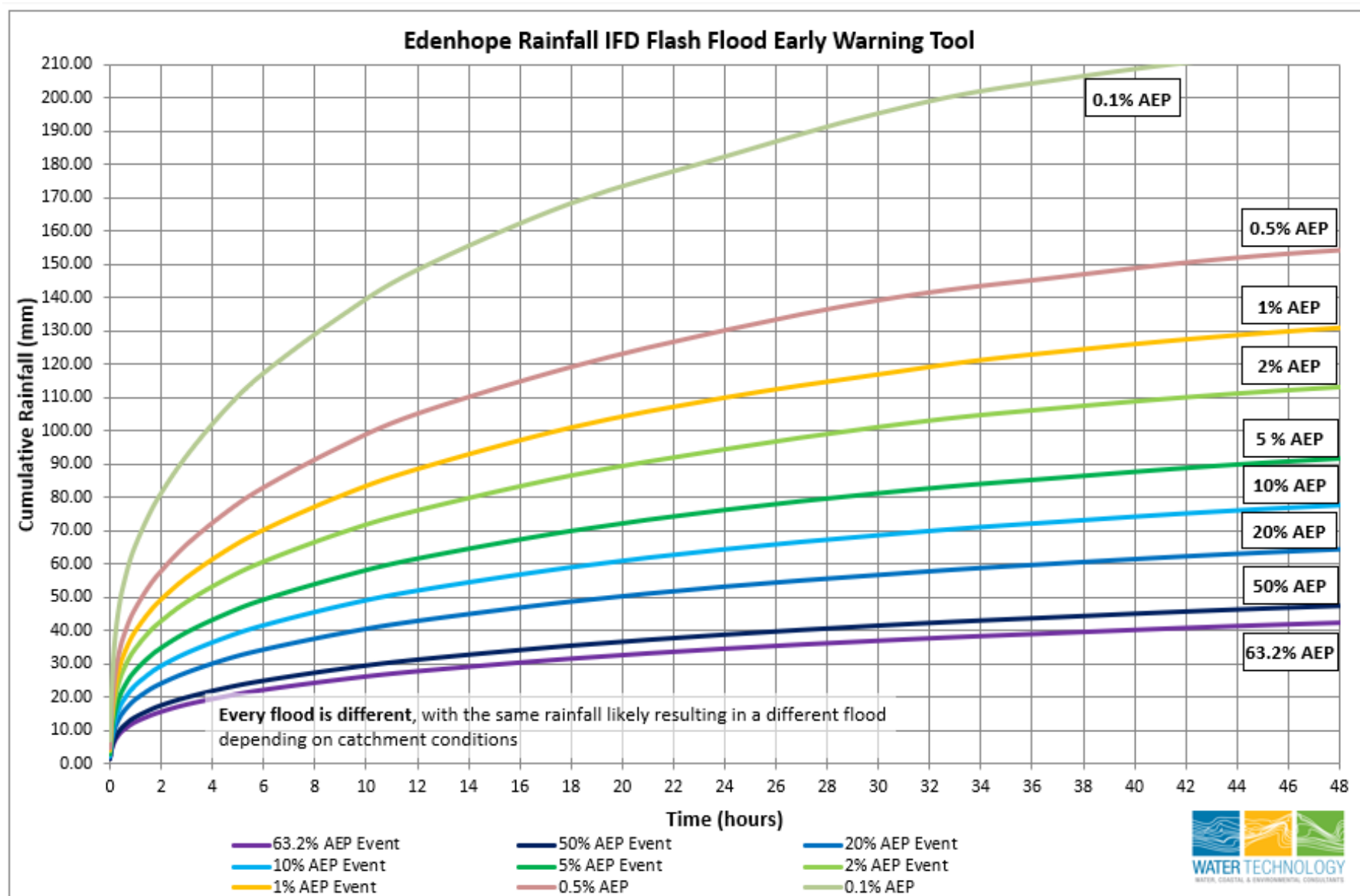


Figure 4-1 Edenhope Flood/No Flood Tool



4.4 Municipal Flood Emergency Plan tables

A set of summary tables was developed for Edenhope, to be read from top to bottom, with each subsequent larger magnitude event reporting on the incremental changes in consequences across different regions of the study area. This is presented in R03A.

4.5 Monitoring capability for flash flooding

Currently, there is no formal flood warning system in place for Edenhope. Additionally, there are no streamflow gauges within the catchment. Given the lack of gauges, official flood warning capability for the catchment and township is limited to the issue of a Flood Watch. Note a Flood Watch is not necessarily guaranteed to be issued prior to flooding.

The closest rain gauges that record sub-daily rainfalls located at Edenhope Airport. The Edenhope Airport gauge report to the Bureau of Meteorology's website¹.

The Edenhope rainfall gauge record should be used together with the Flood/No Flood tool presented in Figure 4-1. It should be noted that the rain gauge may not provide warning times sufficient to enact response actions other than evacuation or shelter in place and a cautious approach should always be taken.

4.6 Overview of Flooding Consequences

4.6.1 Warning Time

Inundation in the Edenhope township impacting properties and infrastructure is caused by overland flow from the southeastern region of the catchment. Due to the nature of the critical storm within that catchment, the warning time of the flash flooding at Edenhope is limited to less than an hour.

4.6.2 Areas Affected

The flood extent map at Edenhope and details on "Flood Impacts and Required Actions" provide guidance on where flooding is likely to occur within the township of Edenhope, are described clearly in R03A.

4.6.3 Roads Affected

Figure 4-2 to Figure 4-4 outlines the roads which are overtopped by flooding in events ranging from the 20% AEP up to the 0.1% AEP event.

More details and mappings for impassable roads can be found in R03A.

4.6.4 Isolated Areas

Flooding across the Edenhope township in all AEP events modelled (0.5% AEP down to the 20% AEP) is relatively shallow and/or slow moving. Therefore, the risk of isolation due to extended periods of road inundation at properties is relatively minimal.

Ingress/egress to and from these properties is possible as shown in the modelling completed in this assessment.

¹ Bureau of Meteorology Edenhope Airport Gauge -
https://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=136&p_display_type=dailyDataFile&p_startYear=&p_c=&p_stn_num=079099



4.6.5 Essential Infrastructure

Regions of Edenhope College and St Malachy's School are inundated in all AEP events (0.5% AEP down to the 20% AEP), which requires action to protect children.

4.6.6 Property Inundation

Property inundation has been assessed based on the maximum flooding across the entire property parcel for each AEP event. Properties that did not contain residences or building structures are not reported on in this assessment. Building floor levels with respect to flooding depths have not been considered in this assessment due to the nature of flooding generally being relatively shallow.

The 1% AEP flood extent and the properties flooded during the range of modelled design events are shown in Figure 4-5 to Figure 4-7, with particular focus on the Edenhope township.

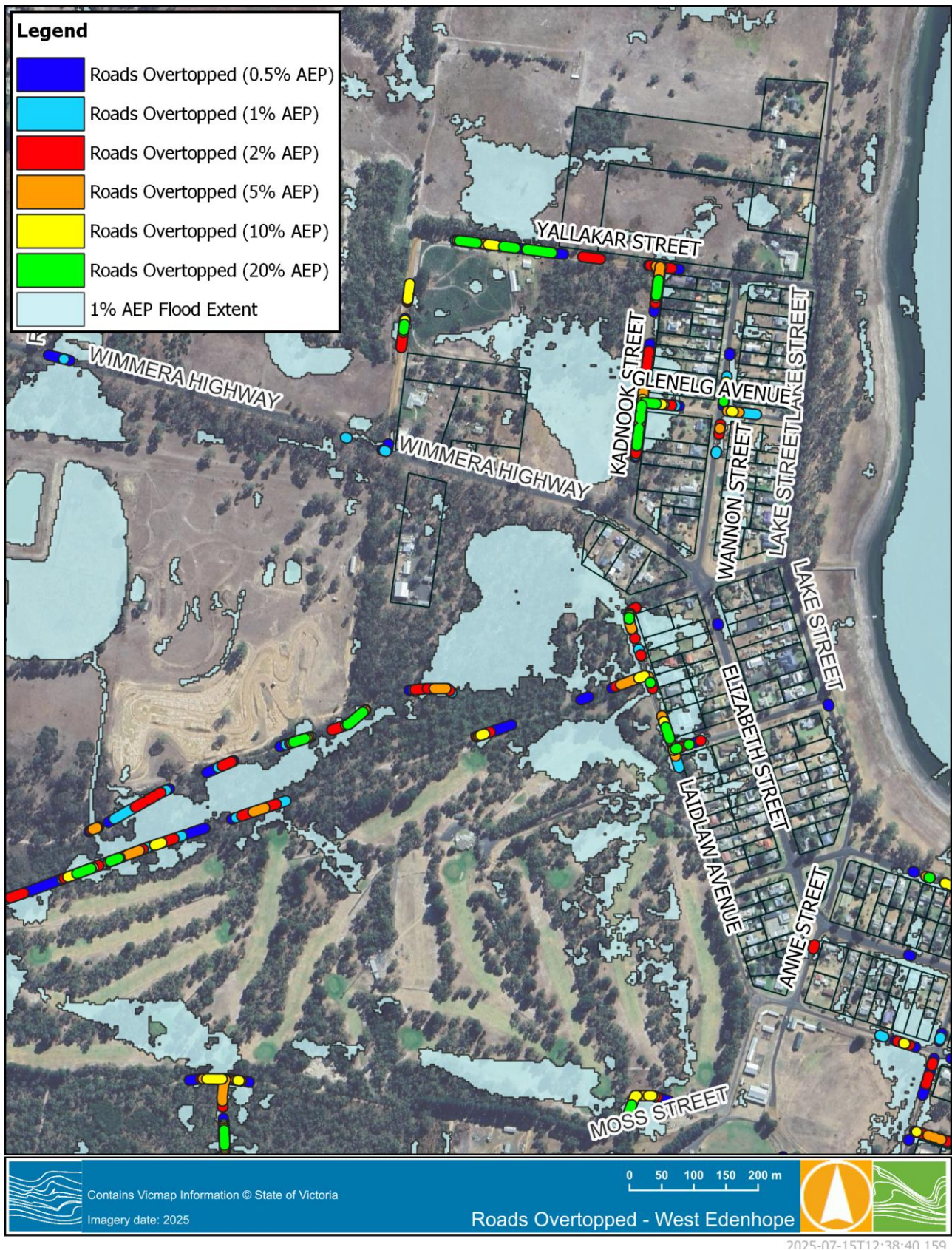


Figure 4-2 Roads overtopping – Edenhope West

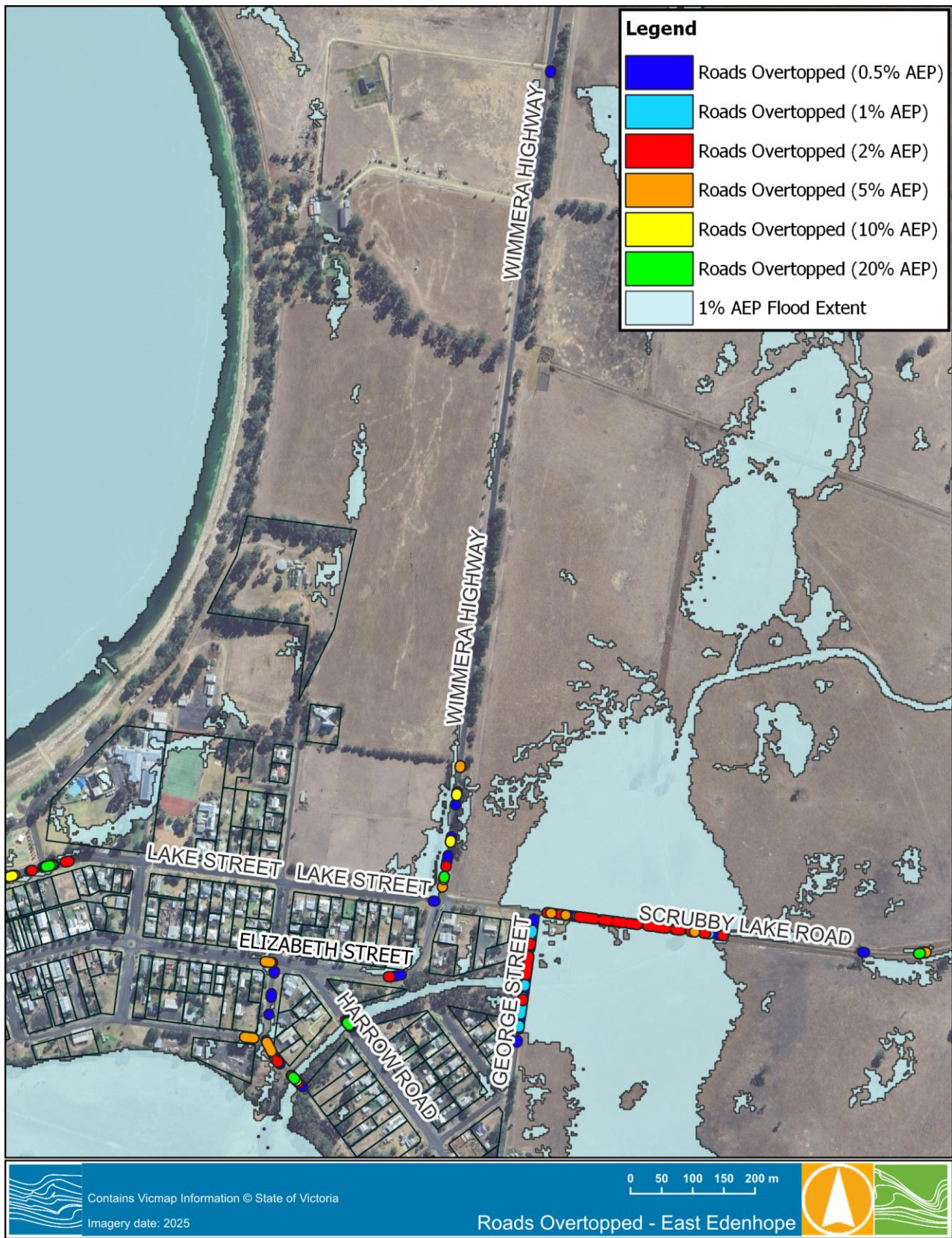


Figure 4-3 Roads overtopping – Edenhope East

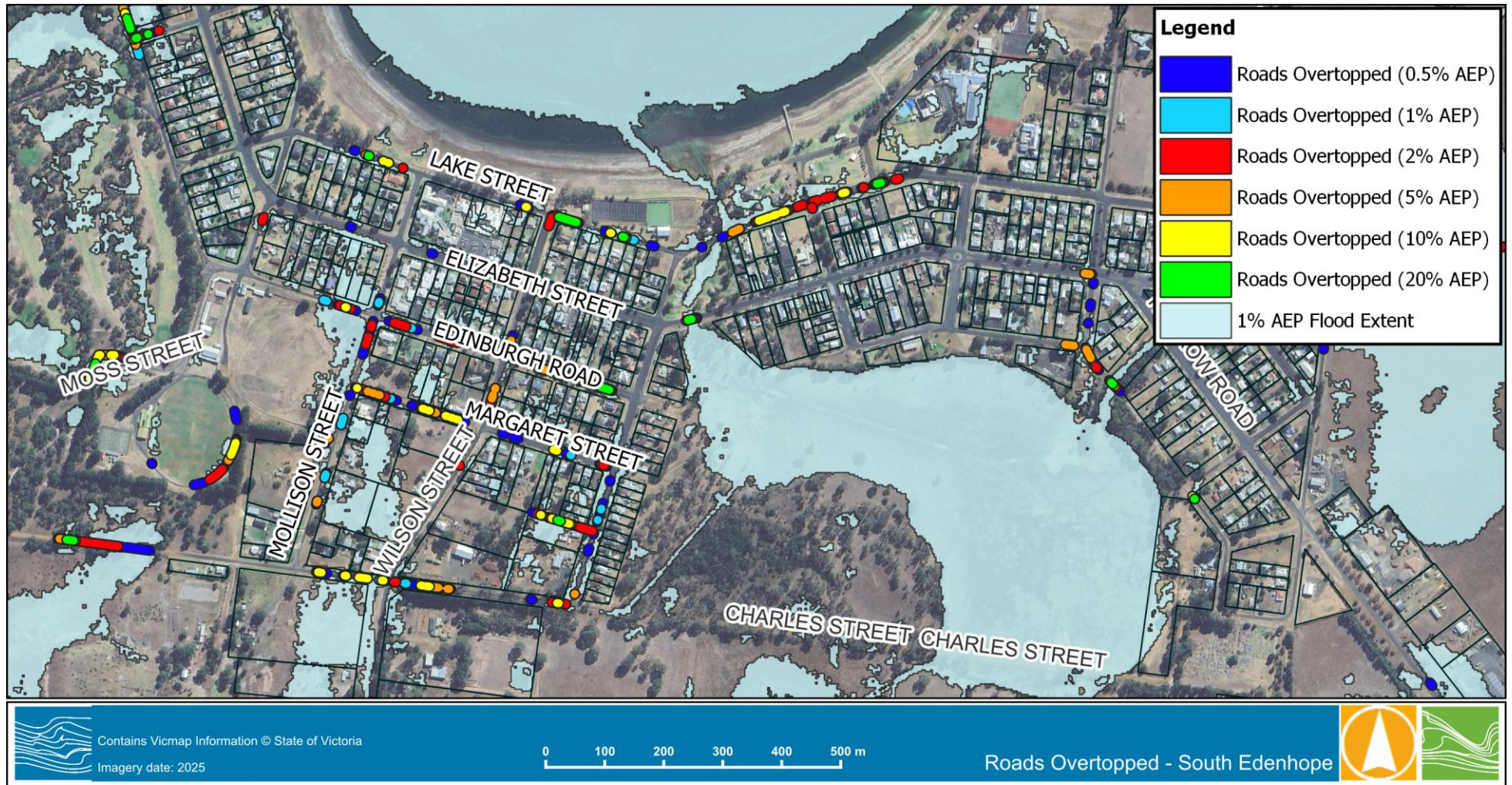


Figure 4-4 Roads overtopping – Edenhope South

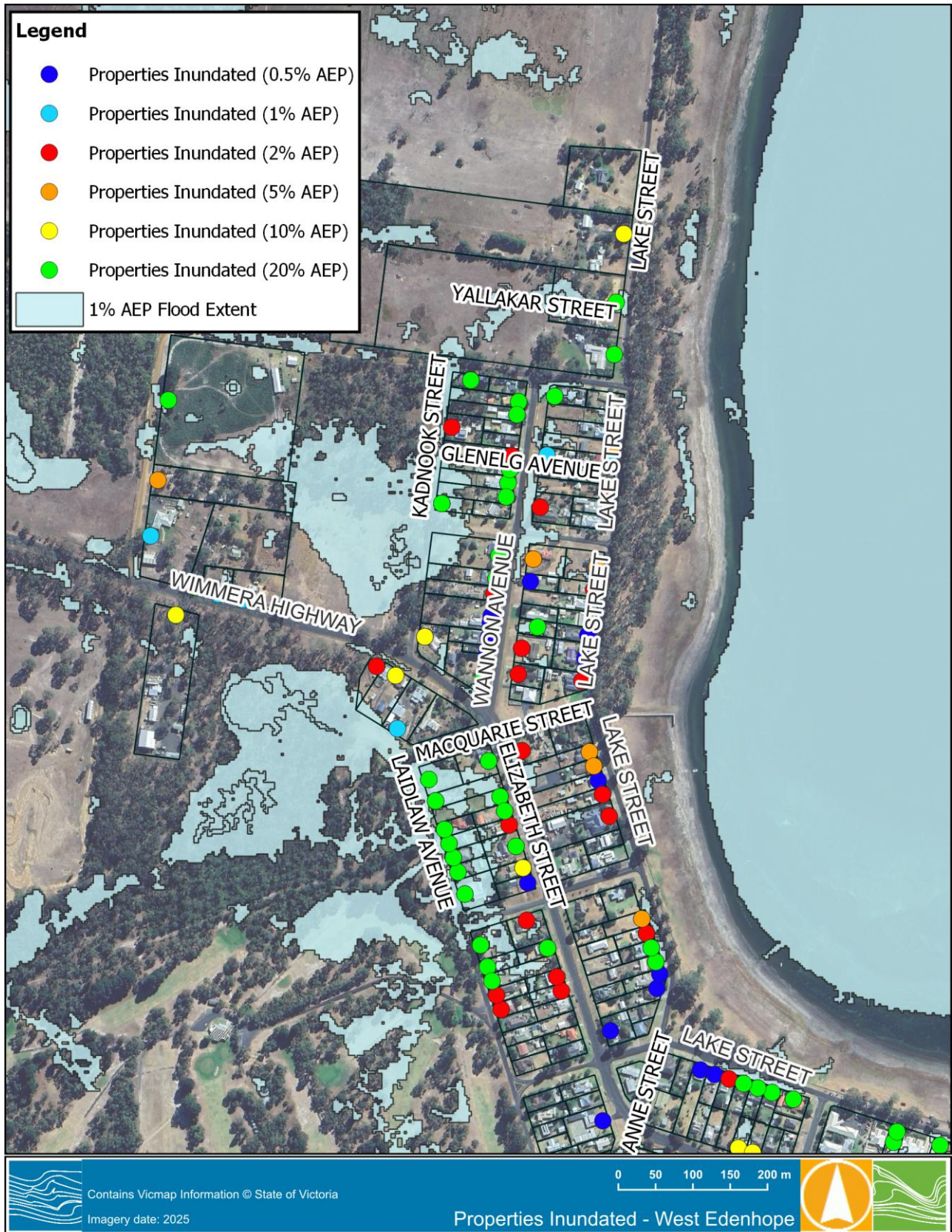


Figure 4-5 Properties Inundated – Edenhope West

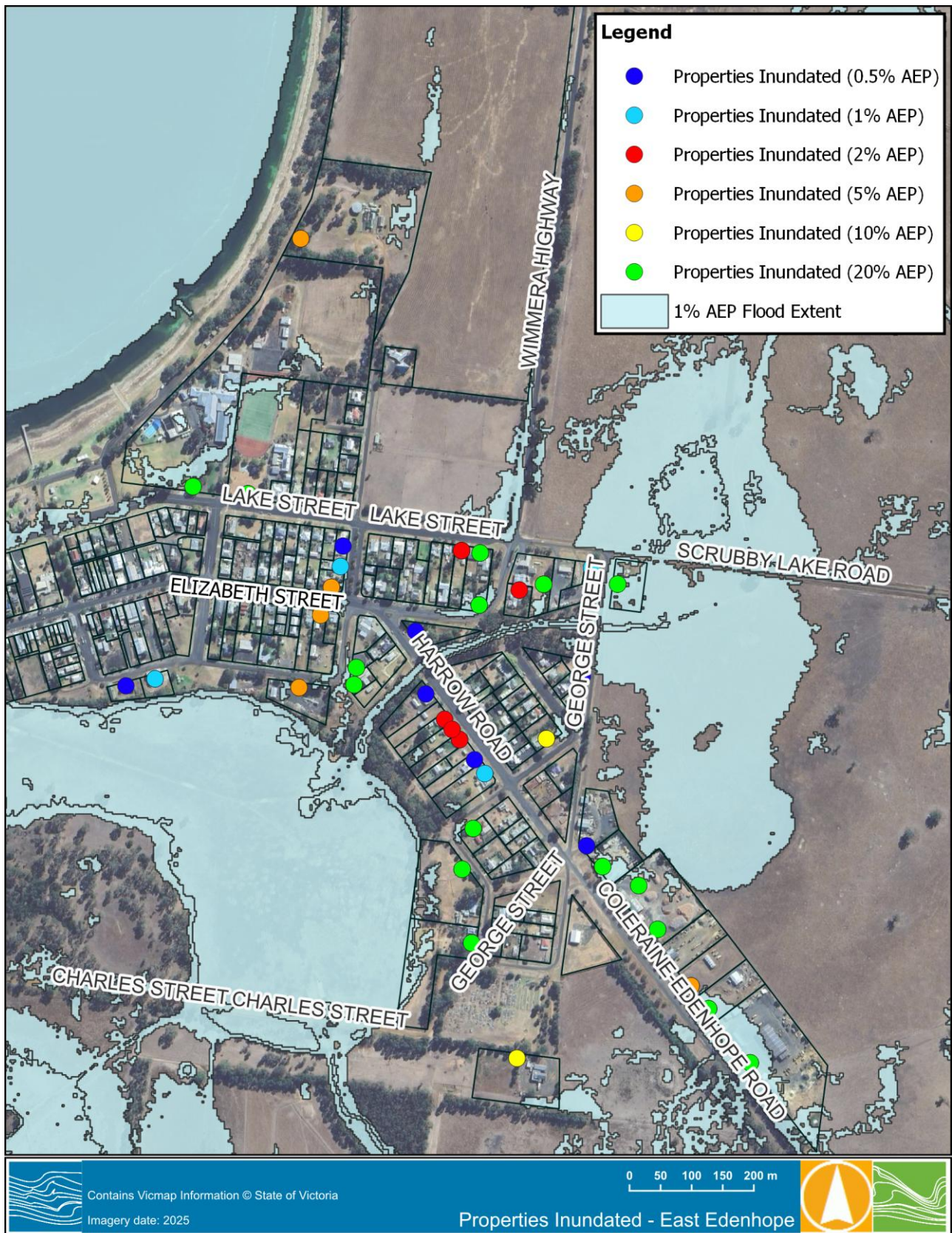


Figure 4-6 Properties Inundated – Edenhope East

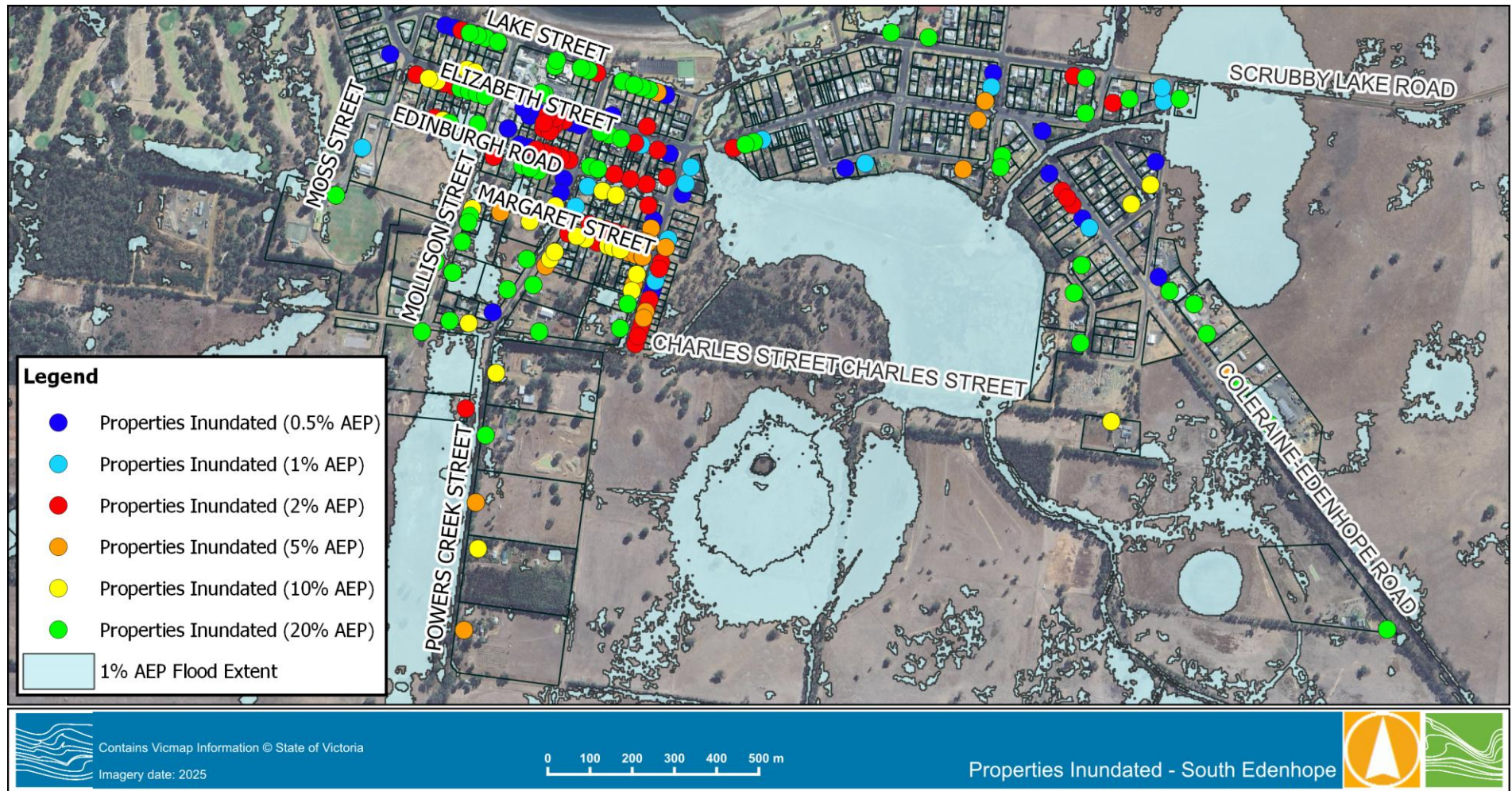


Figure 4-7 Properties Inundated – Edenhope South



4.7 Flood Intelligence Card

The flood intelligence card describes the key flooding consequences across the study area for each design event. This card can be found in R03A.

4.8 Flood Damage Assessment

A summary of the flood damages with respect to each AEP event has been assessed with respect to the number of properties flooded; direct damage cost; and indirect damage cost. A breakdown of the cost is summarised in R03A. Given there are no properties flooded above floor in Edenhope, most of the flood related damage is related to general inundation of residential lots.

Based on this information, the Average Annual Damage has been calculated to be **\$86,466**.

Furthermore, the total cost with respect to each AEP event is presented in Figure 4-8.

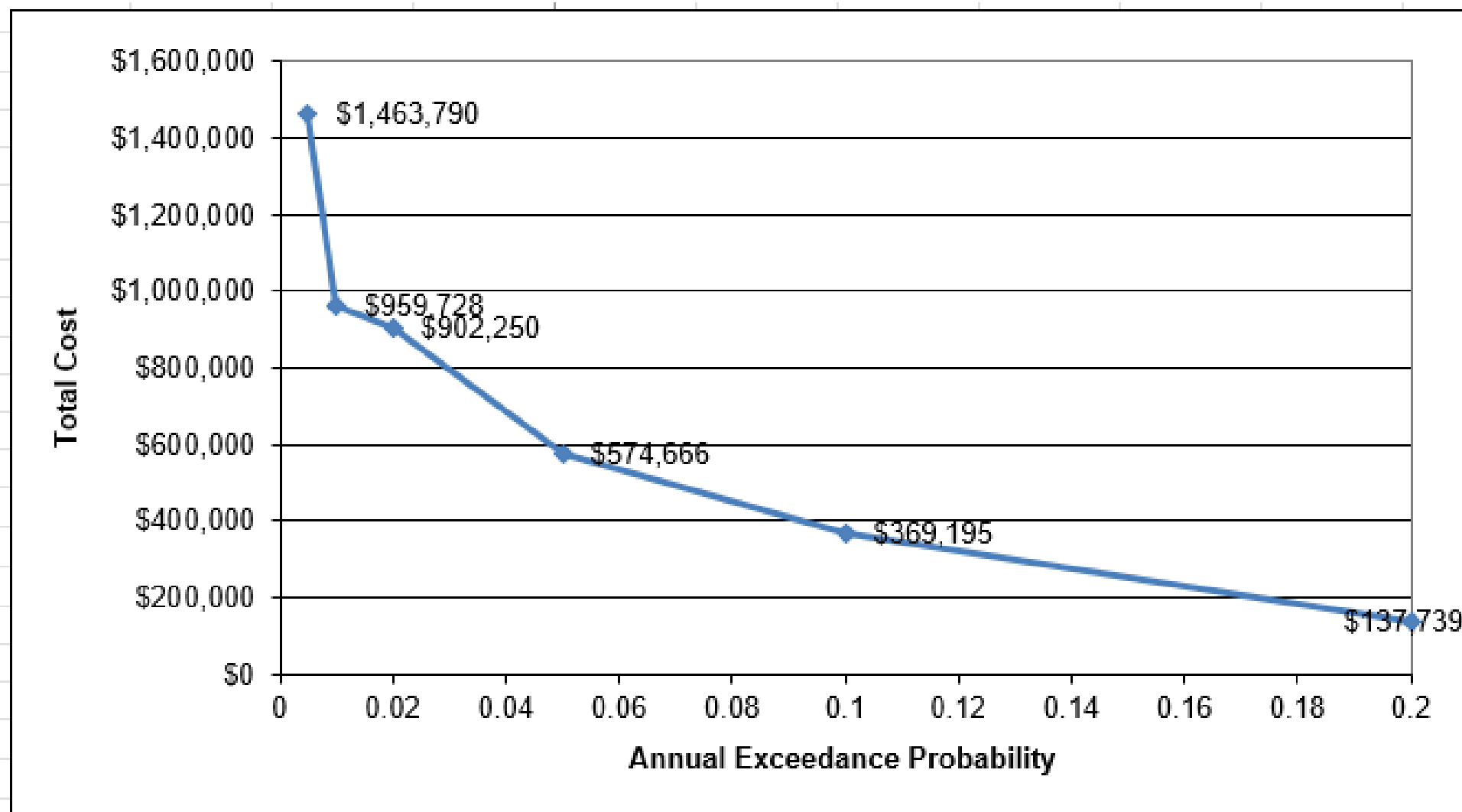


Figure 4-8 Flood Damage Assessment based on AEP Event



5 PLANNING SCHEME LAYERS

5.1 Overview

Land use planning controls and building regulations provide mechanisms for ensuring appropriate use of land and building construction, given the flooding risks to a particular area. Land use planning controls are aimed at reducing the growth in flood damages over time. The controls balance the likelihood of flooding with the consequences (flood risk).

As part of ongoing municipal reform, the State Government introduced a consistent planning scheme format for application across the State. The Victorian Planning Provisions (VPPs) are employed by all Victorian municipalities.

Victorian Building Regulations specify that floor levels should be at least 300 mm above a nominated flood level. If land is subject to flooding, the municipal council may set conditions that require a particular type of construction or particular types of construction materials.

This section details the input data, methodology and outputs for the land use planning flood mapping. The following are discussed:

- Victorian Planning Provisions – outlines the flood related Victoria Planning Provisions (VPPs).
- Flood related planning zones and overlay – details the available flood related planning zone and overlays.
- Flood related planning zone and overlays delineation – details the delineation of the flood related planning zone and overlays for the study area.

5.2 Victorian Planning Provision

The Victoria Planning Provisions (VPPs) aim to achieve consistency in the application of planning controls for areas subject to flooding throughout the State. The stated objectives are to protect life, property and community infrastructure from flood hazard, and to preserve flood conveyance capacity, floodplain storage and natural areas of environmental significance.

The VPPs provide for three overlays and one zone associated with mainstream flooding as follows:

- Land Subject to Inundation Overlay (LSIO)
- Floodway Overlay (FO)
- Urban Floodway Zone (UFZ)
- Special Building Overlay (SBO)

The LSIO and FO overlays were considered relevant to the present study. The definitions of these overlays and their criterion are provided in the following sections:

For each of the overlays, the VPPs specify the appropriate types of land uses and developments which are to be regulated through a system of permits. These are intended to achieve consistency throughout the State, but local variations to these guidelines are allowed in planning permit exemptions through a schedule to a flood overlay and/or performance-based criteria through a local floodplain development plan that has been incorporated into the planning scheme.



5.3 Flood Related Zones and Overlays

5.3.1 Land Subject to Inundation Overlays (LSIO)

The LSIO identifies land liable to inundation by overland flow, in flood storage or in flood fringe areas. In this project the 1% AEP flood event under the SSP3-7.0 2100 climate change scenario was used.

The permit requirements of LSIO are intended:

- To ensure that development maintains the free passage and temporary storage of floodwaters.
- To minimise flood damage.
- To be compatible with the flood hazard and local drainage conditions.
- Not to cause any significant rise in flood level or flow velocity.
- To protect water quality in accordance with relevant State Environment Protection Policies (SEPPs).

In general, emergency facilities (hospitals, schools and police stations etc.) must be excluded from this area (refer Clause 15.02). Similarly, developments or land uses which involve the storage or disposal of environmentally hazardous chemicals or wastes, and other dangerous goods should not be located within LSIO.

5.3.2 Floodway Overlay (FO)

The FO identifies waterways, main flood paths, drainage depressions and high hazard areas. The identification of FO has been based on the below criteria:

- 1% AEP SSP3 2100 depths > 0.5 m
 - 1% AEP SSP3 2100 velocities > 1.5 m/s
- 1% AEP SSP3 2100 velocity x depth $\geq 0.4 \text{ m}^2/\text{s}$

5.3.3 Overlay Generation Criterion

In generating the draft overlays, the following principals and guidelines were developed and applied from the existing flood study and in consultation with West Wimmera Shire Council and Wimmera CMA:

- Raw gridded model results were smoothed on their fringes to create a plausible representation of the floodway and flood fringe boundaries. This removed the irregular 'saw tooth' edge.
- Irregularities in the floodway and flood fringe boundaries, such as small 'tongues' of flood-prone land extending out from the bulk of the identified flood extent were smoothed where necessary. The underlying Planning Scheme Zone was a consideration in doing this.
- Islands (high ground) within the Floodway Overlay (i.e. marooned by high hazard flooding) were in general covered by the Floodway Overlay due to access being cut. A planning permit application would be therefore filled the less than 1-hectare islands which ensures flooded access hazards are accounted for.
- The removal of isolated patches and paddles (such as dams) which less than 1 hectare and mapped outside of the main floodplain area and not connected to any stormwater infrastructure were removed.
- Each overlay polygon was smoothed by applying the Polynomial Approximation with Exponential Kernel (PAEK) in ArcGIS Pro with parameter as 25m.

An overview of the proposed FO and LSIO for Edenhope catchment are presented in Figure 5-1, a broad extent of the Edenhope planning layers are presented in Figure 5-2.



Figure 5-1 Zoomed to Edenhope – Edenhope Planning Overlays

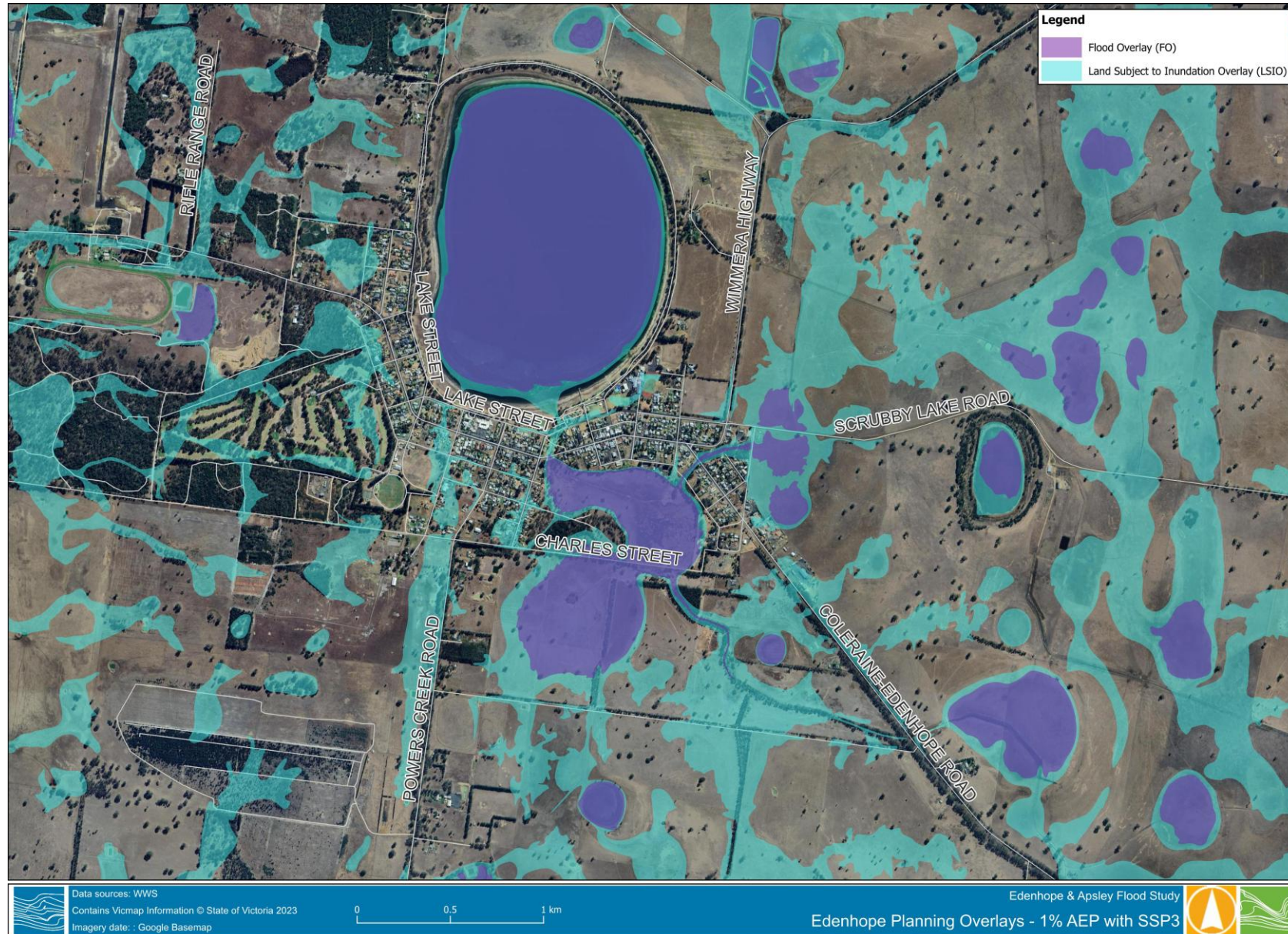


Figure 5-2 Broad Extent – Edenhope Planning Overlays



6 SUMMARY

The Edenhope Flood Investigation has produced detailed flood modelling of overland flooding within and surrounding the township. The mapping produced is fit for the purposes of flood emergency planning and response alongside statutory and strategic planning. The study has also investigated the current flood impacts in terms of average annual damages and the potential for structural mitigation to reduce those damages. Flood intelligence products have been produced and included in a draft update to the West Wimmera Shire Council Municipal Emergency Management Plan, these are detailed in the Flood Intelligence (R03A) Documentation.

- West Wimmera Shire Council
 - Endorse the flood study with the aim of adopting the flood study recommendations.
 - Undertake a planning scheme amendment to update the flood related planning overlays to reflect the flood risk mapping produced by this project. It should be noted a separate planning overlay related report has been produced for this study.
 - Consider the designation of flood prone land as provisioned under the Building Act
 - Discuss with the Bureau of Meteorology and Wimmera CMA for the consideration of potential flash flood monitoring.
 - Review the information within the Flood Intelligence and Flood Warning Report to undertake an update of the Municipal Emergency Management Plan.
 - Undertake a review of the current response, maintenance and operations documentation with Council staff.
 - Investigate clearing activities at the bridge on Elizabeth Street adjacent to the Lions Park, to remove accumulated flood debris and non-native vegetation.
- Wimmera CMA
 - Endorse the flood study and use the flood mapping data to inform floodplain risk management decisions.
 - Upload the Victoria Flood Database mapping data and the excel spreadsheet of property inundation to FloodZoom.
- Victoria State Emergency Service with assistance from Wimmera CMA and the West Wimmera Shire Council:
 - Continue to engage the community through regular flood awareness programs such as the VICSES FloodSafe program.
 - Update Local Flood Guide.
 - Assist the West Wimmera Shire Council in updating the MFEP.
 - Review the updated MFEP (when available) and discuss with the West Wimmera Shire Council the changes proposed by Water Technology prior to adopting the revised document.
- Future flood events in Edenhope should be monitored carefully and compared to the results of this study, with flood levels marked and surveyed where possible. Where flood behaviour appears to disagree with the findings of the study, the reason for the discrepancy should be investigated and an update to the study should be considered.

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