REPORT

Lake Conjola Coastal Management Program

Lake Conjola CMP

Client: Shoalhaven City Council

Reference: PA2591-RHD-CMP-LC-0005

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Supporting Documents

A. Lake Conjola CMP Stage 2: Report A – Environmental, Social & Cultural Assets and Attributes (RHDHV, 2023a)

B. Lake Conjola CMP Stage 2: Report B – Threats and Risk Assessment (RHDHV, 2023b)

C. Lake Conjola CMP Stage 2: Report C – Entrance Processes and Entrance Management Options (RHDHV, 2023c)

D. Community Engagement Summary Report – Lake Conjola Coastal Management Program – Transition from Stage 2 to Stage 3 (EMM, 2022)

E. Lake Conjola CMP Stage 3 – Identify and Evaluate Options (RHDHV, 2024)

Acknowledgement of Country

Walawaani (welcome),

Shoalhaven City Council recognises the First Peoples of the Shoalhaven and their ongoing connection to culture and country. We acknowledge Aboriginal people as the Traditional Owners, Custodians and Lore Keepers of the world's oldest living culture and pay respects to their Elders past, present and emerging.

Walawaani njindiwan (safe journey to you all)

This acknowledgment includes Dhurga language. We recognise and understand that there are many diverse languages spoken within the Shoalhaven.

Executive Summary

Overview of the CMP

Lake Conjola is primarily an estuarine water body, made up of three identified basins (Lake Conjola, Berringer Lake and Pattimores Lagoon). The Lake entrance occasionally closes, sometimes requiring Council intervention to mitigate potential flooding of low-lying areas, however it is predominantly (88% of the time based on Council records over the period 1916 to 2019) open to the ocean and receives tidal interchange of marine waters. The natural environment of Lake Conjola benefits significantly from the large tracts of Lake Conjola National Park and Narrawallee Nature Reserve within the catchment, with some 85% of land remaining vegetated (not cleared).

South Coast villages such as Lake Conjola have a heavy reliance on tourism for their livelihood. While hosting a relatively small resident population (with respect to catchment size) of some 1,200-1,400 permanent residents, primarily based in three villages (Lake Conjola, Conjola Park and Fishermans Paradise), the region is an extremely popular tourism destination, hosting approximately 5,000 additional people during the peak summer period.

However, there are a number of threats and risks to the natural and built environment from coastal hazards at Lake Conjola that require management both now and in the future. These are addressed by the preparation of a Coastal Management Program (CMP) for Lake Conjola in accordance with the NSW Coastal Management Framework and the *Coastal Management Act 2016* (CM Act).

The CMP considers key environmental threats, as well as current and future coastal hazards, and outlines potential opportunities for adaptation and improvement, seeking to provide a set of prioritised, coordinated and cost-effective actions that, when progressively implemented, will help to ensure that Lake Conjola is ecologically healthy, resilient, attractive and accessible for future generations.

The Lake Conjola CMP has been prepared in accordance with the staged process detailed in the NSW Coastal Management Manual Part A (the Manual) (OEH, 2018) (refer **Figure E-1**). The completed stages supporting this CMP are documented in the following documents:

- STAGE 1: *Shoalhaven Coastal Management Program Scoping Study* (Advisian, 2020)
  This included a review of relevant background information, a first pass risk assessment, a data gap analysis, and formulation of a plan for the development of the suite of CMPs covering the Shoalhaven's coastline and estuaries.
- STAGE 2: *Lake Conjola CMP Stage 2: Report A – Environmental, Social & Cultural Assets and Attributes* (RHDHV, 2023) (**Supporting Document A**)
  Provides a review of the physical and social attributes and assets within the Lake Conjola catchment, as well as noting the various pieces of legislation that afford protection to these attributes.
- STAGE 2: *Lake Conjola CMP Stage 2: Report B – Threats and Risk Assessment* (RHDHV, 2023) (**Supporting Document B**)
  Describes the range of, extent, and potential impact of threats posed by coastal hazards on the attributes, as well as providing initial consideration of potential mitigation options and actions.
- STAGE 2: *Lake Conjola CMP Stage 2: Report C – Entrance Processes and Entrance Management Options* (RHDHV, 2023) (**Supporting Document C**)
  Provides a review of coastal processes and entrance dynamics, past and current entrance

management practices, as well as consideration of potential options for management of the entrance into the future.

- STAGE 3: *Lake Conjola CMP Stage 3: - Identify and Evaluate Options* (RHDHV, 2024) (**Supporting Document E**)
  Includes the compilation of an initial long list of management options from the risk assessment process completed in Stage 2 and application of a coarse filter incorporating several criteria to confirm acceptable actions for the Stage 3 community and stakeholder consultation. Following consultation, these actions were refined and consolidated. A cost benefit analysis was completed on selected management options that would require significant expenditure to implement, comprising options for entrance management. The outcome of this stage was to identify management options to be carried forward to Stage 4 (this document) that effectively address issues and risks, take advantage of new opportunities, and give effect to the objectives of the CM Act.

This document has been prepared on behalf of Shoalhaven City Council (Council) with funding and technical support from the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW)[1], and in consultation with various state agencies and other relevant stakeholders.

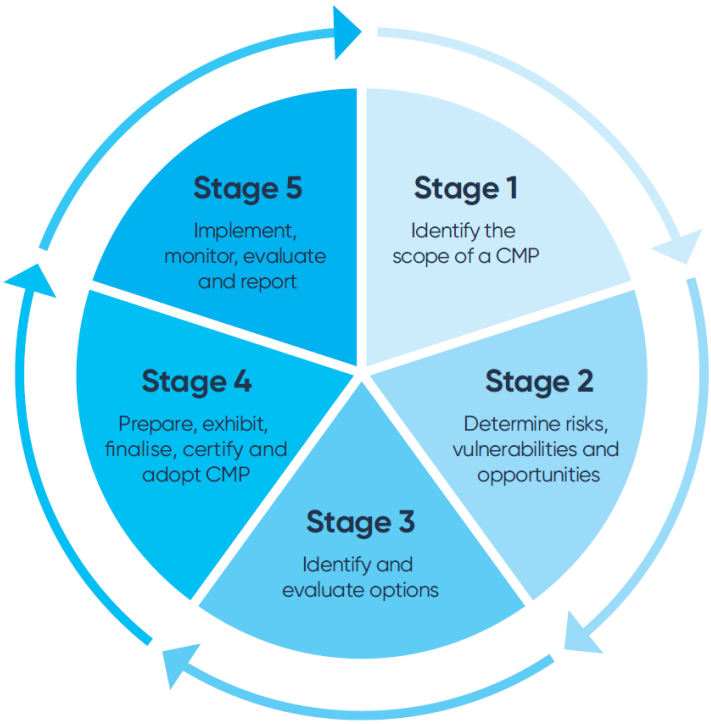


Figure E-1: Stages for preparation of a Coastal Management Program (NSW Coastal Management Manual Part A)

Study Area

The study area for the purposes of the Lake Conjola CMP extends from the entrance of the lake westward to the tidal limit and 500 m beyond consistent with the mapped Coastal Environment Area, as shown in **Figure E-2**. The open coast areas of Lake Conjola, and the potential impact of coastal hazards upon them, will be considered and addressed within the *Open Coast and Jervis Bay Coastal Management Program*. This CMP also covers the beaches and headlands across the LGA.

[1] *Previously NSW Department of Planning & Environment (DPE).*

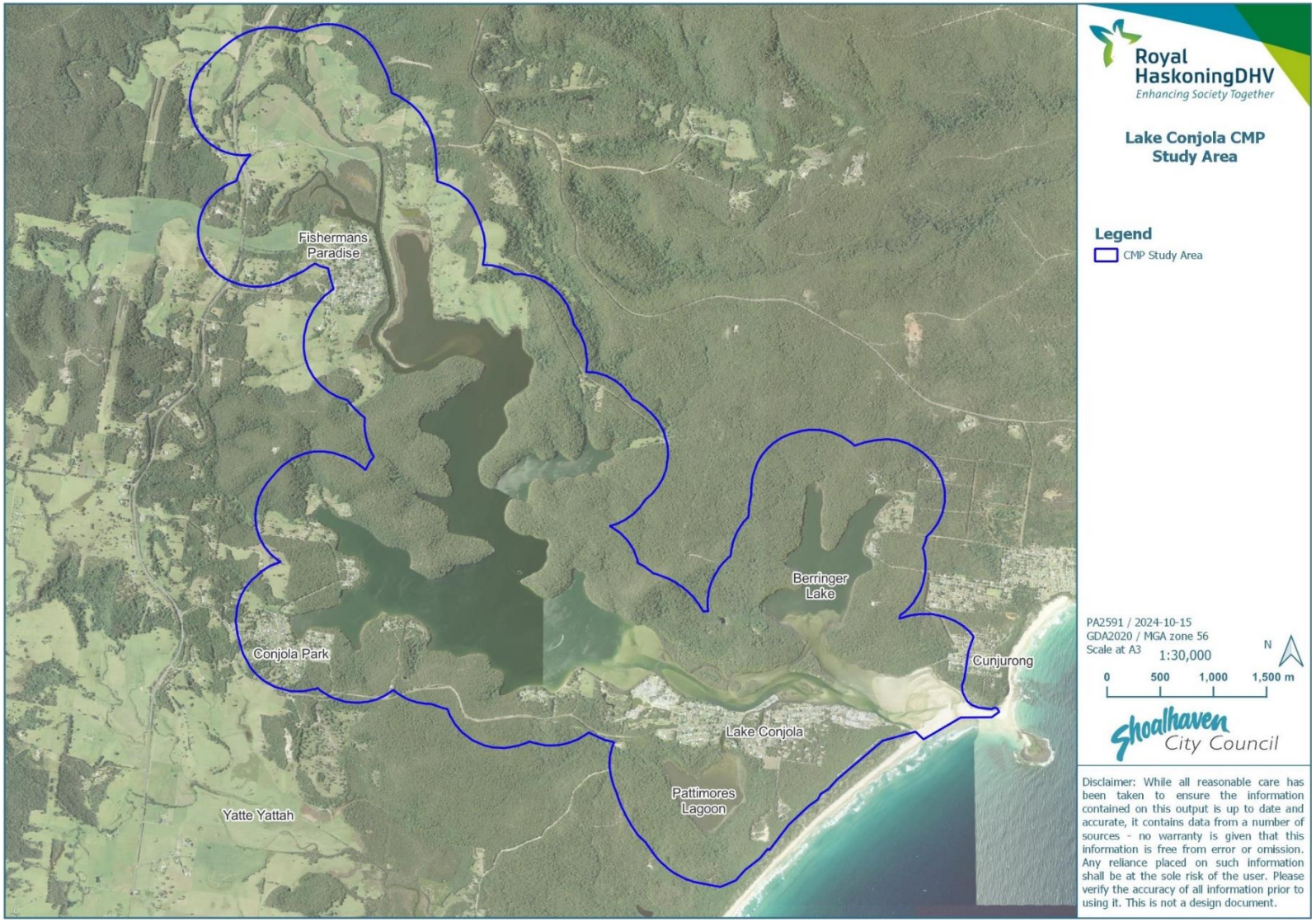


Figure E-2: Lake Conjola CMP Study Area

Objectives, Vision and Purpose, and Strategic Direction

The overarching ***Vision*** of the Lake Conjola CMP is:

> ***"We care for and protect Lake Conjola in a responsible manner so that current & future generations continue to be safe, refreshed & inspired by their coastal experience."***

The overarching ***Purpose*** of the Lake Conjola CMP is:

> ***"To develop a plan for the future management of Lake Conjola in a manner consistent with the principles of ecologically sustainable development for the social, cultural, and economic well-being and safety of the people of the Shoalhaven."***

Following the guidance of, and in accordance with, the NSW Coastal Management Manual and Framework, the Lake Conjola CMP will provide coastal management actions to be implemented over the next 10 years, and each potential action will be measured against the Vision and Purpose, to ensure that they are aligned with these statements.

Consistent with the *Coastal Management Act 2016* (CM Act), the objectives of the Lake Conjola CMP are to manage the coastal zone in a manner that is consistent with the principles of ecologically sustainable development for the social, cultural, and economic well-being of the people of the Lake Conjola area.

Snapshot of Issues

For the Lake Conjola CMP, the following Coastal Hazards (as defined within the CM Act) were identified for assessment:

- coastal lake or watercourse entrance instability,
- coastal inundation,
- tidal inundation,
- erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.

As well as these defined coastal hazards, a number of additional threats to the environmental, social and cultural assets and attributes within the Lake Conjola CMP study area were identified. These included:

- coincident inundation - combination of catchment flooding and coastal inundation;
- poor water quality – both groundwater and surface water;
- impacts of catchment management on waterway health;
- foreshore erosion and removal of riparian vegetation;
- inadequate management of foreshore access, private structures, and watercraft storage; and,
- climate change related impacts from increases in sea level, bushfires and rainfall.

Following identification and quantification of the range of current and projected future threats to the cultural and environmental assets and attributes that exist within Lake Conjola, a risk assessment was undertaken in order to determine the severity of, and potential to mitigate, each of the identified risks.

Stakeholder and Community Engagement

Stakeholder and community engagement was undertaken throughout each stage of the CMP process. Responses received from stakeholders during each formal engagement opportunity, as well as feedback

provided throughout preparation of the draft CMP, have been considered during development and refinement of management actions.

Management Strategies and Actions

An initial long list of management actions was compiled from the risk assessment completed during Stage 2 (refer **Supporting Document B**), with additional selected actions developed to enable the integrated and strategic management of the study area for the Lake Conjola CMP within the broader Shoalhaven coastal zone. A coarse filter incorporating several criteria was applied to this long list to confirm which actions would be accepted for Stage 3 consultation. The actions were consolidated and presented in a summary written document including GIS mapping, for community and stakeholder engagement.

Feedback received from the Stage 3 consultation was used to refine the management actions. A cost benefit analysis was completed during Stage 3 for those management options that would require significant expenditure to implement, namely options for entrance management.

The recommended CMP management actions are structured under several main themes comprising:

- LGA-Wide Management Actions;
- Manage Foreshore Areas and Bank Erosion;
- Improve Planning and Management Arrangements for the Lake Catchment Area;
- Entrance Management Interventions;
- Maintain and Improve Water Quality;
- Protect and Rehabilitate Estuarine and Riparian Vegetation and Habitat; and,
- Maintain and Improve Recreation and Amenity.

For each action, this CMP provides a summary of the tasks involved, roles and responsibilities, costs, and timeframes for delivery, as well as objectives and performance indicators.

Management strategies and actions have been developed for a ten-year period. A timeframe for implementation of the actions is specified, adopting timing consistent with the key Council Integrated Planning and Reporting (IP&R) documents comprising the Operational Plan, Delivery Program 2022-2026, and future delivery programs for 2026-2030 and 2030-2034.

Entrance Management

The CMP includes a draft Entrance Management Policy (refer **Appendix A**) based on the recommended entrance management strategy determined from a detailed assessment completed during Stage 3. The preparation of an updated Lake Conjola Entrance Management Policy, including a supporting Review of Environmental Factors (REF), and ongoing implementation of the policy actions and procedures is a key management action within the CMP.

Business Plan

A Business Plan has been developed which outlines the key components of the funding strategy for the CMP, including the cost of proposed actions, proposed cost-sharing arrangements, and other potential funding mechanisms. Delivery of the CMP is estimated to cost $12.2 Million (2024 dollars) over 10 years.

Sustainable funding and financing arrangements for management actions will be established in consultation with key stakeholders. Council may fund management actions outlined in the Lake Conjola CMP through a combination of sources, including Council internal funds and competitive State and Federal Government grant programs. The range of current funding sources that may be applicable for coastal management actions within the Lake Conjola CMP, as well as potential emergency and disaster support, are outlined in the CMP. The objectives and availability of funding programs are regularly changing, and Council are expected to maintain an awareness of appropriate funding opportunities as they arise.

Implementation and Review

Council is required to implement a monitoring, evaluation, and reporting (MER) programme as part of the Lake Conjola CMP, to identify key indicators, trigger points and thresholds as measures of success of actions in reducing the threats and maintaining the values of Lake Conjola, as well as mitigation actions should the actions not achieve the desired outcomes.

The CM Act requires CMPs to be reviewed at least once every 10 years, to ensure that actions to manage locations such as Lake Conjola remain current and relevant in light of new information, legislative and policy changes, and improved understanding of the local coastal and estuarine processes.

Council must maintain sufficient information and records about its management of the relevant parts of the coastal zone to demonstrate how the Lake Conjola CMP has been implemented, and what has been achieved in connection with the Lake Conjola CMP, including whether coastal management actions have been carried out within the timeframes identified in the Lake Conjola CMP.

1 Introduction

1.1 Purpose of this Coastal Management Program

The purpose of this Coastal Management Program (CMP) is to establish an integrated program for the coordinated management of Lake Conjola.

Coastal management in New South Wales (NSW) is guided by the *Coastal Management Act 2016* (CM Act), the *State Environmental Planning Policy (Resilience and Hazards) 2021* (RH SEPP) and the NSW Coastal Management Manual (the Manual) (OEH, 2018). This legislation and the Manual set out the requirement for councils to prepare Coastal Management Programs (CMPs).

Shoalhaven City Council (Council), with support from the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), have engaged Royal HaskoningDHV (RHDHV) to prepare a Coastal Management Program (CMP) for Lake Conjola. The CMP considers key environmental threats, as well as current and future coastal hazards, and outlines potential opportunities for adaptation and improvement, providing a set of prioritised, coordinated, and cost-effective actions that, when progressively implemented, will help to ensure that Lake Conjola is ecologically healthy, resilient, attractive, and accessible for future generations.

Lake Conjola (also referred to as ‘the Lake’) is a medium sized barrier estuary on the NSW south coast, located approximately 210 km south of Sydney, and approximately 50 km south of Nowra, in the Shoalhaven Local Government Area (LGA) as shown in **Figure 1-1**.

Figure 1-1: Lake Conjola Locality Map (source: BMT WBM, 2013a)

1.2 Area Covered by this CMP

1.2.1 Study Area

The study area for the purposes of the Lake Conjola CMP extends from the entrance of the lake westward to the tidal limit and 500 m beyond consistent with the mapped Coastal Environment Area (refer **Section 1.2.2**), as shown in **Figure 1-2**. It is noted that the more immediate catchment areas adjacent to the lake were also considered in the development of CMP management actions due to their potential impacts on lake water quality through surface runoff. The CMP study area and its coastal sediment compartment (refer **Section 1.2.3**) is wholly contained within the Shoalhaven LGA.

The rationale for completing a CMP for this specific estuary is that there are a number of management issues specific to Lake Conjola, which warranted a separate CMP as identified in the Stage 1 CMP Scoping Study (Advisian, 2020). Council has prepared the certified Shoalhaven Open Coast and Jervis Bay CMP, and are preparing separate CMPs for other Shoalhaven estuaries, including the Lower Shoalhaven River, and Sussex Inlet, St Georges Basin, Swan Lake and Berrara Creek.

Lake Conjola is primarily an estuarine water body with a surface area of approximately 6.9 km^2, made up of three identified basins (Lake Conjola, Berringer Lake and Pattimores Lagoon), within a coastal catchment area of 145 km^2, and seven main reference locations, as shown in **Figure 1-2**. The Lake entrance occasionally closes, sometimes requiring Council intervention to mitigate potential flooding of low-lying areas, however it is predominantly open to the ocean and receives tidal interchange of marine waters.

The open coast areas of Lake Conjola, and the potential impact of coastal hazards upon them, will be considered and addressed within the *Shoalhaven Open Coast and Jervis Bay Coastal Management Program*. The open coastal area to the south of Lake Conjola consists of approximately 6.5 km of east facing sandy beaches, with Lake Conjola Ocean Beach transitioning through Buckleys Point to Buckleys Beach, which extends to the northern shore of Narrawallee Inlet, adjacent to Preservation Rock. The rocky northern shoreline from Cunjurong Point extends past Green Island to the nearly 1 km long Manyana Beach, which is bounded by Inyadda Point, with Inyadda Beach extending further north towards Bendalong.

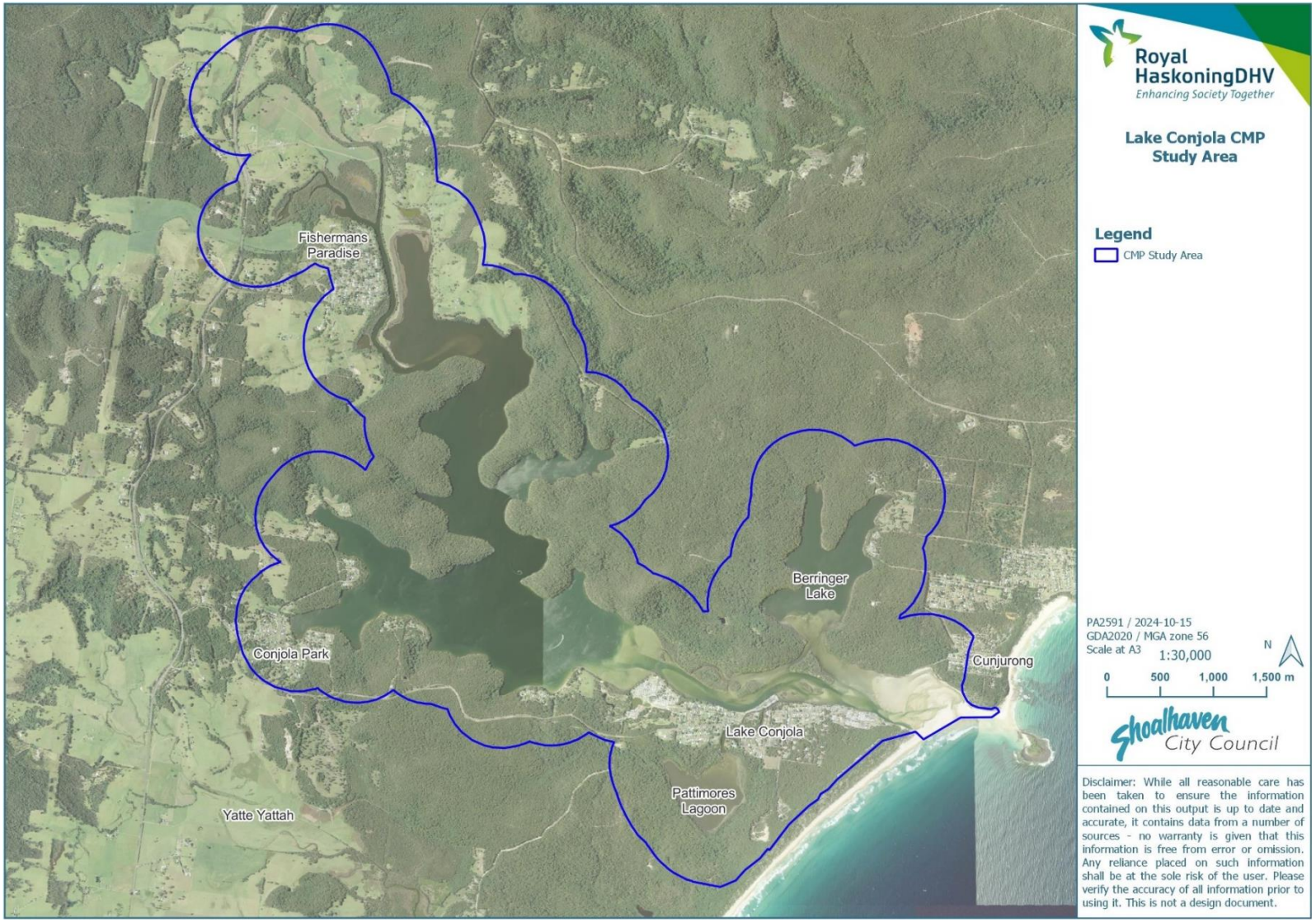


Figure 1-2: Lake Conjola CMP Study Area

1.2.2 Coastal Management Areas

In accordance with the CM Act, this CMP gives effect to the management objectives for the 4 coastal management areas (CMAs) that define the coastal zone of the study area (refer **Appendix E**). Each CMA has different characteristics and objectives, and the areas may overlap (refer **Figure 1-3**). The CM Act provides the definition and objectives for each of the management areas. The RH SEPP provides development controls for each of the management areas, and state-wide mapping of 3 of the 4 areas. The 4 coastal management areas as defined by the CM Act are:

- **Coastal Environment Area (CEA)** – Land containing coastal features such as the coastal waters of the state, estuaries, coastal lakes, coastal lagoons, and land adjoining those features including headlands and rock platforms. Beaches, dunes, and foreshores are included in this area.
- **Coastal Use Area (CUA)** – Land adjacent to coastal waters, estuaries, coastal lakes and lagoons where development is or may be carried out (at present or in the future) and impacts of development on the scenic and cultural values and use and enjoyment of the beaches, foreshores, dunes, headlands, rock platforms, estuaries, lakes and the ocean need to be considered.
- **Coastal Wetlands and Littoral Rainforests Area (CWLR)** – Land which displays the hydrological and floristic characteristics of coastal wetlands or littoral rainforests, as well as a surrounding proximity area to manage impacts of adjacent development.
- **Coastal Vulnerability Area (CVA)** – Land which is subject to any of the coastal hazards listed in the CM Act. Mapping for the coastal vulnerability area has not been provided from the RH SEPP, and no such coastal vulnerability area (CVA) map yet exists for the study area. Nonetheless, it is recognised that the Lake Conjola is subject to coastal hazards and that the scope of this CMP also covers managing coastal vulnerability. Lake Conjola is subject to coastal hazards including coastal lake or watercourse entrance instability, coastal inundation, tidal inundation, and erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.

The objectives of the CMAs covered by this CMP have been given effect in the CMP through the specific alignment between the CMP Objectives and the CMA management objectives, and through the specific alignment of the CMP Management Actions to these objectives (refer **Appendix E**). Implementation of the Management Actions across the 10 year timeframe of this CMP will achieve specific Action outcomes, will address the CMP objectives, and thus will help to address the CMA management objectives with regard to the CMAs within the CMP Study Area.

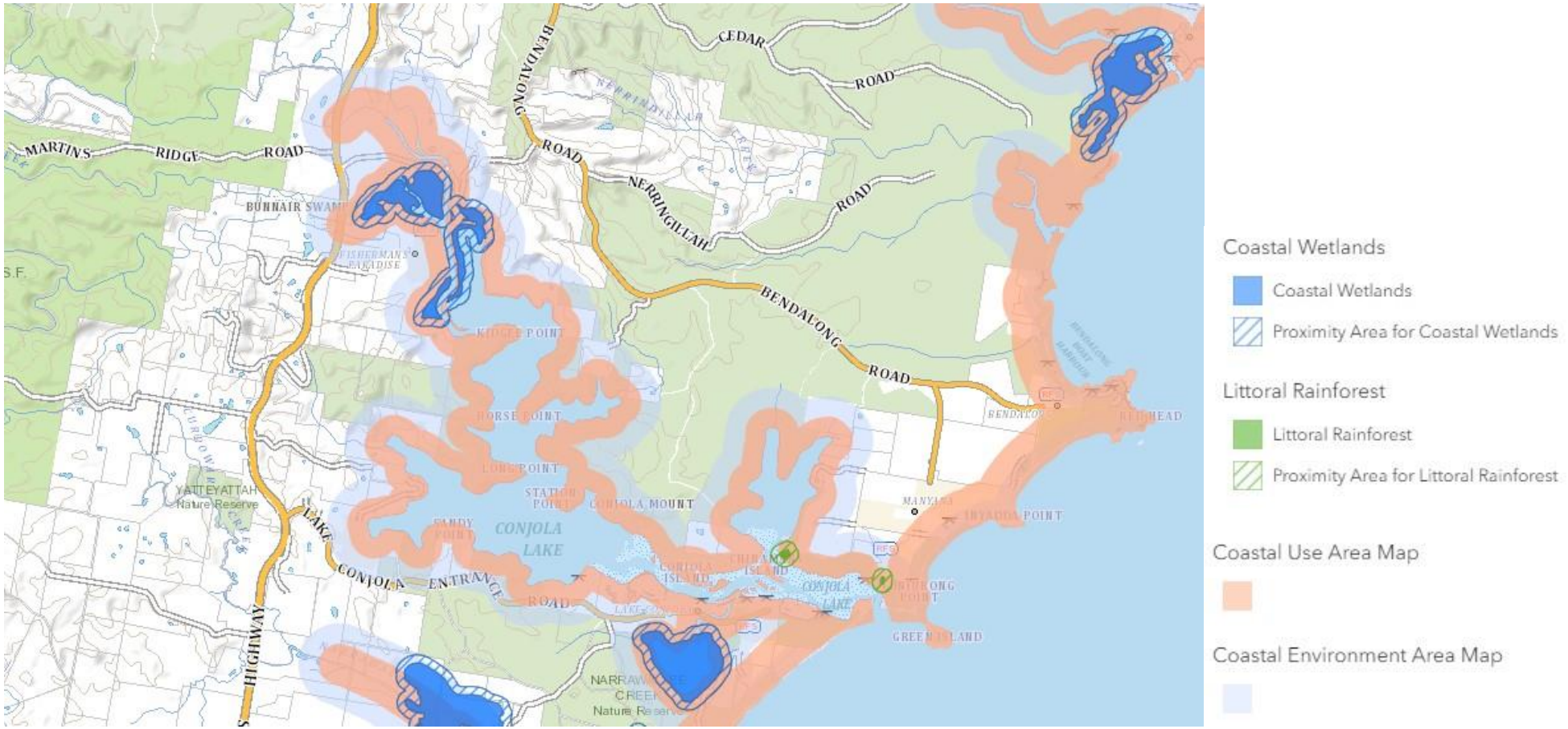


Figure 1-3: RH SEPP Coastal Management Area Mapping (source: NSW ePlanning Spatial Viewer)

1.2.3 Coastal Sediment Compartments

The NSW government has enshrined consideration of primary, secondary and tertiary scale sediment compartments within the CM Act, so as to ensure CMPs take into account potential impacts on adjoining locations and local government areas. According to Short and Tom (2018) classification, Lake Conjola is located within primary sediment compartment NSW02, secondary sediment compartment NSW02.05, and tertiary scale sediment coastal sediment compartment “Conjola North NSW02.05.05”, as shown in **Figure 1-4** and **Figure 1-5**.

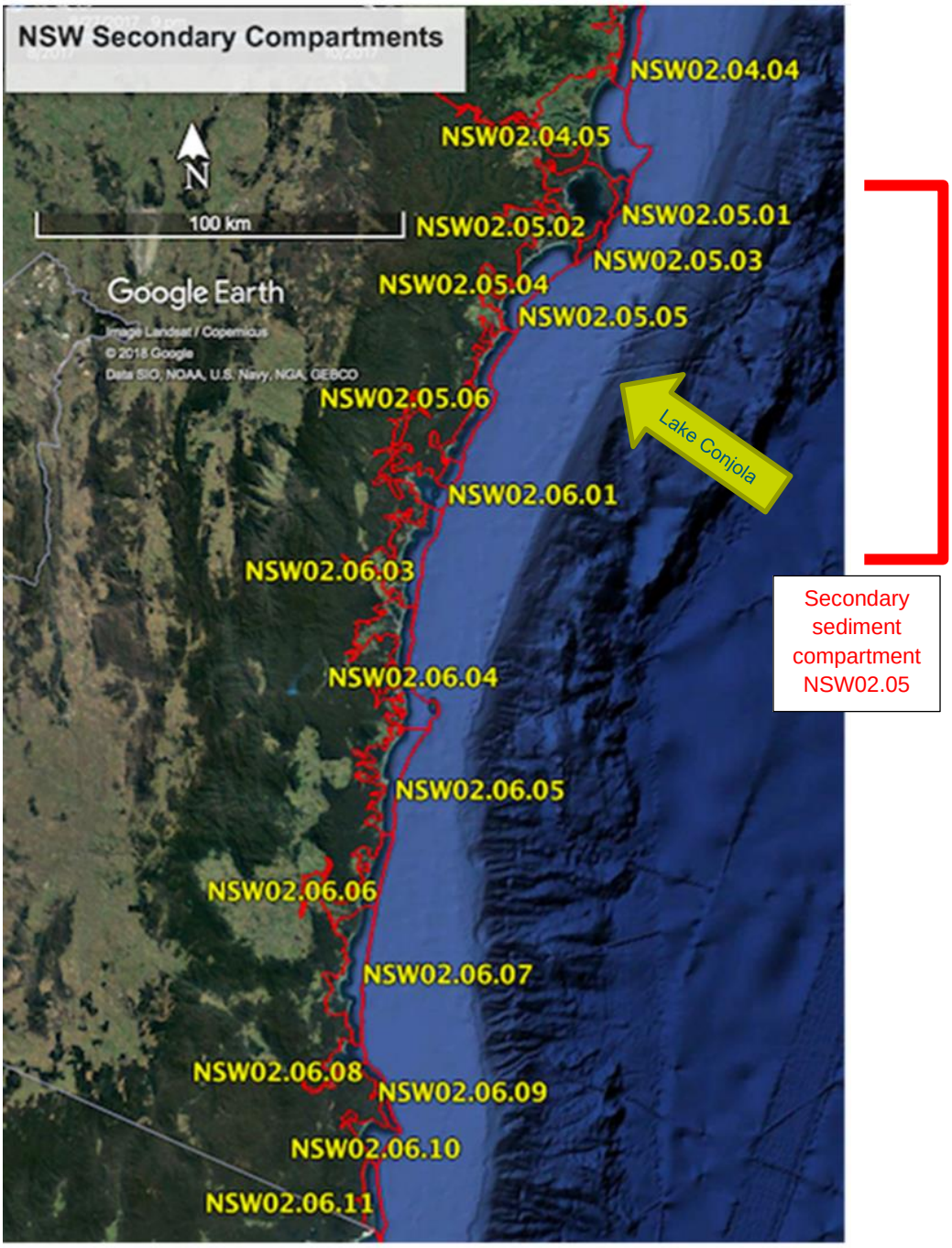


Figure 1-4: NSW Secondary and Tertiary Coastal Sediment Compartments (Short & Thom, 2018)

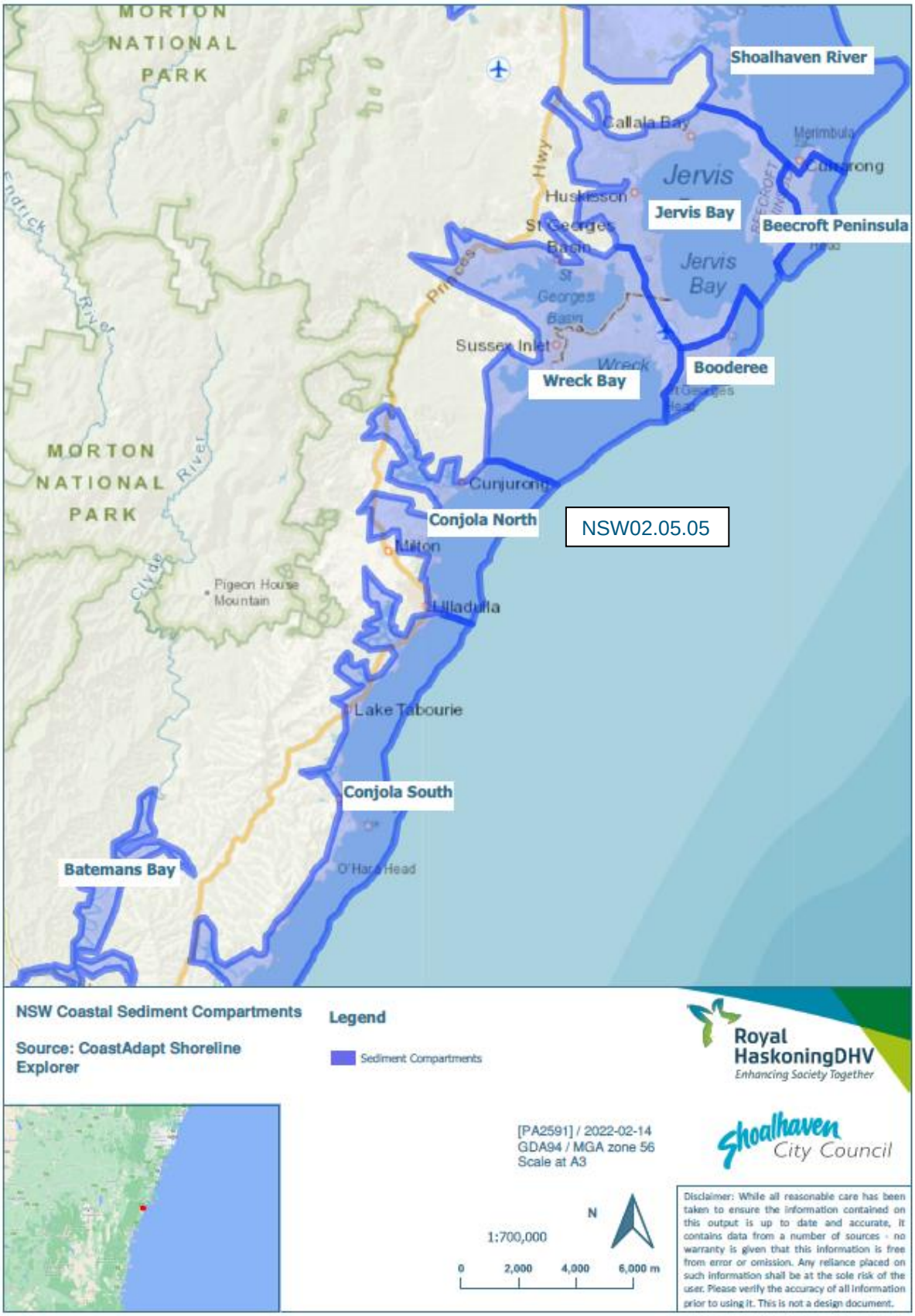


Figure 1-5: Shoalhaven Regional Tertiary Coastal Sediment Compartments (source: NCCARF, 2019)

While open coast coastal processes (including sediment transport) are addressed in the certified *Open Coast and Jervis Bay Coastal Management Program* 2024, it is still relevant to recognise that the entire study area of the Lake Conjola CMP is contained within the Conjola North tertiary sediment compartment. Further refinement of NSW sediment compartments was undertaken by Carvalho and Woodroffe (2015). This work included the definition of the tertiary sediment compartment including Lake Conjola as extending from Red Head (Bendalong) in the north to Bannisters Point in the south (refer to compartment 21b shown in **Figure 1-6**). It is noted that this refined sediment compartment excludes Mollymook Beach and Ulladulla Harbour to the south, which were included in the National Climate Change Adaptation Research Facility (NCCARF) sediment compartment definition (refer **Figure 1-5**).

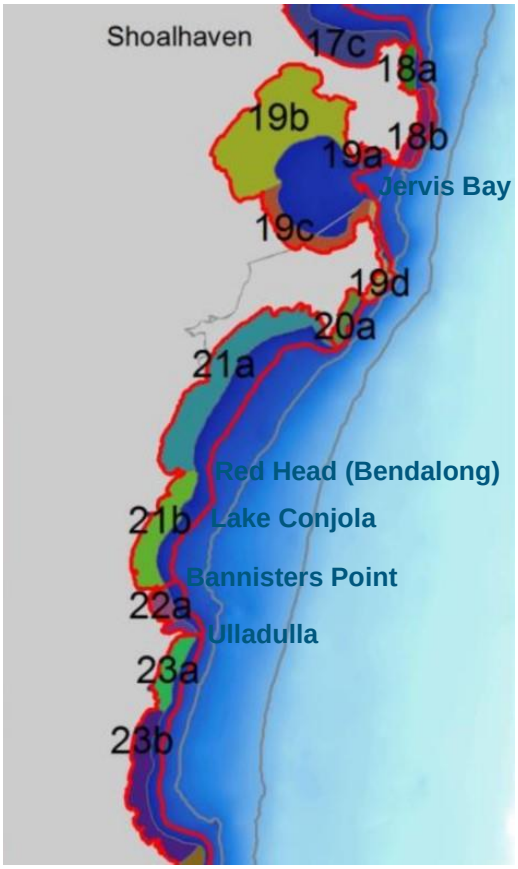


Figure 1-6: Refined NSW Sediment Compartments (source: Carvalho and Woodroffe, 2015)

1.3 Objectives, Vision and Purpose, and Strategic Directions of the CMP

1.3.1 Objectives

Aligned with directives provided by the CM Act, the objective of the Lake Conjola CMP is to provide an integrated, adaptive, and long-term strategy for the co-ordinated management of the Lake Conjola coastal zone. The Lake Conjola CMP will confirm the focus of coastal zone management by Council and by public authorities and co-ordinate the delivery of priority management actions.

The Lake Conjola CMP seeks to guide the informed and coordinated management, and environmentally sustainable development, of the dynamic environment of Lake Conjola, in order to protect the social,

cultural, economic and environmental values, and identity of the region, against current and future coastal hazards and threats to the environment.

1.3.2 Vision and Purpose

The Community Vision Statement, created by Council and the community during development of the Community Strategic Plan "*Shoalhaven 2032*", has strong relevance to the Lake Conjola CMP.

We will work together in Shoalhaven to foster a safe and attractive community for people to live, work, stay and play; where sustainable growth, development and environmental protection are managed to provide a unique and relaxed lifestyle.

The Southern CMP Advisory Committee, with the support of Council and RHDHV, have refined the Vision and Purpose for the Lake Conjola CMP from the vision and purpose statements contained within the Shoalhaven CMP Scoping Study (Advisian, 2020).

The overarching ***Vision*** of the Lake Conjola CMP is:

"We care for and protect Lake Conjola in a responsible manner so that current & future generations continue to be safe, refreshed & inspired by their coastal experience."

The overarching ***Purpose*** of the Lake Conjola CMP is:

"To develop a plan for the future management of Lake Conjola in a manner consistent with the principles of ecologically sustainable development for the social, cultural, and economic well-being and safety of the people of the Shoalhaven."

The vision of the Lake Conjola CMP is consistent with the CM Act (refer to **Appendix E** for more detail regarding the specific objectives of the CM Act).

1.3.3 Strategic Objectives

Following the guidance of, and in accordance with, the NSW Coastal Management Manual and Framework, the Lake Conjola CMP will provide coastal management actions to be implemented over a 10 year timeframe, and each potential action will be measured against the Vision and Purpose, to ensure that they are aligned with these statements.

Consistent with the CM Act, the objectives of the Lake Conjola CMP are to manage the coastal zone in a manner that is consistent with the principles of ecologically sustainable development for the social, cultural, and economic well-being of the people of the Lake Conjola area.

The following overarching and specific *Strategic Objectives* of the Lake Conjola CMP, which drive the overall strategy behind the CMP, have been slightly amended from the adopted Shoalhaven CMP Scoping Study (Advisian, 2020) Strategic Objectives to be locally relevant, with the key themes highlighted in ***bold***:

- Give effect to all relevant ***NSW legislation and policy***, as applied to the coastal zone, in the Lake Conjola context;
- Manage all coastal systems in an ***integrated manner that recognises the links*** between catchment, lake, estuary and open coast processes;
- Manage the coastal zone ***adaptively***, with a clear process for ***modifying management approaches*** as new knowledge becomes available;

- Invest in effective and efficient strategies to achieve ***positive natural, social, cultural and economic outcomes*** within Council's responsibilities;
- Take ***coastal hazards*** into account in Council's ***land use planning***;
- Maintain ***natural systems and processes*** to improve the ***health and diversity*** of natural systems;
- Support the ***social and economic wellbeing*** of local ***communities*** by ***maintaining safe access*** to beaches and headlands and supporting recreational activities;
- ***Align*** the Coastal Management Program with Local Environment Plan 2014, Development Control Plan 2014 and Integrated Strategic Plan;
- ***Engage with the community*** in the review and preparation of Coastal Management Programs; and,
- Keep the ***community informed*** about coastal processes and management responses.

The overarching *Specific Objectives* of the Lake Conjola CMP, based on the objectives of the CM Act, are presented below with the key themes highlighted in ***bold***:

- to ***protect*** and enhance natural ***coastal processes*** and ***coastal environmental values*** including natural character, scenic value, biological diversity and ecosystem integrity and resilience of Lake Conjola and its catchment;
- to support the ***social and cultural values*** of the coastal zone and maintain public access, amenity, use and safety;
- to ***acknowledge and protect Aboriginal peoples'*** spiritual, social, customary and economic use of the coastal zone;
- to recognise the coastal zone as a vital ***economic*** zone and support sustainable coastal economies;
- to facilitate ***ecologically sustainable development*** in the coastal zone and promote sustainable land use planning decision-making;
- to ***mitigate current and future risks*** from coastal hazards, taking into account the effects of ***climate change***;
- to recognise that the ***local and regional scale*** effects of coastal processes and the inherently ambulatory and dynamic nature of the shoreline may result in the loss of coastal land to the sea (including estuaries and other arms of the sea), and to ***manage coastal use and development*** accordingly;
- to promote ***integrated*** and co-ordinated coastal planning, management, reporting and response;
- to encourage and promote plans and strategies to improve the ***resilience*** of coastal ***natural and built assets*** to the impacts of an uncertain climate future including impacts of extreme storm events;
- to ensure ***co-ordination*** of the policies and activities of government and public authorities relating to the coastal zone and to facilitate the proper integration of their management activities;
- to support ***public participation*** in coastal management and planning and greater public ***awareness, education*** and ***understanding*** of coastal processes and management actions;
- to facilitate the ***identification of land*** in the coastal zone for acquisition by public or local authorities in order to promote the protection, enhancement, maintenance and restoration of the environment of the coastal zone; and,
- to support the objects of the *Marine Estate Management Act 2014*.

1.4 NSW Coastal Management Framework

Local councils and public authorities are required to manage their coastal areas and activities in accordance with relevant state legislation, policies, and plans.

The framework for managing the NSW coast as shown in **Figure 1-7** and includes the following key components:

- ***Coastal Management Act 2016* (CM Act):** An act that provides for the integrated management of the coastal environment of NSW, consistent with the principles of ecologically sustainable development, for the social, cultural, and economic wellbeing of the people of the state.
- ***NSW Environmental Planning and Assessment Act 1979* (EP&A Act):** An act that governs land use planning and development in NSW, focusing on sustainable development, environmental protection, community participation, and compliance measures.
- ***State Environmental Planning Policy (Resilience and Hazards) 2021* (RH SEPP):** One of the key environmental planning instruments for land use planning in the coastal zone. It gives effect to the objectives of the CM Act and delivers the statutory management objectives of the act by specifying how development proposals are to be assessed if they fall within the coastal zone.
- **Coastal Management Programs (CMPs):** A 5 stage coastal management process intended to set the long-term strategy for the coordinated management of the coastal zone for a given region.
- **The NSW Coastal Management Manual (The CM Manual):** A manual that sets forth mandatory requirements and provides guidance to coastal councils in connection with the preparation, development, adoption, implementation, amendment, and review of CMPs.
- **The NSW Coastal Council:** It is responsible for providing independent and expert advice on matters relating to the Minister's functions under the CM Act, and in relation to the development and implementation of CMPs by local councils.
- **The NSW Coastal and Estuary Grants Program:** It provides technical and financial support to local government to help manage the coastal zone.

Other NSW legislation is relevant to the management of the environmental, social, and economic values of the coastal zone, including:

- *Local Government Act 1993 (LG Act);*
- *Crown Land Management Act 2016;*
- *National Parks and Wildlife Act 1974;*
- *Fisheries Management Act 1994;*
- *Marine Estate Management Act 2014;*
- *Local Land Services Act 2013;*
- *Biodiversity Conservation Act 2016; and,*
- *Aboriginal Land Rights Act 1983.*

The relevant regional plans and policies prescribed by these regulations include:

- Shoalhaven Local Environmental Plan 2014 (SLEP)
- Shoalhaven Development Control Plan 2014 (SDCP)
- Shoalhaven 2032 – Community Strategic Plan

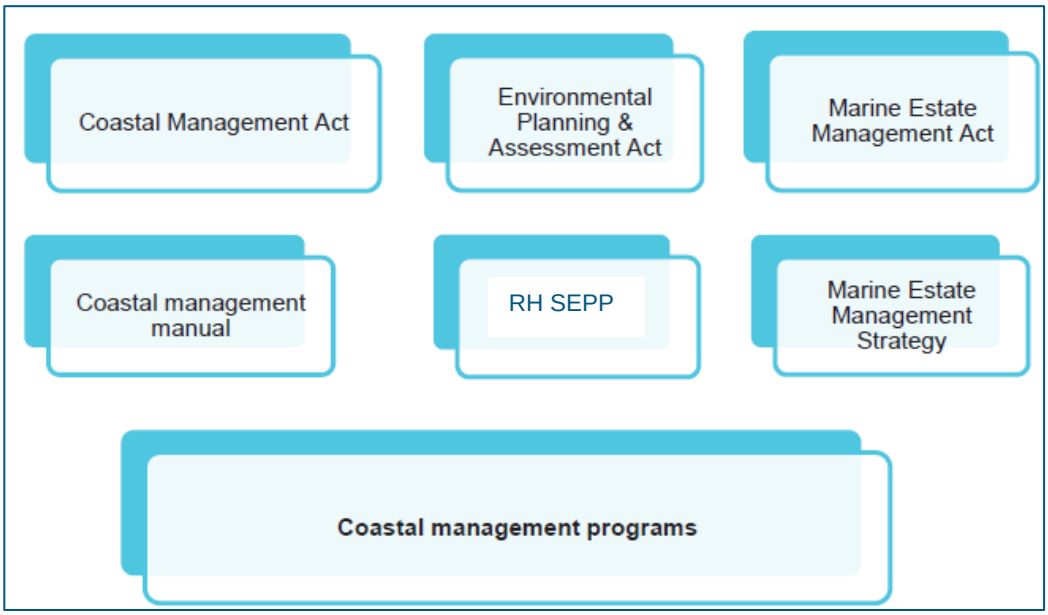


Figure 1-7: NSW Coastal Management Framework

The Shoalhaven CMP Scoping Study (Advisian, 2020) provided a clear description of the linkages between the state legislation, policies and plans listed above. It also provided guidance as to how the key principles of these documents have been incorporated into the Lake Conjola CMP.

The Lake Conjola CMP has been prepared in accordance with the requirements under Division 2 of the CM Act, the provisions of the RH SEPP, and Part A of the Manual (OEH, 2018).

Part A of the Manual recommends that councils follow a five-stage risk management process for preparation and implementation of a CMP as shown in **Figure 1-8**.

To reduce social conflict and improve effective management of coastal and marine resources beyond existing marine parks, the NSW Government introduced the *Marine Estate Management Act 2014* (MEM Act). The MEM Act provides for strategic and integrated management of the whole marine estate. The marine estate includes all marine waters, estuaries, and coastal areas. The NSW Government also established a new advisory Marine Estate Management Authority (MEMA).

MEMA has undertaken a statewide Threat and Risk Assessment (TARA) to consider and prioritise the social, economic, and environmental threats to community benefits of the marine estate. The Marine Estate Management Strategy has been prepared to allow a holistic approach to dealing with the cumulative threats to the marine estate. Consistency between the Marine Estate Management Strategy and CMPs is an essential element listed in the Manual (OEH, 2018). Although the statewide MEMA threat and risk assessment was undertaken at a much broader scale than Lake Conjola, information from the MEMA background reports has been considered during development of the actions within the Lake Conjola CMP.

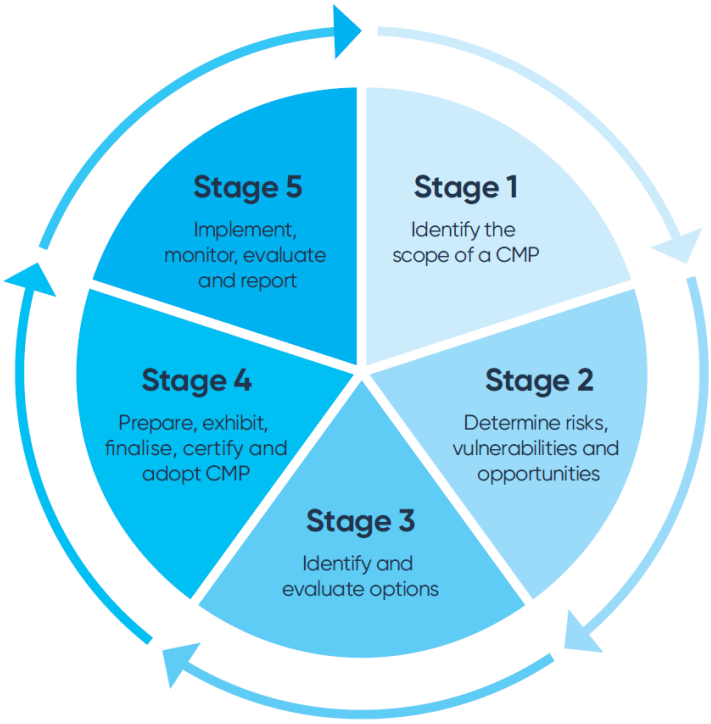


Figure 1-8: Stages for preparation of a Coastal Management Program (NSW Coastal Management Manual Part A)

1.5 Timeframes covered by the Lake Conjola CMP

The Lake Conjola CMP considers a range of timeframes and planning horizons both in completing the risk assessment for known threats, and in terms of the management actions to address these threats both now and into the future.

For certain threats that are likely to change over time, the following future timeframes were considered in relation to sea level rise (SLR) impacts: current, 20 year (0.23m SLR), 50 year (0.36m SLR) and 100 year + (1.2m SLR) planning horizons.

Assessment of coastal vulnerability to processes such as tidal inundation and coastal inundation was based on modelling of inundation extents corresponding to the above planning horizon (and SLR) increments, as reported in Lake Conjola CMP Stage 2: Report B – Threats and Risk Assessment (**Supporting Document B**) and Lake Conjola CMP maps referred to in **Section 9**.

Management actions were developed as a priority for threats considered to be high or extreme at the present timeframe. Management actions were also developed for future high to extreme threats where the future threat is well accepted and requires planning intervention now in order to adequately manage the future threat.

The CM Act requires CMPs to be reviewed at least once every 10 years, in accordance with the Manual. However, a CMP may, at any time, be amended (in whole or in part) by another CMP, for example should the actions within the existing CMP be assessed as ineffective, or should there be significant changes in the land use or physical characteristics of the location that significantly affect delivery of actions within the Lake Conjola CMP.

As a result, key actions within the Lake Conjola CMP and A Business Plan in **Section 6** have been prepared for a 10-year period from 2024 to 2034 (with the anticipation that the Lake Conjola CMP will be adopted, endorsed and Gazetted in 2024), with ongoing maintenance activities after that time.

1.6 Good faith and liability

Section 733 (2) of the Local Government Act 1993 provides that a local council does not incur any liability in respect of:

- any advice furnished in good faith by the council relating to the likelihood of any land in the coastal zone being affected by a coastline hazard (as described in the Manual) or the nature or extent of any such hazard; or,
- anything done or omitted to be done in good faith by the council in so far as it relates to the likelihood of land being so affected.

Also, section 733 (4) (b) relevantly provides that a council is, unless the contrary is proved, taken to have acted in good faith for the purposes of section 733 if the advice was furnished, or the thing was done or omitted to be done substantially in accordance with the principles and mandatory requirements set out in the Manual.

2 A Snapshot of Issues

The Stage 1 CMP Scoping Study (Advisian, 2020) provided the rationale and recommendations of the assessments and studies required for the Lake Conjola CMP based on the priority issues to be addressed, and knowledge and information gaps requiring attention in order to undertake assessment of risk, vulnerabilities, opportunities and evaluation of management options. Stage 2 of the CMP process involves undertaking detailed studies that help to identify, analyse and evaluate risks, vulnerabilities and opportunities. Stage 2 of the Lake Conjola CMP was presented in three (3) separate, complimentary companion reports to reflect and respond to the range of knowledge and interests among stakeholders. These reports comprised:

- **CMP Stage 2 – Report A – "*Environmental, Social & Cultural Assets and Attributes*" (Supporting Document A)**, which provides a history and description of the attributes and assets of the Lake Conjola catchment, as well as noting the various pieces of legislation that afford protection to these attributes. An understanding these physical and social values provides an important baseline for assessment of the risks posed by coastal hazards;

- **CMP Stage 2 – Report B – "*Threats and Risk Assessment*" (Supporting Document B)**, which provides a description of the range, extent, and potential impact of threats posed by coastal hazards on the physical, environmental, cultural, and social attributes and assets of the Lake Conjola catchment, as well as initial consideration of potential mitigation options and actions for further development during Stage 3 of the CMP process; and

- **CMP Stage 2 – Report C – "*Entrance Processes and Entrance Management Options*" (Supporting Document C)**, which provides an overview of the physical processes in the entrance area, sets out the history of entrance management including previous options, plans and policies, outlines the current interim entrance management policy and licence, describes selected mechanical openings in recent years, and outlines the management options proposed to be considered and evaluated for entrance management during Stage 3 of the CMP process.

The following sections provide a summary of the key outcomes and conclusions of the above three reports.

2.1 Environmental, Social & Cultural Assets and Attributes

2.1.1 Catchment and Waterbody

The catchment of Lake Conjola, shown in **Figure 1-2**, is relatively undisturbed with approximately 85% remaining as bushland, including areas of Conjola and Morton National Parks. Small urban settlements and grazed areas are located within the middle and lower catchment. Approximately 75% of the undisturbed areas are managed by either State Forests or National Parks and Wildlife Service (NPWS) (GHD, 2015).

Urban and rural residential development areas associated with Fishermans Paradise, Conjola Park, Lake Conjola and Yatte Yattah, as shown on **Figure 1-2**, occupy about 10% of the catchment. They are relatively minor in area and generally confined to the southern side of the Lake entrance and the upper reaches of the Lake.

The Lake is characterised as an Intermittently Closed and Open Lake and Lagoon (ICOLL), with an entrance located adjacent to Cunjurong Point. The entrance area comprises a broad tidal delta of clean marine sand, with pronounced sand lobes, which are elevated at up to 1 m above mean sea level. Directly

west from the entrance and tidal delta, a shallow inlet channel is the predominant formation within the lower section of the lake. This shallow section includes extensive intertidal muddy sand flats, with an average channel depth in the order of 1-2 m, extending for approximately 3 km until a change (increase) of depth at a location often referred to as 'The Steps', as shown in **Figure 2-1**.

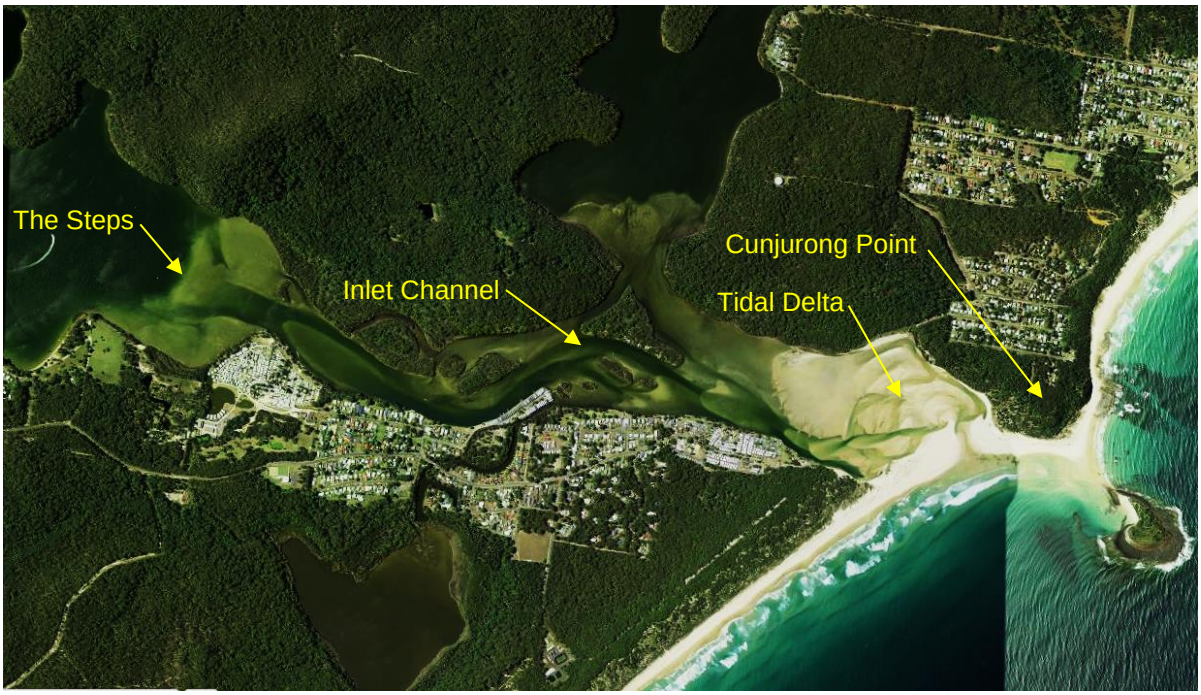


Figure 2-1: Lake Conjola tidal delta and shallow inlet channel extending approximately 3 km upstream until deeper water at "The Steps"

Conjola Creek is the main fluvial inlet to the estuary system and has formed an elongate delta in the northwest section of the lake (refer **Figure 2-2**). The body of Lake Conjola comprises three main water basins: Lake Conjola itself, with a surface area of 5.8 km^2 and water depths reaching 10 m; Berringer Lake, a northern limb of the estuary with a surface area of 0.8 km^2 and depths less than 5 m; and Pattimores Lagoon, a small coastal lagoon forming a southern limb with a surface area of 0.3 km^2 and maximum water depth of 3 m (Sloss et al., 2010).

2.1.2 Sediments

The distribution of different sediment types within Lake Conjola is shown in **Figure 2-2**. Sands form the barrier deposits and shoals within the entrance area and tidal channel, which transition to muddy sands within Berringer Lake, Pattimores Lagoon and upstream of 'The Steps'. The muddy sands along the nearshore areas around Conjola Park transition to muds within the central basin area of the lake. Fluvial deposits are found within Conjola Creek and adjacent low-lying land in the upper reaches of the lake near Fishermans Paradise.

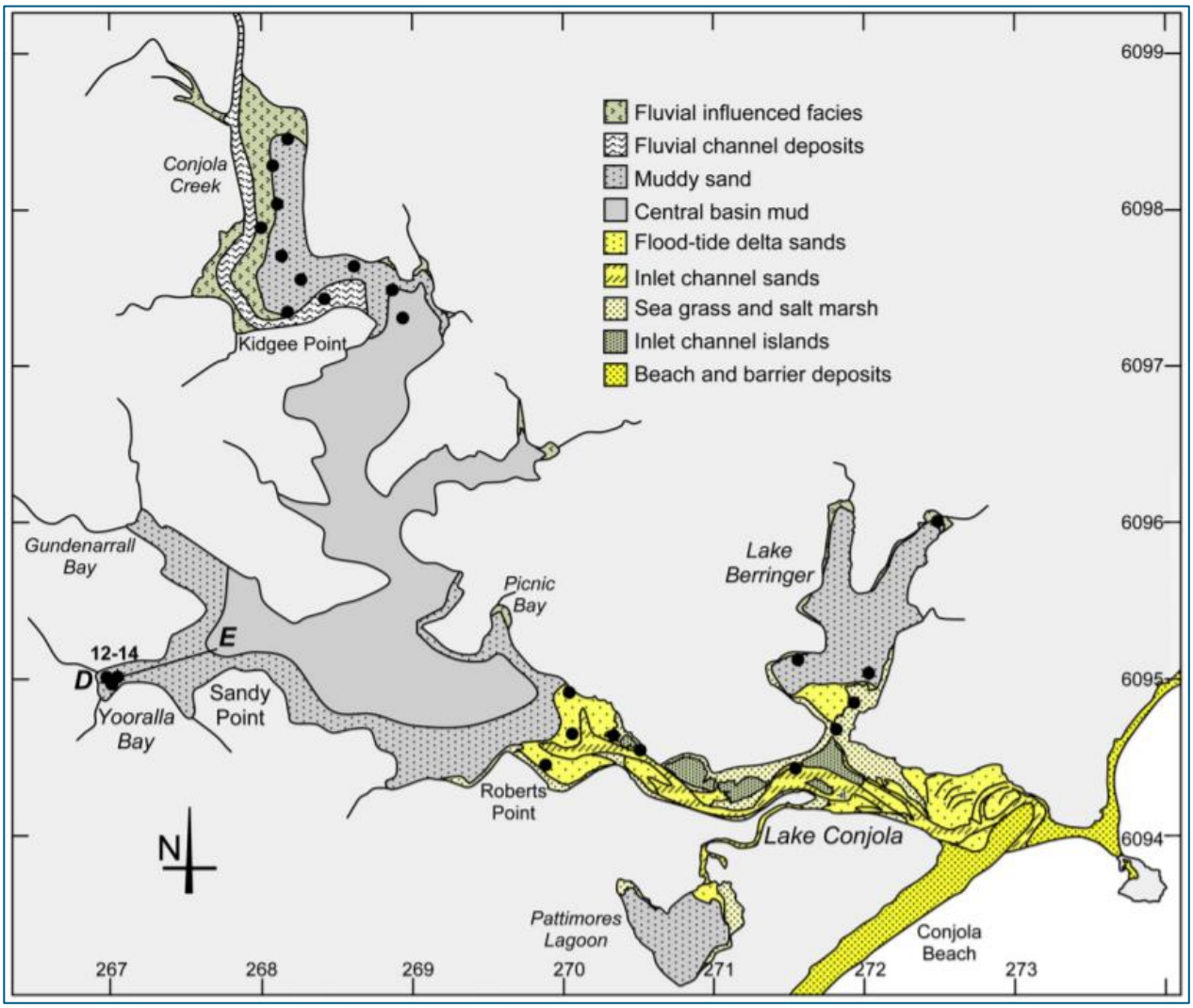


Figure 2-2: Sediment distribution within Lake Conjola (source: Sloss et al., 2010)

2.1.3 Marine and Estuarine Ecology

2.1.3.1 Shorebirds

The presence of the Little Tern is an important consideration for management of the entrance to Lake Conjola. The beach berm at Lake Conjola is noted as a minor but still important breeding location, with annual residence of Little Terns during the breeding season. Previous environmental assessments prepared for mechanical entrance openings have required that entrance management works will be, as far as practicable, undertaken outside of important nesting periods for threatened shorebirds, including the Little Tern (September through to March inclusive). Works are not to impact on threatened shorebird nesting areas. A general minimum buffer distance of 20 m is to apply to the nesting area.

2.1.3.2 Fish Habitat

Like the majority of coastal, estuarine and freshwater locations within NSW, Lake Conjola and it's contributing catchment tributaries are identified as 'Key Fish Habitat', being those aquatic habitats that are important to the sustainability of the recreational and commercial fishing industries, the maintenance of fish populations generally, and the survival and recovery of threatened aquatic species.

Assessment of “Fish communities and threatened species distributions of NSW” undertaken by DPIRD-Fisheries indicated that the majority of aquatic habitat and aquatic biodiversity in NSW river systems was in “Fair”, “Poor” and “Very Poor” condition. In comparison, while the catchment tributaries of Lake Conjola have been recorded as being in “Fair” condition, the main waterbody was recorded as being in “Very Good” condition, indicating the ecological value of Lake Conjola (DPI, 2016).

2.1.3.3 Estuarine Macrophytes

To monitor one of the indicators for assessment of ecosystem health, the NSW government periodically undertake assessment of the distribution and composition of macrophyte assemblages within estuaries, comprising seagrass, mangroves and saltmarsh.

The majority of the seagrass located within Lake Conjola is *Halophila*, which is found within the entrance to Lake Conjola and Berringer Lake and is generally associated with the shallower “steps” of shoaled sand. A number of locations around Conjola Park and the northern extent of Berringer Lake have smaller areas of “fringing” *Zostera* seagrass. There are relatively large extents of saltmarsh adjacent to Fishermans Paradise, along with smaller areas of “fringing” *Zostera* seagrass. A recent assessment of macrophytes by DPE[2] in 2019 did not record the presence of any mangroves, although earlier mapping in 2006 did detect a relatively small extent of mangroves in Lake Conjola. Mangroves have been observed in Pattimores Lagoon and have flourished since the development of the canal estate near the entrance to the lagoon.

2.1.3.4 Invasive Weeds

Invasive weeds have been present in dune vegetation at Lake Conjola. Work has been undertaken by the Lake Conjola Bushcare group to restore the Conjola Beach dunes by controlling weeds to enable natural regeneration and increase biodiversity. Target weeds have included Bitou Bush, Prickly Asparagus, Climbing Asparagus, Pampas Grass and Moth Vine.

Lake Conjola became well-known in the early 2000s for the presence of the invasive marine algae species *Caulerpa taxifolia* (Caulerpa). However, it has not been seen in Lake Conjola since 2013 (NSW EPA, 2018).

2.1.3.5 Commercial Aquaculture

The only known commercial aquaculture activities within Lake Conjola are a number of aquaculture (oyster) leases close to the entrance of Berringer Lake, mid-way along the inlet channel, and on the northern bank approximately at the westward extent of “The Steps”. These oyster leases are listed by DPIRD-Fisheries as Priority Oyster Aquaculture Areas (POAA).

2.1.3.6 Threatened Ecological Communities

Threatened Ecological Communities (TECs) located in coastal hazard areas at Lake Conjola were identified in Council's 2023 report *Assessment of Endangered Ecological Communities In Coastal Hazard Areas: Shoalhaven LGA Tidal Inundation and Coastal Erosion Study Sites* (Ecoplanning, 2023). These included mapped areas of Bangalay Sand Forest, Swamp Oak Floodplain Forest, and saltmarsh (refer **Figure 4-10** and **Figure 4-11**).

[2] *NSW Department of Planning and Environment, now NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW)*

2.1.4 Cultural Heritage

There are 15 heritage items with the greater Lake Conjola area that are listed within *Shoalhaven LEP 2014 Schedule 5 – Environmental Heritage*. These reflect a number of post-colonisation locations and items, but do not include any Aboriginal Heritage sites.

Aboriginal heritage items and locations are registered on the NSW Aboriginal Heritage Information Management System (AHIMS) database. An AHIMS search of recorded sites around Lake Conjola has identified that 69 Aboriginal sites including 22 artefact scatters, 4 middens, 3 burials and 3 Potential Archaeological Deposits are recorded in or near the greater Lake Conjola area.

2.1.5 Community Demographics

Lake Conjola is situated within the “district” identified as “Coastal Mid” in the national Census of Population and Housing undertaken by the Australian Bureau of Statistics (ABS). With a land area of approximately 191 km^2 (including significant tracts of Conjola National Park), the estimated resident population for Coastal Mid in 2020 was 2,544 people. The population growth rate of Coastal Mid has increased markedly in recent years, from less than half that of the wider Shoalhaven LGA in 2013, to nearly double the wider Shoalhaven rate of increase by 2020 (profile.id, 2022).

Lake Conjola is a popular tourist destination and during peak holiday periods the population may, at least, triple. There are four tourist parks in Lake Conjola which can, in total, accommodate around 3,000 people (GHD, 2015), as well as many private or semi-private holiday accommodation opportunities that together can increase the population of the Lake Conjola area further, up to approximately 5,000 people (Conjola Connected Communities Masterplan, 2020). A large proportion of the tourist facilities are located on low-lying land along Lake Conjola Entrance Road, within the Lake Conjola Village and generally near the beach. It is estimated that the value added by tourism to the Lake Conjola area is approximately $1.4 million per year, representing 5.8% of the total value added by all industries in this area.

More broadly, the Shoalhaven LGA is a growing regional centre, and a key hub for the State’s south-north coast. Whilst the region has historically been a popular spot for retirement, in recent decades it has continued to attract residents as traditional economic sectors such as agriculture and tourism have expanded into education, health, and professional services. The total population in Shoalhaven LGA is around 110,000 and is forecasted to grow to 143,000 by 2050 (idCommunity, 2022), an increase of 27%. Over the coming decades, this growth will require significant changes to the built environment that will place additional pressure on the coastal zone.

2.1.6 Recreational Use of Lake Conjola

South Coast villages such as Lake Conjola have a heavy reliance on tourism for their livelihood. Tourist visitors travel to Lake Conjola because of the beaches and waterways, and a large number of residents and visitors to Lake Conjola are boating enthusiasts.

Additional pressure on the coastal zone will be reflected by the development of management actions, including ensuring appropriate planning controls are enacted, including moving assets and infrastructure out of hazard zones, recreational access and amenity is ensured and conservation of habitats and the environment is promoted.

2.2 Threats and Risk Assessment

2.2.1 Threat Identification

Threats relevant to the Lake Conjola study area were identified and assessed within the Stage 2: Report B – Threats and Risk Assessment (Supporting Document B).

For the Lake Conjola CMP, the following Coastal Hazards (as defined within the *Coastal Management Act 2016*) were identified for assessment:

- coastal lake or watercourse entrance instability (refer to **Supporting Document C** for further discussion);
- coastal inundation;
- tidal inundation; and,
- erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.

As well as these defined coastal hazards, a number of additional threats to the environmental, social and cultural assets and attributes within the Lake Conjola CMP study area have been identified. These include:

- coincident inundation - combination of catchment flooding and coastal inundation;
- poor water quality – both groundwater and surface water;
- impacts of catchment management on waterway health;
- foreshore erosion and removal of riparian vegetation;
- inadequate management of foreshore access, private structures, and watercraft storage; and,
- climate change related impacts from increases in sea level, bushfires and rainfall.

The objectives of the *Marine Estate Management Act 2014* have been considered during the development of this CMP. In particular, the Marine Estate Management Authority's NSW Marine Estate Threat and Risk Assessment Report (TARA) was considered when developing the list of threats that are identified for the Lake Conjola CMP as part of the Stage 2: Report B – Threats and Risk Assessment (**Supporting Document B**).

2.2.2 Inundation

Tidal inundation (sometimes referred to as 'nuisance flooding') is the inundation of land by tidal action under ordinary meteorological conditions. Coastal inundation or ocean storm flooding occurs when a combination of meteorological processes raise ocean water levels above normal tidal elevations and inundates low-lying areas, and/or overtops dunes, structures and barriers.

Tidal inundation modelling and coastal inundation modelling have been undertaken as part of the Lake Conjola CMP for a range of sea level rise scenarios and is presented in **Supporting Document B**. This modelling was completed for a range of sea level rise scenarios including 0.1 m, 0.23 m, 0.36 m, 0.6 m, 0.9 m, and 1.2 m, to capture potential hazards over various planning periods.

Modelling of inundation associated with catchment flooding including coincident coastal inundation was completed previously as part of the Lake Conjola Floodplain Risk Management Study and Plan (FRMS&P) (BMT WBM, 2013a), and considered sea level rise scenarios of 0.4 m and 0.9 m.

With sea level rise, parts of the existing areas of Lake Conjola Village, Conjola Park and Fishermans Paradise will be subject to permanent inundation from normal Lake levels. Even before permanent inundation, however, increased frequency of flooding and high groundwater levels will become an issue.

It is expected that under a sea level rise of approximately 0.36 m, roads, structures and even ground vegetation would start to become adversely impacted by high groundwater levels, while under a sea level rise of 0.9 m or 1.2 m a significant depth of inundation (0.25 m depth or greater) would occur within many streets and yards on a frequent basis.

Under existing conditions, low-level persistent flooding presents problems to the community, noting the current entrance management (mechanical opening) trigger level of between 1.0 m and 1.2 m AHD. The FRMS&P also concluded that while a closed entrance may increase the likelihood of low-level persistent flooding and decrease the likelihood of ocean flooding, it has little impact on peak flood levels during major catchment flood events. In these events, flooding of properties is likely to occur whether the entrance is open or closed. A focus on entrance management works to reduce flooding only has some value in association with managing low-level persistent flooding and more frequent flooding events.

2.2.3 Water Quality

Modelling of tidal flushing has demonstrated that water quality in the upper reaches of Lake Conjola is primarily the product of inflows from the catchment, as tidal exchange is very limited in these locations even when the entrance is open and well scoured (refer **Supporting Document B**). This is an important factor to bear in mind when considering management actions to maintain a healthy waterway, as land use and catchment management practices are likely to have a significant influence on ecological and recreational water quality within Lake Conjola, irrespective of Lake entrance management options and actions.

The Conjola Regional Sewerage Scheme (CRSS) includes a dune exfiltration system that is located in the dunes behind Conjola Beach. Reclaimed water from the tertiary treatment process is delivered into slotted pipes in below-ground trenches and allowed to percolate into the groundwater table. The plume of affected groundwater extending from the exfiltration trench is monitored periodically and contains elevated concentrations of nutrients (nitrogen and phosphorus). The groundwater quality within the plume away from the exfiltration trench is interpreted to be unaffected by bacterial contamination. The groundwater plume to the north of the exfiltration trench has reached the Holiday Haven Caravan Park near the entrance to the lake but has not yet intersected with the surface water of the lake. Annual monitoring undertaken to date as part of the CRSS approval conditions has indicated that the effluent discharged into the dune exfiltration system generally complies with the EPA limits outlined in the CRSS Environment Protection Licence (12357). Based on review of surface water quality data from Lake Conjola entrance and Pattimores Lagoon it is unlikely that effluent discharges have adversely impacted the surface water.

Review of available records of ecosystem health water quality ratings from 2008 to 2020 indicates that the overall grade for Lake Conjola is typically ‘very good’ to ‘excellent’.

An analysis of available water sampling data from the ‘Aquadata’ website was undertaken to assess recreational water quality. The water quality data indicates that Lake Conjola is generally suitable for recreation independently of whether the entrance is open or closed. Over the last 19 years, a minimum of 85% of all sample results from all locations (single point sampling of sites across the Lake) achieved a Very Good or Good grade.

When poor water quality events do occur, they may not be as widespread throughout Lake Conjola as may have been expected, as poor water quality results appear to be recorded inconsistently at a range of

locations. Furthermore, the results do not appear to support the influence of a single large source of pollutants (e.g. groundwater plume, over-fertilisation of rural / farmland, or similar), due to the varied distribution of poor water quality results. Poor water quality is more likely to be associated with localised point sources such as stormwater runoff from urban areas.

2.2.4 Foreshore Erosion, Stabilisation and Structures

Several foreshore management issues were identified from site inspection and community consultation, including:

- ad hoc foreshore stabilisation works;
- lack of riparian vegetation;
- private foreshore structures;
- ad hoc watercraft storage;
- uncontrolled stock access to foreshore areas;
- uncontrolled stormwater runoff; and,
- estuarine vegetation migration.

Areas of low-lying wetland vegetation along the Lake Conjola foreshore have the potential to migrate landwards under the influence of sea level rise. Some of these foreshore areas are located within the National Park and a landward buffer for migration would be protected by NPWS. Other areas of inundation of significant foreshore areas (e.g. most of the southern foreshore of the entrance channel) have limited opportunity for estuarine vegetation migration due to existing urban development.

There are some foreshore areas that could be subject to ‘coastal squeeze’ where wetland vegetation is adjacent to undeveloped private land and may be unable to migrate due to existing or future foreshore protection or land management practices (e.g. clearing/grazing). The management actions developed for these areas indicate the need to work closely with landowners over time to explore setting aside buffers for future estuarine vegetation migration through voluntary mechanisms such as land purchase or other compensatory funding.

2.2.5 Climate Change

2.2.5.1 Regional Climate Change

Through AdaptNSW, OEH prepared the regional *Illawarra Climate Change Snapshot report* (OEH, 2014) that provided information on projected climate for the Shoalhaven Illawarra area.

The climate projections for 2020–2039 are described in the report as “near future” and those for 2060–2079 are described in the report as “far future” (OEH, 2014). Key climate change projections were noted as:

- The region is expected to experience an increase in all temperature variables (average, maximum and minimum), more hot days, and fewer cold nights for the near and far futures. Heatwaves are also projected to increase, be hotter and last longer;

- Seasonality of rainfall will change. Autumn rainfall will increase in the near future and the far future. The majority of climate models agree that winter rainfall will decrease in the near future and far future. Spring rainfall is projected to decrease in the near future; however, summer rainfall is projected to increase in the near future; and,

- Fire risk will increase, with projected increases in average and severe Forest Fire Danger Index values in the near future and the far future.

2.2.5.2 Sea Level Rise

As noted in **Section 2.2.2**, a range of sea level rise scenarios have been applied within the coastal hazard mapping and risk assessments completed for the Lake Conjola CMP.

As well as open coast recession and higher inundation levels, saltwater intrusion and landward advance of tidal limits within estuaries will have significant implications for freshwater and saltwater ecosystems and development margins, particularly building structures and foundation systems within close proximity to the shoreline. Existing coastal gravity drainage, stormwater infrastructure and sewerage systems may become compromised over time as sea level rises.

Sea level rise will also influence entrance opening regimes for ICOLLs, such as Lake Conjola. The level of protection provided by existing seawalls and other hard engineering structures will decrease over time due to the increasing threat from inundation at higher projected water levels.

As of 2024, Council's adopted sea level rise projections are as follows:

- 0.1 metres by 2030
- 0.23 metres by 2050
- 0.85 metres by 2100

In accordance with Council's Sea Level Rise Framework, Council will continue to monitor State and Federal Government advice and future Intergovernmental Panel on Climate Change (IPCC) reports to review existing sea level rise projections every 7 years.

2.2.6 Risk Assessment

Following identification and quantification of the range of current and projected future threats to the cultural and environmental assets and attributes that exist within Lake Conjola, a risk assessment was undertaken in order to determine the severity of, and potential to mitigate, each of the identified risks. For the Lake Conjola CMP, two alternative though complimentary risk assessment methodologies were undertaken, for consideration and application by distinct stakeholder groups:

- **Qualitative Threat-Based Risk Assessment**
  - An ***outcome*** based approach that reflects the interests of the community and agencies, and enables consideration of catchment wide issues that may impact many assets and attributes.
- **Quantitative Asset-Based Risk Assessment**
  - An ***output*** based approach that reflects the interests of Council asset managers, and enables consideration of factors impacting each asset so that accurate forward planning for asset improvement / renewal / removal can be undertaken.

The risk assessment methodology is detailed within **Supporting Document B** along with the resulting risk assessments. The threat-based risk assessment considered a wide range of threats (including coastal/tidal inundation, population growth, stormwater erosion, exotic plant/animal species, entrance dynamics, user conflicts, water quality) and the associated hazards they present. The potential impact of these threats was evaluated for several key interconnected risk assessment themes, comprising public safety, infrastructure, environmental, and public amenity. The broad indicative control measures identified

against each risk were used as the basis for further prioritisation and refinement of management actions in Stage 3 of the CMP process.

2.2.7 Current Built Assets within Lake Conjola

As previously noted, the majority of residential properties within the Lake Conjola catchment are located within the three main villages of Lake Conjola, Conjola Park and Fishermans Paradise. However, there are numerous semi-rural and rural properties around the extended foreshore area. Based on information provided by Council, 499 individual properties have been identified and included within tidal and coastal inundation hazard mapping (discussed in **Supporting Document B**).

In addition, in order to assist Council's immediate and long-term asset management planning, RHDHV identified 247 Council owned and/or managed assets within the greater Lake Conjola area that have been included within the Asset-Based Risk Assessment process (refer **Supporting Document B**). These assets include a range of built structures and infrastructure (such as carparks, roads, boat ramps, stormwater and sewerage network, and a caravan park), as well as natural features (such as Threatened Ecological Communities).

2.3 Entrance Processes and Entrance Management Options

2.3.1 General

Supporting Document C contains an examination of the main physical processes, history of entrance management (options, plans and polices), historical events (including floods, closures, natural breakouts, mechanical openings, and dredging), and identifies the entrance management options proposed for assessment during Stage 3 of the Lake Conjola CMP process. **Supporting Document E** presents an assessment of entrance management options and the key factors that influence the effectiveness of mechanical opening of the entrance.

2.3.2 Entrance Processes

The percentage of time Lake Conjola is open to the ocean (85% to 88%) is relatively high in comparison to other NSW ICOLLs. For example, it is noted in Council's Coastal Fact Sheet - Lake Conjola Management that about 70% of ICOLLs in NSW are closed most of the time, that is greater than 50% of the time (information sourced from DPIRD – Fisheries website[3]). Narrabeen Lagoon on Sydney's Northern Beaches, which is heavily managed at the entrance for purposes mostly of flood mitigation (major entrance clearance operations [sand removal] are carried out approximately every four years) is open approximately 75% of the time compared to approximately 85% to 88% for Lake Conjola.

A specific analysis of Lake Conjola entrance stability was also carried out as part of the CMP (refer **Supporting Document C**) and covered the 50-year period 1971 to 2021. It examined the trends for entrance stability in relation to rainfall, ocean storms, and the potential influence of cycles of the El Nino and La Nina phases of the Southern Oscillation Index (SOI) which can cause open coast beach rotation (widening and narrowing of the beach) and hence affect the stability of the entrance to a coastal lake which passes through the beach. The relevant beach in this case is Conjola Beach, which is more than 3.5 km long.

A number of conclusions were reached from the above specific analysis:

[3] https://www.dpi.nsw.gov.au/fishing/habitat/aquatic-habitats/wetland/coastal-wetlands/management-of-coastal-lakes-and-lagoons-in-nsw

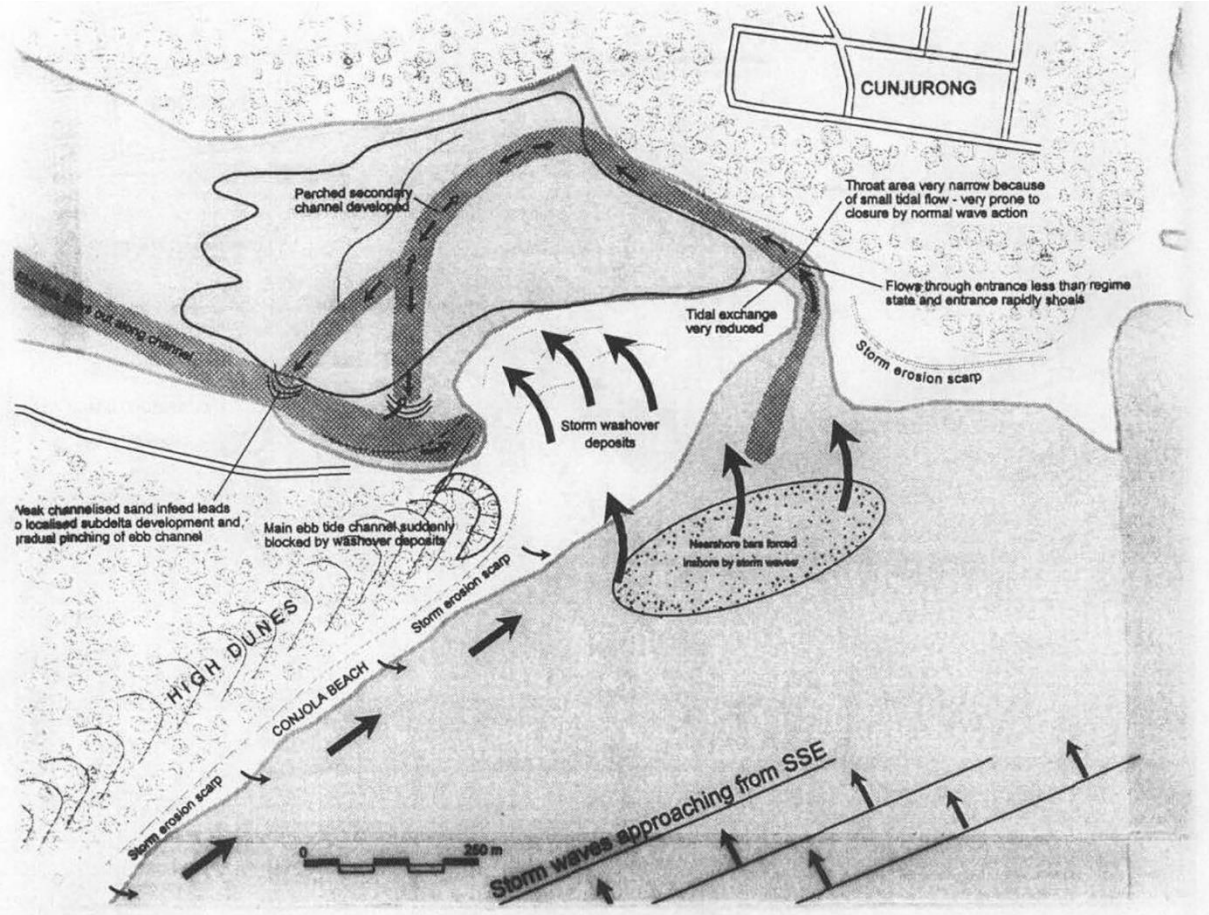
- rainfall is a key mechanism for keeping the entrance open, or causing the entrance to open if it is closed, however even in below average rainfall years the entrance can stay open in the absence of significant ocean storms;
- ocean storms are the key mechanism for closing the entrance, due to storm washover of the sand spit, but high rainfall years can dominate over ocean storms; and,
- the El Nino and La Nina phases of the SOI can influence entrance conditions, all other things being equal, with the El Nino phase tending to influence entrance closure (lower than average rainfall, clockwise rotation of Conjola Beach causing widening of the beach at the northern end) and the La Nina phase tending to influence entrance open conditions (higher than average rainfall, anti-clockwise rotation of Conjola Beach causing narrowing of the beach at the northern end).

Entrance closure as a result of severe ocean storms was described in detail in Patterson Britton (1999). This situation was termed the Storm Washover Entrance State and was one of four basic characteristic entrance states for Lake Conjola identified and described in Patterson Britton (1999). A schematic representation of the Storm Washover Entrance State is shown in **Figure 2-3** and a real-world example at Lake Conjola is shown in the aerial photograph in **Figure 2-4**.

Under the Storm Washover Entrance State, the following is evident:

- the washover sand cuts off (infills) the primary natural ebb tide channel/fluvial channel that is otherwise typically situated behind the entrance sand spit and directed towards Cunjurong Point; and,
- due to the infilling of the primary ebb tide channel, it becomes ‘perched’ on the large flood tide sand delta inside the entrance, leading to sudden and substantially diminished tidal flows, with further washover leading to entrance closure.

The impact of storm washover and infilling of the primary natural ebb tide channel is the rationale for consideration of the option of occasional dredging to sustain the position of the primary natural ebb tide channel. This is further discussed in **Section 2.3.3**.



Storm Washover Entrance State - Broad features:
• washover deposits i.e. 'fans' cut off fluvial channel/primary ebb channel; • ebb channel becomes perched on flood delta lobes leading to suddenly and substantially diminished tidal flows; • flood tide tends to re-establish northern perimeter channel; • sediment infeed is reduced but continues to pinch primary ebb channel which eventually disappears; • further washover leads to closure.

Figure 2-3: Schematic representation of Storm Washover Entrance State (source: PBP, 1999)

Figure 2-4: Aerial photograph showing an example of the Storm Washover Entrance State (source: Nearmap, dated 15 July 2018)

2.3.3 Entrance Management Options Assessment

The entrance management options considered in the CMP fall into four categories involving progressively greater levels of mechanical intervention at the entrance, as summarised below, and were developed in **Supporting Document C**.

- Category 1: The entrance area is allowed to behave naturally. Mechanical opening of the entrance in the form of excavation of a pilot channel is carried out in response to lake water level triggers;
- Category 2: The entrance area is managed by way of a dry notch approach whereby the sand levels in the entrance area (above water level) are regularly mechanically groomed to facilitate an easier mechanical opening (excavation of a pilot channel), when lake water level triggers are met;
- Category 3: The entrance area is managed by way of occasional dredging following a severe storm washover event, whereby a channel is sustained in the position of the natural ebb tide channel to avoid the need to excavate an overly long pilot channel to achieve a mechanical opening following a severe storm washover event, when lake water level triggers are met. This management approach could also be combined with maintenance of a dry notch; and,
- Category 4: Engineering works are constructed in the entrance area, such as entrance breakwaters, to create a permanently open entrance, in which case mechanical opening would not be required.

The CMP Stage 3 report (**Supporting Document E**) presents a detailed description and assessment of the following options:

- Option 1 – TFWS[4] plus Pilot Channel Only
- Option 2 – TFWS[4] plus Dry Notch and Pilot Channel
- Option 3 – TFWS[4] plus Occasional Dredging, Dry Notch and Pilot Channel
- Option 4 – Permanent Entrance Channel

Of the four options considered for management of the entrance to Lake Conjola, Option 2 – TFWS plus Dry Notch and Pilot Channel was recommended as the core option for inclusion in the CMP. In addition, it was recommended that the occasional dredging component of Option 3 be included within the CMP as a contingency measure (only) in conjunction with Option 2, with implementation of dredging subject to obtaining the necessary approvals. A draft Entrance Management Policy (refer **Section 2.3.4**) has been prepared based on the adoption of Option 2, and is provided in **Appendix A**.

Documentation to assist with obtaining the necessary approvals should be compiled in advance, where practical, as the issue which the occasional dredging seeks to address, an unacceptable flooding risk due to a severe storm washover event, can occur suddenly.

2.3.4 Entrance Management Policy

A draft Lake Conjola Entrance Management Policy has been prepared and is provided in **Appendix A**. The draft policy has been developed based on the findings of the CMP and will be finalised, along with the preparation of a supporting Review of Environmental Factors (REF) for ongoing implementation as a key action of the CMP (Action EM1 – Implement revised Entrance Management Policy, refer **Table 4-1**).

The Policy document is structured in the following way:

- General
- Policy Name
- Objectives
- Review of Environmental Factors
- Land to which the Policy Applies
- Climate Change
- Relevant Legislation, Policy and Approvals
- Entrance Management Principles and Procedures
- Penalties
- Responsibility
- Contacts
- Authorisation
- Review Period
- Amendments

[4] *Total Flood Warning System – Proposed to be implemented at three ICOLL catchments within the Shoalhaven LGA, including Lake Conjola. The system will comprise a network of rainfall and water level gauges, a predictive flood warning and decision support tool for use by Council and SES, and a remote berm monitoring station at Lake Conjola entrance.*

- Appendices
- References

The primary reason for entrance management is management of the risk associated with flooding. Accordingly, the Policy allows for the proposed implementation of Council's Total Flood Warning System (TFWS) for Lake Conjola. The core approach for management of the entrance to Lake Conjola involves a TFWS, maintenance of a dry notch, and excavation of a pilot channel when trigger levels are met.

In addition, as a contingency measure only, and subject to separate additional approvals, occasional dredging of the ebb tide channel may be carried out in the event of a severe storm washover that renders the flooding risk unacceptable as determined by Council. Implementation of a contingency ebb tide channel dredging campaign would be subject to the preparation of an REF and separate additional approvals. To streamline the approvals process, Action EM2 of the CMP recommends that a generic REF is prepared along with likely approval application documentation for dredging works.

3 Stakeholder and Community Engagement

3.1 General

Responses received from stakeholders during each formal engagement opportunity, as well as feedback provided throughout preparation of the draft CMP, have been considered during development and refinement of management actions. The consultation undertaken with community and government agency stakeholders during each stage of the CMP process is outlined in the sections below.

3.2 'Get Involved' Project Webpage

At the commencement of Stage 1 of the CMP, Council established a 'Get Involved' webpage for the project. This webpage has been maintained throughout Stages 1 to 4 of the CMP and provides an online destination for the community to access project information, updates via a news feed, and links to facilitate online engagement activities. Information posted on the Get Involved webpage has included:

- Background to the project;
- Project updates;
- Invitations to CMP workshops and drop-in sessions;
- Links to interactive mapping tools;
- Online surveys;
- Map-based feedback portal;
- Map-based suggestion portal;
- 'Close the Loop' documents, outlining Council responses to community consultation feedback; and,
- Links to key project documents, including deliverables for Stage 1, Stage 2, Stage 3 and Stage 4.

3.3 Stage 1

Consultation undertaken as part of the Shoalhaven CMP Scoping Study (Advisian, 2020) included:

- Stakeholder Engagement Workshop held in February 2019;
- Drop-in information sessions, comprising:
    - Ulladulla Civic Centre (24 September 2019);
    - St Georges Basin Community Centre (25 September 2019);
    - Nowra Showground Pavilion (26 September 2019);
    - Lake Conjola Community Centre (1 October 2019);
    - Sussex Inlet Community Centre (2 October 2019);
    - Shoalhaven Heads Community Centre (3 October 2019); and,
- Online survey and submissions via the Get Involved webpage.

Further detail on community feedback and responses provided to the matters raised is provided in the Shoalhaven CMP Scoping Study (Advisian, 2020).

3.4 Stage 2

The following consultation activities were undertaken as part of Stage 2:

- Presentations to Southern Coastal Management Program Advisory Committee on 15 March 2021, 20 October 2021 and 29 March 2022.
- Community drop-in information session held on 19 April 2021.
- A Threat-Based Risk Assessment Workshop was facilitated on 29 November 2021 by Council and RHDHV and attended by representatives of a number of State government agencies and key stakeholder groups (including DCCEEW-BCS[5], DPIRD[6]-Fisheries, DPHI[7]-Crown Lands, NPWS, Shoalhaven Water). This workshop utilised an initial RHDHV risk assessment matrix. Following input from stakeholders during and following the workshop, the Qualitative Threat-Based Risk Assessment was completed.
- Community workshop held in Ulladulla on 5 April 2022.
- Drop-in information session held in Ulladulla on 5th April 2022.
- Community workshop held in Lake Conjola on 6 April 2022.
- Drop-in information session held in Lake Conjola on 6 April 2022.
- Government agency workshop held on 16 August 2022.

Further detail on community feedback received during the community workshops and drop-in information sessions is provided in the Stage 2 Community Engagement Summary Report (**Supporting Document D**).

3.5 Stage 3

Consultation during Stage 3 of the CMP process was undertaken with the community and key stakeholder representatives from government agencies. The consultation asked for feedback on potential management actions that had been developed following the completion of technical studies and community consultation as part of Stage 2 of the CMP. The potential management actions covered a range of topics including:

- Planning and Management Arrangements for the Lake Conjola Catchment Area
- Management of Foreshore Areas and Bank Erosion
- Entrance Management Interventions
- Preparation and Response to Inundation Events
- Maintaining and Improving Water Quality
- Protection and Rehabilitation of Estuarine and Riparian Vegetation and Habitat
- Maintaining and Improving Recreation and Amenity.

Consultation with government agency stakeholders was undertaken to obtain their input during the development of the A3 summary brochure of proposed management actions. A draft version of the A3

[5] *NSW Department of Climate Change, Energy, the Environment and Water – Biodiversity, Conservation and Science Group*
[6] *NSW Department of Primary Industries and Regional Development*
[7] *NSW Department of Planning, Housing and Infrastructure*

summary brochure was issued to representatives from DPIRD-Fisheries, DCCEEW-BCS, DPHI-Crown Lands, Local Land Services, and Transport for NSW. It is noted that Council staff and a DCCEEW-BCS representative were involved in the development and review of the draft A3 summary brochure. It was requested agencies provide any feedback they may have prior to release of the information for community consultation purposes. Formal endorsement of the various actions was not sought at this time. Agency representatives were also invited to attend a meeting on 28 June 2023 to discuss any feedback they may have. The feedback received was used to refine the content of the A3 summary brochure prior to the community consultation period.

A further meeting workshop on entrance management was held on 20 July 2023, with representatives from RHDHV, Council, DCCEEW-BCS, DPIRD-Fisheries, and DPHI-Crown Lands in attendance. At this workshop RHDHV presented the findings of modelling work completed on various entrance management options. During the meeting it was requested that further information was circulated regarding the importance of the ebb tide channel, in relation to the modified 'managed entrance' approach presented as the 'Category 3' entrance management option in CMP Stage 2 Report C (**Supporting Document C**). RHDHV subsequently prepared a technical memorandum to document the relevance of the ebb tide channel to entrance management and the rationale behind the 'Category 3' entrance management option. This was submitted to agency representatives on 27 September 2023 for their information.

Community consultation was facilitated by Council's 'Get Involved' webpage over a consultation period extending from 5 July 2023 to 27 August 2023. The webpage provided access to the potential management actions documented in an A3 summary brochure and also mapped on a publicly accessible interactive GIS platform online. Community feedback was able to be provided through several submission options, comprising:

- Online Survey Tool;
- Map-based Feedback Portal;
- Map-based Suggestion Portal; and,
- Email Submissions.

A factsheet was prepared to summarise Stages 2 and 3 online community engagement and responses to the matters raised and was issued on Council's 'Get Involved' webpage.

Further detail on community feedback and responses provided to the matters raised is provided in the CMP Stage 3 report (**Supporting Document E**).

Following Stage 3 community consultation, the management actions were refined and distributed, along with the draft Entrance Management Policy, to relevant government agency stakeholders for review and comment. A government agency workshop was held on 11 June 2024 to facilitate discussion of feedback and included representatives from RHDHV, Council, DCCEEW-BCS, DPIRD-Fisheries, DPHI-Crown Lands, and NPWS. Written comments were received from Council, DCCEEW-BCS, DPIRD-Fisheries, DPHI-Crown Lands, and NPWS, and were considered and incorporated as required in the finalisation of management actions and the draft Entrance Management Policy documented in the draft CMP report prepared for public exhibition in Stage 4.

3.6 Stage 4

[Outcomes of public exhibition to be summarised]

4 Actions to be Implemented by the Council or by Public Authorities

4.1 General

A key objective of the CMP is to utilise a strategic and practical approach to developing management actions. Management actions included in the program have been rationalised and prioritised by a robust, and comprehensive decision-making framework. The framework adopted in the CMP was developed in order to make sound comparisons between each option and to rank options in a transparent and unbiased manner – in order to identify those that have the greatest overall benefit for management of the coastal zone. Stage 3 of the CMP process is documented in **Supporting Document E** and comprised the identification and assessment of management actions leading to selection of those included herein.

An initial long list of management actions was compiled from the risk assessment completed during Stage 2 (refer **Supporting Document B**), with additional selected actions developed to enable the integrated and strategic management of the study area for the Lake Conjola CMP within the broader Shoalhaven coastal zone. A coarse filter incorporating several criteria was applied to this long list to confirm which actions would be accepted for Stage 3 consultation (refer **Supporting Document E**). The actions were consolidated and presented in a summary written document including GIS mapping, for community and stakeholder engagement.

Feedback received from the Stage 3 consultation was used to refine the management actions. In addition, new actions suggested from the consultation were added if they were considered to have technical merit. A cost benefit analysis was completed during Stage 3 for those management options that would require significant expenditure to implement, namely options for entrance management. Feedback was also sought from key government agency representatives in the finalisation of management actions and the draft Entrance Management Policy included herein.

The coarse filter scoring process completed during Stage 3 (refer **Supporting Document E**), community feedback received during Stage 3 consultation, and feedback from Council and government agency representatives was used to assign an indicative timing and an associated priority level to each action. It should be noted that this process is intended to provide a broad indication of action priority. However, it is acknowledged that this may not marry with the “on the ground” reality over the forward CMP timeframe (Stage 5 – Implementation), and a flexible approach to undertaking works should be adopted as grants and funding opportunities arise from time to time that may allow some options to be progressed ahead of others.

4.2 Implementation of CMP Actions

4.2.1 Actions to be Implemented by Council

Under Section 22 of the CM Act, CMP actions that are to be implemented by Council are to be given effect through the Integrated Planning and Reporting (IP&R) Framework, which is required to conform to the state-based Integrated Planning and Reporting (IP&R) structure mandated in the LG Act.

4.2.2 Integrated Planning and Reporting Framework

The Integrated Planning and Reporting (IP&R) framework as shown in **Figure 4-1** is a legislative requirement for councils under the *Local Government Act 1993*. IP&R considers the longer term future of

an area and is based around a Community Strategic Plan which reflects the community's aspirations and needs for the future.

The IP&R framework consists of four layers of plans:

- the Community Strategic Plan,
- the Resourcing Strategy is a 10-year plan describing the resources that Council will use to achieve the objectives and strategies detailed in its CSP,
- the Delivery Program is a four-year program outlining the commitments and key partnerships required and measures to monitor success in achieving the Strategies, and
- the Operational Plan outlines in more detail the individual Actions that council will undertake in a financial year in order to meet the commitments made in the Delivery Program.

In accordance with the CM Act, the Lake Conjola CMP needs to align with Council's IP&R Framework. This aims to mainstream coastal management into Council's overall service delivery and asset management responsibilities. It is also likely that integrating actions from the Lake Conjola CMP into the service delivery and asset management processes of Council will improve implementation of the Lake Conjola CMP.

Generally, the Operational Plan and Delivery Program are updated on a yearly basis (as the Delivery Program is a rolling four-year program), and it is at this stage that actions from the Lake Conjola CMP can and should be incorporated into these documents.

IP&R requires the preparation of a Delivery Program that sets out a four-year plan to achieve the objectives of the Community Strategic Plan – Shoalhaven 2032 (SCC, 2022a). The business plan in **Section 6** outlines how the management actions within the Lake Conjola CMP will meet the objectives and strategies of the Community Strategic Plan.

To support the integration of the Lake Conjola CMP with the day to day operations of Council, it is recommended that 12 months after the Lake Conjola CMP is certified, and at yearly intervals until superseded, a workshop is held between key staff that are responsible for its implementation and a DCCEEW-BCS Coastal representative(s), to assess implementation and current status of the Lake Conjola CMP. This is consistent with Action LG3 of the CMP.

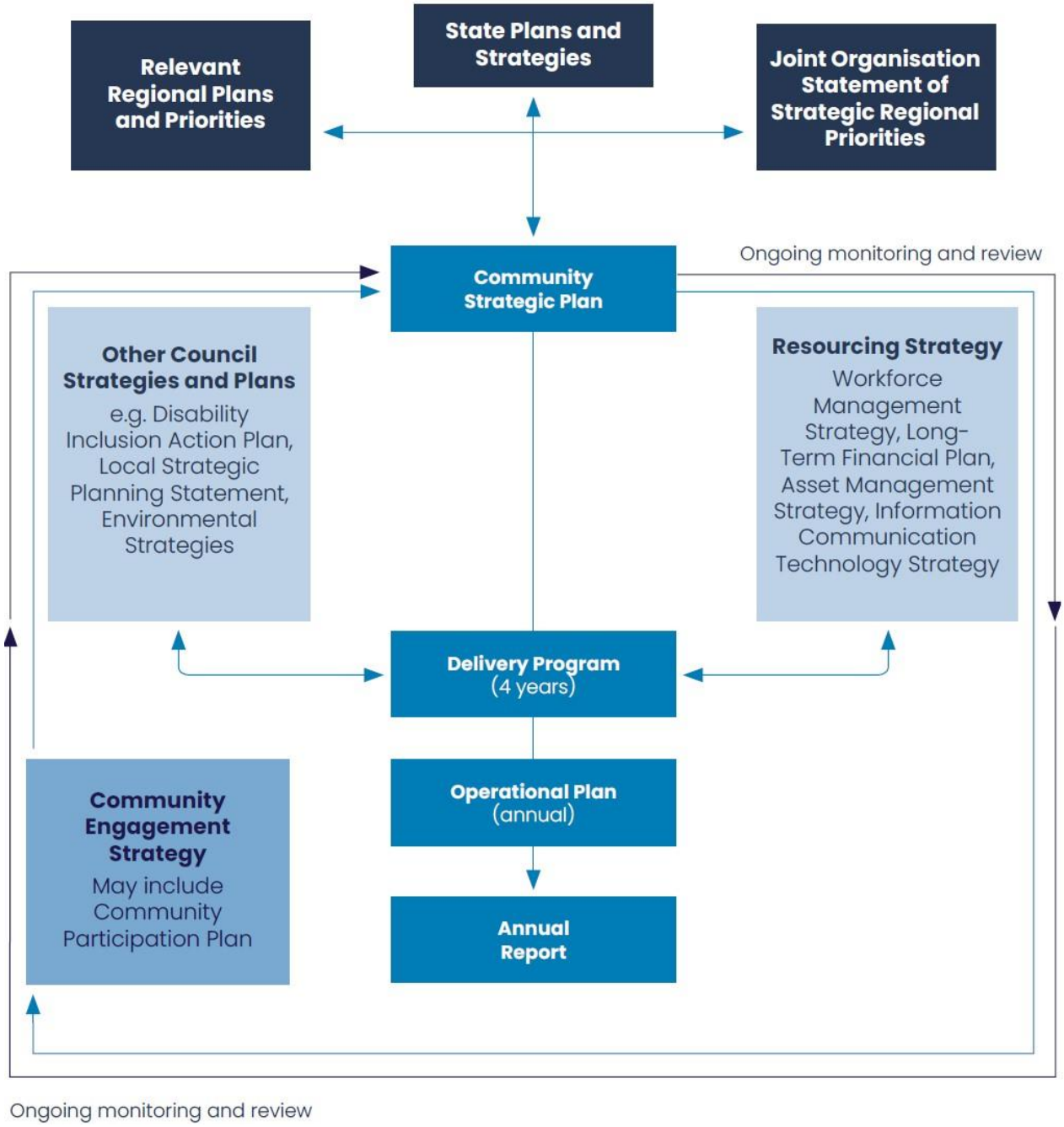


Figure 4-1: Shoalhaven City Council Integrated Planning and Reporting Framework

4.2.2.1 Community Strategic Plan – Shoalhaven 2032

The Community Strategic Plan – Shoalhaven 2032 articulates where Council want to be as a community in 10 years' time, what they need to do to get there, and how they will know when they have arrived. It is the highest level plan for the Shoalhaven LGA. The 10-year plan is supported by a suite of documents that outline how Council will contribute to fulfilling the community's vision and the activities and actions that will be taken.

The key partners to this plan include:

- Federal Government
- NSW Government
- Businesses
- Chambers of Commerce
- Developers
- Community members
- Community groups
- Council advisory committees
- Response agencies
- Community housing providers

The CMP must reflect and support implementation of the Community Strategic Plan. Under the CM Act, the objectives and management actions developed as part of CMPs are required to be strategically aligned with the objectives and strategies outlined in the Community Strategic Plan.

4.2.2.2 Resourcing Strategy

The Resourcing Strategy addresses how Council will implement and resource the Delivery Program through planning for their finances, assets, and workforce. Resourcing implications of the CMP should be reflected in the Resourcing Strategy and CMP actions relating to Council assets should be considered in the relevant Asset Management Plan.

Council's formal adoption of the Lake Conjola CMP following public exhibition will commit Council and other identified stakeholders to implementing the recommended actions. These actions will be largely implemented by Council staff with support of identified agencies, and with outsourcing of specific items requiring specialist expertise to appropriate consultants or contractors.

The costs associated with these actions, will need to be reported to Council for approval and be reflected in Council's financial planning and the projects appropriately scheduled in Council's Delivery Program and Operational Plans. The proposed works are generally located on land owned or managed by Council or the NSW Government. Funding is expected to be sourced from Council, and State and Federal Governments. Where possible, Council will seek to apply for funding assistance from all relevant grant programs, including the NSW Coastal & Estuary Grants Program. New or upgraded assets and their associated lifecycle costs will also need to be reflected in the relevant asset management plans.

4.2.2.3 Delivery Program – 4 Years

The Delivery Program outlines the principal activities that Council will deliver over four years to implement the 10-year Community Strategic Plan. Forthcoming and ongoing CMP actions for the relevant 4-year period must be included in the associated delivery program.

4.2.2.4 Operational Plan – 1 Year

The Operational Plan is the annual plan that details the specific actions that Council will undertake and its budget for completing these. Forthcoming and ongoing CMP actions are to be scheduled into each years' operational plan.

4.2.2.5 Annual Reporting

Council delivers an Annual Report which demonstrates progress in implementing the Delivery Program and Operational Plan activities over each financial year, and it is recommended that this report provides the main reporting mechanism for the MER program (refer **Section 8**). Performance measures are included for each action in the Operational Plan, which can be used to gauge whether the Lake Conjola

CMP actions have been implemented or not, which can then be reported in the Annual Report. This provides for a yearly evaluation of the implementation status of each action in the Lake Conjola CMP.

4.2.3 Actions to be Implemented by Public Authorities other than Council

Section 23 of the CM Act sets out the obligations for public authorities for the implementation of a CMP:

1) Public authorities (other than local councils) are to have regard to coastal management programs to extent that those programs are relevant to the exercise of their functions.
2) In particular, those public authorities are to have regard to relevant coastal management programs and the coastal management manual in the preparation, development and review of, and the contents of, any plans of management that those public authorities are required to produce and, in doing so, are to have regard to the objects of the Act.

4.2.4 Management Action Approvals and Considerations

Management actions in the Lake Conjola CMP will potentially require approvals or authorisation from relevant landowners, government agencies with statutory responsibilities, or stakeholders with interest in the land where the management action is proposed. These approvals or authorisations may potentially be required under various legislative instruments and will be obtained prior to commencement of the management action implementation.

Where management actions are proposed on Crown land relevant authorisations and approvals may need to be obtained under the *Crown Land Management Act 2016* (CLM Act). Management actions undertaken on Crown land will also need to consider Aboriginal Land Claims lodged under the *Aboriginal Land Rights Act 1983*. All activities relating to the use of Crown land must be consistent with the Commonwealth *Native Title Act 1993* (NT Act).

With respect to works and activities that are proposed in the CMP, if they are to occur on Crown land and Council is the appointed Crown Land Manager, and the proposed works are consistent with the reserve purpose and/or a Plan of Management, then no other form of authorisation under the CLM Act will generally be required.

All relevant Plans of Management prepared for Crown land within the CMP study area will make reference to this CMP as appropriate, to ensure that actions within the CMP and relevant Plan of Management are consistent / aligned.

Where management actions could have a potential impact on aquatic ecology or habitat, permits may need to be obtained under Part 7 of the *Fisheries Management Act 1994*.

4.3 Overview of Management Actions

The recommended CMP management actions are structured under several main themes comprising:

- LGA-Wide Management Actions;
- Manage Foreshore Areas and Bank Erosion;
- Improve Planning and Management Arrangements for the Lake Catchment Area;
- Entrance Management Interventions;
- Maintain and Improve Water Quality;
- Protect and Rehabilitate Estuarine and Riparian Vegetation and Habitat; and,

- Maintain and Improve Recreation and Amenity.

Management strategies and actions have been developed for a ten-year period. A timeframe for implementation of the actions is specified, adopting timing consistent with the key Council IP&R documents, as follows:

- Year 1: to match with the Operational Plan (which typically extends for one financial year).
- Year 2 to 3: to match with the Delivery Program 2022-2026 which is a 4 year program (including the Operational Plan).
- Year 4 to 7: to match with the future Delivery Program 2026-2030.
- Year 8 to 10: to match with the future Delivery Program 2030-2034.
- The term ‘ongoing’ is used where an action will need to be repeated regularly, or where ongoing maintenance is required.

The CMP management actions are presented in **Table 4-1**, which includes the following information:

- Action ID;
- Location/scale of the action;
- Action name and description;
- Lead organisation responsible for implementation and any relevant supporting agencies;
- Priority level (low, medium or high);
- Indicative timing of the action; and,
- Performance measures.

All recommended actions that have a specific location associated with them are shown on maps presented as figures within this section. Actions that are generic in nature or apply to an area more broadly have not been mapped. The estimated costs associated with the actions have been provided within the Business Plan **Table 6-3** in **Section 6**.

Table 4-1: Recommended Coastal Management Actions

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
LGA-Wide Management Actions								
LG1	Establish a CMP Governance Framework	Study Area Wide	• Establish a CMP working group, to oversee the implementation of the CMP and ensure that it meets its objectives • Members should include staff from Council, relevant state government agencies, and other groups • Clearly define the purpose, objectives and functions of the working group • Define the roles and responsibilities of the working group members • Execute the function of the working group	Council	N/A	High	Year 1 and ongoing	Working group established and functioning.
LG2	Establish one new Full Time Equivalent (FTE) Coast & Estuary Officer role within Council	Study Area Wide	Establish one new Full Time Equivalent (FTE) Coast & Estuary Officer role within Council - in order to develop the implementation strategy of Council's Lake Conjola CMP, (including long-term funding options) and build Council's capacity to respond.	Council	N/A	High	Year 1 and ongoing	Roles established and maintained for 10 year CMP duration.
LG3	Enact the CMPs Monitoring, Evaluation and Reporting (MER) Program to track progress and report on outcomes	Study Area Wide	• Ongoing monitoring of CMP Actions • Annual review of actions to ensure they are appropriate and current, with completed actions documented • Ongoing reporting of progress • Documentation of the effectiveness of the proposed strategies and actions will be reported as part of Council's Annual Report (which is part of the IP&R framework), including progress towards or full achievement of the performance targets included for each action.	Council	N/A	High	Year 1 and ongoing	Annual reviews completed.
LG4	Review Councils coastal management planning policies every 10 years	Study Area Wide	Review Council's coastal management planning policies for the 10-year CMP implementation lifecycle. This should include consideration of the latest environmental data, observed coastal hazard impacts, and state government policies. The review should consider: • The Shoalhaven City Council Sea Level Rise Framework • The Shoalhaven City Council Coastal Hazard Mapping • Lake Conjola Entrance Management Policy • Council's various planning instruments	Council	DCCEEW-BCS DPHI-Planning	Medium	Year 10	Review completed.
LG5	Continue to collaborate with government agencies and research institutions	Study Area Wide	Continue to collaborate with State and Federal government agencies, universities and others on projects and research that focuses on: • Climate change impacts on coastal and estuarine processes and landforms, including new data on sea level rise, storm behaviour, sediment transport processes, entrance management and stability and coastal and estuarine monitoring • Impact of sea level rise on estuarine macrophytes and supratidal forests • Coastal lake entrance behaviour (sediment budget, morphology, opening and closing regimes) with sea level rise and other aspects of climate change and climate variability • Impact of private moorings and maritime infrastructure on seagrasses, and impacts of unattended vessels on bank stability • Ecological services and functions of estuarine species and most effective vegetation structure to enhance foreshore resilience • Boating safety and navigation • Management of foreshore erosion	Council	NPWS DCCEEW-BCS DPHI-Planning DPIRD-Fisheries DPHI-Crown Lands TfNSW	High	Year 1 and ongoing	Collaboration with government agencies and research institutions is successfully arranged.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
			• The protection of threatened and migratory shorebirds (i.e. through the South Coast Shorebird Recovery Project)					
LG6	Develop and implement a program of dune vegetation management and rehabilitation	Lake Conjola Entrance	Strategically manage and rehabilitate coastal dune systems through weeding, revegetation, erosion control, asset maintenance, feral animal control and fauna surveys – at the entrance spit and entrance channel foreshore immediately west of the spit (Action LG6.01), and on the northern side of the entrance channel at Cunjurong Beach (Action LG6.02) (refer **Figure 4-2**). Works should support the ecological restoration of identified Threatened Ecological Communities (TECs) based on Council's 2023 report *Assessment of Endangered Ecological Communities In Coastal Hazard Areas: Shoalhaven LGA Tidal Inundation and Coastal Erosion Study Sites* (Ecoplanning, 2023). Dune vegetation management will also include collaborating with, and supporting, Council endorsed Bushcare groups through providing educational opportunities, resources, mentoring and technical support. Collaboration with NPWS and the NSW South Coast Shorebird Recovery Program would also be required.	Council	N/A	As per sub-actions LG6.01-LG6.02	As per sub-actions LG6.01-LG6.02	Works completed.
LG6.01	Develop and implement a program of dune vegetation management and rehabilitation	Conjola Beach (area 10,500sqm, perimeter 600m)	Dune revegetation at the entrance spit and entrance channel foreshore immediately west of the spit (refer **Figure 4-2**).	Council	N/A	High	Within 1-3 years	Works completed. Increased native dune vegetation cover.
LG6.02	Develop and implement a program of dune vegetation management and rehabilitation	Cunjurong Beach (area 6,000sqm, perimeter 400m)	Dune revegetation on the northern side of the entrance channel at Cunjurong Beach (refer **Figure 4-2**).	Council	N/A	Medium	Within 4-7 years	Works completed. Increased native dune vegetation cover.
LG7	Develop and execute a communications plan for Stage 5 of the CMP	Study Area Wide	Present information on Council's website and in community engagement activities that shows: • The purpose of the CMP. • The CMP background, and an overview of the NSW Coastal Management Framework. • Key CMP information, including reports available for public consumption. • The status of CMP Actions, with details of the actions and recent updates/progress. • Information pertaining to upcoming community consultation events, and avenues for engagement. • Links to relevant materials such as the NSW Coastal Management Framework, and the Marine Estate Management Strategy. • How coastal zone systems function and how integrated management responses benefits Council and local communities.	Council	DCCEEW-BCS	High	Year 1 and ongoing	Plan developed and implemented.
LG8	Continue Council's program of mapping threatened ecological communities (TECs) across coastal reserves	Study Area Wide	Continue to carry out existing survey program to ground-truth and map the distribution and condition of TECs in coastal hazard risk areas using the Biodiversity Conservation Act, Biodiversity Assessment Methodology. This mapping will be used to update Council's LEP Terrestrial Biodiversity Map, inform the Biodiversity Values Map, and provide further education for the public on the Council website. It should be noted that the outcomes of this may be future potential amendments to the Coastal Wetlands and Littoral Rainforests Area map under the RH SEPP, which could be undertaken through a planning proposal.	Council	DCCEEW-BCS	Medium	Within 7-10 years	Mapping completed.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
LG9	Develop and maintain a program of community engagement with coastal communities about coastal hazard risk	Study Area Wide	Engage with foreshore reserve property owners, residents, beach goers, and community youth around issues such as: • The importance and value of dune vegetation (e.g. trapping wind-blown sand and maintaining dune resilience, ecological functions and buffering against coastal hazards) • Recognising Aboriginal cultural heritage on the coast and within estuaries • Managing the interface between coastal bushland, estuary foreshore and private property, including edge impacts, encroachments, garden refuse dumping, vegetation retention, and weed management • Importance of foreshore vegetation in providing shade and wind protection, stabilising foreshores, reducing erosion, filtering runoff, improving water quality and providing habitat • Illegal pruning, poisoning and removal of trees, private vehicle access and illegal structures/items which restrict public use of the reserve. Enforce regulations outlined in Councils Vegetation Vandalism Prevention Policy POL22/24 in high conservation areas as a priority. • ICOLLs, their entrance dynamics ecology and water quality. • Principles and drivers of ICOLL entrance management, understanding of Council's policy and operational procedures, and to discourage illegal openings Education programs should be enacted every 5 years.	Council	N/A	High	Year 1 and ongoing	Program and materials created, and program implemented.
LG10	Review and update all Council asset management plans (AMPs), relevant to the Lake Conjola study area	Study Area Wide	Review and update all asset management plans (AMPs), relevant to the Lake Conjola coastal zone. AMPs by asset type will be updated by relevant asset custodian. Include an asset management approach to provide for replacement, relocation or retrofitting of public assets that are currently in coastal risk areas – including boat ramps, wharves, jetties, water and wastewater infrastructure, stormwater drainage infrastructure, foreshore protection infrastructure, roads and access tracks. The update of AMPs should be prepared considering current and future coastal hazard impacts, including the impacts of coastal and tidal inundation, and should outline plans and mitigation strategies to reduce the risk from such hazards. The Stage 2 Risk Assessment should be used to inform the update of AMPs to account for coastal hazard impacts. AMPs are to be aligned with the coastal zone emergency action sub-plan.	Council	N/A	High	Within 1-3 years	Plans updated and fit for purpose.
LG11	Develop and implement a program for regular and ongoing monitoring of Council-managed coastal assets and infrastructure	Study Area Wide	This action involves the development and implementation of a monitoring program designed to assess and track the condition of various assets and infrastructure, including: • Foreshore protection structures (revetments, seawalls) • Recreational assets including viewing platforms and coastal and foreshore access tracks • Maritime and boating infrastructure (i.e. jetties, boat ramps) and related ancillary infrastructure (i.e. fish cleaning tables) • Stormwater infrastructure • Stormwater outlets • Sewer and water infrastructure	Council	N/A	High	Year 1 and ongoing	Collected data is of tangible benefit from an asset management perspective.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
			The program should be integrated into Councils broader asset management program.					
LG12	Undertake an estuary-wide Aboriginal Cultural Heritage Survey, and development of local protection/management plans	Study Area Wide	This action will involve engaging with the relevant Local Aboriginal Land Councils, Traditional Owner groups and an archaeologist to undertake an updated cultural heritage survey of the coastal zone within the Lake Conjola CMP Study Area – and in doing so: • fill existing information gaps with the LGA-wide Aboriginal Cultural Heritage Mapping; and, • update the Aboriginal Heritage Information Management System (AHIMS). It is anticipated that there would be three main tasks for this action: 1. Consultation with the relevant Local Aboriginal Land Councils and Traditional Owners and knowledge holders. 2. An Aboriginal cultural heritage assessment, which should include survey field work, and recording of cultural heritage sites (such as middens sites) and detailed documentation of findings. 3. The development and prioritisation of local, site specific management plans for protection and preservation of these sites.	Council	Jerrinja LALC Jerrinja Tribal Group DCCEEW-BCS DPIRD-Fisheries NPWS	High	Year 1 and ongoing	Consultation conducted, survey undertaken, and plan developed.
LG13	Engage with relevant Local Aboriginal Land Councils and local Traditional Owner Groups to develop a cultural educational and awareness program	Study Area Wide	This action will involve engaging with relevant Local Aboriginal Land Councils and local Traditional Owner groups to develop and roll out a cultural educational and awareness program – related to the Aboriginal Cultural Heritage (ACH) of the coastal zone. Design of the program should be led by either relevant Local Aboriginal Land Councils or local Traditional Owner groups. The program could involve educational methods such as: • School programs including planting days, stewardship sites and hands on activities • Signage at local sites such as beaches, estuaries, and headlands (including the use of QR codes that includes elders speaking about the history of the area) • Brochures and information provided to tourists at caravan parks and information centres • Cultural tours to provide greater awareness of ACH values to both the local community and to the large population of seasonal visitors	Council	Jerrinja LALC Jerrinja Tribal Group DCCEEW-BCS DPIRD-Fisheries NPWS	Medium	Within 1-3 years, and ongoing	Program developed and being implemented.
LG14	Provide opportunities and help build capacity to local Aboriginal Ranger programs, to enhance their role in management of Sea Country	Study Area Wide	This action will involve working with relevant Local Aboriginal Land Councils and local Traditional Owner groups to bolster existing ranger programs and facilitate a greater role for these programs in coastal management across the Shoalhaven LGA. • This would involve working with and supporting the ranger team coalition to help enhance/boost their capacity and awareness of coastal management. • Utilise Aboriginal ranger teams (alongside other appropriately qualified contractors) to undertake on ground works associated with dune restoration and monitoring programs. • Work collaboratively to help develop the next generation of junior rangers to be part of future coastal management across the Shoalhaven LGA.	Council	Jerrinja LALC Jerrinja Tribal Group DCCEEW-BCS DPIRD-Fisheries NPWS	Medium	Opportunistic, within 10 years	Capacity of local ranger teams increased. Increased role for Traditional Owner Groups in coastal management across the LGA.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
			This action is consistent with Initiative #4 of the NSW Marine Estate Management Strategy – which aims to: "Increase Aboriginal participation in Sea Country management, planning and monitoring through employment and training of Aboriginal people at a regional and local level".					
LG15	Update Council Plans of Management (POMs) for locations in the coastal zone to support objectives of the CMP	Study Area Wide	Update the relevant Plans of Management (POMs) to the CMP study area and coastal zone for consistency with the *Coastal Management Act 2016*, State Environmental Planning Policy (Resilience and Hazards) 2021 and the objectives of the CMP. This update should consider outcomes of the Stage 2 Technical Studies and the implementation management actions identified in this CMP to complement future land use and character. Updates should account for: • allowing for conservation and restoration of saltmarsh (blue carbon) • bank stabilisation works • sea level rise, as it may impact on assets • minimising grazing access Existing Council PoMs to be updated include: • Generic Council Managed Crown Lands x3 (Natural Area, Parks, Community Use) • Fishermans Paradise - Hazel Robotham Reserve	Council	DPHI-Crown Lands	High	Years 1-3	POMs updated.
Manage Foreshore Areas and Bank Erosion								
FB1	Investigate, remediate and monitor impacted or vulnerable bank areas	Refer below.	This action will involve detailed design of foreshore management activities followed by remediation of bank areas within Lake Conjola that have been impacted or are vulnerable to erosion. The main tasks for this action will include: • Preparation of detailed site assessments and designs for foreshore management activities (under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*) including treatment of eroding and unprotected foreshore areas and working with relevant stakeholders to enable establishment or restoration of riparian vegetation, where identified as lacking, as foreshore management activities. • Preparation of detailed designs for areas of inconsistent foreshore protection works, which include opportunities for installation of environmentally friendly seawalls (DECC, 2009) including benches of estuarine vegetation and a uniform approach to foreshore management activities (under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*). • Establishment of an ongoing monitoring program to inform remediation actions. This monitoring would be included in Councils asset management program as per Action LG11. • Progressive implementation of riparian vegetation restoration (as per Action EV1) combined with foreshore protection remediation works. Integrate riparian vegetation (including estuarine plants like saltmarsh, mangroves and reeds) management with stabilisation works to reduce erosion, improve bank stability, and enhance biodiversity. Consider site-specific revegetation and maintenance plans, particularly where existing riparian vegetation is in reasonable condition. It is noted that several foreshore protection actions completely involve riparian vegetation restoration (i.e. Actions EV1.01, EV1.02, EV1.03, EV1.04, EV1.05 and EV1.06), and would be undertaken as part of Action EV1 (refer **Figure 4-9**).	Council	DPIRD-Fisheries DCCEEW-BCS	As per sub-actions FB1.01-FB1.08	As per sub-actions FB1.01-FB1.08	Foreshore restoration and remediation works successfully implemented.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
			• Community engagement and consultation - Engage with the community, especially in high use areas for boating, water sports or other recreational activities, to inform and involve them in the stabilisation and restoration process. Ensure that any restrictions or changes to community use of areas are communicated well in advance and are undertaken with community understanding and support. • Collaboration and coordination - Foster collaboration with Local Land Services and other relevant stakeholders for integrated and effective bank stabilisation and riparian restoration along the Lake Conjola foreshore. Coordinate with adjacent private landowners and agency landowners to extend the benefits of stabilisation and restoration works beyond Council owned or managed lands where possible and appropriate. Foreshore areas of publicly-owned land that have been identified as priority areas for remediation are shown on **Figure 4-3**. It is noted that there are other areas of privately owned foreshore land that would benefit from restoration of a riparian vegetation buffer, including the eastern shoreline of the lower reach of Conjola Creek and both sides of Conjola Creek upstream of Fishermans Paradise. The protection and restoration of riparian vegetation (i.e. environmental protection works) in these areas would require collaboration with landowners in conjunction with Action FB4.					
FB1.01	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Village - foreshore west of boat ramp carpark	Repair of existing foreshore protection, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009).	Council	DPIRD-Fisheries DCCEEW-BCS	Medium	Within 4-7 years	Repair works successfully implemented.
FB1.02	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Village - eastern portion of Caravan Park foreshore	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design. Retain existing localised swimming areas and provide areas of access.	Council	DPIRD-Fisheries DCCEEW-BCS	Medium	Within 4-7 years	Upgrade works successfully implemented.
FB1.03	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Village - central portion of Caravan Park foreshore	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design. Remove existing concrete works.	Council	DPIRD-Fisheries DCCEEW-BCS	Medium	Within 4-7 years	Upgrade works successfully implemented.
FB1.04	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Village - Caravan Park central swimming area embayment	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well	Council	DPIRD-Fisheries DCCEEW-BCS	Medium	Within 4-7 years	Upgrade works successfully implemented.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
			as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design. Retain existing localised swimming areas and provide areas of access.					
FB1.05	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Village - section west of central swimming area embayment	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design. Remove existing concrete works.	Council	DPIRD-Fisheries DCCEEW-BCS	Medium	Within 4-7 years	Upgrade works successfully implemented.
FB1.06	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Village - western portion of Caravan Park foreshore	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design. Retain existing localised swimming areas and provide areas of access.	Council	DPIRD-Fisheries DCCEEW-BCS	Medium	Within 4-7 years	Upgrade works successfully implemented.
FB1.07	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Village - western portion of Caravan Park foreshore to Post Office	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design.	Council	DPIRD-Fisheries DCCEEW-BCS	Medium	Within 4-7 years	Upgrade works successfully implemented.
FB1.08	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Village - Post Office to western foreshore reserve	Construct environmentally friendly seawall treatment within the open reserve area (saltmarsh berm, riparian vegetation), as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Retain access to foreshore in places for fishing.	Council	DPIRD-Fisheries DCCEEW-BCS	Medium	Within 4-7 years	Environmentally friendly seawall constructed.

FB2	Management of Stormwater Runoff	Refer below.	This action will involve detailed design followed by implementation of management works for identified foreshore areas where uncontrolled stormwater runoff or discharge is impacting on public amenity and safety, foreshore stability, or lake water quality. The main tasks for this action would include:
			• Preparing detailed designs for the specific areas identified (refer **Figure 4-4** and **Figure 4-5**) where surface water runoff pathways and stormwater discharge outlets could be modified to better filter runoff and improve lake water quality, including:
			  ○ filtering of runoff with provision of a riparian vegetation buffer along the foreshore edge (2 locations, refer **Figure 4-4**)
			  ○ replacement of hard drainage channels with grassed and vegetated swales (5 locations, refer **Figure 4-4** and **Figure 4-5**)
				Council	N/A	As per sub-actions FB2.01-FB2.02	As per sub-actions FB2.01-FB2.02	Works completed

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
			○ street sweeping to remove loose sediment and gravel from sealed surfaces (2 locations, refer **Figure 4-5**) • Establishment of an ongoing monitoring program to inform management actions. This monitoring would be included in Councils asset management program as per Action LG11. • Progressive implementation of stormwater management works.					
FB2.01	Management of Stormwater Runoff	Conjola Village (east)	Stormwater management works proposed at Conjola Village (east) comprise: • filtering of stormwater runoff with riparian vegetation buffer (2 locations, refer **Figure 4-4**) • replacement of concrete channel with grassed swale and filtering of stormwater runoff with riparian vegetation buffer (4 locations, refer **Figure 4-4**)	Council	N/A	Medium	Within 4-7 years	Works completed.
FB2.02	Management of Stormwater Runoff	Conjola Park	Stormwater management works proposed at Conjola Park comprise: • replacement of concrete channel with grassed swale and filtering of stormwater runoff with riparian vegetation buffer (1 location, refer **Figure 4-5**) • street sweeping to remove loose sediment and gravel from sealed surfaces (2 locations, refer **Figure 4-5**)	Council	N/A	Medium	Within 4-7 years	Works completed.
FB3	Management of Watercraft Storage	Refer below.	This action will involve the implementation of a removal program for ad hoc stored watercraft (e.g. dinghies, canoes, kayaks etc.) that are abandoned, derelict or illegally stored in public foreshore areas accordance with Council's Foreshore Reserves Policy (POL19/76) (refer **Figure 4-6**). This will be undertaken in conjunction with the development and implementation of formalised watercraft storage systems (e.g. dinghy/kayak racks, tie-up points, permitting system) in the identified foreshore areas around the lake (refer **Figure 4-6**). Ongoing monitoring and policing would be required to prevent re-occurrence of ad hoc watercraft storage.	Council	TfNSW NPWS DPHI-Crown Lands	As per sub-actions FB3.01-FB3.04	As per sub-actions FB3.01-FB3.04	Works completed. Additional storage provided.
FB3.01	Management of watercraft storage	Conjola Village (east)	Installation of formalised watercraft storage system.	Council	TfNSW	Medium	Within 1-3 years	Works completed. Additional storage provided.
FB3.02	Management of watercraft storage	Conjola Village (west)	Installation of formalised watercraft storage system.	Council	TfNSW	Medium	Within 1-3 years	Works completed. Additional storage provided.
FB3.03	Management of watercraft storage	Berringer Lake	Installation of formalised watercraft storage system.	Council	TfNSW NPWS DPHI-Crown Lands	Medium	Within 1-3 years	Works completed. Additional storage provided.
FB3.04	Management of watercraft storage	Conjola Park	Installation of formalised watercraft storage system.	Council	TfNSW	Medium	Within 1-3 years	Works completed. Additional storage provided.
FB4	Management of uncontrolled stock access to foreshore areas to enhance and protect riparian vegetation	Fishermans Paradise / Conjola Creek	This action will involve working collaboratively with farmers/foreshore landowners in conjunction with NSW Local Land Services (LLS) to support change in farming practices (e.g. stock access to lake foreshore). This would be done in conjunction with other site-specific measures in identified deteriorated foreshore areas including: • Engage with property owners to provide education on the importance of managing livestock access to foreshores and the broader environmental benefits. Offer guidelines, support, and potential incentives for compliance to promote proactive landholder involvement. • Foster a close collaboration with Local Land Services (LLS) as the lead agency to support property owner engagement, education, and the	Council	NSW LLS	Medium	Within 4-7 years	Restoration of riparian vegetation buffer. Reduced stock access to foreshore areas.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
			implementation of livestock management measures. Discuss the viability of proposed actions with LLS to ensure alignment with broader environmental and community objectives. • Reinstatement of a riparian vegetation buffer along foreshore areas (as per Action EV1). This initiative will require voluntary agreement and cooperation from landholders along with support from LLS. • Installation of fencing to prevent foreshore stock access (foreshores of upper Lake Conjola and Conjola Creek near Fishermans Paradise, refer **Figure 4-7**) • Establish a framework to monitor and evaluate the effectiveness of livestock management, fencing, and revegetation initiatives, ensuring ongoing alignment with environmental objectives and continuous improvement.					
Improve Planning and Management Arrangements for the Lake Catchment Area								
PM1	Review, update and maintain tidal and coastal inundation development and planning controls to reduce future coastal hazard impacts	Study Area Wide	This action will involve review, update and maintenance of relevant development and planning controls within the Shoalhaven Local Environmental Plan (LEP) 2014 and Shoalhaven Development Control Plan (DCP) 2014 that apply to new development within areas impacted by coastal hazards. This should include consideration of controls for non-habitable areas and incorporation of tidal/coastal inundation events as a hazard and suitable planning controls for management of permanent inundation associated with tidal inundation into the future with sea level rise. Council will be responsible for updating and maintaining notation to section 10.7 (5) certificates for properties affected by coastal hazards consistent with NSW Government legislation. Initial review (and ongoing periodic review) of future zoning of land within the Lake Conjola catchment. This should be undertaken with consideration of the protection and rehabilitation of existing estuarine and riparian vegetation and habitat, future migration of vegetation/habitat, and future inundation of land by tidal/coastal inundation processes under sea level rise. Initial review (and ongoing periodic review) of land use controls and categorisation within the Lake Conjola catchment should be undertaken in the context of the Waterway Health Risk Assessment completed for Lake Conjola, which identified areas where land use intensification should be avoided (refer to red areas shown on **Figure 4-8**). Consideration should also be made to encourage land management and zoning that enables the migration of wetland ecosystems with sea level rise. Support the implementation of the Marine Estate Management Strategy (MEMS) domestic waterfront structure strategies through the promotion of and reference to the strategy though the provision of planning advice and via Council's website. This action also includes the preparation of a Planning Proposal to map and introduce a Coastal Vulnerability Area (CVA) for the estuary and modify and update the LEP and DCP. The planning proposal will seek formal inclusion of a CVA into the *State Environmental Planning Policy (Resilience and Hazards) 2021*. This activity will be undertaken in conjunction with Action LG4.	Council	DPHI-Planning	Medium	Within 4-7 years	Review completed and any amendments to LEP/DCP implemented.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
PM2	Activate and implement Coastal Zone Emergency Action Subplan (CZEAS)	Study Area Wide	This action involves the activation of the Lake Conjola Coastal Zone Emergency Action Subplan (LCCZEAS) prepared as part of this CMP (refer **Appendix B**) as required in the event of a coastal inundation hazard emergency.	Council	DCCEEW-BCS NSW SES DPHI-Crown Lands	High	Year 1 and ongoing	Plan activated and implemented in a timely manner when needed.
Entrance Management Interventions								
EM1	Implement revised Entrance Management Policy	Lake Conjola entrance	The Entrance Management Policy will be finalised as part of the finalisation and certification of the Lake Conjola CMP. This action will involve the preparation of an updated Lake Conjola Entrance Management Policy based on the draft finalised through the CMP, as well as the ongoing implementation of the policy actions and procedures. A Review of Environmental Factors (REF) will need to be prepared to support the implementation of the EMP prior to final agency sign-off and approval of the EMP. A draft entrance management policy is provided in **Appendix A**.	Council	DPIRD-Fisheries DPHI-Crown Lands TfNSW NPWS	High	Year 1 and ongoing	Lake Conjola Entrance Management Policy updated and entrance interventions implemented.
EM2	Prepare generic REF and approval applications for contingency ebb tide channel dredging and implement if required	Lake Conjola entrance	To streamline the approvals process for contingency ebb tide channel dredging, it is recommended that a generic REF is prepared along with likely approval application documentation for dredging works. The generic REF would cover the nominal scope of work, basis of design for the dredged channel, and potential environmental impacts and associated mitigation measures. The final REF for each dredging campaign would be informed by site investigations at the time that dredging is planned. Investigations may include aquatic ecology survey, sediment sampling and analysis, and hydrographic survey to confirm the extent of dredging required, and other studies required for the completion of a comprehensive REF. Approval application documentation would be prepared for the following relevant licences and permits: • Dredging licence under the *Crown Lands Management Act 2016*; and, • Permit to harm marine vegetation under Part 7 of the *Fisheries Management Act 1994*. Ebb tide channel dredging is a contingency measure that is available in the scenario when excavation of a pilot channel directly through the northern spit zone to link with a stranded ebb tide channel is not practicable for emergency response to flooding due to the significant time required for excavation. Implementation of a contingency ebb tide channel dredging campaign would be subject to obtaining the necessary approvals.	Council	DPIRD-Fisheries DPHI-Crown Lands TfNSW	High	Year 1 and ongoing	Generic REF and approval applications prepared.
Maintain and Improve Water Quality								
WQ1	Work with Shoalhaven Water to consider findings of ongoing groundwater monitoring, including the need for any interception of additional treatment	Lake Conjola Village	This action will involve Council reviewing the results of the groundwater monitoring and reporting program required by legislation for the effluent discharged into the dune exfiltration system as part of the Conjola Regional Sewerage Scheme. This program should include ongoing assessment of: • the likelihood of the nutrient plume continuing to migrate and affecting Lake Conjola and / or Pattimores Lagoon, and if so the likely impacts; • the capacity of the groundwater system and environment (estuary and lagoon) to naturally attenuate the nutrients; • whether the mass and concentration of nitrogen and phosphorus being discharged into the groundwater can be further reduced; and, • potential options for interception and additional treatment of the groundwater.	Council / Shoalhaven Water	N/A	High	Year 1 and ongoing	Monitoring completed and recommended management measures implemented.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
WQ2	Continue and implement refined surface water monitoring and reporting program	Lake Conjola / Berringer Lake	This action will involve the implementation of the refined surface water monitoring and reporting program as documented in Environmental Data Analysis (2023). This monitoring program includes the maintenance of the Aquadata online portal for public access to water quality sampling results. The monitoring program will be implemented with consideration of the following: • completing sampling consistently at a selected (rationalised) number of sites that are representative and provide adequate spatial coverage across the lake waterbody, to facilitate improved analysis of events impacting water quality. Sixteen prioritised sites were identified in Environmental Data Analysis (2023); • recording of a range of ancillary information during each water sampling site visit to aid in interpretation of collected data, including weather conditions, recent rainfall quantity and dates, water levels, tide condition, and open/closed status of the entrance; • inclusion of algal bloom monitoring; • increased review, interpretation and public dissemination of Aquadata water quality monitoring results; and, • implementation of warning signage and communications, as well as closure of lake areas in the event of poor water quality conditions for primary contact recreation (e.g. swimming, water skiing etc.). • continue to work with Council's Environmental Health Officers to monitor and better understand any potential impacts from remaining on-site septic tanks on lake water quality. Ensure compliance and enforcement continues on any septics not performing in accordance with current requirements. • align Council's Integrated Environmental Monitoring Program.	Council	DCCEEW-BCS DPIRD-Fisheries	High	Year 1 and ongoing	Monitoring completed and made publicly available. Poor lake water quality communicated to public via signage. Environmental requirements for remaining septics are maintained.
WQ3	Develop and implement water quality controls into future development	Study Area Wide	This action will involve a review and update of the water quality development and planning controls within the Shoalhaven Local Environmental Plan (LEP) 2014 and Shoalhaven Development Control Plan (SDCP) 2014 that apply to new development within the Lake Conjola catchment area. This review will consider the following aspects: • pollutant reduction targets for future development within the Lake Conjola catchment to be based on Neutral or Beneficial Effect (NorBE) for all greenfield development; • possible future application of the "Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions" (OEH, 2017) for Lake Conjola; • avoiding land use intensification in high risk areas as per mapping in "Shoalhaven Local Government Area Estuary Health Diffuse Source Pollution Risk Assessment Mapping" (DPIE, 2020); and, • inclusion of a range of Stormwater Quality Improvement Devices (SQIDs) to meet NorBE outcomes including incorporating wetlands and raingardens in private and public development. This action is to be implemented considering and consistent with Action FB2 and Action LG10.	Council	DCCEEW-BCS	Medium	Within 4-7 years	Review completed and any amendments to LEP/DCP implemented.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
Protect and Rehabilitate Estuarine and Riparian Vegetation and Habitat								
EV1	Protect and/or rehabilitate riparian and foreshore areas to enhance estuarine vegetation	Lake Conjola foreshore	This action will involve a range of measures and environmental protection works to ensure the protection of existing riparian and estuarine vegetation, as well as rehabilitation of currently impacted areas, and would consider the following aspects: • consider acquisition and protection of key locations, notably Coastal Wetlands and Littoral Rainforest areas (refer **Figure 4-9**), and working with landholders to investigate options for modified land management or conservation agreements, voluntary acquisition based on incentives and funding such as Blue Carbon where future funding sources may be available; • encourage implementation of buffers and land management practices to allow for spatial migration of vegetation/habitat under sea level rise (refer **Figure 4-9**) in conjunction with Action PM1. This would require consultation with private landholders. For public lands, Council to consider rezoning identified wetland migration areas for conservation purposes when updating the LEP. • installation of informative signage and fencing in key areas to protect vegetation and habitats; • Council support of volunteer based rehabilitation initiatives such as Bushcare/Parkcare/Dunecare, community based revegetation campaigns, and other community "ownership" projects. Natural areas requiring restoration and environmental protection works will also be identified through cultural engagement and cultural surveys (Actions LG12-LG14). Where culturally sensitive restoration sites are identified, the engagement of Aboriginal rangers and contractors will be prioritised; • continuation of existing Council programs for pest control (e.g. foxes, rabbits, Indian Mynas) and weed management and biosecurity; • enforcement of existing policies/controls on access restrictions to sensitive areas (e.g. boating and pedestrian access); • undertake rehabilitation works in damaged vegetated areas and ongoing implementation of ecological restoration and environmental protection works in Council-managed coastal reserves with reference to the objectives of the associated coastal management areas. These works would be informed by ground-truthing surveys (refer Action LG8) and should support the ecological restoration of identified Threatened Ecological Communities (TECs) based on Council's 2023 report *Assessment of Endangered Ecological Communities In Coastal Hazard Areas: Shoalhaven LGA Tidal Inundation and Coastal Erosion Study Sites* (Ecoplanning, 2023), refer **Figure 4-10** and **Figure 4-11**. Prioritisation will be given to areas that comprise areas of Coastal Wetland and Littoral Rainforest (refer **Figure 4-9**) and/or house TECs, and targeted weed species control works. Tidal flows and natural tidal regimes should be considered in undertaking ecological restoration works; • restoration of riparian vegetation areas (consistent with Actions EV1.01, EV1.02, EV1.03. EV1.04, EV1.05 and EV1.06, refer to **Figure 4-9**) and implement environmental protection works to enhance ecological communities in coastal and estuarine reserves; • continued estuarine macrophyte mapping for the lake waterbody and foreshores as part of a Marine Estate Management Strategy project; and,	Council	DCCEEW-BCS DPIRD-Fisheries DPHI-Planning	Medium	Within 1-3 years, and ongoing	Protection measures implemented. Restoration works completed.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
			• establish a monitoring and evaluation framework to assess the effectiveness of vegetation restoration and control measures, ensuring alignment with environmental goals and continuous improvement. This should be included within the Shoalhaven Integrated Environmental Monitoring Program.					
EV1.01	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Village - foreshore adjacent to boat ramp carpark	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds.	Council	N/A	Low	Opportunistic, within 8-10 years	Restoration works successfully implemented.
EV1.02	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Village - western foreshore reserve to Aney St Boat Ramp	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds.	Council	N/A	Low	Opportunistic, within 8-10 years	Restoration works successfully implemented.
EV1.03	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Village - Edwin Avenue Reserve	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds.	Council	N/A	Low	Opportunistic, within 8-10 years	Restoration works successfully implemented.
EV1.04	Investigate, remediate and monitor impacted or vulnerable bank areas	Conjola Park - Yooralla Bay foreshore reserve	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds.	Council	N/A	Low	Opportunistic, within 8-10 years	Restoration works successfully implemented.
EV1.05	Investigate, remediate and monitor impacted or vulnerable bank areas	Fishermans Paradise - road reserve along foreshore perimeter of farmland at 142 Murrays Road	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds. Area overlaps with Coastal Wetland and associated proximity area mapped within RH SEPP.	Council	N/A	Low	Opportunistic, within 8-10 years	Restoration works successfully implemented.
EV1.06	Investigate, remediate and monitor impacted or vulnerable bank areas	Fishermans Paradise - Hazel Robotham Reserve foreshore	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds. Area overlaps with Coastal Wetland and associated proximity area mapped within RH SEPP.	Council	N/A	Low	Opportunistic, within 8-10 years	Restoration works successfully implemented.
Maintain and Improve Recreation and Amenity								

RA1	Improvement and enhancement of boating access and navigation in Lake Conjola	Study Area Wide
		
		Conjola Park, Havilland St Boat Ramp
			This action aims to provide a structured, coordinated, and community-inclusive approach towards addressing the boating and navigation issues identified within the Lake Conjola Estuary. This should align with the priorities and opportunities identified through the Stage 2 Risk Assessment. Council should include boating infrastructure within the CMP study area within the update of the Council's Asset Management Systems and Plans (refer to Action LG10). This should include at a minimum establishing a framework to regularly conduct thorough condition assessments at boat ramps, ensuring they meet safety standards and user requirements and structural investigations to identify necessary upgrades and repairs for safe and functional facilities.
			
			Council to seek suitable sources of funding to implement the potential upgrades of boating and navigation facilities at Council-managed boating infrastructure, to improve safety and reduce conflicts. Upgrades should implement best practice with reference to relevant Guidelines and Standards and examples from other areas. Investigations will be required for design and environmental approvals for upgrades. This action relates to site specific actions listed for individual estuaries.
			
			Key opportunities relating to upgrade of boating infrastructure include:
			• seeking funding for and completing detailed design and construction of Stage 2 of the boat ramp works at Havilland Street, Conjola Park, comprising:
			  ○ an additional 20 car-trailer spaces and turning bay;
			  ○ amenities block;
				Council	TfNSW	Medium	Within 1-3 years	Funding application submitted and works implemented.

ID	Action Name	Action Location	Action Description	Lead Agency	Support Partners	Priority	Timing	Performance Measures
			○ tap for wash down bay; and, ○ provision of non-powered craft dry storage. Council will continue engaging with the community to gather feedback on proposed upgrades and ensure alignment with user needs and expectations. Additionally, this action will involve consultation and collaboration with Transport for NSW, and will identify opportunities for alignment with the South Coast Boating Network Plan. Funding sources may include programs administered by TfNSW for boating infrastructure.					
RA2	All-ability access to Lake Conjola from Cunjurong side	Cunjurong Point Boat Ramp	This action will involve the investigation of the feasibility of providing all-ability access to the beach area at Lake Conjola entrance from the Cunjurong Point side. This could possibly involve (subject to feasibility assessment) the provision of ramped access alongside the Cunjurong Point Boat Ramp leading to a low-level elevated walkway through bushland along the foreshore until the existing beach track to Cunjurong Point Road, where access to the beach could be provided. If the potential all-ability access works are considered to be technically, financially and socially viable then they would be implemented as a capital works project. This would involve detailed design, approvals and permits, community consultation, and construction of the works. Engagement to occur with disability advocacy groups and accessibility experts to ensure that improvements meet the needs of all community members. This initiative aims to promote inclusive enjoyment of the foreshore while respecting environmental sensitivities and local ecological balance.	Council	N/A	High	Within 1-3 years	Investigation/design completed and works implemented.
RA3	Development of boat ramp consolidation/ optimisation plan	Study Area Wide	This action involves the development of a boat ramp and facilities consolidation / rationalisation plan, and aligns with a similar broader LGA-wide action (RA1). It will involve the review of existing boat ramp conditions, facilities, usage, and distribution. This will result in establishing a framework to regularly conduct thorough condition assessments at boat ramps, ensuring they meet safety standards and user requirements and structural investigations to identify necessary upgrades and repairs for safe and functional facilities. This will also identify boat ramps that are to be decommissioned, and those to be upgraded. For those that are to be decommissioned, it will identify suitable replacement uses for the location. Community engagement will be undertaken as part of the assessment to further understand user needs and gain public support. Other considerations for this action include the provision of suitable passive vessel launch sites, suitable vessel pumpout facilities, fuelling facilities, and slipway facilities.	Council	N/A	High	Within 1-3 years	Plan completed and clear strategy provided.

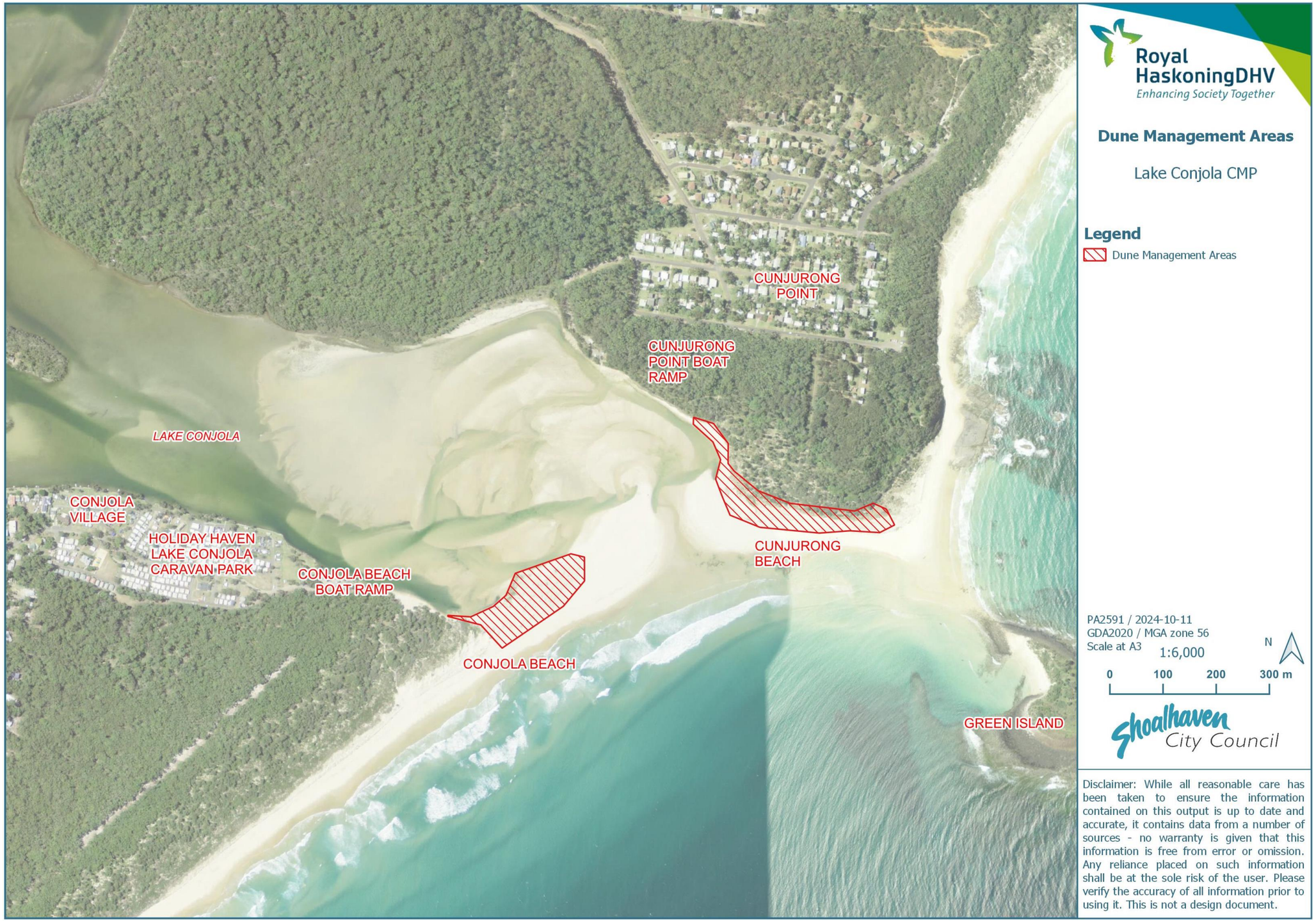


Figure 4-2: Dune Management Areas

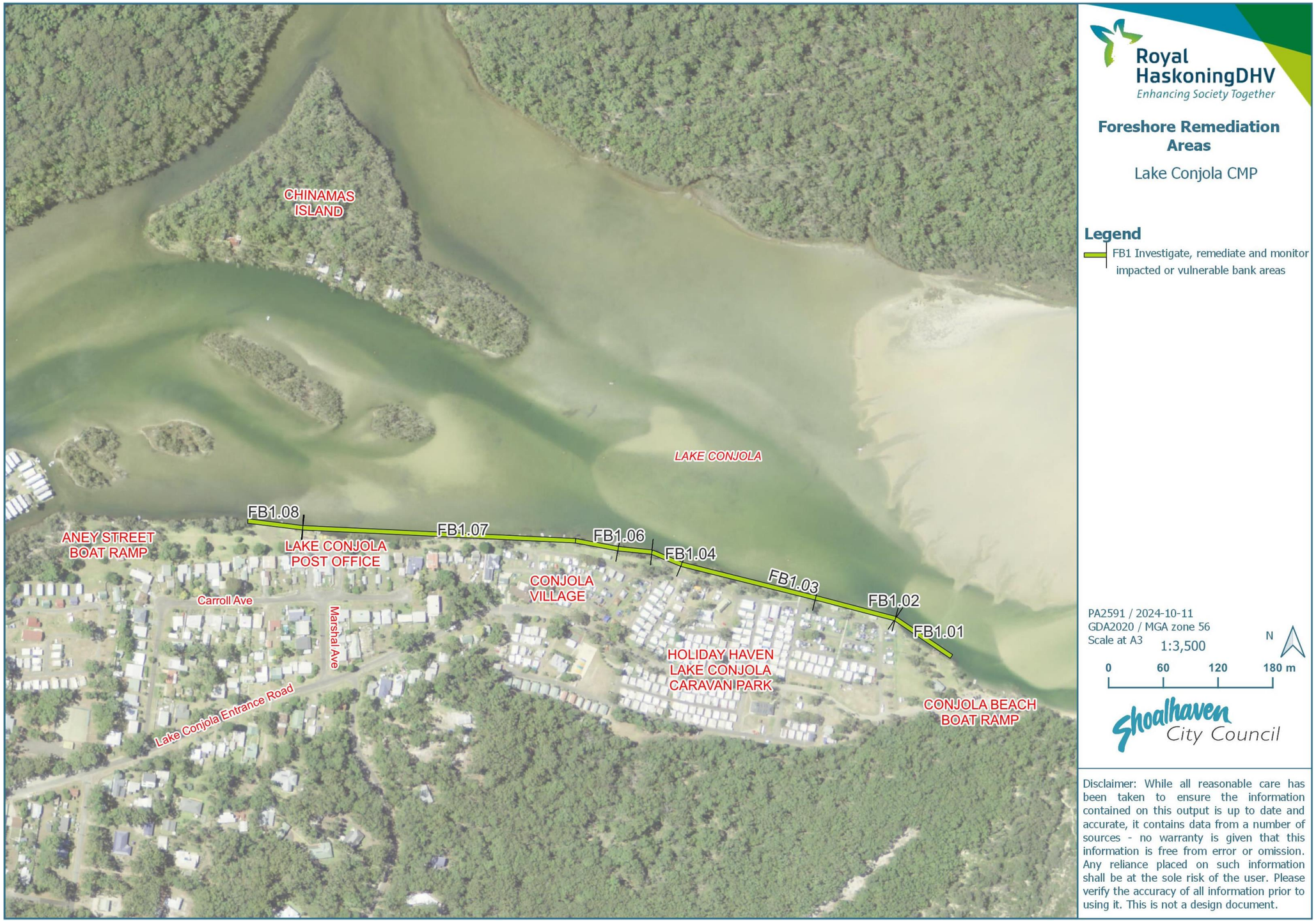


Figure 4-3: Foreshore remediation areas

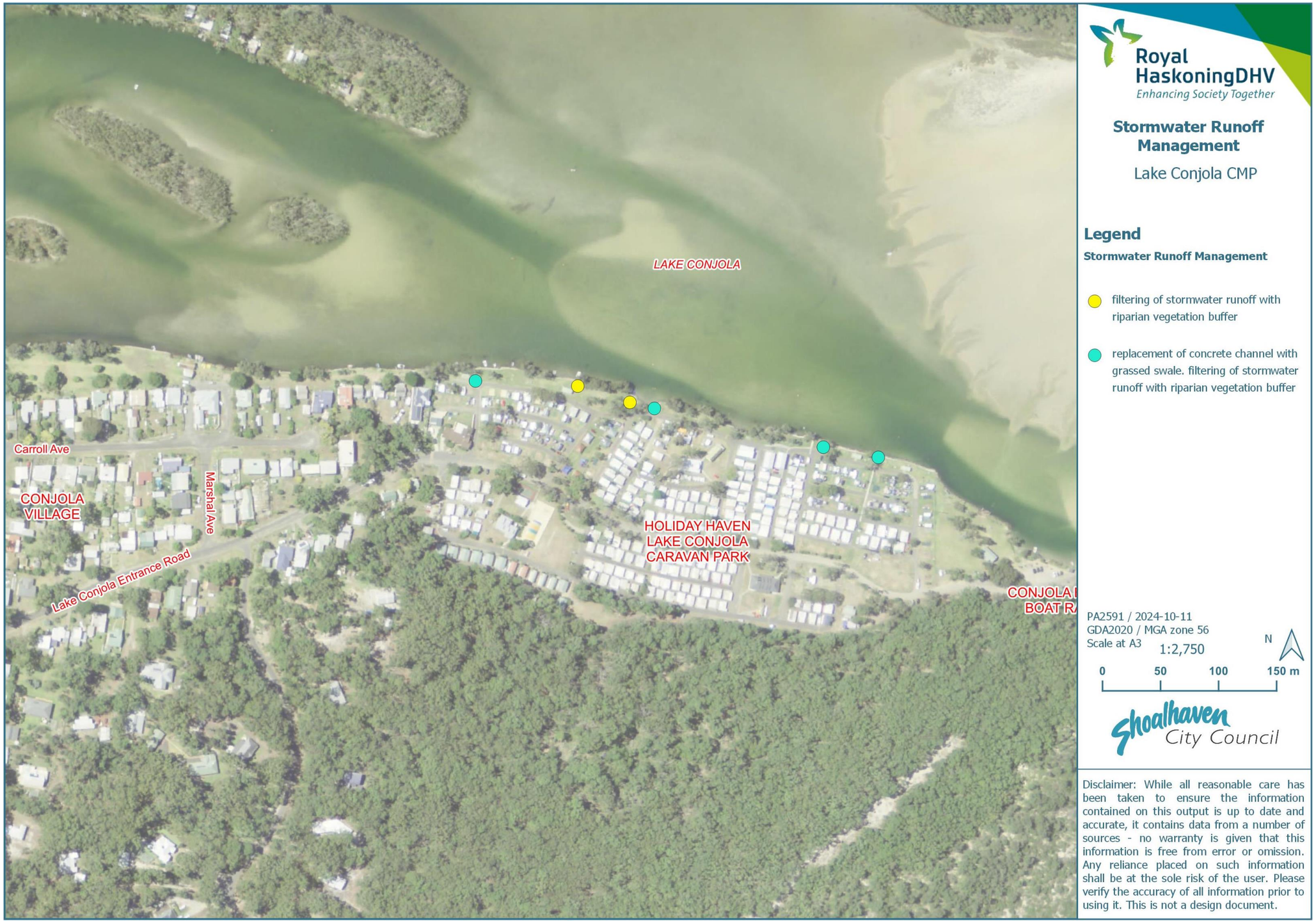


Figure 4-4: Stormwater runoff management – Conjola Village

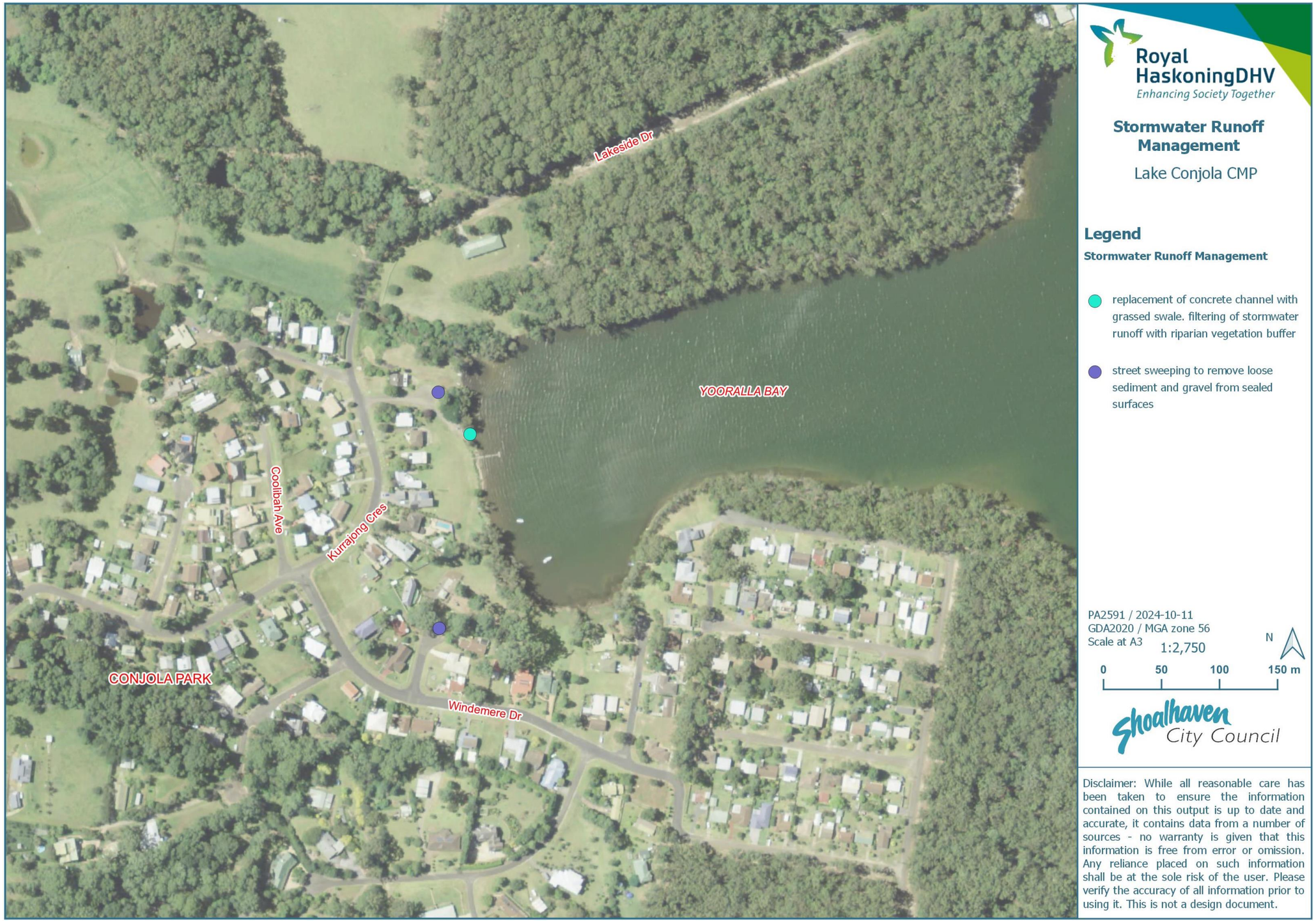


Figure 4-5: Stormwater runoff management – Conjola Park

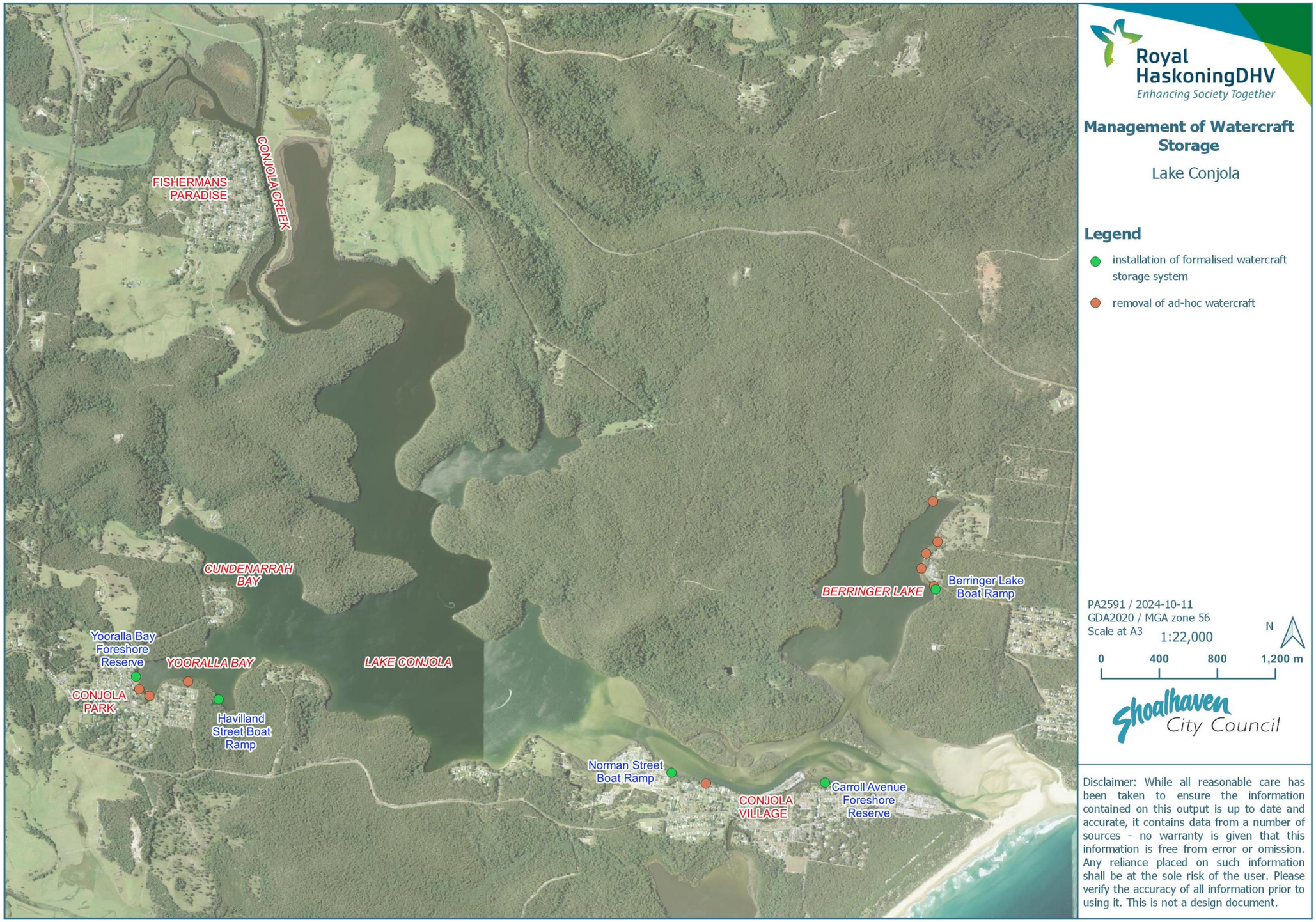


Figure 4-6: Management of watercraft storage

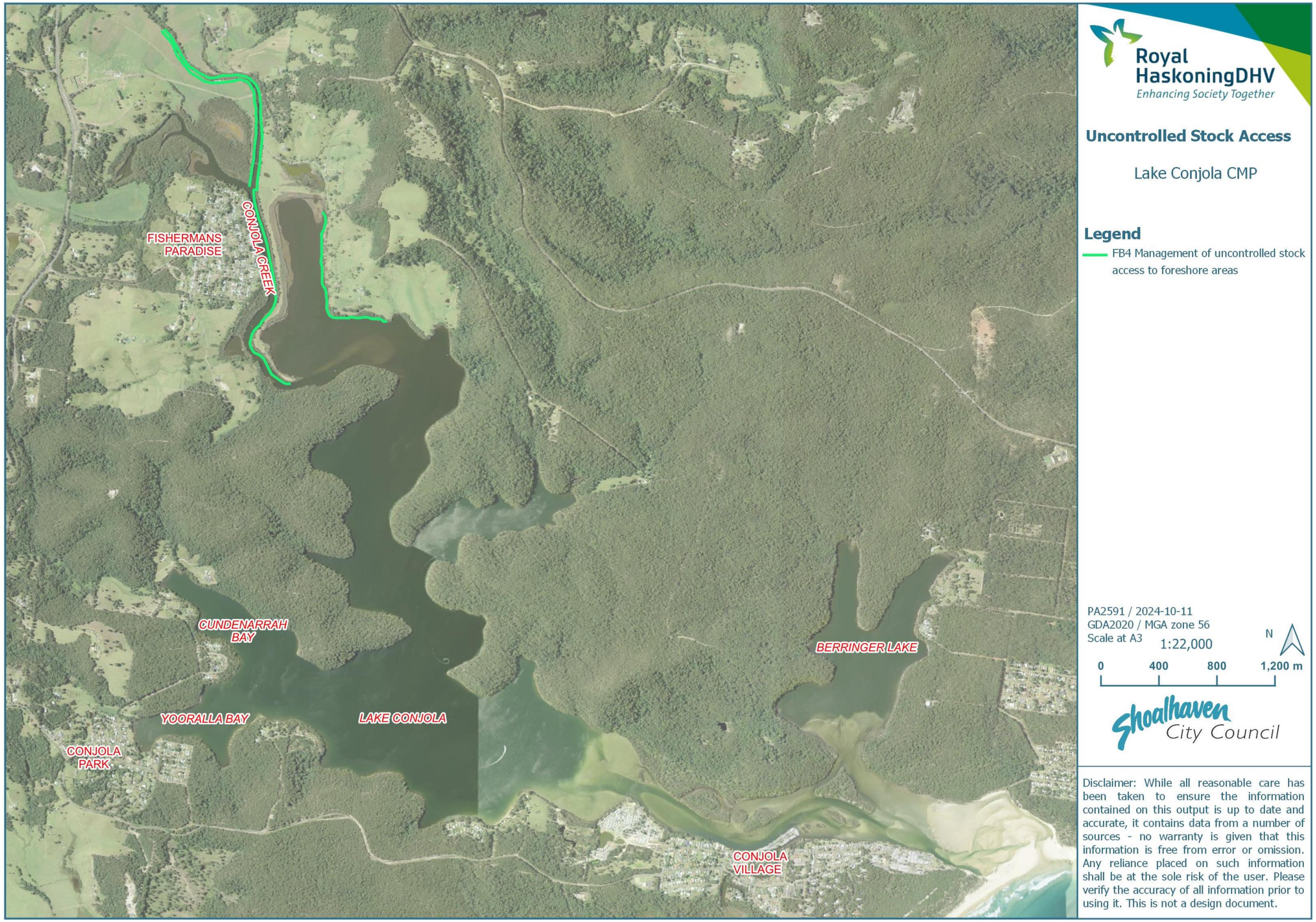


Figure 4-7: Management of uncontrolled stock access

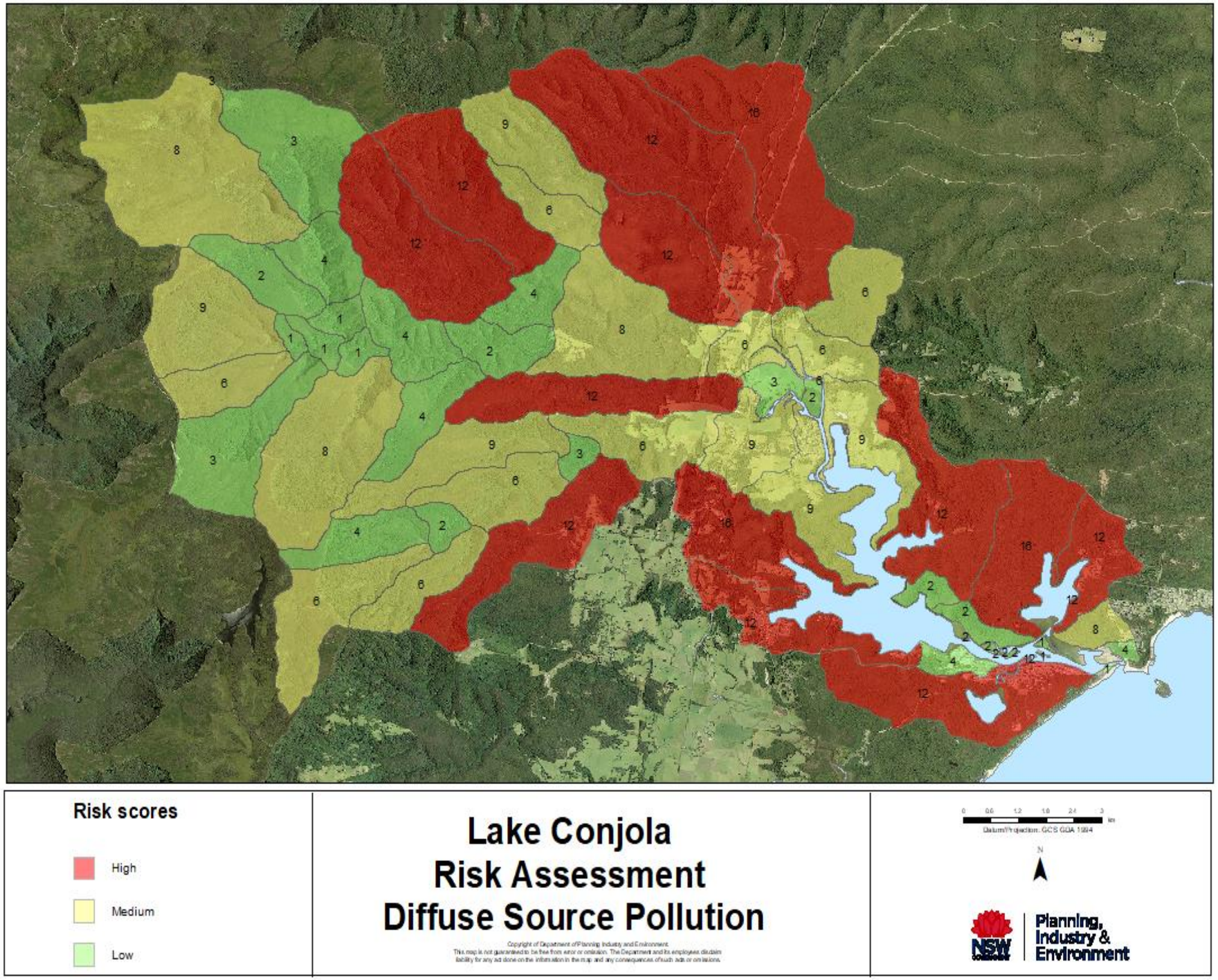


Figure 4-8: Lake Conjola Diffuse Source Pollution Risk Assessment overlaid on satellite image (source: DPIE, 2020)

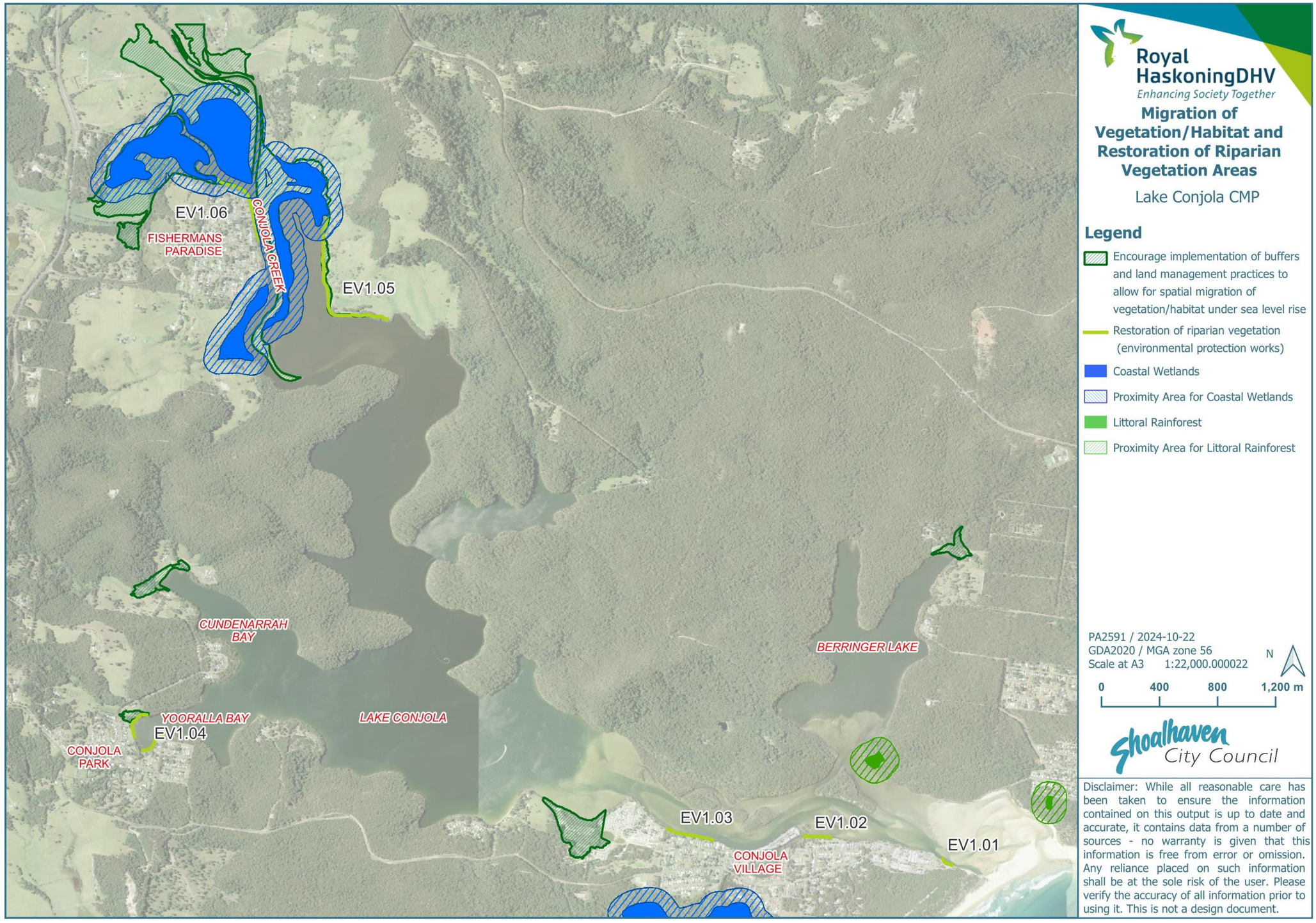


Figure 4-9: Future areas of potential migration of estuarine vegetation and habitat and areas for restoration of riparian vegetation

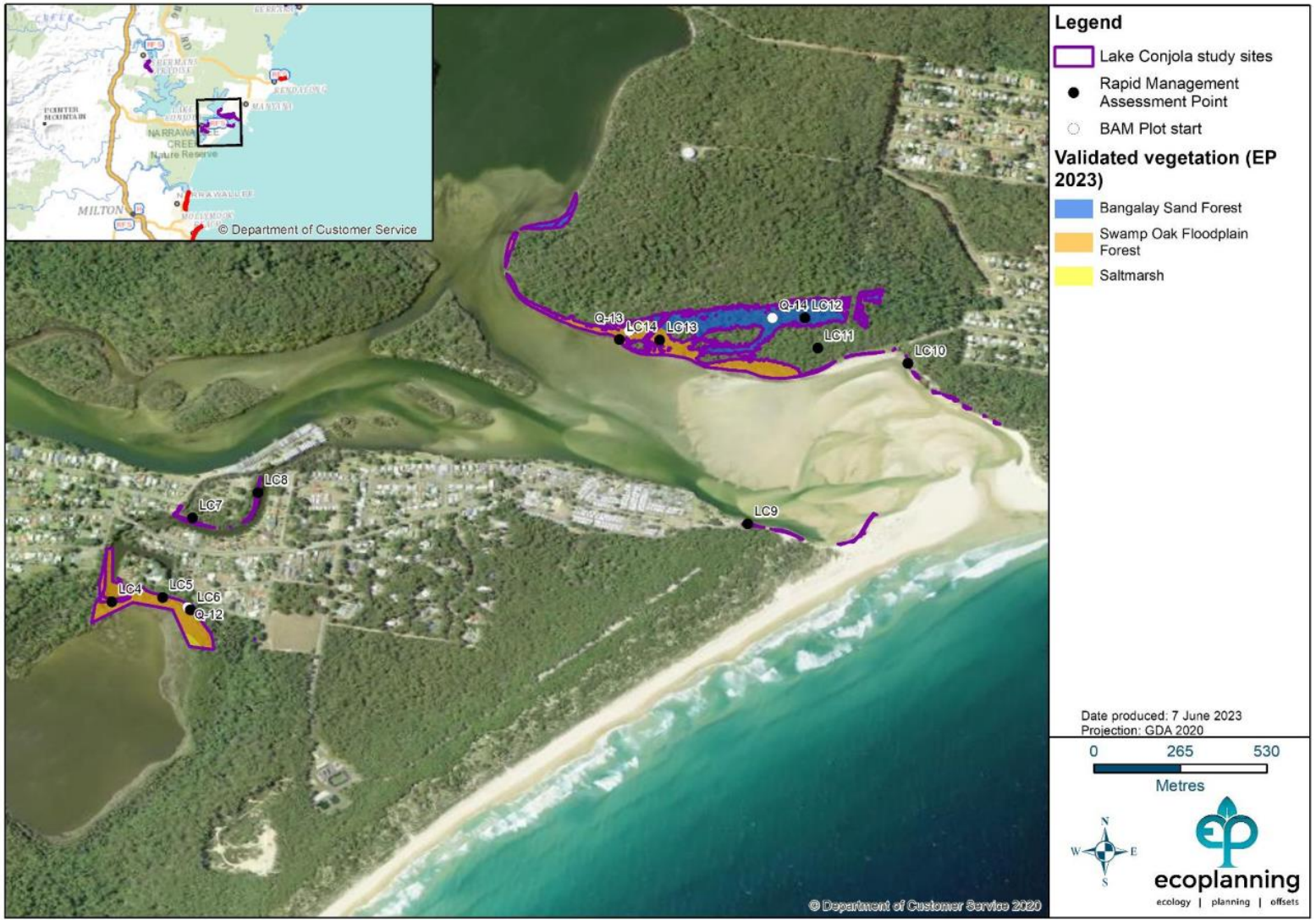


Figure 4-10: Mapped threatened ecological communities in tidal inundation sites – Lower Lake Conjola (source: Ecoplanning, 2023)

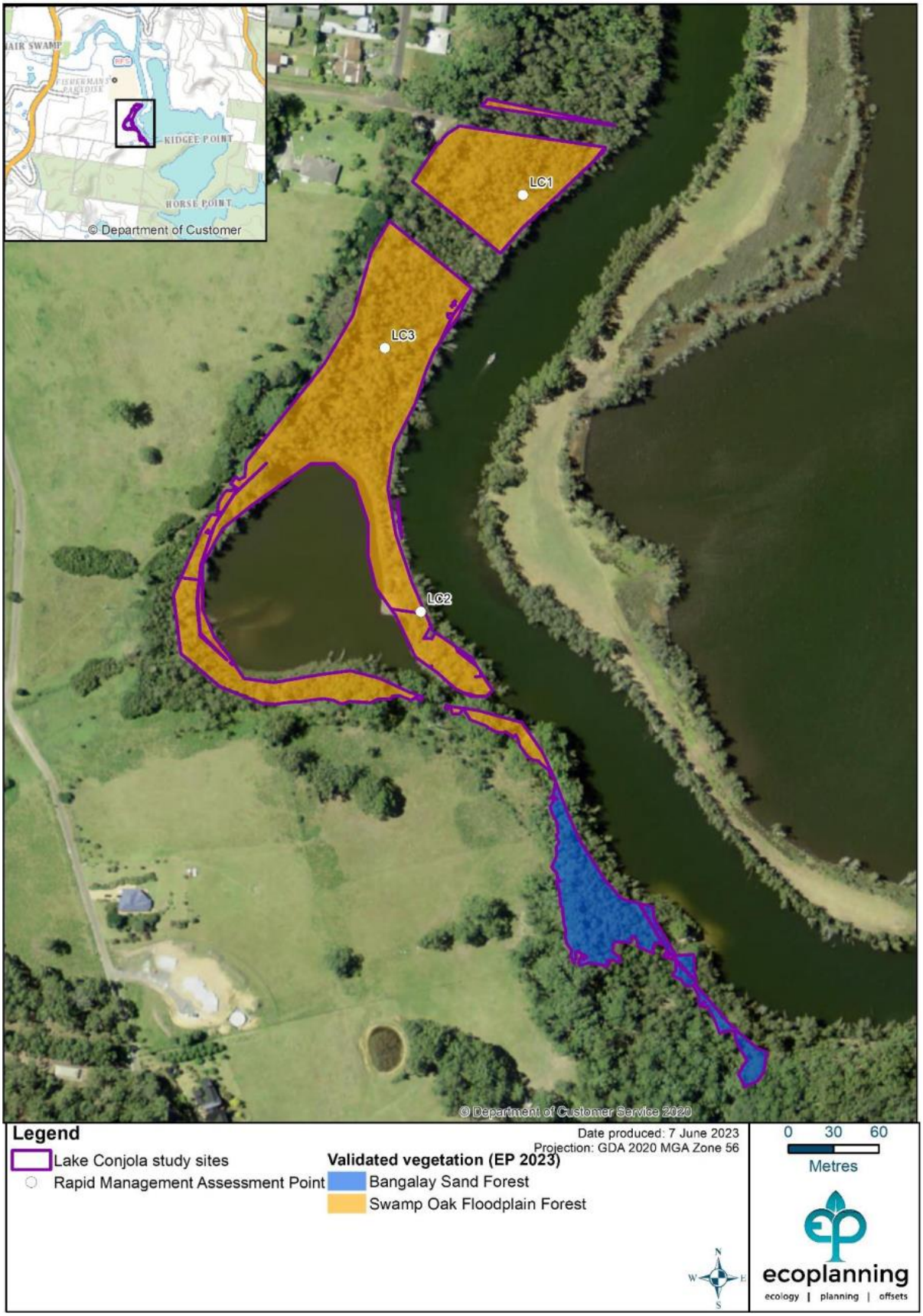


Figure 4-11: Mapped threatened ecological communities in tidal inundation sites – Fishermans Paradise (source: Ecoplanning, 2023)

5 Whether the CMP identifies recommended changes to the relevant planning controls, including any proposed maps

This CMP does not propose any amendments to the existing mapping of the Coastal Environment Area (CEA), Coastal Use Area (CUA), or Coastal Wetlands and Littoral Rainforests (CWLR) areas currently gazetted with the RH SEPP. Mapping for the Coastal Vulnerability Area (CVA) has not been provided from the RH SEPP, and no such CVA map yet exists for the Shoalhaven LGA. It is the intent of Council to propose, by way of a planning proposal, the adoption of a map indicating a CVA – which may be comprised of a combination of the following hazards across the study area, which are identified in the CM Act:

- coastal lake or watercourse entrance instability;
- coastal inundation;
- tidal inundation; and,
- erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.

The making of a planning proposal for a CVA at Lake Conjola for coastal inundation and/or tidal inundation hazards (refer Action PM1, **Table 4-1**) could, if warranted, be combined with proposed revisions to the mapping of other coastal management areas in the Shoalhaven LGA (as a product of other CMPs that are developed).

6 A Business Plan

6.1 General

A Business Plan has been prepared for the Lake Conjola CMP which outlines the key components of the funding strategy for the CMP, including the cost of proposed coastal management actions, proposed cost-sharing arrangements and other potential funding mechanisms. Delivery of the CMP is estimated to cost $12.2 million (2024 dollars) over 10 years.

The Business Plan is summarised in **Table 6-3**, and provides the following information:

- Action ID and Name.
- Action location.
- Responsibilities – including the lead agency for implementation and any supporting agencies.
- Cost estimates – including capital costs and ongoing operational and maintenance costs. These costs have been allocated into the current and future Delivery Program periods of Council's IP&R framework.
- Potential funding mechanisms.

The Business Plan has been informed by the descriptions, priority levels and indicative timing of CMP actions provided in **Table 4-1** in **Section 4**.

The following sections provide an outline of potential funding sources, Cost Benefit Analysis (CBA) distributional analysis considerations for entrance management options, and a disclaimer that applies to cost estimates and funding arrangements within the Business Plan.

6.2 Funding Sources

Sustainable funding and financing arrangements for management actions will be established in consultation with key stakeholders. Council may fund management actions outlined in the Lake Conjola CMP through a combination of sources, including Council internal funds and competitive State and Federal Government grant programs. The range of current funding sources that may be applicable for coastal management actions within the Lake Conjola CMP, as well as potential emergency and disaster support, are outlined in **Table 6-1**.

The objectives and availability of funding programs are regularly changing, and Council is expected to maintain an awareness of appropriate funding opportunities as they arise.

Council's Integrated Planning and Reporting framework described in **Section 4.2.2** requires Council to develop a four year Delivery Program and annual Operational Plan to achieve the objectives and strategies detailed in the Community Strategic Plan – Shoalhaven 2032 (SCC, 2022a).

The Lake Conjola CMP management actions will be incorporated into future iterations of the Delivery Program and Operational Plan for funding through Council's working funds. Management actions may also be included in Council's asset management plans for alternative allocation of funding.

Where an action would only require Council staff time, assets, and services, these are noted as "CST" within the Business Plan presented in **Table 6-3**. A legend for the funding sources included in the Business Plan is provided in **Table 6-2**.

Table 6-1: Potential funding sources and application for Lake Conjola CMP actions

Potential Funding Source	Description and Potential Application of Funding
Council Ordinary Rates, Revenue	Approximately half of the funding available to Council (50% in the 2023/2024 Delivery Program Operational Plan & Budget [SCC, 2023]) is generated through annual charges and ordinary rates, which are levied against all rateable land within the local government area, under the *Local Government Act 1993*. Another 30% of Council's income is derived from user charges and fees, investments, and other revenue sources. This yearly revenue is used to fund ongoing delivery of a range of community assets and services, and may also be used to implement capital (e.g. constructed assets) and operational (e.g. environmental outcomes) coastal management actions.
Development Contributions	Financial contributions are collected by Council as a levy on new development under the *NSW Environmental Planning and Assessment Act 1979*, and are used to improve and expand open space, recreation facilities and public amenities required as a consequence of development. These contributions may be used for coastal management in some instances, such as funding capital works to manage the development impacts on the coast, or to reduce the risk to the development from coastal hazards.
NSW Coastal and Estuary Grants Program	Under this program, the NSW Government provides technical and financial support to local government to help manage the coastal zone. This includes grant funding of coastal management planning (e.g. hazard assessments, management programs) and actions to manage the risks of coastal hazards (e.g. erosion protection), restore degraded coastal habitats (e.g. dunes and wetlands) and improve the health of NSW estuaries. The grant funding program is administered by DCCEEW-BCS, with prioritisation given to Councils with certified CMPs. Successful grant applications currently receive $2 of State Government funding for every $1 provided by the Council (2:1 ratio).
NSW Environment Trust	The NSW Environmental Trust provides funding to a range of community, government, and industry stakeholders to deliver projects that conserve, protect, and rehabilitate the NSW environment, or that promote environmental education and sustainability. The Trust is administered by DCCEEW-BCS, and provides a range of grant programs that may support coastal management applications such as; action in conserving and restoring natural ecosystems; protecting threatened species; undertaking priority environmental research; waste reduction; knowledge and capacity through education; and promoting cultural awareness.
Crown Reserves Improvement Fund	The Crown Reserves Improvement Fund (CRIF) is an annual NSW Government funding program that provides financial support to develop, maintain and improve Crown reserves. It can be used for repairs and maintenance projects, pest and weed control, recreational infrastructure, or environmental initiatives. A significant proportion of the foreshore area within Lake Conjola is Crown Land that is managed by Council. Council may apply for funding of coastal management activities and works on Crown land that support the objectives of the CRIF, such as enhancement of environmental assets by supporting conservation initiatives, bushfire management and invasive species (pest and weed) control; and to manage and renovate infrastructure and

Potential Funding Source	Description and Potential Application of Funding
	other assets on public reserves to optimise value to the community and comply with regulatory obligations, in particular to ensure public safety.
NSW Heritage Grant Programs	The NSW Heritage Grant program is administered by Heritage NSW, and aims to fund projects that provide sustainable, long-term heritage benefits and provide public benefit and enjoyment from heritage. These grants support the protection or repairs to declared Aboriginal Places, and items listed on the State Heritage Register. Council may consider applying for Caring for State Heritage Grant funding for activities that encourage promotion, celebration, and cultural participation of the State's heritage, and for coastal management actions such as physical conservation works, or preparation for disasters and climate change.
Recreational Fishing Trust Grants	All revenue raised by the NSW Recreational Fishing Licence Fee is placed into the Recreational Fishing Trusts. There are two Trusts – one for freshwater and one for saltwater. Grants are provided from the Trusts to deliver a wide range of programs to boost recreational fishing opportunities in NSW. This program is administered by Department of Primary Industries and Regional Development (DPIRD).
TfNSW / MIDO Grants	The NSW Boating Now Program provides grant funding to improve maritime infrastructure and facilities across NSW. This investment supports the needs of recreational and commercial boaters and enables broader economic and social benefits for communities. The program is administered by the Maritime Infrastructure Delivery Office (MIDO) and Transport for NSW (TfNSW).
Disaster Relief and Support	The NSW Government provides financial relief and support services for eligible local councils following a natural disaster through NSW Reconstruction Authority. Some types of support require a disaster declaration for the affected location. Assistance is available to restore essential public assets that have been damaged as a direct result of a natural disaster. Transport for NSW provide assistance to restore public roads, road infrastructure and bridges, while Public Works Advisory provide assistance to restore other essential public assets.
Disaster Ready Fund	The Australian Government's National Emergency Management Agency (NEMA) was established to consolidate a number of former recovery agencies, and administers the Disaster Ready Fund (DRF). NEMA provides funding and support for emergency response and recovery from natural disasters, drought and other hazards that have a significant or catastrophic impact. The Shoalhaven LGA has previously received NEMA funding for several events including the 2019-20 Black Summer bushfires and floods and storms in 2020, 2021 and 2022.
Landcare Grants	Landcare Australia works with governments, corporate and philanthropic organisations, and donors to facilitate funding for good quality, hands on projects and programs that will improve environmental outcomes for the Landcare community.
Coastcare Grants	Coastcare grants support community groups working on projects across Australia. Grants support Landcare and Coastcare groups with projects like dune protection, revegetation of native coastal environments, protection of endangered coastal species habitats, collection and prevention of stormwater pollution, weed and non-native plant removal, and control of human access to sensitive and vulnerable areas.
NSW Estuary Asset Protection	DPIRD-Fisheries have developed an Action Plan to Protect Estuarine and Coastal Floodplain Assets and Values. The program has been approved by the National Emergency Management Authority, spans 2 years and delivers across five action areas: cultural

Potential Funding Source	Description and Potential Application of Funding
	heritage protection; riverbank resilience; roads and waterway crossing management; key habitat and threatened species resilience; and Council managed estuarine infrastructure.

Table 6-2: Legend for Funding Sources in Business Plan

Reference No.	Funding Source
1	Council Operational and Delivery Plan Process
2	NSW Coastal and Estuary Grants Program
3	NSW Marine Estate Management Strategy
4	NSW Heritage Grants Program
5	Environmental Trust Grants
6	Landcare / Coastcare Grants
7	TfNSW / MIDO Grants
8	NPWS Operating Budget
9	DPIRD Recreational Fishing Trust Grants
10	Private Beneficiaries
11	National Emergency Management Agency - Preparing Australian Communities Program - Local Stream
12	DPIRD NSW Estuary Asset Protection
13	Crown Reserves Improvement Fund
CST	Council staff time, assets and services

6.3 CBA Distributional Analysis

As outlined in the Manual (OEH, 2018), an analysis of the distribution of costs and benefits to Council, public authorities, stakeholders, and the environment is recommended when preparing a CMP. A CBA was undertaken for selected management options associated with entrance management (refer **Supporting Document E**).

All costs of entrance management will be borne by Council. None of the actions aim to benefit private interests, although they may do so indirectly as a consequence of improved environmental health and natural hazards resilience (e.g., to commercial businesses in the nearby area including tourism operators and hospitality). Beneficiaries of entrance management are owners of flood prone assets, which may include Council, residents, and holiday home/caravan owners.

6.4 Disclaimer

Note:

- All cost estimates provided in the Business Plan in **Table 6-3** are based on project experience and external inputs, are for budgetary purposes only, and shall not be relied upon for any other purpose.

- In the absence of specific funding agreements, all costs are distributed to Council and other public authorities through the potential funding sources identified, predominantly being Council funds and grant funding opportunities. Therefore, there are no public-private cost sharing arrangements. The funding mechanisms column in **Table 6-3** therefore outlines the likely cost sharing arrangements.

- As no actions identify or address private beneficiaries, the benefits of actions within the CMP accrue broadly to the Shoalhaven LGA and the wider NSW community.

Table 6-3: Business Plan for Lake Conjola CMP

ID	Action Name	Action Location	Lead Agency	Support Partners	Capital Cost	Operational and Maintenance Costs	Years 1-3 DP 2022-2026	Years 4-7 DP 2026-2030	Years 7-10 DP 2030-2034	Total Cost	Potential Funding Mechanisms
LGA-Wide Management Actions											
LG1	Establish a CMP Governance Framework	Study Area Wide	Council	N/A	CST	CST	CST	CST	CST	CST	1
LG2	Establish one new Full Time Equivalent (FTE) Coast & Estuary Officer role within Council	Study Area Wide	Council	N/A	$0	$1,300,000	$390,000	$520,000	$390,000	$1,300,000	1
LG3	Enact the CMPs Monitoring, Evaluation and Reporting (MER) Program to track progress and report on outcomes	Study Area Wide	Council	N/A	CST	CST	CST	CST	CST	CST	1
LG4	Review Councils coastal management planning policies every 10 years	Study Area Wide	Council	DCCEEW-BCS DPHI-Planning	CST	CST	CST	CST	CST	CST	1
LG5	Continue to collaborate with government agencies and research institutions	Study Area Wide	Council	NPWS DCCEEW-BCS DPHI-Planning DPIRD-Fisheries DPHI-Crown Lands TfNSW	$0	$50,000	$15,000	$20,000	$15,000	$50,000	1,8
LG6.01	Develop and implement a program of dune vegetation management and rehabilitation	Conjola Beach	Council	N/A	$550,000	$110,000	$550,000	$110,000	$0	$660,000	1,2,6
LG6.02	Develop and implement a program of dune vegetation management and rehabilitation	Cunjurong Beach	Council	N/A	$320,000	$70,000	$0	$390,000	$0	$390,000	1,2,6
LG7	Develop and execute a communications plan for Stage 5 of the CMP	Study Area Wide	Council	DCCEEW-BCS	$0	$50,000	$15,000	$20,000	$15,000	$50,000	1
LG8	Continue Council's program of mapping threatened ecological communities (TECs) across coastal reserves	Study Area Wide	Council	DCCEEW-BCS	$0	$75,000	$0	$0	$75,000	$75,000	1,2
LG9	Develop and maintain a program of community engagement with coastal communities about coastal hazard risk	Study Area Wide	Council	N/A	$0	$100,000	$30,000	$40,000	$30,000	$100,000	1,2
LG10	Review and update all Council asset management plans (AMPs), relevant to the Lake Conjola study area	Study Area Wide	Council	N/A	$25,000	$400,000	$150,000	$150,000	$125,000	$425,000	1
LG11	Develop and implement a program for regular and ongoing monitoring of Council-managed coastal assets and infrastructure	Study Area Wide	Council	N/A	$50,000	$100,000	$50,000	$50,000	$50,000	$150,000	1,2
LG12	Undertake an estuary-wide Aboriginal Cultural Heritage Survey, and development of local protection/management plans	Study Area Wide	Council	Jerrinja LALC Jerrinja Tribal Group DCCEEW-BCS DPIRD-Fisheries NPWS	$60,000	$60,000	$78,000	$18,000	$24,000	$120,000	1,2,4,5,6

ID	Action Name	Action Location	Lead Agency	Support Partners	Capital Cost	Operational and Maintenance Costs	Years 1-3 DP 2022-2026	Years 4-7 DP 2026-2030	Years 7-10 DP 2030-2034	Total Cost	Potential Funding Mechanisms
LG13	Engage with relevant Local Aboriginal Land Councils and local Traditional Owner Groups to develop a cultural educational and awareness program	Study Area Wide	Council	Jerrinja LALC Jerrinja Tribal Group DCCEEW-BCS DPIRD-Fisheries NPWS	$20,000	$30,000	$25,000	$15,000	$10,000	$50,000	1,2
LG14	Provide opportunities and help build capacity to local Aboriginal Ranger programs, to enhance their role in management of Sea Country	Study Area Wide	Council	Jerrinja LALC Jerrinja Tribal Group DCCEEW-BCS DPIRD-Fisheries NPWS	CST	CST	CST	CST	CST	CST	1
LG15	Update Council Plans of Management (POMs) for locations in the coastal zone to support objectives of the CMP	Study Area Wide	Council	DPHI-Crown Lands	$0	$100,000	$100,000	$0	$0	$100,000	1
Manage Foreshore Areas and Bank Erosion											
FB1.01	Repair of existing foreshore protection, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009).	Conjola Village - foreshore west of boat ramp carpark	Council	DPIRD-Fisheries DCCEEW-BCS	$250,000	$20,000	$250,000	$10,000	$10,000	$270,000	1,2
FB1.02	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design. Retain existing localised swimming areas and provide areas of access.	Conjola Village - eastern portion of Caravan Park foreshore	Council	DPIRD-Fisheries DCCEEW-BCS	$290,000	$20,000	$290,000	$10,000	$10,000	$310,000	1,2

ID	Action Name	Action Location	Lead Agency	Support Partners	Capital Cost	Operational and Maintenance Costs	Years 1-3 DP 2022-2026	Years 4-7 DP 2026-2030	Years 7-10 DP 2030-2034	Total Cost	Potential Funding Mechanisms
FB1.03	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design. Remove existing concrete works.	Conjola Village - central portion of Caravan Park foreshore	Council	DPIRD-Fisheries DCCEEW-BCS	$560,000	$40,000	$560,000	$20,000	$20,000	$600,000	1,2
FB1.04	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design. Retain existing localised swimming areas and provide areas of access.	Conjola Village - Caravan Park central swimming area embayment	Council	DPIRD-Fisheries DCCEEW-BCS	$150,000	$10,000	$150,000	$5,000	$5,000	$160,000	1,2
FB1.05	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design. Remove existing concrete works.	Conjola Village - section west of central swimming area embayment	Council	DPIRD-Fisheries DCCEEW-BCS	$170,000	$20,000	$170,000	$10,000	$10,000	$190,000	1,2

ID	Action Name	Action Location	Lead Agency	Support Partners	Capital Cost	Operational and Maintenance Costs	Years 1-3 DP 2022-2026	Years 4-7 DP 2026-2030	Years 7-10 DP 2030-2034	Total Cost	Potential Funding Mechanisms
FB1.06	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design. Retain existing localised swimming areas and provide areas of access.	Conjola Village - western portion of Caravan Park foreshore	Council	DPIRD-Fisheries DCCEEW-BCS	$140,000	$10,000	$140,000	$5,000	$5,000	$150,000	1,2
FB1.07	Upgrade existing rock protection and construct new rock protection where it does not exist, as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Upgrading to also include raising crest level and improving filtration design.	Conjola Village - western portion of Caravan Park foreshore to Post Office	Council	DPIRD-Fisheries DCCEEW-BCS	$880,000	$40,000	$0	$880,000	$40,000	$920,000	1,2
FB1.08	Construct environmentally friendly seawall treatment within the open reserve area (saltmarsh berm, riparian vegetation), as foreshore management activities under the *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Rock protection works to incorporate benches of estuarine vegetation and plantings amongst rocks, as well as pockets of riparian vegetation behind rock protection in accordance with the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009). Retain access to foreshore in places for fishing.	Conjola Village - Post Office to western foreshore reserve	Council	DPIRD-Fisheries DCCEEW-BCS	$340,000	$20,000	$0	$340,000	$20,000	$360,000	1,2
FB2.01	Management of Stormwater Runoff	Conjola Village (east)	Council	N/A	$70,000	$14,000	$0	$84,000	$0	$84,000	1,2
FB2.02	Management of Stormwater Runoff	Conjola Park	Council	N/A	$24,000	$3,000	$0	$27,000	$0	$27,000	1,2
FB3.01	Management of watercraft storage	Conjola Village (east)	Council	TfNSW	$25,000	$0	$25,000	$0	$0	$25,000	1,7
FB3.02	Management of watercraft storage	Conjola Village (west)	Council	TfNSW	$25,000	$0	$25,000	$0	$0	$25,000	1,7
FB3.03	Management of watercraft storage	Berringer Lake	Council	TfNSW NPWS DPHI-Crown Lands	$25,000	$0	$25,000	$0	$0	$25,000	1,7,8,13

ID	Action Name	Action Location	Lead Agency	Support Partners	Capital Cost	Operational and Maintenance Costs	Years 1-3 DP 2022-2026	Years 4-7 DP 2026-2030	Years 7-10 DP 2030-2034	Total Cost	Potential Funding Mechanisms
FB3.04	Management of watercraft storage	Conjola Park	Council	TfNSW	$25,000	$0	$25,000	$0	$0	$25,000	1,7
FB4	Management of uncontrolled stock access to foreshore areas to enhance and protect riparian vegetation	Fishermans Paradise / Conjola Creek	Council	NSW LLS	$0	$50,000	$0	$50,000	$0	$50,000	1
Improve Planning and Management Arrangements for the Lake Catchment Area											
PM1	Review, update and maintain tidal and coastal inundation development and planning controls to reduce future coastal hazard impacts	Study Area Wide	Council	DPHI-Planning	$0	$50,000	$0	$50,000	$0	$50,000	1
PM2	Activate and implement Coastal Zone Emergency Action Subplan (CZEAS)	Study Area Wide	Council	DCCEEW-BCS NSW SES DPHI-Crown Lands	$0	$150,000	$50,000	$50,000	$50,000	$150,000	1
Entrance Management Interventions											
EM1	Implement revised Entrance Management Policy	Lake Conjola entrance	Council	DPIRD-Fisheries DPHI-Crown Lands TfNSW NPWS	$100,000	$65,000	$120,000	$25,000	$20,000	$165,000	1,2
EM2	Prepare generic REF and approval applications for contingency ebb tide channel dredging and implement if required	Lake Conjola entrance	Council	DPIRD-Fisheries DPHI-Crown Lands TfNSW	$1,790,000	$20,000	$250,000	$10,000	$1,550,000	$1,810,000	1,2
Maintain and Improve Water Quality											
WQ1	Work with Shoalhaven Water to consider findings of ongoing groundwater monitoring, including the need for any interception of additional treatment	Lake Conjola Village	Council / Shoalhaven Water	N/A	$0	$100,000	$20,000	$40,000	$40,000	$100,000	1
WQ2	Continue and implement refined surface water monitoring and reporting program	Lake Conjola / Berringer Lake	Council	DCCEEW-BCS DPIRD-Fisheries	$30,000	$410,000	$153,000	$164,000	$123,000	$440,000	1
WQ3	Develop and implement water quality controls into future development	Study Area Wide	Council	DCCEEW-BCS	CST	CST	CST	CST	CST	CST	1
Protect and Rehabilitate Estuarine and Riparian Vegetation and Habitat											
EV1	Undertake rehabilitation works in damaged vegetated areas and ongoing implementation of ecological restoration and environmental protection works in Council-managed coastal reserves	Lake Conjola foreshore	Council	DCCEEW-BCS DPIRD-Fisheries DPHI-Planning	$0	$300,000	$100,000	$100,000	$100,000	$300,000	1,2,3,6
EV1.01	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds.	Conjola Village - foreshore adjacent to boat ramp carpark	Council	N/A	$30,000	$10,000	$0	$0	$40,000	$40,000	1,2,3,6
EV1.02	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds.	Conjola Village - western foreshore reserve to Aney St Boat Ramp	Council	N/A	$60,000	$20,000	$0	$0	$80,000	$80,000	1,2,3,6

ID	Action Name	Action Location	Lead Agency	Support Partners	Capital Cost	Operational and Maintenance Costs	Years 1-3 DP 2022-2026	Years 4-7 DP 2026-2030	Years 7-10 DP 2030-2034	Total Cost	Potential Funding Mechanisms
EV1.03	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds.	Conjola Village - Edwin Avenue Reserve	Council	N/A	$100,000	$20,000	$0	$0	$120,000	$120,000	1,2,3,6
EV1.04	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds.	Conjola Park - Yooralla Bay foreshore reserve	Council	N/A	$120,000	$30,000	$0	$0	$150,000	$150,000	1,2,3,6
EV1.05	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds. Area overlaps with Coastal Wetland and associated proximity area mapped within RH SEPP.	Fishermans Paradise - road reserve along foreshore perimeter of farmland at 142 Murrays Road	Council	N/A	$330,000	$70,000	$0	$0	$400,000	$400,000	1,2,3,6
EV1.06	Environmental protection works to restore riparian vegetation, including revegetation and controlling weeds. Area overlaps with Coastal Wetland and associated proximity area mapped within RH SEPP.	Fishermans Paradise - Hazel Robotham Reserve foreshore	Council	N/A	$160,000	$40,000	$0	$0	$200,000	$200,000	1,2,3,6
Maintain and Improve Recreation and Amenity											
RA1	Improvement and enhancement of boating access and navigation in Lake Conjola	Study Area Wide Conjola Park, Havilland St Boat Ramp	Council	TfNSW	$950,000	$90,000	$980,000	$35,000	$25,000	$1,040,000	1,7
RA2	All-ability access to Lake Conjola from Cunjurong side	Cunjurong Point Boat Ramp	Council	N/A	$300,000	$15,000	$300,000	$10,000	$5,000	$315,000	1,2
RA3	Development of boat ramp consolidation/ optimisation plan	Study Area Wide	Council	N/A	$0	$100,000	$100,000	$0	$0	$100,000	1,7

7 Coastal Zone Emergency Action Subplan, if the Coastal Management Act 2016 requires that subplan to be prepared

The CM Act defines seven forms of coastal hazards and requires specific emergency management considerations for impacts associated with beach erosion, coastal inundation, and cliff instability. The CM Act (section 15(1)(e)) outlines that a Coastal Zone Emergency Action Subplan (CZEAS) must be included in a CMP if the local council's local government area contains land within the CVA and beach erosion, coastal inundation or cliff instability is occurring on that land due to storm activity or an extreme or irregular event.

As the NSW government did not adopt a CVA map, section 15(1)(e)) of the CM Act does not apply to the Lake Conjola CMP, and preparation of a CZEAS is not required. However, it is recognised that Lake Conjola has been impacted by coastal hazards, notably coastal inundation, and is likely to be progressively more impacted in the future, and as such it is considered appropriate to develop a CZEAS for this location.

Mandatory requirements for a CMP, including the preparation of a CZEAS where required, have been identified in Part A of the Coastal Management Manual (OEH, 2018). Further direction on the preparation of a CZEAS is provided in the *"Guideline for preparing a coastal zone emergency action subplan"* (DPIE, 2019). The Lake Conjola Coastal Zone Emergency Action Subplan (LCCZEAS) has been developed in accordance with this guidance, and is attached as **Appendix B**.

8 Monitoring, Evaluation and Reporting Program

8.1 General

Council is required to implement a monitoring, evaluation, and reporting (MER) programme as part of the Lake Conjola CMP. This is to identify key indicators, trigger points and thresholds of when particular management actions should be implemented, as well as providing measures of success of the management actions in reducing the threats and maintaining the values of Lake Conjola. In addition, it outlines mitigation actions should the management actions not achieve the desired outcomes.

The CM Act requires CMPs to be reviewed at least once every 10 years, to ensure that actions to manage locations such as Lake Conjola remain current and relevant in light of new information, legislative and policy changes, and improved understanding of the local coastal and estuarine processes.

Council must maintain sufficient information and records about its management of the relevant parts of the coastal zone to demonstrate how the Lake Conjola CMP has been implemented, and what has been achieved in connection with the Lake Conjola CMP, including whether coastal management actions have been carried out within the timeframes identified in the Lake Conjola CMP (refer **Table 4-1** in **Section 4**).

8.2 Monitoring, Evaluation and Reporting Program

Monitoring, evaluation, and reporting (MER) is an essential component of any CMP and is a mandatory requirement for CMPs under the CM Act. The purpose of the MER component is to monitor progress towards implementing the coastal management actions outlined in the CMP, and to assess the performance of the CMP in achieving its intended outcomes, and the objects of the CM Act.

The MER process for the CMP should be fit-for-purpose and focus on the information needed to evaluate the status of coastal management actions and their outcomes. As per the CM Manual (OEH, 2018), key elements of a MER program should consider the outcomes that the CMP is trying to achieve over the short, medium, and long term.

8.2.1 Overview

The proposed MER program is summarised in **Figure 8-1** and comprises several components:

- **Component 1: The implementation status of the CMP actions** – The MER should constantly monitor and evaluate the implementation of the management actions.
    - It aims to answer the question: “Has the program of management actions been implemented in accordance with the implementation plan?”
- **Component 2: Relevant environmental parameters** – As per **Section 8.2.3**, one of the main goals of the CMP is to improve the environmental and social values of the coastline. Therefore, the MER should also include a component that monitors key environmental parameters.
    - It aims to answer the question: “Has the implementation of individual management actions, and the integrated CMP more generally, resulted in an improvement in environmental health and social / cultural values of the study area?”
- **Component 3: The performance of the CMP in terms of meeting the objects of the CM Act** – This includes a holistic review of the CMP and its performance against its long-term objectives.
    - It aims to answer the questions – based on the outcomes of Components 1 and 2:
        - “Has the CMP more broadly achieved its intended objectives?”

- “How has the CMP made a difference?” and
- “Has the level of risk associated with the various threats facing the coast been reduced?”.

The three components of the MER are described in more detail in the following sections.

Implementation of the MER is specifically listed as Action LG3 in the CMP (refer **Table 4-1** in **Section 4**).

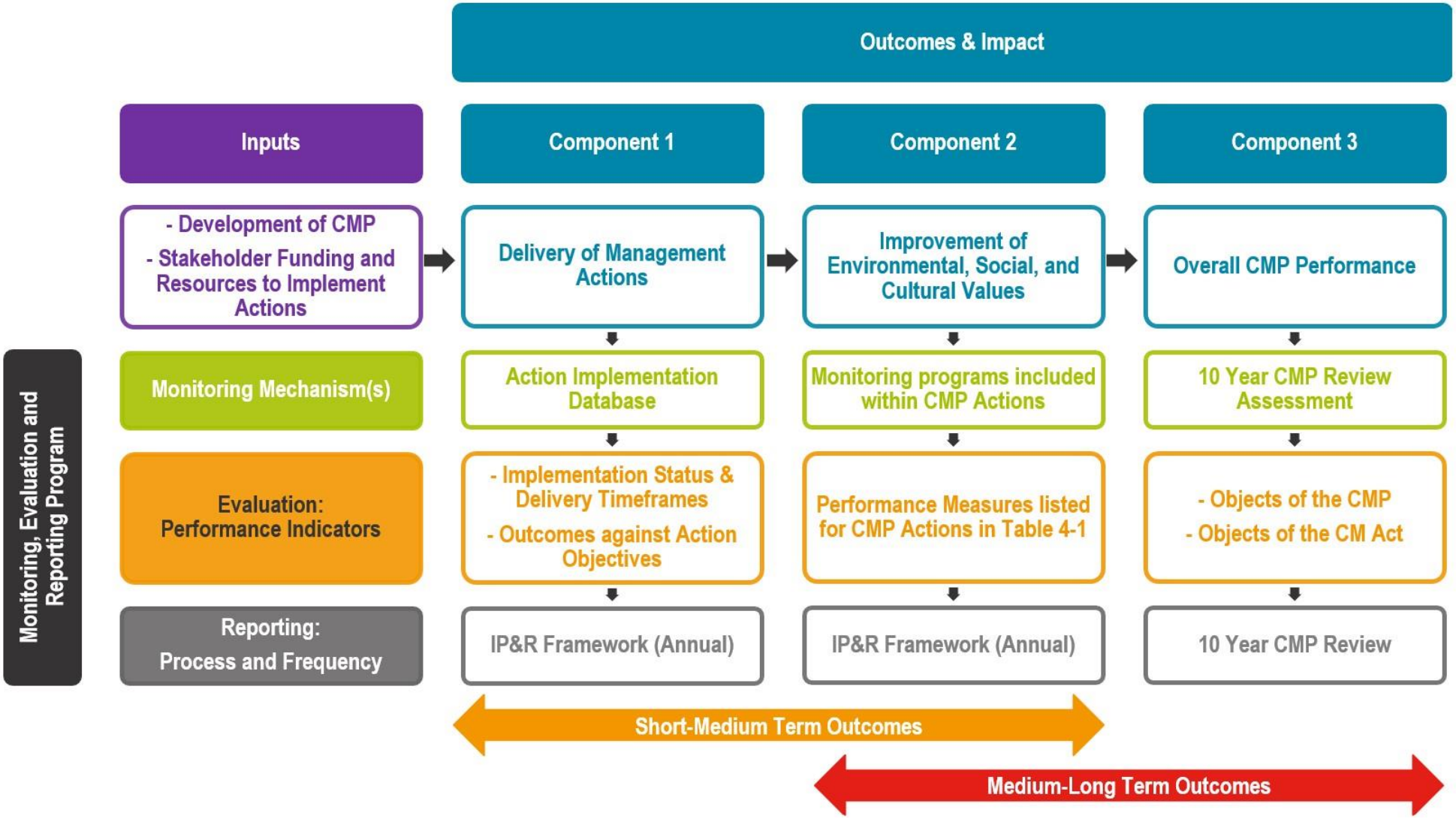


Figure 8-1: Overview of MER program for the CMP

8.2.2 Component 1: Delivery of Management Actions

In the first instance, Council will need to monitor the implementation status of the various CMP actions – including which actions have been implemented, the progress of actions, barriers and issues, allocated funding and resources, and timeline of implementation.

It is recommended that an *Action Implementation Database (AID)* be maintained to monitor the status of the various CMP actions and support the CMP requirements. The fields include information relating the practical implementation of the works, and the overall status of the action. For each action, a monitoring designation should be provided regarding the current status of that action using one of 5 categories:

- *Completed:* Where discrete (one-off) actions items have been completed and no further actions are required.
- *Implemented and Ongoing:* Where actions have an ongoing component and are currently being implemented.
- *In progress/Incomplete:* This includes actions that are in progress or not yet finalised.
- *Not Yet Commenced/Outstanding:* Where outstanding actions have not yet commenced - but have been marked for future implementation.
- *No Longer Applicable:* Where actions are no longer applicable due to changed circumstances or superseding actions from other management plans.

Dates of commencement and practical completion should also be monitored and recorded, in addition to other pertinent information, such as supporting documentation.

Each action itemised in this CMP has been assigned a corresponding performance indicator(s) (refer **Table 4-1** in **Section 4**). Each CMP action should be evaluated for its performance in achieving its objectives, using the established indicator(s). These should be recorded in the AID.

The IP&R reporting system (including annual operational reporting and longer interval strategic reporting) provides the opportunity to formally report on monitoring of coastal management and its outcomes. Council delivers an Annual Report to document its progress in implementing its 4 Year Delivery Program and Annual Operational Plan activities over each financial year. This provides for a yearly evaluation of the implementation status of each action in the CMP.

Where actions have not been included in the IP&R Framework, a yearly evaluation of those CMP actions by the officer(s) responsible for facilitating implementation of the CMP is recommended. This may be undertaken through the annual review of the Business Plan, or as a separate process.

8.2.3 Component 2: Environmental Parameters and Indicators

A key component of the MER process will be to utilise physical datasets that can provide an indication of key physical and environmental parameters and track the progress of the CMP towards key achieving intended outcomes.

There are a number of actions in the CMP which will provide data that can inform the MER, including:

- Action LG12: Develop and implement a program for regular and ongoing monitoring of Council-managed coastal assets and infrastructure.

- Action FB1: Investigate, remediate and monitor impacted or vulnerable bank areas (*includes establishment of an ongoing monitoring program to inform remediation actions*).
- Action FB2: Management of Stormwater Runoff (*includes establishment of an ongoing monitoring program to inform mitigation actions*).
- Action FB3: Management of Watercraft Storage (*includes ongoing monitoring and policing to prevent re-occurrence of ad hoc watercraft storage*).
- Action FB4: Management of uncontrolled stock access to foreshore areas to enhance and protect riparian vegetation (*includes establishing a framework to monitor and evaluate the effectiveness of livestock management, fencing, and revegetation initiatives, ensuring ongoing alignment with environmental objectives and continuous improvement*).
- Action EM1: Implement revised Entrance Management Policy (*includes remote entrance berm monitoring station installed as part of the TFWS and monitoring of natural and mechanical lake openings with comprehensive written, photographic and video records as per the draft Entrance Management Policy provided in **Appendix A***).
- Action WQ1: Work with Shoalhaven Water to consider findings of ongoing groundwater monitoring, including the need for any interception of additional treatment.
- Action WQ2: Continue and implement refined surface water monitoring and reporting program.
- Action EV1: Protect and/or rehabilitate riparian and foreshore areas to enhance estuarine vegetation (*includes establishing a monitoring and evaluation framework to assess the effectiveness of vegetation restoration and control measures, ensuring alignment with environmental goals and continuous improvement*).

A summary of these environmental parameters may also be reported as part of Council's annual reporting requirements.

The environmental parameters monitored as part of the CMP will also be used as trigger points/thresholds for actions to be initiated. Some relevant examples include:

- monitoring of lake water levels and entrance berm levels to initiate entrance management actions including dry notch maintenance, mechanical berm lowering, and mechanical opening by excavation of a pilot channel (refer draft Entrance Management Policy in **Appendix A**); and,
- monitoring of lake and ocean water levels, wave conditions, and Bureau of Meteorology severe weather warnings to initiate the various phases of emergency management (i.e. preparation, response, and recovery phases) within the Lake Conjola Coastal Zone Emergency Action Subplan (refer **Appendix B**).

8.2.4 Component 3: Achievement of Objects of the CMP and CM Act

Generally speaking, the CMP should be viewed as a 'living document' that is reviewed and updated over time. Whilst a review of the performance of the actions within the CMP occur on an annual basis (as per Council's IP&R framework), a key component of the MER process is to undertake a strategic review and stocktake of the CMP at designated timeframes to assess its overall performance.

The CM Act (section 18(1)) and the Manual requires Council to ensure that the CMP is reviewed at least once every 10 years. However, it should be noted that it may be reviewed and/or updated sooner for any reason, including if there are significant new circumstances which need to be considered.

The review of the CMP should be undertaken through a formalised process and represents a significant opportunity to assess the overall performance of the CMP in meetings its objectives. At a broad level, the review should consider, as a minimum:

- The extent to which the CMP has achieved its objectives.
- The extent to which the CMP has achieved the objectives of the CM Act.
- The performance of the CMP as an instrument for improving coastal management.

Review of Key Issues

The primary mechanism for gauging whether the CMP has been successful should be the re-evaluation of the threats and risks across the study area through a repeat of the Stage 2 Risk Assessment (refer **Supporting Document B**). Controls that assist with managing the threats should be included when assessing the level of risk, particularly those actions that have or are being implemented through the CMP. There are 3 specific questions to be answered:

- Has the level of risk changed?
- Have the very high or high threats been adequately managed?
- Are there any new or emerging threats that need to be captured?

During this process, particular focus should be given to evolving or emerging risks – including those associated with climate change. These emerging and evolving risks include the impacts of sea level rise on inundation risk, and habitat squeeze and migration.

Assess CMP Performance

This will subsequently include a formal review of the implemented management strategies. The review should include a granular assessment of:

- The status of CMP actions, including the extent to which actions proposed to be wholly implemented within that 10-year period have been implemented.
- Identification of the CMP's successes, highlights, limitations, and any barriers to the effective implementation.
- Where applicable, the identification of possible avenues for increasing the effectiveness of the CMP.
- Consideration of any new or updated scientific knowledge, including data garnered and compiled from the monitoring programs set forth in the CMP.
- The progress of any actions and commitments which continue beyond the original 10-year timeframe.

If the need arises, new actions or items can also be added to the CMP as part of the review process. Any such changes to the CMP would need to be endorsed by stakeholders and relevant government agencies, as well as the community.

The reporting of management action monitoring and evaluation would be facilitated by the implementation of Action LG1 – Establish a CMP Governance Framework, Action LG3 – Enact the CMPs Monitoring,

Evaluation and Reporting (MER) Program to track progress and report on outcomes, and Action LG7 – Develop and execute a communications plan for Stage 5 of the CMP. Documentation of the effectiveness of the proposed strategies and actions will be reported as part of Council's Annual Report (which is part of the IP&R framework), including progress towards or full achievement of the performance targets included for each action. The status of CMP actions would also be communicated to relevant Council committees and on Council's website.

9 Maps

High level mapping provided in this CMP includes:

- An overview of the CMP study area (**Figure 1-2**)

Furthermore, a set of maps for both Tidal Inundation and Coastal Inundation extent and depth, derived from modelling undertaken as part of the CMP (refer **Supporting Document B**), is included in **Appendix C** and **Appendix D** respectively.

Maps of individual management actions are provided in **Section 4**.

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Acronyms

ABC	Australian Broadcasting Corporation
ABS	Australian Bureau of Statistics
ACH	Aboriginal Cultural Heritage
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AHIMS	NSW Aboriginal Heritage Information Management System
AMP	Asset Management Plan
CBA	Cost Benefit Analysis
CEA	Coastal Environment Area
CLM Act	Crown Land Management Act 2016
CM Act	Coastal Management Act 2016
CMP	Coastal Management Program
CRIF	Crown Reserves Improvement Fund
CRSS	Conjola Regional Sewerage Scheme
CST	Council Staff Time
CUA	Coastal Use Area
CVA	Coastal Vulnerability Area
CZEAS	Coastal Zone Emergency Action Subplan
CZMP	Coastal Zone Management Plan
CWLR	Coastal Wetlands and Littoral Rainforests Area

DAP	Disaster Adaptation Plan
DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
DCCEEW-BCS	NSW Department of Climate Change, Energy, the Environment and Water – Biodiversity, Conservation and Science Group
DCP	Development Control Plan
DPE	NSW Department of Planning and Environment
DPHI	NSW Department of Planning, Housing and Infrastructure
DPHI-Crown Lands	NSW Department of Planning, Housing and Infrastructure – Crown Lands
DPIRD	NSW Department of Primary Industries and Regional Development
DPIRD-Fisheries	NSW Department of Primary Industries and Regional Development - Fisheries
DPIE	NSW Department of Planning, Infrastructure and Environment
DWS	Domestic Waterfront Structure
EMPLAN	Emergency Management Plan
EPA	NSW Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
FESP	Flood Emergency Sub Plan
FMO	Foreshore Management Opportunity
FRMS&P	Floodplain Risk Management Study and Plan
FTE	Full Time Equivalent
ICOLL	Intermittently Closed and Open Lake and Lagoon
IPCC	Intergovernmental Panel on Climate Change
IP&R	Integrated Planning and Reporting

LALC	Local Aboriginal Land Council
LCCZEAS	Lake Conjola Coastal Zone Emergency Action Subplan
LEP	Local Environment Plan
LGA	Local Government Area
LG Act	Local Government Act 1993
LLS	NSW Local Land Services
MEMA	Marine Estate Management Authority
MEM Act	Marine Estate Management Act 2014
MER	Monitoring, Evaluation and Reporting
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MSL	Mean Sea Level
NPV	Net Present Value
NPWS	NSW National Parks and Wildlife Service
NRRA	National Recovery and Resilience Agency
NSW	New South Wales
NT Act	Native Title Act 1993
OEH	NSW Office of Environment and Heritage
REF	Review of Environmental Factors
RFS	NSW Rural Fire Service
RHDHV	Royal HaskoningDHV

RH SEPP	State Environmental Planning Policy (Resilience and Hazards) 2021
SCC	Shoalhaven City Council
SDCP	Shoalhaven Development Control Plan 2014
SDMP	State Disaster Mitigation Plan
SERM Act	State Emergency and Rescue Management Act 1989
SES	NSW State Emergency Service
SLEP	Shoalhaven Local Environmental Plan 2014
SLR	Sea Level Rise
SOI	Southern Oscillation Index
TARA	Threat and Risk Assessment
TEC	Threatened Ecological Communities
TfNSW	Transport for NSW
WWTP	Conjola Wastewater Treatment Plant

Appendix A – Draft Entrance Management Policy

1 General

This document sets out the DRAFT Entrance Management Policy (EMP) for management of the entrance to Lake Conjola. The primary driver for entrance management is the risk associated with flooding. Accordingly, the EMP allows for the future implementation of Council's Total Flood Warning System (TFWS) for Lake Conjola to support entrance management decision-making. The EMP has been developed based on the findings of the Lake Conjola Coastal Management Program (CMP), Lake Conjola Flood Study (2007), Lake Conjola Floodplain Risk Management Study & Plan (2013), and Shoalhaven LGA Floor Level Survey for Flood Planning (2024) investigations.

The EMP document is structured in the following way:

- Policy Name
- Objectives
- Review of Environmental Factors
- Land to which the EMP Applies
- Climate Change
- Relevant Legislation, Policy and Approvals
- Entrance Management Principles and Procedures
- Penalties
- Responsibility
- Contacts
- Authorisation
- Review Period
- Amendments
- Appendices
- References

2 Policy Name

Lake Conjola Entrance Management Policy.

3 Objectives

The EMP provides a framework that assists in the management of the entrance to Lake Conjola. The EMP aims to:

- Minimise risk to life and risk to public and private property and assets due to flooding.
- Establish clear triggers for initiating mechanical intervention in the natural processes of the entrance, with consideration of ocean conditions.
- Establish procedures for mechanical interventions at the entrance and for disposal of excavated material.

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- Minimise interference with natural entrance behaviour and allow mechanical entrance openings to mimic a natural Intermittently Closed and Open Lake and Lagoon (ICOLL) opening regime as closely as possible.
- Accommodate future climate considerations, in particular sea level rise.
- Conserve or enhance the ecological diversity and flora and fauna communities of the lake system.
- Conserve or enhance the recreational activities within the lake and its foreshores.
- Define key responsibilities for management of the entrance.
- Detail the procedures for monitoring the entrance.

Council, is responsible for managing the Lake Conjola entrance for the purpose of flood mitigation for low-lying properties in accordance with authorisations from the NSW Government. The mechanical opening of the Lake Conjola entrance will not prevent flooding of houses within the entirety of the catchment. Even if the entrance is fully open at the start of a large flood (i.e., it has recently been scoured by a preceding flood) there are existing houses that can still flood. Accordingly, the EMP aims to reduce, not eliminate, the impacts of flooding.

4 Review of Environmental Factors

A supporting Review of Environmental Factors (REF) will need to be prepared to support the EMP and be updated over time in line with any EMP changes and/or new information. The REF describes the activities involved in management of the entrance in accordance with the EMP, outlines the potential impacts of implementing the EMP on the coastal and estuary environments, and details the mitigation measures to be adopted to minimise potential impacts in accordance with the *Environmental Planning and Assessment Act 1979*, Part 5.

5 Land to which the EMP Applies

The EMP applies to lands located at the entrance to Lake Conjola, including those lands where excavation of sand would be carried out as part of entrance management and those lands where excavated sand may be beneficially placed. In the latter case, such lands could include the sand spit north and south of the entrance, Conjola Beach, Manyana Beach, lake foreshore beaches downstream of the Holiday Haven Caravan Park, and along the Cunjurong shoreline. These locations are all within the same tertiary sediment compartment for this stretch of coastline as described in the Lake Conjola CMP.

The land to which the EMP applies is shown graphically in **Figure 5-1** and is wholly within Minister-managed Crown Land except for a section of the southern spit, which is council-managed Crown Reserve.

The REF for management of the entrance will consider the wider Lake Conjola estuary and catchment.

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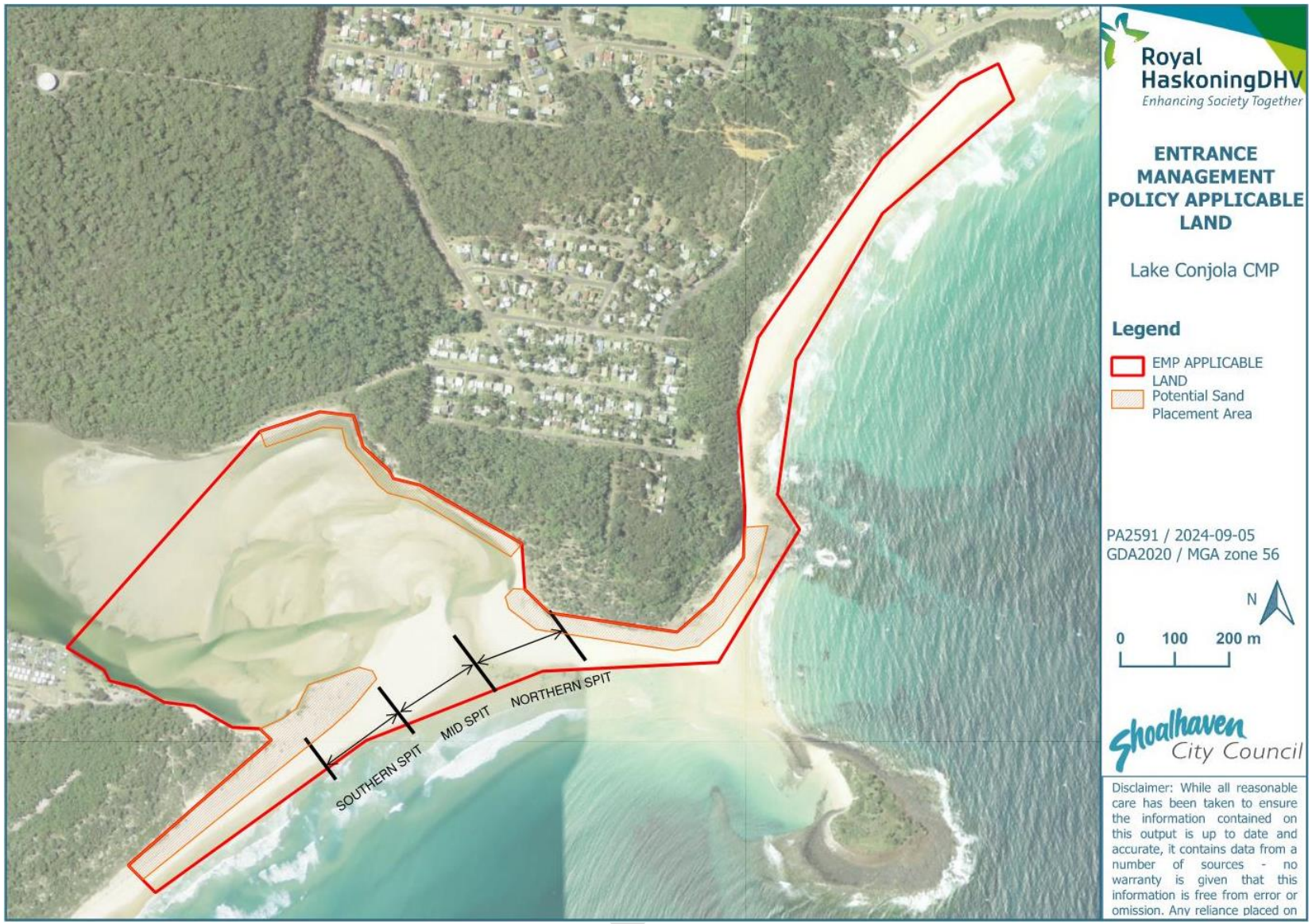

Figure 5-1: Land to which the EMP applies

6 Climate Change

The current proposed trigger values for management of the entrance to Lake Conjola (outlined in **Section 8**) will need to be revised over time associated with future sea level rise. These revisions should be considered at the proposed Review Periods of the EMP (refer **Section 13**) or at such other times determined by Council.

As of 2024, Council's adopted sea level rise projections are as below:

- 0.10 metres by 2030
- 0.23 metres by 2050
- 0.85 metres by 2100

In accordance with Council's Sea Level Rise Framework, Council will continue to monitor State and Federal Government advice and future Intergovernmental Panel on Climate Change (IPCC) reports to review existing sea level rise projections approximately every seven (7) years.

7 Relevant Legislation, Policy and Approvals

The EMP broadly complies with various State Government initiatives for environmental management of coastal lakes, and will be applied with consideration of the following legislation and policies:

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.
- *NSW Environmental Planning and Assessment Act 1979.*
- *NSW Local Government Act 1993.*
- *NSW Coastal Management Act 2016.*
- *NSW Fisheries Management Act 1994.*
- *NSW Crown Land Management Act 2016.*
- *NSW Flood Prone Land Policy 2023.*
- *NSW National Parks and Wildlife Act 1974.*
- *NSW Biodiversity Conservation Act 2016.*
- *NSW Protection of the Environment Operations Act 1997.*
- *NSW State Environmental Planning Policy (Resilience and Hazards) 2021*.
- *NSW State Environmental Planning Policy (Transport and Infrastructure) 2021*.
- Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 update)

Table 7-1 provides a list of potential permits/approvals that may be required for the carrying out of mechanical interventions at the entrance. These will be confirmed following completion of the supporting REF for the EMP.

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Table 7-1: Potential permits and approvals for mechanical interventions at the entrance

Relevant Act	Approvals Required	Approval Body
NSW Crown Land Management Act 2016	Licence to carry out activities on Crown Land	NSW Department of Planning, Housing and Infrastructure – Crown Lands
NSW Fisheries Management Act 1994	Permit to harm marine vegetation, if applicable. Permit for dredging and reclamation.[1]	NSW Department of Primary Industries and Regional Development - Fisheries
NSW Biodiversity Conservation Act 2016	Species Impact Statement (SIS), if applicable.	NSW Department of Climate Change, Energy, the Environment and Water
NSW National Parks and Wildlife Act 1974	Aboriginal Heritage Impact Permit (AHIP), if applicable.	NSW Department of Climate Change, Energy, the Environment and Water

Notes:

1. A dredging permit under section 200 of the *NSW Fisheries Management Act 1994* (FM Act) is not required, provided that dredging has been authorised under *NSW Crown Land Management Act 2016* and under s.199 of the FM Act NSW Department of Planning, Housing and Infrastructure – Crown Lands has consulted with NSW Department of Primary Industries and Regional Development – Fisheries prior to authorising.

8 Entrance Management Principles and Procedures

The EMP will be implemented in accordance with the principles and procedures set out in the following sections.

The approach for management of the entrance to Lake Conjola involves the future implementation of a TFWS (subject to funding), maintenance of a dry notch, mechanical berm lowering, and excavation of a pilot channel when water level triggers are met. In addition, as a contingency measure only, and subject to separate additional environmental approvals, occasional dredging of the ebb tide channel may be carried out in the event of a severe storm washover that could adversely impact the ability for Council to complete mechanical intervention works in a timely manner.

8.1 Management Principles

The following general principles apply to management of the entrance to Lake Conjola:

- Open the entrance when water level triggers (refer **Section 8.3** and **Section 8.5**) are reached or predicted to be reached due to rain falling or forecast heavy rainfall.
- Implementation of the EMP is a short-term to medium-term flood mitigation measure, as recommended in the Lake Conjola Floodplain Risk Management Plan (2013).
- Implementation of long-term flood mitigation measures, as identified in the Lake Conjola Floodplain Risk Management Plan (2013), to negate the need for mechanical intervention to restore a more natural opening regime over time.
- Incorporate provisions for increasing water level triggers commensurate with sea level rise and in accordance with Council's Sea Level Rise Framework. This would need to be undertaken in conjunction with the implementation of long-term flood mitigation measures investigated through a Floodplain Risk Management Study and Plan to ensure that existing low-lying dwellings and assets are raised over time and new development is appropriately located.

8.2 Excavation of a Pilot Channel

A pilot channel is excavated to facilitate the opening of the Lake at the nominated trigger level under closed entrance conditions during a flood event. The purpose of excavating a pilot channel is to control the timing, lake level and location of the Lake opening to coincide with favourable oceanic conditions and maximise scour potential to allow an effective opening, while also limiting impacts to shorebirds and possible erosion of the southern dunes. Pilot channel excavation should ideally be planned for implementation under conditions that will facilitate an effective opening which is largely dependent on the hydraulic gradient (water level difference across a distance) achieved between the Lake and the Ocean. The following aspects should be considered when planning a pilot channel excavation to achieve an effective opening:

- Lake water levels: For a mechanical opening to be as effective as possible the opening should be initiated at as high a lake level as feasible without impacting adversely on flood risk. Planning and preparation for an opening can take place at lower lake levels (in line with the trigger levels prescribed in the EMP, refer **Section 8.3**), particularly with the benefit of a TFWS.
- Timing with ocean tides: Initiating a mechanical opening around ocean high tide, subject to other factors such as the safety of operations, generally results in a well scoured entrance and generally a longer period of entrance open conditions. This greater effectiveness is related to the longer duration of sustained positive head (water level) difference between the lake and the ocean over time as the ocean tide level falls.
- Length of the required excavation: Pilot channel length is an important factor as it affects the response time for mechanical intervention (quantity of sand to be excavated) and the effectiveness of a mechanical breakout event (scouring of the channel). A situation where the required excavation for the pilot channel is overly long should be avoided, if possible, as a shorter channel length has the benefit of a steeper hydraulic gradient and quicker excavation duration for a mechanical opening. Allowing the water level in the lake to rise as a means of reducing the pilot channel length needs to be carefully managed due to the associated flood risk. Maintenance of a dry notch area (refer **Section 8.6**) is proposed to reduce the length of the sand berm through which a pilot channel needs to be excavated

The pilot channel should ideally be excavated within the dry notch area (typically maintained in the northern spit zone), with a base level of approximately 0m AHD. The channel base could be flat or graded towards the sea, with the relative effectiveness of this evaluated over time with review of lake opening records (refer **Section 8.9**). The preferred location of the pilot channel would be variable based on the entrance berm and shoal configuration at the time of opening and the presence of threatened migratory shorebirds.

Excavation of the pilot channel through the northern side of the northern spit zone (refer **Figure 5-1**) should be avoided as breakout channel scour would be prematurely limited by elevated bedrock levels in this area. Positioning the pilot channel towards the southern side of the northern spit zone would be expected to promote additional longevity of the opening, as the channel will typically tend to migrate north over time. Excavation of the pilot channel through the mid spit zone (refer **Figure 5-1**) could be undertaken to initiate an immediate opening, subject to conditions regarding the presence of threatened migratory shorebirds.

The nominal width of the pilot channel along its length should be 2m but should be made wider at its upstream end where it connects to the lake (where practicable), by a factor of at least two to three times, to increase the initial outflow from the lake and enhance natural scour of the breakout channel. Access for excavation of the pilot channel should be from the north at Cunjurong Point or Manyana Beach depending on the prevailing access conditions.

The exact dimensions of the pilot channel may be varied (within a range of metres) depending on operational experience and local site factors at the time.

8.3 Triggers for Mechanical Opening (excavation of a pilot channel)

Analysis of the performance of mechanical openings carried out over recent years by Council and the results of a numerical modelling study carried out as part of development of the CMP have shown the benefit of opening the lake at water levels as high as practicable. The proposed trigger water levels were also informed by the lowest habitable floor level of 1.79m AHD determined from the Shoalhaven LGA Floor Level Survey for Flood Planning (2024) and the lowest level for evacuation along Lake Conjola Entrance Rd of approximately 1.2m AHD.

Intervention trigger conditions for mechanical opening (excavation of a pilot channel) are as follows:

(a) Planned Opening: When the lake water level is at or exceeds 1.0m AHD and heavy rainfall is falling or forecast in the Lake Conjola catchment which is expected to result in a lake water level of 1.2m AHD being exceeded and continuing to rise, a pilot channel can be excavated to open the lake; OR,

(b) Planned Opening: When the lake water level is at or exceeds 1.0m AHD and a TFWS for Lake Conjola (following implementation) predicts that the lake water level will reach 1.2m AHD and continue to rise, a pilot channel can be excavated to open the lake; OR,

(c) Immediate Opening: A lake level of 1.2m AHD facilitates an immediate entrance opening; AND,

(d) Satisfaction of requirements regarding threatened migratory shorebirds. [subject to REF and licence conditions]

With implementation of dry notch maintenance, the TFWS (subject to funding), and pre-emptive mechanical berm lowering, it is expected that the need for immediate openings would reduce.

A Decision Flow Chart for management of the entrance to Lake Conjola is shown in **Figure 8-1**.

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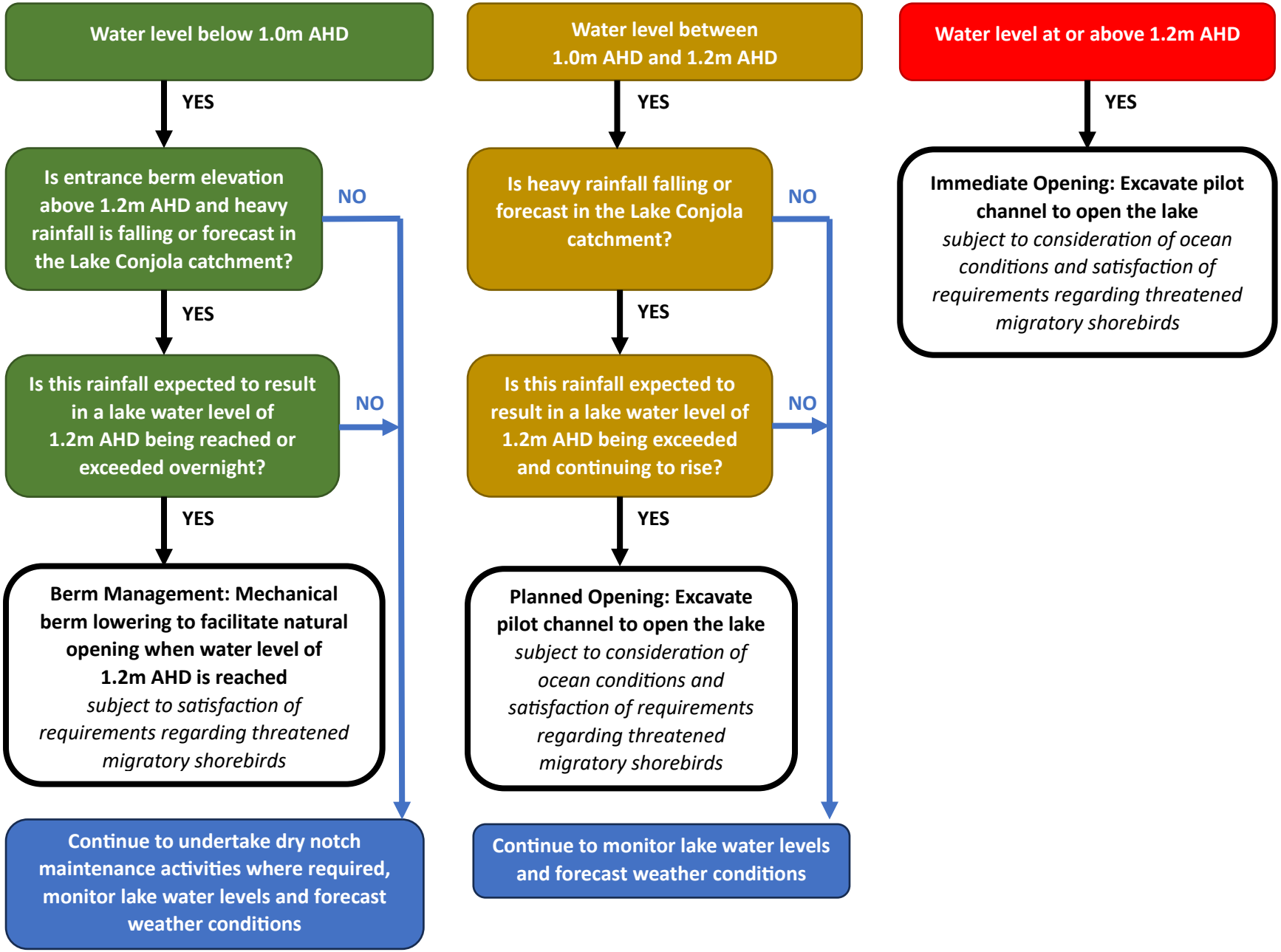

Figure 8-1: Decision Flow Chart

8.4 Timing of the Mechanical Opening of a Pilot Channel

Mechanical opening (commencement of outflow) should be timed to take place around ocean high tide and during mild wave conditions, where practicable. Consideration should also be made of any positive tidal anomaly that would affect the head difference between the lake and ocean water levels.

The effectiveness of the timing of the mechanical opening relative to ocean tide level should be monitored (refer **Section 8.9**). The timing may be varied based on continued experience and learnings.

8.5 Mechanical Berm Lowering

Mechanical berm lowering comprises the pre-emptive lowering of sand berm levels under closed entrance conditions ahead of a predicted flood event by excavation of sand over the dry notch footprint and the sand plug at the beach face. This should be carried out in daylight hours under certain circumstances to promote natural opening when flooding is expected to occur overnight, and further mechanical intervention may not be possible due to safety reasons. In these circumstances, undertaking pilot channel excavation procedures (refer **Section 8.2** and **Section 8.3**) would be hindered by the timing of the expected trigger level breach and coastal processes are anticipated to result in excavation works being ineffective (i.e. wave action results in return of sand to the berm and beach face, infilling pilot channel excavations). It should be noted that wave conditions will also impact the longevity of the berm lowering and that some sand build-up could occur again prior to the Lake opening being achieved. Hence it is important to undertake berm lowering at a time that has considered possible impacts of oceanic conditions and the predicted timing for the trigger level being met (i.e. the day prior).

Mechanical berm lowering is an effective management strategy in the following situation:

- A low lake level prior to a forecast rainfall event;
- Surveyed berm elevation is above the planned immediate opening level; and,
- Heavy rainfall (forecast or actual) would result in the trigger levels for an immediate opening potentially being reached overnight.

Mechanical berm lowering in this situation allows the lake level to rise and then naturally open at the planned opening level, reducing the risk of flooding and allowing the lake opening to better mimic natural ICOLL processes. In the event that the lake level does not reach the level of the lowered berm, the lake would not open. This therefore avoids ineffective entrance openings at a low level.

Intervention trigger conditions for mechanical berm lowering are as follows:

(a) Berm Management: The lake water level is below 1.0m AHD, berm elevation above 1.2m AHD, and heavy rainfall is falling or forecast in the Lake Conjola catchment which is expected to result in a lake water level of 1.2m AHD being reached or exceeded overnight and continuing to rise; facilitates lowering of the entrance berm to promote natural opening when a water level of 1.2m AHD is reached and further mechanical intervention is not possible due to safety considerations; OR,

(b) Berm Management: The lake water level is below 1.0m AHD, berm elevation above 1.2m AHD, and a TFWS for Lake Conjola (following implementation) predicts that the lake water level will reach 1.2m AHD and continue to rise overnight; facilitates lowering of the entrance berm to promote natural opening when a level of 1.2m AHD is reached; AND,

(c) Satisfaction of requirements regarding threatened migratory shorebirds. [subject to REF and licence conditions]

8.6 Maintenance of a Dry Notch

Dry notch maintenance comprises the periodic lowering of the 'dry notch' area (refer **Figure 8-2**) under closed entrance conditions as a preparatory measure to reduce the burden of sand to be removed at the time of a mechanical entrance opening. This activity is intended to form part of the ongoing management of the Lake entrance to manage flood risk. The excavation and maintenance of a dry notch can benefit mechanical interventions (i.e. pilot channel excavation and berm lowering) as it can lead to a reduced pilot channel length (allowing for greater scour potential), and a reduced volume of sand to be excavated when undertaking mechanical interventions, allowing a faster opening to be achieved.

The dry notch should typically be maintained in the northern spit zone (refer **Figure 5-1**) during closed entrance conditions to minimise impacts on threatened migratory shorebirds, especially during shorebird nesting season (September to March inclusive). Access for maintenance of the dry notch should be achieved from the north at Cunjurong Point Boat Ramp or Manyana Beach.

The base of the dry notch should be maintained at a level of approximately 1.0m AHD to facilitate mechanical opening as per the possible flooding conditions outlined in **Section 8.3** below. The dry notch should have a typical approximate width of 50m (but can be varied, refer below), with a short sand 'plug' retained at the beach face (refer **Figure 8-2**).

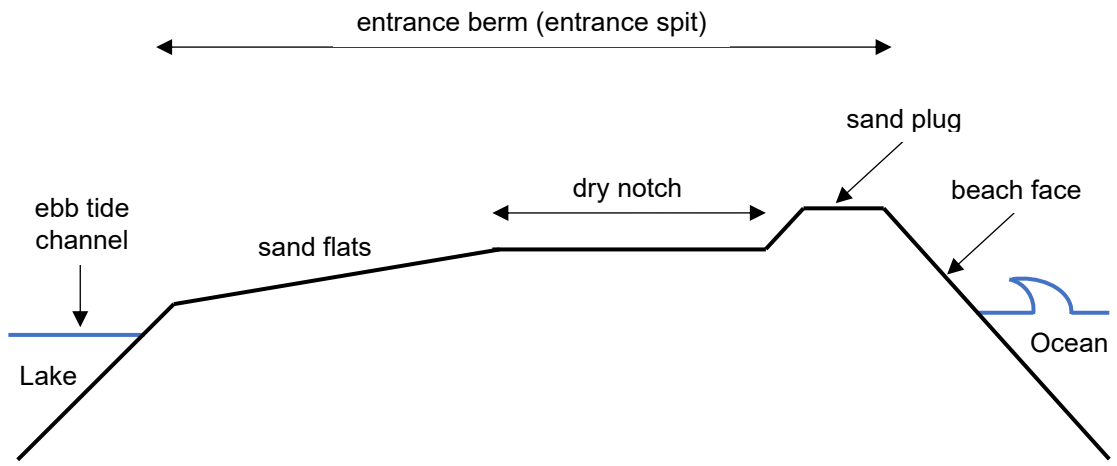

Figure 8-2: Diagrammatic east-west section showing configuration of the Dry Notch

The remote entrance berm monitoring station to be installed as part of the future implementation of a TFWS should be used to inform the timing and frequency of dry notch maintenance. In the interim, the condition of the entrance berm should be monitored with monthly entrance surveys when the entrance is closed using traditional manual topographic survey techniques.

The location and the width of the dry notch may vary (increased within 10's of metres) based on experience but must not impact adversely on threatened migratory shorebirds as determined through the REF. The largest dry notch maintenance area determined to be appropriate through the REF will ensure that entrance management operations are as efficient and flexible as possible for Council to implement in response to variable natural entrance berm and shoal configurations.

8.7 Occasional Dredging of the Ebb Tide Channel

As a contingency measure only, and subject to separate additional approvals on a case-by-case basis, occasional dredging of the ebb tide channel may be carried out in the event of a severe coastal storm washover. This does not include dredging to maintain a permanently open entrance.

A severe storm washover event occurs when waves during major to severe coastal storms wash over the entrance spit, leading to significant infilling of the entrance to the lake with sand. The washover sand deposits cover an extensive area and cut off the primary ebb tide channel that would typically run behind the entrance spit. The primary ebb tide channel becomes 'perched' on the sand deposits, leading to sudden and substantially diminished tidal flows, with further washover leading to entrance closure. Following closure of the entrance, sand berm levels on the seaward side of the spit would typically reach a level above 2m AHD due to wave and wind processes. Opening of the lake under such conditions would only occur in significant rainfall/flooding or by mechanical intervention.

For dredging to be considered, the following factors need to apply:

- The ebb tide channel is infilled such that the channel is stranded in the lee of the frontal dune.
- The amount of excavation (time) required to re-establish a dry notch and link a pilot channel to lake waters is excessive.
- The excavation required to re-establish a dry notch would impact adversely on threatened migratory shorebirds.

The details of any ebb tide channel dredging campaign would be determined at the time based on the individual circumstances and would be informed by a hydrographic survey of the entrance area. As a guide, the proposed minimum dimensions of the dredged channel would be nominally 20m wide, base level -0.8m AHD, and side slopes 1 Vertical to 3 Horizontal (1V:3H) for a distance of up to approximately 300-400m. The alignment of the dredged channel would follow the general natural alignment of the ebb tide channel behind the entrance sand spit as depicted in the Regime Entrance State (Patterson Britton, 1999).

Each ebb tide channel dredging campaign would need to be supported by a separate REF, which would be informed by site investigations at the time that dredging is planned. Investigations may include aquatic ecology survey, sediment sampling and analysis, and hydrographic survey to confirm the extent of dredging required, and other studies required for the completion of a comprehensive REF. Additional approval applications may be required for the following relevant licences and permits:

- Dredging licence under the *Crown Lands Management Act 2016*; and,
- Permit to harm marine vegetation under Part 7 of the *Fisheries Management Act 1994*.

8.8 Disposal of Excavated and Dredged Sand

Sand excavated to maintain the dry notch, lower the berm, and to create a pilot channel, and dredged to re-establish the natural ebb tide channel, should be reused beneficially, in the following ways:

- Sand from the dry notch maintenance, berm lowering, and ebb tide channel dredging should be placed on the spit to the south of the entrance to increase the height of the spit and mitigate storm washover (preferred option subject to the threatened migratory shorebird nesting season), and/or be used for beach nourishment to the north, and/or be used for restoration of erosion areas on the surrounding lake foreshore.
- Sand from the pilot channel excavation should be placed on the spit to the north of the pilot channel (noting that excavation of the pilot channel would be conducted from the north side of the channel, hence access to the south of the channel for disposal would not be possible),

and as far away as practicable from the edge of the pilot channel (i.e. within the reach of the excavator) to reduce the likelihood of the stockpiled sand falling back into the pilot channel prior to opening.

Sand placed on the spit to the south of the entrance to increase the height of the spit (dune) should be stabilised with vegetation where possible to reduce transport back into the entrance by wind action. Sufficient width should be retained north of any vegetated dune to accommodate flood flows through the entrance.

As noted above, placement of excavated or dredged sand must consider potential impacts to threatened migratory shorebirds, as determined through the preparation of supporting REFs and development of associated conditions and guidelines for placement to mitigate potential impacts.

8.9 Monitoring of Lake Openings

Comprehensive records of entrance opening events, both natural and mechanical, are to be maintained by Council staff. This should include a photographic and video record of entrance conditions before, during and after the event. The standard form included as an Appendix to this EMP should be completed by Council staff and capture the following details as a minimum:

- opening date;
- whether it was a natural or mechanical opening;
- berm level prior to opening (if known);
- position and geometry of the initial natural breach in the spit or the excavated pilot channel (i.e. length, width, base level);
- final channel dimensions;
- location of excavated material placement;
- ocean tide and wave conditions at the time of opening (from ocean tide gauges and waverider buoys);
- lake water level at the time of opening (from available Council or MHL gauges);
- rate of lake water level change following opening (from available Council or MHL gauges);
- peak lake water level during the flood event (from available Council or MHL gauges);
- recorded rainfall before, during and after the opening (from available Council or MHL gauges);
- actual rainfall versus predictions;
- relative rating of the effectiveness of the opening and opportunities for improvement/lessons learnt; and,
- duration of open conditions before commencement of entrance shoaling and/or closure.

9 Penalties

Council has the authority to penalise persons opening the lake without appropriate authorisation under Section 632(1) of the *Local Government Act 1993*. In some circumstances it is also illegal under the *Fisheries Management Act 1994* to conduct non-authorised opening of the lake entrance.

10 Responsibility

Primary responsibility for implementing this EMP is with Shoalhaven City Council.

DRAFT

11 Contacts

Key contacts regarding implementation of this EMP are shown in **Table 11-1**.

All key contacts are to be advised of any intention to carry out entrance works, prior to the activities.

Table 11-1: Lake Conjola Entrance Management Policy - Contacts

Organisation	Contact Details
Shoalhaven City Council	Lead Floodplain Management Number: 1300 293 111 Email: Floodplain.Management@shoalhaven.nsw.gov.au Lead Coastal Management Number: 1300 293 111 Email: coastal.management@shoalhaven.nsw.gov.au Manager Environmental Services Number: 1300 293 111 Email: Environmental.Services@shoalhaven.nsw.gov.au
NSW Department of Climate Change, Energy, the Environment and Water	Senior Coast and Estuaries Officer (South East Regional Delivery – Shoalhaven LGA) Number: (02) 4221 6917 (Wollongong office) Email: admin-southeast@environment.nsw.gov.au
NSW Department of Primary Industries and Regional Development – Fisheries	Fisheries Manager – Coastal Systems Number: 1800 043 536 Email: information-advisory@dpi.nsw.gov.au and ahp.central@dpi.nsw.gov.au
National Parks and Wildlife Service Ulladulla	Number: (02) 4554 9500
National Parks and Wildlife Service	Shorebird Ranger Number: (02) 4428 6300 (Nowra office) Email: npws.shoalhaven@environment.nsw.gov.au
NSW Department of Planning, Housing and Infrastructure – Crown Lands	Area Manager Number: 1300 886 235 Email: cl.enquiries@crownland.nsw.gov.au
Jerrinja Local Aboriginal Land Council	Number: (02) 4447 5669
Ulladulla Police Station	Number: (02) 4454 8599
Ulladulla State Emergency Service	Number: 13 25 00

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12 Authorisation

This EMP was adopted on: XX/XX/2024 [To be Advised – Draft Only]

This EMP commenced on: XX/XX/2024 [To be Advised – Draft Only]

This EMP is due for review on: XX/XX/2029 [To be Advised – Draft Only]

13 Review Period

This EMP is to be reviewed following the implementation of the Lake Conjola TFWS and as necessary every 5 to 10 years depending on the duration of the NSW Crown Lands licence. This will be determined following the receipt of a Crown Lands Licence.

14 Amendments

[*This section of the EMP should summarise the amendments to the EMP since its first adoption. The summary should include the date of the amendment, a brief description of the amendment, and the section within the EMP where the amendment can be found*].

15 Appendices

[*The EMP would likely include several Appendices providing specific further information relevant to the EMP. Based on similar EMPs for other ICOLLs, this further information could include:*

- *The assets at risk of inundation.*
- *Links to relevant information available online, including:*

  Lake Conjola Flood Study (2007)

  https://doc.shoalhaven.nsw.gov.au/LinkGeneratorAPI/record/2444473/preview_latest_final_version_pdf

  Lake Conjola Floodplain Risk Management Study & Plan (2013)

  https://doc.shoalhaven.nsw.gov.au/LinkGeneratorAPI/record/3114010/preview_latest_final_version_pdf

  Shoalhaven Council Online Flood Mapping

  https://maps.shoalhaven.nsw.gov.au/SCCViewer/index.html?Viewer=extFlood

  Shoalhaven Council Entrance Management Website

  https://www.shoalhaven.nsw.gov.au/Environment-and-emergency/Coast-and-waterways/Entrance-management
- *The entrance monitoring form to be completed for each lake opening.*]

16 References

BMT WBM (2007), *Lake Conjola Flood Study*, Final Report R.N0758.004.05, July 2007. https://doc.shoalhaven.nsw.gov.au/LinkGeneratorAPI/record/2444473/preview_latest_final_version_pdf

BMT WBM (2013), *Lake Conjola Floodplain Risk Management Study and Plan*, Final Report R.N1778.001.04, February 2013. https://doc.shoalhaven.nsw.gov.au/LinkGeneratorAPI/record/3114010/preview_latest_final_version_pdf

GHD (2013), *Lake Conjola Interim Entrance Management Policy*, prepared for Shoalhaven City Council, August 2013.

Patterson Britton (1999), *Lake Conjola Entrance Study*, prepared for Shoalhaven City Council, Issue No.2, May 1999.

Royal HaskoningDHV [RHDHV] (2024), *Lake Conjola Coastal Management Program*, prepared for Shoalhaven City Council.

DRAFT

Appendix B – Lake Conjola Coastal Zone Emergency Action Subplan

REPORT

Lake Conjola Coastal Management Program

Coastal Zone Emergency Action Subplan

Client: Shoalhaven City Council

Reference: PA2591-RHD-CMP-CZEAS-0006

Status: Draft/5.0

Date: 8 October 2024

Royal HaskoningDHV
Enhancing Society Together

HASKONING AUSTRALIA PTY LTD.

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Website: royalhaskoningdhv.com

Document title: Lake Conjola Coastal Management Program

Subtitle: Coastal Zone Emergency Action Subplan
Reference: PA2591-RHD-CMP-CZEAS-0006
Your reference
Status: Draft/5.0
Date: 8 October 2024
Project name: Lake Conjola Coastal Management Program
Project number: PA2591

Classification
Project related

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Revision	Date	Description	Prepared	Checked	Approved
1	16 April 2024	Preliminary Draft	MP		
2	30 April 2024	Draft	MP	GWB	
3	14 August 2024	Final Draft	MP	GWB	GWB
4	19 September 2024	Revised Final Draft	MP	GWB	GWB
5	8 October 2024	Revised Final Draft	MP	GWB	GWB

Royal HaskoningDHV

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Appendix A: Coastal Inundation Maps

Executive Summary

Lake Conjola is primarily an estuarine water body with a surface area of approximately 6.9 km^2, made up of three identified basins (Lake Conjola, Berringer Lake and Pattimores Lagoon), within a coastal catchment area of 145 km^2. The Lake entrance occasionally closes, sometimes requiring Council intervention to mitigate potential flooding of low-lying areas, however it is predominantly open to the ocean and receives tidal interchange of marine waters.

The NSW Government has established a Coastal Management Framework under the *Coastal Management Act 2016* (CM Act), which incorporates State Environmental Planning Policy (Resilience and Hazards) 2021 (RH SEPP), grant funding, technical guidance and governance arrangements.

Section 5 of the CM Act defines the coastal zone as the area of land comprised of four Coastal Management Areas, which are described and defined as the Coastal Wetlands and Littoral Rainforests Area (CW&LRA), the Coastal Vulnerability Area (CVA), the Coastal Environment Area (CEA), and the Coastal Use Area (CUA).

The NSW Government prepared and adopted mapping of each Coastal Management Area, except for the CVA, at the commencement of the RH SEPP. It is expected that local coastal vulnerability areas will be identified through coastal hazard modelling and mapping undertaken by or on behalf of councils when preparing their Coastal Management Programs (CMPs), and will be submitted to the NSW Government as a Planning Proposal to amend the State CVA map.

CMPs prepared by local councils are the primary mechanism for achieving the objectives and requirements of the CM Act and RH SEPP, in accordance with technical guidance provided within the Coastal Management Manual.

The CM Act defines seven forms of coastal hazards and requires specific emergency management considerations for impacts associated with beach erosion, coastal inundation, and cliff instability. The CM Act (section 15(1)(e)) outlines that a Coastal Zone Emergency Action Subplan (CZEAS) must be included in a CMP if the local council's local government area contains land within the CVA and beach erosion, coastal inundation and coastal cliff or slope instability is occurring on that land due to storm activity or an extreme or irregular event.

As the NSW government did not adopt a CVA map, section 15(1)(e)) of the CM Act does not apply to the Lake Conjola CMP, and preparation of a CZEAS is not required. However, it is recognised that Lake Conjola has been impacted by coastal hazards, notably coastal inundation, on several occasions, and as such it is considered appropriate to develop a CZEAS for this location. Beach erosion and coastal cliff or slope instability are not applicable coastal hazards within the Lake Conjola CMP study area, although these hazards are considered within the CZEAS prepared for the Shoalhaven Open Coast and Jervis Bay CMP (Water Technology, 2024). Other coastal hazards identified in section 4 of the CM Act (shoreline recession, coastal lake or watercourse entrance instability, tidal inundation and erosion and inundation of foreshores caused by tidal waters and the action of waves) are outside the scope of a CZEAS.

Mandatory requirements for a CMP, including the preparation of a CZEAS, have been identified in Part A of the Coastal Management Manual (OEH, 2018). Further direction on the preparation of a CZEAS is provided in the *"Guideline for preparing a coastal zone emergency action subplan"* (DPIE, 2019). The Lake Conjola Coastal Zone Emergency Action Subplan (LCCZEAS) has been developed in accordance with this guidance.

The following key principles are applied to emergency management in New South Wales:

- Prevention: to eliminate or reduce the level of the risk or severity of emergencies.
- Preparation: to enhance capacity of agencies and communities to cope with the consequences of emergencies.
- Response: to ensure the immediate consequences of emergencies to communities are minimised.
- Recovery: measures which support individuals and communities affected by emergencies in the reconstruction of physical infrastructure and restoration of physical, emotional, environmental, and economic well-being.

The overarching framework for emergency management in New South Wales is established by the *State Emergency and Rescue Management Act 1989* (SERM Act). The SERM Act outlines roles and responsibilities for all emergency management in New South Wales and establishes the hierarchy and requirements of Emergency Management Plans (EMPLANs) from a State through to local level.

The NSW State Emergency Service (NSW SES) prepares the State Storm Plan, State Flood Plan and State Tsunami Plan, which are Subplans to the NSW State EMPLAN, and is the designated combat agency for management of floods, tsunami, and storms, including severe storms which cause coastal inundation.

The LCCZEAS is designed to be consistent with, and complimentary to, other Subplans prepared under the SERM Act including the state, regional and local EMPLANs, State Storm Plan and State Flood Plan. The relationship between the SERM Act and CM Act is detailed in **Figure E1-1**.

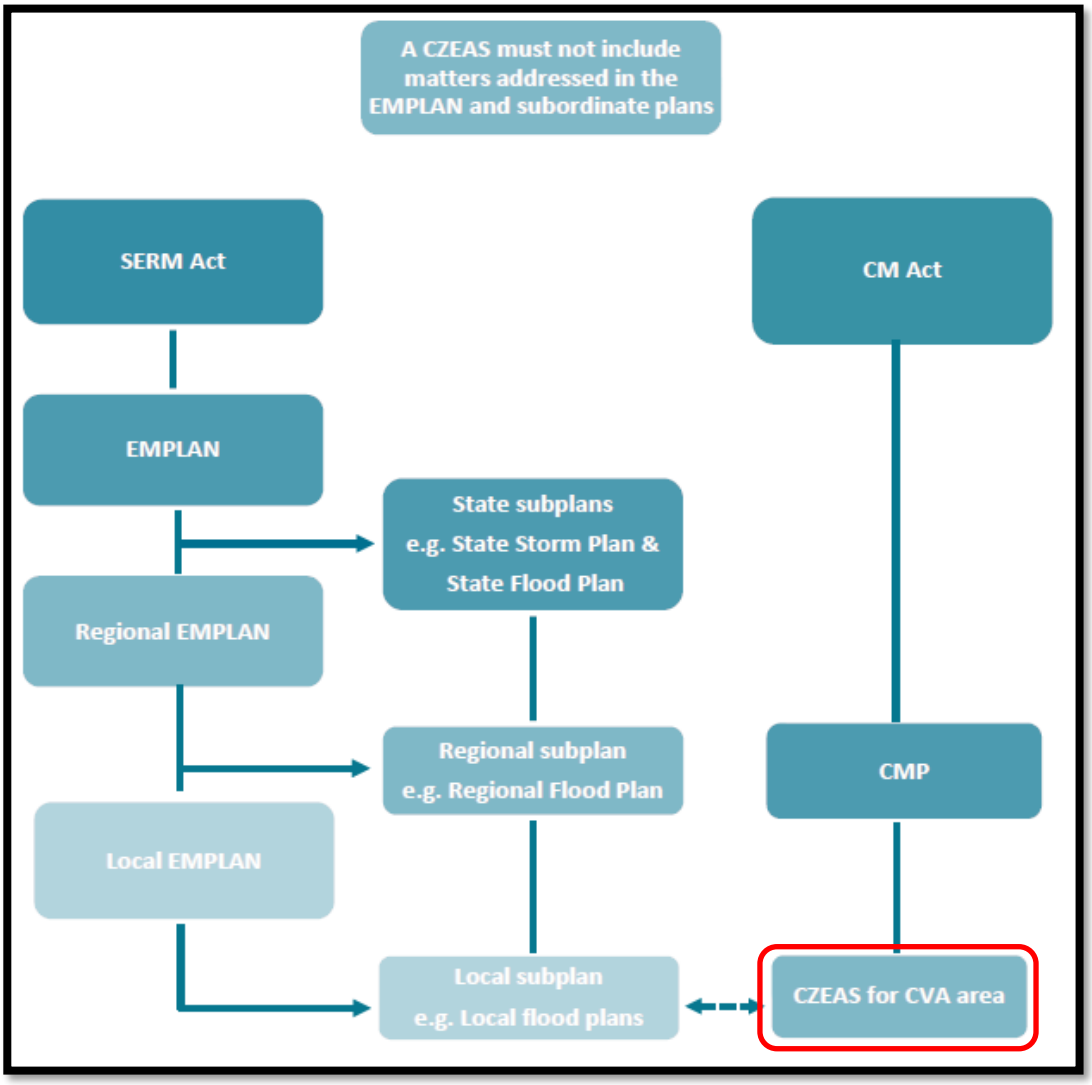


Figure E1-1: Simplified legislative framework for emergency management in NSW and its relationship with coastal management legislation and coastal management programs related to coastal hazards (DPIE, 2019), with the CZEAS outlined in red.

Council is a signatory to the Shoalhaven Local Emergency Management Plan (Shoalhaven EMPLAN 2021) (New South Wales Government, 2021a), which details arrangements for prevention of, preparation for, response to, demobilisation from, and transition of control for emergencies, between combat agencies including Council, NSW Police, Ambulance Service, NSW SES, Fire and Rescue NSW and others.

The Shoalhaven City Flood Emergency Subplan (Shoalhaven FESP) (NSW SES, 2022) was endorsed by the Shoalhaven City Council Local Emergency Management Committee as a subplan of the Local EMPLAN, and covers preparedness measures, the conduct of response operations and the coordination of immediate recovery measures from flooding and management of coastal erosion in the council area, notably through defining specific roles and responsibilities of the NSW SES, Council, and other agencies.

The LCCZEAS forms part of the CMP and is a Supporting Plan to the local emergency management plans made under the SERM Act, providing:

- objectives and scope of the LCCZEAS, consistent with the objects of the CM Act, management objectives of the CVA and the strategic direction of the CMP;

- a definition of coastal emergencies;
- criteria/thresholds/triggers for when a coastal emergency is occurring;
- a map and/or register of land and assets that are, or may be, affected by coastal inundation;
- coastal emergency actions for the four phases of emergency management: prevention, preparation, response, and recovery; and,
- a protocol for communication and engagement before, during and after an emergency event.

1 Introduction

Lake Conjola is primarily an estuarine water body with a surface area of approximately 6.9 km^2, made up of three identified basins (Lake Conjola, Berringer Lake and Pattimores Lagoon), within a coastal catchment area of 145 km^2. The Lake entrance occasionally closes, sometimes requiring Council intervention to mitigate potential flooding of low-lying areas, however it is predominantly open to the ocean and receives tidal interchange of marine waters.

The NSW Government has established a revised coastal management framework that aims to achieve a healthy and resilient coastline with thriving coastal communities. The introduction of the *Coastal Management Act 2016* (CM Act), the *State Environmental Planning Policy (Resilience and Hazards) 2021* (RH SEPP) and the NSW Coastal Management Manual (the Manual) (OEH, 2018) have been further supported by release of the NSW Coastal Design Guidelines 2023 (DPE, 2023). Prepared by local councils in accordance with the five stage process outlined in the Manual, Coastal Management Programs (CMPs) are the primary mechanism for achieving the objectives of the CM Act, and aim to set a long-term, coordinated and sustainable direction for the management of coasts and estuaries.

Council has embarked on the staged preparation of a CMP for Lake Conjola in accordance with the NSW Coastal Management Framework and with financial and technical assistance provided through the NSW Coastal and Estuary Grants Program and the NSW Department of Climate Change, Energy, the Environment and Water – Biodiversity and Conservation Division (DCCEEW - BCD). The Lake Conjola CMP provides a set of prioritised, coordinated, and cost-effective actions that, when progressively implemented, will help to ensure that Lake Conjola is ecologically healthy, resilient, attractive, and accessible.

Stage 2 of the CMP process included the identification of threats to the environmental, social and cultural assets and attributes within the Lake Conjola CMP study area, and included modelling and mapping of the current and future coastal inundation hazard.

The CM Act defines seven forms of coastal hazards[1] and requires specific emergency management considerations for impacts associated with beach erosion, coastal inundation, and coastal cliff or slope instability. The CM Act (section 15(1)(e)) outlines that a Coastal Zone Emergency Action Subplan (CZEAS) must be included in a CMP if the local council's local government area contains land within the Coastal Vulnerability Area (CVA) and beach erosion, coastal inundation and coastal cliff or slope instability is occurring on that land due to storm activity or an extreme or irregular event.

As the NSW government did not adopt a CVA map through the RH SEPP, section 15(1)(e)) of the CM Act does not apply to the Lake Conjola CMP, and preparation of a CZEAS is not required. However, it is recognised that Lake Conjola has been impacted by coastal hazards, notably coastal inundation, on several occasions, and as such it is considered appropriate to develop a CZEAS for this location. Beach erosion and coastal cliff or slope instability are not applicable coastal hazards within the Lake Conjola CMP study area. Other coastal hazards identified in section 4 of the CM Act (shoreline recession, coastal

[1] *Coastal Management Act 2016 No 20 [NSW] Part 1 Section 4 defines "coastal hazard" to mean the following:*
(a) beach erosion,
(b) shoreline recession,
(c) coastal lake or watercourse entrance instability,
(d) coastal inundation,
(e) coastal cliff or slope instability,
(f) tidal inundation,
(g) erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.

lake or watercourse entrance instability, tidal inundation and erosion and inundation of foreshores caused by tidal waters and the action of waves) are outside the scope of a CZEAS.

The context and content of the LCCZEAS is provided as follows:

Section 2	Purpose of the Lake Conjola CZEAS
Section 3	Coastal hazard emergency preparation and response framework, including the overarching NSW Planning and Legislative context for emergency events and coastal management, and a description of, and relationship between, Emergency Plans and Subplans
Section 4	Action Plan, describing triggers and actions to be implemented in each of the four phases of emergency management, being Prevention, Preparation, Response and Recovery
Section 5	Definition of coastal hazards within Lake Conjola
Section 6	Roles and responsibilities of Council, the NSW SES, and other agencies
Section 7	Communication before, during and after an emergency event
Section 8	Implementation and review of the Lake Conjola CZEAS
Section 9	Recommendations for amendments to the Shoalhaven EMPLAN and Shoalhaven FESP
Section 10	References

2 Purpose of the Lake Conjola CZEAS

The purpose of the LCCZEAS is to identify and facilitate the implementation of appropriate emergency responses for emergencies related to coastal inundation hazards that will:

- Protect human life and public safety;
- Minimise damage to property and assets;
- Minimise impacts on social, environmental, and economic values; and,
- Not create additional hazards or risks.

Actions in the LCCZEAS aim to reduce risk:

- Where coastal inundation hazard risks have not been reduced or eliminated because an agreed action in the Lake Conjola CMP has not yet been implemented or no feasible action has been identified to be implemented for this purpose;
- Where coastal inundation hazard risks remain after other actions have been implemented (residual risk); and,
- When rare and very large or unexpected events occur, outside the design criteria or capacity of agreed management actions in the Lake Conjola CMP.

The LCCZEAS has been prepared to facilitate effective emergency responses by:

- Defining a **coastal emergency** and triggers for emergency response actions;
- Identifying the locations that may be affected by coastal inundation that would constitute a coastal emergency;
- Outlining the roles and responsibilities of all public authorities (including Council) and coordinating their response to emergencies immediately preceding or during periods of coastal inundation;
- Identifying the locations and types of works that may be undertaken for the protection of property and assets;
- Outlining what actions are to be undertaken in the prevention, preparation, response and recovery phases of emergency management; and,
- Informing the public and potentially affected property owners about their responsibilities during a coastal emergency and what actions they are and are not permitted to undertake.

3 Coastal Hazard Emergency Preparation and Response Framework

A CZEAS within a CMP must not include matters dealt with in any plan made under the SERM Act (refer **Figure 3-1** and **Section 3.1**). Where actions, roles or responsibilities relating to coastal emergencies are covered by the SERM Act framework, the CZEAS should refer to the relevant plan or subplan, rather than duplicate those actions.

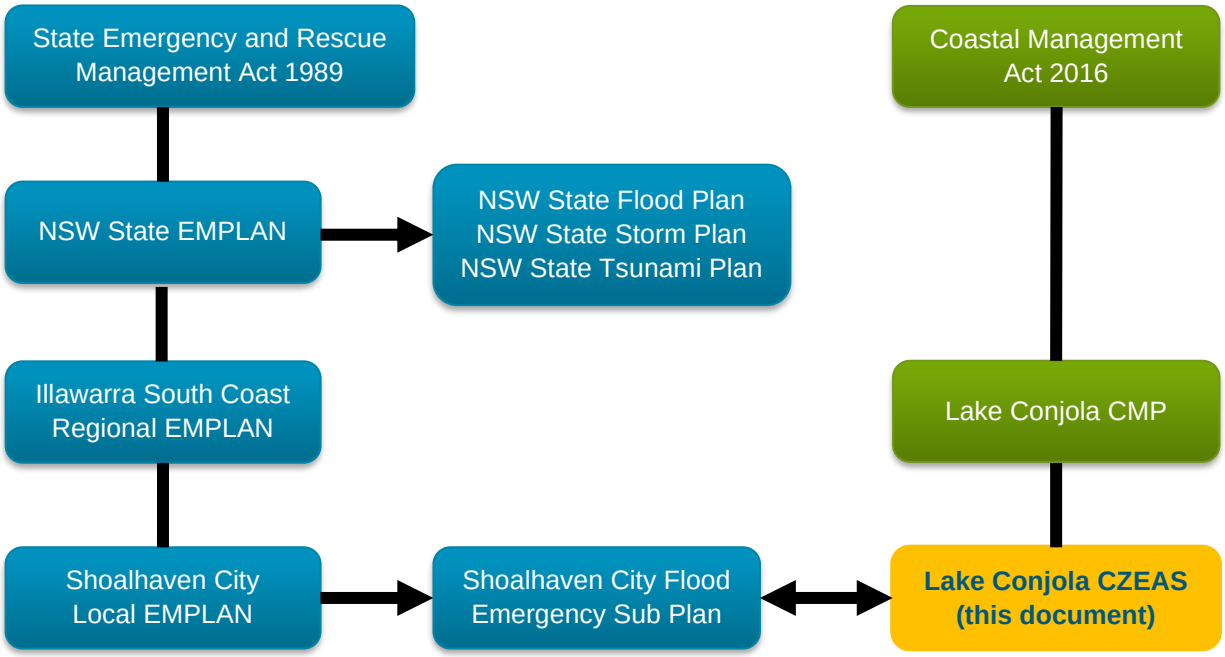


Figure 3-1: Simplified legislative framework for emergency management in NSW and its relationship with coastal management legislation and coastal management programs

The NSW State Storm Plan (New South Wales Government, 2023) is a subplan to the NSW EMPLAN (refer **Figure 3-1**), and is a comprehensive strategy to effectively prepare for and respond to severe storms across NSW. Section 1.4.4 of the plan states that the arrangements for the emergency management of flooding are dealt with in the NSW State Flood Plan (New South Wales Government, 2021).

Coastal inundation caused by storm activity is within the scope of the NSW State Storm Plan (New South Wales Government, 2023); which clarifies the respective roles of the NSW SES and Local Government in relation to coastal inundation; as follows:

- Local Government is to activate the CZEAS as required;
- NSW SES is to develop and review NSW SES Local Flood Emergency Sub Plans as required. NSW SES Local Flood Emergency Sub Plans include local level emergency response planning for coastal erosion and/or coastal inundation which may also be caused by storm events;
- Local Government is to assist the NSW SES with the protection of readily moveable household and business contents in areas where coastal storms (likely to result in coastal erosion and/or inundation) are forecast or occurring; and,

- NSW SES will control and coordinate the evacuation of affected communities/properties when there is a risk to public safety.

The NSW State Flood Plan is a subplan to the NSW State EMPLAN (refer **Figure 3-1**), and sets out the state level multi-agency arrangements for the emergency management of flooding in NSW. Section 1.4.2 of the NSW State Flood Plan defines "flooding" as:

> "*a relatively high-water level which overtops the natural or artificial banks in any part of a stream, river,* ***estuary****, lake, or dam, and/or local overland flooding associated with drainage before entering a watercourse,* ***and/or coastal inundation resulting from super-elevated sea levels and/or waves (including tsunami) overtopping coastline defences***"

Subsequently, at a strategic level, the emergency management arrangements for prevention, preparation, response, and initial recovery for still water level coastal inundation is covered by the NSW State Flood Plan. At a more regional level this issue is addressed by the Shoalhaven City Flood Emergency Sub Plan (Shoalhaven FESP).

The LCCZEAS forms part of the CMP and is a Supporting Plan to the local emergency management plans made under the SERM Act, including the Shoalhaven Local Emergency Management Plan (Shoalhaven EMPLAN, refer **Section 3.3**), and the Shoalhaven FESP (refer **Section 3.4**).

The LCCZEAS provides guidance as to actions that Council and other combat agencies can take during a "coastal inundation" emergency event, as well as recognising the actions for other types of emergency events that are described within the Shoalhaven EMPLAN and Shoalhaven FESP.

Please note:

Specific actions within the Shoalhaven EMPLAN and Shoalhaven FESP that relate to coastal hazards are repeated in ***Section 3.3*** *and* ***Section 3.4*** *below, to facilitate rapid reference during a coastal hazard emergency event.*

Additional guidance, including the definitions and locations of coastal hazards within Lake Conjola is provided in ***Section 5****, and an Emergency Action Plan that describes roles and responsibilities in a coastal hazard emergency event is provided in* ***Section 4****.*

Recommendations for amendments to the Shoalhaven EMPLAN and Shoalhaven FESP are provided in ***Section 9****.*

3.1 State Emergency and Rescue Management Act 1989

The overarching framework for emergency management in New South Wales is established by the *State Emergency and Rescue Management Act 1989* (SERM Act).

The SERM Act defines an **emergency** as follows:

> *(1) In this Act:*
> ***emergency*** *means an emergency due to an actual or imminent occurrence (such as fire, flood, storm, earthquake, explosion, terrorist act, accident, epidemic or warlike action) which:*
> *(a) endangers, or threatens to endanger, the safety or health of persons or animals in the State, or*

(b) destroys or damages, or threatens to destroy or damage, property in the State, or
(c) causes a failure of, or a significant disruption to, an essential service or infrastructure, being an emergency which requires a significant and coordinated response.

*(2) For the purposes of the definition of **emergency**, property in the State includes any part of the environment of the State. Accordingly, a reference in this Act to:*
(a) threats or danger to property includes a reference to threats or danger to the environment, and
(b) the protection of property includes a reference to the protection of the environment.

The SERM Act outlines roles and responsibilities for all emergency management in NSW. The SERM Act specifies:

- That emergency management committees are established at the state, regional and local levels;
- That emergency management plans (EMPLANs) are prepared and reviewed at the state, regional and local level;
- Arrangements for controlling emergency operations; and,
- Responsibilities of emergency operations controllers.

The NSW SES is the designated combat agency for management of floods, tsunami, and storms, including severe storms which can be associated with coastal inundation. The NSW SES prepared the State Storm Plan, State Flood Plan and State Tsunami Plan, which are subplans to the NSW EMPLAN.

3.2 Coastal Management Act 2016

The CM Act identifies specific emergency management considerations associated with beach erosion, coastal inundation and cliff instability. The CM Act (section 15(1)(e)) outlines that a CZEAS must be included in a CMP if the local council's local government area contains land within the Coastal Vulnerability Area (CVA), and beach erosion, coastal inundation and coastal cliff or slope instability is occurring on that land due to storm activity or an extreme or irregular event.

As the NSW government did not adopt a CVA map, section 15(1)(e)) of the CM Act does not apply to the Lake Conjola CMP, and preparation of a CZEAS is not required. However, it is recognised that Lake Conjola has been impacted by coastal hazards, notably coastal inundation, on several occasions, and as such it is considered appropriate to develop a CZEAS for this location. Beach erosion and coastal cliff or slope instability are not applicable coastal hazards within the Lake Conjola CMP study area. Other coastal hazards identified in section 4 of the CM Act (shoreline recession, coastal lake or watercourse entrance instability, tidal inundation and erosion and inundation of foreshores caused by tidal waters and the action of waves) are outside the scope of a CZEAS.

Mandatory requirements for a CMP, including the preparation of a CZEAS where required, are identified in Part A of the Coastal Management Manual (OEH, 2018). Further direction on the preparation of a CZEAS is provided in the *"Guideline for preparing a coastal zone emergency action subplan"* (DPIE, 2019).

Relevant statutory provisions from the CM Act as they relate to the preparation of a CZEAS:

15 Matters to be dealt with in coastal management program

(1) A coastal management program must:

(e) if the local council's local government area contains land within the coastal vulnerability area and beach erosion, coastal inundation or cliff instability is occurring on that land, include a coastal zone emergency action subplan.

(3) A coastal zone emergency action subplan is a plan that outlines the roles and responsibilities of all public authorities (including the local council) in response to emergencies immediately preceding or during periods of beach erosion, coastal inundation or cliff instability, where the beach erosion, coastal inundation or cliff instability occurs through storm activity or an extreme or irregular event. For the purposes of this subsection, those roles and responsibilities include the carrying out of works for the protection of property affected or likely to be affected by beach erosion, coastal inundation or cliff instability.

(4) A coastal management program must not include the following:

(a) matters dealt with in any plan made under the State Emergency and Rescue Management Act 1989 in relation to the response to emergencies,
(b) proposed actions or activities to be carried out by any public authority or relating to any land or other assets owned or managed by a public authority unless the public authority has agreed to the inclusion of those proposed actions or activities in the program.

Relevant mandatory requirements of the Coastal Management Manual Part A:

Requirements for preparing a CMP which includes a proposed or mapped coastal vulnerability area

10. Where coastal hazards have been identified in a coastal management area, a CMP must identify proposed coastal management actions for those hazards.

11. If the CM Act requires that a coastal zone emergency action subplan be prepared, it must identify any requirements for how emergency coastal protection works, within the meaning of the CM SEPP, are to be carried out.

Note: Section 2.16(4) of the RH SEPP defines emergency coastal protection works to mean '*works comprising the placement of sand, or the placing of sandbags for a period of not more than 90 days, on a beach, or a sand dune adjacent to a beach, to mitigate the effects of coastal hazards on land*'.

3.3 Shoalhaven Local Emergency Management Plan

The Shoalhaven Local Emergency Management Plan (Shoalhaven EMPLAN) (Shoalhaven City Council, 2021) details arrangements for prevention of, preparation for, response to, demobilisation from and transition of control for emergencies.

It encompasses arrangements for:

- emergencies controlled by combat agencies;
- emergencies controlled by combat agencies and supported by the Local Emergency Operations Controller (LEOCON);
- emergency operations for which there is no combat agency; and,
- circumstances where a combat agency has passed control to the LEOCON.

The following principles are applied in the Shoalhaven EMPLAN:

a) The Emergency Risk Management (ERM) process is to be used as the basis for emergency planning in New South Wales.

b) Responsibility for preparation, response and recovery rests initially at Local level and augmented by those at Regional level as required.

c) Control of emergency response and recovery operations is conducted at the lowest effective level.

d) Agencies may deploy their own resources from their own service from outside the affected Local area or Region if they are needed.

e) The LEOCON is responsible, when requested by a combat agency, to coordinate the provision of resources support.

f) Emergency preparation, response and recovery operations should be conducted with all agencies carrying out their normal functions wherever possible.

g) Prevention measures remain the responsibility of authorities/agencies charged by statute with the responsibility.

Annexure B of the Shoalhaven EMPLAN provides a summary of hazards that have risk of causing loss of life, property, utilities, services and/or the community's ability to function within its normal capacity, i.e. identified as having the potential to create an emergency. Annexure B does not identify "coastal hazards" (as defined in the CM Act) as having the potential to create an emergency.

*Please note: Recommendations for amendments to the Shoalhaven EMPLAN are provided in **Section 9**.*

3.4 Shoalhaven Flood Emergency Sub Plan

The Shoalhaven Flood Emergency Sub Plan (Shoalhaven FESP) (NSW SES, 2022) is a sub plan of the Local EMPLAN and specifically covers preparedness measures, the conduct of response operations and the coordination of immediate recovery measures from flooding within the Shoalhaven City Council area. It covers operations for all levels of flooding and makes reference to coastal erosion in the council area, notably through defining specific roles and responsibilities of the NSW SES, Council, and other agencies.

The Shoalhaven FESP defines a 'flood' as "*a relatively high water level which overtops the natural or artificial banks in any part of a stream, river, estuary, lake, or dam, and/or local overland flooding associated with drainage before entering a watercourse, and/or **coastal inundation** resulting from super-elevated sea levels and/or waves (including tsunami) overtopping coastline defences*". As such, this definition captures coastal inundation hazards.

Under Section 3 Prevention / Mitigation, in relation to floodplain risk management it is stated that "*NSW SES will provide coordinated and consistent emergency management advice to councils and other agencies in relation to the management of land that is subject to flooding or coastal inundation*".

The general responsibilities of emergency service organisations and supporting services (functional areas) are listed in the Local and State Emergency Management Plans (EMPLANs), however some responsibilities relevant to coastal hazards are expanded upon within the Shoalhaven FESP. Under Appendix B Roles and Responsibilities, the following specific responsibilities for coastal hazards are nominated:

- Shoalhaven City Council

- Establish and maintain floodplain and **coastal risk management committees** and ensure that key agencies are represented.

- Energy and Utilities Services Functional Area
  - Advise NSW SES of any hazards from utility services during flooding and **coastal erosion/inundation**.
  - Advise the public with regard to electrical hazards during flooding and **coastal erosion/inundation**, and to the availability or otherwise of the electricity supply.

*Please note: Recommendations for amendments to the Shoalhaven FESP are provided in **Section 9**.*

4 Criteria for Initiating a Coastal Inundation Emergency Response

4.1 General

Section 5.1.1 of the Shoalhaven FESP states that flood response operations will begin:

- On receipt of a Bureau Severe Weather Warning or Thunderstorm Warning that includes heavy rain or storm surge; or,
- On the receipt of a Bureau Flood Watch or Flood Warning; or,
- On receipt of warnings for flash flood; or,
- On receipt of a dam failure alert; or,
- When other evidence leads to an expectation of flooding.

The Bureau of Meteorology (BoM) provide severe weather warnings for potentially hazardous or dangerous weather include damaging or destructive winds, heavy rain, abnormally high tides, damaging waves and blizzards in Alpine areas. When the waves are expected to be powerful enough to cause damage to property or significant erosion to beaches the BoM will issue a Coastal Hazard Warning for Damaging Surf. When water levels are forecast to be higher than the highest astronomical tide and could flood low lying coastal areas, the BoM will issue a Coastal Hazard Warning for Abnormally High Tides.

The BoM specifies the following thresholds for issuing warnings for ‘severe storms’:

- Wind equals to or exceeding 90km/h (damaging), 125km/h (destructive), or average wind speed equal to or exceeding 63km/h.
- Tornadoes.
- Rainfall with sufficient intensity to cause flash flooding (generally 10% Annual Exceedance Probability (AEP) event or rarer, i.e. lower AEP).
- Hailstones of at least 2cm in diameter.
- Waves equal to or exceeding 5m in height in the surf zone.
- Sea level higher than 50cm above the Highest Astronomical Tide (Abnormally High Tides and Storm Surge).

These are the same thresholds as those used by the NSW SES as a primary test of whether or not they should be involved in a potential coastal erosion and/or inundation event. It is under these conditions where oceanic water levels at the entrances of the estuaries would be elevated and would have the potential to propagate inside the estuary. Consequently, the above criteria and the issue by the BoM of a Coastal Hazard Warning for Damaging Surf or a Coastal Hazard Warning for Abnormally High Tides will trigger the application of the LCCZEAS for coastal inundation events.

In addition to the official warnings from the BoM, the NSW State Storm Plan stipulates that the response phase of the storm plan is triggered when information processes or intelligence indicates imminent or actual storm impacts to the community. For example, if there is no official warning from the BoM, other evidence may be used to determine that there is a risk of coastal inundation risk to the community that will trigger the actions in this CZEAS i.e. verbal advice from the BoM, or advice issued from the DCCEEW - BCD Coastal Expert.

4.2 Emergency Response Action Plan

The emergency response actions described in this subplan have been developed to cover the four phases of emergency management as described in the SERM Act and the Guideline for preparing a coastal zone emergency action subplan (DPIE, 2019), and illustrated in **Figure 4-1**.

Figure 4-1: The four phases of emergency management (source DPIE, 2019)

The following tables provide a list of actions for the LCCZEAS including:

- triggers for implementation of the LCCZEAS; and,
- the identification of actions that Council should undertake before, during and after a coastal inundation emergency.

Note that the LCCZEAS is independent of the Shoalhaven City FESP but may be triggered at the same time as the FESP. Council will need to fulfil its required responsibilities and undertake actions under that Plan in conjunction with the actions outlined in this LCCZEAS.

Triggers for initiation of the various phases of emergency management are outlined in **Table 4-1**. Actions to be undertaken during each phase are provided in **Table 4-2**, **Table 4-3**, **Table 4-4**, and **Table 4-5**. Identification of triggers will require the ongoing monitoring of coastal conditions and events, including the following sources of information:

- weather conditions (measurements, warnings and forecasts);
- nearshore wave forecasts (height and direction) available at https://nearshore.waves.nsw.gov.au/home/forecast;
- ocean water level (tidal) predictions at Ulladulla Boat Harbour automatic gauge (Station No. 216471) available at https://mhl.nsw.gov.au/Station-216471;
- real-time offshore wave conditions at the Port Kembla Waverider Buoy via the MHL website (https://www.mhl.nsw.gov.au/Station-PTKMOW);
- real-time ocean water level conditions at the Ulladulla Boat Harbour automatic gauge (Station No. 216471) available at https://mhl.nsw.gov.au/Station-216471;
- real-time lake water level conditions at Lake Conjola Downstream tide gauge (Station No. 216420D) available at https://mhl.nsw.gov.au/Site-216420D);
- Total Flood Warning System (TFWS) predictions; and,
- Seeking advice from NSW SES, BoM or coastal experts from DCCEEW to assess potential for occurrence of coastal inundation emergency. Using this information to assess threats to life and property arising from a coastal inundation emergency.

Table 4-1: Triggers for initiation of emergency management phases

Emergency Management Phase	Trigger
Prevention Phase	Prevention actions are to be undertaken as soon as practicable and are independent of the occurrence of a coastal inundation emergency.
Precaution Preparedness Phase	If ocean waves in 10m water depth off the entrance to Lake Conjola are predicted to exceed Hs = 5 m (according to https://nearshore.waves.nsw.gov.au/home/forecast) and ocean tide levels at the Ulladulla Boat Harbour tide gauge (Station No. 216471) are predicted to exceed 0.6m AHD (approximately MHWS) according to tidal prediction charts (https://mhl.nsw.gov.au/Station-216471) within the next 5 days, or other intelligence is received from BoM, DCCEEW or NSW SES that water levels may cause coastal inundation in the Study Area within 5 days, this will trigger the Precaution Preparedness Phase of the LCCZEAS.
Response Phase	Response Phase of the LCCZEAS triggered IF: • If ocean waves in 10m water depth off the entrance to Lake Conjola are predicted to exceed Hs = 5 m (according to https://nearshore.waves.nsw.gov.au/home/forecast) within the next 12 hours and ocean tide levels at the Ulladulla Boat Harbour tide gauge (Station No. 216471) are predicted to exceed 0.6m AHD (approximately MHWS) according to tidal prediction charts (https://mhl.nsw.gov.au/Station-216471) within next the 12 hours; OR, • if a Coastal Hazard Warning for Damaging Surf or Abnormally High Tides is issued; OR, • if the NSW SES is mobilised under the Shoalhaven City FESP.
Recovery Phase	Initiate the Recovery Phase of the LCCZEAS 24 hours after the cancellation of the Coastal Hazard Warning from the Bureau of Meteorology, AND once real-time monitoring at Lake Conjola Downstream tide gauge (Station No. 216420D https://mhl.nsw.gov.au/Site-216420D) indicates that water levels at high tide have fallen below 1m AHD.

Table 4-2: Prevention Phase actions for CZEAS for Lake Conjola CMP

Action	Description	Timing	Responsibility
1.1	**Inform:** Make this CZEAS available to all relevant Stakeholders identified in **Section 6**.	Ongoing	Council
1.2	**Inform:** Provide advice to the community, landholders, and the NSW SES about the potential for a coastal inundation emergency – and the types of responses that are and are not permitted.	Ongoing	Council
1.3	**Inform:** Inform the community of Council's intended coastal inundation emergency responses under this CZEAS	Ongoing	Council
1.4	**Review:** Through the Local Emergency Management Committee (LEMC), consult with SES, DCCEEW, Local Police, LEOCON, FRNSW to ensure this CZEAS remains consistent the relevant local, regional, and state-based emergency management plans (see **Figure 3-1**).	Within 6 months of EMPLAN updates	Council
1.5	**Review:** Review and update this CZEAS in line with any future updates to the CVA Mapping or CMP implementation.	During CMP preparation and review	Council NSW SES
1.6	**Review:** Assess threats to life and property arising from a coastal inundation emergency through the CMP process.	During CMP preparation and review	Council
1.7	**Plan:** Apply development controls to developments in the coastal inundation hazard areas in accordance with the Shoalhaven LEP and DCP.	Ongoing	Council
1.8	**Plan:** Develop protocols between Council and NSW SES and LEOCON in relation to operational activities for situations where an Emergency Operations Centre (EOC) is not established.	Upon finalisation of CZEAS, and with review annually	Council NSW SES
1.9	**Plan:** Establish internal operational protocol and procedures for all coastal inundation hazard scenarios for LEMO, Council's coastal officers and works crews, and communications staff.	Upon finalisation of CZEAS, and with review annually	Council

Table 4-3: Preparedness Phase actions for CZEAS for Lake Conjola CMP

Action	Description	Timing	Responsibility
"Sunny Day" Preparedness			
2.1	**Inform:** Inform community members and businesses about the need to develop a household / business Emergency Management Plan (EMP) for the coastal inundation hazard.	Ongoing	Council
2.2	**Inform:** Inform Council staff about the emergency responses within this plan and ensure relevant personnel have the copies of the plan.	Ongoing	Council
2.3	**Plan:** The LEMC will review the Shoalhaven Local EMPLAN every three (3) years as per **Table 6-1** to ensure interoperability preparedness.	Ongoing	LEMC
2.4	**Plan:** Prepare an up-to-date list of contact details for key Council staff involved in coordinating actions under the CZEAS (include responsibilities of staff who prepare for, manage and coordinate recovery from a coastal inundation emergency event) and individuals from whom Council may need advice, such as DCCEEW staff, or with whom to integrate from other emergency sectors).	Ongoing	Council
2.5	**Plan:** Prioritise planning and response to maximise (to the greatest extent practical) continued functionality for essential infrastructure during an emergency event.	Ongoing	Council
2.6	**Plan:** Develop an operations procedure to guide Council's response to coastal inundation emergency events (including resourcing, internal training, testing and periodic review).	Ongoing	Council
2.7	**Monitor:** Undertake regular monitoring of coastal conditions for indications of approaching coastal inundation hazards.	Ongoing.	Council

Action	Description	Timing	Responsibility
Precaution Preparedness – where triggers for Response Phase are anticipated			
2.8	**Plan:** Ensure signage to close Council-managed access tracks, foreshore reserves, roads and other public areas, and signage warning pedestrians of coastal inundation hazard risks are available for use during coastal emergencies. Ensure sufficient sandbags, sand stockpiles, warning signage and road closure barricades/tape are available for use if required (e.g. to close off damaged and potentially dangerous roads or access points). A list of roads and access points to be considered is provided in **Section 5** and are mapped in **Appendix A**.	Ongoing	Council
2.9	**Plan:** Ensure appropriate plant, equipment and experienced personnel are available for protection of assets at risk. Both internal and external personnel will be required based on specific scope of works.	Ongoing	Council
2.10	**Monitor:** Monitor events and triggers that will activate the Response Phase.	Ongoing	Council

Table 4-4: Response Phase actions for CZEAS for Lake Conjola CMP

Action	Description	Timing	Responsibility
3.1	**Monitor:** Monitor events and triggers that will activate the Response Phase.	Ongoing	Council NSW SES
3.2	**Plan:** The LEMC (inc. Council LEMO) should consider Council advice regarding Warnings and Triggers, and advice provided by the NSW BoM. From here SEOCON, REOCON, LEOCON and NSW SES are to decide on the emergency management process (supported by Council). This may include the establishment of an Emergency Operations Centre (EOC).	Response Phase activated	SEOCON REOCON LEOCON NSW SES
3.3	**Plan:** No actions undertaken should impede, conflict, or overlap with those of response agencies under the SERM Act unless there is prior agreement between the relevant parties.	Response Phase activated	Council

Action	Description	Timing	Responsibility
3.4	**Communicate:** Implement the communication protocol in conjunction with the combat agency (NSW SES) to advise landholders, residents, public authorities and other organisations that a coastal inundation emergency is likely or is occurring and that actions in this CZEAS are to be implemented. When EOC not is in place, communications are to be directed through the communications business partner for the Coastal Management Unit. LEMO to be copied into all communications for oversight Release media information as necessary to keep the community informed.	Response Phase activated	Council NSW SES
3.5	**Prepare:** Place appropriate emergency plant and equipment on stand-by and accessible for use. Have authorised personnel ready to access sandbags, sand stockpiles, warning signage and road closure barricades/tape for use where required (e.g. to close off damaged and potentially dangerous roads or access points). Ensure the stockpiles of equipment will be accessible when water levels rise, or sufficient access to equipment is obtained prior to water levels rising. A list of roads and access points to be considered is provided in **Section 5**.	Response Phase activated	Council
3.6	**Monitor:** At locations that are impacted – or expected to be impacted - by coastal inundation, undertake monitoring of coastal inundation conditions on a daily basis (minimum), preferably during high tide. This includes monitoring: • The need for barriers and safety signage to be erected in Council-managed access tracks, foreshore reserves, and other public areas. • The need to close off damaged and potentially dangerous roads and access points. • The need for sandbagging to be deployed to protect public assets. • The need to enact other response measures.	Response Phase activated Only if/when safe to do so	Council
3.7	**Close Foreshore Access:** Close access to public foreshore reserves and other public areas. Erect barricades and signs, where possible.	As required. Only if/when safe to do so	Council
3.8	**Close Roads:** Close affected Council managed roads or liaise with road owners to enable closure. Erect barricades and signs as necessary.	As required. Only if/when safe to do so	Council

Action	Description	Timing	Responsibility
3.9	**Manage Essential Infrastructure:** Through consultation with utilities providers (such as Shoalhaven Water) assess the requirement and options for utilities management where such infrastructure becomes or is likely to become affected by coastal inundation. Erect barricades and signs, as necessary.	As required.	Council
3.10	**Respond:** Seek specialist coastal engineering advice where required.	As required.	Council DCCEEW
3.11	**Respond:** Seek advice from DCCEEW staff as required.	As required.	Council DCCEEW

Table 4-5: Recovery Phase actions for CZEAS for Lake Conjola CMP

Action	Description	Timing	Responsibility
4.1	**Monitor:** Monitor physical environmental conditions and BoM Coastal Hazard Warnings to assess whether the trigger conditions to initiate the recovery phase have been reached. Initiate Recovery phase of CZEAS once waves and water levels have fallen below trigger levels.	Once trigger is reached.	Council
4.2	**Restore:** Assess and reopen Council-managed roads and access points once inspections have been carried out by the relevant authority and deemed safe to do so. Seek professional advice as required. Maintain temporary safety fencing and associated warning signage, as necessary.	Following an emergency event. Once it is safe to do so.	Council
4.3	**Restore:** Remove, replace, or repair minor infrastructure (e.g., picnic facilities, garbage bins etc.) that have been impacted on by inundation events where required.	Following an emergency event. Once it is safe to do so.	Council
4.4	**Restore:** Removal of storm debris that poses high risk to public safety, in line with Council's Foreshore Reserves Policy (POL19/76) and associated contemporary risk assessment on a site-by-site basis.	Following an emergency event. Once it is safe to do so.	Council
4.5	**Restore:** Restore access to foreshore reserves and other public areas.	Following an emergency event. Once it is safe to do so.	Council
4.6	**Monitor:** Investigate any unauthorised coastal works and monitor as necessary.	Ongoing	Council

Action	Description	Timing	Responsibility
4.7	**Inform:** Liaise with property owners to ensure any private and/or public structures do not pose a risk to the public.	Ongoing	Council
4.8	**Inform:** If necessary, issue orders under the *Local Government Act 1993* and/or the *Environmental Planning and Assessment Act 1979* when properties are deemed structurally unsafe or pose a risk to the public.	As required.	Council
4.9	**Record:** Undertake post-storm reconnaissance of affected areas to gather intelligence including recording of maximum inundation levels, mapping of inundation extents, surveys of debris marks, post-event damage assessments etc. Use the intelligence gathered to improve future CZEAS operations and share resources/work with the NSW SES and DCCEEW to assist in future decision-making. Collate and maintain photographic and written records of events and decision making processes.	Following an emergency event. Once it is safe to do so.	Council
4.10	**Inform:** Erect permanent warning signs if necessary.	Following an emergency event.	Council
4.11	**Restore:** Replenish any emergency materials and supplies for future emergency events.	Following an emergency event.	Council NSW SES
4.12	**Restore:** Assess, repair and/or replace any essential Council-owned/managed structures that are damaged as a result of a coastal inundation emergency. Such structures may include Council-owned roads, sewerage and water supply infrastructure, jetties/wharves, boat ramps, foreshore accessways, pathways and foreshore erosion protection structures. Assess the structural integrity of unprotected assets affected by or damaged during the inundation emergency event. Seek professional advice as required.	Following an emergency event. Once it is safe to do so	Council
4.13	**Communicate:** Participate in post-event community engagement coordinated by Council e.g. community forums, workshops, or other opportunities to provide communities a chance to provide feedback, address any concerns and provide input into the recovery process. These will typically include other agencies such as the Bureau of Meteorology and Welfare Services.	As required	Council DCCEEW BoM

Action	Description	Timing	Responsibility
4.14	**Review:** Undertake After Action critical review of the CZEAS in conjunction with NSW SES, DCCEEW and LEMC to assess its effectiveness. Update this Subplan as required as part of future CMP preparation and review to improve future coastal inundation emergency management operations. Lessons learnt from the emergency event may be documented and applied back to the prevention and preparedness phases for future coastal inundation emergency events.	Within 2 weeks of plan activation or as necessary. During CMP preparation and review	Council NSW SES DCCEEW

5 Areas at Risk

Stage 2 of the CMP process included the identification of threats to the environmental, social and cultural assets and attributes within the Lake Conjola CMP study area, and included modelling and mapping of the current and future coastal inundation hazard.

Coastal inundation or ocean storm flooding occurs when a combination of meteorological processes raise ocean water levels above normal tidal elevations and inundates low-lying areas, and/or overtops dunes, structures and barriers. The elevated ocean water levels are due to storm surge (increase in water level due to low barometric pressure plus wind setup), wave setup, wave run-up and over-wash flows.

Storm surge and powerful waves can also penetrate Lake Conjola (particularly if the entrance is open), giving rise to strong currents, as well as elevating the water levels inside the Lake. In the longer-term, the extent of coastal inundation will increase due to sea level rise.

NSW coastal hazard assessment guidelines (OEH, 2010) recommend a 1 in 100 (chance of occurrence each year) ocean storm event for assessing potential risks from coastal inundation. The estimated extent of coastal inundation occurring under present day conditions (excluding sea level rise) from a 1 in 100 year ocean storm event and a typical non-scoured entrance condition is shown on the maps provided in **Appendix A**.

The extent of coastal inundation covers the same low-lying areas of the Lake Conjola foreshore as those areas identified in the Shoalhaven FESP (refer Map 18 Lake Conjola Town Map in Volume 2: Hazard and Risk in Shoalhaven City). Infrastructure and assets that are at risk of coastal inundation under present day conditions are summarised in **Table 5-1**.

Table 5-1: Infrastructure and assets subject to present day coastal inundation risk

Infrastructure or Asset Type/Name	Street Address	Location
Road	Murrays Road	Fishermans Paradise
Fishermans Paradise Boat Ramp (asset ID 13003600)	Anglers Parade	Fishermans Paradise
Hazel Robotham Reserve	Anglers Parade	Fishermans Paradise
The Leaning Oak Holiday Lifestyles	Lake Conjola Entrance Road	Lake Conjola Village
Ingenia Holidays Lake Conjola	Norman Street	Lake Conjola Village
Norman Street trailer launching ramp	Norman Street	Lake Conjola Village
Road	Norman Street	
Edwin Avenue Reserve	Edwin Avenue	Lake Conjola Village
Road	Edwin Avenue	Lake Conjola Village
Road	Milham Street	Lake Conjola Village
Road	Garrad Way	Lake Conjola Village
Lake Conjola Deepwater Resort	Garrad Way	Lake Conjola Village
Road	Lake Conjola Entrance Road	Lake Conjola Village
Road	Aney Street	Lake Conjola Village

Infrastructure or Asset Type/Name	Street Address	Location
Seachange Parks Lake Conjola	Aney Street	Lake Conjola Village
Arthur Jones Reserve	Lake Conjola Entrance Road	Lake Conjola Village
Lake Conjola Community Centre	Lake Conjola Entrance Road	Lake Conjola Village
Lake Conjola Tennis Courts	Lake Conjola Entrance Road	Lake Conjola Village
Aney Street Boat Ramp (asset ID 15005856)	Aney Street	Lake Conjola Village
Lake Conjola Waterfront Holiday Park	Aney Street	Lake Conjola Village
Foreshore Reserve	Aney Street	Lake Conjola Village
Foreshore Reserve	Carroll Avenue	Lake Conjola Village
Road	Carroll Avenue	Lake Conjola Village
Foreshore Reserve	Carroll Avenue	Lake Conjola Village
Road	Marshal Avenue	Lake Conjola Village
Holiday Haven Lake Conjola	Lake Conjola Entrance Road	Lake Conjola Village
Conjola Beach Boat Ramp (asset ID 13003599)	Lake Conjola Entrance Road	Lake Conjola Village
Yooralla Bay Boat Ramp (asset ID 13003651)	Valley Drive	Conjola Park
Yooralla Bay Jetty (asset ID 13003658)	Valley Drive	Conjola Park
Yooralla Bay foreshore reserve	Valley Drive / Kurrajong Crescent / Windermere Drive	Conjola Park
Berringer Lake Boat Ramps (asset IDs 13003642, 15005846)	Berringer Crescent	Berringer Lake

Council does not intend to protect private property from coastal inundation hazards before or during an emergency event, and proposes only to undertake the actions identified in **Section 4.2** of this Subplan. Due to the nature of the coastal inundation events that may impact the study area, including the depth, area impacted and large number of properties potentially affected, it is not considered practical for Council or private property owners to install emergency coastal protection works that would be capable of protecting property from coastal inundation.

6 Roles and Responsibilities

The general responsibilities of emergency services organisations and support agencies are listed in the NSW State Storm Plan (NSW Government, 2023), NSW State Flood Plan (NSW Government, 2021), NSW EMPLAN (NSW Government, 2018), and the Shoalhaven FESP (NSW SES, 2022). **Table 6-1** summarises the roles and responsibilities of these stakeholders that are specifically relevant to the LCCZEAS.

Table 6-1: Roles and Responsibilities

Organisation / Personnel	Responsibilities
Shoalhaven City Council	• Prepare, maintain, and update this CZEAS (NSW Government, 2023). • Provide the NSW SES with a copy of this CZEAS (NSW Government, 2023). • Assist the NSW SES with community awareness programs to ensure people in locations potentially threatened by coastal inundation understand the threat and its management (NSW Government, 2023). • Prevention & Preparation: Implement the Prevention and Preparation Phase emergency actions prior to a coastal inundation emergency event occurring. • Response: In the event of a coastal inundation emergency at a location at risk, activate this CZEAS and implement the Response Phase emergency actions for the duration of the coastal inundation emergency event. • Recovery: Implement the Recovery Phase emergency actions following a coastal inundation emergency event. • Under the CM Act, Council is the designated coastal authority with responsibility for care of public land within its care, control, and management. The carrying out (or authorising and coordinating) of coastal inundation emergency protective works to protect public assets from coastal inundation is Council's role, if it chooses to undertake such measures. • Assist the NSW SES with reconnaissance of areas susceptible to coastal inundation. • Assist, at their request, the Police, NSW SES, and Local Emergency Operations Controller (LEOCON) in dealing with a coastal inundation emergency. • Liaise with the NSW SES Local Controller to provide advice regarding the need for response actions by the NSW SES such as evacuations.

Local Emergency Management Committee (LEMC)	• The LEMC is constituted under the SERM Act for each local government area and is responsible for preparing plans for response and recovery from emergencies.
	• The LEMC is chaired by the Chief Executive Officer or their nominated representative from Shoalhaven City Council (Shoalhaven City Council, 2023). Represented on the LEMC are combat agencies including:
	  ○ Police
	  ○ Rural Fire Service
	  ○ Fire and Rescue NSW
	  ○ State Emergency Services
	  ○ Surf Life Saving NSW
	  ○ Marine Rescue
	• The LEMC will review the Shoalhaven Local EMPLAN every three (3) years, or following any (Shoalhaven City Council, 2021):
	  ○ Activation of the Plan in response to an emergency;
	  ○ Legislative changes affecting the Plan;
	  ○ Exercises conducted to test all or part of the Plan;
	  ○ In the event of that deficiencies are identified; or,

Organisation / Personnel	Responsibilities
	○ Change of roles and responsibilities.
Local Emergency Operations Controller (LEOCON)	• Monitor coastal emergency event operations. • When requested by a combat agency, to coordinate the provision of resources support (Shoalhaven City Council, 2021). • Act as the combat/responsible agency in the event of (Shoalhaven City Council, 2021): ○ Utilities failure ○ Bridge collapse ○ Building collapse ○ Landslip ○ Transport emergency – air/rail/road/sea • Coordinate support for the NSW SES Local Incident Controller if requested to do so (NSW SES, 2022; Shoalhaven City Council, 2021).
Shoalhaven City Council Local Emergency Management Officer (LEMO)	• If requested by the NSW SES Incident Controller, advise appropriate agencies and officers of the start of response operations (NSW SES, 2022). • Provide executive support to the LEMC and LEOCON in accordance with the Shoalhaven Local EMPLAN (Shoalhaven City Council, 2021).
NSW State Emergency Service (NSW SES) Local Unit Members	• Act as the combat/responsible agency for damage control and the coordination of community evacuation during the following coastal zone hazards as per the Shoalhaven Local EMPLAN (Shoalhaven City Council, 2021): ○ Flooding. ○ Storms. ○ Tsunamis. • NSW SES roles and responsibilities in relation to storms are detailed within the NSW State Storm Plan (NSW Government, 2023), and where relevant the NSW State Flood Plan (NSW Government, 2021). Responsibilities may include: ○ Assist in the collection of flood and coastal inundation information for the development of intelligence. ○ Evacuation. ○ Delivery of warnings. ○ Assisting with road closures and traffic control operations. • Undertake preparedness education related to its legislated responsibilities of flood, storm, and tsunami.
NSW SES Local Controller	• Deal with floods as per the Shoalhaven City Flood Emergency Sub Plan (NSW SES, 2022). • Identify and monitor people and/or communities at risk of flooding. • Provide an information service in relation to: ○ Coastal inundation. ○ Road conditions and closures (general information only). ○ Confirmation of evacuation warnings. • Direct the evacuation of people and/or communities. • Ensure caravan parks are advised of coastal inundation warnings. • Coordinate the collection of coastal inundation information for development of intelligence.
NSW Rural Fire Service (RFS)	Roles and responsibilities are outlined in NSW State Storm Plan (NSW Government, 2023) and NSW State Flood Plan (NSW Government, 2021) and include:

Organisation / Personnel	Responsibilities

	• Identify and notify the NSW SES of any locations at risk of fire or hazardous materials that pose a significant threat to surrounding populations due to the impact of a flood for incorporation into NSW SES flood intelligence and planning.
	• Conduct HAZMAT operations including asbestos risks, arising from flood and storm emergencies in coordination with the SES Incident Controller.
	• Assist the NSW SES with the:
	  ○ Delivery of evacuation warnings and the conduct of evacuations.
	  ○ Warning and/or evacuation of at-risk communities.
	  ○ Monitoring/reconnaissance of flood prone areas.
	• Provide equipment for pumping flood water out of buildings and from low-lying areas.
	• Assist with clean-up operations, including the hosing of flood affected properties.

Ambulance Service of NSW	The roles and responsibilities for NSW Ambulance are outlined in the Health Services (HEALTHPLAN) Supporting Plan and NSW State Flood Plan (NSW Government, 2021). Roles and responsibilities in addition those include: • Participate in NSW SES briefings, training & exercises as required. • Provide a Liaison Officer to the NSW SES State Command or Incident Control Centre/s as required. • Provide Incident Management Personnel and Liaison Officers to the NSW SES where required.

Australian Government Bureau of Meteorology (BoM)	Roles and responsibilities are outlined in NSW State Storm Plan (NSW Government, 2023) and NSW State Flood Plan (NSW Government, 2021) and include:
	• The BoM issue public weather and storm warning products before and during a storm (NSW Government, 2023). These may include:
	  ○ Coastal Hazard Warnings (including for Damaging Surf, and Abnormally High Tides).
	  ○ Severe Thunderstorm Warnings.
	  ○ Severe Weather Warnings.
	  ○ Tropical Cyclone Watches.
	  ○ Tropical Cyclone Warnings.
	  ○ Coastal Strong Wind, Gale Storm and Hurricane Force Warnings.
	  ○ Flood Watches and Flood Warnings.
	• Provide weather and flood information directly to the NSW SES, LEMC and relevant agencies (NSW Government, 2021).

Marine Rescue NSW	Roles and responsibilities are outlined in NSW State Storm Plan (NSW Government, 2023) and NSW State Flood Plan (NSW Government, 2021) and include:
	• When requested by NSW SES, assist in flood operations when training and equipment are available and suitable including assistance with:
	  ○ Warning and/or evacuation of at-risk communities.
	  ○ Providing communications personnel.
	  ○ Property protection tasks including sandbagging.
	  ○ Flood rescue operations.

NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Roles and responsibilities are outlined in NSW State Storm Plan (NSW Government, 2023) and NSW State Flood Plan (NSW Government, 2021) and include: • Oversee the delivery of the NSW Coastal legislation including financial support through the Coastal Management Program and technical advice to Local Government Councils and

Organisation / Personnel	Responsibilities
	state agencies including assistance with the identification of risks in areas which are subject to coastal erosion and coastal inundation, the preparation and implementation of management plans and programs and associated mitigation and management actions. • Provide storm damage response teams to assist the NSW SES and National Parks and Wildlife Service (NPWS). • Provide related advice on coastal hazards to the NSW SES on request. • Support recovery committees as required.
NSW National Parks and Wildlife Service (NPWS)	Roles and responsibilities are outlined in NSW State Storm Plan (NSW Government, 2023) and NSW State Flood Plan (NSW Government, 2021) and include: • Assist the NSW SES with identification of road infrastructure in National Parks at risk from storms. • Close and reopen NPWS managed roads when affected by storms and advise the NSW SES of its status. • Facilitate the safe reliable access by emergency resources on NPWS managed roads. • Assist the NSW SES with the communication of warnings and information provision to the public through variable message signs and other appropriate means.

NSW Police Force	Roles and responsibilities are outlined in NSW State Storm Plan (NSW Government, 2023) and NSW State Flood Plan (NSW Government, 2021) and include:
	• Provide Incident Management personnel and Liaison Officers to the NSW SES Operation Centre if required.
	• When requested by NSW SES in storm operations:
	  ○ Restrict access to areas affected by storms.
	  ○ Assist with warning and/or evacuation of at-risk communities.
	  ○ Provide specialist storm damage response teams to assist the NSW SES if available.
	  ○ Assist with monitoring and reconnaissance of areas potentially damaged by storms.
	• Coordinate search and rescue operations.
	• Conduct road and traffic control operations in conjunction with NSW SES, Council and/or TfNSW.
	• Coordinate security of supply lines for evacuated and damaged areas.
	• Manage Disaster Victim Registration.
	• Operate the Public Information and Inquiry Centre, if requested or otherwise needed during flood events.

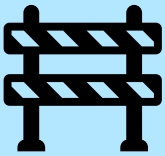
Surf Life Saving NSW	• Where local arrangements allow, provide support to NSW SES as per agreed arrangements (NSW Government, 2023).
Transport for NSW	Roles and responsibilities are outlined in NSW State Storm Plan (NSW Government, 2023) and NSW State Flood Plan (NSW Government, 2021) and include: • TfNSW (Maritime), following the direction of the NSW Police Force will assist in the identification and recovery of vessels.

7 Communication Protocols

7.1 Overview

Council will provide information about anticipated coastal emergency events to impacted communities through the mechanisms provided in **Table 7-1**.

Table 7-1: Communication Protocols

Communication	
	• Provide routine emergency management briefings to communicate the strategy outlined in this Subplan including coastal inundation emergency triggers, areas at risk, roles and responsibilities and response action plan.
	• Provide emergency management information (in the form of signage and brochures) at local community centres. • Inform the community of Council's intended coastal inundation emergency responses under this CZEAS. • Inform community members and businesses about the need to develop a household / business Emergency Management Plan (EMP) for coastal inundation.
	• In consultation with the NSW SES and BoM, provide public information about approaching coastal inundation emergencies where possible through digital means. • Provide emergency management briefings to the public as needed, in particular affected landholders, to communicate the strategy outlined in this CZEAS, including coastal inundation emergency event triggers, locations at risk, roles and responsibilities and the emergency response actions, including what actions a landholder may need to take and any assistance that may be available to them. • Coordinate with the NSW SES to ensure residents are aware of urgent hazards during emergency events and provide assistance with door-to-door communication as necessary. • See **Section 7.2** for more information about message construction.
	• Place barriers and signage at roads and public access points that are closed due to the impacts of coastal inundation. • Provide up to date information on Council's website regarding roads and public access points closures and re-openings.

7.2 Message Construction

7.2.1 The AWS Framework

As per **Section 7.1**, Council is to consult with the NSW SES and BoM, in order to help provide public information about approaching coastal inundation emergencies.

The design of Council's external messaging during an emergency event should be aligned with the Australian Warning System (AWS) framework (AIDR, 2021) – which is a new national approach to information and warnings during emergencies like bushfire, flood, storm, extreme heat, and severe

weather. Up until now there have been different warning systems for different hazard types across Australia. The new Australian Warning System aims to provide consistent warnings to Australian communities so that people know what to do when they see a warning level. There are three warning levels, provided in **Table 7-2**, as per AIDR (2021).

Table 7-2: Warning Levels from the Australia Warning System framework (AIDR, 2021)

Alert Level	Description
Advice (Yellow)	An incident has started. There is no immediate danger. Stay up to date in case the situation changes.
Watch and Act (Orange)	There is a heightened level of threat. Conditions are changing and you need to start taking action now to protect you and your family.
Emergency Warning (Red)	An Emergency Warning is the highest level of warning. You may be in danger and need to take action immediately. Any delay now puts your life at risk.

The Australian Warning System utilises a system of triangular hazard icons with escalating tiers and associated colour palettes. Specific icons have been developed for bushfire, flood, storm, extreme heat, and severe weather, as per **Figure 7-1**. It is recommended that the “Storm” icon is used for coastal inundation that occurs with a storm event.

The Australian Warning System utilises a nested model for communications that includes the warning level + hazard / location + action statements – as per **Figure 7-1**. Each warning level has a set of action statements to give the community clearer advice about what to do. Calls to action can be used flexibly across all three warning levels and contextualised for each hazard for a given location. **Table 7-3** provides some examples of the Australian Warning System’s “calls to action” input (AIDR, 2021) that may be useful in a coastal inundation emergency.

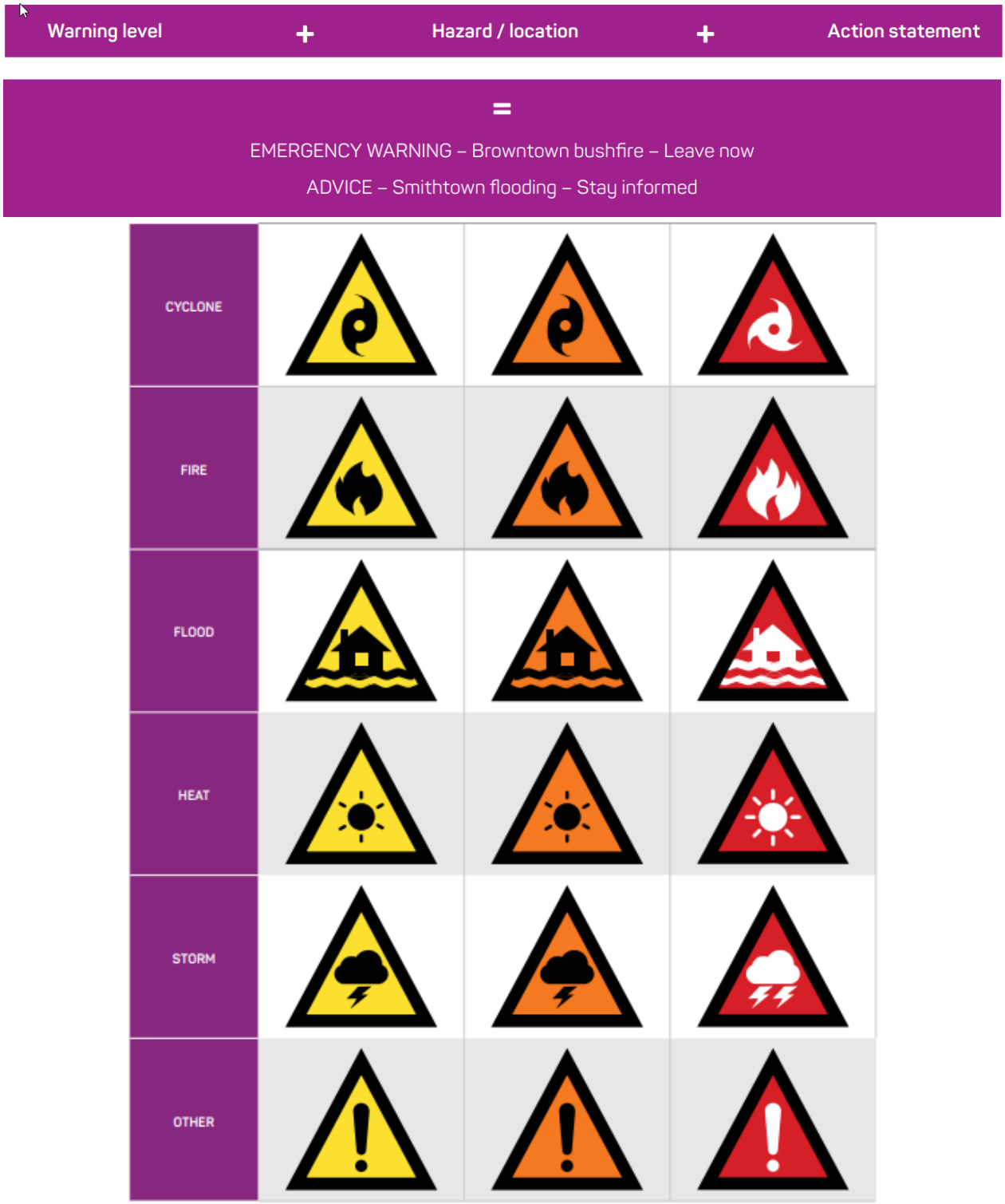


Figure 7-1: Australian Warning System messaging model (top) and hazard icons (AIDR, 2021)

Table 7-3: Examples of Australian Warning System calls to action (AIDR, 2021) that may be used in a coastal inundation emergency

Advice	Watch and Act	Emergency Warning
• Prepare now • Stay informed • Monitor conditions • Stay informed/threat is reduced • Avoid the area • Return with caution	• Prepare to leave/evacuate • Leave/evacuate now (if you are not prepared) • Prepare to take shelter • Move/stay indoors • Stay near shelter • Walk two or more streets back • Monitor conditions as they are changing • Move to higher ground (away from creeks/rivers/coast) • Limit time outside • Avoid the area • Stay away from damaged buildings and other hazards • Prepare for isolation • Do not enter flood water • Not safe to return • Prepare your property	• Leave/evacuate (immediately, by am/pm/hazard timing) • Seek/take shelter now • Shelter indoors now • Too late/dangerous to leave

7.2.2 Message Communication

According to the Australian Disaster Resilience Handbook (AIDR, 2009):

'the best predictions, the best interpretive material and the best warning messages are of little value if they have no impact on damages or safety. Failure is guaranteed if warning messages based on … predictions and interpretations … are not conveyed effectively to those expected to respond. In essence, a warning which is not communicated effectively is no warning at all if it is not heard or heeded'.

The handbook identifies two different types of message communication based on target audience:

1. General warnings are disseminated ('broadcast') to whole communities or regions.
2. Specific warnings are intended for individuals or parts of communities and reflect the need for 'narrowcasting' to specific audiences who may have specific characteristics or be at different kinds of risk.

A combination of the following warning methods may be utilised:

- Internet – including authorised social media and the official Council website.
- Mobile and fixed public address systems
- Two-way radio
- Emergency Alert
- Telephone/fax
- Door knocking

- Variable message signs
- Community notices in identified hubs
- Distribution through established community liaison networks/partnerships

Emergency Alert is a national telephony-based alert system used by emergency service agencies to send voice messages and short message service (SMS) to landline/mobile telephones in times of emergency. Where appropriate and usually in conjunction with other warning messages, Emergency Alert is used to send SMS/voice alerts to landline and mobile telephones in a specified geographic area. The emergency alert system should be used in conjunction with the three levels of emergency warning depicted in **Figure 7-1**.

8 Lake Conjola CZEAS Implementation and Review

This LCCZEAS applies from the date of gazettal of the Lake Conjola CMP. Council will monitor and evaluate the implementation of the LCCZEAS after a coastal inundation emergency event, and amend where necessary as part of future CMP preparation and review.

9 Recommendations for amendments to the Shoalhaven EMPLAN and Shoalhaven FESP

9.1 Shoalhaven EMPLAN

Annexure B of the Shoalhaven EMPLAN provides a summary of hazards that have risk of causing loss of life, property, utilities, services and/or the community's ability to function within its normal capacity, i.e. identified as having the potential to create an emergency, but does not include reference to coastal hazards.

The closest relevant hazard description, **Storm** is defined as "Severe storm with accompanying lightning, hail, wind, and/or rain that causes severe damage and/or localised flooding (includes tornado)". Annexure B does not identify "coastal inundation" (or other coastal hazards noted within the CM Act) as having the potential to create an emergency.

It is recommended that the Shoalhaven EMPLAN is reviewed and updated as necessary, including reference to "coastal hazard" (as defined in the CM Act, including coastal inundation) and to the LCCZEAS.

9.2 Shoalhaven FESP

The Shoalhaven Flood Emergency Sub Plan (Shoalhaven FESP) is a Sub-Plan of the Shoalhaven EMPLAN, and covers preparedness measures, the conduct of response operations and the coordination of immediate recovery measures from flooding and the management of coastal erosion within the Shoalhaven City Council area.

A CZEAS within a CMP must not include matters dealt with in any plan made under the *State Emergency and Rescue Management Act 1989*. Where actions, roles or responsibilities relating to coastal emergencies are covered by the SERM Act framework, the CZEAS should refer to the relevant plan or subplan, rather than duplicate those actions.

The LCCZEAS is part of the CMP and is a Supporting Plan to the local emergency management plans made under the SERM Act, providing specific guidance as to actions that Council and other combat agencies can take in preparation for “coastal inundation” emergency events at Lake Conjola.

It is recommended that the Shoalhaven FESP is reviewed and updated as necessary, including:

- *section 5.1 – to include reference to the Lake Conjola CZEAS and any other relevant CZEAS prepared for other CMPs within the LGA.*
- *section 5.1.1 – that Council and the NSW SES local controller clarify which agency is responsible for monitoring of BoM “Severe Weather Warnings” with respect to coastal hazards;*
- *section 5.1.1 – Council and the NSW SES local controller clarify which agency is responsible for monitoring for “when other evidence leads to an expectation of flooding”; and,*
- *section 4 and section 5 – to include reference to the Total Flood Warning Systems to be implemented at Lake Conjola, Burrill Lake, and Tabourie Lake.*

10 References

Australian Institute for Disaster Resilience [AIDR] (2009), *Australian National Disaster Resilience Handbook Collection: Manual 21 – Flood Warning*.

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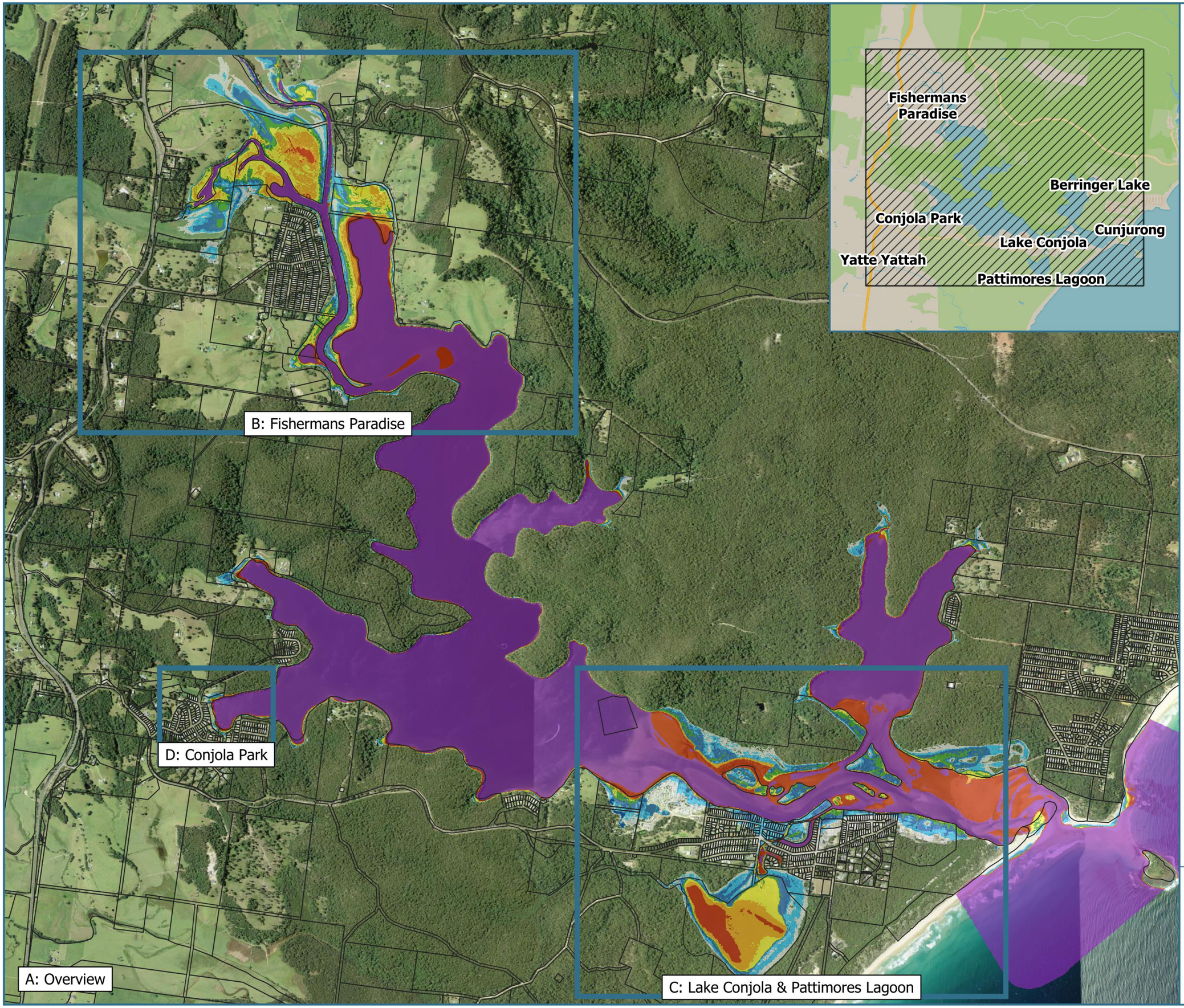
Appendix A: Coastal Inundation Maps



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Lake Conjola Coastal Management Program

Figure A-01
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

Shoalhaven City Council

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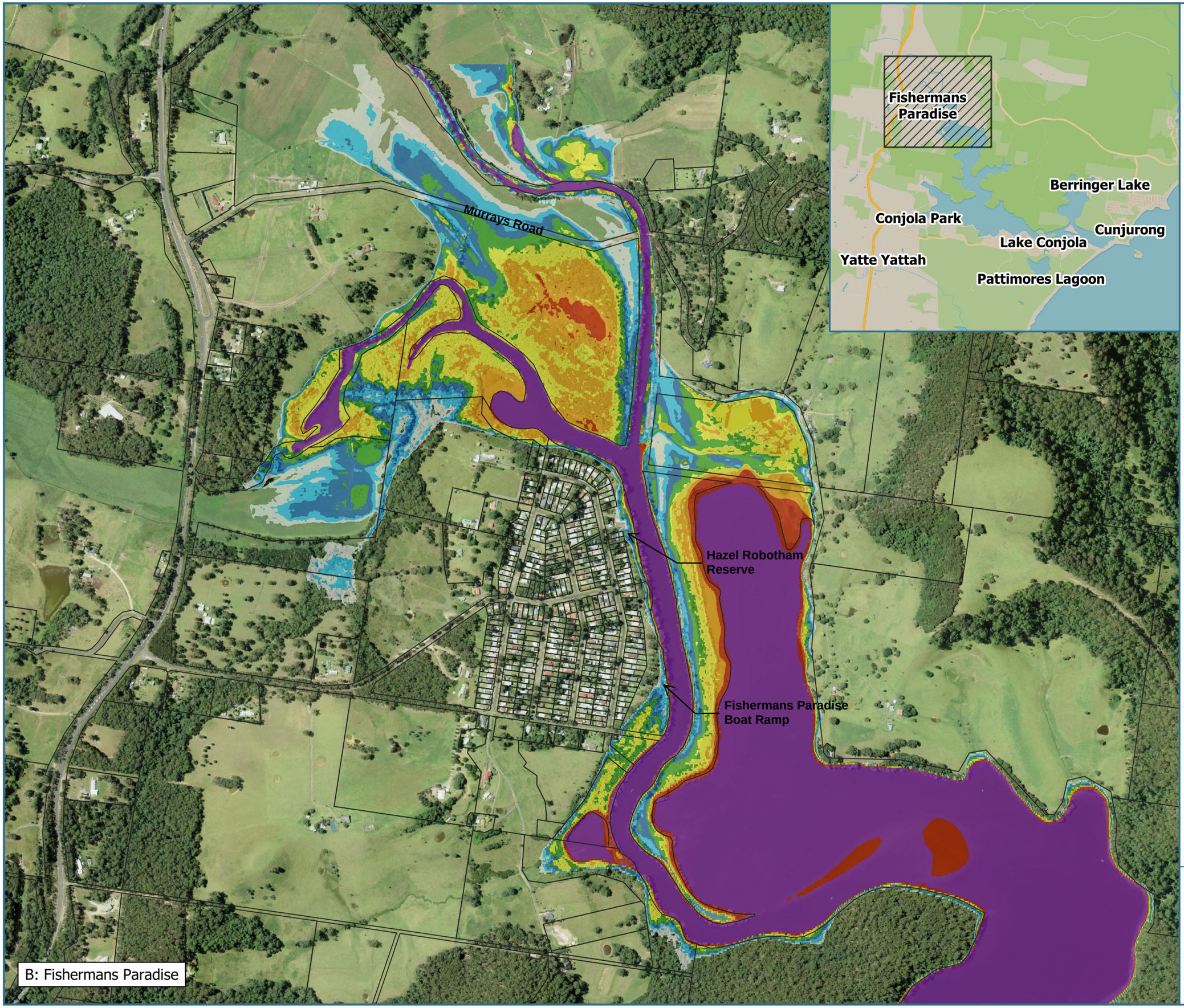

B: Fishermans Paradise

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Lake Conjola Coastal Management Program

Figure B-01
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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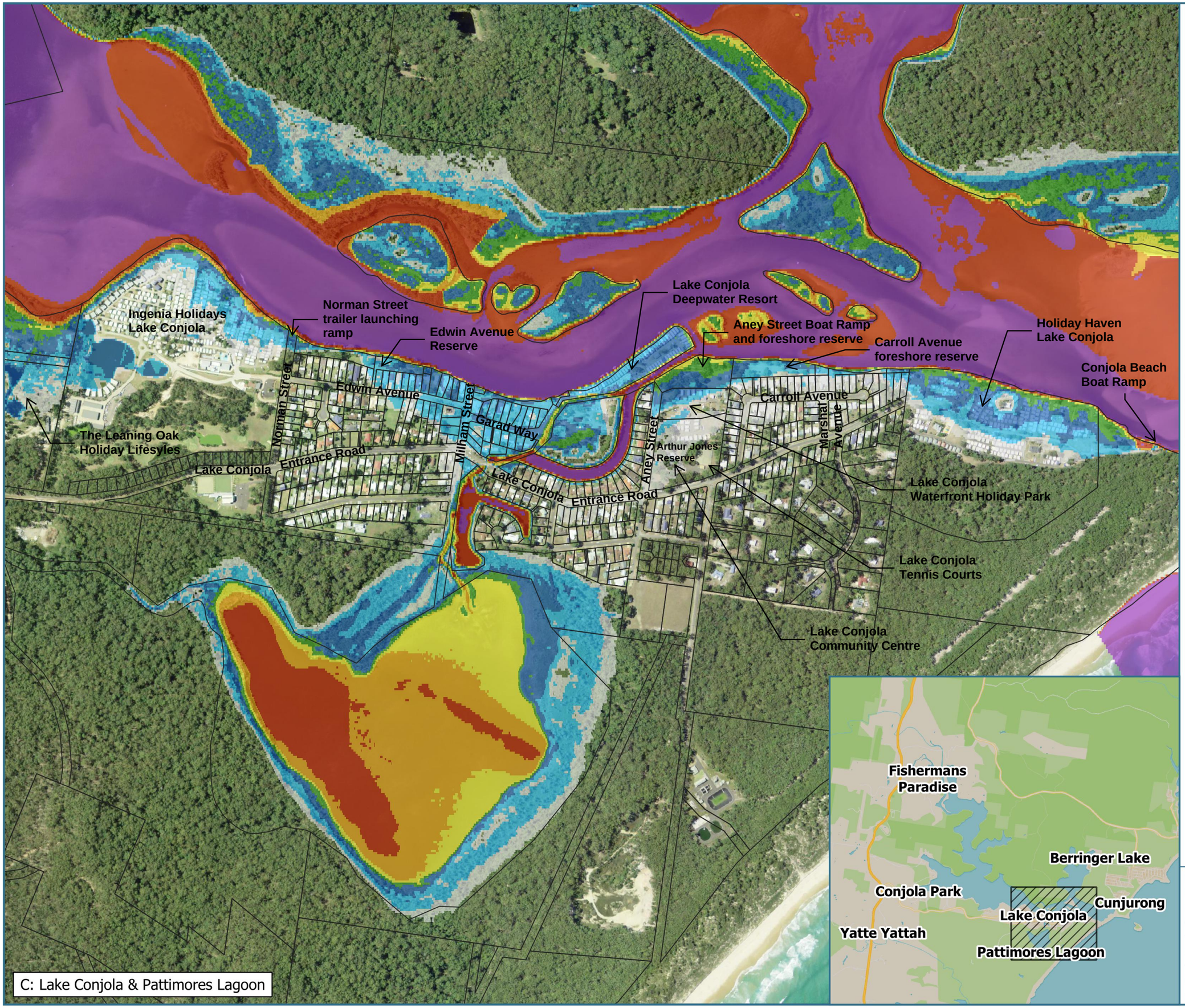

C: Lake Conjola & Pattimores Lagoon

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Lake Conjola Coastal Management Program

Figure C-01
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

Shoalhaven City Council

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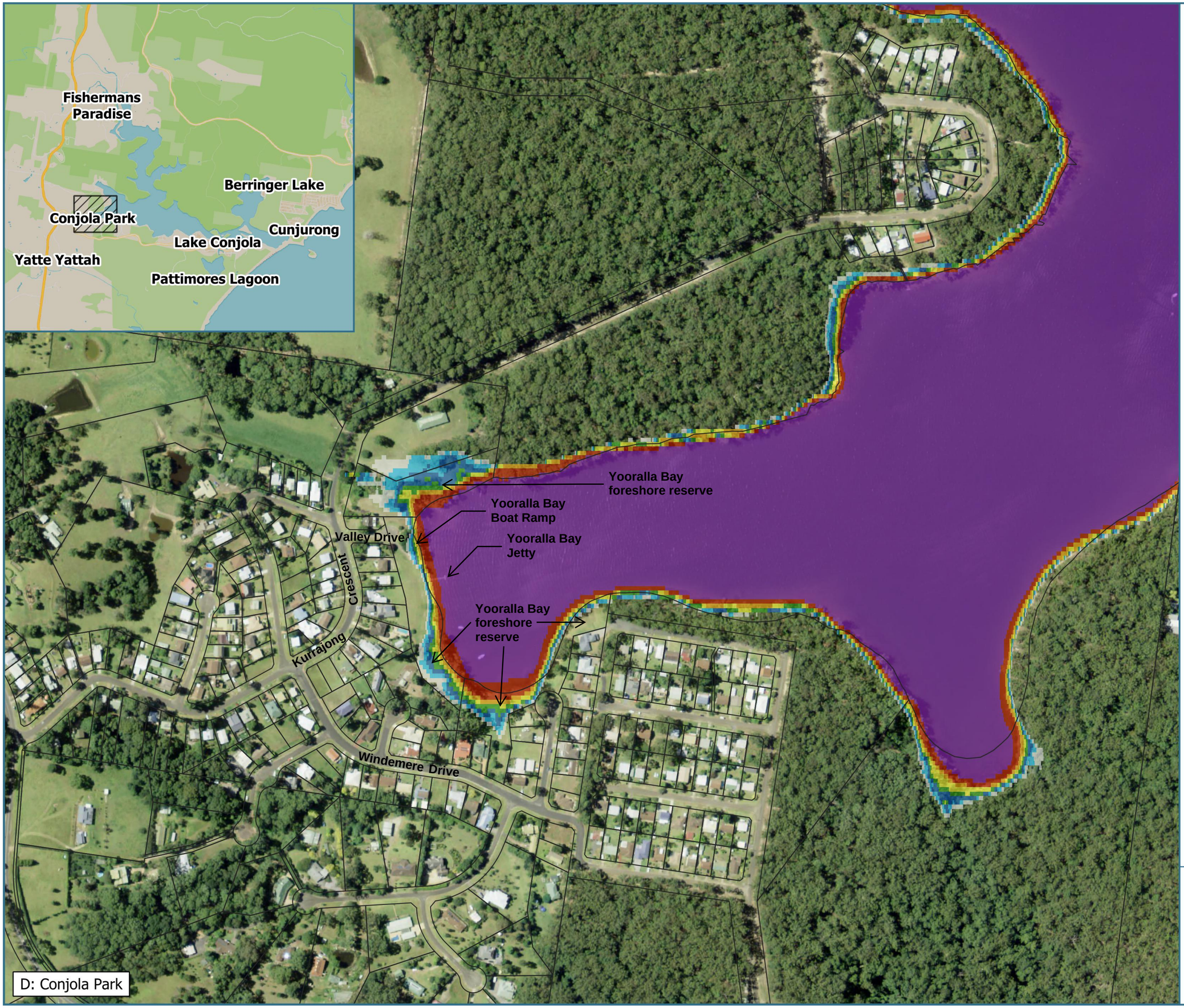

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Lake Conjola Coastal Management Program

Figure D-01
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

Shoalhaven City Council

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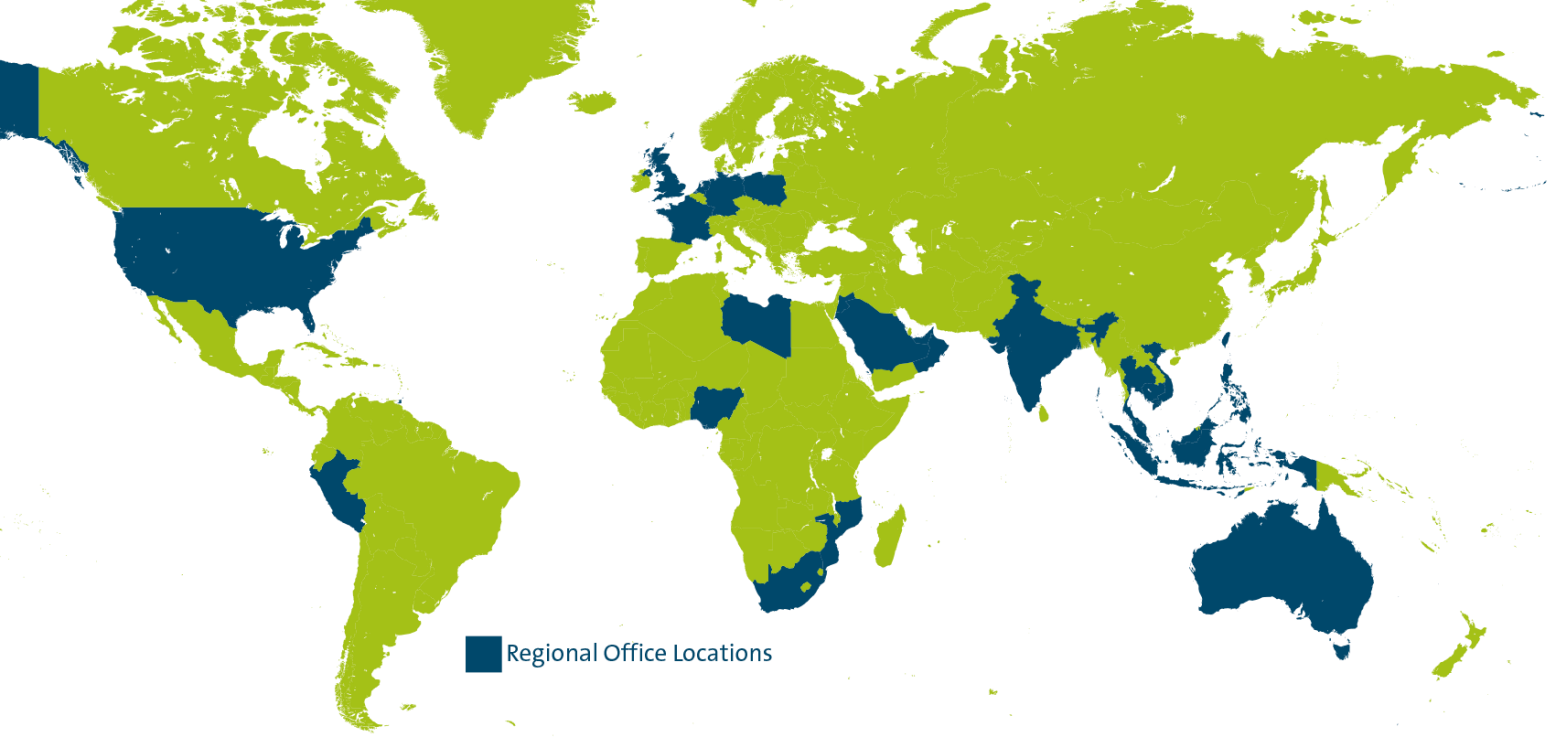

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Backed by the expertise of over 6,000 colleagues working from offices in more than 20 countries across the world, we are helping organisations to turn these challenges into opportunities and make the transition to smart and sustainable operations. We do this by seamlessly integrating engineering and design knowledge, consulting skills, software and technology to deliver more added value for our clients and their asset lifecycle.

We act with integrity and transparency, holding ourselves to the highest standards of environmental and social governance. We are diverse and inclusive. We will not compromise the safety or well-being of our team or communities – no matter the circumstances.

We actively collaborate with clients from public and private sectors, partners and stakeholders in projects and initiatives. Our actions, big and small, are driving the positive change the world needs, and are enhancing society now and for the future.

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Appendix C – Tidal Inundation Maps - all SLR ranges

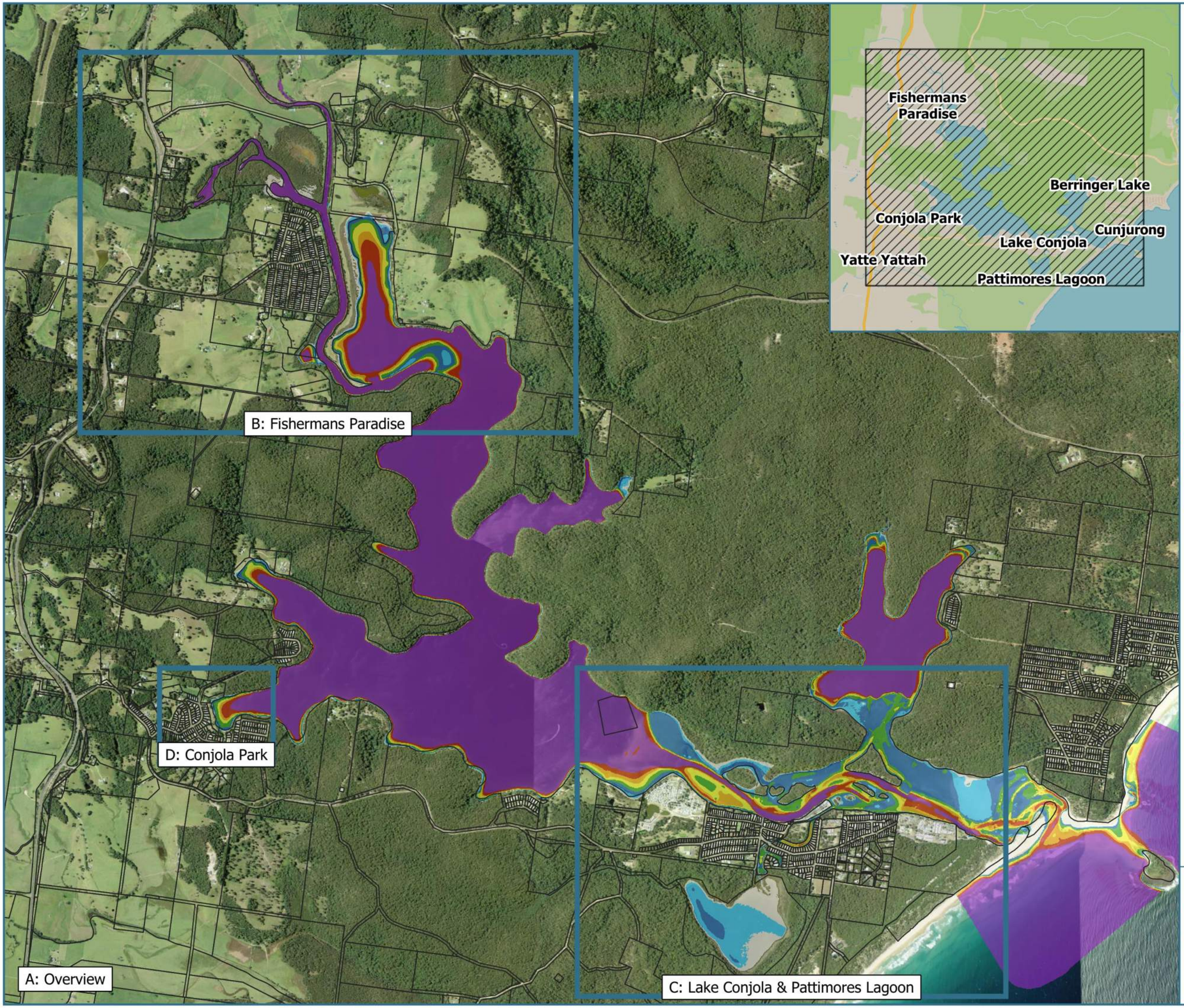

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Figure A-01
Tidal Inundation
SLR 0 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

Shoalhaven City Council

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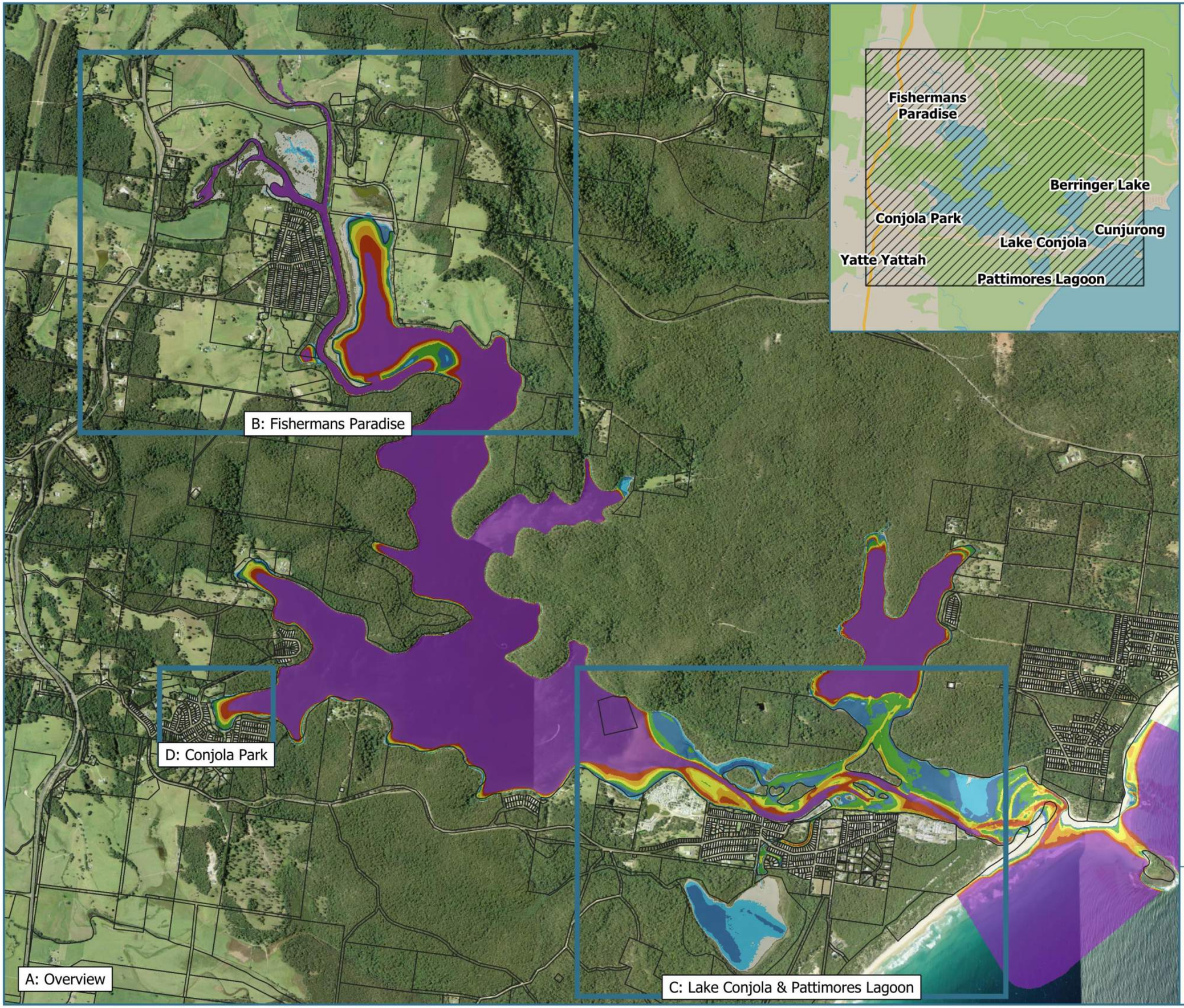

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Figure A-02
Tidal Inundation
SLR 0.1 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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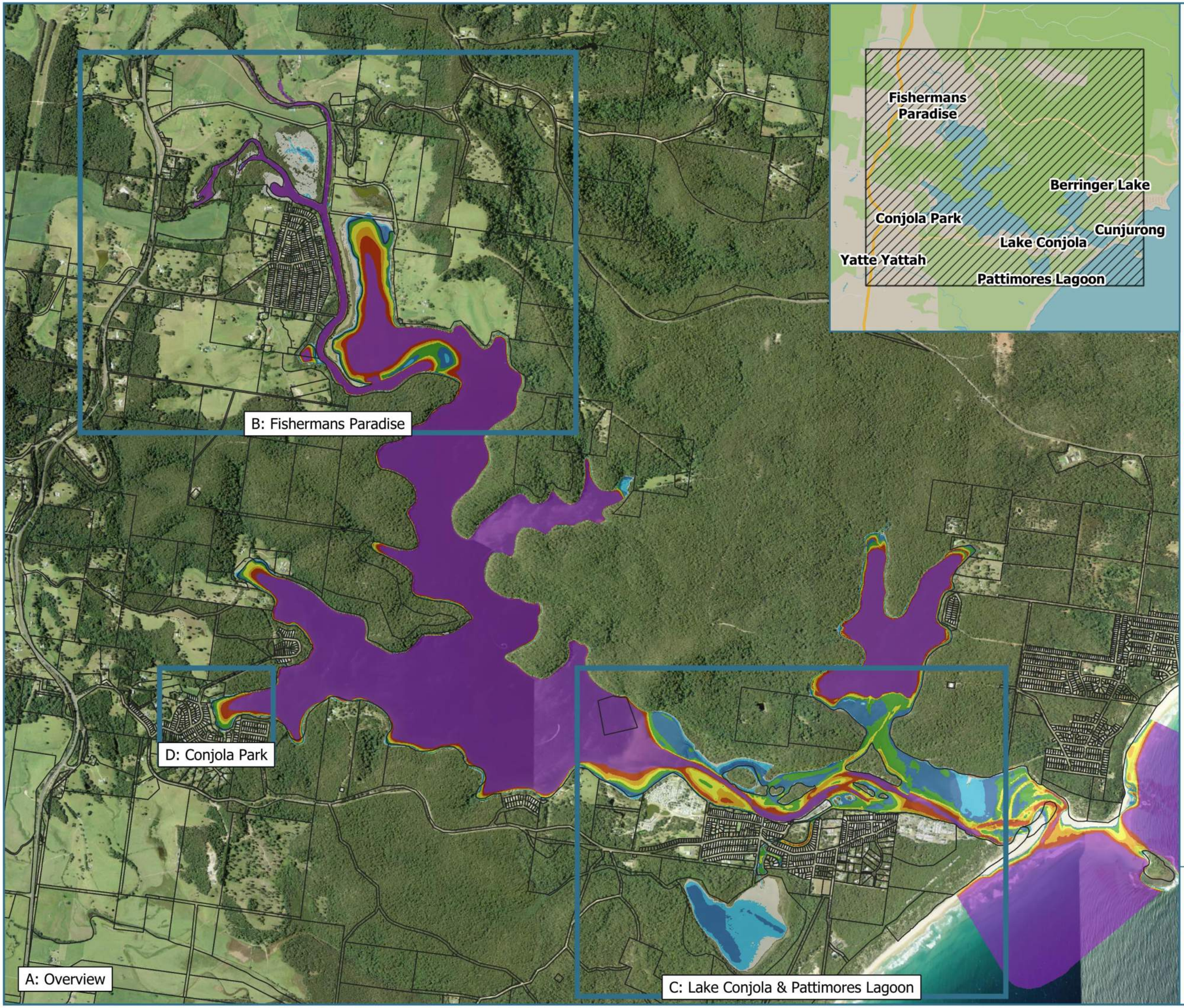

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Figure A-03
Tidal Inundation
SLR 0.1 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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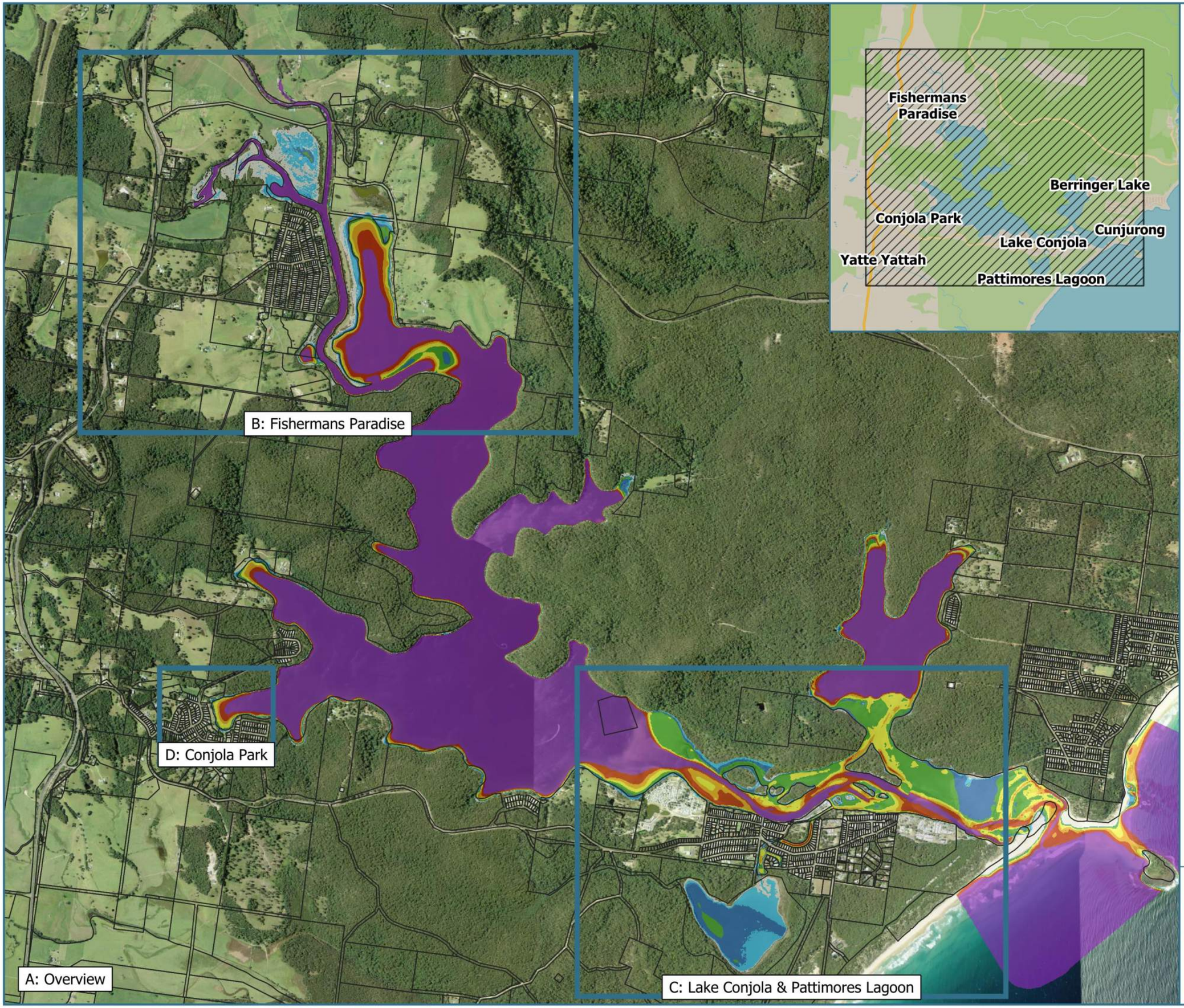

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Figure A-04
Tidal Inundation
SLR 0.23 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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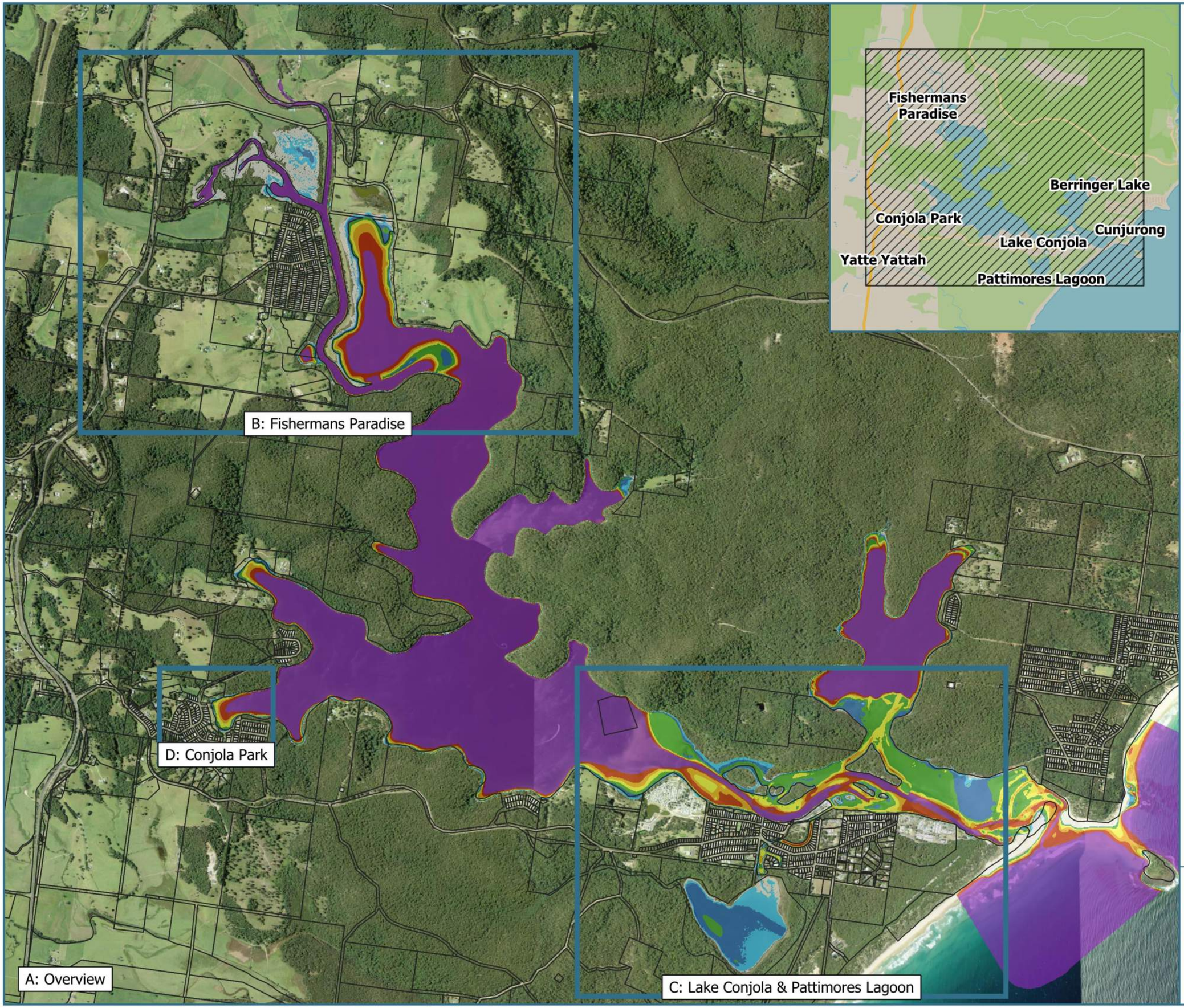

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Figure A-05
Tidal Inundation
SLR 0.23 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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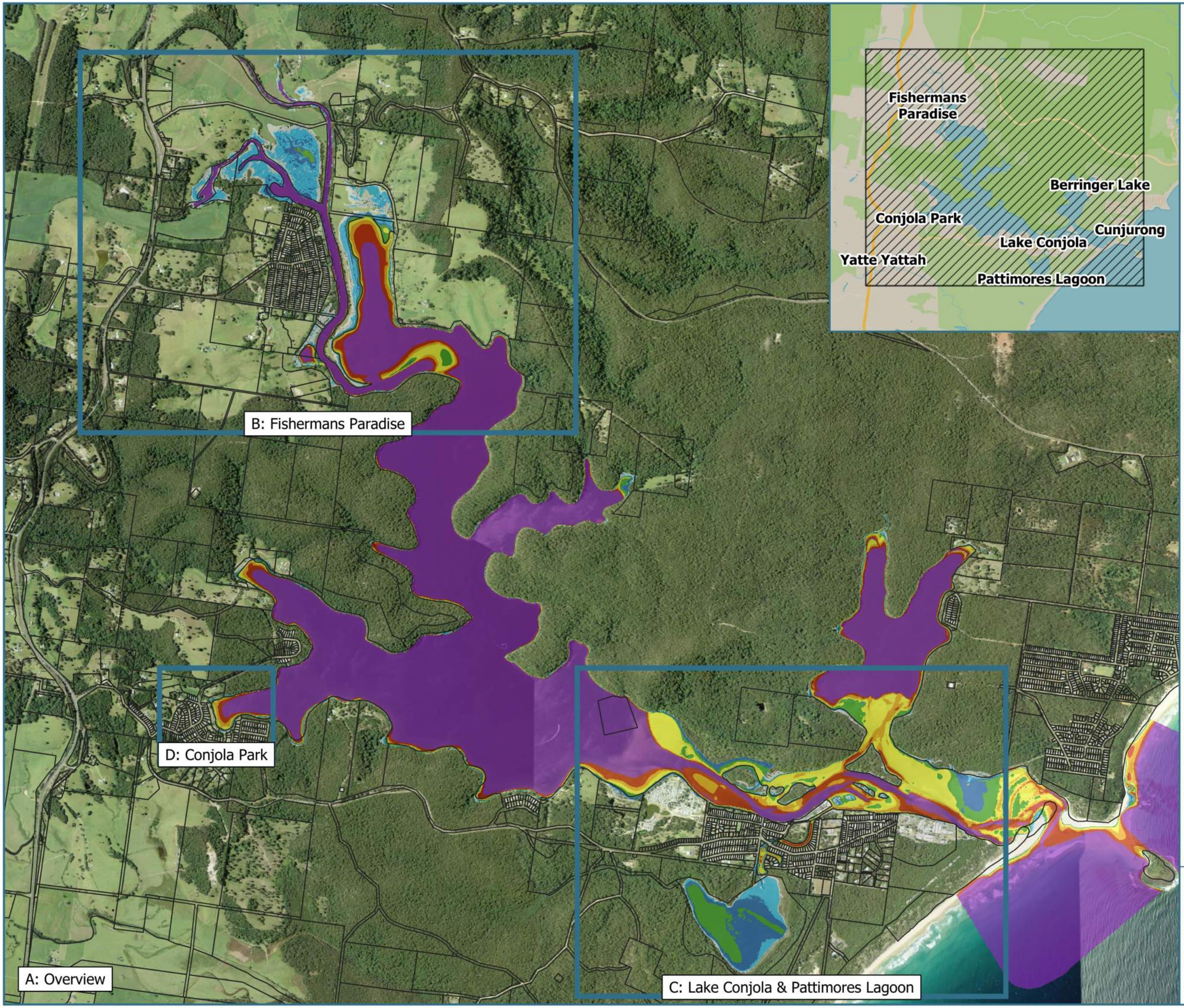

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Figure A-06
Tidal Inundation
SLR 0.36 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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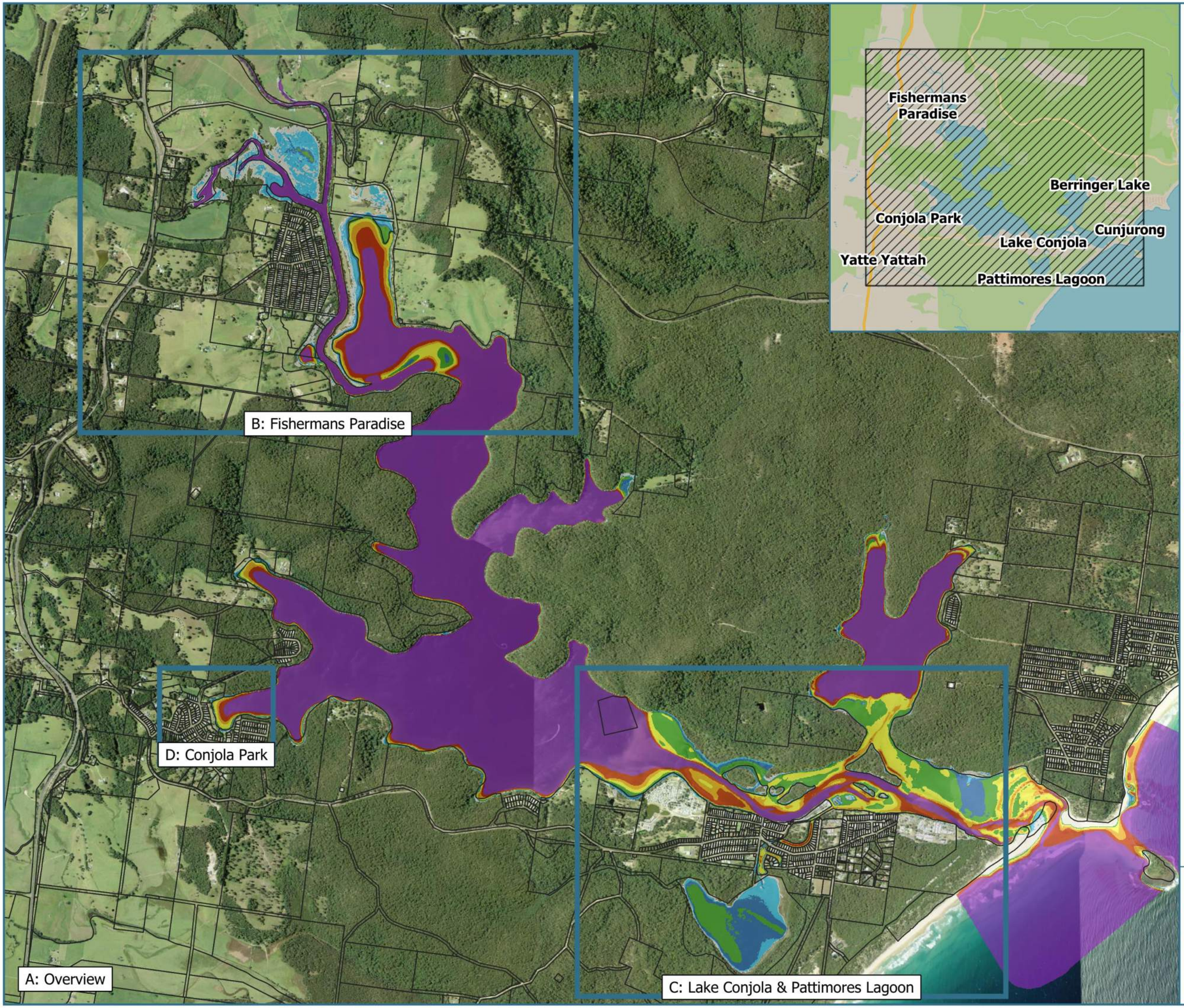

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Figure A-07
Tidal Inundation
SLR 0.36 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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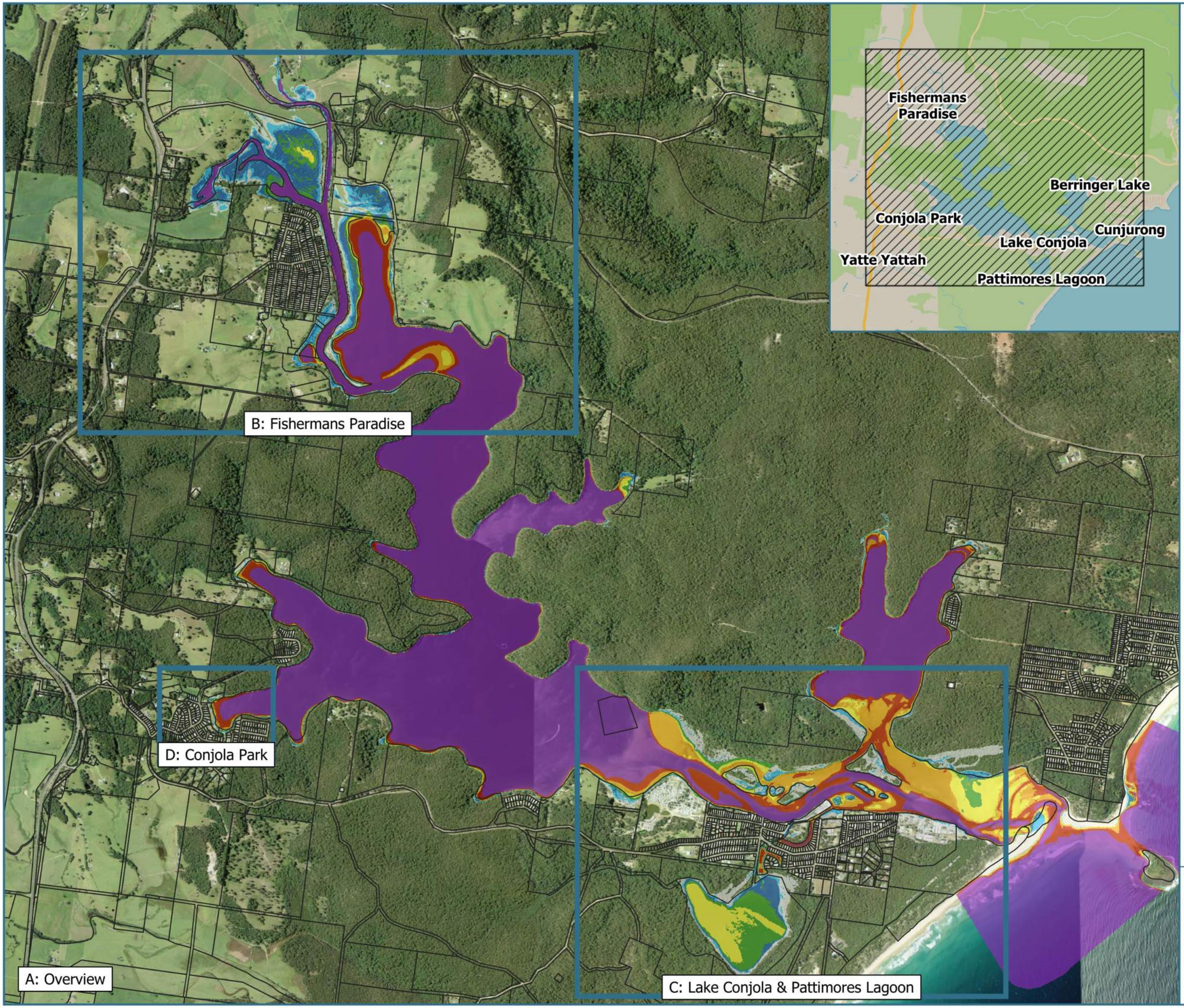

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Figure A-08
Tidal Inundation
SLR 0.6 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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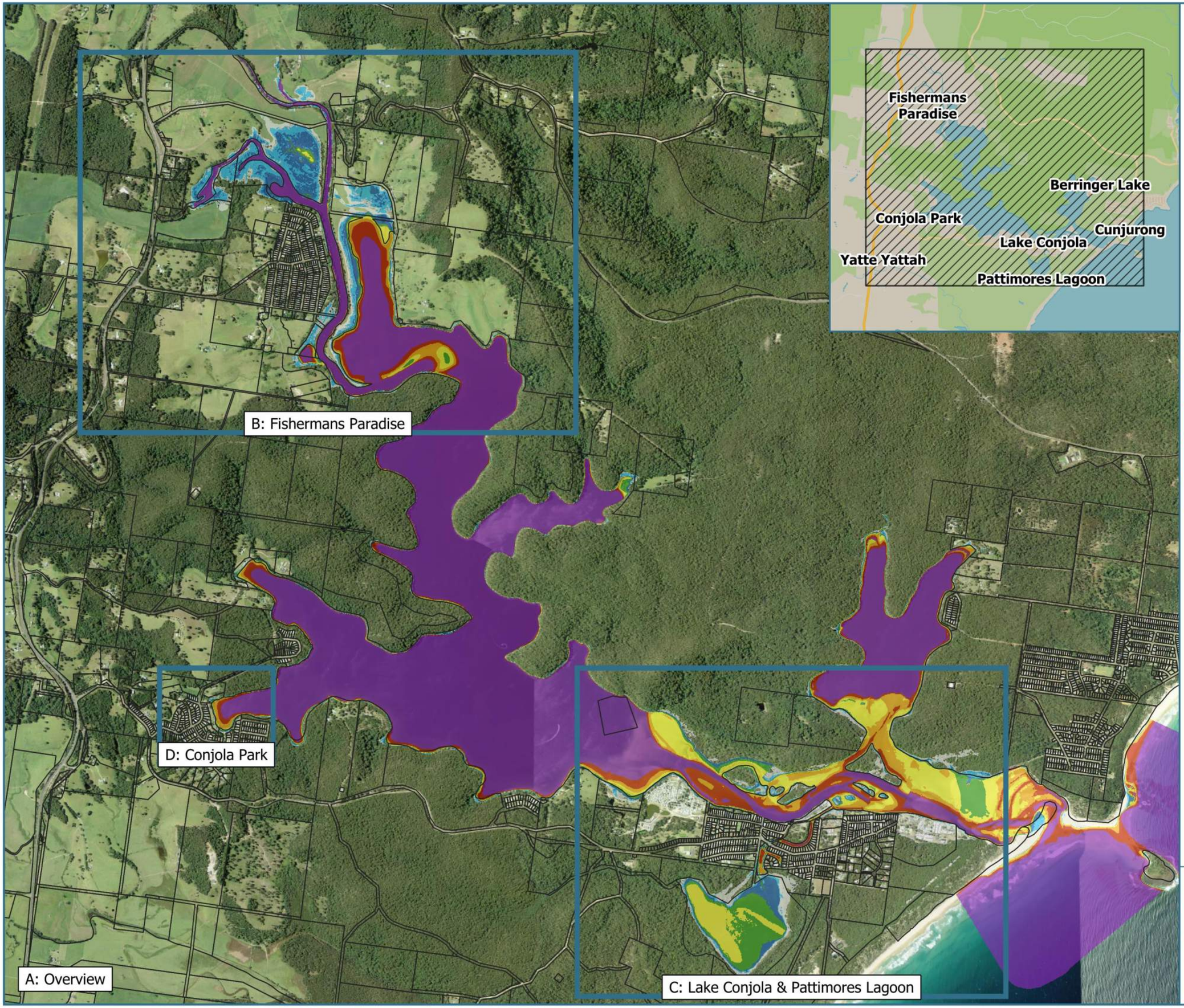

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Figure A-09
Tidal Inundation
SLR 0.6 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

Shoalhaven City Council

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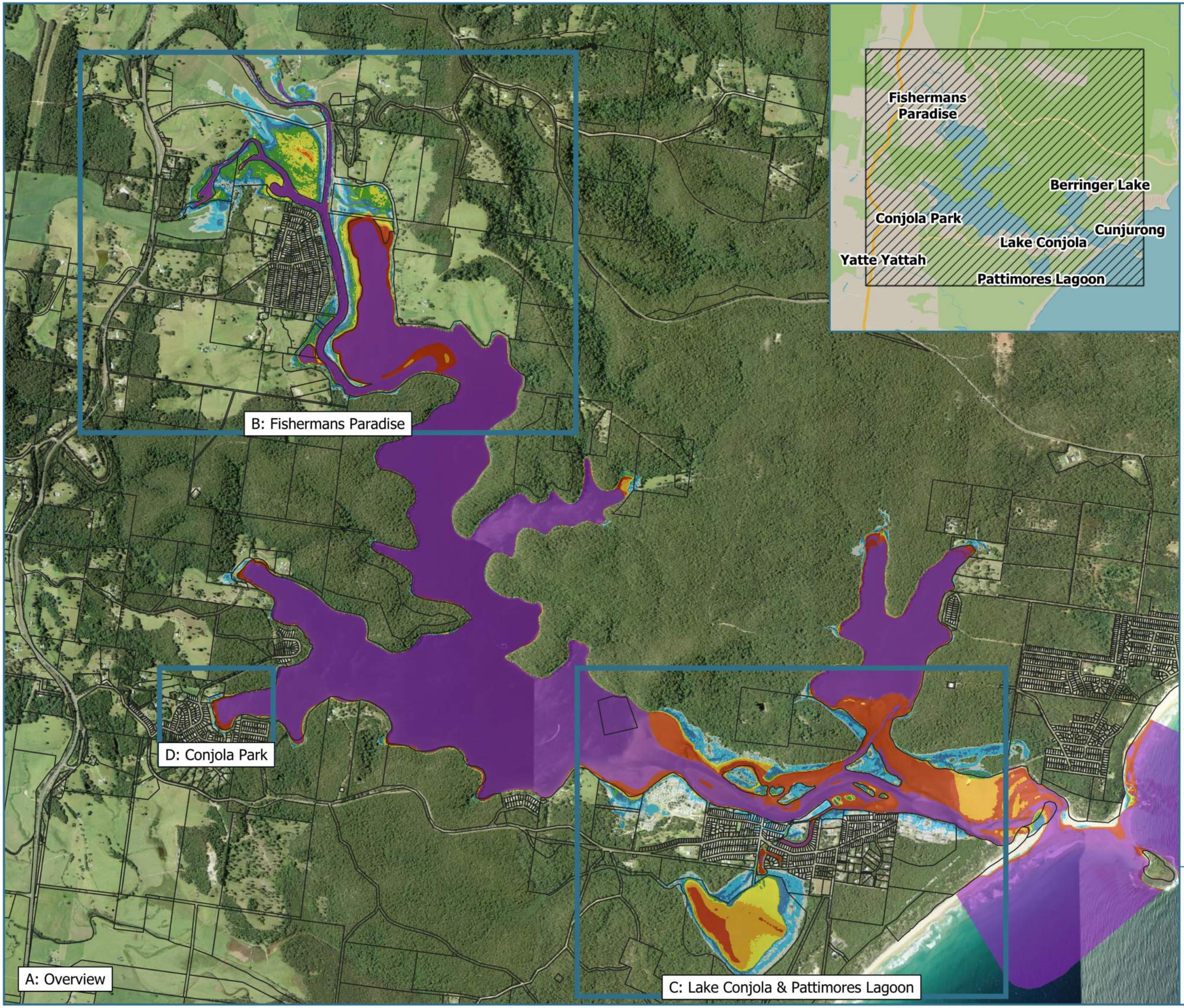

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Figure A-10
Tidal Inundation
SLR 0.9 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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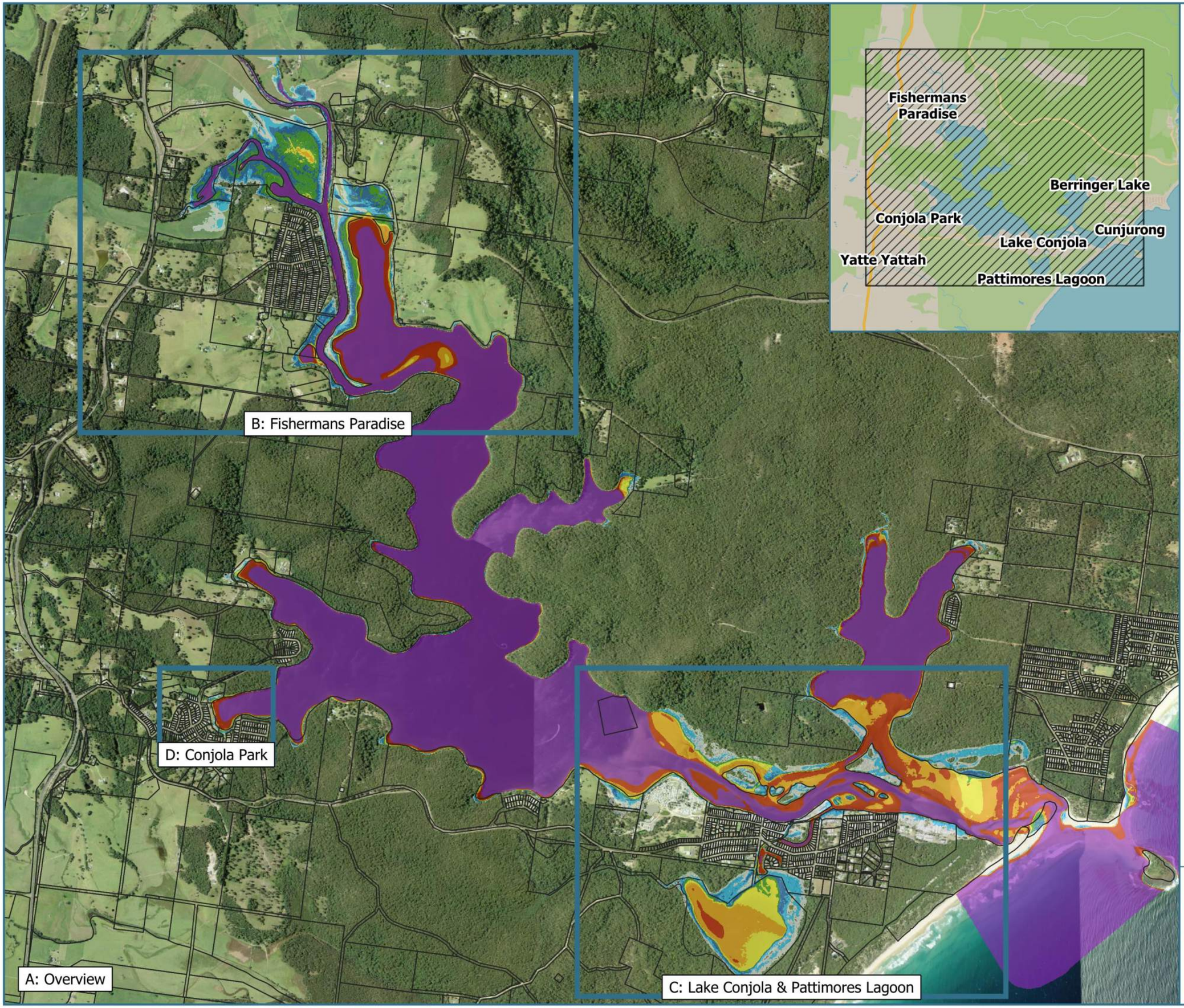

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Figure A-11
Tidal Inundation
SLR 0.9 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

Shoalhaven City Council

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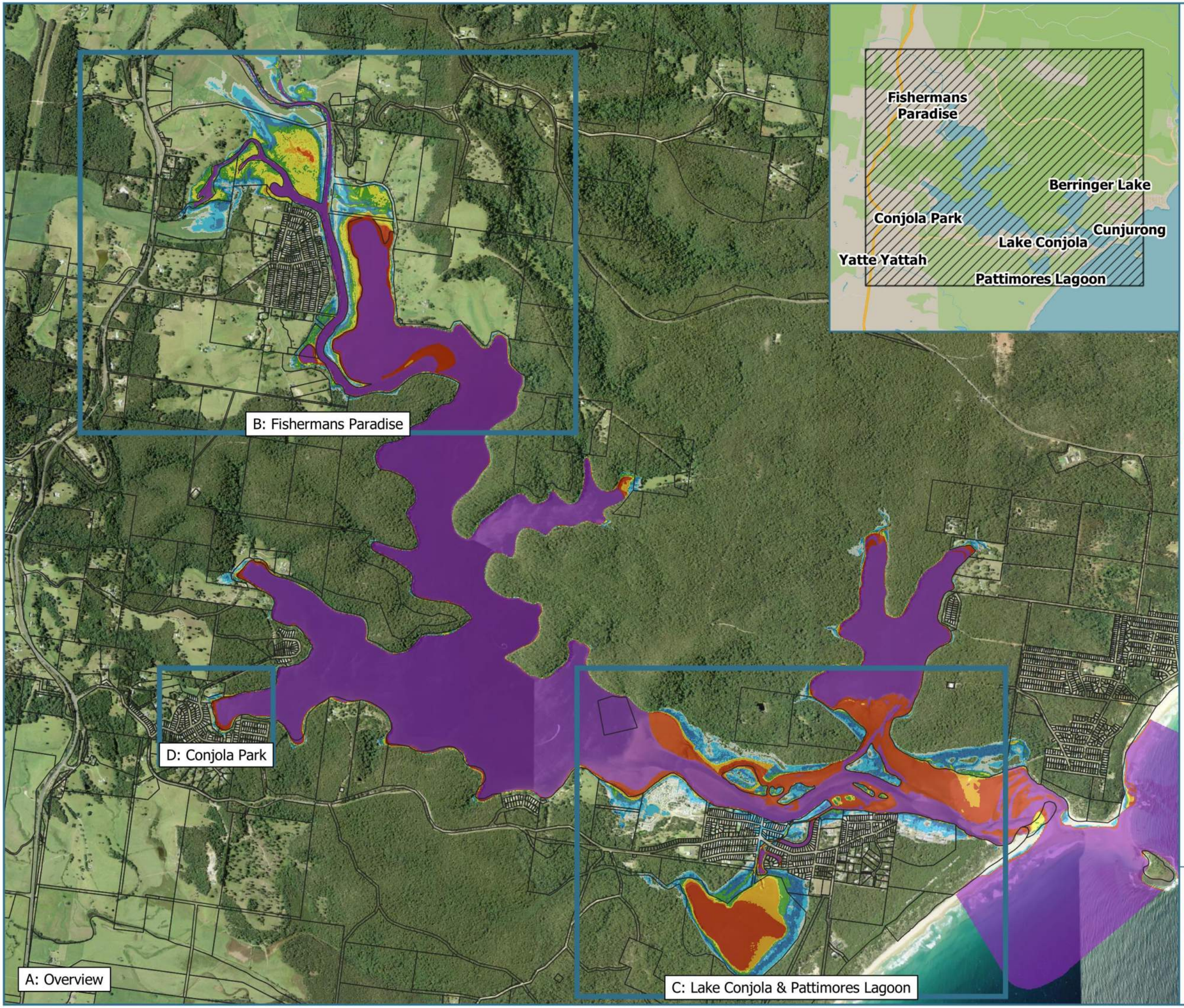

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Figure A-12
Tidal Inundation
SLR 1.2 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-14
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

Shoalhaven City Council

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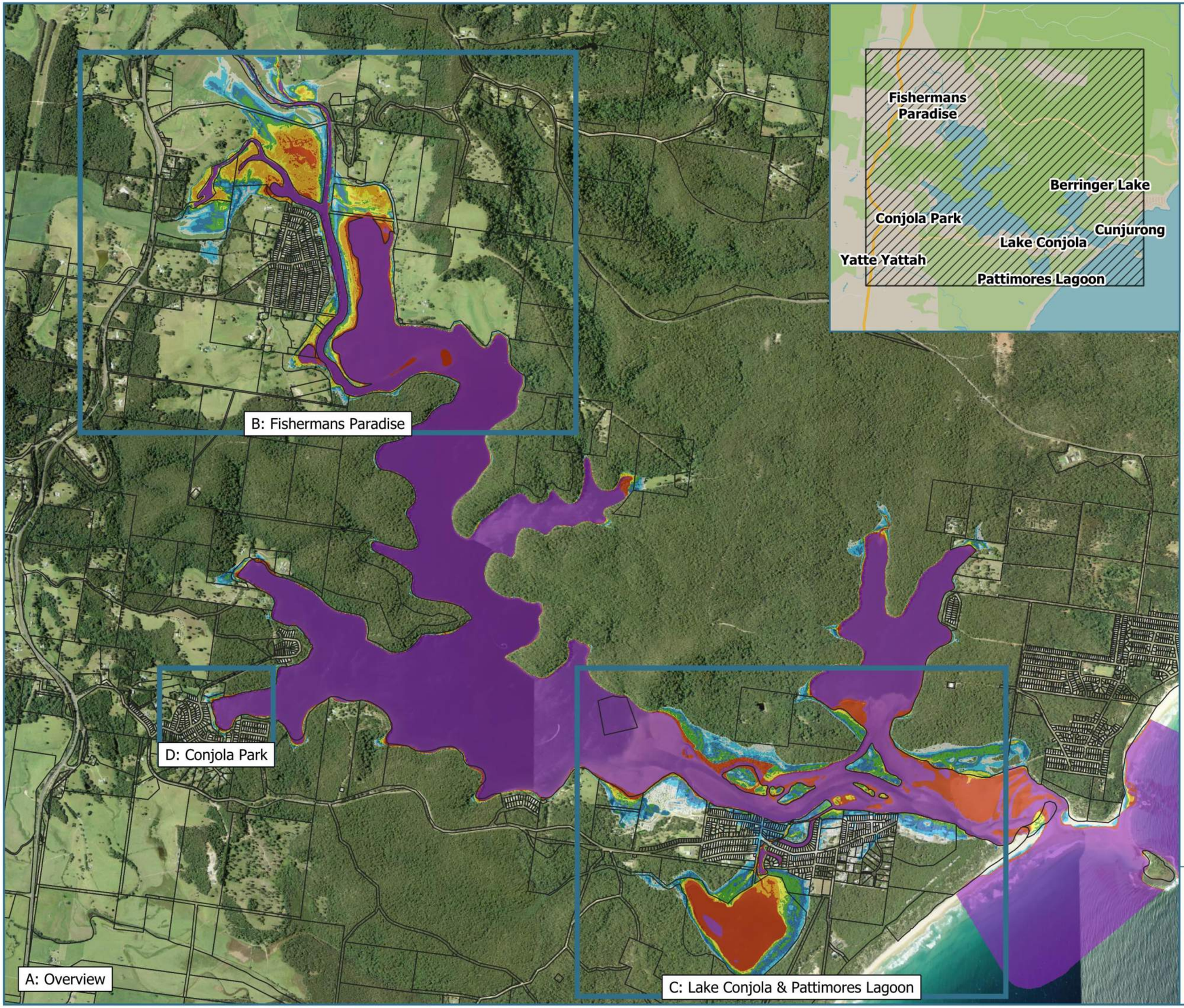

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Figure A-13
Tidal Inundation
SLR 1.2 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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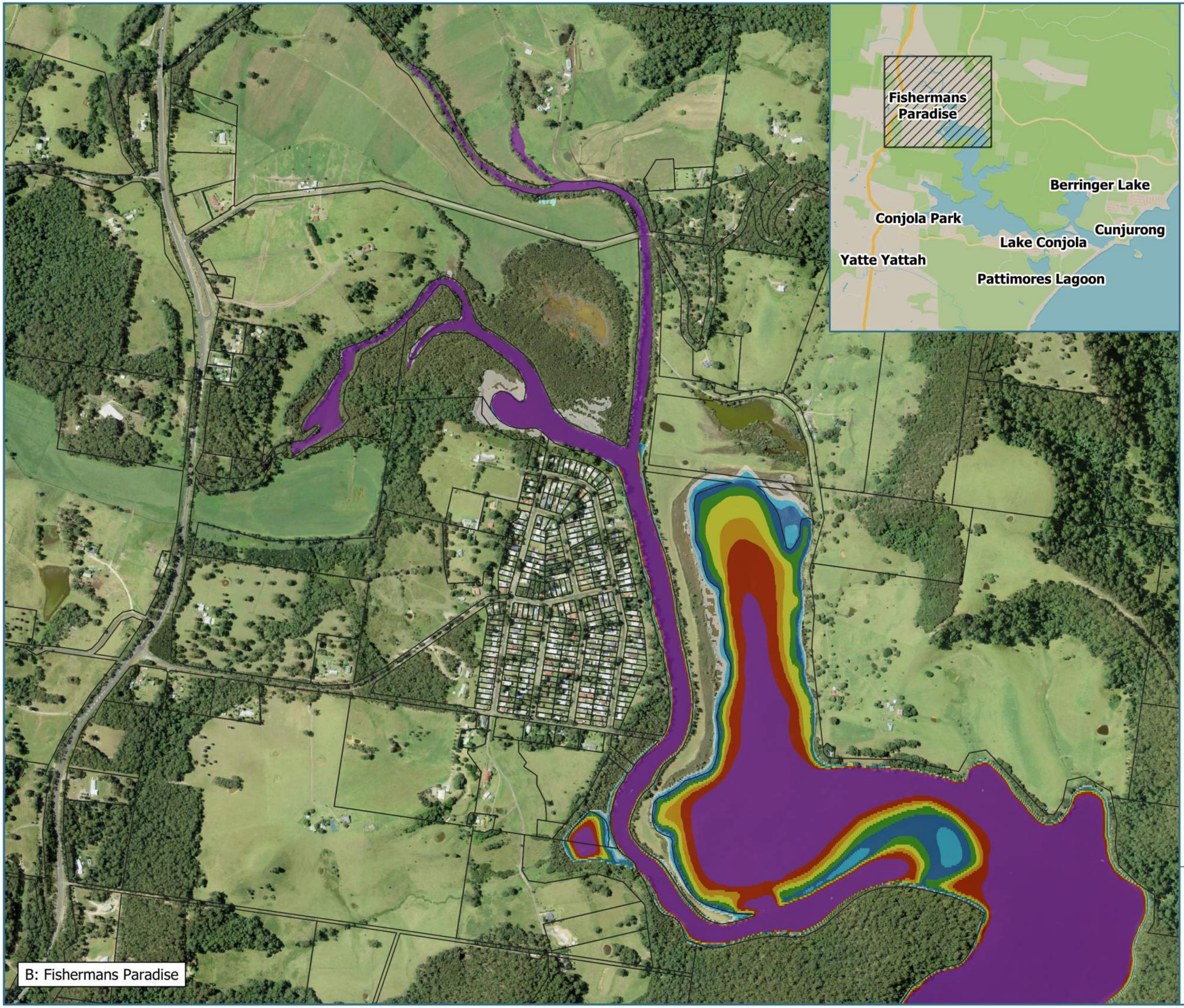

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Figure B-01
Tidal Inundation
SLR 0 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

Shoalhaven City Council

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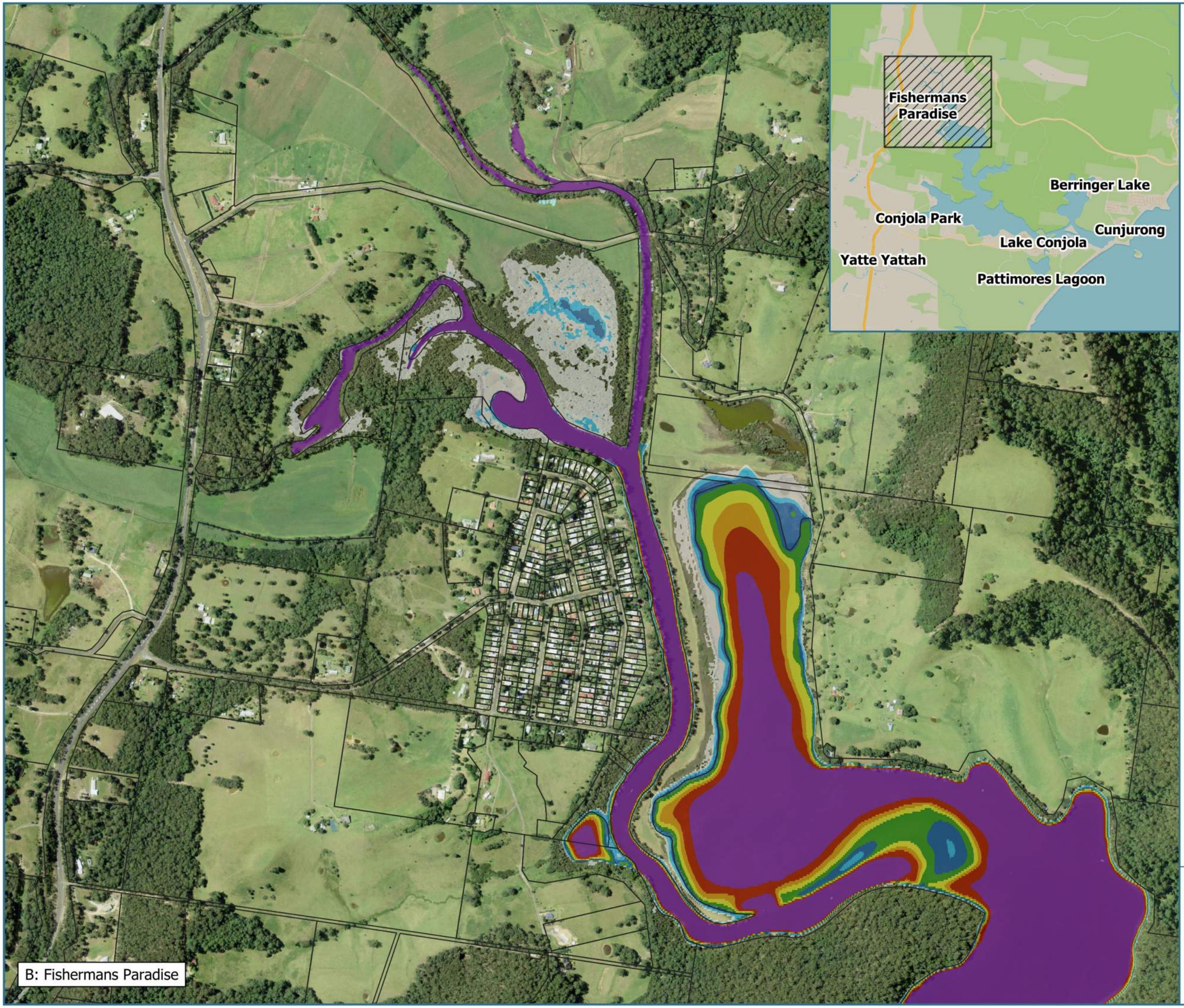

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Figure B-02
Tidal Inundation
SLR 0.1 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

Shoalhaven City Council

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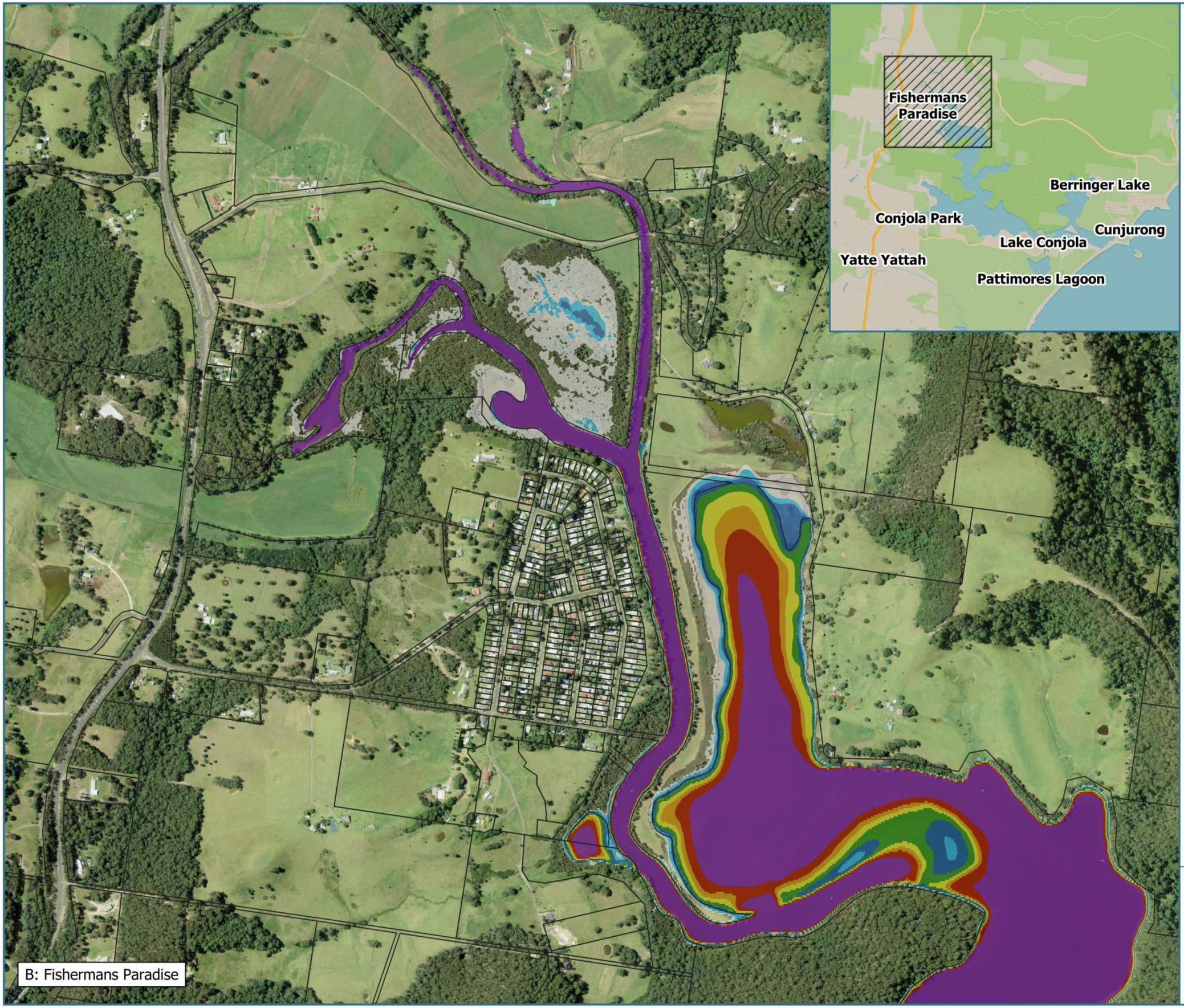

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Figure B-03
Tidal Inundation
SLR 0.1 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

Shoalhaven City Council

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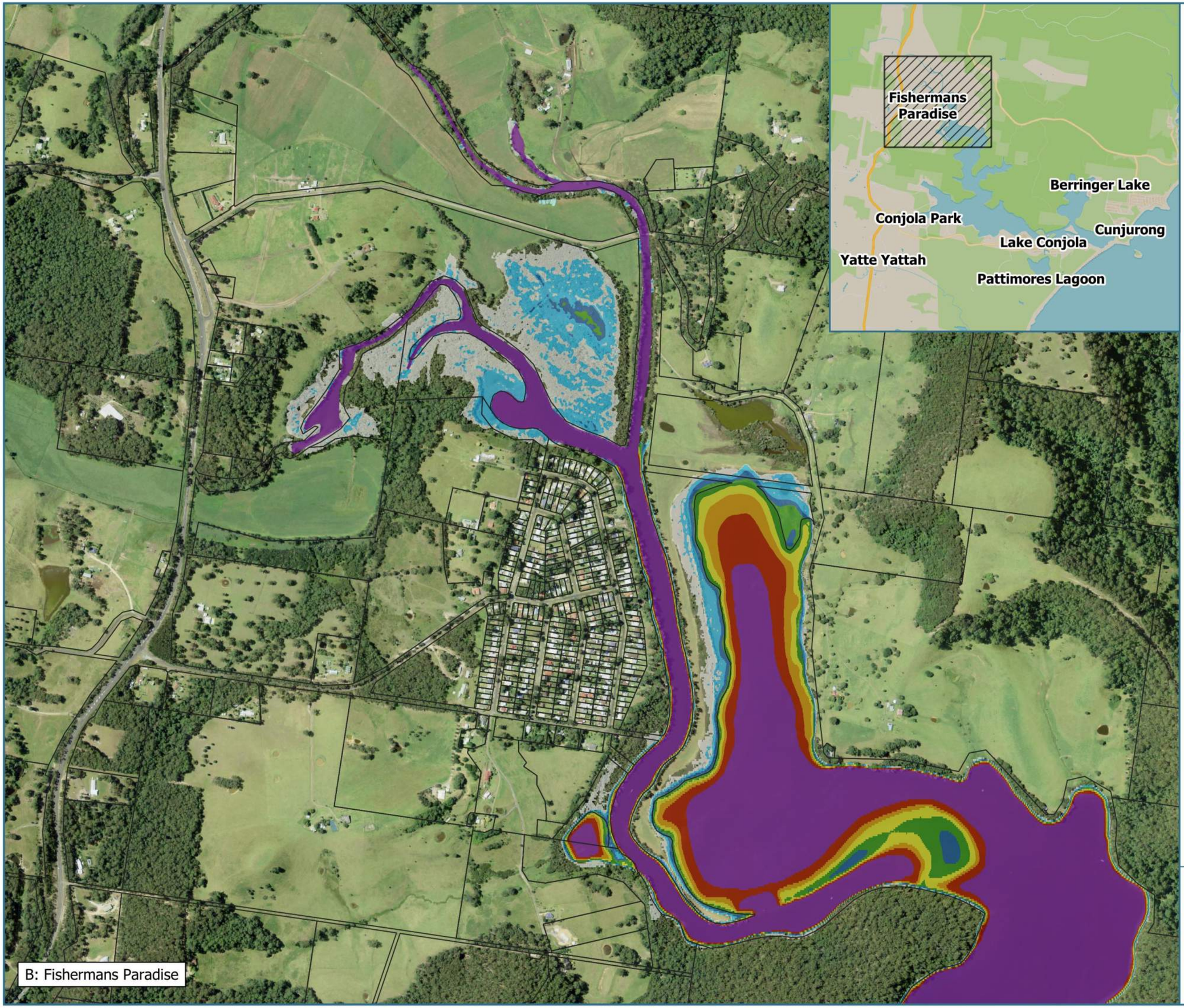

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Figure B-04
Tidal Inundation
SLR 0.23 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

Shoalhaven City Council

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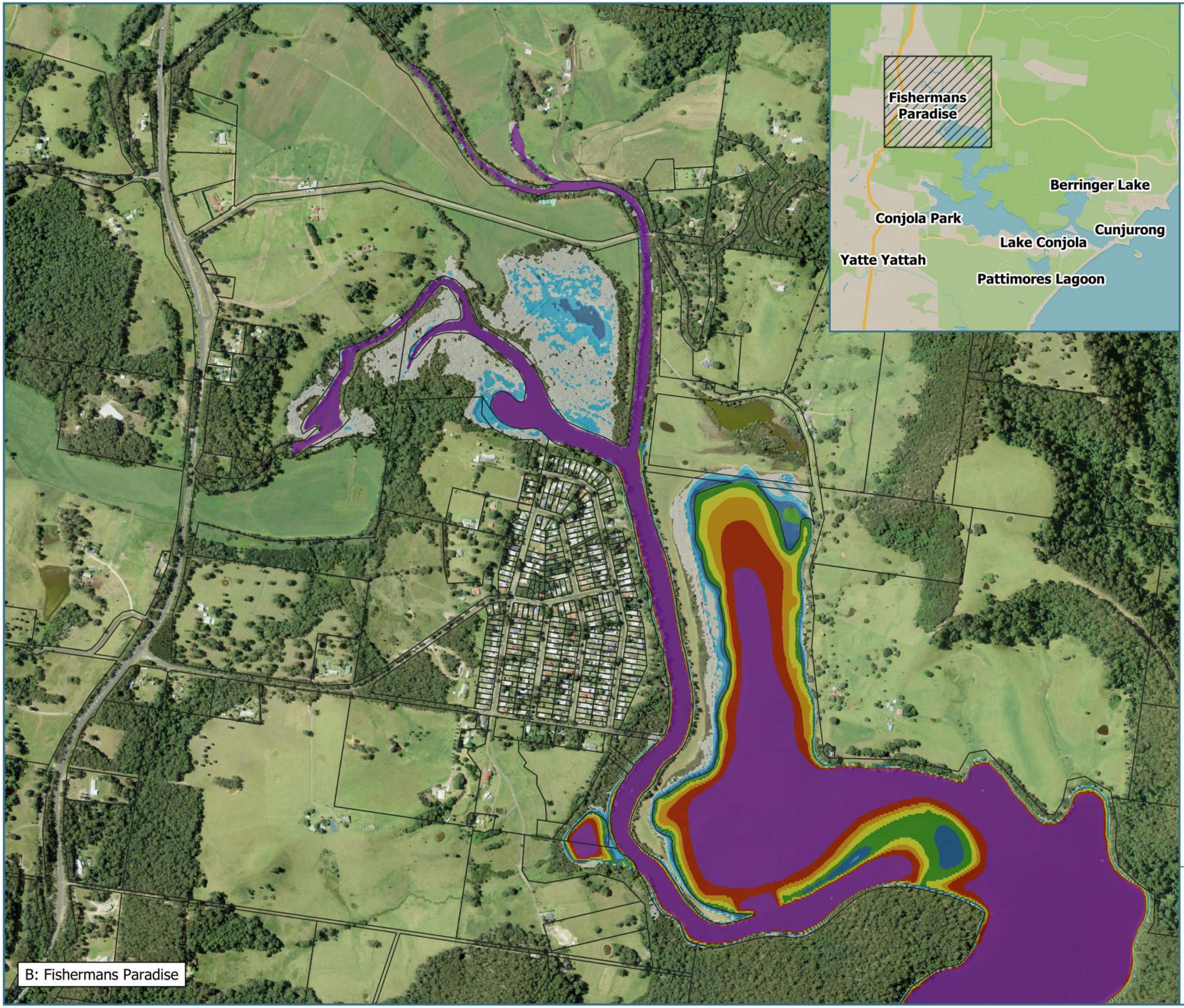

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Figure B-05
Tidal Inundation
SLR 0.23 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

Shoalhaven City Council

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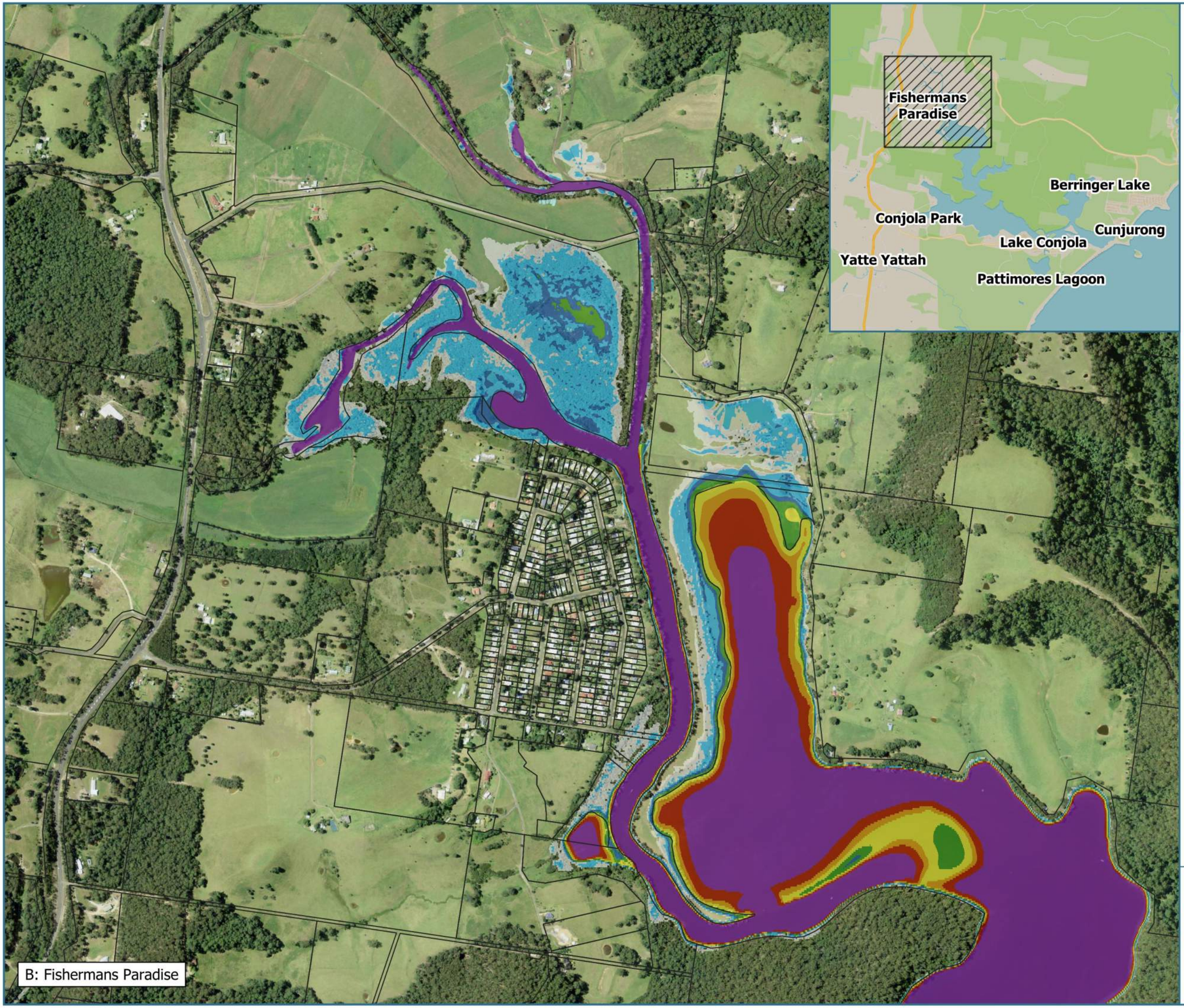

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Figure B-06
Tidal Inundation
SLR 0.36 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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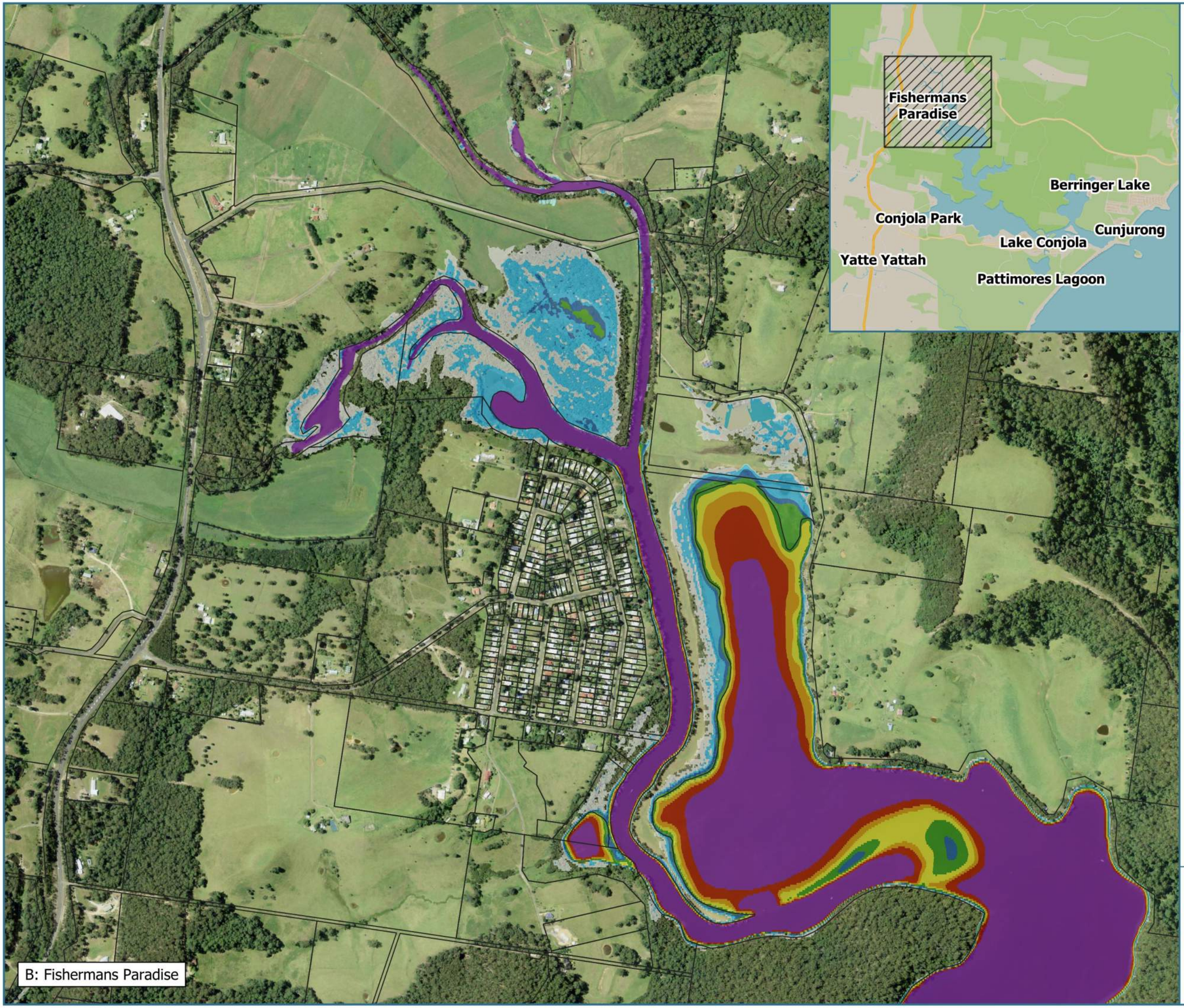

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Figure B-07
Tidal Inundation
SLR 0.36 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

Shoalhaven City Council

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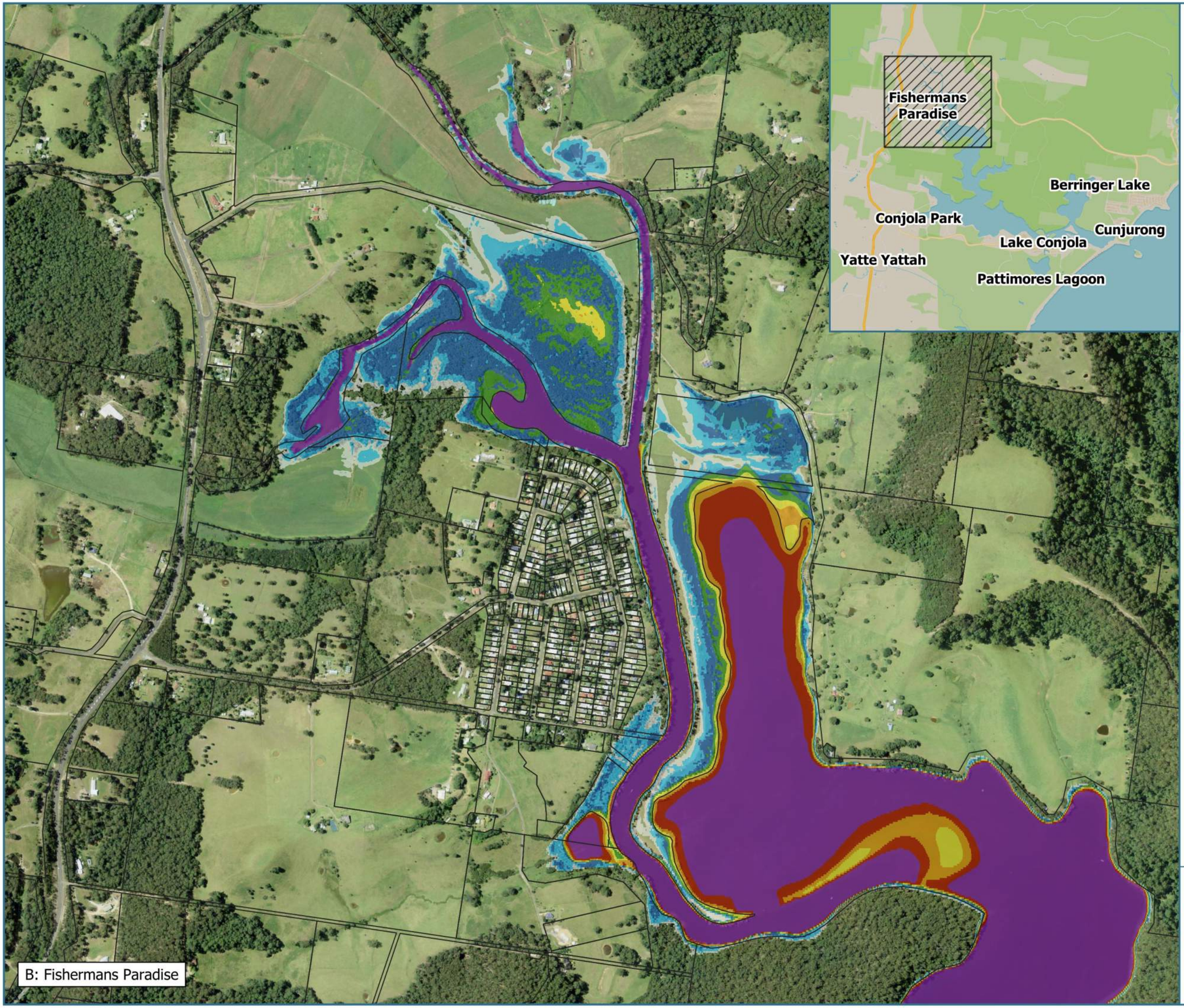

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Figure B-08
Tidal Inundation
SLR 0.6 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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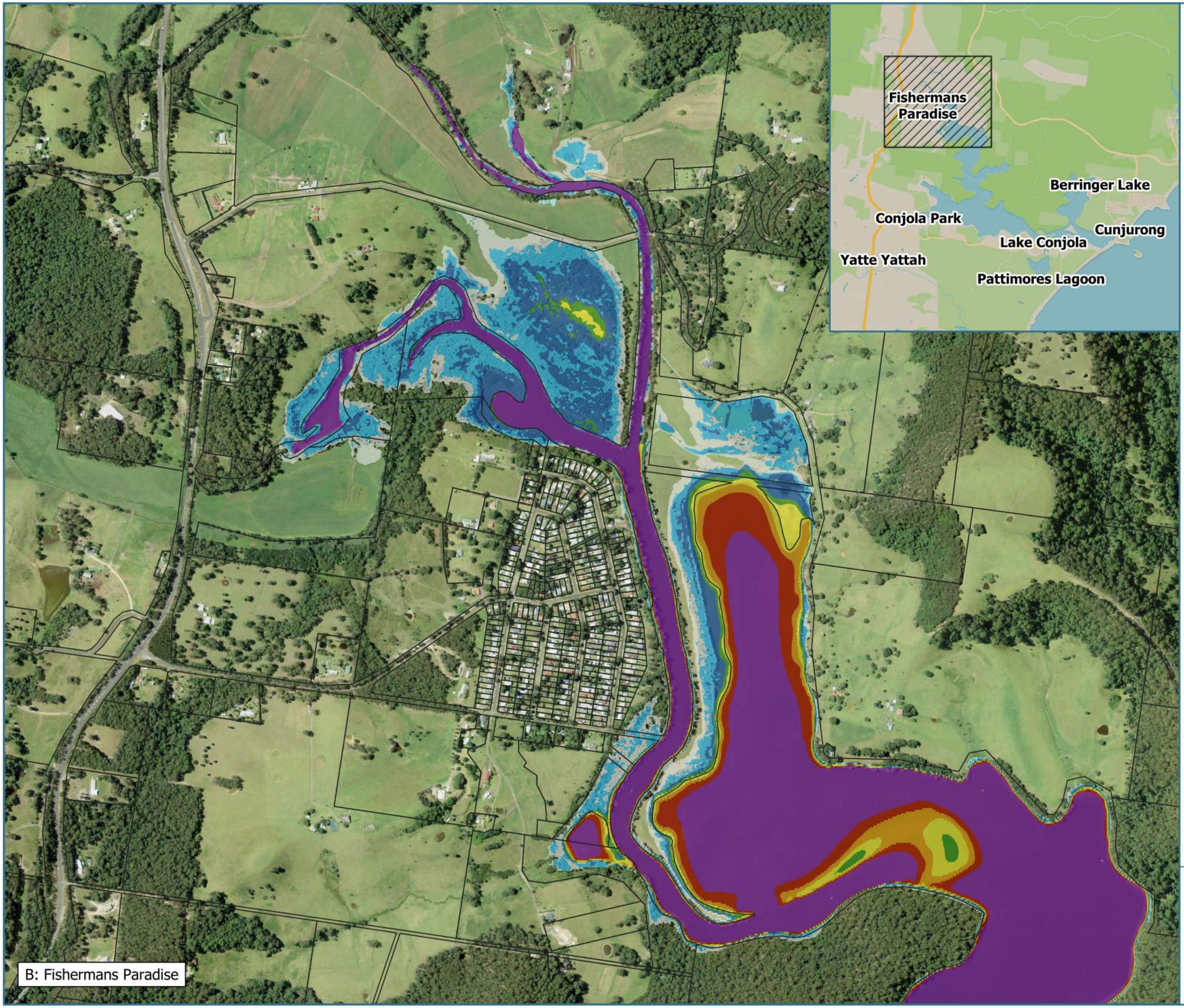

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Figure B-09
Tidal Inundation
SLR 0.6 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

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N

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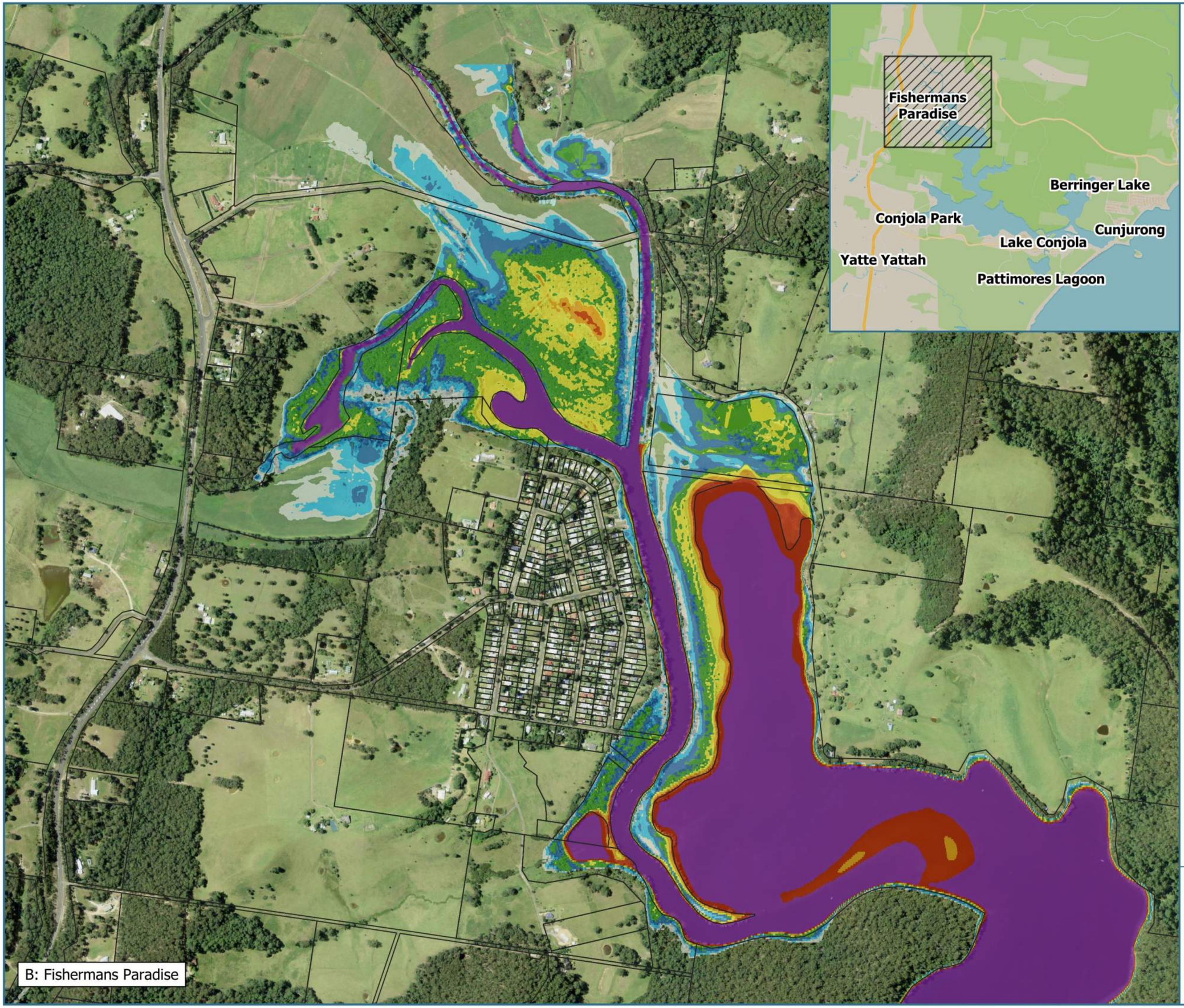

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Figure B-10
Tidal Inundation
SLR 0.9 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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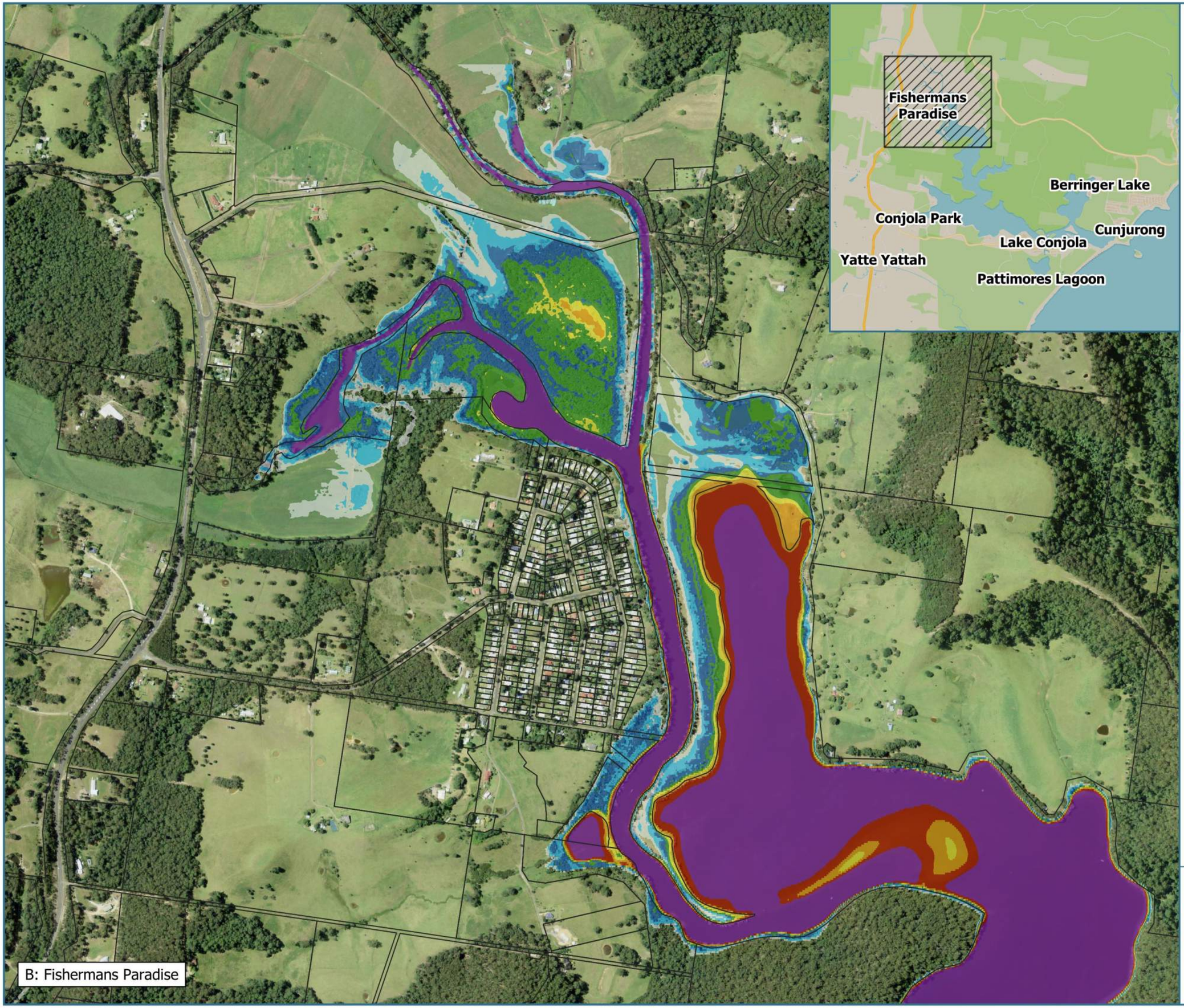

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Figure B-11
Tidal Inundation
SLR 0.9 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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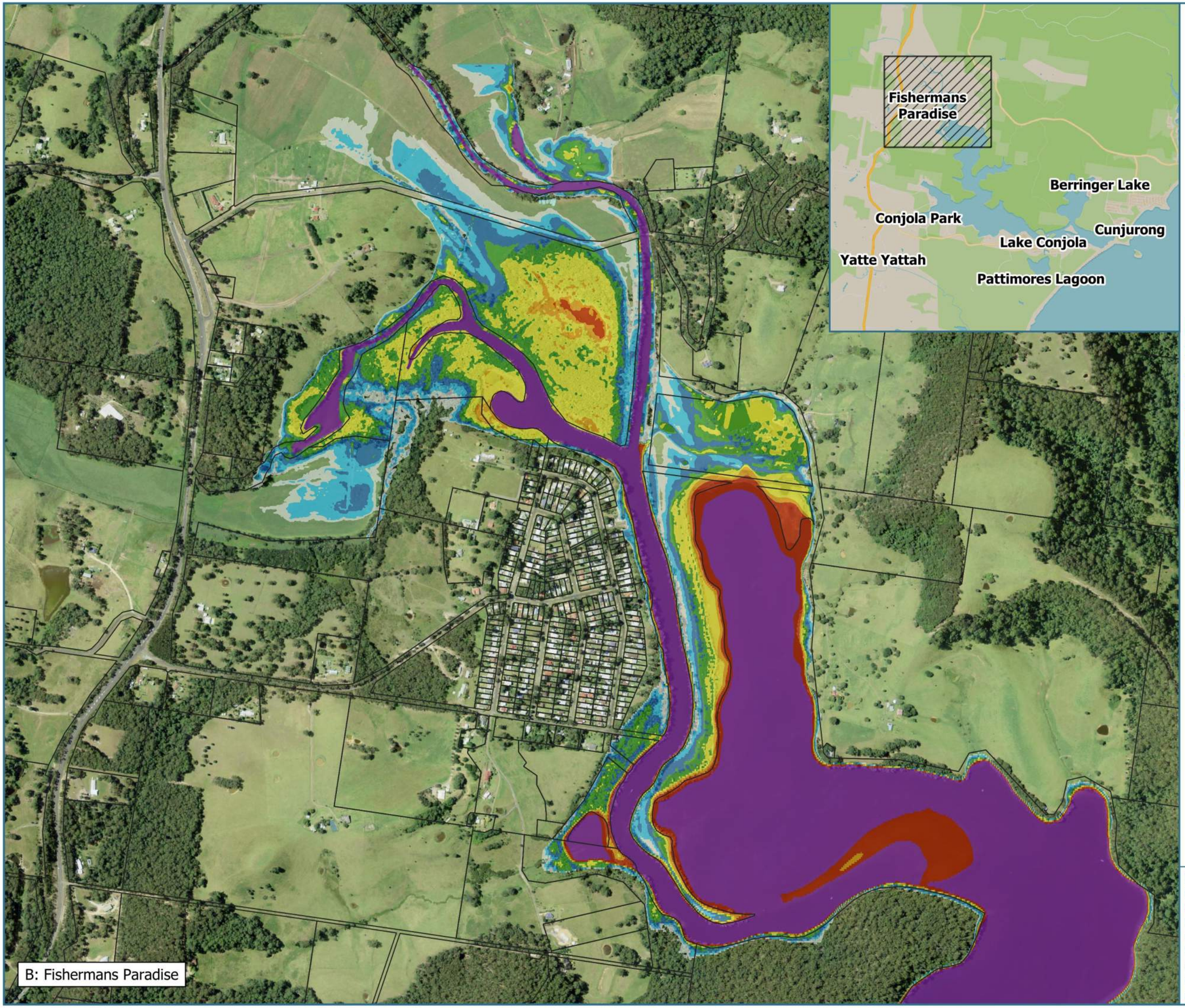

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Figure B-12
Tidal Inundation
SLR 1.2 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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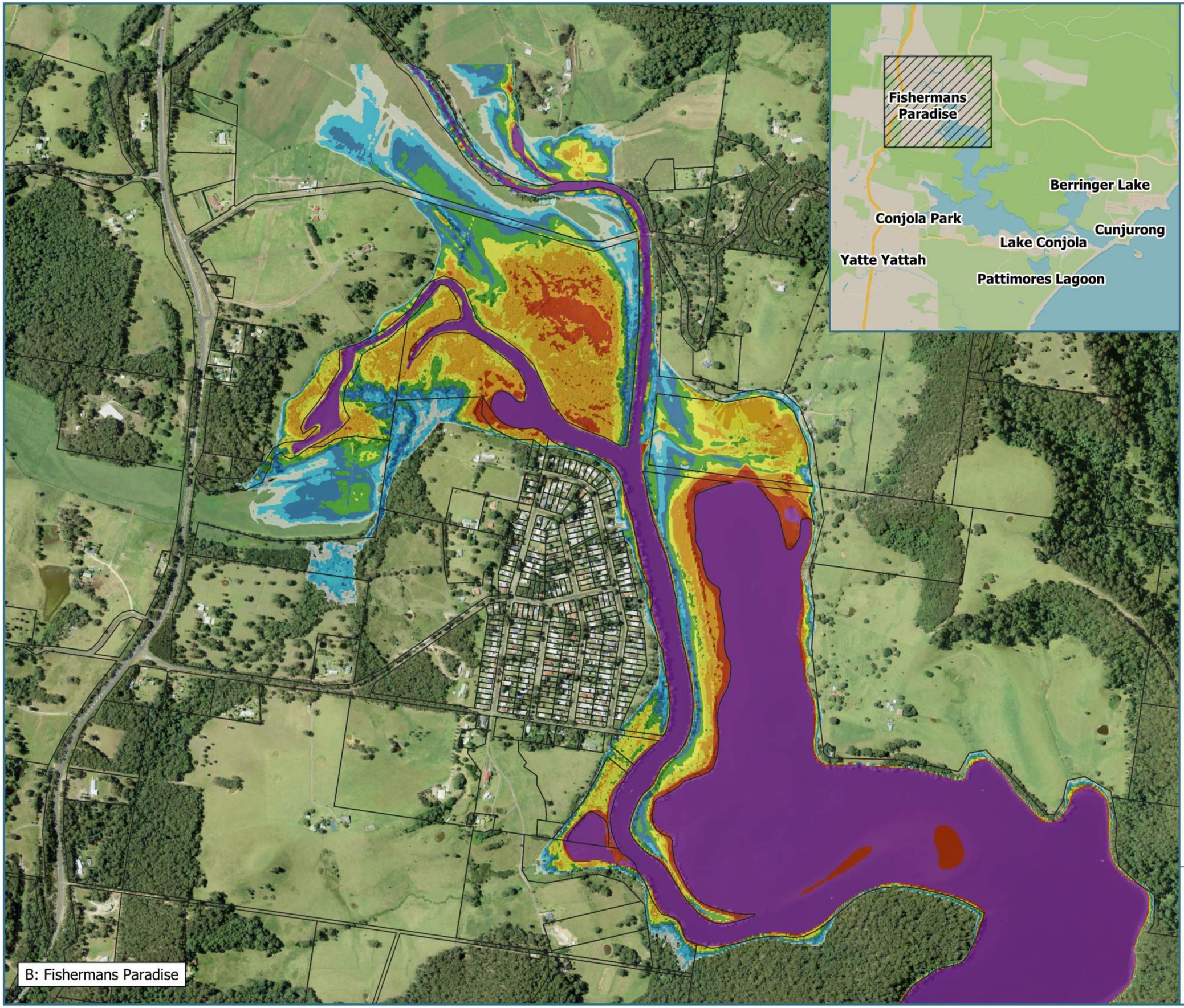

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Figure B-13
Tidal Inundation
SLR 1.2 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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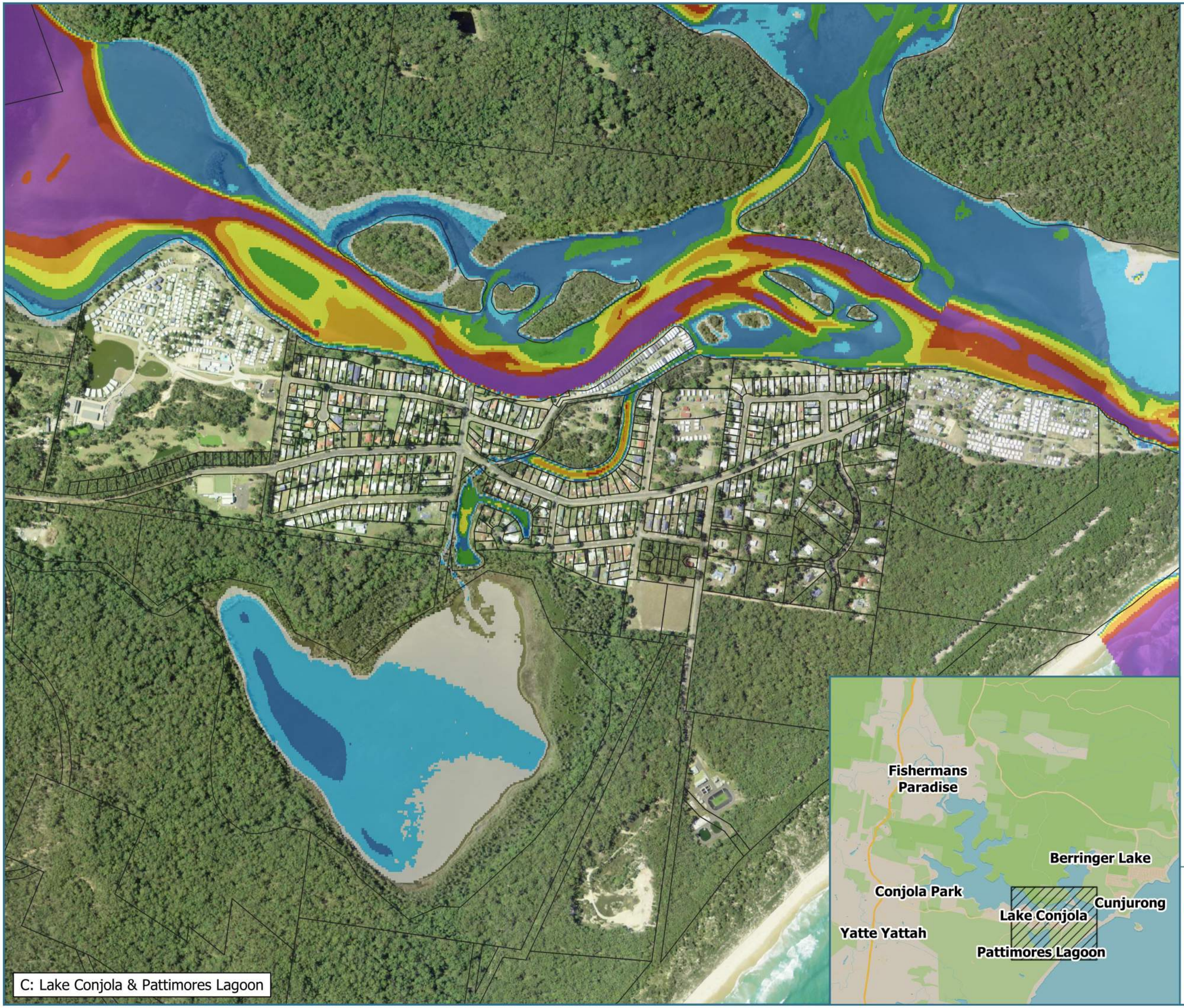

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Figure C-01
Tidal Inundation
SLR 0 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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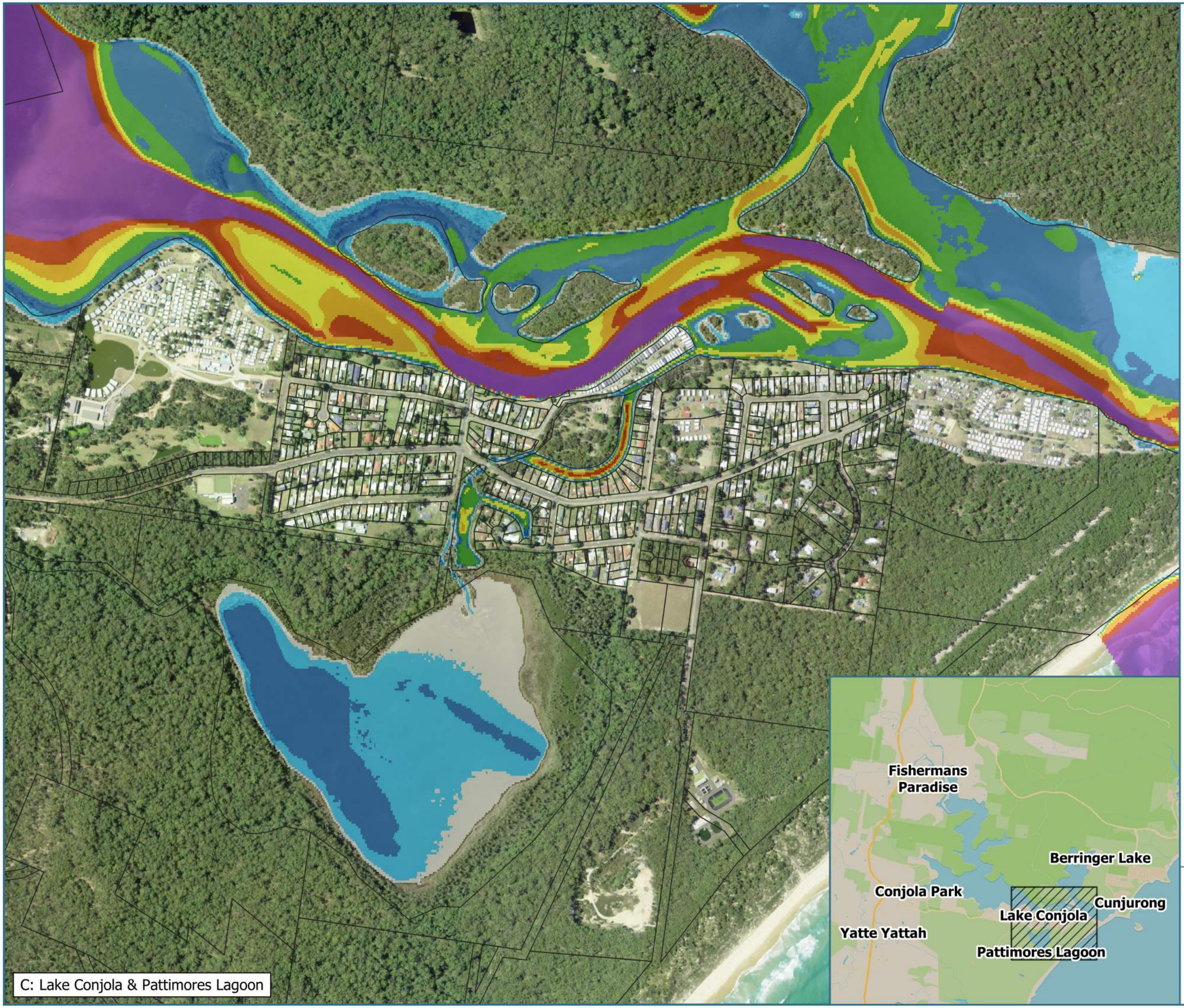

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Figure C-02
Tidal Inundation
SLR 0.1 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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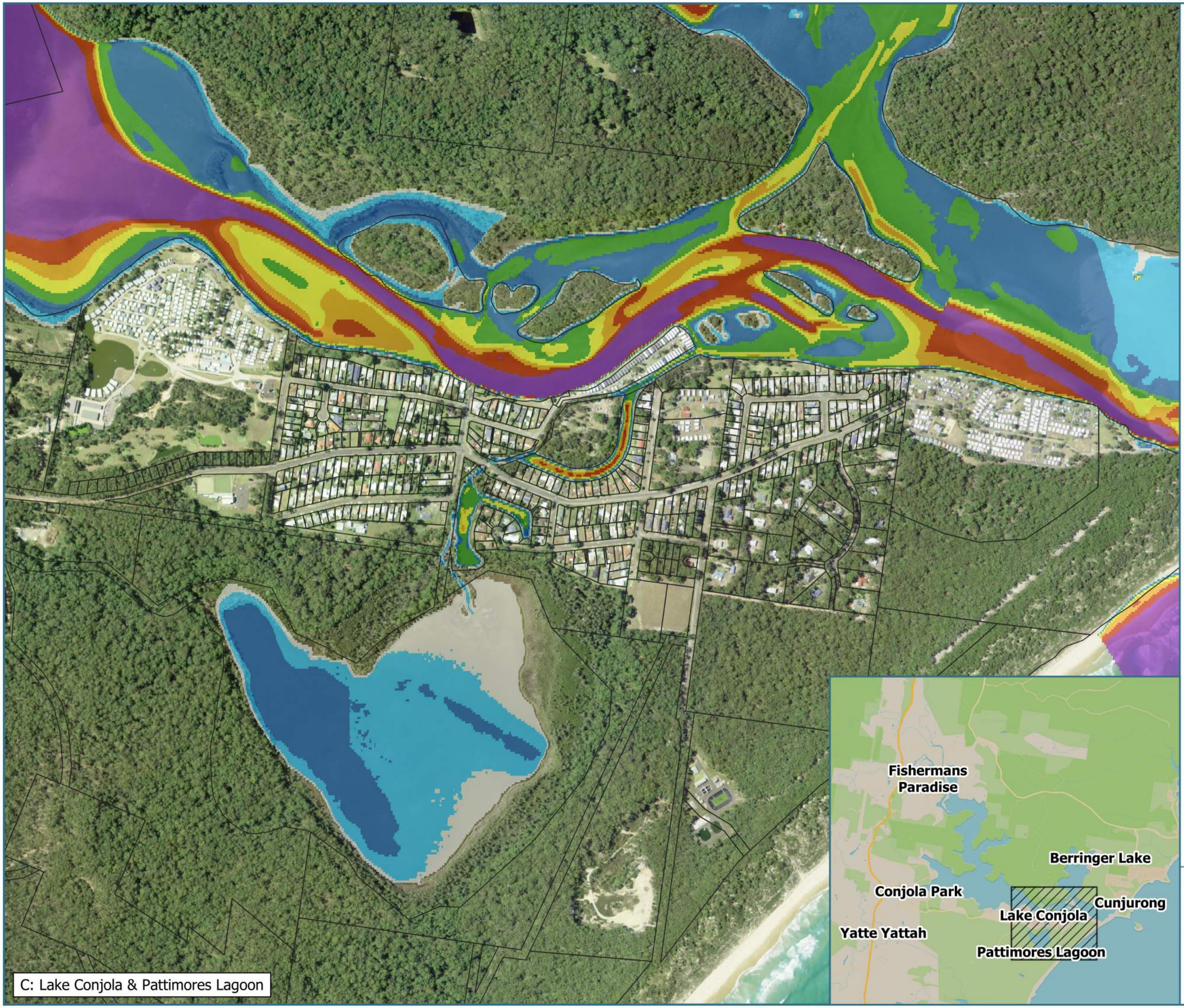

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Figure C-03
Tidal Inundation
SLR 0.1 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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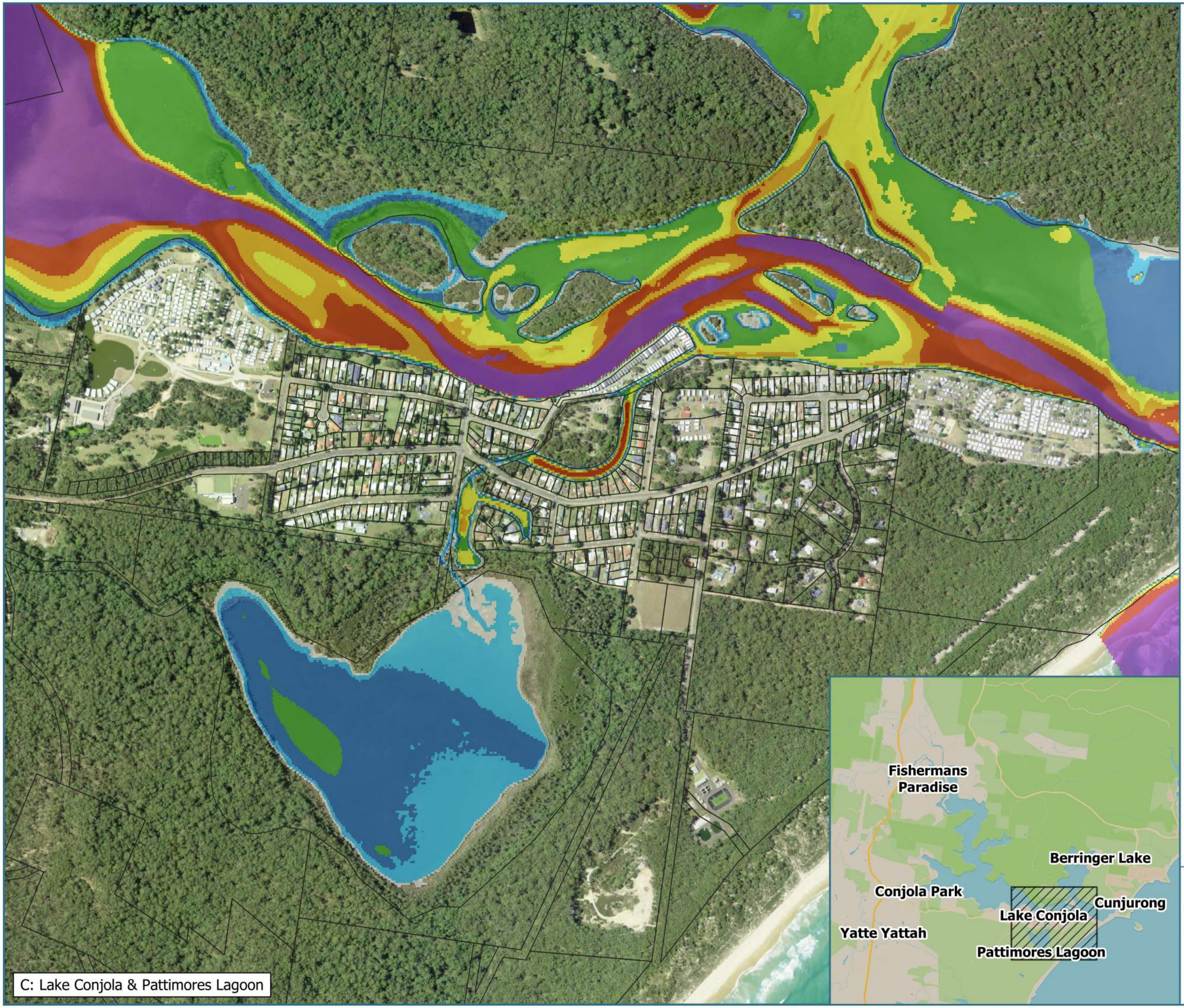

C: Lake Conjola & Pattimores Lagoon

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Figure C-04
Tidal Inundation
SLR 0.23 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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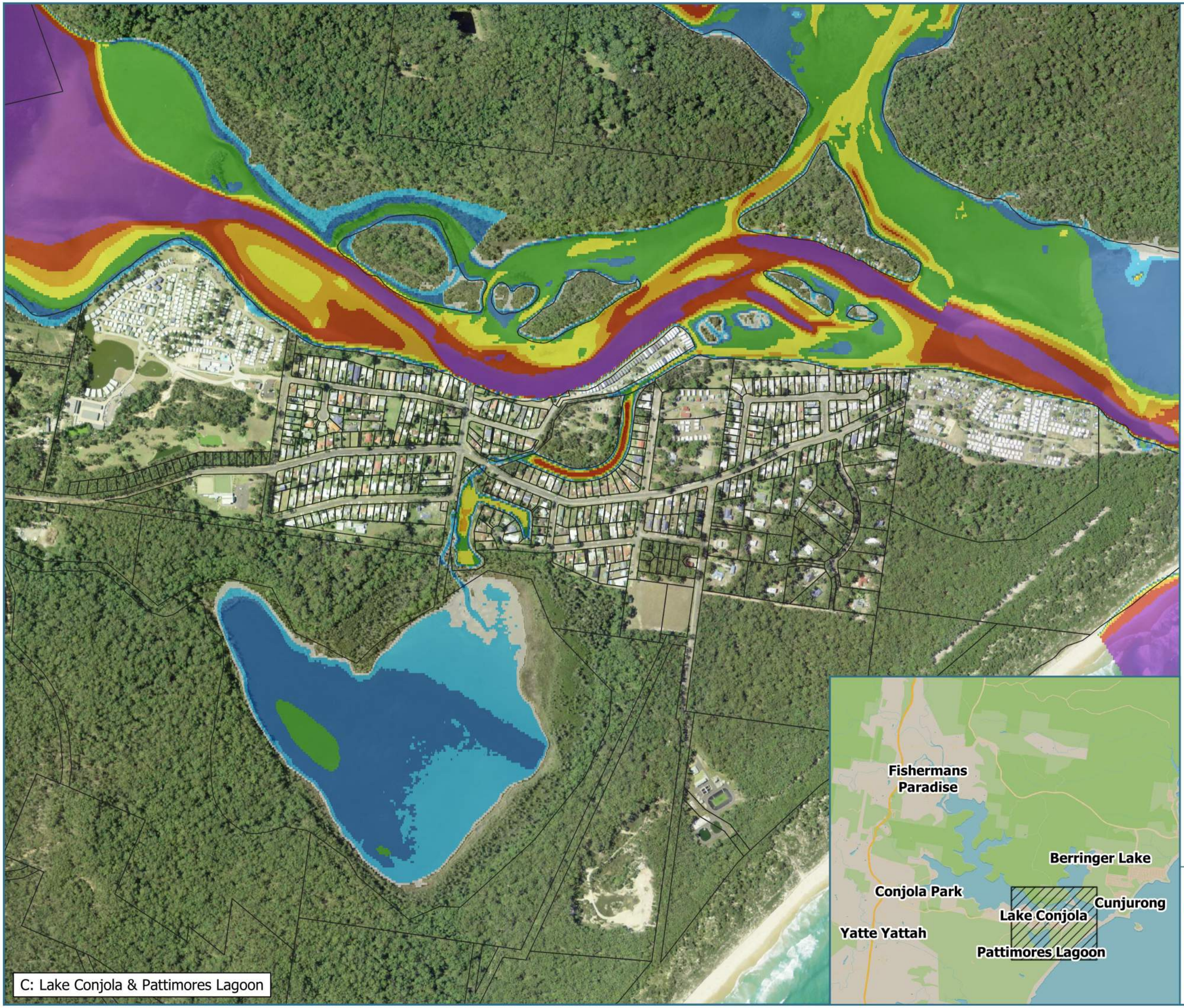

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Figure C-05
Tidal Inundation
SLR 0.23 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

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0 100 200 300 m

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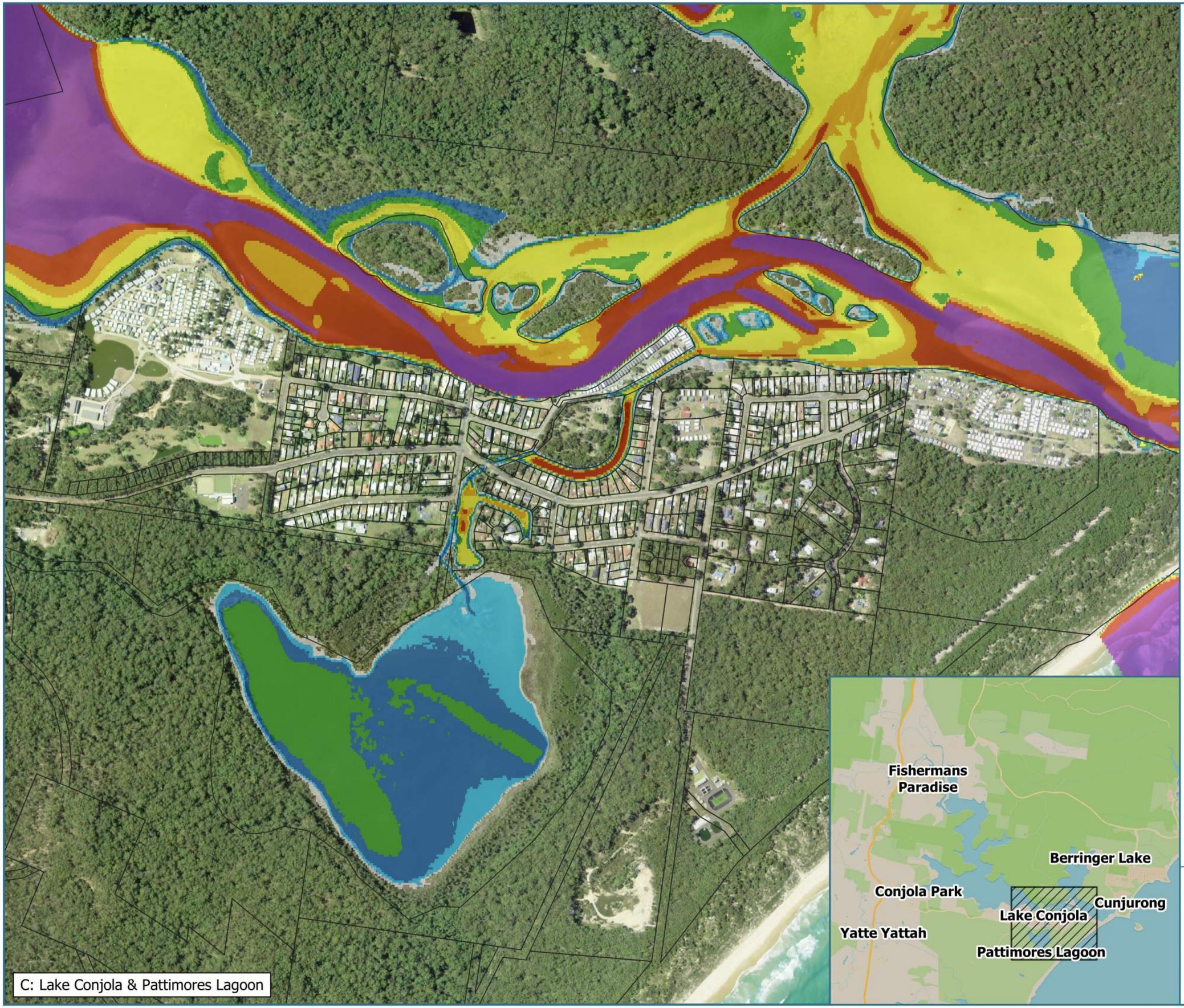

C: Lake Conjola & Pattimores Lagoon

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Figure C-06
Tidal Inundation
SLR 0.36 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

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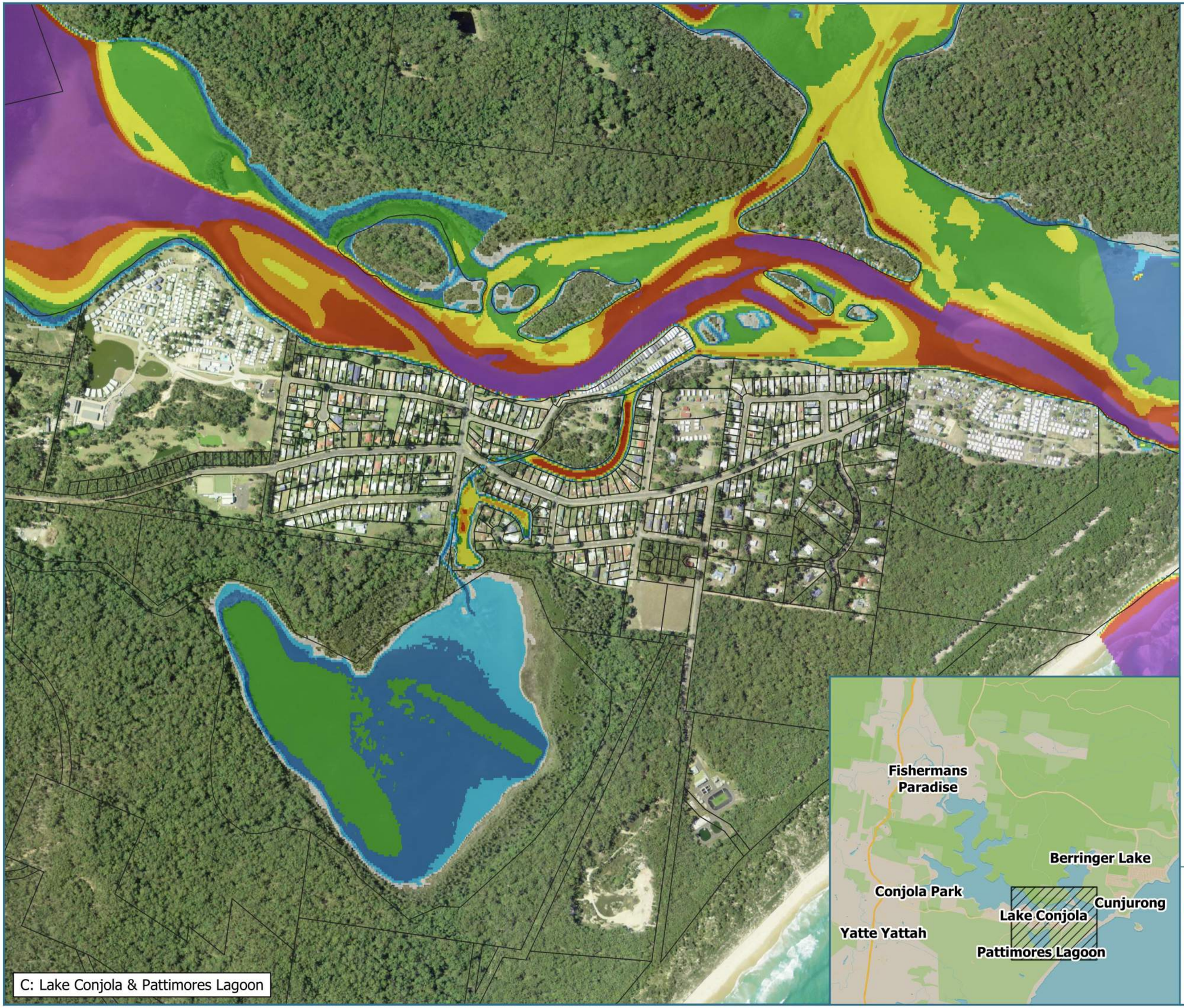

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Figure C-07
Tidal Inundation
SLR 0.36 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

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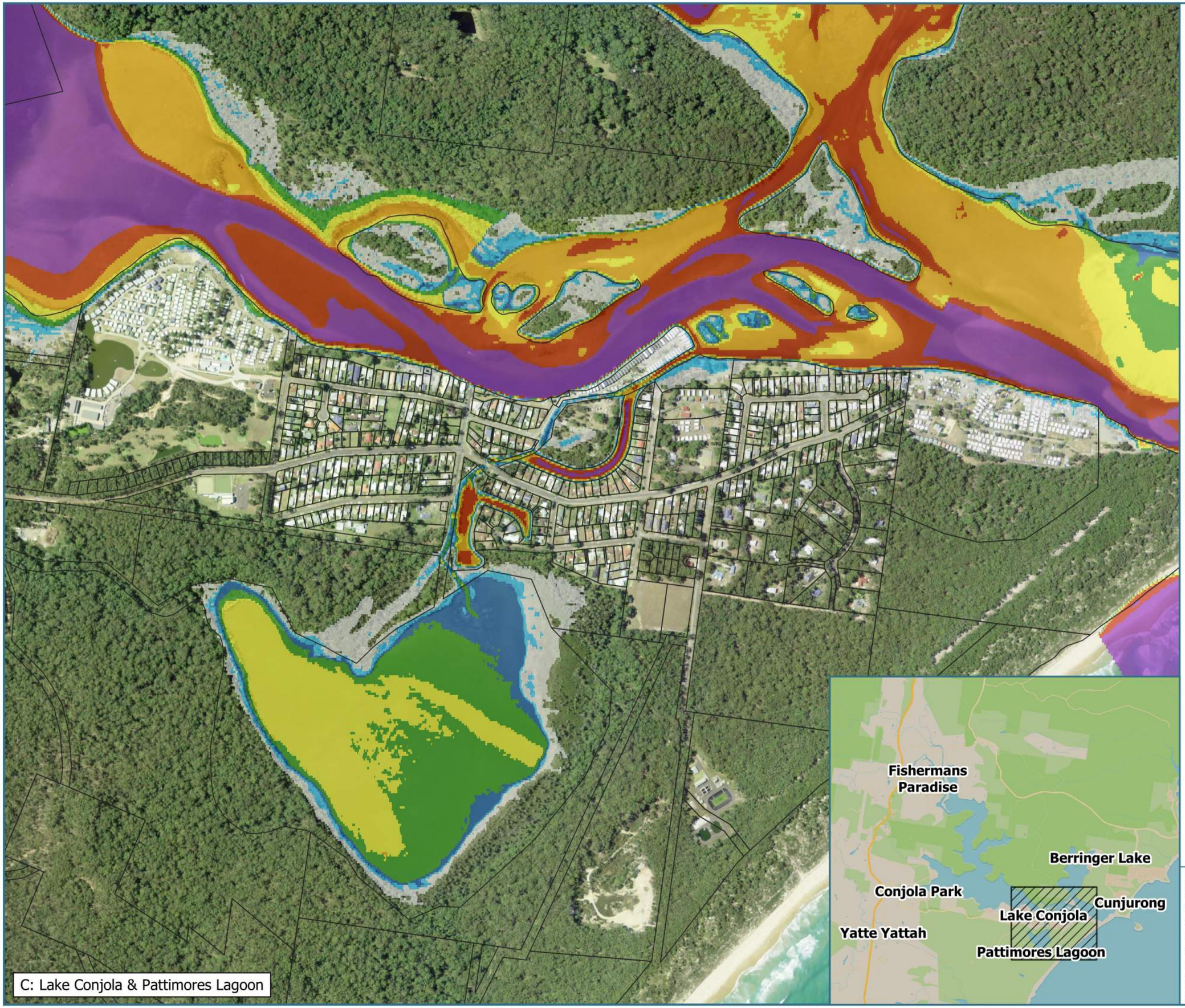

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Figure C-08
Tidal Inundation
SLR 0.6 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

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N

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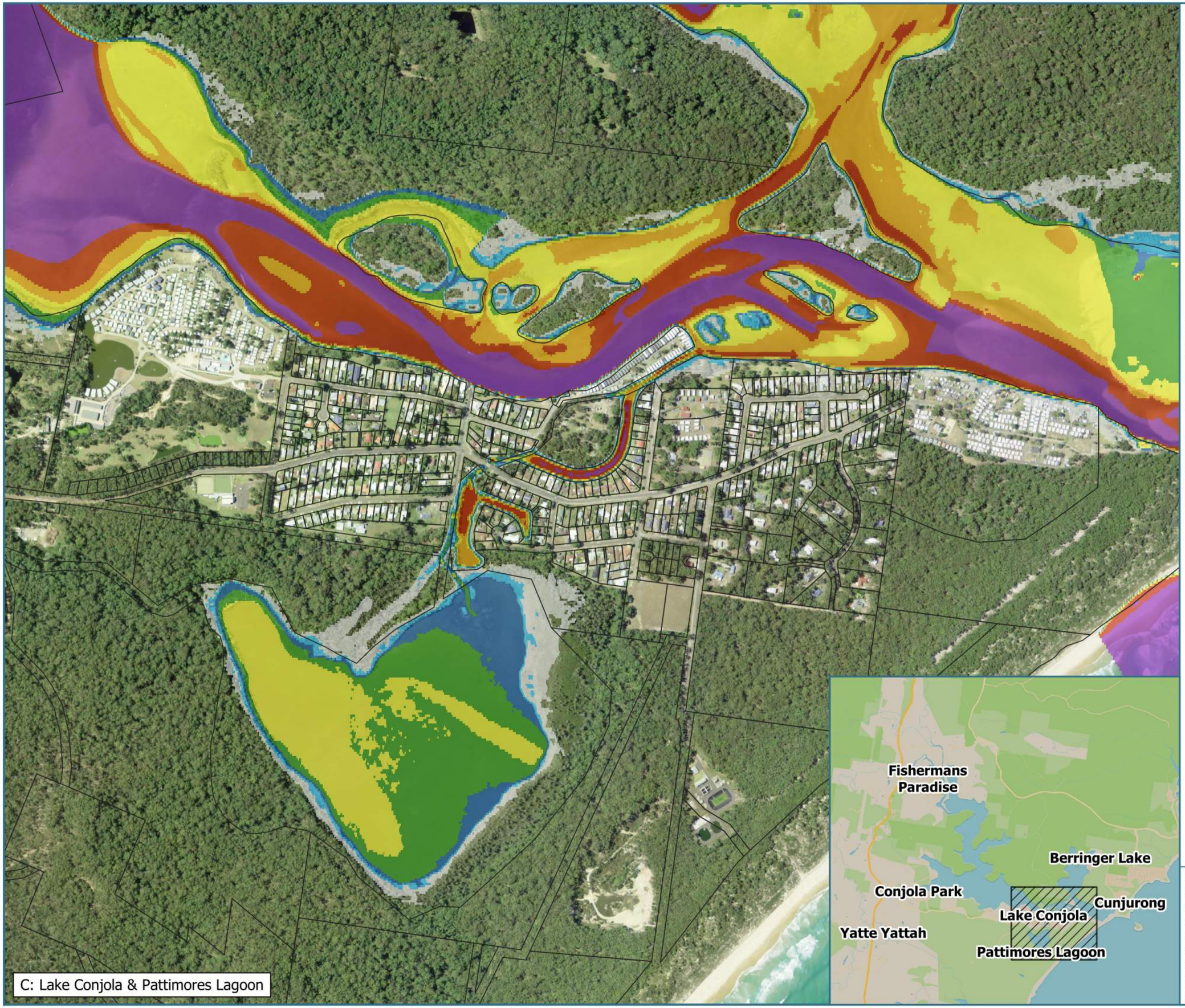

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Figure C-09
Tidal Inundation
SLR 0.6 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
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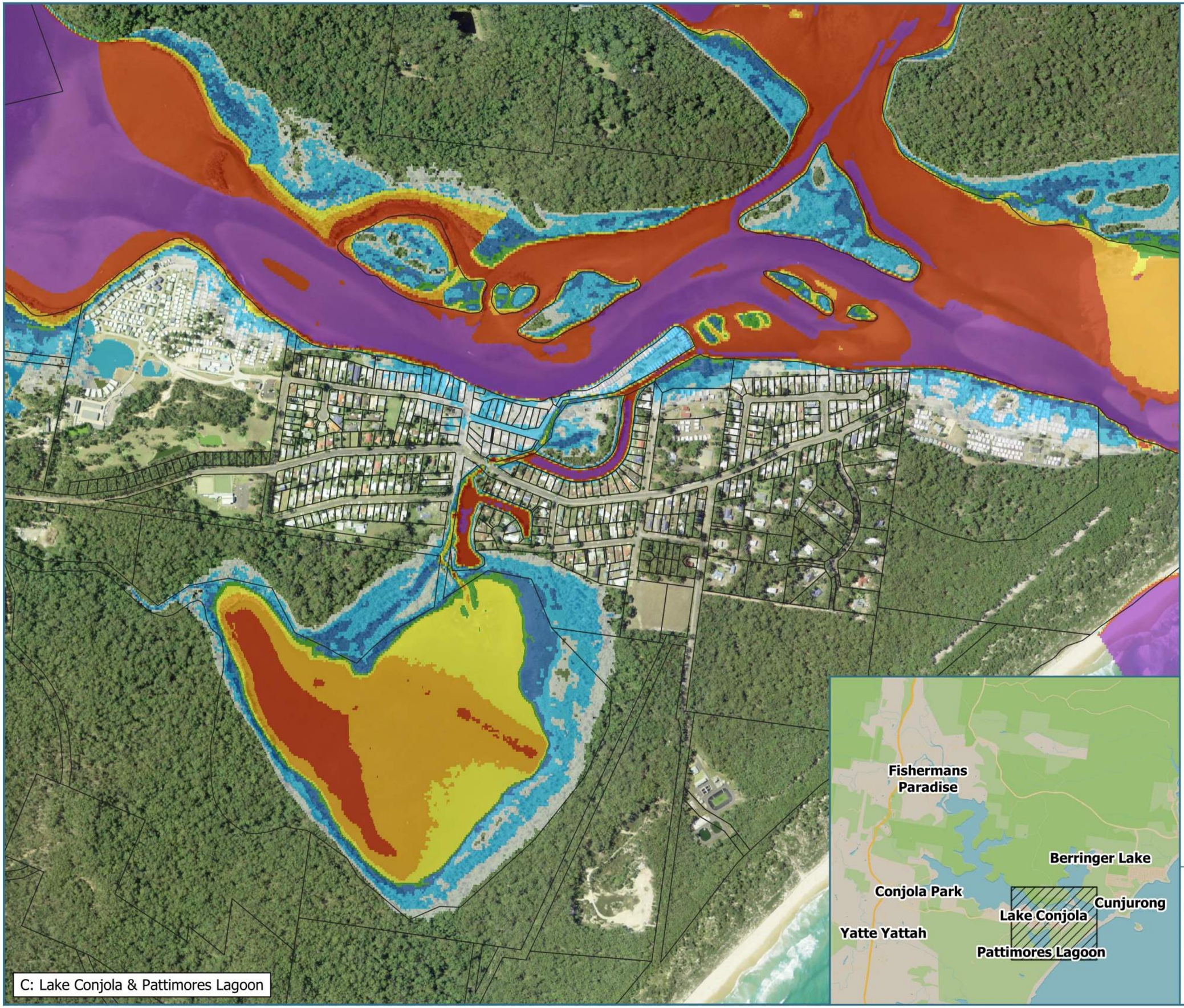

C: Lake Conjola & Pattimores Lagoon

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Lake Conjola Coastal Management Program

Figure C-10
Tidal Inundation
SLR 0.9 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

Shoalhaven City Council

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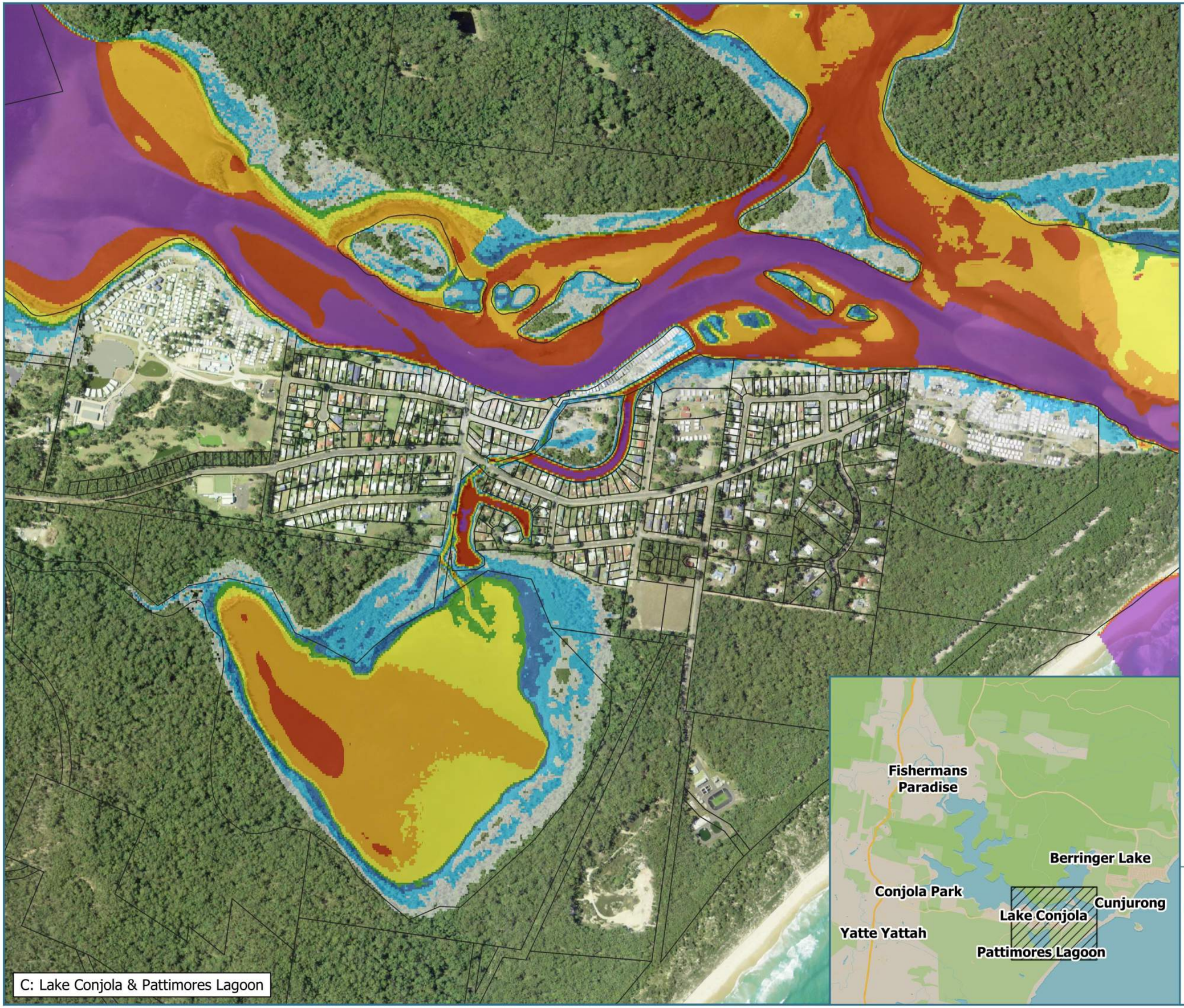

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Lake Conjola Coastal Management Program

Figure C-11
Tidal Inundation
SLR 0.9 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

Shoalhaven City Council

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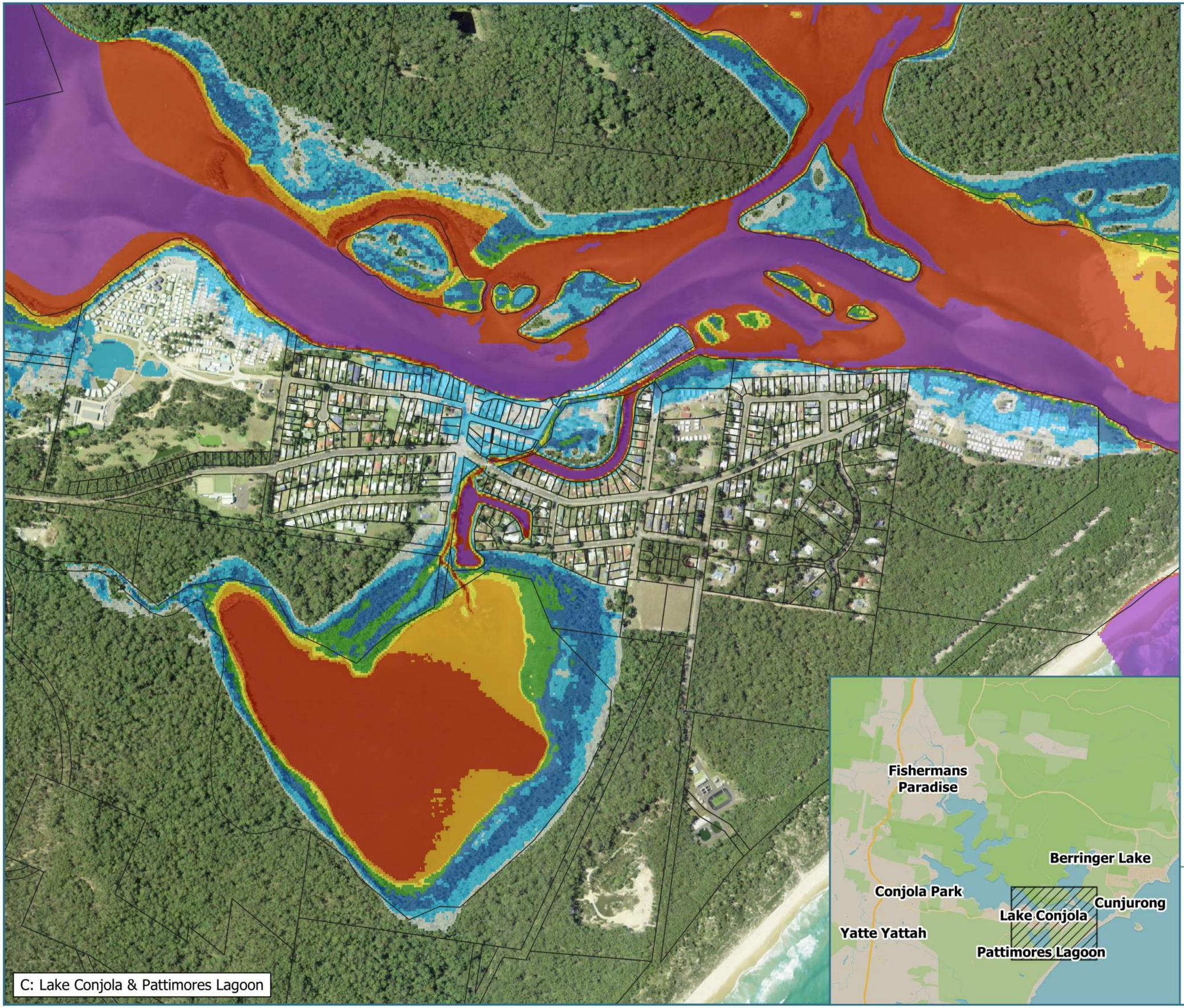

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Figure C-12
Tidal Inundation
SLR 1.2 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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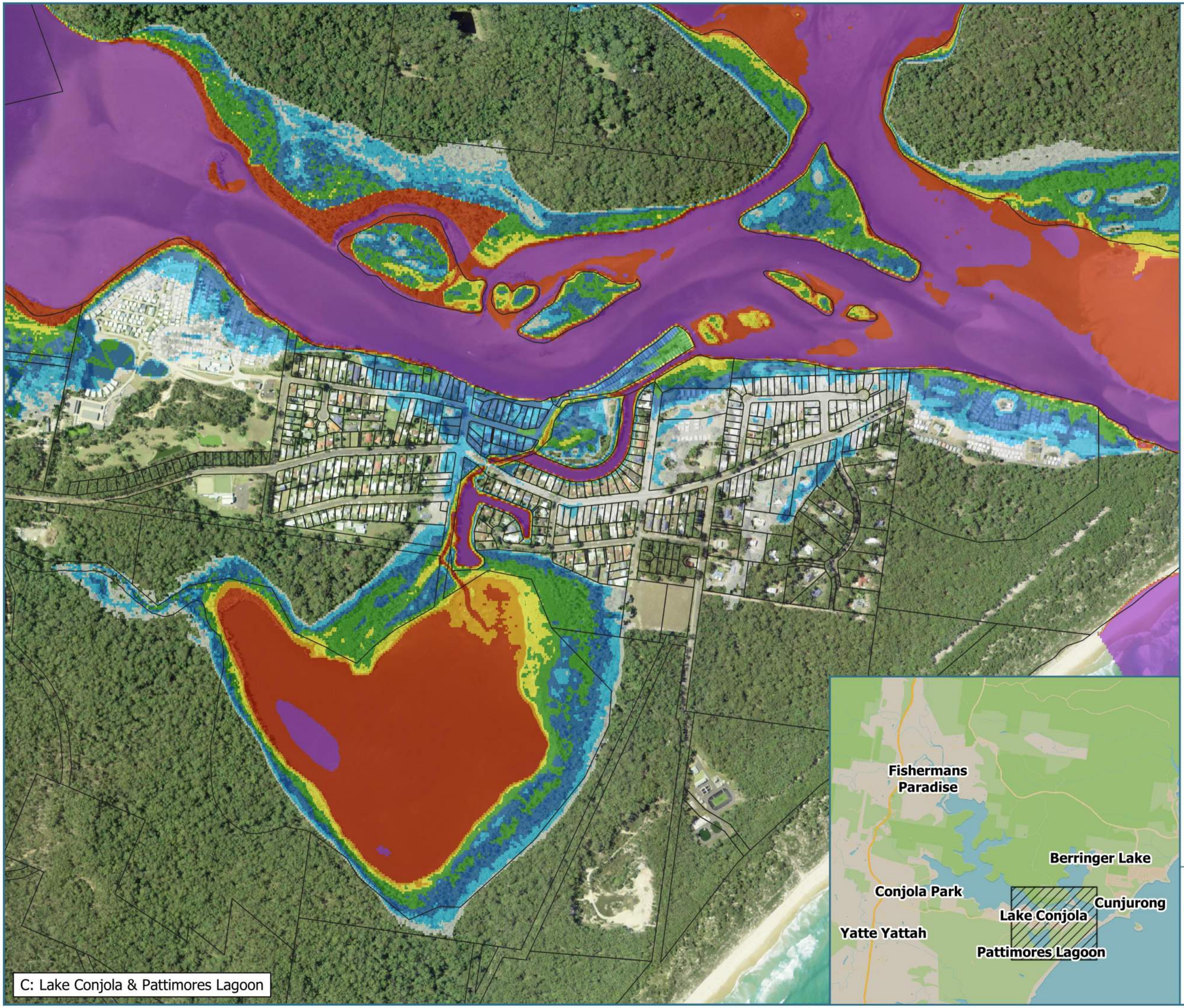

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Figure C-13
Tidal Inundation
SLR 1.2 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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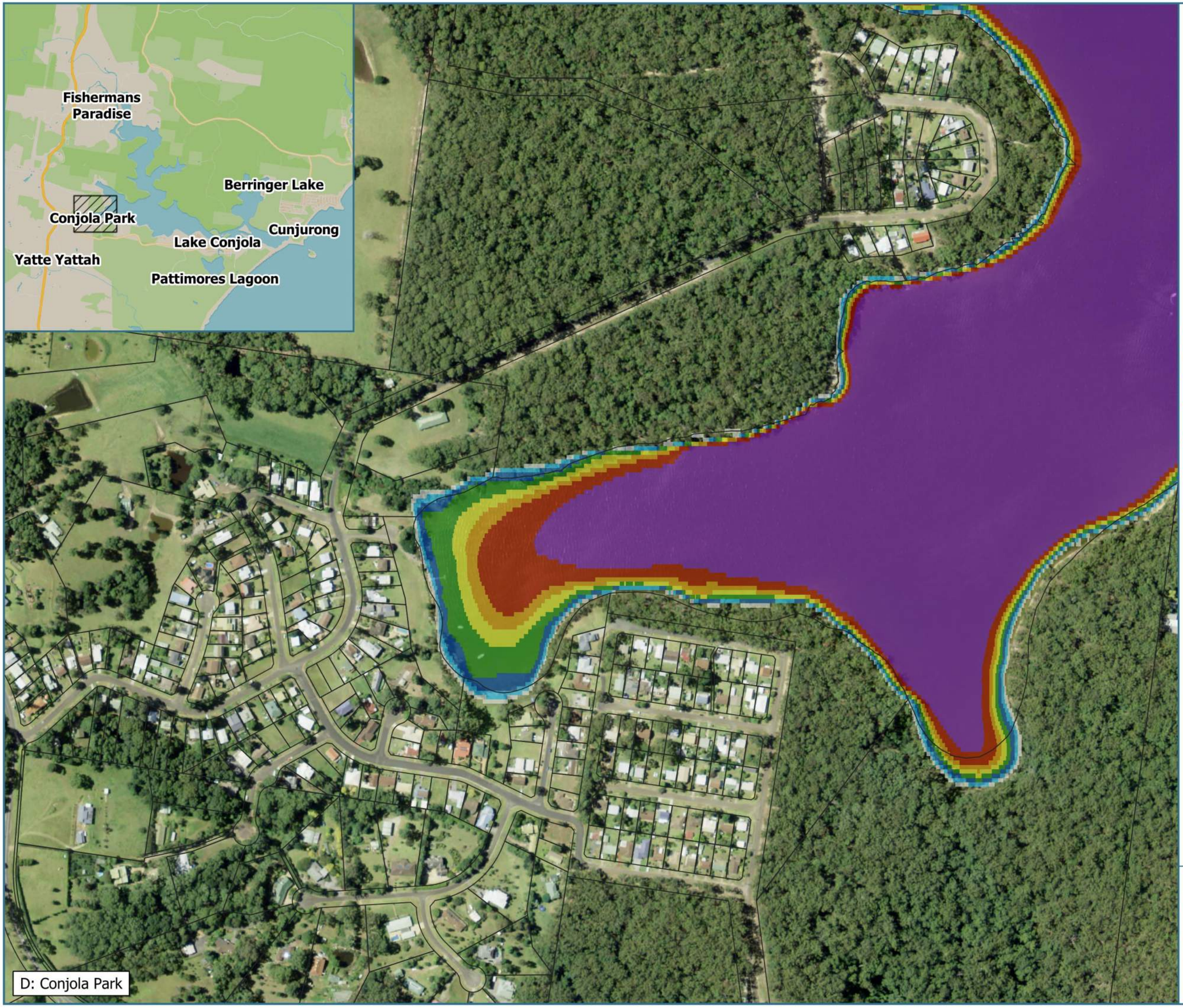

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Figure D-01
Tidal Inundation
SLR 0 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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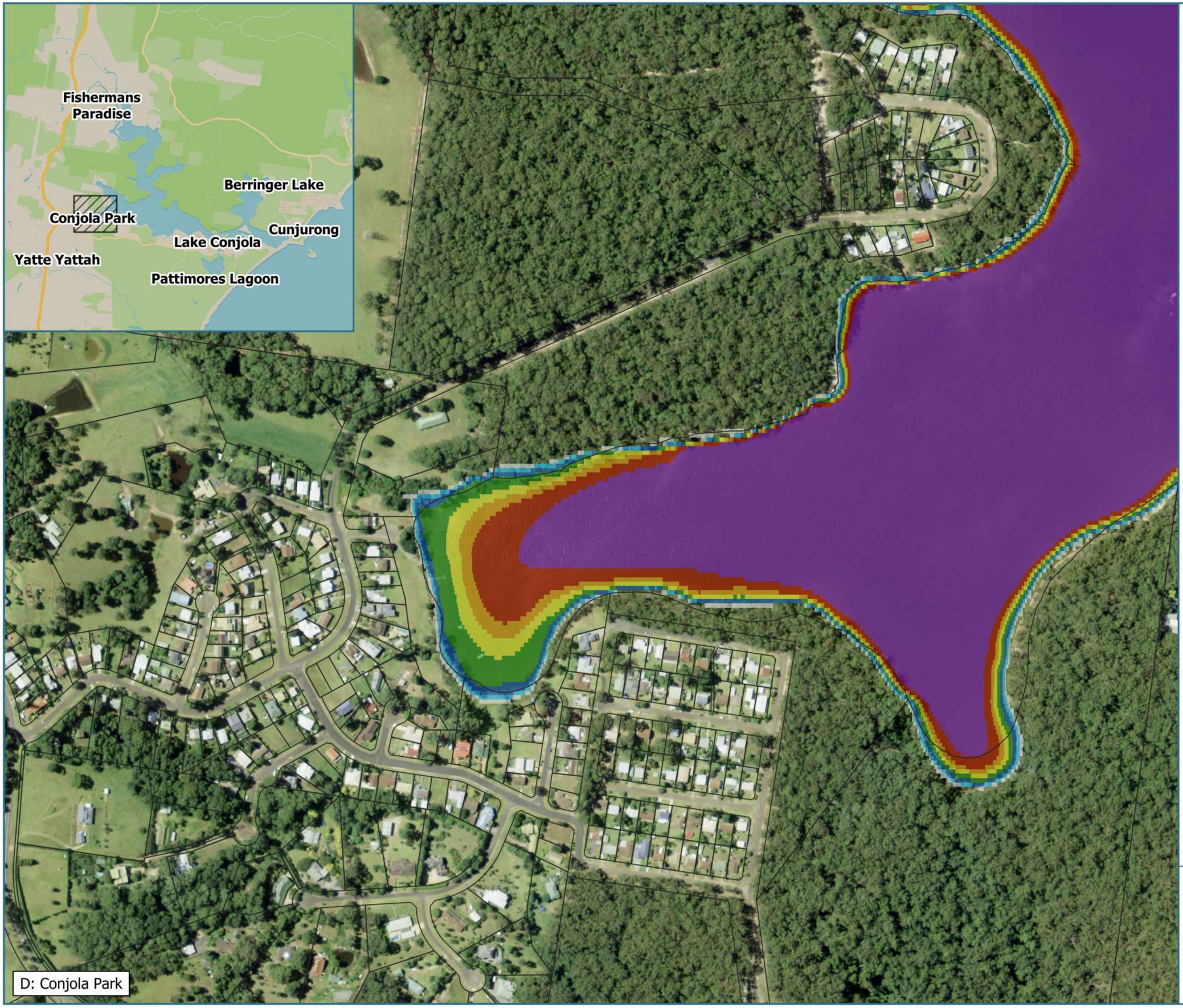

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Figure D-02
Tidal Inundation
SLR 0.1 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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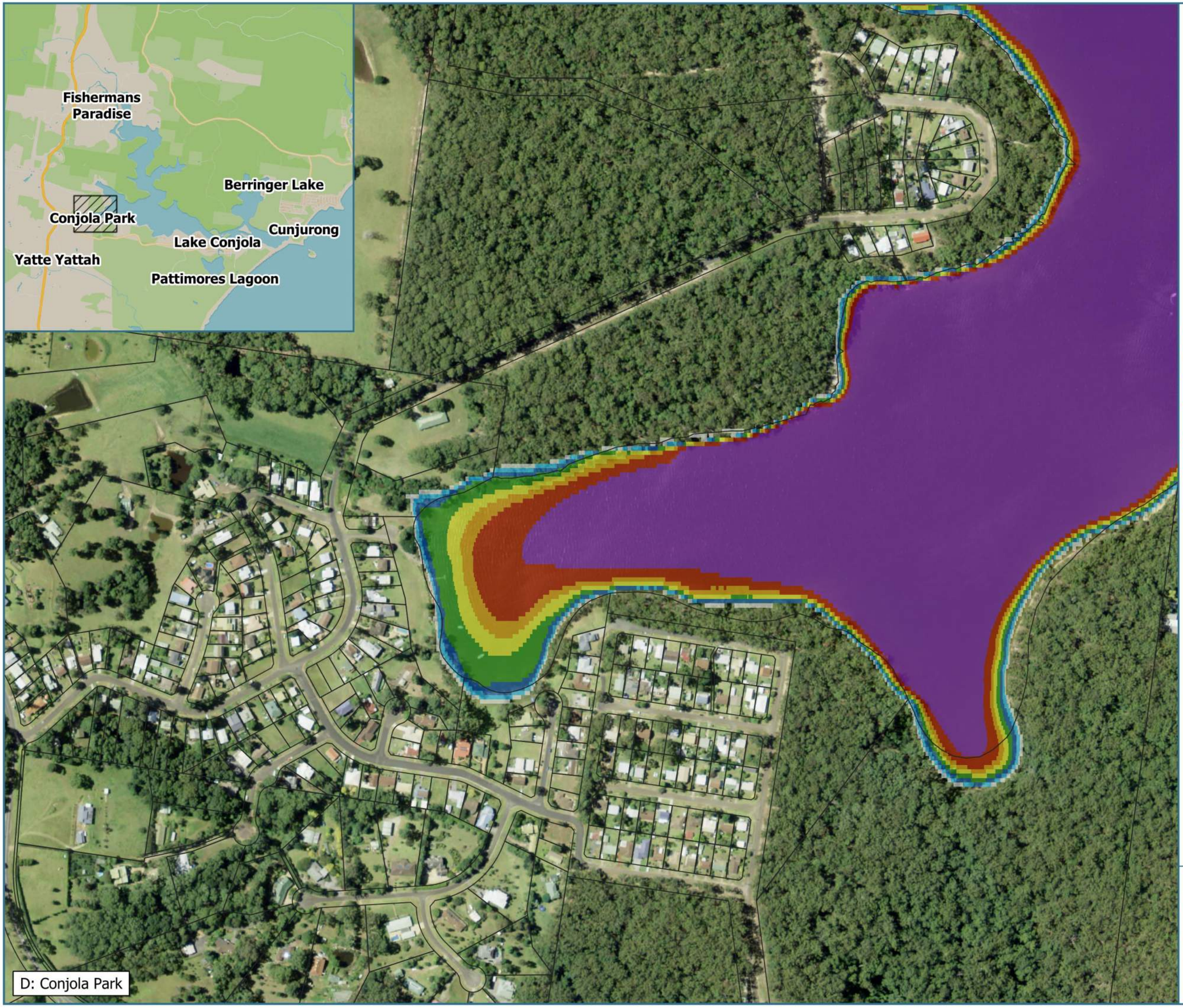

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Figure D-03
Tidal Inundation
SLR 0.1 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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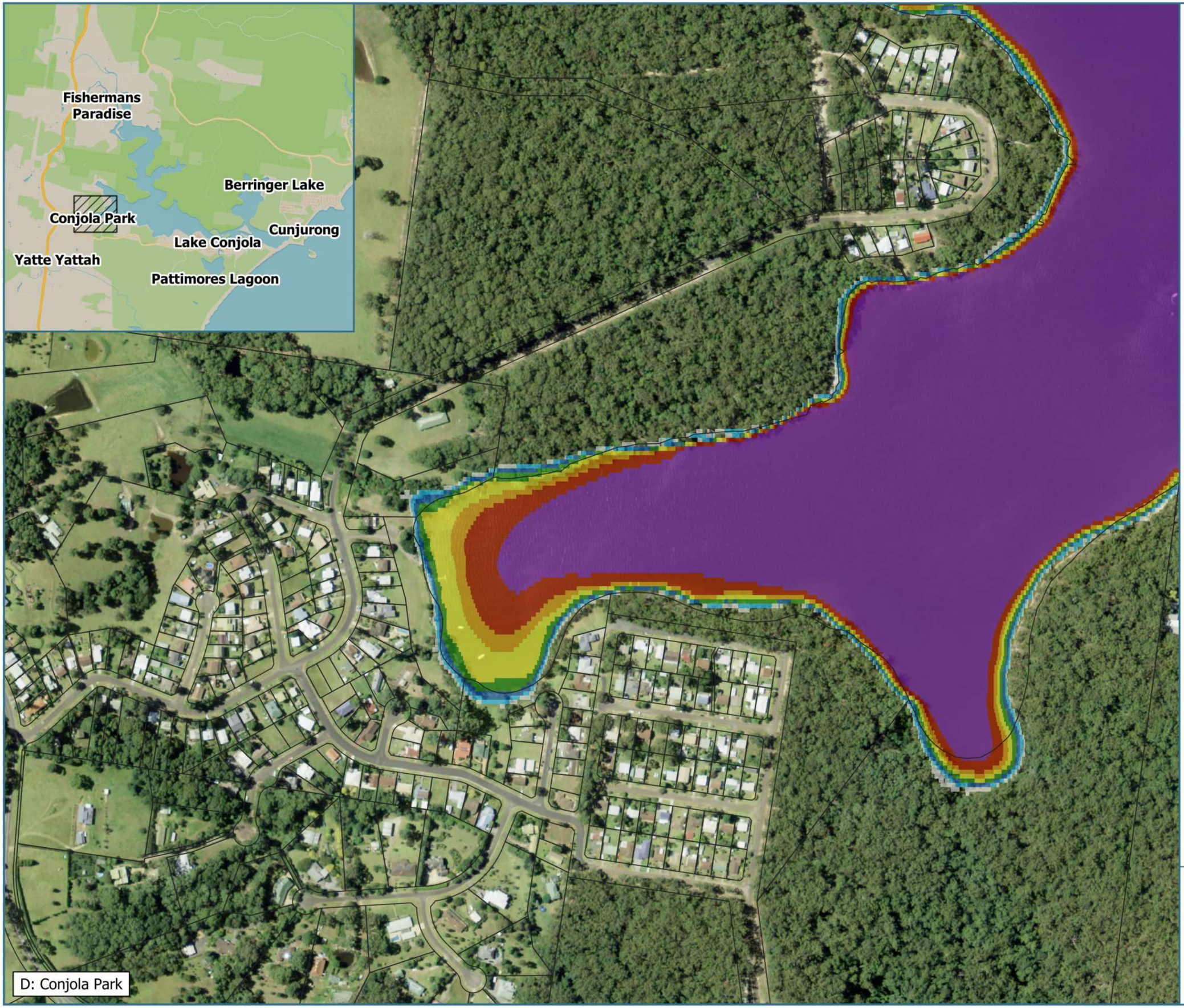

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Figure D-04
Tidal Inundation
SLR 0.23 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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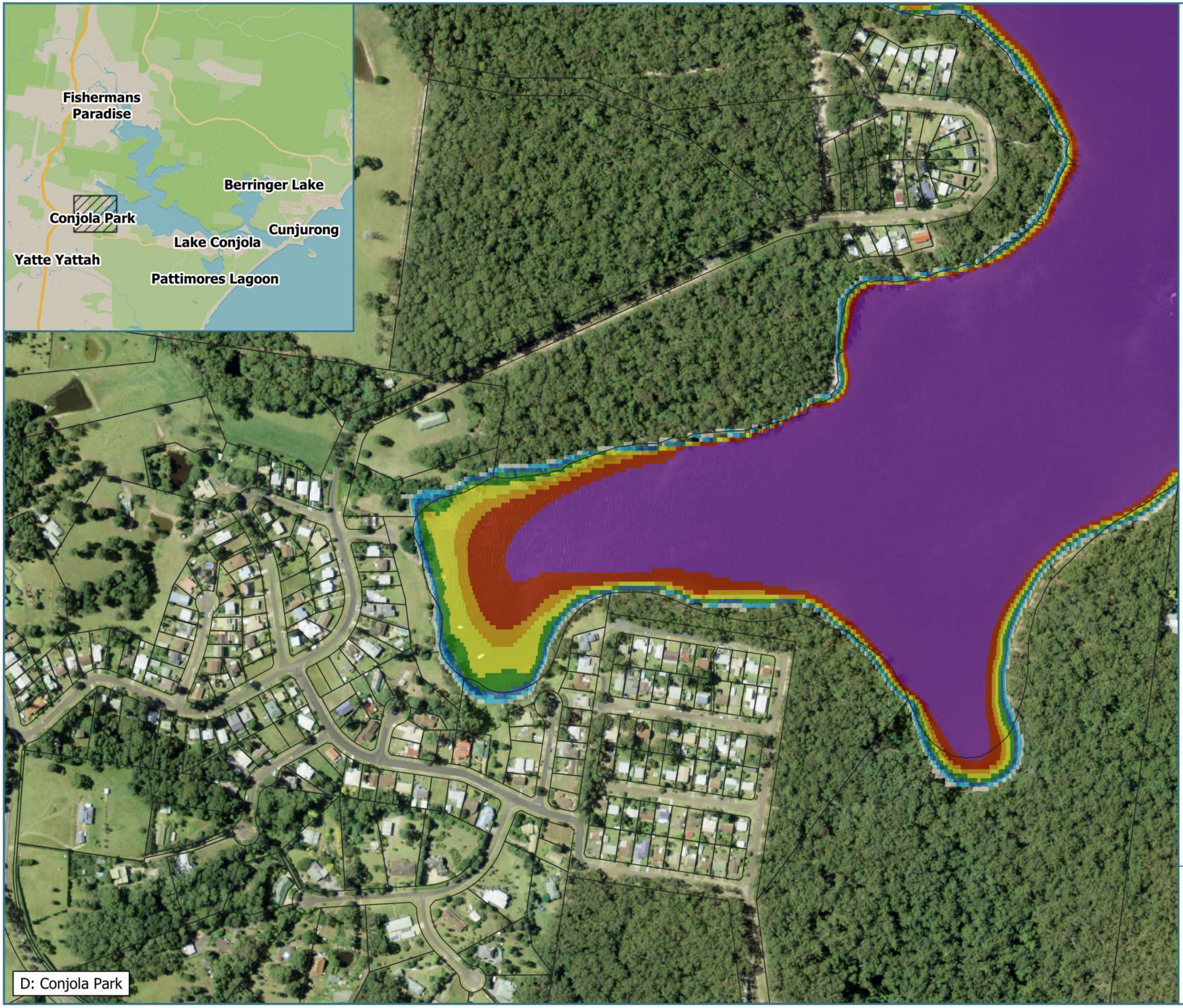

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Figure D-05
Tidal Inundation
SLR 0.23 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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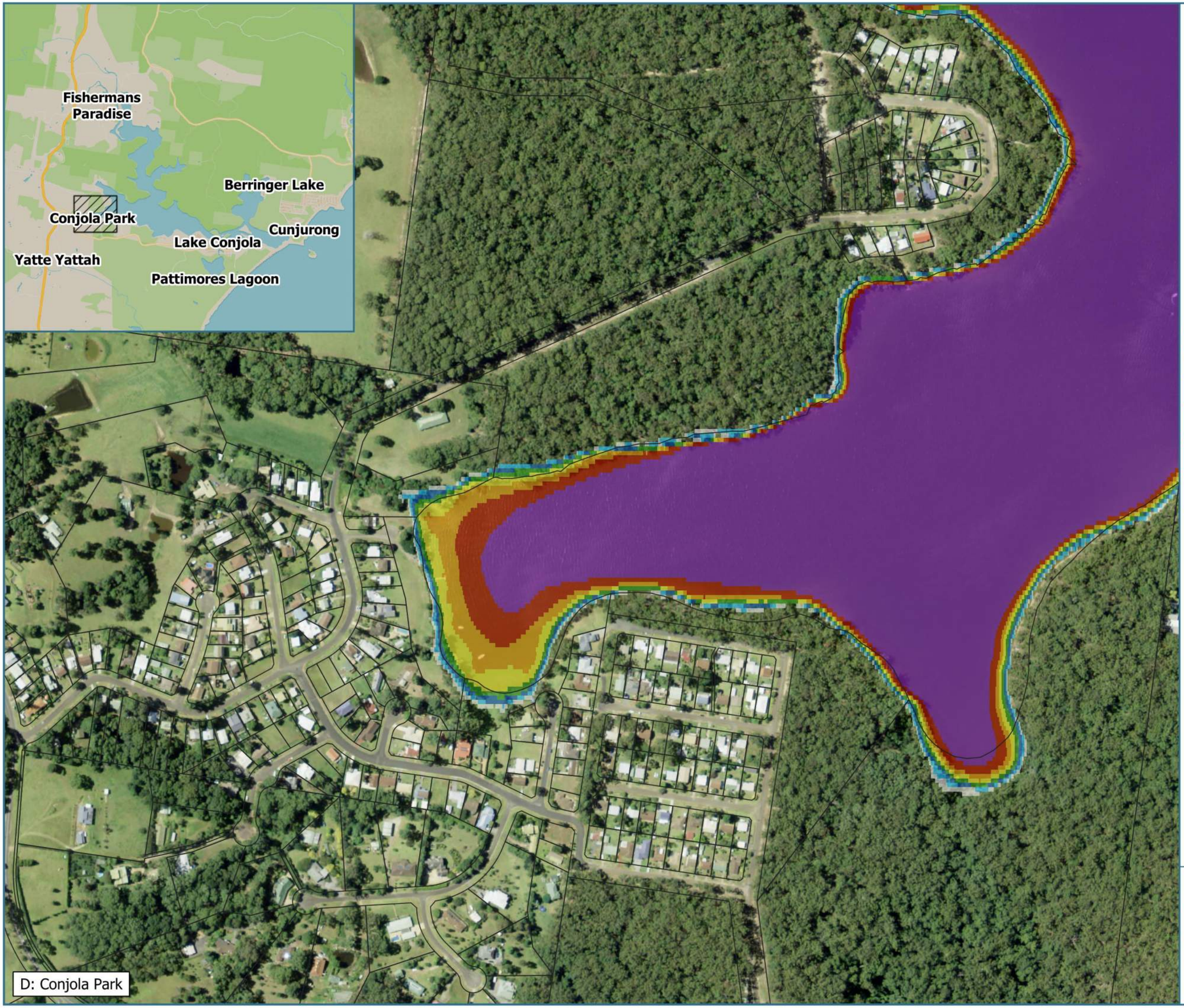

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Figure D-06
Tidal Inundation
SLR 0.36 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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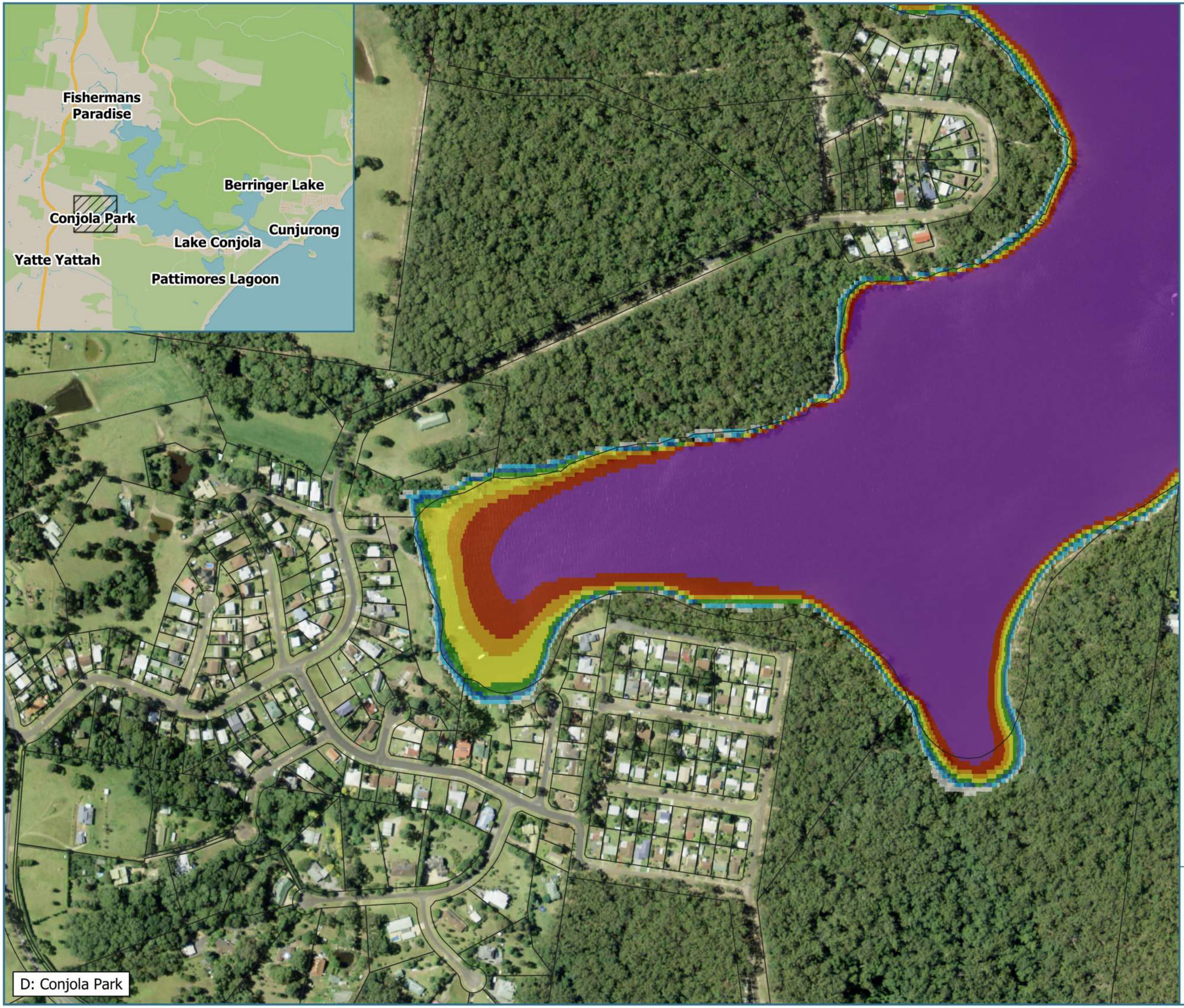

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Figure D-07
Tidal Inundation
SLR 0.36 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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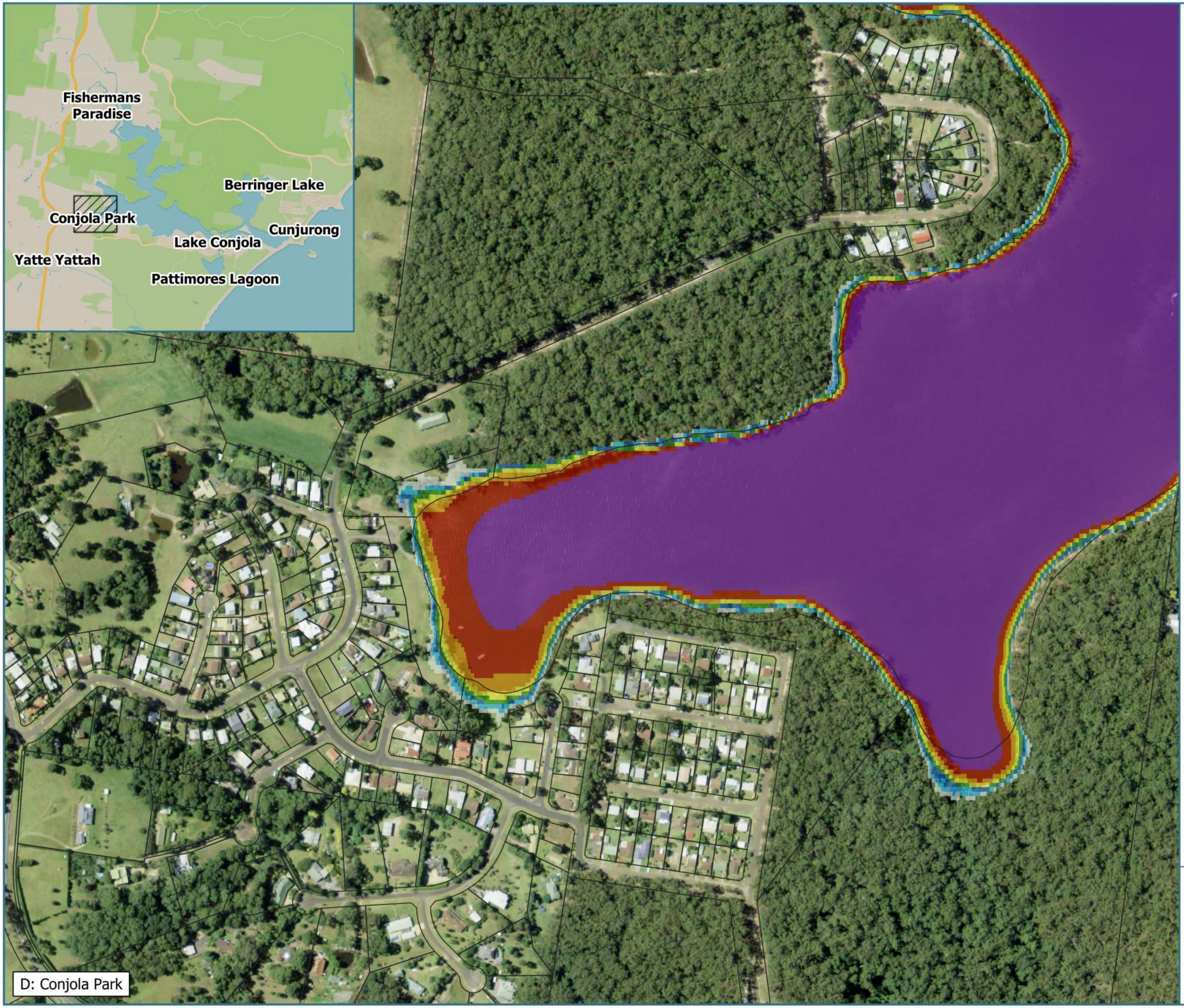

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Figure D-08
Tidal Inundation
SLR 0.6 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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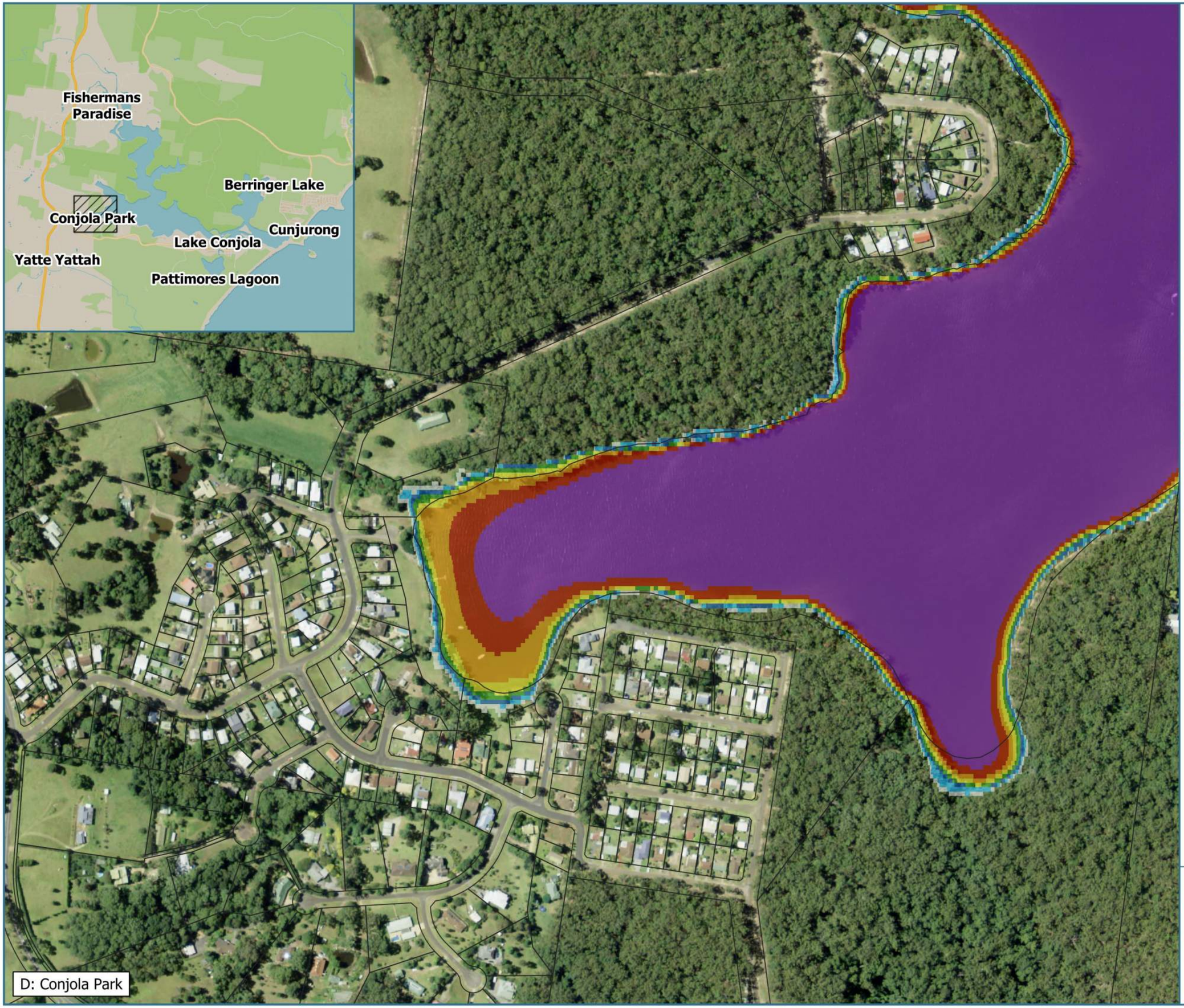

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Figure D-09
Tidal Inundation
SLR 0.6 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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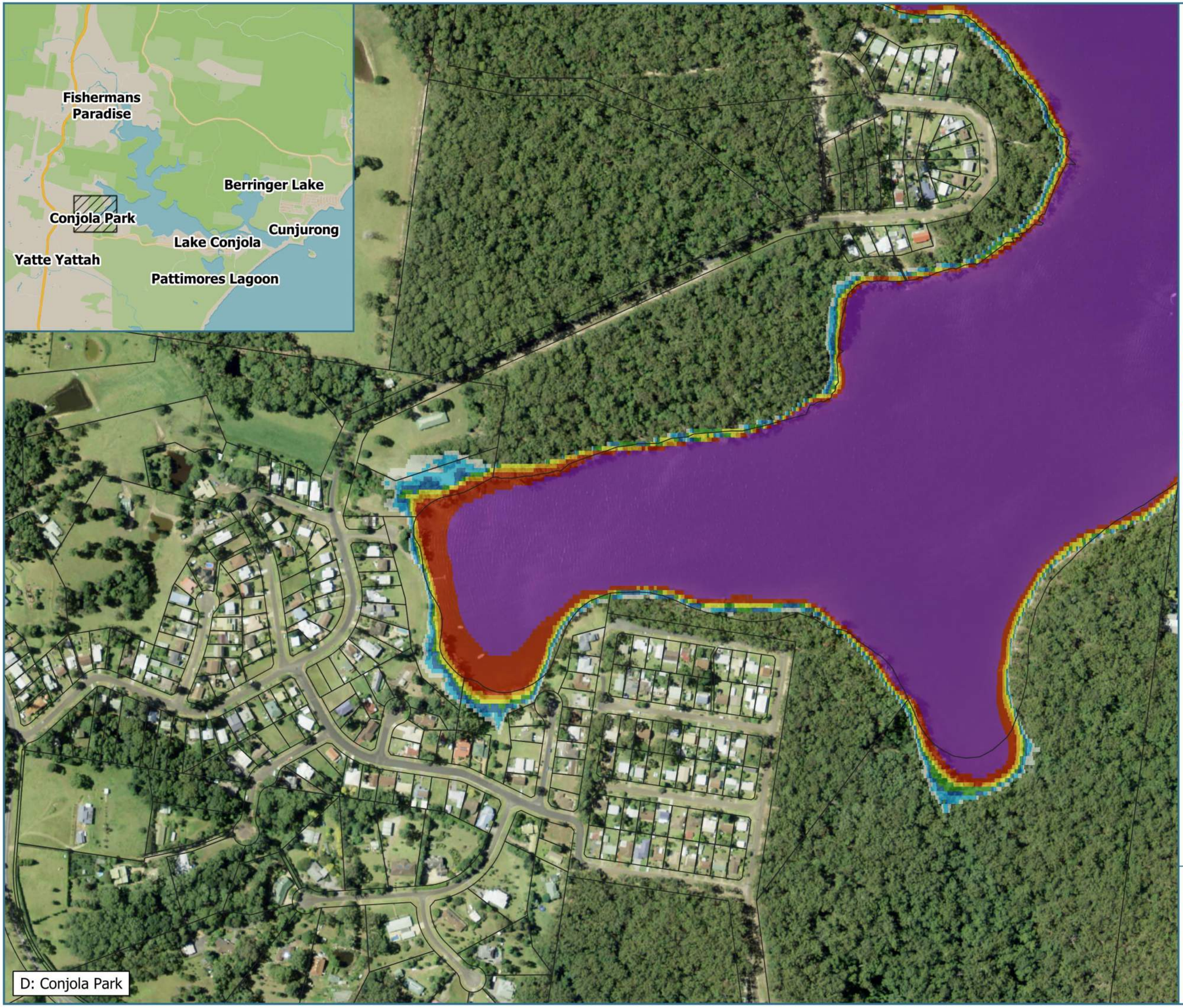

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Figure D-10
Tidal Inundation
SLR 0.9 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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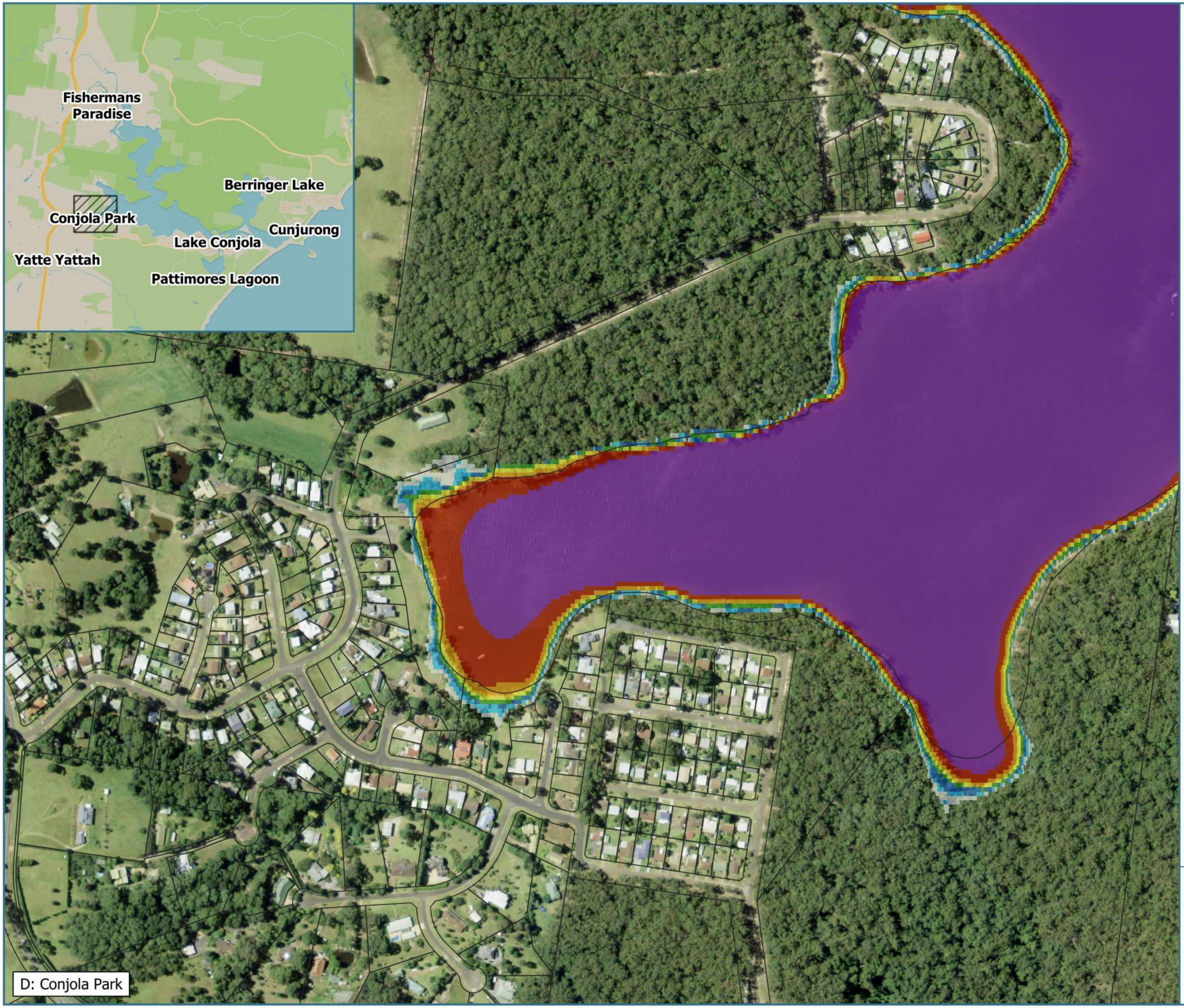

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Figure D-11
Tidal Inundation
SLR 0.9 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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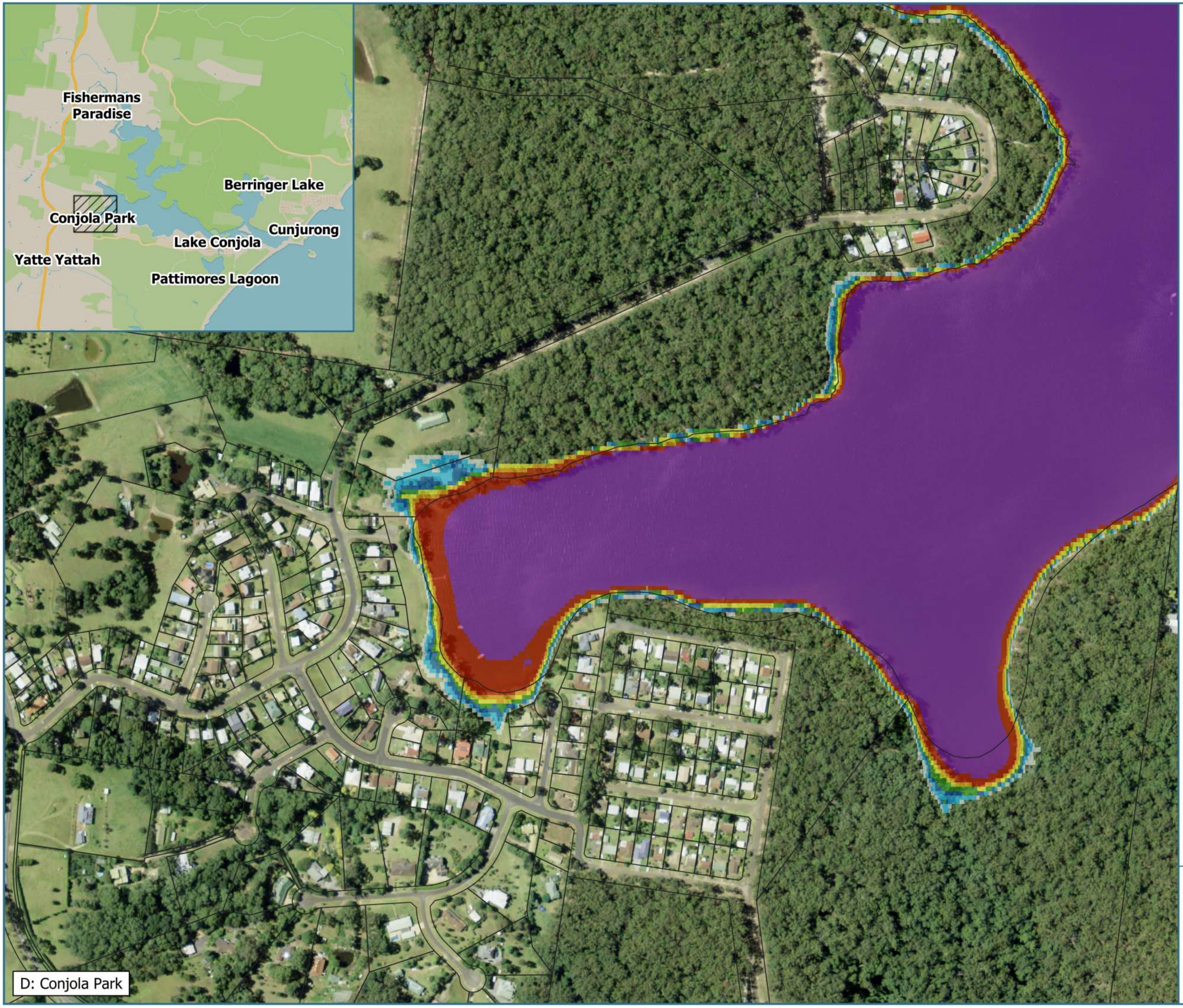

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Figure D-12
Tidal Inundation
SLR 1.2 m
Bed Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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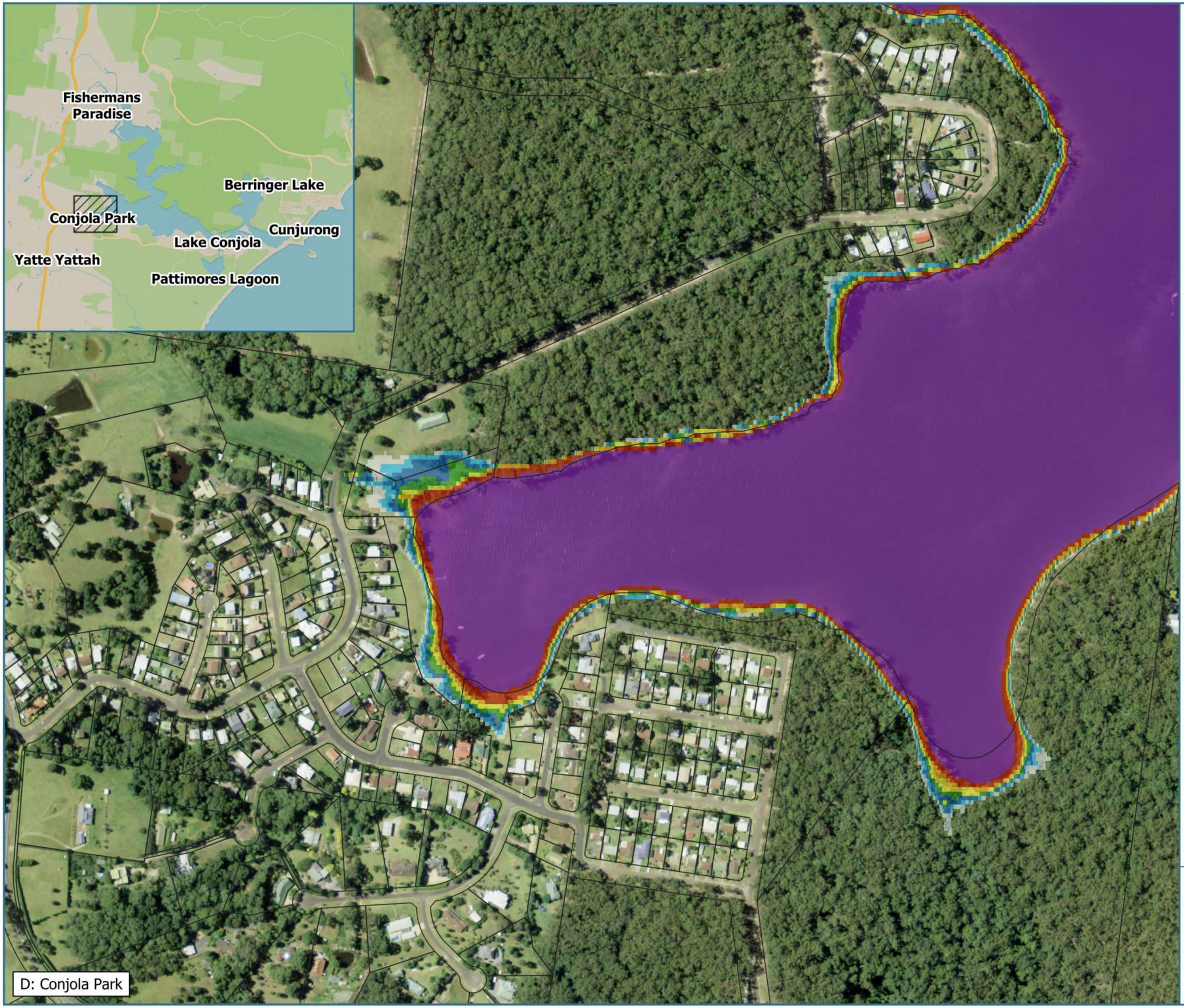

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Figure D-13
Tidal Inundation
SLR 1.2 m
Bed Not Raised
Tidal Plane: HHWSS

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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Appendix D – Coastal Inundation Maps - all SLR ranges

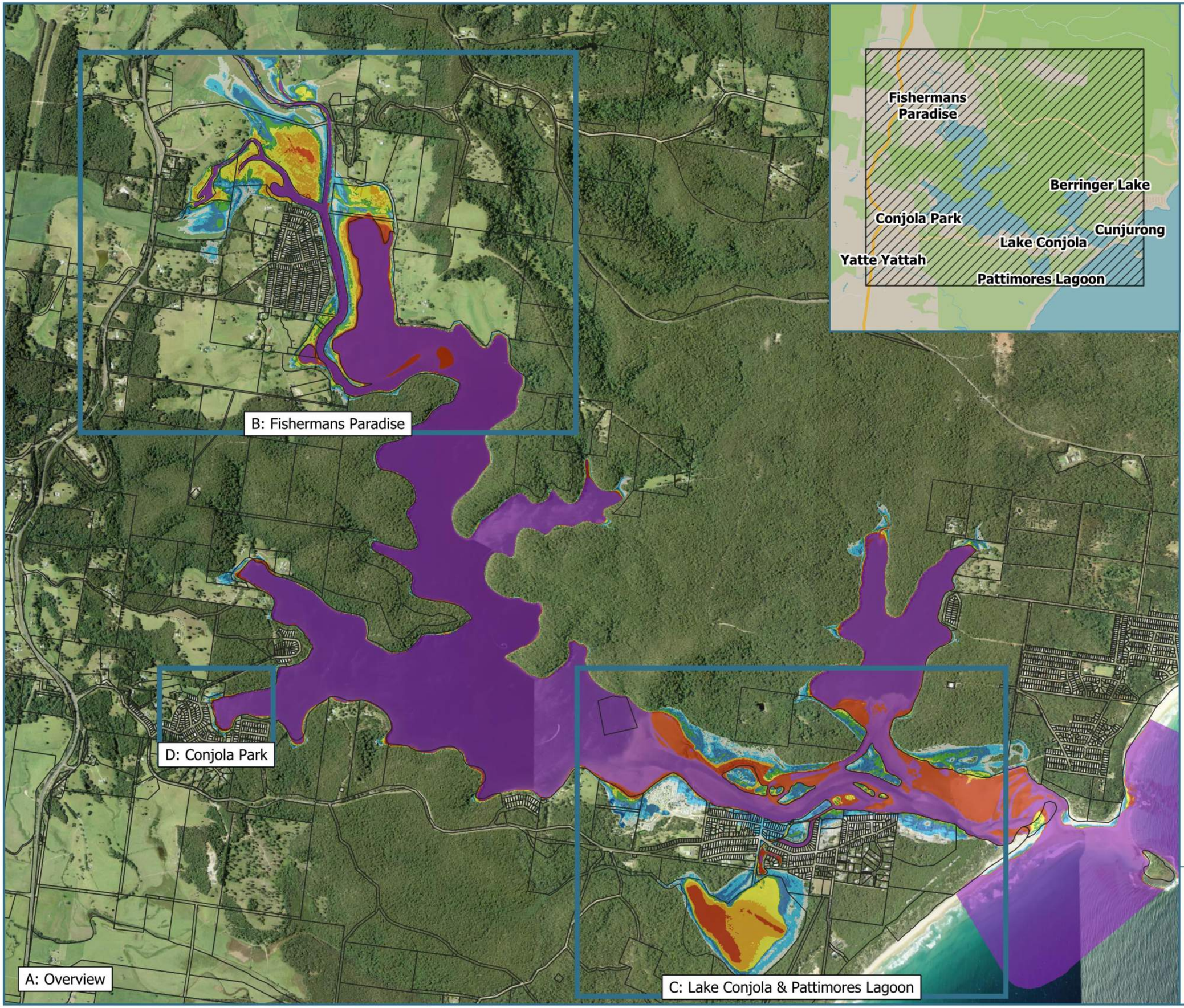

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Figure A-01
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

Shoalhaven City Council

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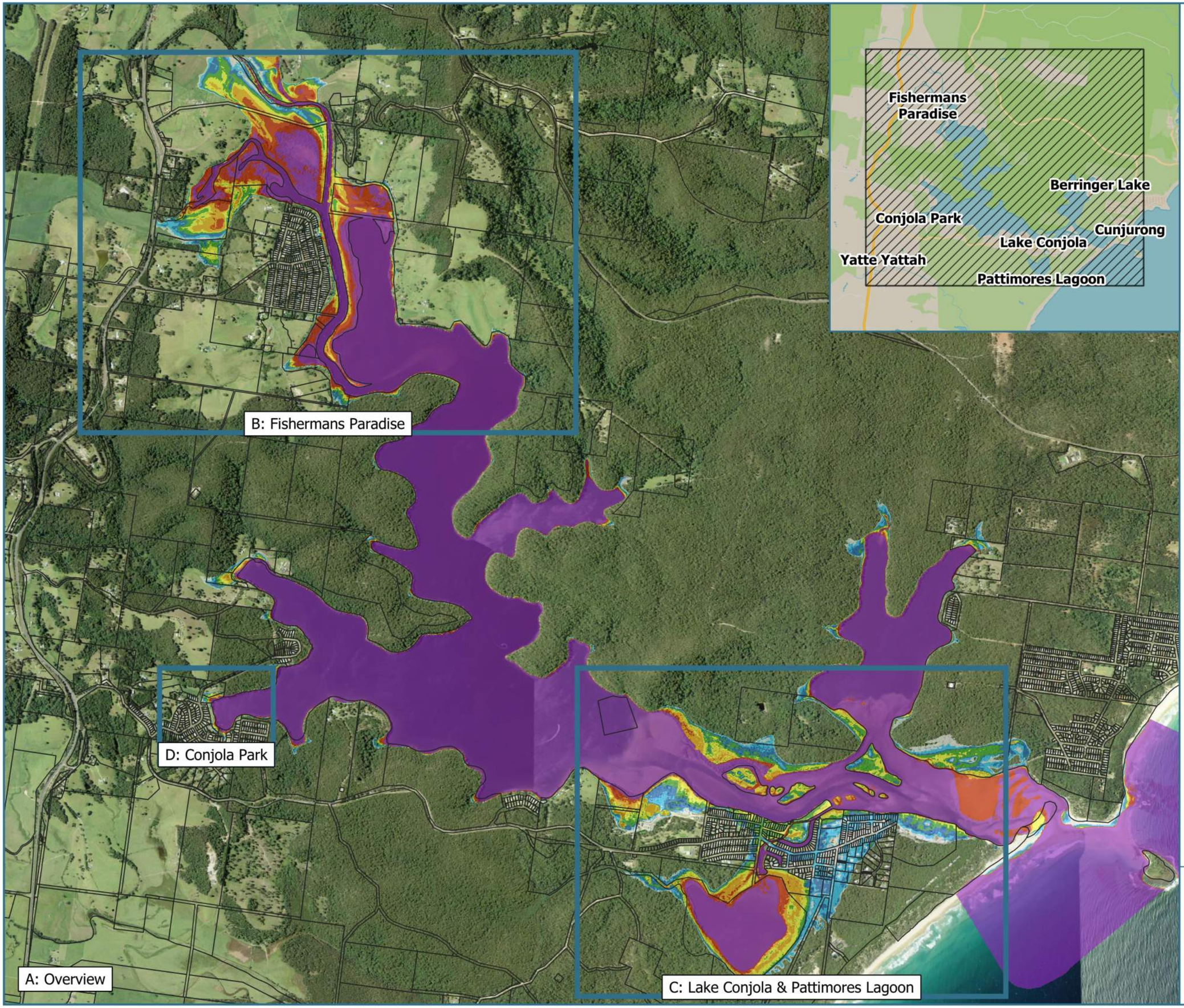

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Figure A-02
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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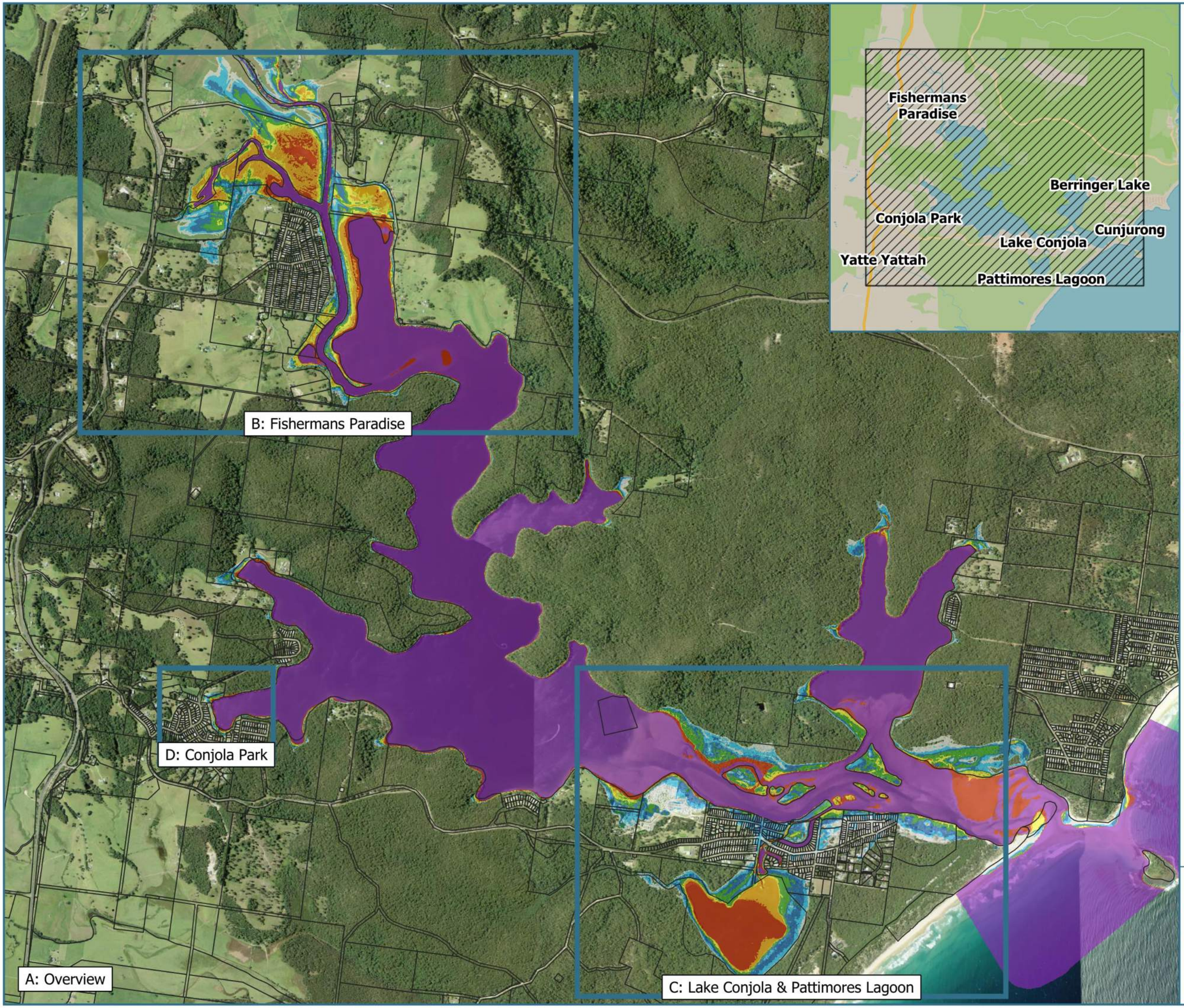

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Figure A-03
Coastal Inundation
SLR 0.1 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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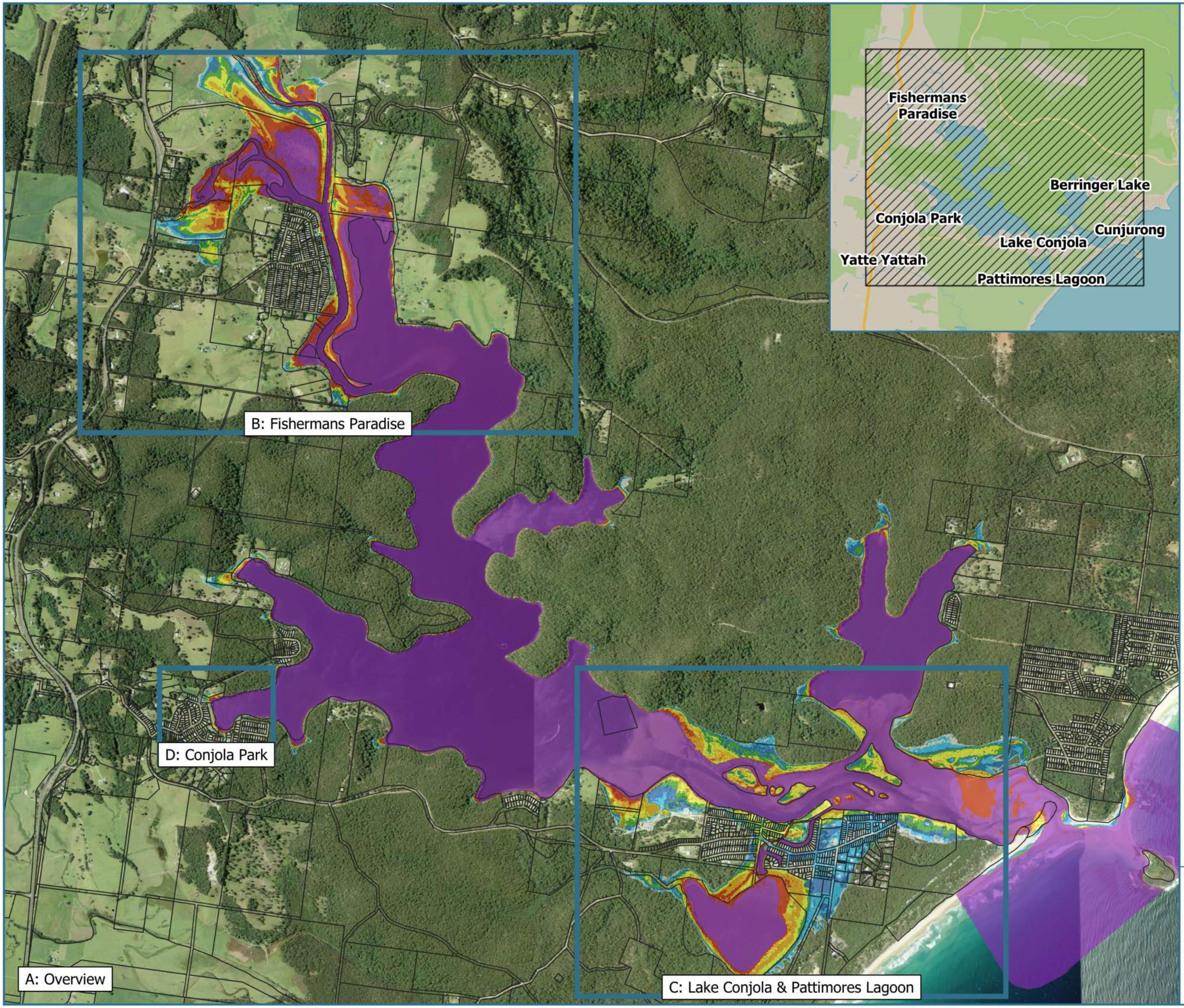

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Figure A-04
Coastal Inundation
SLR 0.1 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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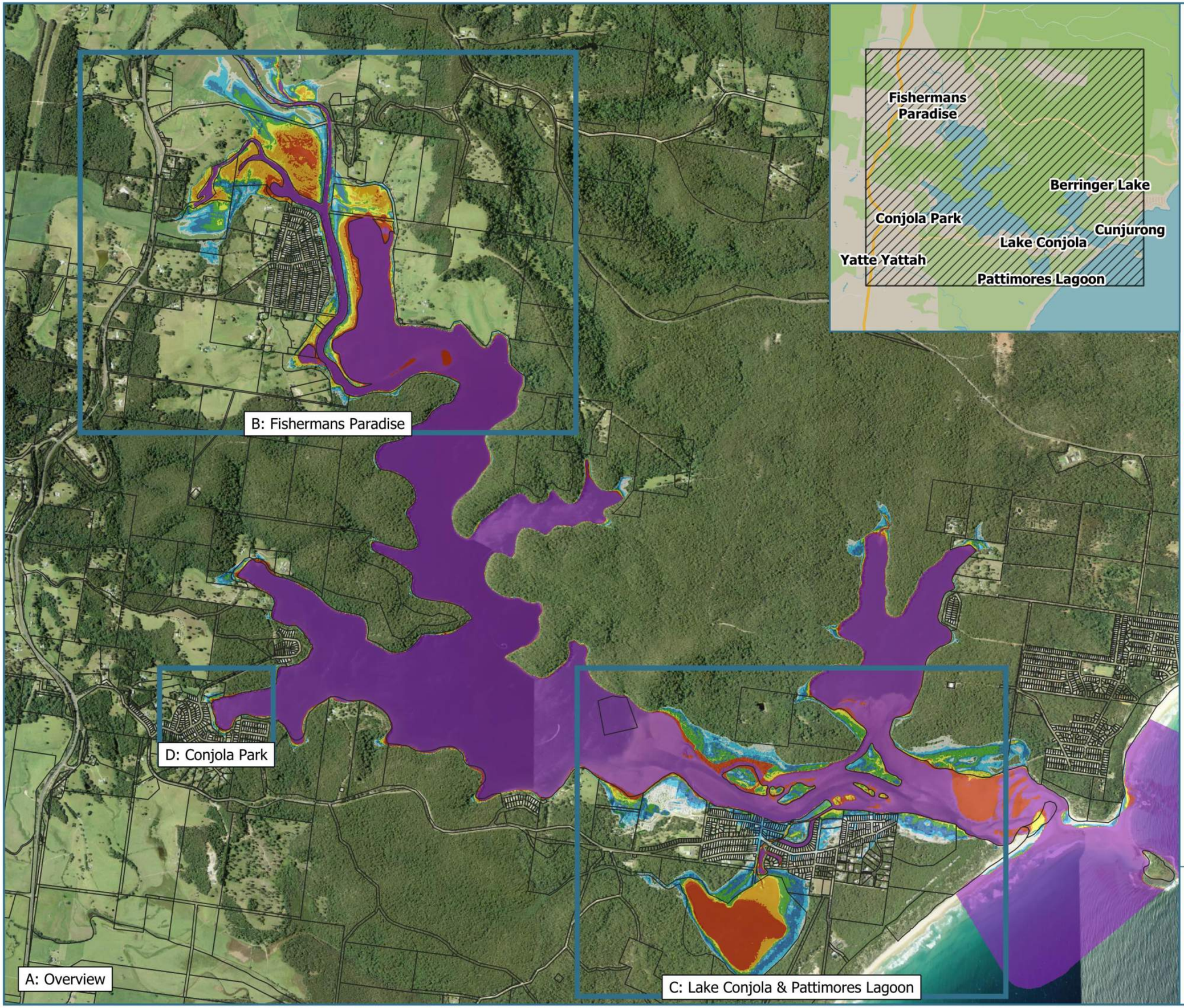

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Figure A-05
Coastal Inundation
SLR 0.1 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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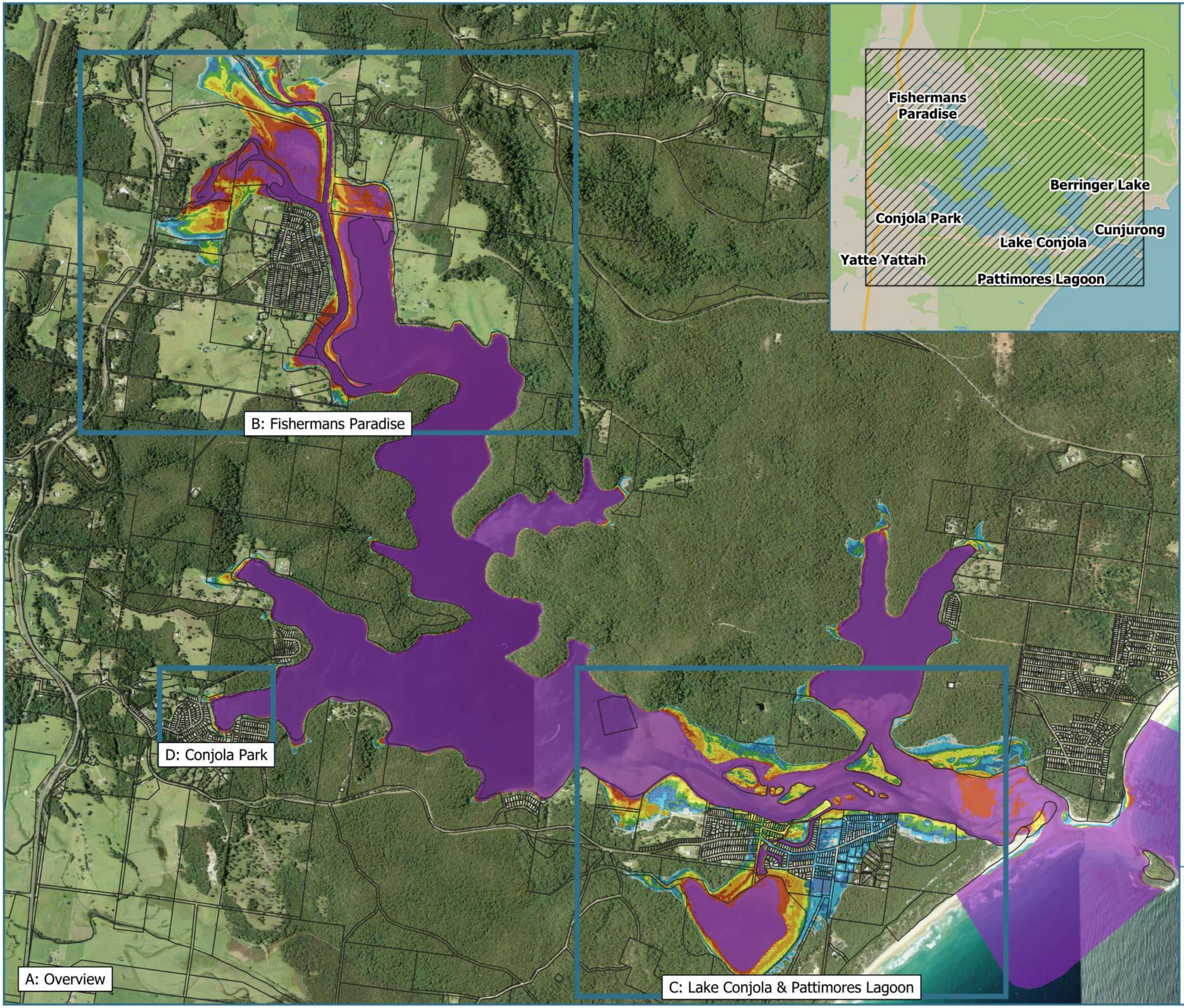

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Figure A-06
Coastal Inundation
SLR 0.1 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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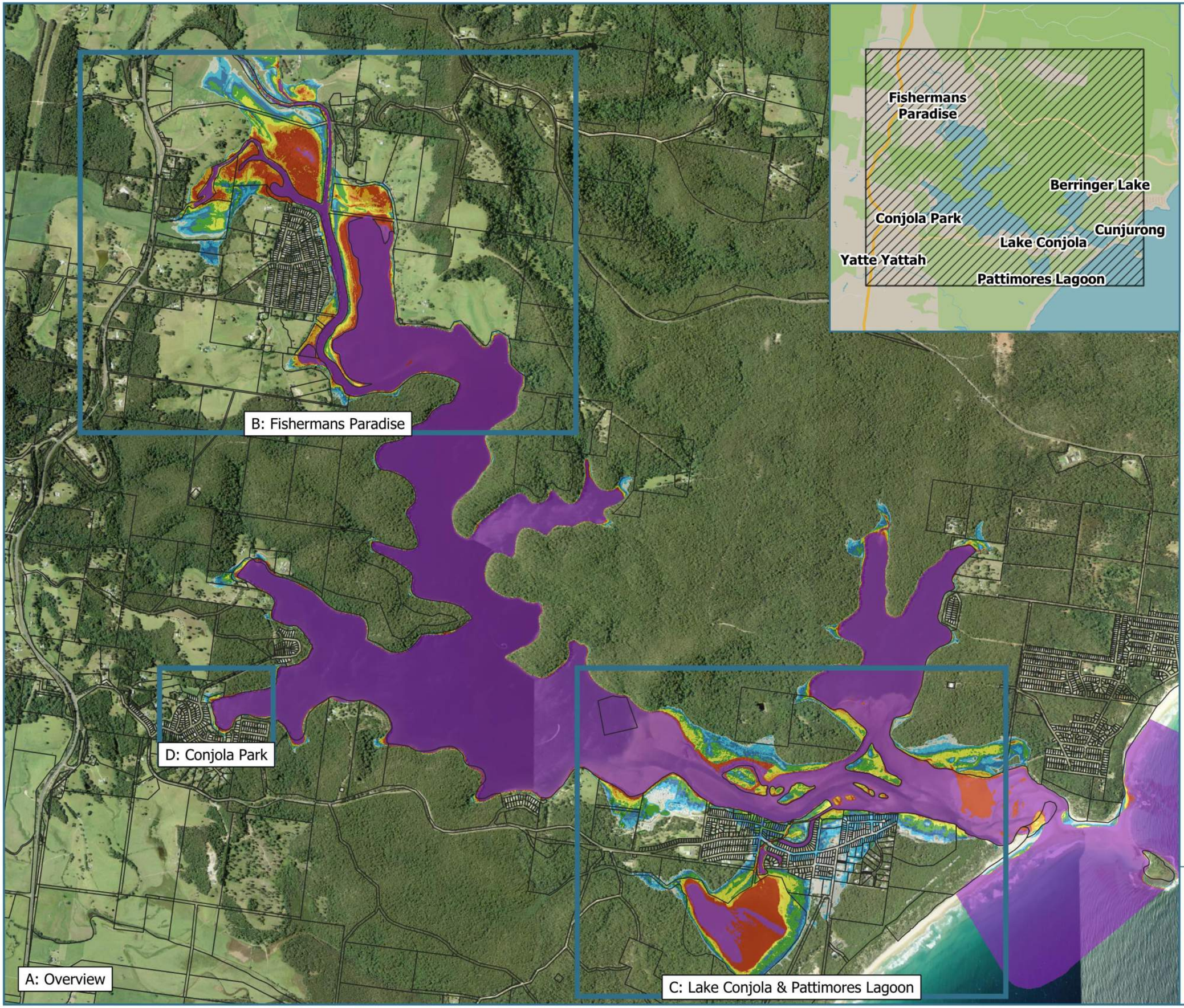

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Figure A-07
Coastal Inundation
SLR 0.23 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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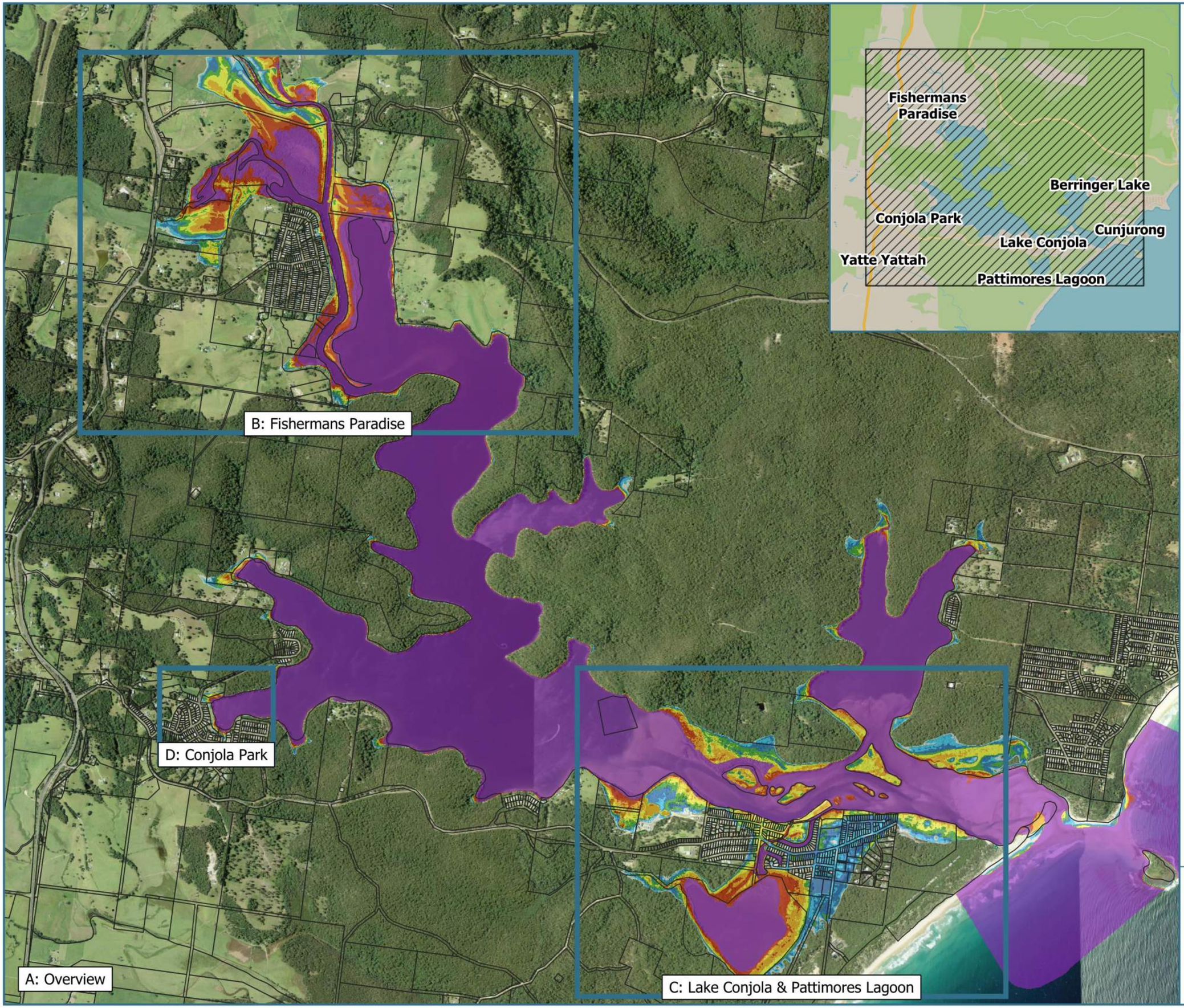

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Figure A-08
Coastal Inundation
SLR 0.23 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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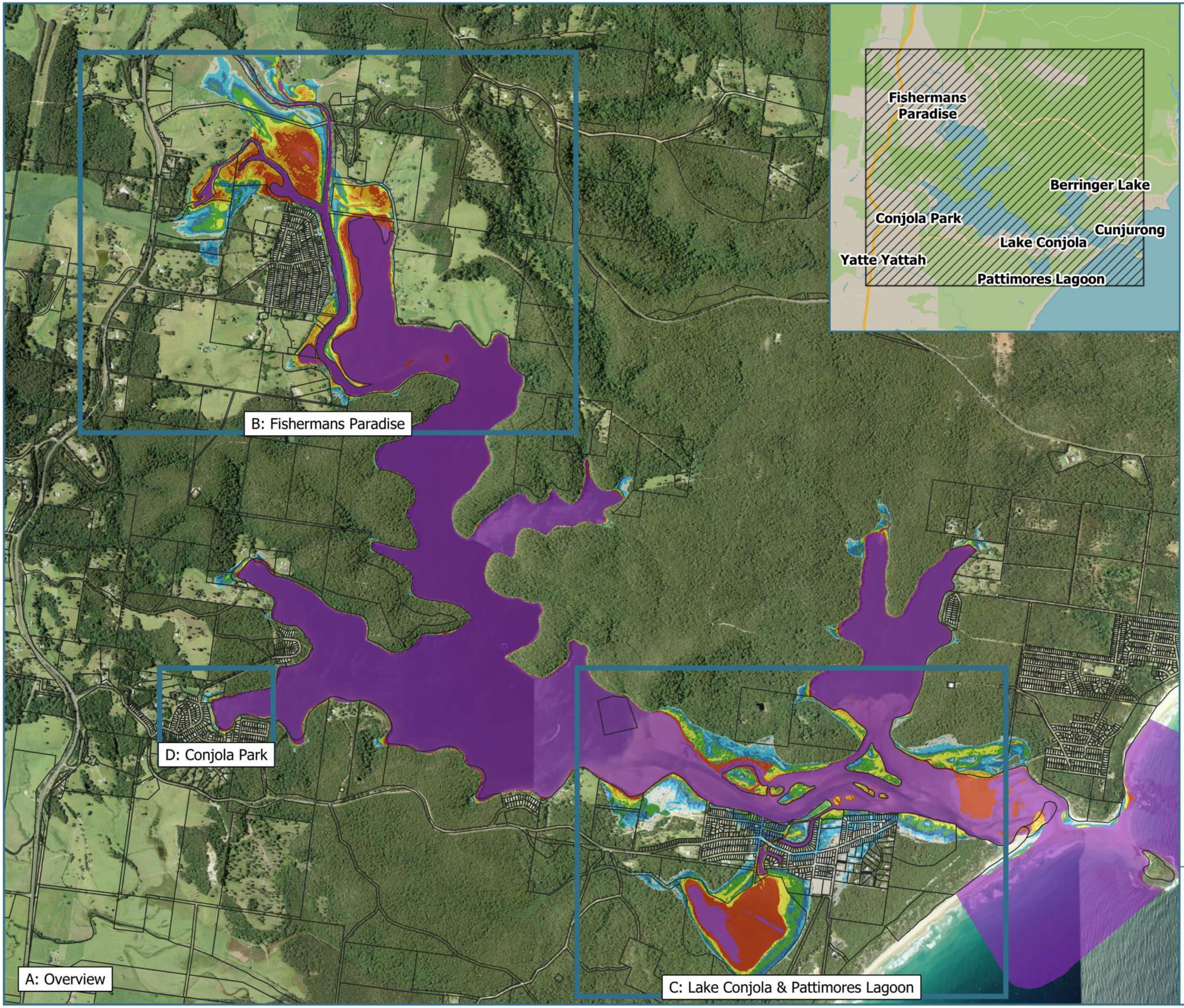

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Figure A-09
Coastal Inundation
SLR 0.23 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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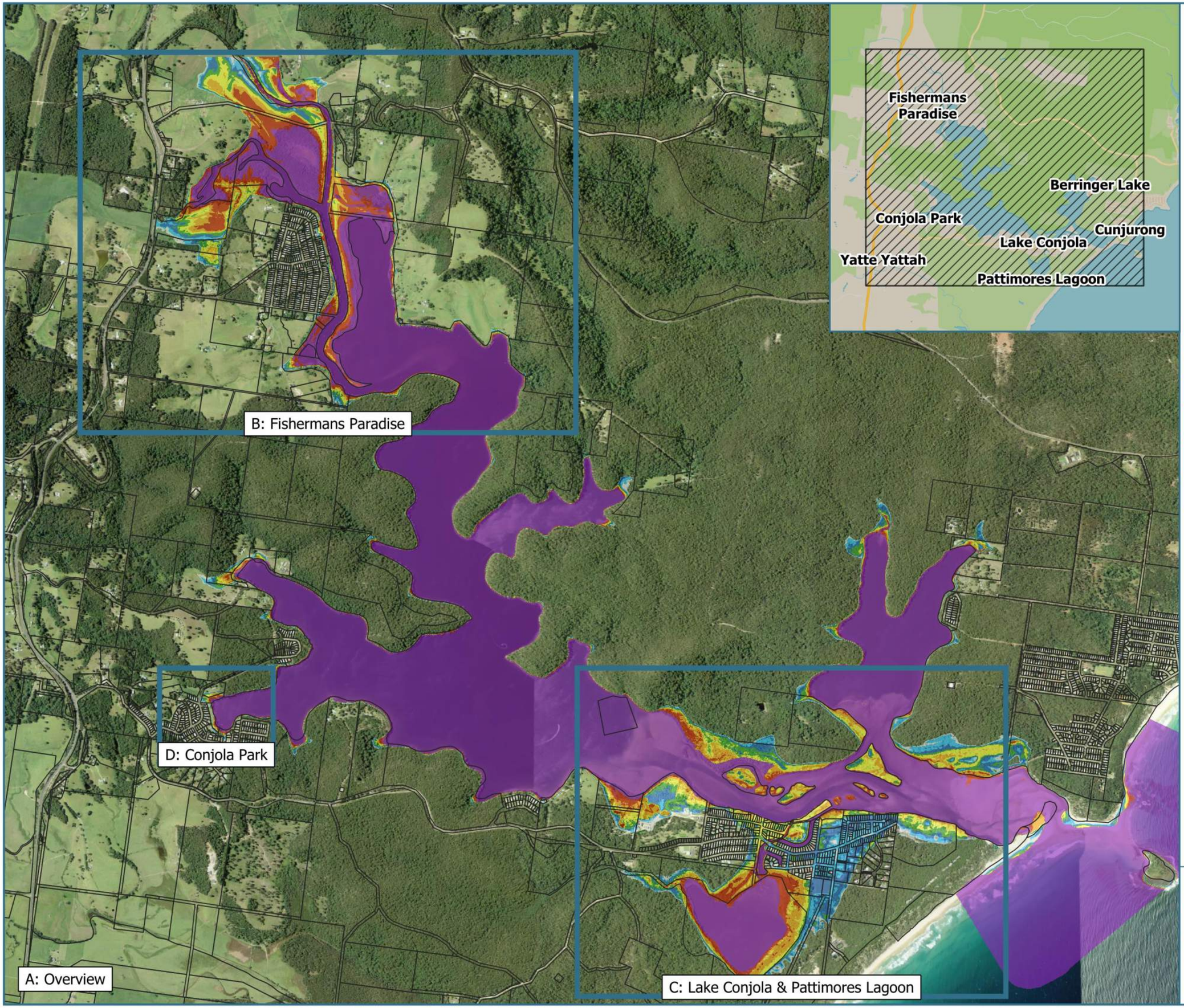

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Figure A-10
Coastal Inundation
SLR 0.23 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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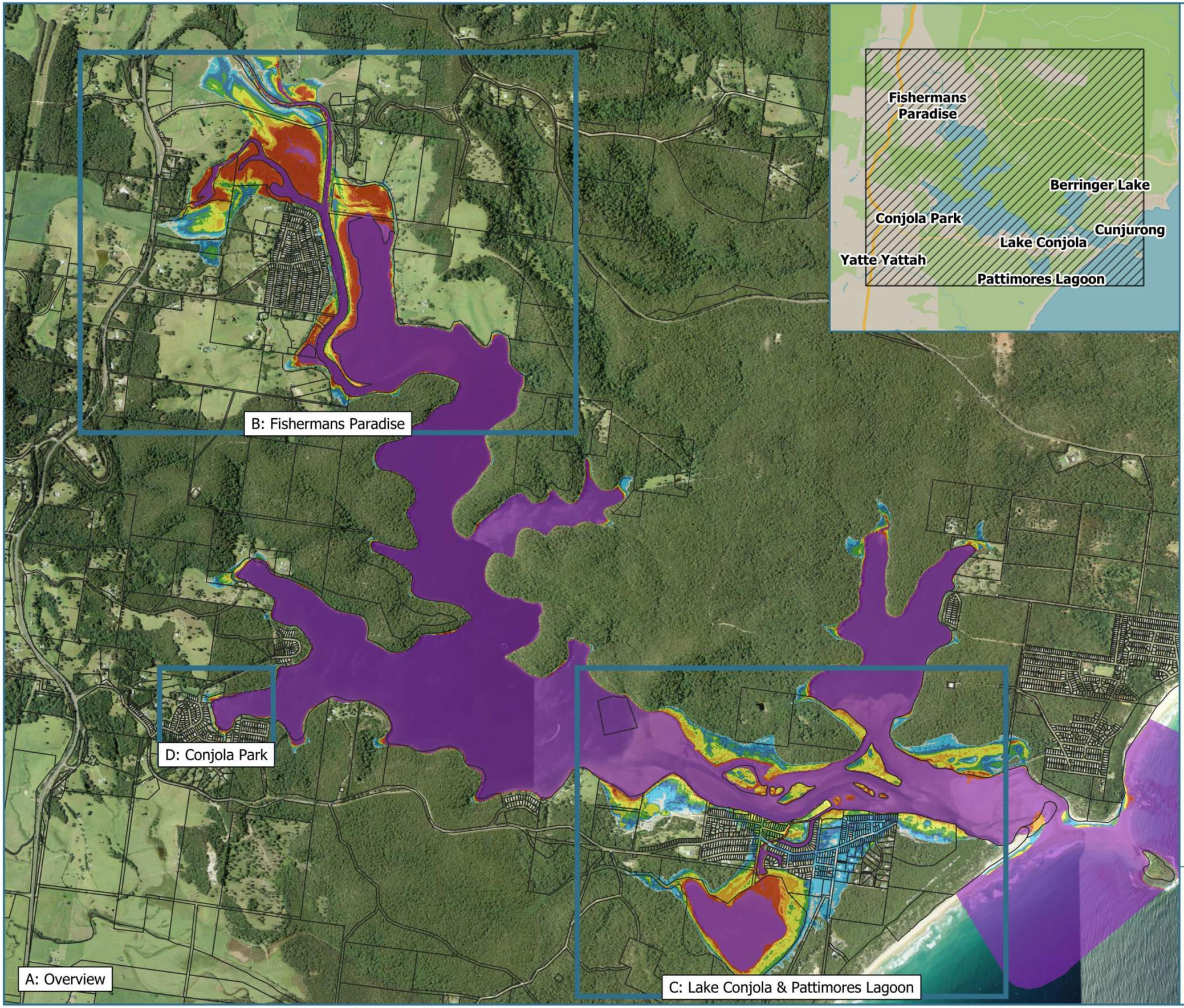

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Figure A-11
Coastal Inundation
SLR 0.36 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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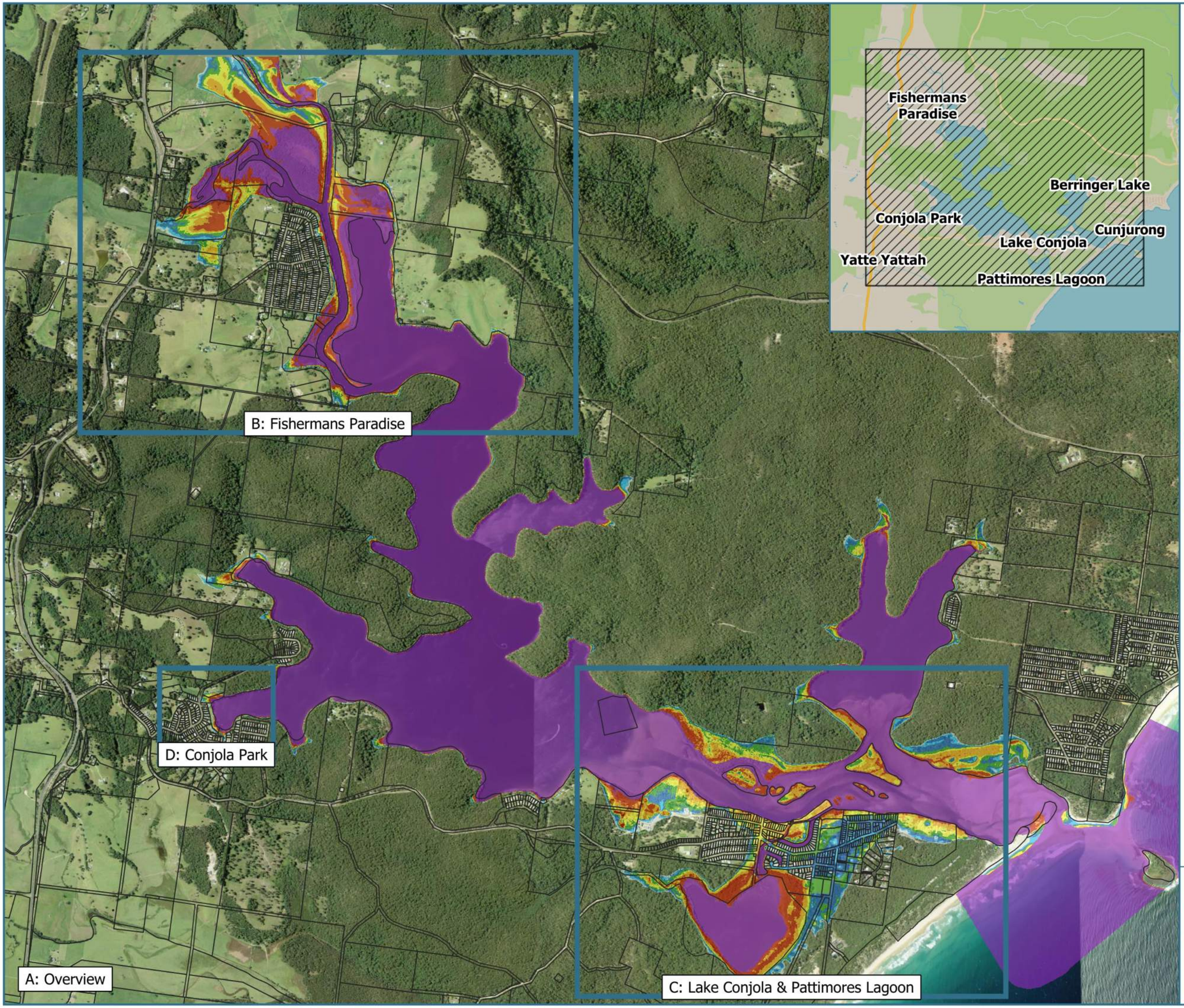

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Figure A-12
Coastal Inundation
SLR 0.36 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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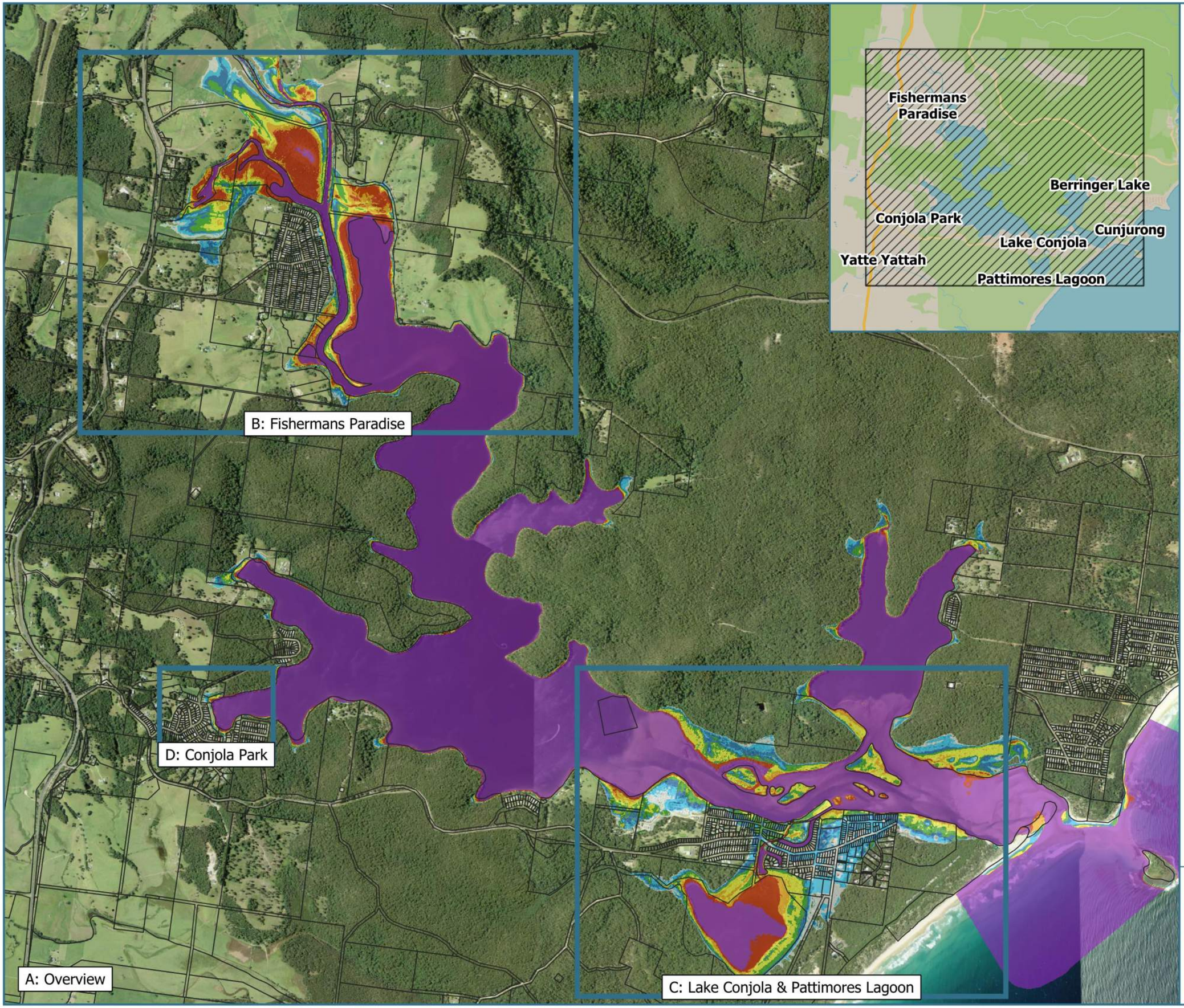

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Figure A-13
Coastal Inundation
SLR 0.36 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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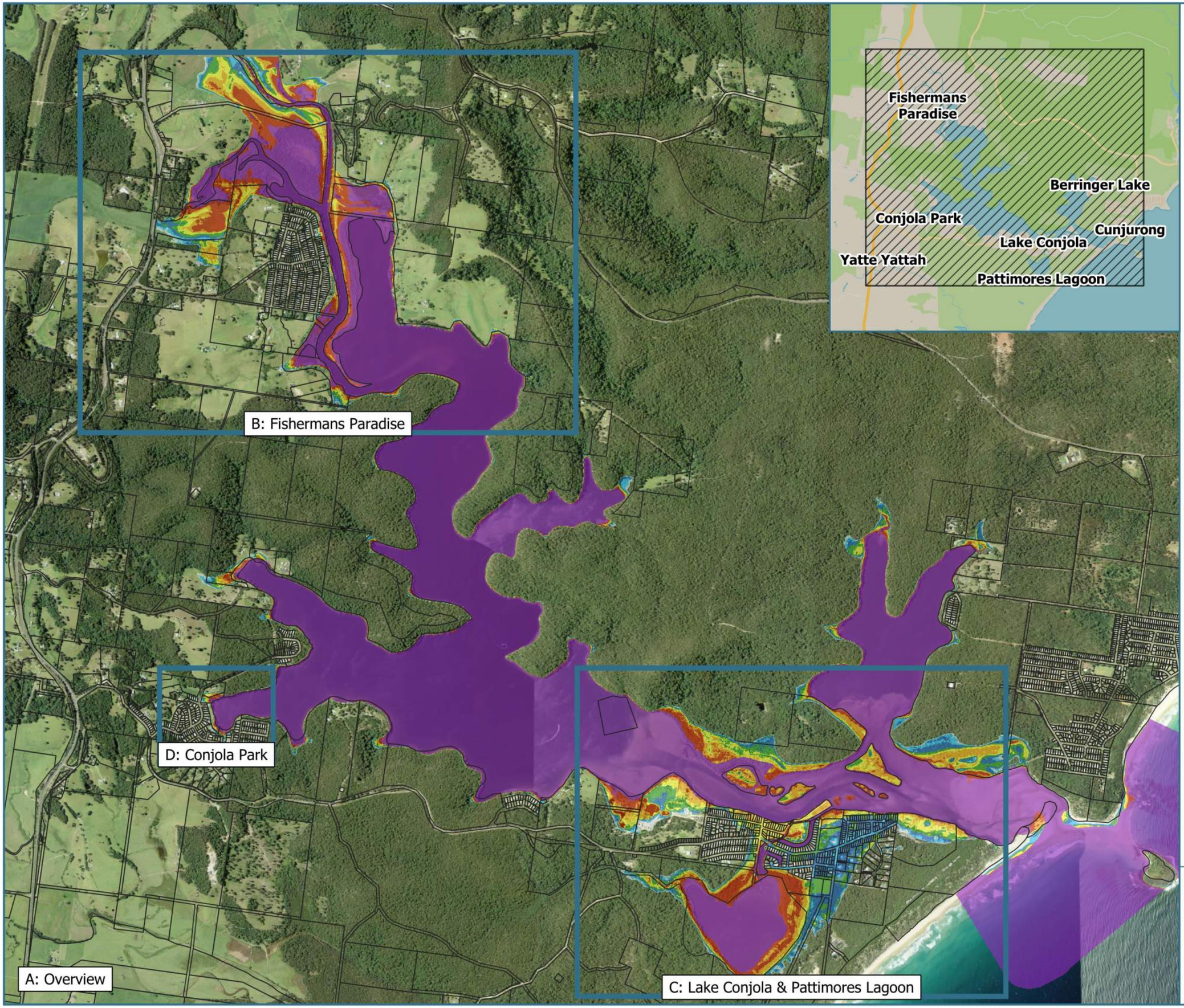

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Figure A-14
Coastal Inundation
SLR 0.36 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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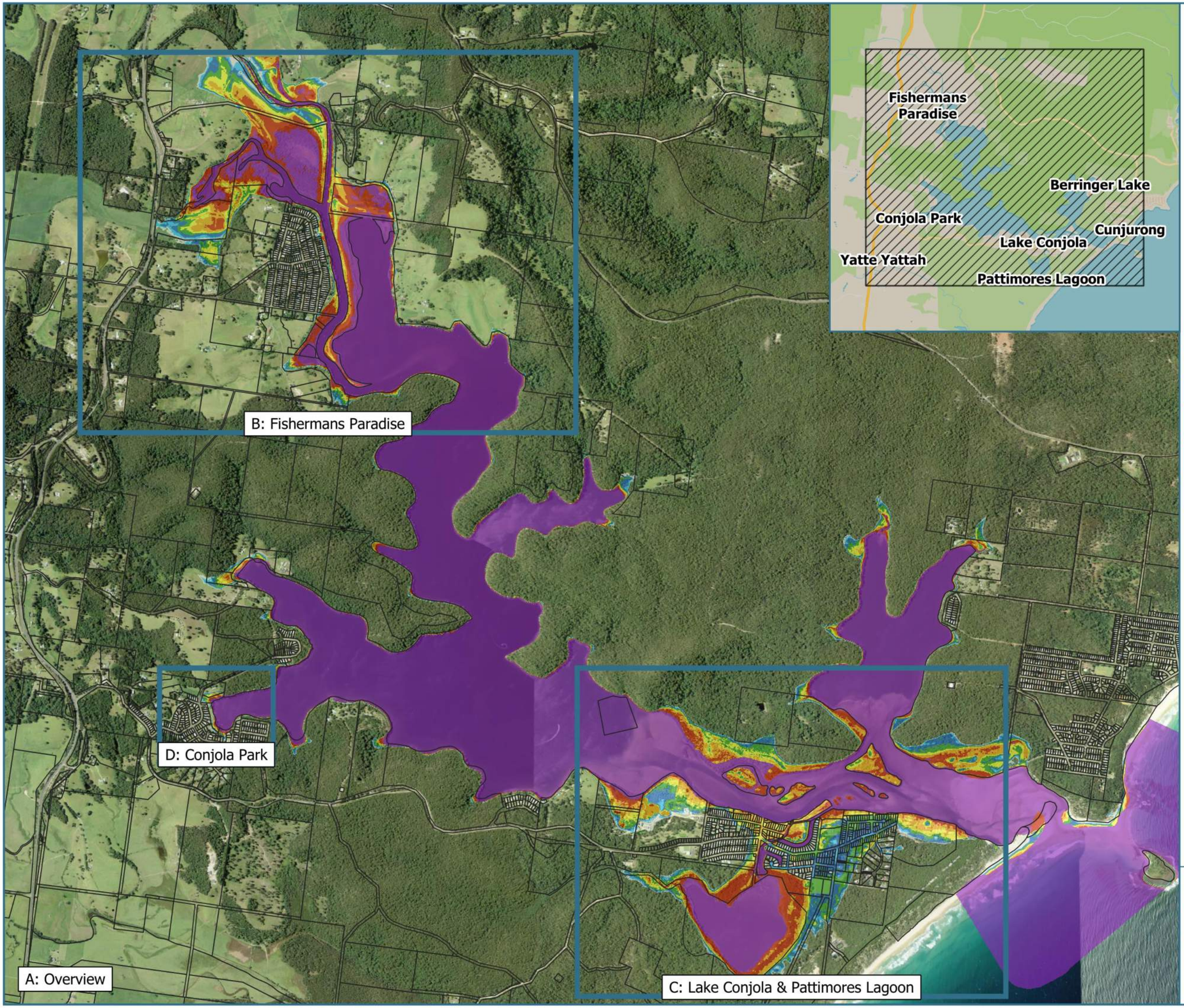

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Figure A-15
Coastal Inundation
SLR 0.6 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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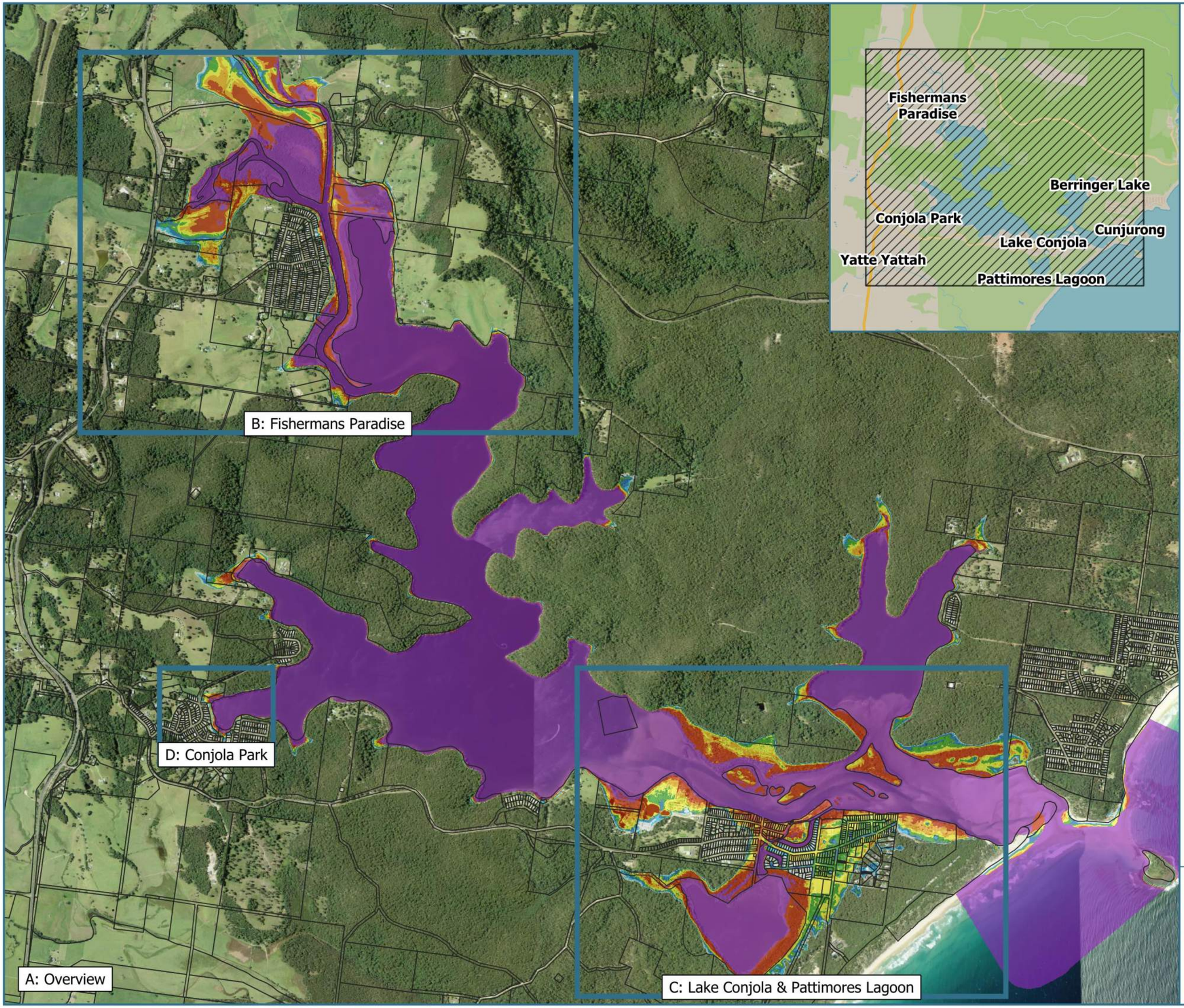

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Figure A-16
Coastal Inundation
SLR 0.6 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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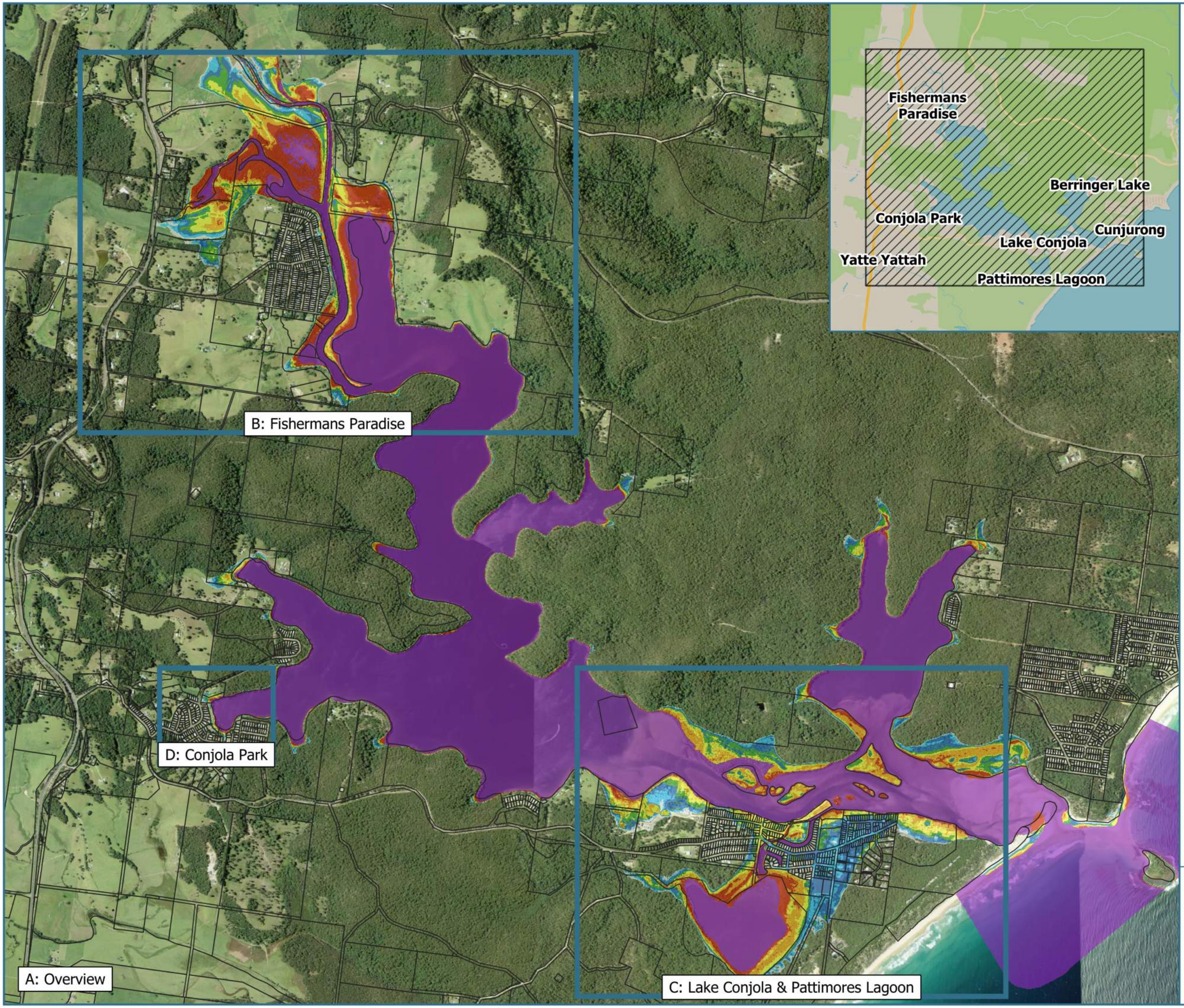

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Figure A-17
Coastal Inundation
SLR 0.6 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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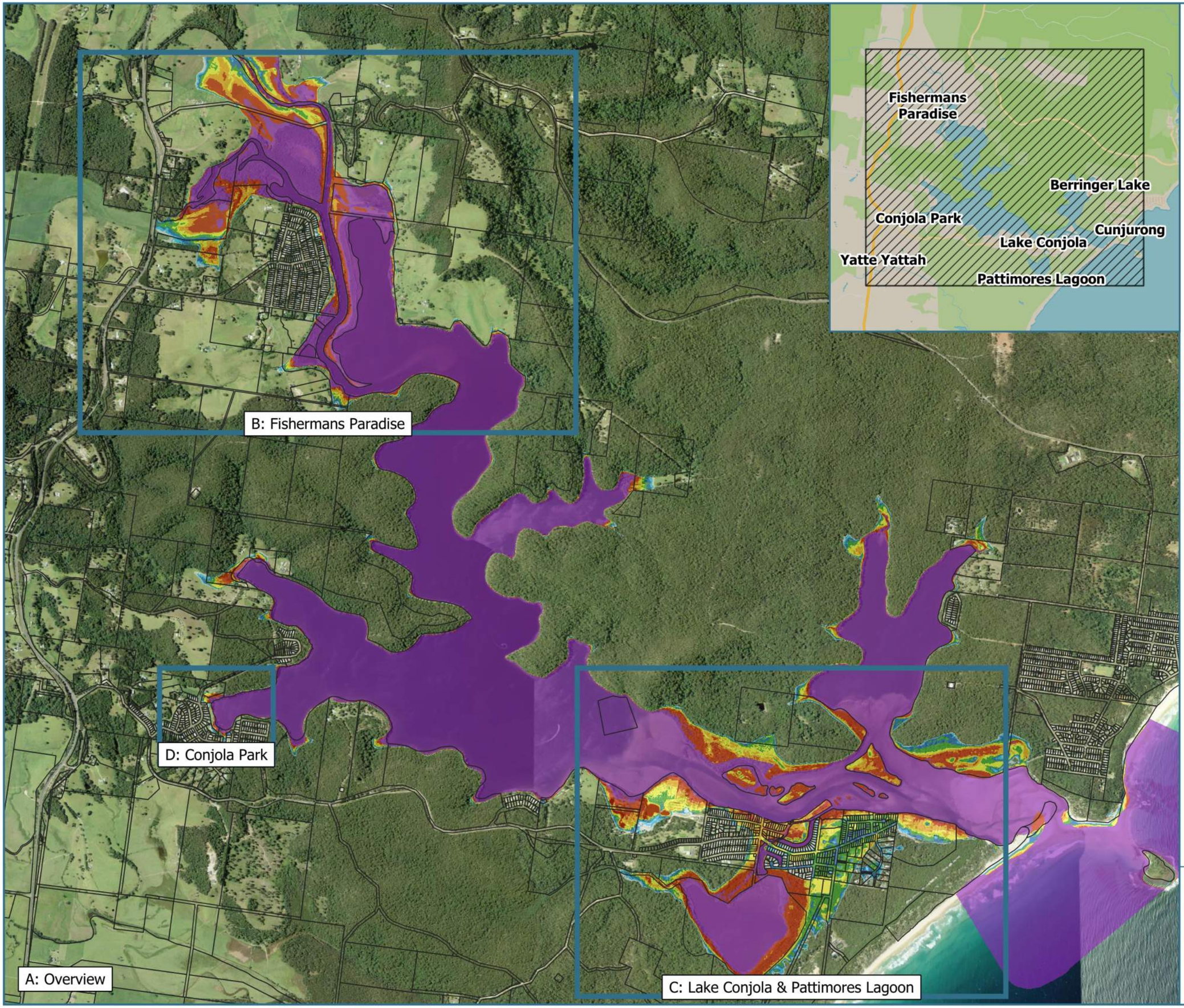

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Figure A-18
Coastal Inundation
SLR 0.6 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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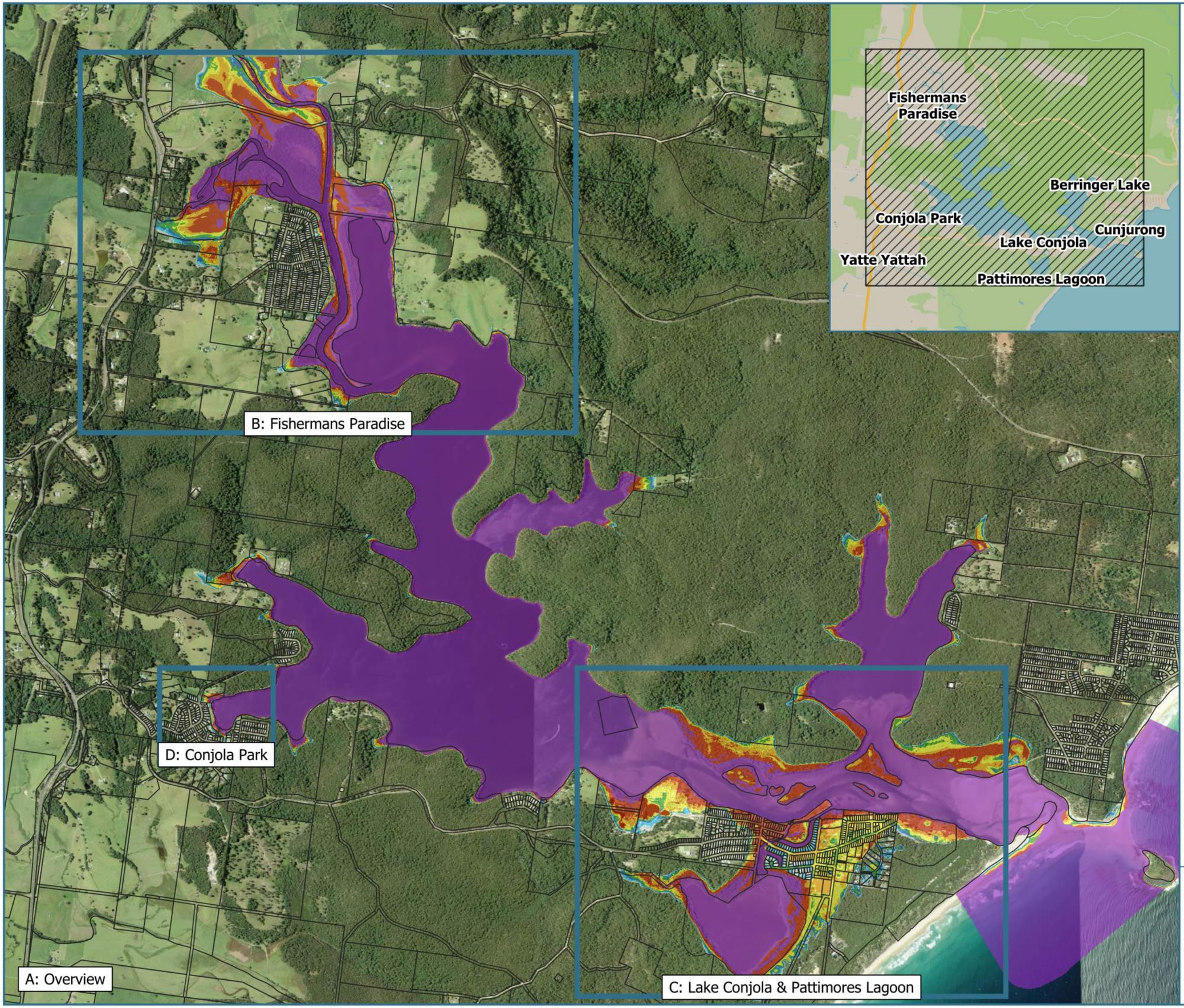

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Figure A-19
Coastal Inundation
SLR 0.9 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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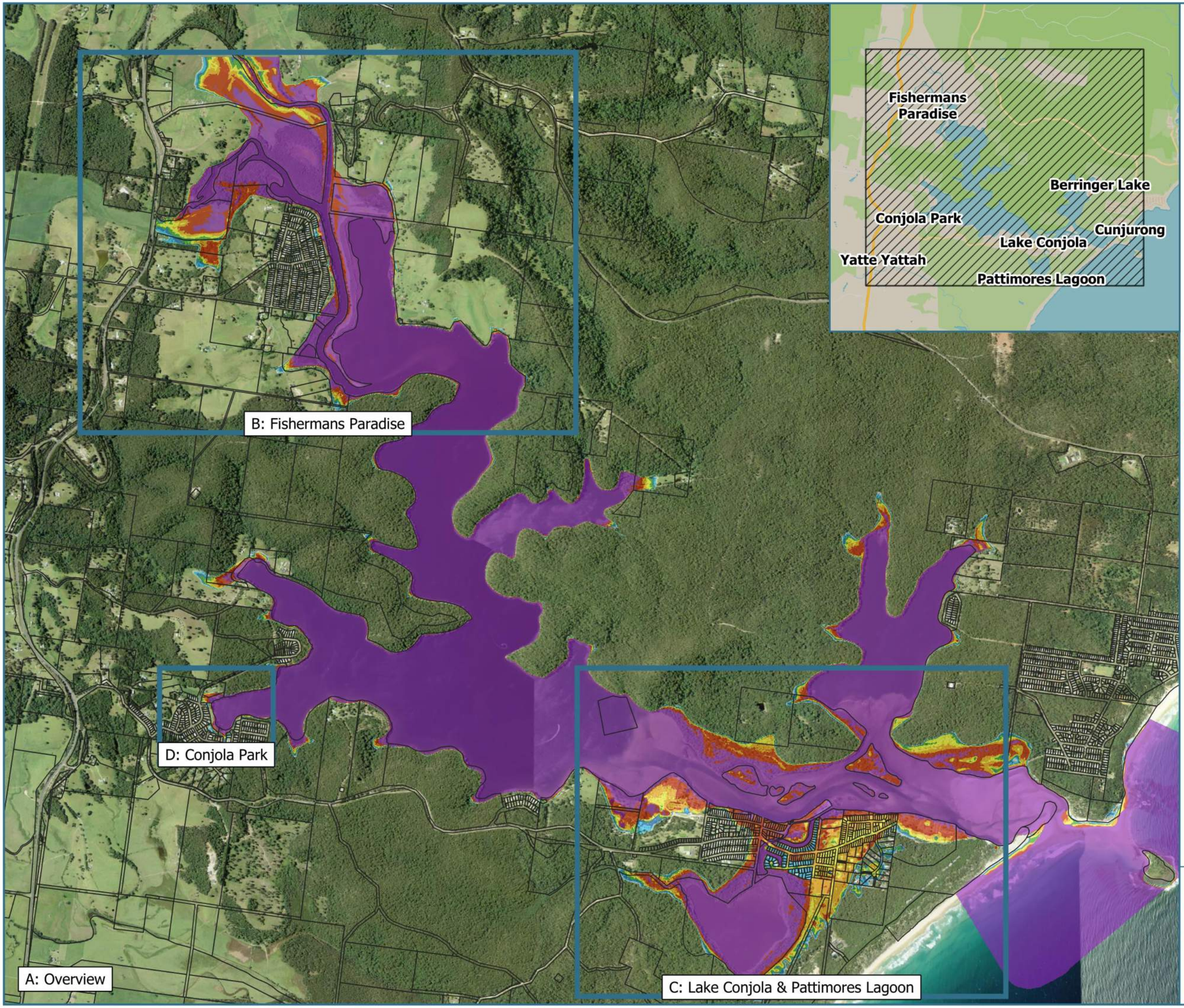

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Figure A-20
Coastal Inundation
SLR 0.9 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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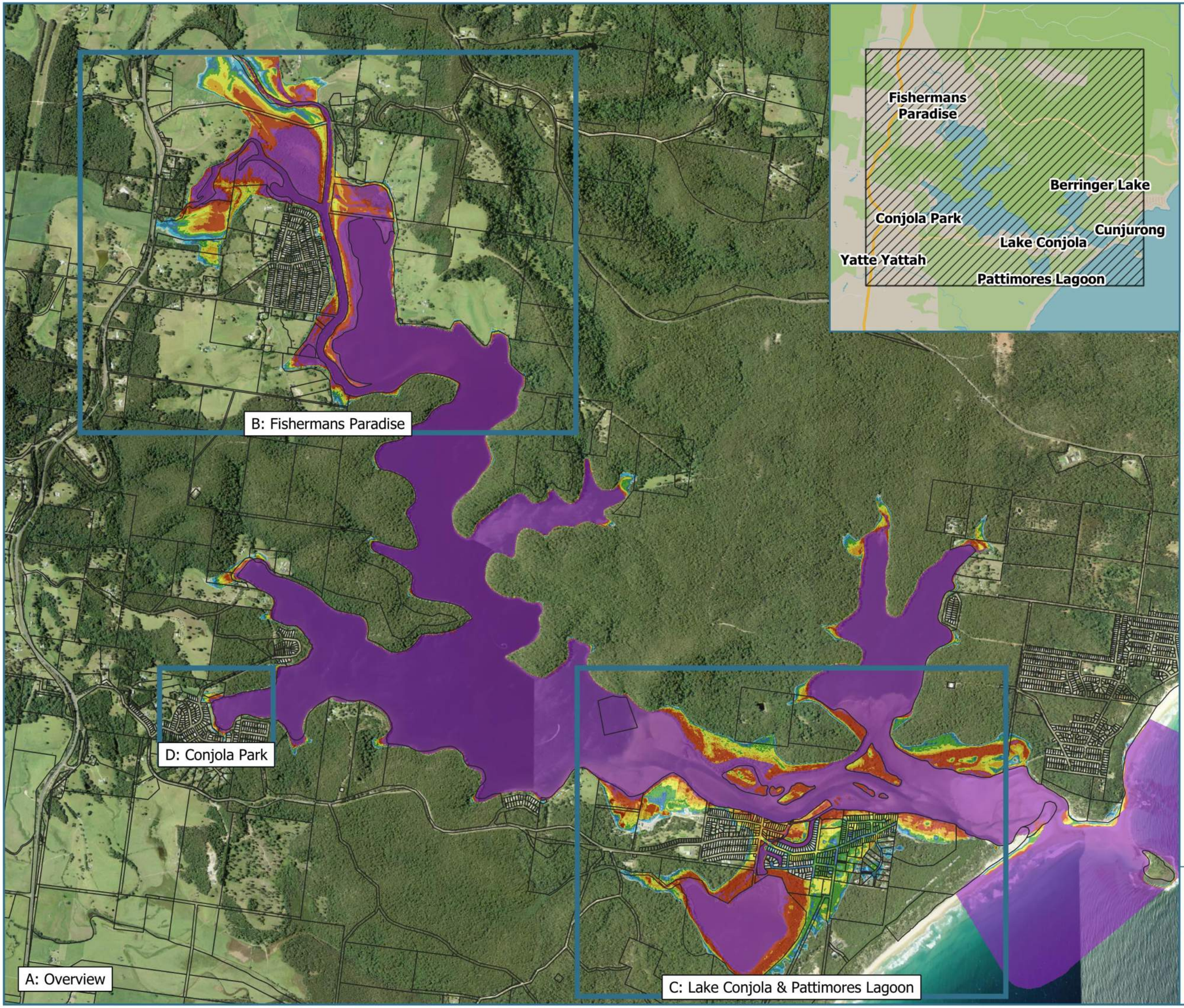

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Figure A-21
Coastal Inundation
SLR 0.9 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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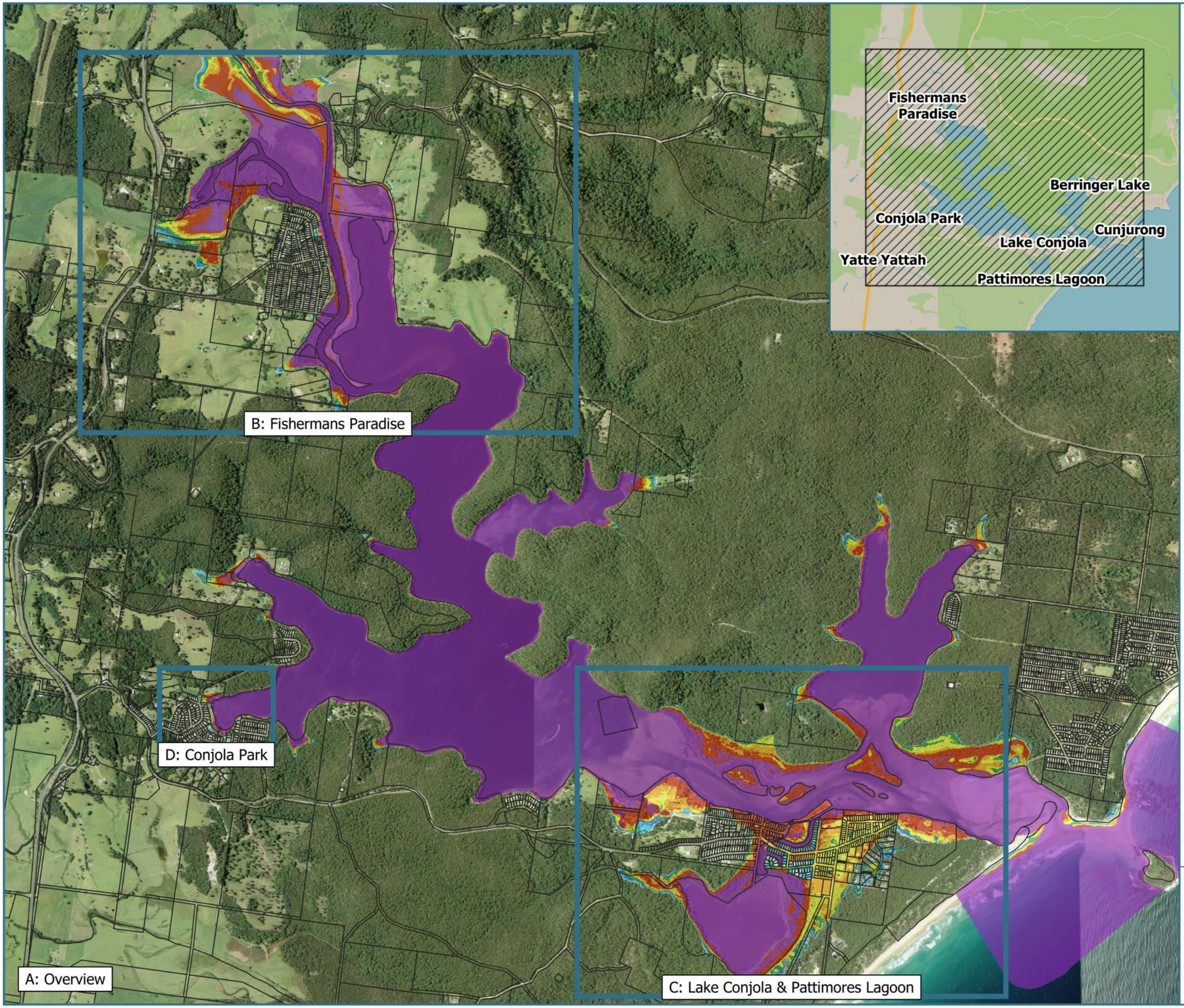

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Figure A-22
Coastal Inundation
SLR 0.9 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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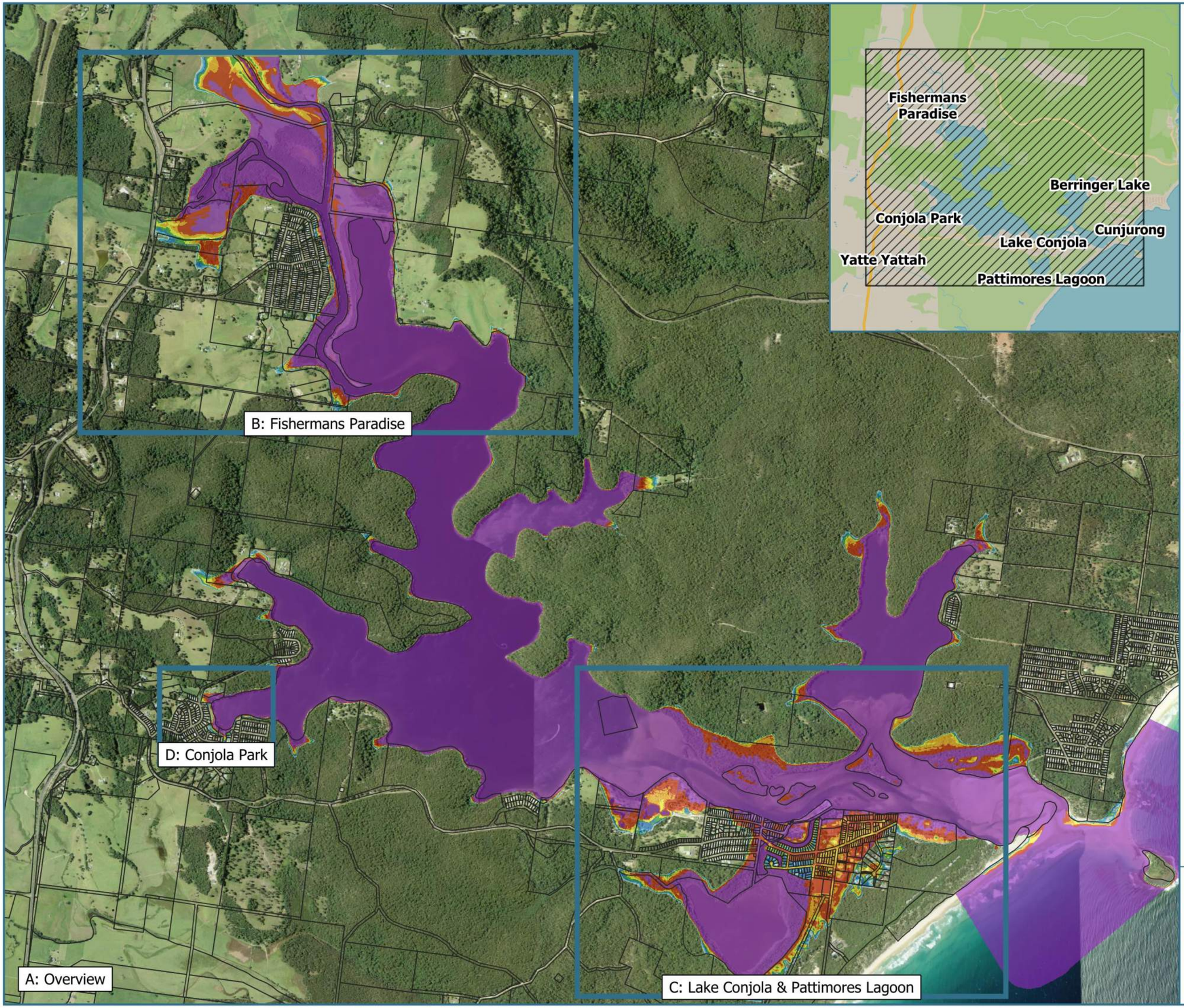

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Figure A-23
Coastal Inundation
SLR 1.2 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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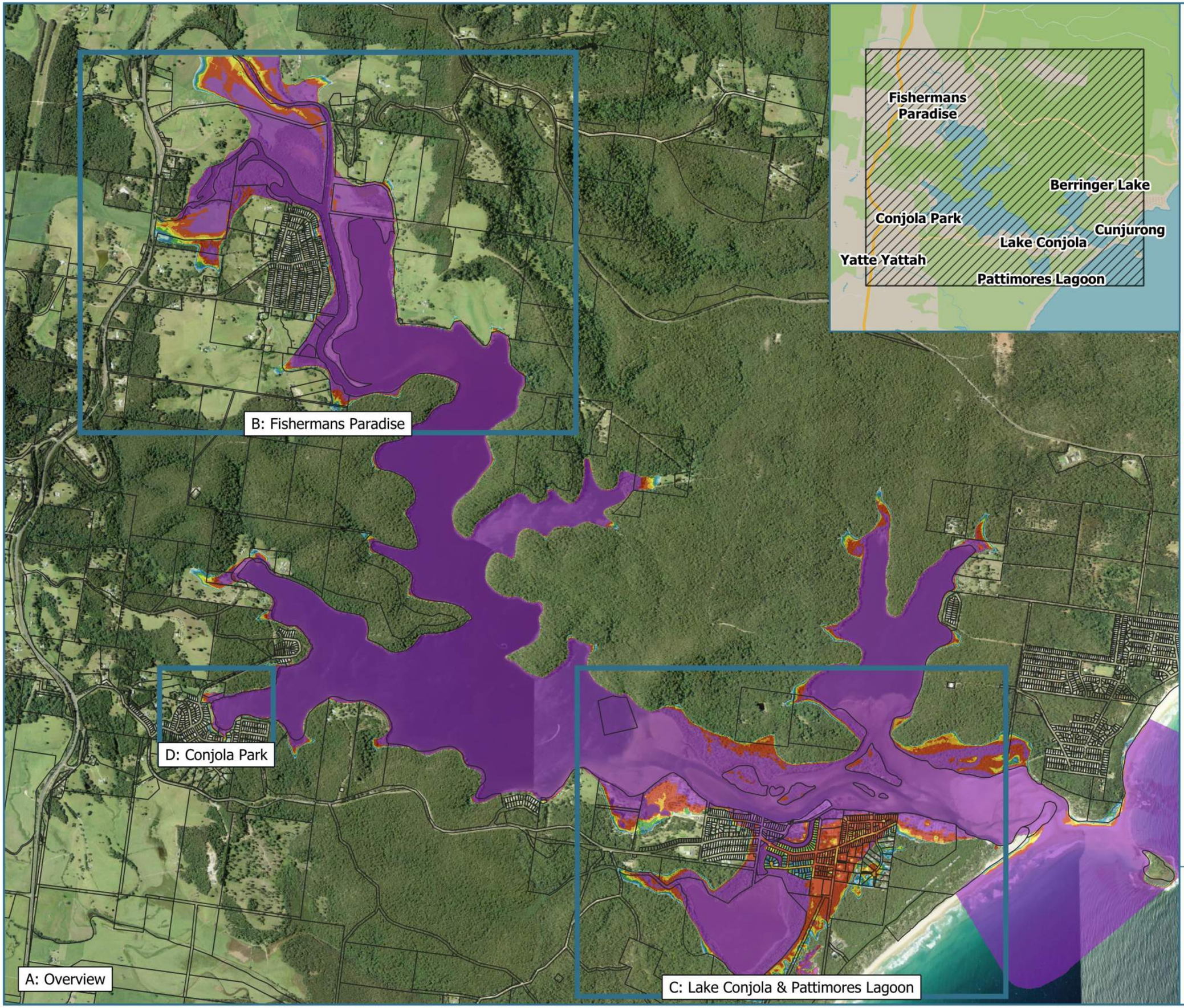

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Figure A-24
Coastal Inundation
SLR 1.2 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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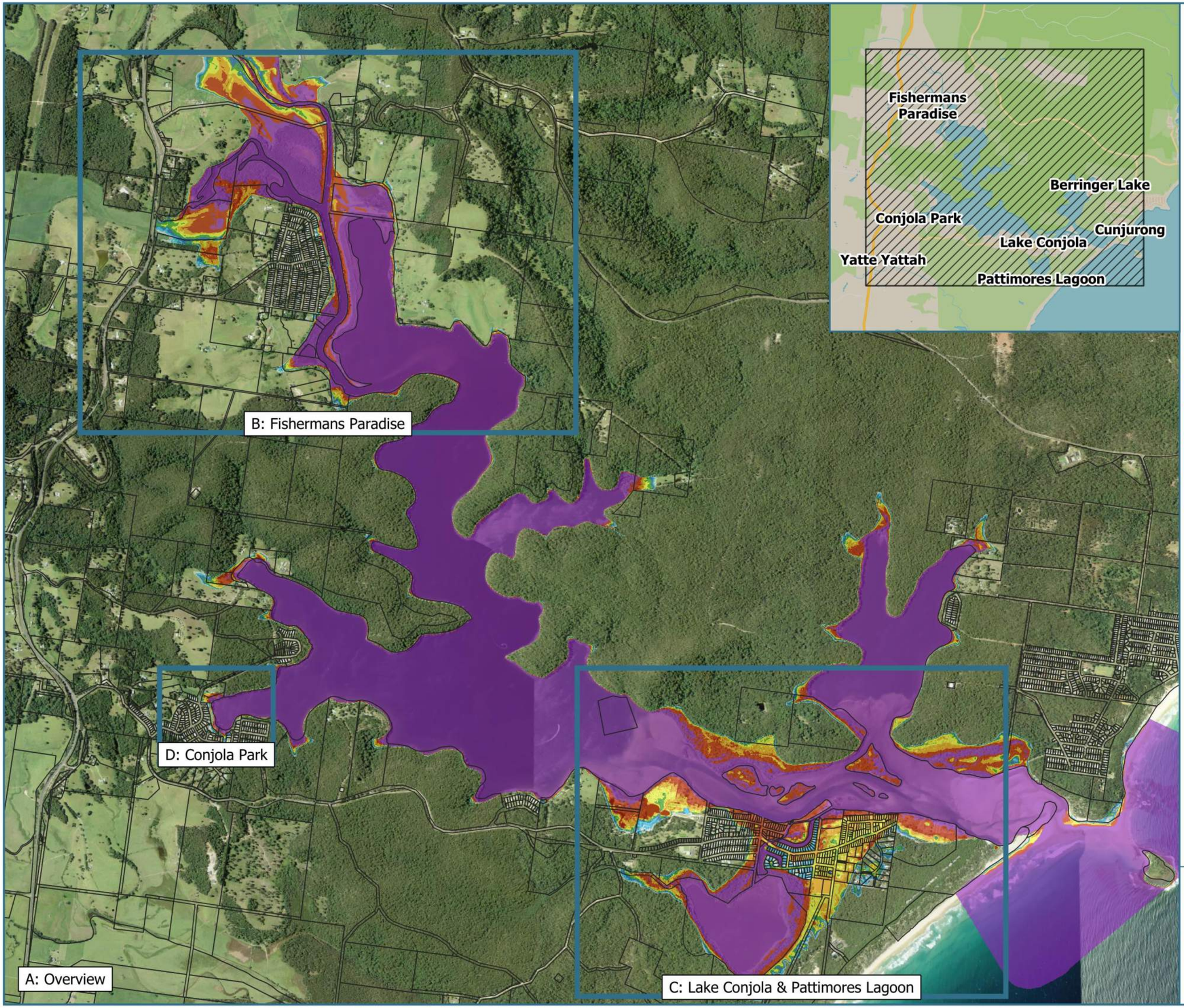

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Figure A-25
Coastal Inundation
SLR 1.2 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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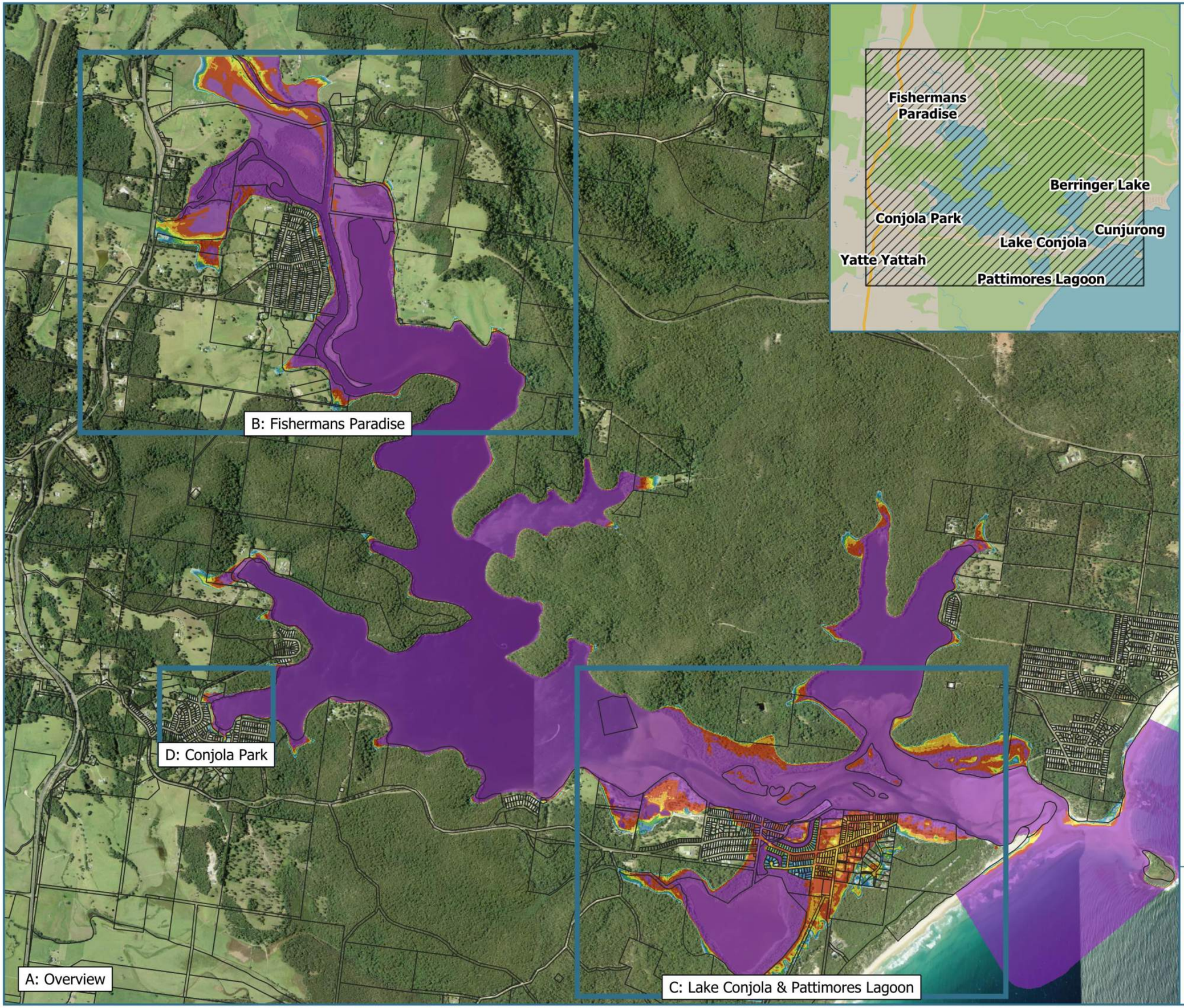

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Figure A-26
Coastal Inundation
SLR 1.2 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:26,000

N

0 400 800 1,200 m

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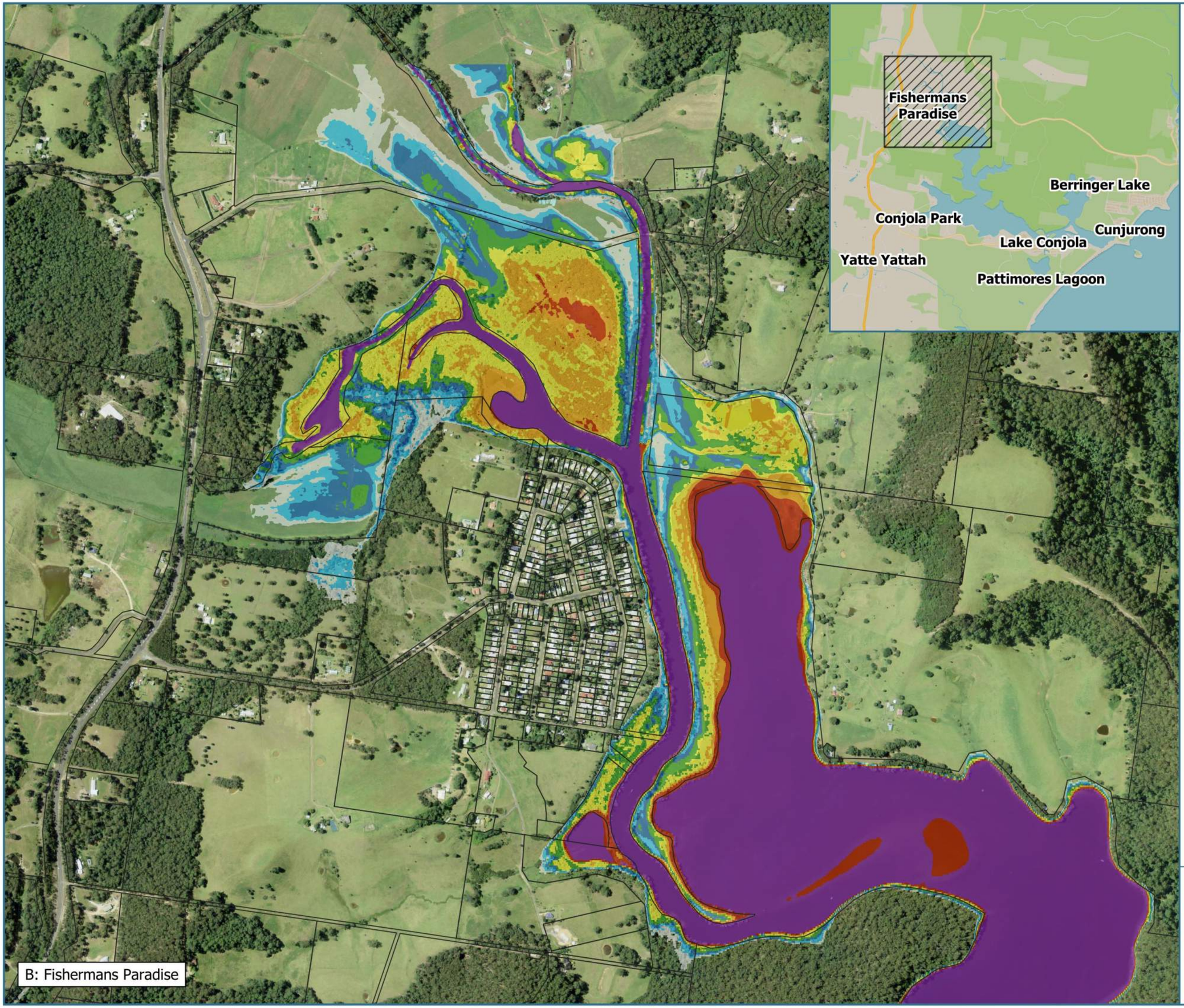

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Figure B-01
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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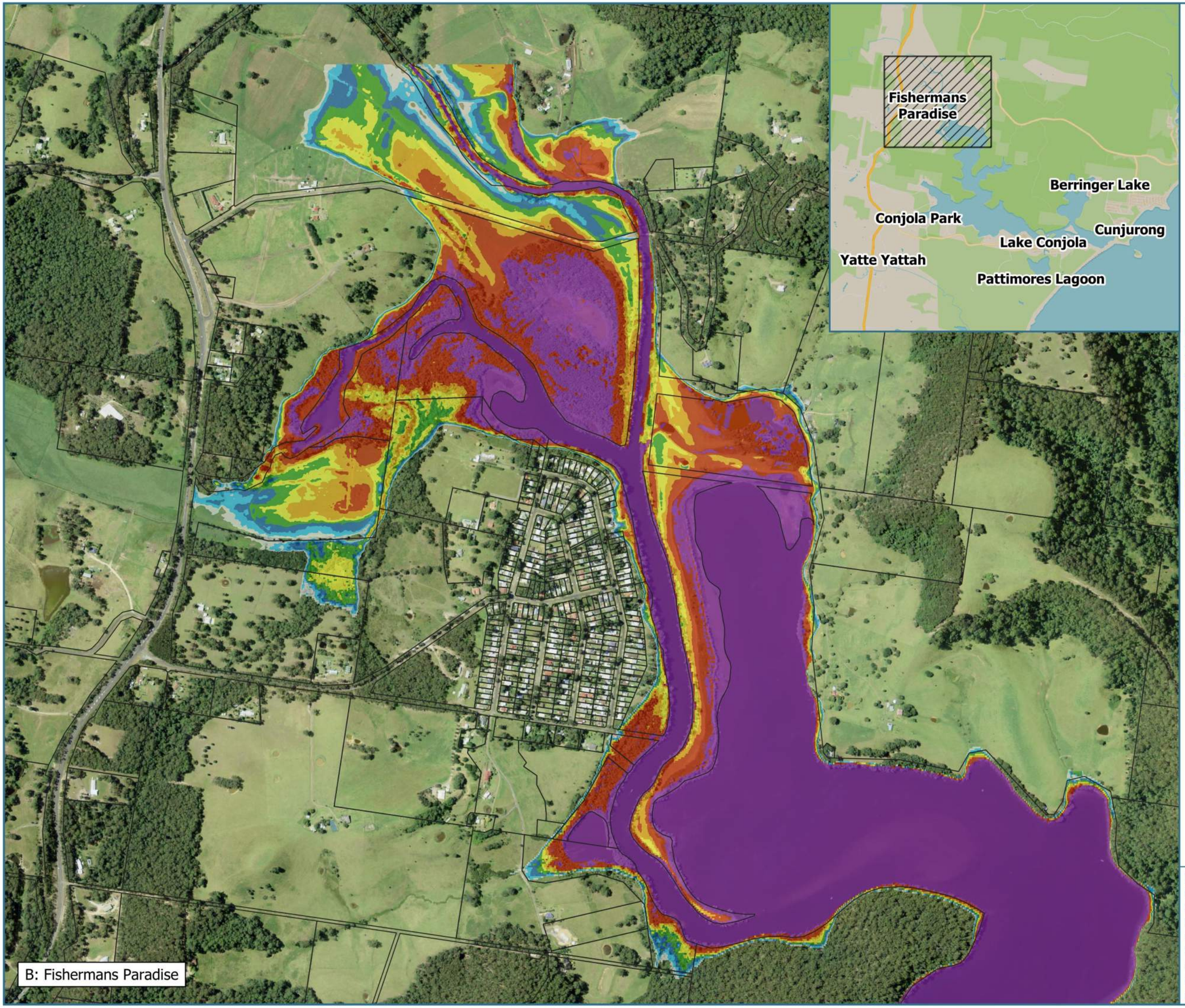

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Figure B-02
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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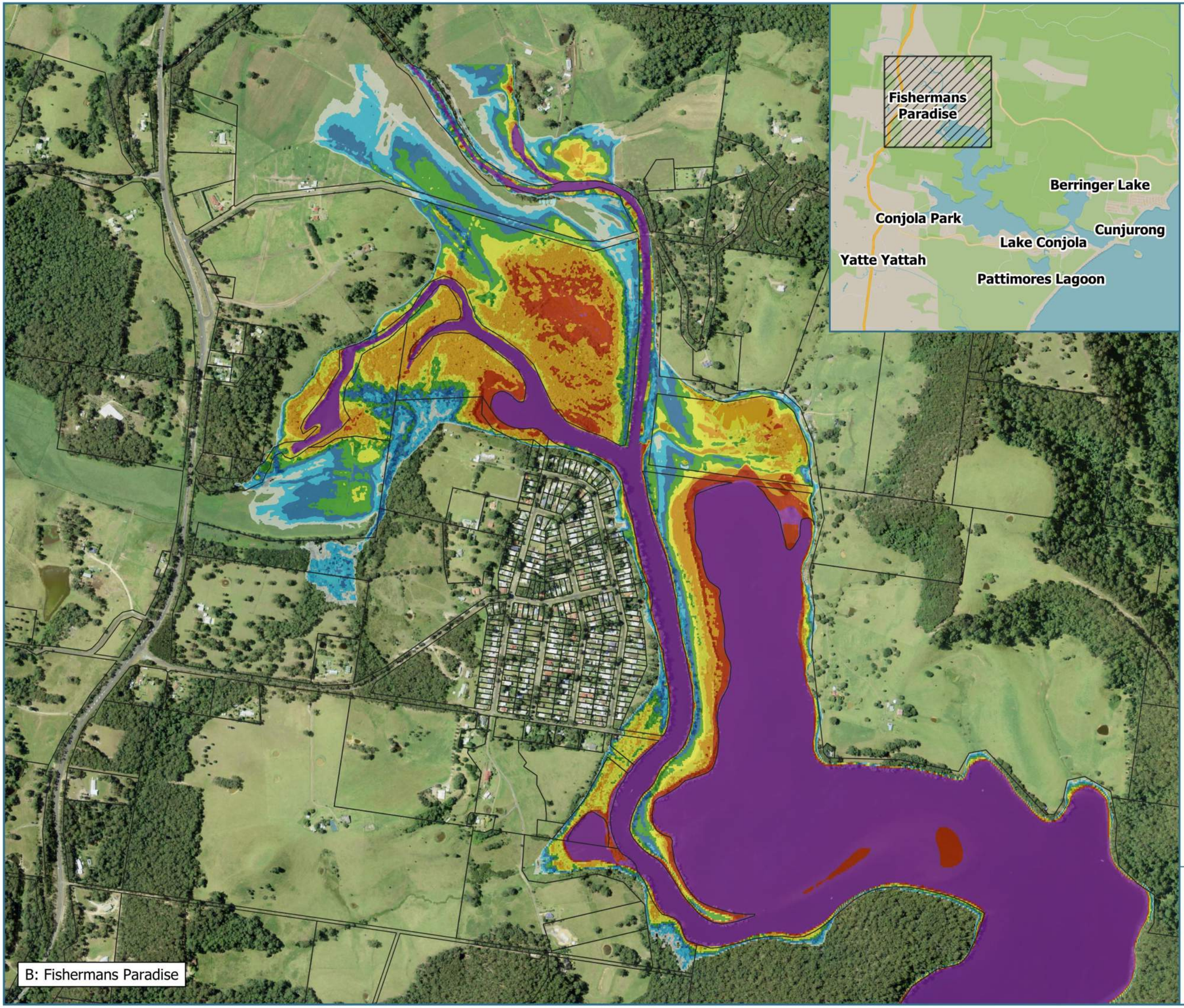

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Figure B-03
Coastal Inundation
SLR 0.1 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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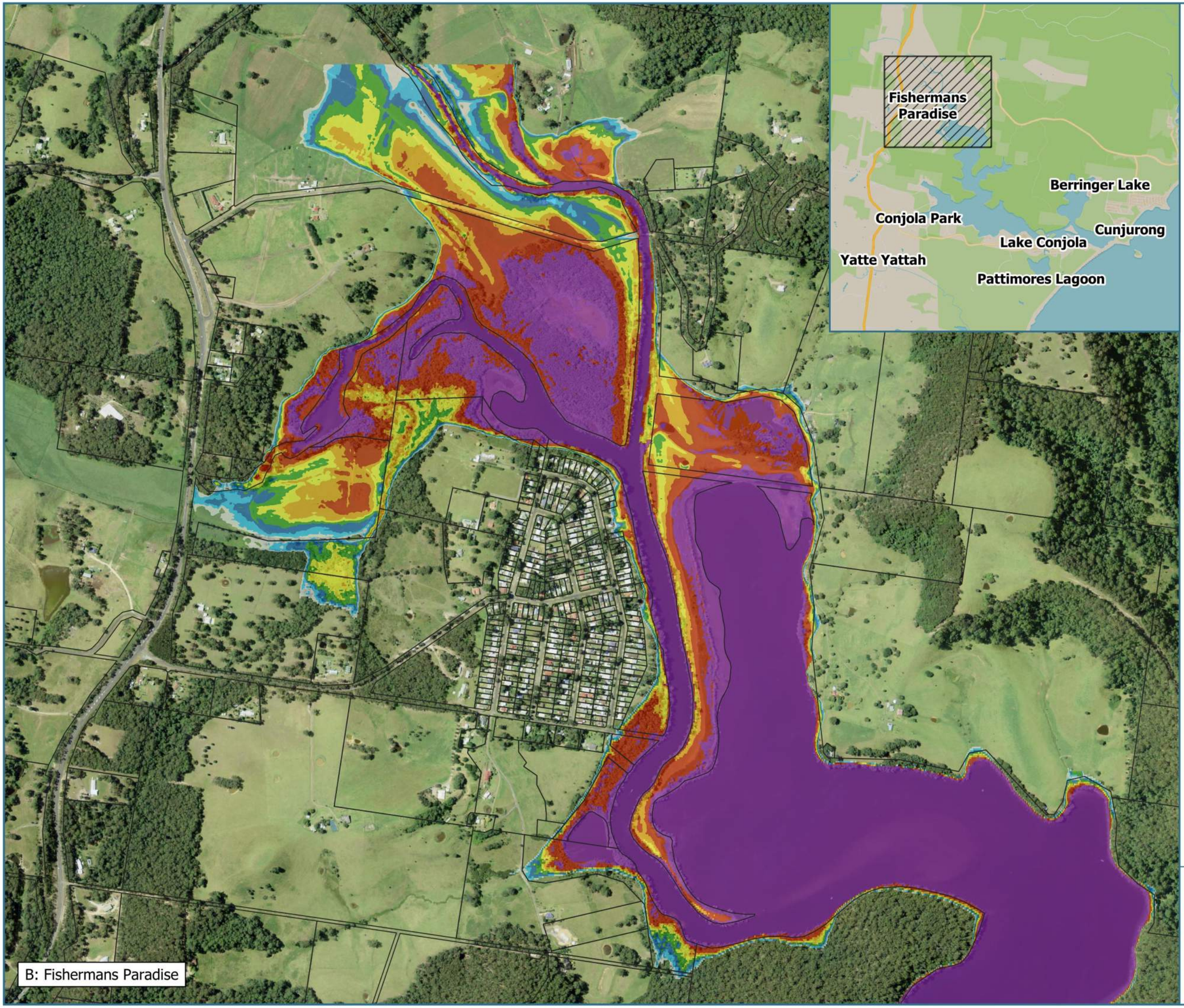

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Figure B-04
Coastal Inundation
SLR 0.1 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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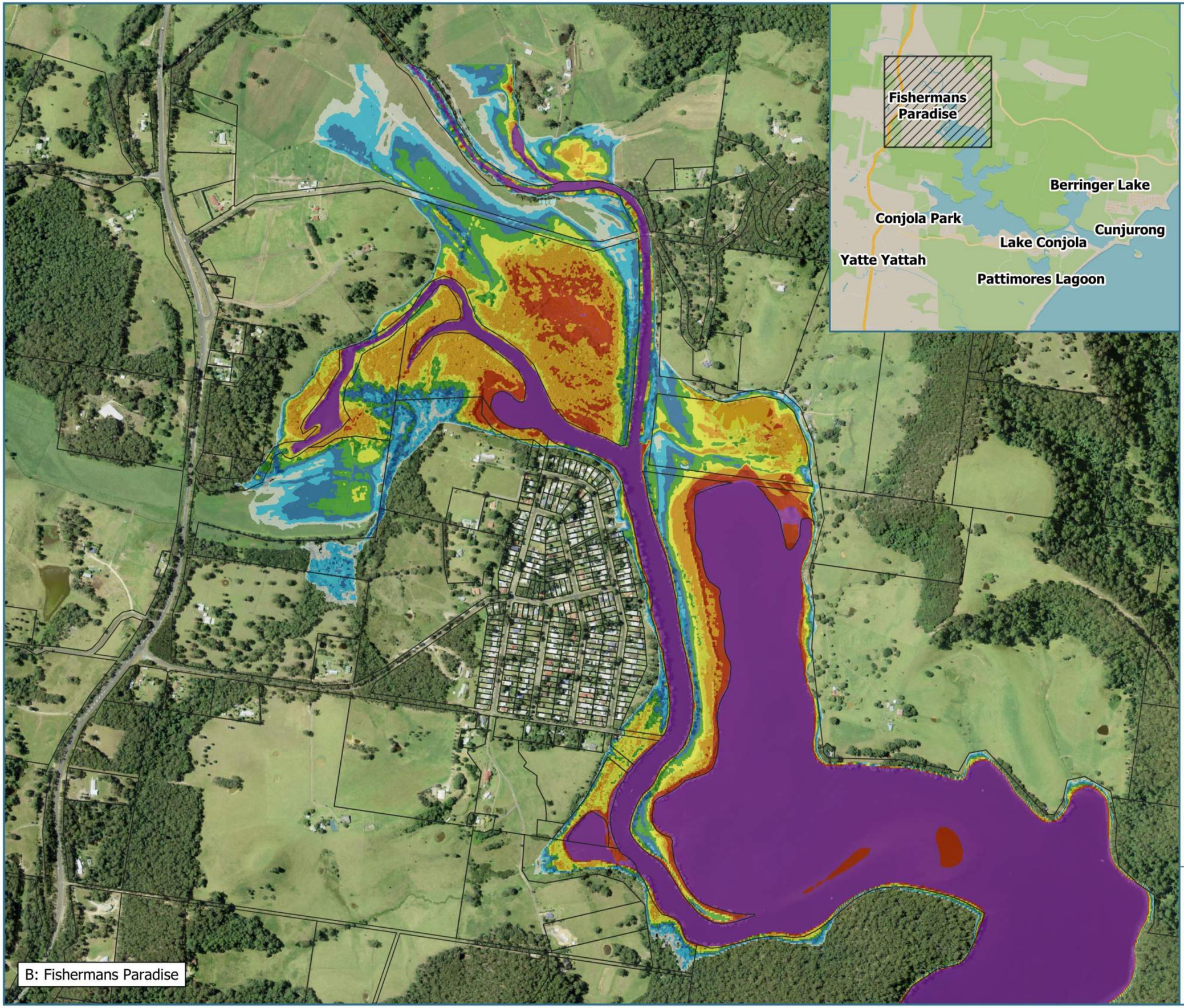

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Figure B-05
Coastal Inundation
SLR 0.1 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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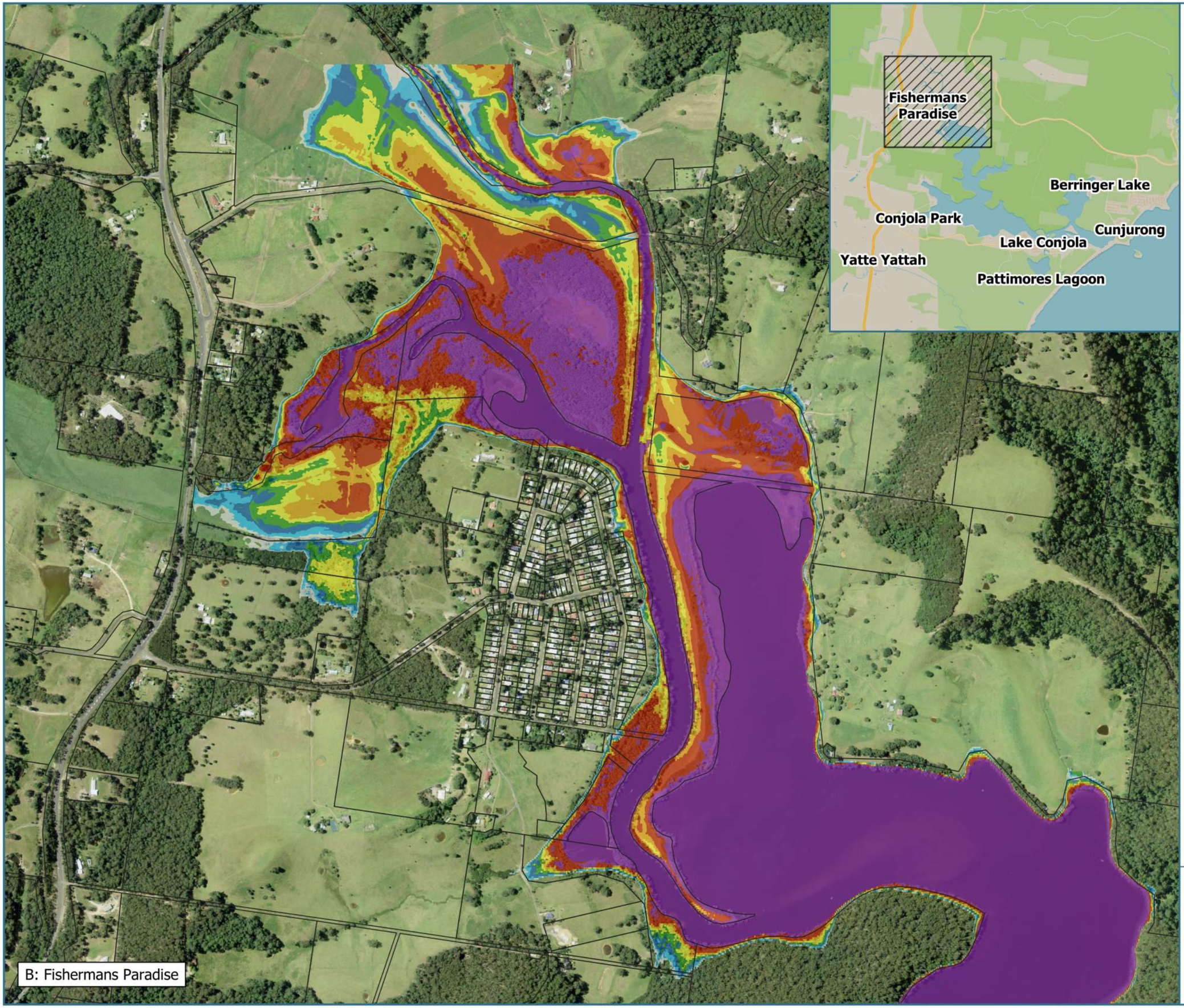

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Figure B-06
Coastal Inundation
SLR 0.1 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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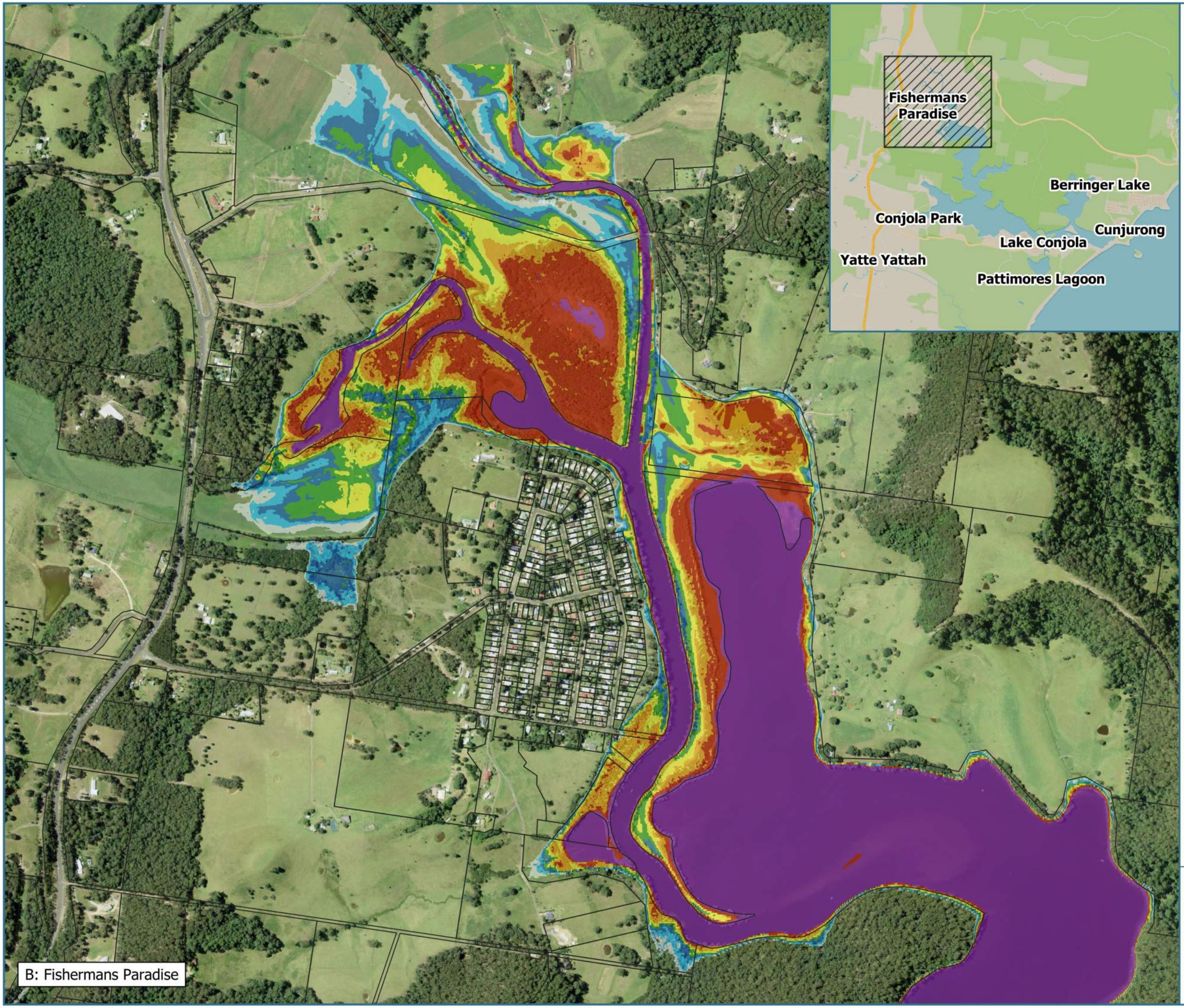

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Figure B-07
Coastal Inundation
SLR 0.23 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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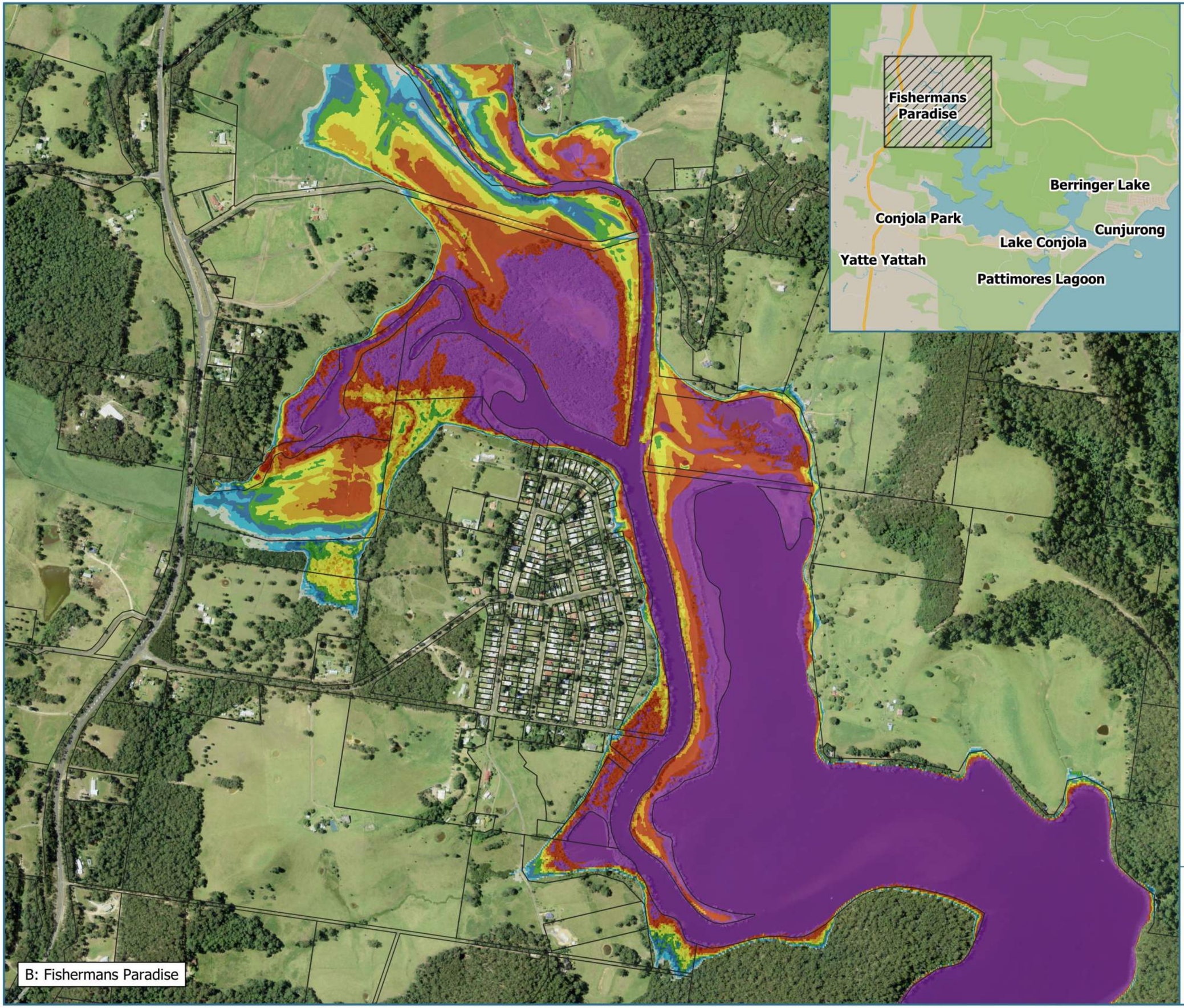

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Figure B-08
Coastal Inundation
SLR 0.23 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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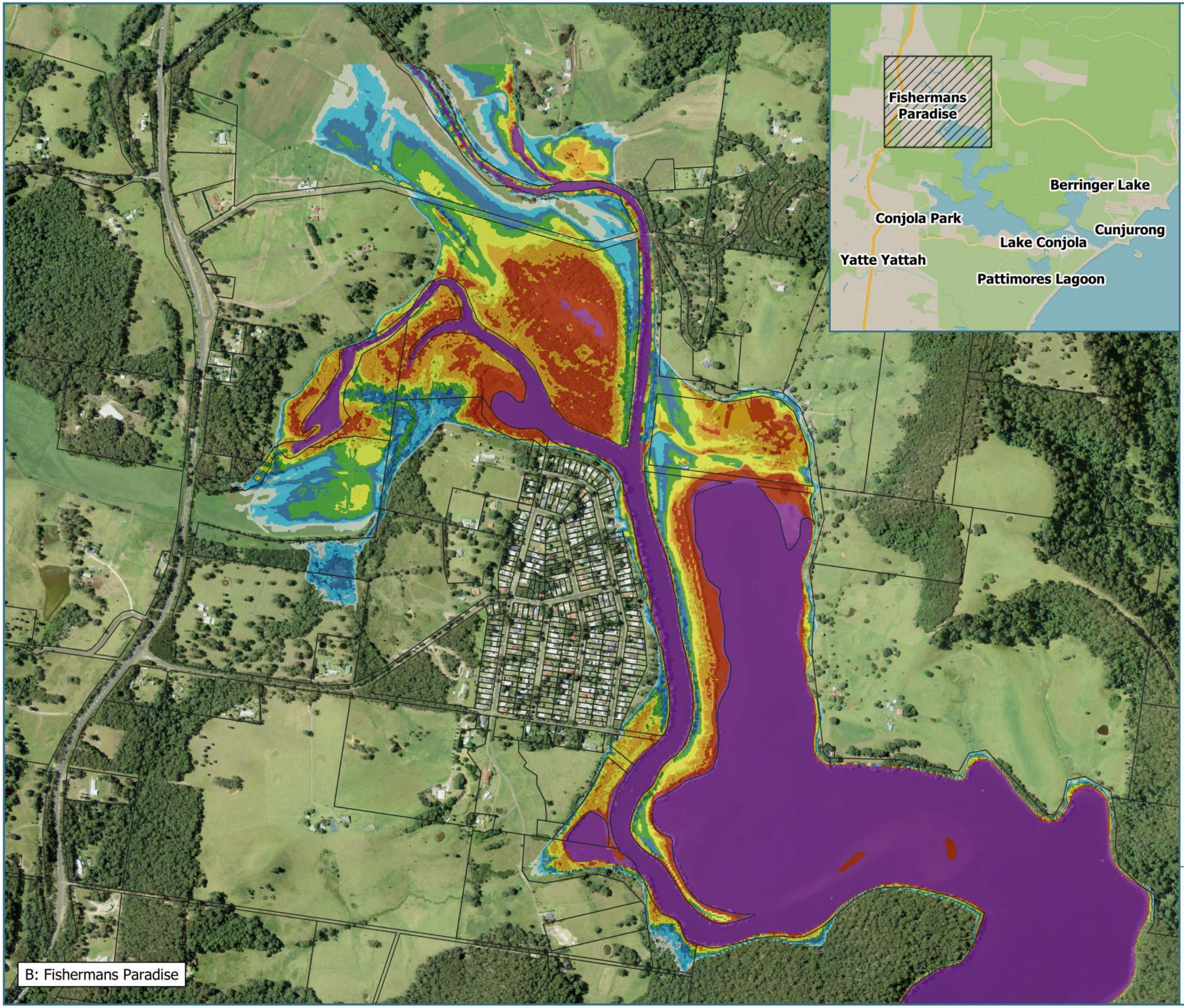

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Figure B-09
Coastal Inundation
SLR 0.23 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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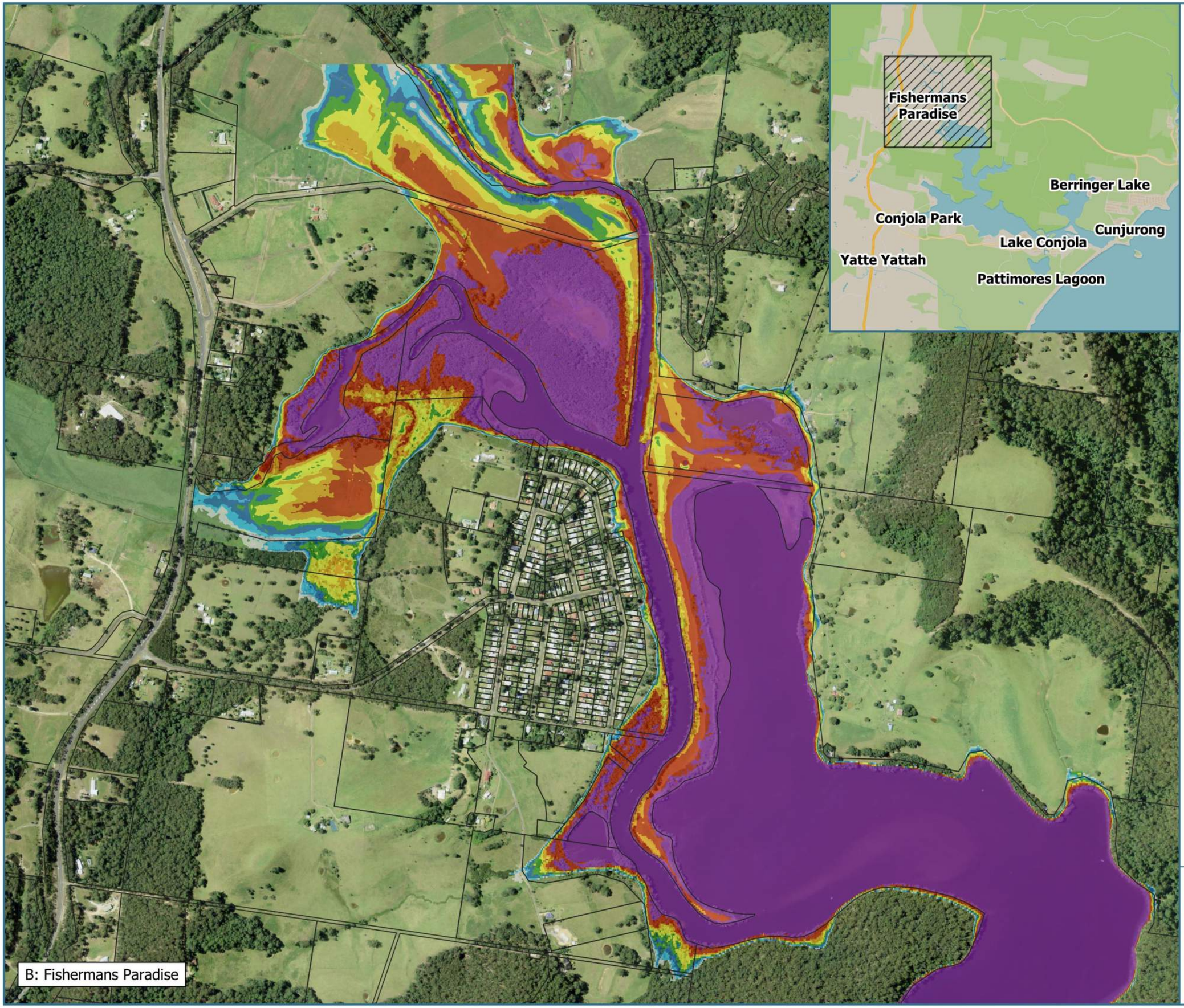

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Lake Conjola Coastal Management Program

Figure B-10
Coastal Inundation
SLR 0.23 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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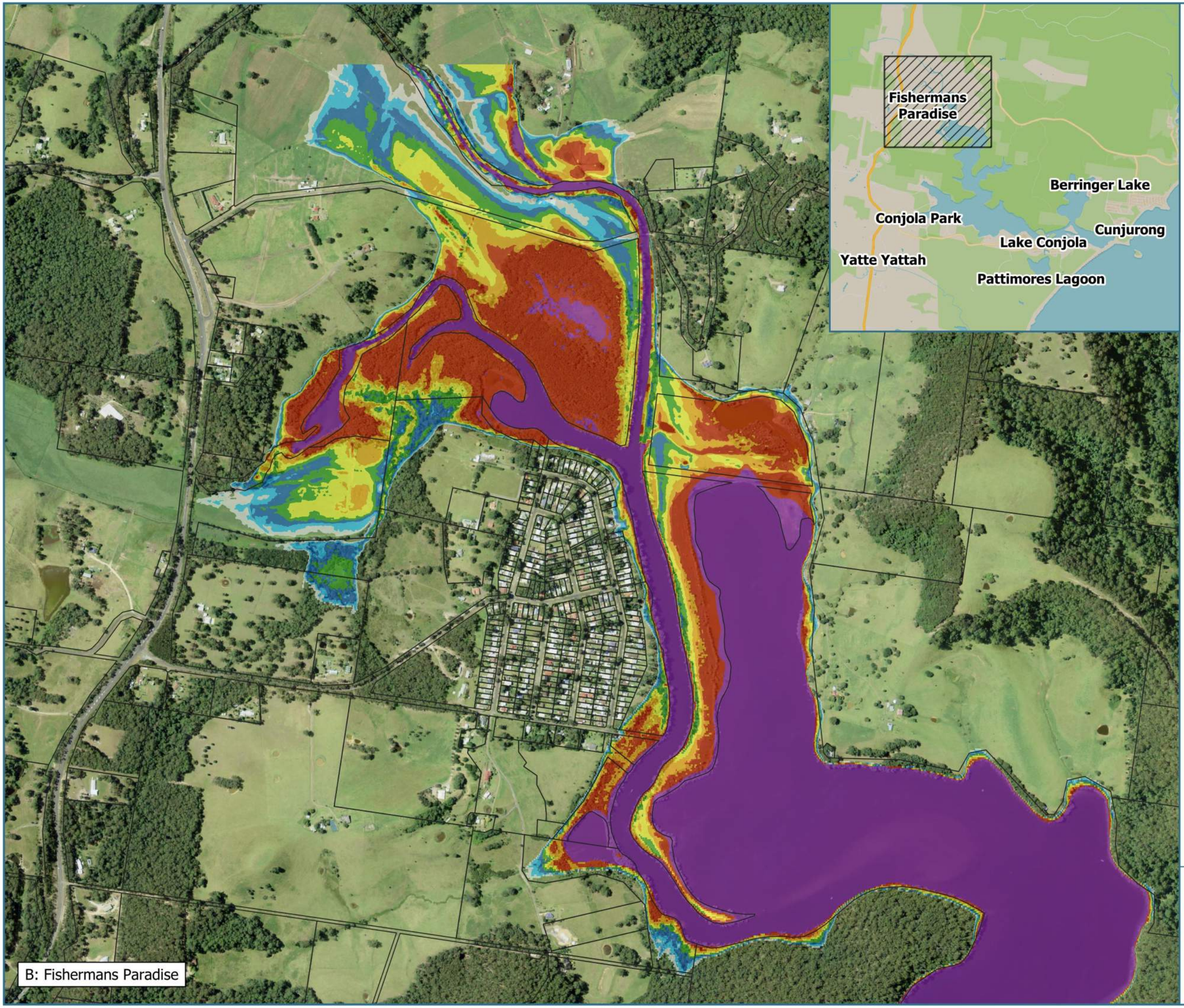

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Figure B-11
Coastal Inundation
SLR 0.36 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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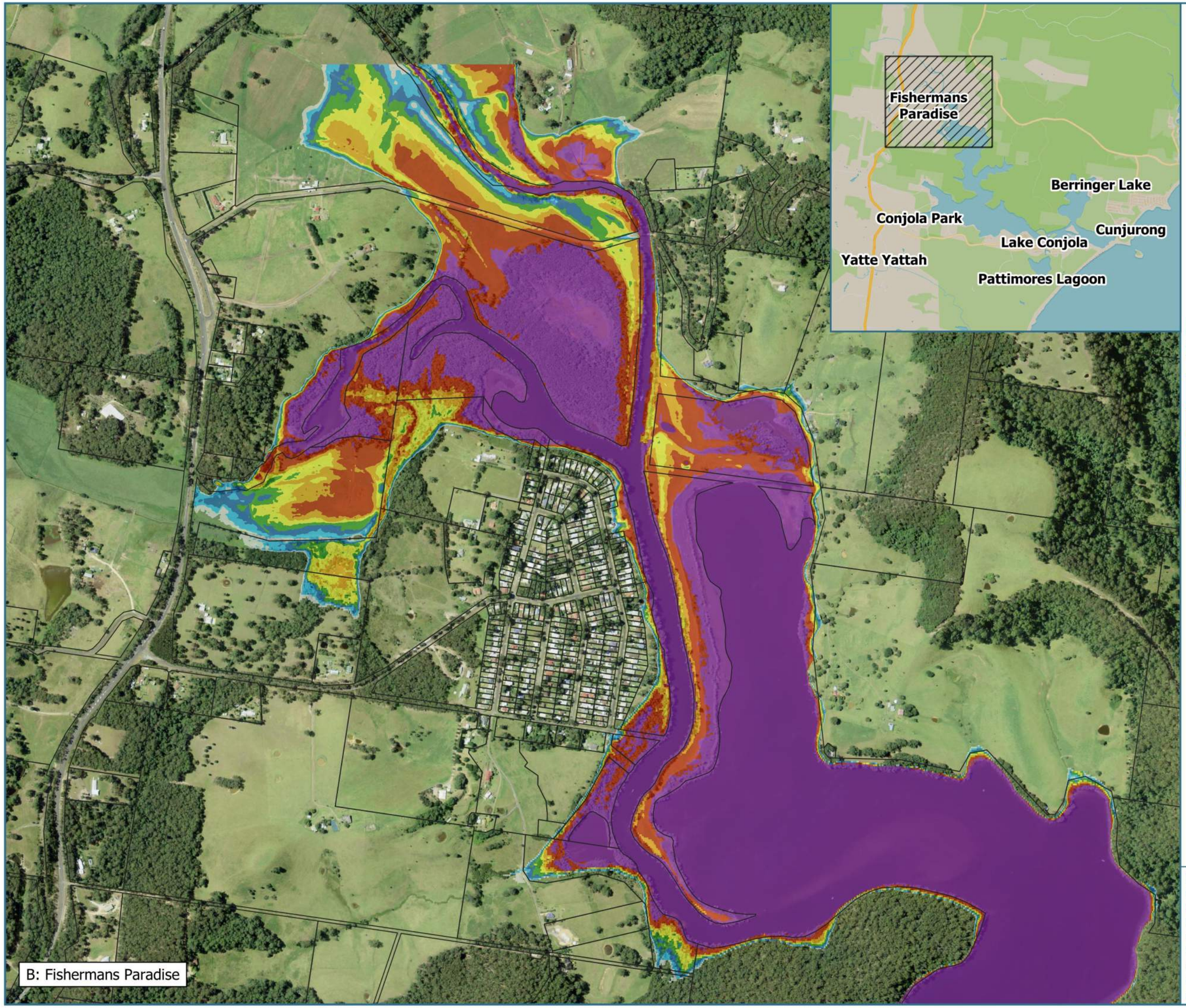

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Figure B-12
Coastal Inundation
SLR 0.36 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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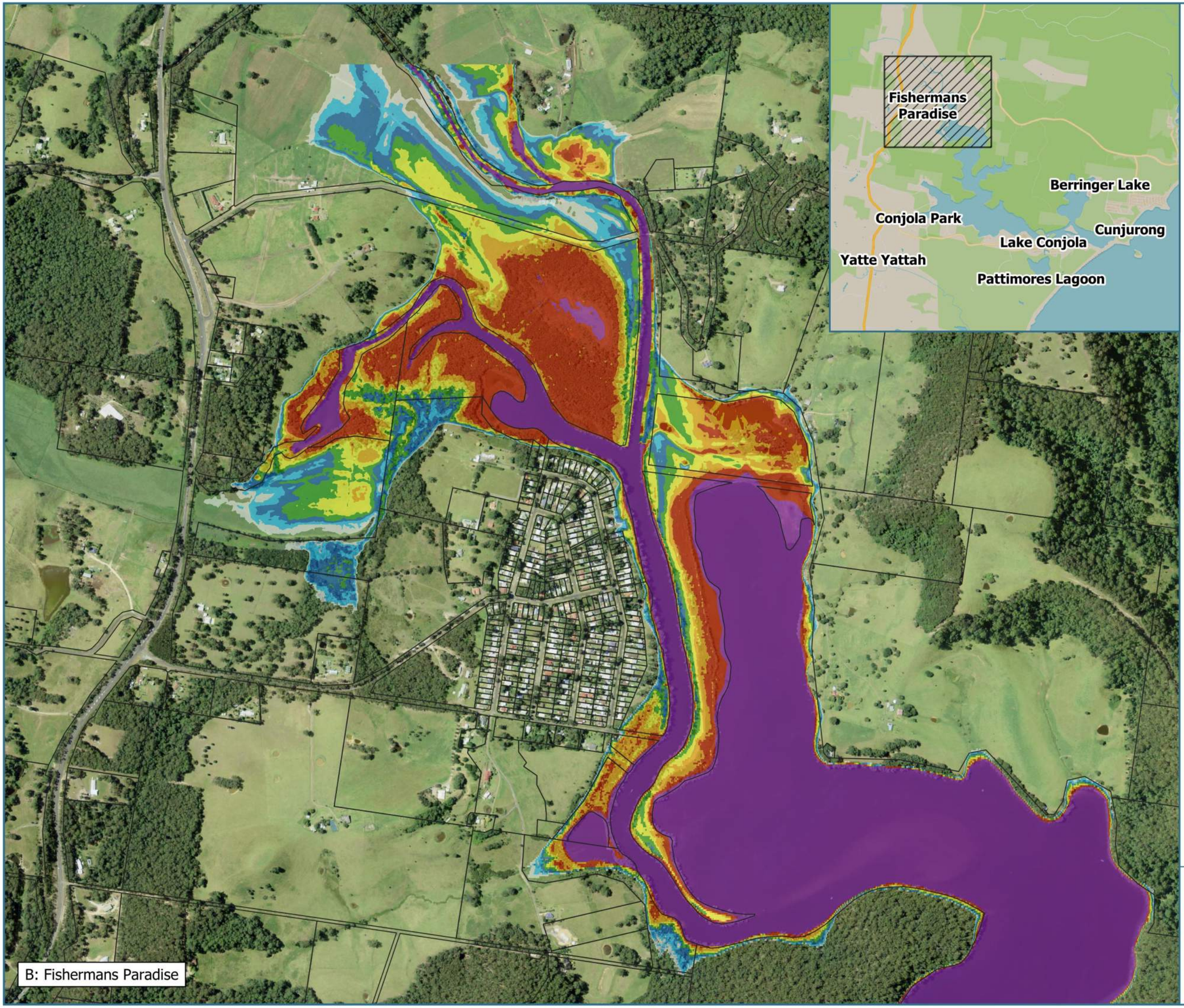

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Figure B-13
Coastal Inundation
SLR 0.36 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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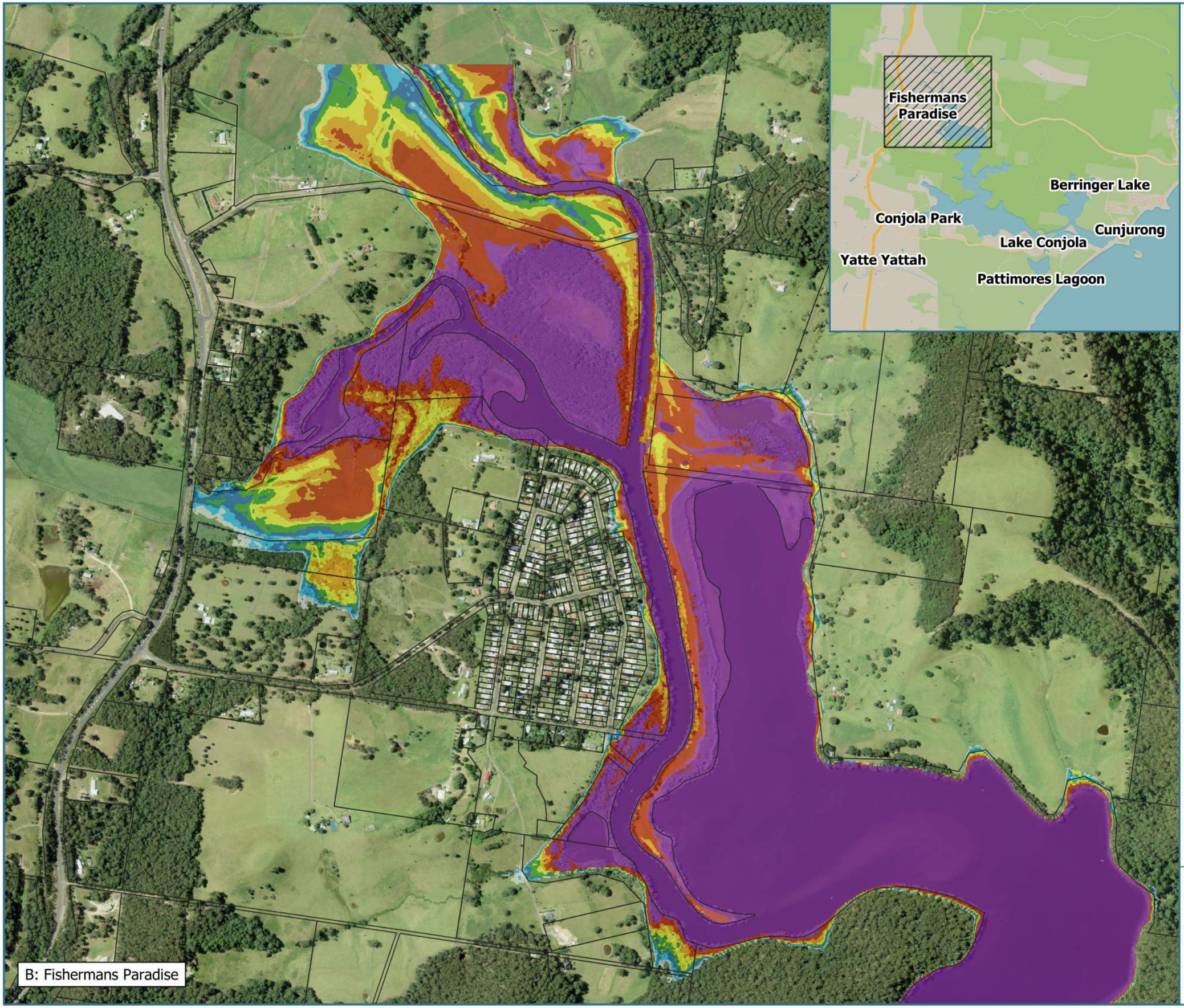

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Figure B-14
Coastal Inundation
SLR 0.36 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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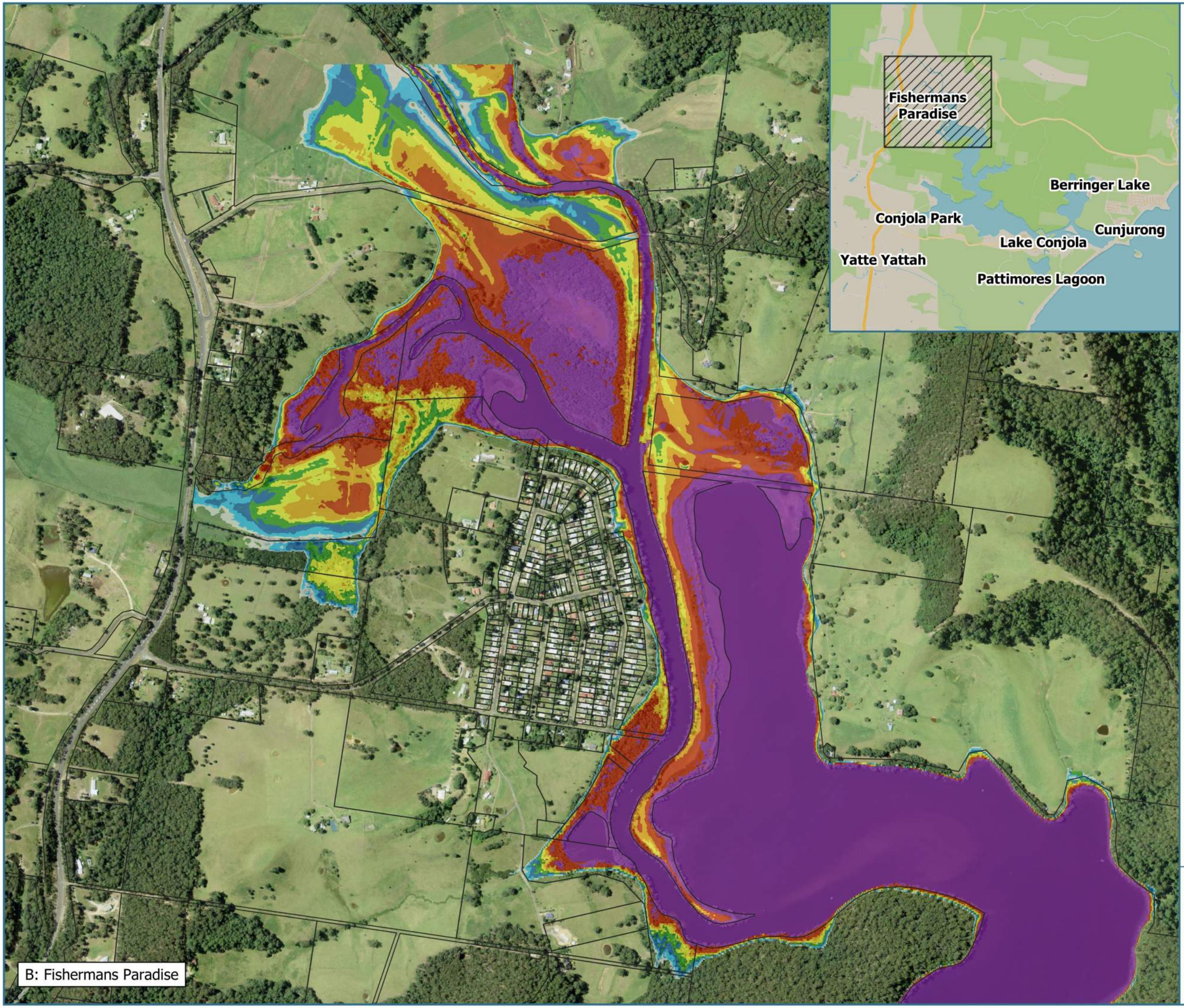

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Figure B-15
Coastal Inundation
SLR 0.6 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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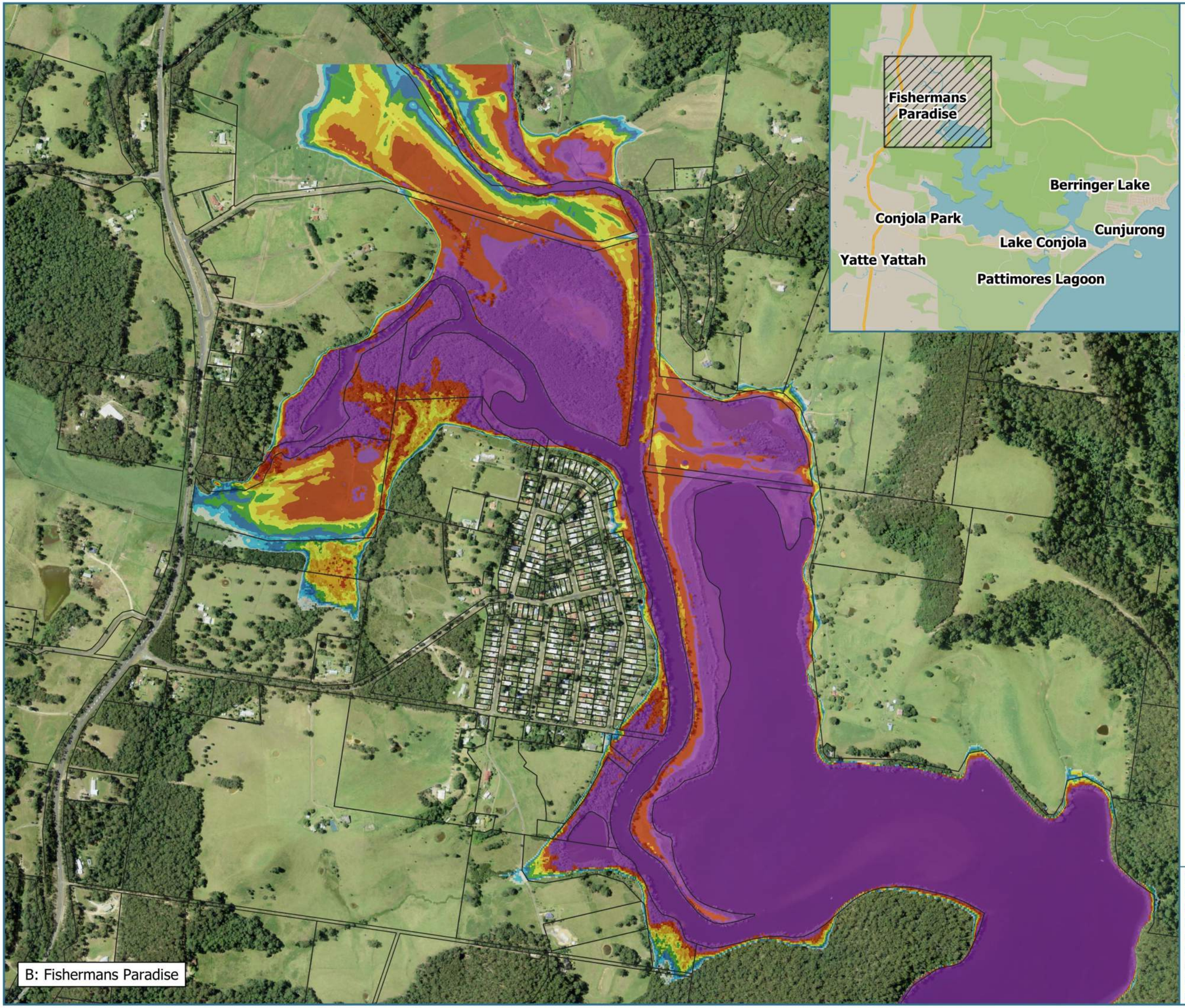

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Figure B-16
Coastal Inundation
SLR 0.6 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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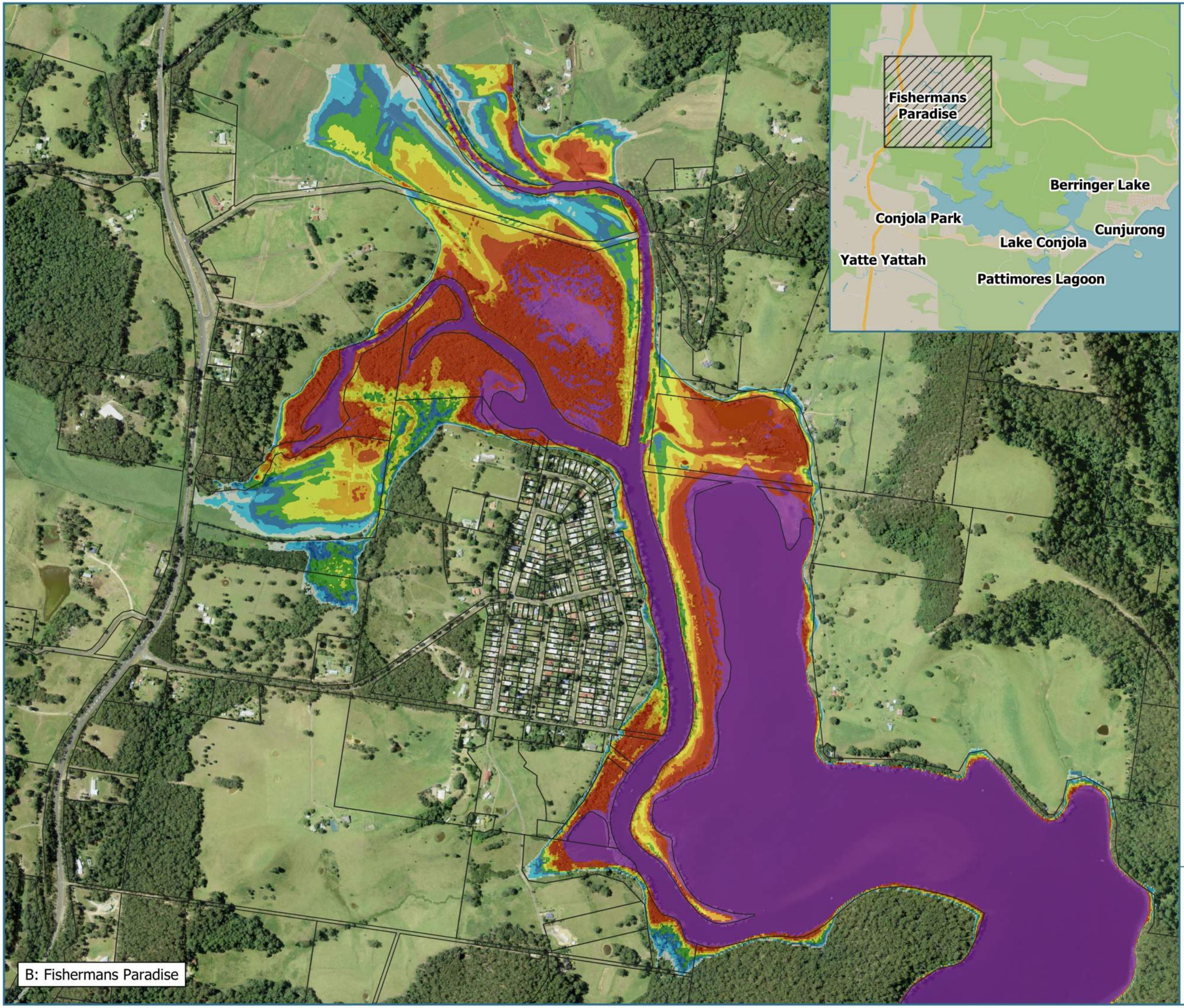

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Figure B-17
Coastal Inundation
SLR 0.6 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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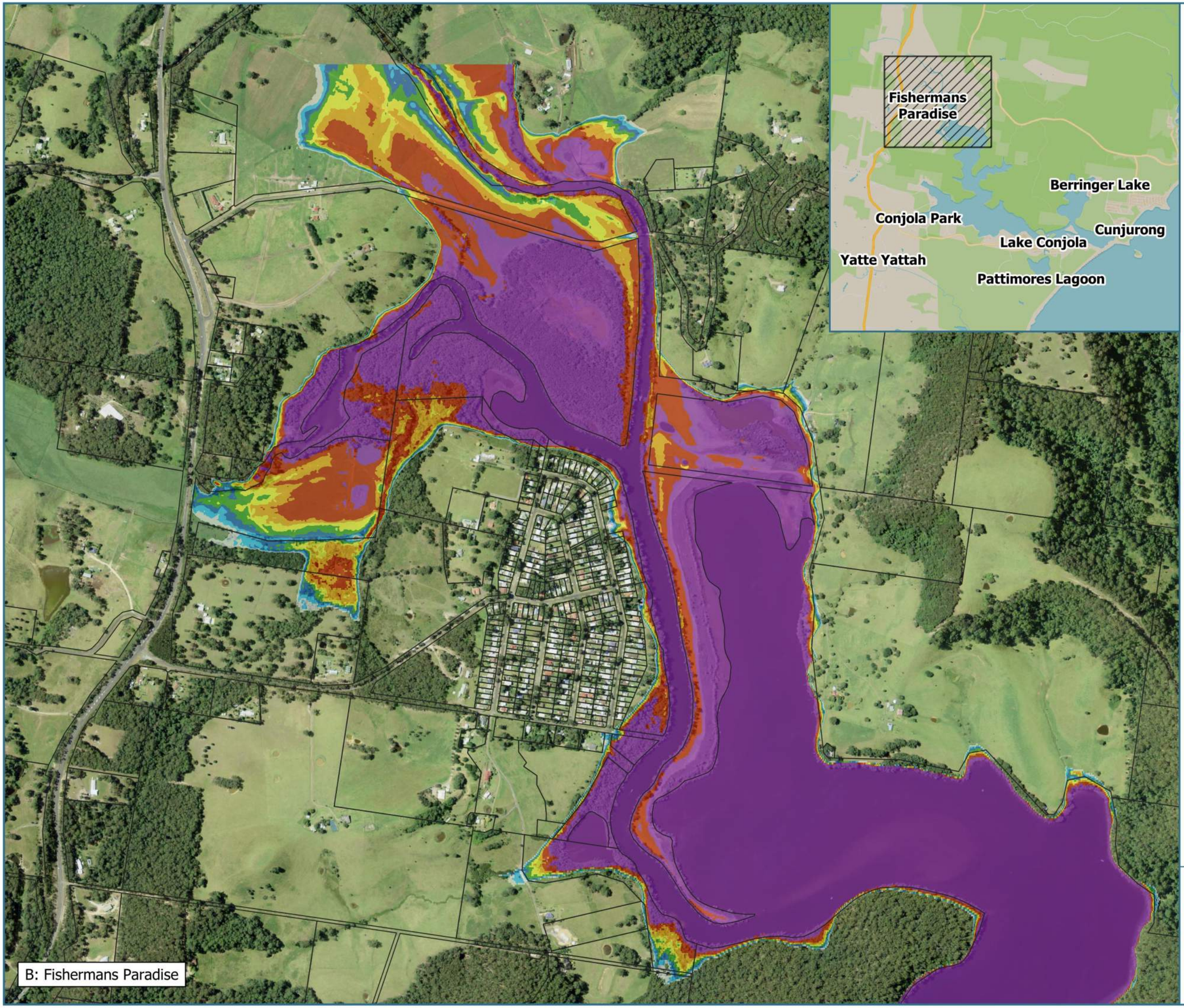

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Figure B-18
Coastal Inundation
SLR 0.6 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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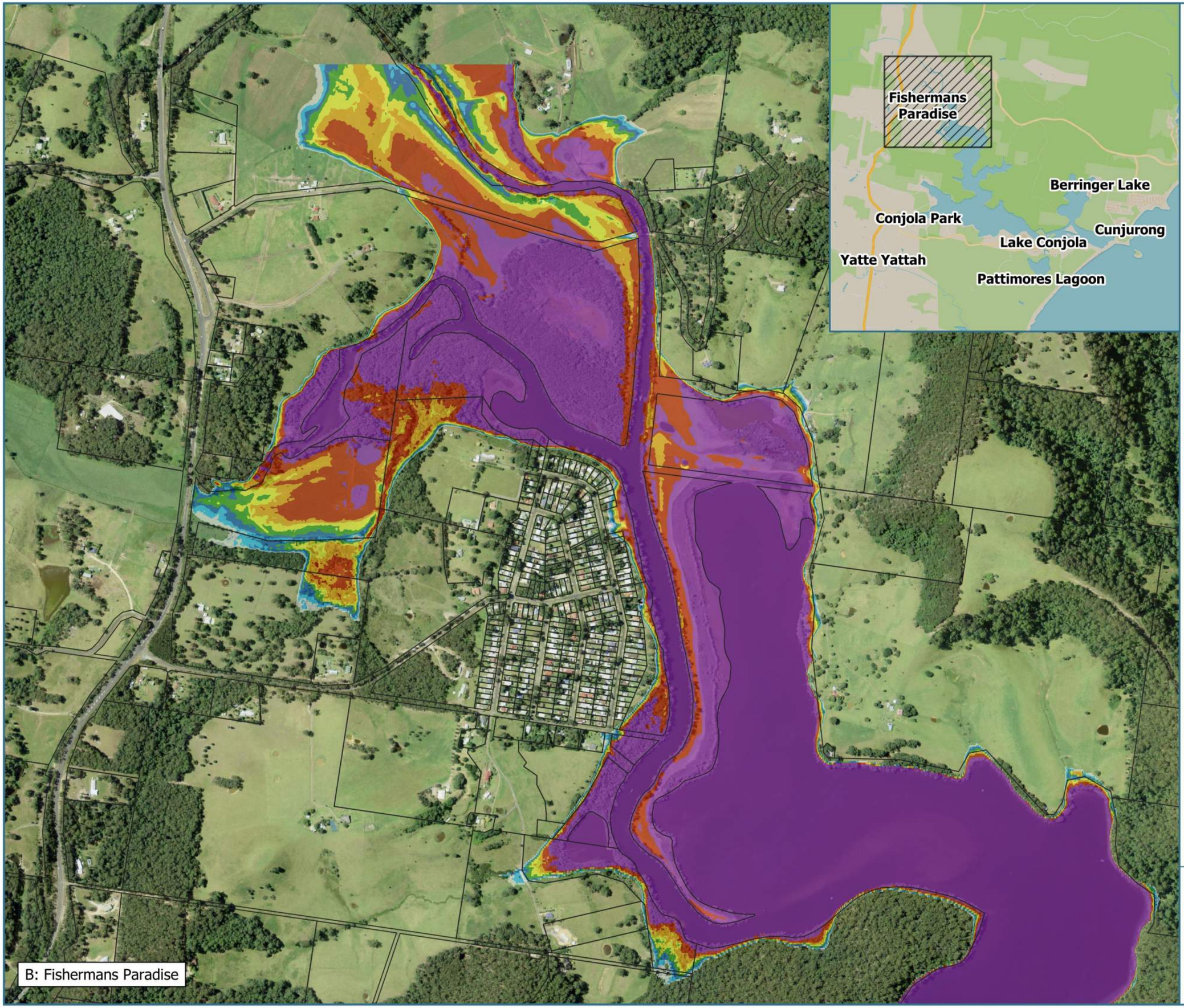

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Figure B-19
Coastal Inundation
SLR 0.9 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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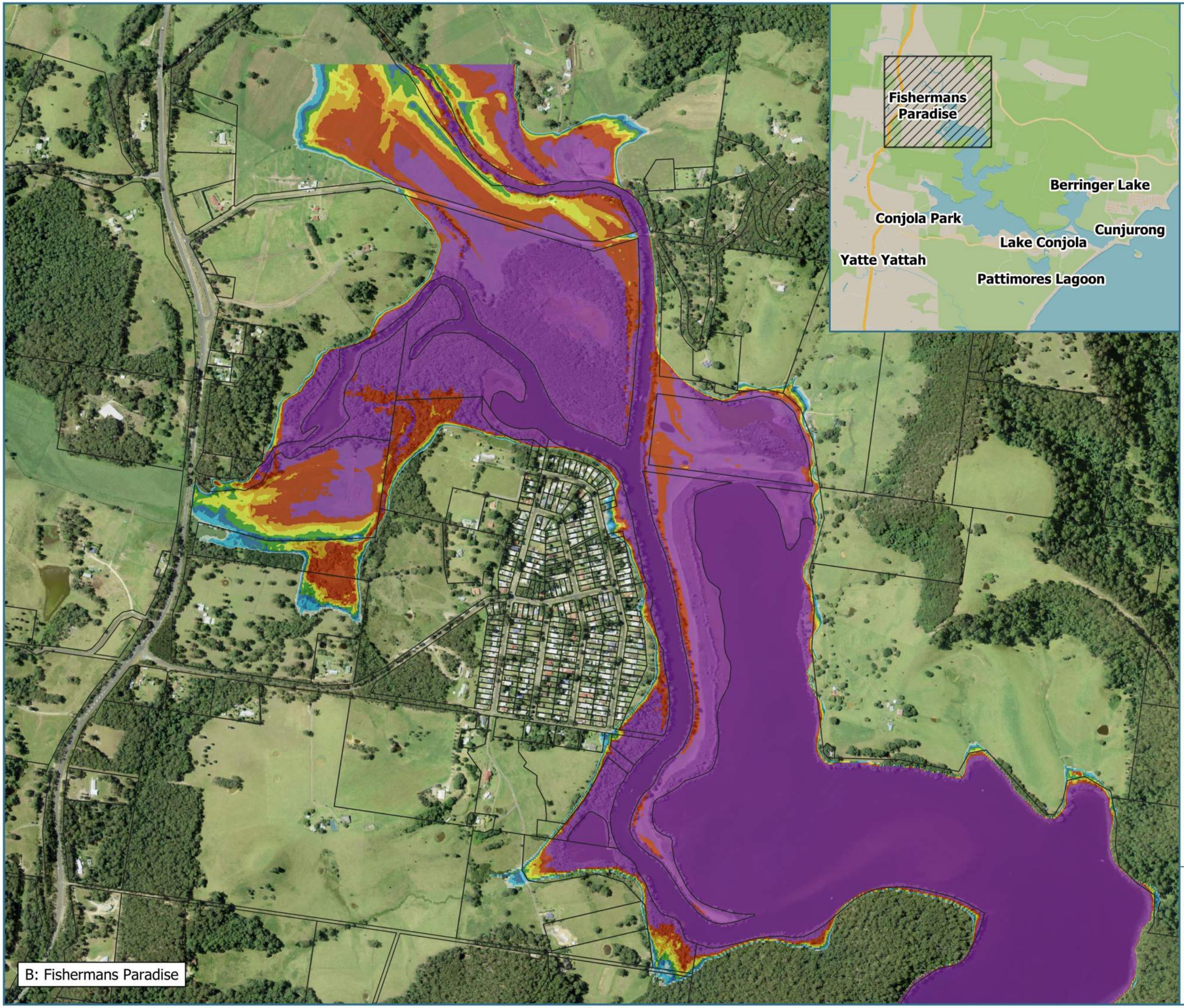

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Figure B-20
Coastal Inundation
SLR 0.9 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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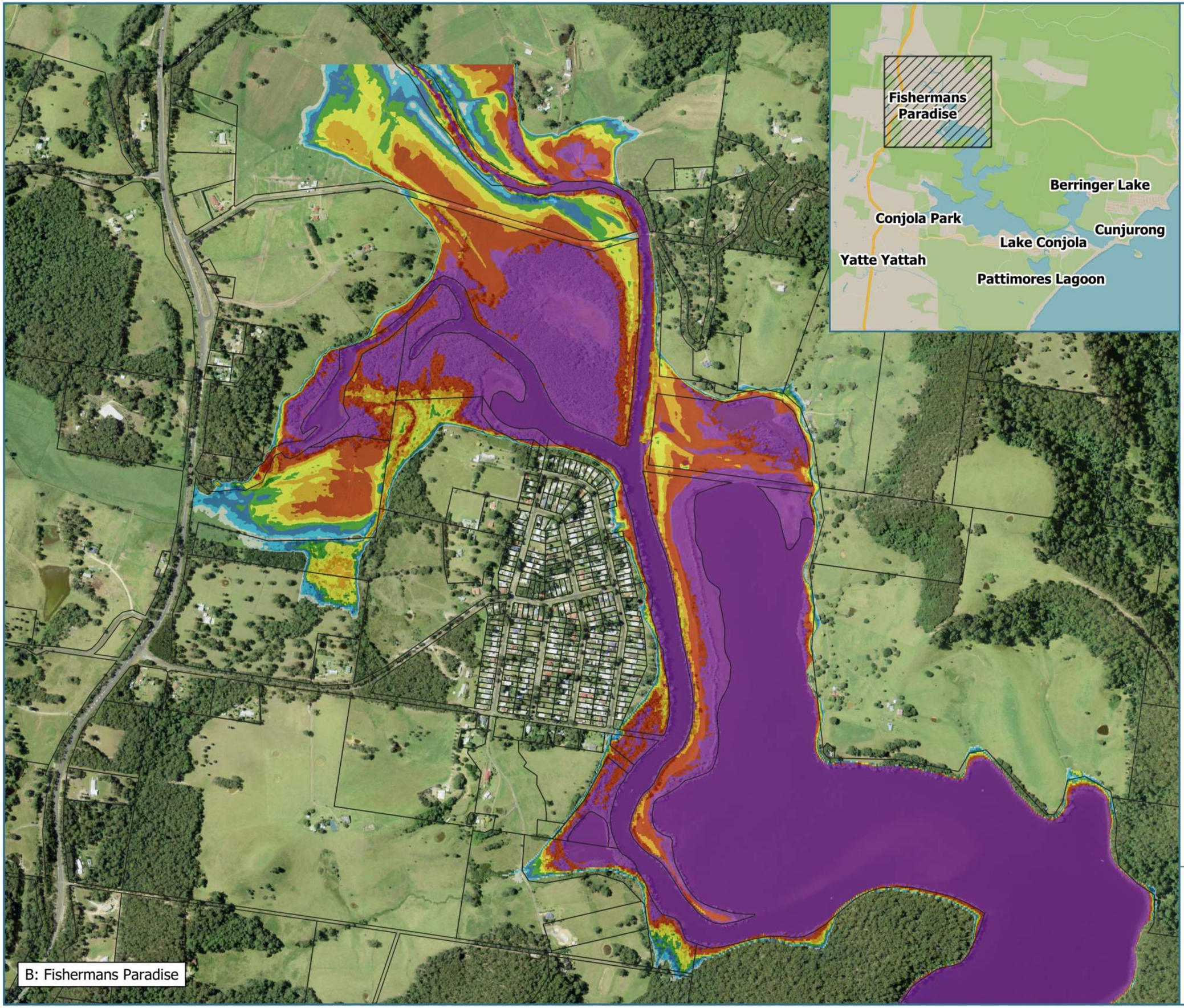

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Figure B-21
Coastal Inundation
SLR 0.9 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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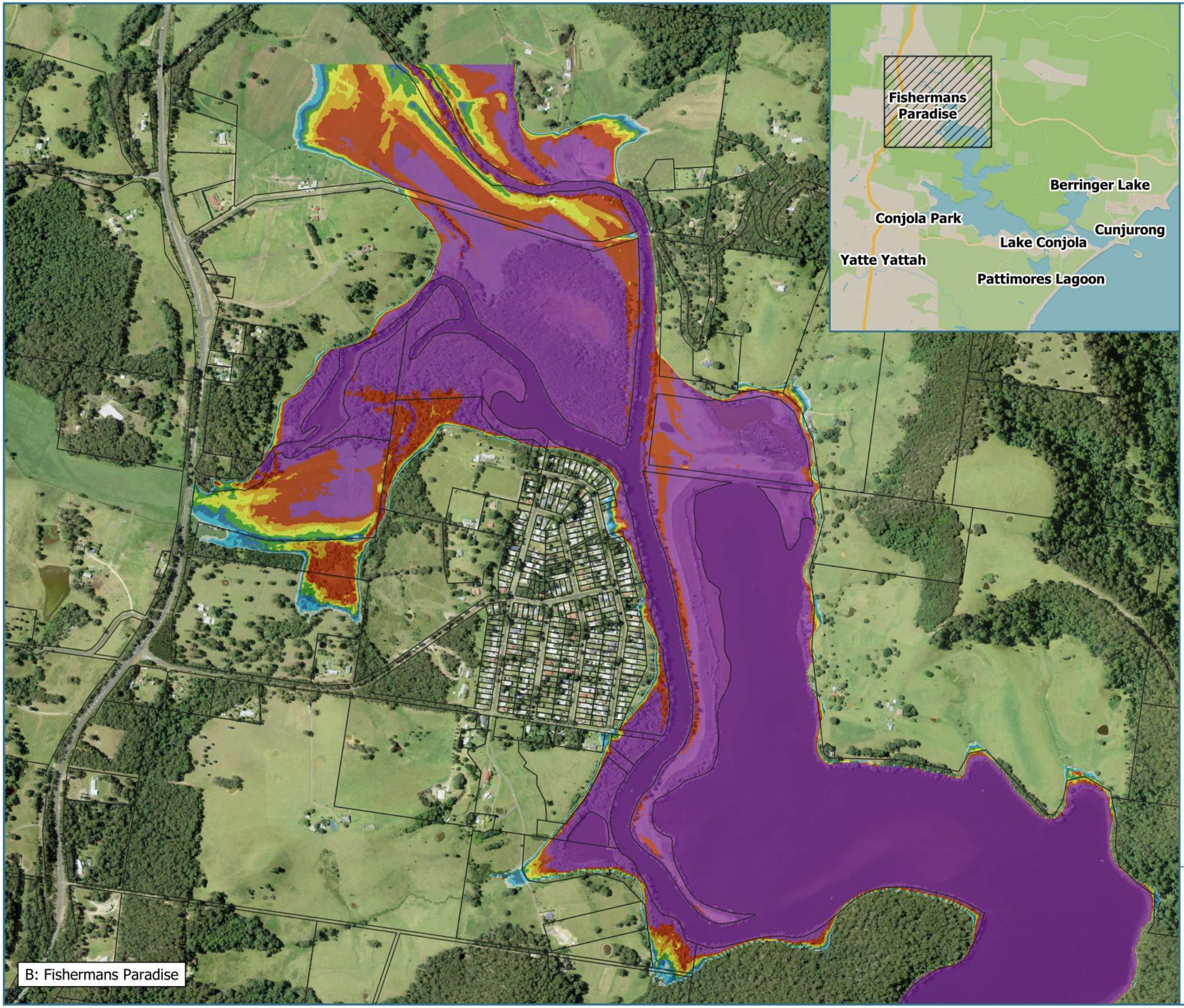

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Figure B-22
Coastal Inundation
SLR 0.9 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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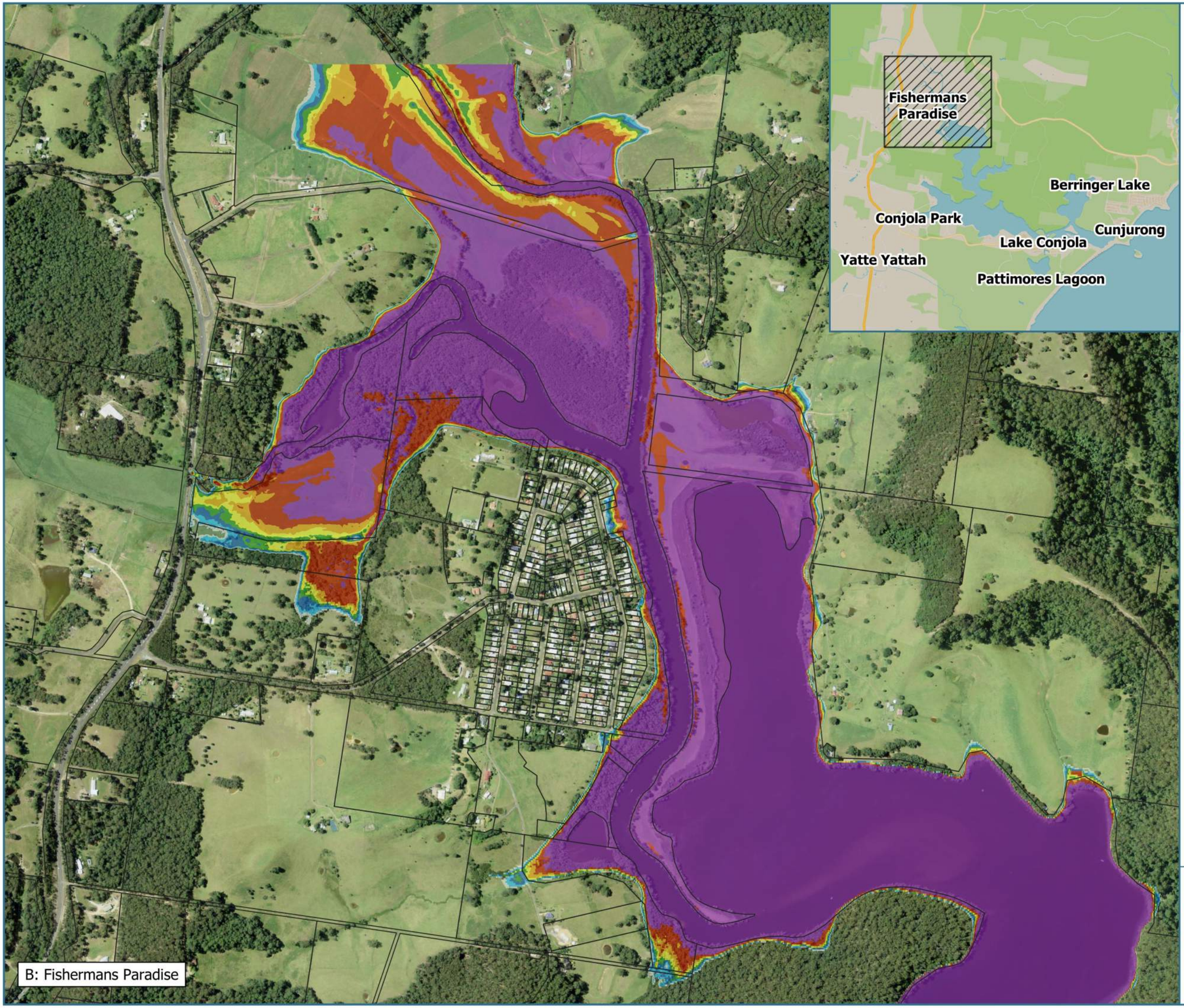

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Figure B-23
Coastal Inundation
SLR 1.2 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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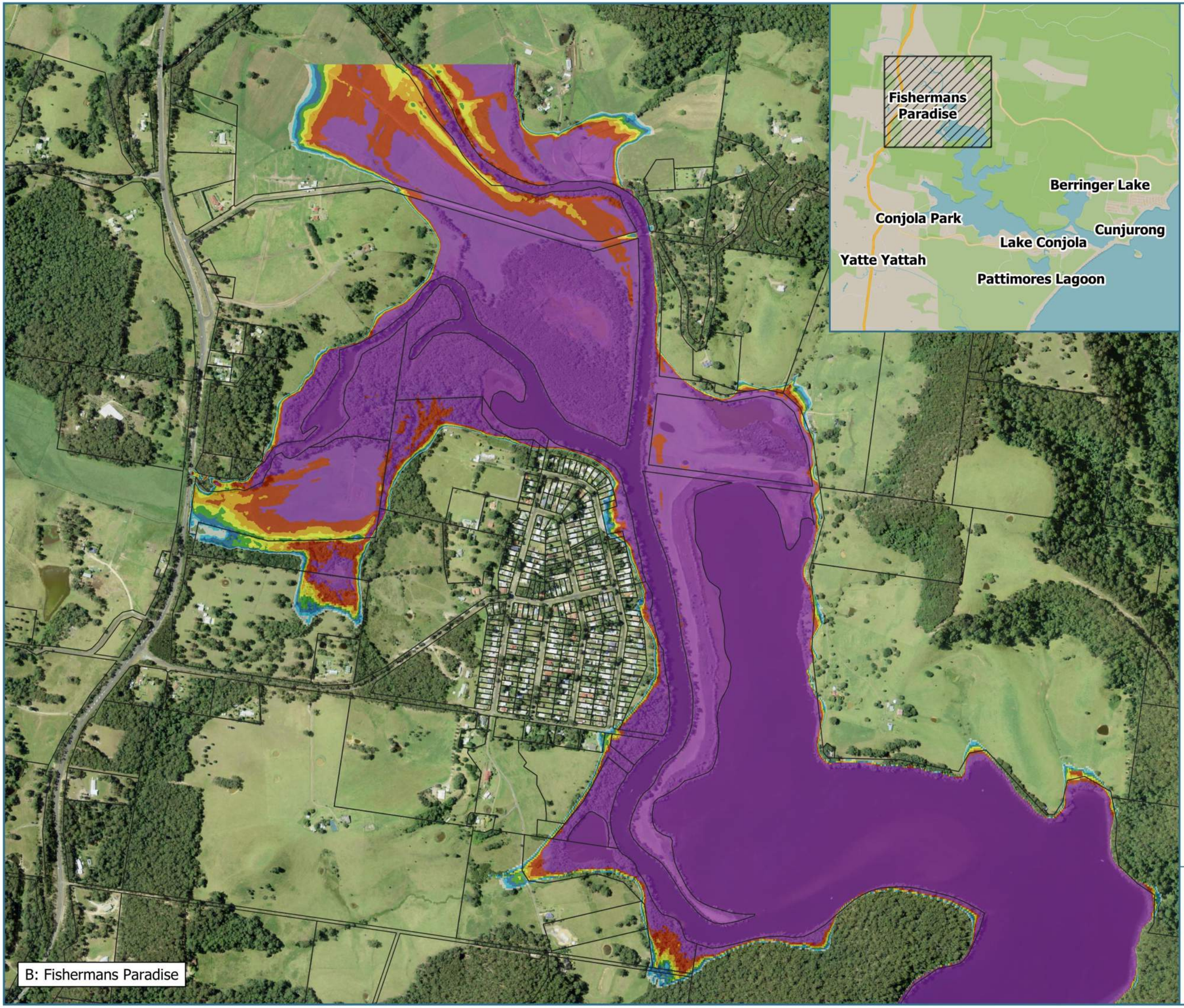

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Figure B-24
Coastal Inundation
SLR 1.2 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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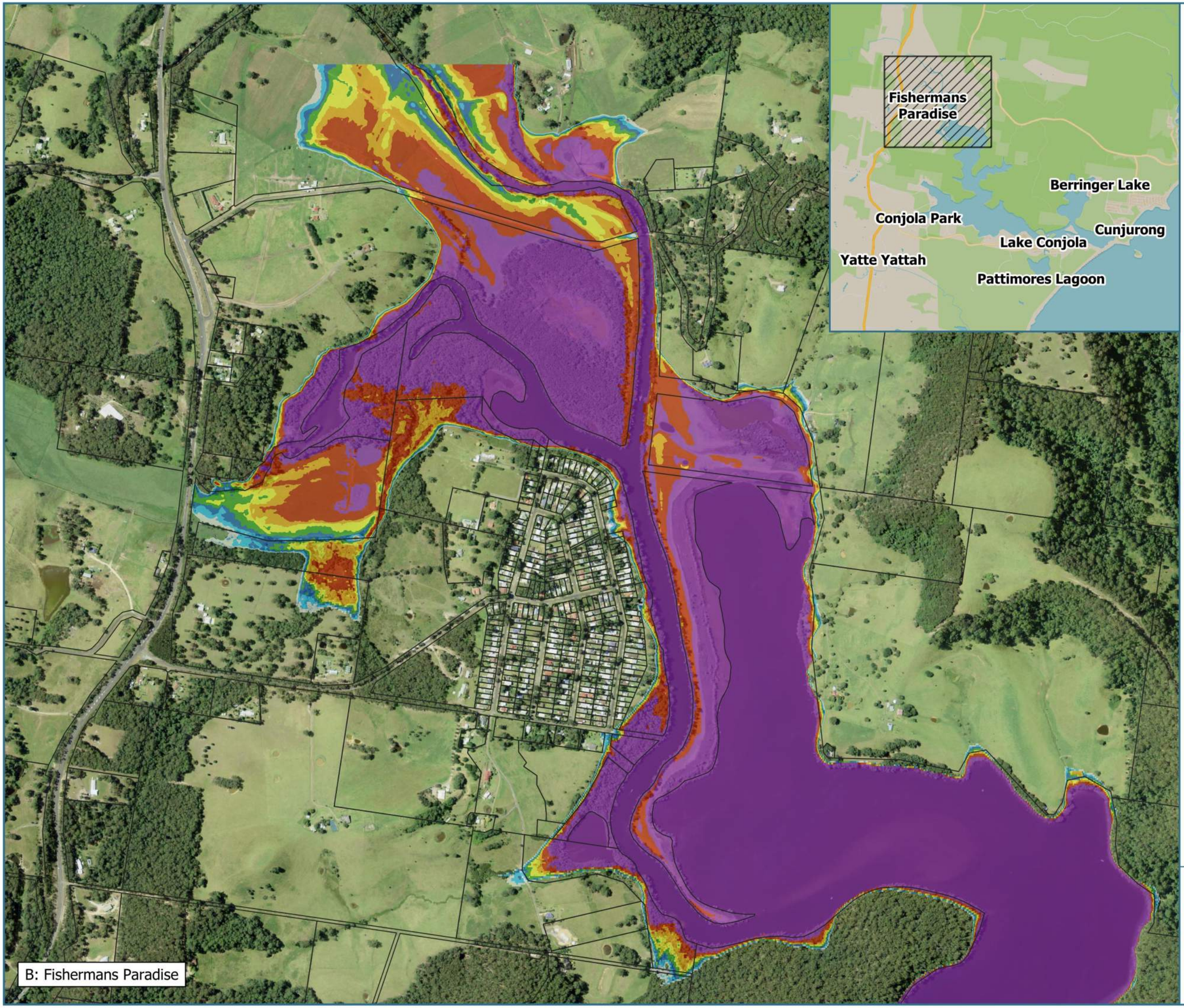

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Figure B-25
Coastal Inundation
SLR 1.2 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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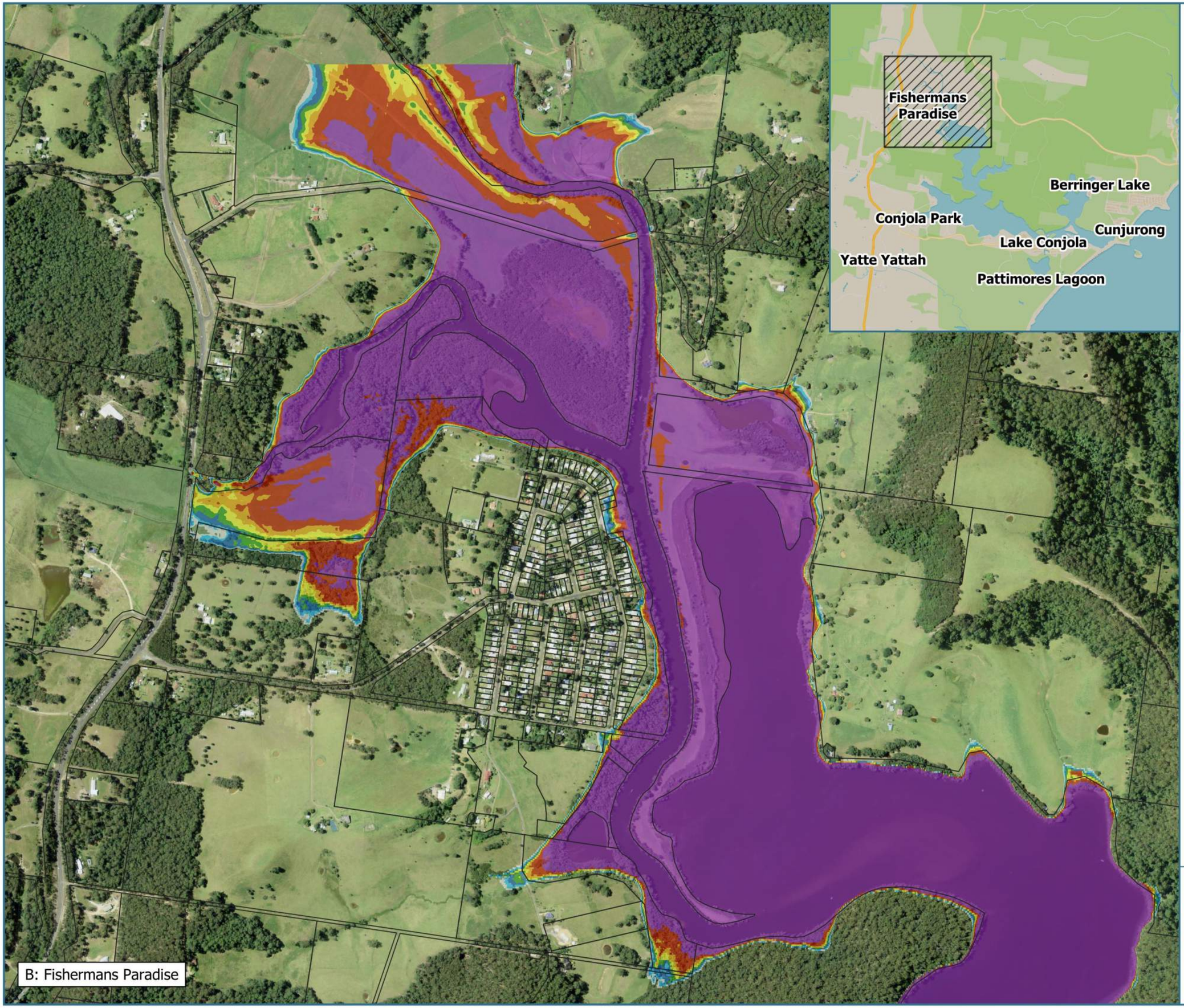

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Figure B-26
Coastal Inundation
SLR 1.2 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

≥ 2.00	0.75 - 1.00
1.50 - 2.00	0.50 - 0.75
1.25 - 1.50	0.25 - 0.50
1.00 - 1.25	0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:10,000

N

0 100 200 300 m

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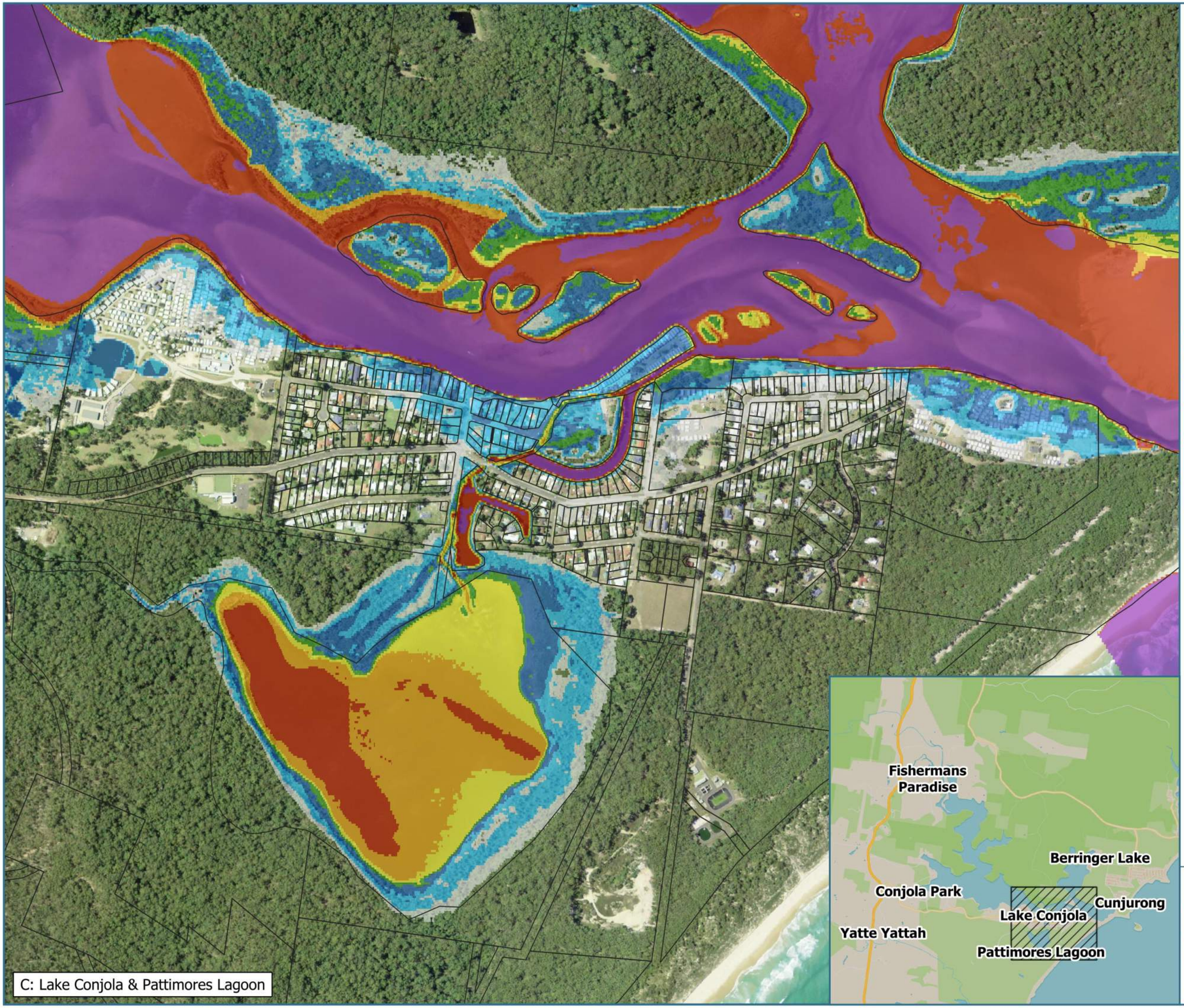

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Figure C-01
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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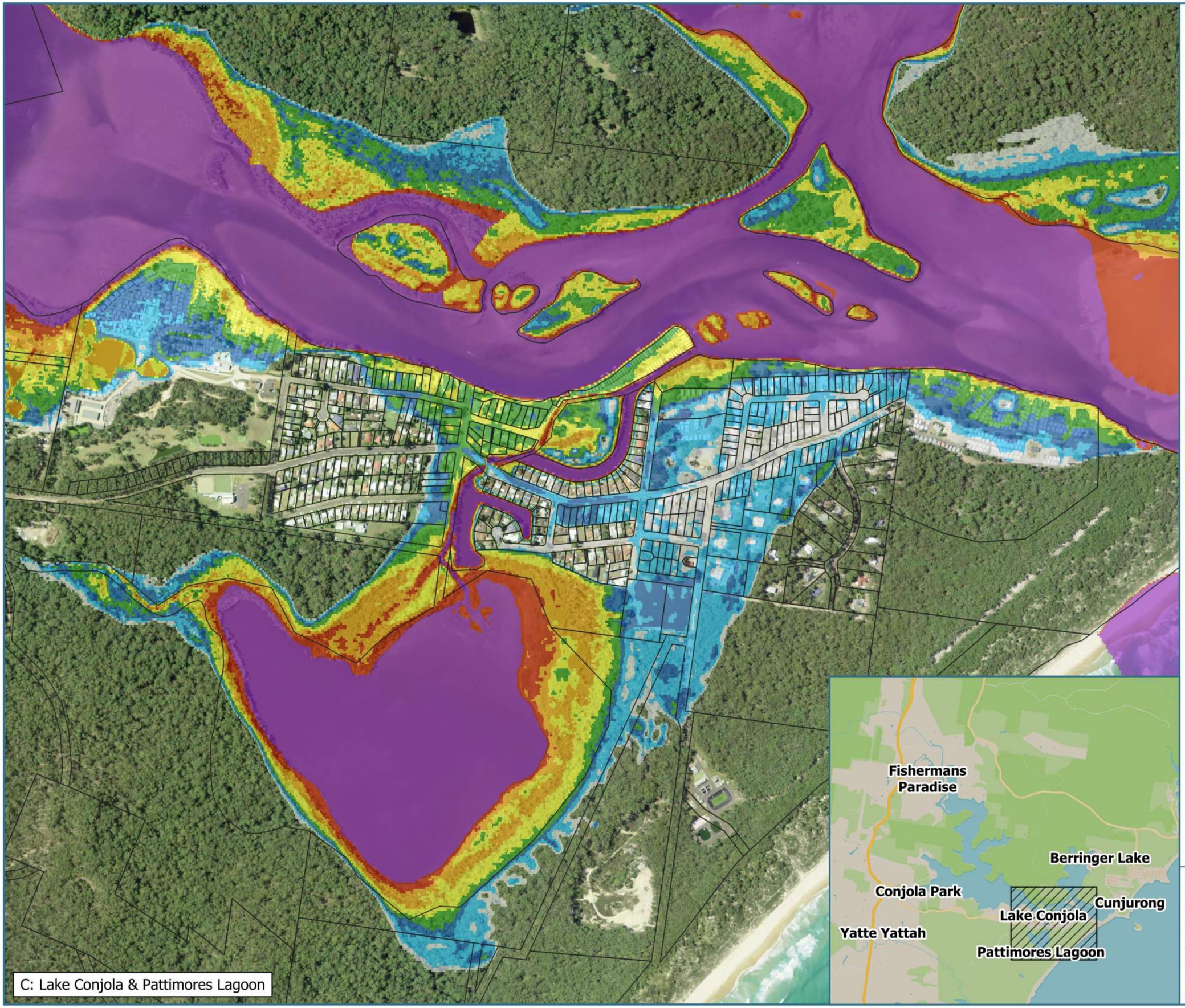

C: Lake Conjola & Pattimores Lagoon

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Figure C-02
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

Shoalhaven City Council

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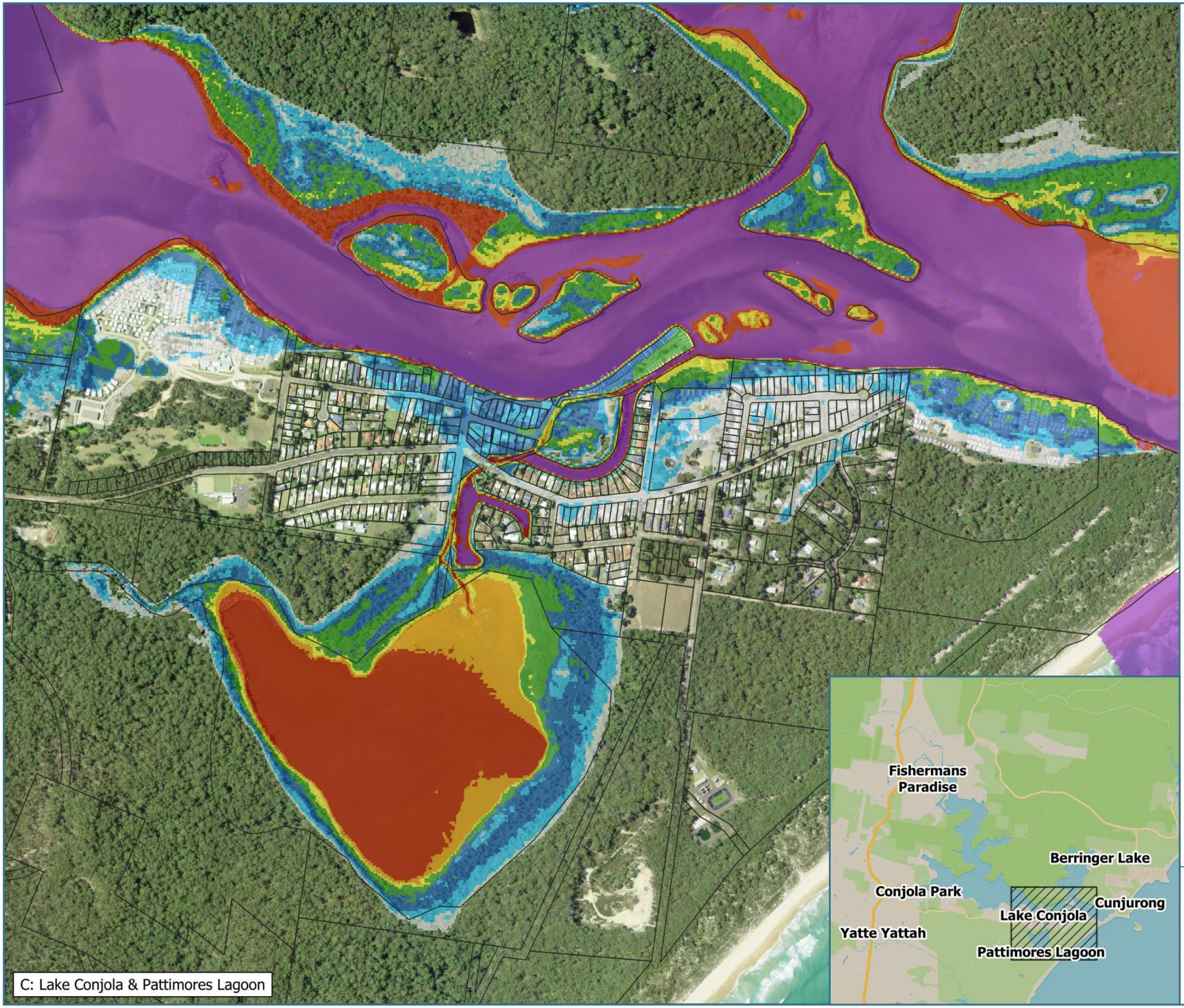

C: Lake Conjola & Pattimores Lagoon

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Figure C-03
Coastal Inundation
SLR 0.1 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

Shoalhaven City Council

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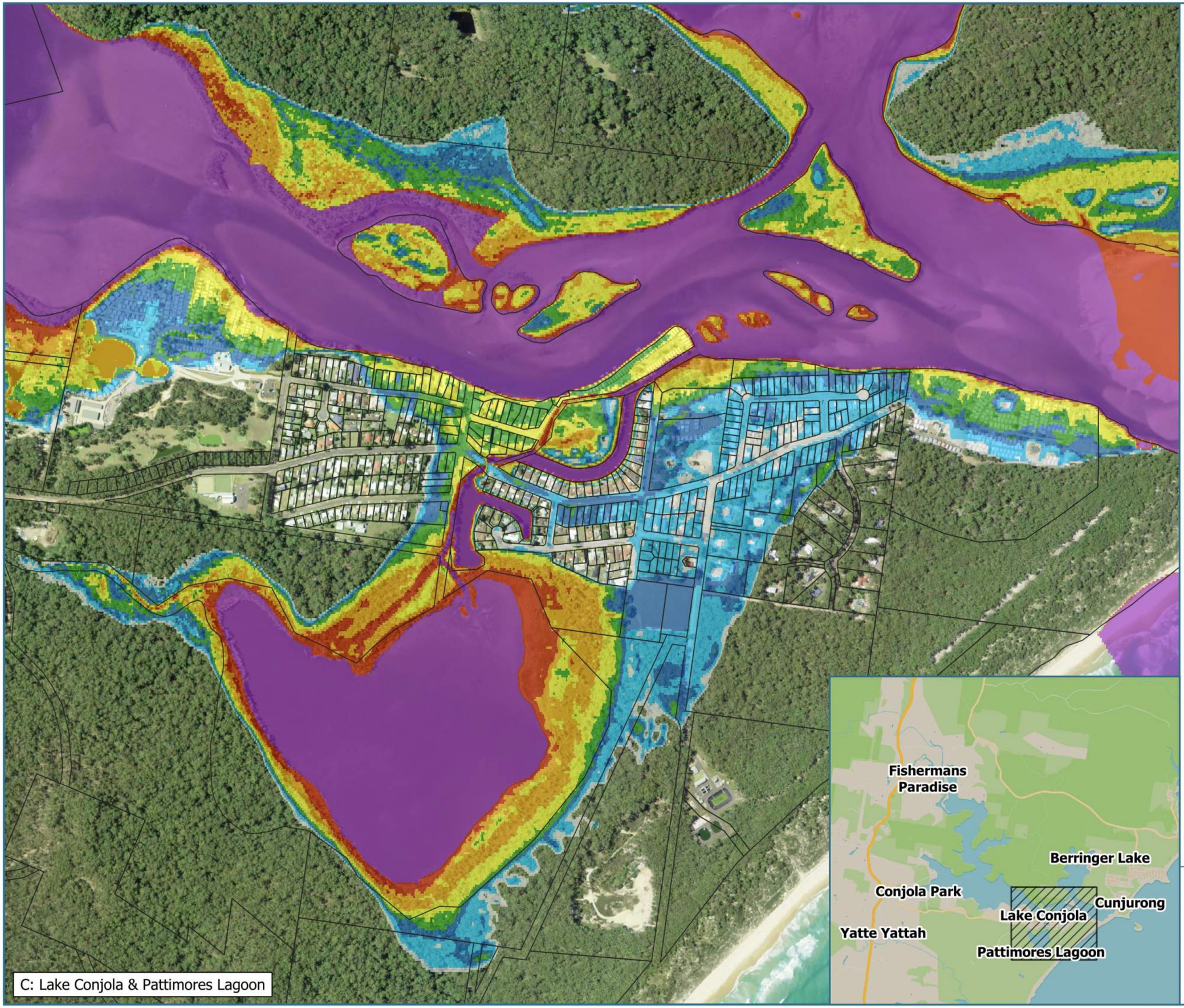

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Figure C-04
Coastal Inundation
SLR 0.1 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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Figure C-05
Coastal Inundation
SLR 0.1 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

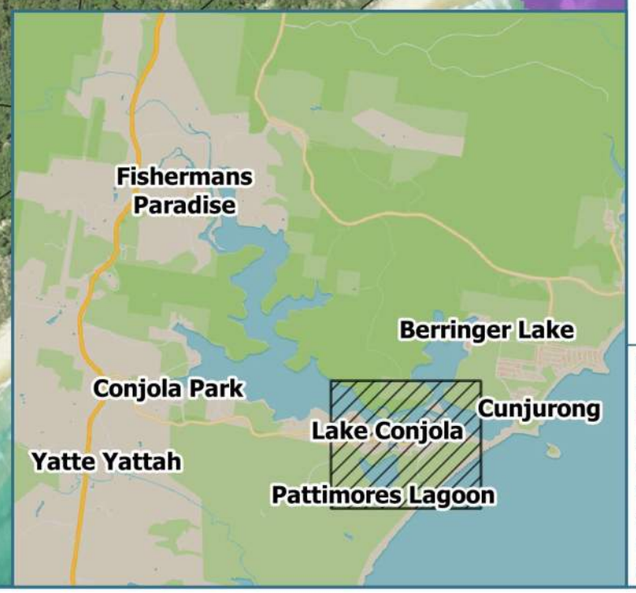
PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

Shoalhaven City Council



C: Lake Conjola & Pattimores Lagoon

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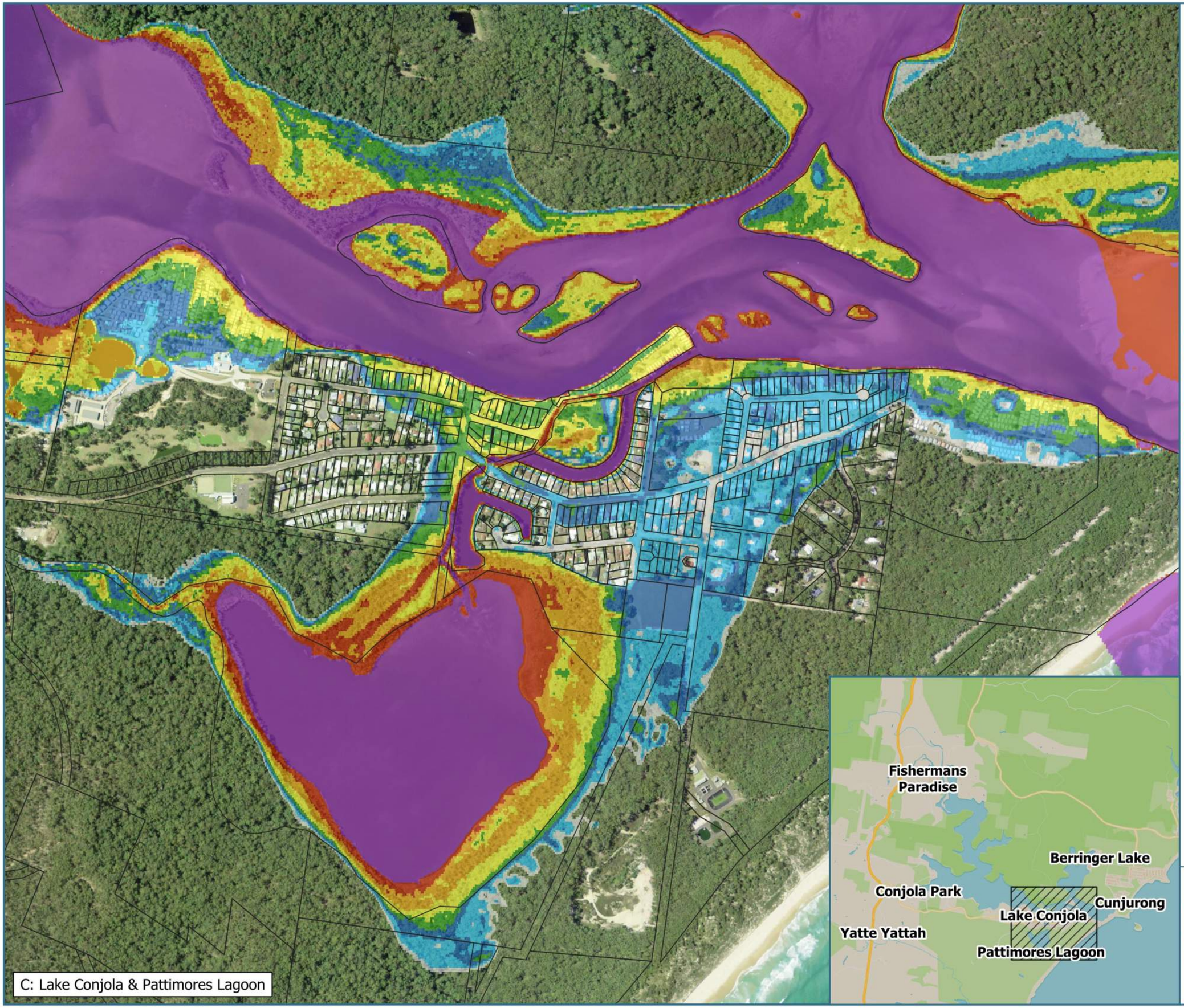

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Figure C-06
Coastal Inundation
SLR 0.1 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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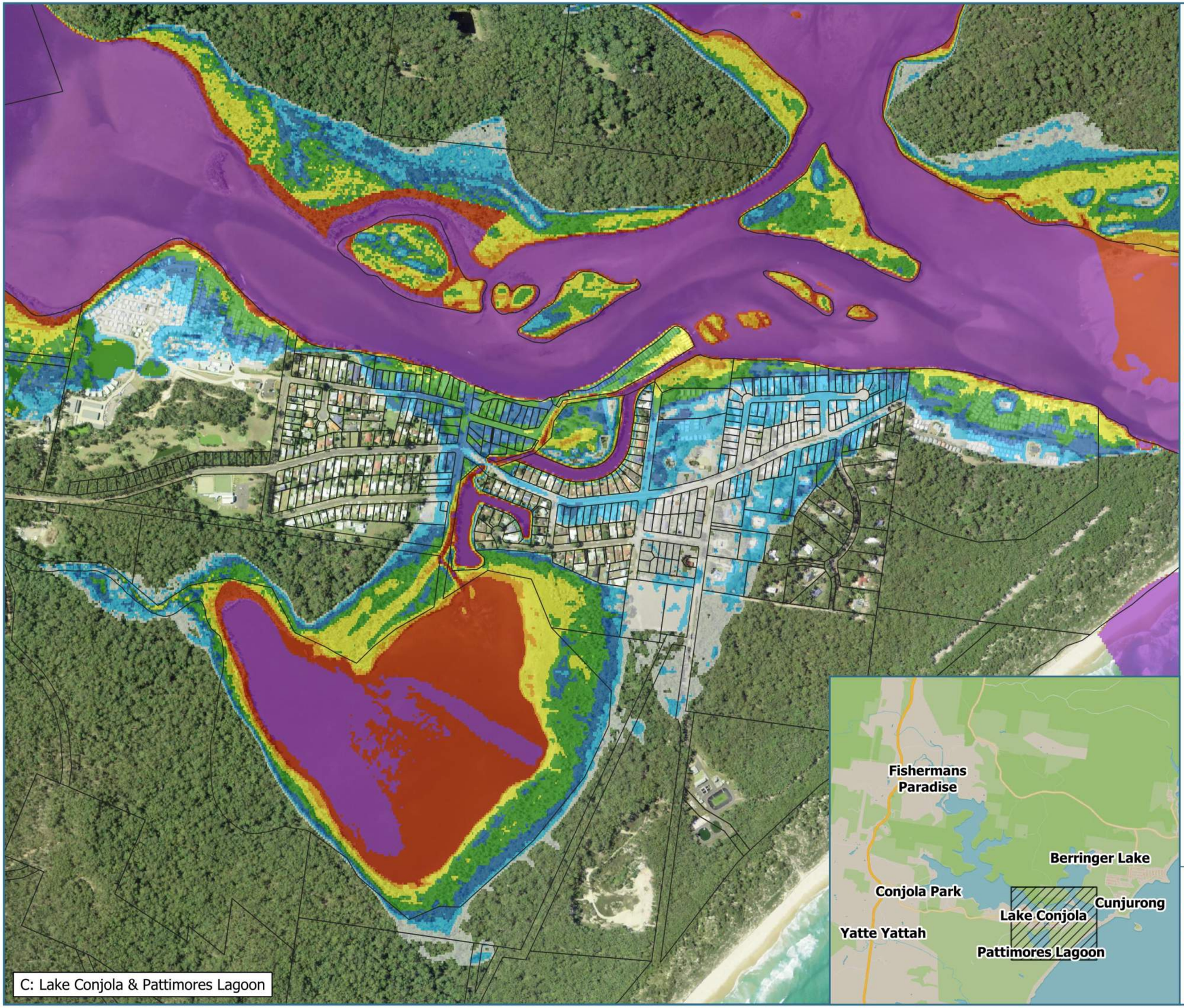

C: Lake Conjola & Pattimores Lagoon

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Figure C-07
Coastal Inundation
SLR 0.23 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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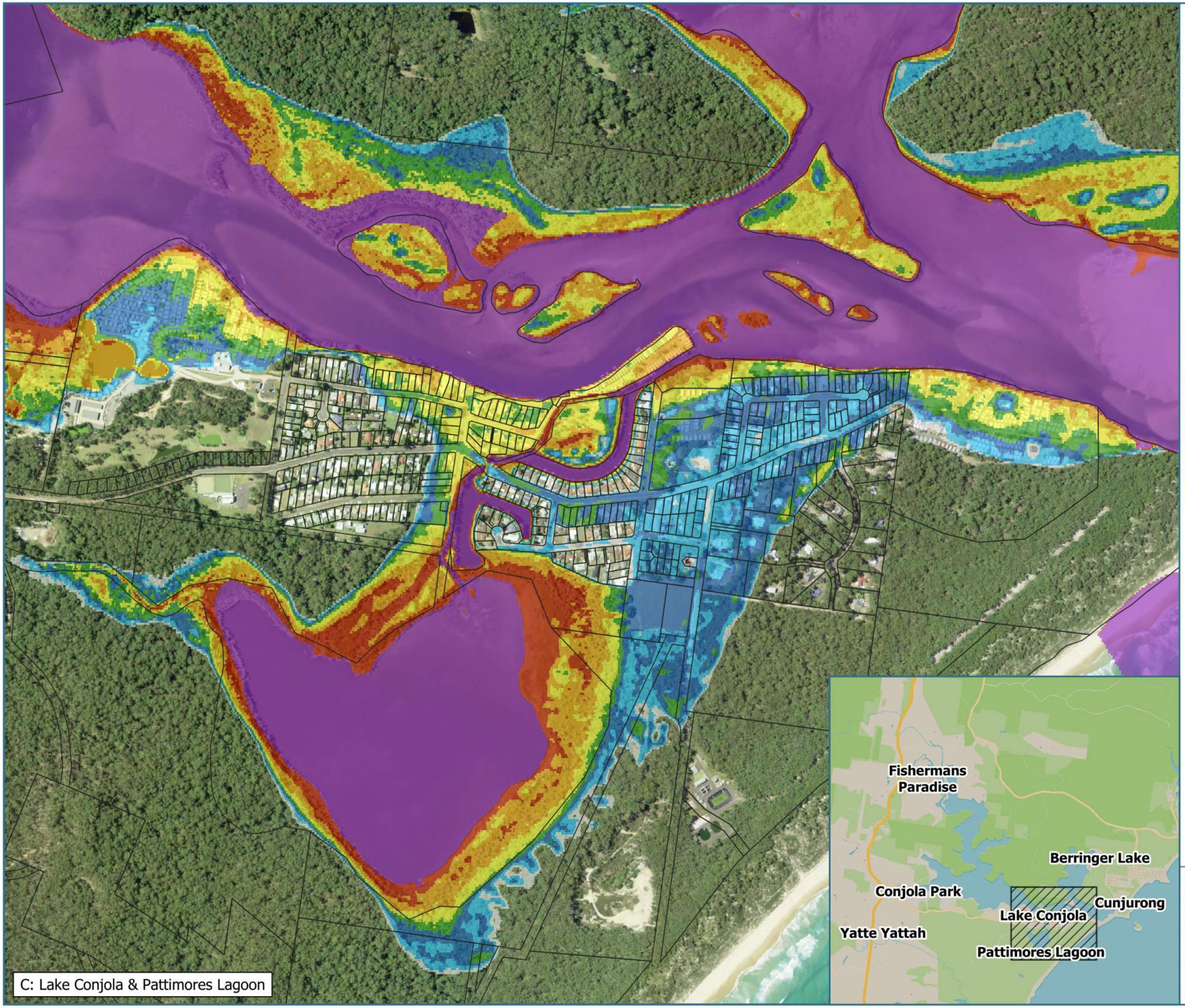

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Figure C-08
Coastal Inundation
SLR 0.23 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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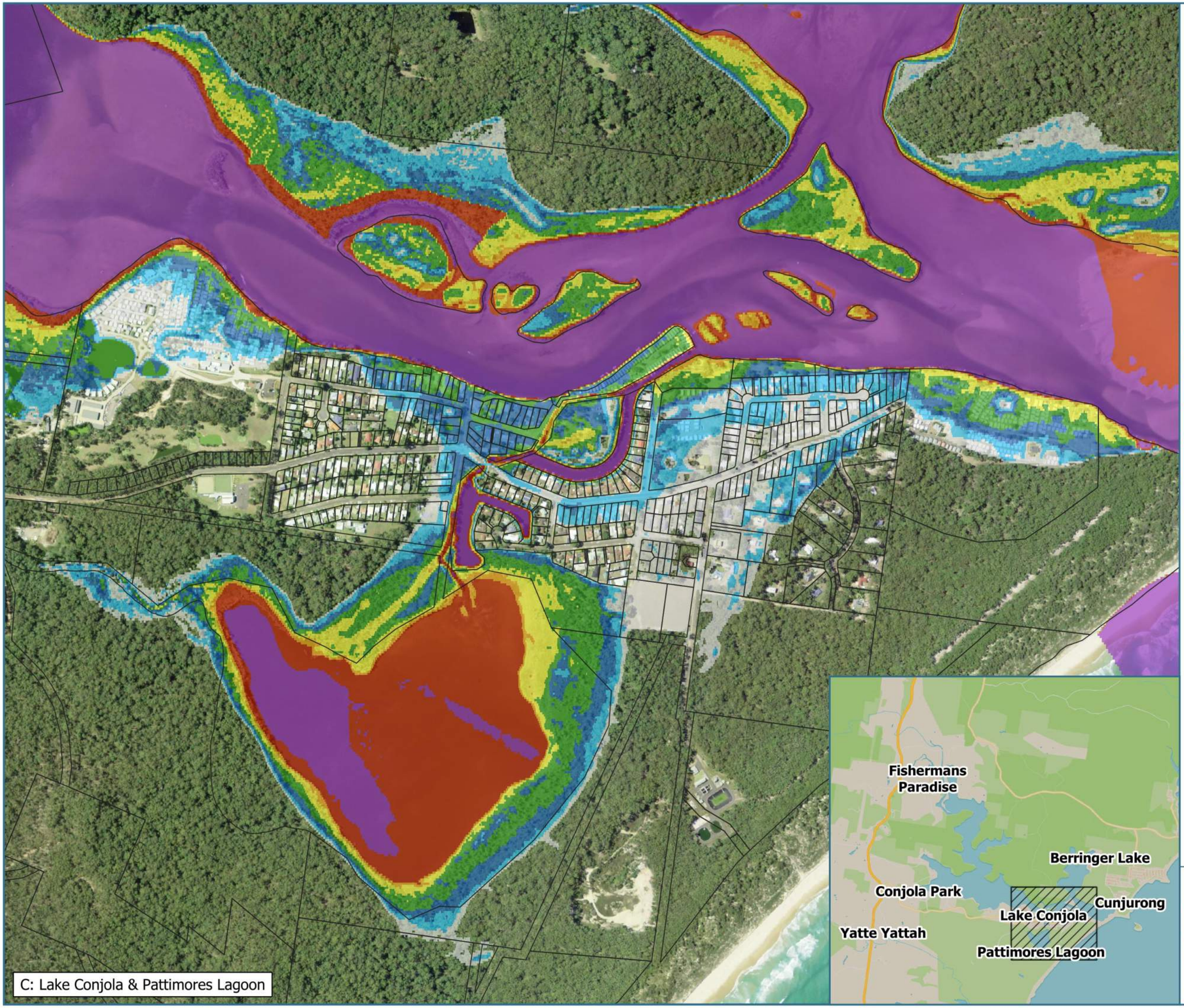

C: Lake Conjola & Pattimores Lagoon

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Figure C-09
Coastal Inundation
SLR 0.23 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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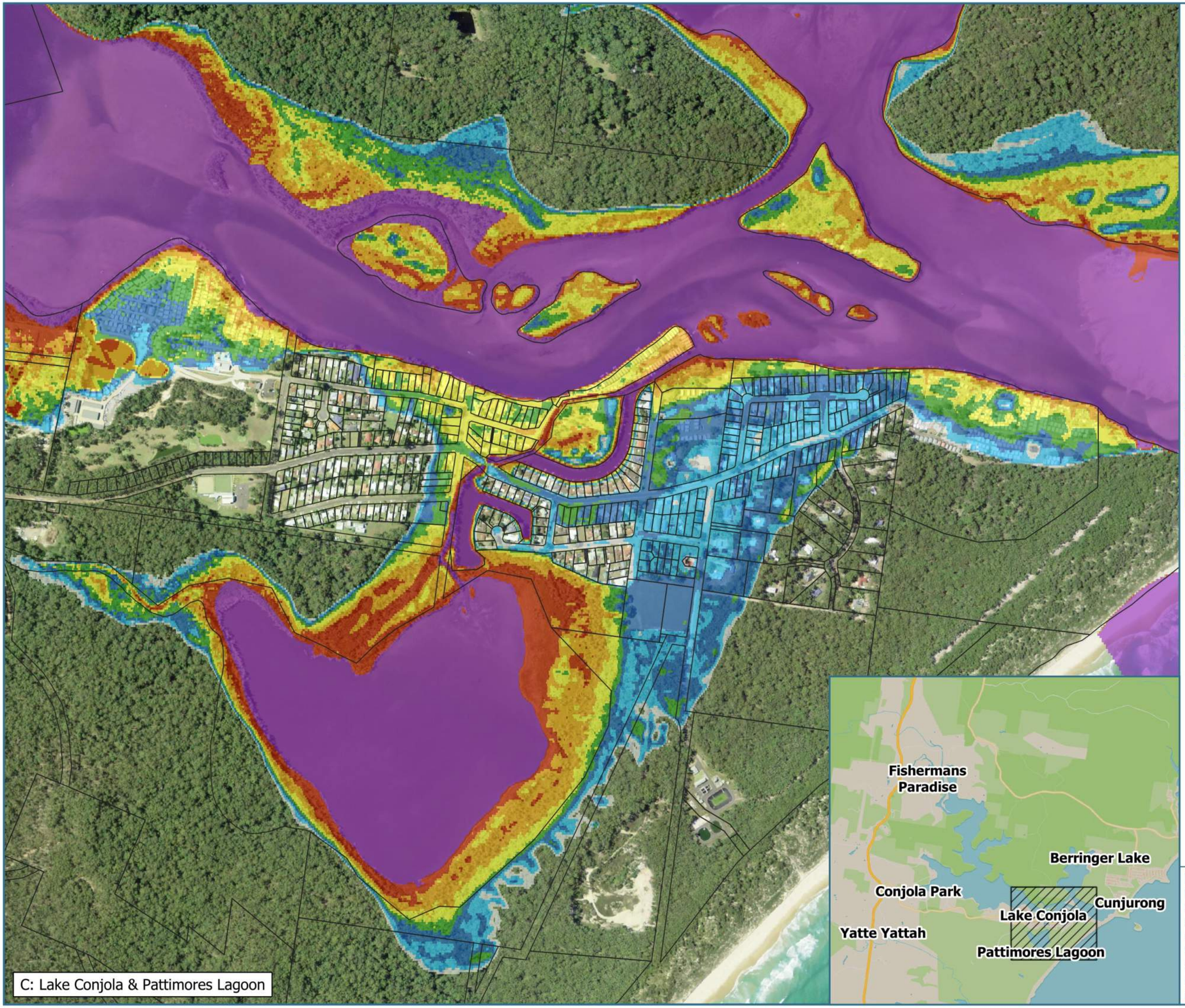

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Figure C-10
Coastal Inundation
SLR 0.23 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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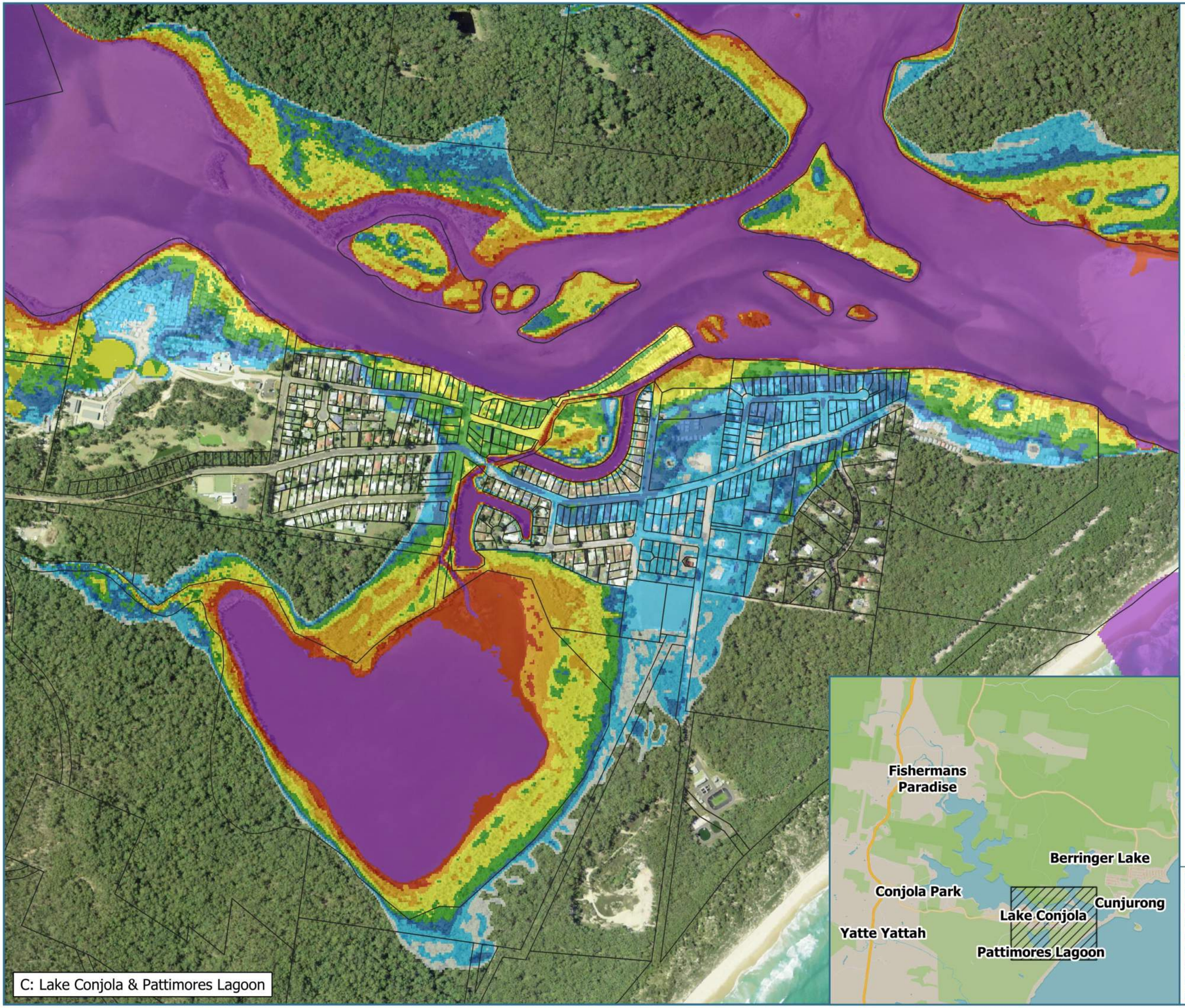

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Figure C-11
Coastal Inundation
SLR 0.36 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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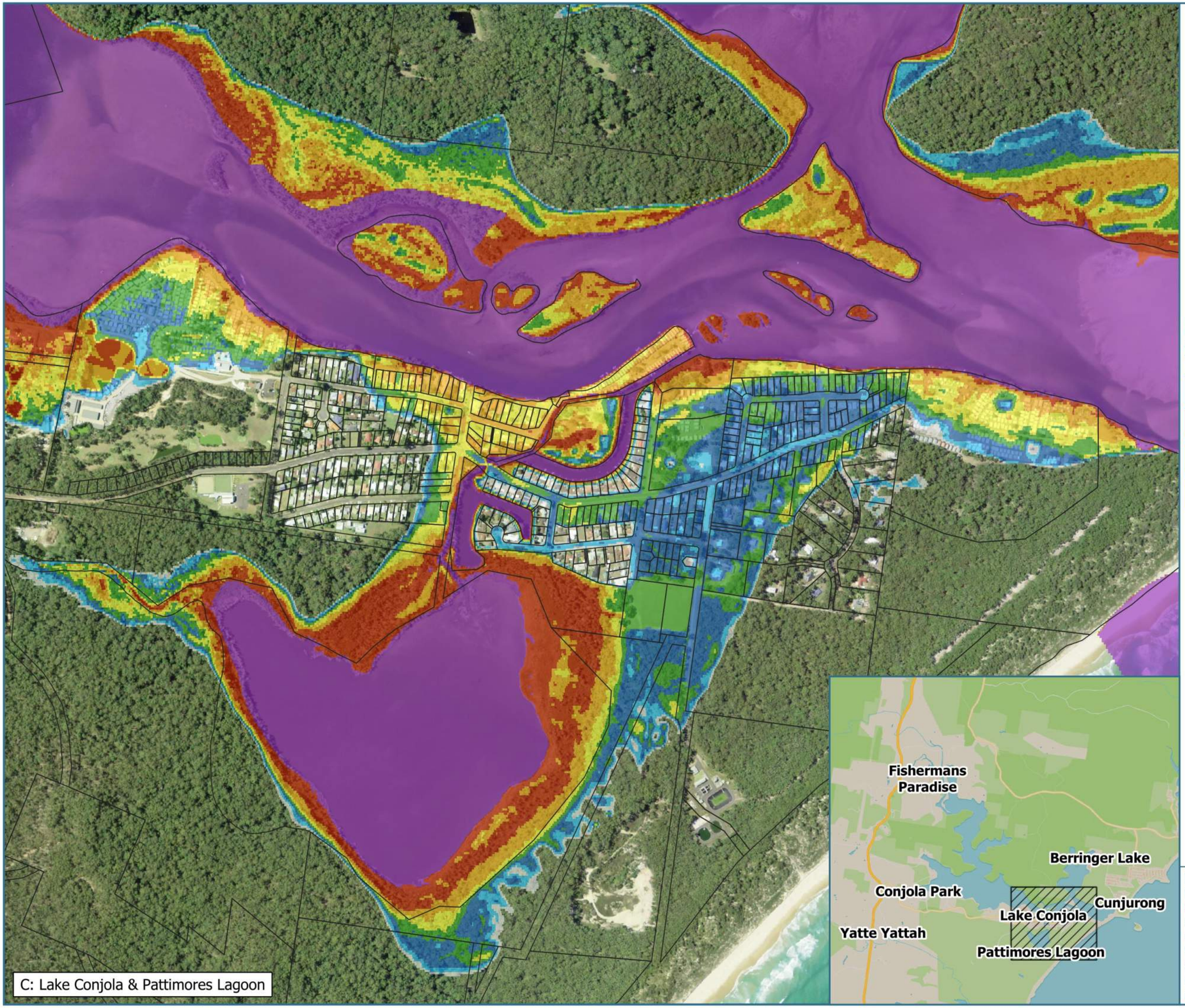

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Figure C-12
Coastal Inundation
SLR 0.36 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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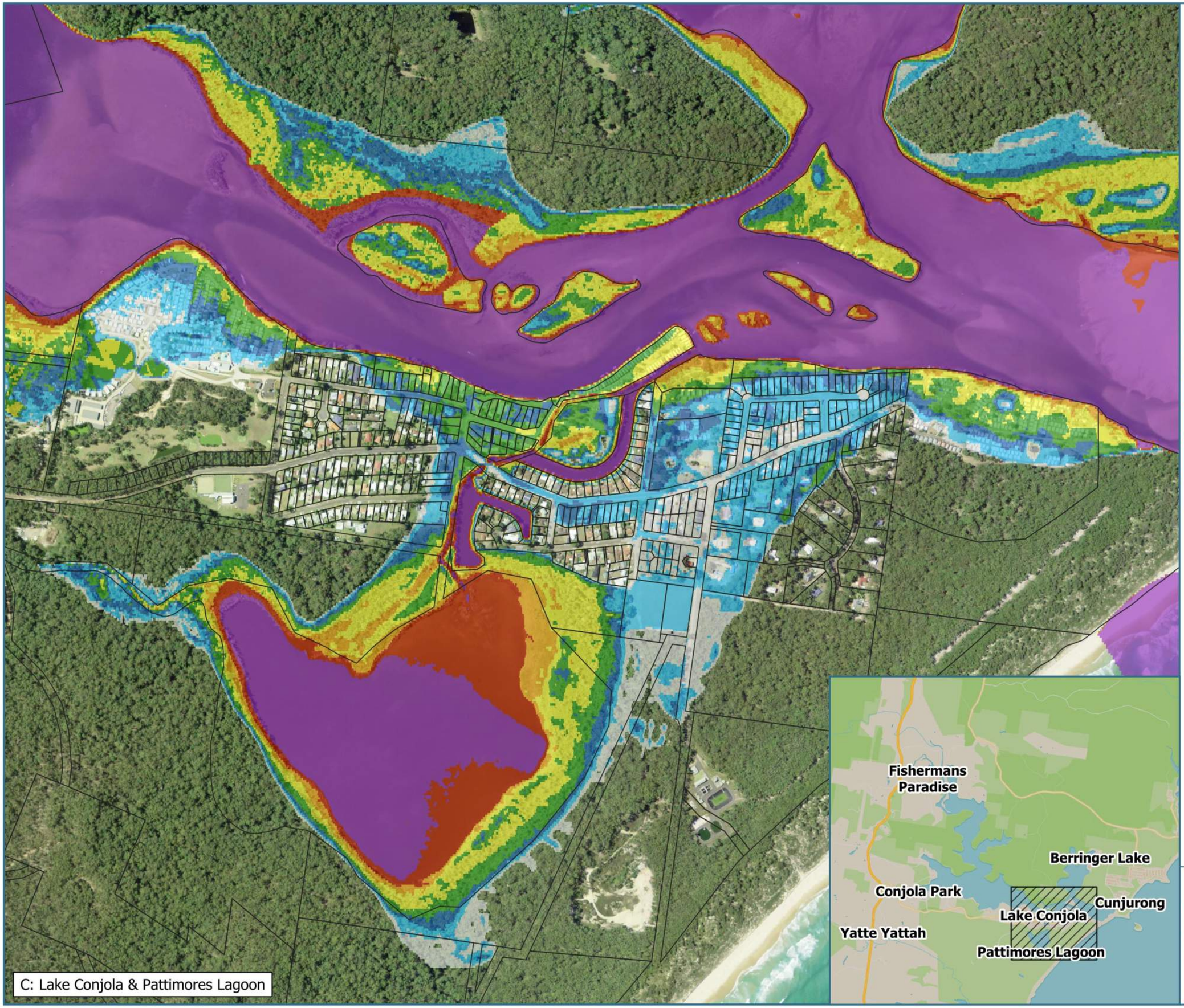

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Figure C-13
Coastal Inundation
SLR 0.36 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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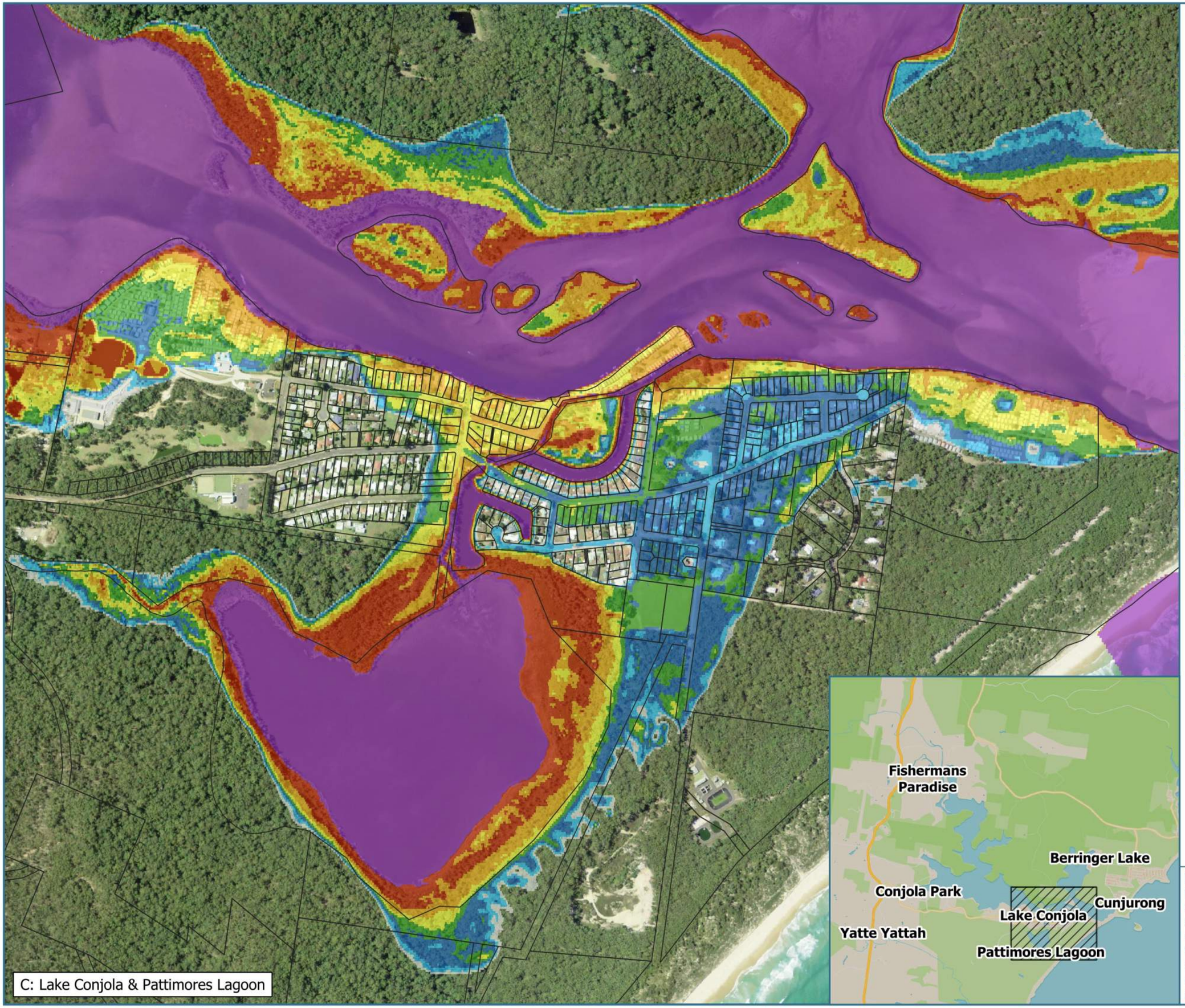

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Figure C-14
Coastal Inundation
SLR 0.36 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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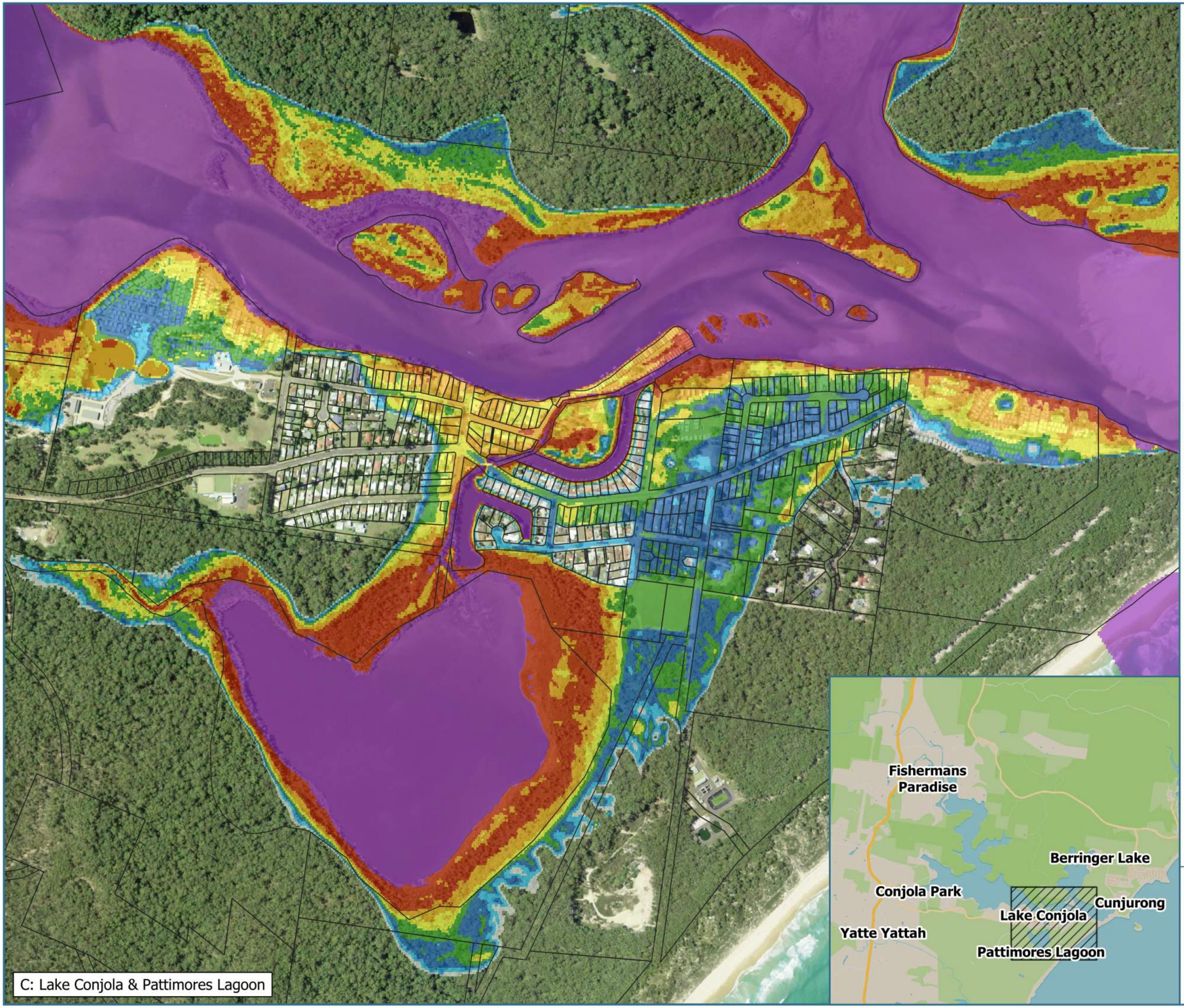

C: Lake Conjola & Pattimores Lagoon

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Figure C-15
Coastal Inundation
SLR 0.6 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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Figure C-16
Coastal Inundation
SLR 0.6 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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Fishermans Paradise
Berringer Lake
Conjola Park
Cunjurong
Lake Conjola
Yatte Yattah
Pattimores Lagoon

C: Lake Conjola & Pattimores Lagoon

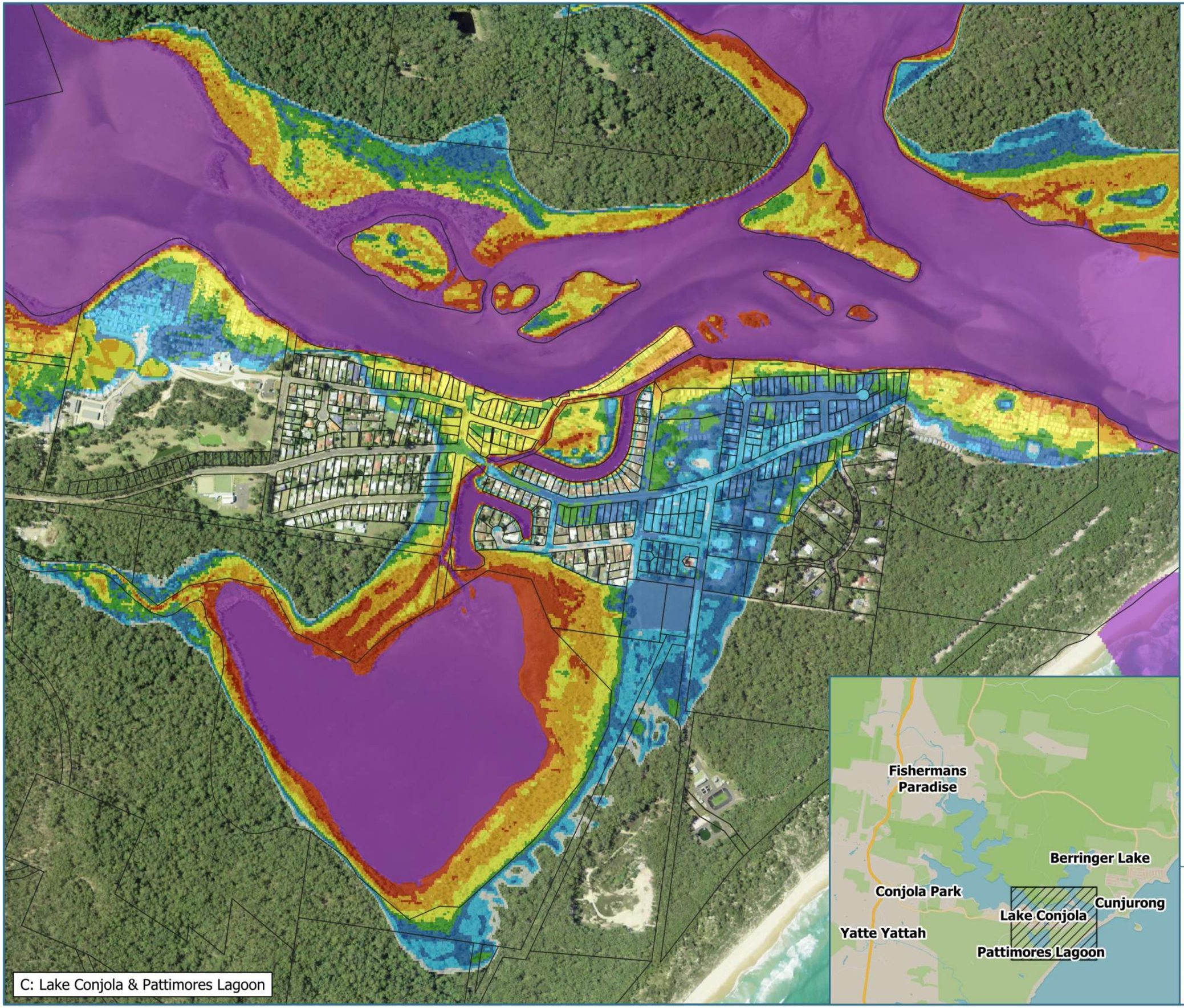

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Figure C-17
Coastal Inundation
SLR 0.6 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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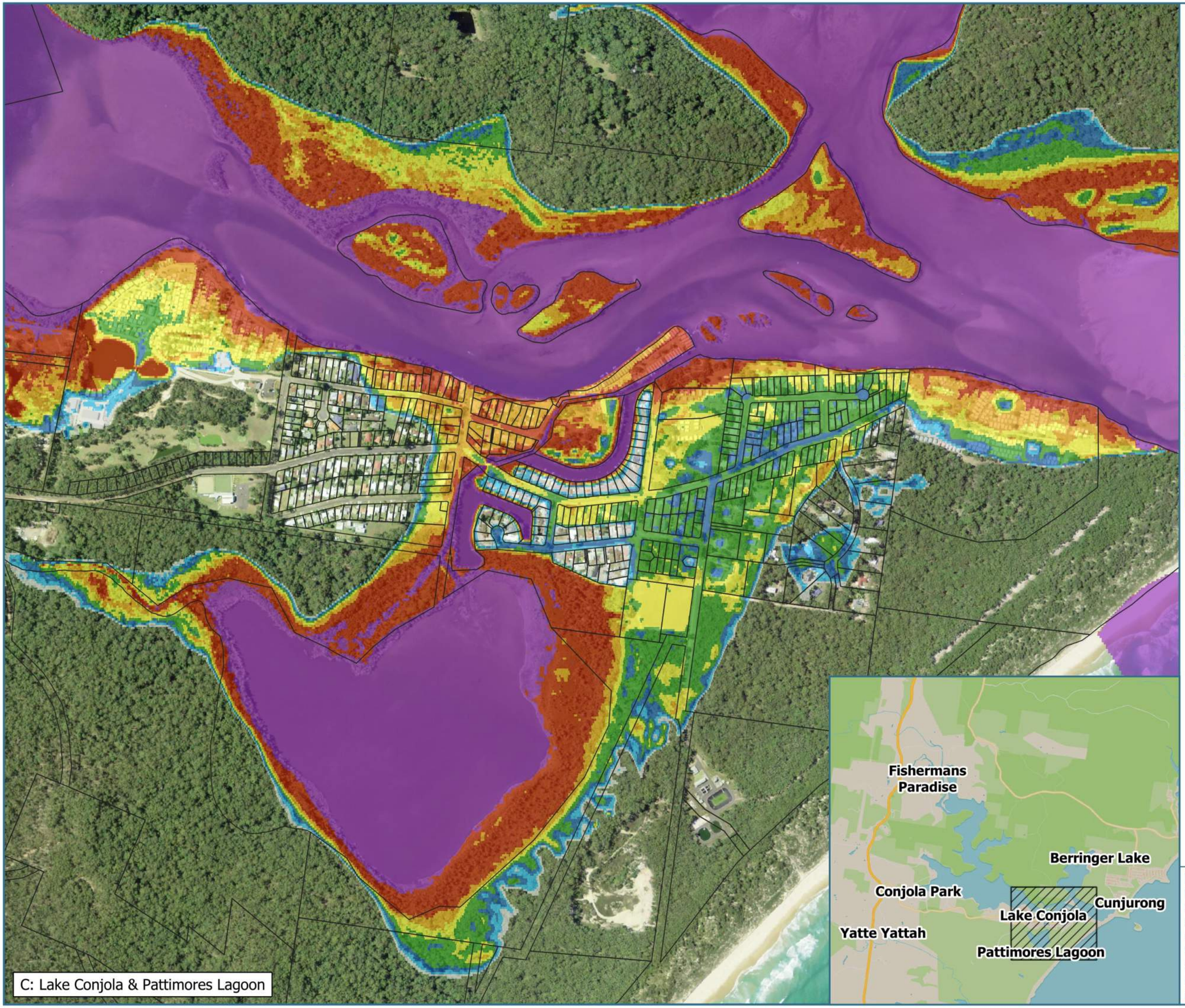

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Figure C-18
Coastal Inundation
SLR 0.6 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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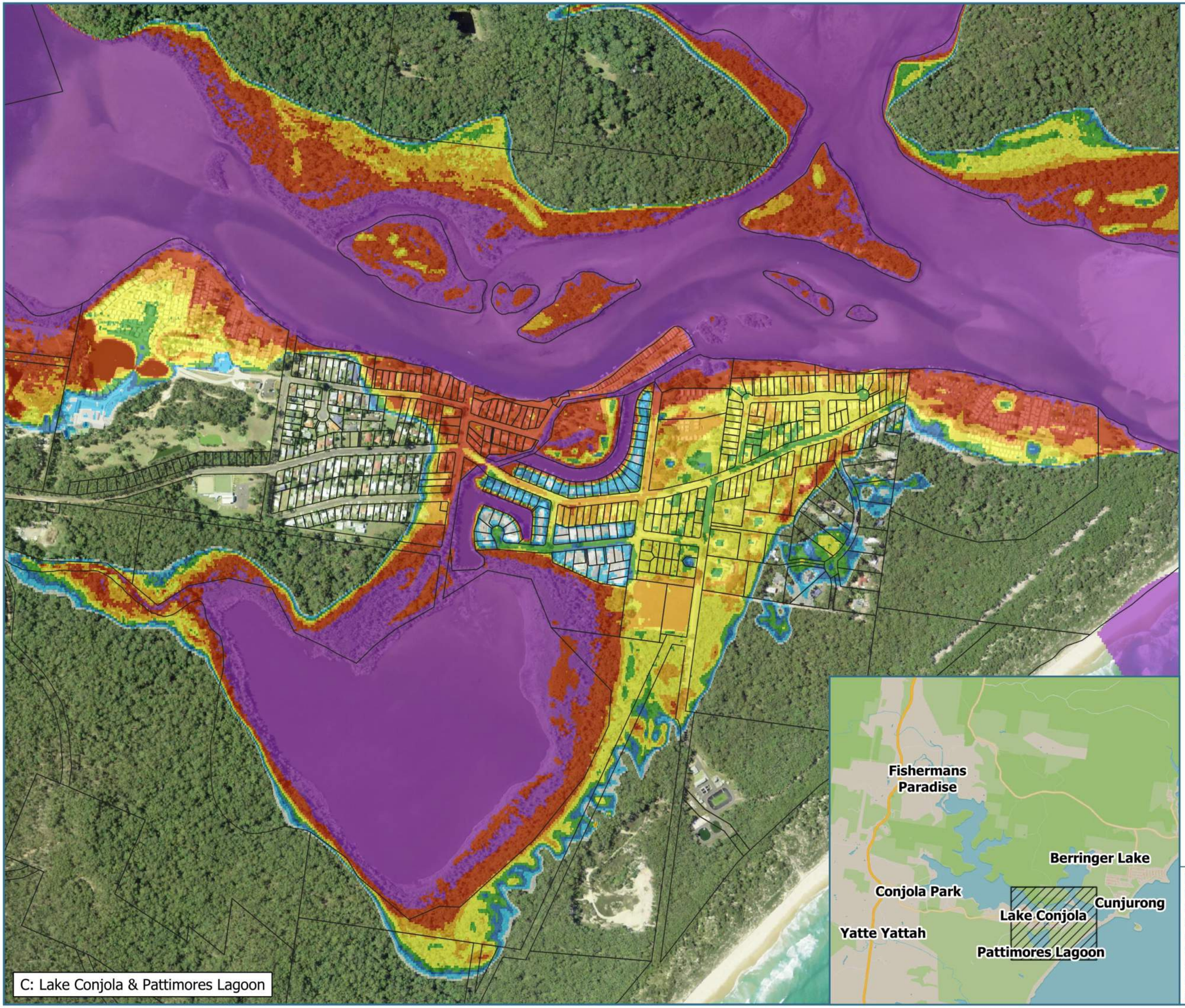

C: Lake Conjola & Pattimores Lagoon

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Lake Conjola Coastal Management Program

Figure C-19
Coastal Inundation
SLR 0.9 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

Shoalhaven City Council

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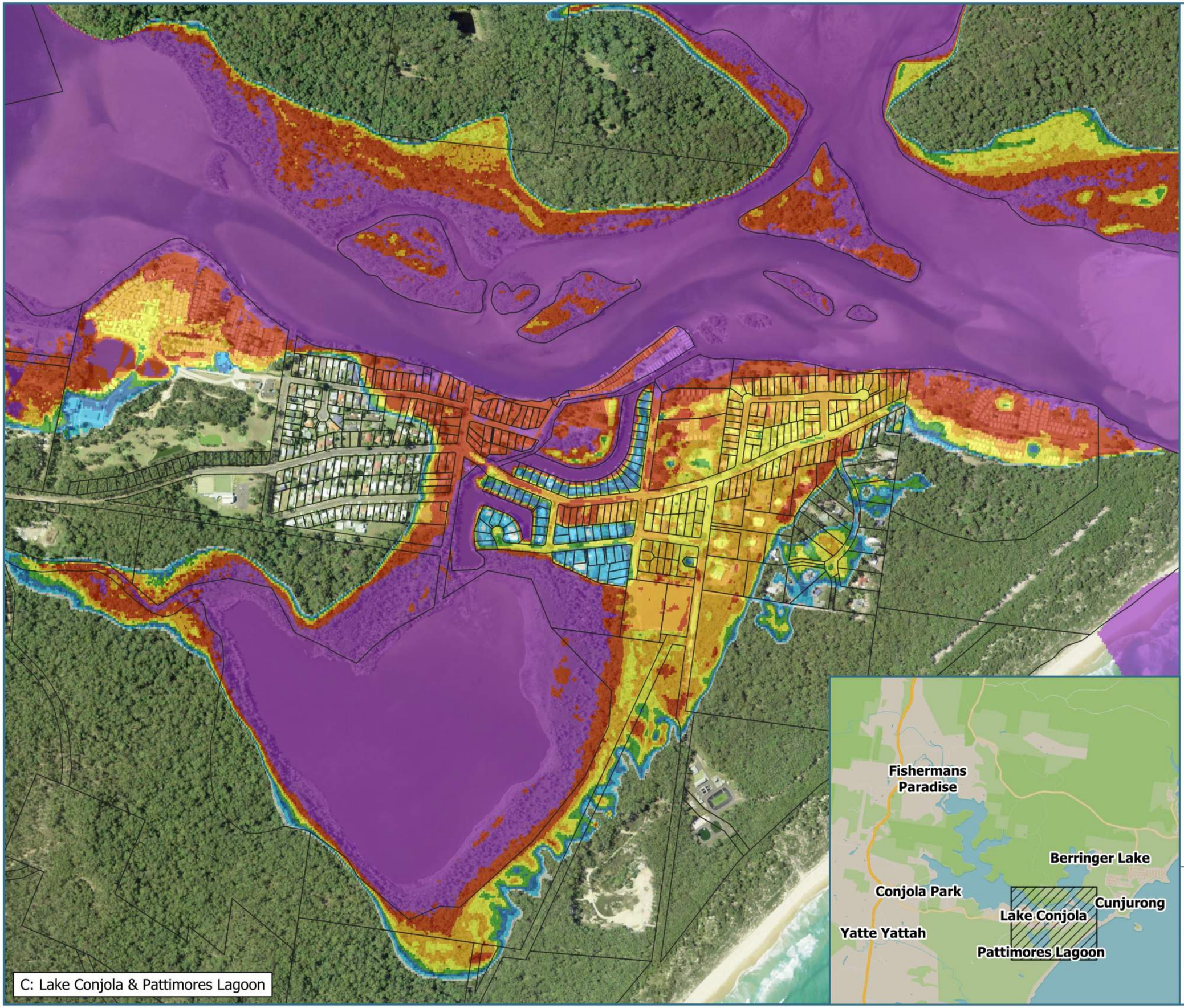

C: Lake Conjola & Pattimores Lagoon

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Lake Conjola Coastal Management Program

Figure C-20
Coastal Inundation
SLR 0.9 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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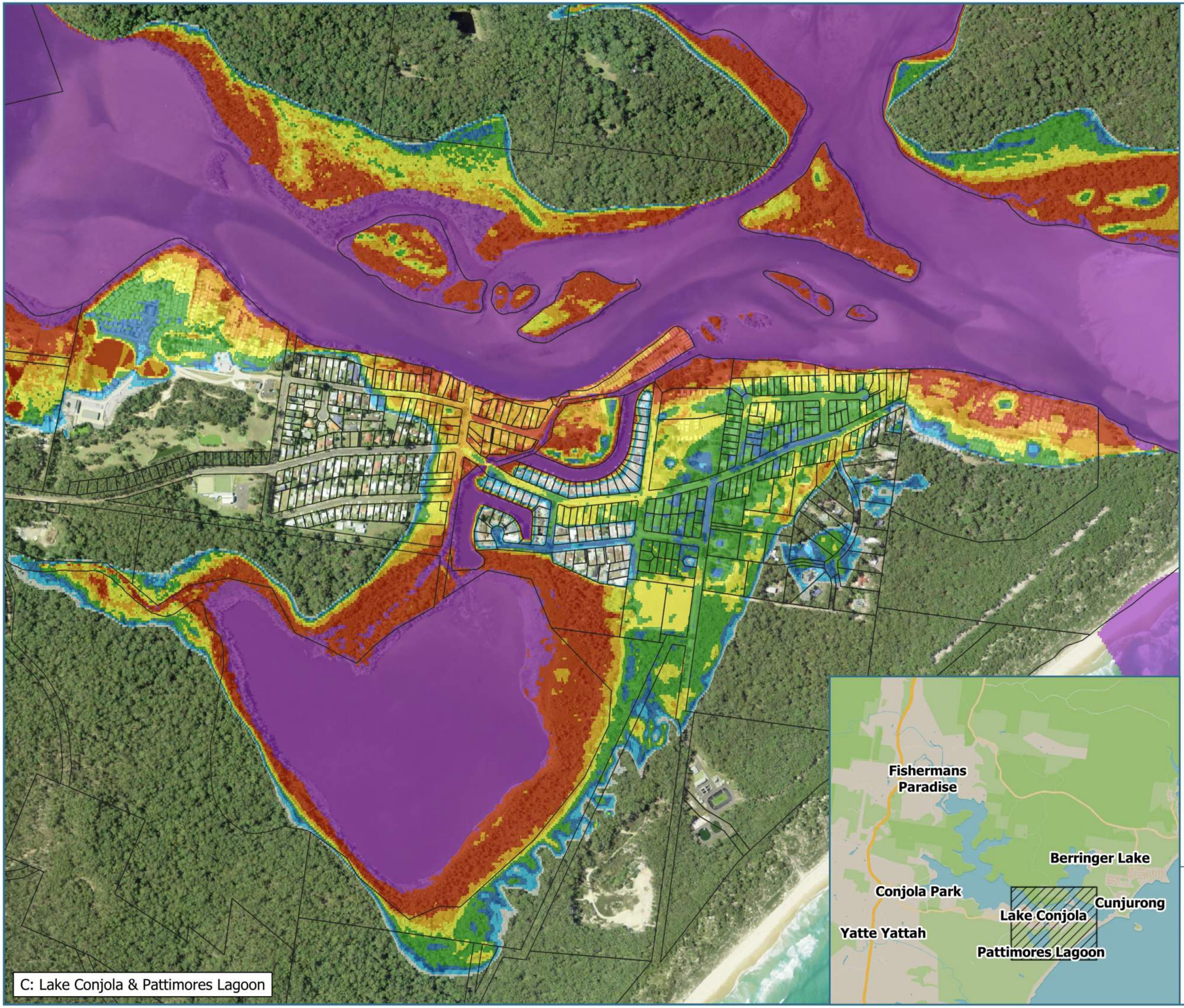

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Lake Conjola Coastal Management Program

Figure C-21
Coastal Inundation
SLR 0.9 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

Shoalhaven City Council

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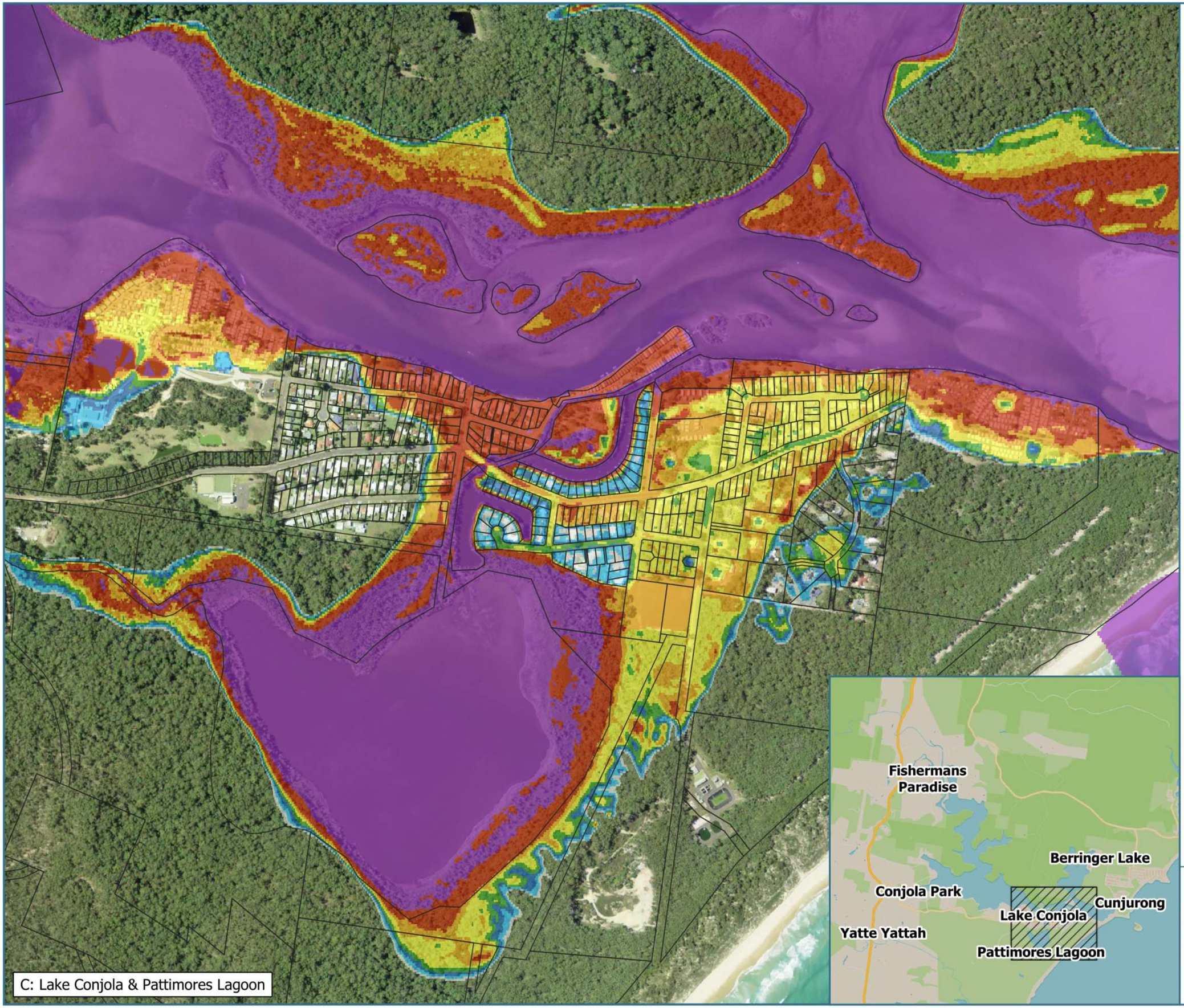

C: Lake Conjola & Pattimores Lagoon

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Figure C-22
Coastal Inundation
SLR 0.9 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

Shoalhaven City Council

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Figure C-23
Coastal Inundation
SLR 1.2 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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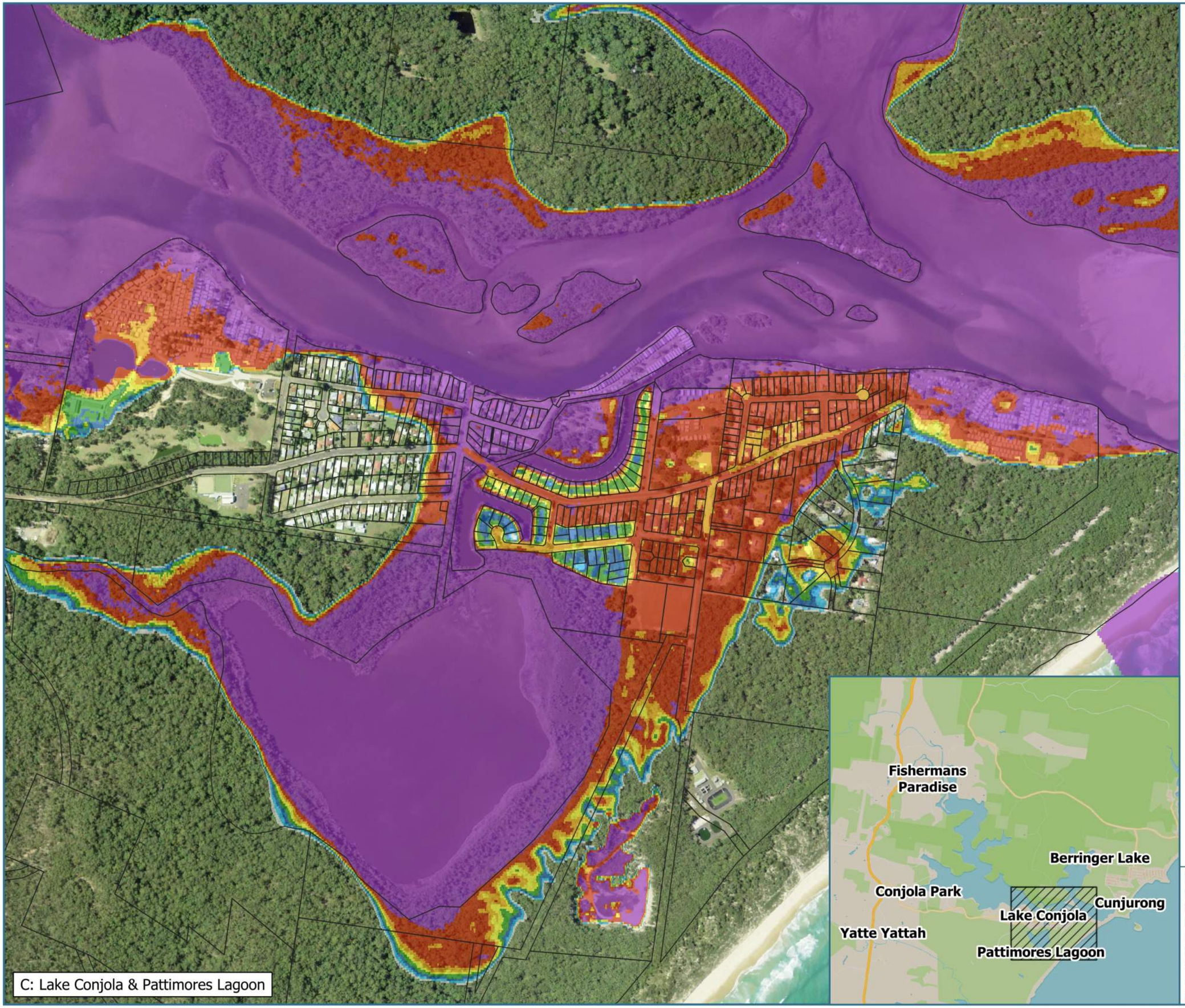
C: Lake Conjola & Pattimores Lagoon

Fishermans Paradise
Berringer Lake
Conjola Park
Cunjurong
Lake Conjola
Yatte Yattah
Pattimores Lagoon



C: Lake Conjola & Pattimores Lagoon

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Lake Conjola Coastal Management Program

Figure C-24
Coastal Inundation
SLR 1.2 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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Figure C-25
Coastal Inundation
SLR 1.2 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

≥ 2.00	0.75 - 1.00
1.50 - 2.00	0.50 - 0.75
1.25 - 1.50	0.25 - 0.50
1.00 - 1.25	0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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Fishermans Paradise
Berringer Lake
Conjola Park
Cunjurong
Lake Conjola
Yatte Yattah
Pattimores Lagoon

C: Lake Conjola & Pattimores Lagoon

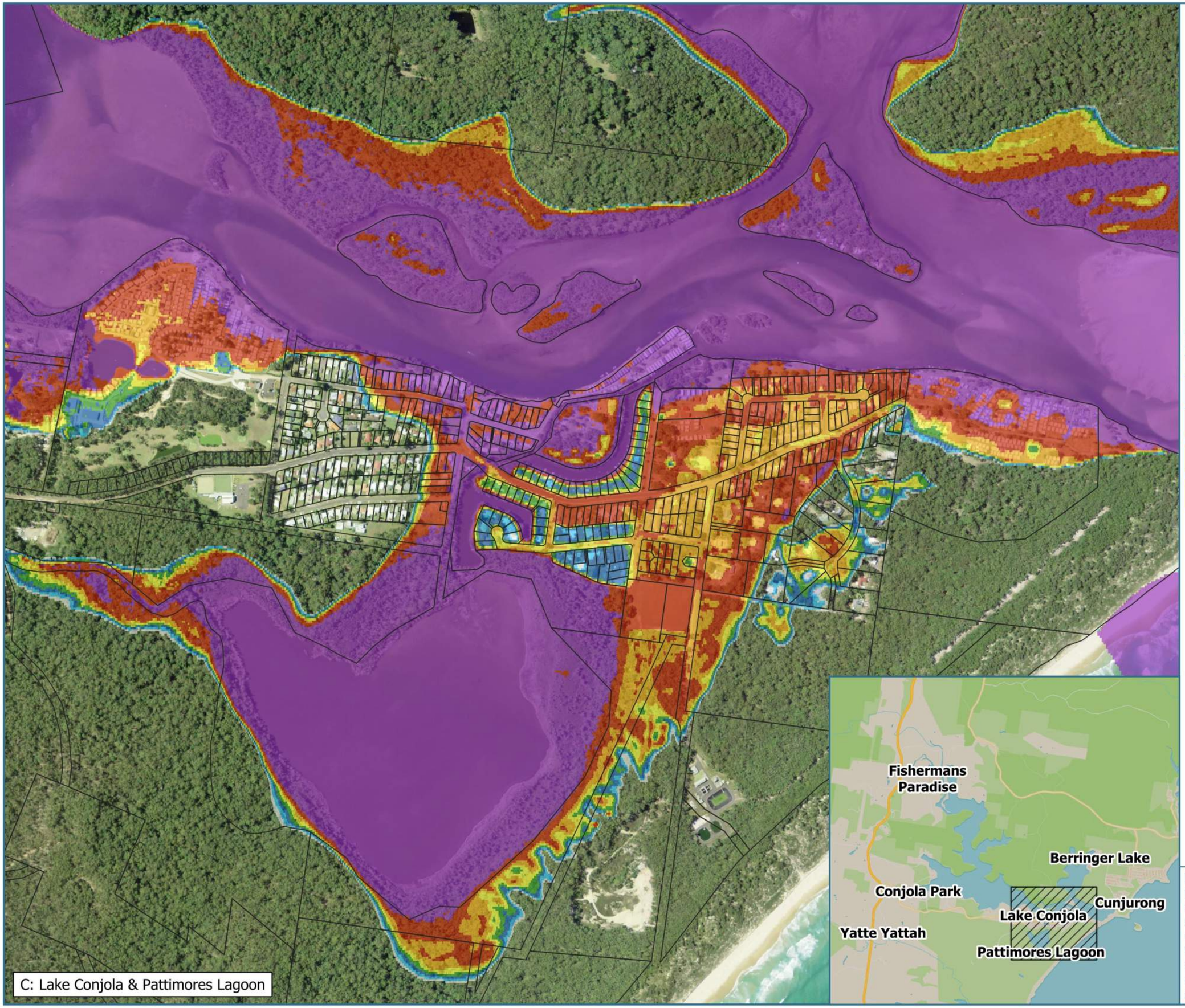

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Figure C-26
Coastal Inundation
SLR 1.2 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:8,000

N

0 100 200 300 m

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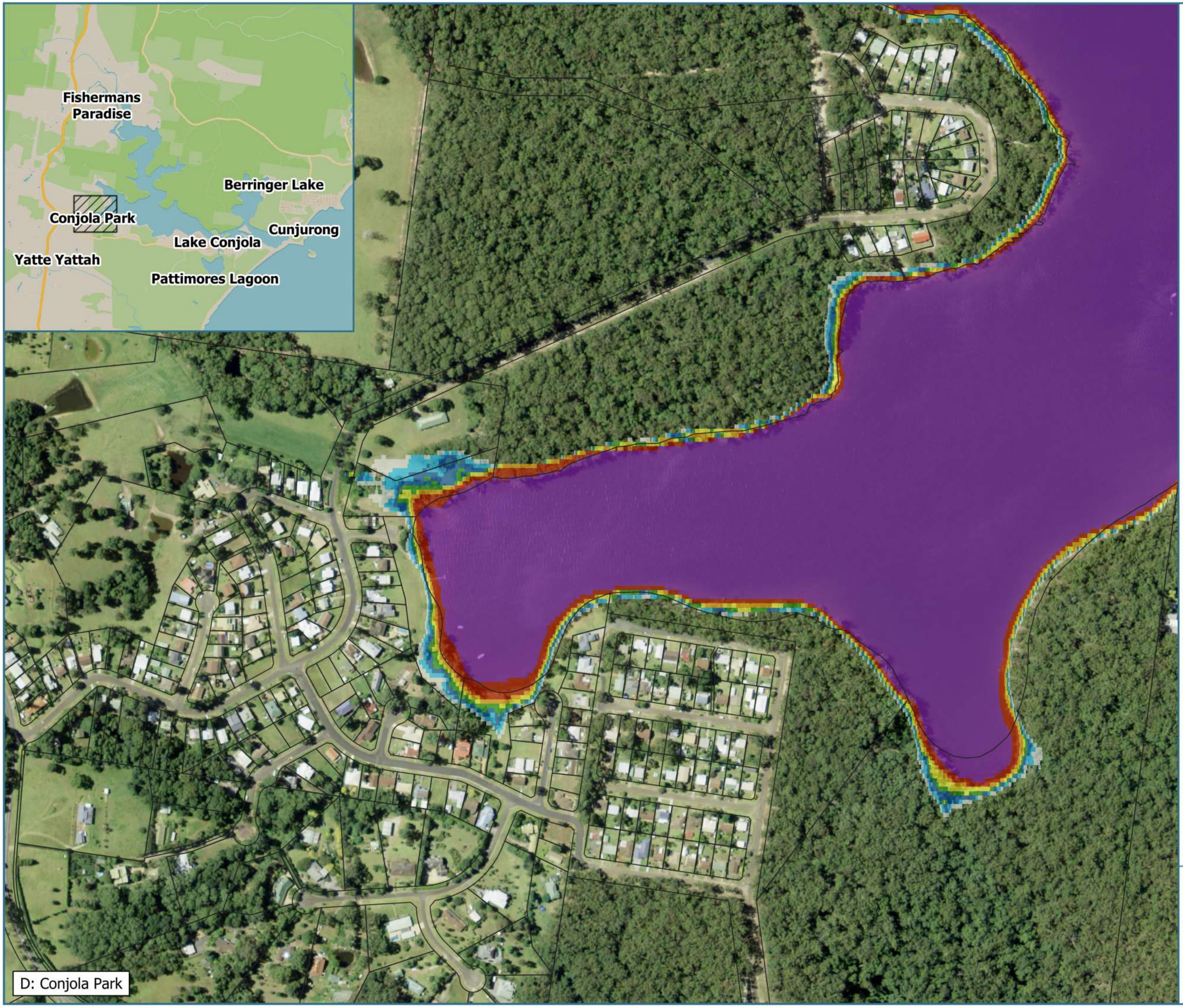

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Lake Conjola Coastal Management Program

Figure D-01
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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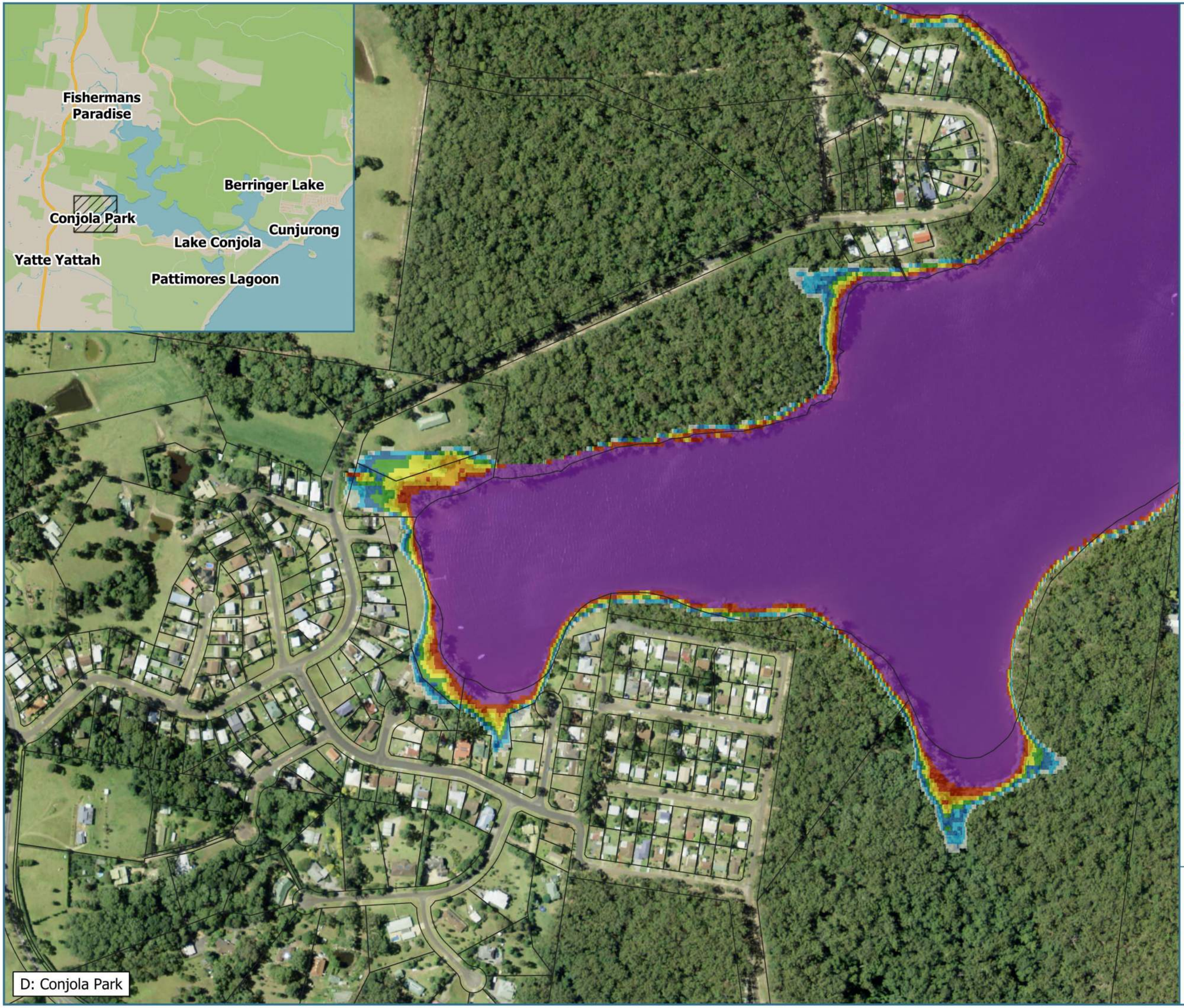

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Figure D-02
Coastal Inundation
SLR 0 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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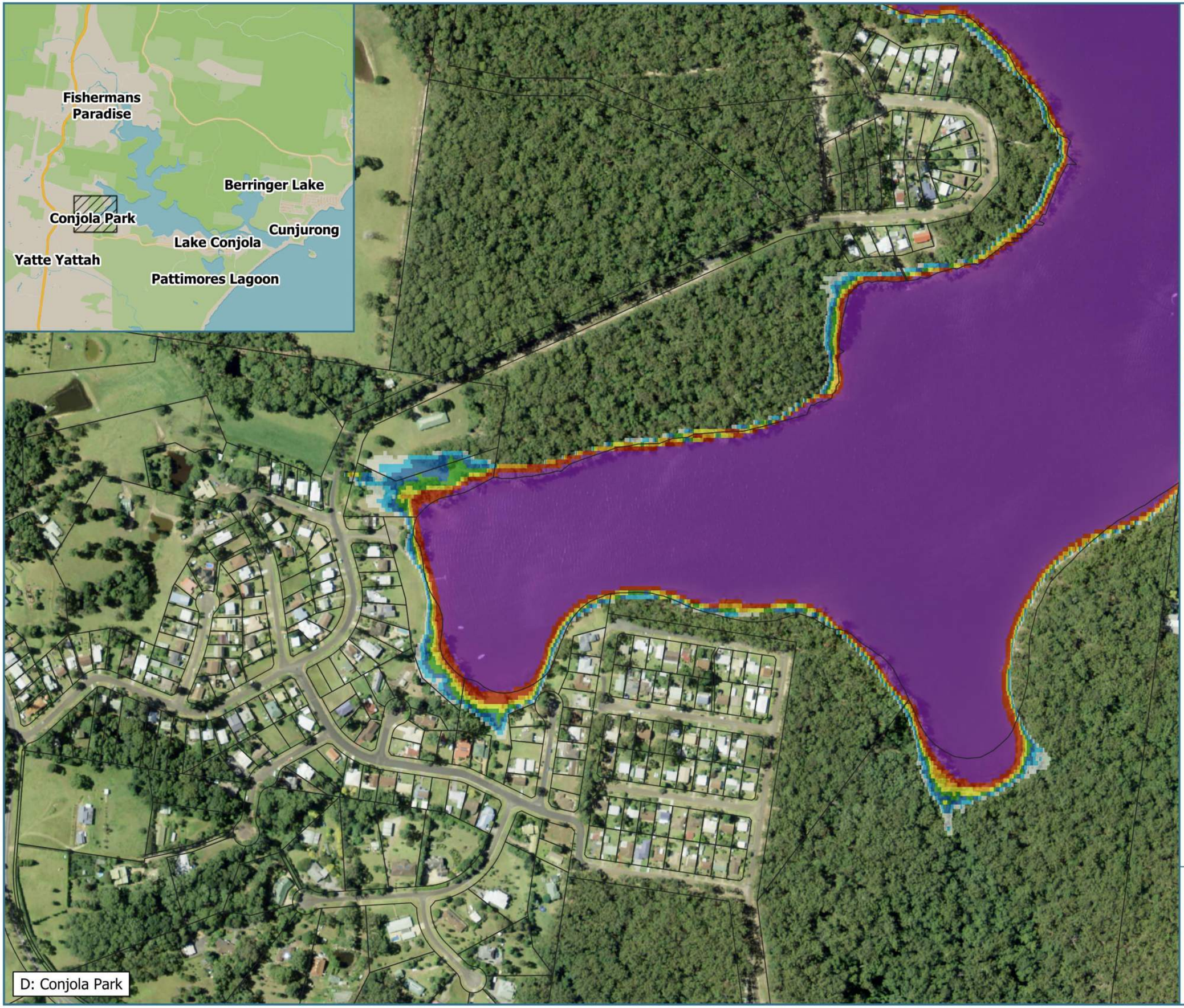

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Figure D-03
Coastal Inundation
SLR 0.1 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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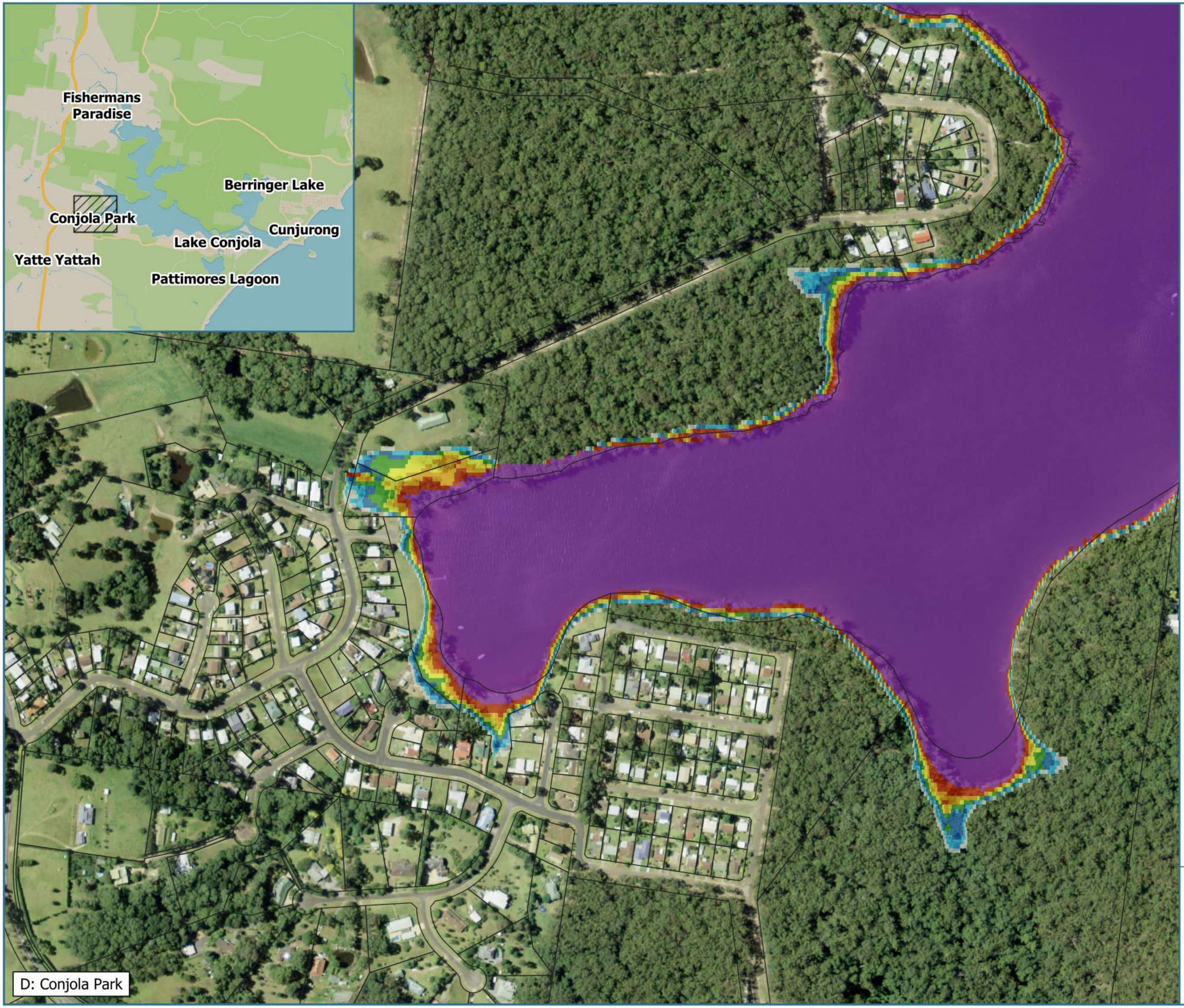

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Figure D-04
Coastal Inundation
SLR 0.1 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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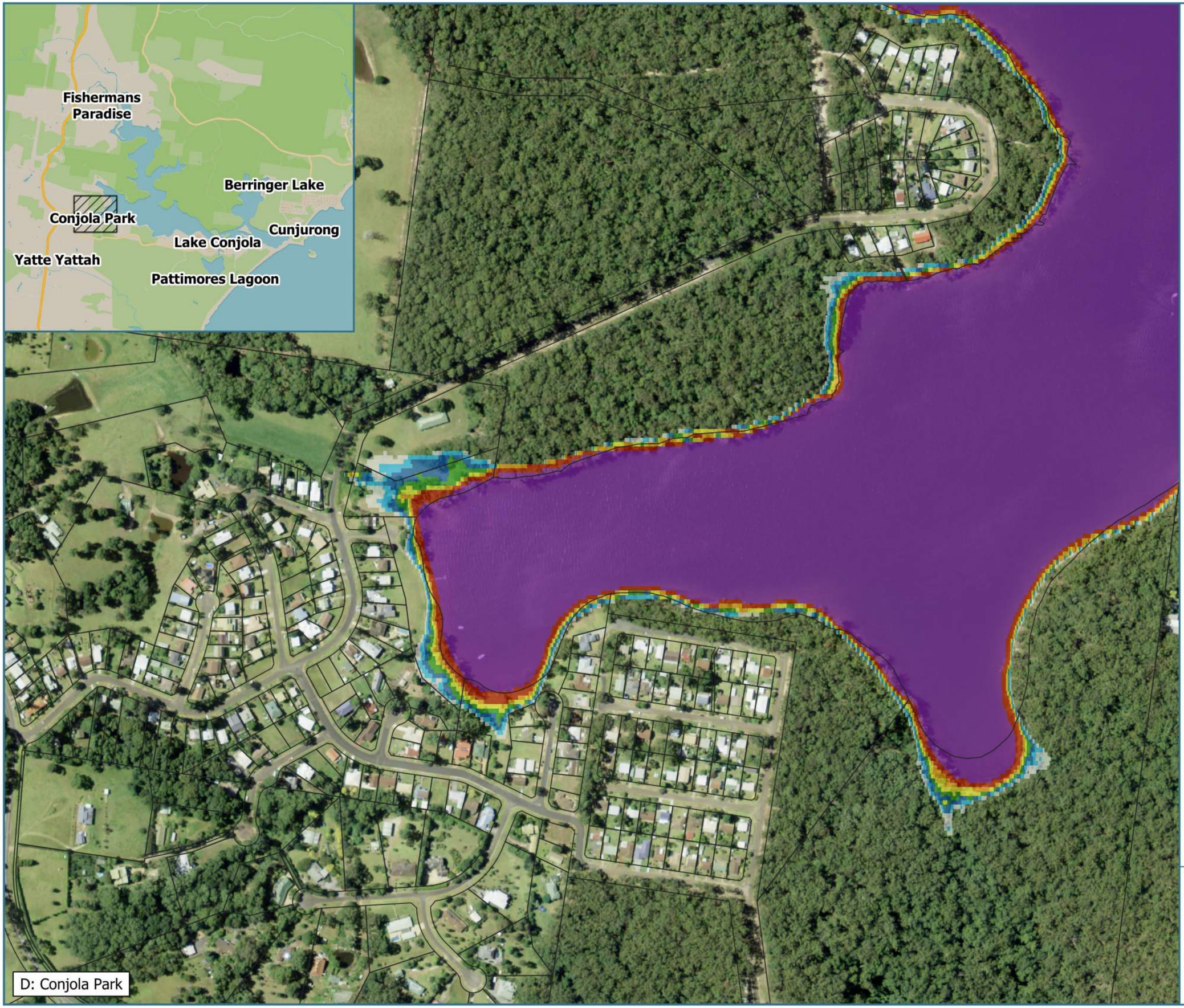

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Figure D-05
Coastal Inundation
SLR 0.1 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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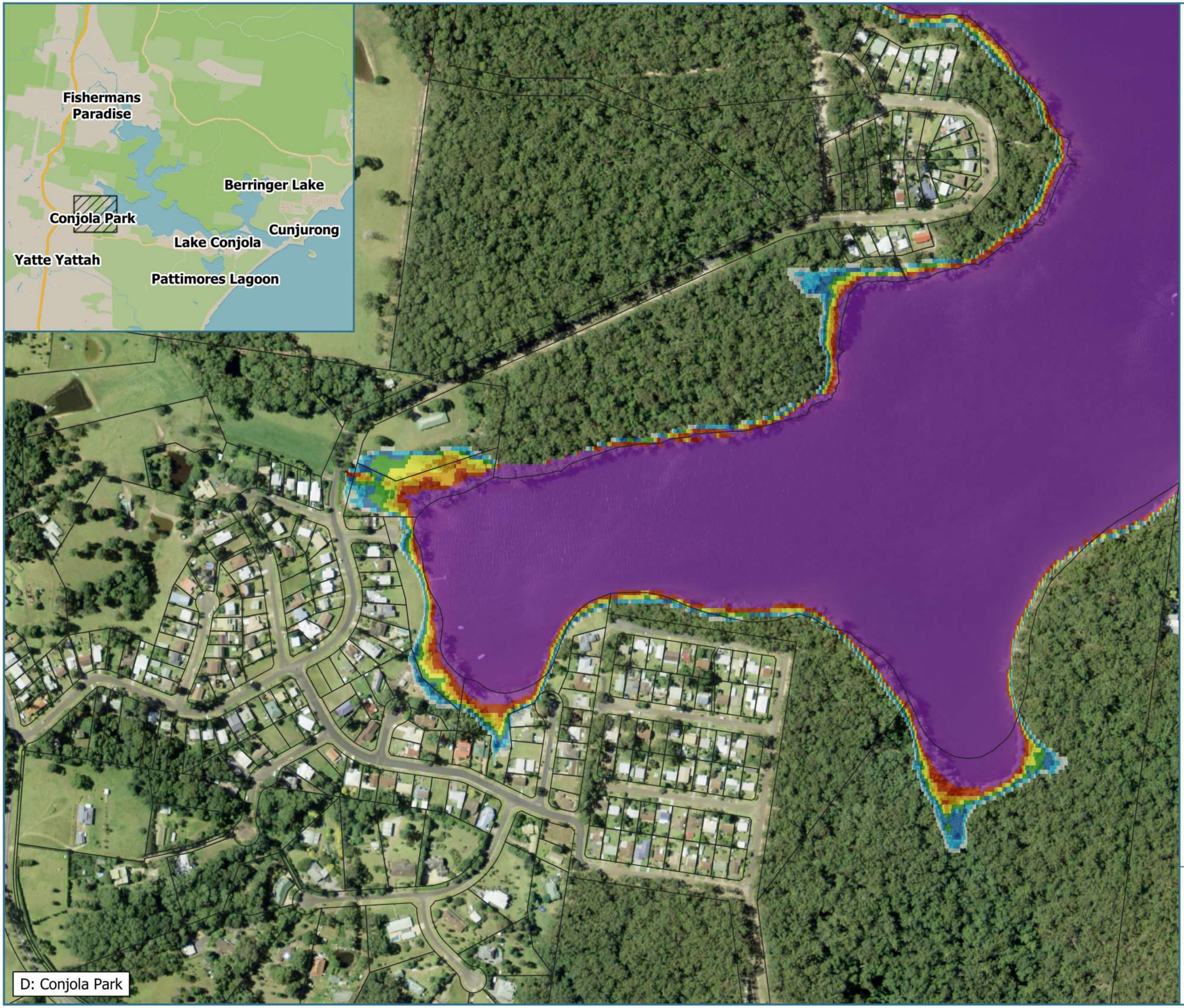

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Figure D-06
Coastal Inundation
SLR 0.1 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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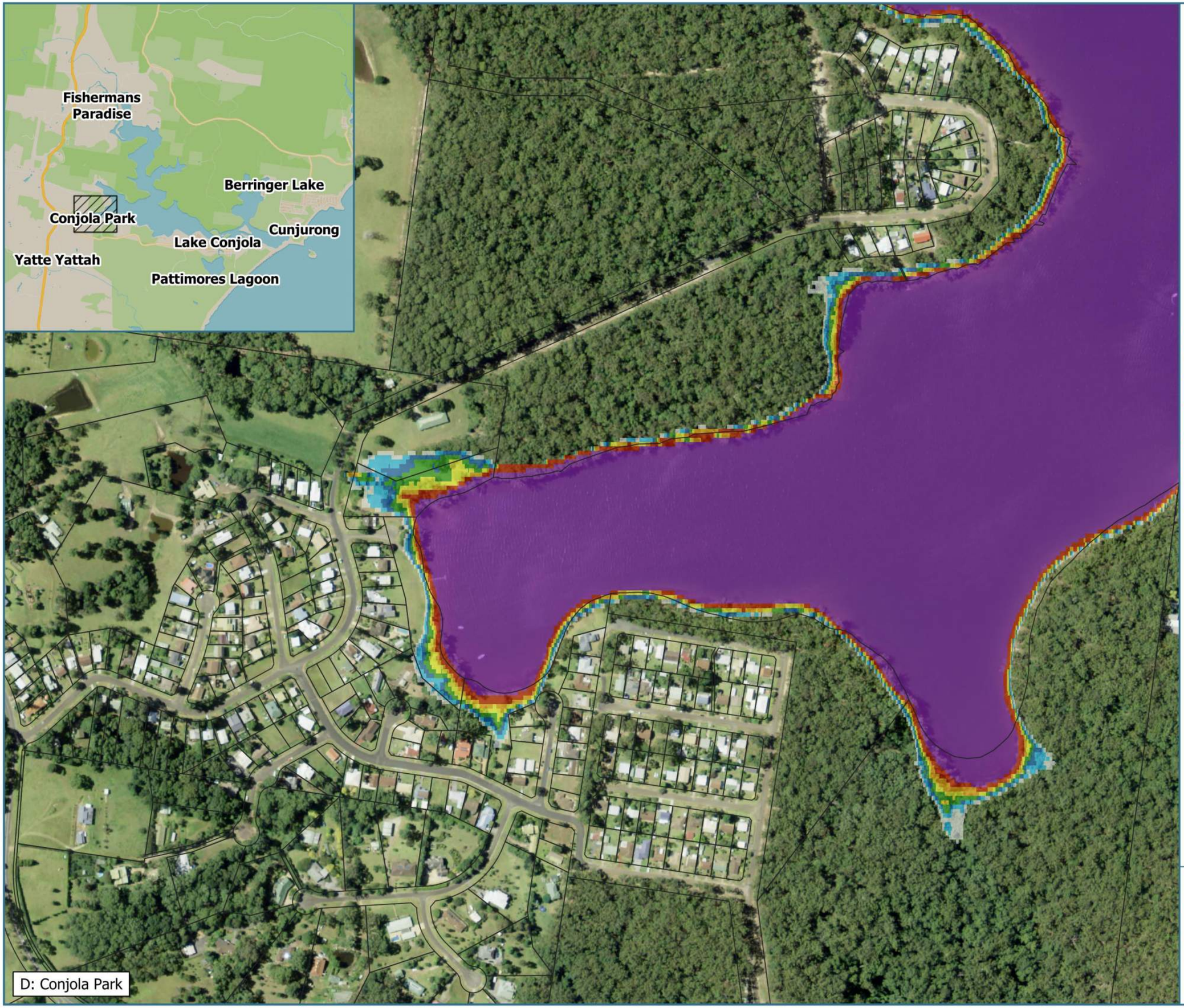

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Figure D-07
Coastal Inundation
SLR 0.23 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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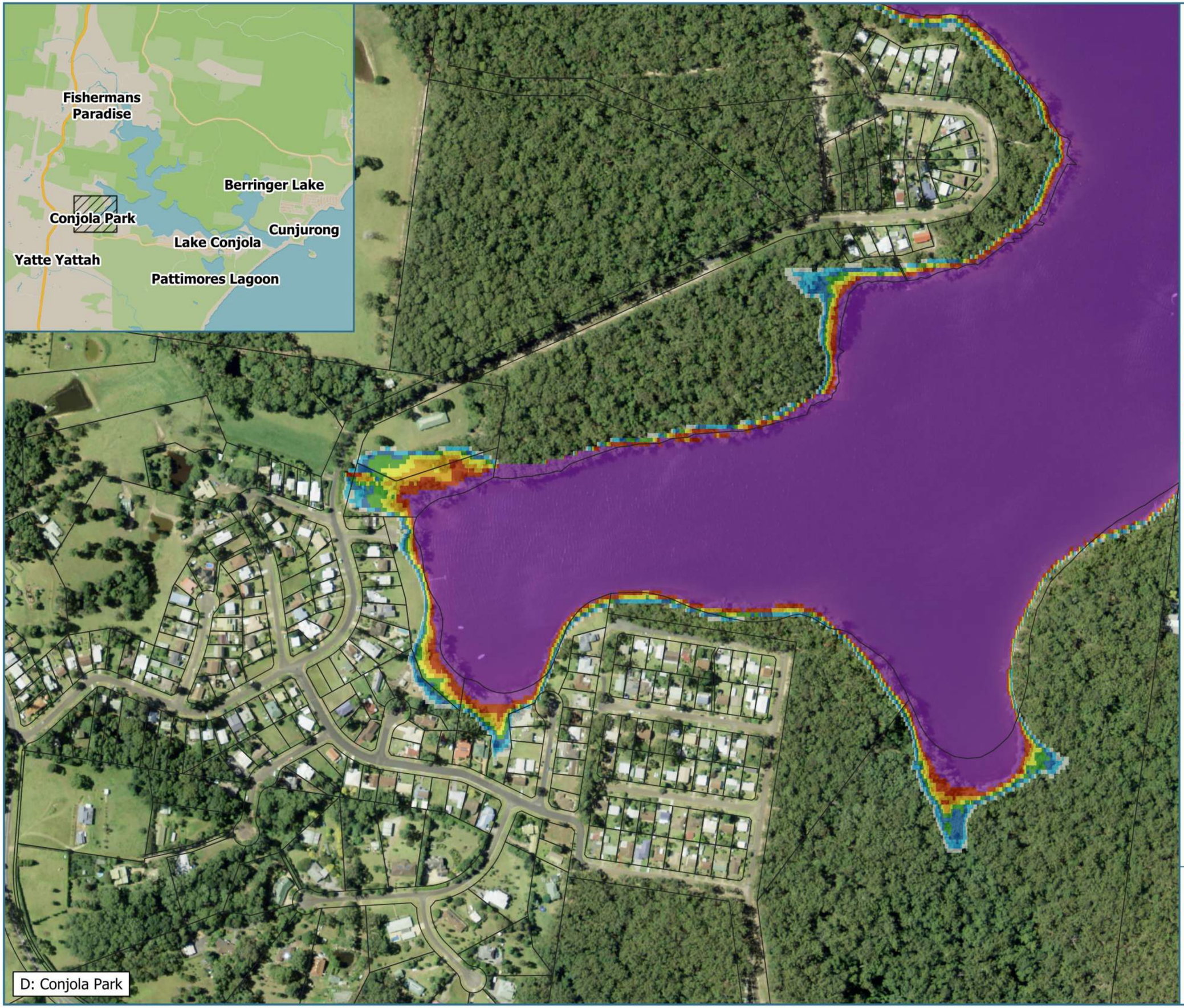

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Figure D-08
Coastal Inundation
SLR 0.23 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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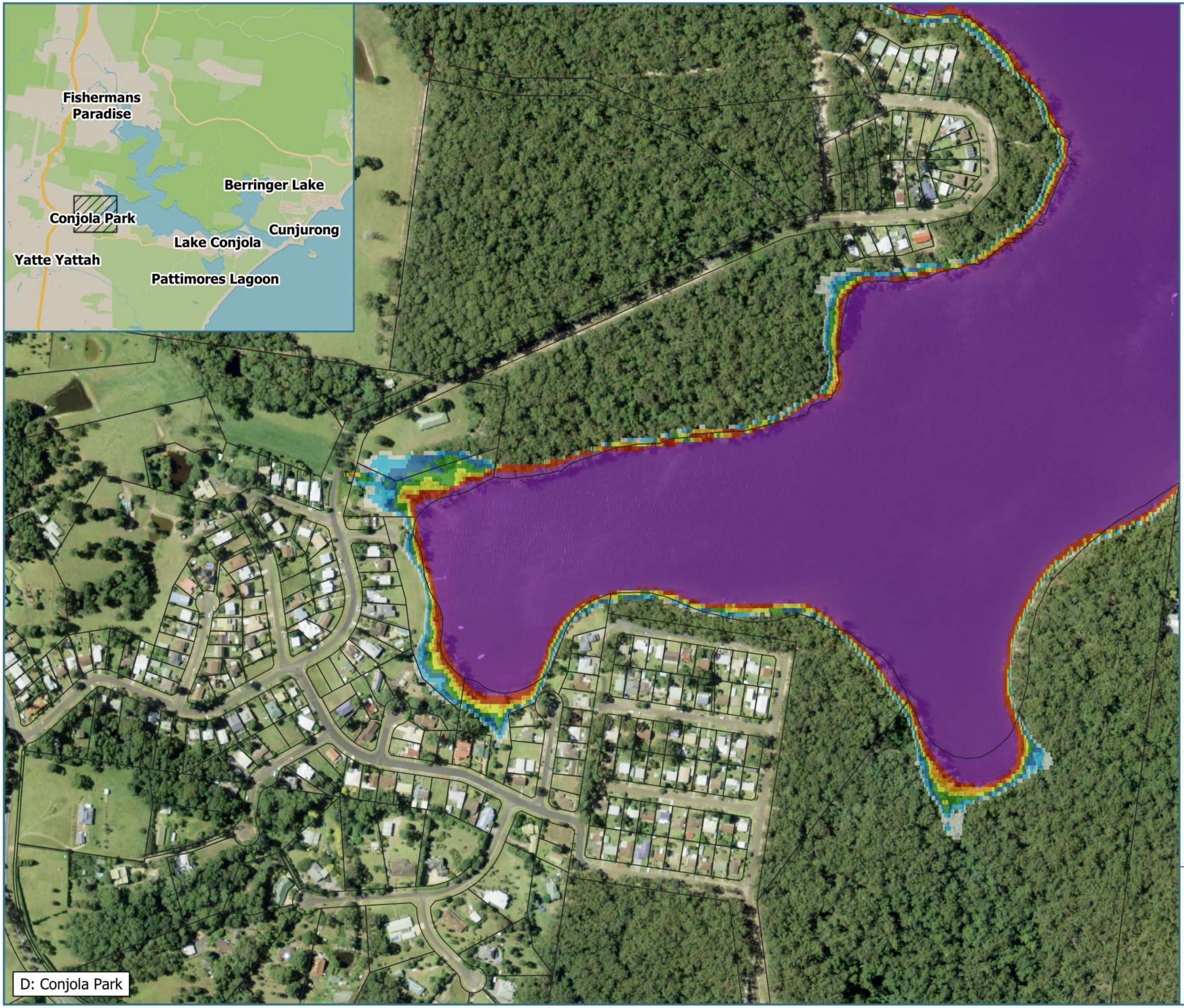

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Figure D-09
Coastal Inundation
SLR 0.23 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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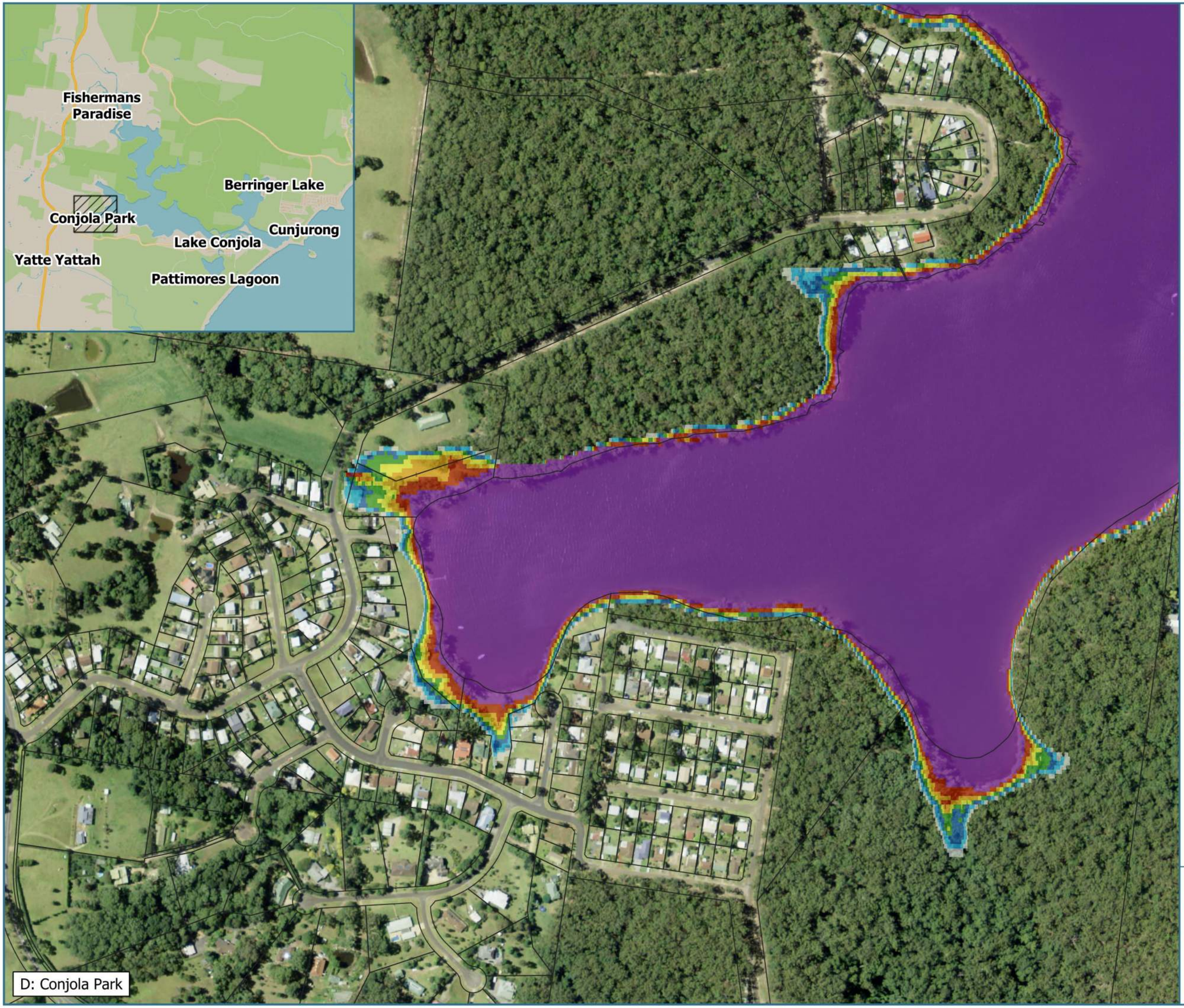

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Figure D-10
Coastal Inundation
SLR 0.23 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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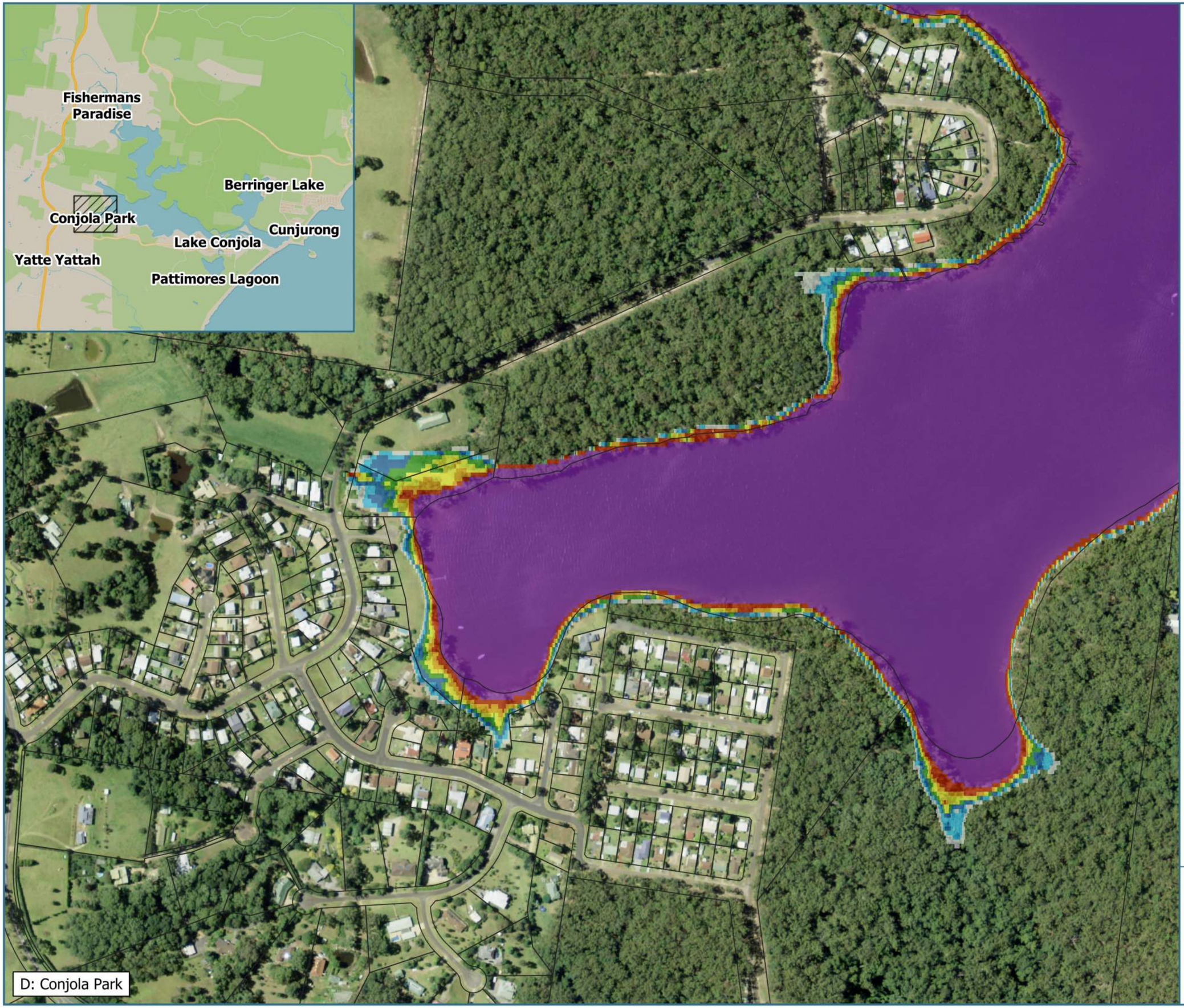

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Figure D-11
Coastal Inundation
SLR 0.36 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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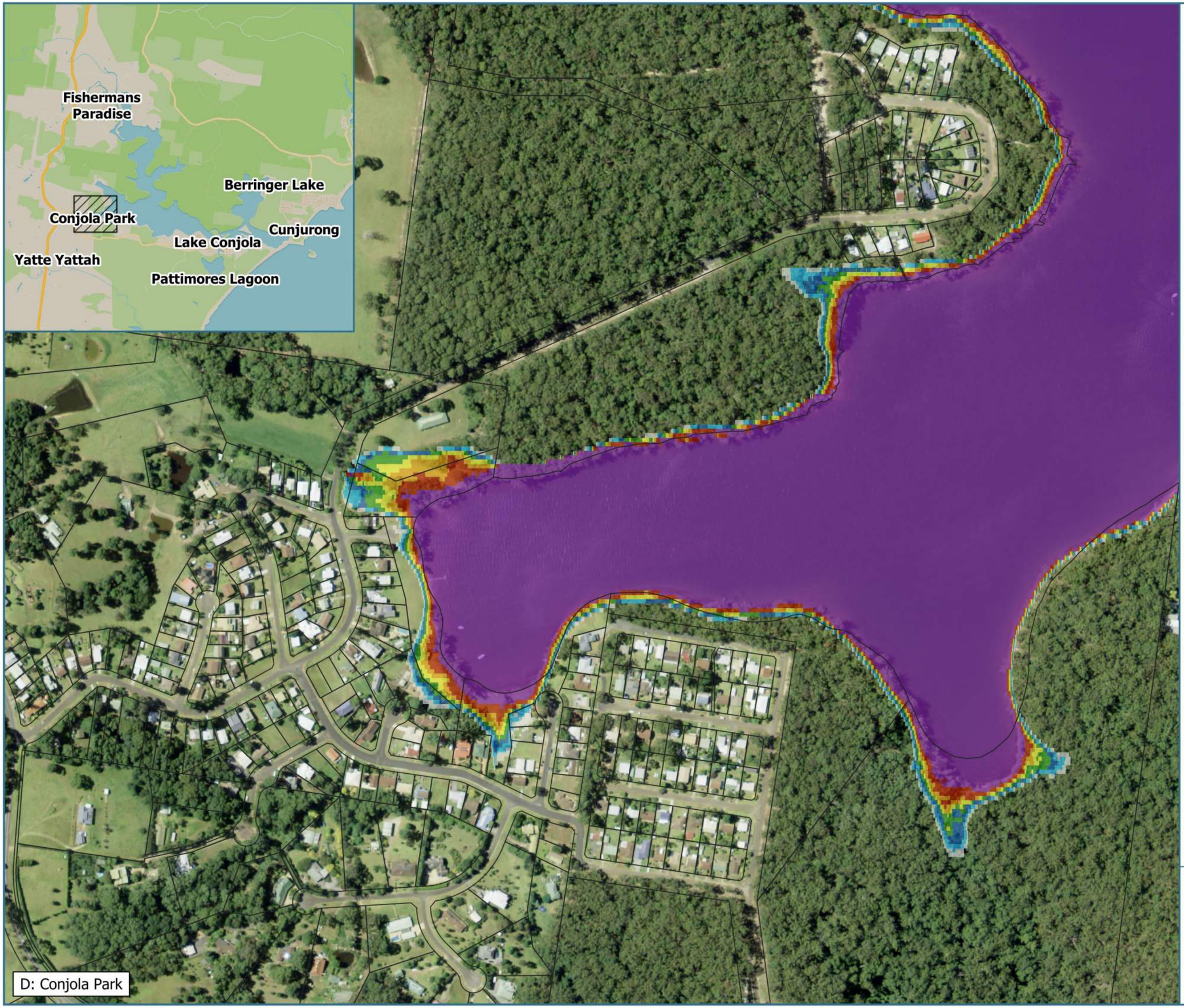

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Figure D-12
Coastal Inundation
SLR 0.36 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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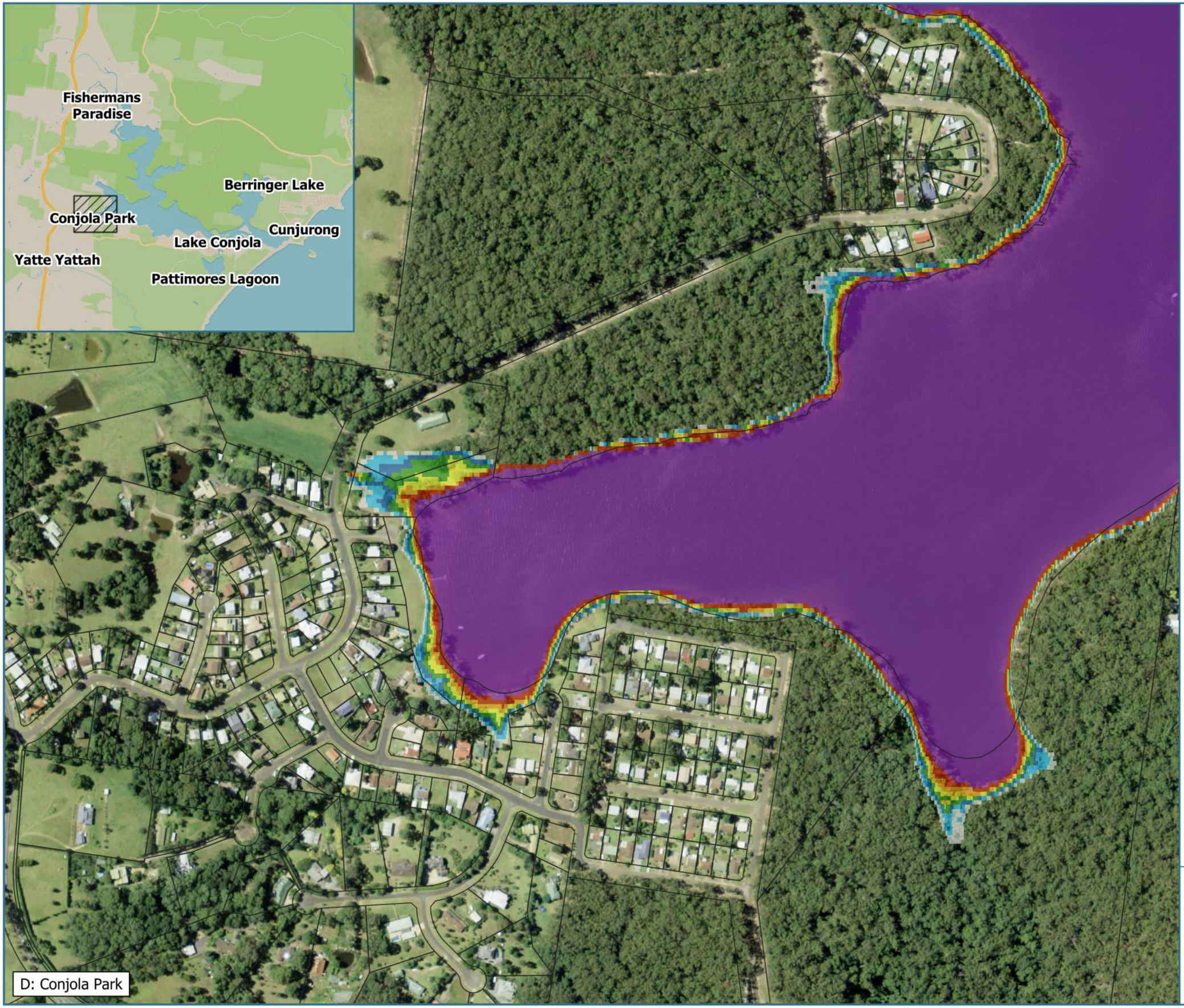

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Figure D-13
Coastal Inundation
SLR 0.36 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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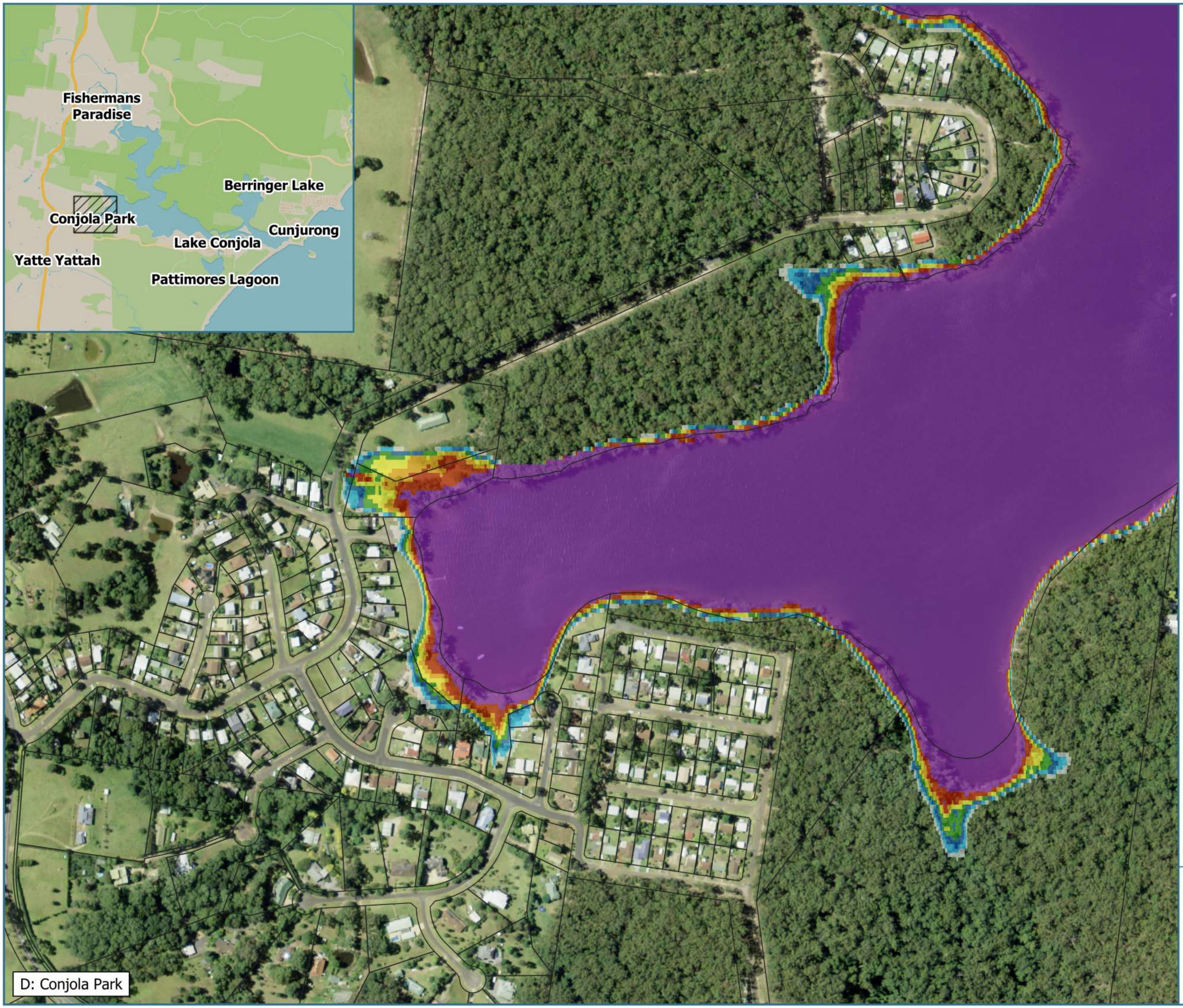

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Figure D-14
Coastal Inundation
SLR 0.36 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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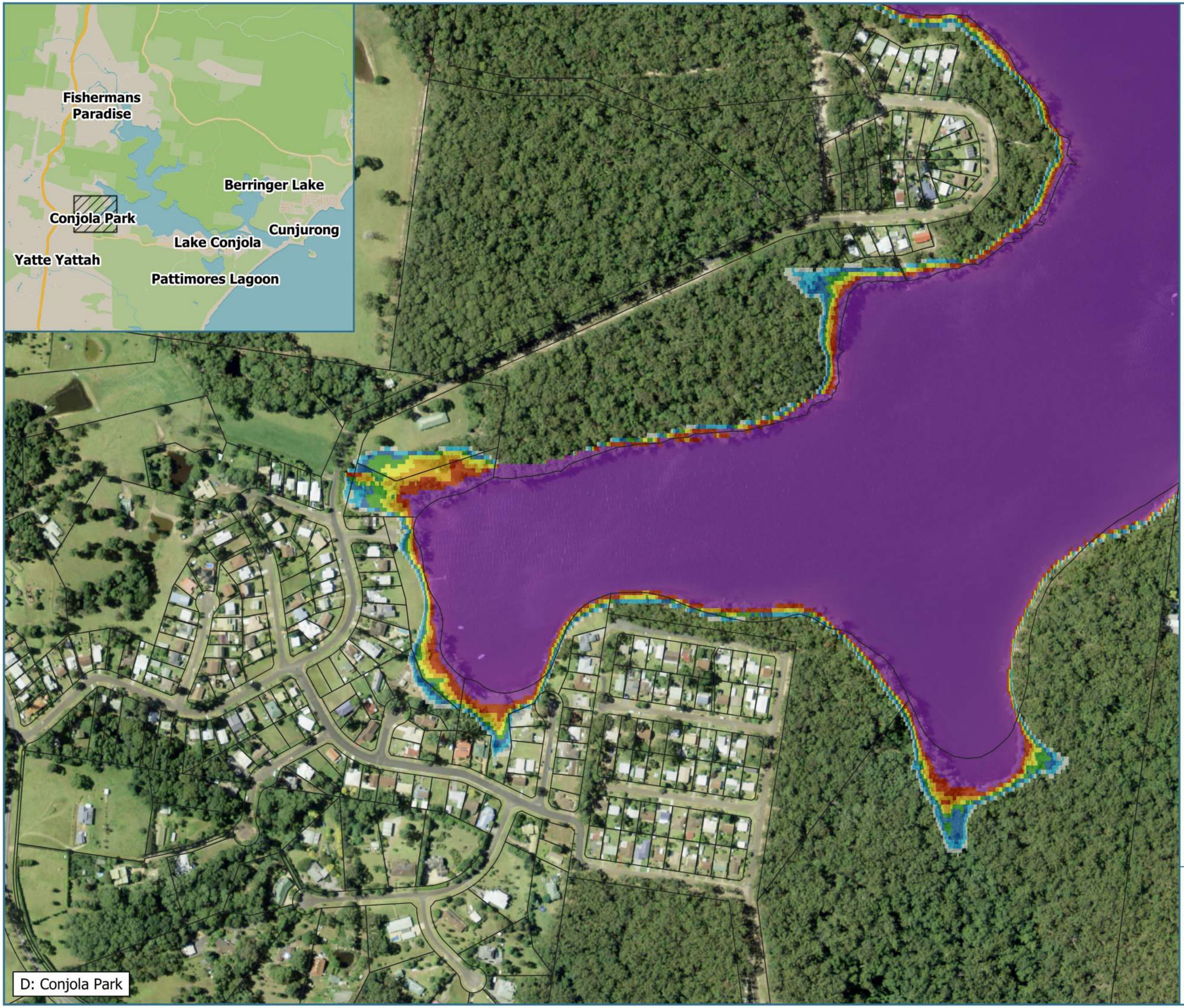

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Figure D-15
Coastal Inundation
SLR 0.6 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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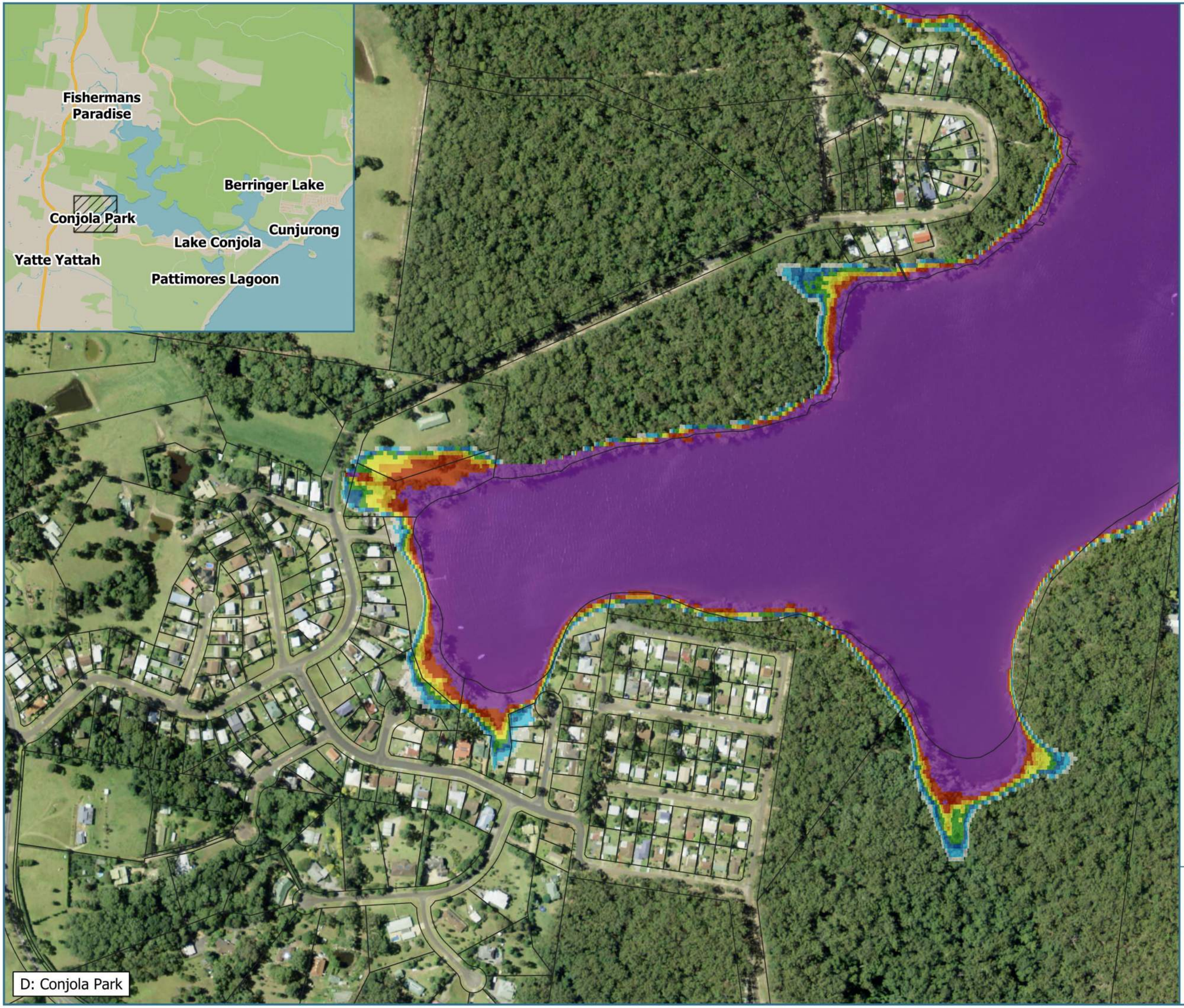

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Figure D-16
Coastal Inundation
SLR 0.6 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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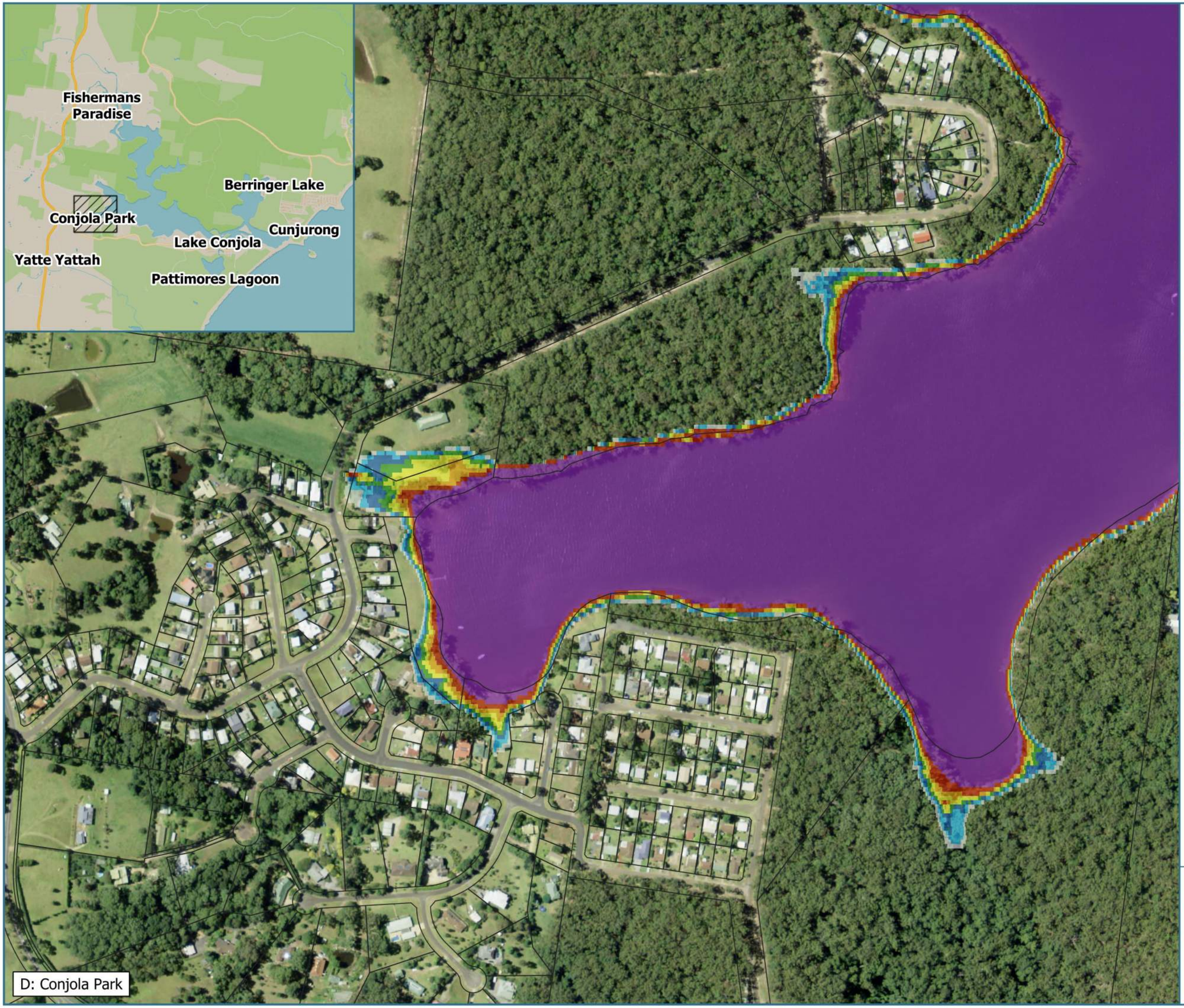

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Figure D-17
Coastal Inundation
SLR 0.6 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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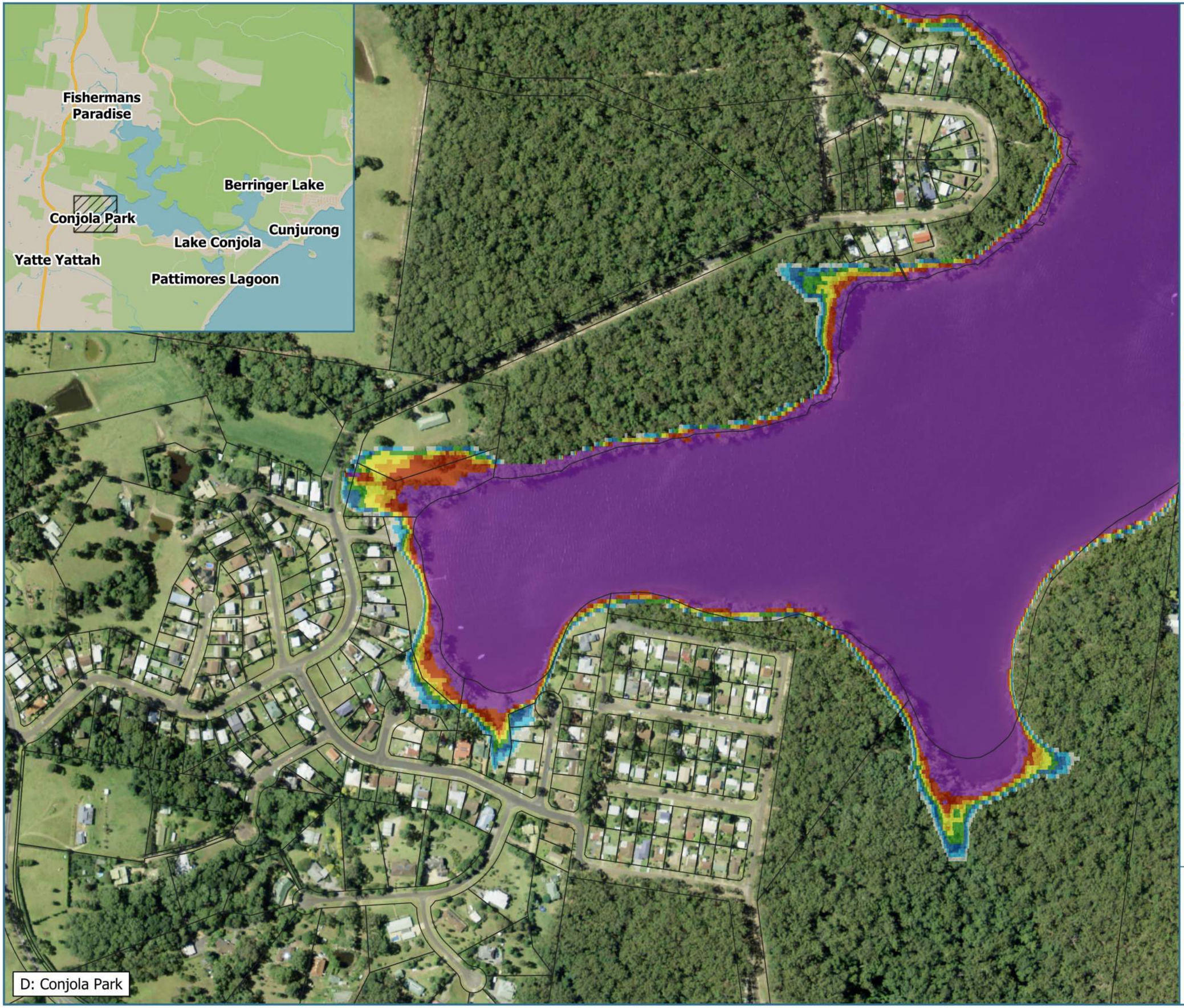

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Figure D-18
Coastal Inundation
SLR 0.6 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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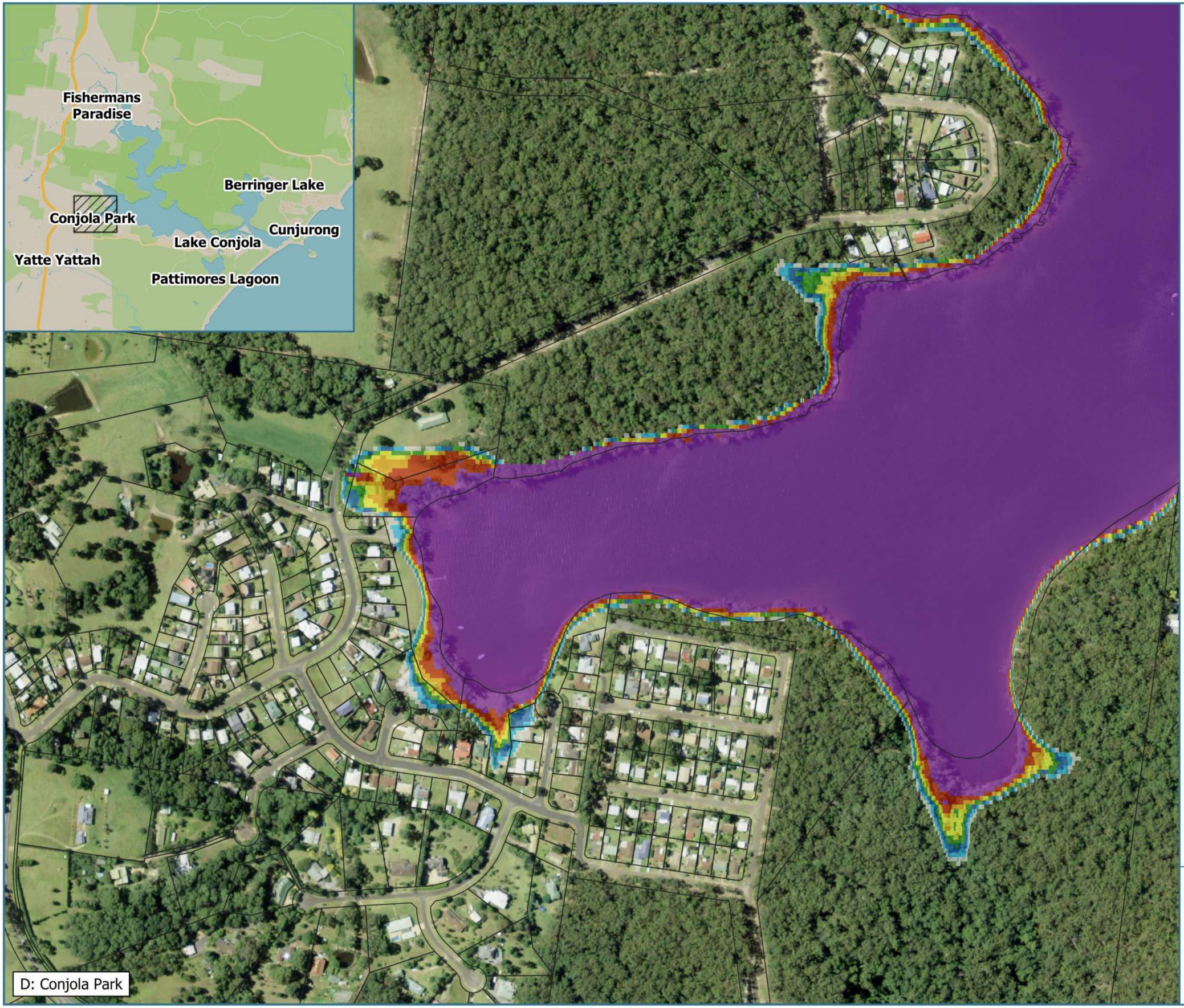

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Figure D-19
Coastal Inundation
SLR 0.9 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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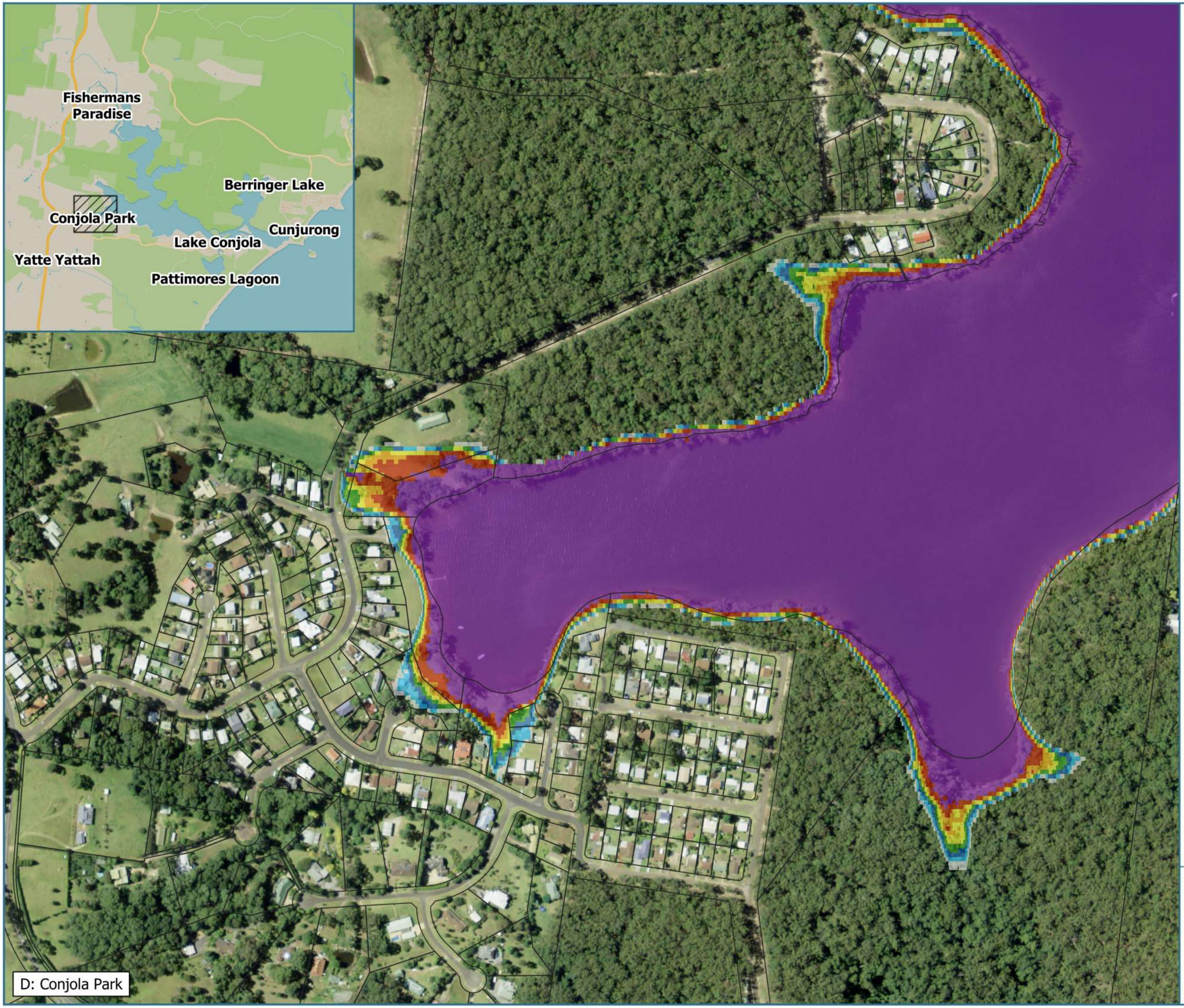

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Figure D-20
Coastal Inundation
SLR 0.9 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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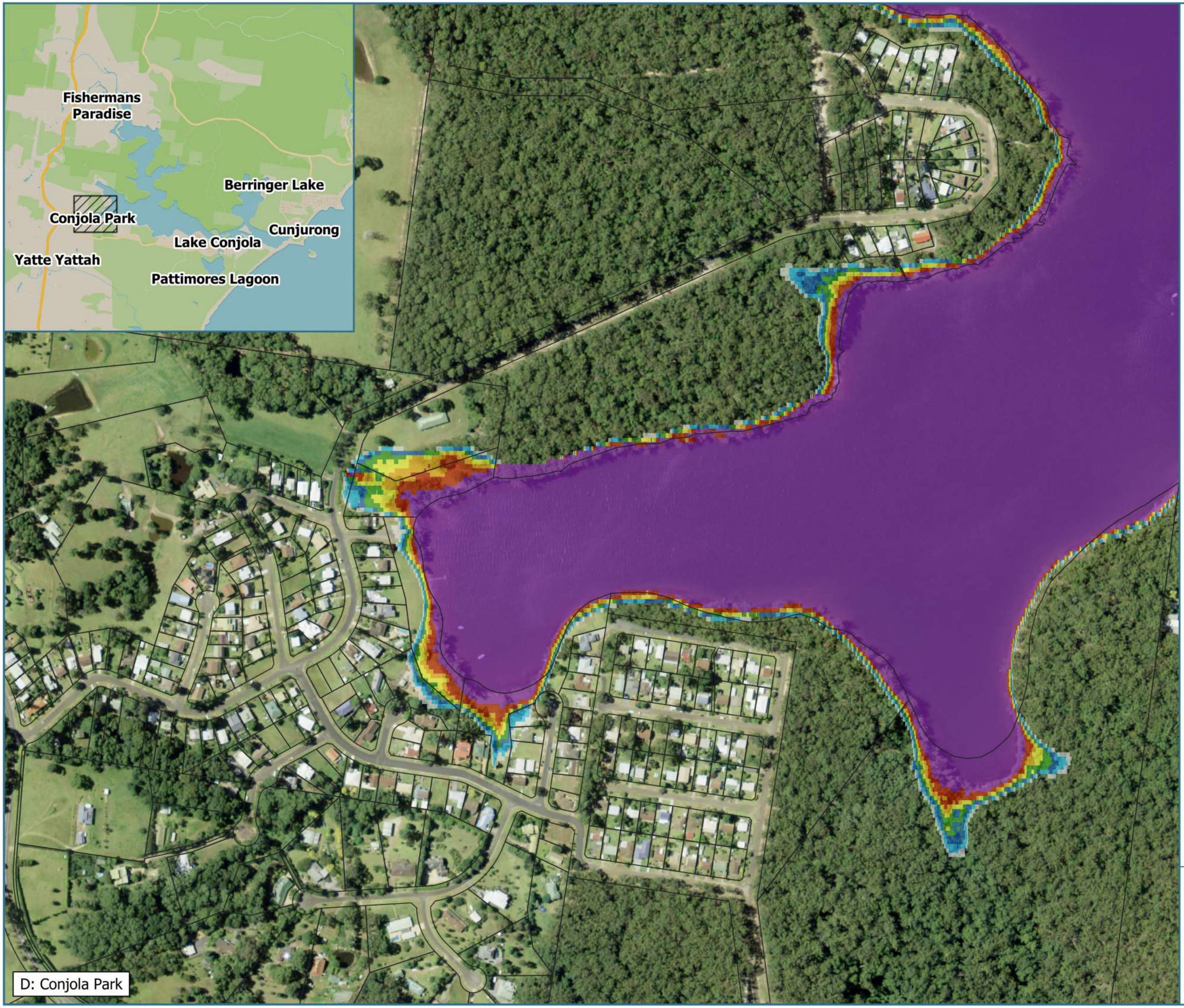

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Figure D-21
Coastal Inundation
SLR 0.9 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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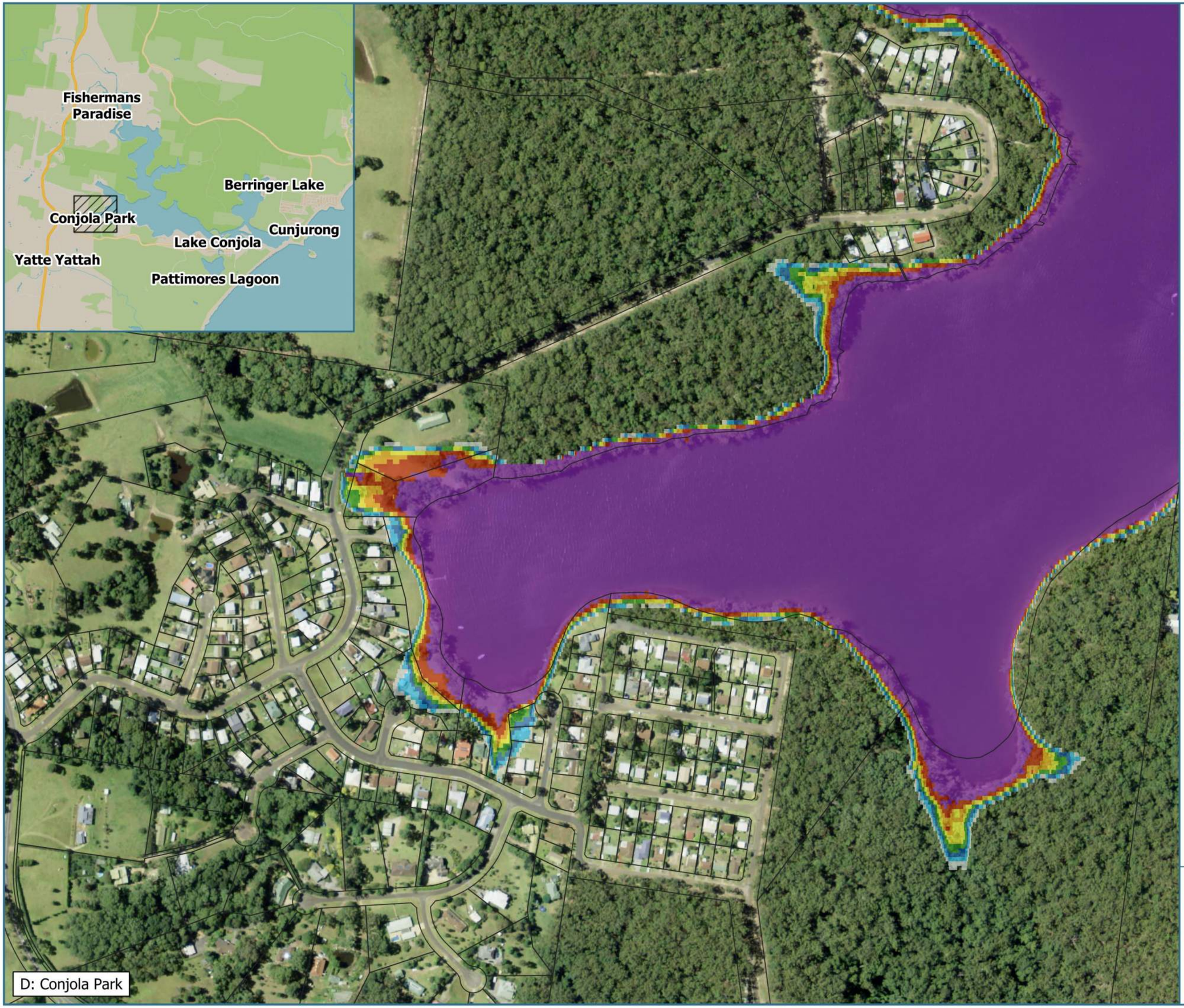

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Figure D-22
Coastal Inundation
SLR 0.9 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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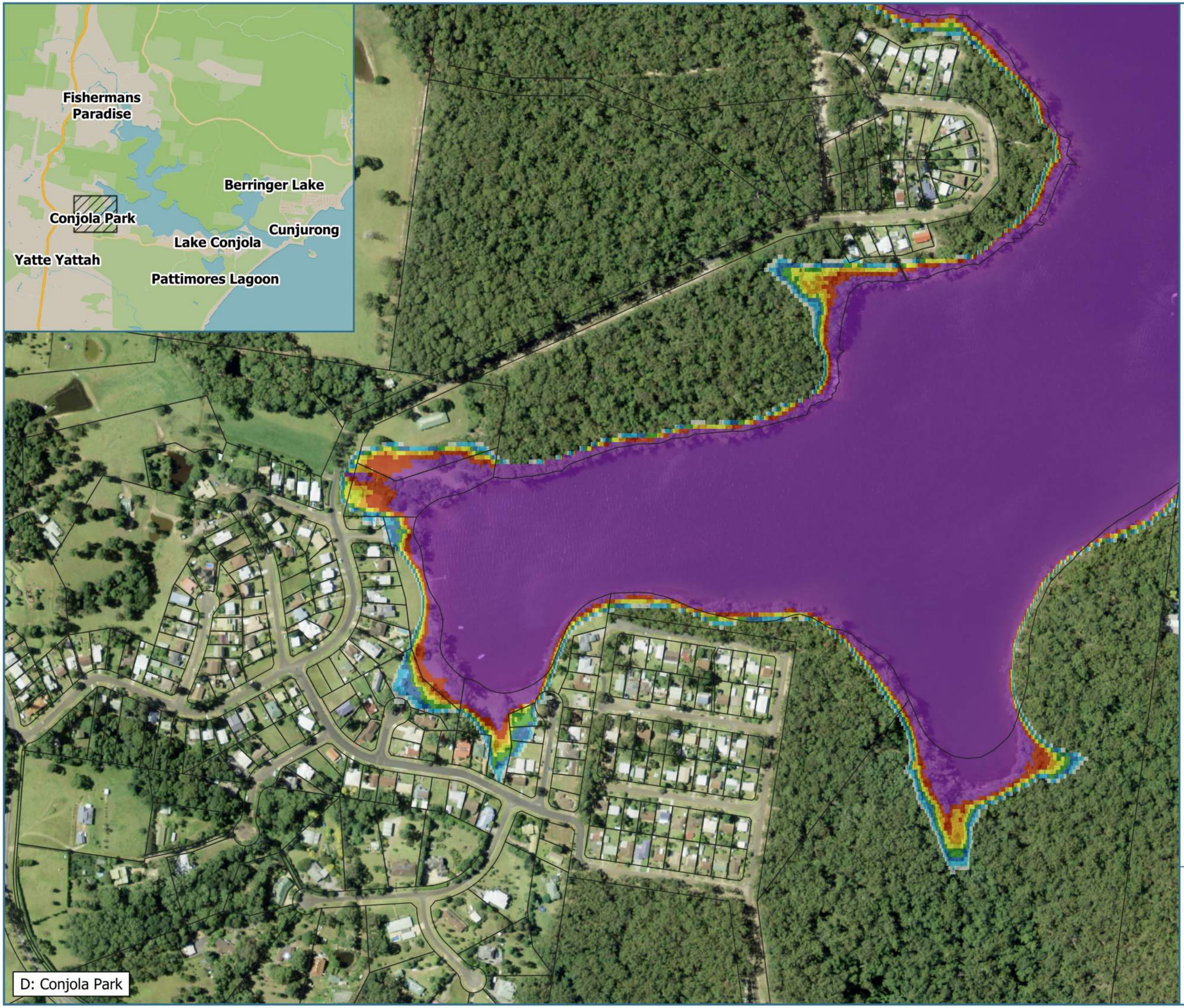

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Figure D-23
Coastal Inundation
SLR 1.2 m
Bed Not Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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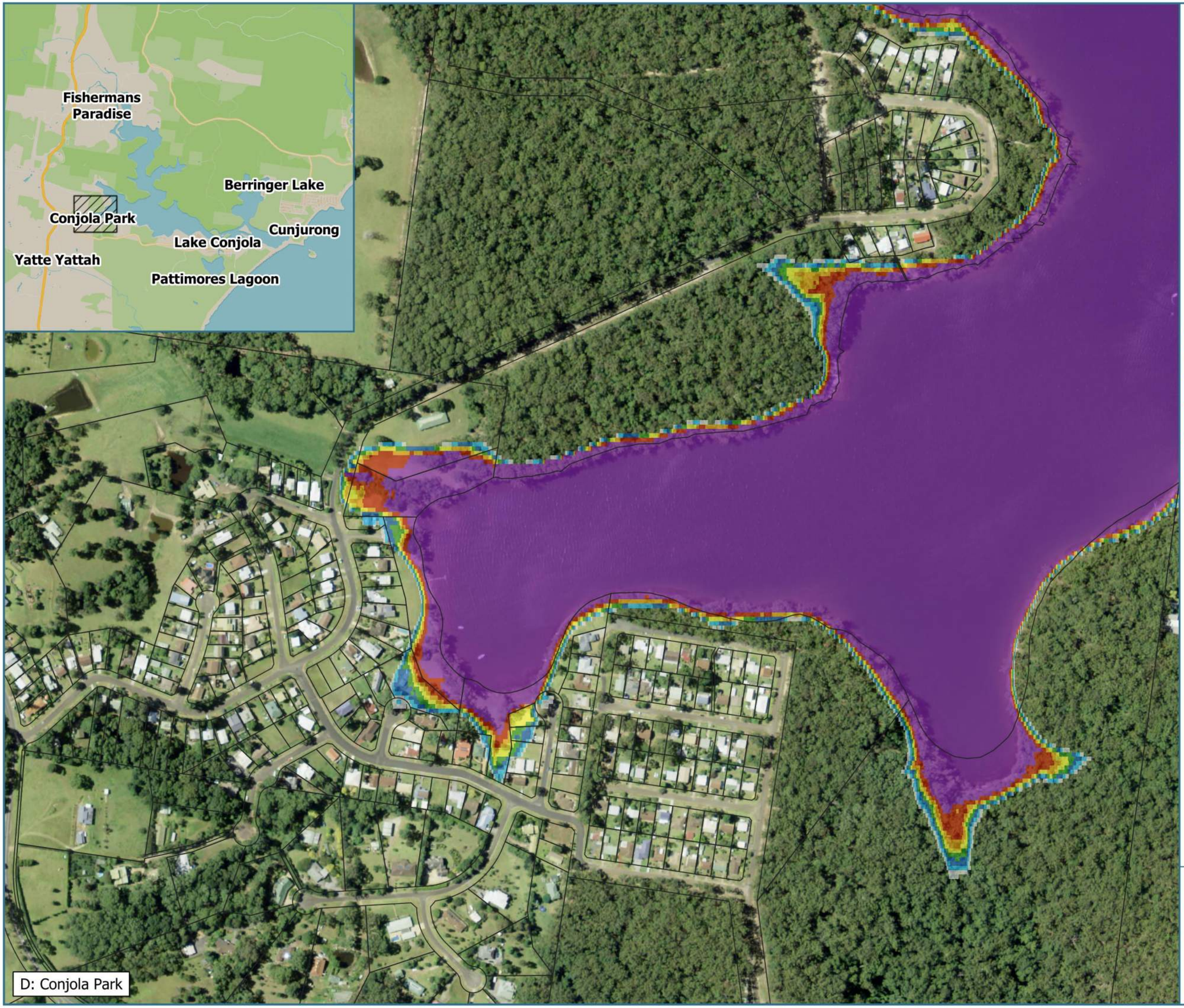

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Figure D-24
Coastal Inundation
SLR 1.2 m
Bed Not Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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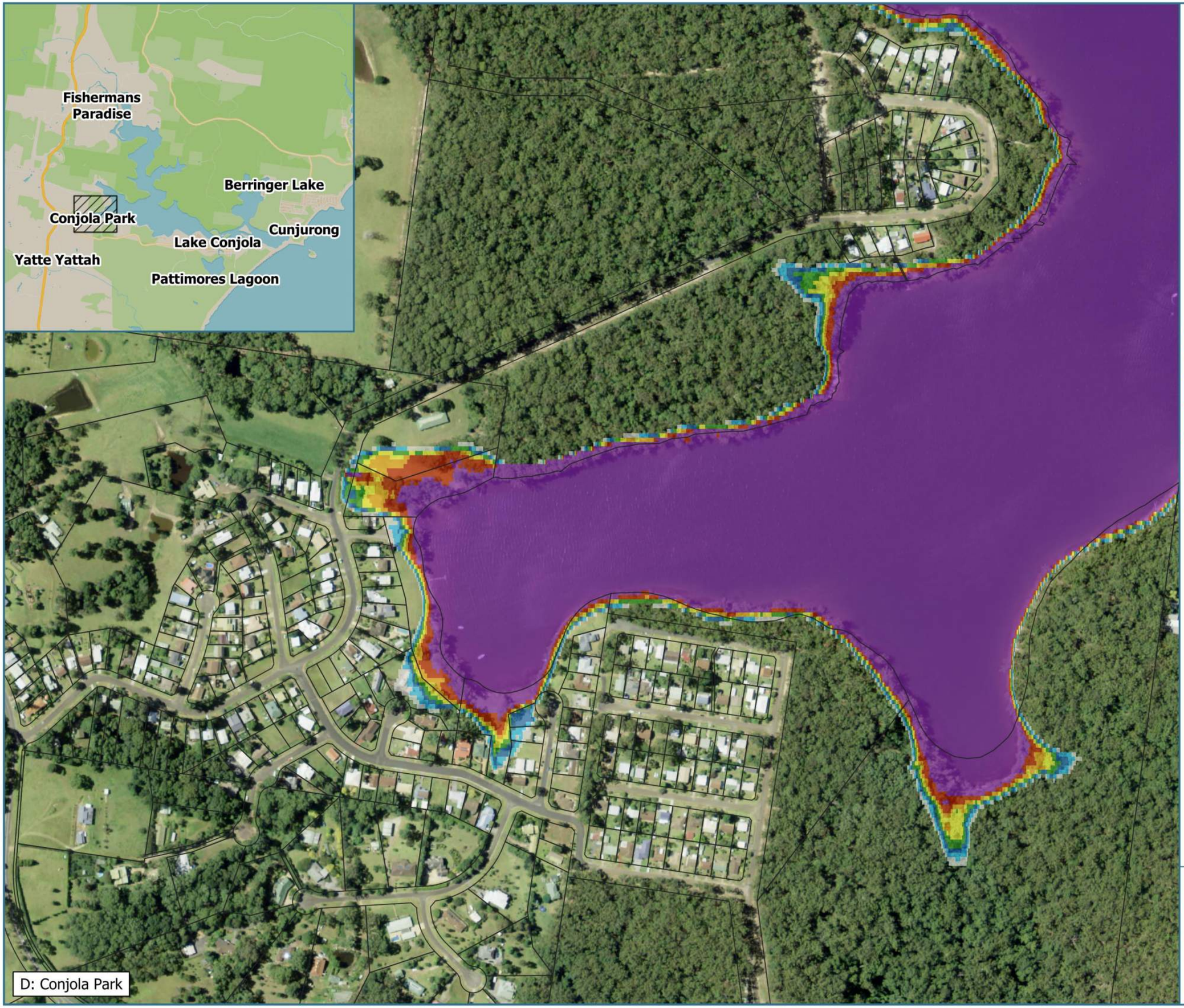

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Figure D-25
Coastal Inundation
SLR 1.2 m
Bed Raised
Event: 100 yr Ocean Only

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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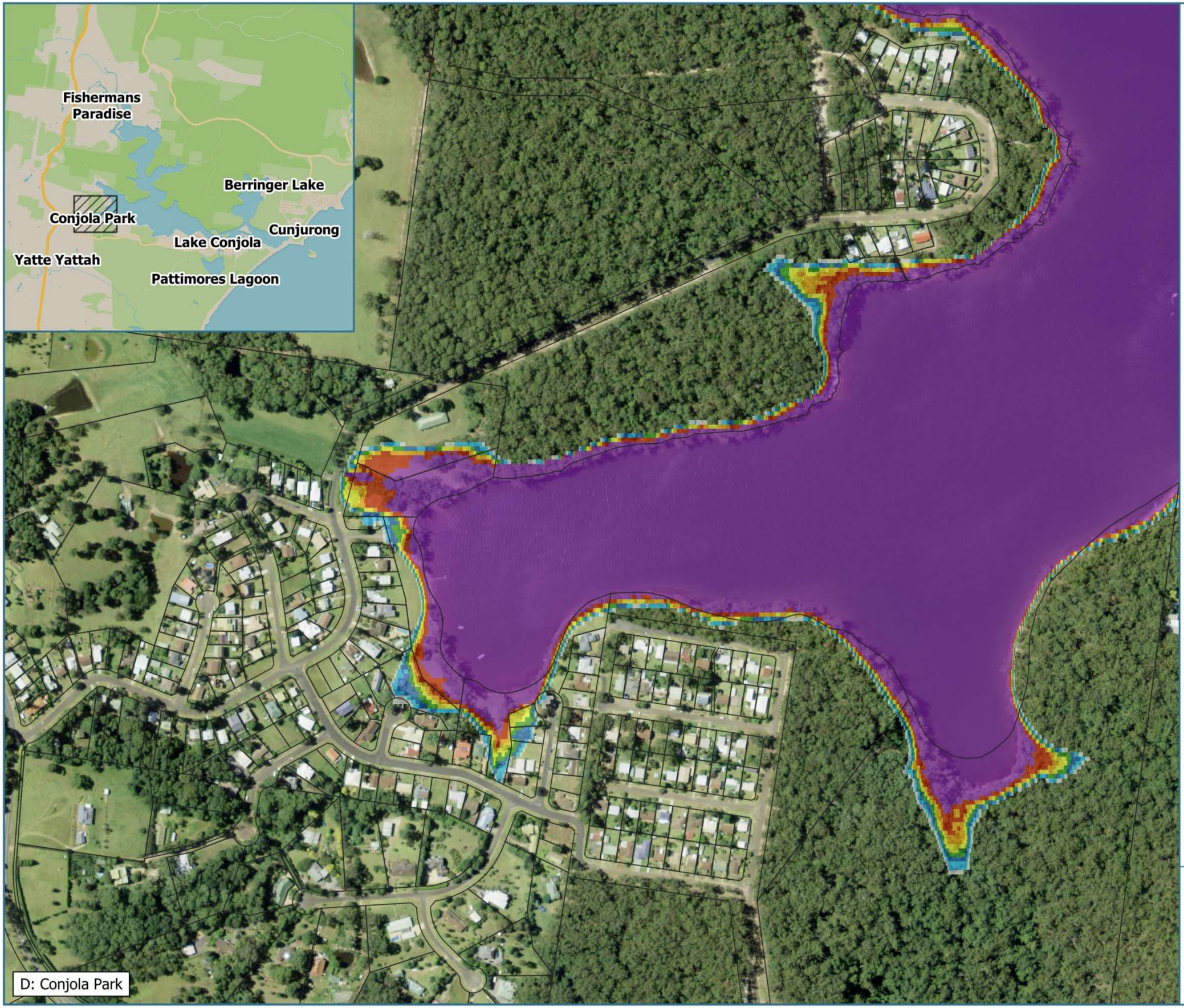

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Figure D-26
Coastal Inundation
SLR 1.2 m
Bed Raised
Event: 5 yr Catchment Inc.100 yr Ocean Event

Legend
Inundation Depth (m)

- ≥ 2.00
- 1.50 - 2.00
- 1.25 - 1.50
- 1.00 - 1.25
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25

PA2591
Basemap: NSW Six Maps
Aerial Image: 08-12-2013

PA2591 / 2022-11-02
GDA2020 / MGA zone 56
Scale at A4

1:4,000

N

0 70 140 210 m

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Appendix E – Alignment of CMP with Objectives of the CM Act and RH SEPP

Table E-1: Objects of the CM Act and how they have been addressed in this CMP

CM Act Objects	How this is addressed in this CMP
(a) to protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience	The CMP, through the implementation of Section 6 A Business Plan which includes coastal management actions (Section 4) to address the threats (Section 2) to the values of the coastal zone (Section 1.3). It aims to protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience. CMP Stage 2 Report B (Supporting Document B) included a detailed study of the various threats to physical coastal processes and environmental values of the study area – this is also discussed in the CMP in Section 2 (p16-30). Section 9 of Stage 2 Report B includes the description of the risk assessment methodology, risk assessment matrix, quantitative threat-based risk assessment, quantitative asset-based risk assessment. Stage 3 of the CMP process involved the development of management actions to address the risks and issues identified in Stage 2. Management options were identified that address the threats to the natural coastal processes and environmental values of the coastal zone. These actions were then assessed and prioritised using key criteria that included their efficacy in terms of the protection of these values. A number of actions outlined in Section 4 (p34-63) of the CMP aim to protect and enhance natural coastal processes and coastal environmental values. Some of the actions aiming to achieve this objective are: • LG6: Develop and implement a program of dune vegetation management and rehabilitation • LG8: Continue Council's program of mapping threatened ecological communities (TECs) across coastal reserves • FB1: Investigate, remediate and monitor impacted or vulnerable bank areas • PM1: Review, update and maintain tidal and coastal inundation development and planning controls to reduce future coastal hazard impacts • WQ2: Continue and implement refined surface water monitoring and reporting program • EV1: Protect and/or rehabilitate riparian and foreshore areas to enhance estuarine vegetation
(b) to support the social and cultural values of the coastal zone and maintain public access, amenity, use and safety	A number of additional threats to the environmental, social and cultural assets and attributes within the Lake Conjola CMP study area have been identified and are addressed within this report. These include: • catchment flooding; • coincident inundation - combination of catchment flooding and coastal inundation; • poor water quality – groundwater and surface water; • impacts of catchment management on waterway health;

CM Act Objects	How this is addressed in this CMP
	• foreshore erosion and removal of riparian vegetation; • inadequate management of foreshore access, private structures, and watercraft storage; and, • climate change related impacts from increases in sea level, bushfires and rainfall. CMP Stage 2 Report B (Supporting Document B) included a detailed study of the various threats to social and cultural values of the study area – this is discussed in the CMP in Section 2 (p16-30). Key social and cultural issues from this assessment are presented in Section 2.1 Environmental, Social & Cultural Assets and Attributes (p16-20) and Section 2.2 Threats and Risk Assessment (p21-25), and include indigenous and non-indigenous cultural risks, population impacts and public safety hazards, including safe access to the coastal zone, amenity of the coastal zone and use. Stage 3 of the CMP process involved the development of management actions to address these risks and issues identified in Stage 2. Management options were identified that address the threats to the social and environmental values of the coastal zone. These actions were then assessed and prioritised using key criteria that included their efficacy in terms of the protection of these values. These actions are spelt out in Section 4 (p34-63). Relevant actions for this objective are include: LG9, LG10, PM1, RA1, RA2.
(c) to acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone	The CMP, through the implementation of Section 6 A Business Plan which includes coastal management actions (Section 4) to address the threats (Section 2) to the values of the coastal zone (Section 1.3). It aims to acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone. The CMP has identified the threats and risks to ACH values (see Section 2, p16-30) and developed specific management actions aimed at protection of ACH and increasing the participation of local First Nations groups in coastal zone management detailed in Section 4 (p34-6), refer Actions LG12, LG13 and LG14.
(d) to recognise the coastal zone as a vital economic zone and to support sustainable coastal economies	The Stage 1 Scoping Study of this CMP provided an overview of the economic value of the coastal zone, and this is emphasised in the objectives, vision and purpose, and strategic directions provided in Section 1.3 (p9-11) of the CMP. Management options were identified that address the threats to the economic value of the coastal zone (including coastal hazards, and the loss of social and recreational amenity) in Stage 2 Report B (Supporting Document B) and Stage 3 (Supporting Document E) reports. These actions were then assessed and prioritised using key criteria that included their efficacy in terms of the protection of these values in Stage 3. More information is provided in Section 4 of the CMP (p34-63). Relevant actions for this objective are: FB2, FB3, FB4, PM1, EM2, WQ1, WQ3, RA1.
(e) to facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making	CMP Stage 2 Report B (Supporting Document B) included a detailed study of the various threats to environmental and ecological values of the study area – this is discussed in the CMP in Section 2 A Snapshot of Issues (p16-30). Some notable issues included the impacts of coastal development on local environmental values

CM Act Objects	How this is addressed in this CMP
	(such as loss of habitat, poor water quality, migration of ecological habitat under future sea level rise, and other issues related to urbanisation and population growth). Several actions are related to maintaining sustainable planning controls that appropriately manage development in the dynamic coastal zone. These actions were then assessed and prioritised using key criteria that included their efficacy in terms of the protection of these values. More information is provided in Section 4 (p34-63). Relevant actions for this objective are: PM1, EM1, EM2.
(f) to mitigate current and future risks from coastal hazards, taking into account the effects of climate change	The extent of current and future coastal hazards - and the associated risks – were assessed in detail in CMP Stage 2 Report B (Supporting Document B) and summarised in the CMP in Section 2 (p16-30). Several actions were developed with the aim to mitigate the impacts of coastal hazards on the study area. This includes incorporating the effects of climate change, including sea level rise. These actions are spelt out in Section 4 (p34-63), and are: LG5, LG6, LG9, LG10, PM1, PM2.
(g) to recognise that the local and regional scale effects of coastal processes, and the inherently ambulatory and dynamic nature of the shoreline, may result in the loss of coastal land to the sea (including estuaries and other arms of the sea), and to manage coastal use and development accordingly	Local and regional coastal processes were assessed in detail in Stage 2 of the CMP (summarised in Section 2, p16-30), for example tidal and coastal inundation, coastal estuary entrance stability, and regional processes (e.g., ENSO and climate change). Several actions relate to maintaining sustainable planning controls to appropriately managed development in the dynamic coastal zone, with recognition of the local and regional scale effects of coastal processes, understanding that coastal land may be lost to the sea. More information is provided in Section 4 (p34-63). Relevant actions for this objective include: LG10, PM1.
(h) to promote integrated and co-ordinated coastal planning, management and reporting	The CMP includes a range of actions aimed at facilitating integrated coastal zone planning. More information is provided in Section 4 (p34-63) and includes eight (8) overarching strategic themes aimed to provide a large scale, coordinated approach to coastal management across the study area (p38-39). Relevant actions for this objective are: LG1, LG2, LG3, LG4, LG7, LG9. Inherently, the CMP process provides an integrated approach to coastal planning and management by providing a holistic view of the coastal zone within the study area. The CMP also sets out a clear MER framework (refer Section 8, p77-83) to monitor progress towards implementing the coastal management actions outlined in the CMP, and to assess the performance of the CMP in achieving its intended outcomes, and the objects of the CM Act. This provides an integrated and co-ordinated approach to reporting.
(i) to encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events	The CMP includes a range of actions aimed at improving the resilience of coastal assets and infrastructure. These are covered in Section 4 in Table 4-1, p40-53, and refer to actions: LG10, LG11, PM1. These actions have been developed based on a thorough review of coastal hazard risks, and associated impacts on assets and infrastructure in Stage 2 Report B (Supporting Document B) – this is discussed in Section 2 (p16-30).

CM Act Objects	How this is addressed in this CMP
	Future hazard projects have included a range of future SLR scenarios that account for future uncertainty associated with climate change and the response of coastal systems, including extreme storm events.
(j) to ensure co-ordination of the policies and activities of government and public authorities relating to the coastal zone and to facilitate the proper integration of their management activities	This CMP has included a review and assessment of policies and activities from government and public authorities relating to the coastal zone, which facilitates the proper integration of management programs. This is provided in Section 1.4 (p12-14), and in further detail in the Stage 1 Scoping Study (Advisian, 2020) and CMP Stage 2 Report A (Supporting Document A) Section 7 (p40-55). To ensure the coordination of government and public authorities, a robust program of engagement with a range of public authorities was performed - including relevant state government agencies (refer Section 3, p31-33). A key outcome of this CMP includes several actions intended to assist Council in engaging effectively with relevant stakeholders in order to facilitate a more integrated approach to coastal management. These actions are listed in Table 4-1 (p40-53), Section 4, and are: LG1, LG2, LG4, LG7.
(k) to support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions	During Stage 1 of the CMP, a comprehensive Stakeholder and Community Engagement Strategy was developed (Advisian, 2020). This outlined the timing, content, and engagement methods to be utilised during Stages 2 to 4 of the CMP. The engagement strategy was developed in accordance with the CMP Engagement Guidelines (OEH, 2018), the Shoalhaven City Council Community Engagement Policy and the use of the International Association for Public Participation (IAP2) guidelines. This strategy has been implemented through the development of the CMP, which has involved a robust regime of stakeholder and community engagement integrated through all stages. A summary of the engagement process for the CMP is described in Section 3 (p31-33). In addition, public participation in coastal management is encouraged through a series of actions described in Section 4 (p34-63) and listed in Table 4-1, including but not limited to Actions LG7, LG9, and FB4.
(l) to facilitate the identification of land in the coastal zone for acquisition by public or local authorities in order to promote the protection, enhancement, maintenance and restoration of the environment of the coastal zone	Whilst there are no actions in this CMP with the explicit intention to purchase private properties - the CMP has included actions intended to promote the protection, enhancement, maintenance, and restoration of the environment of the coastal zone. This includes several actions related to dune restoration work, maintenance and enhancement of ecological communities in coastal reserves, protection and rehabilitation of riparian vegetation, managing future spatial migration of vegetation/habitat under sea level rise and others. Moreover, Action EV1: Protect and/or rehabilitate riparian and foreshore areas to enhance estuarine vegetation includes measures such as considering acquisition and protection of key locations (i.e. Coastal Wetlands and Littoral Rainforests).

CM Act Objects	How this is addressed in this CMP
(m) to support the objects of the *Marine Estate Management Act 2014*	Stage 2 of this CMP identified a range of threats and risks to the study area, including the NSW Marine Estate Threat and Risk Assessment (TARA) (BMT WBM, 2017) – and included strong consideration of stressors identified in the TARA as high priority stressors for the south coast of NSW. This is described in Section 2 (p16-30). The CMP supports the objectives of the MEM Act by identifying and implementing actions that address these high priority stressors – both in the present day and over future planning horizons.

Table E-2: Objects of the CM Act for the various CMAs, and how they have been addressed in this CMP

CMA Objectives	How this is addressed in this CMP
Coastal Wetlands and Littoral Rainforests	
(a) to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity	Potential risks to the coastal wetlands and littoral rainforests across the CMP study area have been identified and assessed across the CMP Stage 2 Report B (Supporting Document B) and in Stage 2 Report A (Supporting Document A) where maps of the coastal wetlands and rainforests are presented in maps in Section 7.2.3.1 (p48-50). The identification and design of management actions in Stage 3 and 4 are cognisant of the need to protect coastal wetlands and littoral rainforests in their natural state and to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change. Actions that may have a potential impact on these areas were assessed as such and did not proceed to Stage 4. Several actions include provisions to protect coastal wetlands and littoral rainforests, including Actions PM1, WQ3, and EV1.
(b) to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests	Potential risks to the coastal wetlands and littoral rainforests across the CMP study area have been identified and assessed across the CMP Stage 2 Report B (Supporting Document B) and in Stage 2 Report A (Supporting Document A) where maps of the coastal wetlands and rainforests are presented in maps in Section 7.2.3.1 (p48-50). The identification and design of management actions in Stage 3 and 4 are cognisant of the need to protect coastal wetlands and littoral rainforests in their natural state and to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change. Actions that may have a potential impact on these areas were assessed as such and did not proceed to Stage 4. The CMP promotes the rehabilitation and restoration of degraded coastal areas in general via Action EV1 *Protect and/or rehabilitate riparian and foreshore areas to enhance estuarine vegetation*.
(c) to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration	Potential risks to the coastal wetlands and littoral rainforests across the CMP study area have been identified and assessed across the CMP Stage 2 Report B (Supporting Document B) and in Stage 2 Report A (Supporting document A) where maps of the coastal wetlands and rainforests are presented in maps in Section 7.2.3.1 (p48-50). The identification and design of management actions in Stage 3 and 4 are cognisant of the need to protect coastal wetlands and littoral rainforests in their natural state and to

CMA Objectives	How this is addressed in this CMP
	improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change. Actions that may have a potential impact on these areas were assessed as such and did not proceed to Stage 4. The CMP promotes to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration via Actions: LG8, PM1, which specifically outlines that 'Consideration should also be made to encourage land management and zoning that enables the migration of wetland ecosystems with sea level rise.'; EV1, which particularly includes in its description that 'For public lands, Council to consider rezoning identified wetland migration areas for conservation purposes when updating the LEP.'
(d) to support the social and cultural values of coastal wetlands and littoral rainforests	Potential risks to the coastal wetlands and littoral rainforests across the CMP study area have been identified and assessed across the CMP Stage 2 Report B (Supporting Document B) and in Stage 2 Report A (Supporting document A) where maps of the coastal wetlands and rainforests are presented in maps in Section 7.2.3.1 (p48-50). The identification and design of management actions in Stage 3 and 4 are cognisant of the need to protect coastal wetlands and littoral rainforests in their natural state and to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change. Actions that may have a potential impact on these areas were assessed as such and did not proceed to Stage 4. The CMP promotes social and cultural values of coastal wetlands and littoral rainforests via Action EV1.
(e) to promote the objectives of State policies and programs for wetlands or littoral rainforest management	Potential risks to the coastal wetlands and littoral rainforests across the CMP study area have been identified and assessed across the CMP Stage 2 Report B (Supporting Document B) and in Stage 2 Report A (Supporting document A) where maps of the coastal wetlands and rainforests are presented in maps in Section 7.2.3.1 (p48-50). The identification and design of management actions in Stage 3 and 4 are cognisant of the need to protect coastal wetlands and littoral rainforests in their natural state and to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change. Actions that may have a potential impact on these areas were assessed as such and did not proceed to Stage 4.

CMA Objectives	How this is addressed in this CMP
	The CMP promotes the objectives of State policies and programs for wetlands or littoral rainforest management (and all actions) via Actions: LG1, LG2, LG3, LG4.
Coastal Vulnerability Area	
(a) to ensure public safety and prevent risks to human life	The CMP has considered and contains several actions to help ensure public safety and prevent risks to human life. Section 5 (p64) states that it is the intent of Council to propose, by way of a planning proposal, the adoption of a map indicating a Coastal Vulnerability Area (CVA). This would include the combination of the following hazards: estuary entrance instability, coastal inundation, tidal inundation and erosion and inundation of foreshores caused by tidal waters and the action of waves. A detailed risk assessment of coastal hazard risks to public safety and public and private assets was undertaken in Stage 2 of the CMP; Section 7.2.3.2 of Stage 2 Report A (p51) (Supporting Document A) introduces the definition of the CVA in terms of the CM framework. Stage 2 Report B (Supporting Document B) focuses on the risk assessments undertaken for tidal inundation and coastal inundation. This included associated risks to public safety through coastal hazards, infrastructure and use of the coastal zone, including both in the present day and into the future, incorporating climate change. Subsequently, in Stage 3, actions were developed and prioritised in terms of their ability to mitigate these risks – whilst also considering social, environmental and cultural values. The relevant actions are presented in the Stage 3 report (Section 6 p107-139, Supporting Document E) and listed in Table 4.1 (p40-53) of Section 4 of the CMP. Relevant actions are: LG10, LG11, FB2, PM1, WQ2, RA1, RA2. Moreover, Action LG9 is to develop and maintain a program of community engagement with coastal communities about coastal hazard risk. An Emergency Action sub-plan has also been developed to support the CMP (Appendix B). This also includes actions to ensure public safety and prevent risks to human life. The implementation of the CZEAS is supported by Action PM2 within the CMP.
(b) to mitigate current and future risk from coastal hazards by taking into account the effects of coastal processes and climate change	The effects of projected climate change and how they may affect the relevant CMP study area has been considered in preparing the CMP.

CMA Objectives	How this is addressed in this CMP
	Risks associated with projected climate change have been considered (Stage 2 Report B and Stage 2 Report C and Section 2.2.5 p23-24 and Section 8.2.4 p81-83 of the CMP) at current and future scenarios, e.g., at 20 years, 50 years and 100 years in relation to sea level rise impacts. Where risks associated with projected climate change have been identified, specific actions have been proposed to address those risks as detailed in Table 4-1 and Table 6-3. These include actions: LG6, LG10, LG11, FB1, PM1, EV1. Moreover, Action LG9 is to develop and maintain a program of community engagement with coastal communities about coastal hazard risk. An Emergency Action sub-plan has also been developed to support the CMP (Appendix B). This also includes actions to mitigate current and future risk from coastal hazards by taking into account the effects of coastal processes and climate change. The implementation of the CZEAS is supported by Action PM2 within the CMP.
(c) to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place	Actions within the CMP to address coastal hazard threats (Section 4 and Table 4-1) within vulnerability areas have aimed to maintain the natural features and presence of beached, dunes and natural features of foreshores, taking into account the beach system operating at the relevant place. Several actions relate to foreshore and dune restoration works – in order to conserve dunes and the natural features of foreshores. This takes into account the beach systems and natural sediment transport pathways. Specific examples from Table 4-1 and Table 6-3 are: LG6, EV1.
(d) to maintain public access, amenity and use of beaches and foreshores	Several actions relate to management of foreshore areas in order to maintain and, where practicable, improve public access, amenity and use of beaches and foreshores within the lake and its entrance area. This also includes dune restoration works, formalised watercraft storage to increase the use of beaches and foreshores, and retaining and protecting public foreshores and recreational areas. Specific examples from Table 4-1 and Table 6-3 are: LG10, FB4, RA1, RA2.
(e) to encourage land use that reduces exposure to risks from coastal hazards, including through siting, design, construction and operational decisions	Several actions relate to maintaining and enforcing planning controls to encourage land use that reduces exposure to risks from coastal hazards and ensures ecologically sustainable

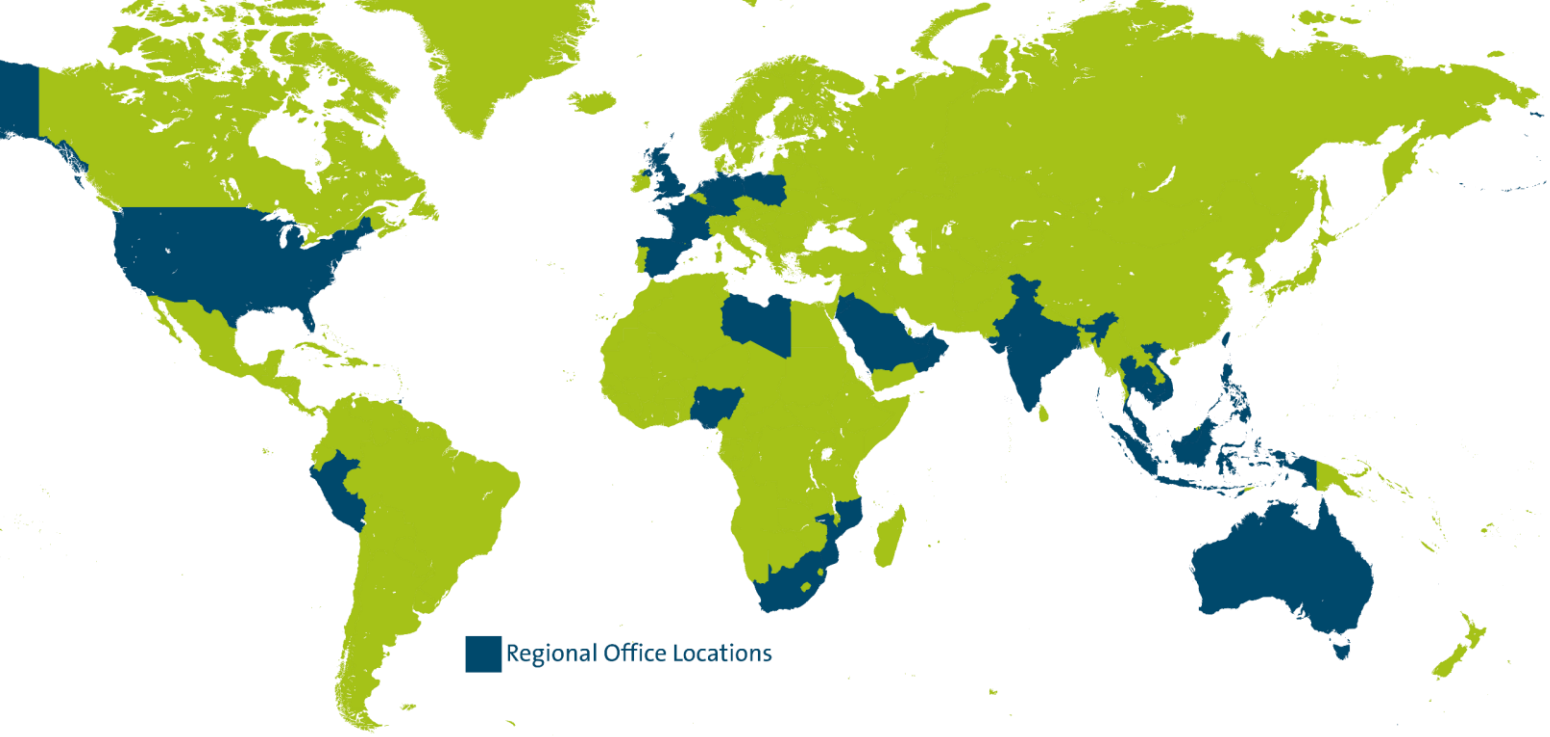
CMA Objectives	How this is addressed in this CMP
	development; including the development of a planning proposal to introduce a CVA and update the LEP and DCP. See Actions LG4 and PM1. This includes the design, construction and operational decisions of land use, including asset management plans for public assets likely to be impacted by coastal hazards in the future, for example Actions LG10, LG11.
(f) to adopt coastal management strategies that reduce exposure to coastal hazards: (i) in the first instance and wherever possible, by restoring or enhancing natural defences including coastal dunes, vegetation and wetlands, and (ii) if that is not sufficient, by taking other action to reduce exposure to those coastal hazards	The CMP adopts coastal management strategies that reduce exposure to coastal hazards: (i) In the first instance by restoring or enhancing natural defences. Several actions relate to foreshore and dune restoration works – in order to preserve beaches, dunes and the natural features of foreshores. All potential options in Stage 3 were assessed, not just on their ability to provide coastal hazard protection, but their impact on the coastal environment, public safety, social and recreational amenity. Relevant actions within the CMP (Tables 4-1 and Table 6-3) Include: LG6, LG14, FB1, FB4, EV1. Moreover, Action LG9 is to develop and maintain a program of community engagement with coastal communities about coastal hazard risk. As a result, this CMP champions the use of "nature-based solutions", and several actions relate to beach restoration and dune restoration works and incorporation of the principles of the Environmentally Friendly Seawall Guidelines (DECC, 2009) into foreshore protection. (ii) If these are not sufficient, then other actions, for example relocation of assets, or allowing for natural wetland migration. As outlined in Table 4-1 and Table 6-3, examples of these are Actions: LG10, PM1, EV1.
(g) if taking that other action to reduce exposure to coastal hazards: (i) to avoid significant degradation of biological diversity and ecosystem integrity, and (ii) to avoid significant degradation of or disruption to ecological, biophysical, geological and geomorphological coastal processes, and (iii) to avoid significant degradation of or disruption to beach and foreshore amenity and social and cultural values, and (iv) to avoid adverse impacts on adjoining land, resources or assets, and	As above, where the proposed other action will meet all these requirements whilst reducing exposure to coastal hazards. See Table 4-1 (p40-53) in Section 4 (p34-63), where they have been assessed on these requirements through the processes and multi-criteria analysis documented in the CMP Stage 3 Report (Supporting Document E). As an example of Actions for each option: (i) LG8, EV1 (ii) LG6, FB1, EV1 (iii) LG10, LG11, EV1 (iv) LG11, PM1

CMA Objectives	How this is addressed in this CMP
(v) to provide for the restoration of a beach, or land adjacent to the beach, if any increased erosion of the beach or adjacent land is caused by actions to reduce exposure to coastal hazards	(v) FB1
(h) to prioritise actions that support the continued functionality of essential infrastructure during and immediately after a coastal hazard emergency	The Coastal Zone Emergency Action Subplan (CZEAS, Appendix B) prioritises actions that support the continued functionality of essential infrastructure during a coastal hazard emergency. The CZEAS outlines actions that need to occur in the prevention, preparation, response and recovery phases of an emergency. Action PM2 (Table 4-1 and Table 6-3) is to activate and implement the CZEAS. Stage 2 of the CMP (Supporting Documents A and B) specifically investigated coastal hazard risks to essential infrastructure including roads, wastewater assets, major infrastructure. In Stage 3, actions were developed specifically to address the continued functionality of essential infrastructure are outlined within Table 4-1 and Table 6-3: LG10, LG1, PM2.
(i) to improve the resilience of coastal development and communities by improving adaptive capacity and reducing reliance on emergency responses	The actions that improve the resilience of coastal development and communities are provided in Section 4 (p34-63), after being evaluated for their feasibility, acceptability and viability to meet these objectives in the CMP Stage 3 Report (Supporting Document E). PM1 is an example of this type of action (Table 4-1 and Table 6-3).
Coastal Environment Area	
(a) to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity	The various threats to the environmental values and natural processes and character, scenic value, biological diversity and ecosystem integrity of the study area were assessed in detail in CMP Stage 2 Report B (Supporting Document B). These values and their associated threats were considered in the development and assessment of management actions in the CMP Stage 3 Report (Supporting Document E). Actions to protect and enhance the values above (e.g., environmental values and natural processes) are detailed in Table 4-1 (p40-53) and Table 6-3 (p70-75). Several actions relate to foreshore restoration and dune restoration works – in order to preserve beaches, dunes and the natural features of foreshores. Refer to Actions LG6 and FB1. Several actions relate to maintenance and enhancement of ecological communities in coastal reserves, protection and rehabilitation of riparian vegetation, and managing future

CMA Objectives	How this is addressed in this CMP
	spatial migration of vegetation/habitat under sea level rise. Refer to Actions FB1, FB4 and EV1. Several actions relate to maintaining and improving water quality and estuary health, including Actions FB2, WQ1, WQ2, and WQ3. Several actions relate to management of foreshore areas in order to maintain and, where practicable, improve public access, amenity and use of beaches and foreshores within the lake and its entrance area. Refer to Actions FB1, FB3, and RA2.
(b) to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change	Threats to the environmental values and natural processes and character, scenic value, biological diversity and ecosystem integrity of the study area were assessed in detail in CMP Stage 2 Report B (Supporting Document B). These values and their associated threats were considered in the development and assessment of management actions in the CMP Stage 3 Report (Supporting Document E). Actions to reduce these threats and improve resilience to the study area are detailed in Table 4-1 (p40-53) and Table 6-3 (p70-75) in the CMP, and refer to Actions: • to foreshore restoration and dune restoration: LG6 and FB1. • to maintain and enhance ecological communities in coastal reserves, protection and rehabilitation of riparian vegetation: FB1, FB4 and EV1 • to maintain and improve water quality and estuary health: FB2, WQ1, WQ2, and WQ3. • To research about impacts of coastal hazards and climate change (in particular SLR): LG5.
(c) to maintain and improve water quality and estuary health	Threats to the environmental values and natural processes and character, scenic value, biological diversity and ecosystem integrity of the study area were assessed in detail in CMP Stage 2 Report B (Supporting Document B). These values and their associated threats were considered in the development and assessment of management actions in the CMP Stage 3 Report (Supporting Document E). The CMP includes management actions to address priority risks to water quality. Actions that aim to maintain and improve water quality include listed in Table 4-1 (p40-53) and Table 6-3 (p70-75), and refer to Actions FB2, WQ1, WQ2, and WQ3.
(d) to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons	As above, threats to the environmental values and natural processes and character, scenic value, biological diversity

CMA Objectives	How this is addressed in this CMP
	and ecosystem integrity of the study area were assessed in detail in CMP Stage 2 Report B (Supporting Document B). These values and their associated threats were considered in the development and assessment of management actions in the CMP Stage 3 Report (Supporting Document E). The CMP incorporates specific management actions that support the social and cultural values of the Lake Conjola study area. These are listed in Table 4-1 (p40-53) and Table 6-3 (p70-75) and include examples such as: • to foreshore restoration and dune restoration in order to preserve beaches: LG6 and FB1 • to review and improve infrastructure public asset management: LG10, LG11 • to protect Aboriginal cultural heritage: LG12 • to provide opportunities and help build capacity to local Aboriginal Ranger programs, to enhance their role in management of Sea Country: LG14 • to improve boat access: RA1, RA3.
(e) to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place	As above, threats to the environmental values and natural processes and character, scenic value, biological diversity and ecosystem integrity of the study area were assessed in detail in CMP Stage 2 Report B (Supporting Document B). These values and their associated threats were considered in the development and assessment of management actions in the CMP Stage 3 Report (Supporting Document E). Specific management actions are included within the CMP that relate to maintaining the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating. These are outlined in Table 4-1 (p40-53) and Table 6-3 (p70-75) and include LG6 and FB1, among others.
(f) to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms	As above, threats to the environmental values and natural processes and character, scenic value, biological diversity and ecosystem integrity of the study area were assessed in detail in CMP Stage 2 Report B (Supporting Document B). These values and their associated threats were considered in the development and assessment of management actions in the CMP Stage 3 Report (Supporting Document E). The CMP includes therefore coastal management actions that aim to facilitate improved public access, amenity and use of the foreshore within the CMP study area. These are outlined in Table 4-1 (p40-53) and Table 6-3 (p70-75) and include: LG6, FB1, FB3 and RA2.

CMA Objectives	How this is addressed in this CMP
Coastal Use Area	
(a) to protect and enhance the scenic, social and cultural values of the coast by ensuring that: (i) the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast, and (ii) adverse impacts of development on cultural and built environment heritage are avoided or mitigated, and (iii) urban design, including water sensitive urban design, is supported and incorporated into development activities, and (iv) adequate public open space is provided, including for recreational activities and associated infrastructure, and (v) the use of the surf zone is considered	The various threats to the scenic, social and cultural values of the study area were assessed in detail in CMP Stage 2 Report B (Supporting Document B). These values and their associated threats were considered in the development and assessment of management actions in the CMP Stage 3 Report (Supporting Document E). All potential options in Stage 3 were assessed, not just on their ability to provide coastal hazard protection, but also their impact on the coastal environment, public safety, social and recreational amenity. This is documented in the CMP Stage 3 Report (Supporting Document E), and if they did not meet these criteria, then the proposed option did not proceed through to Stage 4 of the CMP. The final CMP includes coastal management actions that aim to protect and enhance the scenic, social and cultural values of the coast. As well as the prevision of public access, facilities and cultural considerations along the coastline, this also includes the preparation of a planning proposal to incorporate a CVA and update the LEP and DCP to control development within the CVA area. These are listed in Table 4-1 (Section 4, p40-53) and Table 6-3 (Section 6, p70-75), examples are Actions LG10 and PM1.
(b) to accommodate both urbanised and natural stretches of coastline	The CMP includes coastal management actions that aim to accommodate both urbanised and natural stretches of coastline. These are listed in Table 4-1 and Table 6-3 and include actions such as: LG10, PM1, EM1.



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