Picton Road upgrade between Nepean River and Almond Street, Wilton

Review of Environmental Factors

Appendix G

Hydrology and Hydraulics Assessment

G

Transport for NSW

Picton Road upgrade between Nepean River and Almond Street, Wilton

Hydrology and Hydraulic Assessment

Transport for NSW

January 2024

Project name		Picton Road upgrade between Nepean River and Almond Street, Wilton					
Document title		Picton Road upgrade between Nepean River and Almond Street, Wilton | Hydrology and Hydraulic Assessment					
Project number		12560200					
File name		12560200_REP_Picton Road Upgrade REF_Hydrology - rev 0.docx					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S4	Final for exhibition	Carol Schreiber	N Philps D Bannigan	*Nicole Philps*	K O'Brien		22.1.2024

GHD Pty Ltd | ABN 39 008 488 373

133 Castlereagh Street, Level 15

Sydney, New South Wales 2000, Australia

T +61 2 9239 7100 | **F** +61 2 9239 7199 | **E** sydmail@ghd.com | **ghd.com**

Executive summary

Transport for NSW (Transport) is proposing to upgrade Picton Road between the Nepean River and Almond Street in Wilton, NSW (the proposal). The proposal includes upgrading the Picton Road interchange with the M31 Hume Motorway.

The proposal is located within the catchment of the Nepean River and crosses a number of tributaries that drain directly to the river. Tributaries that form the receiving waters for the study area (and potential runoff from the proposal site) include Byrnes Creek, Stringybark Creek and Allens Creek.

To understand the flooding risks and to identify relevant mitigation measures, flood modelling has been carried out to assess baseline flooding conditions and to predict the potential impact of the proposal on flooding regimes.

Currently, within the extent of the proposal site, Picton Road generally has one per cent AEP flood immunity under existing conditions with the following exceptions:

– At a section of Picton Road 350 metres west of Almond Street where there is diversion of flow from the catchment of Tributary 8 to Tributary 7. At this location water flows onto the road from where it is diverted west along Picton Road to Tributary 7.
– At the western end of the proposal, where there is flow across Picton Road where the proposal ties back into the existing Picton Road pavement.

New culverts that would be delivered as part of the proposal have been sized to have capacity to carry the one per cent AEP flow rates under conditions of partial blockage of the culvert inlets. As a result, culvert sizes have been increased compared to existing culverts at most of the tributaries.

The proposal is predicted to have minimal potential for impacts on surrounding areas for events up to and including the one per cent AEP. Predicted flood level increases outside the proposal site are within the suggested Austroads 2023 guideline flood impact limits with the exception of two locations:

– North of Picton Road there is a property on the south side of Hornby Street with a building located within the modelled one per cent AEP flood extent of Tributary 8.
– There is also a property north of Hornby Street where the modelled one per cent AEP flood extent in Tributary 7 (Stringybark Creek) is in close proximity to an existing roofed structure at the rear of the property.

Flood modelling predicts that the proposal could potentially cause increases in flood levels affecting these structures of up to 40 and 80 millimetres respectively. Further investigation of these properties, including floor level survey, would be carried out during detailed design to confirm the extent of impacts and appropriate mitigation measures. A concept level assessment has been carried out to confirm that there are feasible solutions to mitigate these flooding impacts if confirmed through the additional surveys.

There is another flood affected building in Condell Park Road however the proposal would not cause afflux at this property as the catchment headwaters and tailwaters lie outside the influence of the proposal site.

A climate change assessment found that flood levels would increase within the study area in both high and low future emissions scenarios. In accordance with Austroads 2023 guidelines, the proposed design would not overtop in a one per cent event under a low emissions future climate change scenario. In a high emissions future climate change scenario, overtopping may occur during a one per cent AEP storm at Picton Road immediately west of Pembroke Parade, between Pembroke Parade and Almond Street, and at Almond Street north of the intersection with Picton Road. Therefore, the effects of climate change may negatively impact the safety of vehicles and pedestrians in areas that are not currently exposed to such hazards under high emissions scenarios.

Construction and operational safeguards have been recommended to mitigate the predicted impacts of the proposal.

Contents

Table index

Figure index

Appendices

1. Introduction

1.1 The proposal

Transport for NSW (Transport) proposes to upgrade Picton Road between the Nepean River and Almond Street in Wilton, NSW (the proposal). The proposal includes upgrading the section of Picton Road from about 1.3 kilometres east of the bridge over the Nepean River to about 200 metres east of Almond Street, including the M31 Hume Motorway interchange.

The proposal forms the western section of the broader Picton Road upgrade, which involves upgrading about 30 kilometres of Picton Road between the Nepean River and the M1 Princes Motorway.

The proposal is subject to assessment by a review of environmental factors (REF) under Division 5.1 of *Environmental Planning and Assessment Act 1979* (EP&A Act). For the purposes of these works, Transport is the proponent and the determining authority under Division 5.1 of the EP&A Act.

1.1.1 Proposal location

The proposal is located within Wilton, in the Wollondilly local government area (LGA). The proposal site, shown in Figure 1.1 and Figure 1.2, comprises the area that would be required to construct and operate the proposal, including ancillary facilities and operational infrastructure.

1.1.2 Key features of the proposal

Key features of the proposal include:

– widening and upgrading Picton Road for a distance of about five kilometres between the Nepean River and Almond Street to provide:
  - a minimum of two 3.5 metre-wide traffic lanes in each direction with a central median, increasing to three traffic lanes in each direction approximately between the Wilton Park Road and Aerodrome Drive intersection and the Pembroke Parade and Greenway Parade intersection
  - three-metre-wide shoulders on the left lane side in each direction
– upgrading the existing Picton Road and M31 Hume Motorway interchange into a diverging diamond layout, including:
  - removing the existing Picton Road bridge and constructing two new bridges over the M31 Hume Motorway
  - upgrading and realigning on and off ramp connections with the M31 Hume Motorway to suit the new interchange layout and to allow free flow of traffic between Picton Road and the M31 Hume Motorway
  - providing a new four-metre-wide shared user path along the southern bridge
  - removing the existing traffic signals on Picton Road and installing new traffic signals with more efficient phasing and more traffic capacity
– new and upgraded shared paths on Picton Road, including underpasses under the southbound on ramp connections to the M31 Hume Motorway and an overpass of the northbound off ramp connection from the M31 Hume Motorway, located:
  - adjacent to the westbound slow lane of the proposal from the western extent to around 420 metres west of Almond Street to connect with planned active transport infrastructure to be delivered as part of the South East Wilton development
  - adjacent to the eastbound slow lane between Aerodrome Drive and the western extent of the proposal and between Pembroke Parade and Almond Street

– reconfiguring the existing Picton Road intersections with Wilton Park Road, Aerodrome Drive, Janderra Lane and Almond Street into left in, left out only (the timing of delivery of the reconfigured Almond Street intersection is subject to confirmation of timeframes for delivery of other road works planned at the intersection as outlined in section 1.1.3 and chapter 3 of the REF)
– integration with new traffic signals and widening roadworks constructed in 2023 at the intersection of Picton Road and Pembroke Parade and Greenway Parade
– adjusting the posted speed from the western extent of the proposal, through the interchange and to the east of Pembroke Parade to 60 kilometres per hour.

Ancillary work and construction activities associated with the proposal would include:

– property works including acquisition, adjustment to existing accesses and fencing
– civil earthworks and drainage works
– construction and adjustment of retaining walls, road pavement, and water quality devices
– tie-in work to adjoining sections of Picton Road, M31 Hume Motorway and other local roads
– installing and adjusting roadside furniture and delineation, such as safety barriers, kerb and gutter, fencing, lighting, signage, noise treatment and pavement markings
– installing new intelligent transport systems including, but not limited to, closed circuit television and variable message signs
– protecting, adjusting and relocating existing utilities and associated structures
– landscaping and rehabilitation of disturbed areas
– adjustment and provision of noise treatments, including at-property works and noise mounds, as required
– establishment of temporary ancillary facilities to support construction including compound sites, site offices, stockpiles, access tracks, turning bays and laydown areas
– site preparation works, including vegetation clearing and grubbing, site fencing, temporary drainage measures, traffic management, and implementation of environmental management measures.

An overview of the proposal is provided in Figure 1.2. Further information is provided in chapter 3 of the REF.

1.2 Purpose of the report

This hydrology and hydraulic assessment has been prepared by GHD Pty Ltd (GHD) on behalf of Transport as part of the REF. This report has been prepared to assess the potential impacts of constructing and operating the proposal on the hydrology and flooding regimes of the surrounding watercourses and catchments. The report:

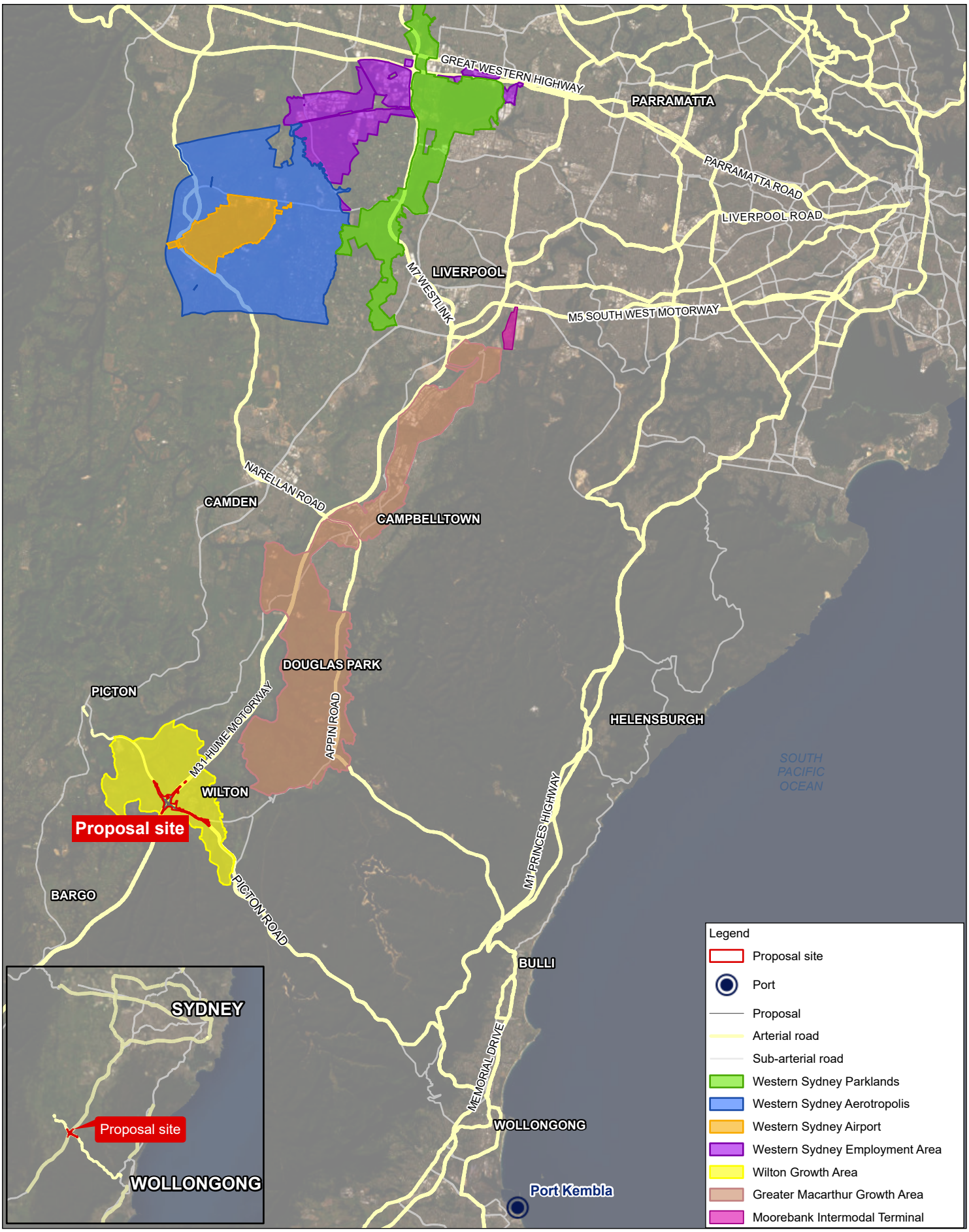
– describes the existing catchments, watercourses and flooding regimes
– assesses the potential impacts of constructing and operating the proposal on the flooding regimes of the local watercourses
– recommends measures to avoid, minimise, mitigate and manage the potential impacts identified.

1.3 Report structure

The report is comprised of the following sections:

– **Section 1 – Introduction**: introduces the report and assessment.
– **Section 2 – Methodology**: a brief summary of the methods and guidance used for the assessment of the proposal.
– **Section 3 – Existing environment**: summarises the existing hydrology environment.
– **Section 4 – Construction impact assessment**: discusses the potential construction impacts of the proposal and results of the hydrology assessment.
– **Section 5 – Operational impact assessment**: discusses the potential operational impacts of the proposal and results of the hydrology assessment.

- **Section 6** – **Climate change assessment**: discusses the potential impacts of climate change on the proposal.
- **Section 7 – Cumulative impacts**: discusses the potential impacts of nearby projects which could be under construction or operational during a similar timeframe.
- **Section 8 – Recommended safeguards and management measures**: provides recommendations of proposed mitigation options for the potential construction and operational impacts of the proposal.
- **Section 9 – Conclusion**: presents a summary of flooding and hydrology assessment findings and sets out the principal conclusions for the study.
- **Section 10 – References**: presents the documents that have been referenced within this report.



Paper Size ISO A4

0 5 10

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GDA2020

GHD

Transport for NSW
Picton Road upgrade between Nepean River and Almond Street, Wilton – Hydrology and Hydraulic Assessment

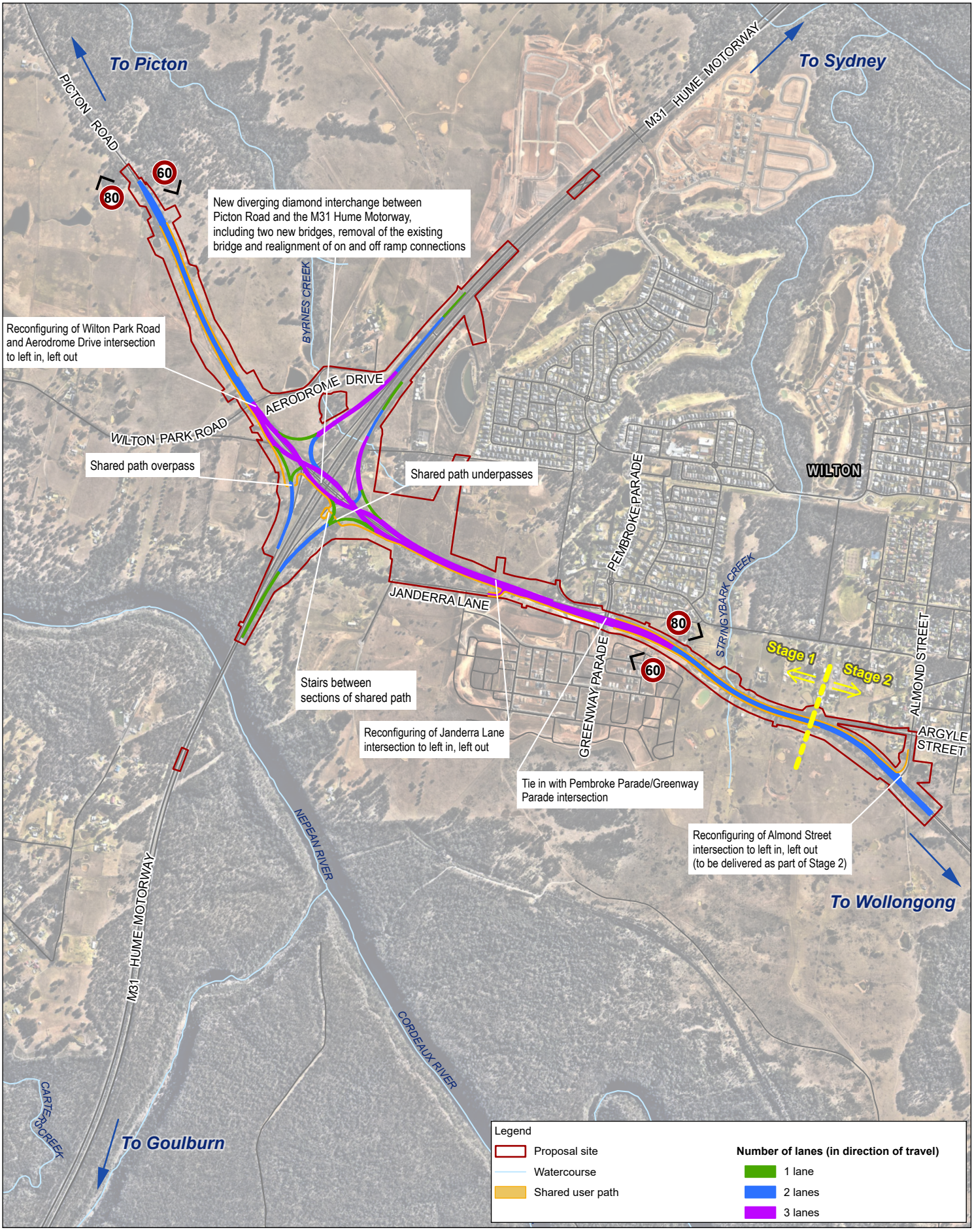
Location of the proposal

Project No. **12560200**
Revision No. **0**
Date **24/10/2023**

FIGURE 1.1

N:\AU\Wollongong\Projects\23\12560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_REF_B.aprx
Print date: 24 Oct 2023 - 15:17

Data source: Earthstar GeographicsNSW SS-SDS, Topographic base data, 2023; Transport network - TfNSW, 2023.
Created by:akildea



Paper Size ISO A4

0 250 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GDA2020

GHD

Transport for NSW
Picton Road upgrade between Nepean River and Almond Street, Wilton – Hydrology and Hydraulic Assessment

The proposal

Project No. **12560200**
Revision No. **0**
Date **24/10/2023**

FIGURE 1.2

N:\AU\Wollongong\Projects\23\12560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_REF_B.aprx
Print date: 24 Oct 2023 - 15:18

Data source: NSW SS-SDS, Topographic base data, 2023; Transport network - TfNSW, 2023.
Created by:akildea

2. Methodology

2.1 Study approach

The study area includes the wider area including and surrounding the proposal site, with the potential to be directly or indirectly affected by the proposal, that has been considered for the purposes of this assessment.

The proposal is located within the catchment of the Nepean River and is traversed by a number of ephemeral tributaries that drain across Picton Road through stormwater culverts and ultimately to the Nepean River. The catchments to these tributaries currently have a mixture of rural and developing urban land uses. The urban developments surrounding the proposal include the Wilton Greens estate currently under construction and other future planned developments within the Wilton Growth Area. Planned developments include the Wilton Town Centre, North Wilton, South Wilton, West Wilton and the further stages of Bingara Gorge and South East Wilton precincts.

The proposal would result in increased impervious surfaces within the tributary catchments and has the potential to alter flooding behaviour, including changes to flood levels and velocity of flows in the surrounding watercourses. Key potential hydrology issues associated with the proposal include:

– increased runoff due to additional areas of pavement
– increased flood levels upstream due to proposed culvert extensions and road embankments
– flood level impacts through existing and proposed residential areas downstream of the proposal.

To understand the potential flooding risks and identify relevant mitigation measures, flood modelling has been carried out to assess baseline flooding conditions and to predict the potential impact of the proposal on flooding regimes. The methodology adopted for the assessment is summarised as follows:

– review of previous studies relating to the flooding and hydrology of the study area
– review of design criteria, applicable design standards and relevant legislation and policies
– collation of input data to enable development of a flood model
– flood modelling to assess the existing conditions, proposed conditions and effectiveness of mitigation options
– recommendations for monitoring and management of identified impacts and risk, including mitigation measures as appropriate.

2.2 Relevant policies and guidelines

2.2.1 Legislative context

Environmental Planning and Assessment Act 1979

An REF is prepared to satisfy Transport's duties under Part 5, section 5.5 of the EP&A Act to 'examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity' and section 5.7 in making decisions on the likely significance of any environmental impacts. This hydrology assessment forms part of the REF being prepared for the proposal and assesses the potential hydrology and flooding impacts of the proposal.

Water Management Act 2000

The *Water Management Act 2000* (WM Act) provides a framework for the sustainable and integrated management of water sources across NSW. The WM Act primarily deals with the establishment of management plans for committees who manage water management areas, issue of access licenses for users to retrieve water from a designated area and approvals for the use of water from a particular location.

Under section 91 of the WM Act, approval is required for a 'controlled activity that is carried out on 'waterfront land'. Waterfront land is defined as the bed of any river, lake or estuary, and the land within 40 metres of the river banks, lake shore or estuary mean high-water mark. Waterfront land can be identified using *Natural Resources Access Regulator Waterfront land tool* (NSW Department of Planning, Industry and Environment). A number of the tributaries that cross the proposal and the adjacent land are identified as waterfront land.

Transport is exempt from controlled activity approvals (section 91E of the WM Act) in accordance with clause 38 of the Water Management (General) Regulation 2011.

Further information about the legislative context for the proposal is provided in chapter 4 of the REF.

New South Wales Flood Prone Land Policy

The primary objective of the flood prone land policy is to reduce the impact of flooding and flood liability on communities and individual owners and occupiers of flood prone property. The policy adopts a merit-based approach for development decisions in the floodplain taking into account social, economic and ecological factors, as well as flooding considerations.

2.3 Guidelines

This report has been prepared with consideration to the following guidelines.

2.3.1 Flood Risk Management Manual

The *Flood Risk Management Manual* (Department of Planning and Environment (DPE), 2023) (the Flood Risk Management Manual) supports the NSW Government's flood prone land policy. The policy sets the direction for flood risk management in New South Wales. The Flood Risk Management Manual and its toolkit support the implementation of the policy through the combined efforts of all levels of government.

2.3.2 Climate Risk Ready NSW Guide

The *Climate Risk Ready NSW Guide* (Department of Planning, Industry and Environment (DPIE), 2020) has been developed to help the NSW Government sector to lead, influence and enable their organisations to better understand their exposure to climate change risks and opportunities, and to develop plans to address them. The guide provides practical guidance to assess and manage climate change risks.

2.3.3 Transport for NSW Climate Risk Assessment Guidelines

The Transport for New South Wales *Climate Risk Assessment Guidelines* ((Transport, 2021) have been developed to provide Transport, Project Teams, Alliance partners, contractors, and other Transport stakeholders (external and internal) with practical "how-to" advice and requirements on conducting a Climate Risk Assessment. The developed framework can be used for planning and investment/options assessment.

2.3.4 Australian Rainfall and Runoff: A Guide to Flood Estimation

Australian Rainfall and Runoff: A Guide to Flood Estimation 2019 (Australian Government and Engineers Australia) (ARR 2019) is used nationally as a guideline document, data and software suite, providing the information necessary for the estimation of design flood characteristics in Australia. The purpose of ARR 2019 is to provide a framework for reliable and robust estimates of flood characteristics to enable the assessment of flooding risk and design of infrastructure. ARR 2019 also provides procedures for climate change impact estimation.

The procedures and data provided in ARR 2019 have been adopted in the flood modelling of the study area and assessment of the proposal flooding impacts presented in this document.

2.3.5 Technical Guideline: Temporary stormwater drainage for road construction

Technical Guideline: Temporary stormwater drainage for road construction (Roads and Maritime Services, 2011) provides design considerations and example drawings to assist Transport and contractors to plan and design for temporary stormwater drainage on Transport construction sites. The use of the guideline is intended to support improved environmental performance and efficient construction delivery.

The guideline has been applied in the development of construction stormwater impact mitigation measures described in section 4.

2.3.6 Guide to Road Design Part 5: Drainage - General and Hydrology Considerations

Guide to Road Design Part 5: Drainage - General and Hydrology Considerations (Austroads, 2023) (Austroads 2023 guideline) provides guidance on the design of drainage systems for roads. It provides reference to the implementation of the guidance provided in ARR 2019 as it relates to the design of drainage systems for road drainage systems. This includes guidance on hydrology, safety and environmental aspects and the maintenance and operation of these systems.

The Austroads 2023 guideline has been used to provide guidance on allowable afflux limits for the proposal and for assessment of climate change impact and development of adaptation measures.

2.3.7 Technical Flood Risk Management Guideline: Flood Hazard

The *Technical Flood Risk Management Guideline: Flood Hazard* (Australian Institute for Disaster Resilience, 2014) (Technical Flood Risk Management Guideline) provides a basis for quantifying the variations in flood hazard on a floodplain. The development of Technical Flood Risk Management Guideline was overseen by the National Flood Risk Advisory Group. The guideline provides methods to assess the vulnerability of people and/or the built environment to flood hazard using specific flood parameters for a select range of flood events that can be compared to thresholds. By using the guideline it is possible to describe the danger of the flooding to people, buildings and infrastructure in the community.

The Technical Flood Risk Management Guideline has been used to assess the flood hazards associated with the proposal.

2.4 Previous studies

2.4.1 Wollondilly Shire Flood Study - Broad Scale Assessment

The broad scale flood assessment was prepared for Wollondilly Shire Council by Advisian in 2021 and was focused on the eastern portion of Wollondilly Shire. The objectives of the study are:

- To develop flood models to assess flood conditions in areas not previously studied. The broad scale assessment is to not replace the findings of existing detailed studies, such as those completed recently for Stonequarry Creek at Picton and the Nepean River.
- The flood modelling focus is to be on watercourse flooding upstream from the influence of the Nepean River.
- To account for the rainfall data and methodologies published in the ARR 2019 guidelines.
- To prepare flood depth and level mapping for a range of design flood events, which is to be used to identify flood affected properties for the purposes of notification of flood controls on Planning Certificates.
- To identify locations for the second stage detailed flood assessments.

The hydrology and hydraulic assessment methodology described in section 2 has adopted the modelling approach described in Advisian (2021) with the use of Watershed Bounded Network Model (WBNM) and TUFLOW software to simulate flooding behaviour, albeit at a finer resolution as is appropriate to assess the proposal flooding impacts on surrounding land.

2.4.2 Wilton Greens Development Stage 1 – Stormwater Management Report

The Wilton Greens Stage 1 Stormwater Management Report was prepared by SMEC in July 2021 to support the detailed design for the Wilton Greens Stage 1 drainage works. This report describes the outcomes of the development of the Stage 1 stormwater management plan. This includes calculation of pre and post development stormwater discharges from the Stage 1 development, sizing of stormwater detention basins and design of culverts to convey Stage 1 flows across Picton Road.

The report and associated drainage design plans have been used to determine culvert requirements as part of the concept design of the proposal at this location of Picton Road.

2.4.3 Preliminary Water Cycle Management Plan for Wilton Greens – Stages 2 and 3 Neighbourhood Plan Submission

The Preliminary Water Cycle Management Report was prepared by Indesco in 2021 on behalf of Country Garden Wilton East Pty Ltd in support of the Neighbourhood Plan application for the proposed development of Stages 2 and 3 of the Wilton Greens development. This report provides limited information demonstrating the potential for Stages 2 and 3 to comply with Wollondilly Shire Council's requirements, as set out in the *Wilton Growth Area Development Control Plan 2021* (Department of Planning, Industry and Environment (DPIE), 2021) (the Wilton Growth Area DCP).

This report has been reviewed as background information in assessing the potential cumulative impacts of the proposal.

2.4.4 Draft Wollondilly Hazards Analysis and Emergency Management Study

The draft *Wollondilly Hazards Analysis and Emergency Management Study* (2021) was prepared by Molino Stewart Pty Ltd on behalf of Wollondilly Shire Council and provides an integrated study on hazards for the entire LGA, following the 2019-2020 bushfires and major local flooding in Picton. This study is currently in draft form and has not been publicly released. The report considers flooding hazards and flood risk in the Shire and identifies the site specific studies that are separately underway. It notes that there is a need to conduct flood studies to assess existing and future overland flow in the Wilton urban development area.

2.5 Criteria

2.5.1 Flooding performance

Transport has developed a series of hydrologic design criteria with the aim of meeting the proposal objectives with respect to flooding performance of the proposal elements. The proposal has the following objectives in relation to flooding:

– the proposal would not have adverse flooding impacts on adjoining properties and infrastructure
– adverse impacts to the environment are minimised
– the proposal is to be safe to construct and operate and meets WHS requirements.

The flood compliance criteria for the proposal are summarised in Table 2.1.

Table 2.1 Hydrology criteria

Element	Criteria
No surcharging of channels and open drains	20% AEP
Capacity of culverts where surcharge is allowable	2% AEP
Capacity of watercourse structures where surcharge is undesirable	1% AEP
Major storm event for which the proposal should cause no property damage	1% AEP
Major storm event for which the proposal should cause no structural damage	0.05% AEP

2.5.2 Flooding impacts

The Austroads 2023 guideline provides guidance on acceptable flood impacts related to road design. The guideline notes that every project is distinct, and the potential impacts need to be considered in each case, and that these should be confirmed through consultation with stakeholders and local residents, and property owners. The suggested maximum impacts from the Austroads 2023 guideline are listed below:

Flood levels

- Residential buildings – 25 millimetres maximum impact in a one per cent Annual Exceedance Probability (AEP) (10 millimetres where flooding would cause significant damage).
- Residential yards – 50 millimetres.
- Industrial and commercial buildings – 50 millimetres.
- Industrial and commercial yard – 100 millimetres.
- Non-habitable structures (sheds) – 100 millimetres.
- Agricultural land – 200 to 400 millimetres impact in events up to a one per cent AEP depending on the sensitivity of the crops.
- Grazing land – 200 millimetres impact in events up to the one per cent AEP.
- Open space or forest – 400 millimetres in events up to the one per cent AEP.

Change in velocity, flow distribution and inundation times

- Change in velocity, flow distribution and inundation times should be kept to a minimum by placing watercourse structures where existing flow paths are present. Poorly placed or undersized structures can change the flow distribution, increase velocity downstream and increase inundation upstream.
- Duration of inundation – No more than the larger of 10 per cent of the existing duration of inundation or one hour whichever is largest for durations over two hours.
- Flow distribution – No more than 10 per cent change in the volume of flow proportioned to each flow path.
- Velocities – Velocity increases to keep velocities less than one metre per second, or if existing is greater than one metre per second then no more than 10 per cent change.

2.6 Flood modelling

2.6.1 Extent of flood modelling

The extent of flood modelling is shown on Figure 2.3. The flood modelling covers the tributaries that cross the proposal and their floodplains and extends upstream and downstream of the proposal to enable potential flood impacts on the surrounding watercourses to be assessed.

2.6.2 Input data

Survey

Airborne Light Detection and Ranging (LiDAR) survey is available covering the study area. This survey is available as a one metre grid Digital Elevation Model. This information was used in the flood modelling to represent the topography of the floodplain and watercourses. The LiDAR used in this study is dated 2019.

In addition, Transport has obtained detailed ground survey within the proposal corridor which includes existing road levels, drainage and limited utilities infrastructure and other ground surface features. The detailed survey has been used in developing the concept design for the proposal and the flood model terrain and culvert inputs.

Aerial photography

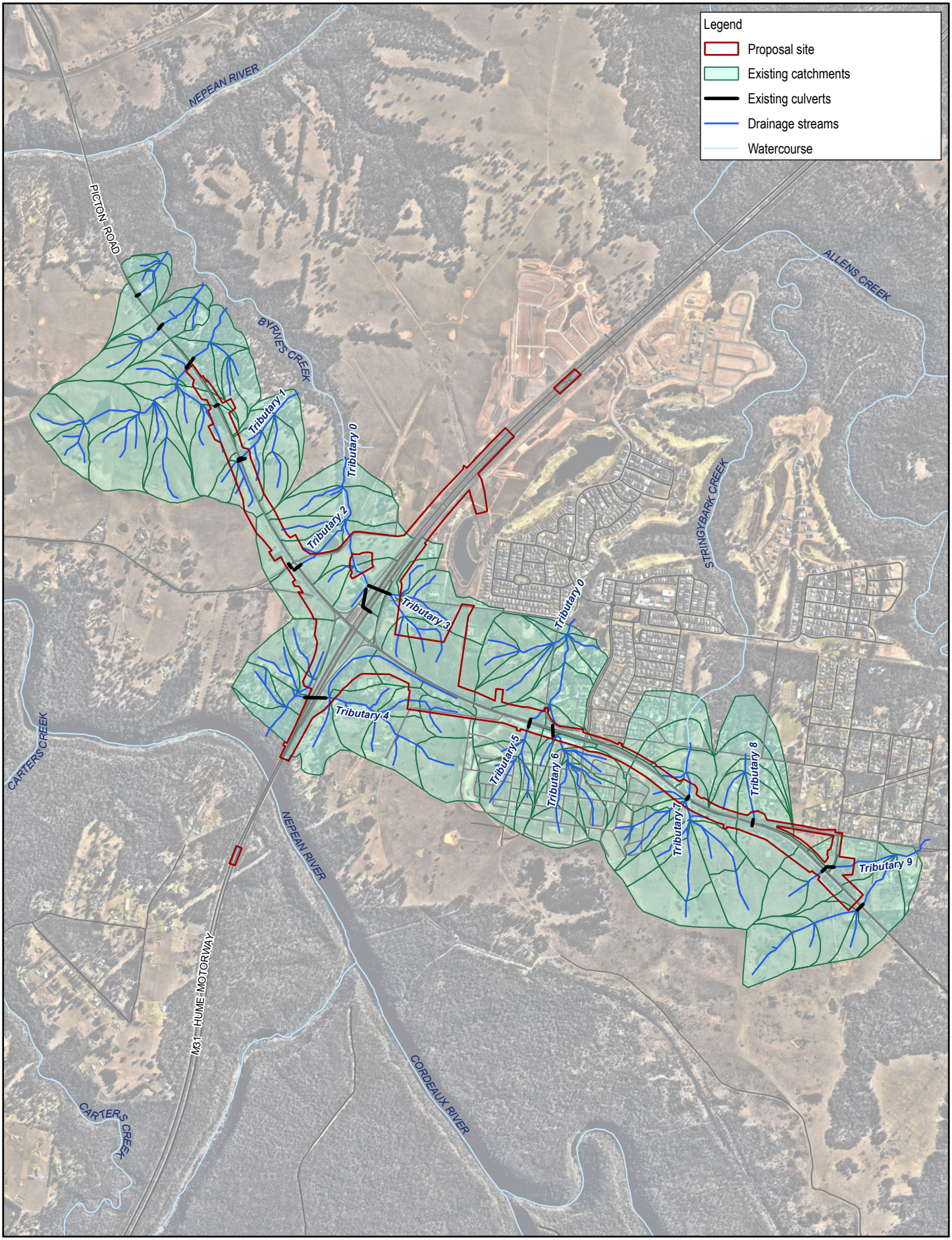
Aerial photography is available covering the study area and surrounding region. Aerial photography was used in the flood modelling to identify features such as vegetation, buildings and roads which have different effects on the movement of flood water.

Design rainfall and loss rates

Design rainfalls, storm loss rates and pre-burst depths were obtained from the ARR 2019 data hub. In accordance with NSW specific recommendations, the continuing loss values were multiplied by 0.4. Probability neutral pre-burst rainfall depths were applied in accordance with ARR 2019 recommendations. The adopted design rainfall, loss rates and pre-burst rainfall depths are provided in Appendix A.

2.6.3 Hydrology

The hydrology of the study area was modelled using Watershed Bounded Network Model (WBNM) software. WBNM is a rainfall runoff routing model that converts design rainfall to stormwater runoff hydrographs. The catchments to the various tributaries within the study area were subdivided in accordance with the recommendations of the model documentation. Models were developed to represent existing and proposed conditions and the model subdivision is shown on Figure 2.1 and Figure 2.2 respectively. Rainfall design storm intensities, temporal patterns and storm losses were obtained from ARR 2019 and the Bureau of Meteorology (BoM).



Paper Size ISO A4

0 250 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GDA2020

GHD

Transport for NSW
Picton Road upgrade between Nepean River and Almond Street, Wilton – Hydrology and Hydraulic Assessment

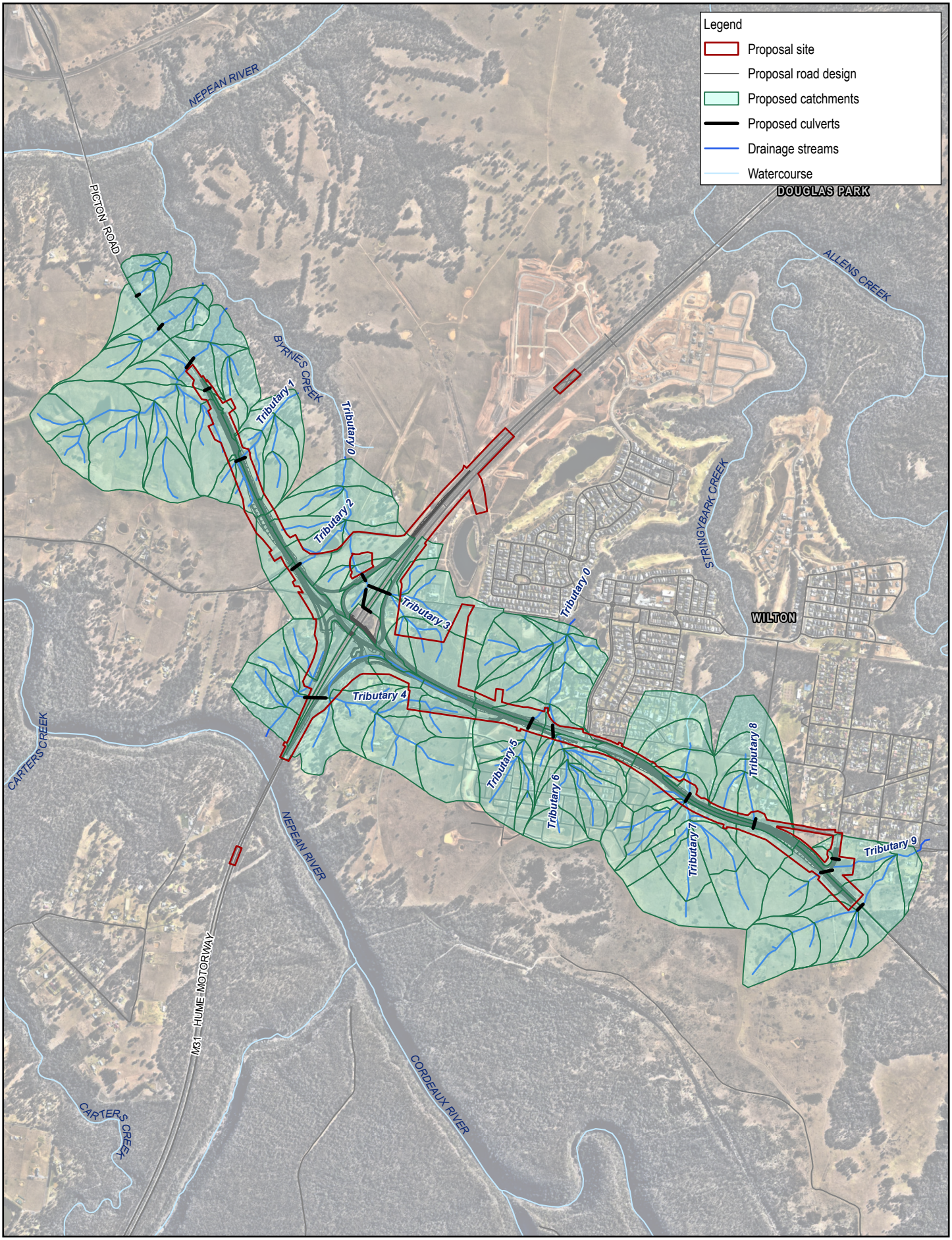
WBNM model layout - existing conditions

Project No. **12560200**
Revision No. **0**
Date **24/10/2023**

FIGURE 2.1

N:\AU\Wollongong\Projects\23\12560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_Hydro_A.aprx
Print date: 24 Oct 2023 - 15:04

Data source: Vegetation Zones - Biosis 2023, Nearmap WMS Server: . Created by: akildea



Paper Size ISO A4

0 250 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GDA2020

GHD

Transport for NSW
Picton Road upgrade between Nepean River and Almond Street, Wilton – Hydrology and Hydraulic Assessment

WBNM model layout - proposed conditions

Project No. **12560200**
Revision No. **0**
Date **24/10/2023**

FIGURE 2.2

N:\AU\Wollongong\Projects\23\12560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_Hydro_A.aprx
Print date: 24 Oct 2023 - 15:05

Data source: Vegetation Zones - Biosis 2023, Nearmap WMS Server: . Created by: akildea

2.6.4 Hydraulic modelling

The study area hydraulics were simulated using TUFLOW flood modelling software. TUFLOW is a two-dimensional hydraulic modelling software which is used to model the flooding behaviour of flood water through floodplains, creeks, watercourse structures including bridges and pipe culverts and stormwater drainage systems. The TUFLOW model extent is shown on Figure 2.3.

The TUFLOW model inputs included:

– terrain surface levels derived from LiDAR survey, ground survey and the concept design surface levels
– existing and proposed culvert sizes, locations and levels obtained from survey and the concept design
– surface roughness parameters determined from aerial photography
– inflow hydrographs obtained from the WBNM model
– downstream boundary conditions determined from the downstream watercourse dimensions and slopes.

Scenarios used for flood simulation of existing and proposed conditions are outlined in Table 2.2.

A culvert blockage risk assessment was carried out using the method described in ARR 2019. This procedure considers land use and debris generation and transportability characteristics and culvert sizes to determine appropriate blockage factors to be applied to culverts for flood modelling purposes. A blockage factor of 25 per cent was determined as being appropriate for the existing and proposed culverts for events up to the 20 per cent AEP and for events rarer than the 20 per cent AEP up to the 0.5 per cent AEP a 50 per cent blockage factor was adopted. For events rarer than 0.5 per cent AEP, 100 per cent blockage was adopted.

Table 2.2 Simulated events and blockage factors for existing and proposed culverts

Event	Blockage factor
20% AEP	25%
5% AEP	50%
1% AEP	50%
0.5% AEP	50%
0.2% AEP	100%
Probable Maximum Flood (PMF)	100%

The TUFLOW calculated flood levels, depths and velocities were mapped for existing and proposed conditions. Using the calculated velocities and depths, the flood hazard was also determined in accordance with the Australian Institute for Disaster Resilience publication *Technical Flood Risk Management Guideline: Flood Hazard* (Australian Institute for Disaster Resilience, 2014). Flood hazards are categorised as shown in Table 2.3.

Table 2.3 Flood hazard categories

Hazard category	Description
H1	Generally safe for vehicles, people and buildings.
H2	Unsafe for small vehicles.
H3	Unsafe for vehicles, children and the elderly.
H4	Unsafe for vehicles and people.
H5	Unsafe for vehicles and people. All building types vulnerable to structural damage. Some less robust building types vulnerable to failure.
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure.

2.6.5 Climate change assessment

Potential climate change impacts have been assessed using the ARR 2019 guidelines. The ARR 2019 guidelines recommend that climate change should be considered for the design of significant infrastructure.

The ARR 2019 climate change assessment processes adopt findings from the Intergovernmental Panel on Climate Change Fifth Assessment Report (Intergovernmental Panel on Climate Change, 2013). The process adopts projected changes from Global Climate Models and can be explored for four Representative Concentration Pathways (RCPs) for greenhouse gas and aerosol concentrations that were used to derive the Global Climate Models. The use of RCPs 4.5 (low emissions) and 8.5 (high emissions) are recommended by the guidelines for the assessment. The 0.5 per cent AEP and 0.2 per cent AEP events are typically used to represent one per cent AEP flooding under climate change scenarios RCP 4.5 and RCP 8.5 respectively.

These events have been modelled and the performance of the proposal has been assessed with respect to these scenarios. Refer to section 6 for further discussion on the climate change assessment.

2.7 Limitations

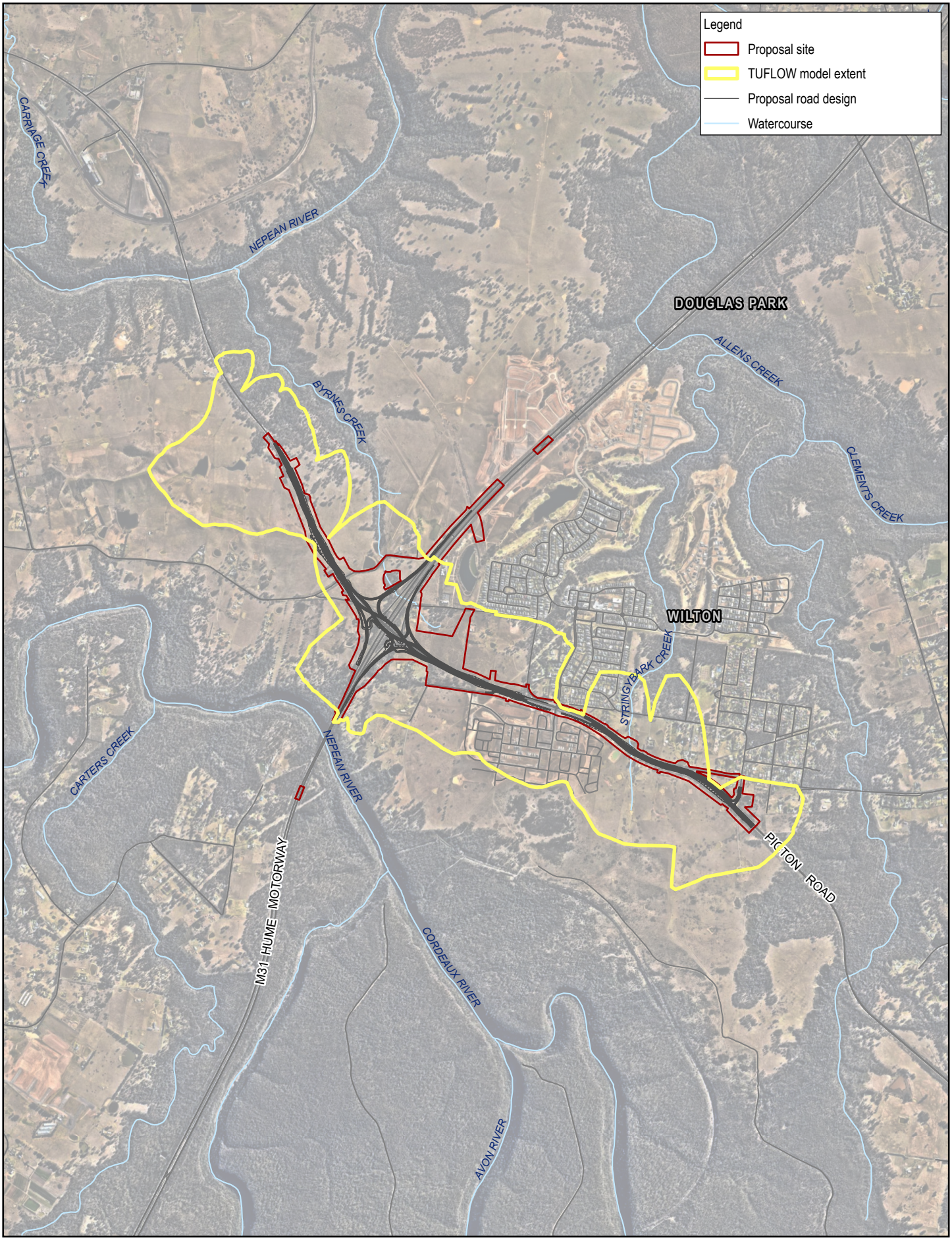
This report has been prepared by GHD for Transport for NSW and may only be used and relied on by Transport for NSW for the purpose agreed between GHD and Transport for NSW as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Transport for NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this document are based on conditions encountered and information identified in the references at the date of preparation of the report. GHD has no responsibility or obligation to update this document to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this document on the basis of information provided by Transport for NSW and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.



Paper Size ISO A4

0 500 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GDA2020

GHD

Transport for NSW
Picton Road upgrade between Nepean River and Almond Street, Wilton – Hydrology and Hydraulic Assessment

TUFLOW model extent

Project No. **12560200**
Revision No. **0**
Date **24/10/2023**

FIGURE 2.3

N:\AU\Wollongong\Projects\23\12560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_Hydro_A.aprx
Print date: 24 Oct 2023 - 15:06

Data source: Vegetation Zones - Biosis 2023, Nearmap WMS Server: . Created by: akildea

3. Existing environment

3.1 The study area

The proposal is located within the catchment of the Nepean River and crosses several tributaries that drain directly to the river. Tributaries that form the receiving waters for the study area (and potential runoff from the proposal site) include those of Byrnes Creek, Stringybark Creek and Allens Creek.

The proposal site is located close to the Sydney Drinking Water Catchment and Water NSW Schedule 1 Special Area (see Figure 3.1). The proposal site drains to the Nepean River downstream of the Sydney Drinking Water Catchment and Water NSW Schedule 1 Special Area. The location of the proposal and the study area is shown on Figure 3.1.

There are nine ephemeral watercourses that cross the proposal site labelled Tributaries 1 to 9 (see Figure 3.1). Culverts convey stormwater in these tributaries under Picton Road and the Hume Motorway. The sizes of the existing culverts are shown in Table 3.1.

Table 3.1 Existing stormwater culverts

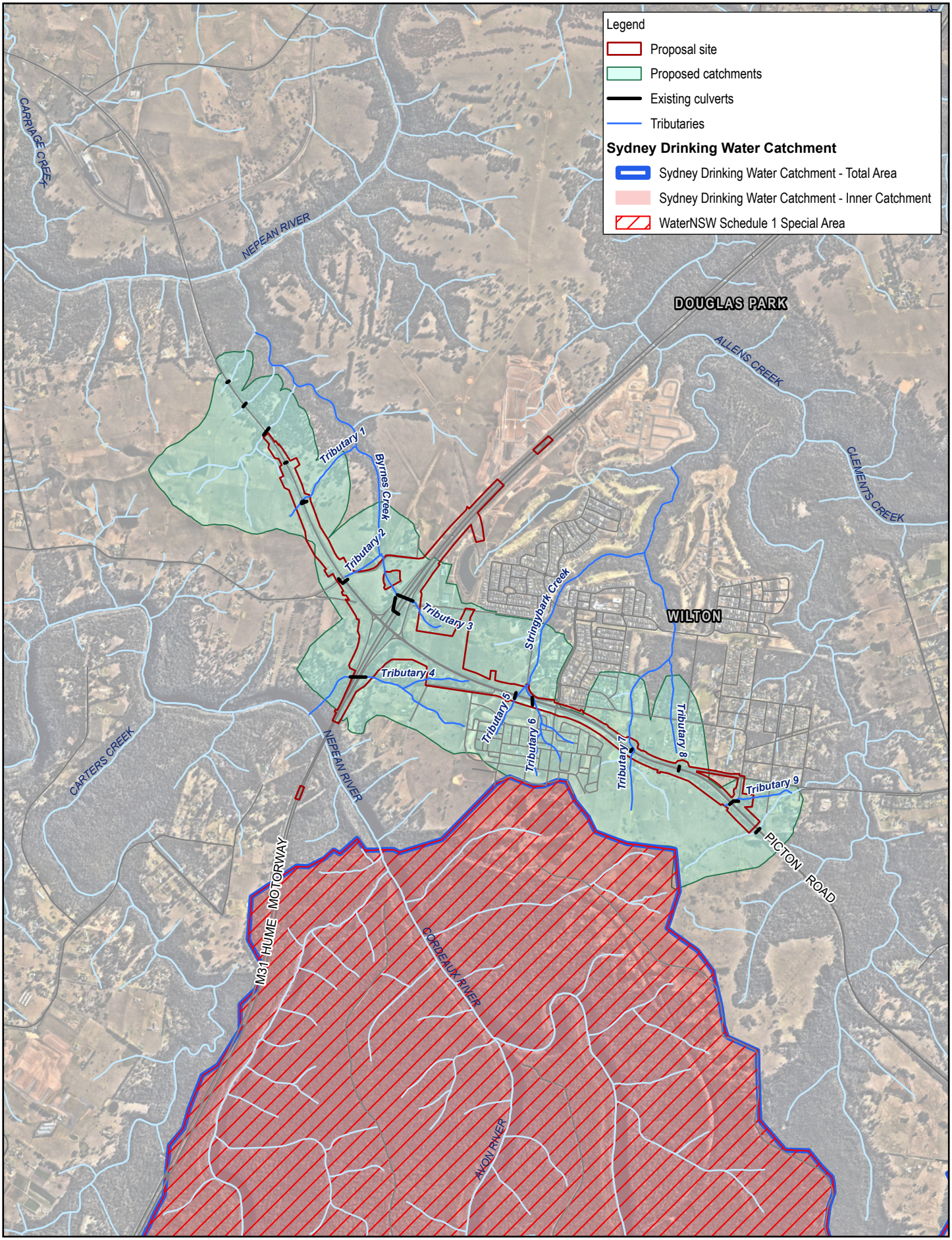
Watercourse	Existing culvert size
Tributary 1	3 m x 3 m underpass + 750 mm diameter pipe
Tributary 2	750 mm diameter pipe
Tributary 3	1500 mm diameter pipe
Tributary 4	1200 mm diameter pipe
Tributary 5	1200 mm diameter pipe
Tributary 6	1350 mm diameter pipe
Tributary 7	2 x 1350 mm diameter pipe
Tributary 8	900 mm diameter pipe
Tributary 9	2 x 900 mm diameter pipe

3.2 Land use

Land within the proposal site is mainly used for transport infrastructure purposes, with smaller areas subject to rural land uses. Within the study area land uses generally consist of rural (Zones RU2 and RU4), residential (Zone R2 Low Density Residential and Zone UD Urban Development), infrastructure (Zone SP2 Water Supply System) and transport (Zones SP2 Road and SP2 Regional Road). There are a small section of Environmental Conservation/Management (Zone C2) adjacent to the proposed north bound entry ramp to the M31 Hume Motorway.

The proposal is located within the Wilton Growth Area, which surrounds Picton Road and the M31 Hume Motorway. DPE and Wollondilly Shire Council are planning for Wilton to become a new town providing about 15,000 homes and 15,000 jobs across seven precincts.

Further information about existing and future land use within and around the proposal site is provided in section 6.11 of the REF.



Paper Size ISO A4

0 500 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GDA2020

GHD

Transport for NSW
Picton Road upgrade between Nepean River and Almond Street, Wilton – Hydrology and Hydraulic Assessment

Hydrology and hydraulic assessment study area

Project No. **12560200**
Revision No. **0**
Date **24/10/2023**

FIGURE 3.1

N:\AU\Wollongong\Projects\23\12560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_Hydro_A.aprx
Print date: 24 Oct 2023 - 15:06

Data source: Nearmap WMS Server: . Created by: akildea

3.3 Existing flooding behaviour

Existing flooding behaviour upstream and downstream of Picton Road has been modelled using TUFLOW software. Flood mapping for a range of AEPs is provided in Appendix B.

3.3.1 Flood depths and levels

Flood levels and flood depths upstream and downstream of Picton Road are shown in Appendix B.

Currently within the extent of the proposal site, Picton Road generally has one per cent AEP flood immunity under existing conditions with the following exceptions:

– At a section of Picton Road 350 metres west of Almond Street where there is diversion of flow from the catchment of Tributary 8 to Tributary 7. At this location water flows onto the road from where it is diverted west along Picton Road to Tributary 7.
– At the western end of the proposal, where there is flow across Picton Road where the proposal ties back into the existing Picton Road pavement.

At the western end of the proposal, the flood modelling indicates that there would be flow across Picton Road where the proposal ties back into the existing Picton Road pavement. This is caused by water flowing along the road in a westerly direction towards a large culvert immediately west of the proposal. However, this is not a frequent occurrence and there is no historical evidence of any flood damage or disruption at this location.

Based on flood modelling, under one per cent AEP conditions, water upstream of Picton Road would pond at the culvert inlets inundating land upstream of Picton Road. At some locations ponded water is observed in the model to encroach onto the Picton Road northbound carriageway without overtopping the crest of the road. Downstream of Picton Road, flows are generally confined to the watercourses and immediate overbank areas.

North of Picton Road there is a property on the south side of Hornby Street with a building located within the modelled one per cent AEP flood extent of Tributary 8. This property lies in land zoned RU4 (primary production small lots). There is also a property north of Hornby Street where the modelled one per cent AEP flood extent in Tributary 7 (Stringybark Creek) is in close proximity to an existing structure at the rear of the property. This property lies in land zoned RU2 (rural landscape).

On Condell Park Road there is a property just east of the M31 Hume Motorway in land zoned RU2 (rural landscape) with buildings located within the one per cent AEP flood extent.

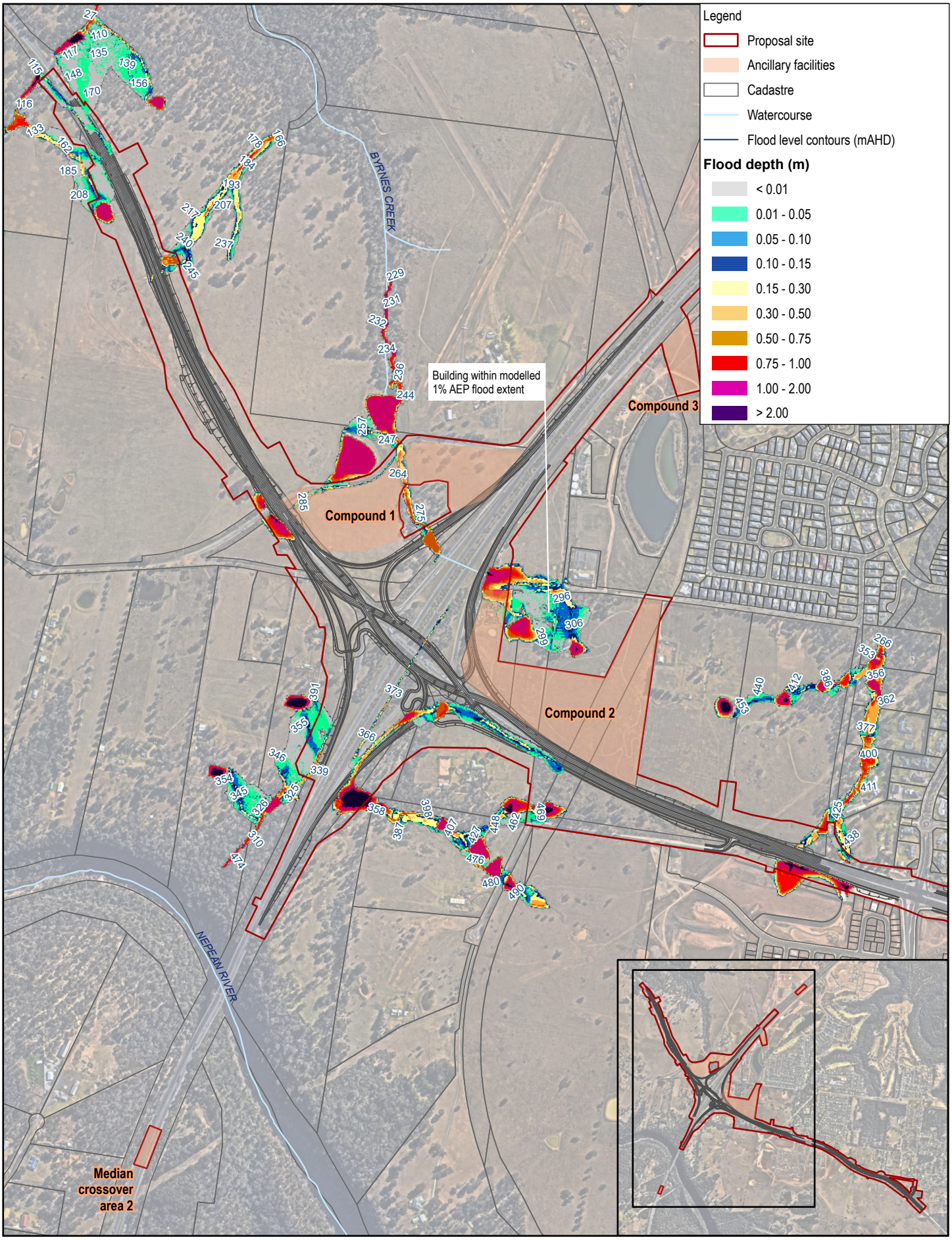
The locations of the affected properties and the one per cent AEP flood extent are shown on Figure 3.2 and Figure 3.3. Flood depths are shown in Appendix B, refer to Figures 1 to 18.

3.3.2 Flood velocities

The one per cent AEP velocities in the tributaries within the study area are generally in the range of 0.5 to one metre per second on the overbank areas and up to two metres per second in the tributary channels. Velocities in this range are unlikely to result in scour of the watercourses. Velocities are shown in Appendix B, refer to Figures 19 to 36.

3.3.3 Flood hazard

The flood hazard mapping indicates that where Picton Road is overtopped by shallow floodwaters in a one per cent AEP, the water depths and velocity are such that the hazard is generally in the H1 category – which is generally safe for people and vehicles. The modelled existing flood hazard along Picton Road is shown in Appendix B, refer to Figures 37 to 54.



Paper Size ISO A4

0 100 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GDA2020

GHD

Transport for NSW
Picton Road upgrade between Nepean River and Almond Street, Wilton – Hydrology and Hydraulic Assessment

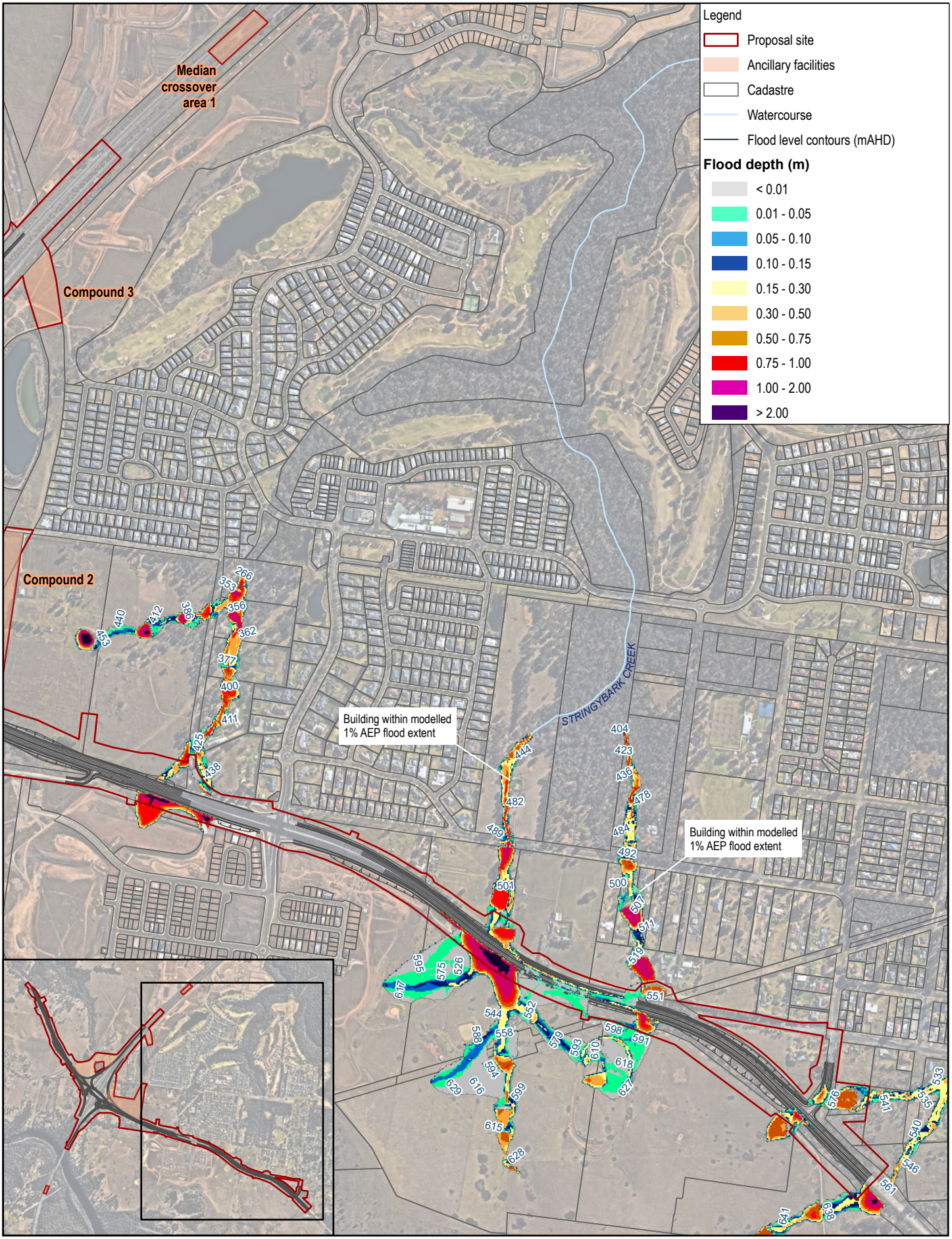
Existing one per cent AEP flood level and depth - map 1

Project No. **12560200**
Revision No. **0**
Date **24/10/2023**

FIGURE 3.2

N:\AU\Wollongong\Projects\23\12560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_Hydro_A.aprx
Print date: 24 Oct 2023 - 15:07

Data source: Vegetation Zones - Biosis 2023, Nearmap WMS Server: . Created by: akildea



Paper Size ISO A4

0 100 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GDA2020

GHD

Transport for NSW
Picton Road upgrade between Nepean River and Almond Street, Wilton – Hydrology and Hydraulic Assessment

Existing one per cent AEP flood level and depth - map 2

Project No. **12560200**
Revision No. **0**
Date **24/10/2023**

FIGURE 3.3

N:\AU\Wollongong\Projects\23\12560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_Hydro_A.aprx
Print date: 24 Oct 2023 - 15:08

Data source: Vegetation Zones - Biosis 2023, Nearmap WMS Server: . Created by: akildea

4. Construction impact assessment

Potential flood impacts during construction would include possible increased flood levels immediately upstream of Picton Road resulting from temporary flow obstructions of existing culverts and drainage channels within the existing Picton Road corridor.

Construction staging would need to make provision for maintaining existing drainage flow paths by providing connectivity of piped drainage systems and overland flow paths through the proposal site throughout the construction period. The design of the proposal has generally offset new culverts away from existing culverts to enable the existing culverts and flows to be maintained during construction.

The staging of construction of the roadworks and culverts at Tributaries 7 and 8 has the potential to temporarily alter the distribution of flows between these tributaries, potentially impacting downstream properties in Hornby Street. This tributary interaction would need to be carefully managed during construction.

Site compounds would be located outside of the extent of twenty per cent AEP overland flooding. However, it would be necessary for the construction contractor to provide for minor localised catchment diversions around the compounds and stockpiles in accordance with standard construction stormwater management practices. The construction contractor would also need to store materials and plant away from locations where these could block stormwater flow paths either through being inappropriately located in overland flow paths or becoming mobilised to form obstructions to flows.

A Construction Environmental Management Plan (CEMP) would be developed prior to construction of the proposal. It is recommended that, as part of the CEMP, a Construction Soil and Water Management Plan (CSWMP) be developed to provide a strategy to minimise potential flood impacts on the floodplain and adjoining land during construction.

5. Operational impact assessment

Predicted flooding behaviour upstream and downstream of the proposal has been modelled using TUFLOW software. Flood mapping for the operational case is provided in Appendix C and Appendix D. The potential operational impacts outlined in this section are under present day climate conditions. Potential operational impacts under future climate change scenarios are discussed in section 6.

5.1 Flood levels

The proposal would include widening of the Picton Road formation and installation of new culverts and other drainage infrastructure to convey the one per cent AEP flows across the road corridor.

New culverts have been sized to have capacity to carry the one per cent AEP flow rates under conditions of 50 per cent blockage of the culvert inlets. As a result, culverts sizes have been increased compared to the existing at most of the tributaries. Climate change has been considered for the proposed culvert sizing, with the RCP 4.5 scenario checked to ensure the road is not overtopped for this climate change scenario. Proposed culvert sizes are shown in Table 5.1.

Table 5.1 Proposed stormwater culverts

Watercourse	Existing culvert size	Proposed culvert size
Tributary 1	3 m x 3 m underpass + 750 mm diameter pipe	1200 mm diameter pipe
Tributary 2	750 mm diameter pipe	1050 mm diameter pipe
Tributary 3	1500 mm diameter pipe	1500 mm diameter pipe
Tributary 4	1200 mm diameter pipe	1200 mm diameter pipe
Tributary 5	1200 mm diameter pipe	1200 mm diameter pipe + 900 mm diameter pipe
Tributary 6	1350 mm diameter pipe	1350 mm diameter pipe + 900 mm diameter pipe
Tributary 7	2 x 1350 mm diameter pipe	2 x 1050 mm diameter pipe
Tributary 8	900 mm diameter pipe	1050 mm diameter pipe
Tributary 9	2 x 900 mm diameter pipe	2 x 1050 mm diameter pipe

Flood level and depths for the one per cent AEP are shown in Appendix C and flood level afflux is shown in Appendix D. The increased culvert capacity combined with the additional impervious area from widened road pavement would result in flood level increases downstream of the proposal. Downstream increases are within the Austroads 2023 guideline limits outlined in section 2.5.2 with the following exceptions:

– North of Picton Road there is a property on the south side of Hornby Street with a building located within the modelled one per cent AEP flood extent of Tributary 8. The afflux exceeds the suggested 10 to 25 millimetres limit. Afflux is calculated to be 40 millimetres at this location. This property is currently zoned RU4 (Primary production small lots).
– There is also a property north of Hornby Street where the modelled one per cent AEP flood extent in Tributary 7 (Stringybark Creek) is in close proximity to an existing structure at the rear of the property. The roofed structure is located near to where the afflux is 80 millimetres. This structure appears to be non-habitable however further investigation to confirm the use of this structure would be required at detailed design. This property is currently zoned RU4 (Rural landscape).

To determine the potential impacts of the calculated afflux on the properties and design suitable mitigation measures, further investigation would need to be carried out as part of the detailed design of the proposal. A concept level assessment has been carried out to confirm that there are feasible solutions including provision of detention storage within the proposal corridor to mitigate these flooding impacts.

There is another flood affected building in Condell Park Road (refer to section 3.3.1) however the proposal would not cause afflux at this property as the catchment headwaters and tailwaters lie outside the influence of the proposal site.

5.2 Velocity impacts

Velocity maps for the proposed case are shown in Appendix C. The impacts of the proposal on velocities, assessed against the Austroads 2023 guidelines is shown in Table 5.2 . Velocities described in the table are representative of those in the waterways but may vary from those described at some locations due to localised topographic features.

Table 5.2 Velocity impacts

Tributary Name	Impact of the proposal
Tributary 1	Velocities post proposal would generally remain below 1 m/s downstream of the proposal. Velocity increases near culvert outlets would be managed with energy dissipation and scour protection measures to slow the water and protect the waterway.
Tributary 2	Velocities post proposal would generally remain below 1 m/s downstream of the proposal. Velocity increases near culvert outlets would be managed with energy dissipation and scour protection measures to slow the water and protect the waterway.
Tributary 3	Velocities post proposal would generally remain below 1 m/s downstream of the proposal. Velocity increases near culvert outlets would be managed with energy dissipation and scour protection measures to slow the water and protect the waterway.
Tributary 4	Velocities post proposal would generally remain below 1 m/s downstream of the proposal. Velocity increases near culvert outlets would be managed with energy dissipation and scour protection measures to slow the water and protect the waterway.
Tributary 5	Velocities post proposal would increase from 1.0 m/s to 1.2 m/s downstream of the proposal. The increase in velocity exceeds the Austroads 2023 guidelines but is not expected to result in increased erosion risk given the existing vegetation cover. Velocity increases near culvert outlets would be managed with energy dissipation and scour protection measures to slow the water and protect the waterway.
Tributary 6	Velocities post proposal would increase from 1.0 m/s to 1.1 m/s downstream of the proposal. The increase in velocity is within the Austroads 2023 guidelines and is not expected to result in increased erosion risk given the existing vegetation cover. Velocity increases near culvert outlets would be managed with energy dissipation and scour protection measures to slow the water and protect the waterway.
Tributary 7	Velocities post proposal would generally remain below 1 m/s downstream of the proposal. Velocity increases near culvert outlets would be managed with energy dissipation and scour protection measures to slow the water and protect the waterway.
Tributary 8	Velocities post proposal would increase from 1.7 m/s to 1.8 m/s downstream of the proposal. The increase in velocity is within the Austroads 2023 guidelines and is not expected to result in increased erosion risk given the existing vegetation cover. Velocity increases near culvert outlets would be managed with energy dissipation and scour protection measures to slow the water and protect the waterway.
Tributary 9	Velocities post proposal would generally remain at 1.2 m/s downstream of the proposal. Velocity increases near culvert outlets would be managed with energy dissipation and scour protection measures to slow the water and protect the waterway.

Further detailed assessment against the Austroads 2023 guideline velocity impact criteria would be carried out as part of the detailed design to mitigate erosion risks downstream of the proposal.

The enlarged culverts included in the proposal have the potential to locally increase velocities in the downstream tributaries near the proposal boundary. Energy dissipators and scour protection have been included in the proposal to mitigate potential scour impacts.

5.3 Duration of inundation

The duration of inundation of land by floodwaters could potentially be increased as a result of detaining floodwaters upstream of the proposal and releasing water at a slower rate than under existing conditions. The Austroads 2023 guidelines state that the duration of inundation should not increase by more than the larger of 10 per cent of the existing duration of inundation or one hour whichever is largest for durations over two hours.

The drainage culverts included in the proposal have equivalent or greater capacity than the existing culverts. Furthermore, the duration of flood producing storms is typically less than two hours. Consequently, water would not be detained upstream of the road embankment for extended periods and inundation times would not be expected to increase by more than one hour in land upstream and downstream of the proposal compared to existing conditions.

5.4 Flood hazard

Flood hazard in the proposed conditions for the one per cent AEP is shown in Appendix C. Currently there are some locations where low hazard flooding occurs on Picton Road where tributaries overtop the culverts under existing conditions. Overtopping of Picton Road would no longer occur under proposal as the proposed drainage system is designed to convey the one percent AEP.

6. Climate change assessment

A climate change risk assessment has been undertaken as part of the concept design for the proposal. This assessment has considered the risks associated with increased rainfall intensities under future climate emissions scenarios. The associated hazards would include overtopping of the road and scouring of culvert outlets due to more intense storms due to climate change.

As defined in the Climate Risk Assessment Guidelines (Transport for NSW, 2021), Representative Concentration Pathways (RCPs) are a set of time series of plausible future concentrations of greenhouse gases, aerosols, and chemically active gases, as well as land-use changes. These RCPs are input to regional climate models (RCMs) to enable prediction of future climate.

The one percent AEP, RCP 4.5 (low emissions) and RCP 8.5 (highest emissions) climate change flooding scenarios (represented by 0.5 per cent AEP and 0.2 per cent AEP floods respectively) have been modelled under proposed conditions to assess the climate change resilience of the proposal.

The Austroads 2023 guideline suggests that for road infrastructure projects the design criteria should be met for the RCP 4.5 scenario. The culverts included in the proposal have been designed to convey the one per cent AEP flows under the RCP 4.5 scenario without overtopping of the road.

In the RCP 8.5 scenario, overtopping may occur at Picton Road immediately west of Pembroke Parade, between Pembroke Parade and Almond Street and at Almond Street north of the intersection with Picton Road. West of Pembroke Parade, the modelling indicates that flood hazard category is H3, which is unsafe for vehicles and pedestrians. The flood hazard category between Pembroke Parade and Almond Street is H1 and generally safe for vehicles and pedestrians. At Almond Street, north of the intersection with Picton Road, the road is overtopped and a flood hazard category of H2 is anticipated, which would be unsafe for small vehicles.

Further climate change risk assessment is recommended to be carried out at detailed design to confirm that adopting the RCP 4.5 scenario as the culvert design criteria appropriately addresses the risks and consequences of future climate change on the operation of the proposal. Further discussion on the climate risks is provided in section 6.13 of the REF. Flood maps are provided in Appendix C. Refer to figures labelled ‘1 in 200 AEP’ in Appendix C which equate to the one per cent AEP event in the RCP 4.5 scenario and the figures labelled ‘1 in 500 AEP’ in Appendix C for the one per cent AEP event in the RCP 8.5 scenario.

Table 6.1 Simulated events for climate change assessment

RCP	Design event representing 1% AEP under climate change scenario	Flood map reference
4.5 (low emissions)	0.5% (1 in 200 year) AEP	Figure 64 – Flood Depth and Extent - Map Extent 1 - 1 in 200 AEP – Design Figure 65 – Flood Depth and Extent - Map Extent 2 - 1 in 200 AEP – Design Figure 66 – Flood Depth and Extent - Map Extent 3 - 1 in 200 AEP – Design Figure 82 – Peak Velocity - Map Extent 1 - 1 in 200 AEP - Design Figure 83 – Peak Velocity - Map Extent 2 - 1 in 200 AEP - Design Figure 84 – Peak Velocity - Map Extent 3 - 1 in 200 AEP - Design Figure 100 – Flood Hazard - Map Extent 1 - 1 in 200 AEP - Design Figure 101 – Flood Hazard - Map Extent 2 - 1 in 200 AEP - Design Figure 102 – Flood Hazard - Map Extent 3 - 1 in 200 AEP - Design
8.5 (high emissions)	0.2% (1 in 500 year) AEP	Figure 67 – Flood Depth and Extent - Map Extent 1 - 1 in 500 AEP – Design Figure 68 – Flood Depth and Extent - Map Extent 2 - 1 in 500 AEP – Design Figure 69 – Flood Depth and Extent - Map Extent 3 - 1 in 500 AEP – Design Figure 85 – Peak Velocity - Map Extent 1 - 1 in 500 AEP - Design Figure 86 – Peak Velocity - Map Extent 2 - 1 in 500 AEP - Design Figure 87 – Peak Velocity - Map Extent 3 - 1 in 500 AEP - Design Figure 103 – Flood Hazard - Map Extent 1 - 1 in 500 AEP - Design Figure 104 – Flood Hazard - Map Extent 2 - 1 in 500 AEP - Design Figure 105 – Flood Hazard - Map Extent 3 - 1 in 500 AEP - Design

7. Cumulative impacts

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of a proposal when added to other existing, planned, and/or reasonable anticipated future projects.

The proposal forms the western section of the broader Picton Road upgrade, which involves upgrading about 30 kilometres of Picton Road between the Nepean River and the M1 Princes Motorway. The area surrounding the proposal site would be subject to significant development as part of the Wilton Growth Area, which comprises a number of development precincts, including South East Wilton, North Wilton, Wilton Town Centre, West Wilton, Maldon and Bingara Gorge. Further information about land use and development around the proposal site is provided in section 6.11 of the REF.

Cumulative stormwater impacts from proposed urban developments around the proposal site would be managed in accordance with the Wilton Growth Area DCP, which outlines objectives and controls for developments in the Wilton Growth Area. Relevant to the potential for flooding and hydrological impacts, these objectives include:

– to manage the flow of stormwater from urban parts of the Precinct to replicate, as closely as possible, pre-development flows
– to ensure an integrated approach to drinking water, wastewater and stormwater services is considered to drive more sustainable water management outcomes
– to ensure that water management measures for development incorporate key principles of water sensitive urban design to help protect, maintain or restore waterway health of identified high value waterways with a minimum requirement of maintaining current health, including:
    - protecting existing hydrological and ecological processes of these waterways including natural features and systems including watercourses, wetlands, lagoons and aquatic, riparian and groundwater dependant ecosystems
    - maintaining the natural hydrological behaviour of the catchment.

In accordance with the objectives and controls of the Wilton Growth Area DCP, future developments would include measures such as stormwater detention basins to mitigate increased stormwater flows.

Stage 1 of the South East Wilton precinct (the Wilton Greens development) is currently under construction and includes stormwater detention basins designed to attenuate stormwater flow rates from the entire Stage 1 development back to pre-development (rural land use) flow rates for events up to the one per cent AEP. Other proposed developments in the Wilton Growth Area would incorporate similar measures such that the cumulative impacts of development on stormwater flow rates is minimised.

The proposal involves widening the carriageways of Picton Road. This would result in increased impervious surfaces within the catchments of the downstream receiving waters and potential increases in runoff volumes. The proposal site drains to tributaries of Allens Creek, Stringybark Creek and Byrnes Creek (Nepean River tributaries) and at the M31 Hume Motorway southbound on ramp, directly to the Nepean River via a small un-named tributary (Tributary 4). These tributaries would have small increases in runoff volumes as a result of the proposal. Notwithstanding the potential increase to stormwater runoff volumes, the increase in stormwater flow rates as a result of the proposal have been modelled and assessed as part of this assessment, with mitigation measures proposed where required.

A portion of the remaining central section of the proposal, directly east of Almond Street, would drain to Allens Creek and this would, in future, result in small additional volumes of flow to this creek. East of Almond Street, additional volumes would potentially affect other tributaries of the Nepean River and the Nepean River itself downstream of the portion affected by the proposal; however, the additional volume would be negligible in comparison to the Nepean River catchment generated runoff volumes. Cumulative impacts from the construction and operation of the Picton Road upgrade would be further assessed in subsequent impact assessments for the central and eastern sections.

8. Recommended safeguards and management measures

To minimise the potential flooding impacts that could result from the proposal, a series of mitigation measures have been proposed. These are described in the following sections.

8.1 Construction phase

Construction phase mitigation measures would developed as part of a Construction Environment Management Plan (CEMP) and Construction Soil and Water Management Plan (CSWMP). Recommended safeguards to mitigate the predicted construction impacts are shown in Table 8.1.

Table 8.1 Construction phase hydrology and flooding safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Watercourse and flow path impacts	All ancillary facility structures and stockpiles will be located above the 20 per cent AEP flood level.	Contractor	Construction	Additional safeguard
	Temporary drainage infrastructure will be constructed and implemented in accordance with the technical guideline*: Temporary stormwater drainage for road construction* (Roads and Maritime Services 2011).	Contractor	Construction	Additional safeguard

Additional construction risks and potential design considerations to be considered during the detailed design and construction phases are shown in Table 8.2.

Table 8.2 Potential construction risks and recommended design considerations

Risk	Potential impacts	Measures to avoid, mitigate and minimise impacts
Impact on surface water flow in watercourses	Temporary changed surface flow paths across the proposal site due to associated construction works.	Install temporary drainage works prior to or concurrent with site compound set-up and/or stockpiling. Works within or near creeks should be undertaken with consideration given to the NSW Department of Primary Industries (Water) *Guidelines for controlled activities on waterfront land – Riparian corridors* (2018).
Impact of road earthworks and temporary earthworks in the floodplain	Temporary flood level impacts upstream and downstream of structures.	Install drainage works prior to or concurrent with road formation construction to minimise potential adverse impacts. Avoid or minimise obstruction of overland flow paths and limit the extent of flow diversion required. Consider how the works would affect the existing stormwater network such that alternatives are in place prior to any disconnection or diversion of stormwater infrastructure. Maintain the distribution of flows in the downstream floodplain at Tributaries 7 and 8.
Working in the floodplain or flood prone areas	Impact to construction workers working on flood prone land.	Prepare wet weather working and construction flood management plans.

8.2 Operational phase

Design flood events have been assessed to understand the likelihood of potential flooding impacts from the proposal to the surrounding tributaries and floodplain areas. The stormwater management elements as they are currently designed are predicted to cause minimal impacts on surrounding areas for events up to and including the one per cent AEP. The recommended operational safeguard to mitigate predicted impacts is shown in Table 8.3.

Table 8.3 Hydrology and flooding safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Flooding impacts	Further flood modelling and investigations will be undertaken to inform detailed design development to avoid impacts on properties, resulting from the proposal, that exceed the acceptable flooding impacts detailed in Austroads 2023.	Transport	Detailed design	Additional safeguard
Climate change	Further climate change risk assessment will be carried out at detailed design to confirm that adopting the RCP 4.5 scenario as the culvert design criteria appropriately addresses the risks and consequences of future climate change on the operation of the proposal.	Transport	Detailed design	Additional safeguard

Additional potential operational impacts and recommended design considerations are shown in Table 8.4.

Table 8.4 Potential operational impacts and recommended design considerations

Risk	Potential impacts	Measures to avoid, mitigate or minimise impacts
Impact on surface flow in watercourse and flows in channels/drainage structures	Modified surface flow volume or rate downstream of the road corridor	Design stormwater drainage elements to minimise risk of localised surface water ponding.
	Changed surface flow paths across the proposal site	Minimise regrading of terrain along the road corridor Install appropriately sized stormwater drainage pipes along the road corridor.
Impact of additional road pavement	Increased runoff to watercourses	The impact of increased runoff to minor drainage lines should be investigated further as part of the detailed design phase and assessed against the proposal flood impact criteria. Where the criteria is not met, site specific mitigation measures should be developed.
Impact of road construction	Increased upstream flooding depths, extents and hazard Increased upstream flood durations Increased upstream impacts on buildings Increased impacts on adjacent infrastructure (e.g. road closures) Additional impacts downstream of structures	Velocity and depth should be further assessed considering newly approved adjoining development proposals to ensure that the proposal does not result in adverse hazard impacts to adjoining development. The risk and consequences of culvert blockage should be further examined during the detailed design phase and appropriate measures such as increasing culvert sizes to cater for blockage would be incorporated into the design if required.

Risk	Potential impacts	Measures to avoid, mitigate or minimise impacts
Impact of providing increased stormwater drainage capacity	Increased downstream flooding depths, extents and hazard Increased downstream flood durations and reduced emergency access Increased downstream impacts on buildings Increased impacts on adjacent infrastructure (e.g. road closures) Increased downstream velocities and scour potential	The impact of increased runoff to minor drainage lines should be investigated further as part of the detailed design phase and assessed against the proposal flood impact criteria. Where the criteria is not met, site specific mitigation measures should be developed. The design of culverts at Tributaries 7 and 8 should maintain the current distribution of flow between these catchments to minimise changes to downstream flooding in properties in Hornby Street. To determine the potential impacts of the calculated afflux on the two downstream properties and design suitable mitigation measures, such as provision of detention within the proposal site or property adjustment works in consultation with the property owners. Further investigation including floor level surveys of the affected buildings would be carried out as part of the detailed design of the proposal. Further assessment of changes in velocity should be carried out as part of the detailed design and where velocities are found to increase by more than 10 per cent (where greater than one metre per second), inspection of affected watercourses should be carried out to assess the scour resistance of the watercourses to any increased velocities.

9. Conclusion

Transport is proposing to upgrade Picton Road between the Nepean River and Almond Street in Wilton, NSW (the proposal). The proposal includes upgrading the Picton Road interchange with the M31 Hume Motorway.

The proposal is located within the catchment of the Nepean River and crosses a number of tributaries that drain directly to the river. Tributaries that form the receiving waters for the study area (and potential runoff from the proposal site) include Byrnes Creek, Stringybark Creek and Allens Creek.

To understand the flooding risks and to identify relevant mitigation measures, flood modelling has been carried out to assess baseline flooding conditions and to predict the potential impact of the proposal on flooding regimes.

Currently, within the extent of the proposal site, Picton Road generally has one per cent AEP flood immunity under existing conditions with the following exceptions:

– At a section of Picton Road 350 metres west of Almond Street where there is diversion of flow from the catchment of Tributary 8 to Tributary 7. At this location water flows onto the road from where it is diverted west along Picton Road to Tributary 7.
– At the western end of the proposal, where there is flow across Picton Road where the proposal ties back into the existing Picton Road pavement.

New culverts that would be delivered as part of the proposal have been sized to have capacity to carry the one per cent AEP flow rates under conditions of partial blockage of the culvert inlets. As a result, culvert sizes have been increased compared to existing culverts at most of the tributaries.

The proposal is predicted to have minimal potential for impacts on surrounding areas for events up to and including the one per cent AEP. Predicted flood level increases outside the proposal site are within the suggested Austroads 2023 guideline flood impact limits with the exception of two locations:

– North of Picton Road there is a property on the south side of Hornby Street with a building located within the modelled one per cent AEP flood extent of Tributary 8.
– There is also a property north of Hornby Street where the modelled one per cent AEP flood extent in Tributary 7 (Stringybark Creek) is in close proximity to an existing roofed structure at the rear of the property.

Flood modelling predicts that the proposal could potentially cause increases in flood levels affecting these structures of up to 40 and 80 millimetres respectively. Further investigation of these properties, including floor level survey, would be carried out during detailed design to confirm the extent of impacts and appropriate mitigation measures. A concept level assessment has been carried out to confirm that there are feasible solutions to mitigate these flooding impacts if confirmed through the additional surveys.

There is another flood affected building in Condell Park Road however the proposal would not cause afflux at this property as the catchment headwaters and tailwaters lie outside the influence of the proposal site.

A climate change assessment found that flood levels would increase within the study area in both high and low future emissions scenarios. In accordance with Austroads 2023 guidelines, the proposed design would not overtop in a one per cent event under a low emissions future climate change scenario. In a high emissions future climate change scenario, overtopping may occur during a one per cent AEP storm at Picton Road immediately west of Pembroke Parade, between Pembroke Parade and Almond Street and at Almond Street north of the intersection with Picton Road. Therefore, the effects of climate change may negatively impact the safety of vehicles and pedestrians in areas that are not currently exposed to such hazards under high emissions scenarios.

Construction and operational safeguards have been recommended to mitigate the predicted impacts of the proposal.

10. References

Advisian 2021, *Wollondilly Shire Flood Study - Broad Scale Assessment*

Australian Disaster Resilience Guideline 7-3: *Technical flood risk management guideline: Flood hazard*, 2014, Australian Institute for Disaster Resilience CC BY-NC

Austroads 2023, *Guide to Road Design Part 5: Drainage - General and Hydrology Considerations*

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), 2019, *Australian Rainfall and Runoff: A Guide to Flood Estimation*

Bureau of Meteorology, 2003, *The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration Method*

CSIRO and Bureau of Meteorology, 2015, *Climate Change in Australia Information for Australia's Natural Resource Management Regions: Technical Report*

Department of Planning and Environment (DPE), 2023, *Flood risk management manual – The policy and manual for the management of flood liable land*

Department of Planning, Industry and Environment (DPIE), 2020, *Climate Risk Ready NSW Guide – Practical guidance for the NSW Government sector to assess and manage climate change risks*

DPIE, 2021, *Wilton Growth Area Development Control Plan 2021*

Indesco, 2021, *Preliminary Water Cycle Management Plan for Wilton Greens – Stages 2 & 3 Neighbourhood Plan Submission*

Intergovernmental Panel on Climate Change, 2013, *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate*

Molino Stewart Pty Ltd, 2021. *Draft Wollondilly Hazards Analysis and Emergency Management Study*

Roads and Maritime Services, 2011. *Technical guideline - Temporary stormwater drainage for road construction*.

Roads and Maritime Services, 2019, *Roads and Maritime Environmental Sustainability Strategy 2019-2023*

SMEC, 2021, *Wilton Development Stage 1 Wilton South East Precinct - Stormwater Management Report*

Transport for New South Wales, 2021. *Climate Risk Assessment Guidelines*

11. Glossary of terms and abbreviations

Term/abbreviation	Definitions
AEP	Annual Exceedance Probability
Afflux	The difference between the normal water level and the water level due to a natural or artificial restriction/obstruction within the channel.
Annual Exceedance Probability	The likelihood of a flood of a given magnitude occurring in any one year, expressed as a percentage.
ARR 2019	Australian Rainfall and Runoff, 2019
BoM	Bureau of Meteorology
Catchment	The area drained by a stream or body of water or the area of land from which water is collected.
CEMP	Construction Environmental Management Plan
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Direct impact	Where an event or circumstance is a direct consequence of the action.
EP&A Act	*Environmental Planning and Assessment Act 1979*
Flood immunity	The degree to which infrastructure is protected from the encroachment of flood water.
Flood hazard	The potential loss of life, injury and economic loss caused by future flood events. The degree of hazard varies with the severity of flooding and is affected by flood behaviour.
Hydraulics	The science of the conveyance of liquids through pipes and channels.
Hydrology	The properties of water and its distribution and movement across the ground.
Indirect impact	Where a primary action is a substantial cause of a secondary event or circumstance.
LiDAR	Light Detection and Ranging
LGA	Local government area
Locality	The area within a five kilometre radius of the study area.
Mitigation	Action to reduce the severity of an impact (OEH 2014).
Mitigation measure	Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality.
mm	Millimetres
mm/h	Millimetres per hour
m/s	Metres per second
NSW	New South Wales
Overland flow path	The path that water can follow if it leaves the confines of the main flow channel. Overland flow paths can occur through private property or along roads. Water travelling along overland flow paths, often referred to as ‘overland flows’, may either re-enter the main channel or may be diverted to another watercourse.
PMF	Probable Maximum Flood
Pre-burst	Storm rainfall that occurs before the main rainfall burst.
Probable Maximum Flood	The largest flood that could conceivably occur at a given location.
Proposal	The construction and operation of the Picton Road upgrade between the Nepean River and Almond Street, Wilton.

Term/abbreviation	Definitions
Proposal site	The area that would be directly affected by construction works (also known as the construction footprint). It includes the location of the proposed infrastructure, the area that would be directly disturbed by the movement of construction plant and machinery, and the location of the compounds and ancillary facilities that would be used to construct that infrastructure.
RCP	Representative Concentration Pathway
REF	Review of Environmental Factors
Runoff	Water that flows across the land towards as waterway.
Study area	The wider area including and surrounding the proposal site, with the potential to be directly or indirectly affected by the proposal, that has been considered for the purposes of this assessment.
SWMP	Soil and Water Management Plan
Transport	Transport for New South Wales
Watercourse	A river, creek or other stream, including a stream in the form of an anabranch or a tributary, in which water flows permanently or intermittently, regardless of the frequency of flow events.
WBNM	Watershed Bounded Network Model
WM Act	*Water Management Act 2000*

Appendix A

Hydrologic model input data

Table A.1 ARR 2019 Design rainfall depths (millimetres) (extracted BoM August 2022)

Duration	AEP						
	63.20%	50%	20%	10%	5%	2%	1%
1 minute	1.98	2.25	3.16	3.83	4.53	5.54	6.38
2 minute	3.35	3.77	5.19	6.22	7.28	8.85	10.2
3 minute	4.63	5.22	7.21	8.67	10.2	12.4	14.2
4 minute	5.76	6.52	9.06	10.9	12.9	15.7	18
5 minute	6.77	7.67	10.7	12.9	15.3	18.6	21.4
10 minute	10.5	11.9	16.8	20.4	24.3	29.7	34.2
15 minute	13	14.8	20.9	25.4	30.1	36.9	42.6
20 minute	14.9	17	23.8	29	34.4	42.1	48.5
25 minute	16.5	18.7	26.2	31.8	37.7	46.2	53.2
30 minute	17.8	20.1	28.2	34.2	40.5	49.5	56.9
45 minute	20.8	23.6	32.8	39.7	46.8	57.1	65.5
1 hour	23.2	26.2	36.4	43.9	51.6	62.8	71.9
1.5 hour	26.9	30.4	42.1	50.6	59.4	71.9	82.1
2 hour	29.8	33.8	46.8	56.2	65.8	79.4	90.5
3 hour	34.7	39.4	54.8	65.7	76.8	92.4	105
4.5 hour	40.6	46.2	64.7	77.7	90.9	109	123
6 hour	45.4	51.9	73.1	88	103	123	139
9 hour	53.1	61.1	87.1	105	124	148	167
12 hour	59.3	68.5	98.6	120	142	169	191
18 hour	68.9	80	117	143	170	203	229
24 hour	76	88.5	130	160	192	230	259
30 hour	81.6	95.2	141	174	209	251	283
36 hour	86.1	101	149	185	223	268	303
48 hour	92.9	109	162	202	244	294	332
72 hour	102	119	178	222	269	325	368
96 hour	108	126	188	234	283	342	388
120 hour	112	131	194	242	292	352	399
144 hour	115	135	200	248	298	359	405
168 hour	119	138	205	253	303	363	409

Table A.2 Initial and continuing losses (extracted ARR Data Hub August 2022)

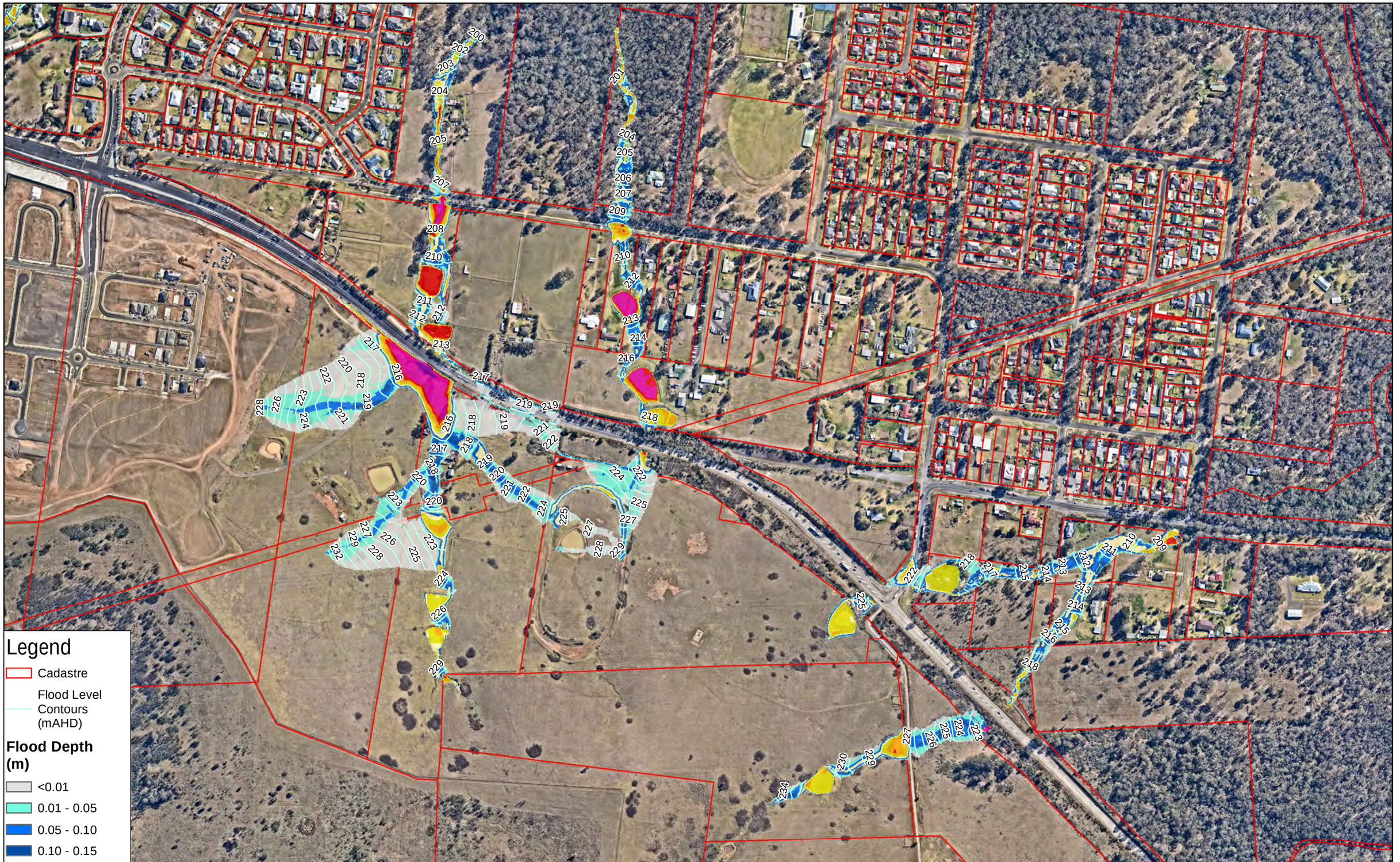
Parameter	Value
Impervious area initial loss (mm)	0
Pervious area initial loss (mm)	42.0
Pervious area continuing loss (mm/h)	4.0 (unadjusted) 1.6 (adjusted)

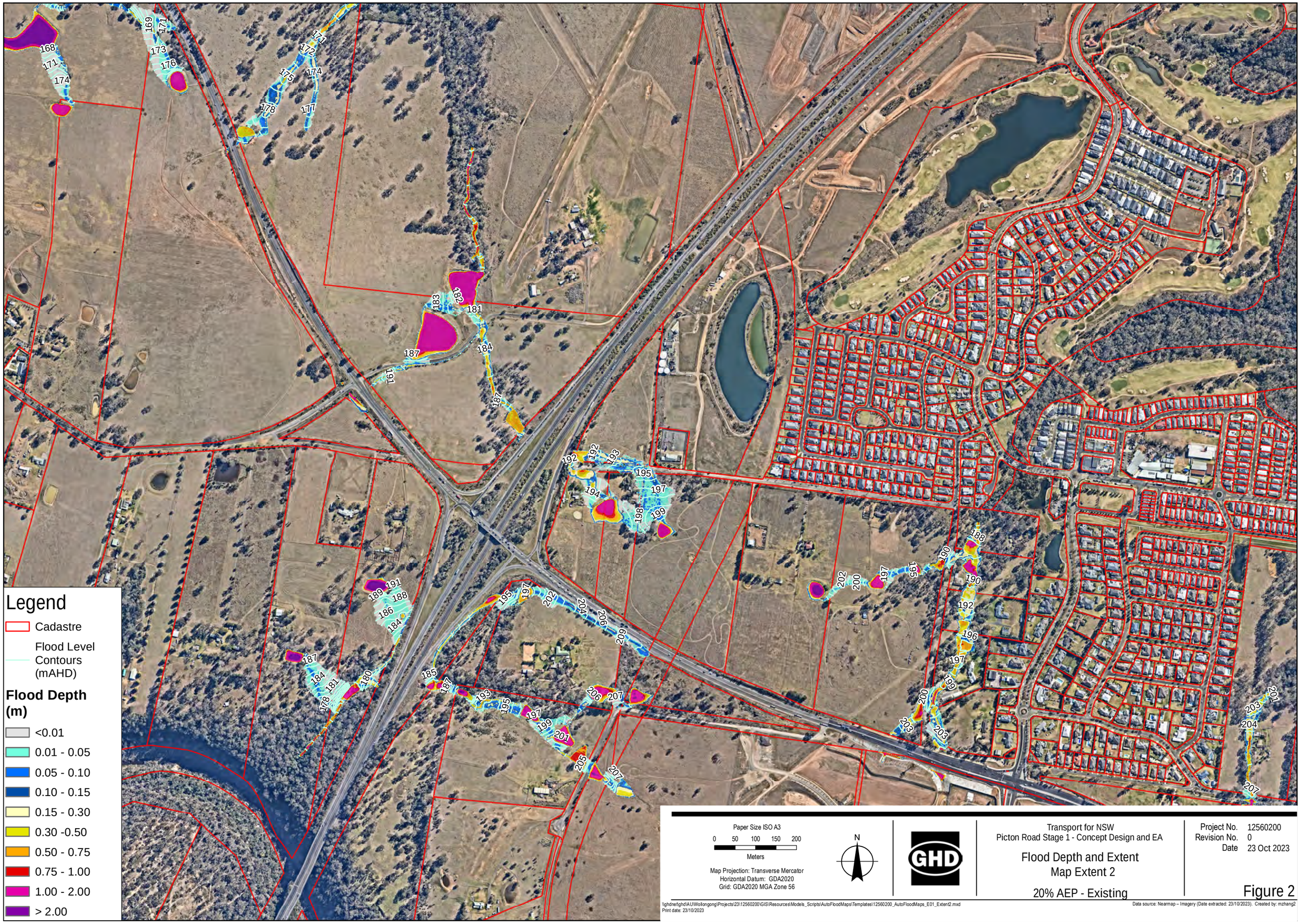
Table A.3 Probability neutral pre-burst depths (millimetres) (extracted ARR Data Hub August 2022)

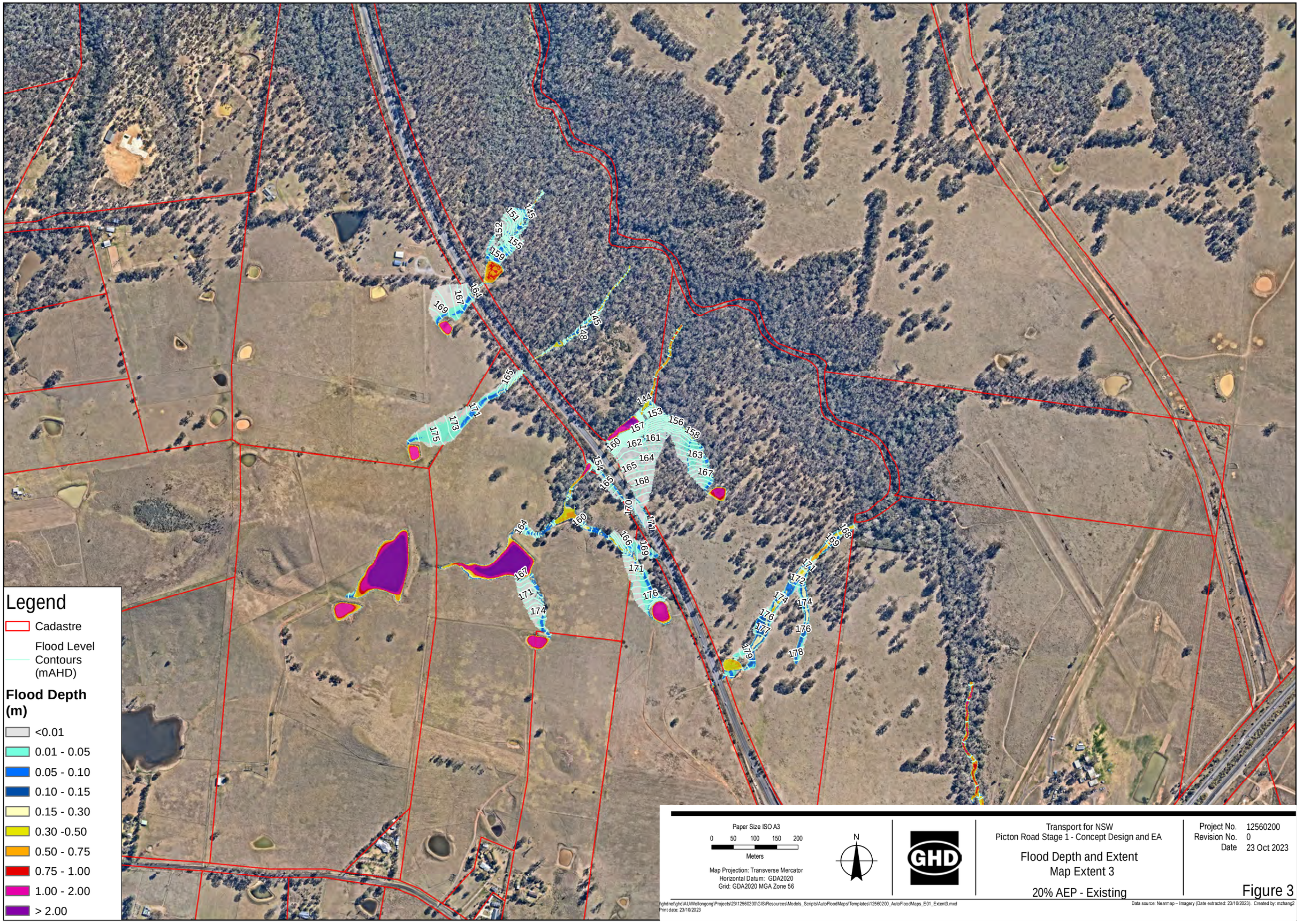
Duration	AEP					
Minutes (hours)	50%	20%	10%	5%	2%	1%
60 (1)	25	15.6	14.5	15	15.1	13.2
90 (1.5)	24.3	12.8	12.6	13.2	12.8	11.7
120 (2)	29.9	16.4	13.8	13.1	11.9	8.8
180 (3)	26.5	15.2	12.8	12.5	11.5	9.2
360 (6)	26.8	16.5	13.9	11.6	10	5.7
720 (12)	27.2	20	18.5	16.8	13.7	7.6
1080 (18)	29.6	22.3	21	19.2	18.1	10.6
1440 (24)	33.9	26.9	25.3	23.9	22.7	15.9
2160 (36)	35.1	28.7	28.9	30.2	26.6	14.5
2880 (48)	39.6	33	32.9	35.3	28.6	16
4320 (72)	42.4	37.7	37.6	43.4	34.9	25.1

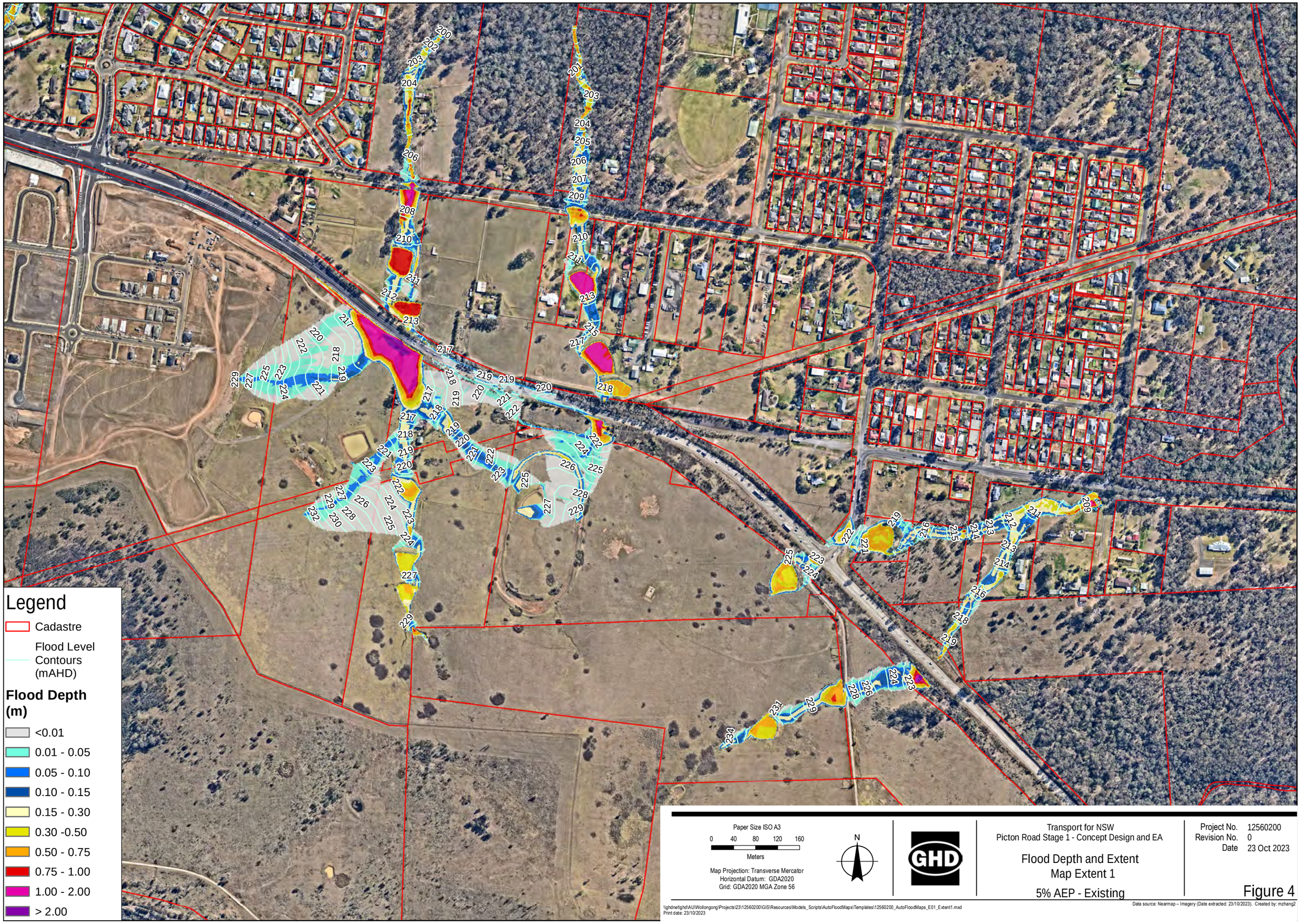
Appendix B

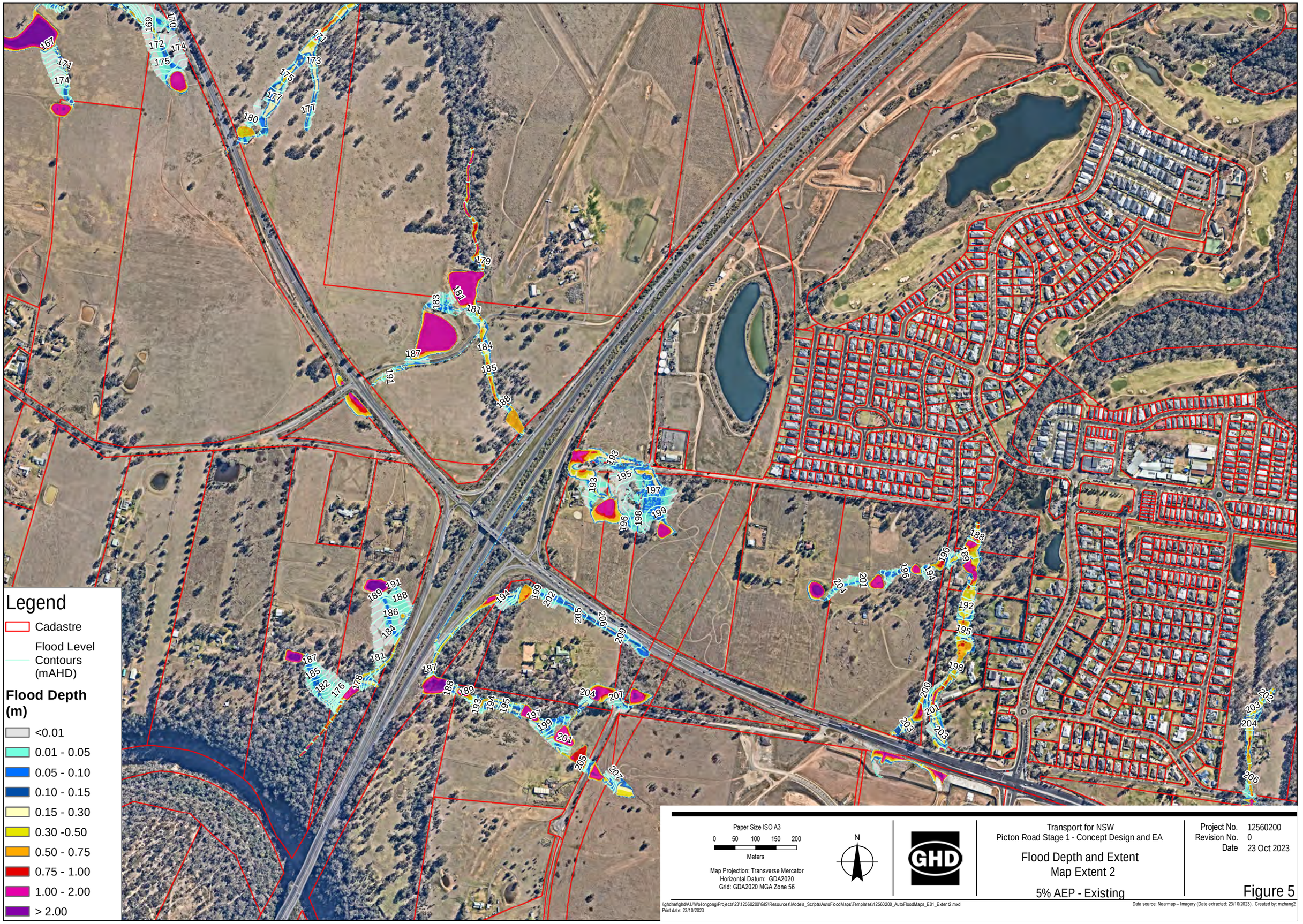
Flood mapping – existing conditions

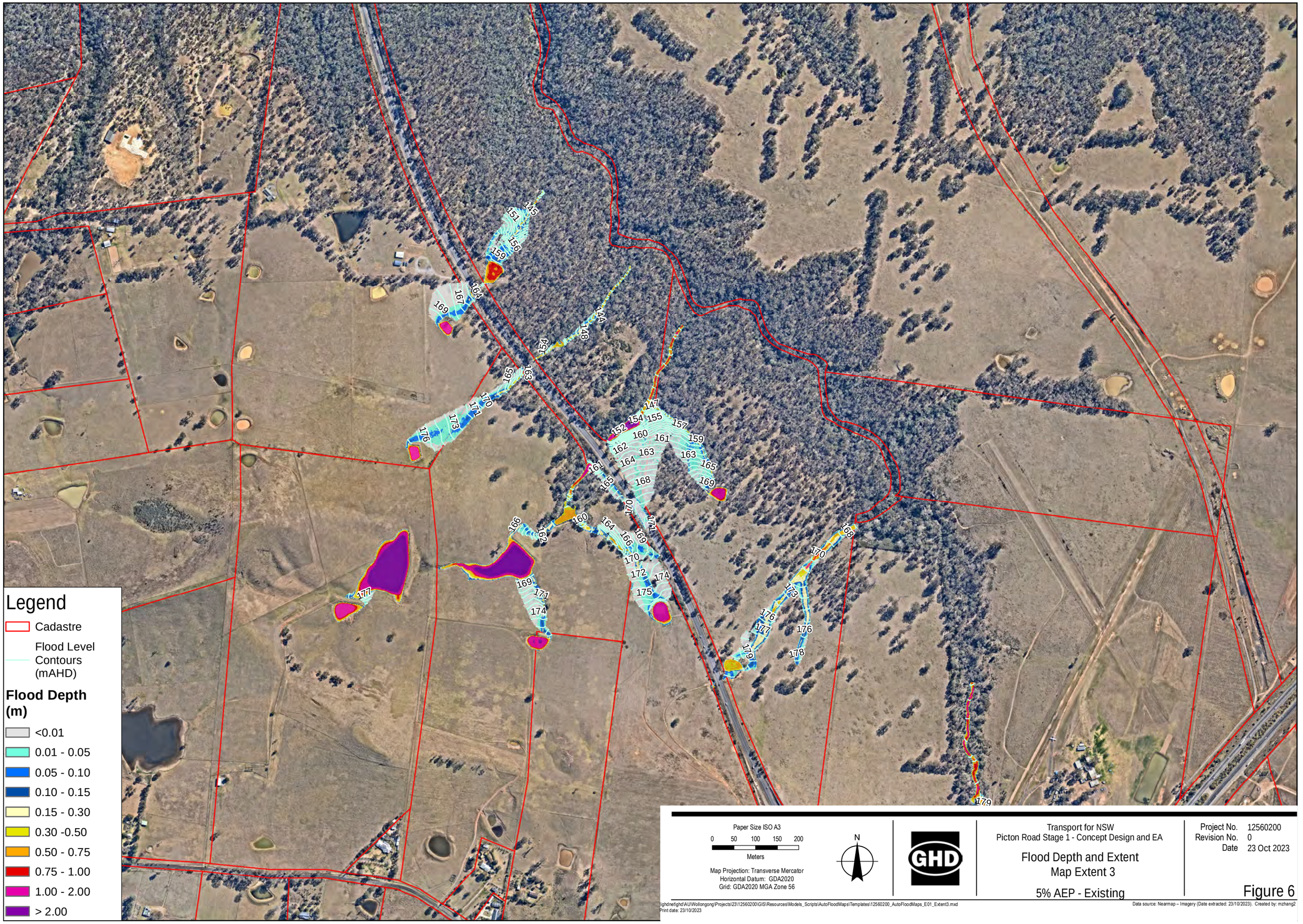

Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 40 80 120 160
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 1
20% AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 1
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 2
20% AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 2
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 3
20% AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 3
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 40 80 120 160
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 1
5% AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 4
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 2
5% AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 5
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 3
5% AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 6
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

- Cadastre
- Flood Level Contours (mAHD)

Flood Depth (m)

- <0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.30
- 0.30 -0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 2.00
- > 2.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Depth and Extent
Map Extent 1

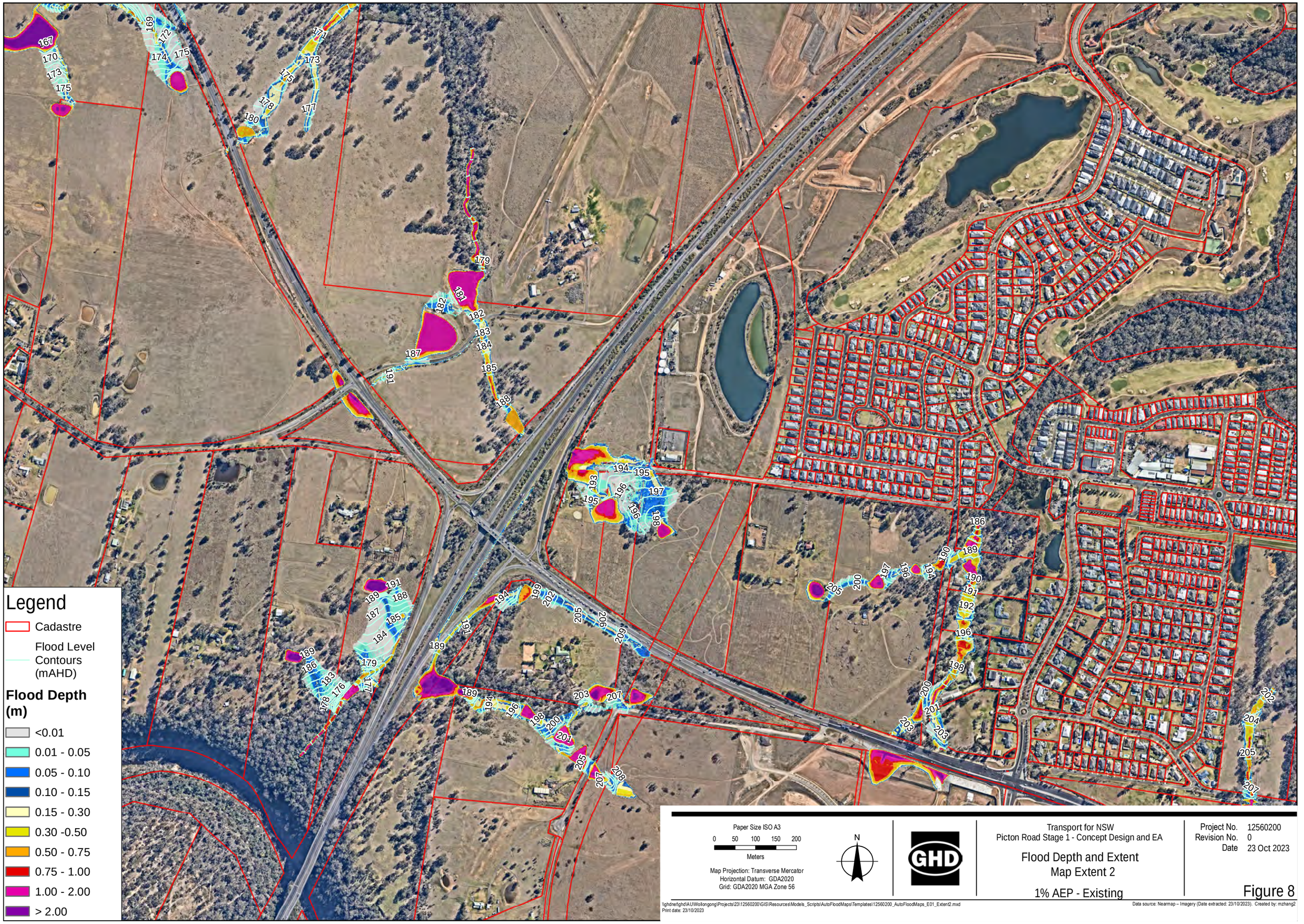
1% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 7

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Depth and Extent
Map Extent 2

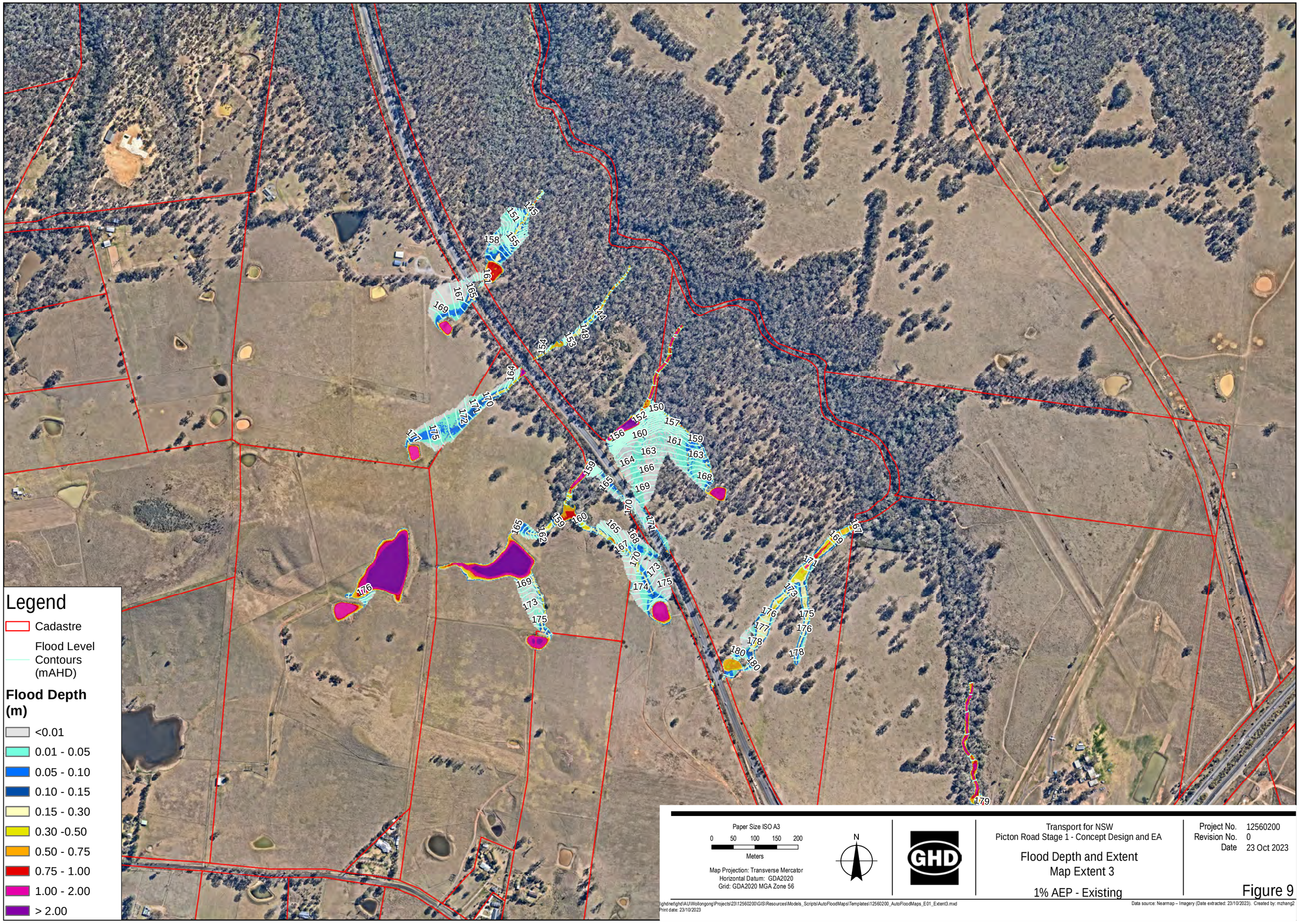
1% AEP - Existing

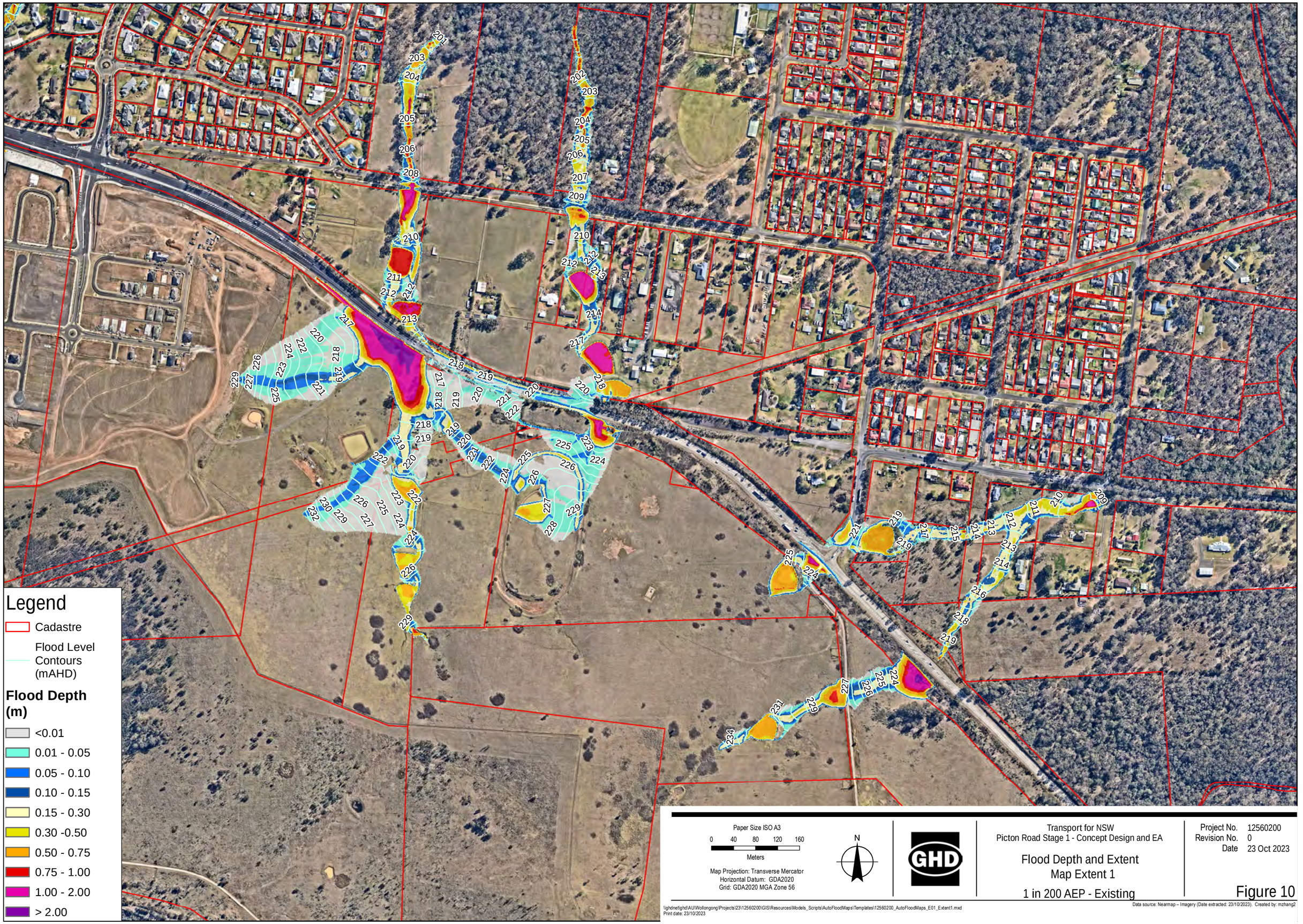
Project No. 12560200
Revision No. 0
Date 23 Oct 2023

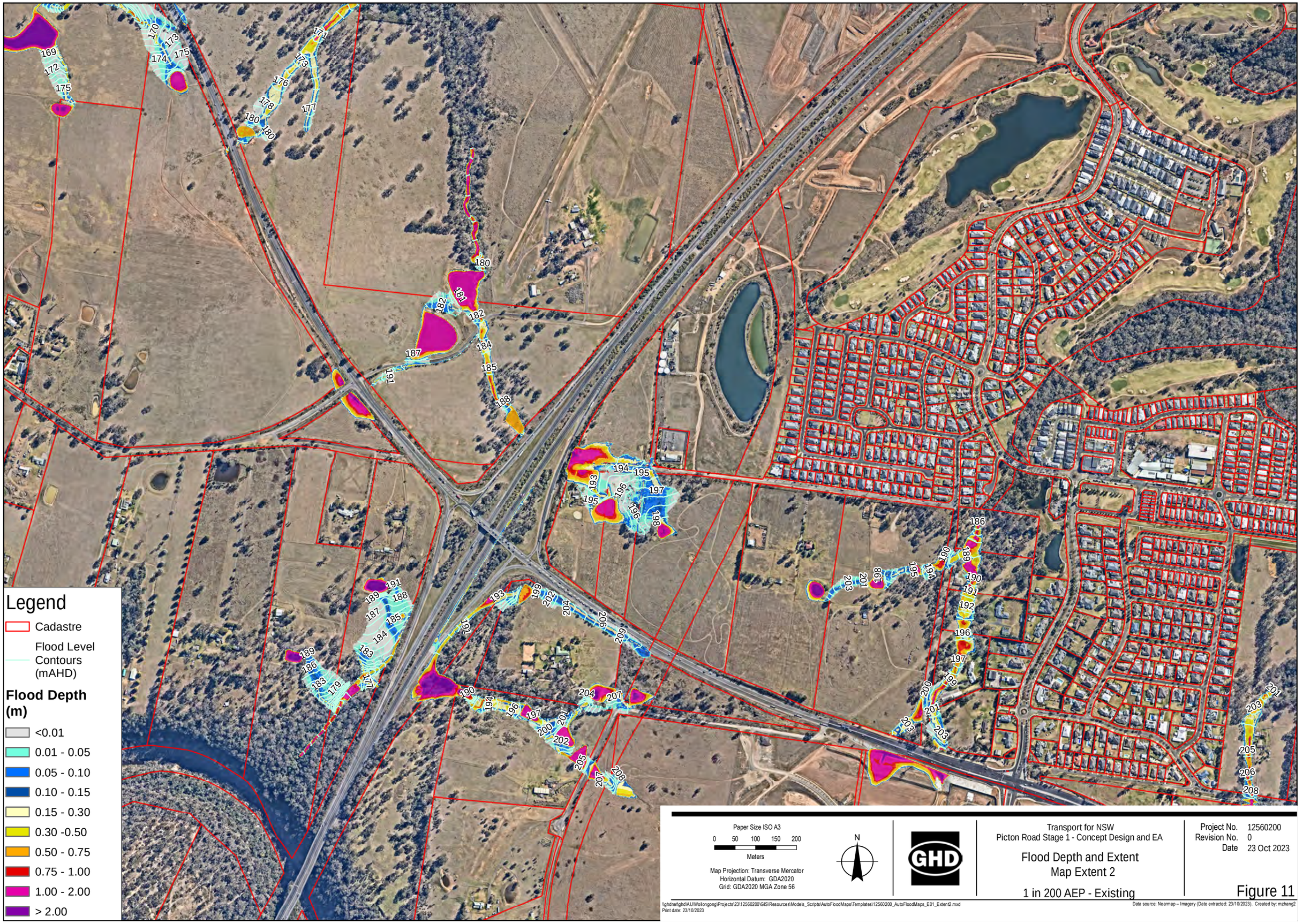
Figure 8

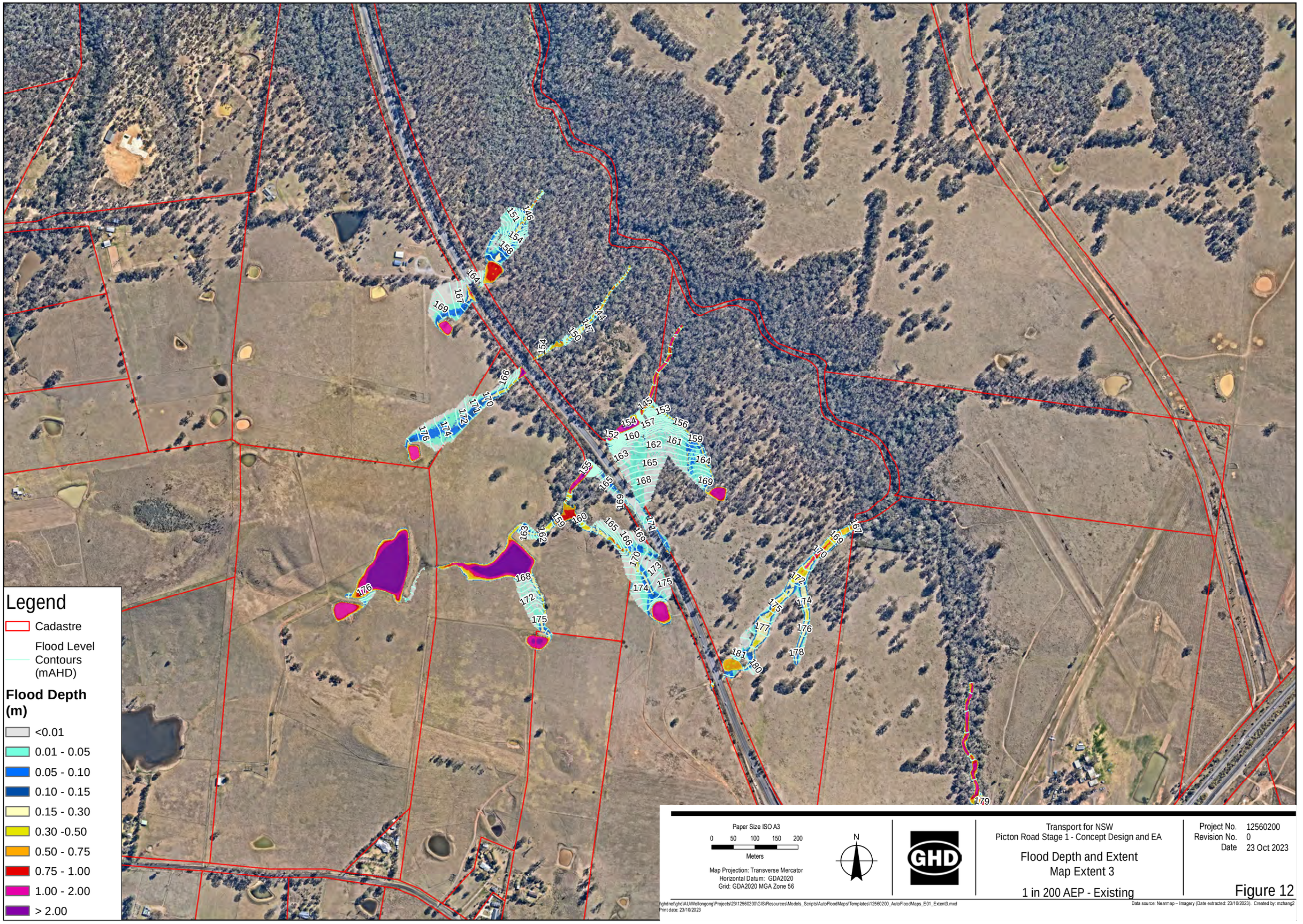
\\ghdnetfghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 3
1% AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 9
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 40 80 120 160
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 1
1 in 200 AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 10
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 2
1 in 200 AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 11
\\ghdnetfghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 3
1 in 200 AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 12
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

- Cadastre
- Flood Level Contours (mAHD)

Flood Depth (m)

- <0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.30
- 0.30 -0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 2.00
- > 2.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Depth and Extent
Map Extent 1

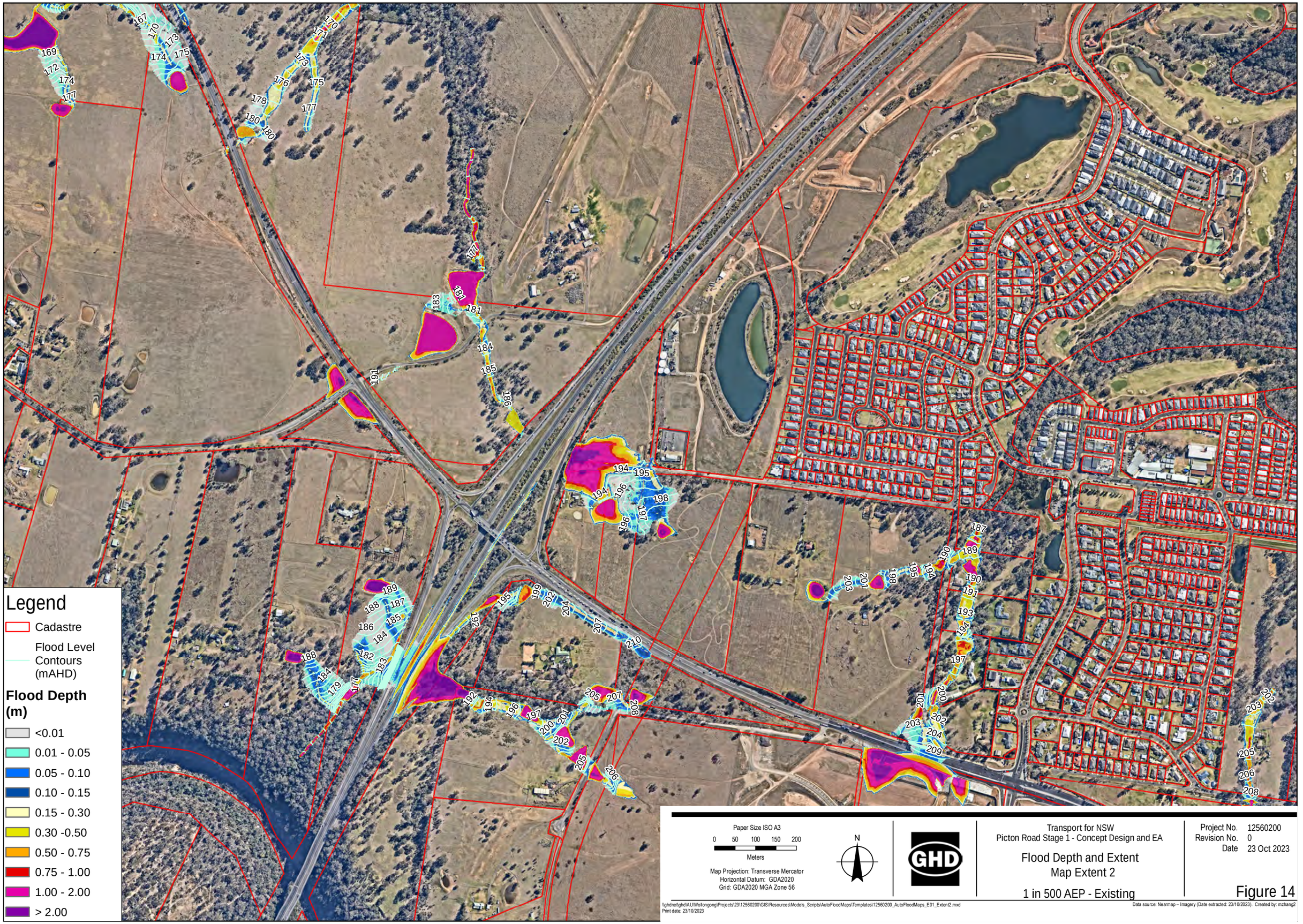
1 in 500 AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 13

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Depth and Extent
Map Extent 2

1 in 500 AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 14

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

- Cadastre
- Flood Level Contours (mAHD)

Flood Depth (m)

- <0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.30
- 0.30 -0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 2.00
- > 2.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Depth and Extent
Map Extent 3

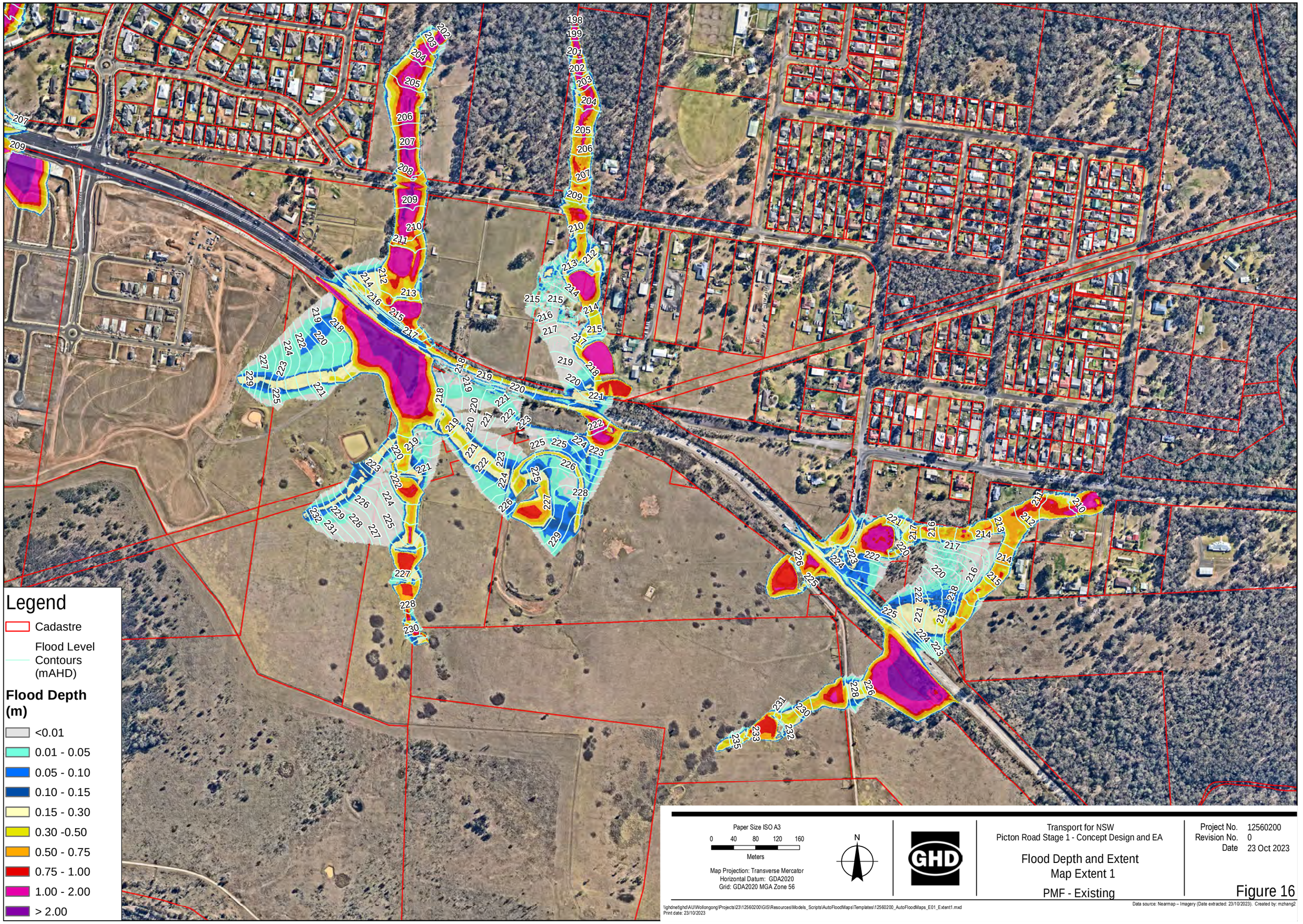
1 in 500 AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 15

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 40 80 120 160
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 1
PMF - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 16
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

- Cadastre
- Flood Level Contours (mAHD)

Flood Depth (m)

- <0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.30
- 0.30 -0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 2.00
- > 2.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Depth and Extent
Map Extent 2

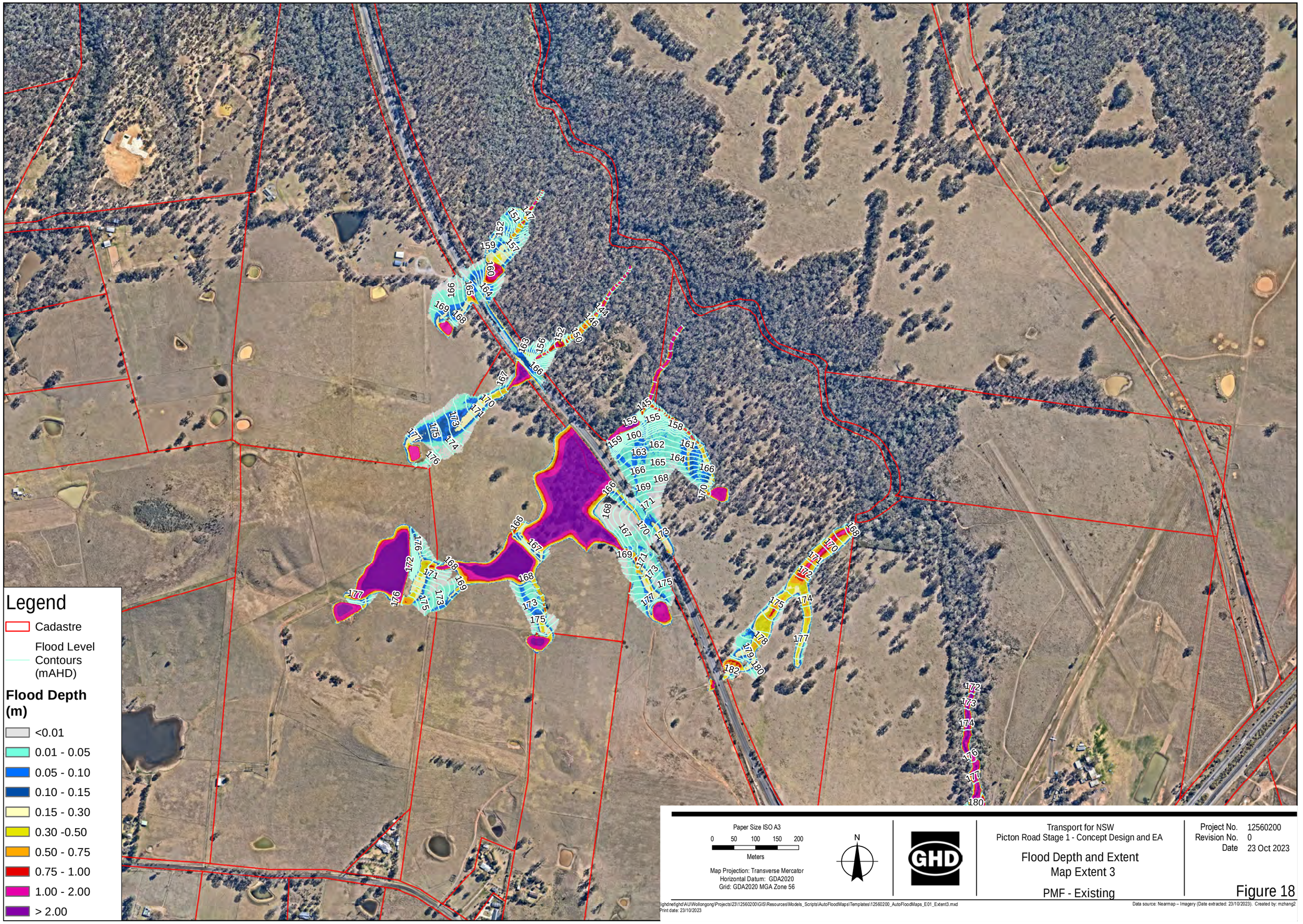
PMF - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 17

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 3
PMF - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 18
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

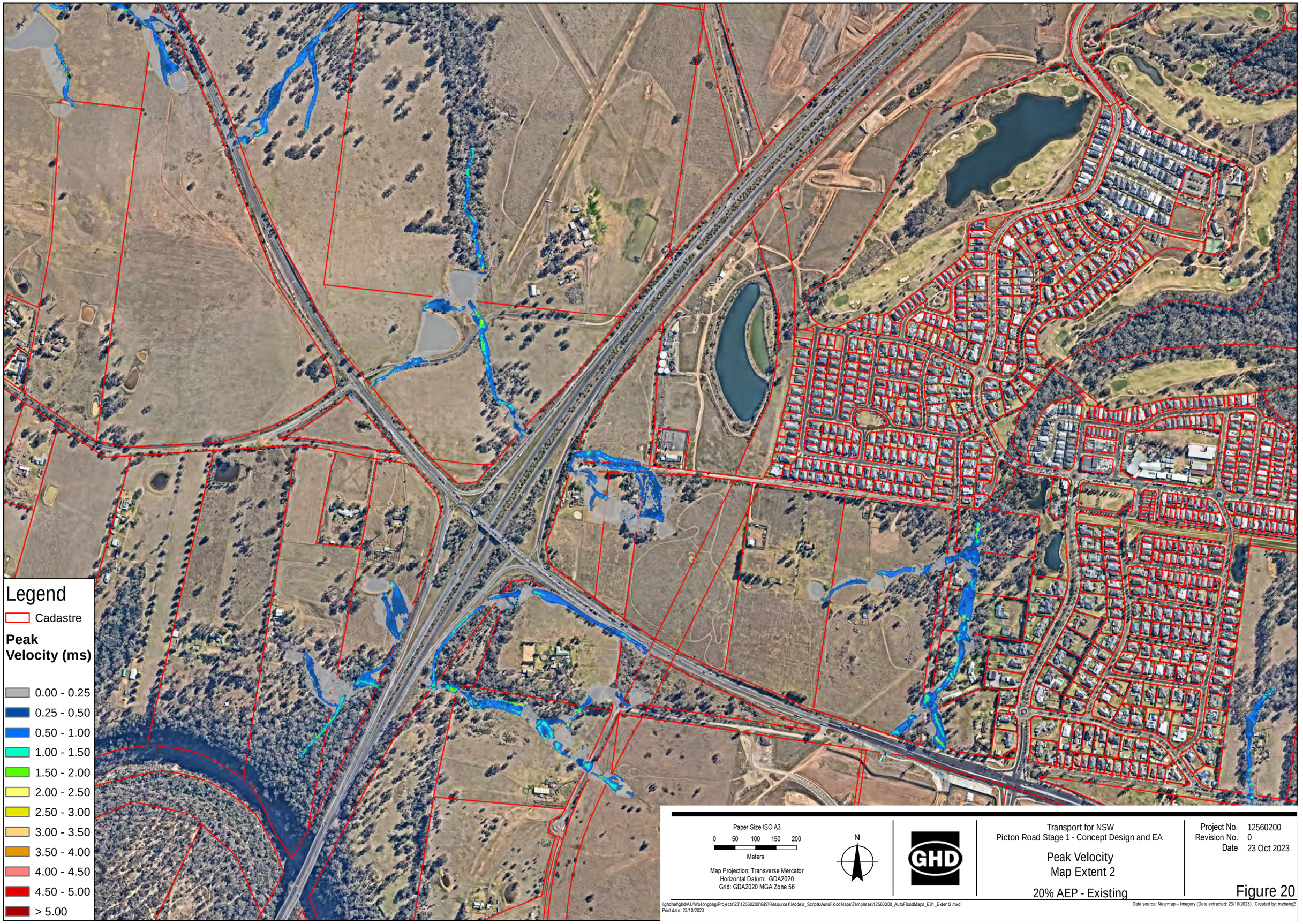
20% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 19

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 2

20% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 20

\\ghdnetfghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

20% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 21

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

5% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 22

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 2

5% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 23

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

5% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 24

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

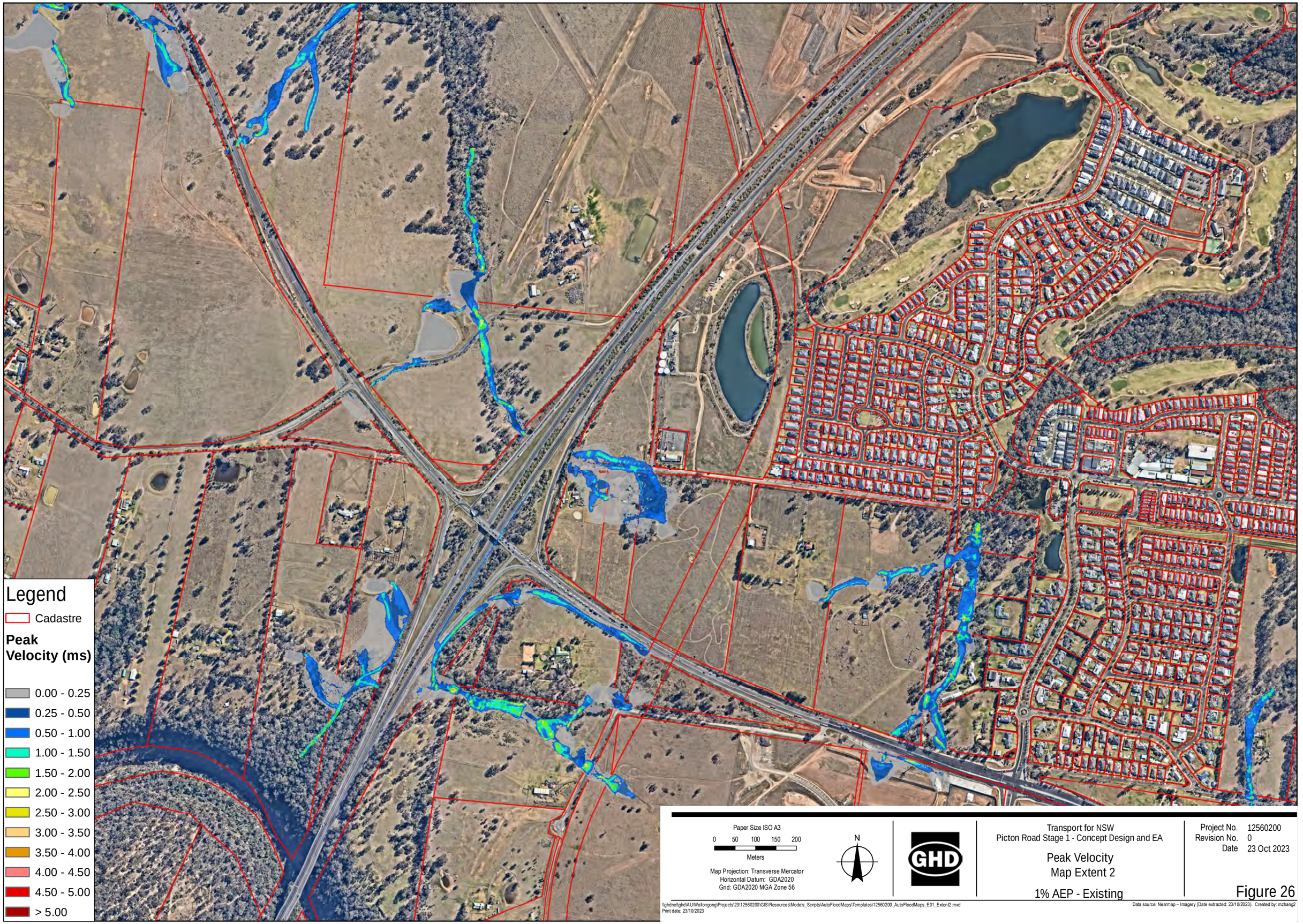
1% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 25

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 2

1% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 26

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

1% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 27

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

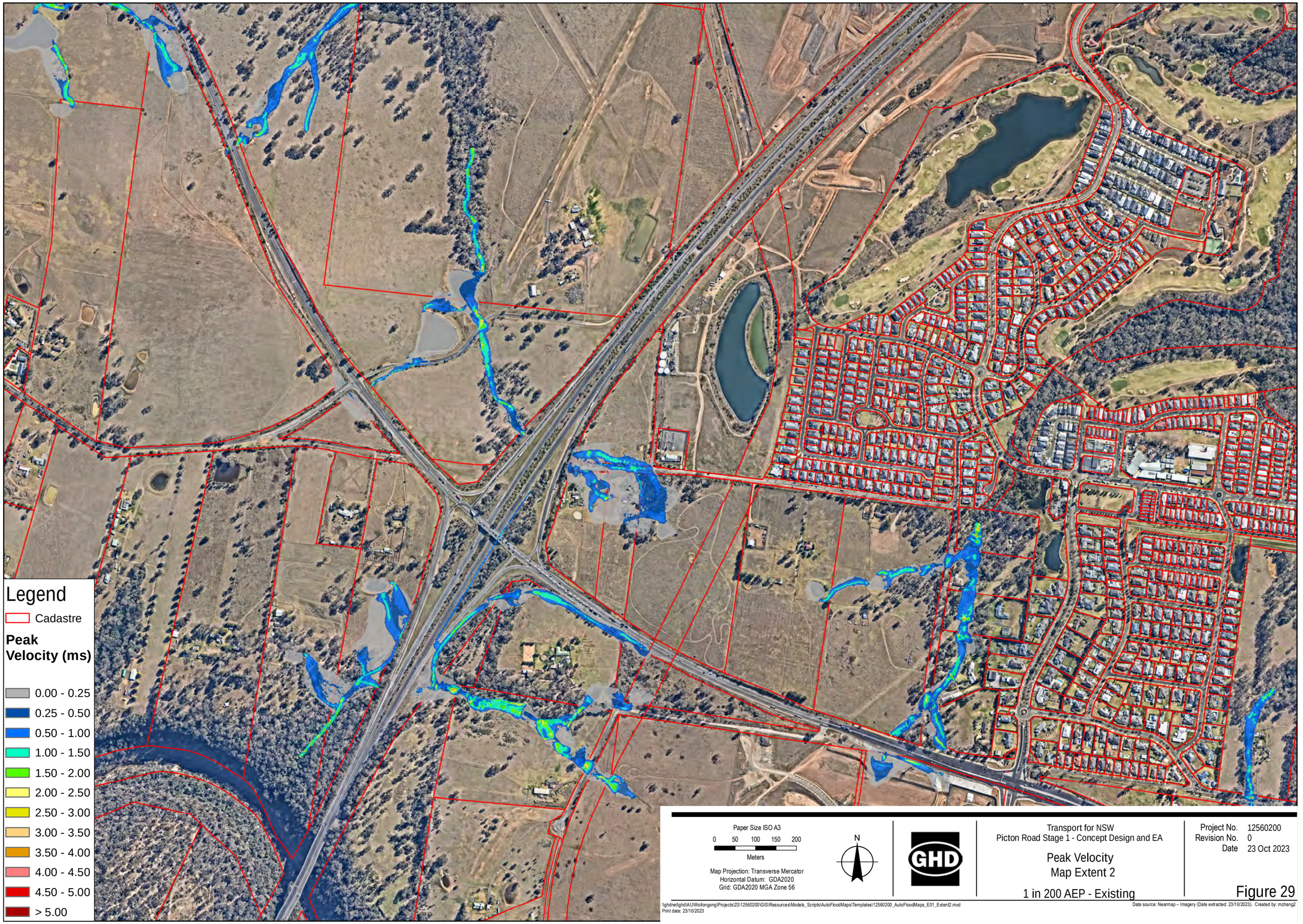
1 in 200 AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 28

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 2

1 in 200 AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 29

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

1 in 200 AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 30

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

1 in 500 AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 31

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 2

1 in 500 AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 32

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

1 in 500 AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 33

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

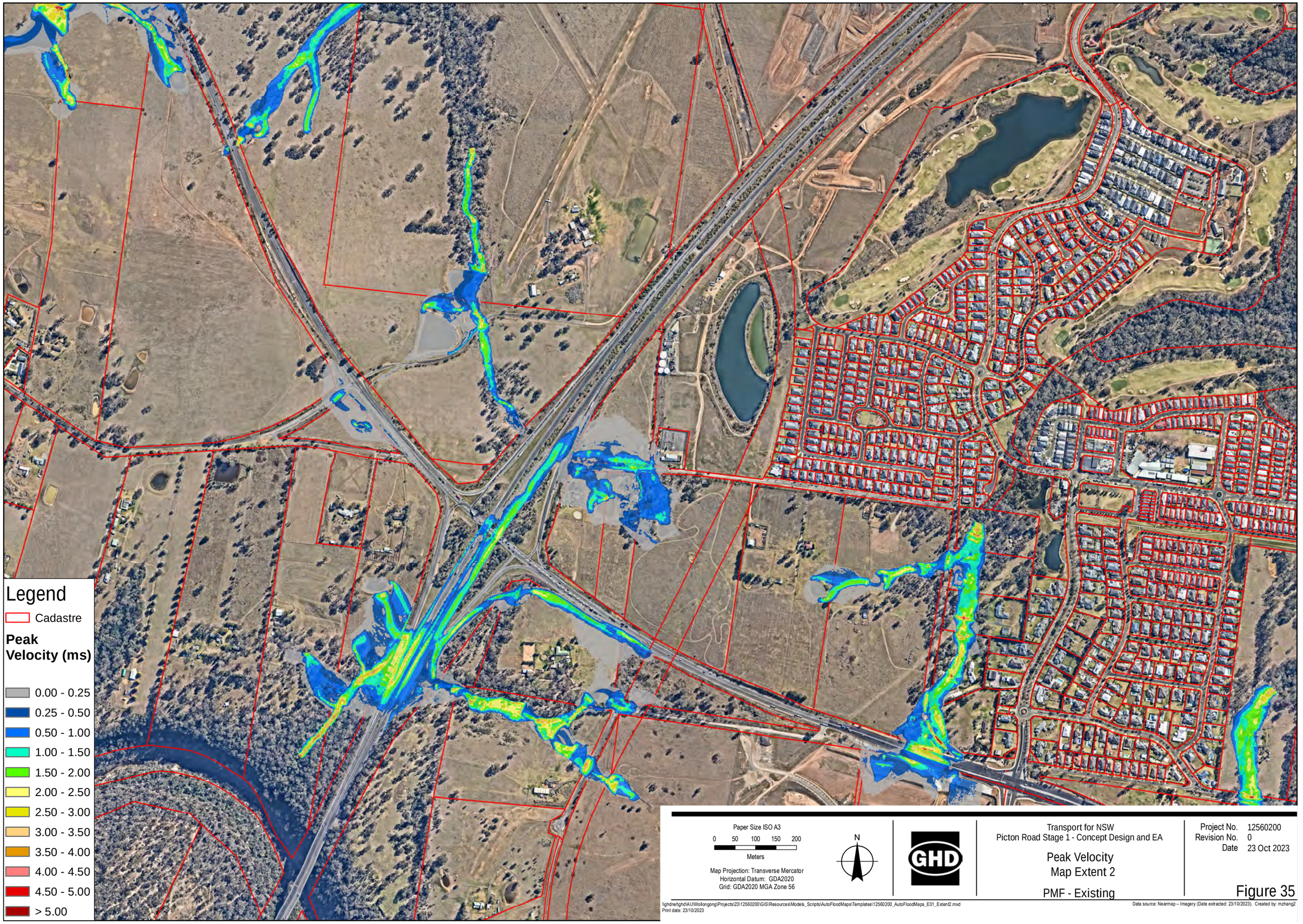
PMF - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 34

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Peak Velocity (ms)
0.00 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
2.00 - 2.50
2.50 - 3.00
3.00 - 3.50
3.50 - 4.00
4.00 - 4.50
4.50 - 5.00
> 5.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Peak Velocity
Map Extent 2
PMF - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 35
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

PMF - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 36

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 1

20% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 37

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 2

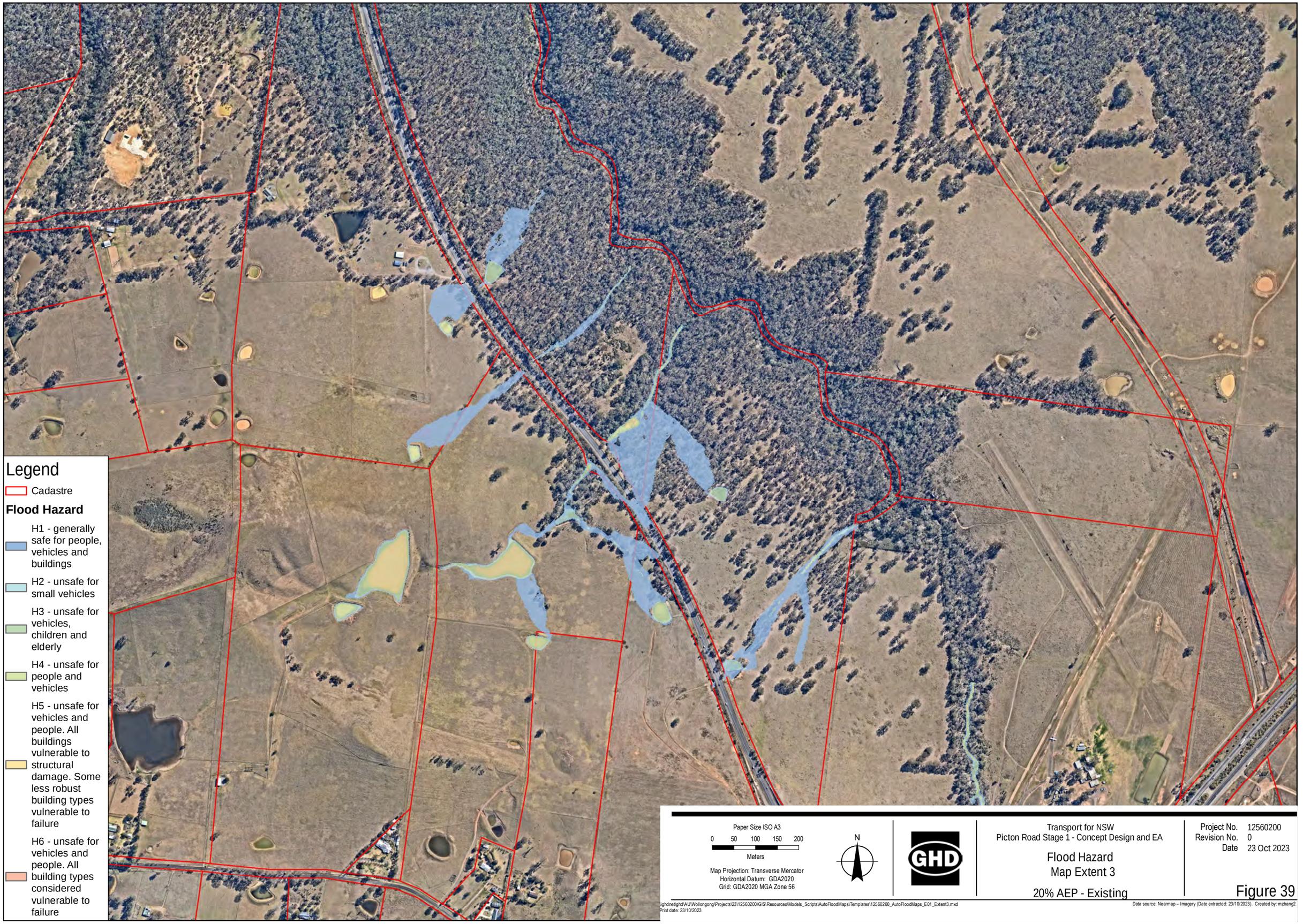
20% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 38

\\ghdnetfghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 3

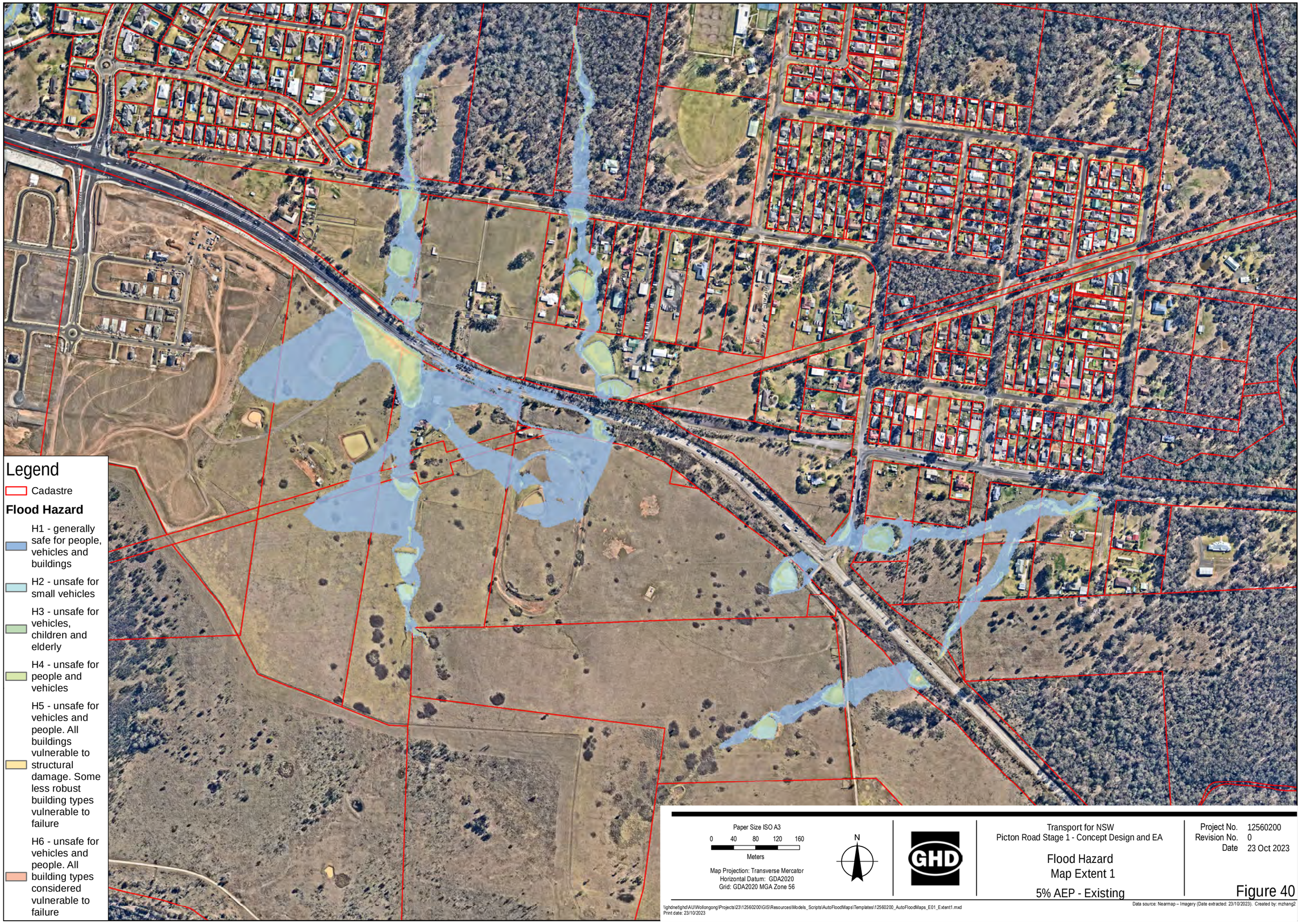
20% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 39

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 1

5% AEP - Existing

Project No.	12560200
Revision No.	0
Date	23 Oct 2023

Figure 40

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

- Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 2

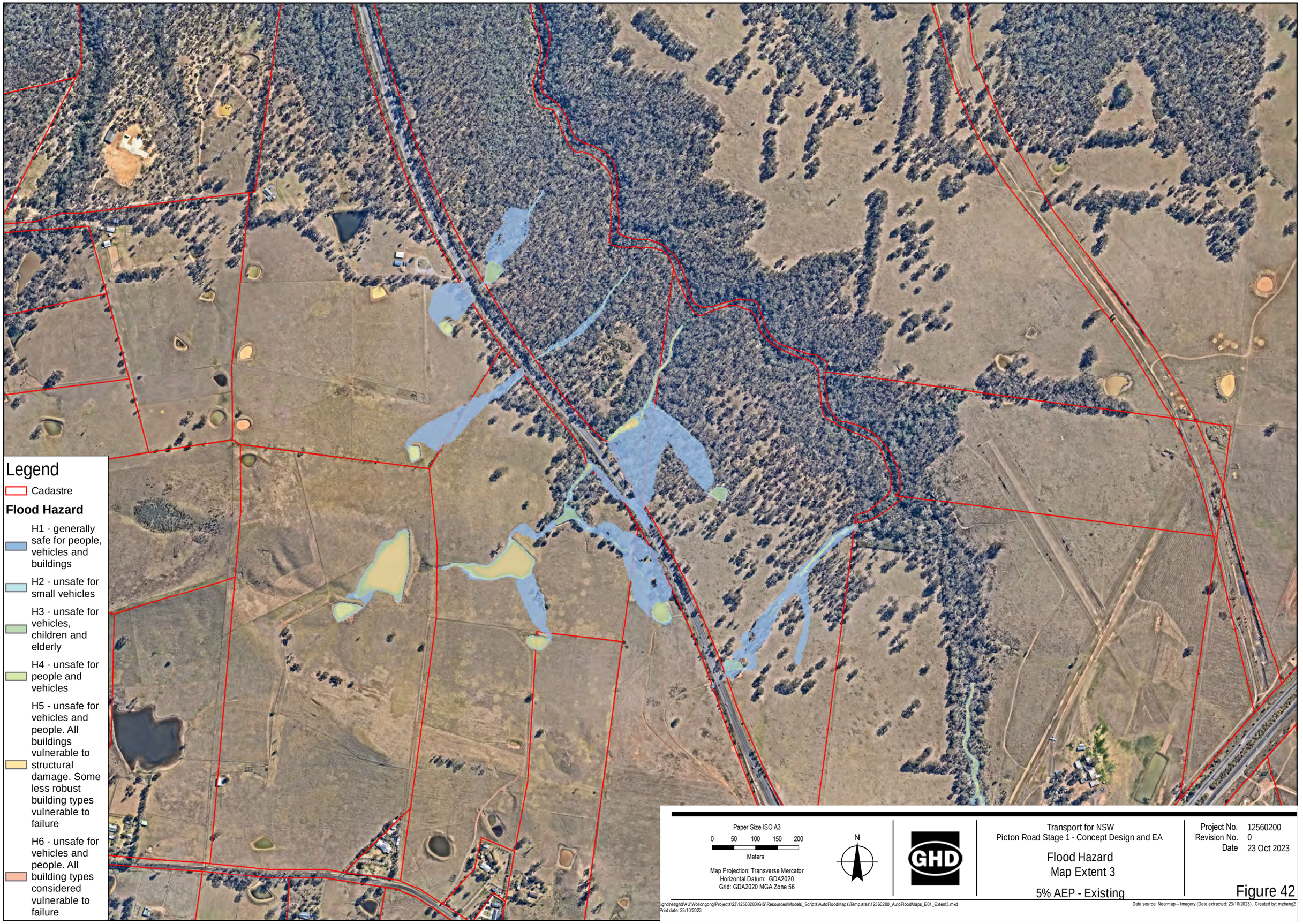
5% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 41

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Hazard
H1 - generally safe for people, vehicles and buildings
H2 - unsafe for small vehicles
H3 - unsafe for vehicles, children and elderly
H4 - unsafe for people and vehicles
H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
H6 - unsafe for vehicles and people. All building types considered vulnerable to failure
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Hazard
Map Extent 3
5% AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 42
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 1

1% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 43

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

- Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 2

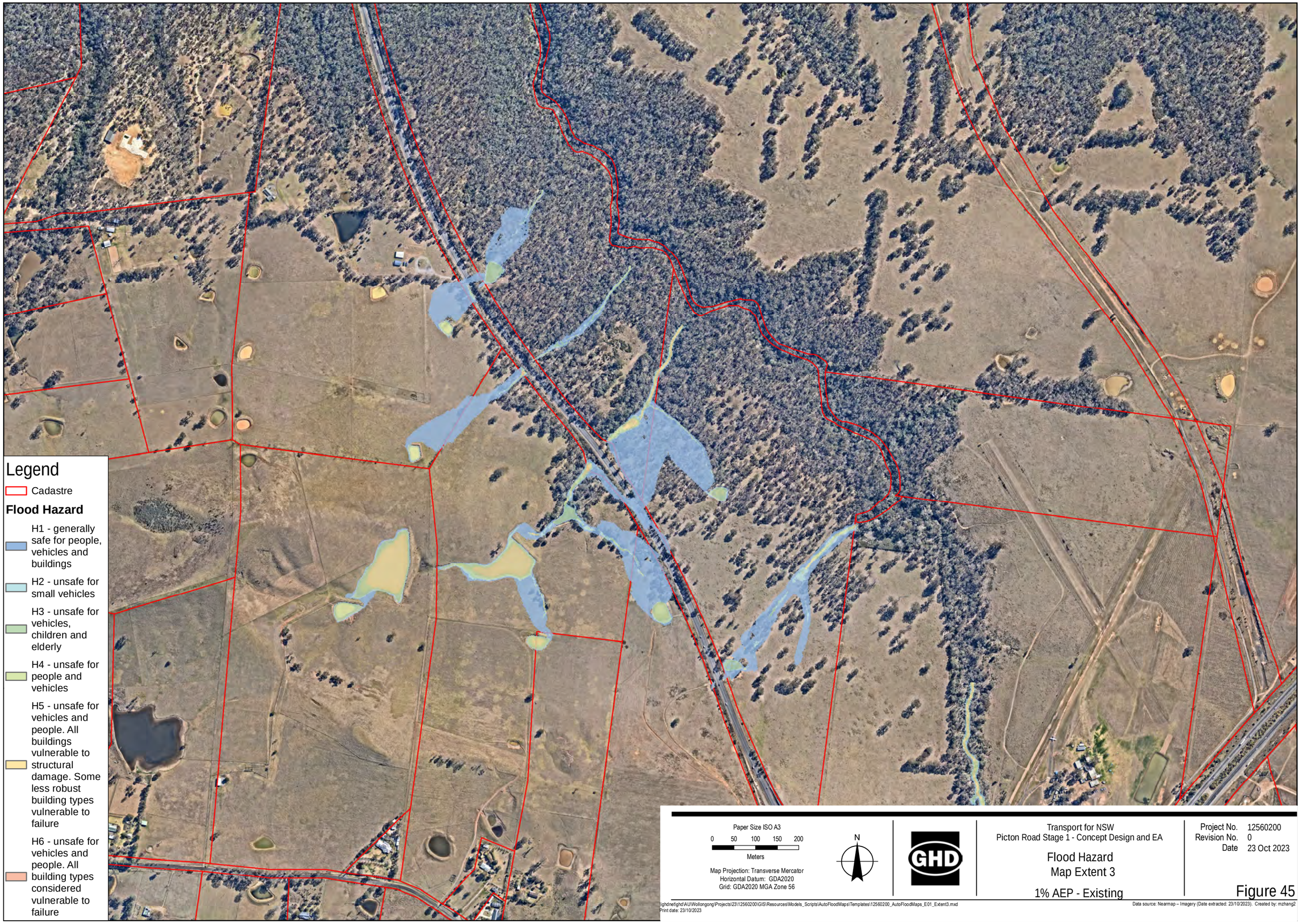
1% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 44

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 3

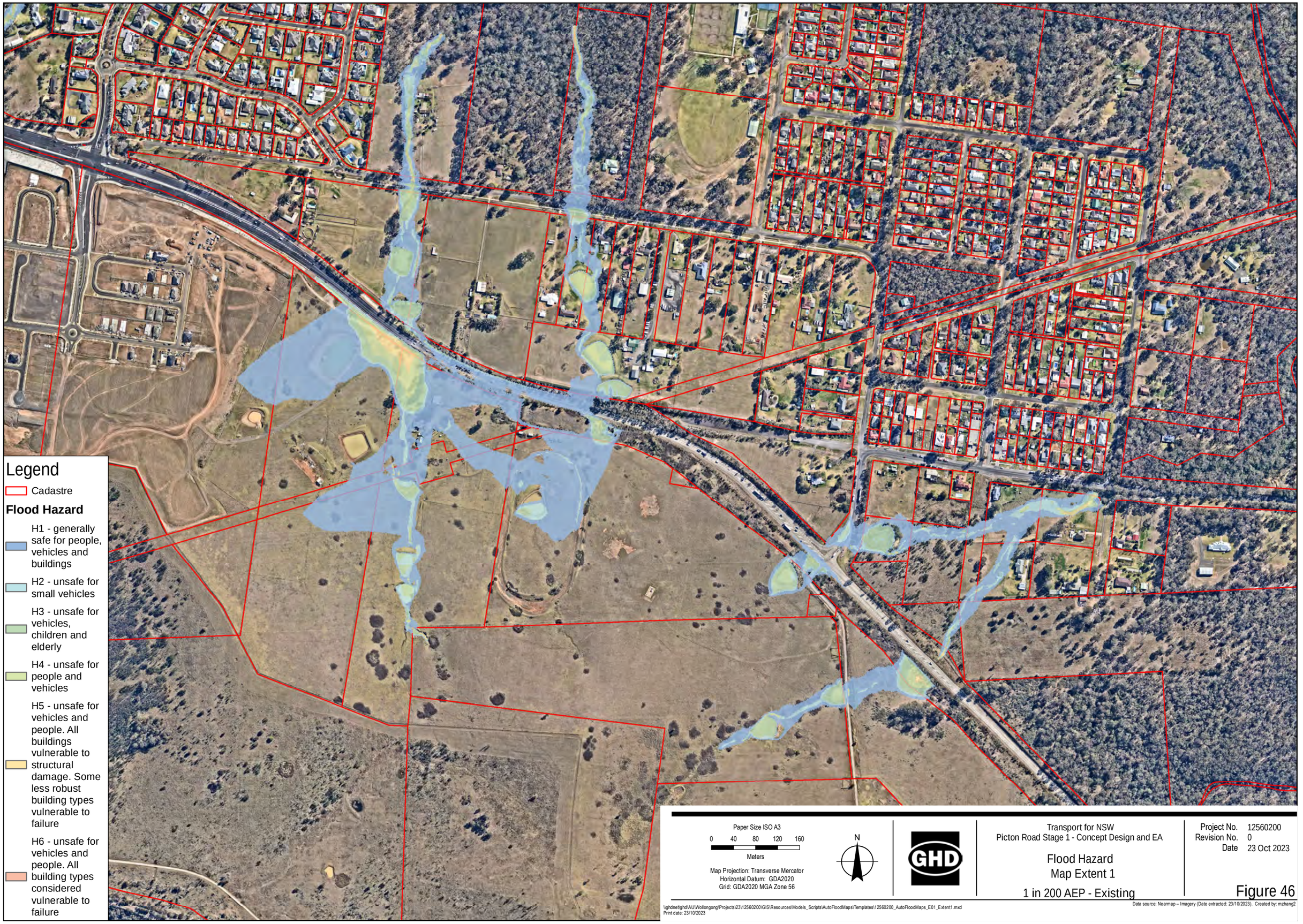
1% AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 45

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 1

1 in 200 AEP - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 46

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 2

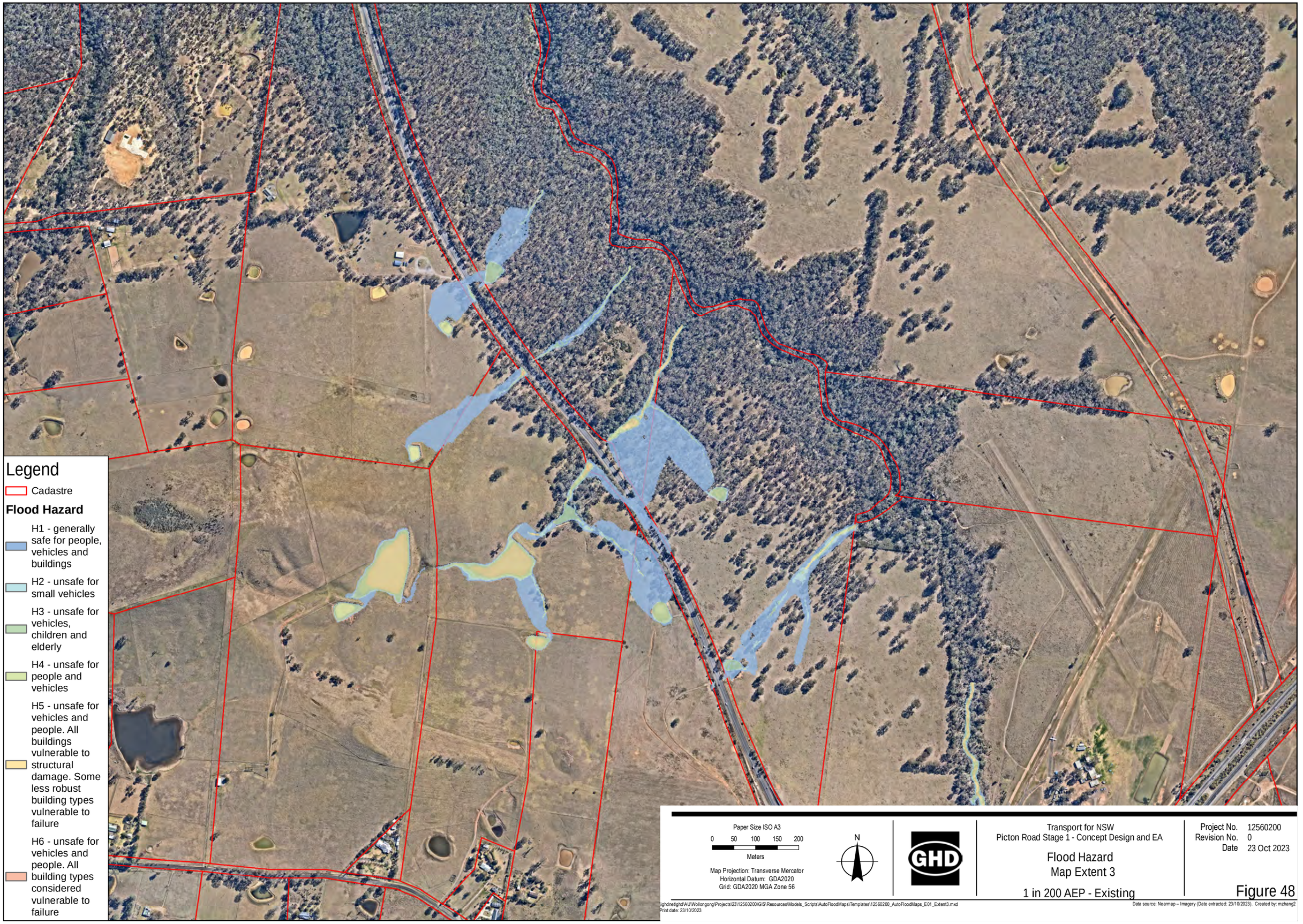
1 in 200 AEP - Existing

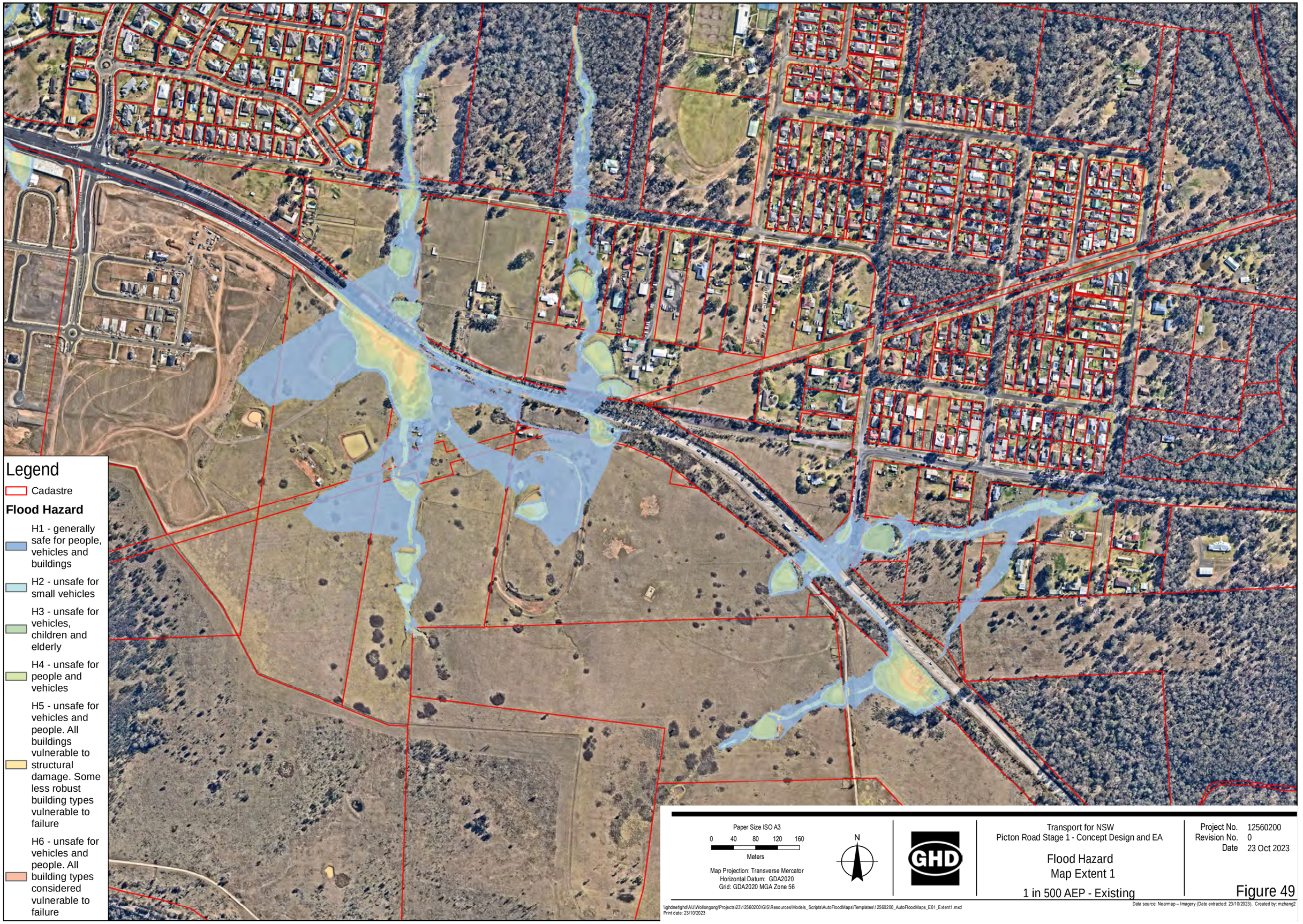
Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 47

\\ghdnetfghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Hazard
H1 - generally safe for people, vehicles and buildings
H2 - unsafe for small vehicles
H3 - unsafe for vehicles, children and elderly
H4 - unsafe for people and vehicles
H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
H6 - unsafe for vehicles and people. All building types considered vulnerable to failure
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Hazard
Map Extent 3
1 in 200 AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 48
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 1

1 in 500 AEP - Existing

Project No.	12560200
Revision No.	0
Date	23 Oct 2023

Figure 49

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 2

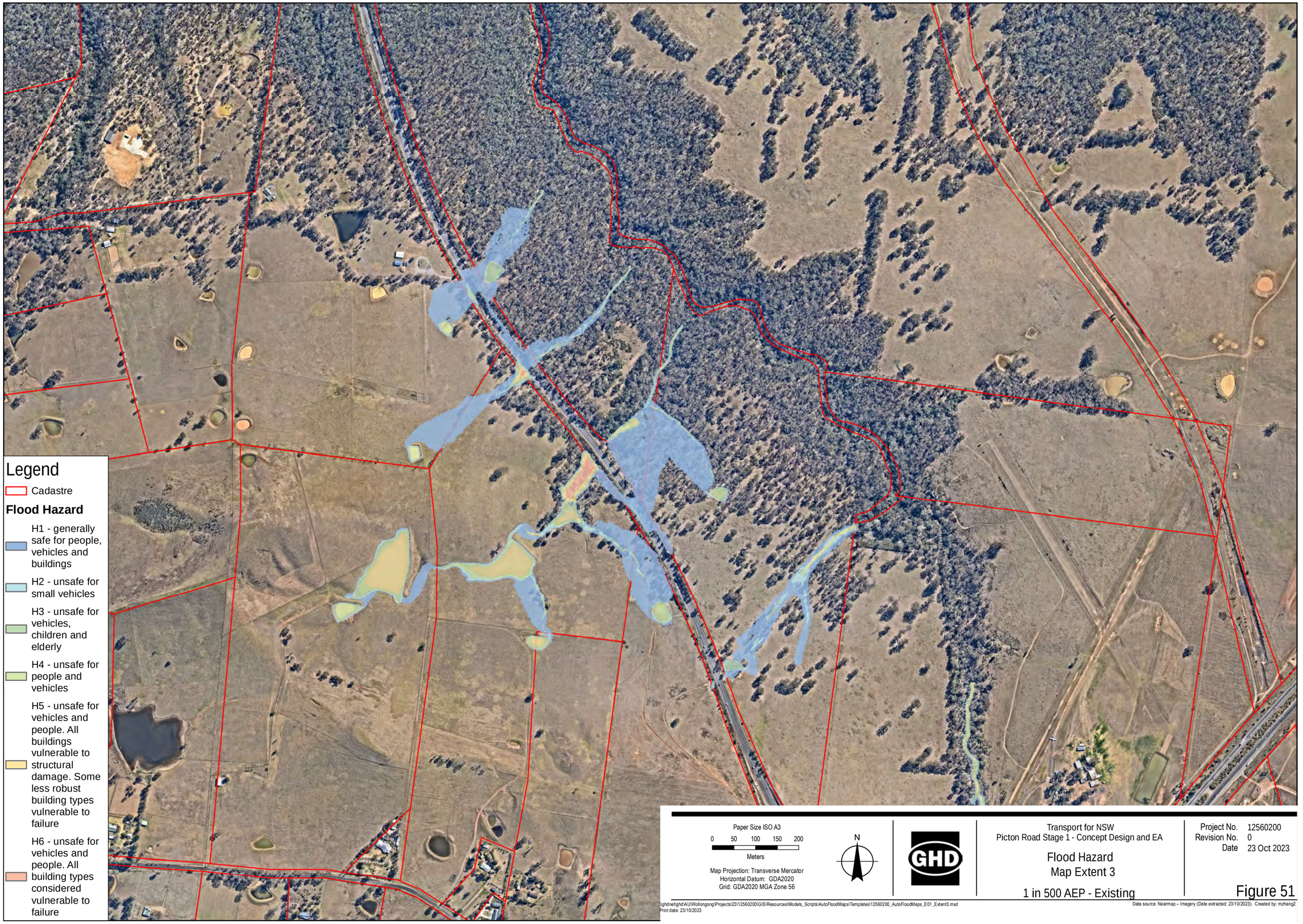
1 in 500 AEP - Existing

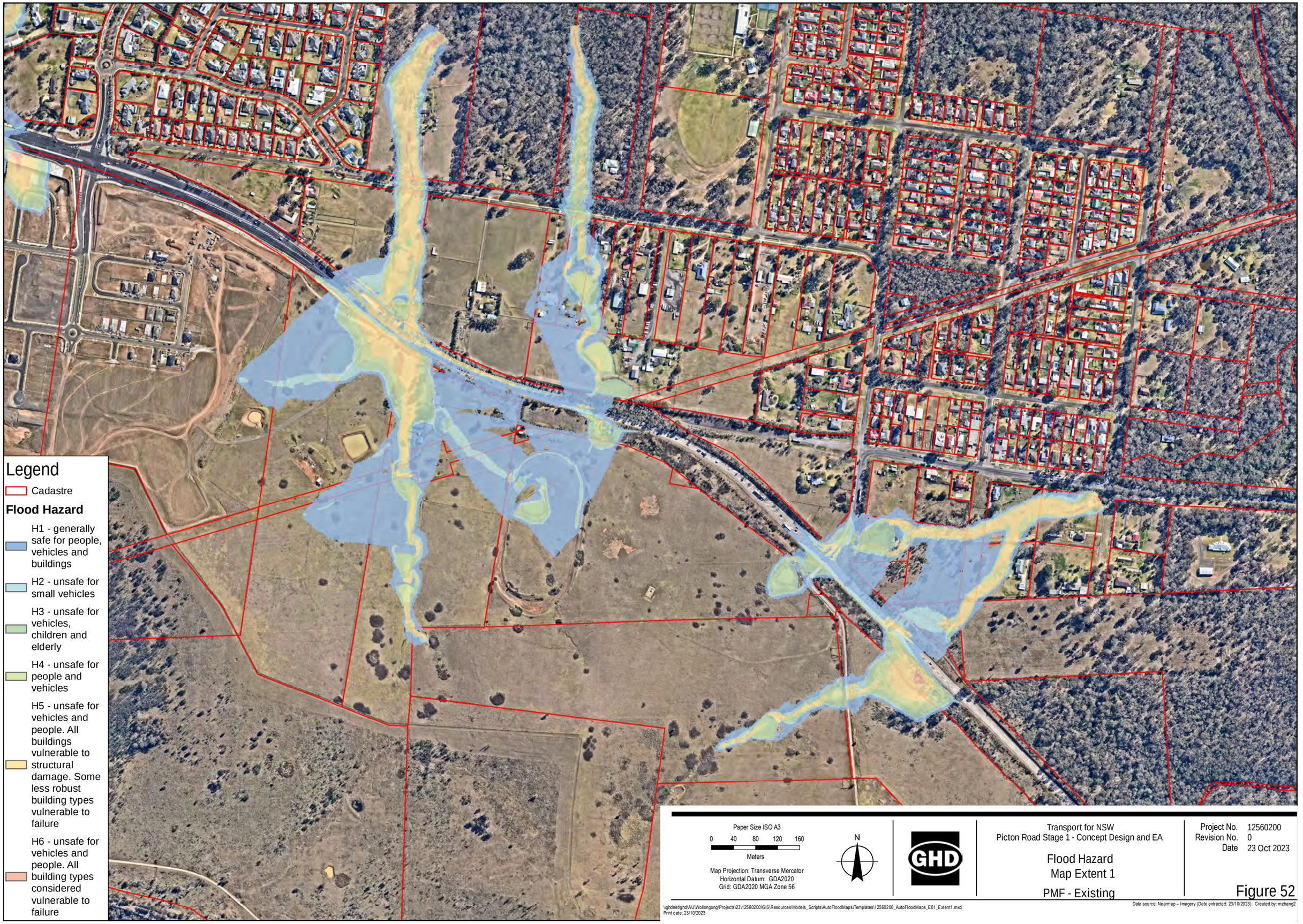
Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 50

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2


Legend
Cadastre
Flood Hazard
H1 - generally safe for people, vehicles and buildings
H2 - unsafe for small vehicles
H3 - unsafe for vehicles, children and elderly
H4 - unsafe for people and vehicles
H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
H6 - unsafe for vehicles and people. All building types considered vulnerable to failure
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Hazard
Map Extent 3
1 in 500 AEP - Existing
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 51
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 1

PMF - Existing

Project No.	12560200
Revision No.	0
Date	23 Oct 2023

Figure 52

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Legend

Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 2

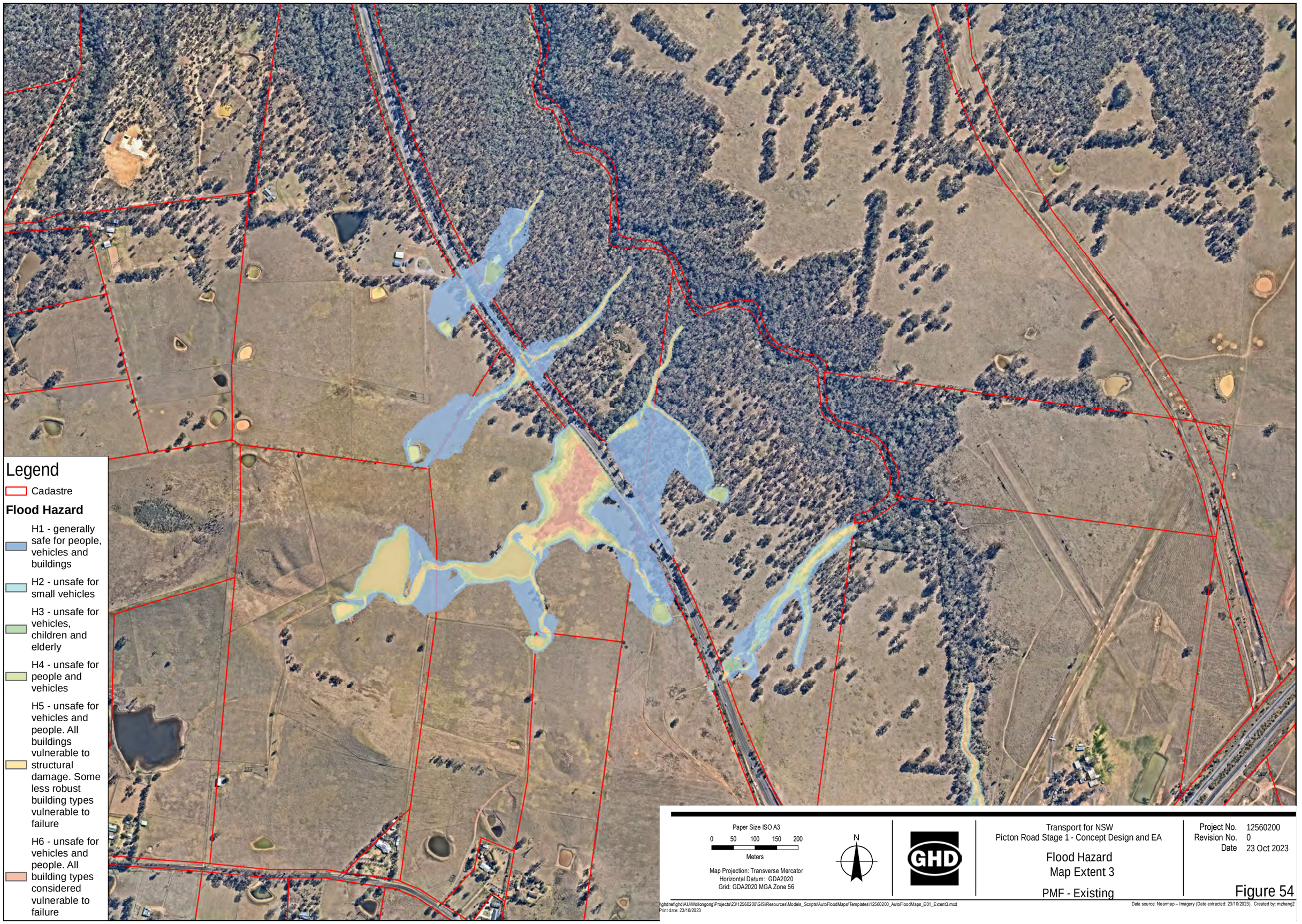
PMF - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 53

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 3

PMF - Existing

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

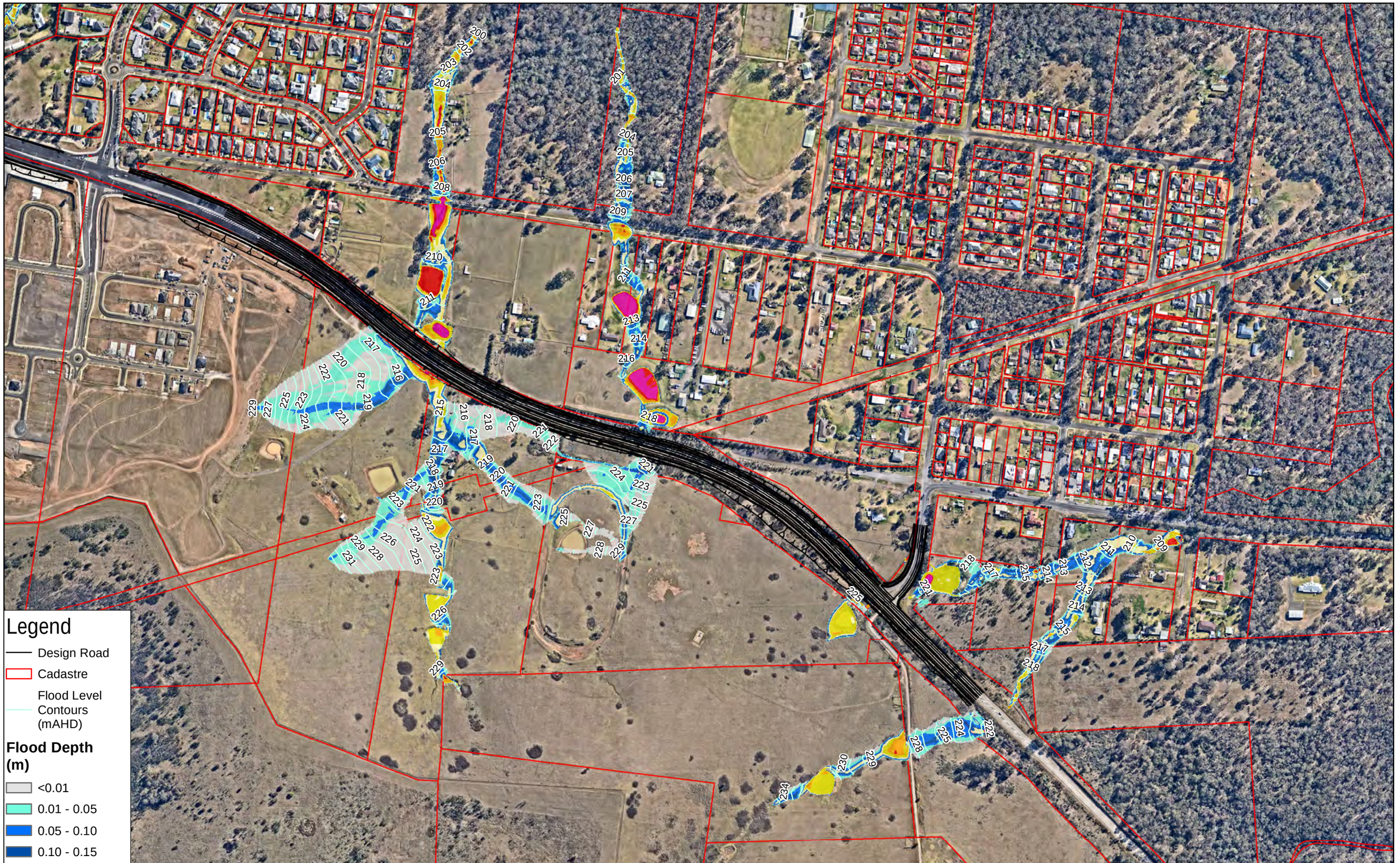
Figure 54

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_E01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023). Created by: mzhang2

Appendix C

Flood mapping – proposed conditions



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Depth and Extent
Map Extent 1

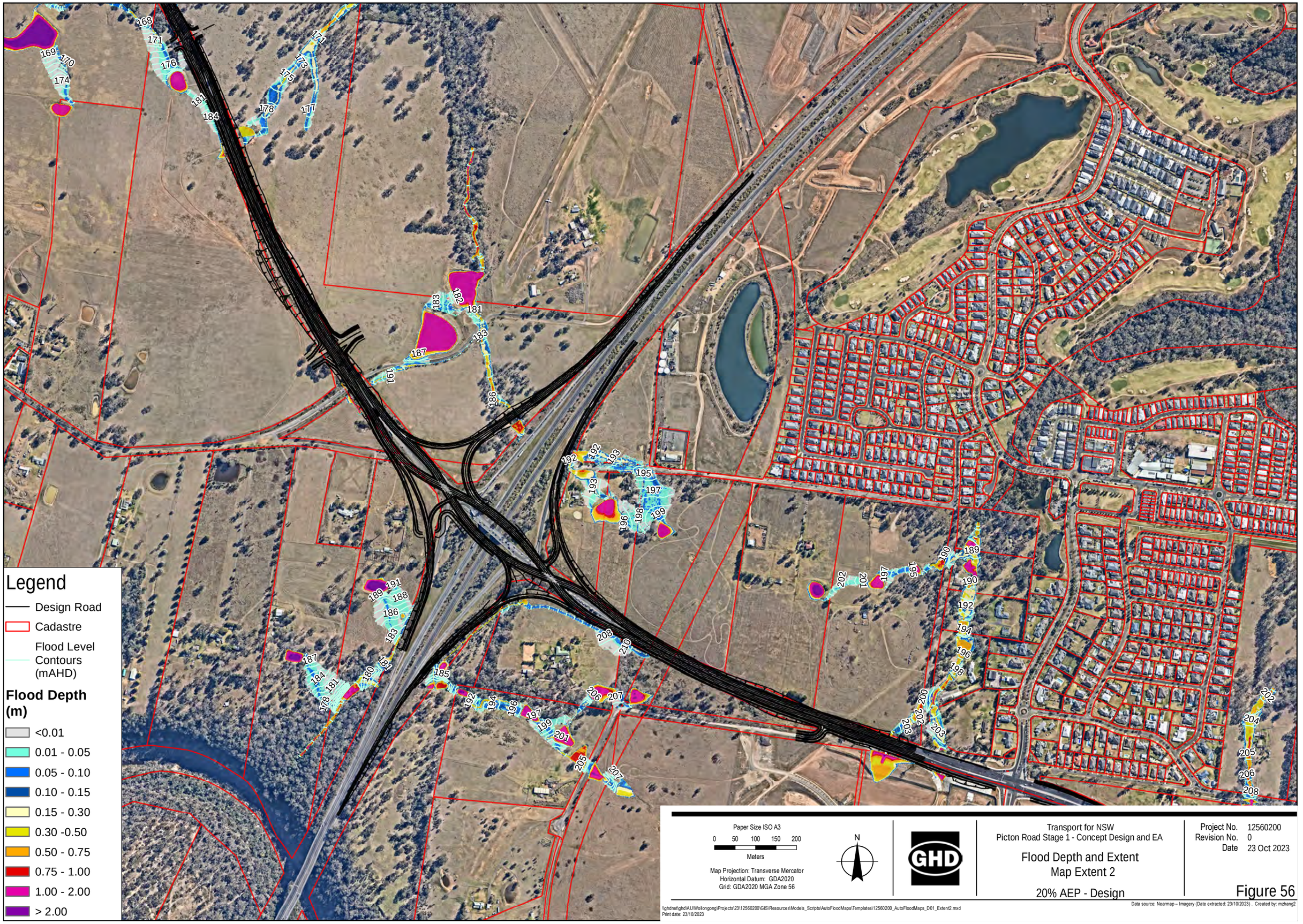
20% AEP - Design

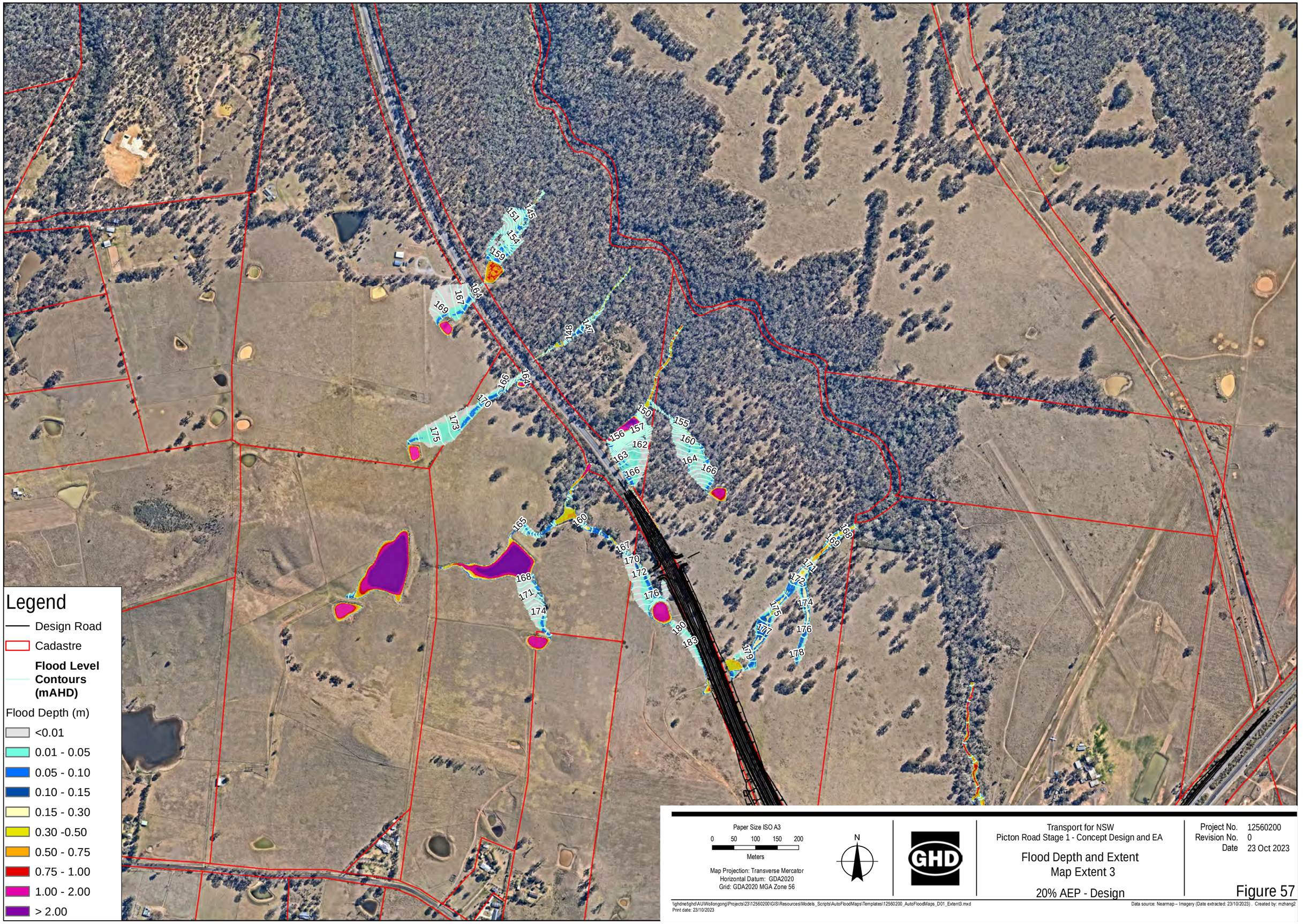
Project No. 12560200
Revision No. 0
Date 23 Oct 2023

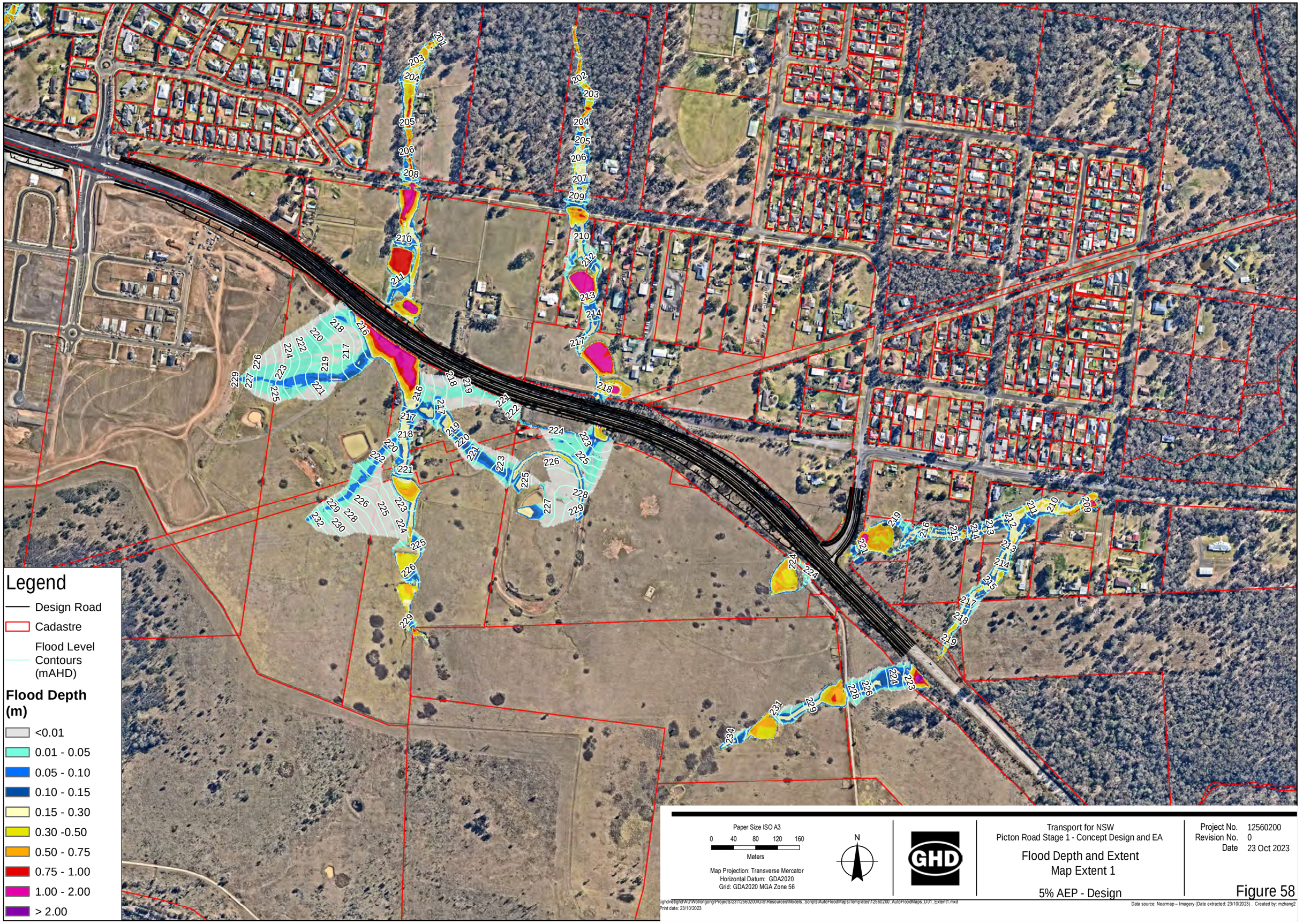
Figure 55

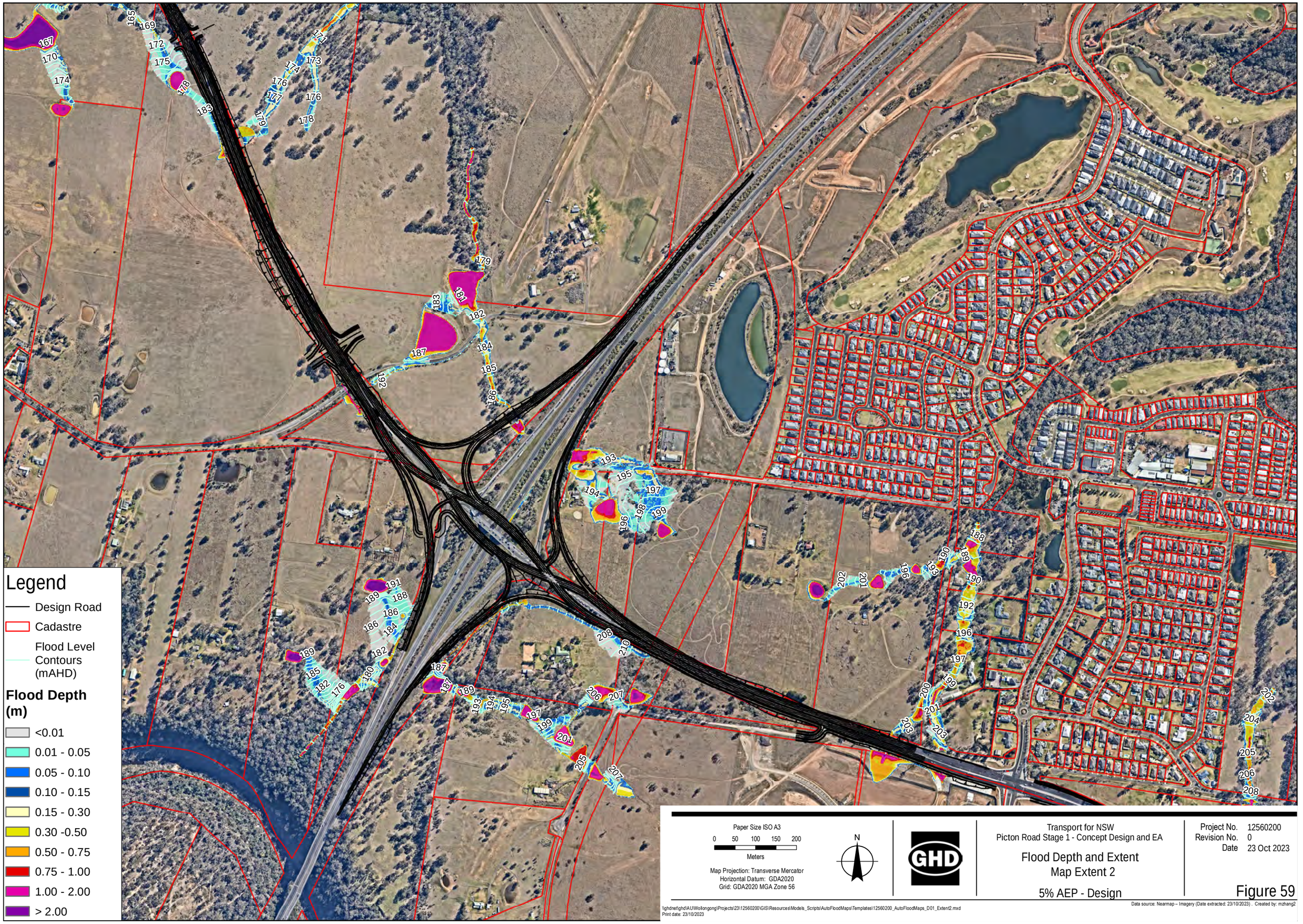
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

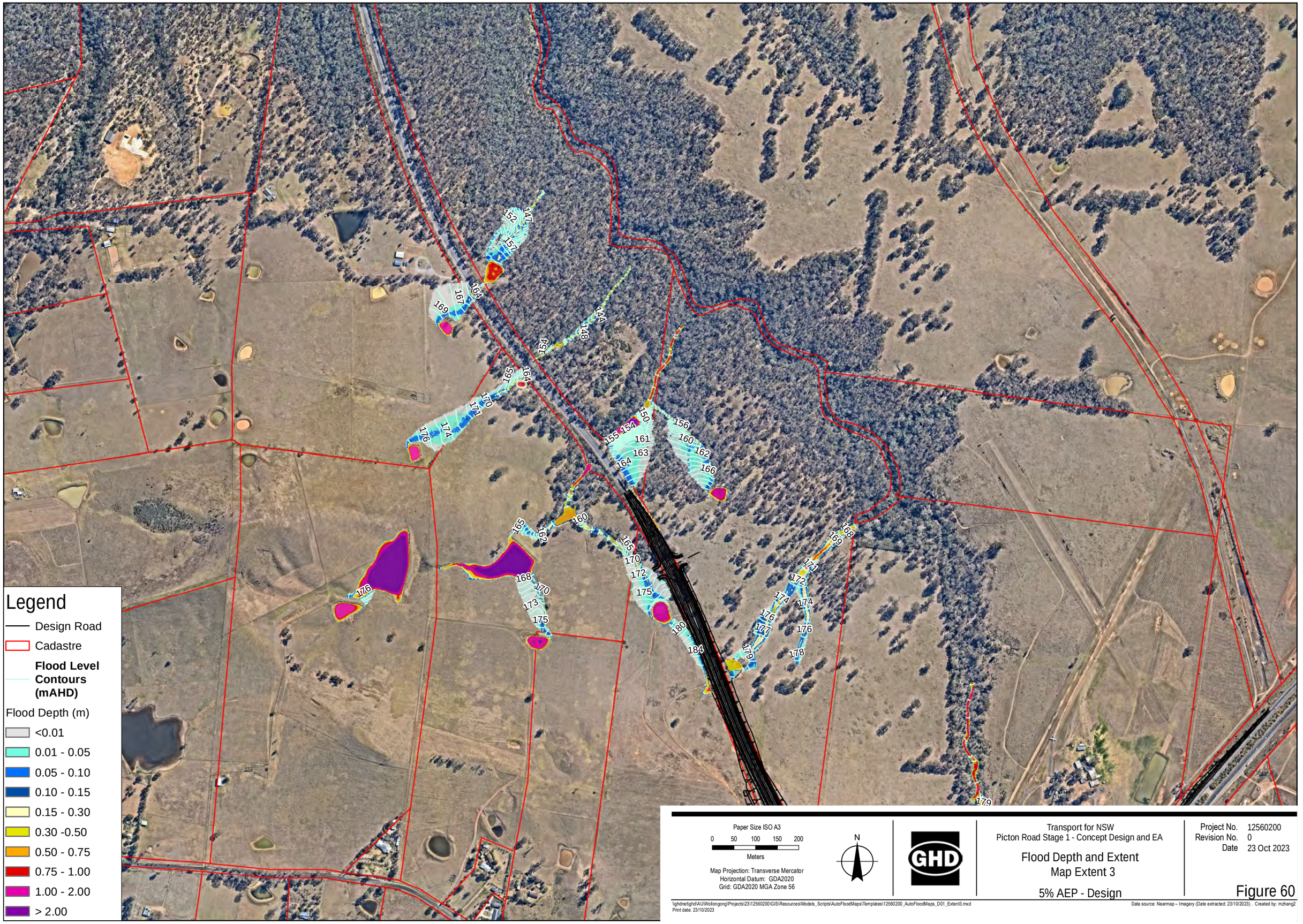
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

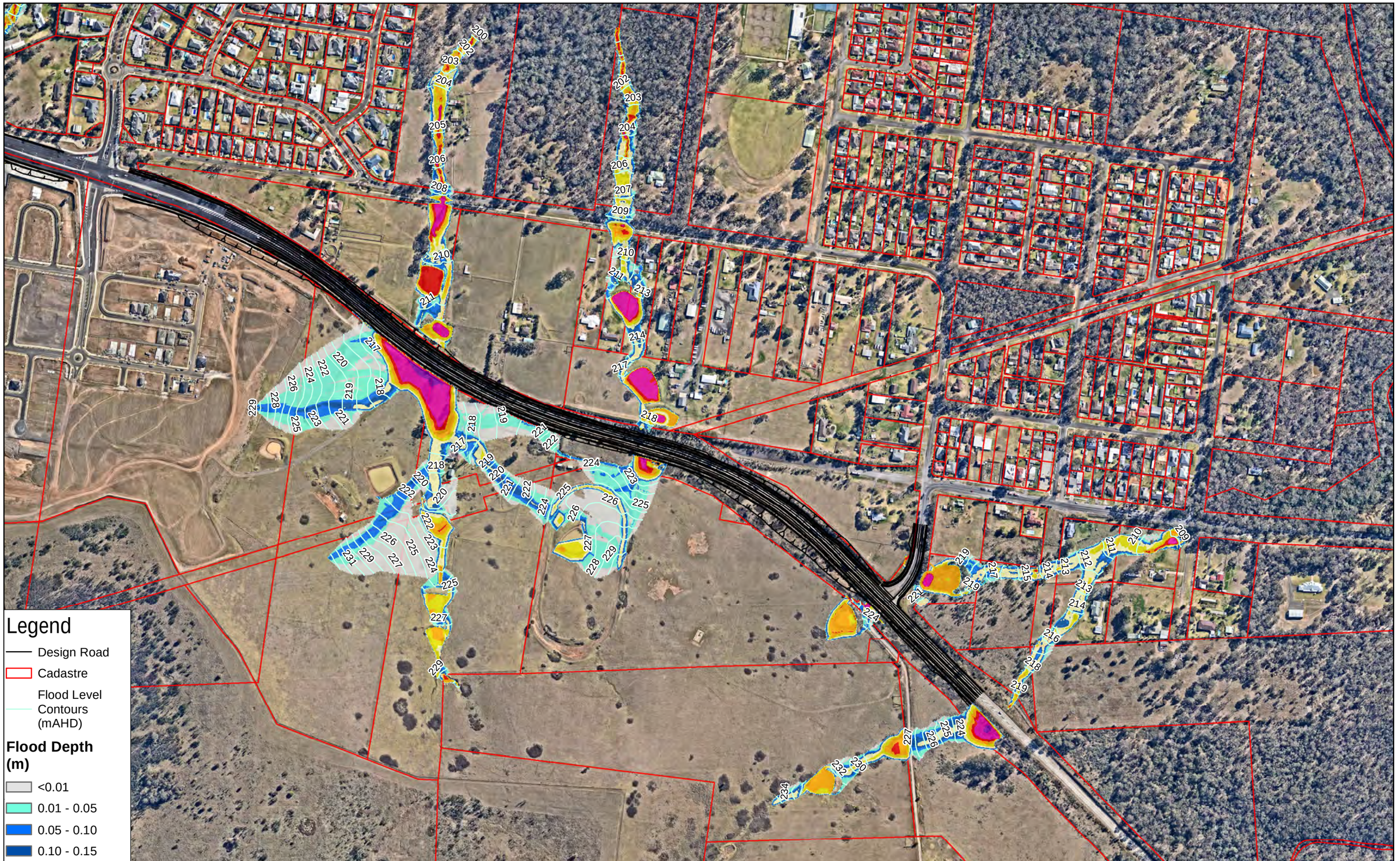

Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 2
20% AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 56
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 3
20% AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 57
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 40 80 120 160
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 1
5% AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 58
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 2
5% AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 59
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 3
5% AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 60
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 40 80 120 160
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 1
1% AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 61
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre
- Flood Level Contours (mAHD)

Flood Depth (m)

- <0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.30
- 0.30 -0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 2.00
- > 2.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Depth and Extent
Map Extent 2

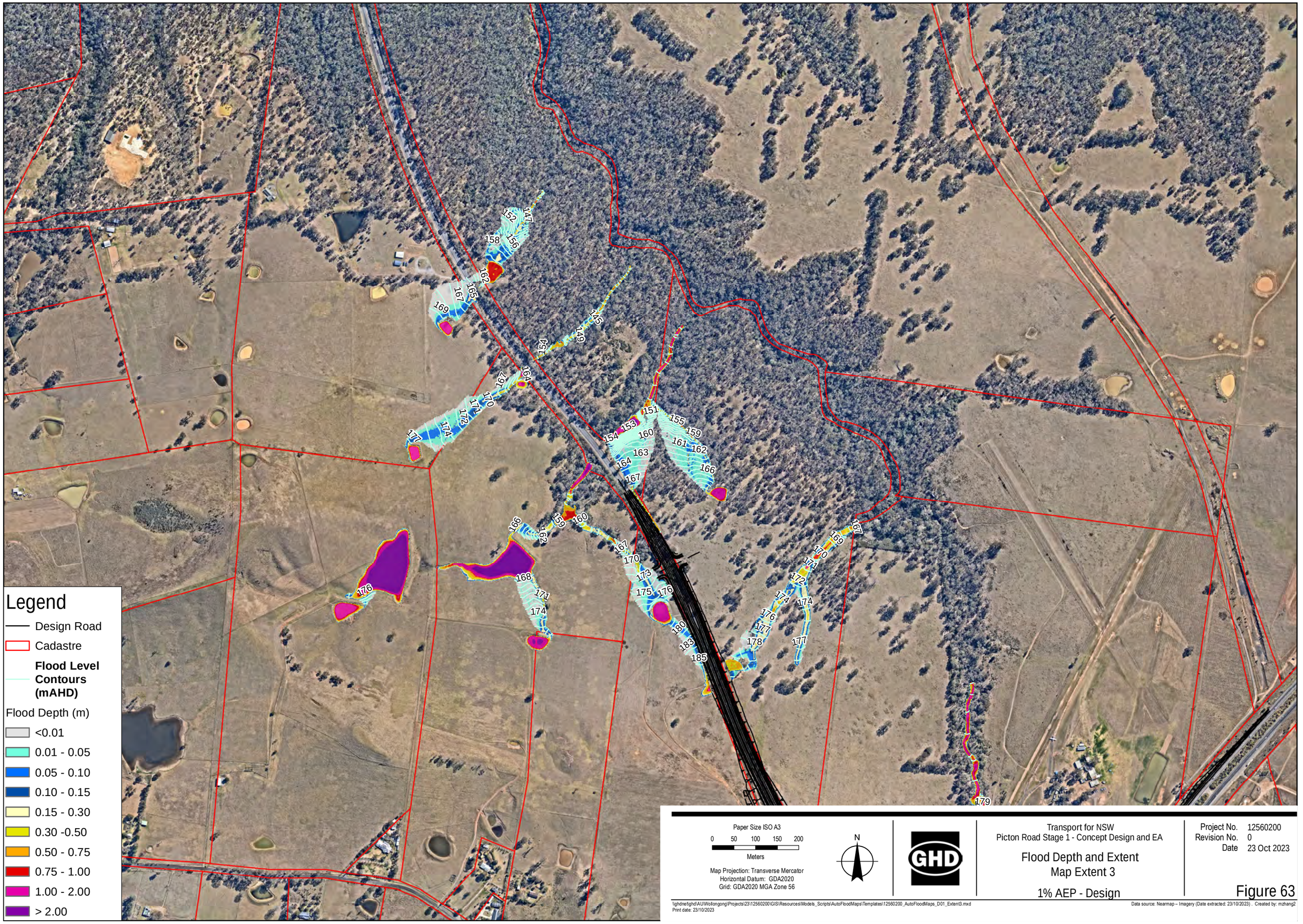
1% AEP - Design

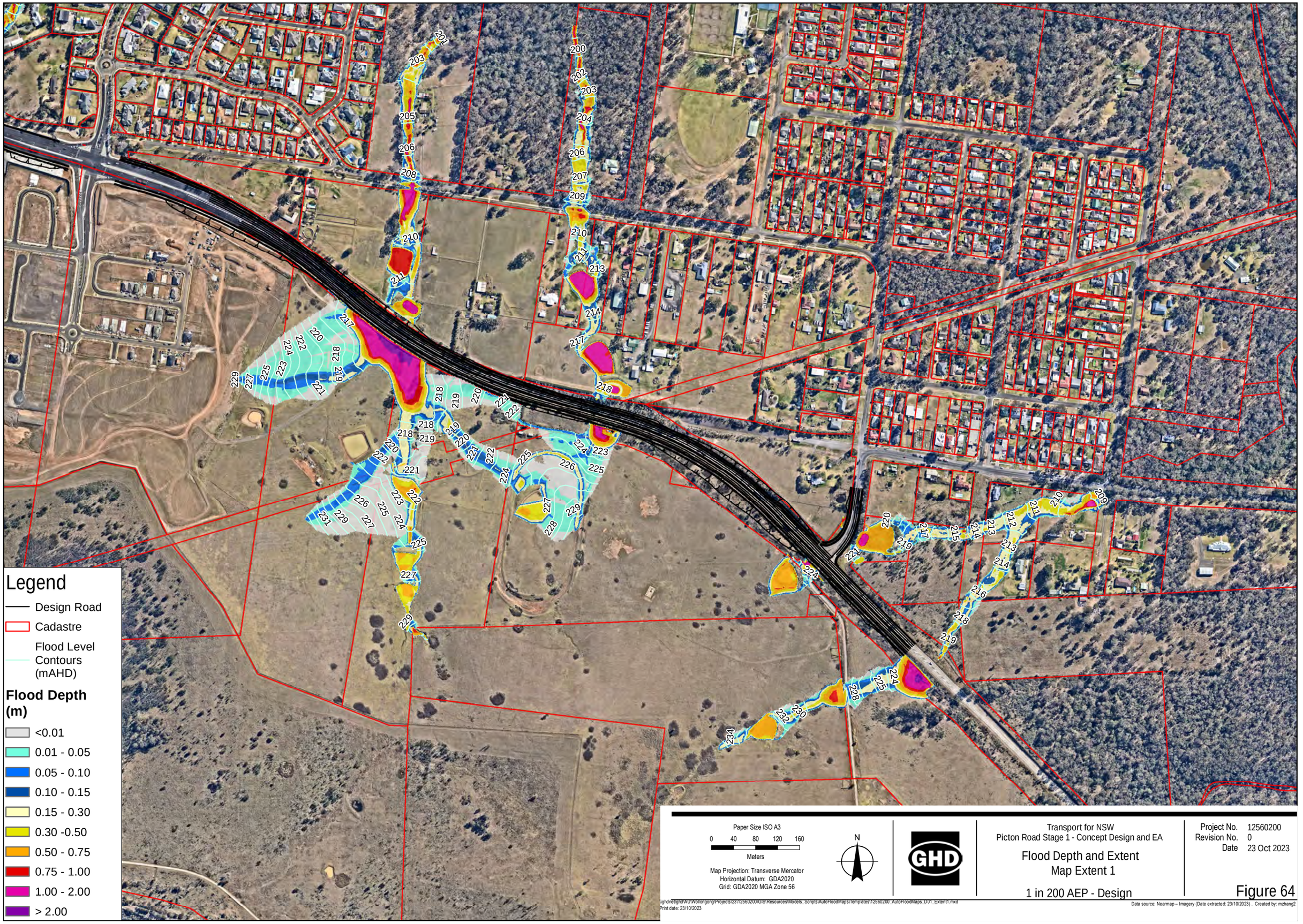
Project No. 12560200
Revision No. 0
Date 23 Oct 2023

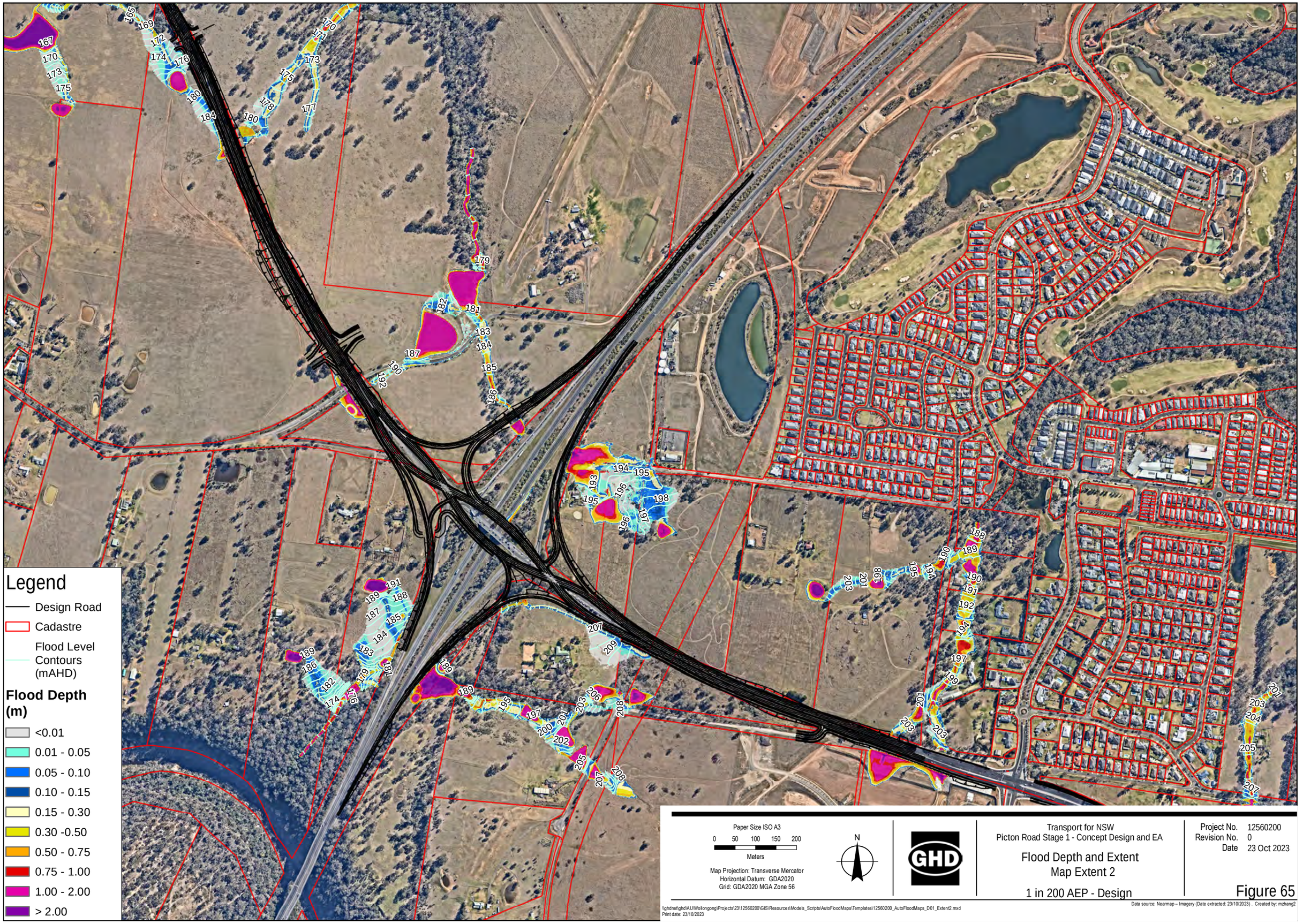
Figure 62

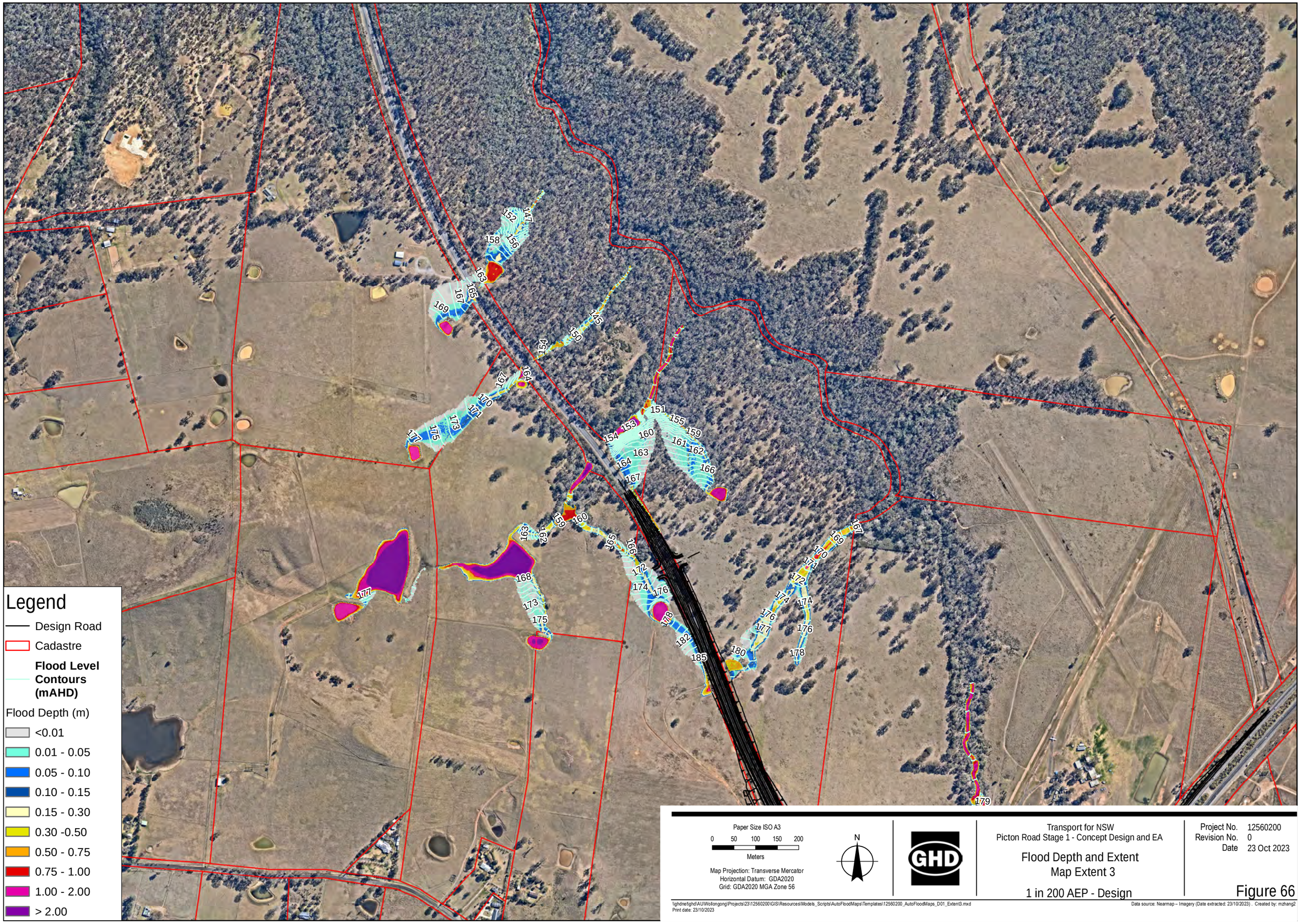
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 3
1% AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 63
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 40 80 120 160
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 1
1 in 200 AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 64
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 2
1 in 200 AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 65
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Depth and Extent
Map Extent 3

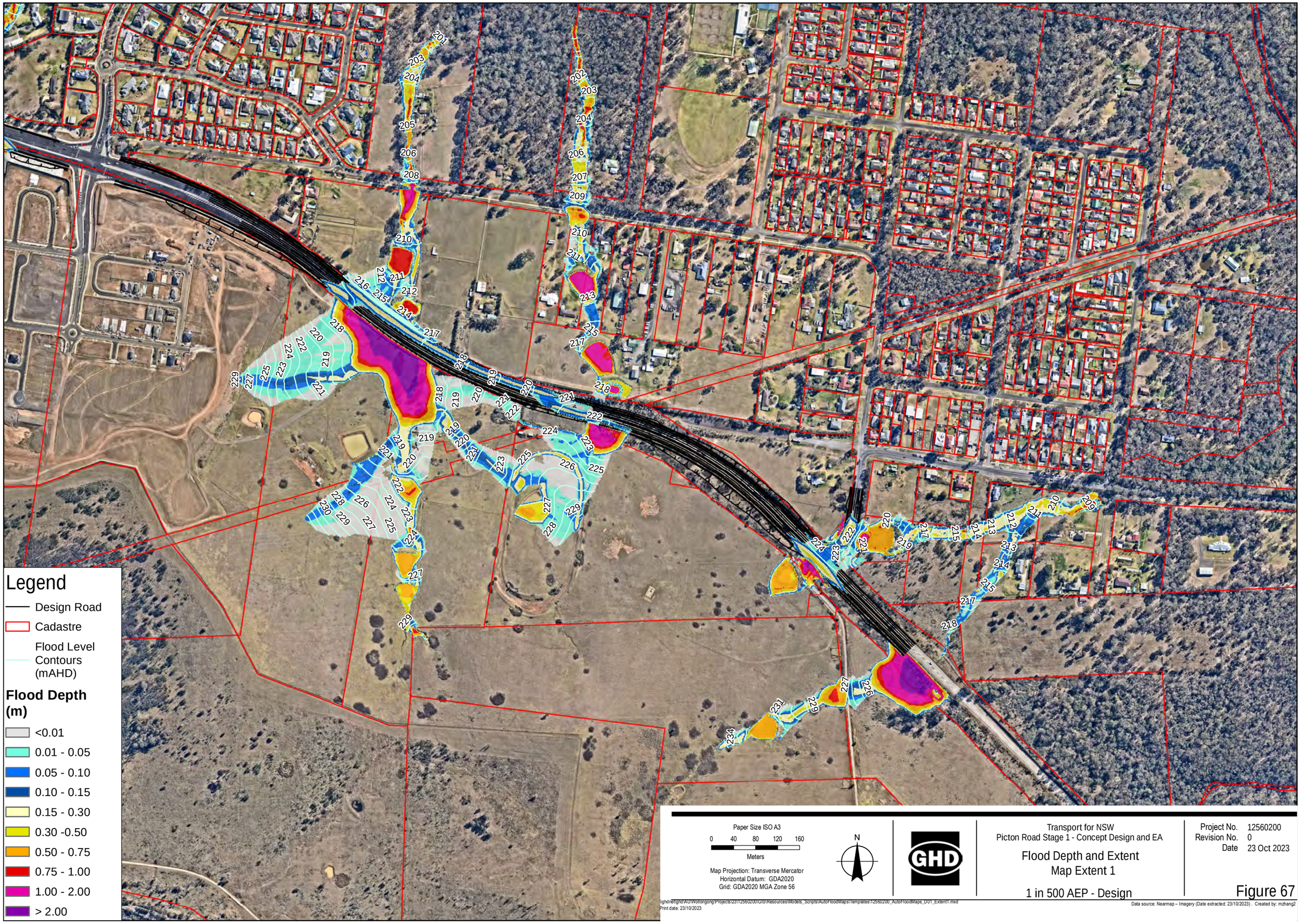
1 in 200 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 66

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 40 80 120 160
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 1
1 in 500 AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 67
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre
- Flood Level Contours (mAHD)

Flood Depth (m)

- <0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.30
- 0.30 -0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 2.00
- > 2.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Depth and Extent
Map Extent 2

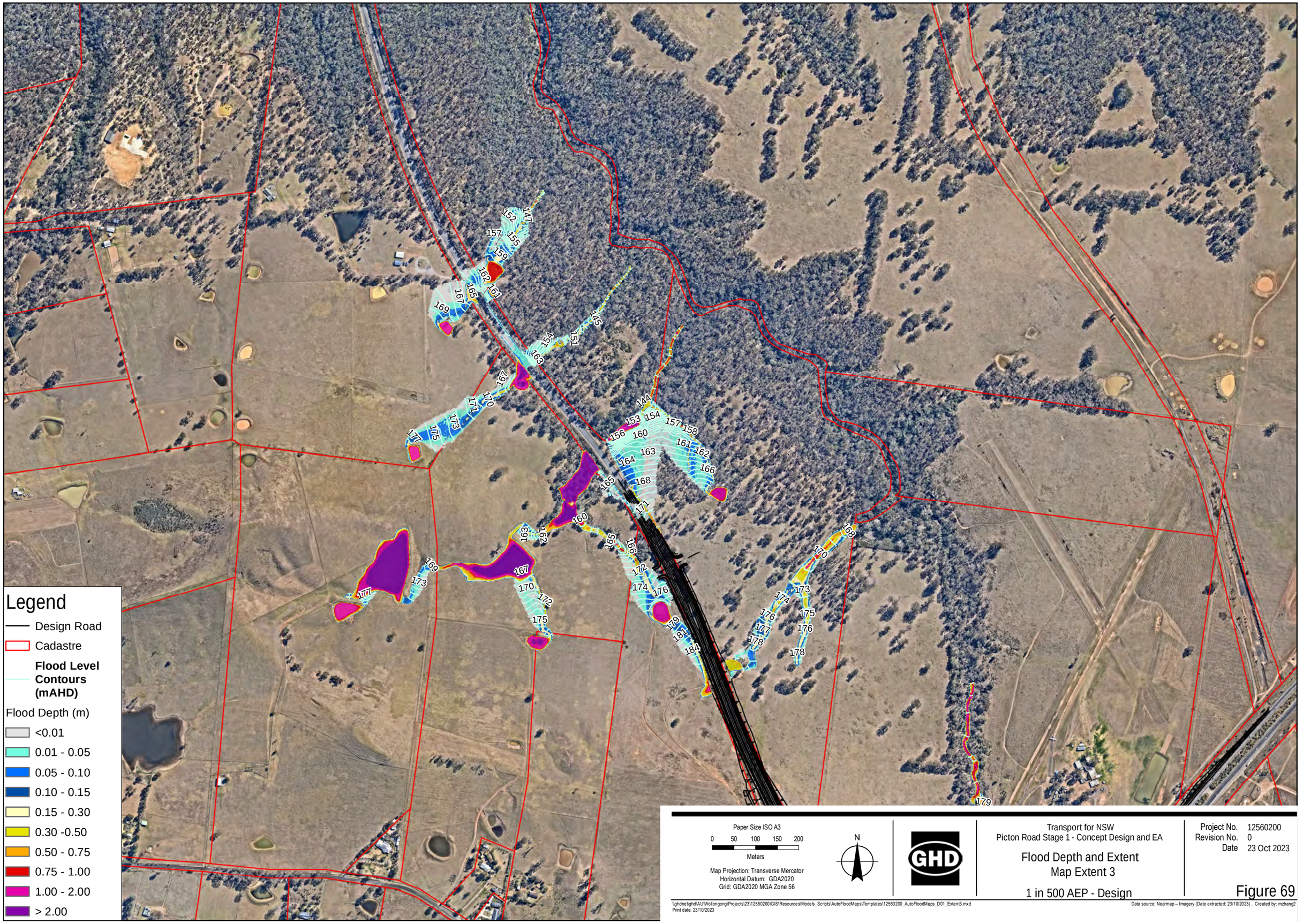
1 in 500 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 68

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 3
1 in 500 AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 69
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre
- Flood Level Contours (mAHD)

Flood Depth (m)

- <0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.30
- 0.30 -0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 2.00
- > 2.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Depth and Extent
Map Extent 1

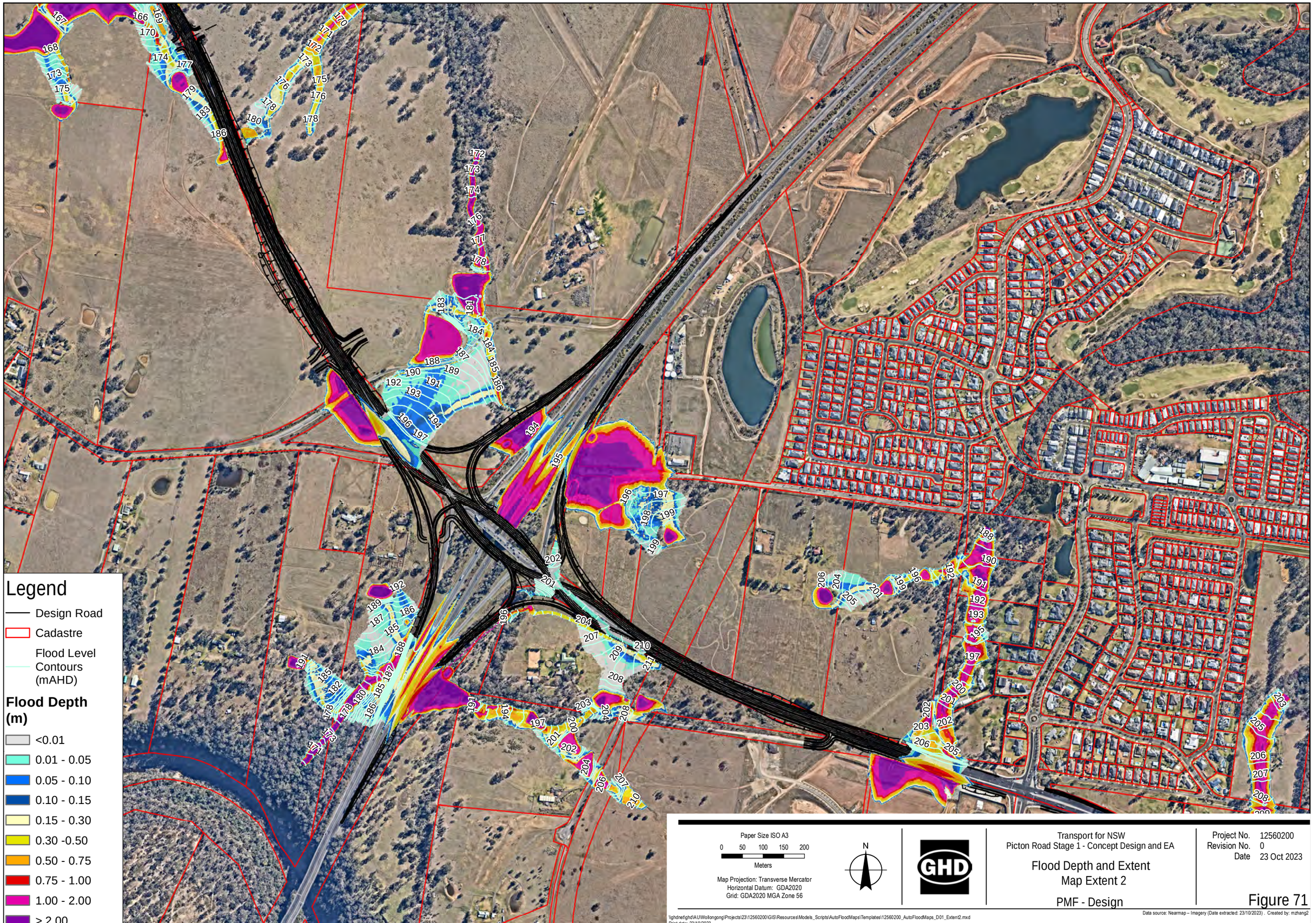
PMF - Design

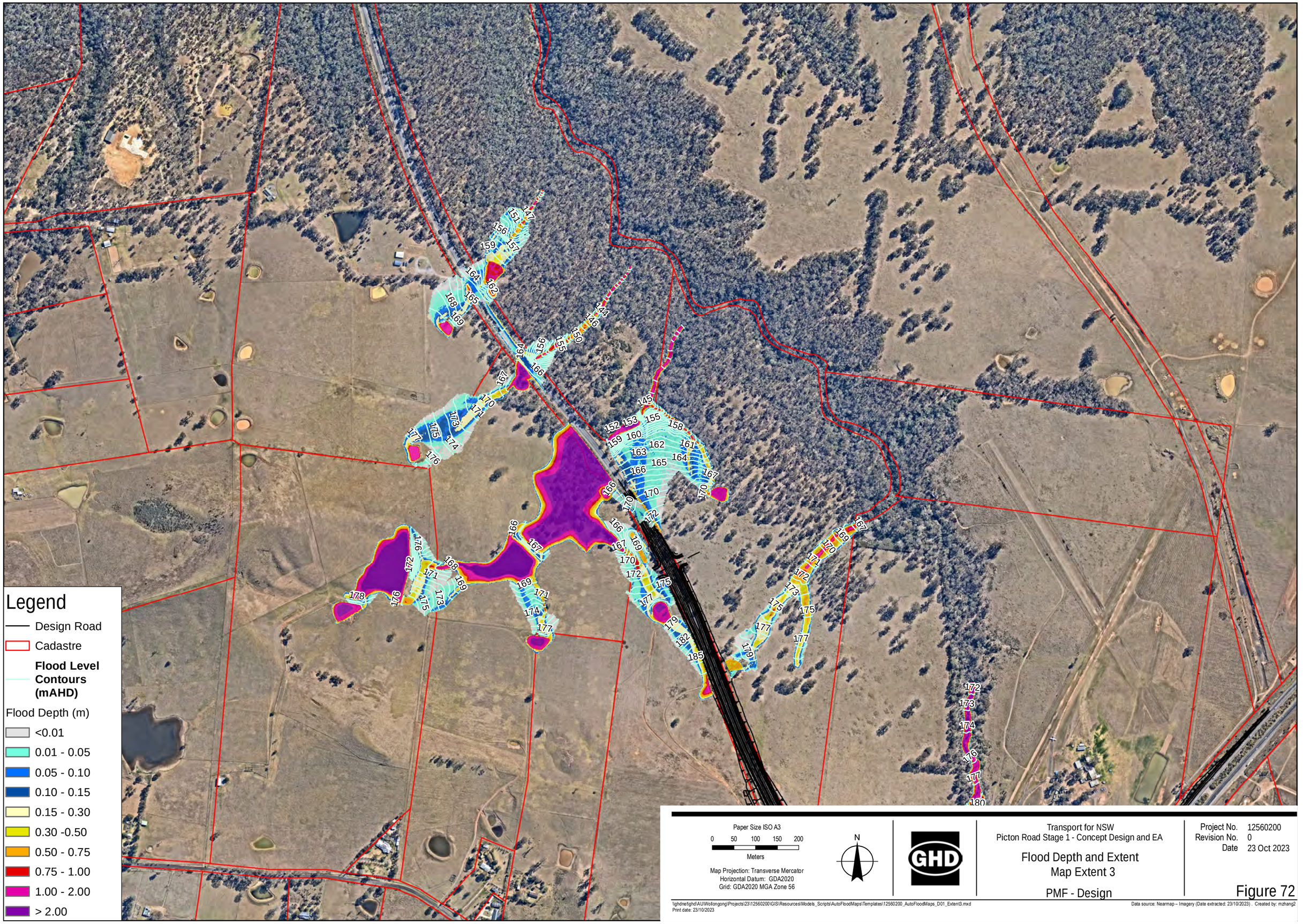
Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 70

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_001_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 2
PMF - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 71
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Level Contours (mAHD)
Flood Depth (m)
<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 -0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Depth and Extent
Map Extent 3
PMF - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 72
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

Design Road

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

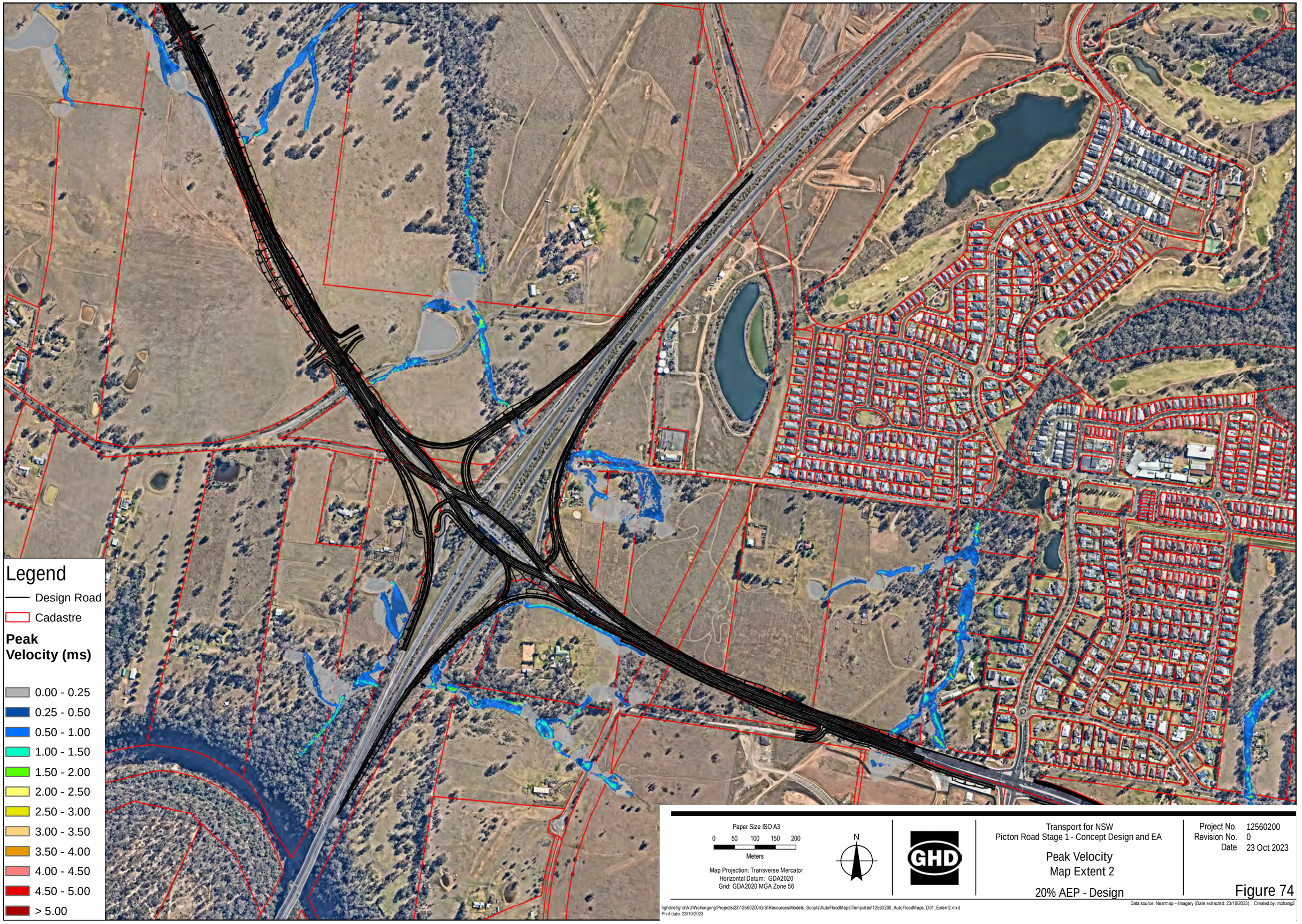
20% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 73

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_001_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 2

20% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 74

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Legend

Design Road

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

20% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 75

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

Design Road

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

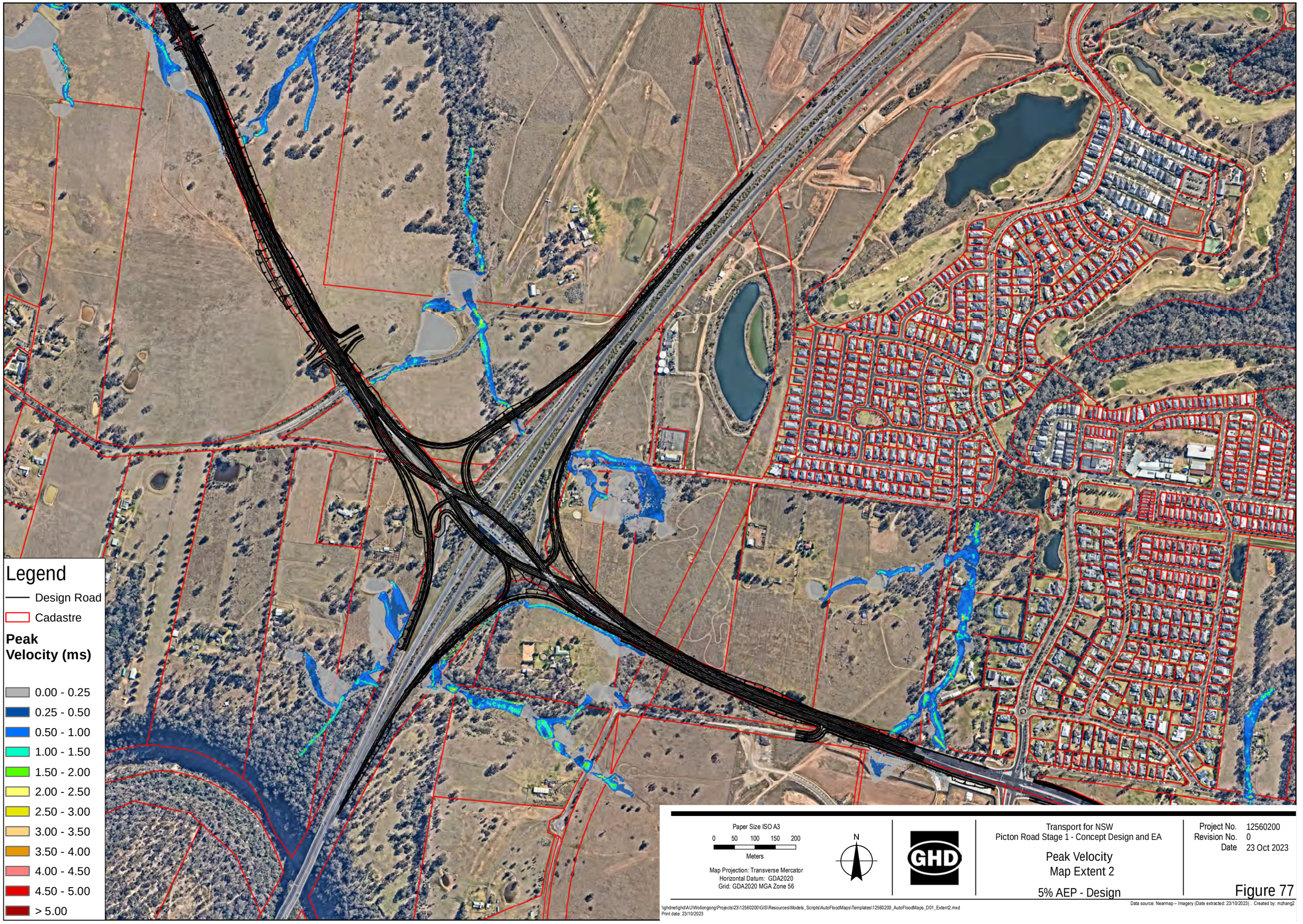
5% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 76

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_001_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 2

5% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 77

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Legend

Design Road

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

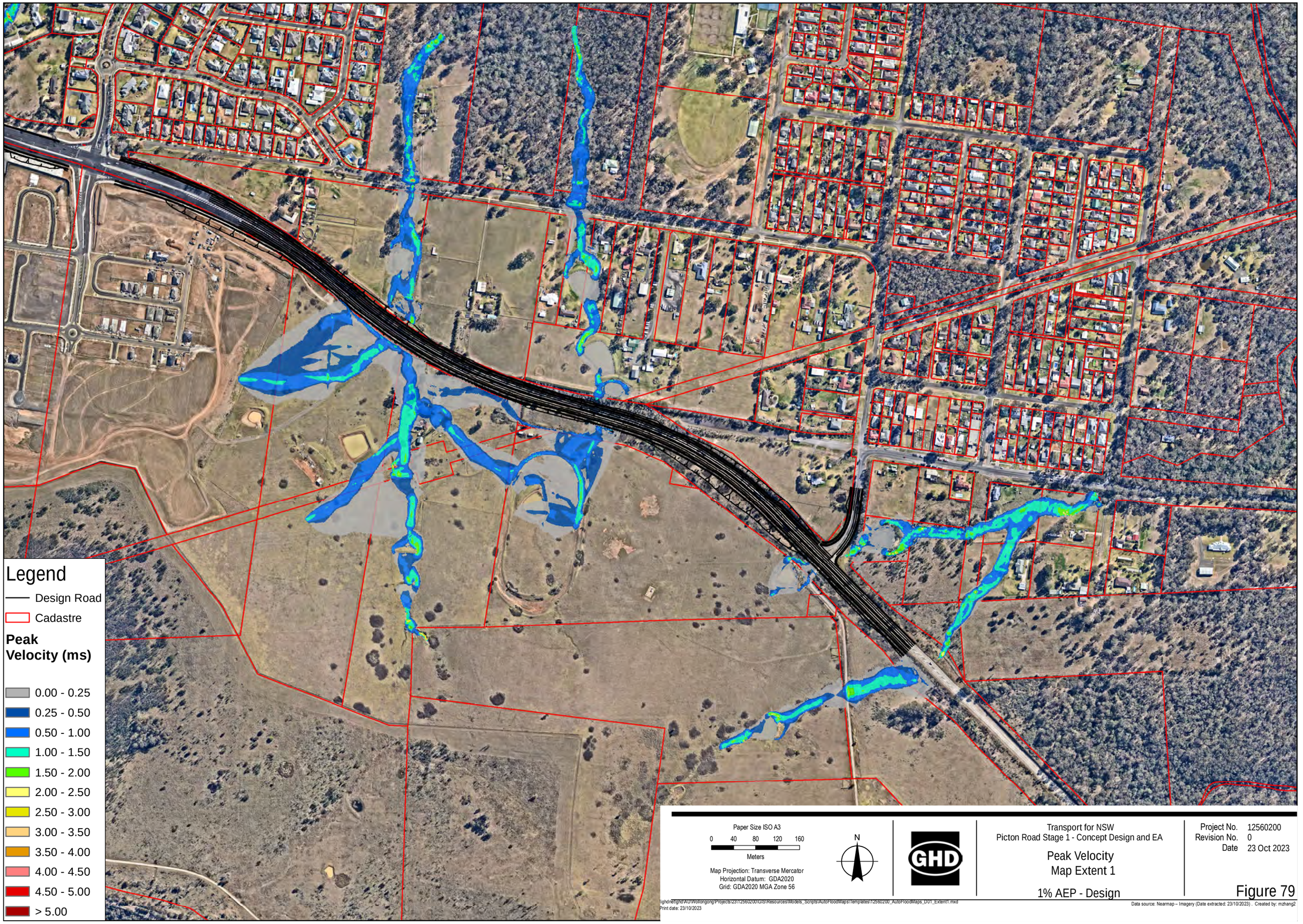
5% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 78

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

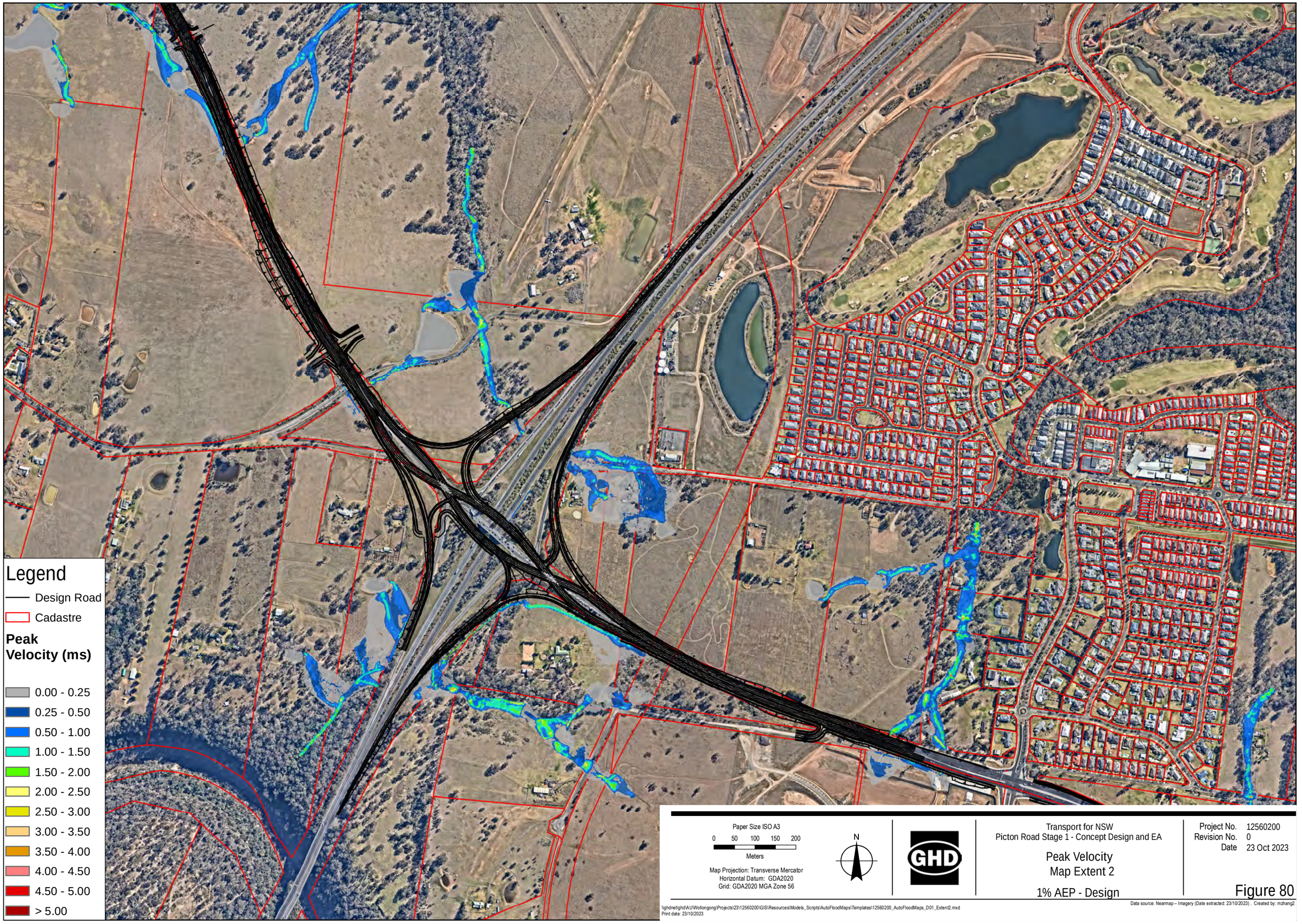
1% AEP - Design

Project No.	12560200
Revision No.	0
Date	23 Oct 2023

Figure 79

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_001_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Peak Velocity (ms)
0.00 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
2.00 - 2.50
2.50 - 3.00
3.00 - 3.50
3.50 - 4.00
4.00 - 4.50
4.50 - 5.00
> 5.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Peak Velocity
Map Extent 2
1% AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 80
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

Design Road

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

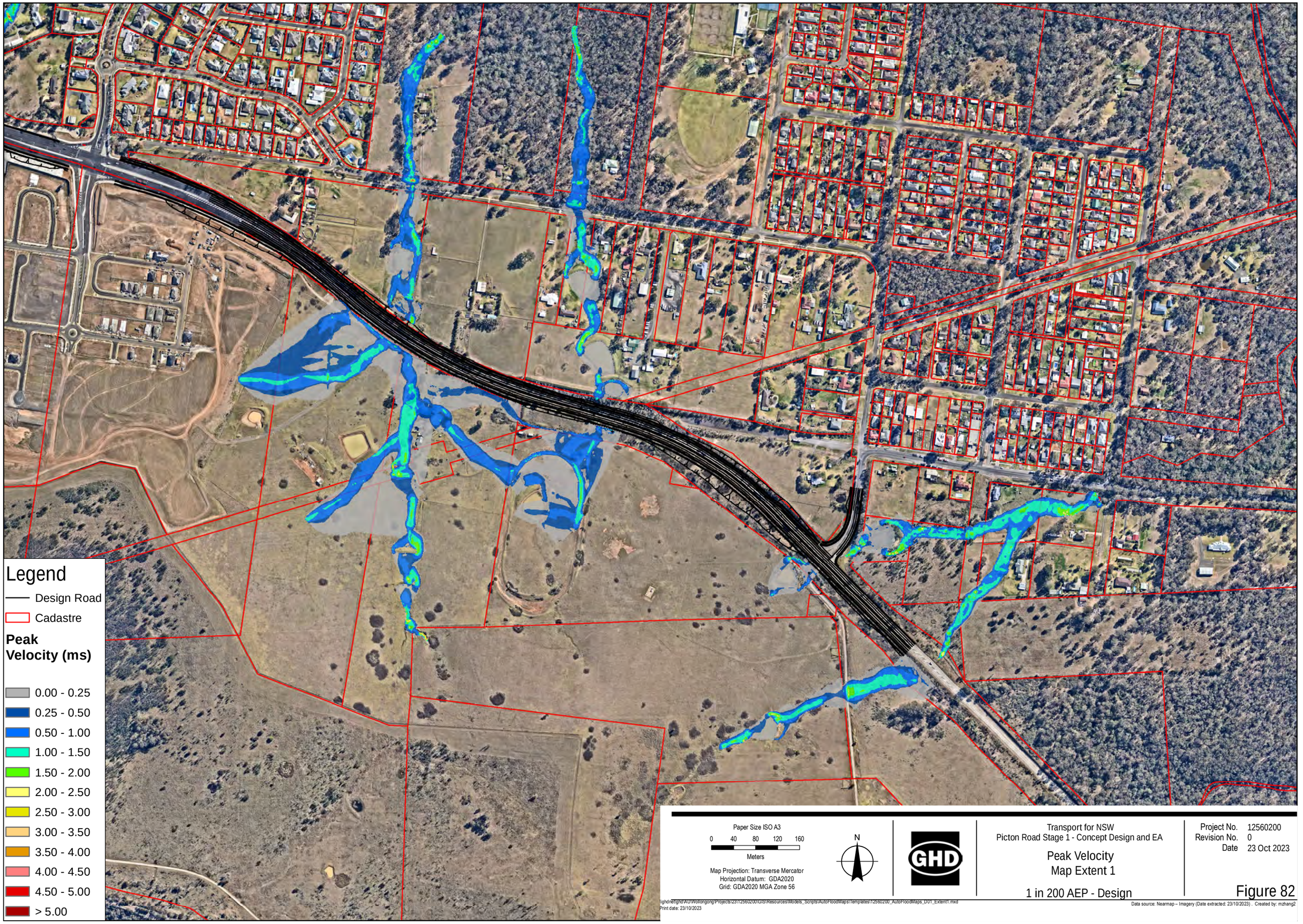
1% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 81

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

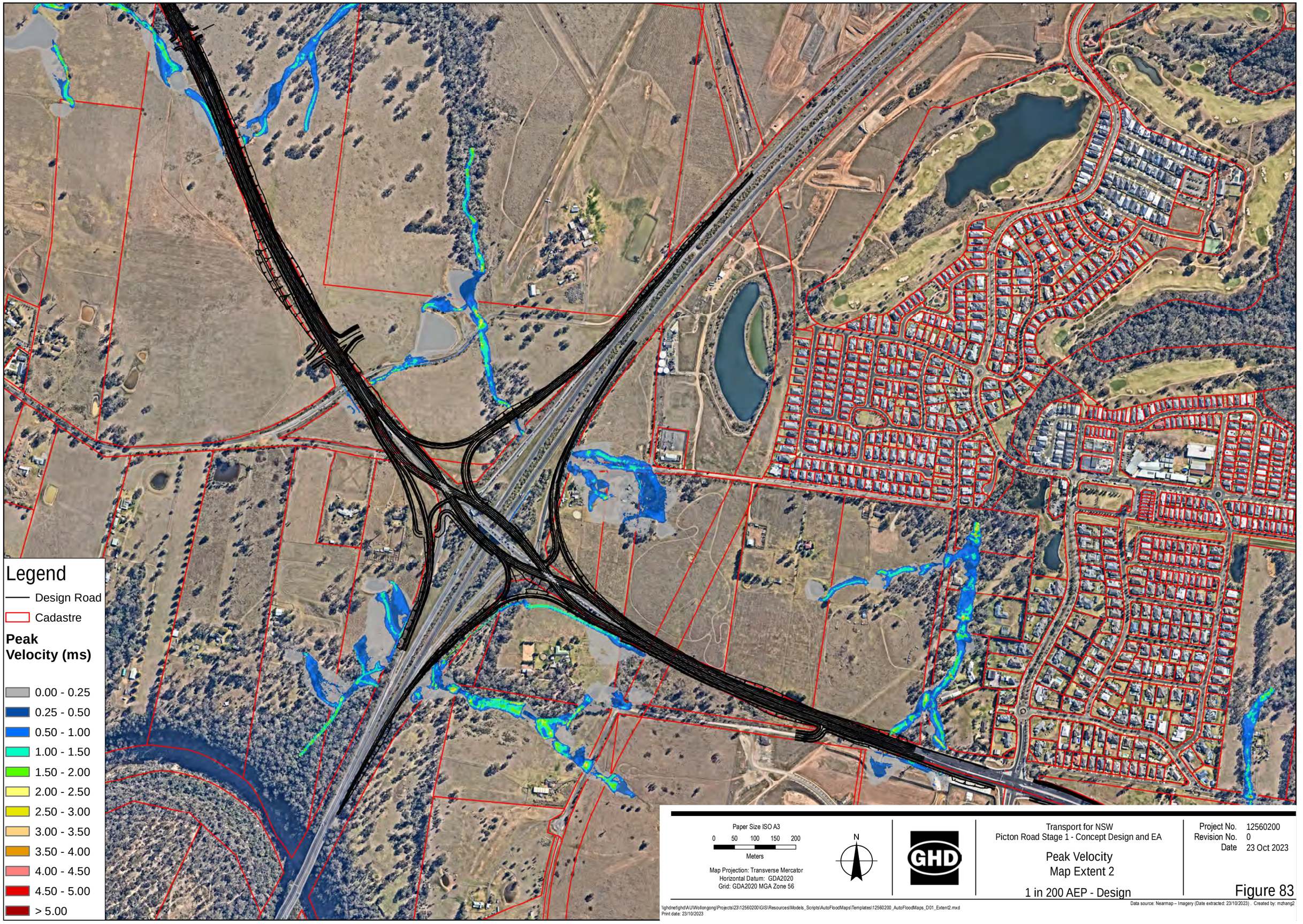
1 in 200 AEP - Design

Project No.	12560200
Revision No.	0
Date	23 Oct 2023

Figure 82

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_001_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Peak Velocity (ms)
0.00 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
2.00 - 2.50
2.50 - 3.00
3.00 - 3.50
3.50 - 4.00
4.00 - 4.50
4.50 - 5.00
> 5.00
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Peak Velocity
Map Extent 2
1 in 200 AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 83
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

Design Road

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

1 in 200 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 84

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

Design Road

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

1 in 500 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 85

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_001_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

Design Road

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 2

1 in 500 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 86

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

Design Road

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

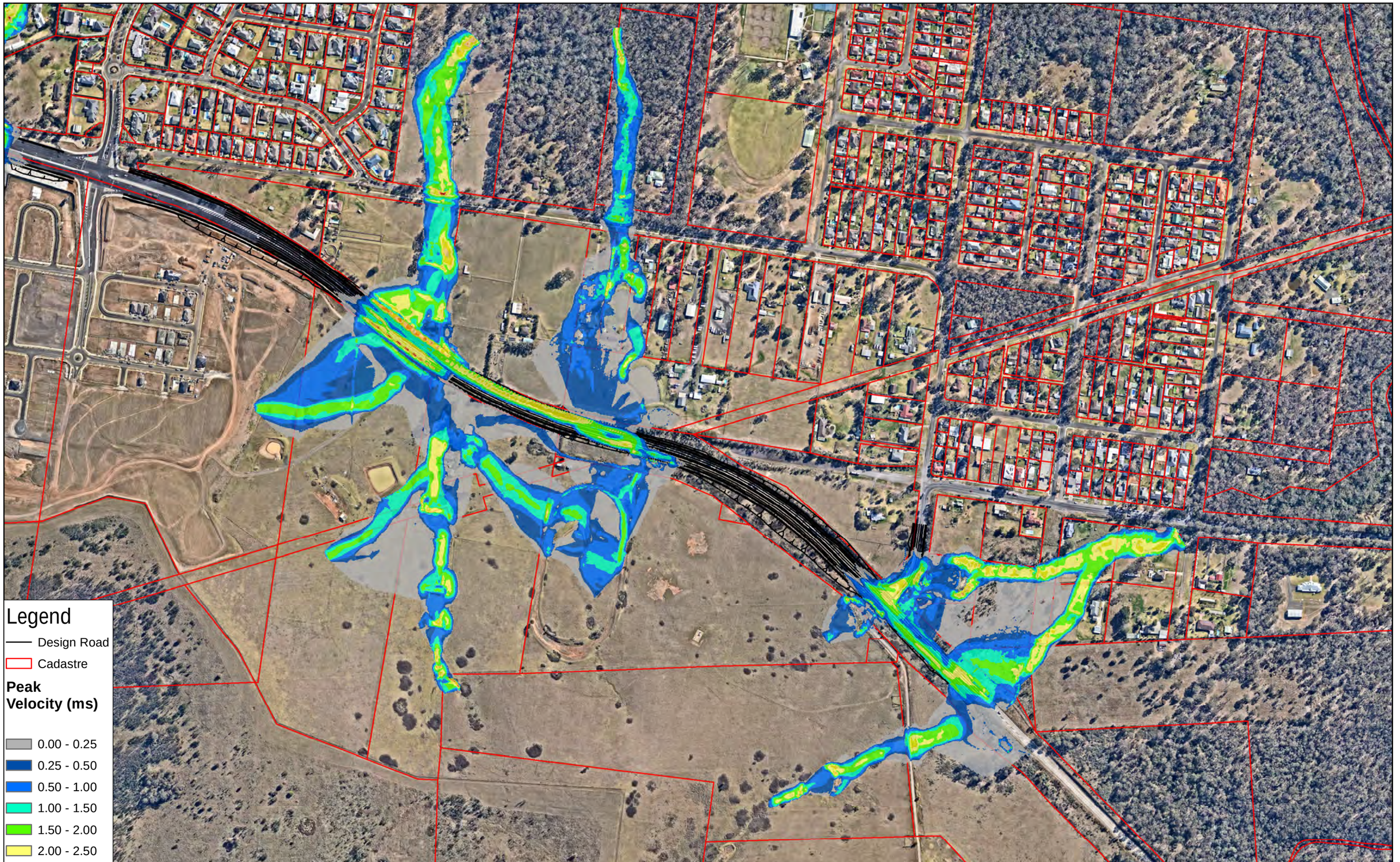
1 in 500 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 87

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 1

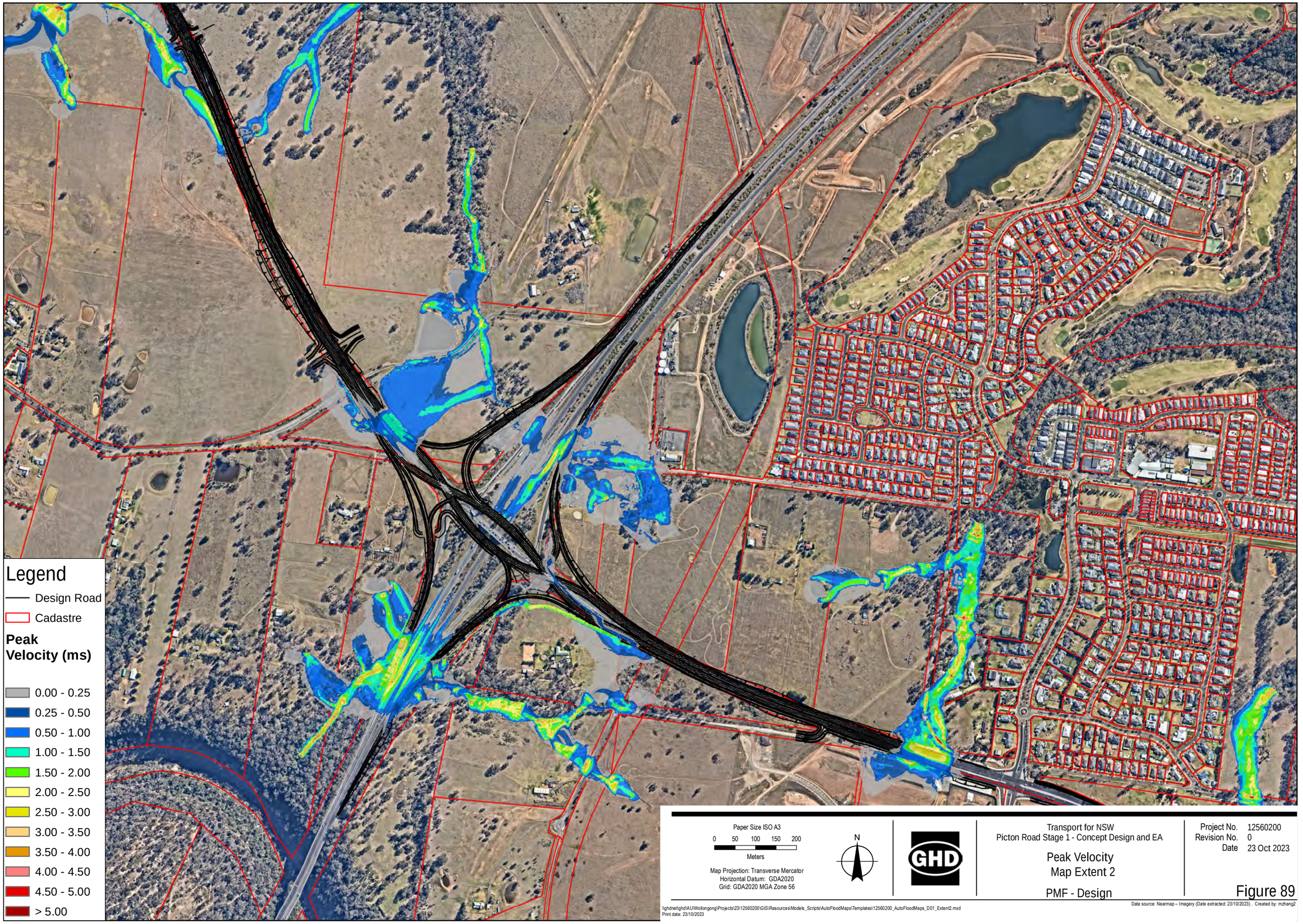
PMF - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 88

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 2

PMF - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 89

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

Design Road

Cadastre

Peak Velocity (ms)

- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 4.50
- 4.50 - 5.00
- > 5.00

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Peak Velocity
Map Extent 3

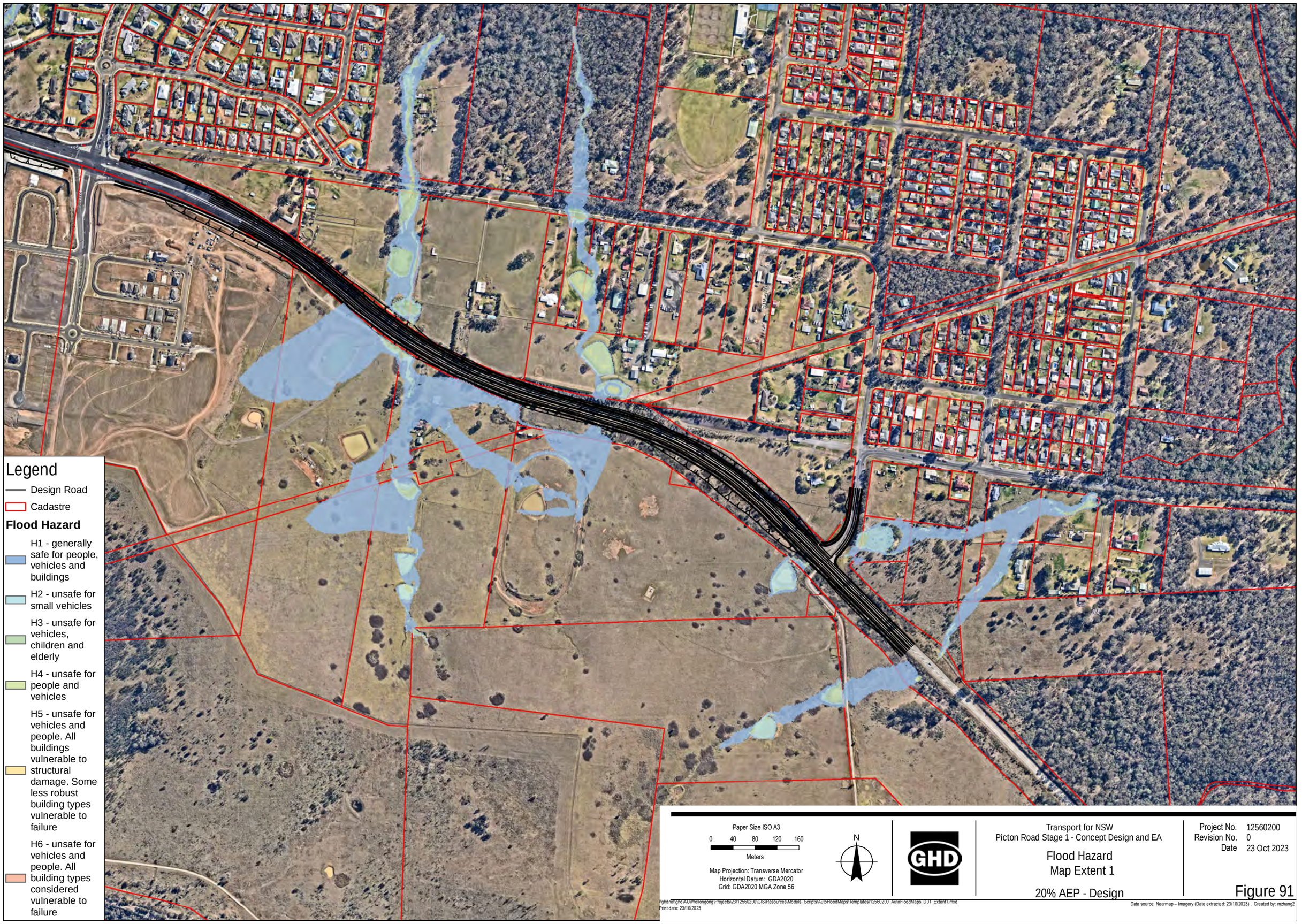
PMF - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 90

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 1

20% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 91

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 2

20% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 92

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 3

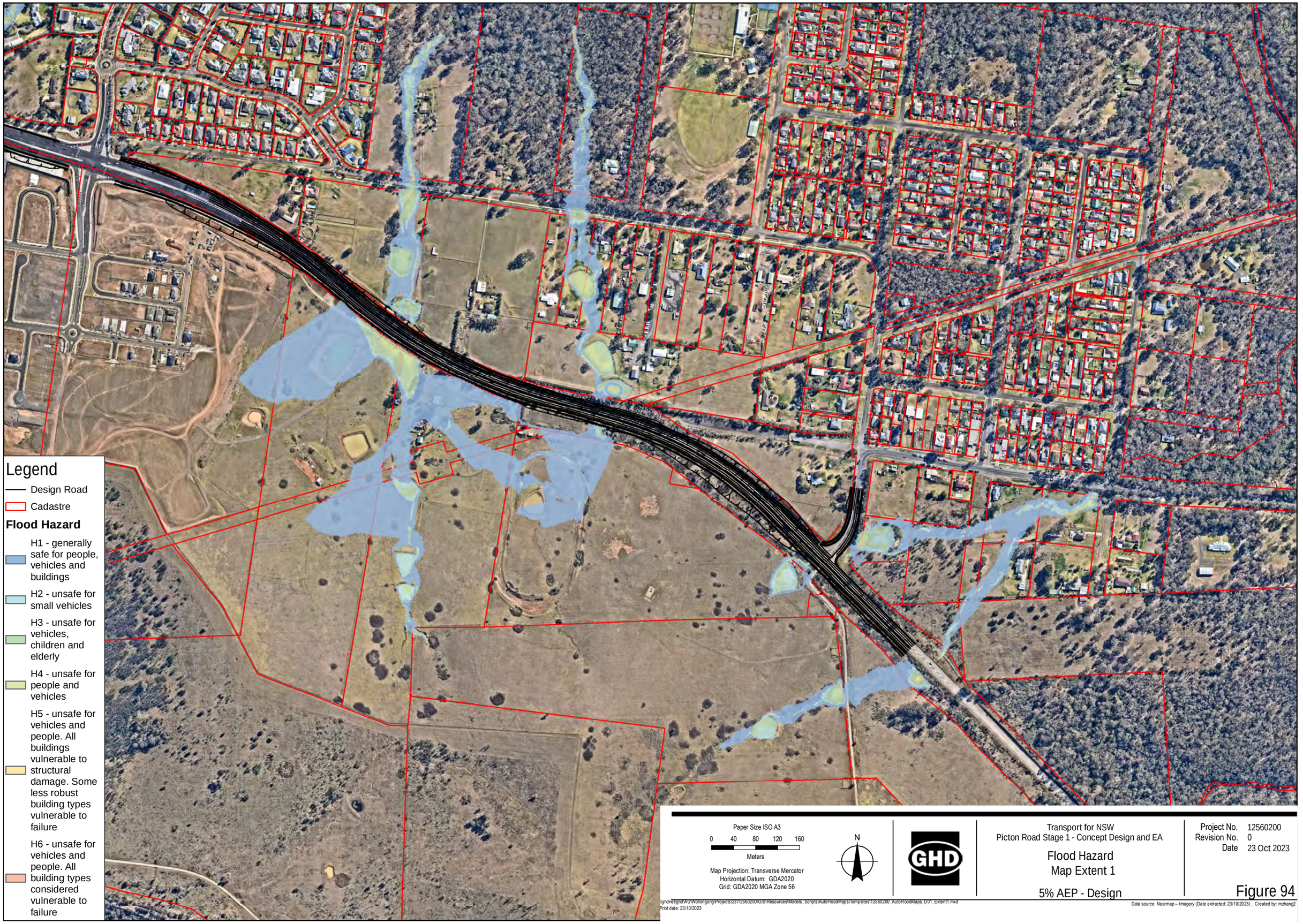
20% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 93

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Hazard
H1 - generally safe for people, vehicles and buildings
H2 - unsafe for small vehicles
H3 - unsafe for vehicles, children and elderly
H4 - unsafe for people and vehicles
H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
H6 - unsafe for vehicles and people. All building types considered vulnerable to failure
Paper Size ISO A3
0 40 80 120 160
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Hazard
Map Extent 1
5% AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 94
\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_001_Extent1.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 2

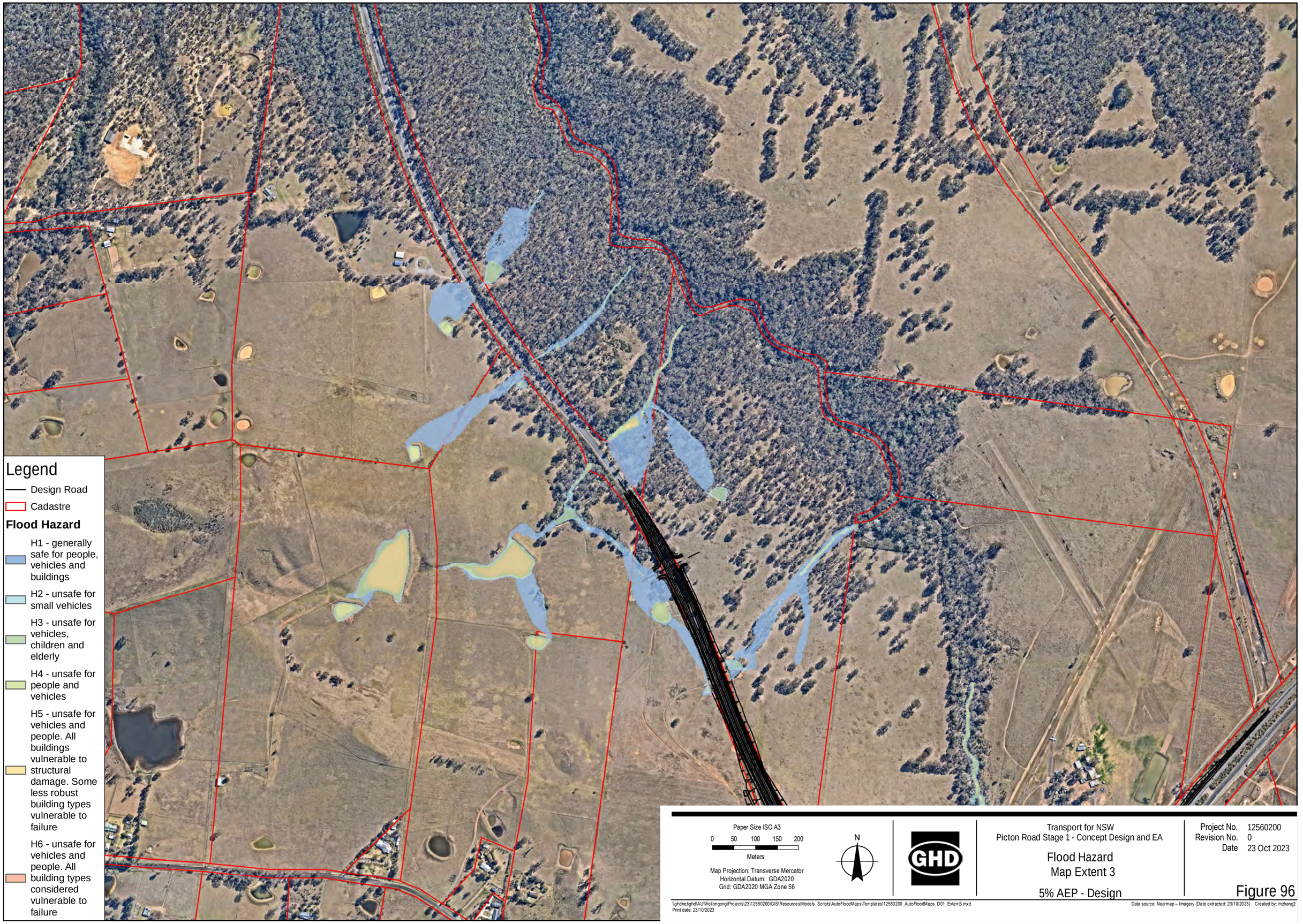
5% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 95

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 3

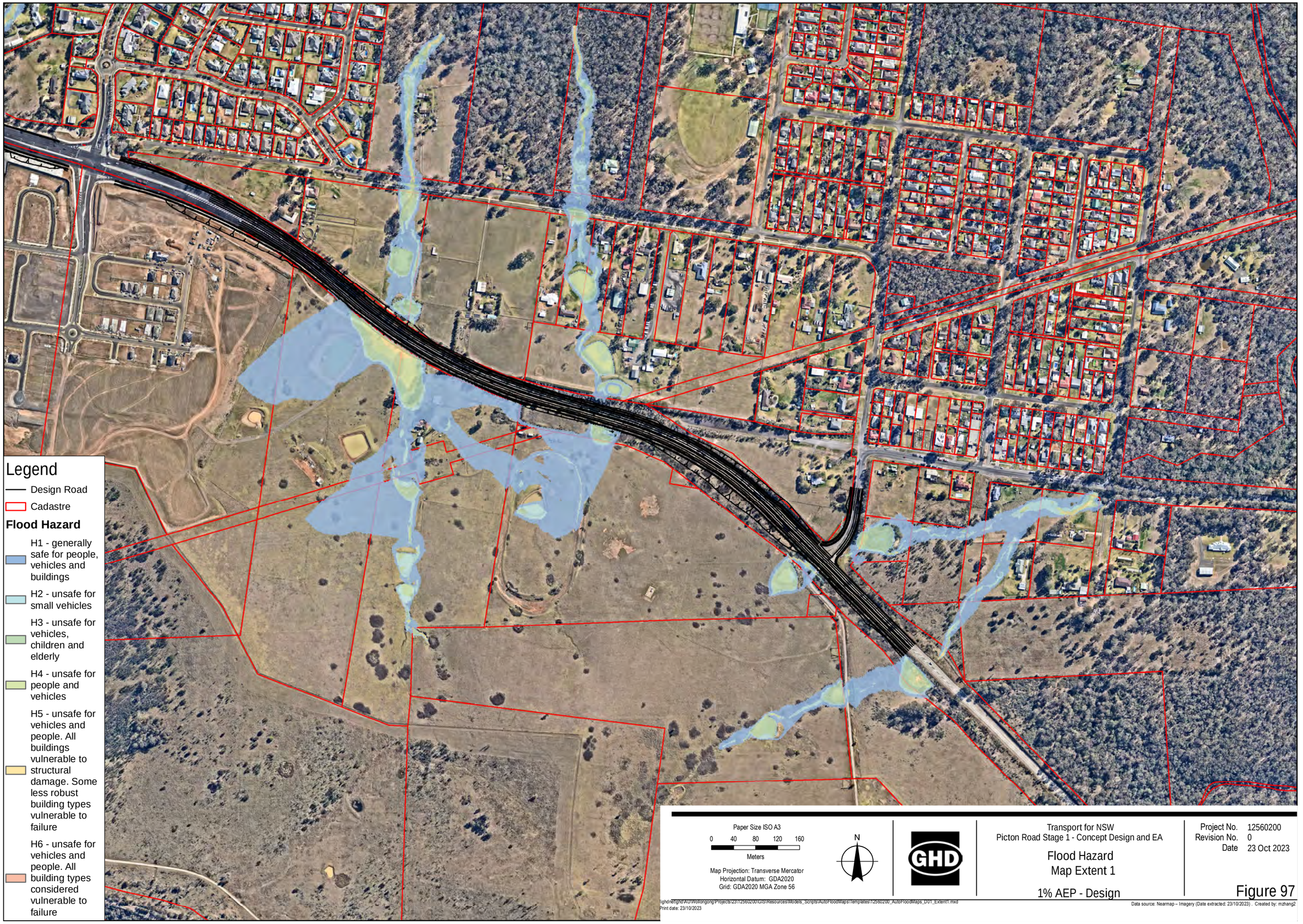
5% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 96

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 1

1% AEP - Design

Project No.	12560200
Revision No.	0
Date	23 Oct 2023

Figure 97

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 2

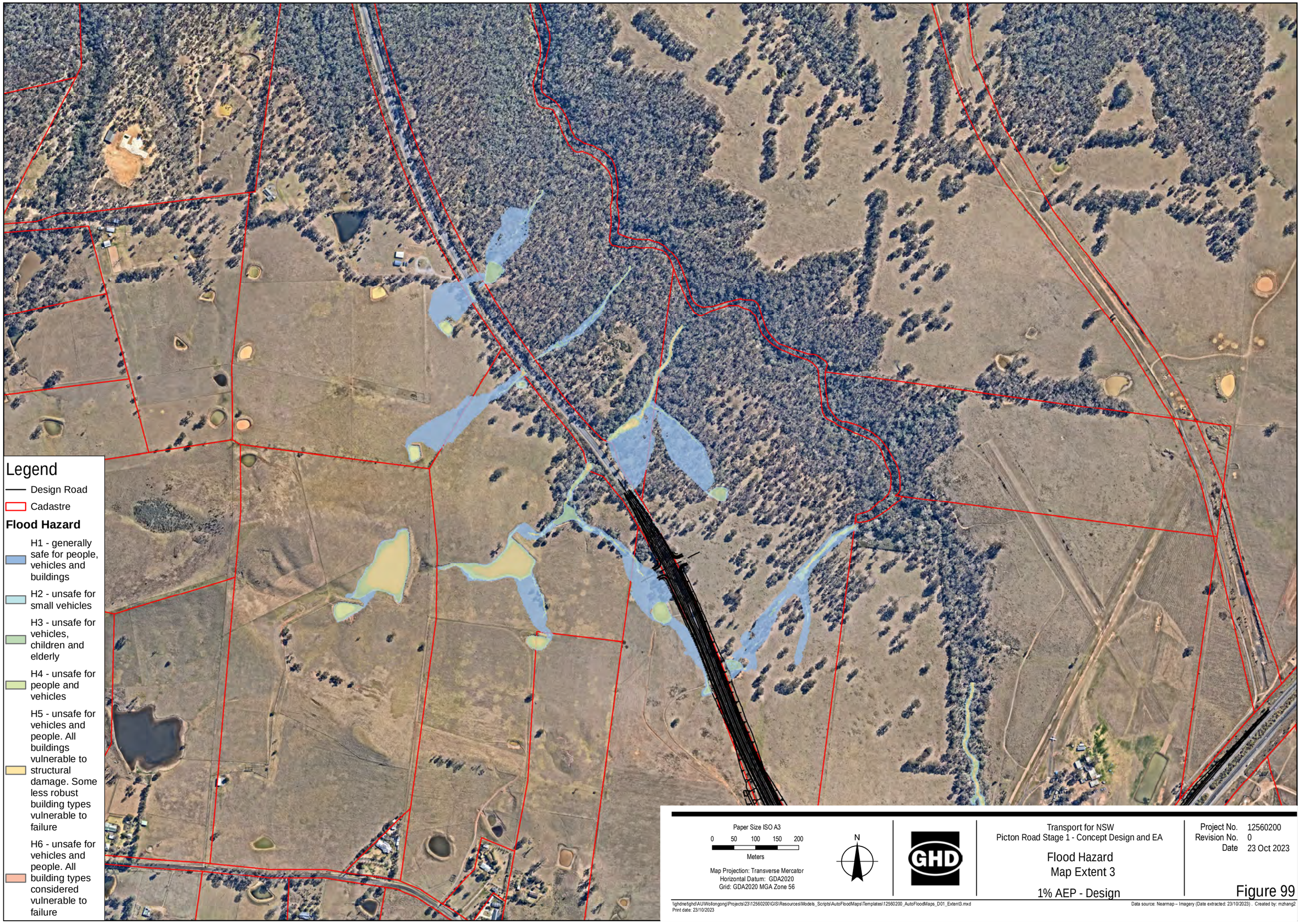
1% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 98

\\ghdnetfghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 3

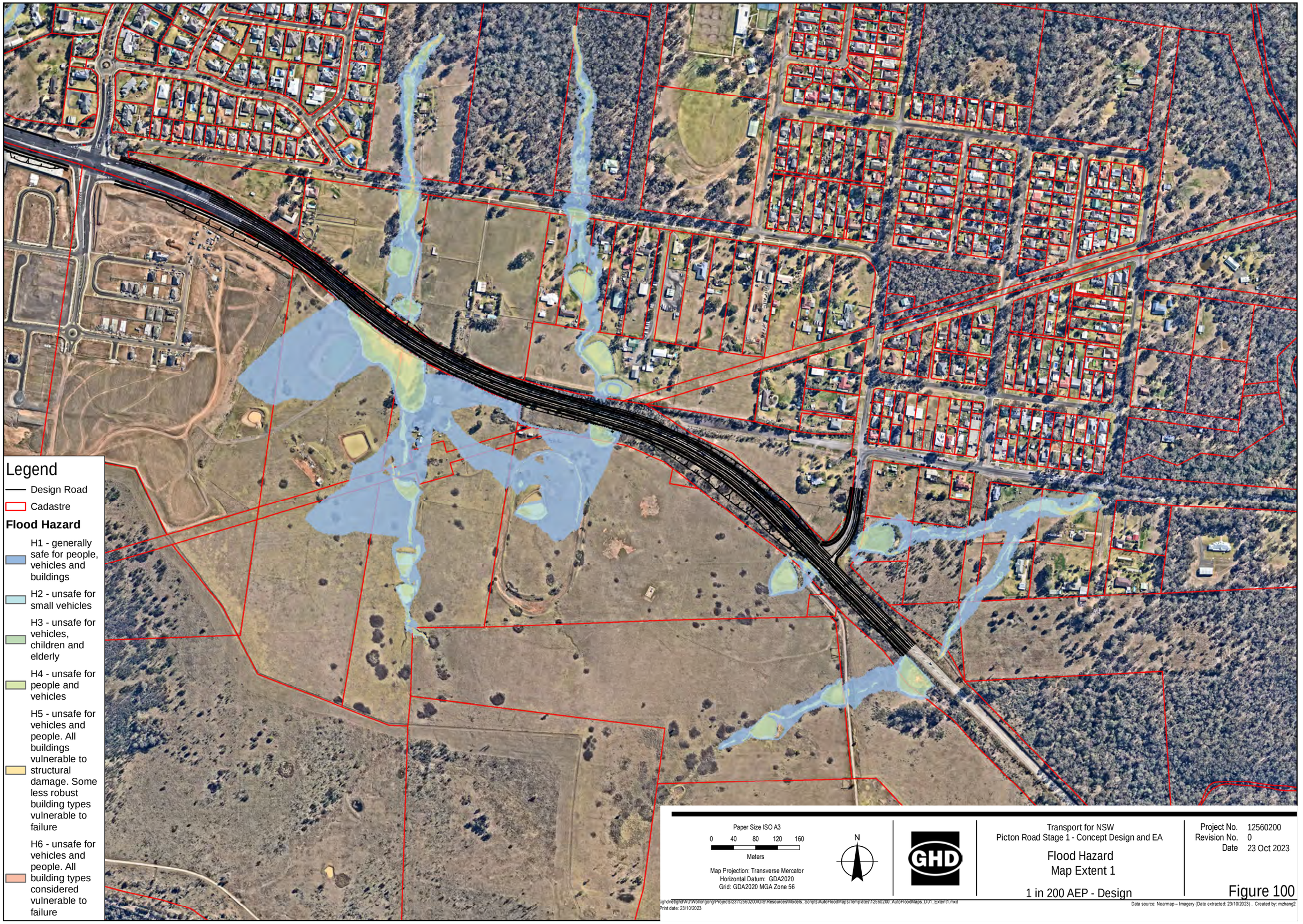
1% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 99

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 1

1 in 200 AEP - Design

Project No.	12560200
Revision No.	0
Date	23 Oct 2023

Figure 100

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 2

1 in 200 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 101

\\ghdnetfghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

Design Road

Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 3

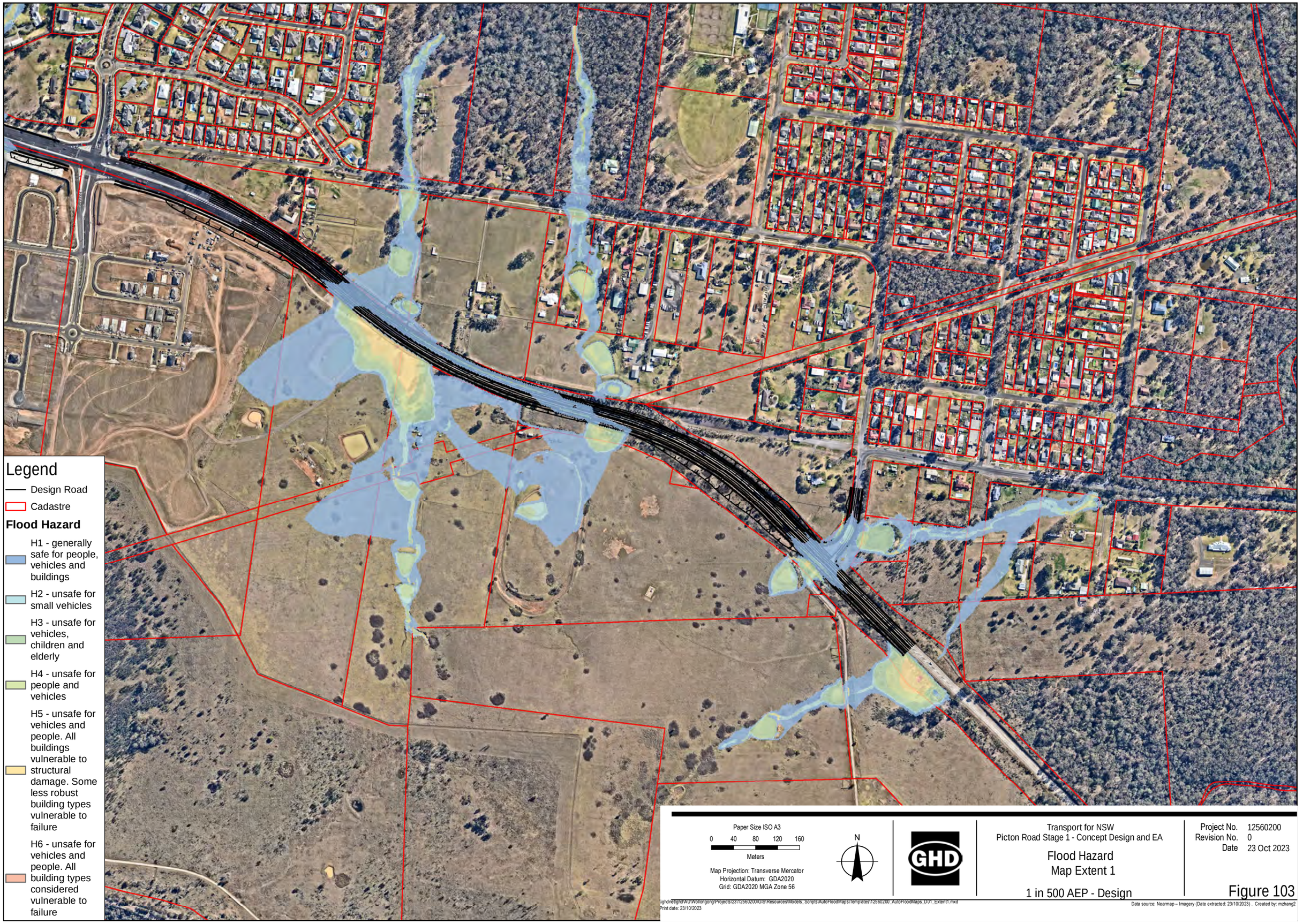
1 in 200 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 102

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 1

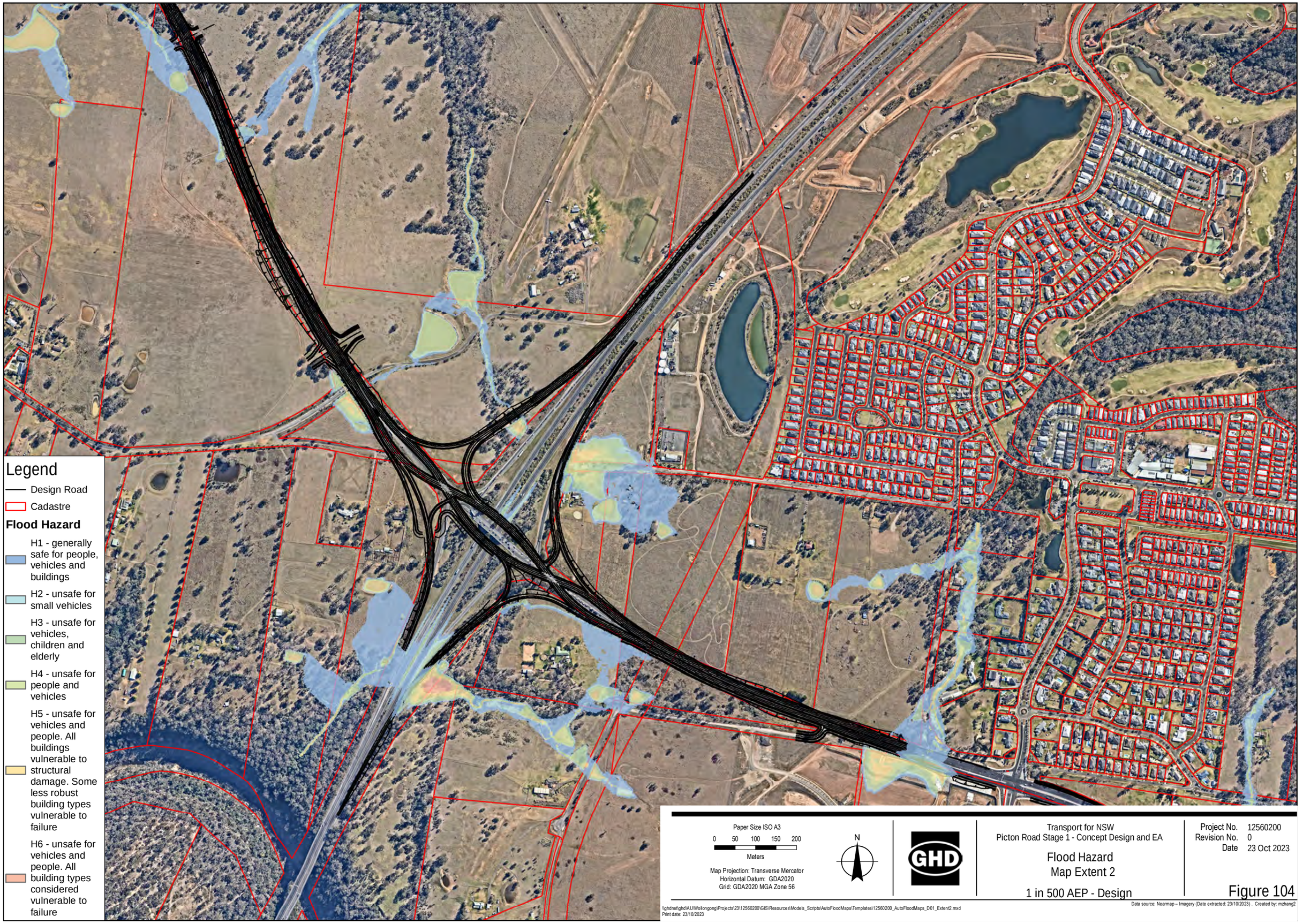
1 in 500 AEP - Design

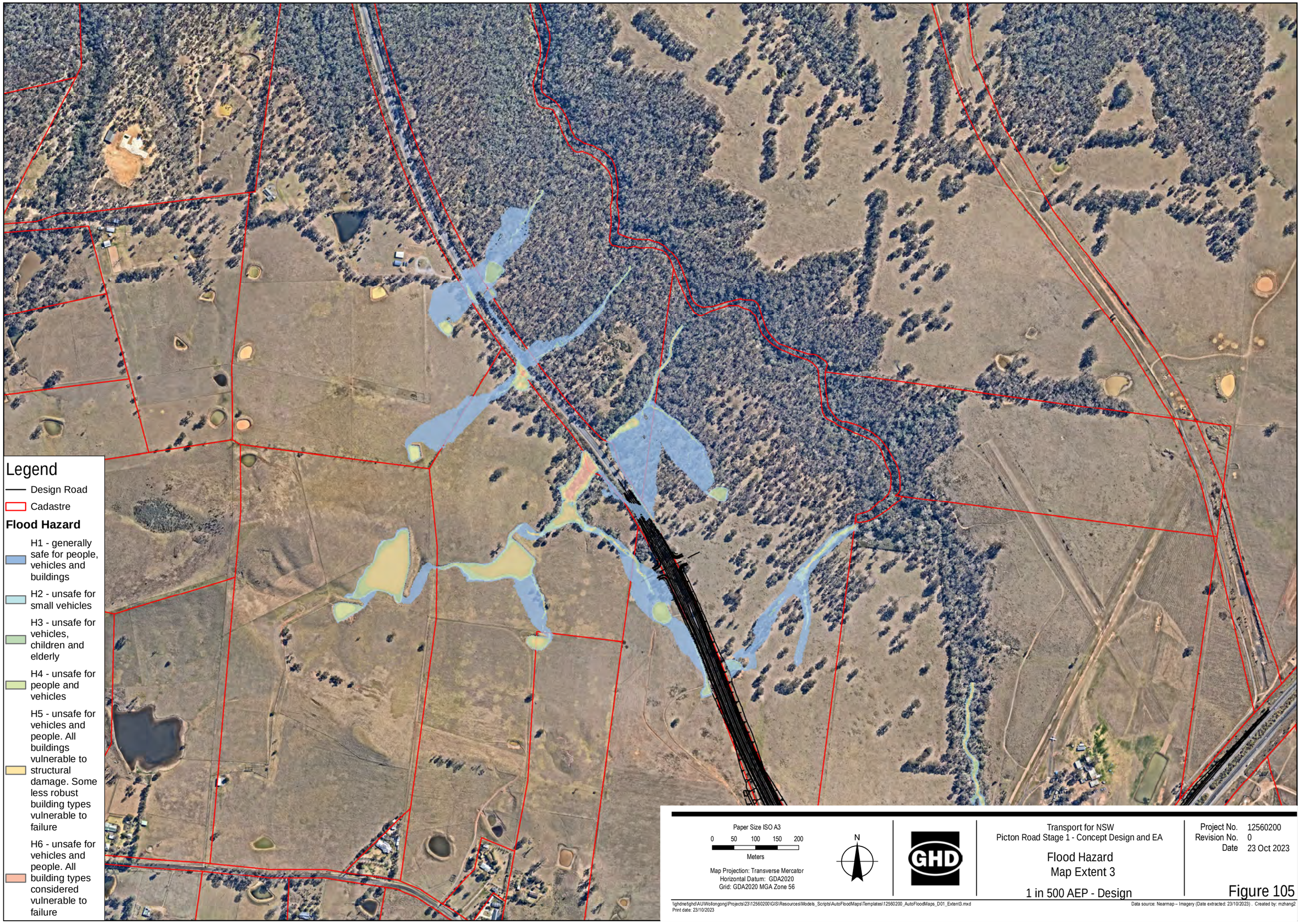
Project No.	12560200
Revision No.	0
Date	23 Oct 2023

Figure 103

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Flood Hazard
H1 - generally safe for people, vehicles and buildings
H2 - unsafe for small vehicles
H3 - unsafe for vehicles, children and elderly
H4 - unsafe for people and vehicles
H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
H6 - unsafe for vehicles and people. All building types considered vulnerable to failure
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Hazard
Map Extent 2
1 in 500 AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 104
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 3

1 in 500 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 105

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre

Flood Hazard

- H1 - generally safe for people, vehicles and buildings
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles, children and elderly
- H4 - unsafe for people and vehicles
- H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 1

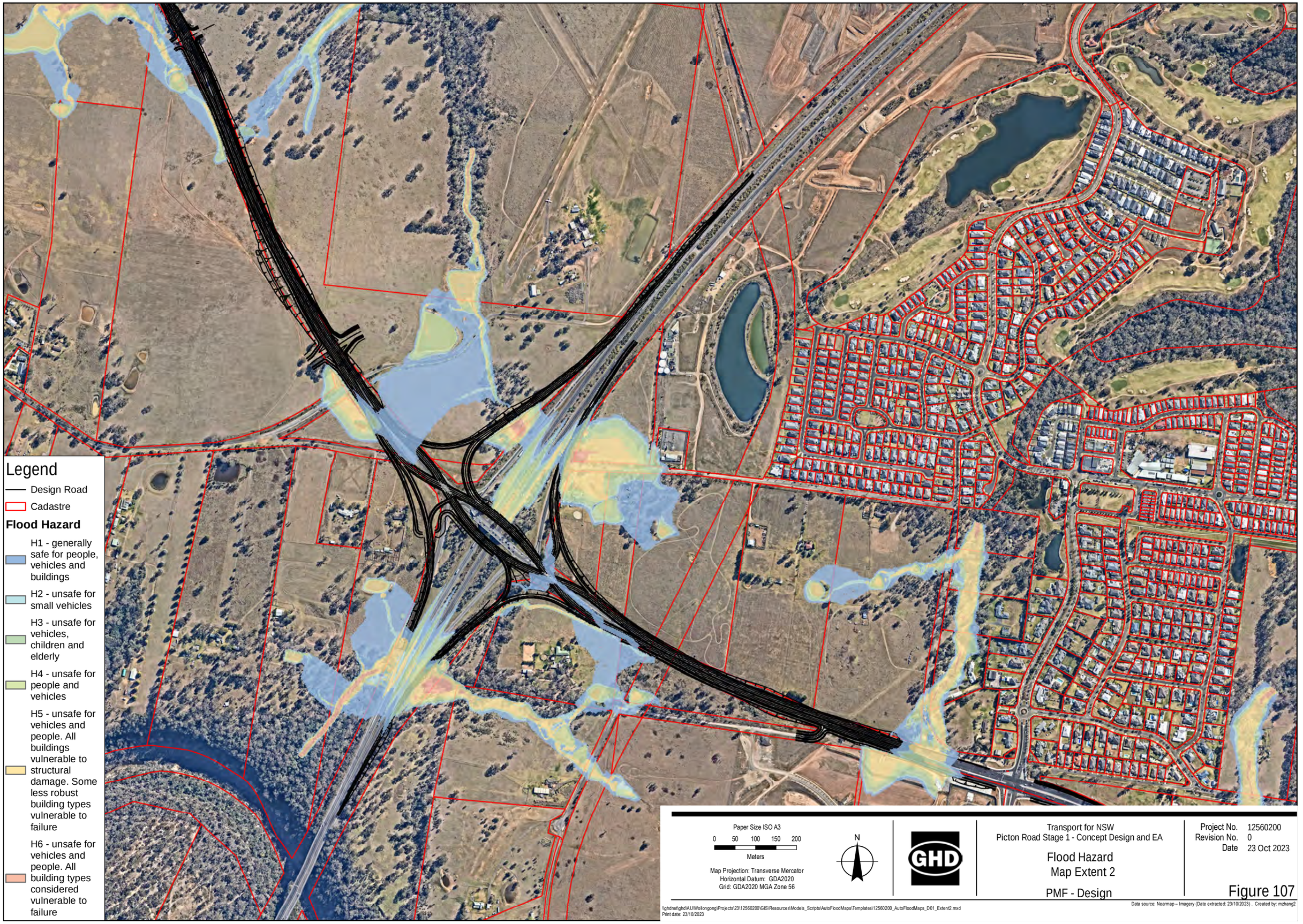
PMF - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 106

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Flood Hazard
Map Extent 2

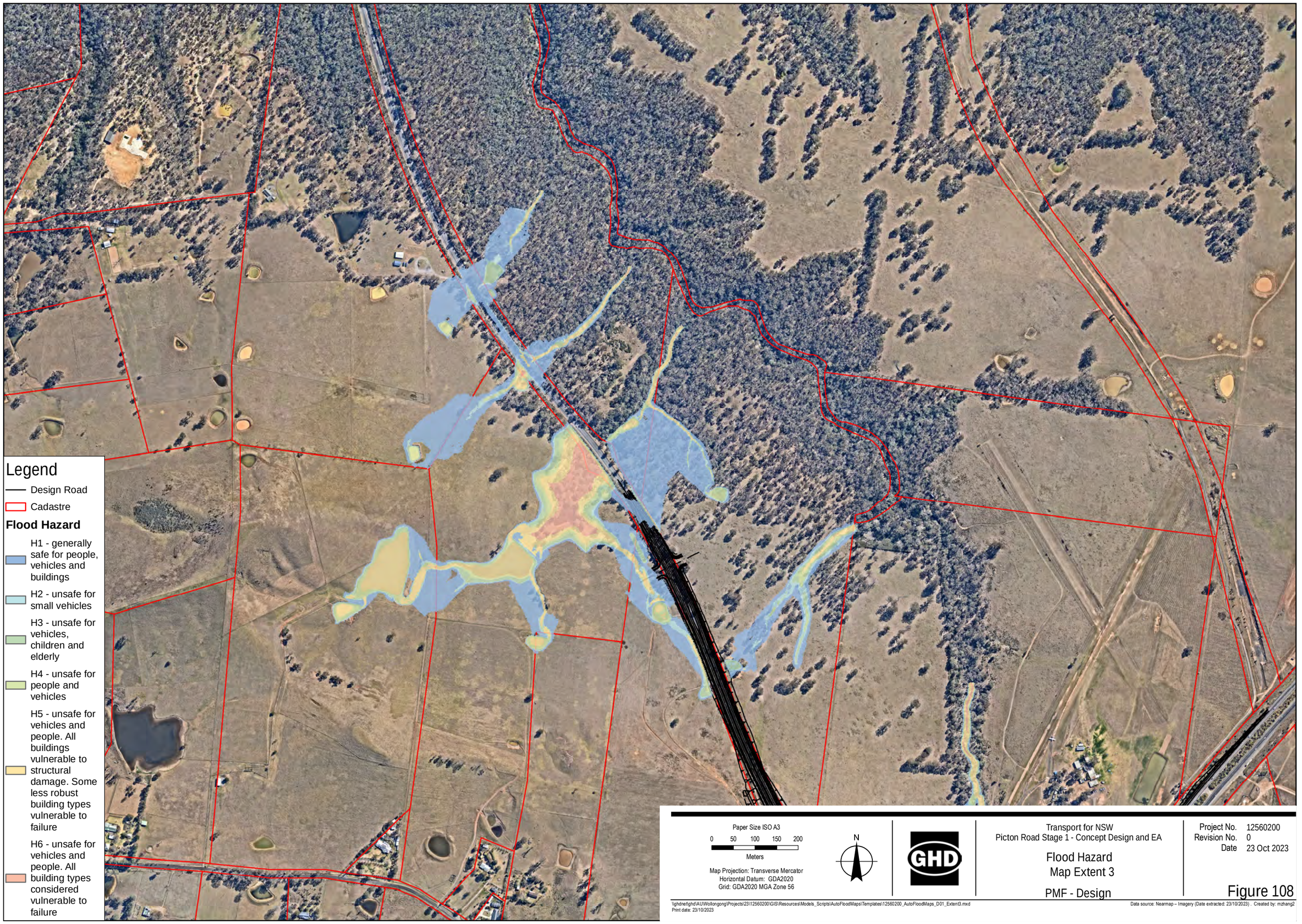
PMF - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 107

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023


Legend
Design Road
Cadastre
Flood Hazard
H1 - generally safe for people, vehicles and buildings
H2 - unsafe for small vehicles
H3 - unsafe for vehicles, children and elderly
H4 - unsafe for people and vehicles
H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
H6 - unsafe for vehicles and people. All building types considered vulnerable to failure
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Flood Hazard
Map Extent 3
PMF - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 108
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Appendix D

Flood mapping – flood level impacts

Legend

- Design Road
- Cadastre

Change in Flood Level (mm)

- >-500
- -500 - -400
- -400 - -300
- -300 - -200
- -200 - -100
- -100 - -50
- -50 - -25
- -25 - -10
- -10 - +10
- +10 - +25
- +25 - +50
- +50 - +100
- +100 - +200
- +200 - +300
- +300 - +400
- +400 - +500
- >+500

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 1

20% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 109

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_001_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre

Change in Flood Level (mm)

- >-500
- -500 - -400
- -400 - -300
- -300 - -200
- -200 - -100
- -100 - -50
- -50 - -25
- -25 - -10
- -10 - +10
- +10 - +25
- +25 - +50
- +50 - +100
- +100 - +200
- +200 - +300
- +300 - +400
- +400 - +500
- >+500

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 2

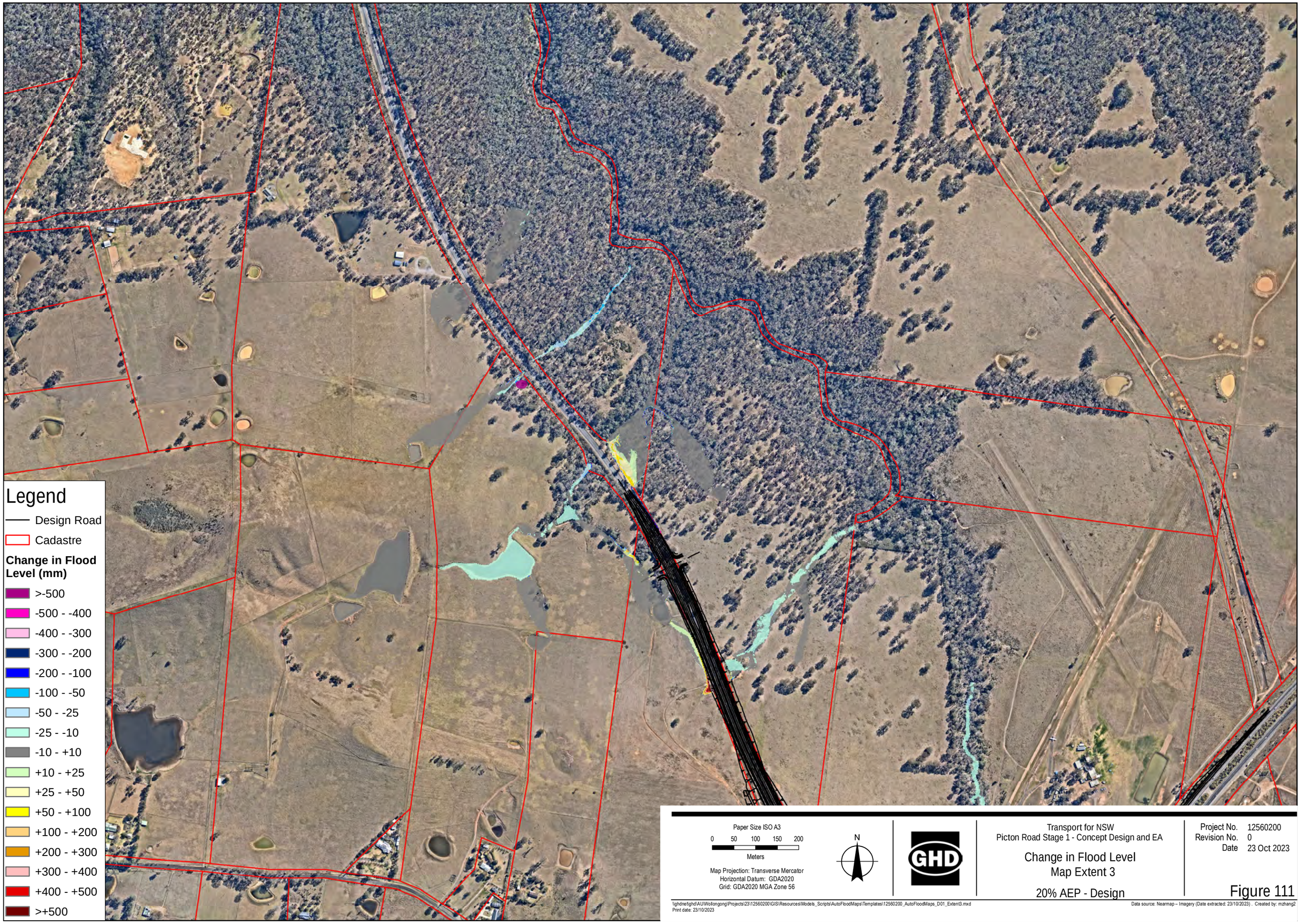
20% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 110

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 3

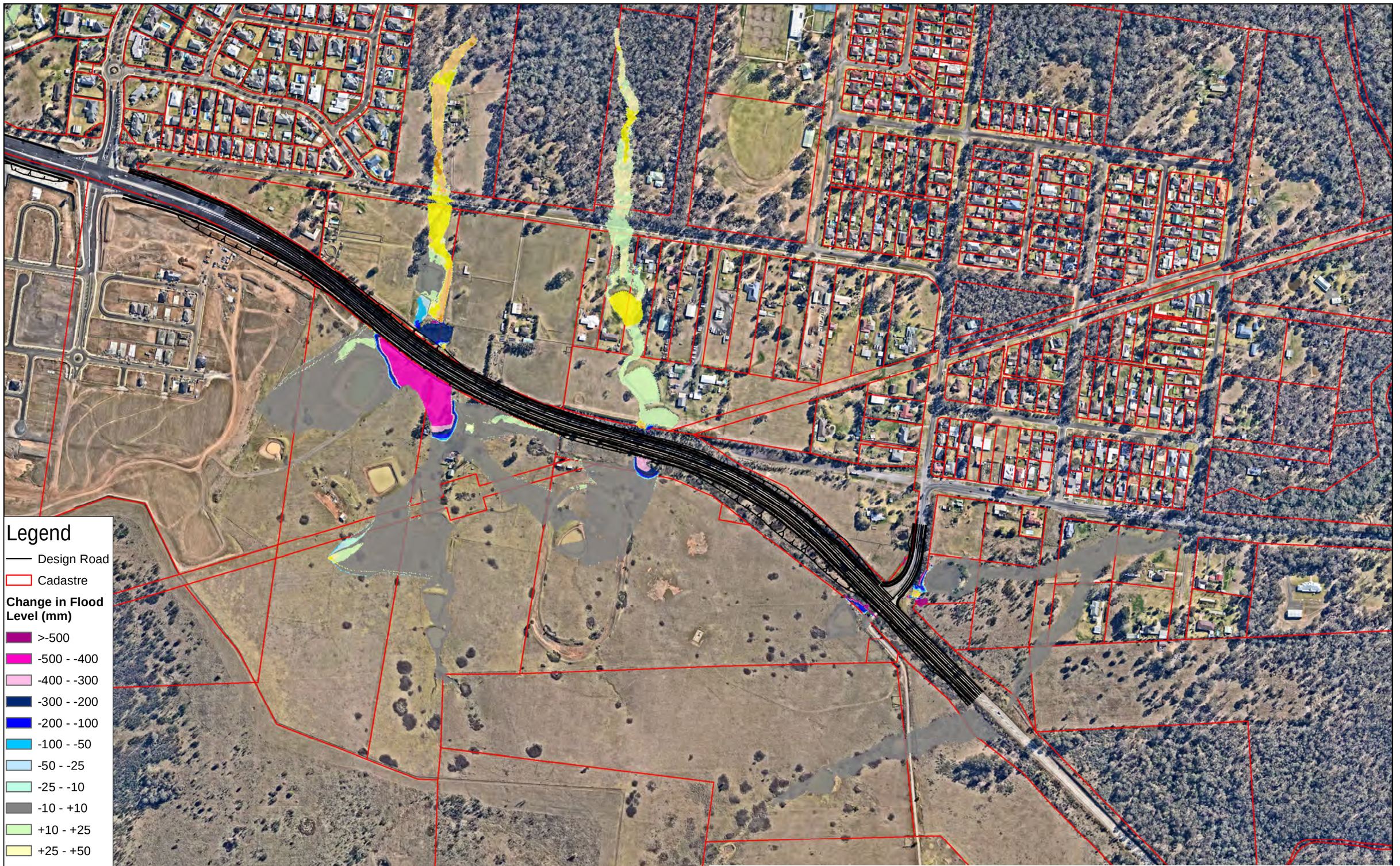
20% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 111

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 1

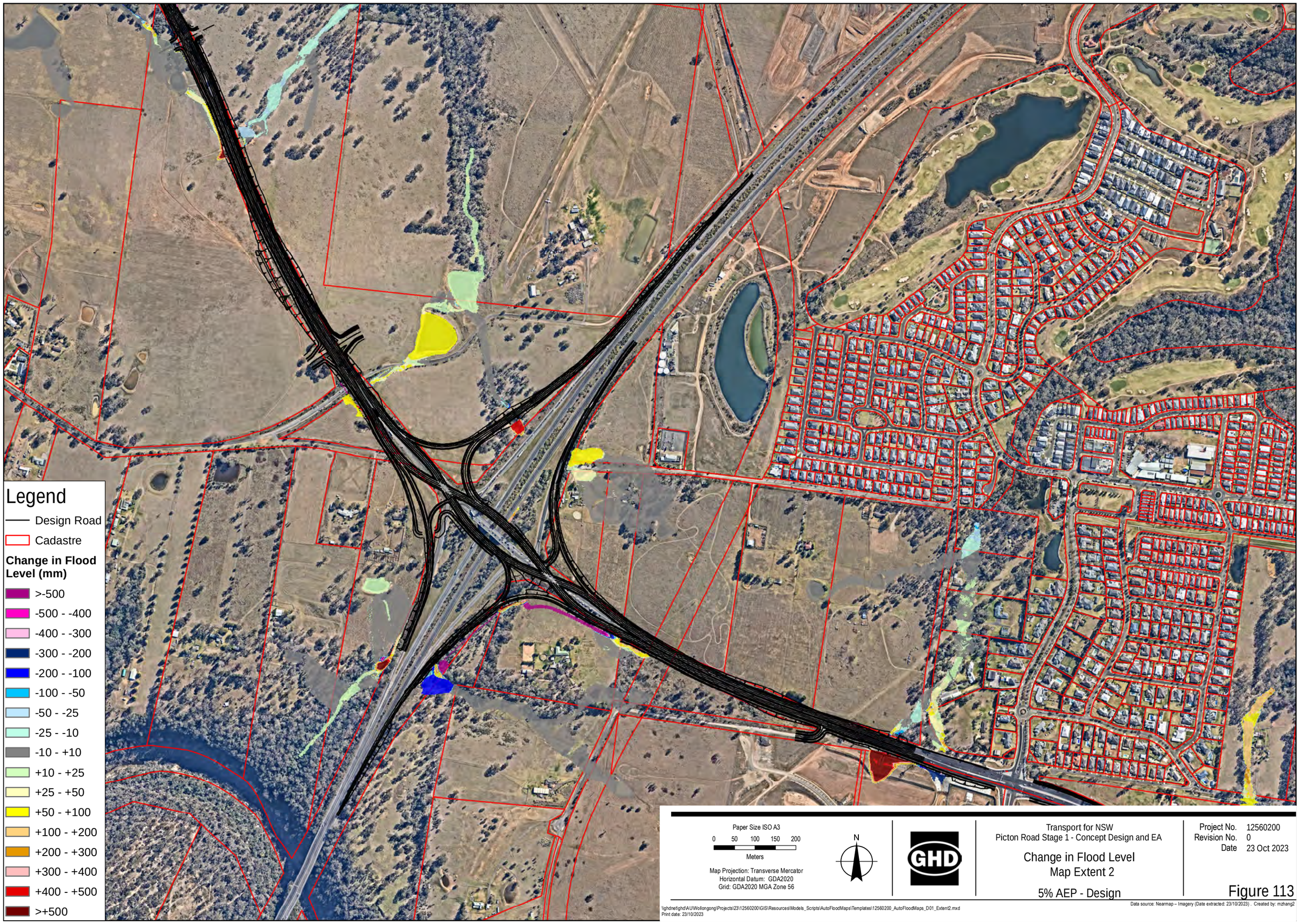
5% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 112

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 2

5% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 113

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

Design Road

Cadastre

Change in Flood Level (mm)

- >-500
- -500 - -400
- -400 - -300
- -300 - -200
- -200 - -100
- -100 - -50
- -50 - -25
- -25 - -10
- -10 - +10
- +10 - +25
- +25 - +50
- +50 - +100
- +100 - +200
- +200 - +300
- +300 - +400
- +400 - +500
- >+500

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 3

5% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 114

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 1

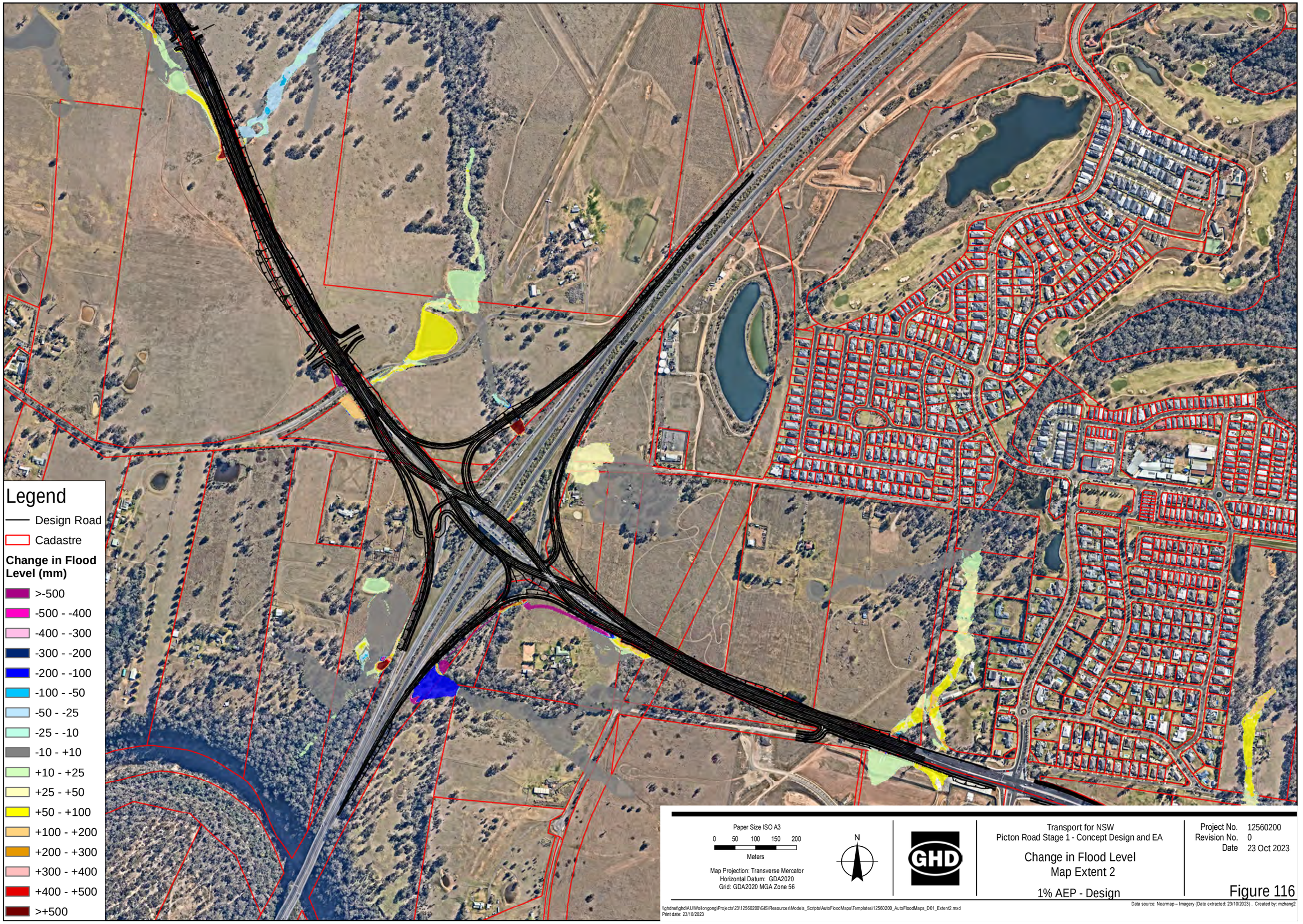
1% AEP - Design

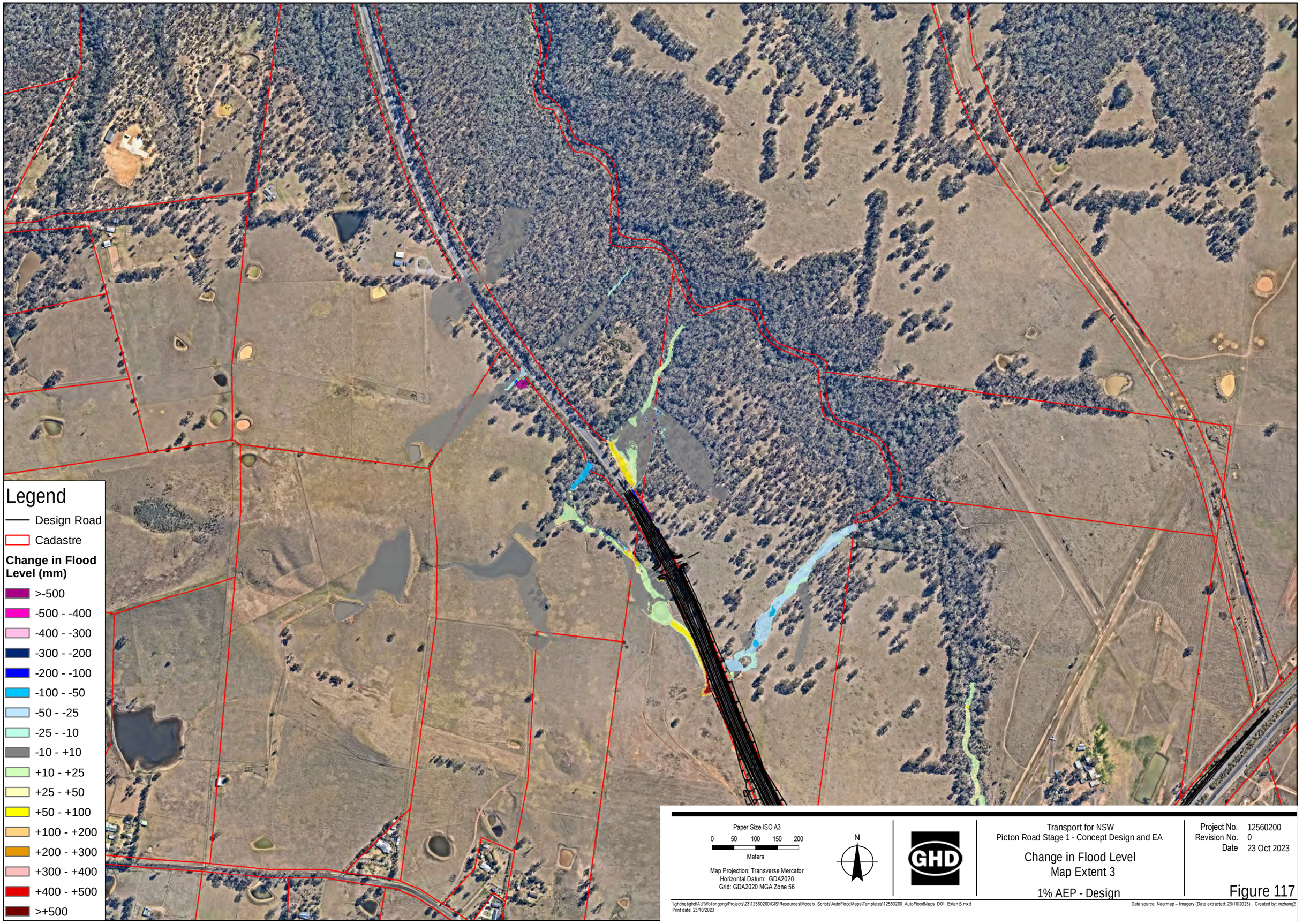
Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 115

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2


Legend
Design Road
Cadastre
Change in Flood Level (mm)
>-500
-500 - -400
-400 - -300
-300 - -200
-200 - -100
-100 - -50
-50 - -25
-25 - -10
-10 - +10
+10 - +25
+25 - +50
+50 - +100
+100 - +200
+200 - +300
+300 - +400
+400 - +500
>+500
Paper Size ISO A3
0 50 100 150 200
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56
N
GHD
Transport for NSW
Picton Road Stage 1 - Concept Design and EA
Change in Flood Level
Map Extent 2
1% AEP - Design
Project No. 12560200
Revision No. 0
Date 23 Oct 2023
Figure 116
\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023
Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 3

1% AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 117

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 1

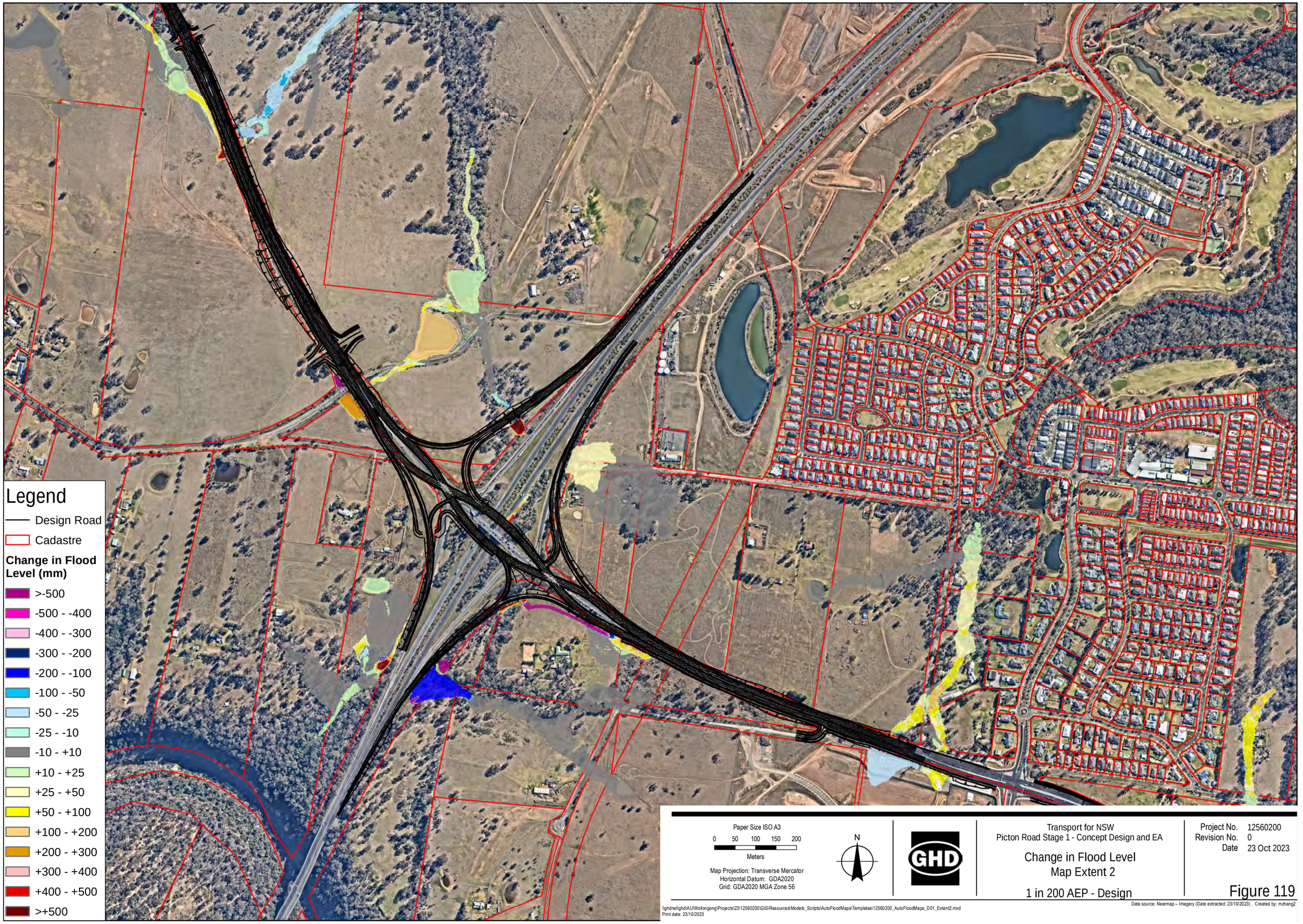
1 in 200 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 118

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 2

1 in 200 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 119

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

Design Road

Cadastre

Change in Flood Level (mm)

- >-500
- -500 - -400
- -400 - -300
- -300 - -200
- -200 - -100
- -100 - -50
- -50 - -25
- -25 - -10
- -10 - +10
- +10 - +25
- +25 - +50
- +50 - +100
- +100 - +200
- +200 - +300
- +300 - +400
- +400 - +500
- >+500

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 3

1 in 200 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 120

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre

Change in Flood Level (mm)

- >-500
- -500 - -400
- -400 - -300
- -300 - -200
- -200 - -100
- -100 - -50
- -50 - -25
- -25 - -10
- -10 - +10
- +10 - +25
- +25 - +50
- +50 - +100
- +100 - +200
- +200 - +300
- +300 - +400
- +400 - +500
- >+500

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 1

1 in 500 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 121

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre

Change in Flood Level (mm)

- >-500
- -500 - -400
- -400 - -300
- -300 - -200
- -200 - -100
- -100 - -50
- -50 - -25
- -25 - -10
- -10 - +10
- +10 - +25
- +25 - +50
- +50 - +100
- +100 - +200
- +200 - +300
- +300 - +400
- +400 - +500
- >+500

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 2

1 in 500 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 122

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Legend

- Design Road
- Cadastre

Change in Flood Level (mm)

- >-500
- -500 - -400
- -400 - -300
- -300 - -200
- -200 - -100
- -100 - -50
- -50 - -25
- -25 - -10
- -10 - +10
- +10 - +25
- +25 - +50
- +50 - +100
- +100 - +200
- +200 - +300
- +300 - +400
- +400 - +500
- >+500

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 3

1 in 500 AEP - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 123

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre

Change in Flood Level (mm)

- >-500
- -500 - -400
- -400 - -300
- -300 - -200
- -200 - -100
- -100 - -50
- -50 - -25
- -25 - -10
- -10 - +10
- +10 - +25
- +25 - +50
- +50 - +100
- +100 - +200
- +200 - +300
- +300 - +400
- +400 - +500
- >+500

Paper Size ISO A3

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 1

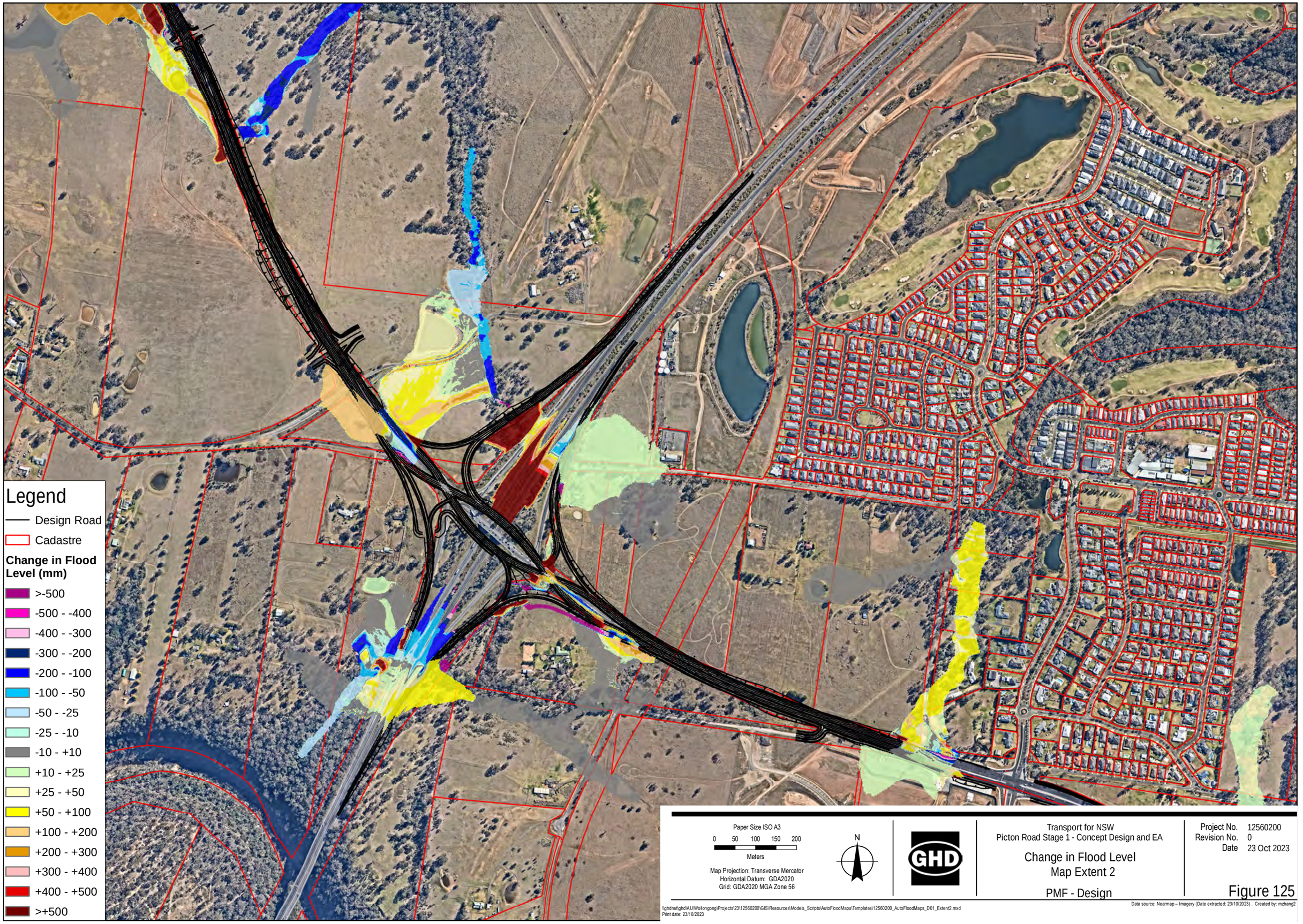
PMF - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 124

\\ghdnet\ghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent1.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2



Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 2

PMF - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 125

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent2.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

Legend

- Design Road
- Cadastre

Change in Flood Level (mm)

- >-500
- -500 - -400
- -400 - -300
- -300 - -200
- -200 - -100
- -100 - -50
- -50 - -25
- -25 - -10
- -10 - +10
- +10 - +25
- +25 - +50
- +50 - +100
- +100 - +200
- +200 - +300
- +300 - +400
- +400 - +500
- >+500

Paper Size ISO A3

0 50 100 150 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Transport for NSW
Picton Road Stage 1 - Concept Design and EA

Change in Flood Level
Map Extent 3

PMF - Design

Project No. 12560200
Revision No. 0
Date 23 Oct 2023

Figure 126

\\ghdnetghd\AU\Wollongong\Projects\23\12560200\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\12560200_AutoFloodMaps_D01_Extent3.mxd
Print date: 23/10/2023

Data source: Nearmap – Imagery (Date extracted: 23/10/2023) . Created by: mzhang2

ghd.com

The Power of Commitment