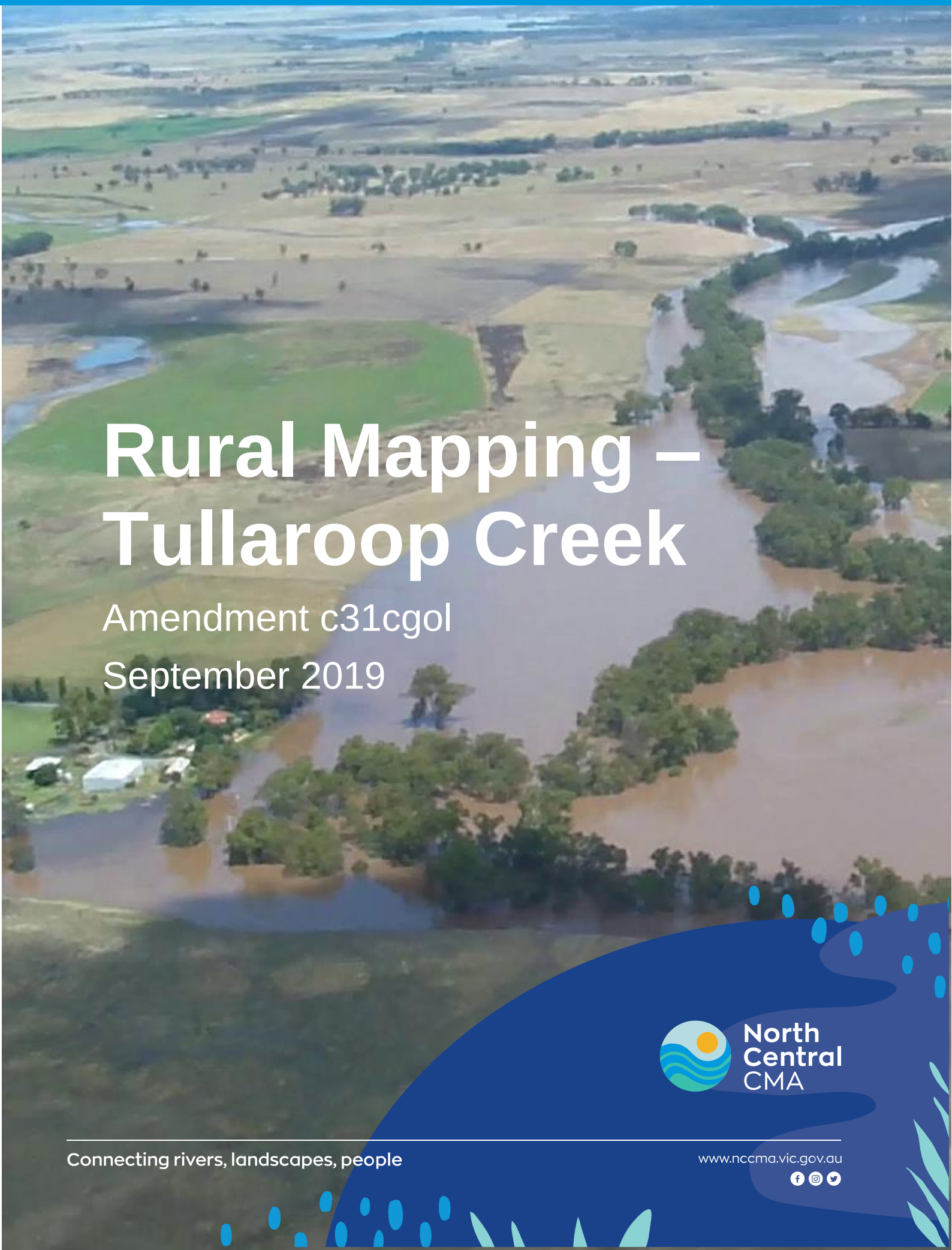

# Rural Mapping – Tullaroop Creek

Amendment c31cgol

September 2019

North Central CMA

Connecting rivers, landscapes, people

www.nccma.vic.gov.au

## Acknowledgment of Country

The North Central Catchment Management Authority acknowledges Aboriginal Traditional Owners within the region, their rich culture and spiritual connection to Country. We also recognise and acknowledge the contribution and interest of Aboriginal people and organisations in land and natural resource management.

Document name: “Final Report Rural Mapping Tullaroop Creek”
Front cover photo:  January 2011 Flood Event, VicSES



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A copy of the draft is also available at www.nccma.vic.gov.au
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# 1. Introduction

Detailed flood modelling was undertaken as part of the Carisbrook Flood and Drainage Management Plan, 2013. It is proposed that this flood modelling is used to update the flood related planning controls in the Central Goldfields Planning Scheme. However, the detailed modelling is limited to the urban area of Carisbrook and its surrounds. In preparing the proposed planning scheme maps, it became evident that the existing LSIO that covers the rural areas of Tullaroop Creek is extremely inaccurate and there is no clear way to transition the detailed flood modelling to the existing Land Subject to Inundation Overlay (LSIO).

In 2000, the Department of Natural Resources and Environment (now known as the Department of Environment Land Water and Planning) engaged consultants to collect and collate flood data across the state for the purposes of updating the local government planning schemes. This project was known as the Flood Data Transfer Project. Within the Central Goldfields municipality no detailed flood and land level information was available, therefore the consultants based their mapping on large scale geological maps by outlining the alluvial type soils. Since this time, detailed survey information has been captured for most of the major waterways within Central Goldfields and technology has significantly improved to enable flood modelling.

North Central CMA has taken this opportunity to undertake rapid flood modelling to refine and update the LSIO overlay upstream of Carisbrook through to Tullaroop Reservoir and downstream of Carisbrook through to the council boundary. This report provides a summary of the methodology undertaken to prepare updated LSIO maps for the rural sections of Tullaroop Creek within the Central Goldfields municipality.

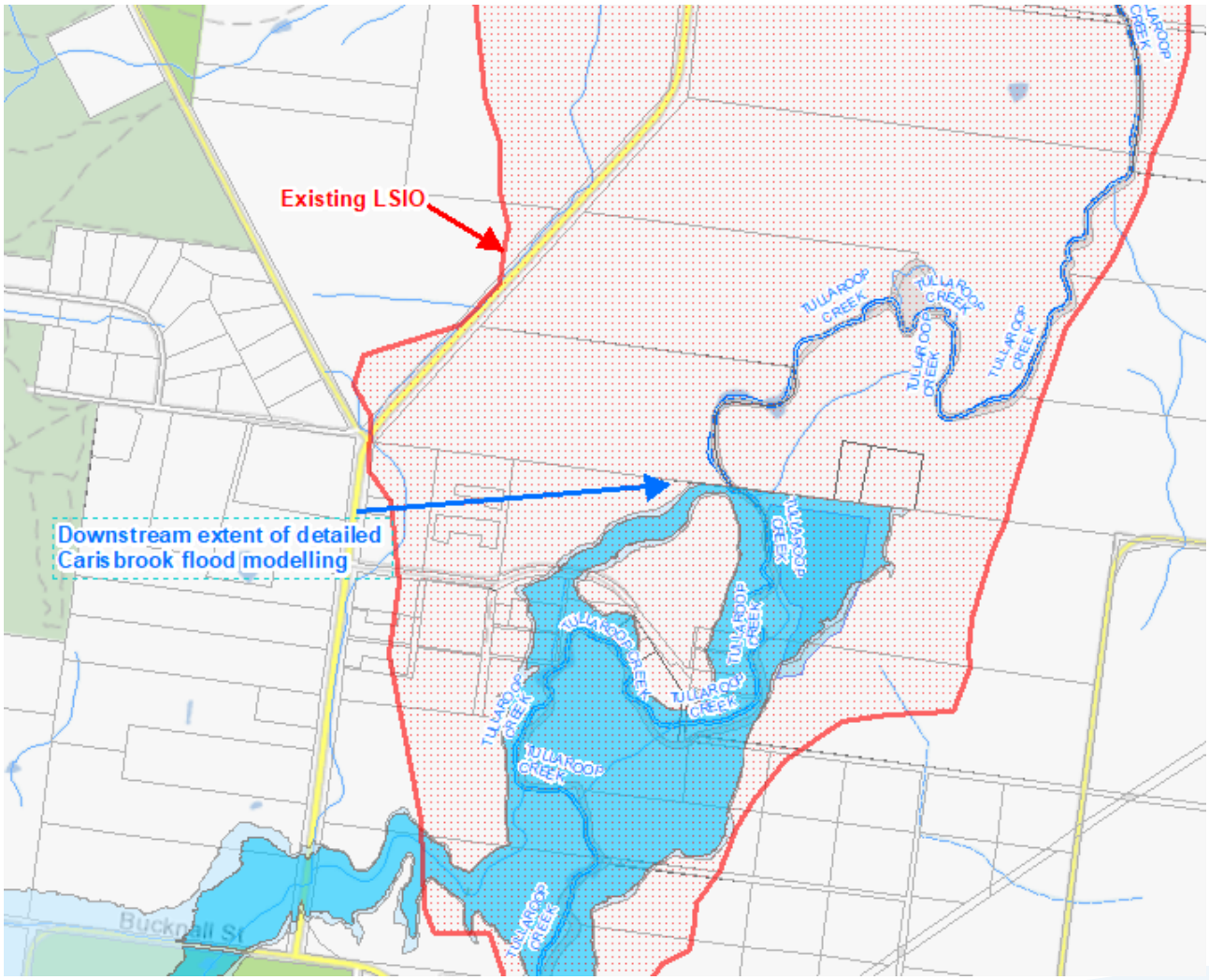



Figure 1 – Interface between existing LSIO and downstream boundary of detailed Carisbrook flood modelling

# 2. Available Information

## 2.1 Historical Flood Information

In January 2011 the region experienced widespread heavy rainfall which resulted in devastating flooding to much of the region. During this flood event a helicopter was deployed from the VicSES Incident Control Centre to undertake reconnaissance of the area to understand the impacts of the flood in the Carisbrook area. This helicopter captured video footage of the flood around 6pm on 14th January 2011. It is estimated that flood waters peaked in the town around midday to early afternoon on 14th January 2011. Floodwaters in the town remained elevated for many hours with floodwaters from the Tullaroop Creek peaking late afternoon. The footage, whilst it does not cover the full length of Tullaroop Creek, is of sufficient quality to enable comparisons to modelled flood extents and actual flood extents. This will assist in refining the rapid flood modelling to ensure that the modelled extent generally accords with what actually occurred.

## 2.2 Topographic Data

Two sources of Light Detection and Ranging (LIDAR) data is available for the study area. Both datasets were captured in 2011. Neither dataset comprehensively covers the area to be modelled, however of the two datasets, the Rivers LIDAR dataset captured in December 2011 most comprehensively covered the area to be mapped. In addition, as outlined in on page 21 of the Carisbrook Flood and Drainage Management Plan, the Rivers LIDAR dataset was determined to have a higher level of accuracy.

Therefore, the Rivers LIDAR dataset was adopted as the base topographic dataset for the hydraulic model.

## 2.3 Previous Flood Studies

The existing LSIO for the rural areas of Tullaroop Creek is not based on any previous flood study.

# 3. Flood Modelling Approach

## 3.1 Hydrology

A detailed hydrologic model was prepared as part of the Carisbrook Flood and Drainage Management Plan. Modelled hydrographs for the January 2011 flood event were extracted from this hydrologic model. There are two key locations where hydrographs are required:

- Tullaroop Creek downstream of Tullaroop Reservoir; and
- Tullaroop Creek downstream of the confluence with McCallums Creek

The two hydrographs extracted from the hydrologic model that were used in the hydraulic modelling are shown in Figure 2 below:

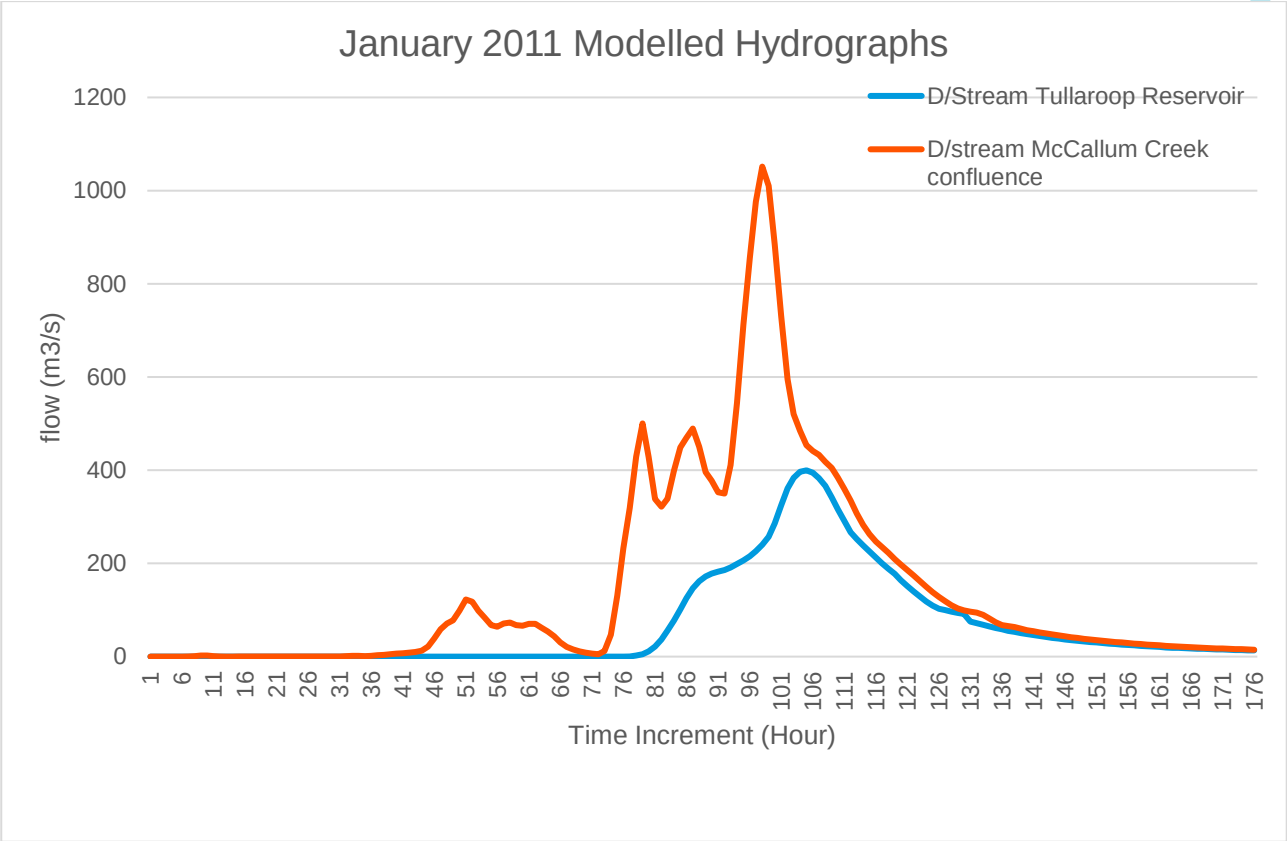



Figure 2 – January 2011 modelled hydrographs

## 3.2 Hydraulic Modelling

Two separate hydraulic models were developed to calculate the Jan 2011 flood extent for Tullaroop Creek.

Model 1 – extends from Tullaroop Reservor through to the upstream boundary of the detailed Carisbrook flood model

Model 2 – extends from the downstream boundary of the detailed Carisbrook flood model through to the Council boundary at Greenings Road.

HEC-RAS modelling software developed by the United States Army Corps of Engineers was utilised to undertake the flood modelling for this project. Two-dimensional (2D) unsteady-flow modelling using Saint Venant equations was undertaken.

### 3.2.1 Boundary Conditions

The outflow boundary condition for both models was a normal depth relationship based on a slope of 1/2000 which is based on slope of the calculated Jan 2011 flood levels.

The inflow boundary condition for Model 1 was the calculated hydrograph for the January 2011 flood event directly downstream of Tullaroop Reservoir.

The inflow boundary condition for Model 2 was the calculated hydrograph for the January 2011 flood event directly downstream of the confluence of McCallums Creek. There are no significant tributaries or flow paths downstream of McCallums Creek to warrant adding inflow boundaries to the model.

### 3.2.2 Cell Size

A model cell grid size of 10 metres was used for each of the models. Breaklines for the centreline of Tullaroop Creek were used to ensure that there were sufficient cells to pick up the general topography of the

waterway. Figure 3 below shows an extract of the hydraulic model showing the delineation of the cells within the model.

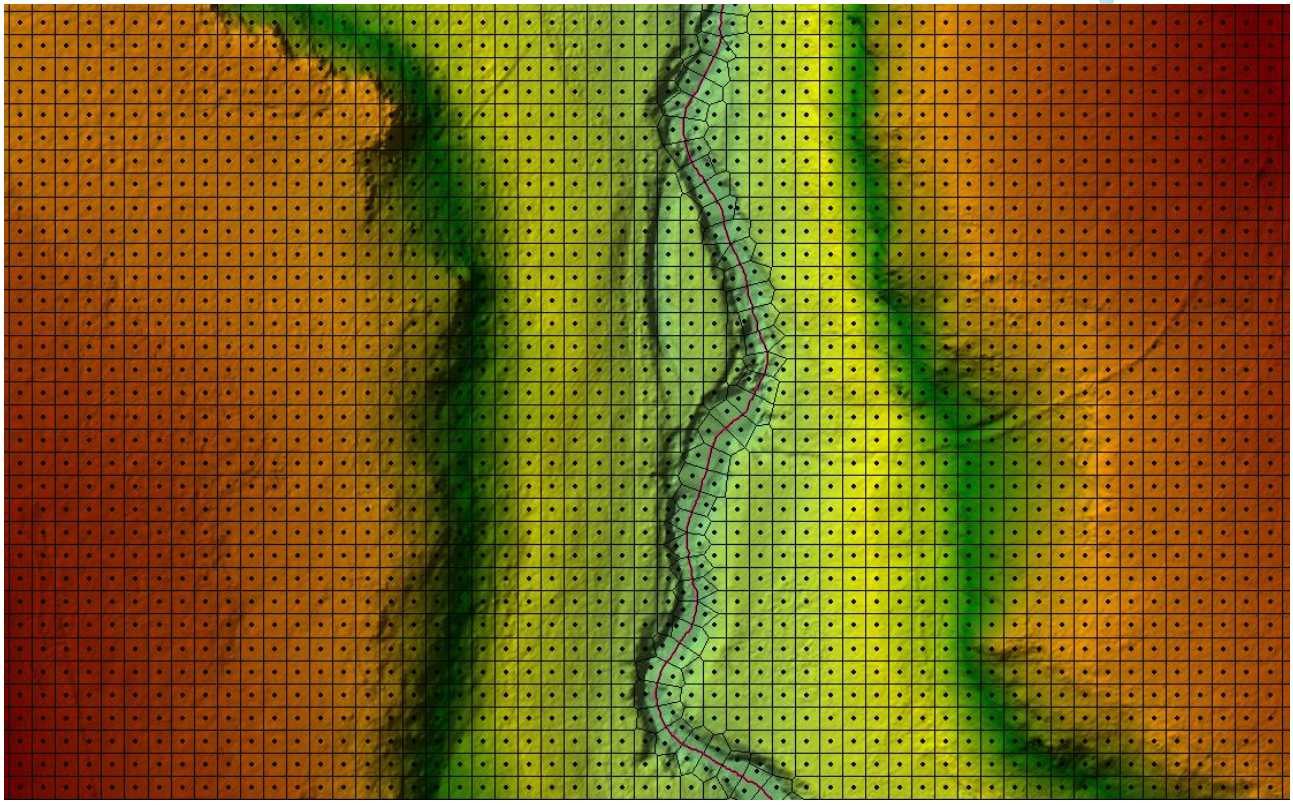


Figure 3 – Example of cell delineation within the hydraulic model

### 3.2.3 Roughness Values

The land within the study area consists of cleared rural farmland. Tullaroop Creek through the study area is a vegetated waterway. In the past invasive species predominately basket willow has been present within the bed and banks of Tullaroop Creek both upstream and downstream of Carisbrook. Significant works were undertaken by the local landcare group prior to the 2010-11 flood events to clear the willows from Tullaroop Creek within and downstream of Carisbrook. Following the flood event of 2011, the North Central CMA will government funding removed the vast majority of willows within Tullaroop Creek upstream of Carisbrook.

For the purposes of the modelling the following roughness values were assumed:

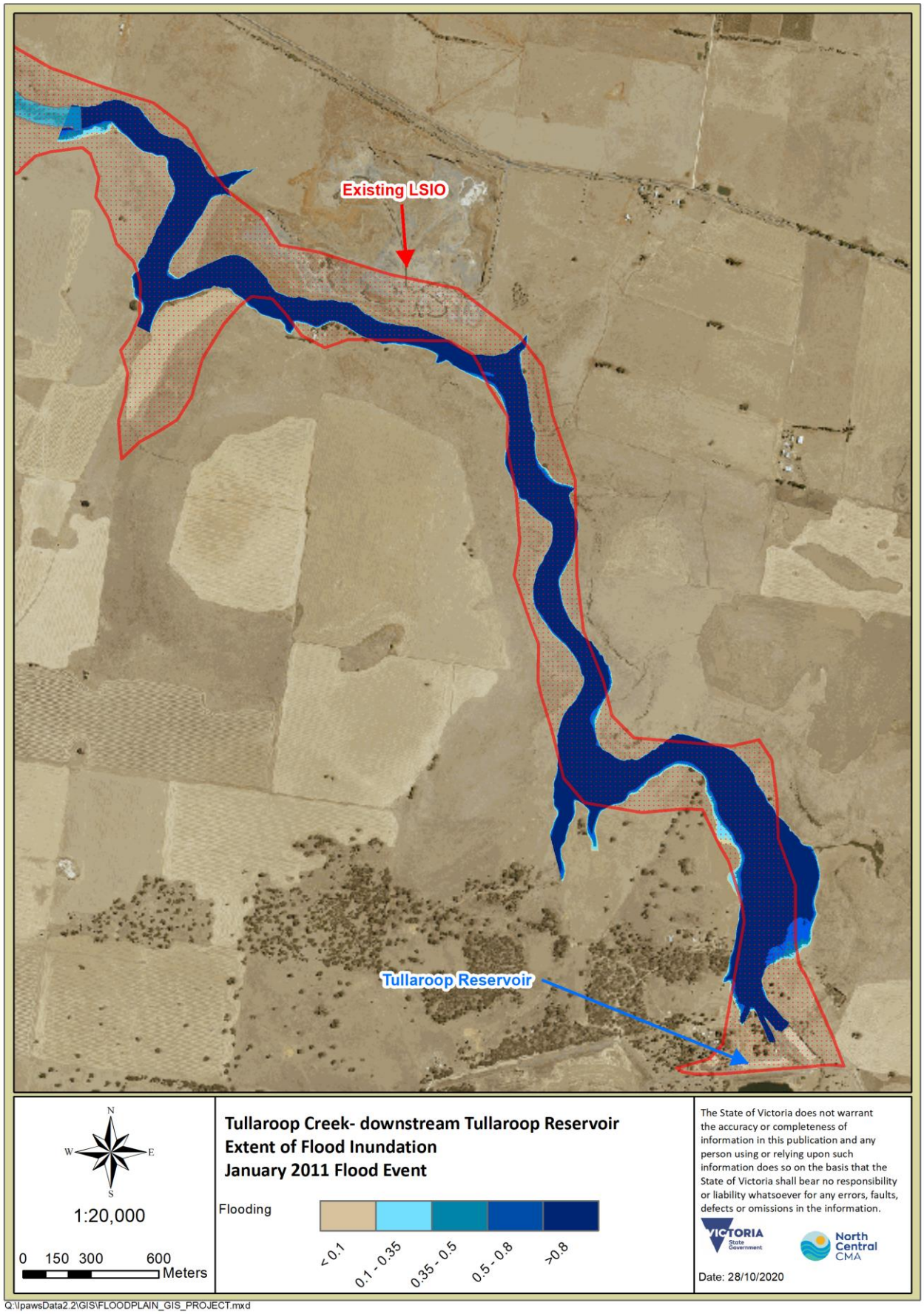
- Tullaroop Creek and land within 30 metres of Tullaroop Creek – 0.08
- All other land – 0.05

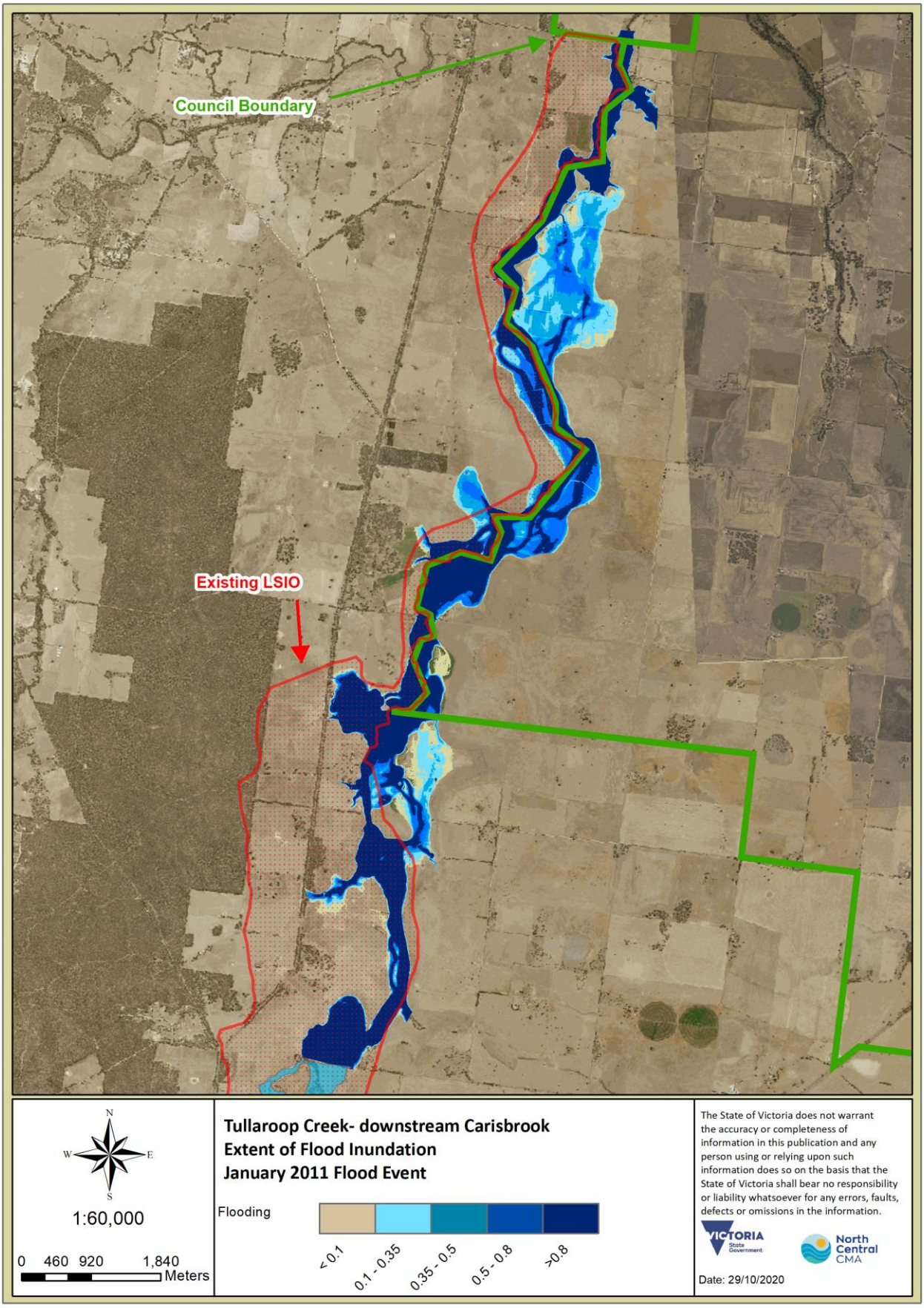
### 3.2.4 Structures

No structures were included in either of the hydraulic models. A desktop assessment was undertaken of each of the known structures over Tullaroop Creek. None of the structures are likely to have a significant impact on the conveyance of flood waters. All structures are expected to be inundated in large flood events. Whilst there may be some isolated impacts in and around the structures, modelling of these structures for the purpose of refining the overlays in these rural areas was not considered warranted.

| Structure | Type of Structure |
|---|---|
| Greenings Road | Timber Bridge |
| Mullins Road | Timber Bridge |
| Baringhup Havelock Road | Timber Bridge |
| Private Crossing – 582 Carisbrook Eddington Road | Ford Crossing |

### 3.2.6 Flood Mapping Results


Existing LSIO
Tullaroop Reservoir
N
W
E
S
1:20,000
0 150 300 600
Meters
Tullaroop Creek- downstream Tullaroop Reservoir
Extent of Flood Inundation
January 2011 Flood Event
Flooding
<0.1
0.1 - 0.35
0.35 - 0.5
0.5 - 0.8
>0.8
The State of Victoria does not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that the State of Victoria shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.
VICTORIA State Government
North Central CMA
Date: 28/10/2020
Q:\lpawsData2.2\GIS\FLOODPLAIN_GIS_PROJECT.mxd


Council Boundary
Existing LSIO
N
W
E
S
1:60,000
0 460 920 1,840
Meters
Tullaroop Creek- downstream Carisbrook
Extent of Flood Inundation
January 2011 Flood Event
Flooding
< 0.1
0.1 - 0.35
0.35 - 0.5
0.5 - 0.8
>0.8
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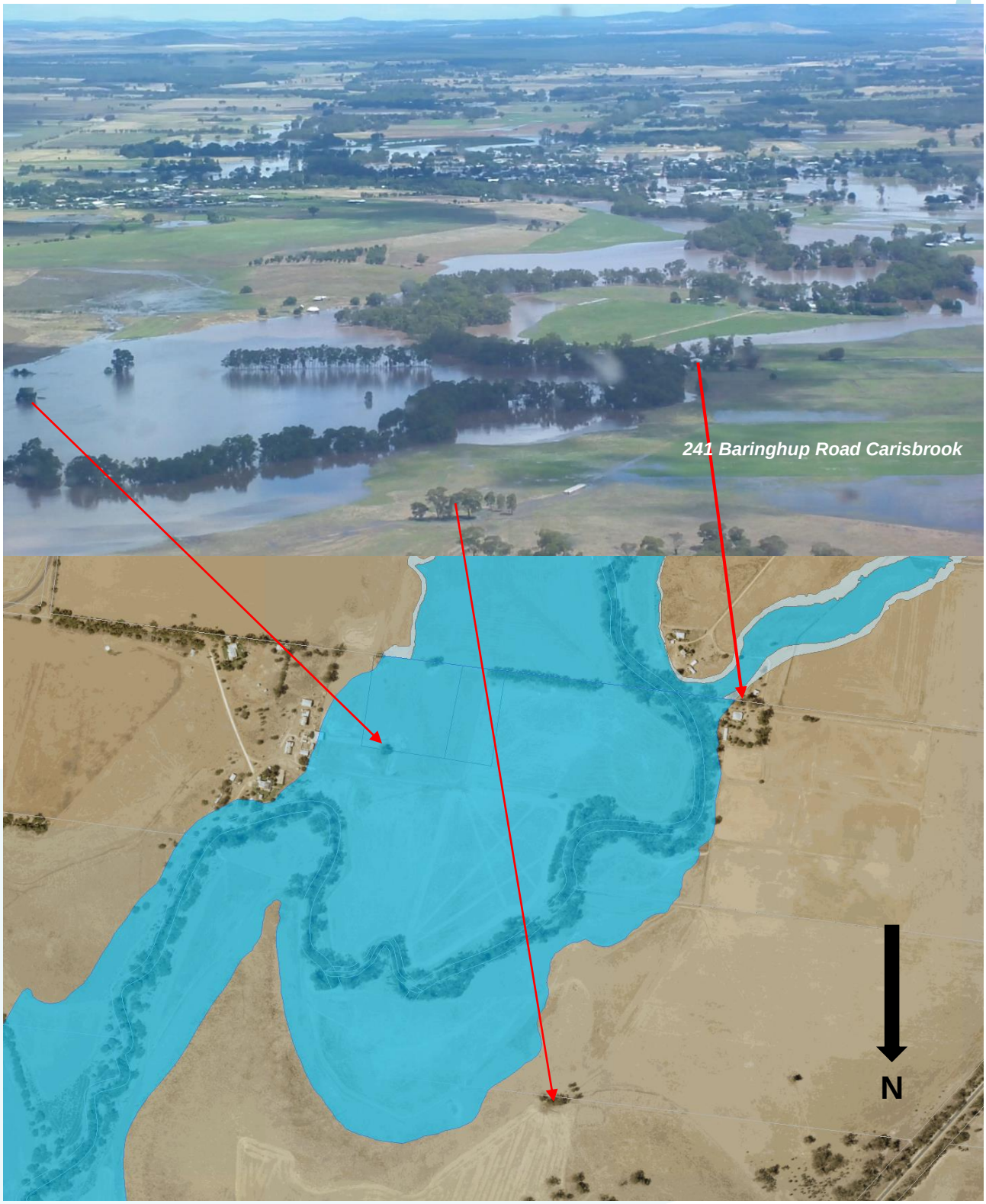
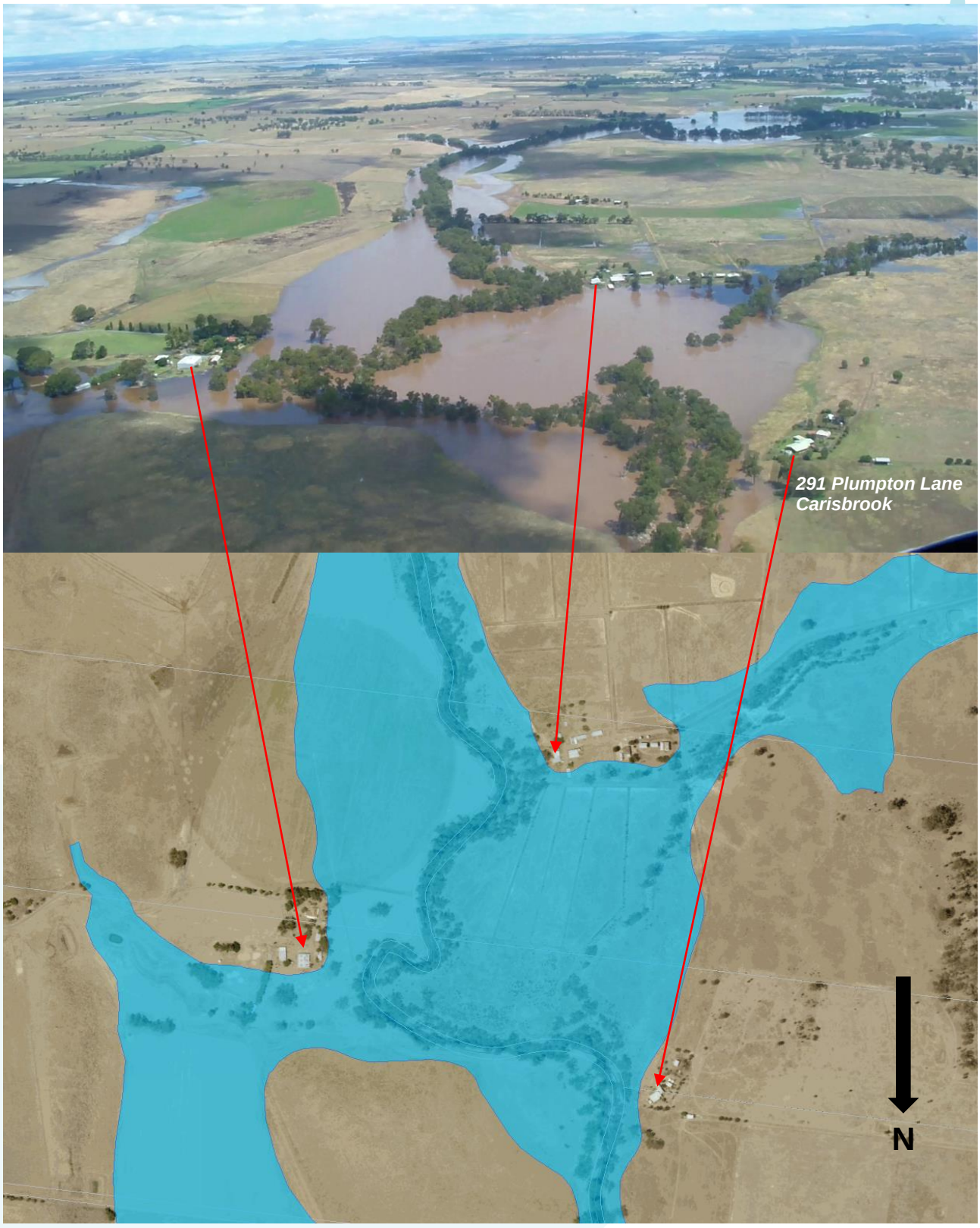
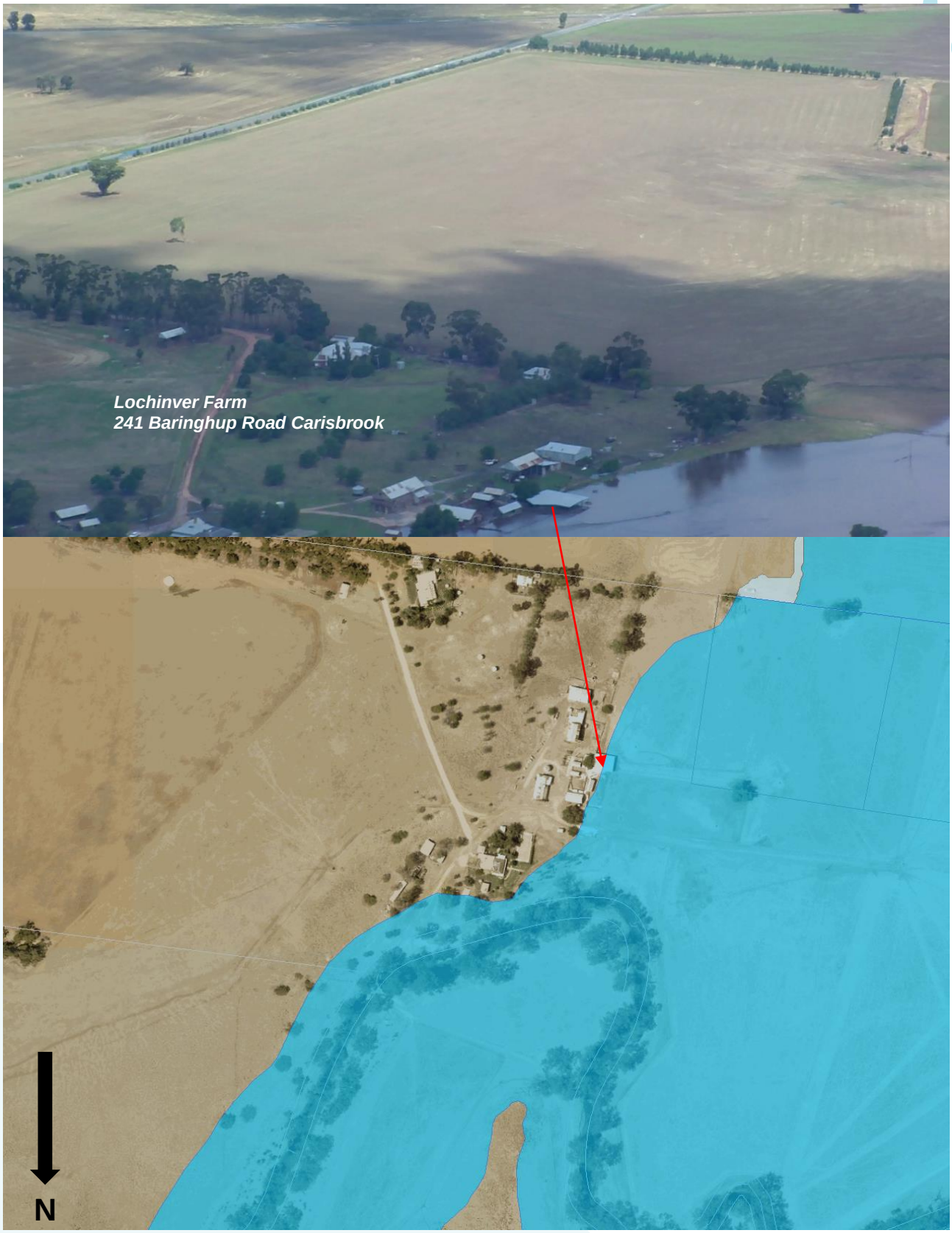
VICTORIA State Government
North Central CMA
Date: 29/10/2020

# 4. Comparison to January 2011 Flood Event

The following imagery is from video footage taken by VicSES emergency personnel on 14th January 2020 around 18:00, the subsequent map shows the proposed LSIO in vicinity to the photo.


241 Baringhup Road Carisbrook
N


291 Plumpton Lane
Carisbrook
N


Lochinver Farm
241 Baringhup Road Carisbrook
N

# 5. Proposed Overlays

Given the rapid nature of the flood modelling, delineation between LSIO and Floodway Overlay (FO) is not considered appropriate. Therefore, the entire rural floodplain of Tullaroop Creek is proposed to be included as LSIO.

The flood modelling generally accorded reasonably well with the aerial photography of the January 2011 event, however there were some location where the modelled extent was slightly higher. In preparing the LSIO, close attention was paid around existing buildings to ensure that the LSIO did not extend over buildings that were not flooded in the January 2011 flood event. In these situations, the proposed LSIO extent was manually manipulated to remove these locations from the proposed LSIO.

The implications of the proposed changes to the LSIO are summarised as follows:

| | Existing LSIO | Proposed LSIO |
|---|---|---|
| Area of land with LSIO | 1689 hectares | 716 hectares |
| Properties within LSIO | 52 | 45 |
| Dwellings within LSIO | 12 | 0 |

There is a proposed significant reduction in LSIO, in particular removing LSIO covering existing dwellings that are not subject to flooding. This will reduce unnecessary red tape for farmers/landowners by removing a trigger for a planning permit that may otherwise not be required.

# 6. Conclusion

The North Central CMA has undertaken rapid flood modelling to provide an estimate of the January 2011 flood extent. The rapid modelling that has been undertaken is high level and conservative in nature but the North Central CMA maintains that it is of sufficient accuracy to update the LSIO within the rural areas along Tullaroop Creek.

This rapid modelling whilst not perfect is far more accurate than the basis of the existing LSIO to define the land that may be potentially subject to flood inundation. The rapid flood modelling on balance provides a significant reduction in the extent of the LSIO, which will assist in reducing unnecessary red tape for future buildings and works by landowners.