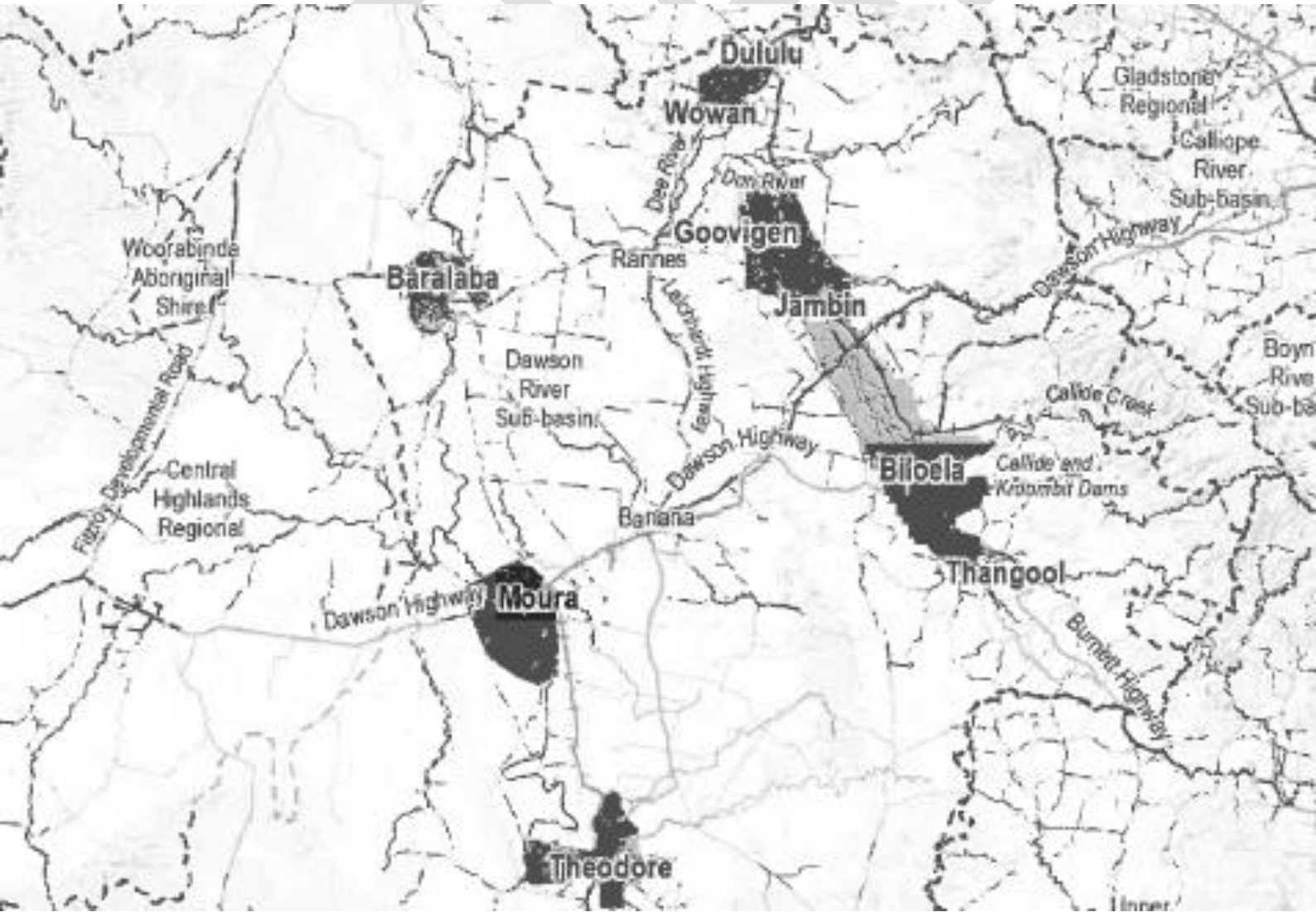
Review of Total Flood warning System

Draft Report

Banana Shire Council

28 May 2025

→ The Power of Commitment



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1. Introduction

Banana Shire Council (BSC) encompasses an area of 28,500 km^2 and sits within the larger Fitzroy Basin, with the majority of the Dawson River basin within the Local Government Area (LGA). The LGA is split north to south by the Leichardt Highway and west to east by the Dawson Highway. The main watercourses within the LGA are Dawson River, Kroombit Creek, Callide Creek / Callide Dam, Don River and Dee River.

Banana Shire Council has a number of populated towns located on the Dawson River, Dee River and tributaries. During widespread rainfall and severe storms this region experiences significant flooding as witnessed during December 2010/January 2011 flood, 2013 ex-Tropical Cyclone Oswald and in 2015 by Tropical Cyclone Marcia.

The township of Biloela sits downstream of Sunwater's Callide Dam which was impacted severely by Tropical Cyclone Maria in 2015. Kroombit Dam is also located with the BSC area and is also operated by Sunwater. Council's most recent flood study and Floodplain Management Plan was completed in 2016, which will be invaluable in establishing flood behaviours within the catchment.

A total flood warning system should consist of six (6) components:

1. Prediction - detecting changes in the environment that lead to flooding and predicting river levels during the flood.
2. Interpretation - identifying in advance the impacts of the predicted flood levels on communities at risk.
3. Message construction - devising the content of the message that will warn people of impending flooding.
4. Communication - disseminating warning information in a timely fashion to people and organisations likely to be affected by the flood.
5. Response - generating appropriate and timely actions from the threatened community and from the agencies involved.
6. Review - examining the various aspects of the system with a view to improving its performance.

1.1 Purpose of this report

Banana Shire Council commissioned GHD to undertake a review of the Total Flood Warning Systems applicable to the communities of the Banana Shire. The goal of the review was to ascertain whether the system is sufficient to aid flood management agencies and flood prone communities within the Banana Shire and to understand the nature of developing floods so that action can be taken to mitigate their effects. The review was to be conducted in accordance with the Australian Disaster Resilience Handbook Collection - Flood Warning.

1.2 Objective of the study

The objectives to be accomplished through the review are as follows:

– Gain a greater understanding of flood behaviour, historical occurrences, impacts within the shire, and assess the current level of community resilience in relation to floods.
– Gain a greater understanding of the monitoring network, encompassing an analysis of its ownership, technology utilized, and identification of limitations or shortcomings.
– Determine the effectiveness of the existing Total Flood Warning System, including an in-depth examination of the services delivered to the community by the Council, various State and Federal government departments, and assess how these components interact and collaborate.
– Determine what short-term, medium-term, and long-term actions may be taken to enhance the flood warning system and monitoring network. Additionally, determine what potential funding sources and strategies, including ongoing strategic projects, that the Council can strategically leverage to their advantage in improving flood preparedness and response.
– Engage in meaningful community consultation and participation throughout the review process to gather valuable insights, concerns, and suggestions from local residents, businesses, and stakeholders. Ensure that community perspectives are incorporated into the recommendations for enhancing the flood warning system and monitoring network to better align with the specific needs and expectations of Council's constituents

1.3 Scope and limitations

This report: has been prepared by GHD for Banana Shire Council and may only be used and relied on by Banana Shire Council for the purpose agreed between GHD and Banana Shire Council as set out in section 1.4 of this report.

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

GHD has prepared this report on the basis of information provided by Banana Shire Council 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.

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 report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 7 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

2. Available information

2.1 Rainfall gauges

The locations of rainfall gauges within the catchment are outlined in Table 2.1 and illustrated in Figure 2.1.

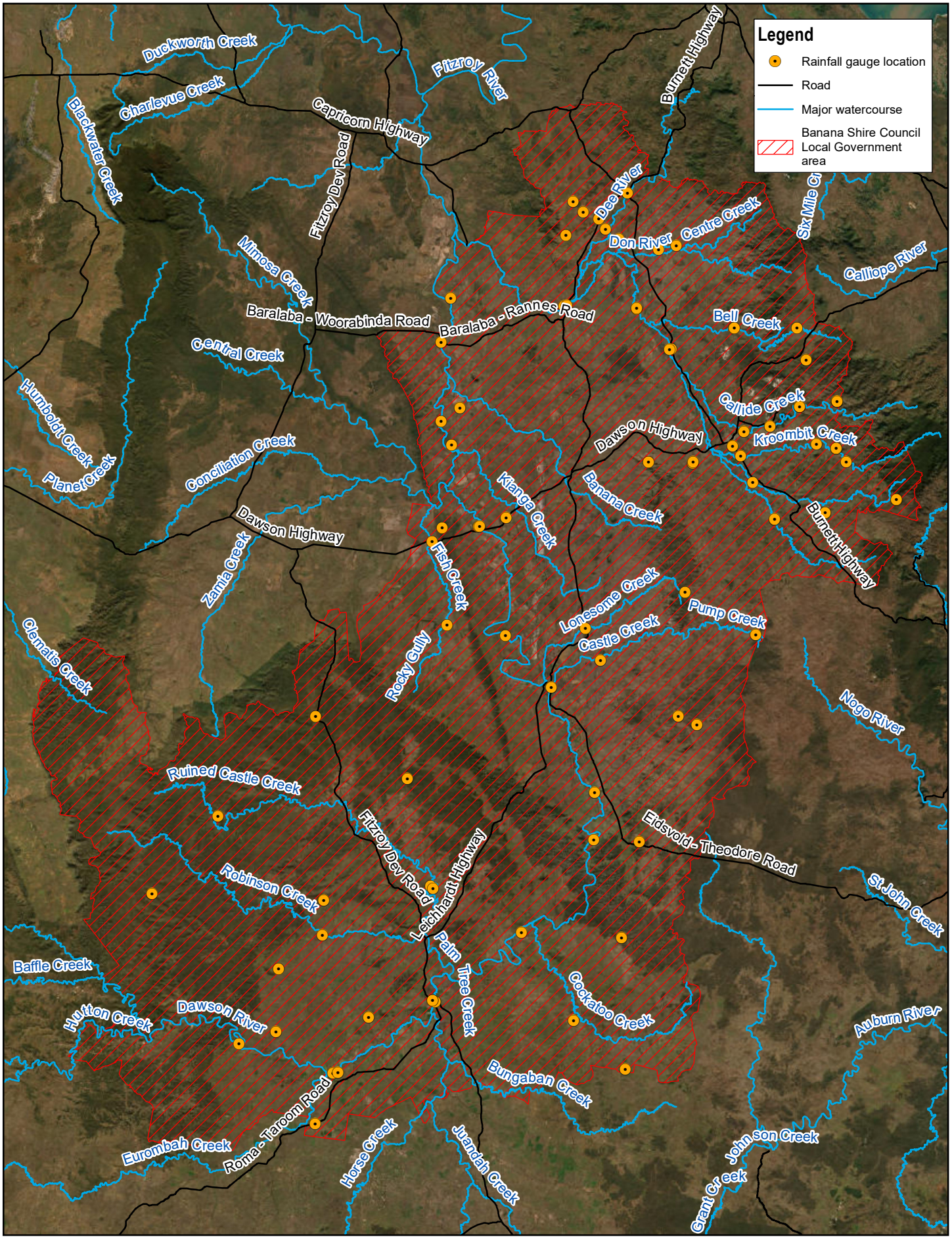
Table 2.1 Rainfall gauges within Banana Shire Council

Bureau Number	Station Name	Bureau Latitude	Bureau Longitude	Gauge Type	Telemetry Type	Owner	Maintenance
35015	The Sandstone	-25.4025	149.1044	Manual	ROT	Bureau	Bureau
35070	Taroom Post Office	-25.6408	149.7958	Manual	SYNOP	Bureau	Bureau
35096	The Glebe	-25.4875	150.0064	Manual	ROT	Bureau	Bureau
35115	Taroom	-25.6377	149.7895	Manual	ROT	Bureau	Bureau
35117	La Palma	-25.3864	149.7842	Manual	ROT	Bureau	Bureau
35135	Hornet Bank Homestead	-25.7064	149.4078	Manual	ROT	Bureau	Bureau
35182	Kinnoul	-25.6753	149.6331	Manual	ROT	Bureau	Bureau
35271	Tarana Crossing	-25.7968	149.5457	Manual	ROT	Bureau	Bureau
35282 130302A	Taroom Tm	-25.6377	149.7895	Automatic	TELEMETER	DRDMW	DRDMW
39022	Camboon Station	-25.0303	150.4342	Manual	ROT	Bureau	Bureau
39054	Jambin Post Office	-24.1967	150.3714	Manual	ROT	Bureau	Bureau
39071	Moura Post Office	-24.5722	149.9694	Manual	ROT	Bureau	Bureau
39089	Thangool Airport	-24.4935	150.5709	Automatic	AWS	Bureau	Bureau
39102	Wowan Post Office	-23.9078	150.1953	Manual	ROT	Bureau	Bureau
39106	Mount Kroombit	-24.4081	150.7258	Manual	ROT	Bureau	Bureau
39143	Baralaba	-24.1817	149.8100	Manual	ROT	Bureau	Bureau
39158	Theodore	-24.9472	150.0789	Manual	ROT	Bureau	Bureau
39201	Belvedere	-24.3278	149.8556	Manual	ROT	Bureau	Bureau
39240	Kroombit	-24.4472	150.7981	Manual	ROT	Bureau	Bureau
39290	Biloela - Valbona	-24.4131	150.5208	Manual	ROT	Bureau	Bureau
39296	Moura	-24.5917	149.9017	Manual	ROT	Bureau	Bureau
39308	Rannes	-24.1019	150.1097	Manual	ROT	Bureau	Bureau
39332	Lloyona	-24.4100	149.8356	Manual	ROT	Bureau	Bureau
535015 130322A	Beckers Tm	-24.0833	149.8333	Automatic	Telemeter	DRDMW	DRDMW
535032 130324A	Utopia Downs Tm	-25.7333	149.3167	Automatic	Telemeter	DRDMW	DRDMW
535049 130313A	La Palma Tm	-25.3911	149.7908	Automatic	Telemeter	DRDMW	DRDMW
535050 130363A	Roundstone Creek Tm	-24.6250	149.7886	Automatic	Telemeter	DRDMW	DRDMW

Bureau Number	Station Name	Bureau Latitude	Bureau Longitude	Gauge Type	Telemetry Type	Owner	Maintenance
535055 130375A	Broadmere Tm	-25.4939	149.5206	Automatic	Telemeter	DRDMW	DRDMW
535065 1303P002	Cockatoo Ck Tm	-25.7883	150.2594	Automatic	Telemeter	DRDMW	DRDMW
535066 1303P008	Peekadoo Tm	-25.9089	149.5033	Automatic	Telemeter	DRDMW	DRDMW
535131	Glenhaughton Rd Alert	-25.4172	149.5236	Automatic	Alert	BSC	BSC
535132	Coorada Alert	-25.0114	149.5042	Automatic	Alert	BSC	BSC
535133	Ghinghinda Alert	-25.1497	149.7281	Automatic	Alert	BSC	BSC
535136	Broadmere Alert	-25.5686	149.4142	Automatic	Alert	BSC	BSC
535137	Cockatoo Road Alert	-25.6811	150.1336	Automatic	Alert	BSC	BSC
535138	Krismark Downs Alert	-24.8100	149.8247	Automatic	Alert	BSC	BSC
535140	Ruined Castle Alert	-25.2317	149.2658	Automatic	Alert	BSC	BSC
535142	Tarana Crossing Alert	-25.7961	149.5583	Automatic	Alert	BSC	BSC
535143 130317B	Dawson Range South Alert	-24.5944	149.8133	Automatic	Alert	BSC	BSC
539043	Woodleigh Tm	-24.8333	149.9667	Automatic	Telemeter	DRDMW	DRDMW
539057 130306B	Rannes Tm	-24.1000	150.1167	Automatic	Telemeter	DRDMW	DRDMW
539062 130349A	Kingsborough Tm	-23.9667	150.3833	Automatic	Telemeter	DRDMW	DRDMW
539067	Malakoff Junction Tm	-24.3131	150.7758	Automatic	Telemeter	SunWater	SunWater
539068 130327A	Goovigen Tm	-24.1081	150.2869	Automatic	Telemeter	DRDMW	DRDMW
539095 130374A	Bindaree Tm	-24.3575	149.8094	Automatic	Telemeter	DRDMW	DRDMW
539099 1303P006	Blue Hills Tm	-24.5328	150.9206	Automatic	Telemeter	DRDMW	DRDMW
539100 130348A	Red Hill Tm	-24.4506	150.4236	Automatic	Telemeter	DRDMW	DRDMW
539105 130336A	Folding Hills Tm	-24.5756	150.6242	Automatic	Telemeter	DRDMW	DRDMW
539106 130334A	South Kariboe Creek Tm	-24.5614	150.7469	Automatic	Telemeter	DRDMW	DRDMW
539107 130319A	Craiglands Tm	-24.1500	150.5247	Automatic	Telemeter	DRDMW	DRDMW
539111	Callide Dam Inflow Tm	-24.3253	150.6842	Automatic	Telemeter	SunWater	SunWater
539112	Kroombit Dam Hw Tm	-24.4183	150.7742	Automatic	Telemeter	SunWater	SunWater

Bureau Number	Station Name	Bureau Latitude	Bureau Longitude	Gauge Type	Telemetry Type	Owner	Maintenance
539115 13030791A	Wowan Cemetry Rd Tm	-23.9303	150.2108	Automatic	Telemeter	DRDMW	DRDMW
539116 13030880A	Alma Ck Bore Tm	-23.9522	150.2439	Automatic	Telemeter	DRDMW	DRDMW
539119 13030332A	Doreen Tm	-23.9756	150.3406	Automatic	Telemeter	DRDMW	DRDMW
539160	Camboon Alert	-25.0106	150.3889	Automatic	Alert	BSC	BSC
539161	Cracow Alert	-25.2883	150.2936	Automatic	Alert	BSC	BSC
539162	Downfall Ck Alert	-25.5003	150.2506	Automatic	Alert	BSC	BSC
539163	Gyranda Weir Alert	-25.2842	150.1825	Automatic	Alert	BSC	BSC
539164	Isla-Delusion Crossing Alert	-25.1803	150.1850	Automatic	Alert	BSC	BSC
539165	Moura Weir Alert	-24.5903	149.9039	Automatic	Alert	BSC	BSC
539168	Upper Castle Alert	-24.8311	150.5781	Automatic	Alert	BSC	BSC
539169	Pheasant Ck Alert	-23.8686	150.1317	Automatic	Alert	BSC	BSC
539170	Pocket Ck Rd Alert	-23.9442	150.1147	Automatic	Alert	BSC	BSC
539171	Upper Lonesome Alert	-24.7369	150.4056	Automatic	Alert	BSC	BSC
539172	Castle Creek Alert	-24.8881	150.1992	Automatic	Alert	BSC	BSC
539173	Wowan Westwood Rd Alert	-23.8925	150.1569	Automatic	Alert	BSC	BSC
539174	Banana Range Alert	-24.4486	150.3156	Automatic	Alert	BSC	BSC
539175	Lonesome Creek Alert	-24.8167	150.1617	Automatic	Alert	BSC	BSC
539219 130378A	Dululu Tm	-23.8492	150.2644	Automatic	Telemeter	DRDMW	DRDMW
539229	Upper Rainbow Alert	-24.2209	150.7013	Automatic	Alert	BSC	BSC
539232	Biloela Alert	-24.4350	150.5410	Automatic	Alert	BSC	BSC
539233	Blue Hills Alert	-24.5320	150.9200	Automatic	Alert	BSC	BSC
539235	Callide Dam Hw Alert	-24.3689	150.6128	Automatic	Alert	BSC	BSC
539236	Callide Dam Inflow Alert	-24.3253	150.6842	Automatic	Alert	BSC	BSC
539237	Craiglands Alert	-24.1500	150.5250	Automatic	Alert	BSC	BSC
539238	Folding Hills Alert	-24.5750	150.6240	Automatic	Alert	BSC	BSC
539239	Goovigen Alert	-24.1060	150.2870	Automatic	Alert	BSC	BSC
539240	Jambin Alert	-24.1980	150.3670	Automatic	Alert	BSC	BSC
539241	Kroombit Dam Alert	-24.4180	150.7740	Automatic	Alert	BSC	BSC

Bureau Number	Station Name	Bureau Latitude	Bureau Longitude	Gauge Type	Telemetry Type	Owner	Maintenance
539244	Linkes Causeway Alert	-24.3806	150.5492	Automatic	Alert	BSC	BSC
539245	Malakoff Junction Alert	-24.3131	150.7758	Automatic	Alert	BSC	BSC
539247	Red Hill Alert	-24.4480	150.4250	Automatic	Alert	BSC	BSC
539248	South Kariboe Ck Alert	-24.5610	150.7470	Automatic	Alert	BSC	BSC
539249	Upper Bell Ck Alert	-24.1500	150.6780	Automatic	Alert	BSC	BSC



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Kilometers

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

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Flood Warning Systems

Project No. **12625254**
Revision No. **A**
Date **26 Jun 2024**

Rainfall Gauge Locations

Figure 2.1

Data source: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. Created by: sshortland

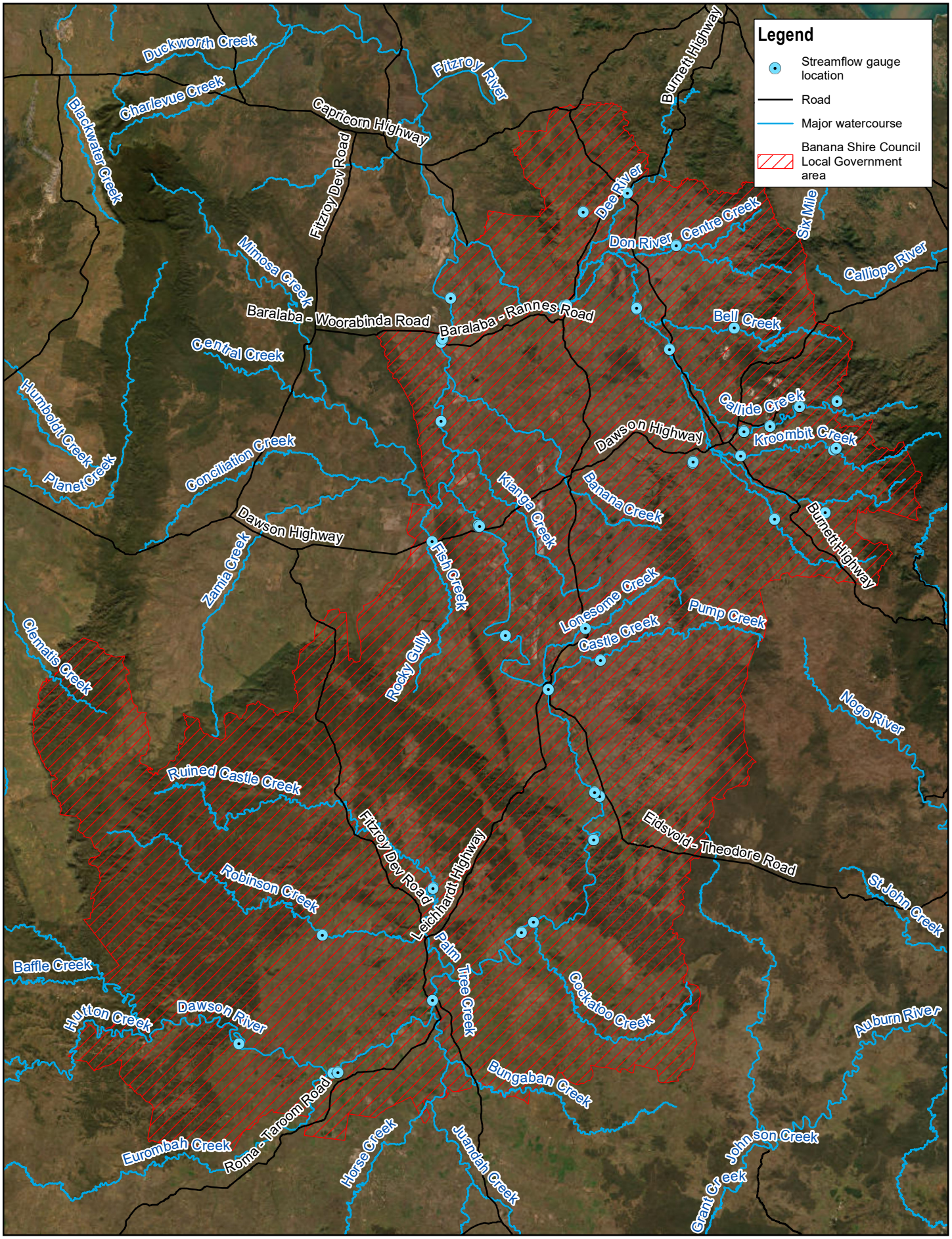
2.2 Streamflow gauges

The locations of streamflow gauges within the catchment are outlined in Table 2.2 and illustrated in Figure 2.2.

Table 2.2 Streamflow gauges within Banana Shire Council

Bureau Number	Station Name	Bureau Latitude	Bureau Longitude	Gauge Type	Telemetry Type	Owner	Maintenance
35096	The Glebe	-25.4875	150.0064	Manual	ROT	Bureau	Bureau
35115	Taroom	-25.6377	149.7895	Manual	ROT	Bureau	Bureau
35271	Tarana Crossing	-25.7968	149.5457	Manual	ROT	Bureau	Bureau
35282 130302A	Taroom Tm	-25.6377	149.7895	Automatic	Telemeter	DRDMW	DRDMW
39143	Baralaba	-24.1817	149.8100	Manual	ROT	Bureau	Bureau
39296	Moura	-24.5917	149.9017	Manual	ROT	Bureau	Bureau
39308	Rannes	-24.1019	150.1097	Manual	ROT	Bureau	Bureau
39315	Theodore	-24.9525	150.0719	Manual	ROT	Bureau	Bureau
535015 130322A	Beckers Tm	-24.0833	149.8333	Automatic	Telemeter	DRDMW	DRDMW
535032 130324A	Utopia Downs Tm	-25.7333	149.3167	Automatic	Telemeter	DRDMW	DRDMW
535044	Glebe Weir Hw Tm	-25.4653	150.0353	Automatic	Telemeter	SunWater	SunWater
535045	Glebe Weir Tw Tm	-25.4653	150.0353	Automatic	Telemeter	SunWater	SunWater
535049 130313A	La Palma Tm	-25.3911	149.7908	Automatic	Telemeter	DRDMW	DRDMW
535050 130363A	Roundstone Creek Tm	-24.6250	149.7886	Automatic	Telemeter	DRDMW	DRDMW
535055 130375A	Broadmere Tm	-25.4939	149.5206	Automatic	Telemeter	DRDMW	DRDMW
535110	Theodore Weir Tm	-24.9525	150.0719	Automatic	Telemeter	SunWater	SunWater
535142	Tarana Crossing Alert	-25.7961	149.5583	Automatic	Alert	BSC	BSC
539043 130317B	Woodleigh Tm	-24.8333	149.9667	Automatic	Telemeter	DRDMW	DRDMW
539057 130306B	Rannes Tm	-24.1000	150.1167	Automatic	Telemeter	DRDMW	DRDMW
539062 130349A	Kingsborough Tm	-23.9667	150.3833	Automatic	Telemeter	DRDMW	DRDMW
539065 1300358A	Isla-Delusion Xing Tm	-25.1883	150.1972	Automatic	Telemeter	SunWater	SunWater
539067	Malakoff Junction Tm	-24.3131	150.7758	Automatic	Telemeter	SunWater	SunWater
539068 130327A	Goovigen Tm	-24.1081	150.2869	Automatic	Telemeter	DRDMW	DRDMW
539070	Gyranda Weir Tm	-25.2842	150.1817	Automatic	Telemeter	SunWater	SunWater
539071	Callide Dam Hw Tm	-24.3689	150.6128	Automatic	Telemeter	SunWater	SunWater
539079 130361A	Baralaba Tw Tm	-24.1733	149.8136	Automatic	Telemeter	SunWater	SunWater

Bureau Number	Station Name	Bureau Latitude	Bureau Longitude	Gauge Type	Telemetry Type	Owner	Maintenance
539080	Baralaba Hw Tm	-24.1733	149.8136	Automatic	Telemeter	SunWater	SunWater
539081	Moura Weir Tm	-24.5889	149.9014	Automatic	Telemeter	SunWater	SunWater
539083	Kroombit Dam Tw Tm	-24.4219	150.7678	Automatic	Telemeter	SunWater	SunWater
539095 130374A	Bindaree Tm	-24.3575	149.8094	Automatic	Telemeter	DRDMW	DRDMW
539100 130348A	Red Hill Tm	-24.4506	150.4236	Automatic	Telemeter	DRDMW	DRDMW
539105 130336A	Folding Hills Tm	-24.5756	150.6242	Automatic	Telemeter	DRDMW	DRDMW
539106 130334A	South Kariboe Creek Tm	-24.5614	150.7469	Automatic	Telemeter	DRDMW	DRDMW
539107 130319A	Craiglands Tm	-24.1500	150.5247	Automatic	Telemeter	DRDMW	DRDMW
539110	Linkes Causeway Tm	-24.3806	150.5492	Automatic	Telemeter	SunWater	SunWater
539111	Callide Dam Inflow Tm	-24.3253	150.6842	Automatic	Telemeter	SunWater	SunWater
539112	Kroombit Dam Hw Tm	-24.4183	150.7742	Automatic	Telemeter	SunWater	SunWater
539163	Gyranda Weir Alert	-25.2842	150.1825	Automatic	Alert	BSC	BSC
539164	Isla-Delusion Crossing Alert	-25.1803	150.1850	Automatic	Alert	BSC	BSC
539165	Moura Weir Alert	-24.5903	149.9039	Automatic	Alert	BSC	BSC
539172	Castle Creek Alert	-24.8881	150.1992	Automatic	Alert	BSC	BSC
539173	Wowan Westwood Rd Alert	-23.8925	150.1569	Automatic	Alert	BSC	BSC
539175	Lonesome Creek Alert	-24.8167	150.1617	Automatic	Alert	BSC	BSC
539219 130378A	Dululu Tm	-23.8492	150.2644	Automatic	Telemeter	DRDMW	DRDMW
539232	Biloela Alert	-24.4350	150.5410	Automatic	Alert	BSC	BSC
539235	Callide Dam Hw Alert	-24.3689	150.6128	Automatic	Alert	BSC	BSC
539236	Callide Dam Inflow Alert	-24.3253	150.6842	Automatic	Alert	BSC	BSC
539237	Craiglands Alert	-24.1500	150.5250	Automatic	Alert	BSC	BSC
539238	Folding Hills Alert	-24.5750	150.6240	Automatic	Alert	BSC	BSC
539239	Goovigen Alert	-24.1060	150.2870	Automatic	Alert	BSC	BSC
539240	Jambin Alert	-24.1980	150.3670	Automatic	Alert	BSC	BSC
539241	Kroombit Dam Alert	-24.4180	150.7740	Automatic	Alert	BSC	BSC
539244	Linkes Causeway Alert	-24.3806	150.5492	Automatic	Alert	BSC	BSC
539247	Red Hill Alert	-24.4480	150.4250	Automatic	Alert	BSC	BSC
539248	South Kariboe Ck Alert	-24.5610	150.7470	Automatic	Alert	BSC	BSC



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Grid: WGS 1984 Web Mercator Auxiliary Sphere

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Flood Warning Systems

Project No. **12625254**
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Date **26 Jun 2024**

Streamflow Gauge Locations

Figure 2.2

Data source: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. Created by: sshortland

2.3 Disaster management

There are three main resources within disaster management within Banana Shire council, these include the disaster dashboard, the local disaster management plan and adverse events plan. The following section discusses each of these resources.

2.3.1 Disaster dashboard

Banana Shire Council has a disaster dashboard which can be accessed by the public through the following link **Dashboard (banana.qld.gov.au)**. Through the disaster dashboard information (see Figure 2.3) about river heights, rainfall, road closures, links to sunwater information and the flood extents for the 10%, 5%, 2% and 1% AEP flood extents are provided. This is the main location that council disseminates information during an flood event.

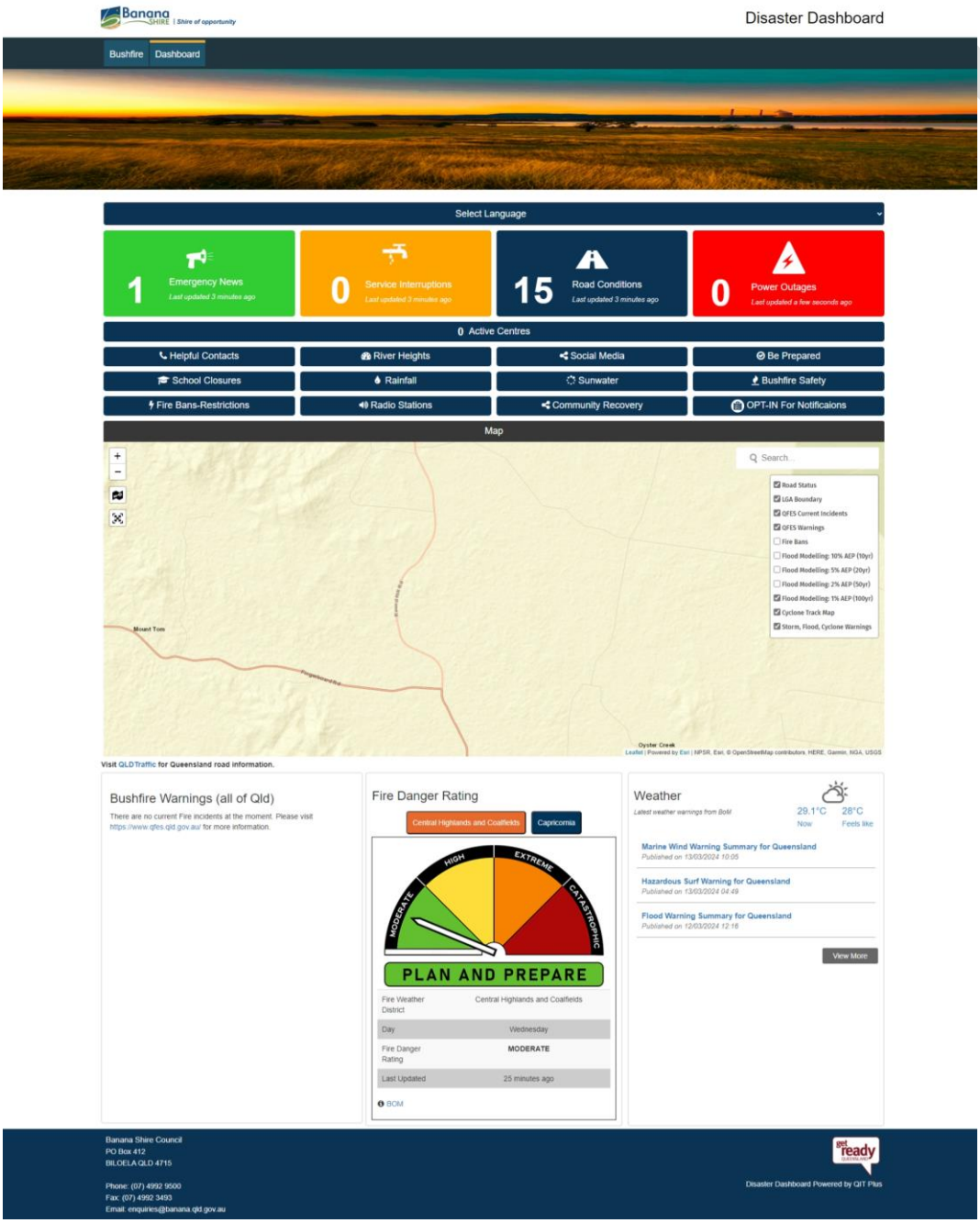


Figure 2.3 Banana Shire Council Disaster Dashboard

2.3.2 Local disaster management plan

The local disaster management plan outlines the following information about the council area:

- current population and social economic demographics for region
- critical infrastructure locations including power stations, hospitals, major roads, aged care facilities, water and sewerage locations
- hazard identification within the shire including cyclones, dam operations / failure of Callide Dam, Kroombit Dam, Moura off-stream storage and No. 7 dam Mt Morgan.
- Flood impacts within the council area
- Chapter 3 of the plan outlines the preparedness of the council, it also outlined the schedule reviews that should be undertaken post storm / cyclone season
- There are several sub groups to the Local Disaster Management Group. These are:
  - Evacuation Sub Group
  - Local Recovery Group
  - Taroom Local Emergency Coordination Committee
  - Theodore / Cracow Local Emergency Coordination Committee
  - Moura / Banana Local Emergency Coordination Committee
  - Baralaba / Rannes Local Emergency Coordination Committee
  - Goovigen / Jambin Local Emergency Coordination Committee
  - Wowan / Dululu Local Emergency Coordination Committee
- Local warnings and information
  - At a local level, the release of information to the community regarding the emergency, and associated threats, will be the responsibility of the Local Disaster Management Group
  - Bureau of Meteorology (BOM) - provides cyclone, flood (flood alert, flood watch and flood advice), severe storm (including thunderstorm), tsunami, land gales and severe bushfire weather advices.
  - Banana Shire Council – for local information on road closures, traffic routes, advised or voluntary evacuations, evacuation centres, welfare centres, debris clean-up and all matters relating to the activation of the LDMG and LDMP.
  - District Disaster Coordinator – advises detail of mandatory evacuations and declarations under the Disaster Management Act 2003, relating to any disaster event.
  - Sunwater – advice and warnings via SMS to residents downstream of Sunwater owned/operated dams
- Emergency alert system
  - The Emergency Alert is a national telephone warning system that provides Australian emergency authorities with an enhanced ability to warn the community in the event of an emergency.
  - LDMG's may request the use of the Emergency Alert System via a request to the State Disaster Coordination Centre (SDCC).

2.3.3 Adverse events plan

BSC has developed an Adverse Events Plan which was developed to provide guidance to the Council and community to prepare for, and manage adverse events that directly and indirectly affect the Banana Shire. This plan deals with many different events that can impact the community but only information relating to floods and weather events has been reviewed as part of this project. Key information included within this plan is that it is Council's responsibility to respond to storm events within the LGA. Information used to add in the decision-making process flood forecasting information from the Bureau and the information from the Banana Shire Flood Study.

2.4 Evacuation locations

Whilst the Banana Shire Local Disaster Management Group (LDMG) has identified a number of facilities throughout the region, which may be utilised as evacuation centres and/or shelters, facilities and services available may be limited and these locations should therefore be utilised for accommodation purposes only as a last resort.

The LDMG preferred options for persons requiring accommodation due to evacuation, are in priority order;

– A destination of the person's choosing away from the "at risk" area (i.e. relatives, friends, etc);
– An established accommodation venue away from the "at risk" area (i.e. motel, hotels, caravan park etc);
– A nominated and established evacuation centre; and
– A nominated shelter

An Evacuation Centre is a designated building specifically selected as a location not anticipated to be adversely affected by the hazard.

Establishment and management of evacuation centres is a responsibility of the Local Disaster Management Group, in conjunction with the District Disaster Management Group.

When an evacuation is ordered, because it is no longer safe to shelter in place and evacuees have no alternative means of accommodation away from the at risk area, residents should relocate to an evacuation centre that is open and staffed and as designated and advised by the Local Disaster Management Group.

The location and opening of an Evacuation Centre will be announced by the Local Disaster Management Group and conveyed within warnings and advice messages.

The following facilities have been nominated by the LDMG as potential evacuation centres:

– Biloela Civic Centre;
– Moura Kianga Hall; and
– Taroom Showgrounds

A place of refuge (also referred to as a Shelter) is usually a building, private or government owned that will provide a level of protection from the effects of the hazard.

The location and opening of a place of refuge will be announced by the Local Disaster Management Group and conveyed within warnings and advice messages.

The following facilities have been nominated by the LDMG as potential places of refuge (shelters):

– Banana Sutherland Hall;
– Baralaba Hall;
– Cracow Community Hall;
– Dululu Community Hall;
– Goovigen Hall;
– Jambin State School;
– Jambin Hall;
– Thangool Recreation Reserve;
– Theodore Aerodrome;
– Theodore RSL Hall; and
– Wowan Multi-Purpose Centre

2.5 WaterRide Models

There are six (6) WaterRide projects that have built for the Banana Shire Council LGA. The WaterRide projects comprises of the following locations:

– Baralaba
– Callide Valley

– Dululu & Wowan
– Moura
– Taroom
– Theordore

The information within each WaterRide project was reviewed and assessed. These WaterRide project were constructed based on information from the Banana Shire Flood Study undertaken by KBR in 2016. The detailed review of this models is outlined in Section 5.11. These WateRide projects are predominantly used to assess development applications and are not used during a flood event.

2.6 Banana Shire Flood Study

A Banana Shire Flood study was commission in November 2015 to understanding the impact of flooding on people, property and industry, and how existing and future flood risks can be managed through improved warning and protection measures. The project involved four (4) stages:

– Stage 1 – data gathering and analysis
– Stage 2 – Dawson River Flood Study
– Stage 3 – proposed areas of investigation
– Stage 4 – Floodplain Management Plan

KBR undertook the project between 2015 to 2017. The project comprises of three reports:

– Dawson River Flood Study – Hydrological Assessment Report (KBR, 2016)
– Banana Shire Flood Study Stage 2 – Floodplain Management Plan (KBR, 2017)
– Banana Shire Flood Study Stage 2 – Volume 1 Structural Measure Report (KBR, 2016)

The key activities of the Banana Shire Flood study were to identify the flood risk to Thangool, Biloela, Jambin, Goovigen, Dululu, Wowan, Taroom, Theodore, Moura, Baralaba and their surrounding areas. The assessments were based on catchment wide hydrologic models and detailed hydraulic models for the townships. The outputs from the flood study were used to refine advice regarding land use planning techniques and the development of emergency and evacuation management. Structural mitigation options were investigated to minimise the flood risk associated with key townships within the local government area.

2.6.1 Dawson River Flood Study

Two hydrological models were developed for the study to encompass the Dawson River catchment and the Dee and Don River. Six (6) hydraulic models were built to focus of the following townships:

– Thangool,
– Biloela,
– Jambin
– Goovigen
– Wowan
– Dululu
– Taroom
– Theodore
– Moura
– Baralaba

The hydrologic models were built in XP-RAFTS using 1987 Australian Rainfall and Runoff methodology. These inputs have been used to define the flood levels for different Annual exceedance probabilities and are inputs into the WaterRide proejcts. The Dawson River was calibrated to the 2010 and 2013 flood event while Don River / Dee River catchment was calibrated to the 2015, 2013 and 2010 flood events.

The hydraulic models were built in TUFLOW and calibrated to the same events within the hydrologic calibration. There was limited debris information that could be used in the hydraulic calibration and the models were built

based on a 10 m grid resolution. Outputs from the hydraulic model were used to define flood hazard mapping for the townships.

2.6.2 Floodplain Management Plan

A floodplain management plan was developed based on the outputs of the Dawson River Flood Study. The plan identified a number of further actions that BSC could take to improve the flood resilience of its area of governance. A damages assessment was undertaken as part of the project which idented that the following number of buildings located within the floodplain in the 5% AEP, 1% AEP and 0.2% AEP events. The number of buildings impacted in each township is reproduced in Table 2.3. Theodore has the greatest number of buildings impacted in all the flood events assessed.

Table 2.3 Number of buildings in the floodplain for each design event

Town	5% AEP	1% AEP	0.2% AEP
Theodore	28	289	357
Biloela	10	145	261
Jambin	5	21	29
Moura	0	18	-
Taroom	3	12	-
Wowan	0	12	23
Thangool	2	11	22
Dululu	0	11	21
Baralaba	4	8	-
Goovigen	0	4	6

Structural mitigation options were assessed for all the townships included within the flood study. Most of the structural mitigation options that were assessed included:

– Levees
– Minor drainage improvements
– Road raising and
– House relocation / raising.

Of all the mitigation options assessed they all had a cost-benefit ratio below 0.4. Therefore, the cost of the mitigation option was too high compared the benefits associated within each option. No mitigation option was progressed.

2.7 Public access of flood results

All of the flood results developed as part of the KBR Banana Shire Flood Study is available through **https://planmap.banana.qld.gov.au/connect/analyst/mobile/#/main?mapcfg=%2FAnalyst%2FNamedProjects%2FFlood%20Models** with council cadastral boundary. This enables all residents to understand their flood risk. Each AEP flood level modelled is outlined to correspond which different gauge measurements which is provided through Banana Shire Flood Model Maps platform. The platform is illustrated in Figure 2.4. Part of this mapping platform the failure impact zones associated with Callide Dam, Kroombit Dam and Moura Offstream Storage are documented.

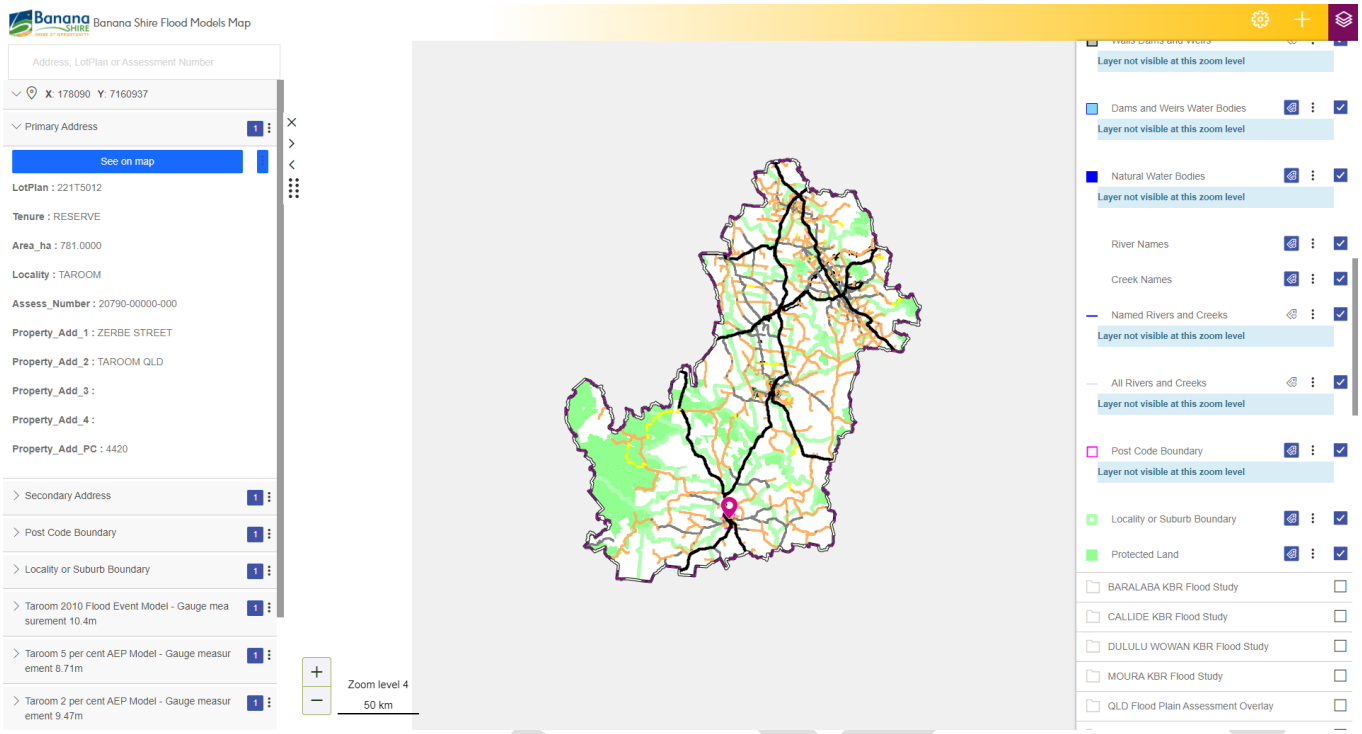


Figure 2.4 Banana Shire Flood Models Maps

2.8 Banana and Wowan Townships Flood Study Update

Alluvium Consulting Australia was engaged by BSC to develop a flood assessment for the townships of Banana and Wowan for flash flooding. This flood study concentrated on the local flood impacts instead of the regional flood impacts which were assessed in the KBR 2017 flood study.

The hydrologic modelling undertaken as part of this project adopted the ARR 2019 methodology, this included the implementation of 2016 IFDs, pre-burst and new temporal patterns. The hydrologic model for this project was constructed within RORB. Two new hydraulic models were developed as part of the project using new LiDAR information and structure information sourced from TMR and Queensland Rail about their hydraulic structures within each catchment. The climate change has been modelled as part of the project however recently climate change guidance has been amended and there is no clear indication which climate change guidance has been adopted within the study. Key information with the report that is important for flood warning is the vulnerability of access roads and the estimated over floor flooding information included within the report.

Based on the results within the report:

– the Leichhardt Highway in Banana has approximately a 5% AEP immunity,
– the Dawson highway in Banana in an eastern direction has approximately a 5% AEP immunity,
– the Dawson highway in Banana in a western direction has approximately a 50% AEP immunity,
– the Leichhardt Highway in Wowan in a northern direction has approximately a 5% AEP immunity,
– the Leichhardt Highway in Wowan in a southern direction has approximately a 10% AEP immunity,
– the Leichhardt Highway in Wowan in town and in a western direction has approximately a 10% AEP immunity,

The results for the over floor flooding within Banana and Wowan show a significant more properties impacted than those noted within the KBR report. In the report it is noted that over 56 structures are impacted in Banana in a 1% AEP event with 94 structures impacted in a 1% AEP in Wowan. Both reports did not survey floor levels but used aerial imagery to make assumptions about floor levels of properties. At the time of the review this report was only draft and had not incorporated the new LiDAR that was flown after the 2022 floods. Part of the new LiDAR information, an algorithm has been used to estimate floor levels of buildings. This report will be updated based on this information.

2.9 Current standards

The Flood Warning Infrastructure Standard (Bureau of Meteorology, 2019) identifies the specific performance requirements for infrastructure, sensing, collecting and communicating data for flood forecasting and warning purposes.

QRA developed a document to assist local governments to understand the recommended minimum requirements for the supply, installation, operation and maintenance of alternative flood warning infrastructure (rain and level gauges). This guideline is not mandatory however, the minimum requirements set out in the guideline have been informed by a technical review which involved a detailed assessment of alternative flood warning infrastructure against the Bureau's Flood Warning Infrastructure Standard 2019. All gauges within BSC meets the required guidance within both documents.

2.10 Spatial Information

2.10.1 Data provide by BSC

Banana Shire council provided the following geographical information:

- KBR Flood Study flood extents
- Flood extents for the 2010 / 2011 flood event
- Evacuation locations
- Cadastre
- Sunwater failure impact zones
- Rainfall and river gauge locations
- Places of shelter locations
- Critical infrastructure location
- KBR Flood Study report
- Alluvium Flood Study

2.10.2 Terrain

Terrain information for the BSC was extracted from the ELVIS website. Terrain information for the LGA can be split into the following captured dates:

- Part of the Inlands Towns Stage 2 2011 project, LiDAR was captured of Baralaba, Taroom, Theordore, Biloela and Thangool between May 2011 and November 2012.
- Part of the Inlands Towns Stage 4 2012 project, LiDAR was captured of Moura and Biloela between June 2012 and September 2012.
- Part of the Fugro ROAMES Power Network Survey LiDAR was captured of Moura in 2013 and 2018.

2.10.3 Imagery

Flood imagery is available from Queensland Globe for the 2010 / 2011 floods that impacted Theodore, Moura, Taroom and Baralaba. None of the other flood events have historical imagery that is included within the Queensland Globe dataset. The flood imagery was used in the KBR study calibration as there was limited available information to calibrate the hydraulic models.

2.11 Local government area

The Banana Shire council area spans 28,610 km^2 with a population of 14,513 spread throughout the LGA. The largest community within the LGA is Biloela with a population of 7,038, it also where the Callide Power Station, Callide Coal Mine and Teys Bros Meatworks are located. Moura is the second largest town within the LGA with a population of 1,993 and is the home of Dawson Coal Mine and the second largest grain depot in Queensland. The

Queensland Cotton processing gin and Queensland Nitrates ammonium manufacturing plant are located adjacent to Moura.

The third largest town is Taroom with a population of 885 which main industry is the rural sector. Thangool has a population of 685 while Theodore has a population of 451 with the main industry being cotton growing, cereal and fodder production and saw milling. Baralaba has a population of 324 with Banana, Dululu, Goovigen, Jambin, Wowan and Cracow the last new significant townships within the LGA.

2.11.1 Key infrastructure

Key infrastructure within the LGA is outlined below:

- Aerodromes
  - Thangool
  - Taroom
  - Moura
  - Theodore
  - Baralaba
  - Taroom landing strip
- Water treatment plants
  - Moura
  - Biloela
  - Theodore
  - Baralaba
  - Taroom
- Sewerage treatment plants
  - Biloela
  - Moura
  - Theodore
  - Taroom
- Art Gallery
  - Biloela
- Libraries
  - Biloela
  - Moura
  - Theodore
  - Taroom
- Community centres / halls
  - Moura
  - Theodore
  - Taroom
  - Baralaba
  - Wowan
- Public swimming pools
  - Biloela
  - Moura
  - Taroom
- Schools
  - Banana State School
  - Baralaba P-10 State School
  - Biloela State School
  - Biloela State High School
  - Redeemer P-12 School
  - St Joseph's Primary School
  - Goovigen State School
  - Jambin State School
  - Moura State School
  - Moura State High School
  - Taroom P-10 State School
  - Thangool State School
  - Theodore P-10 State School
  - Wowan State School
  - Mount Murchison State School
  - Prospect Creek State School

3. Historical flooding

The following information was reviewed to develop an understanding of how floods impact the LGA:

– The Bureau Queensland Flood Summary
– TROVE historical newspaper articles
– Tropical cyclone Oswald flood report (Bureau of Meterology, 2013)
– Tropical cyclone Marcia flood report (Bureau of Meteorology, 2015)
– 2015 Callide Creek Flood Review (Inspector-General Emergency Management, 2015)
– Flood summary for the Dawson River at Taroom (Bureau of Meteorology, 2011)
– Flood summary for the Dawson River at Theodore (Bureau of Meteorology, 2011)

Historical flood events have been represented in Figure 3.1. Additional information regarding some of the more important flood events is outlined the below sections. Historical peak flood levels at key locations within the catchment are outlined in Table 3.1.

Table 3.1 Historical peak flood levels

Flood Event	Taroom	Theodore	Moura	Baralaba
Jan-18	6.71	-	-	-
Feb-54	8.15	13.64	-	15.52
Jan/Feb 1978	4.08	11.27	10.46	11.85
May-83	7.46	13.24	12.09	13.6
Jan-91	6.24	7.98	6.6	9.45
Jan-08	6.07	-	8	-
Feb/Mar 2010	7.26	13.45	12.23	12.5
Dec 10/ Jan 11	10.43	14.7	12.66	15.25
Feb/Mar 2012	6.35	9.78	8.52	-
Jan/Feb 2013	5.32	9.03	9.3	-

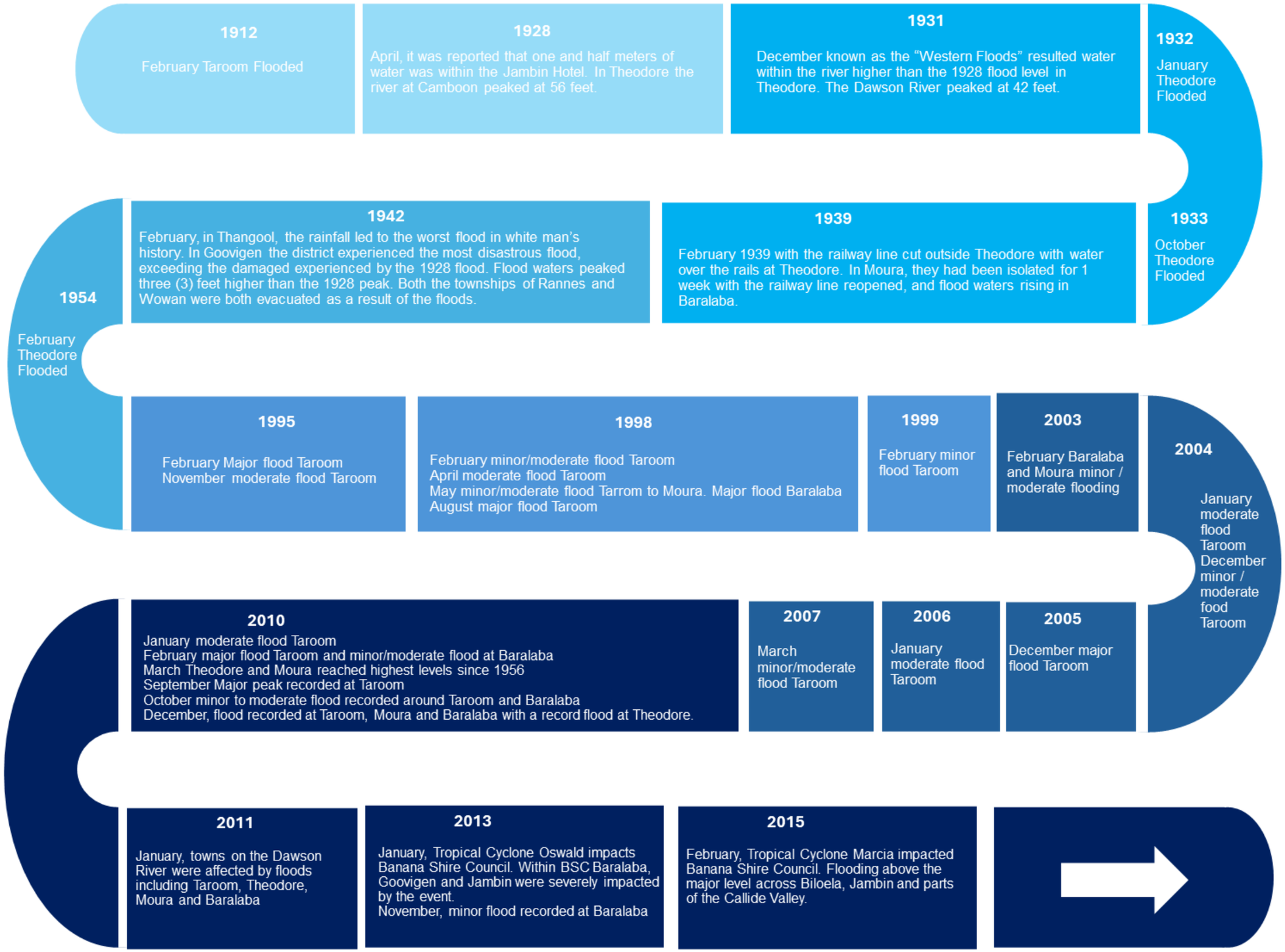


Figure 3.1 History of Flooding within Banana Shire Council

3.1 Big Flood of 1928

There is limited information on the big flood of 1928 that impacted the Callide, Dawson and Dee Valleys. The flood was caused by a Tropical Cyclone that developed over Mackay in late April 1928 and washed houses away with nine people drowning. The floods resulted in extensive crop losses. Figure 3.2 illustrates the flood experienced in Goovigen in the 1928. It was reported that one and half meters of water was within the Jambin Hotel and that in Jambin and Rannes there was cattle carcases six to seven meters up the trees (Inspector-General Emergency Management, 2015). Based on a news article in the Western Champions from the 5 May 1928 (The Western Champions, 2024) communications were cut within the Dawson Valley due to the flood event. Wowan experienced 15 inches of rain on the Saturday and the state coal mine in Baralaba collapsed. In Dululu significant damage was noted to result from this event. In Theodore the river at Camboon was 34 feet and rising 5 inches an hour, it was expected to peak at 56 feet. Based on the information presented within the article extensive damage occurred though out the LGA of BSC with loss of houses and agricultural / pastural land.

Figure 3.2 Rescuing stock in 1928 flood in Goovigen (State Library of Queensland, 2023)

3.2 Flood of 1931

In December 1931 what was known as the “Western Floods” resulted in three quarters of the irrigatable farms under water with the river higher than the 1928 flood level in Theodore (TROVE, 2024). The township of Theordore was an island isolated with floodwaters surrounding the township. The Dawson River peaked at 42 feet at Theodore and was flowing away from town given the downstream catchment was not in flood also which was not the case in the 1928 flood.

3.3 Flood of 1939

There was localised flooding noted within BSC during February 1939 with the railway line cut outside Theodore with water over the rails at Theodore. In Moura, they had been isolated for 1 week with the railway line reopened, and flood waters rising in Baralaba.

3.4 Flood of 1942

Heavy rains in the Callide Valley filled up waterholes, dam and flooded low-lying areas in Biloela. In Thangool, the rainfall led to the worst flood in white man's history. The school which is located on elevated land had 3 feet of water under the school during the event (Morning Bulletin Rockhampton, 2024). Roads and bridges were damaged and for nearly a fortnight no communication via telephones. In Goovigen the district experienced the most disastrous flood, exceeding the damaged experienced by the 1928 flood. On Sunday 8 February 1942, 385 points was registered, on Tuesday (10 February) a further 349 points were registered and a further 819 was registered on the Wednesday. Over a four (4) day period 1553 points was recorded.

Water started to breakout from the floodplain and came within 50 yards of township. Residents who were within the town during the 1928 flood events reported that the 1942 event was three (3) feet higher than the 1928 peak. Both the townships of Rannes and Wowan were both evacuated as a result of the floods. Some of the damage is illustrated in Figure 3.3 which were taken by Harold and Dulcie which lived in Rannes during the flood.

Figure 3.3 1942 Rannes Flood - Rannes Hotel (Facebook, 2024)

3.5 Floods of 2010 / 2011

The flood events of 2010 to 2011 lead to several floods impacting the BSC LGA throughout a 12 month period. The first floods impacted Taroom in January 2010 with a moderate flood recorded. By February of the same year Taroom was impacted by a major flood with Baralaba impacted by moderate to major flooding. In March 2010, Theodore and Moura reached their highest levels since the 1956 event. September 2010, Taroom was impacted again with a major flood recorded of 6.03 m on the gauge in the river.

The floods of 2010 were not over with Taroom and Baralaba again impacted by moderate flooding in October 2010. In December 2010, Taroom, Moura and Moura were again impacted by floods with Theordore recording a record flood level during this event. The final flood event of this season occurred in January 2011 where towns on the Dawson River were affected by floods including Taroom, Theordore, Moura and Baralaba.

During this flood season, aerial imagery was captured of the flood extents within the townships that were affected. These flood extents are illustrated in Figure 3.4, Figure 3.5, Figure 3.6 and Figure 3.7 for Taroom, Theodore, Moura and Baralaba.

Figure 3.4 Taroom 2010/2011 flood imagery (QLDglobe, 2024)

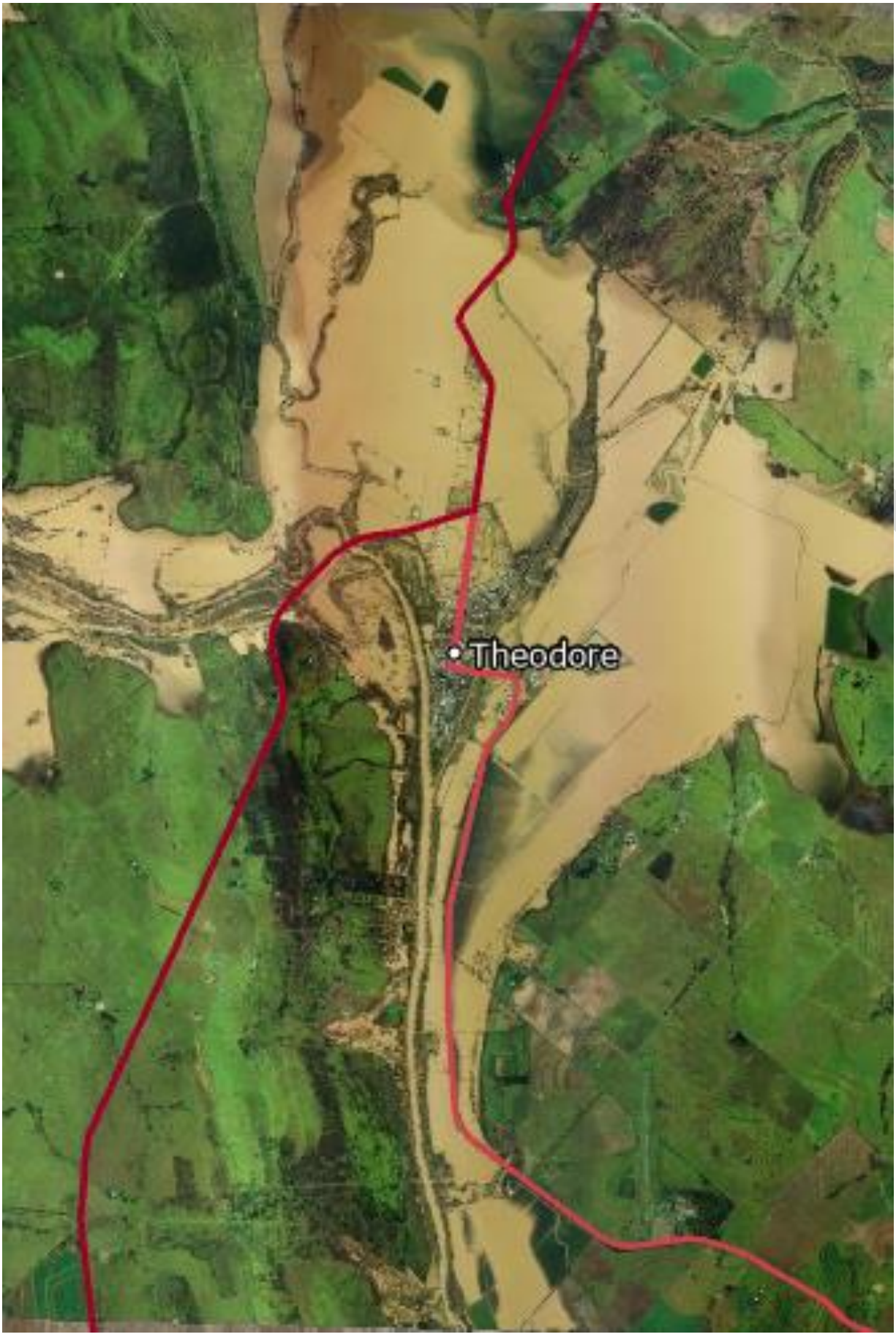


Figure 3.5 Theodore 2010/2011 flood imagery (QLDglobe, 2

Figure 3.6 Moura 2010/2011 flood imagery (QLDglobe, 2024)

Figure 3.7 Baralaba 2010/2011 flood imagery (QLDglobe, 2024)

3.6 Tropical Cyclone Oswald - 2013

Severe tropical cyclone Oswald occurred between 17 January 2013 to the 29 January 2013. The cyclone tracking path is illustrated in Figure 3.8. The cyclone developed between the Northern Territory and Cape York crossing in Queensland near Kowanyama as a category 1 intensity. The system weakened to a tropical low, with system producing sever weather over all of eastern Queensland. The tropical low stalled west of Rockhampton for two days on January 25th and 26th impacting the BSC region. Over 1000 mm was recorded in the 48 hours near BSC. Within BSC Baralaba, Goovigen and Jambin were severely impacted by the event.

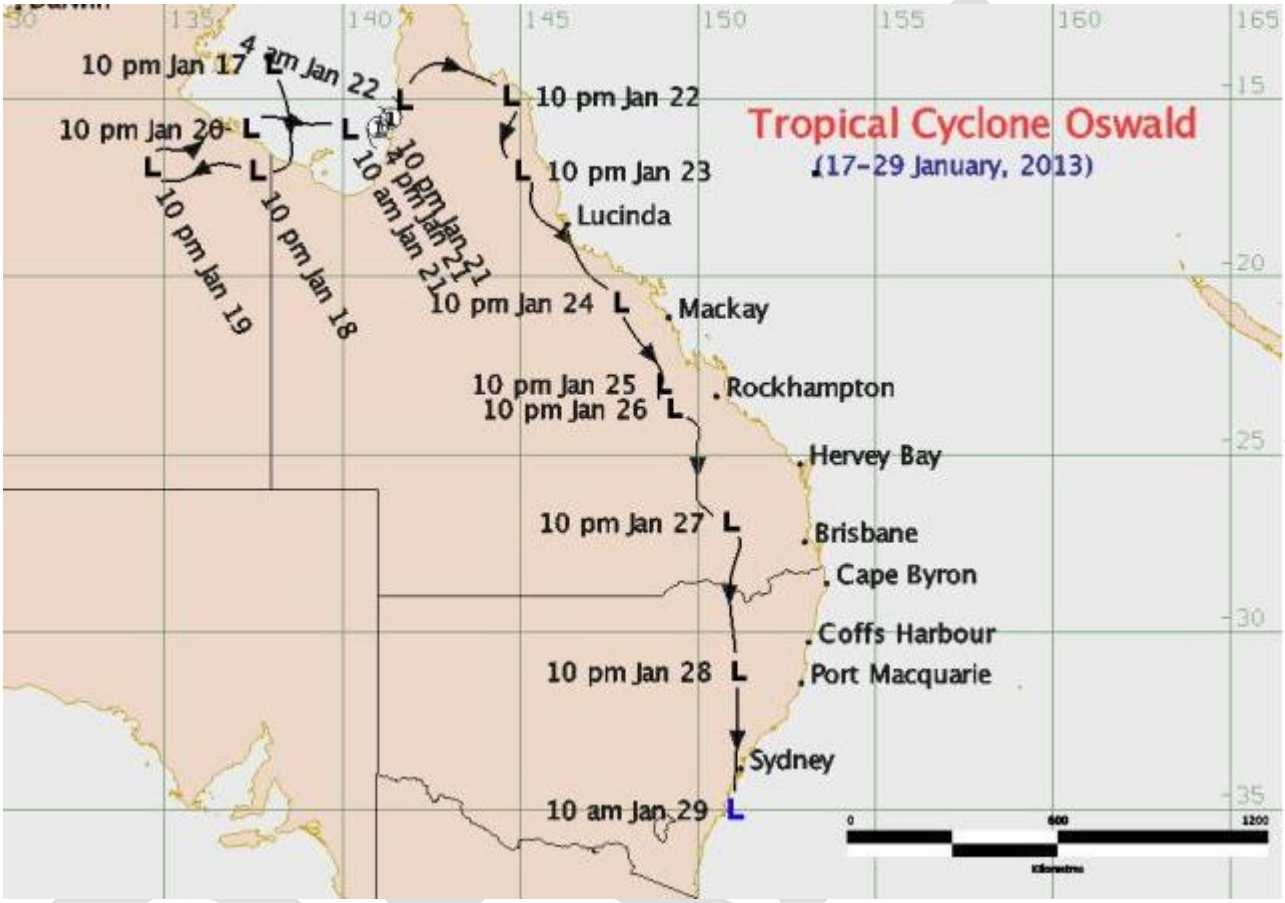


Figure 3.8 Cyclone Osland tracking path

3.7 Cyclone Marcia - 2015

Severe tropical cyclone Marcia occurred between 15 February 2015 to the 21 February 2015. The cyclone tracking path is illustrated in Figure 3.9. The cyclone developed northwest of Yeppoon cross the coast as a category 5 intensity causing significant damage in Yeppoon and Rockhampton. The system weakened as it processes overland but was a fast-moving system. The system crosses land at 8am on 20 February 2015 and impacted Biloela in the early hours of that same evening. Up to 300 mm of rainfall was recorded in 6-8 hours during the evening and evening of the 20 February 2015. Flooding above the major level occurred in the Don and Dee Rivers and Callide Creek in the Fitzroy River Catchment. Within BSC Biloela, Jambin and parts of the Callide Valley were severely impacted by the event.

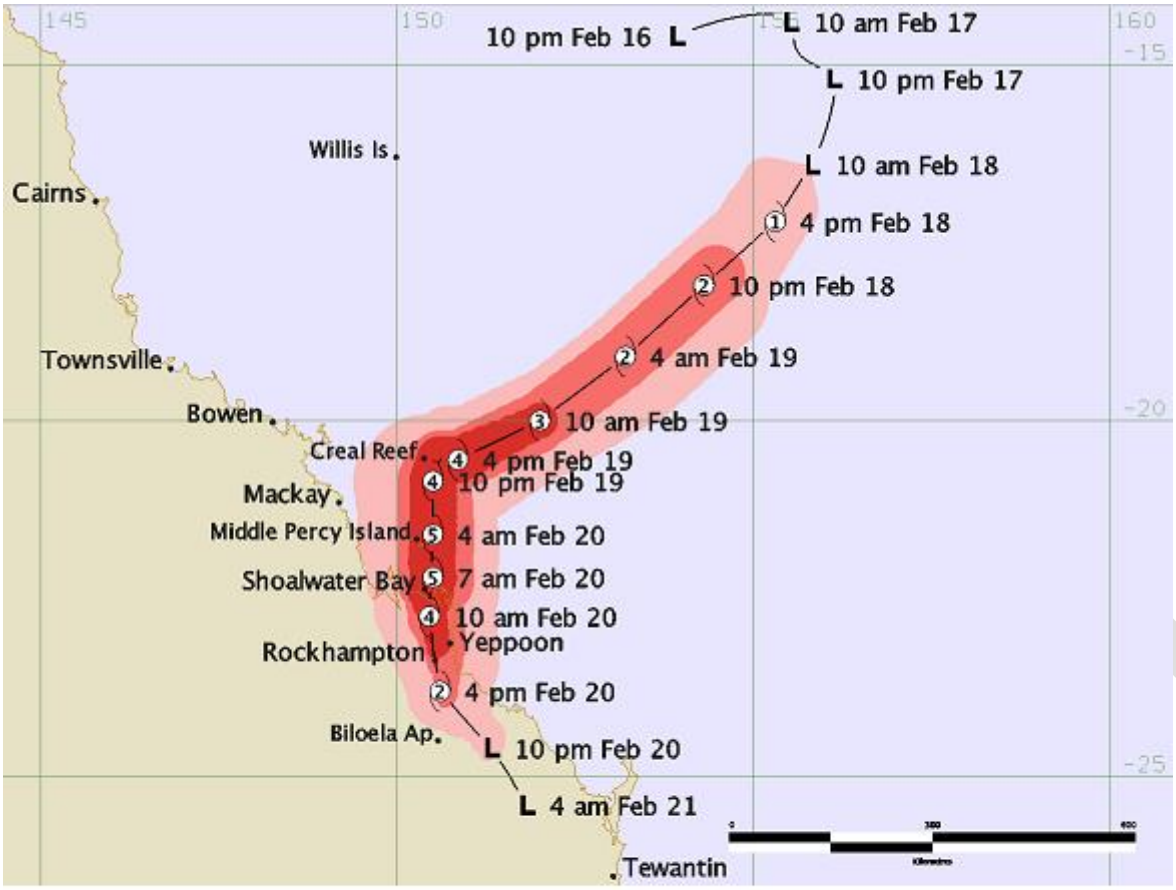


Figure 3.9 Cyclone Marcia tracking path

3.8 Other floods

There is historical information that outlines the following locations within the BSC LGA have been impacted by floods:

- February 1912, the river at Taroom was in flood for two days
- January 1932, floods at Theodore inundated the cotton plantations
- October 1933, floods in Theodore peaked at 34 feet and 6 inches on the gauge
- February 1954, floods impacted Theodore
- February 1995, major flood at Taroom.
- November 1995, moderate flooding around Taroom and minor / moderate flooding downstream.
- February 1998, minor to moderate flooding around Taroom.
- April 1998, moderate flooding at Taroom.
- May 1998, minor to moderate flood was experienced between Taroom to Moura. Major flooding at Baralaba.
- August 1998, major flood at Taroom peaked at 7.4 m.
- January 1999, Moderate flood recorded at Taroom.
- February 1999, minor flood downstream of Taroom.
- February 2003, heavy rains resulted in rapid river rises in Baralaba and Moura with minor / moderate flooding recorded in the Dawson River downstream of Baralaba.
- January 2004, moderate flood in Taroom recorded.

– December 2004, minor to moderate flood recorded around Taroom.
– December 2005, major flood recorded at Taroom.
– January 2006, moderate flood recorded at Taroom.
– March 2007, minor to moderate flood recorded around Taroom.
– November 2013, minor flood recorded at Baralaba

4. Critical infrastructure review

The following section outlines the current flood risk associated with key infrastructure within the LGA. This included investigating the flood risk associated with evacuation centres, places of shelter key infrastructure within each township and transport routes. This assessment relies on the KBR Flood Study information which was developed in 2015.

4.1 Flood risk associate with evacuation locations

The eleven (11) place of refuge (shelter) and three (3) evacuation centres locations were investigated in terms of the current flood information for each location. The flood risk associated with each location is outlined in Table 4.1. This flood risk has been established based on model results from the 2017 KBR flood study and the 2023 Alluvium Flood Study. It is noted that two of the three evacuation centres are located outside the PMF extent within the Biloela Evacuation centre being impacted in a 0.05% AEP event which is a 1 in 2000 AEP event.

Both the Jambin and Theodore places of refuge should not be used during a flood events given the low immunity associated with each structure. The structural stability of the each building needs to be understood and it should be noted in Theodore that although the physical structure has a higher immunity, it gets cutoff in frequent flood events.

Table 4.1 Flood Risk – evacuation locations

Location	Type of Structure	Flood Risk
Biloela Civic Centre	Evacuation Centres	Outside 0.05% AEP extent
Moura Kianga Hall	Evacuation Centres	Outside PMF extent
Taroom Showgrounds	Evacuation Centres	Outside PMF extent
Banana Sutherland Hall	Place of Refuge (shelter)	To be checked once Alluvium provides flood results
Baralaba Hall	Place of Refuge (shelter)	Between a 1% AEP and PMF immunity
Cracow Community Hall	Place of Refuge (shelter)	No flood information available for this location
Dululu Community Hall	Place of Refuge (shelter)	Between a 5% AEP and 2% immunity
Goovigen Hall	Place of Refuge (shelter)	Outside the Callide Creek PMF flood extent
Jambin State School	Place of Refuge (shelter)	Outside 0.05% AEP extent
Jambin Hall	Place of Refuge (shelter)	Between a 10% AEP and 5% immunity. Isolated in a 10% AEP event
Thangool Recreation Reserve	Place of Refuge (shelter)	More than a 0.05% AEP immunity.
Theodore Aerodrome	Place of Refuge (shelter)	Outside PMF extent
Theodore RSL Hall	Place of Refuge (shelter)	Between a 5% AEP and 2% immunity. Isolated in a 5% AEP event
Wowan Multi-Purpose Centre	Place of Refuge (shelter)	Between a 0.05% AEP and PMF immunity.

4.2 Flood risk of key assets

There are many key assets within the BSC LGA, that are of important to the community such as schools, water treatment facility, sewerage treatment facilities, aerodromes, community facilities, hospitals, ambulance stations / fire stations etc. All of these assets have been mapped and the associated flood risk has been established based on the 2017 KBR flood study and the 2023 Alluvium Flood Study. Maps for each township is illustrated in Figure 4.1 to Figure 4.9 showing the location of assets in relation to mapped flood results.

Table 4.2 Flood Risk – key assets

Town	Name	Type of Structure	Flood Risk
Banana	Banana No 1 Rural Fire Brigade	Fire Station	No flood information available for this location
	Banana State School	School	No flood information available for this location
Baralaba	Baralaba Aerodrome	Aerodrome	Outside PMF extent
	Baralaba Water treatment plant	Water treatment plant	Between a 1% AEP with climate change and PMF immunity.
	Baralaba Community centre / hall	Community centre / hall	Outside PMF extent
	Baralaba Ambulance Station	Ambulance Station	Outside PMF extent
	Baralaba Fire Station	Fire Station	Outside PMF extent
	Baralaba Hospital	Hospitals	Between a 1% AEP with climate change and PMF immunity
	Baralaba P-10 State School	Schools	Between a 1% AEP with climate change and PMF immunity.
	Baralaba Police Station	Police Station	Outside PMF extent
	Baralaba SES Facility	State Emergency Services Facility	Outside PMF extent
Biloela	Biloela Water treatment plant	Water treatment plant	Outside PMF extent
	Biloela Sewerage Treatment plant	Sewerage Treatment plant	Between a 0.2% AEP and 0.05% immunity
	Biloela Art Gallery	Art Gallery	Between a 5% AEP and 2% immunity
	Biloela Library	Library	Outside PMF extent
	Biloela Public swimming pool	Public swimming pool	Outside 0.05% extent
	Biloela Ambulance Station	Ambulance Station	More than a 0.05% AEP immunity.
	Biloela Fire Station	Fire Station	More than a 0.05% AEP immunity.
	Biloela Hospital	Hospital	More than a 0.05% AEP immunity.
	Biloela Police Station	Police Station	More than a 0.05% AEP immunity.
	Biloela SES Facility	State Emergency Services Facility	More than a 0.05% AEP immunity.
	Biloela State High School	School	More than a 0.05% AEP immunity.
	Biloela State School	School	More than a 0.05% AEP immunity.
	Redeemer P-12 School	School	Between a 0.2% AEP and 0.05% immunity
	St Joseph's Primary School	School	Outside PMF extent
Cracow	Cracow Rural Fire Brigade	Fire Station	No flood information available for this location
Dululu	Dululu Rural Fire Brigade	Fire Station	Between a 5% AEP and 2% immunity
Goovigen	Goovigen Police Station	Police Station	More than a 0.05% AEP immunity.
	Goovigen Rural Fire Brigade	Fire Station	More than a 0.05% AEP immunity.
	Goovigen State School	Schools	More than a 0.05% AEP immunity.
Jambin	Jambin State School	Schools	More than a 0.05% AEP immunity.

Town	Name	Type of Structure	Flood Risk
Mount Murchison	Mount Murchison State School	Schools	Outside PMF extent
Moura	Moura Aerodrome	Aerodrome	Outside PMF extent
	Moura Water treatment plant	Water treatment plant	Outside PMF extent
	Moura Sewerage Treatment plant	Sewerage Treatment plant	Outside PMF extent
	Moura Library	Library	Outside PMF extent
	Moura Community centre / hall	Community centre / hall	Outside PMF extent
	Moura Public swimming pool	Public swimming pool	Outside PMF extent
	Moura Ambulance Station	Ambulance Station	Outside PMF extent
	Moura Fire Station	Fire Station	Outside PMF extent
	Moura Hospital	Hospitals	Outside PMF extent
	Moura Police Station	Police Station	Outside PMF extent
	Moura SES Facility	State Emergency Services Facility	Outside PMF extent
	Moura State High School	School	Outside PMF extent
	Moura State School	School	Outside PMF extent
Prospect	Prospect Creek State School	School	No flood information available for this location
Taroom	Taroom Aerodrome	Aerodrome	No flood information available for this location
	Taroom Water treatment plant	Water treatment plant	Outside PMF extent
	Taroom Sewerage Treatment plant	Sewerage Treatment plant	Outside PMF extent
	Taroom Library	Library	Between a 1% AEP with climate change and PMF immunity.
	Taroom Community centre / hall	Community centre / hall	Between a 1% AEP with climate change and PMF immunity.
	Taroom Public swimming pool	Public swimming pool	Outside PMF extent
	Taroom Ambulance Station	Ambulance Station	Outside PMF extent
	Taroom Fire Station	Fire Station	Outside PMF extent
	Taroom Hospital	Hospital	Outside PMF extent
	Taroom P-10 State School	School	Outside PMF extent
	Taroom Police Station	Police Station	Outside PMF extent
Thangool	Thangool Aerodromes	Aerodromes	Between a 2% AEP and 1% immunity.
	Thangool Fire Station	Fire Station	More than a 0.05% AEP immunity.
	Thangool State School	Schools	Between a 5% AEP and 2% immunity.
Theodore	Theodore Aerodrome	Aerodrome	Outside PMF extent
	Theodore Water treatment plant	Water treatment plant	Between a 10% AEP and 5% immunity
	Theodore Sewerage Treatment plant	Sewerage Treatment plant	Between a 5% AEP and 2% immunity. Isolated in a 5% AEP event

Town	Name	Type of Structure	Flood Risk
	Theodore Library	Library	Between a 5% AEP and 2% immunity. Isolated in a 5% AEP event
	Theodore Community centres / hall	Community centres / hall	Between a 5% AEP and 2% immunity. Isolated in a 5% AEP event
	Theodore Ambulance Station	Ambulance Station	Between a 5% AEP and 2% immunity. Isolated in a 5% AEP event
	Theodore Fire Station	Fire Station	Between a 5% AEP and 2% immunity. Isolated in a 5% AEP event
	Theodore P-10 State School	School	Between a 5% AEP and 2% immunity. Isolated in a 5% AEP event
	Theodore Police Station	Police Station	Between a 5% AEP and 2% immunity. Isolated in a 5% AEP event
	Theodore SES Facility	State Emergency Services Facility	Between a 5% AEP and 2% immunity. Isolated in a 5% AEP event
Wowan	Wowan Community centre / hall	Community centre / hall	Between a 1% AEP and 1% with climate change immunity
	Wowan Ambulance Station	Ambulance Station	Between a 0.05% AEP and PMF immunity
	Wowan Police Station	Police Station	Between a 0.05% AEP and PMF immunity
	Wowan Rural Fire Brigade	Fire Station	Between a 0.05% AEP and PMF immunity
	Wowan SES Facility	State Emergency Services Facility	Between a 1% AEP and 1% with climate change immunity
	Wowan State School	School	Between a 5% AEP and 2% immunity

As part of the KBR Floodplain Management Plan a Critical Infrastructure assessment was undertake and information this assessment is reproduced in Table 4.3 which it sorted in terms of each township. Within the KBR information the water level at each critical infrastructure location is reported in terms of design flood levels.

Table 4.3 KBR Critical Infrastructure information

Town	Classification	Type	Name	Historic Flood Level (mAHD)				Design Event (AEP) Flood Level (mAHD)			
				2010	2013	2015	10%	5%	2%	1%	1%CC
Banana	Place of Refuge	Public buildings, spaces	Banana Sutherland Hall								
Baralaba	Place of Refuge	Public buildings, spaces	Baralaba Hall								
	Vulnerable	School	Baralaba State School	87.49						87.41	87.92
	Critical Infrastructure	Aged Care	Community Aged Care Association								
	Critical Infrastructure	Emergency Services	Ambulance								
	Critical Infrastructure	Emergency Services	Fire Station								
	Critical Infrastructure	Emergency Services	Police								
	Critical Infrastructure	Hospital	Baralaba Hospital								
	Critical Infrastructure	Water & sewerage	Water Treatment Plant								
Biloela	None	Administration	Council Shire Chambers			176.32			176	176.31	176.69
	None	Public buildings, spaces	Biloela Shopping world								
	None	Public buildings, spaces	IGA SUPA Biloela								
	None	Public buildings, spaces	Library								
	Evacuation Centres	Public buildings, spaces	Biloela Civic Centre								
	Vulnerable	Early Education	Biloela Community Kindergarten								
	Critical Infrastructure	Early Education	C&K Biloela Kindergarten								

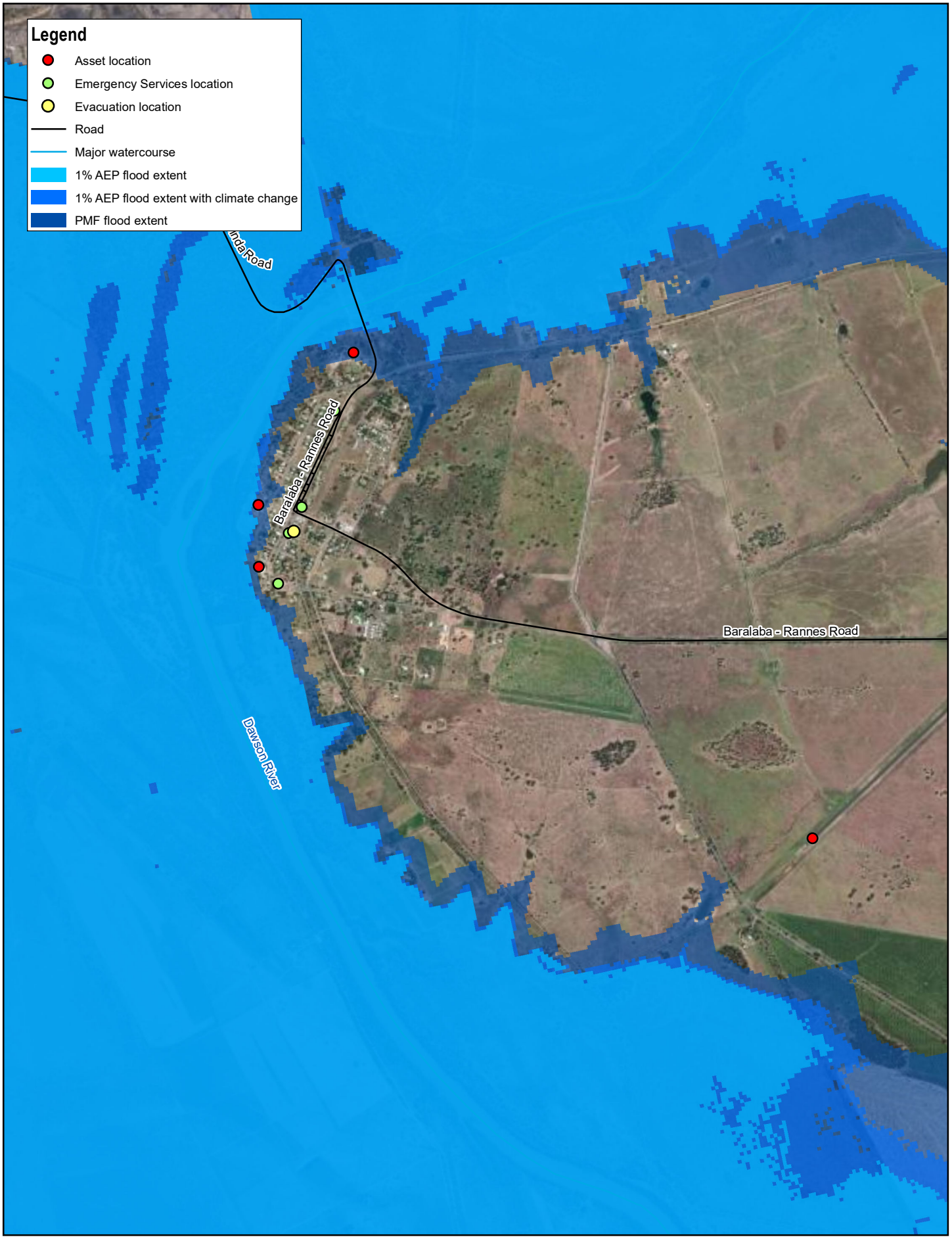
	Vulnerable	Early education	Early Learning Centre & Child Care								
	Vulnerable	School	Redeemer Lutheran College								
	Vulnerable	School	Prospect Creek State School								
	Vulnerable	School	Biloela State High School								
	Vulnerable	School	Biloela State School								
	Vulnerable	School	St Joseph's Catholic Primary School								
	Critical Infrastructure	Aged Care	Wahroonga Retirement Village		175	175.46			175.2	175.41	175.94
	Critical Infrastructure	Aged Care	Reserve for Health								
	Critical Infrastructure	Aged Care	Qld Country Women's Assoc.								
	Critical Infrastructure	Aged Care	Queensland Housing Commission								
	Critical Infrastructure	Emergency Services	Ambulance								
	Critical Infrastructure	Emergency Services	Fire Station								
	Critical Infrastructure	Emergency Services	Police								
	Critical Infrastructure	Energy	Callide Power Station								
	Critical Infrastructure	Energy	Retail fuel outlet								
	Critical Infrastructure	Energy	Retail fuel outlet								
	Critical Infrastructure	Energy	Retail fuel outlet								
	Critical Infrastructure	Energy	Retail fuel outlet								
	Critical Infrastructure	Energy	Retail fuel outlet								

	Critical Infrastructure	Energy	Retail fuel outlet								
	Critical Infrastructure	Health Centre	Biloela Community Health Service								
	Critical Infrastructure	Hospital	Biloela Hospital								
	Critical Infrastructure	Water & sewerage	Sewage Treatment Plant								
	Critical Infrastructure	Water & sewerage	Water Treatment Plant								
Dululu	Place of Refuge	Public buildings, spaces	Dululu Community Hall		127.51	127.58			127.47	127.57	127.79
Goovigen	Place of Refuge	Public buildings, spaces	Goovigen Hall								
	Critical Infrastructure	Emergency Services	Police								
Jambin	Place of Refuge	Public buildings, spaces	Jambin Hotel	133.09	133.58	133.6	132.77	132.87	133.44	133.77	134.1
	Place of Refuge	Public buildings, spaces	Jambin State School								
	Place of Refuge	Public buildings, spaces	Jambin Hall	133.33	133.79	133.81		132.93	133.66	133.98	134.29
	Vulnerable	School	Jambin State School								
Moura	None	Administration	Government Agency (QGAP)								
	None	Public buildings, spaces	Library								
	None	Public buildings, spaces	IGA Moura								
	Evacuation Centres	Public buildings, spaces	Moura Kianga Hall								
	Vulnerable	Early education	C&K Community Kindergarten								
	Vulnerable	School	Moura State High School								
	Vulnerable	School	Moura State School								

	Critical Infrastructure	Aerodromes	Moura Aerodrome								
	Critical Infrastructure	Aged Care	Retirement Village Committee Inc.								
	Critical Infrastructure	Emergency Services	Ambulance								
	Critical Infrastructure	Emergency Services	Fire Station								
	Critical Infrastructure	Emergency Services	Police								
	Critical Infrastructure	Energy	Retail fuel outlet								
	Critical Infrastructure	Energy	Retail fuel outlet								
	Critical Infrastructure	Hospital	Moura Hospital								
	Critical Infrastructure	Water & sewerage	Sewage Treatment Plant								
	Critical Infrastructure	Water & sewerage	Water Treatment Plant								
Taroom	None	Administration	Council Administration Office								
	None	Public buildings, spaces	IGA Taroom								191.76
	None	Public buildings, spaces	Library								
	Evacuation Centres	Public buildings, spaces	Taroom Showgrounds								
	Vulnerable	School	Taroom State School								
	Critical Infrastructure	Aerodromes	Taroom Aerodrome								
	Critical Infrastructure	Aged Care	Leichhardt Villa								
	Critical Infrastructure	Emergency Services	Ambulance								

	Critical Infrastructure	Emergency Services	Police								
	Critical Infrastructure	Energy	Retail fuel outlet	191.45				189.61	190.44	191.06	191.77
	Critical Infrastructure	Energy	Retail fuel outlet								
	Critical Infrastructure	Health Centre	Taroom Health Services								
	Critical Infrastructure	Hospital	Taroom Hospital								
	Critical Infrastructure	Water & sewerage	Water Treatment Plant								
	Critical Infrastructure	Water & sewerage	Sewage Treatment Plant								
Thangool	Vulnerable	School	Thangool Primary School		192.5	193.16		192.46	192.82	193.17	193.45
	Critical Infrastructure	Aerodromes	Thangool Aerodrome			193.28				193.29	193.57
	Critical Infrastructure	Emergency Services	Fire Station								
	Critical Infrastructure	Energy	Retail fuel outlet								
Theodore	None	Public buildings, spaces	Library	142.47					142.16	142.59	143.27
	None	Public buildings, spaces	Supermarket	142.51					142.21	142.61	143.23
	None	Public buildings, spaces	Supermarket	142.42					142.17	142.52	143.17
	Place of Refuge	Public buildings, spaces	Theodore RSL Hall	142.67					142.32	142.76	143.36
	Vulnerable	Early education	Theodore Early Learning Centre	142.82				141.67	142.41	142.93	143.54
	Vulnerable	School	School	142.23					141.7	142.36	143.08
	Vulnerable	School	School	142.22					141.73	142.35	143.06

	Critical Infrastructure	Aerodromes	Theodore Airport								
	Critical Infrastructure	Aged Care	Theodore Council of the Ageing	142.32						142.45	143.17
	Critical Infrastructure	Emergency Services	Ambulance	142.22					141.73	142.35	143.06
	Critical Infrastructure	Emergency Services	Fire Station	142.56					142.25	142.65	143.26
	Critical Infrastructure	Emergency Services	Police	142.56					142.2	142.66	143.29
	Critical Infrastructure	Energy	Retail fuel outlet	142.34					141.96	142.46	143.16
	Critical Infrastructure	Energy	Retail fuel outlet	142.2					141.68	142.33	143.04
	Critical Infrastructure	Hospital	Theodore Hospital	142.2					141.69	142.32	143.04
	Critical Infrastructure	Water & sewerage	Water Treatment Plant	142.74				141.66	142.37	142.84	143.46
Wowan	Place of Refuge	Public buildings, spaces	Wowan Multi Purpose Centre		115.26						115.24
	Vulnerable	School	Wowan State School		115.49				115.49	115.49	115.49
	Critical Infrastructure	Aged Care	Dundee Retirement Units								
	Critical Infrastructure	Emergency Services	Ambulance								
	Critical Infrastructure	Emergency Services	Police								
	Critical Infrastructure	Energy	Retail fuel outlet		114.81				114.82	114.81	114.81



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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Banana Shire Council
Flood Warning Systems

Flood Risk - Assets
Baralaba

Project No. **12625254**
Revision No. **A**
Date **01 Aug 2024**

Figure 4.1

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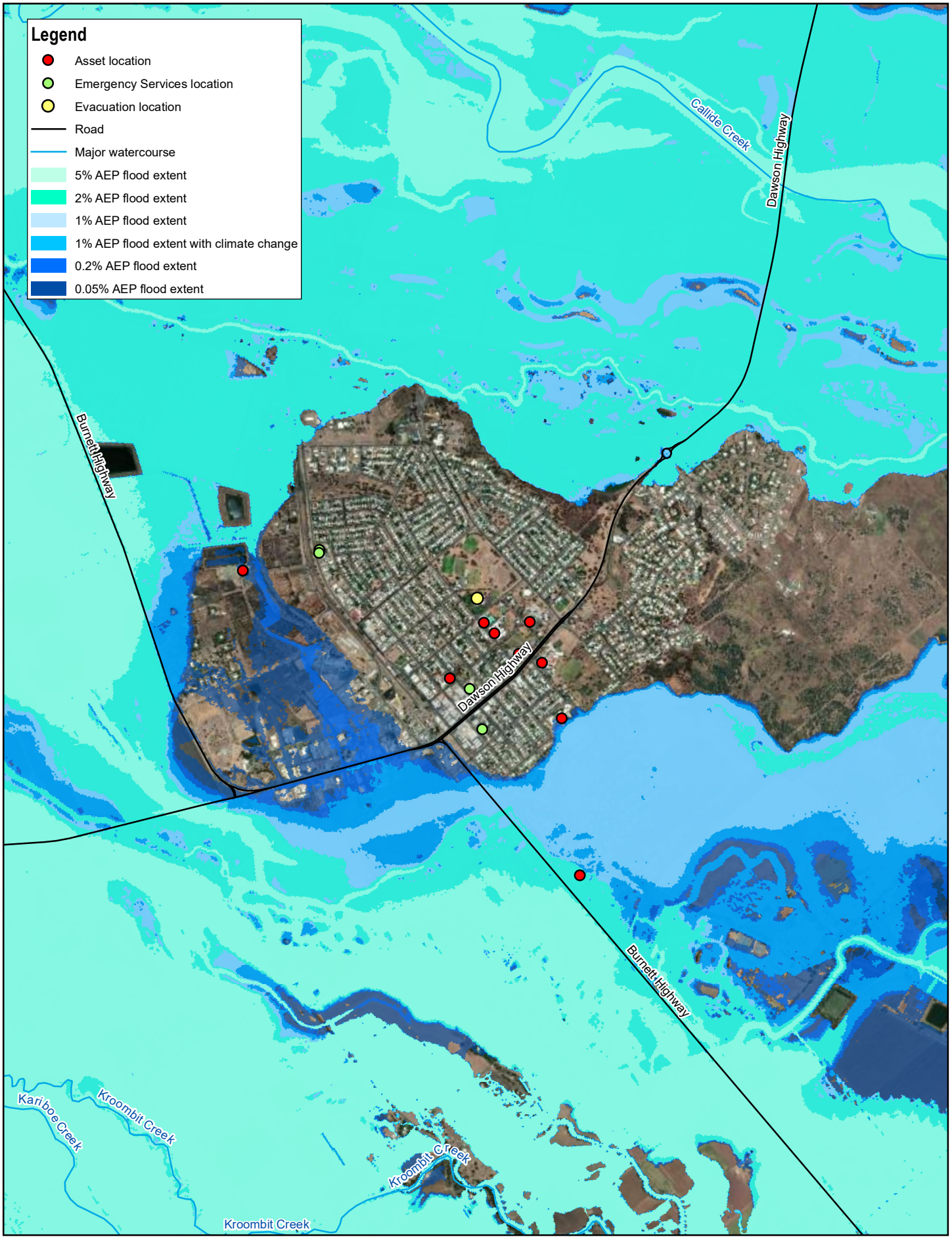

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Kilometers

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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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GHD

Banana Shire Council
Flood Warning Systems

Flood Risk - Assets
Biloela

Project No. **12625254**
Revision No. **A**
Date **01 Aug 2024**

Figure 4.2

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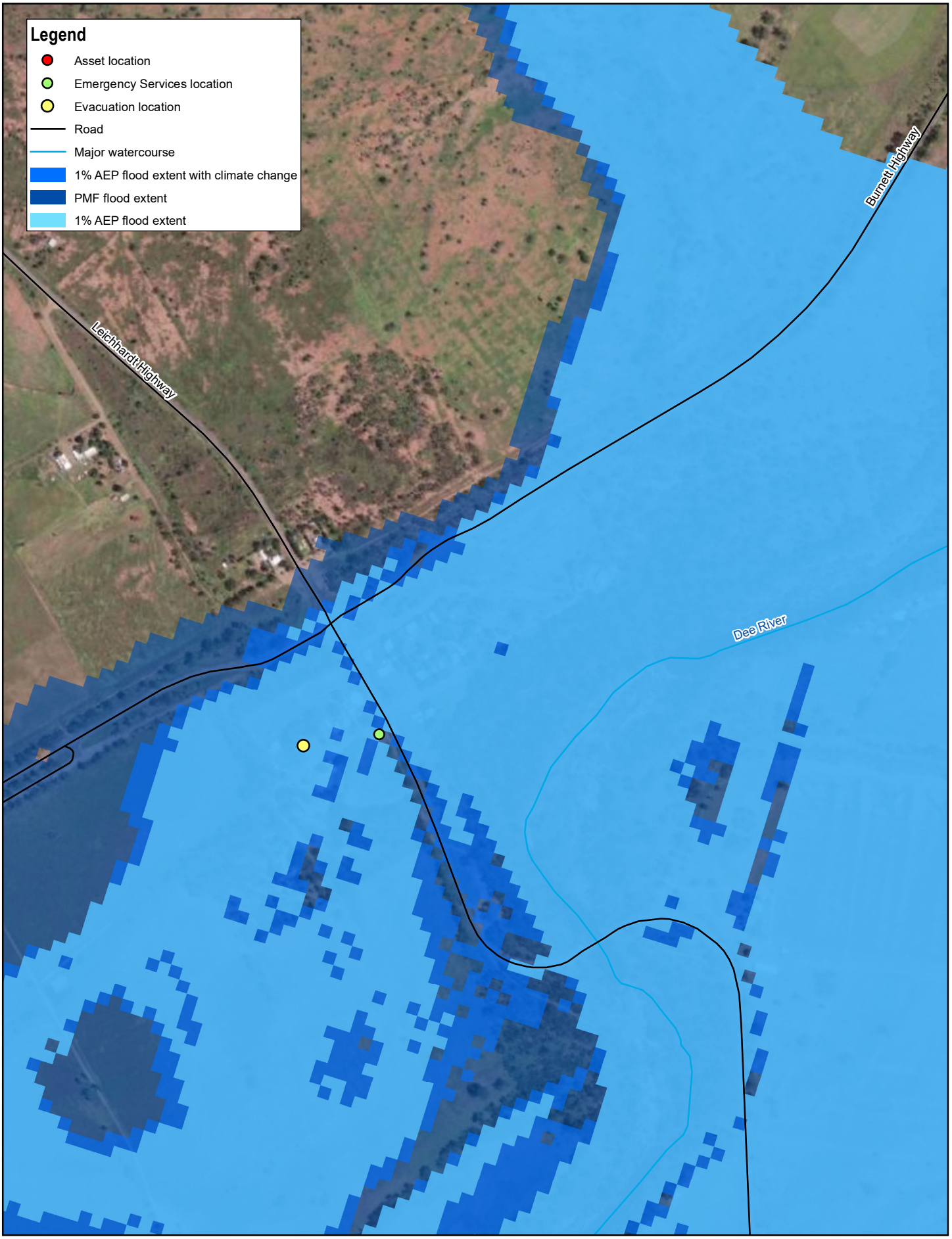

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Kilometers

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 55

N

GHD

Banana Shire Council
Flood Warning Systems

Flood Risk - Assets
Dululu

Project No. **12625254**
Revision No. **A**
Date **01 Aug 2024**

Figure 4.3

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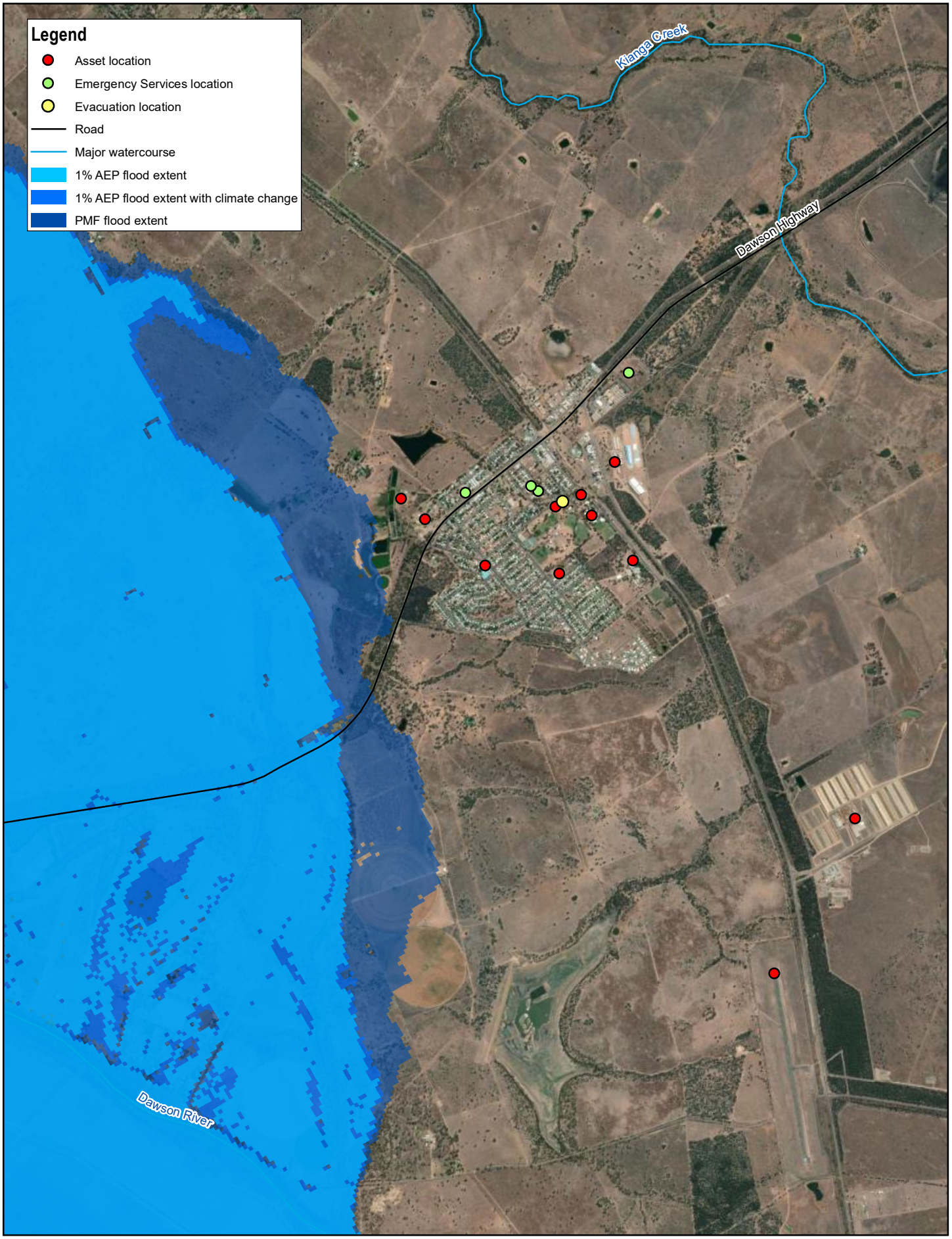

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Banana Shire Council
Flood Warning Systems

Flood Risk - Assets
Moura

Project No. **12625254**
Revision No. **A**
Date **01 Aug 2024**

Figure 4.4

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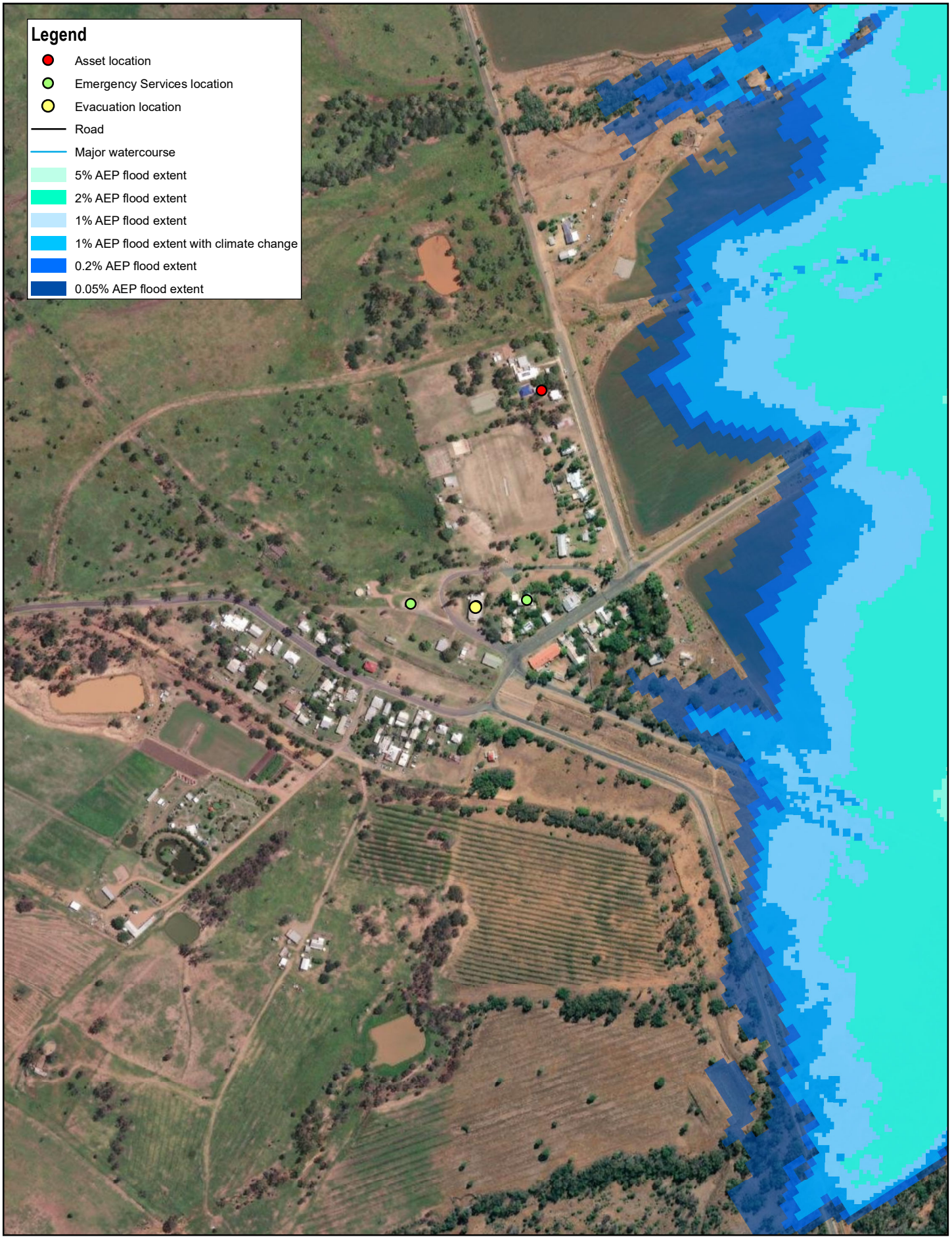

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Banana Shire Council
Flood Warning Systems

Flood Risk - Assets
Goovigen

Project No. **12625254**
Revision No. **A**
Date **01 Aug 2024**

Figure 4.5

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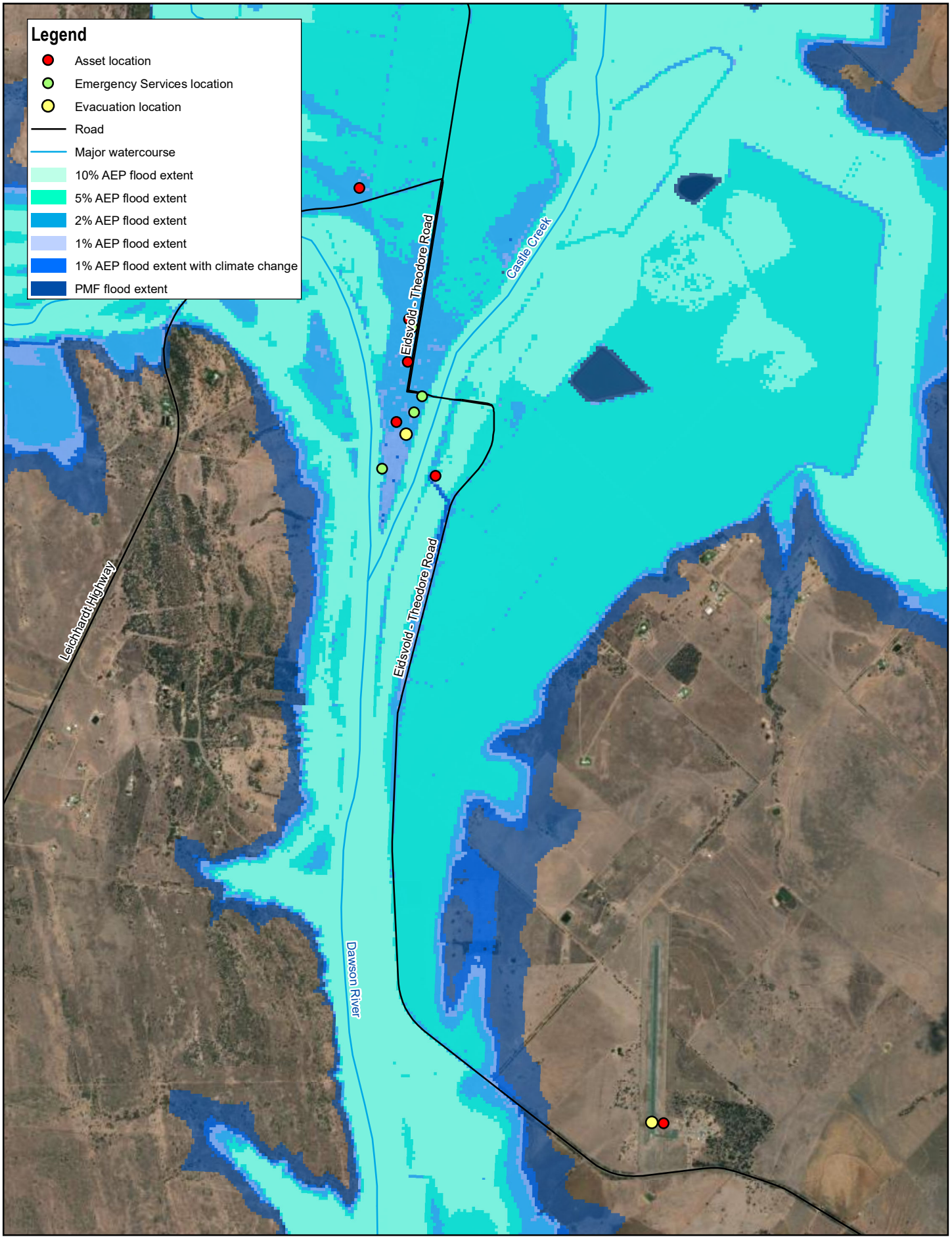

Paper Size ISO A4

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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GHD

Banana Shire Council
Flood Warning Systems

Flood Risk - Assets
Theodore

Project No. **12625254**
Revision No. **A**
Date **01 Aug 2024**

Figure 4.6

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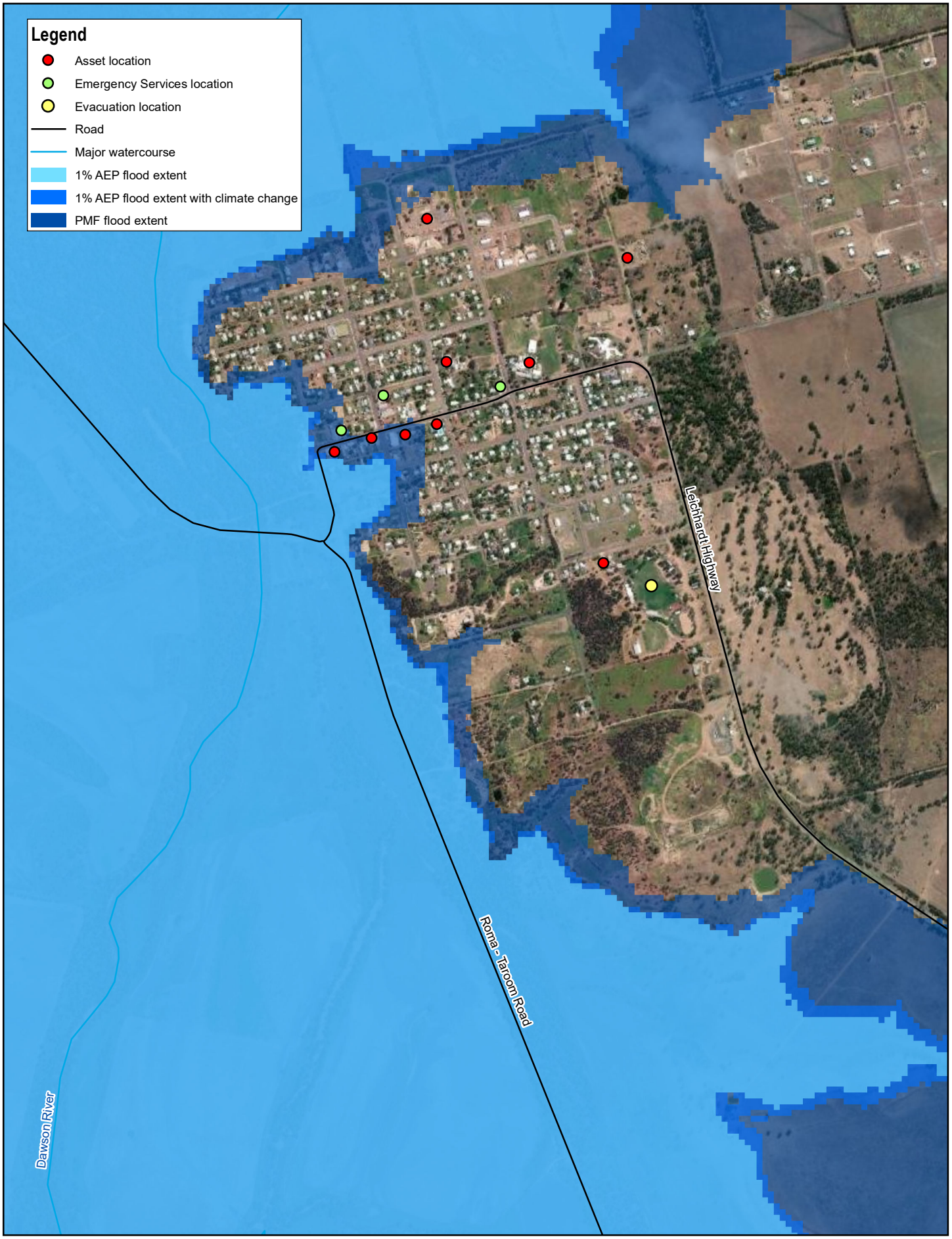

Paper Size ISO A4

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Banana Shire Council
Flood Warning Systems

Flood Risk - Assets
Taroom

Project No. **12625254**
Revision No. **A**
Date **01 Aug 2024**

Figure 4.7

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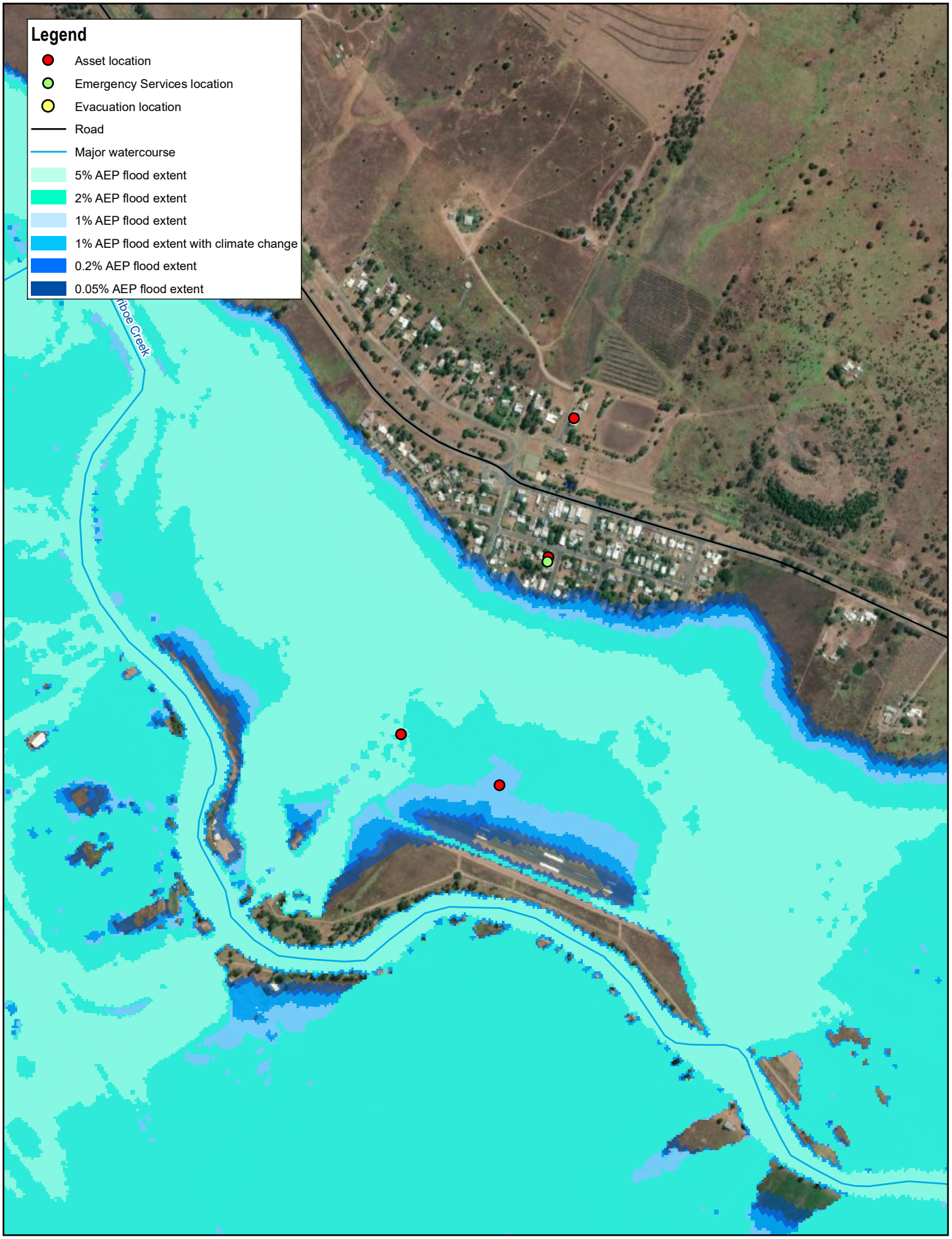

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Banana Shire Council
Flood Warning Systems

Flood Risk - Assets
Thangool

Project No. **12625254**
Revision No. **A**
Date **01 Aug 2024**

Figure 4.8

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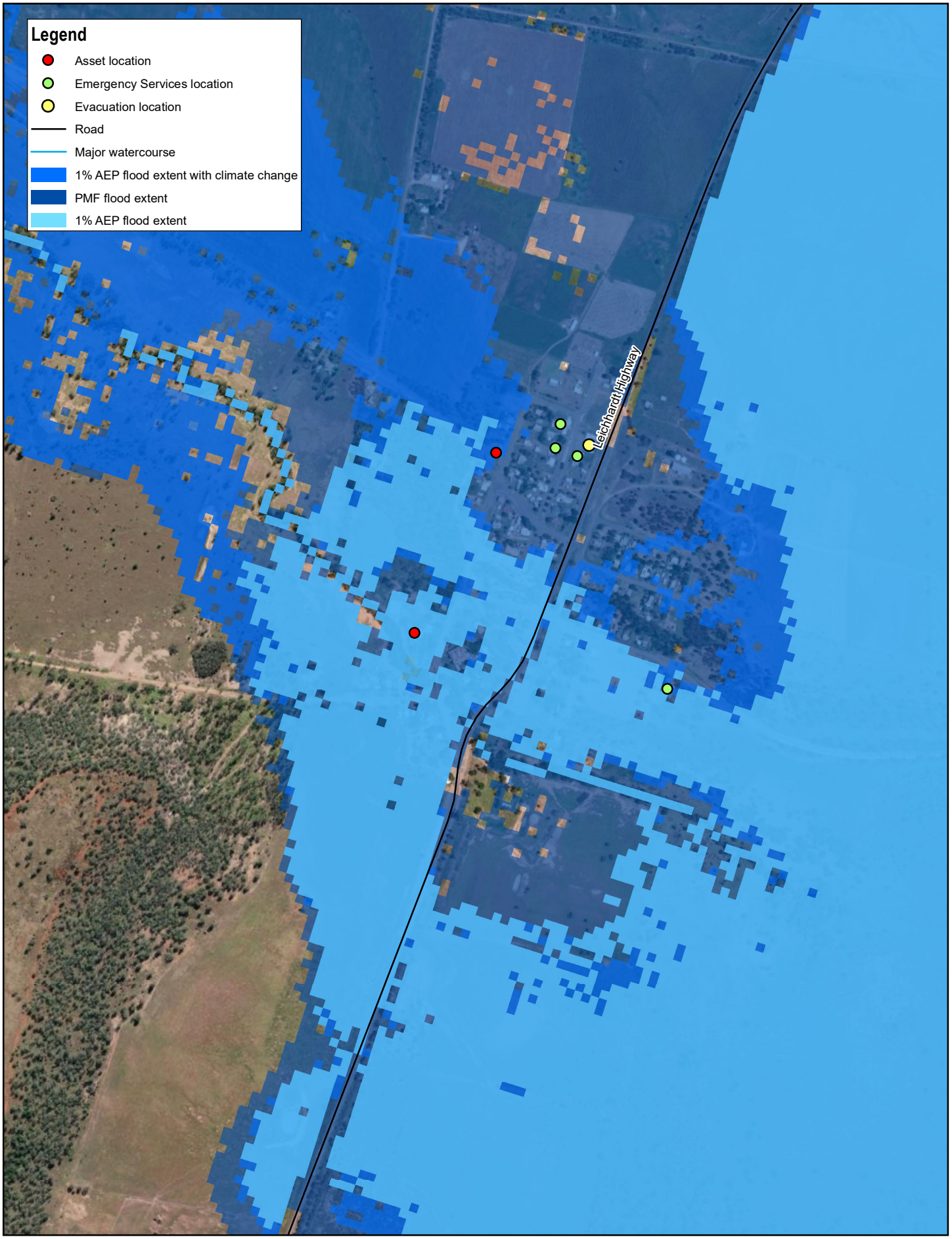

Paper Size ISO A4

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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GHD

Banana Shire Council
Flood Warning Systems

Flood Risk - Assets
Wowan

Project No. **12625255**
Revision No. **A**
Date **01 Aug 2024**

Figure 4.9

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Print date: 01 Aug 2024 - 17:12 (SMA record: 13)

Data source: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. Created by: nneupane

5. Existing flood warning network

5.1 Current flood warning system description

BSC relies on the flood forecasting information from the Bureau and does not do any flood forecasting within council. Based on the information that the Bureau provides council looks at their developed flood triggers to understand the likely impacts of the forecasted event.

At a local level, local government is responsible for the management and operation of local warning systems and communication channels. Public information, warning and community awareness activities should continue before, during and after an event.

Banana Shire Council has developed the following strategies to assist in promoting and contributing to community awareness and capacity:

- Disaster Management Public Warning and Advice Strategy to enable the identification and use of a variety of delivery mechanisms and multiple formats to ensure the community receive appropriate advice and or warnings of imminent events that may impact the region;
- Pre-formatted emergency alert messages and associated GIS polygons, pre-registered with the State Disaster Coordination Centre relevant to flood events;
- Operational “trigger points” to assist the LDMG and Council in ensuring proactive action due to an event associated with flooding or potential flooding in the Shire;
- Installation of rain and river height gauges to provide real time data relevant to rainfall, river and local tributary heights. Data from this system has been made available to the Bureau of Meteorology to assist them in the provision of associated flood warnings. This information is also made available for public consumption via the bureau’s website.
- Social Media (Facebook) Utilised to provide a summary of events, advices and warnings.
- Council website – Disaster Management Dashboard Provides up to date information in relation to weather conditions, road conditions; power outages, river heights, emergency news/advices, fire incidents, evacuation centres and preparedness information.
- Callide Creek Water Release Notifications - An opt in SMS and email messaging system intended for people who reside on or own property adjacent to the Callide Creek from Biloela
- Standard Emergency Warning Signal (SEWS) - SEWS is intended for use as an alert signal to be played on public media to draw listeners” attention to a following emergency warning. It is meant to attract listener’s attention to the fact that they should take notice of the emergency message

The LDMG and Council have operational “trigger points” to assist in ensure proactive actions are taken. Figure 5.1 illustrates the trigger points for Theodore. There are trigger points for Taroom, Moura and Dululu which are illustrated in

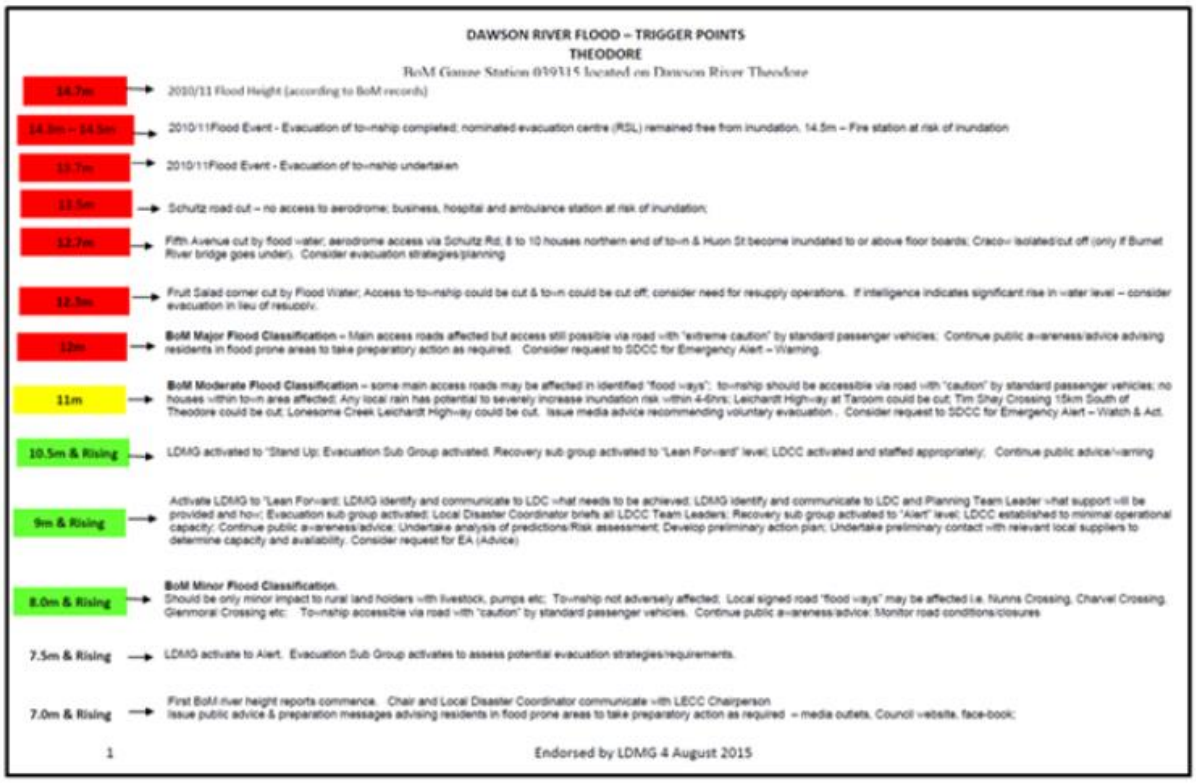


Figure 5.1 Trigger Points Theodore

14.78m	1890 Flood Level (prior to BoM records) – flood water reached the Leichhardt Tree in main street of Taroom
10.95	1%CC AEP Event
10.43m	Dec 2010/Jan 2011 flood level – highest recorded flood level
10.24m	1% AEP Event
10.0m	Evacuation required from lower residential areas/premises (occurred in 2010/11)
9.50m	Further business premises affected/inundated; Consider request to SDCC for Emergency Alert - Warning
9.27m	1956 flood level (DERM) – flooded low area of town (Lower Hutton St area)
9.62	2% AEP Event
9.0m	Door knock affected properties businesses (refer 9.27m, 9.5m & 10.0m data); Assess possible evacuation requirements / gather evac centre resources; Lions Park & facilities Lower Hutton Rd affected/inundated; Cabins across road from Caltex Service Station at risk; Sewerage Pump Stn No.1 inundated & switched off; Sewerage Pump near Caravan Park inundated & switched off
8.79	5% AEP Event
8.50m	Start to get water in town area possibly affecting business premises; Caltex Service Station Lower Hutton St affected by water; Polocross Grounds & Facilities affected/inundated; Steel Wings windmill, river walk & picnic areas affected/inundated; Showgrounds Irrigation pump in river switched off

7.60m	BoM advice/indications that some houses may be affected but local knowledge indicates that this will not occur; Increased monitoring of rainfall and stream rises/flows required; Continue public awareness/advice; Monitor road impact/closures; Issue media advice recommending voluntary evacuation/relocation outside of "at risk" area to friends or relatives
7.25m	March 2010 Flood level – cut highways; Continue public awareness/advice;
7.0m & rising	**BoM Major Flood Classification**; LDMG activated to "Stand Up; Main access roads affected but access still possible via road with "extreme caution" by standard passenger vehicles; Recovery sub group activated to "Lean Forward" level; LDCC activated and staffed appropriately; Submit request to SDCC for Emergency Alert – Watch and Act;
6.70m	Activate LDMG to "Lean Forward; LDMG identify and communicate to LDC what needs to be achieved; LDMG identify and communicate to LDC and Planning Team Leader what support will be provided and how;; Local Disaster Coordinator briefs all LDCC Team Leaders; Recovery sub group activated to "Alert" level; LDCC established to minimal operational capacity; Continue public awareness/advice; Undertake analysis of predictions/Risk assessment; Develop preliminary action plan; Undertake preliminary contact with relevant local suppliers to determine capacity and availability
5.0m	When Dawson River reaches 5m at Taroom, local heavy rain which floods the local creeks giving rapid rise indicating flooding - Roma-Injune Rd closed at Juandah Creek; Injune Rd closed at Moorat Continue public awareness/advice; Monitor road conditions/closures
4.5m	**BoM Minor Flood Classification**. Should be only minor impact to rural land holders with livestock, pumps etc; Township not adversely affected; Township accessible via road Continue public awareness/advice: Monitor road conditions/closures
2.0m	First BoM river height reports commence Chair and Local Disaster Coordinator communicate with LECC Chairperson Issue public advice & preparation messages advising residents in flood prone areas to take preparatory action as required – media outlets, Council website, face-book;

Figure 5.2 Trigger Points Taroom

River Gauge Height (m) at Moura (manual gauge)	Areas and Possible Effects of Flooding MOURA/BANANA	Considerations for LDMG
6.0m	First BoM river height reports commence BoM Minor Flood Classification (Causes inconvenience. Low-lying areas next to water courses may be inundated which may require removal of stock and equipment. Minor roads may be affected or closed and low level bridges may be submerged).	• Consider media releases/advices
8.0m	Jan 2008 flood height	
10.46m	Jan/Feb 1978 Flood Height	
11.0m	BoM Moderate Flood Classification (In addition to minor flood issues – evacuation of some houses may be required. Main traffic	• Recommend media releases/advices be issued

	routes may be covered. The area of inundation is substantial in rural areas requiring the removal of stock). Crops & grazing may be affected	• Monitor northern side of Dawson Hwy (west of Moura) – issue advices/warnings to residents/landholders in this area • Monitor local tributaries flow and impact; • Monitor predictions to allow for forward planning including river levels and expected rainfall. • Identify vulnerable group in community that may require assistance.
12.0m	BoM Major Flood Classification (In addition to minor and moderate flood issues – extensive rural areas and/or urban areas are inundated. Properties and towns are likely to be isolated and major traffic routes likely to be closed. Evacuation of people from flood affected areas may be required).	• Continue media releases/advice/warnings; • Increase reconnaissance/intelligence gathering operations • If increases predicted – commence consideration of evacuation requirements and/or resupply issues; • Assess water supply, waste treatment and electricity supply issues
12.09m	May 1983 Flood Height	
12.20m	Feb/March 2010 Flood Height (flood study)	
12.5m	Bridge height Some inundation of Dawson Highway	• Continue media advice/warnings; • Monitor access issues
12.73m	Dec 10/ Jan 11 Flood Height	
13.20m	5%AEP Event (flood study)	
13.50m	2%AEP Event (flood study)	
13.80m	DFE (1%AEP + climate change) (flood study)	

Figure 5.3 Trigger Points Moura

DAWSON RIVER *FLOOD* – TRIGGER POINTS
DULULU
DNRM Gauge Station 539016 (Wura) located on Dee River Burnett Highway Wura (Minor 4m Moderate 6.0m Major 8.0m)

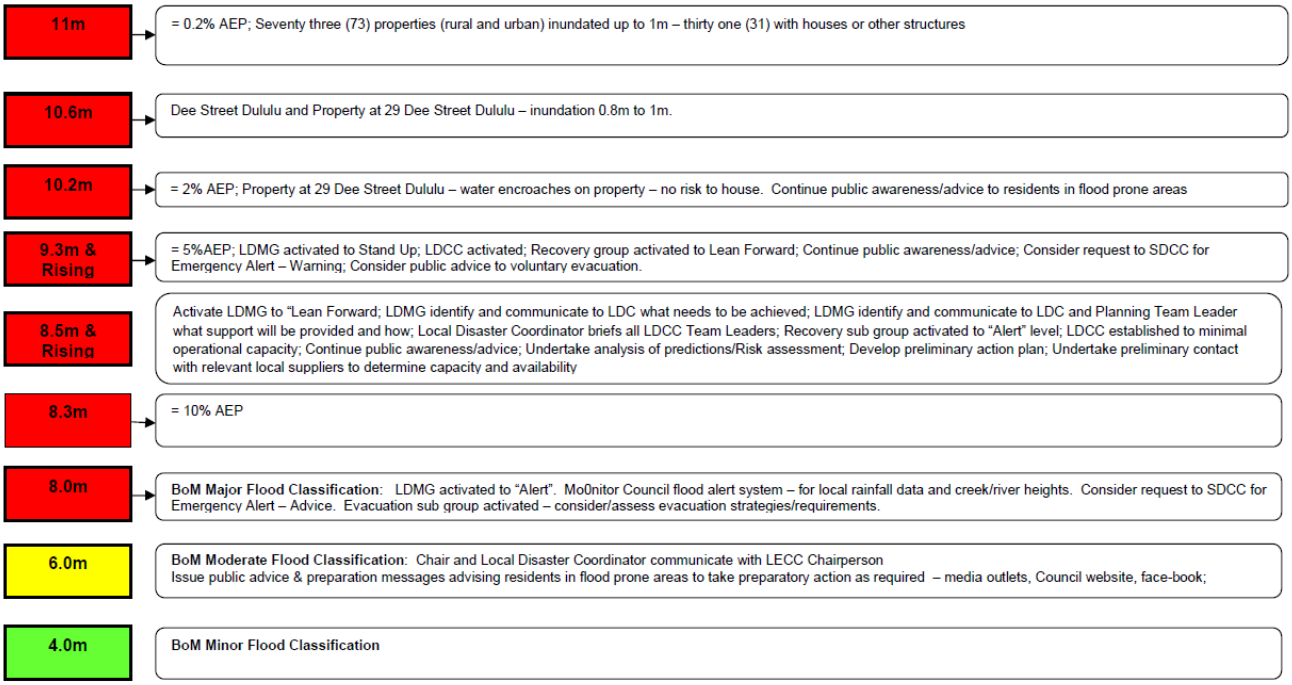


Figure 5.4 Trigger Points Dululu

The disaster management reporting relationship is illustrated in Figure 5.5.

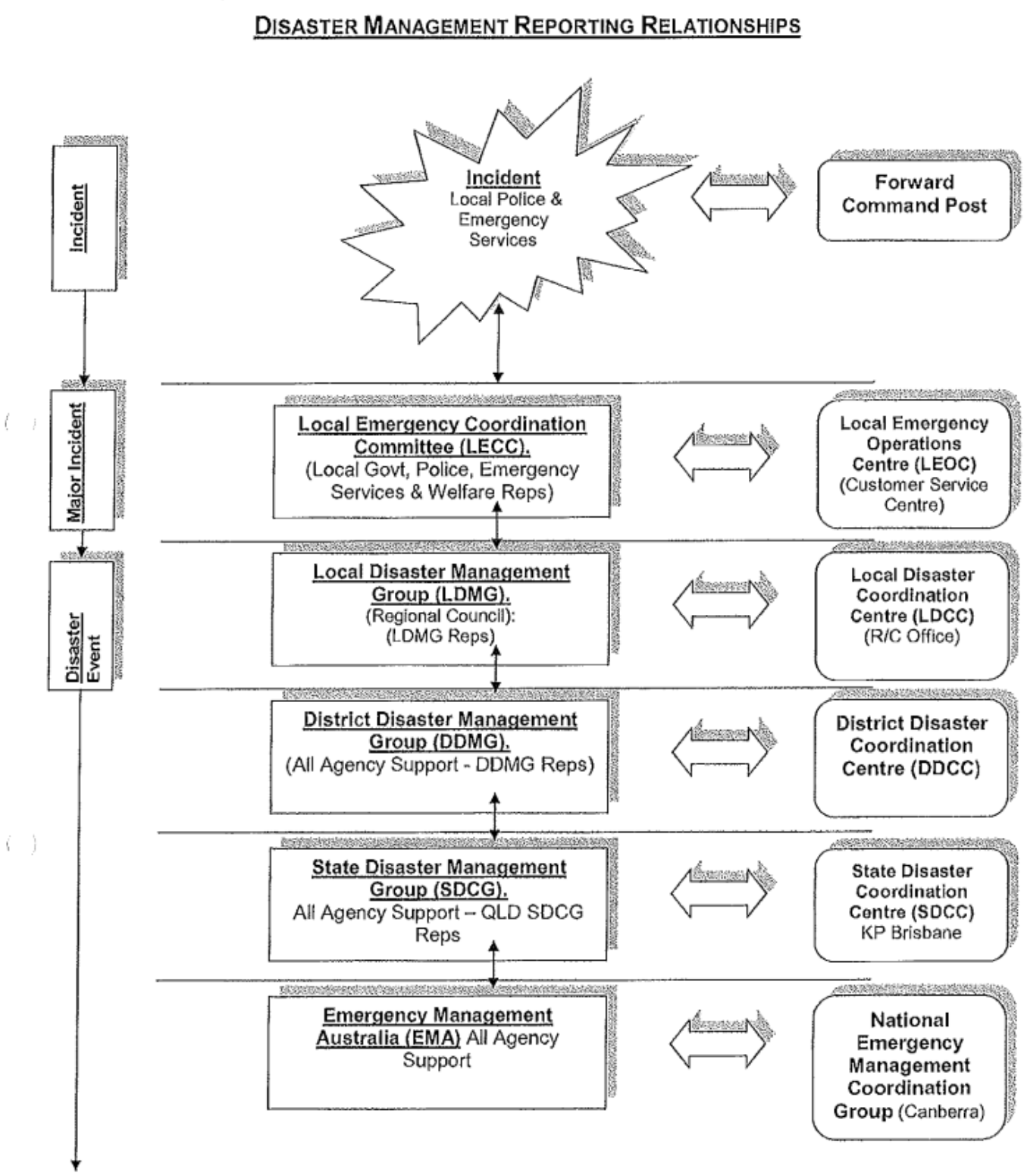


Figure 5.5 Disaster Management reporting relationship

5.2 Type of floods that impact BSC

Given the types of floods that impact BSC are long duration events where there is generally more than 12 hours of warning available before an event occurs. In different parts of the LGA, some events that impact Jambin can result in the town being cut for 2 to 3 days. While other places the town is only isolated for 1 day. Out of all the townships within the LGA, Theodore poses the highest risk as it starts to be inundated in very frequent events and was also the only town that has required to be fully evacuated by private helicopters during the 2011 event. The main concern with council in respond to these floods is how long each township will be isolated as this impacts council after the event to make sure supplies are provided into the flooded towns.

5.3 Rainfall and streamflow gauges

There are 85 rainfall gauges within the BSC LGA, with 64 of these gauges being automatic and the other 21 gauges are manually read gauges. The ownership of the 85 gauges is illustrated in Figure 5.6, with 38 gauges owned by BSC, 22 gauges owned by both the Bureau and DRDMW and only three rainfall gauges owned by Sunwater. Of the 21 gauges that are manual gauges there is also an automatic gauge at the same location as the manual gauge or close by.

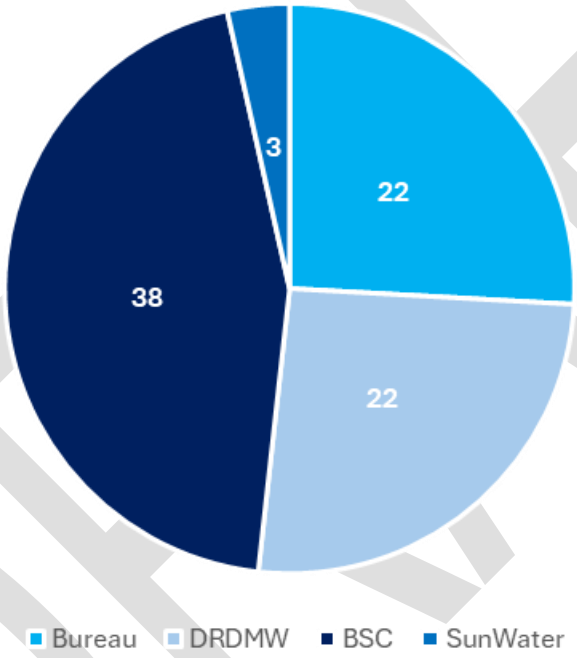


Figure 5.6 Rainfall Gauge ownership

There are five (5) types of rainfall telemetry used within the BSC area which is illustrated in Figure 5.7. The majority of the rainfall gauges are alert gauges which are stations that automatically communicate by radio and report every one millimetre to the local base station. These gauges are all owned by BSC.

The next most common type of automatic telemetry within the LGA is telemeter gauges, these stations are connected to the public telephone network and polled regularly by computers during periods of heavy rain. All of the DRDMW and sunwater gauges being this type of telemetry.

The Bureau gauges are all manual gauges that are either remote observer terminal (ROT), synoptic (SYNOP) or automatic weather station (AWS). ROT, SYNOP or AWS type telemetry. ROT manual stations report whenever 25 or 50 millimetres of rain has been recorded and thereafter at frequent intervals during heavy rain. They also report daily totals to 9am. Reports from these stations are lodged via a Remote Observer Terminal (ROT) connected to the telephone. Both the SYNOP and AWS type gauges are stations that report via the ROT network and provide daily rainfall reports to 9am.

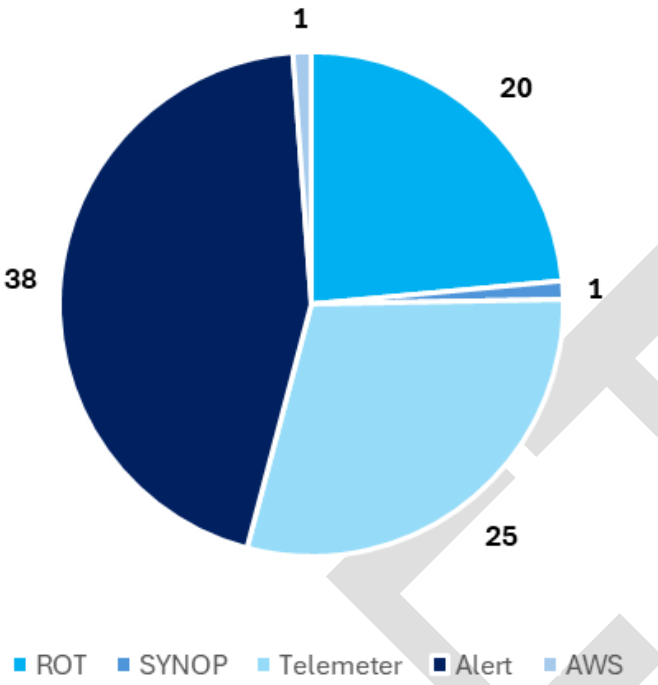


Figure 5.7 Rainfall Telemetry Type

There are 55 streamflow gauges within the BSC LGA, with 48 of these gauges being automatic and the other 7 gauges are manually read gauges. The ownership of the 55 gauges is illustrated in Figure 5.6, with 18 gauges owned by BSC, with 16 gauges owned by DRDMW, Sunwater owns 14 of the gauges with only seven (7) streamflow gauges owned by the Bureau.

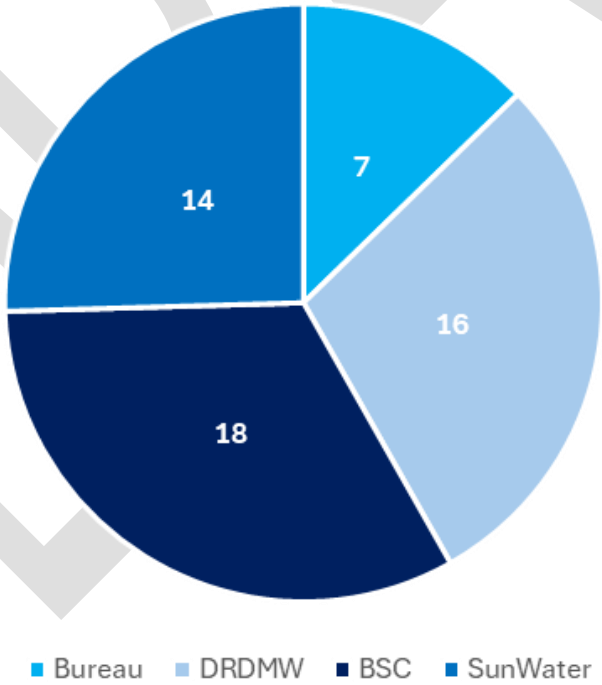


Figure 5.8 Streamflow Gauge ownership

There are three (3) types of streamflow telemetry used within the BSC area which is illustrated in Figure 5.9. The majority of the streamflow gauges are telemeter gauges, these stations are connected to the public telephone

network and polled regularly by computers during flood periods. All of the DRDMW and sunwater gauges are this type of telemetry.

The next most common type of streamflow telemetry gauges which alert gauges which are stations that automatically communicate by radio and report every one millimetre to the local base station These gauges are all owned by BSC.

The next most common type of automatic telemetry within the LGA is telemeter gauges, these stations communicate by radio and report every time the river level changes by 50 millimetre to the local base station and the Flood Warning Centre. All of the BSC gauges are this type of telemetry.

The Bureau gauges are all manual gauges that are ROT type telemetry. ROT manual stations report whenever the first report height is reached and thereafter at frequent intervals whenever the river is above first report height. Reports from these stations are lodged via a Remote Observer Terminal (ROT) connected to the telephone.

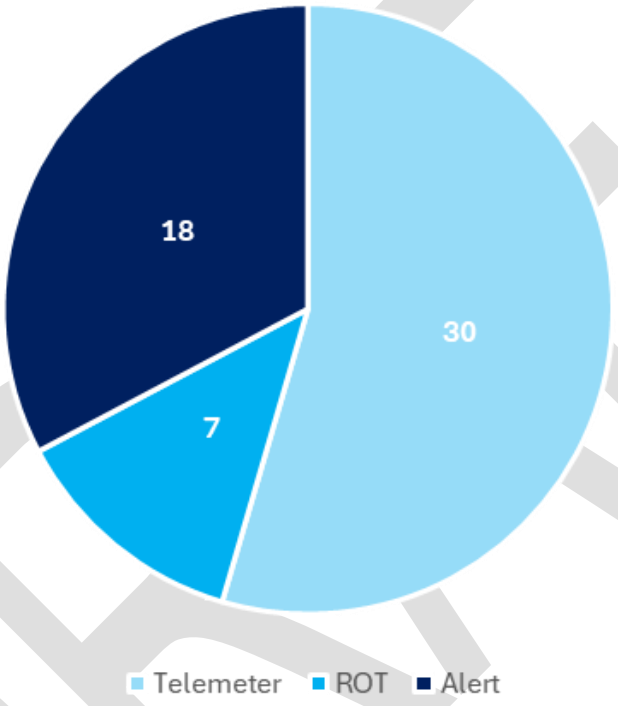


Figure 5.9 Streamflow Telemetry Type

5.4 Future planned assets

Back in 2022 in consultation in the Queensland Reconstructive Authority (QRA), BSC came up a masterplan of assets that would be beneficial for the LGA. Current rainfall and streamflow gauges density is sufficient for a flood event to be forecasted within the catchment with adequate warning time to evacuation planning. There is currently very little concern about a significant amount of investment required for additional gauges within the LGA. Only two additional gauges have been proposed within the LGA to understand localised flood issues.

The main investment that has been proposed as being the most beneficial for the LGA is the inclusion of cameras and signage on key roads within the BSC LGA. Given that a high majority of the roads that connect to each township has a low immunity, BSC wants more investment concentrated on the road network. The full list of proposed future assets is outlined in Table 5.1.

Table 5.1 BSC future proposed assets

Site Reference	Asset Location and Name	Longitude	Latitude	Asset Type	Asset Code	Signage Type	Agreed Priority	Comments
7	Coolum Road, Baralaba - Unknown Creek Name (approx 500m south from Baralaba-Woorabinda Road)	-24.161176	149.752780	Camera	(C)		High	Nominated by BSC.
8	Tarana Crossing Road, Taroom - Dawson River (approx 12km south from Injune Taroom Road)	-25.797570	149.559320	Camera	(C)		High	Nominated by BSC.
9	Bears Lagoon Road, Moura - Mimosa Creek (approx 12km north west from Dawson Highway)	-24.539257	149.811712	Camera and Signage	(C/S)	Wig Wag	High	Nominated by BSC.
10	Capricorn Highway (Rockhampton-Duaringa) 16A - Westwood, Leichhardt Highway intersection (Ch 52.1 approx)	-23.664913	150.121177	Electronic Sign	(S)	LED Road Closed sign	High	Nominated by TMR Fitzroy. Approx 450m west of Leichhardt Highway intersection.
11	Burnett Highway (Monto-Biloela) 41D - Dawes, Burns Road intersection (Ch 42.3 approx)	-24.711008	150.817041	Electronic Sign	(S)	LED Road Closed sign	High	Nominated by TMR Fitzroy. Approx 350m south of Burns Road intersection.
12	Burnett Highway (Biloela-Mt Morgan) 41E - Callide Creek (SID 731 at Ch 20.760)	-24.247419	150.396993	Camera	(C)		High	Nominated by TMR Fitzroy.
13	Burnett Highway (Biloela-Mt Morgan) 41E - Alma Creek (SID 724 at Ch 63.160)	-23.910060	150.286610	Camera	(C)		High	Nominated by BSC.
14	Dawson Highway (Biloela-Banana) 46B - Kroombit Creek (SID 714 at Ch 4.561)	-24.247419	150.396993	Camera	(C)		High	Nominated by TMR Fitzroy.
15	Dawson Highway (Biloela-Banana) 46B - Grevillea Creek (SID 4610 at Ch 5.410)	-24.419964	150.462135	Camera	(C)		High	Nominated by TMR Fitzroy.
16	Dawson Highway (Banana-Rolleston) 46C - Banana Creek (SID 716 at Ch 1.270)	-24.482018	150.114469	Camera	(C)		High	Nominated by TMR Fitzroy.

Site Reference	Asset Location and Name	Longitude	Latitude	Asset Type	Asset Code	Signage Type	Agreed Priority	Comments
17	Dawson Highway (Banana-Rolleston) 46C - Kianga Creek (SID 35784 at Ch 16.067)	-24.552862	149.992031	Camera	(C)		High	Nominated by TMR Fitzroy.
18	Eidsvold-Theodore Road 454 - Cracow (Ch 93.2 approx)	-25.296200	150.295113	Electronic Sign	(S)	LED Road Closed sign	High	Nominated by TMR Fitzroy. Approx 350m west of Third Avenue intersection.
19	Eidsvold-Theodore Road 454 - Delusion Creek (SID 762 at Ch 111.060)	-25.175254	150.206225	Camera	(C)		High	Camera AND River Gauge. Nominated by TMR Fitzroy.
20	Eidsvold-Theodore Road 454 - Delusion Creek (SID 762 at Ch 111.060)	-25.175254	150.206225	River Gauge	(RV)		High	Camera AND River Gauge. Nominated by TMR Fitzroy.
21	Eidsvold-Theodore Road 454 - Oxtrack Creek (SID 763 at Ch 118.506)	-25.110067	150.181205	Camera	(C)		High	Camera AND River Gauge. Nominated by TMR Fitzroy.
22	Eidsvold-Theodore Road 454 - Oxtrack Creek (SID 763 at Ch 118.506)	-25.110067	150.181205	River Gauge	(RV)		High	Camera AND River Gauge. Nominated by TMR Fitzroy.
23	Eidsvold-Theodore Road 454 - Boam Creek (SID 764 at Ch 127.971)	-25.031835	150.150521	Camera	(C)		High	Camera AND River Gauge. Nominated by TMR Fitzroy.
24	Eidsvold-Theodore Road 454 - Boam Creek (SID 764 at Ch 127.971)	-25.031835	150.150521	River Gauge	(RV)		High	Camera AND River Gauge. Nominated by TMR Fitzroy.
25	Eidsvold-Theodore Road 454 - Theodore (Ch 141.1 approx)	-24.952791	150.079771	Electronic Sign	(S)	LED Road Closed sign	High	Nominated by TMR Fitzroy. Approx 900m south of Castle Creek bridge.
26	Roma-Taroom Road 4397 - Eurombah (Ch 99.0 approx)	-25.911631	149.482700	Electronic Sign	(S)	LED Road Closed sign	High	Nominated by TMR Fitzroy. Approx 4.5km west of Brig-O-Doon turnoff.

5.5 BoM warning services for Queensland

The Bureau (Bureau of Meteorology) provides flood forecasting and warning services for Queensland. The *Service Level Specification for Flood Forecasting and Warning Services for Queensland* (Commonwealth Bureau of Meteorology, 2024) documents the Bureau's contribution to the Total Flood Warning System. The Bureau's main role is to focus on the monitoring and prediction, and to a lesser extent interpretation, message construction and communication components.

The Bureau collects and publishes rainfall and river levels information. Locations where the Bureau publishes information can be separated into three categories, forecast location, information location and data location. A description of each category is provided below:

– Forecast location is a location for which the Bureau provides a forecast of future water level either as the class of flood that is predicted (minor, moderate or major) or as a level and class. At these locations observed data, flood classifications and additional qualifying information will also be available.
– Information location is a location at which flood classifications are defined and observations of water level data are provided. At these locations forecasts of future water level are not produced. Other key thresholds may be defined and reported against.
– Data location is a location for which just the observed water level data is provided. Flood classifications are not available for these locations and forecasts of future water level are not produced.

The Bureau provides an indicative level of priority to each observation site and key communication infrastructure based on the expected impact on the Bureau's service. There are eight forecast locations within BSC and their locations are outlined in Table 5.2 and illustrated in Figure 5.10. Of the eight (8) forecast locations that the Bureau provides forecast information for, only half are automatic gauges with the other half of the forecast gauges are manual. There are only six (6) townships which have a Bureau forecast location.

It should be noted that Taroom (35115) and Taroom TM (35282 / 130302A) are both located at the same location within the Dawson River. At this location there are manual gauge boards that can be read if the automatic devices fail. The same occurs at Theodore (39315) and Theodore Weir Tm (535110) with both the automatic and manual gauge being located at the same location.

Table 5.2 Bureau Forecast location and levels of service within Banana Shire Council

Bureau number	Forecast location	Station owner	Guage type	Flood Classification (m)			Prediction type	Target warning lead time		70% of peak forecast within	Priority
				Minor	Moderate	Major		Time (hrs)	Trigger height (m)		
35115	Taroom	Bureau	Manual	4.5	6	7	Quantitative	12 hrs	>6.0	±0.3m	High
35282 / 130302A	Taroom Tm	DRDWM	Automatic	4.5	6	7	Quantitative	12 hrs	>6.0	±0.3m	High
39315	Theodore	Bureau	Manual	8	11	12	Quantitative	1 day	>10.0	±0.3m	High
535110	Theodore Weir Tm	Sunwater	Automatic	8	11	12	Quantitative	1 day	>10.0	±0.3m	High
39296	Moura	Bureau	Manual	6	11	12	Quantitative	1 day	>10.0	±0.3m	High
39143	Baralaba	Bureau	Manual	4	7.5	9	Quantitative	1 day	>9.0	±0.3m	High
539232	Biloela Alert	BSC	Automatic	2.2	3.2	4.2	Quantitative	6 hrs	>3.2	±0.3m	High
539240	Jambin Alert	BSC	Automatic	2.65	4.15	5.15	Quantitative	12 hrs	>4.15	±0.3m	High

There are 24 locations where the Bureau provides flood class levels for information purposes within BSC. These locations are defined in Table 5.3 and illustrated in Figure 5.10.

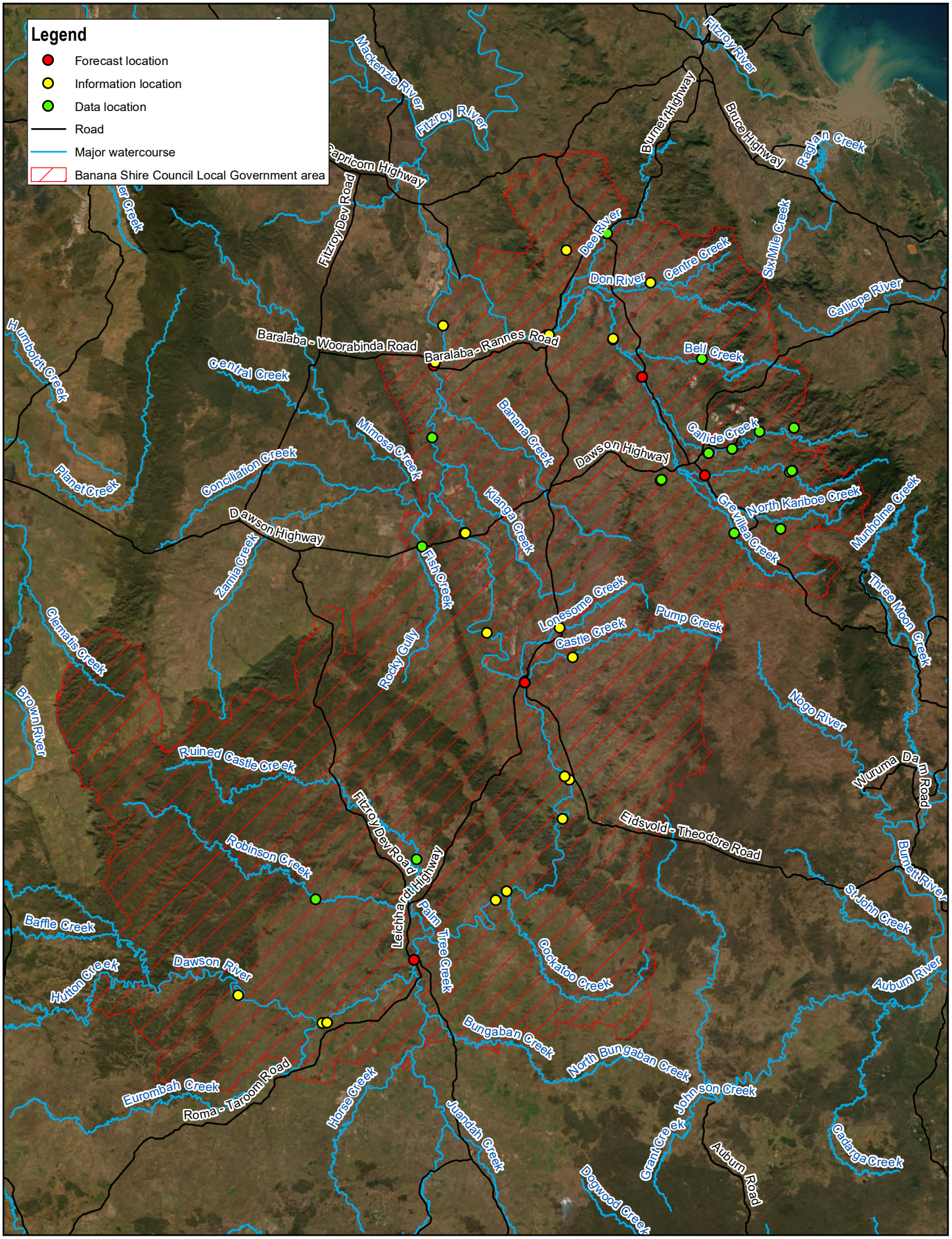
Table 5.3 Bureau information location and levels of service within Banana Shire Council

Bureau number	Station name	Station owner	Gauge type	Flood classification (m)			Priority
				Minor	Moderate	Major	
535032	Utopia Downs	DRDMW	Automatic	5	8	13	High
035271	Tarana Crossing	Bureau	Manual	6	9	12	Medium
535142	Tarana Crossing	Banana Shire Council	Automatic	6	9	12	Medium
535013	Windamere	DRDMW	Automatic	5	7	9	Medium
035273	Chilgerrie Hill	Bureau	Manual	5	7	9	Medium
035096	The Glebe	Bureau	Manual	2	3	4	Medium
535044	Glebe Weir Hw	Sunwater	Automatic	1.5	2.5	3.5	Medium
535045	Glebe Weir Tw	Sunwater	Automatic	8.5	10.5	12	Medium
539070	Gyranda Weir	Sunwater	Automatic	1.5	2	3	Medium
539163	Gyranda Weir	Banana Shire Council	Automatic	1.5	2	3	Medium
539065	Isla-Delusion Crossing	Sunwater	Automatic	7	9	10	Medium
539164	Isla-Delusion Crossing	Banana Shire Council	Automatic	7	9	10	Medium
539175	Lonesome Creek	Banana Shire Council	Automatic	4	5.5	7	Medium
539172	Castle Creek	Banana Shire Council	Automatic	4	6	8	Medium
539043	Woodleigh	DRDMW	Automatic	7.5	13	15	Medium
539081	Moura Weir	Sunwater	Automatic	1	4	5.5	Medium
539165	Moura Weir	Banana Shire Council	Automatic	1	4	5.5	Medium
035083	Woorabinda	Bureau	Manual	6	7	8	Medium
535021	Redcliffe	DRDMW	Automatic	4	5	6	Medium
535124	Karamea	Central Highlands Regional Council	Automatic	7	8	9	Medium
539080	Baralaba Hw	Sunwater	Automatic	0.8	1.5	2	Medium
539079	Baralaba Tw	Sunwater	Automatic	4.2	7.7	9.2	Medium
535015	Beckers	DRDMW	Automatic	5	8.5	10.5	High
539062	Kingsborough	DRDMW	Automatic	5	6	7	Medium
539068	Goovigen	DRDMW	Automatic	6.5	9	10.5	High
539016	Wura	DRDMW	Automatic	4	6	8	Medium
539173	Wowan Westwood Rd	Banana Shire Council	Automatic	3	4	5	Medium
039308	Rannes	Bureau	Manual	6	8	11	Medium
539057	Rannes	DRDMW	Automatic	6	8	11	Medium

River data locations are outlined in Table 5.4.

Table 5.4 Bureau River data locations

Bureau number	Station name	Station owner	Guage type	Priority
535111	Eurombah Creek	DRDMW	Automatic	Low
535055	Broadmere	DRDMW	Automatic	Low
Bureau number	Station Name	Owner	Gauge type	Priority
535049	La Palma	DRDMW	Automatic	Low
535050	Roundstone Creek	DRDMW	Automatic	Low
539095	Bindaree	DRDMW	Automatic	High
539067	Malakoff Junction	Sunwater	Automatic	Low
539248	South Kariboe Creek	Banana Shire Council	Automatic	Low
539106	South Kariboe Creek	DRDMW	Automatic	Low
539236	Callide Dam Inflow	Banana Shire Council	Automatic	Low
539111	Callide Dam Inflow	Sunwater	Automatic	Low
539235	Callide Dam Hw	Banana Shire Council	Automatic	Low
539071	Callide Dam Hw	Sunwater	Automatic	Low
539244	Linkes Causeway	Banana Shire Council	Automatic	Low
539110	Linkes Causeway	Sunwater	Automatic	Low
539241	Kroombit Dam	Banana Shire Council	Automatic	Low
539112	Kroombit Dam Hw	Sunwater	Automatic	Low
539083	Kroombit Dam Tw	Sunwater	Automatic	Low
539238	Folding Hills	Banana Shire Council	Automatic	Low
539105	Folding Hills	DRDMW	Automatic	Low
539247	Red Hill	Banana Shire Council	Automatic	Low
539100	Red Hill	DRDMW	Automatic	Low
539237	Craiglands	Banana Shire Council	Automatic	Low
539107	Craiglands	DRDMW	Automatic	Low
539104	Number 7 Dam	DRDMW	Automatic	Low
539102	Dairy Ck	DRDMW	Automatic	Low
539056	Kenbula	DRDMW	Automatic	Low
539219	Dululu	DRDMW	Automatic	Low



Paper Size ISO A4

0 10 20 30 40

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Banana Shire Council
Flood Warning Systems

Project No. **12625254**
Revision No. **A**
Date **01 Aug 2024**

Bureau Gauge Locations

Figure 5.10

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Print date: 01 Aug 2024 - 17:18 (SMA record: 14)

Data source: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. Created by: nneupane

5.6 Flood classification in Queensland

The Queensland Reconstruction Authority (QRA) developed a best practice guide for local governments to assist local governments to understand:

– Flood classifications
– River heights and flood forecasts
– Different types of gauges
– Flood warnings based on river height
– How to determine and set flood classifications
– Considerations when reviewing the flood classifications
– Roles and responsibilities of key stakeholders

A responsibility outlined in the document is that flood classification levels are the responsibility of the local government in consultation with the Bureau.

5.6.1 BSC Current gauge classifications

The current gauge classification for streamflow gauges is documented in Table 5.5 are from the Summary Asset List – Flood Warning gauges provided by BSC. It is noted there is limited information on when the gauges were last classified or when the gauge zero was surveyed. There are 32 streamflow gauges which have a flood classification associated with them with only eight (8) used as a Bureau flood forecasting location. There is an additional 23 streamflows that do not currently have a gauge classification associated with them.

Table 5.5 Current gauge classifications – BSC information

Bureau Number	Station Name	Forecast location	Information location	Guage Zero (m)	Datum	Flood Classification		
						Minor (m)	Moderate (m)	Major (m)
535032 / 130324A	Utopia Downs Tm		Y	216.07	AHD	5	8	13
35271	Tarana Crossing		Y	195.87	AHD	6	8	12
535142	Tarana Crossing Alert		Y	195.87	AHD	6	8	12
35115	Taroom	Y		180.82	AHD	4.5	6	7
35282 / 130302A	Taroom Tm	Y		180.82	AHD	4.5	6	7
35096	The Glebe		Y	170.76	AHD	2	3	4
535044	Glebe Weir Hw Tm		Y	150.00	STATE	1.5	2.5	3.5
535045 / 130345A	Glebe Weir Tw Tm		Y	160.95	STATE	8.5	10.5	12
539070	Gyranda Weir Tm		Y	100.25	AHD	1.5	2	3
539163	Gyranda Weir Alert		Y	100.25	AHD	1.5	2	3
539065 / 1300358A	Isla-Delusion Xing Tm		Y	145.52	AHD	7	9	10
539164	Isla-Delusion Crossing Alert		Y	145.52	AHD	7	9	10
39315	Theodore	Y		127.65	AHD	8	11	12
535110	Theodore Weir Tm	Y				8	11	12
539172	Castle Creek Alert		Y	0.00	ASSUM	4	6	8
539175	Lonesome Creek Alert		Y	0.00	ASSUM	4	5.5	7
539043 / 130317B	Woodleigh Tm		Y	110.09	AHD	7.5	13	15
39296	Moura	Y		97.19	AHD	6	11	12
539165	Moura Weir Alert		Y			1	4	5.5

Bureau Number	Station Name	Forecast location	Information location	Guage Zero (m)	Datum	Flood Classification		
						Minor (m)	Moderate (m)	Major (m)
539081	Moura Weir Tm		Y			1	4	5.5
39143	Baralaba	Y		71.28	AHD	4	7.5	9
539080	Baralaba Hw Tm		Y	80.30	AHD	0.8	1.5	2
539079	Baralaba Tw Tm		Y	71.07	AHD	4.2	7.7	9.2
535015 / 130322A	Beckers Tm		Y	64.53	AHD	5	8.5	10.5
539232	Biloela Alert	Y		179.80	AHD	2.2	3.2	4.2
539240	Jambin Alert	Y		127.85	AHD	2.65	4.15	5.15
539068 / 130327A	Goovigen Tm		Y	111.32	AHD	6.5	9	10.5
539239	Goovigen Alert		Y			6.5	9	10.5
539062 / 130349A	Kingsborough Tm		Y	121.02	AHD	5	6	7
539173	Wowan Westwood Rd Alert		Y	0.00	ASSUM	3	4	5
539057 / 130306B	Rannes Tm		Y	87.86	AHD	6	8	11
39308	Rannes		Y	87.79	AHD	6	8	11

5.6.2 Bureau current gauge classifications

The current gauge classification for streamflow gauges is documented in Table 5.6 are from the Summary Asset List – Flood Warning gauges provided by BSC. It is noted there is limited information on when the gauges were last classified or when the gauge zero was surveyed. There are 32 streamflow gauges which have a flood classification associated with them with only eight (8) used as a Bureau flood forecasting location. There is an additional 23 streamflows that do not currently have a gauge classification associated with them.

Table 5.6 Current gauge classifications – Bureau information

Station No.	Station Name	First report	Bridge height	Type	Minor Fld Ht	Crops Grazing	Moderate Fld Ht	Towns Fld Ht	Major Fld Ht
535032	Utopia Downs Tm				5		8		13
35271	Tarana Crossing	1	0.7	X	6	9	9		12
535142	Tarana Crossing Alert		0.7	X	6	9	9		12
535013	Windamere Tm				5		7		9
35273	Chilgerrie Hill	3			5		7		9
35115	Taroom	2	6.7	A	4.5	3	6	7.6	7
35282	Taroom Tm		6.7	A	4.5	3	6	7.6	7
35096	The Glebe	1			2	2	3		4
535044	Glebe Weir Hw Tm		0	W	1.5		2.5		3.5
535045	Glebe Weir Tw Tm				8.5		10.5		12
539070	Gyranda Weir Tm		0	W	1.5		2		3
539163	Gyranda Weir Alert		0	W	1.5		2		3
539065	Isla-Delusion Xing Tm				7		9		10
539164	Isla-Delusion Crossing Alert				7		9		10
539172	Castle Creek Alert		3.62	R	4		6		8
39315	Theodore	7	5.9	W	8	10	11	12.2	12
535110	Theodore Weir Tm		5.9	W	8	10	11	12.2	12
539175	Lonesome Creek Alert		3.95	B	4		5.5		7
539043	Woodleigh Tm				7.5		13		15

Station No.	Station Name	First report	Bridge height	Type	Minor Fld Ht	Crops Grazing	Moderate Fld Ht	Towns Fld Ht	Major Fld Ht
539081	Moura Weir Tm		0	W	1		4		5.5
539165	Moura Weir Alert		0	W	1		4		5.5
39296	Moura	6	12.5	B	6	11	11		12
35083	Woorabinda	1			6	8	7	10.1	8
535021	Redcliffe Tm				4		5		6
535124	Karamea Alert	2	1.6	C	7	8	8		9
39143	Baralaba	3	8.84	B	4		7.5		9
539080	Baralaba Hw Tm		0	W	0.8		1.5		2
539079	Baralaba Tw Tm		9.04	B	4.2		7.7		9.2
535015	Beckers Tm				5		8.5		10.5
539241	Kroombit Dam Alert		0	F					
539112	Kroombit Dam Hw Tm		0	F					
539232	Biloela Alert		5.6	B	2.2		3.2		4.2
539071	Callide Dam Hw Tm		0	F					
539235	Callide Dam Hw Alert		0	F					
539240	Jambin Alert		2.7	B	2.7		4.2		5.2
539068	Goovigen Tm				6.5		9		10.5
539239	Goovigen Alert				6.5		9		10.5
539062	Kingsborough Tm				5		6		7
539016	Wura Tm				4		6		8
539219	Dululu Tm		3.8	C	3.4	3.4	9.4	12.4	12.4
539173	Wowan Westwood Rd Alert				3		4		5
39308	Rannes	3	2.5	C	6		8	12.2	11
539057	Rannes Tm		2.5	C	6		8	12.2	11

5.6.2.1 Inconsistencies

Some of the flood warning classifications outlined in Table 5.5 are different to the flood warning classifications that are outlined on the Bureau's website. Consistency between both BSC and the Bureau's flood classification needs to be established. These inconsistencies need to be further assessed to understand what the gauge classification should be at all gauges within the LGA. Currently there are communications between BSC and the Bureau to take over ownership of the BSC gauges. It is likely that the updated gauge classification project which is a recommendation of this review outlined in Section 7 should be undertaken once an updated flood study for the LGA is completed.

5.7 Council response

The following section outlines council response after 2015 Inspector General Emergency Management (IGEM) report about the Cyclone Marcia event. The IGEM made several recommendations for BSC to action in response to this event.

5.7.1 2015 Callide Creek Flood Review

The Inspector General Emergency Management (IGEM) was commissioned to report on the circumstances of the Callide Creek flood event during Cyclone Marcia as it was the opinion of the community that the operations of Callide Dam gates exacerbated flooding in the downstream community. The community was affected in 2013 when the Callide Dam gates were opened, and many had not recovered from the floods of January 2013 and February 2013 when the 2015 event impacted the community.

An independent hydrologist report was commissioned to undertake a technical assessment to understand if the discharges from Callide Dam, different operating rules would have provided greater flood mitigations. The report concluded that regardless of how Callide Dam was operated during the February 2015 event, the communities along the Callide Valley would still have experienced a major flood.

There were nine (8) recommendations made from the report for Banana Shire council and one recommendation for the Banana Shire Local Disaster management group. These recommendations are outlined below:

- Banana Shire Council investigate means to prioritise the commissioning of a fit-for-purpose flood study for high-risk areas across the Banana Shire to better inform flood risk management, including improved town planning. The outcomes of such a study should be available to the public and inform flood awareness campaigns, flood warnings, and building approvals.
    - BSC commissioned KBR to undertake a flood study for key townships within BSC. Information from these flood studies were provided on council's website for the community.
- Banana Shire Council coordinates the development of a strategy to significantly enhance public education regarding local disaster management arrangements within the Banana Shire, focusing on key identified risks.
    - A community consultation was undertaken as part of the KBR Flood Study to make sure the community was brought along the journey to understand flood risk within the catchment.
- In accordance with recommendations of the BMT WBM report, the Banana Shire Council, SunWater, and the Bureau of Meteorology, under the stewardship of the Department of Natural Resources and Mines, jointly identify the requirements for a suitable gauge network for the Callide Valley to allow meaningful and timely flood warnings. The review should identify key stakeholders, examine potential funding sources and include a cost benefit analysis.
    - Several additional gauges were added in the BSC LGA post 2015 in enhance the streamflow and rainfall information available within the LGA
- Prior to September 2015, the Banana Shire Council develops a multi-channel warning strategy and associated public information campaign, including common language and consistent messaging, for the Banana Shire.
    - BSC uses the Standard Emergency Warning Signal and Pre-formatted emergency alert messages and associated GIS polygons after the event.
- Prior to September 2015, SunWater and the Banana Shire Council jointly develop a multi-channel, common warning strategy, including common language and consistent messaging, for residents downstream of SunWater assets within the Banana Shire Council, and clearly articulate procedures for dissemination.
    - There is significant more communication and meetings between Sunwater and BSC after the 2015 event to be on the same page during rainfall events and dam releases.
- As part of the above, both the Banana Shire Council and SunWater ensure Emergency Alert messages are pre-formatted, consistent, polygons are identified according to risk, and that they are tested and practiced with the State Disaster Coordination Centre.
    - BSC and SunWater have pre-populated polygon that are used during a disaster. These polygon have been tested under flood events after the 2015 floods.
- Banana Shire Council completes business continuity planning as a matter of priority, including documentation and testing of the plan.
    - After the KBR flood study was completed a Business continuity plan was completed.
- The evacuation sub-plan component of the Local Disaster Management Plan should be reviewed, including any identified triggers for activation. Ideally, the plan should be tested in a live, multi-agency exercise prior to next summer.
    - Yes, the triggers were reviewed in the KBR flood study and amended based on new information but these triggers have not been refined since 2015 with the inclusion of the additional rainfall and streamflow gauges within the catchment.
    - Sub-groups have been developed for each region to ensure local knowledge is use to enhance the planning and evacuation strategy for each of the different flood impacts that affect the townships within BSC.

– Local Disaster Coordination Centre capability and capacity should be reviewed to ensure adequate staffing arrangements are in place to fill key positions, and that operational protocols are known and practiced across all functions to provide redundancy. Assistance for review and necessary training should be sought from key Local Disaster Management Group member agencies.
    - Banana Shire Council has implemented an annual training calendar to ensure the on-going availability of such training to relevant Council staff.

5.8 Community response

The following section outlines the community's response to the questionnaire as part of the project and the community interaction and responses provide as part of the flood commission.

5.8.1 Questionnaire

Part of this review is to understand the community's resilience to flooding and current strategies the community uses during flood events. Community participation is critical in the development of effective warning systems. By undertaking this questionnaire, the community is helping BSC understand where future community education is required to aid all residents in having the required information to make an informed decision during flood events. This will also drive any future flood studies for BSC.

Flood hazard is a risk to the community as a whole. It is therefore appropriate that the community have input into changes to the current flood warning system, thereby accounting for their needs, where applicable to do so. The community survey is the first step in ensuring the community's needs are identified so they can be incorporated within the review.

Information gathered from the survey will:

– Assist with the review and understanding of BSC's flood hazard.
– Inform changes and refinements of the information presented during a flood event.
– Inform where the community feels information is limited to inform flood risk and evacuation; and
– Shape Council's response to flood emergencies.

A questionnaire was developed and is outlined in Appendix A.

5.8.1.1 Questionnaire response

Key information from the questionnaire is outlined below:

– Only 95 people responded to the questionnaire with a total population of 19,000
– Majority of respondents who took part in the questionnaire were from Biloela and Moura, accounting for over 65% of respondents
– Majority that responded were either a homeowner or landowner within the LGA with a small portion of people renting
– Over 60% of the respondents have lived in the LGA for over 11 years
– There is over 25% of the respondents that have lived in the LGA for between 2 to 5 years which are likely to have not experienced a long history of flooding
– Over 75% of the respondents have experienced flooding at their property
– Of those that have experienced flooding 56% responded that hey did not find the messages they received to be helpful in informing decisions
– Over 67% of respondents know how a minor, moderate and major flood impacts their property and evacuation.
– The majority of respondents had both flood cover for both building and contents.
– Over 67% of respondents have not seen a flood map for their property. And over 70% would find a digital platform with flood events helpful.
– Over 75% of respondents were prepared for a flood event.

– The majority of people use the Bureau of Meteorology, Council SMS alerts, Social Media and Personal observation to make decisions leading up to a flood event. These items are also the key elements that are used to stay up to date during a flood event.
– The community majority stays and bunder down or use Bureau of Meteorology alerts to guide a decision for a flood event.
– The majority of the community can evacuate in less than 6 hours.
– The vast majority of the respondents were either hesitant to leave early under a volunteer evacuation order due to looting or were usure what their decision would be. Only 30% said they would evacuate early.
– The majority of the respondents wanted major roads to be reopen after up to 2 days.
– The three key elements that the community wants running after a flood event are hospitals, the highway open and supermarkets open.

5.8.2 Banana Shire Flood Event De-Brief – response December 2010 to January 2011

As part of the Queensland Flood Commission of Inquiry, Banana Shire Council provided their de-brief after the 2010 / 2011 flood event. Key information from the de-brief was that the LDCC had a false sense of security leading into the flood event. At the time of the event no flood mapping existed to aid council is understanding the flood levels that the Bureau was reporting during the event. It is also noted from the information within the de-brief that there was a council belief that council had over-reacted during the March event therefore they did not want to over-react with this event.

Other issue raised in the de-brief was that about staffing and the event occurring during a time when many members of council were on leave. A key issue raised was that BSC needed more automatic measuring weather stations within the LGA and that a new streamflow gauge was required on Castle Creek as that was the direction of flooding for Theordore. This issue of lack of automatic weather gauges has been rectified after the event and a new streamflow gauge was installed post event on Castle Creek to ensure council has sufficient information about potential flooding causes.

Council during the event was relying on historical information from locals to drive the evacuation and where was safe within each township. The issue was that when river levels exceeded the 1956 levels, there was no historical knowledge to fully understand what was about to occur. A lot of these problems that were noted during the 2010 / 2011 floods was rectified when BSC commissioned the Flood Study for the LGA. This provided council with maps to show what could occur when river levels were at specific levels.

Based on the information within the de-brief the response in Wowan and Jambin were perceived to have gone well with the only concerns that water from Callide Dam might be released and cause more flooding impacts. A key issue that was noted by council was that many roads that were impacted where not identified on the DTMR website. Sandbags were required to be available at all townships. It is noted that no information about if sandbags are provided in future events based on the information that has been reviewed.

The lessons learned from the event are outlined below:

– The public needs to receive up to date information and advice,
– More accurate river levels and contours are needed.
– Lack of local knowledge of BOM: Cr Warren Middleton advised that once the Theodore SES had evacuated the SES shed, BOM were totally reliant on the LDCC for river heights / information and the LDCC was updating BOM's website.
– Access to Aerodromes: Collin Head advised that the Deputy Premier has been verbally advised of the need to upgrade access to Aerodromes.

5.9 Taroom flood warning

The Taroom flood warning system is dictated by two gauges along the Dawson River downstream of the main township. Both gauges are located at the same location within the river, with one gauge being automatic and owned by DRWMW and the other gauge being manual and owned by the Bureau. The current flood extent modelled for this township focused on floods rarer than the 5% AEP flood. These flood extents that have been modelled are in excess of the current major gauge classification.

Over the 115 years that the Taroom gauge has been operation since 1911, there have been 19 major floods recorded on a yearly basis and 33 moderate floods recorded. The maximum water level recorded for each year compared to the minor, moderate and major gauge classification is illustrated in Figure 5.11. There is a historical flood level from 1890 which is the highest flood of record for this location which is documented to correspond to a flood level of 14.78 m on gauge datum. The current gauge classification for this location is illustrated in Figure 5.12.

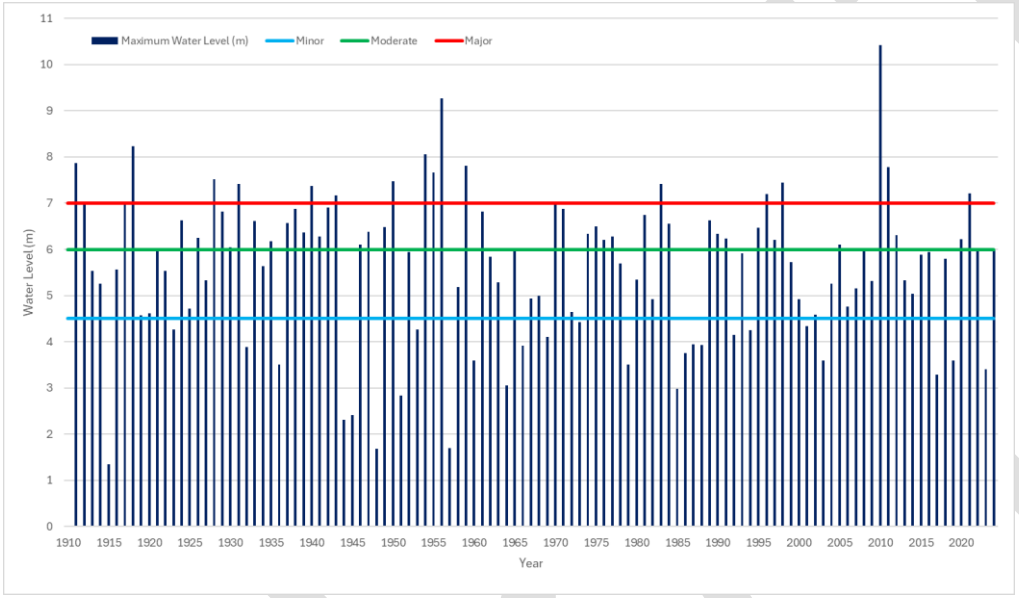

Figure 5.11 Taroom Gauge maximum yearly flood level

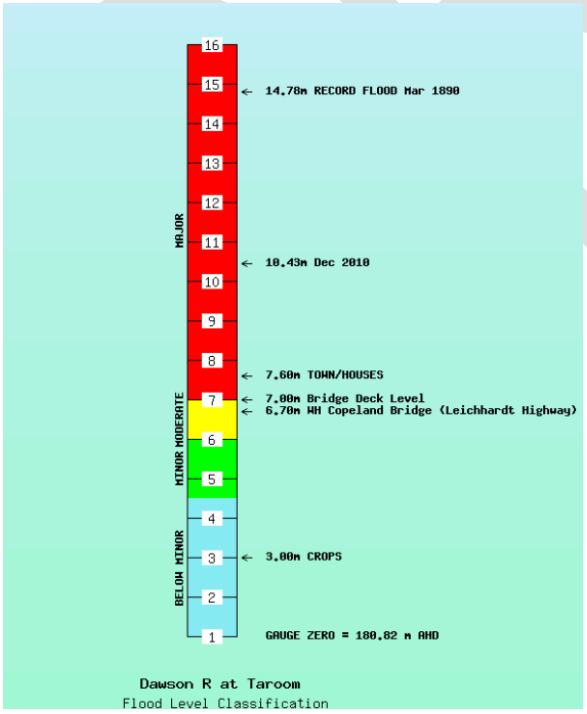

Figure 5.12 Taroom Gauge flood classification

There are three Bureau information locations upstream of Taroom that can be used by BSC in the understanding of flood warning for the township. The most upstream Bureau information gauge is located 68 km upstream of Taroom gauge at Utopia Downs. The next two gauges are located 38 km upstream of Taroom at Tarana Crossing.

Each of these gauges are owned by different entities with limited information available for the two Tarana Crossing gauges owned by the Bureau and BSC. A relationship between the gauge classification at Utopia Downs and Taroom gauge needs to be developed so that early warning ccan be provided to the downstream township. Graphing the year flood peaks at Utopia Downs with the current minor, moderate and major flood classifications is illustrated in Figure 5.13.

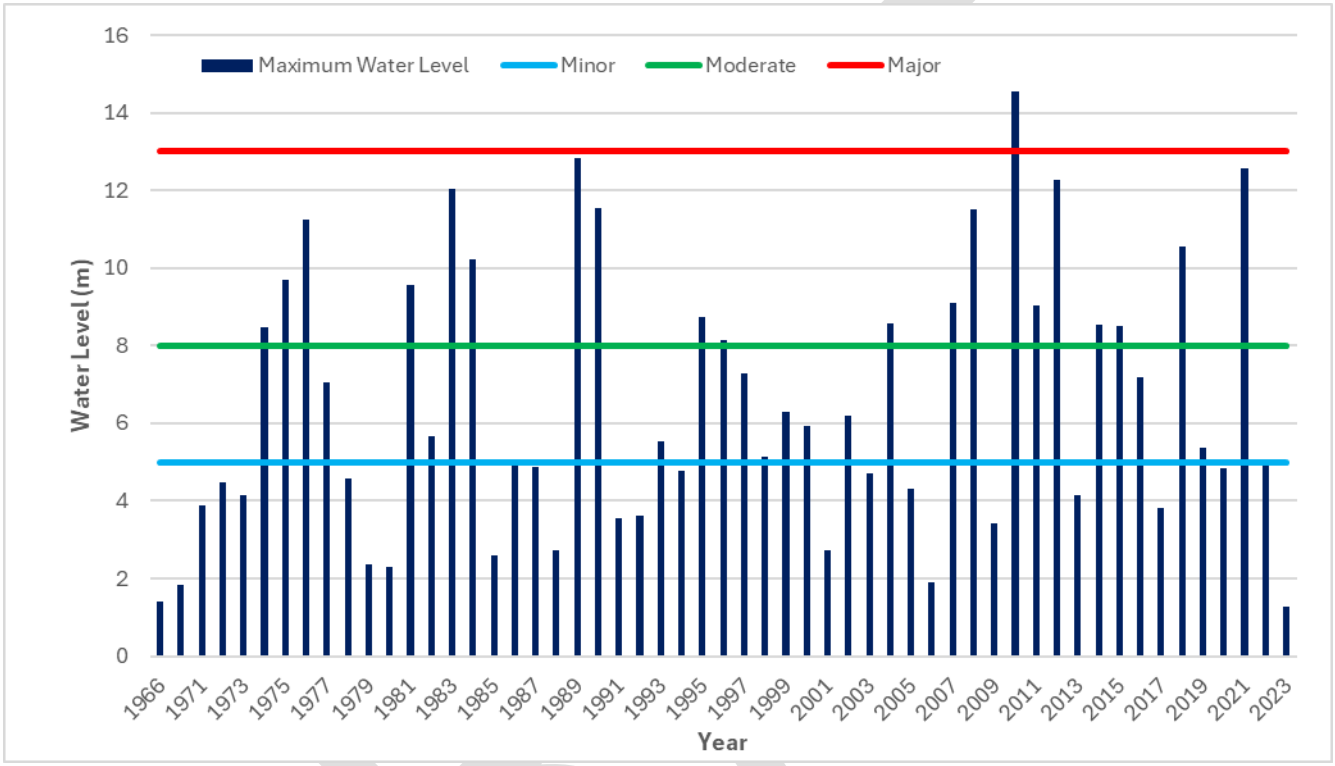

Figure 5.13 Utopia Downs Gauge maximum yearly flood level

Currently the gauge classifications for Taroom show very limited assets within the minor or moderate flood extent which may lead to the community becoming complacent as major floods are noted to occur frequently. These gauge classification needs to be amended to align with QRA's guide for gauge classifications (Queensland Reconstruction Authority, 2020). As outlined within Section 4, a significant amount of assets within Taroom are impacted in events that are rarer than the 1% AEP event which is above a major flood classification.

Table 5.7 Current gauge classifications – Taroom Township

Bureau Number	Station Name	Forecast location	Information location	Guage Zero (m)	Datum	Flood Classification		
						Minor (m)	Moderate (m)	Major (m)
35115	Taroom	Y		180.82	AHD	4.5	6	7
35282 / 130302A	Taroom Tm	Y		180.82	AHD	4.5	6	7

5.10 Theodore Gauge classification

There are five (5) information streamflow gauges between the townships of Taroom and Theodore and two (2) forecast locations for Theodore. These information gauges and forecast gauges are outlined in Table 5.8. The Theodore gauge classification totem is illustrated in Figure 5.14.

Table 5.8 Current gauge classifications - Theodore

Bureau Number	Station Name	Forecast location	Information location	Guage Zero (m)	Datum	Flood Classification		
						Minor (m)	Moderate (m)	Major (m)
35096	The Glebe		Y	170.76	AHD	2	3	4
535044	Glebe Weir Hw Tm		Y	150.00	STATE	1.5	2.5	3.5
535045 / 130345A	Glebe Weir Tw Tm		Y	160.95	STATE	8.5	10.5	12
539070	Gyranda Weir Tm		Y	100.25	AHD	1.5	2	3
539163	Gyranda Weir Alert		Y	100.25	AHD	1.5	2	3
539065 / 1300358A	Isla-Delusion Xing Tm		Y	145.52	AHD	7	9	10
539164	Isla-Delusion Crossing Alert		Y	145.52	AHD	7	9	10
39315	Theodore	Y		127.65	AHD	8	11	12
535110	Theodore Weir Tm	Y				8	11	12

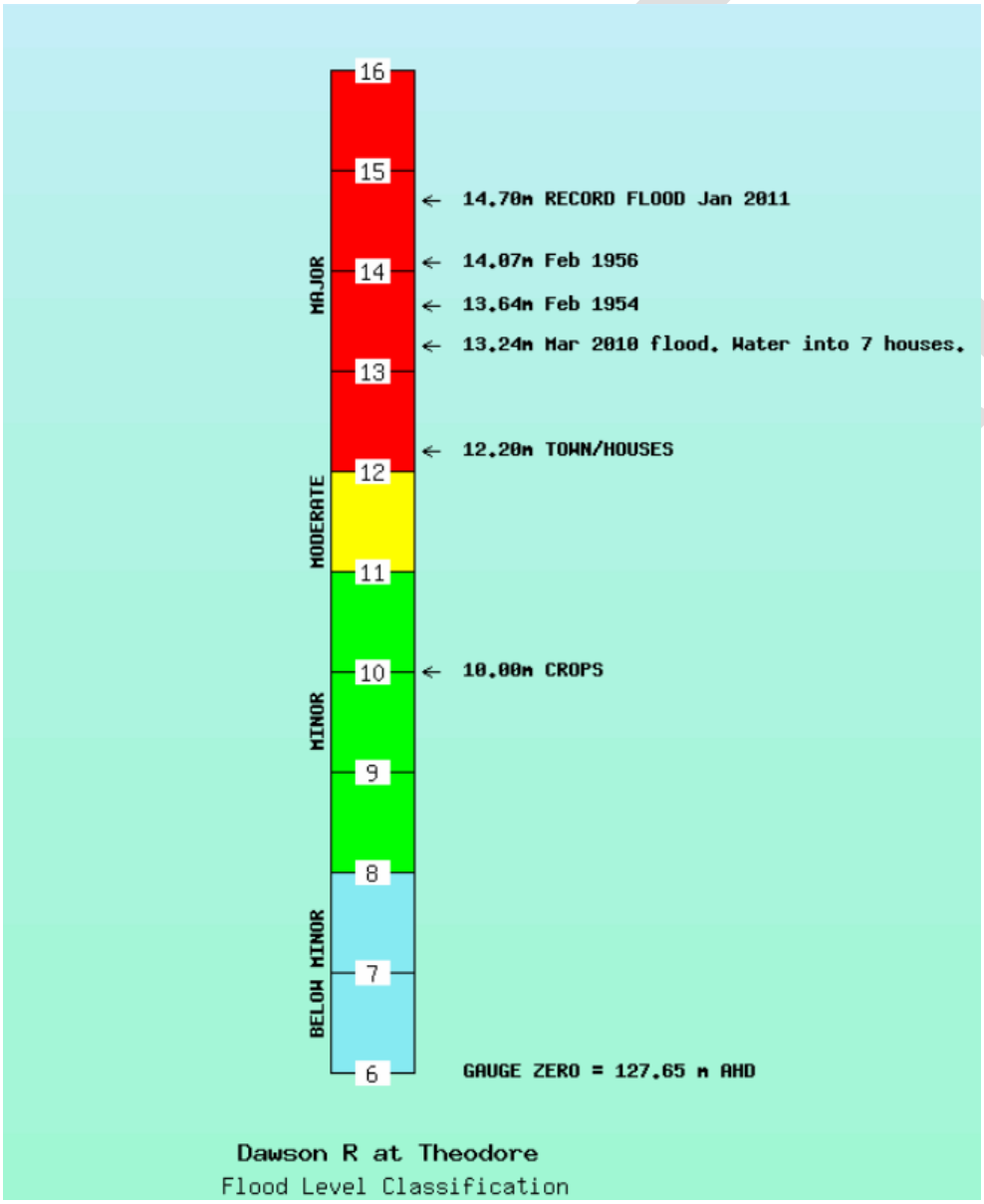

Figure 5.14 Theodore Gauge flood classification

Table 5.9 outlines the conversion of the gauge height gauge classifications into water level in meters Australia height datum (mAHD) at Theodore gauge.

Table 5.9 Current gauge classifications – Theodore (GH to water level conversion)

Gauge Height (m)			Water Level (mAHD)		
Flood Classification			Flood Classification		
Minor	Moderate	Major	Minor	Moderate	Major
8	11	12	135.65	138.65	139.65

As part of the preparedness fact sheet provided through the BSC Disaster Management, the flood results for the 10% AEP, 5% AEP, 2% AEP and 1% AEP are mapped. On these maps the gauge water level in gauge height is outlined. Included on the maps is that the1% AEP flood level corresponds to 14.54 m on the gauge which was 10 cm above the 2010 level. A similar statement is also on the 10% AEP maps which states that the 10% AEP design level is 1.5 m higher than the 2013 flood level.

Within the Banana Shire Flood Model Maps (Banana Shire, 2024), this same information is discussed with different gauge heights documented within the digital platform compared to the pdf maps available within the Preparedness fact Sheets linked under the Disaster Management section of BSC website. It is noted that the water levels within the waterRide models were checked against those reported on the maps, the correlation between the gauge height and the water level is outlined in Table 5.10 for the design events

Information on the pdf maps and both WaterRide and BSC mapping platform should all be based on the same dataset. There is generally an agreement between the WaterRide and gauge water level within the BSC mapping platform, but the information presented in the pdf that are part of the Preparedness Fact Sheets are lower than the information presented in both digital datasets.

It does not appear that the errors are associated with different gauge zeros being used in either assessment as the difference between the pdf and digital information is not consistent. Given the general agreement between the WaterRide and BSC mapping platform, information from these two sources should be used to assess the likely flood extents for different flood events that impacts Theodore. It is noted that all the design flood events that were modelled within Theodore all correspond to moderate to major flood events. No floods that correspond to the minor flood event have been modelled as part of the KBR study.

Table 5.10 Design gauge classifications – Theodore (GH to water level conversion)

Event	According to the pdf maps		According to WaterRide results		According to spatial information reported on BSC mapping platform	
	GH (m)	Level (mAHD)	GH (m)	Level (mAHD)	GH (m)	Level (mAHD)
10% AEP	11.42	139.07	12.71	140.36	12.71	140.36
5% AEP	12.51	140.16	13.41	141.06	13.41	141.06
2% AEP	13.81	141.46	14.22	141.87	14.22	141.87
1% AEP	14.54	142.19	14.82	142.47	14.82	142.47
1% AEP with climate change	15.27	142.92	15.51	143.16	15.51	143.16
0.2% AEP			15.71	143.36	15.71	143.36
0.5% AEP			16.41	144.06	16.41	144.06
PMF			20.28	147.93	20.28	147.93
Historical – 2010 Event			14.7	142.35	14.7	142.35
Historical – 2013 Event			10.83	138.48	10.83	138.48

5.10.1 Annual flood peaks

The annual flood peaks at Theodore gauge are outlined in Figure 5.15. This figure was extracted from the Theodore flood summary for the 2010-2011 event (Bureau of Meteorology, 2011). Based on information presented

within this figure, Theodore has recorded over 14 major floods since 1920. There have been six (6) moderate floods recorded and 24 minor floods recorded.

The flood history at The Glebe TW (535045 / 130345A) and Isla-Delusion Xing Tm (539065 / 1300358A) gauges is outlined in Figure 5.16 and Figure 5.17. Over the 42 years of data at The Glebe TW (539065 / 1300358A), 21 yearly maximum peak water levels were below minor flood classification, ten (10) were classified as a minor flood, three (3) was classified as a moderate flood and eight (8) were classified as a major flood. Over the 31 years of data at Isla-Delusion Xing Tm (539065 / 1300358A), 15 yearly maximum peak water levels were below minor flood classification, ten (10) were classified as a minor flood, one was classified as a moderate flood and five (5) were classified as a major flood. It is noted there is a correlation between a flood major flood classification being noted at The Glebe that also corresponds with a major flood at Isla-Delusion Xing Tm. This same correlation was not between the two upstream gauges and Theodore gauge information. Theodore was noted to have been impacted by more major flood events that what was noted upstream.

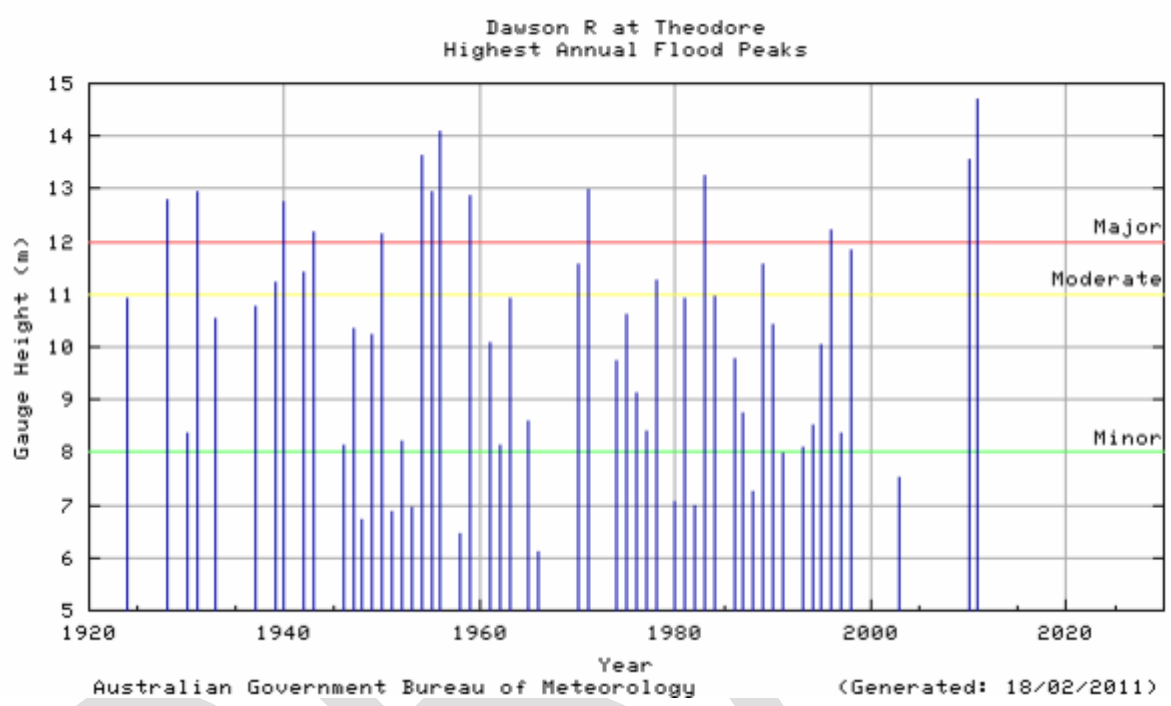

Figure 5.15 Theodore Gauge maximum yearly flood level

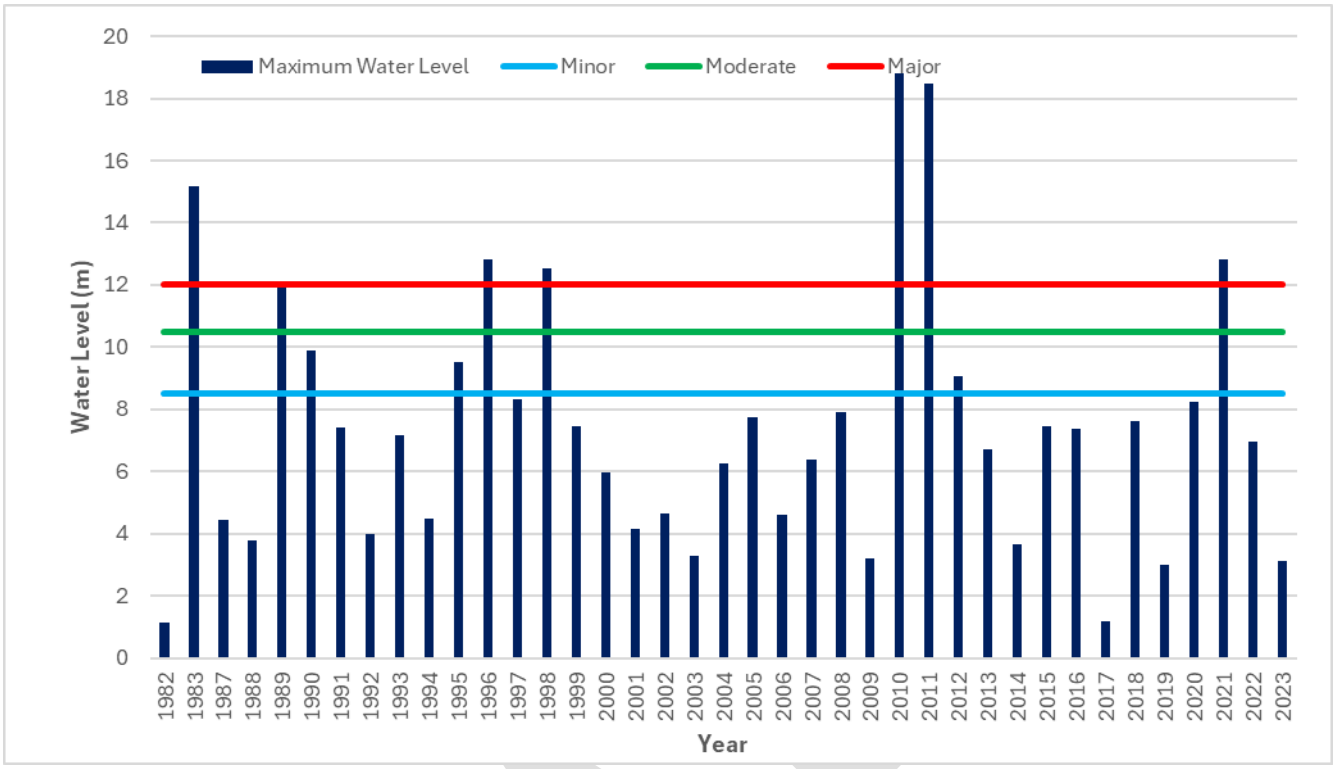

Figure 5.16 The Glebe TW (535045 / 130345A) Gauge maximum yearly flood level

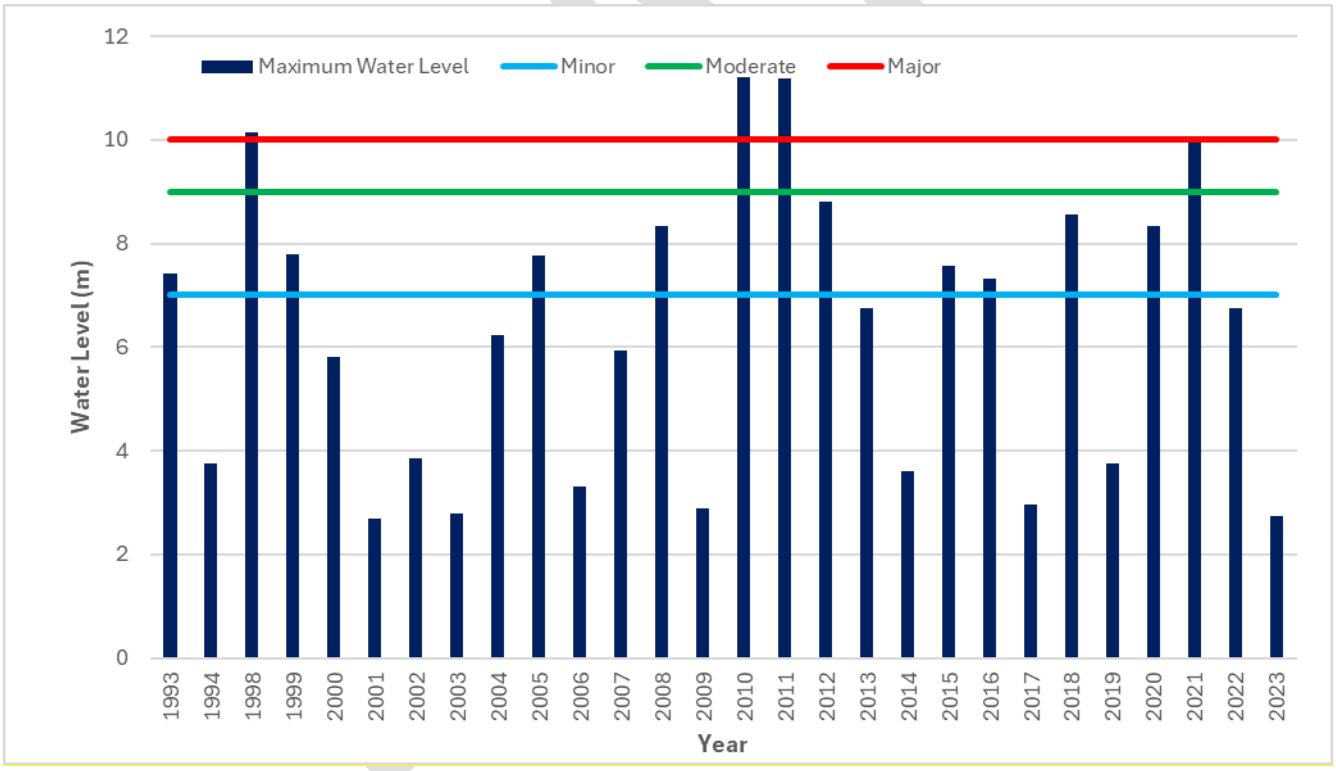

Figure 5.17 Isla-Delusion Xing Tm (539065 / 1300358A) Gauge maximum yearly flood level

When a new flood study is commissioned that includes modelling the whole catchment of BSC, further relationships between gauges can be developed to enhance the current flood warning system that is employed by council to include the additional gauges within the catchment. This will provide a robust warning system with redundancies. A key item that is lacking within the current warning network is a traffic light system that uses the information from the upstream gauges to inform early decisions for Theodore. The current warning system relies on information from a single gauge.

5.11 Review of WaterRide Models

There are six (6) WaterRide projects that make up the flood warning system within the Banana Shire Council LGA. The WaterRide projects comprises of the following locations:

– Baralaba
– Callide Valley
– Dululu & Wowan
– Moura
– Taroom
– Theordore

5.11.1 Baralaba WaterRide project

The current Baralaba WaterRide project comprises of the following information:

– Cadastre
– 1978 event – depth, water level and velocity
– 2010 event – depth, water level and velocity
– 2013 event – depth, water level and velocity
– 2015 event – depth, water level and velocity
– 10 year flood – depth, water level and velocity
– 20 year flood – depth, water level and velocity
– 50 year flood – depth, water level and velocity
– 100 year flood – depth, water level and velocity
– 100 year flood with climate change – depth, water level and velocity
– 500 year flood – depth, water level and velocity
– 2000 year flood – depth, water level and velocity
– PMF – depth, water level and velocity

5.11.2 Callide Valley WaterRide project

The current Callide Valley WaterRide project comprises of the following information:

– Cadastre
– 1978 event – depth, water level and velocity
– 2010 event – depth, water level and velocity
– 2013 event – depth, water level and velocity
– 2015 event – depth, water level and velocity
– 10 year flood – depth, water level and velocity
– 20 year flood – depth, water level and velocity
– 50 year flood – depth, water level and velocity
– 100 year flood – depth, water level and velocity
– 100 year flood with climate change – depth, water level and velocity
– 500 year flood – depth, water level and velocity
– 2000 year flood – depth, water level and velocity

5.11.3 Dululu & Wowan WaterRide project

The current Dululu & Wowan WaterRide project comprises of the following information:

– Cadastre
– 2010 event – depth, water level and velocity
– 2013 event – depth, water level and velocity
– 2015 event – depth, water level and velocity
– 10 year flood – depth, water level and velocity
– 20 year flood – depth, water level and velocity
– 50 year flood – depth, water level and velocity
– 100 year flood – depth, water level and velocity
– 100 year flood with climate change – depth, water level and velocity
– 500 year flood – depth, water level and velocity
– 2000 year flood – depth, water level and velocity
– PMF – depth, water level and velocity

5.11.4 Moura WaterRide project

The current Moura WaterRide project comprises of the following information:

– Cadastre
– 2010 event – depth, water level and velocity
– 20 year flood – depth, water level and velocity
– 50 year flood – depth, water level and velocity
– 100 year flood – depth, water level and velocity
– 100 year flood with climate change – depth, water level and velocity
– PMF – depth, water level and velocity

5.11.5 Taroom WaterRide project

The current Taroom WaterRide project comprises of the following information:

– Cadastre
– 2010 event – depth, water level, velocity, depth-velocity product and hazard
– 20 year flood– depth, water level, velocity, depth-velocity product and hazard
– 50 year flood– depth, water level, velocity, depth-velocity product and hazard
– 100 year flood– depth, water level, velocity, depth-velocity product and hazard
– 100 year flood with climate change– depth, water level, velocity, depth-velocity product and hazard
– PMF– depth, water level, velocity, depth-velocity product and hazard

5.11.6 Theordore WaterRide project

The current Theordore WaterRide project comprises of the following information:

– Cadastre
– 2010 event – depth, water level and velocity
– 2013 event – depth, water level and velocity
– 10 year flood– depth, water level and velocity
– 20 year flood– depth, water level and velocity
– 50 year flood– depth, water level and velocity
– 100 year flood– depth, water level and velocity
– 100 year flood with climate change– depth, water level and velocity
– 500 year flood– depth, water level and velocity

– 2000 year flood– depth, water level and velocity
– PMF– depth, water level and velocity

5.11.7 Improvements to WaterRide projects

The following improvements to the WaterRIDE models can be undertaken to ensure information within this platform is informative during flood events:

– Ensuring that the gauge locations are included within the WaterRide project include all water level and rainfall gauges
  - There is limited ability of doing flood forecasting within the current projects as the streamflow gauges have not been included. Currently the platform is unable to model a gauge height that would be determined from the Bureau to understand the likely roads and properties impacted if that direct flood event has not been modelled.
– Ensure integration of the Envirmon information into WaterRide to see current gauge readings within flood warning system
– Key road crossings to be digitised and included within the WaterRide to enable key reporting information that drives evacuation is available within the flood warning system
– Currently there is limited flood intelligence available within the platform that enables for a rainfall event to be modelled within the platform to understand the localised flood issues or flash floods.

6. Funding arrangements

Current funding arrangements which are available to council is outlined below.

6.1 Disaster Ready Fund

The Disaster Ready Fund (DRF) is the Australian Government's flagship disaster risk reduction initiative which will fund a diverse set of projects in partnership with states and territories to deliver medium-term and long-term national outcomes, investing up to $1 billion over the next five years.

Objectives

– Increase the understanding of natural hazard disaster impacts, as a first step towards reducing disaster impacts in the future.
– Increase the resilience, adaptive capacity and/or preparedness of governments, community service organisations and affected communities to minimise the potential impact of natural hazards and avert disasters.
– Reduce the exposure to risk, harm and/or severity of a natural hazard's impacts, including reducing the recovery burden for governments and vulnerable and/or affected communities.

The next round of Disaster Ready Funding will open in January 2025 and there will only be three more rounds of funding under this arrangement.

7. Recommendations

Key recommendations from this review are outlined below:

– Update the Flood Study for the whole of catchment to Australian Rainfall and Runoff 2019 for the regional flood event.
  - Information from this updated flood study can be used to re-classify the gauge classification within the LGA,
  - Provide updated flood risk for the LGA including understanding the current impact to design floor levels within the catchment with consideration to climate change
  - Update the representation of the catchment within the hydraulic model as there has been significant improvements with modelling methodology which enables a finer resolution product to be developed.
  - Expand the hydraulic model representation to the whole of LGA instead of each township so that evacuation immunity understanding can be undertaken
  - Expanding the hydraulic model to the whole of the LGA will enable the immunity of access roads to be fully understood so conversation with TMR and other responsibility entities can be undertaken in the future. This will enable council to have conversation with TMR to raise specific section of the roads the will provide faster recovery after an event has impacted the region

The below table outlines all the recommendations with associated priority for implementation by BSC

Table 7.1 Recommendations

Priority	Expected Year of Execution	Funding	Item	Reason	Key outcomes
1	2025- 2027	Disaster Ready Fund – Grant Application (2025-2026) Application would need to go in by March 2025 (Round 3 funding)	Updated Flood Study for BSC	Have a flood study that is in accordance with current practice ARR 2019.	– Having a better understanding on evacuation route immunity – Current flood risk within the catchment based on the refinements to hydrology and hydraulic modelling – This has current being included in the current funding from QRA
2	2025 - 2028	Disaster Ready Fund – Grant Application (2025-2026) Application would need to go in by March 2025 (Round 3 / Round 4 funding)	Review and update the gauge classifications based on the updated Flood Study. This project is contingent on the Flood Study being completed	Current gauge classification is not consistent with QRA guidance and there are discrepancies between BSC and Bureau gauge classification	– Develop gauge classification that are consistent with QRA guidelines – Develop a gauge classification manual which outlines what roads and houses are impacted in each gauged event – Develop a formalised document that LDMG can used in flood events – Educate the community about different gauge classifications
1	ASAP	No funding required	Filing of event de-briefs after flood events	There was limited information that could be used to review how the total flood	This information is required to fully understand during event where information was lacking and what systems did not work.

Priority	Expected Year of Execution	Funding	Item	Reason	Key outcomes
				warning system worked in a real event.	A key element of a total flood warning system is a post event analysis which illustrates what worked, what did not work and where additional information would be helpful.
5			WaterRide Model updates	The current WaterRIde projects provide limited flood intelligence applicability given the lack of information included within these models. Additional features can be included within the model so these model have a flood intelligence facility.	This is more of future high-level goal as it requires significant education of the council workforce to ensure this program is usable. Given the current limited resources within the Council area, this recommendation should only be considered if it is part of council future plans to expand their internal skills.
2	2025		Community Education	Based on the response from the community doing community engagement to show the online flood platform to make your community understand their current flood risk	

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Appendices

Appendix A

Questionnaire

Table 2 Banana Shire Council Questionnaire – Flood Risk and Flood Warning

Question	Options	Tick or Cross
Q1: Which township do you live within or closest township to your property?	Banana	
	Baralaba	
	Biloela	
	Cracow	
	Dululu	
	Goovigen	
	Jambin	
	Moura	
	Taroom	
	Thangool	
	Theordore	
	Wowan	
Q2: Which describes your residential status within Banana Shire?	I am a homeowner	
	I am a landowner	
	I rent	
	I only work in the region	
Q3: How long have you lived at your current address?	0 -1 year	
	2 – 5 years	
	6 – 10 years	
	11 – 20 years	
	20 + years	
Q4: Has there been a flood event while you have lived at your current address?	Yes	
	No	
Q5: If you have experienced a flood within Banana Shire, did you feel the messages you received helpful in informing your decisions during the flood event?	Yes	
	No	
	NA	
The size of a flood event can be expressed as Minor, Moderate and Major. On the Bureau of Meteorology's website, the Minor, Moderate and Major flood levels are illustrated for each water level gauge within Banana Shire Council.		
Q6: Do you know how a Minor; Moderate or Major flood impacts your property or evacuation?	Yes	
	No	
Q7: Do you have flood insurance for your property or land?	Yes, contents coverage only	
	Yes, building coverage only	

	Yes, Building and Contents coverage	
	No, I don't have flood insurance	
	Unsure	
	Prefer not to say	
Q8: Have you seen a flood map for your property?	Yes	
	No	
	Unsure	
Q8a: Do you know where you can get flood information about your property?	Yes	
	No	
	Unsure	
Q8b: What information would be useful to understand your flood risk?	Digital Mapping Platform with flood events	
	Hard copy information	
	Other	
Q9: The size of a flood event can be expressed as Minor, Moderate and Major.		
Q9A: How well prepared are you for a flood event?	Very prepared, I know my flood risk and evacuation plan	
	Somewhat prepared	
	Unsure	
	Not very well prepared	
	Unprepared	
Q9B: How well prepared are you to act if the flood warning becomes more severe than initial warnings?	Very prepared, I know my flood risk and evacuation plan	
	Somewhat prepared	
	Unsure	
	Not very well prepared	
	Unprepared	
Q10: If a Major flood event was to occur tomorrow, how well informed do you feel about the flood risk to you and your property.	Very informed - I know my property well	
	Somewhat informed - I would like to know more	
	Unsure	
	Not very informed - I would like to know more	
	Unprepared - I am unaware of the full extent of risk to my property	

Q11: What warnings would you use to make decisions leading up to a flood event? (tick multiple)	Bureau of Meteorology	
	Flood warning siren	
	ABC radio	
	Council SMS alert	
	Council Disaster Dashboard	
	Social media	
	Personal observations (rain gauge, rain radar)	
	My neighbours	
	Local SES	
	News	
	Police	
	Other	
Q11a: During a flood event, how would you use to stay up to date with flood information?	Bureau of Meteorology	
	Flood warning siren	
	ABC radio	
	I watch the weather	
	I measure rainfall	
	Council SMS alert	
	Council Disaster Dashboard	
	Social media	
	My neighbours	
	Local SES	
	News	
	Police	
	Other	
Q12: How would you typically prepare for a flood event? (tick multiple)	Stay and bunker down	
	Retreat to safety (friends/family) on higher ground or another region	
	Refer to my personal emergency plan	
	I don't have a personal emergency plan	
	Unsure what I would do	
	Seek/listen to advice from Rural Fire Service/State Emergency Services	
	Listen for warning sirens	
	Use Bureau of Meteorology alerts to guide my decision making	

	Use Council notifications to guide decision making	
	Watch the change in weather and work out if I want to evacuate	
	Other	
Q12a: How long would it take for you to prepare for a flood event to evacuate?	< 3 hours	
	3 – 6 hours	
	6 – 12 hours	
	12 – 24 hours	
	24+ hours	
Q12b: If you were to stay and bunker down, how prepared are you for extended periods of isolation?	Adequate supplies for 1 day	
	Adequate supplies for 2 – 5 days	
	Adequate supplies for 6 - 10 days	
	Adequate supplies for 10+ days	
Q13: How likely are you to evacuate early or evacuate under volunteer evacuation orders?	Happy to evacuate early	
	Hesitant to leave property for fear of looting	
	Unsure	
Q14: After a flood event, how long do you believe is reasonable for the major roads across the region to remain closed?	Up to 2 days	
	Up to 5 days	
	Up to 1 week	
	Up to 2 weeks	
	Up to one month	
	Most roads should be open within 24 hours after the flood recedes.	
Q15: After a major flood event, what are the top three things you feel would be important to you and the community? (Tick multiple)	Hospital is operational	
	Local schools reopened	
	Highway open	
	Supermarket open	
	Local business reopened	
	Parks reopened	
	I'm in my home with my family and pets	
	Power is back on	
	Other	

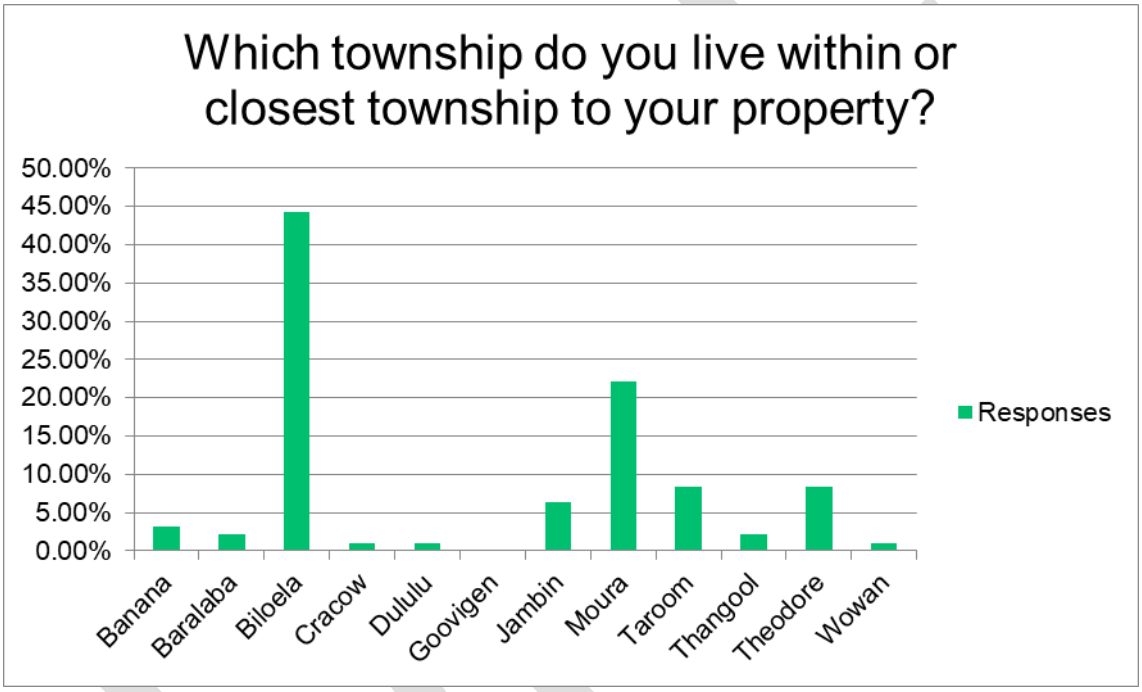
Additional Comments:

Appendix B

Questionnaire Response

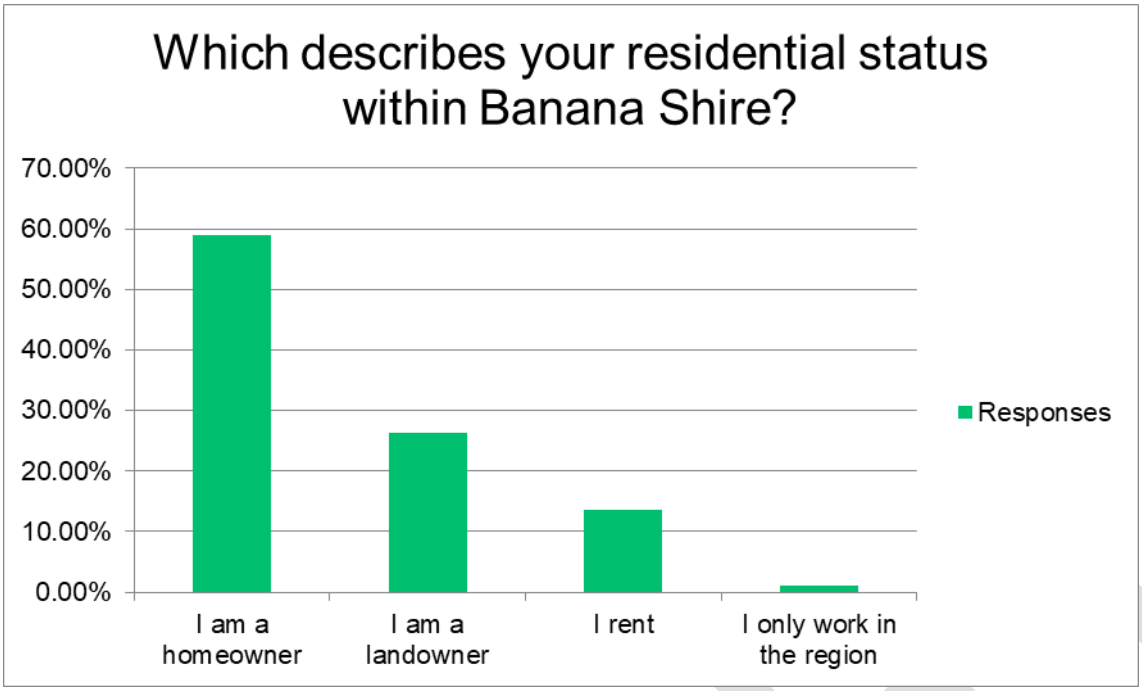
Which township do you live within or closest township to your property?

Answer Choices	Responses	
Banana	3.16%	3
Baralaba	2.11%	2
Biloela	44.21%	42
Cracow	1.05%	1
Dululu	1.05%	1
Goovigen	0.00%	0
Jambin	6.32%	6
Moura	22.11%	21
Taroom	8.42%	8
Thangool	2.11%	2
Theodore	8.42%	8
Wowan	1.05%	1
	Answered	**95**

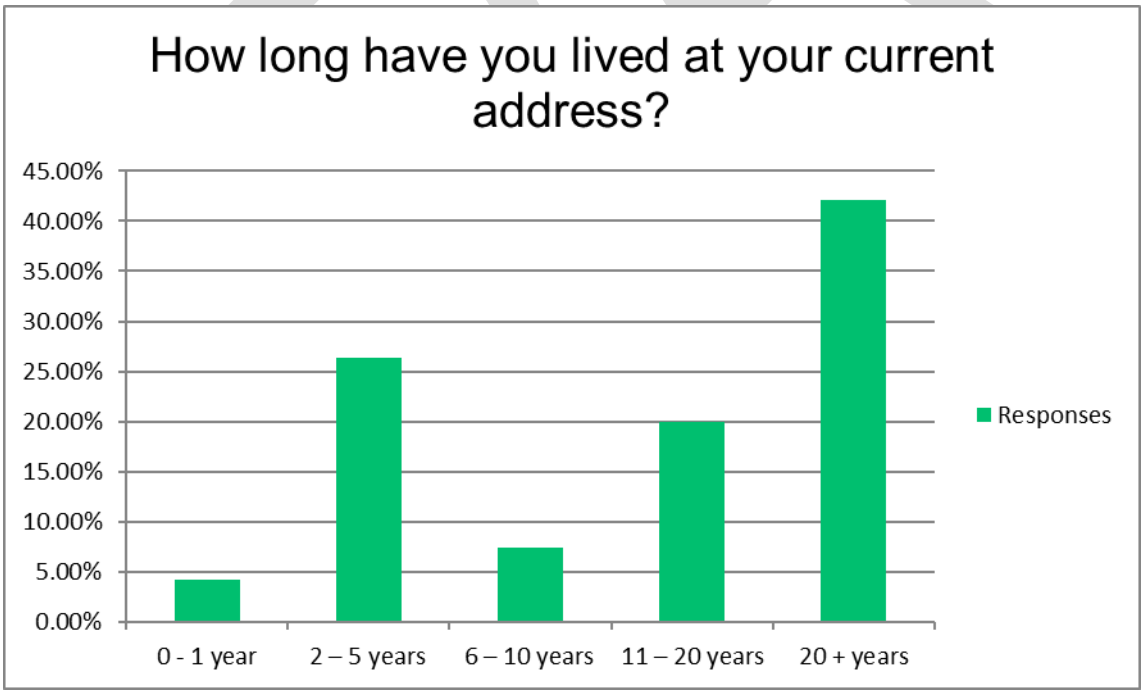


Which describes your residential status within Banana Shire?

Answer Choices	Responses	
I am a homeowner	58.95%	56
I am a landowner	26.32%	25
I rent	13.68%	13
I only work in the region	1.05%	1
	Answered	**95**



Answer Choices	Responses	
0 - 1 year	4.21%	4
2 – 5 years	26.32%	25
6 – 10 years	7.37%	7
11 – 20 years	20.00%	19
20 + years	42.11%	40



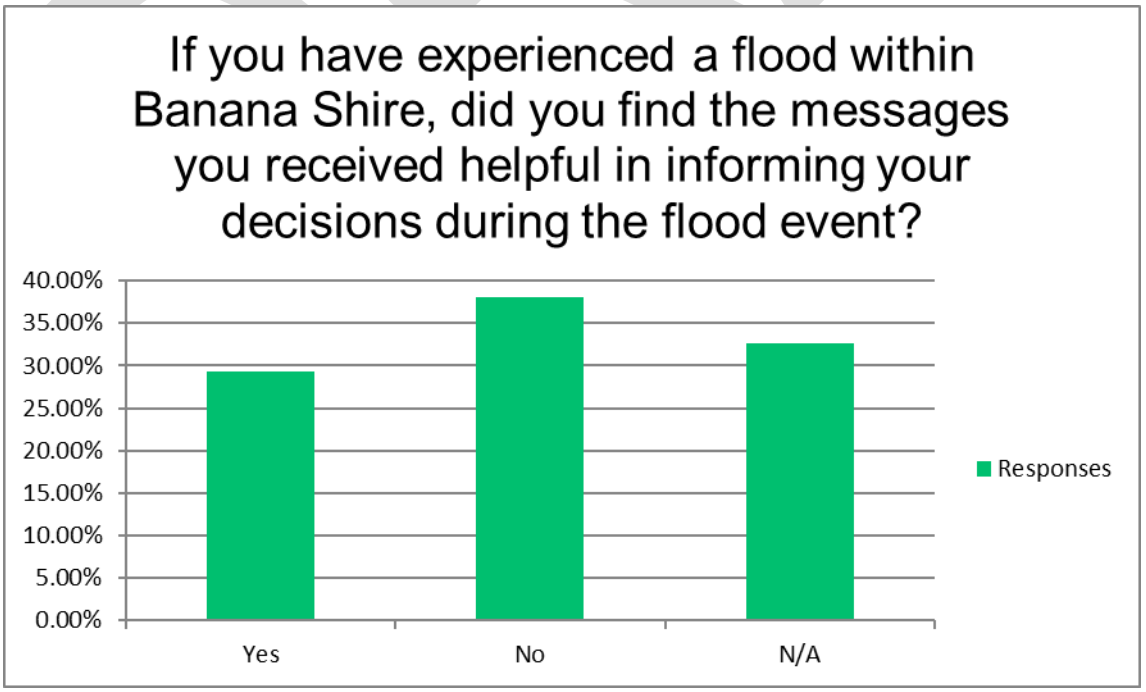
Has there been a flood event while you have lived at your current address?

Answer Choices	Responses

Yes	75.79%	72
No	24.21%	23

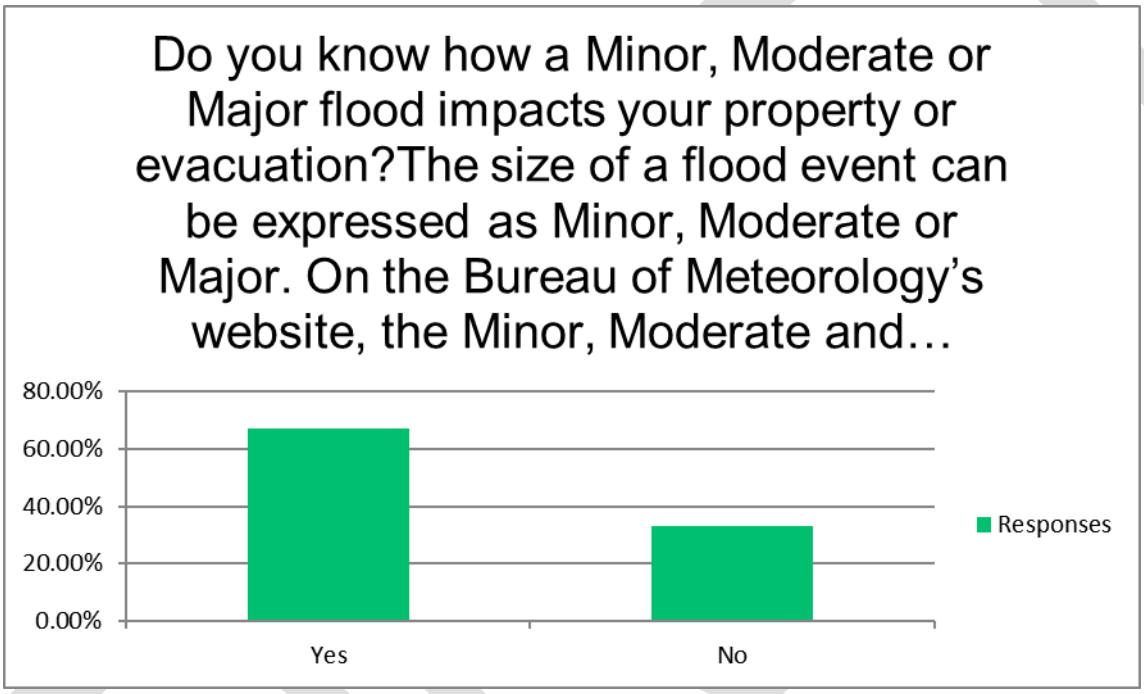
If you have experienced a flood within Banana Shire, did you find the messages you received helpful in informing your decisions during the flood event?

Answer Choices	Responses	
Yes	29.35%	27
No	38.04%	35
N/A	32.61%	30



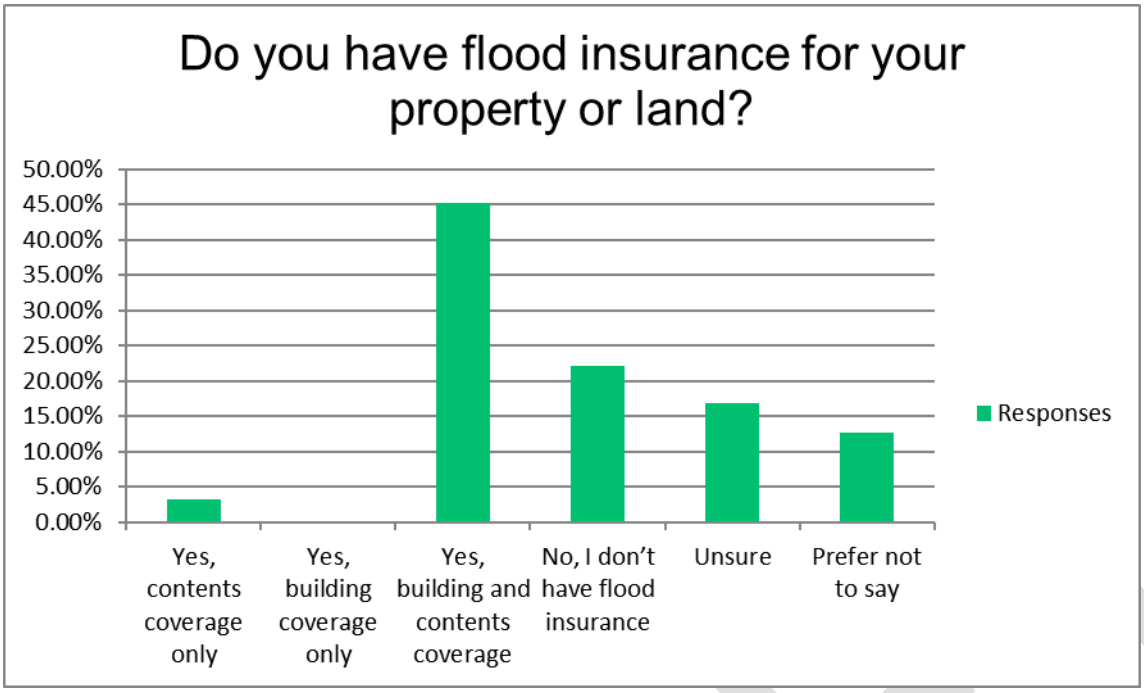
Do you know how a Minor, Moderate or Major flood impacts your property or evacuation? The size of a flood event can be expressed as Minor, Moderate or Major. On the Bureau of Meteorology's website, the Minor, Moderate and Major flood levels are illustrated for each water level gauge within Banana Shire.

Answer Choices	Responses	
Yes	67.02%	63
No	32.98%	31



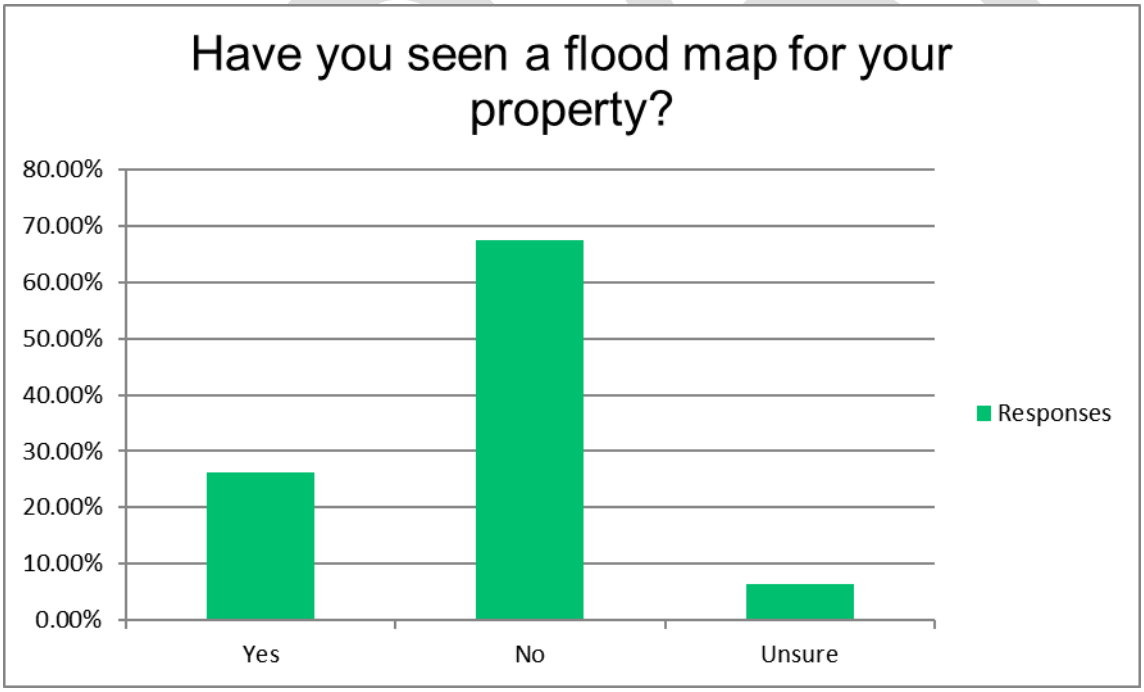
Do you have flood insurance for your property or land?

Answer Choices	Responses	
Yes, contents coverage only	3.16%	3
Yes, building coverage only	0.00%	0
Yes, building and contents coverage	45.26%	43
No, I don't have flood insurance	22.11%	21
Unsure	16.84%	16
Prefer not to say	12.63%	12



Have you seen a flood map for your property?

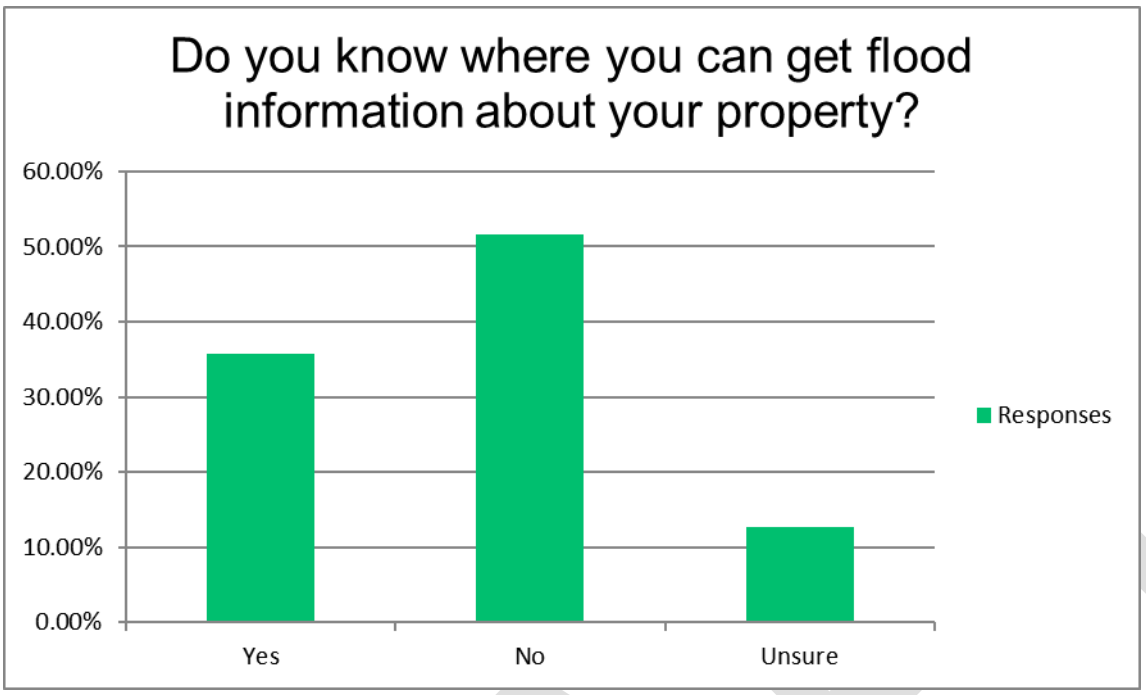
Answer Choices	Responses	
Yes	26.32%	25
No	67.37%	64
Unsure	6.32%	6



Do you know where you can get flood information about your property?

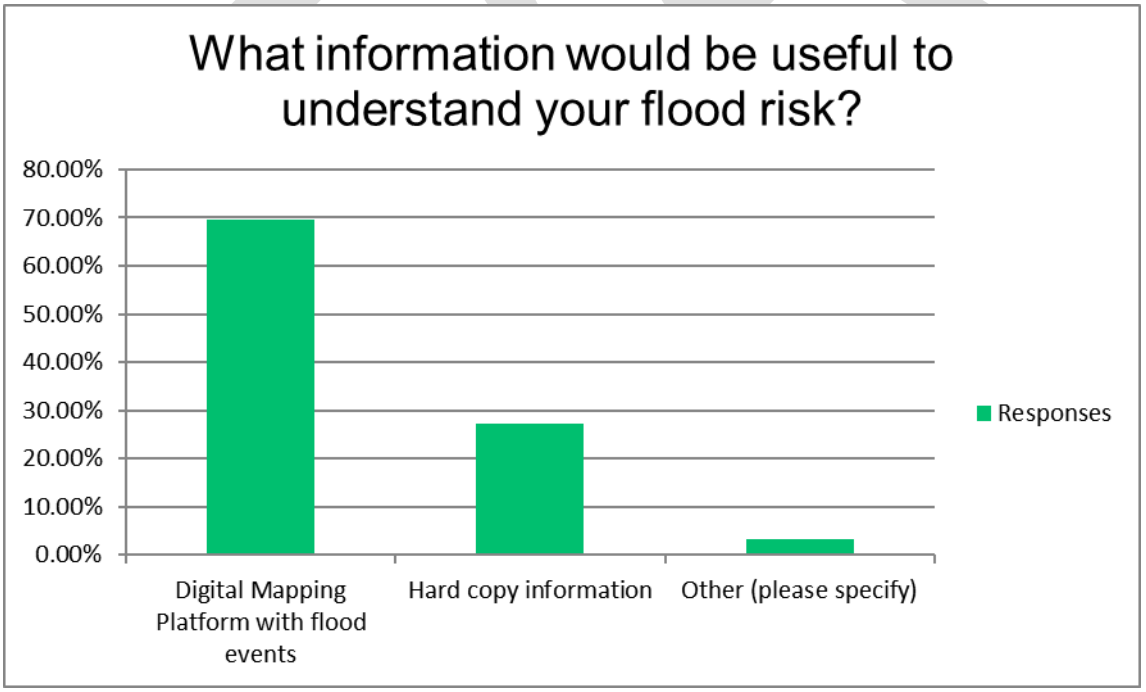
Answer Choices	Responses	
Yes	35.79%	34
No	51.58%	49

Unsure	12.63%	12



What information would be useful to understand your flood risk?

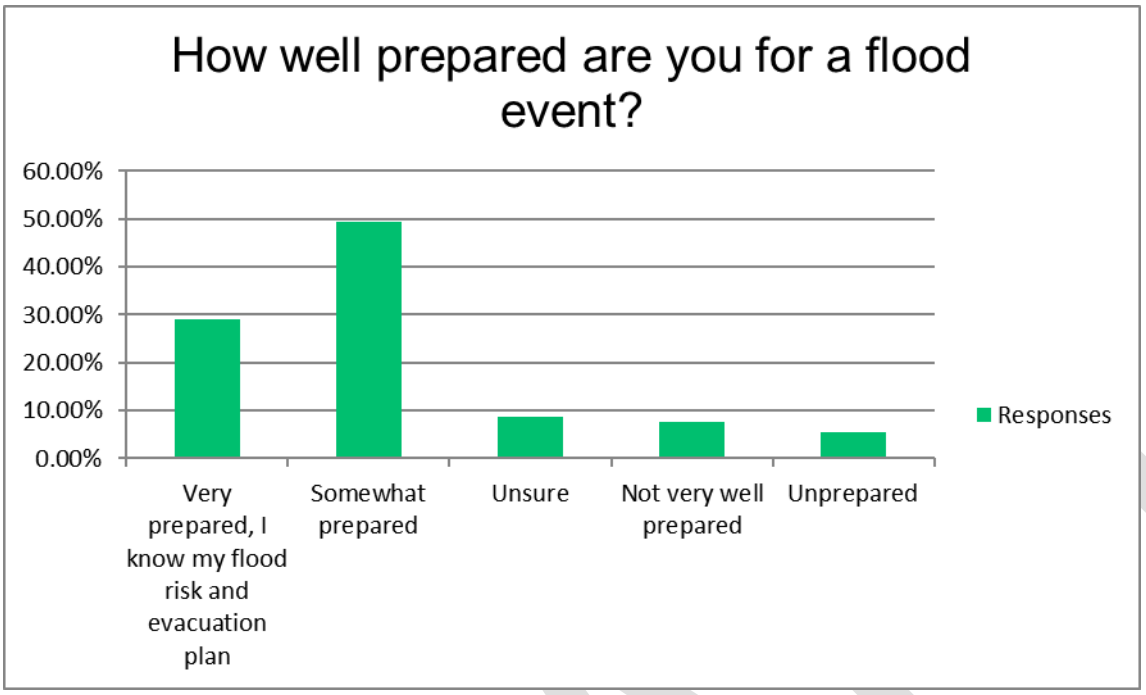
Answer Choices	Responses	
Digital Mapping Platform with flood events	69.57%	64
Hard copy information	27.17%	25
Other (please specify)	3.26%	3



How well prepared are you for a flood event?

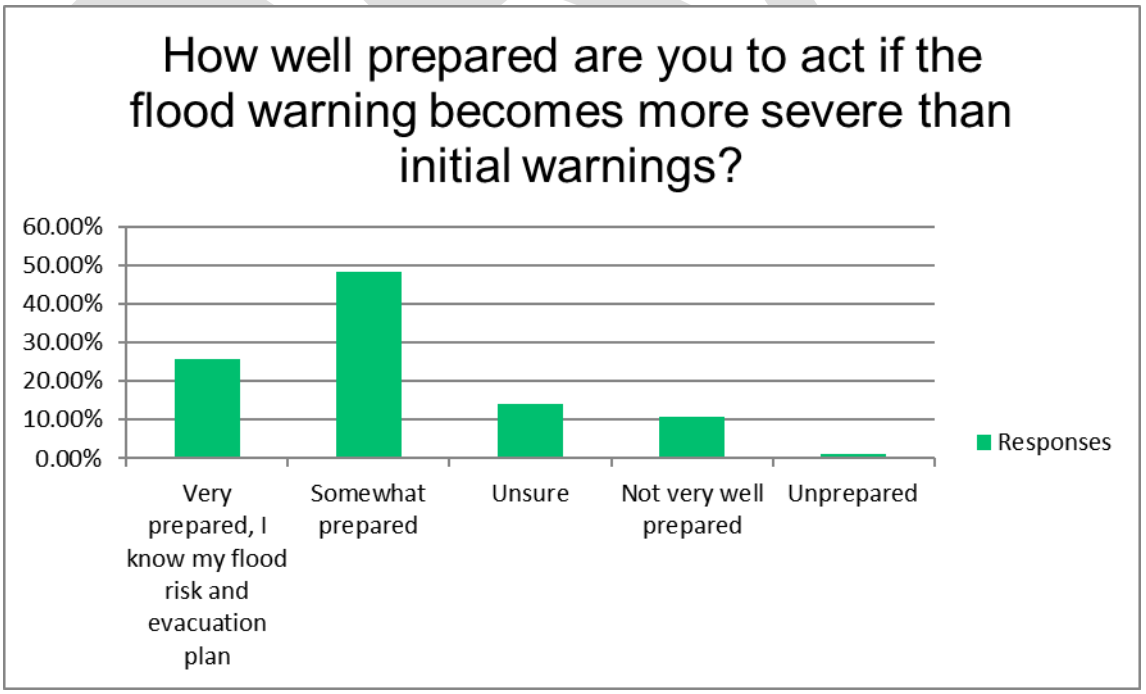
Answer Choices	Responses	
Very prepared, I know my flood risk and evacuation plan	29.03%	27
Somewhat prepared	49.46%	46

Unsure	8.60%	8
Not very well prepared	7.53%	7
Unprepared	5.38%	5



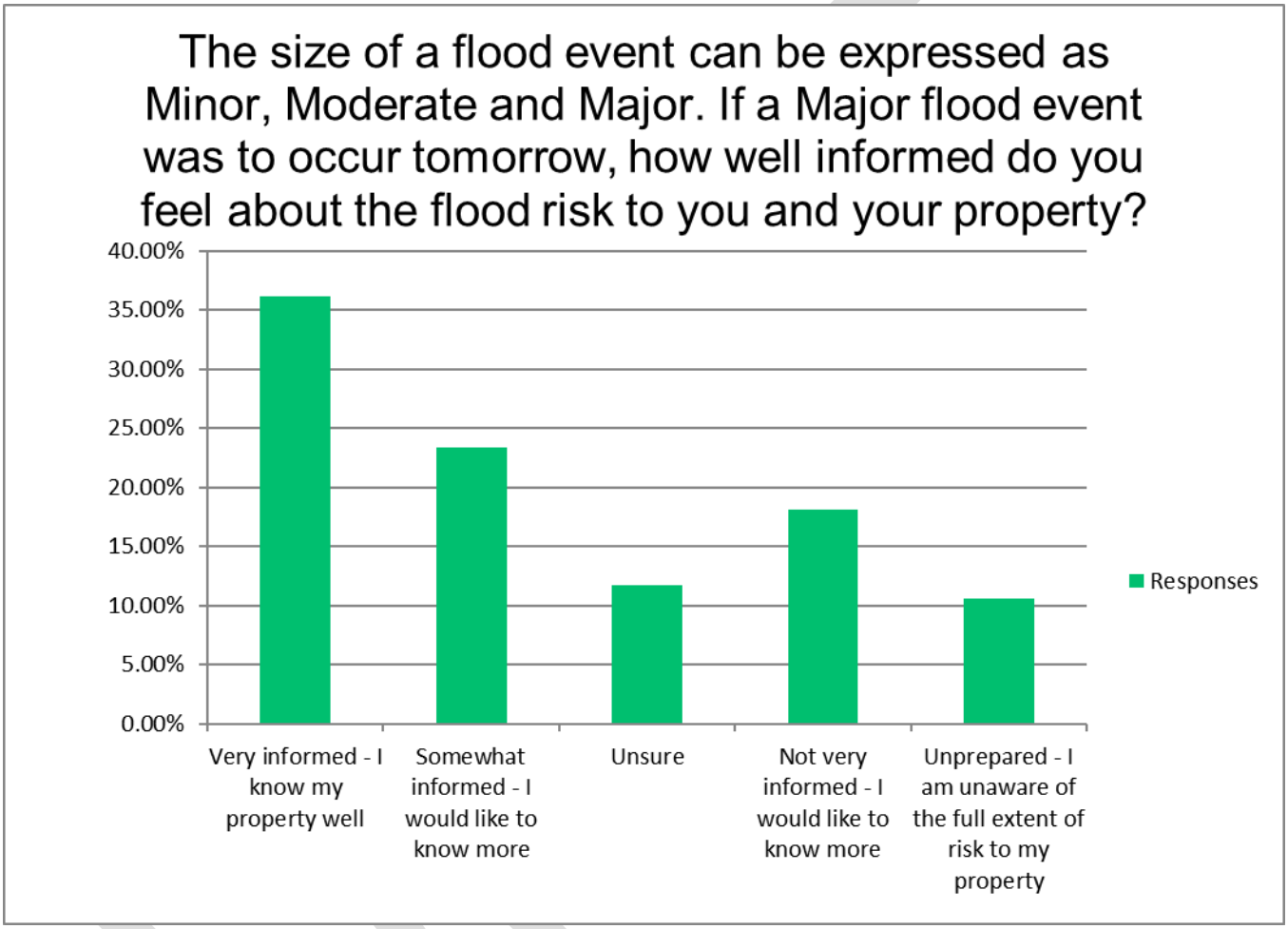
How well prepared are you to act if the flood warning becomes more severe than initial warnings?

Answer Choices	Responses	
Very prepared, I know my flood risk and evacuation plan	25.81%	24
Somewhat prepared	48.39%	45
Unsure	13.98%	13
Not very well prepared	10.75%	10
Unprepared	1.08%	1



The size of a flood event can be expressed as Minor, Moderate and Major. If a Major flood event was to occur tomorrow, how well informed do you feel about the flood risk to you and your property?

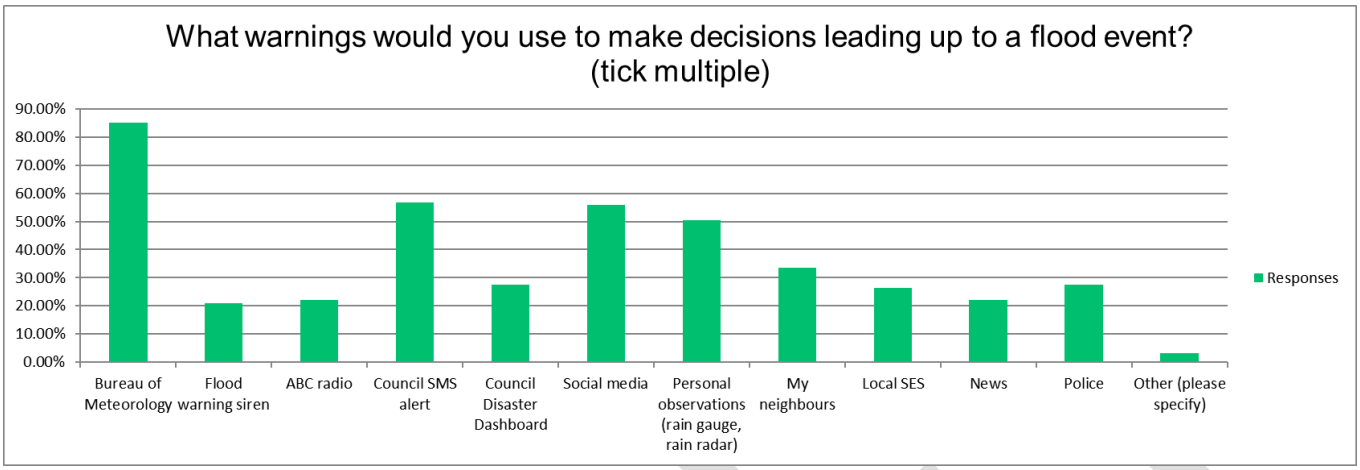
Answer Choices	Responses	
Very informed - I know my property well	36.17%	34
Somewhat informed - I would like to know more	23.40%	22
Unsure	11.70%	11
Not very informed - I would like to know more	18.09%	17
Unprepared - I am unaware of the full extent of risk to my property	10.64%	10



What warnings would you use to make decisions leading up to a flood event? (tick multiple)

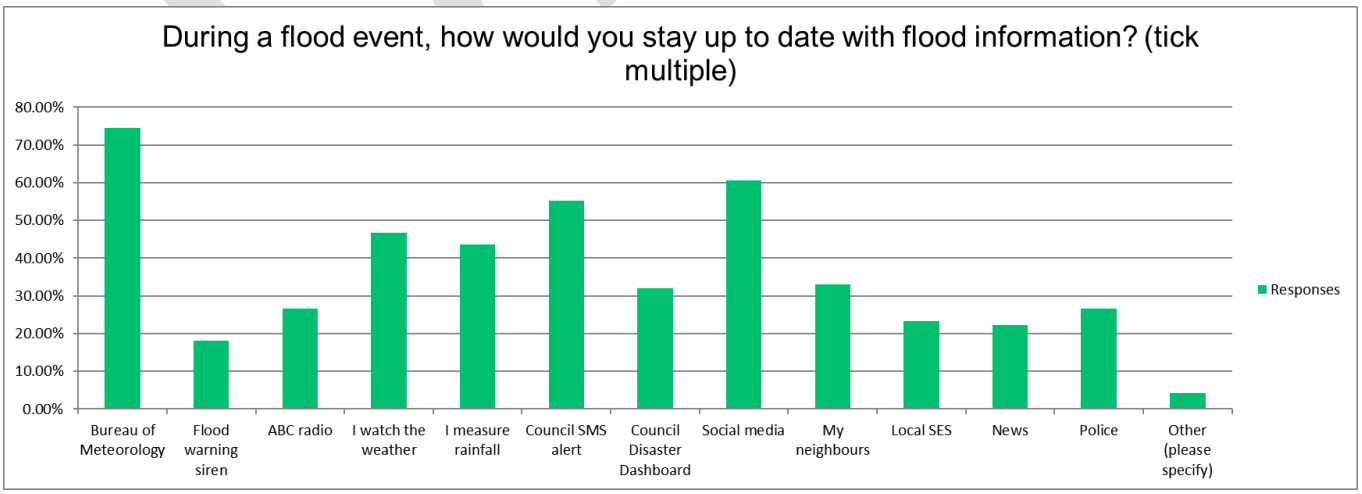
Answer Choices	Responses	
Bureau of Meteorology	85.26%	81
Flood warning siren	21.05%	20
ABC radio	22.11%	21
Council SMS alert	56.84%	54
Council Disaster Dashboard	27.37%	26
Social media	55.79%	53
Personal observations (rain gauge, rain radar)	50.53%	48
My neighbours	33.68%	32
Local SES	26.32%	25

News	22.11%	21
Police	27.37%	26
Other (please specify)	3.16%	3



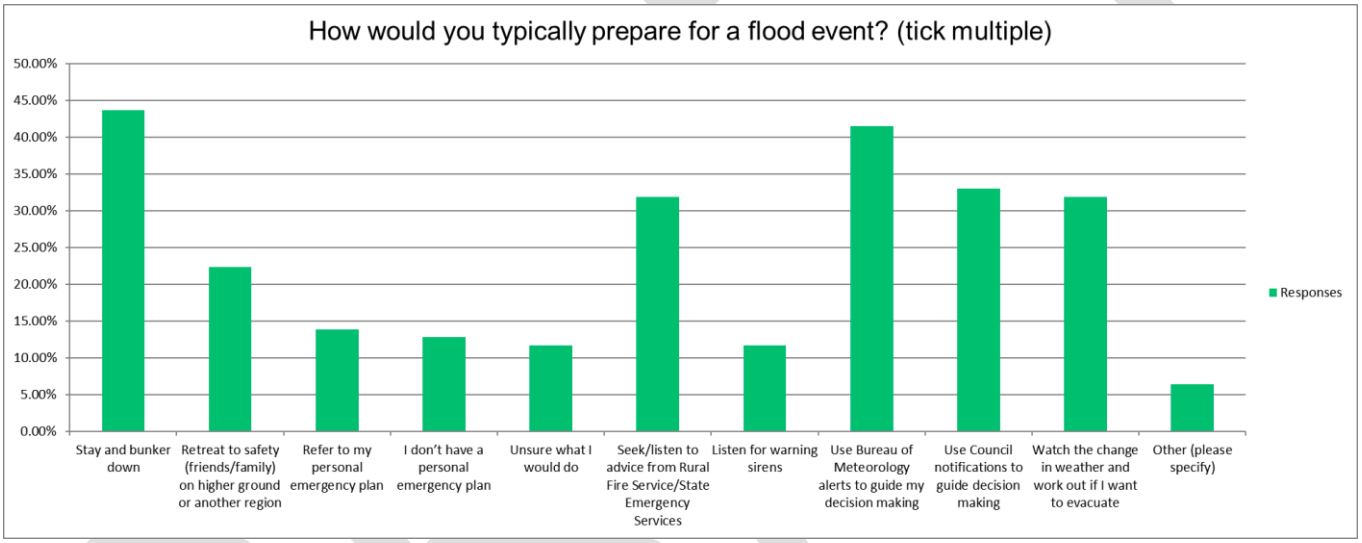
During a flood event, how would you stay up to date with flood information? (tick multiple)

Answer Choices	Responses	
Bureau of Meteorology	74.47%	70
Flood warning siren	18.09%	17
ABC radio	26.60%	25
I watch the weather	46.81%	44
I measure rainfall	43.62%	41
Council SMS alert	55.32%	52
Council Disaster Dashboard	31.91%	30
Social media	60.64%	57
My neighbours	32.98%	31
Local SES	23.40%	22
News	22.34%	21
Police	26.60%	25
Other (please specify)	4.26%	4



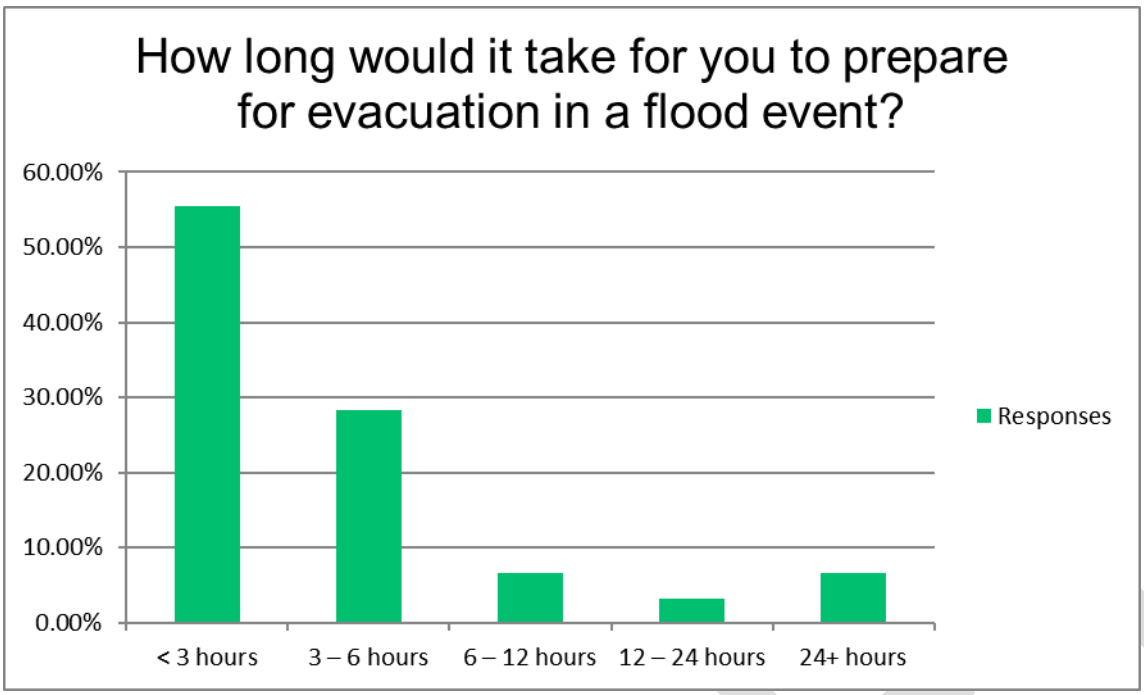
How would you typically prepare for a flood event? (tick multiple)

Answer Choices	Responses	
Stay and bunker down	43.62%	41
Retreat to safety (friends/family) on higher ground or another region	22.34%	21
Refer to my personal emergency plan	13.83%	13
I don't have a personal emergency plan	12.77%	12
Unsure what I would do	11.70%	11
Seek/listen to advice from Rural Fire Service/State Emergency Services	31.91%	30
Listen for warning sirens	11.70%	11
Use Bureau of Meteorology alerts to guide my decision making	41.49%	39
Use Council notifications to guide decision making	32.98%	31
Watch the change in weather and work out if I want to evacuate	31.91%	30
Other (please specify)	6.38%	6



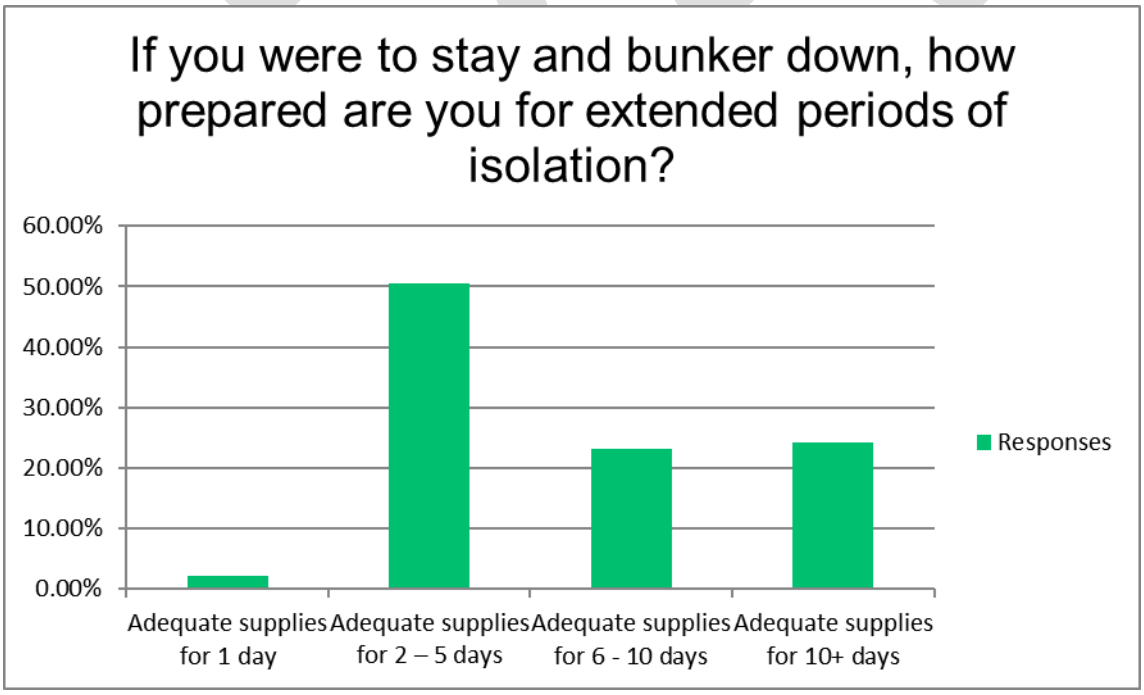
How long would it take for you to prepare for evacuation in a flood event?

Answer Choices	Responses	
< 3 hours	55.43%	51
3 – 6 hours	28.26%	26
6 – 12 hours	6.52%	6
12 – 24 hours	3.26%	3
24+ hours	6.52%	6



If you were to stay and bunker down, how prepared are you for extended periods of isolation?

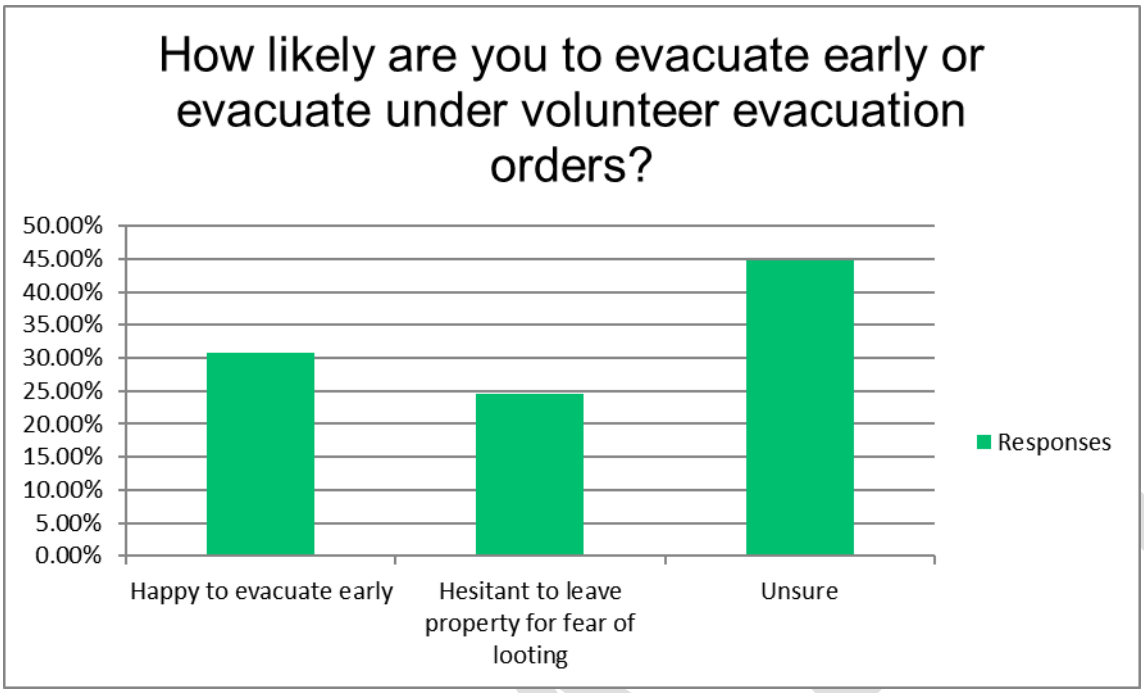
Answer Choices	Responses	
Adequate supplies for 1 day	2.20%	2
Adequate supplies for 2 – 5 days	50.55%	46
Adequate supplies for 6 - 10 days	23.08%	21
Adequate supplies for 10+ days	24.18%	22



How likely are you to evacuate early or evacuate under volunteer evacuation orders?

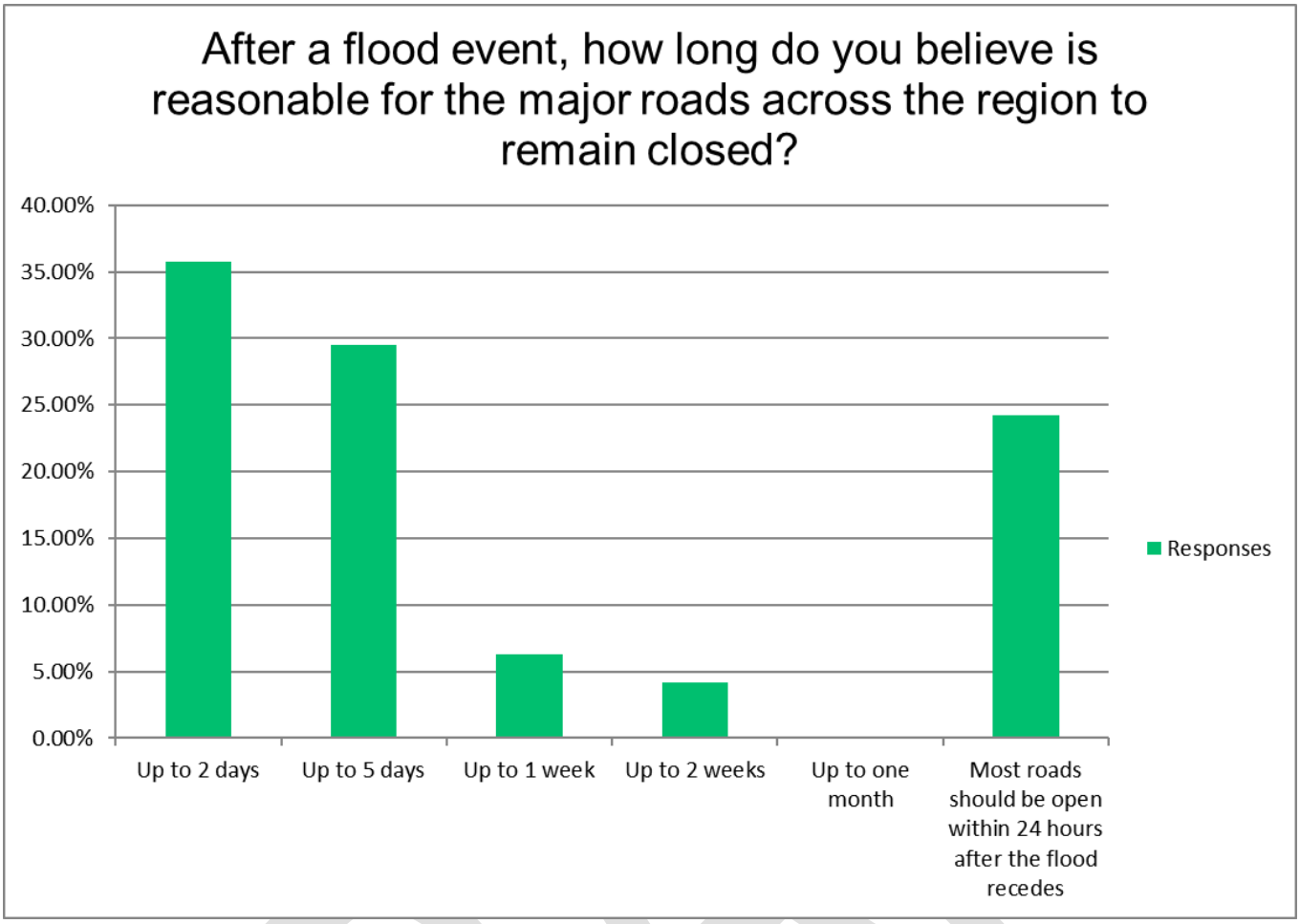
Answer Choices	Responses	
Happy to evacuate early	30.85%	29

Hesitant to leave property for fear of looting	24.47%	23
Unsure	44.68%	42



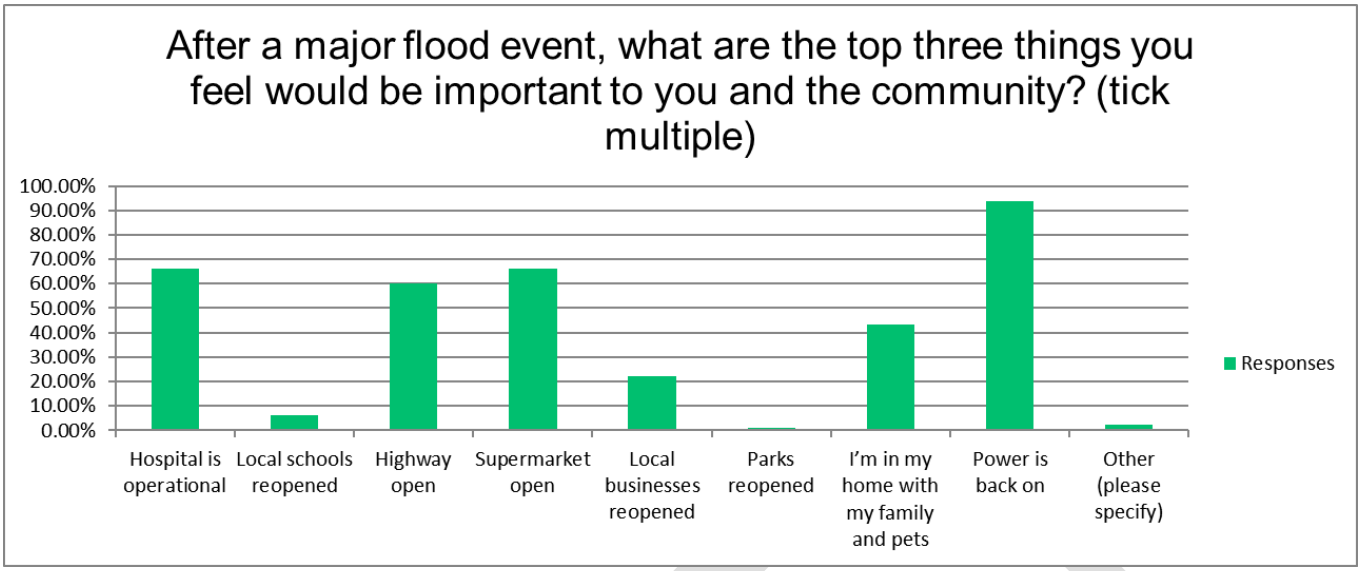
After a flood event, how long do you believe is reasonable for the major roads across the region to remain closed?

Answer Choices	Responses	
Up to 2 days	35.79%	34
Up to 5 days	29.47%	28
Up to 1 week	6.32%	6
Up to 2 weeks	4.21%	4
Up to one month	0.00%	0
Most roads should be open within 24 hours after the flood recedes	24.21%	23



After a major flood event, what are the top three things you feel would be important to you and the community? (tick multiple)

Answer Choices	Responses	
Hospital is operational	66.32%	63
Local schools reopened	6.32%	6
Highway open	60.00%	57
Supermarket open	66.32%	63
Local businesses reopened	22.11%	21
Parks reopened	1.05%	1
I'm in my home with my family and pets	43.16%	41
Power is back on	93.68%	89
Other (please specify)	2.11%	2



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