



Saltwater Creek Scoping Plan for Active Floodgate Management

2021-2024

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Authorisation

This Plan has been endorsed by the landowners within the immediate catchment whose land is influenced by the management of floodgates. Those landowners have signed a letter of endorsement stating they support the information included within this Plan.

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Version control

Version	Description	By	Date
0.1	Draft developed before landowner consultation	Chrisy Clay	06/05/20
0.2	Draft incorporating landowner feedback	Chrisy Clay	29/01/21
1.0	Final version	Chrisy Clay	23/06/21

CM: D20/6796

1. Site background and characteristics

Saltwater Creek is located 4.5 kilometres north of Wardell in northern New South Wales. The approximately 3-kilometre-long creek enters the Richmond River on its left (western) bank.

The creek forms on the southern side of Coolgardie Hill and runs east towards the Richmond River. The creek's characteristics distinctly change from its steep descent off Coolgardie Hill to the last 1.2 kilometres, which meanders across the floodplain. The creek above the floodplain shows many natural characteristics and maintains its natural riparian vegetation. The lower floodplain section of the creek, which is surrounded by intensive agriculture, is highly modified. The lower half of the creek was previously surrounded by sugar cane but has been recently converted to macadamias. There is no riparian vegetation and the channel itself has been modified. The new Pacific Highway transects the creek, and this has further modified the system. It is unclear how well the upper and lower sections of the creek are now connected. The creek's entrance to the Richmond River is floodgated with a large concrete headwall and three floodgates. Although it is named as a creek and maintains a few meanders, the lower section is highly modified and shows few natural characteristics.

Rous County Council has management responsibility for approximately the first 1.2 kilometres of the creek from the floodgate upstream to where it meets Saltwater Creek Road. On Council's asset database, this section is listed as both a natural waterway and a canal. Council also has responsibility for the three floodgates, the creek outlet and the Saltwater Creek levee in which the floodgate structure is located. One floodgate has been modified to allow tidal exchange, with a sluice window installed.

Active floodgate management was first undertaken on Saltwater Creek in 2006. Continuing active floodgate management on a regular basis at Saltwater Creek has been difficult because of the risk of land upstream being inundated by tides. Attempts were made previously to reduce this risk, which were unfortunately unsuccessful and active floodgate management has never occurred as outlined in the existing Active Floodgate Management Plan.

Asset number and description

A reference in this section to 'asset number' is to a unique reference that Council has assigned to the specified asset.

Asset number 4280 – Saltwater Creek

- Three square 1,500mm floodgates, one with a sluice window operated with a winch.

Asset No.	Description	Number
4280-290	Outlet	1
4280-030	Aluminium floodgate (1500mm square) one modified for tidal exchange with a sluice window (50cm aperture).	3
4280-610	Handrail	2
4280-260	Saltwater Creek (canal)	1
6900-410	Saltwater Creek levee	1

Aerial photograph of asset location and images of asset



1: Saltwater Creek locality map.



2: Saltwater Creek floodgate outlet.



3: Saltwater Creek floodgates.



*4: Saltwater Creek looking immediately upstream of the floodgates.
Note the low-lying area immediately to the left of the image.*

Drainage system characteristics

Location in estuary.	Lower estuary.
Location in landscape.	Riverine natural floodplain.
Land elevation.	0.3m – 2m AHD.
Land use.	Agriculture: recently converted from sugar cane to macadamias.
Vegetation.	Minimal, limited to grasses on the banks.
Salinity levels and estuary dilution capacity.	Very high.
Tidal range.	Very high.
Land elevation adjacent to drains.	Very low, particularly on the southern side of the creek. These areas are at risk of overtopping when there is tidal exchange through the floodgate.
Soil type.	Likely to be estuarine clay overlaid by alluvial sediment.
Acid sulfate soils.	Likely to be present, and closest to the soil surface where land elevation is lowest. The creek is not known to discharge acidity.
Hydraulic conductivity.	Unknown, likely to be low considering the creek is not known to experience chronic acidic conditions.
Acid export.	Likely to be low.
Water quality issues.	Unknown. Systems with no tidal exchange are at risk of water becoming stagnant and accumulating organic matter and nutrients in low-flow periods. This may cause dissolved oxygen to fluctuate.

Water quality

There is little known about water quality within Saltwater Creek. A water quality reading taken in the field by the former Richmond River County Council in 2008, showed neutral pH 450m upstream of the floodgate, good dissolved oxygen levels (7mg/L) and minimal salinity. How long these conditions occur is not known. The creek has not been observed discharging acidity or deoxygenated water (blackwater) after major summer floods.

If there was no tidal exchange, water in the creek could become stagnant and accumulate organic matter and nutrients in low-flow periods. This could cause dissolved oxygen to fluctuate, which could be harmful to aquatic life within the drain.

Aquatic habitat values

Being a natural waterway, Saltwater Creek would have provided aquatic habitat prior the floodgates being installed and the riparian vegetation removed. Historic aerial photography shows that in 1958 the lower half of Saltwater Creek on the floodplain had continuous riparian vegetation (see Figure 5). Eight years later in 1966, all of the riparian vegetation had been removed and sugar cane cropping had expanded (see Figure 6). These changes, together with the floodgating of the creek, completely altered the nature and function of the system.

Today, the creek above the floodplain shows many natural characteristics and maintains its natural riparian vegetation. The lower floodplain section of the creek, which is surrounded by intensive agriculture, is highly modified. There is no riparian vegetation and the channel itself has been modified.

The lower half of the creek was previously surrounded by sugar cane but has been recently converted to macadamias. Although it is named as a creek and maintains a few meanders the lower section is highly modified and shows few natural characteristics.



*5: Aerial photograph of Saltwater Creek taken in 1958.
Note riparian vegetation present along the lower reaches of the creek.*



*6: Aerial photograph of Saltwater Creek taken in 1966. Note that in eight years since 1958,
all of the riparian vegetation has been removed from the lower reaches of the creek.*

2. Why Saltwater Creek is a priority for active floodgate management

Saltwater Creek is a priority site for active floodgate management for the following reasons:

- The current landowners are willing to have the creek tidally flushed, if land upstream is not inundated by tides.
- The sluice window previously installed on one of the floodgates remains in place and in working order.
- Saltwater Creek is a natural waterway and the section above the floodplain has good riparian vegetation and features. Few natural waterways exist on the floodplain today.
- The site is a priority for fish passage and to allow connectivity between the Richmond River and the waterway upstream. It is rare for a floodplain waterway to have such a connection between higher land and the estuary.

3. Current challenges to active floodgate management

Undertaking active floodgate management at Saltwater Creek has been difficult. There is very little height difference between normal water level in the creek and the surrounding land to the south. Advice from Rous County Council staff is that there is a high risk if the sluice is open, even 50-100mm, because of the elevation of the land, along with the large tidal range and high salinity in this part of the estuary. Keeping the sluice open, even at a conservative aperture, would result in land upstream being regularly inundated with very saline, tidal water. This advice is supported by the long-term landowner and his previous experience.

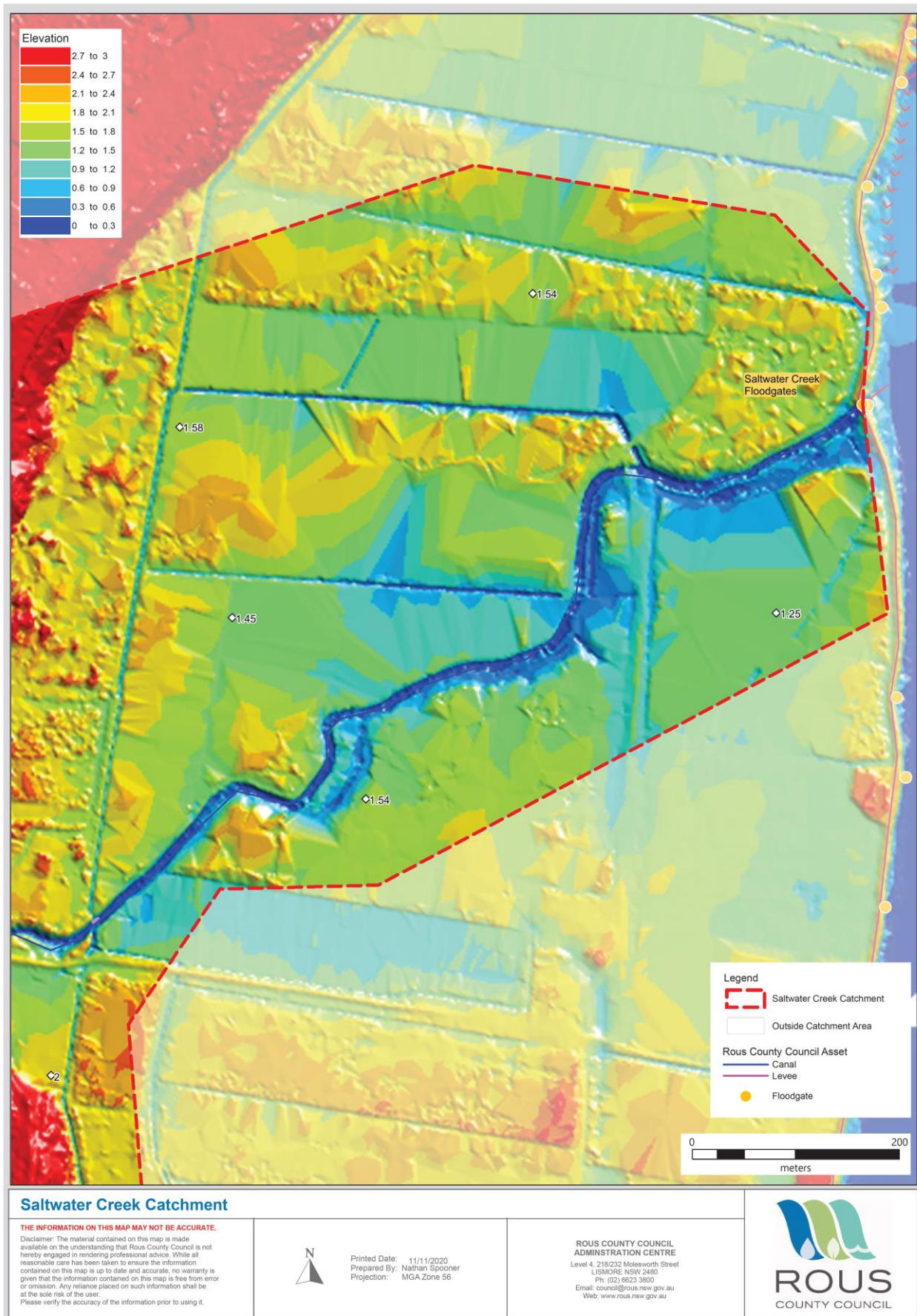
The extent of low-lying land at risk of being inundated is indicated in Figure 7. The exact size of that area and the relative heights of the land, sluice window and normal tidal range has not been determined and surveying of the area would need to occur to confirm those levels.

4. Previous strategies to address challenges

Richmond River County Council developed an Active Floodgate Management Plan for Saltwater Creek in 2006. The aim of active floodgate management was to improve water quality in the system.

During an initial trial of tidal exchange in November 2006, the drain banks overtopped and caused significant inundation of sugar cane crops with very saline, tidal water. To reduce the risk of this occurring again, Richmond River County Council installed a small bund alongside the southern side of the creek and included pipe crossings to drain water from behind the bund into the creek. Richmond River County Council provided the material to create the 500m bund, the seven concrete and green pipes and tidal flaps. In 2008, the works were completed, however the landowner raised concerns over whether the works would be sufficient to prevent tidal inundation.

Unfortunately, the retrofitting that occurred was not successful in reducing the risk of inundation and many of the pipes and floodgates are now in disrepair (Figure 8 and 9). Due to the risks involved, regular tidal exchange never occurred as planned in the Active Floodgate Management Plan.



7: Land elevation along Saltwater Creek, using LiDAR data.
 Note the extent of land to the south of the creek, which is below 0.9m (shaded blue).



8: Photo of low-lying area alongside the southern side of Saltwater Creek, showing a previously installed pipe, and to the right of the image the small bund that was constructed. Note the pipe is not draining recent rainfall from this area.



9: One of the previously installed pipes and floodgates currently in disrepair.

5. Summary of what is required to allow tidal flushing

- A staged approach to address the risk associated with tidal inundation could be taken.
- The area would need to be surveyed to accurately confirm the height of the land upstream in relation to the height of the sluice window and range of tides experienced at Saltwater Creek.
- That information would be used to assess what retrofitting would be required to prevent land upstream from being inundated by tidal water.
- Full costings for installation / construction and future maintenance of any works would need to occur. The ownership of these structures and who would be responsible for future maintenance needs to be confirmed before any works occurred.
- Retrofitting could include:
 - Replacing the broken pipes and floodgates, and/or
 - Constructing a higher bund or levee along the creek.
- The landowner on the southern side of the creek has indicated he may be interested in revegetating along the creek bank with native species.
- External funding, along with a willing organisation to undertake the survey and works, needs to be identified.

Stakeholder involvement

This Scoping Plan documents how tidal exchange could occur at Saltwater Creek. The Plan has been developed in consultation with landowners whose property would be impacted from the floodgate's operation. Rous County Council also sought the input and advice from NSW Department of Primary Industries and Ballina Shire Council.

A summary of different stakeholders' input on Active Floodgate Management is provided below.

All parties agreed:

- to transition the existing Active Floodgate Management Plan to a Scoping Plan that identifies the issues that need addressing to allow tidal exchange.
- that external funding could be sought from a number of sources and the site is ready for an organisation to champion the project.

Rous County Council, Ballina Shire Council and NSW Department of Primary Industries agreed:

- that Saltwater Creek highlights issues associated with farming low-lying land on the floodplain, and how reliant some properties are on flood mitigation assets. With climate change set to increase sea levels, policy and direction is required to confirm how agriculture will continue to occur in these low-lying areas.
- to look for opportunities to progress active floodgate management at Saltwater Creek and to address the issues that currently prevent tidal exchange from occurring.
- to continue to highlight the need for policy that address the sustainability of farming very low-lying land on the floodplain in the face of rising sea levels.

Landowners	Are supportive of active floodgate management if inundation of land upstream can be prevented.
Rous County Council	Rous County Council cannot make any changes to the operation of the floodgates without the support of the impacted landowners. The retrofitted pipes, floodgates and earth bund are not listed as Council assets and the required works is currently out of Rous County Council's resources and capacity. The sluice window would remain in place, so tidal exchange could potentially recommence again at this site and the site remains a priority for tidal exchange.

	Saltwater Creek would be removed from Rous County Council's list of Active Floodgate Management sites that are monitored monthly to reduce organisational costs.
NSW Department of Primary Industries – Fisheries	Long-term, DPI Fisheries has a preference to allow tidal inundation to occur of land below high astronomical tide, although the constraints in this occurring are acknowledged. DPI Fisheries does not have funds for on-ground works, and it is unlikely any funding associated with Stage 2 of Marine Estate Management Strategy would be available either.
Ballina Shire Council	Ballina Shire Council's Healthy Waterways Program does not fund projects that include private works, and as these works would protect agricultural land, they could be seen as such.

6. Council's Active Floodgate Management Program

The majority of coastal floodplains in New South Wales have been extensively modified for flood mitigation. Networks of drains have been constructed, natural water courses altered, and floodgates installed to mitigate the impacts of floods and large rainfall events.

Constructed drains reduce inundation after flooding and floodgates prevent flood and tidal water from inundating low areas of the floodplain. This in many cases has converted prior wetlands and low-lying floodplain areas into dryland farming areas. While these developments have enhanced rural settlement and agricultural industries, they have also caused unintended adverse impacts to downstream water users, fisheries, and the ecology of estuaries.

Rous County Council is the Flood Mitigation Authority operating across the local government areas of Ballina, Lismore and Richmond Valley, and is responsible for the construction, replacement, and routine maintenance of flood mitigation infrastructure, including floodgates and some pipes, levees, rural drains, and canals. Rous County Council's natural resource management function relates to the environmental consequence resulting from the operation of this infrastructure.

The flood mitigation directive that Rous County Council operates under in the *Local Government Act 1993* is '*Prevent and mitigate menace to the safety of life or property from floods and natural resource management issues arising therefrom*'.

Active floodgate management is the opening of floodgates during non-flood periods when the floodgate is otherwise operating passively. Opening floodgates and allowing tidal exchange can reduce their environmental impact by improving water quality and enhancing aquatic habitat and fish passage. Opening a floodgate for tidal exchange can occur by modifying a floodgate with a sluice window or an automatic, tidally operated float system, or the floodgate can be winched opened.

For each of its active floodgate management sites, a plan is developed which outlines:

- how active management can assist in reducing the environmental impact of the floodgate,
- a strategy for how that will be monitored and achieved,
- appropriate and consistent strategy for opening the floodgate and returning it to the operational position or state and by whom,
- safe operating procedures for volunteers and Council staff,
- how adverse effects on current land use will be identified and prevented, and
- additional management strategies for the drainage system that would further reduce the environmental impact of flood mitigation.

Each plan is tailored for the system and its floodgates, considering their location, purpose, and function.

Guiding principles for active floodgate management

- Rous County Council is the Flood Mitigation Authority and acts in consultation with stakeholders on the management of its infrastructure.
- The primary function of Council's infrastructure is for flood mitigation.
- The intention of active floodgate management is to reduce environmental impact without causing adverse effect on current land use.
- All landowners behind the floodgate whose property may be impacted will be invited to participate in reviewing and updating the Plan.
- Active floodgate management is a cooperative exercise between Council, as the Flood Mitigation Authority, and the surrounding landowners. Council appreciates landowners' continued support of this important activity.

Plan review frequency

The Scoping Plan will be formally reviewed in three years (from the date of adoption).

Feedback on the Plan and active floodgate management matters

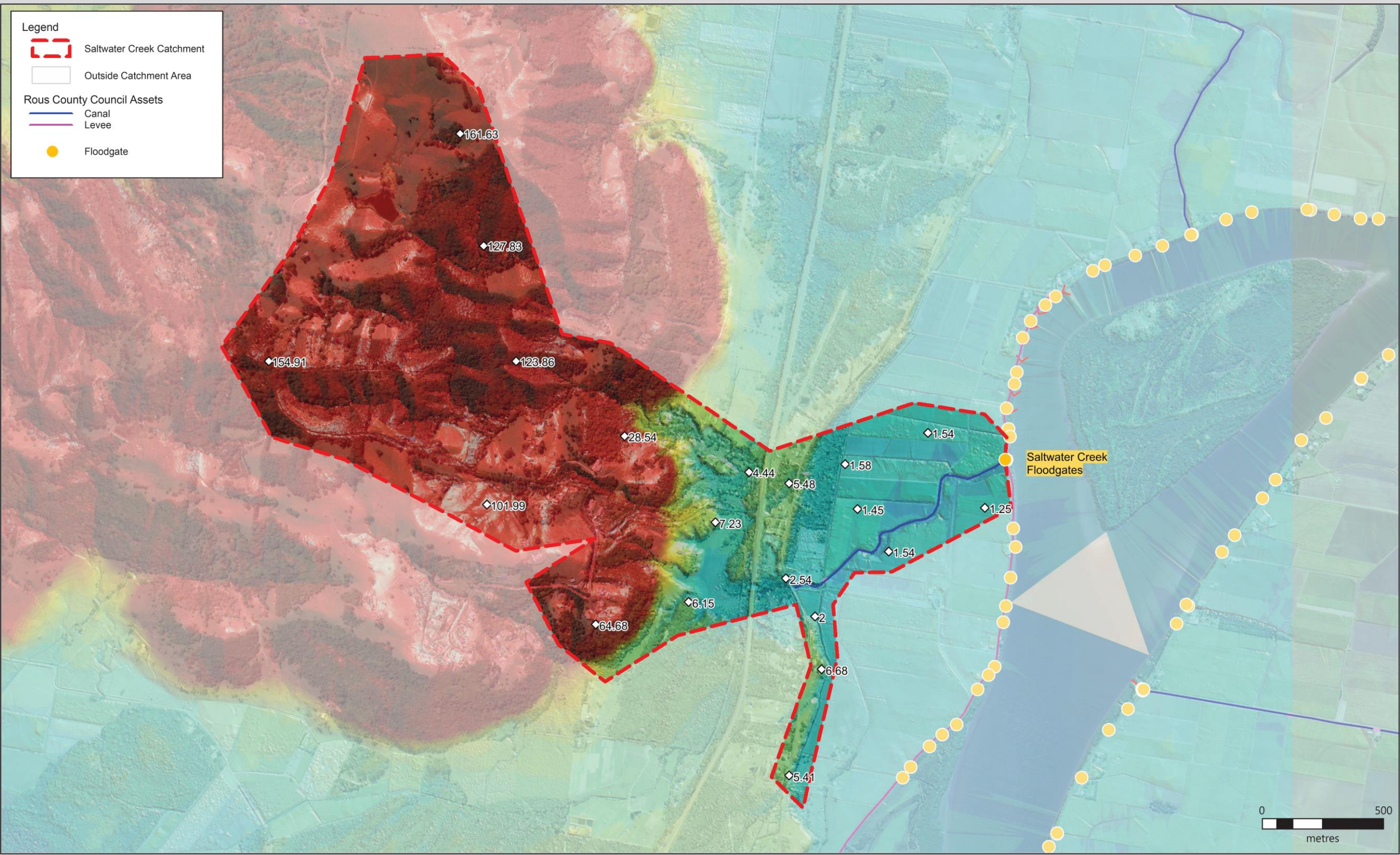
Feedback and comments should be referred to Council by telephone on (02) 6623 3800 or by email: council@rous.nsw.gov.au

7. Historical context

History of when and why asset was installed

There is no historical information on when and why the floodgates at Saltwater Creek were constructed. The existing main headworks and floodgates are likely to have been installed in between 1958 and 1966, coinciding with the removal of riparian vegetation and expansion of sugar cane.

Sugar cane was historically grown in the Saltwater Creek area, with a reference made as far back as 1893 in local newspapers. However, this was likely to have been only on higher elevation land (see Figure 5), and expansion on the low-lying floodplain areas surrounding Saltwater Creek only occurred after the system was floodgated (See Figure 6).



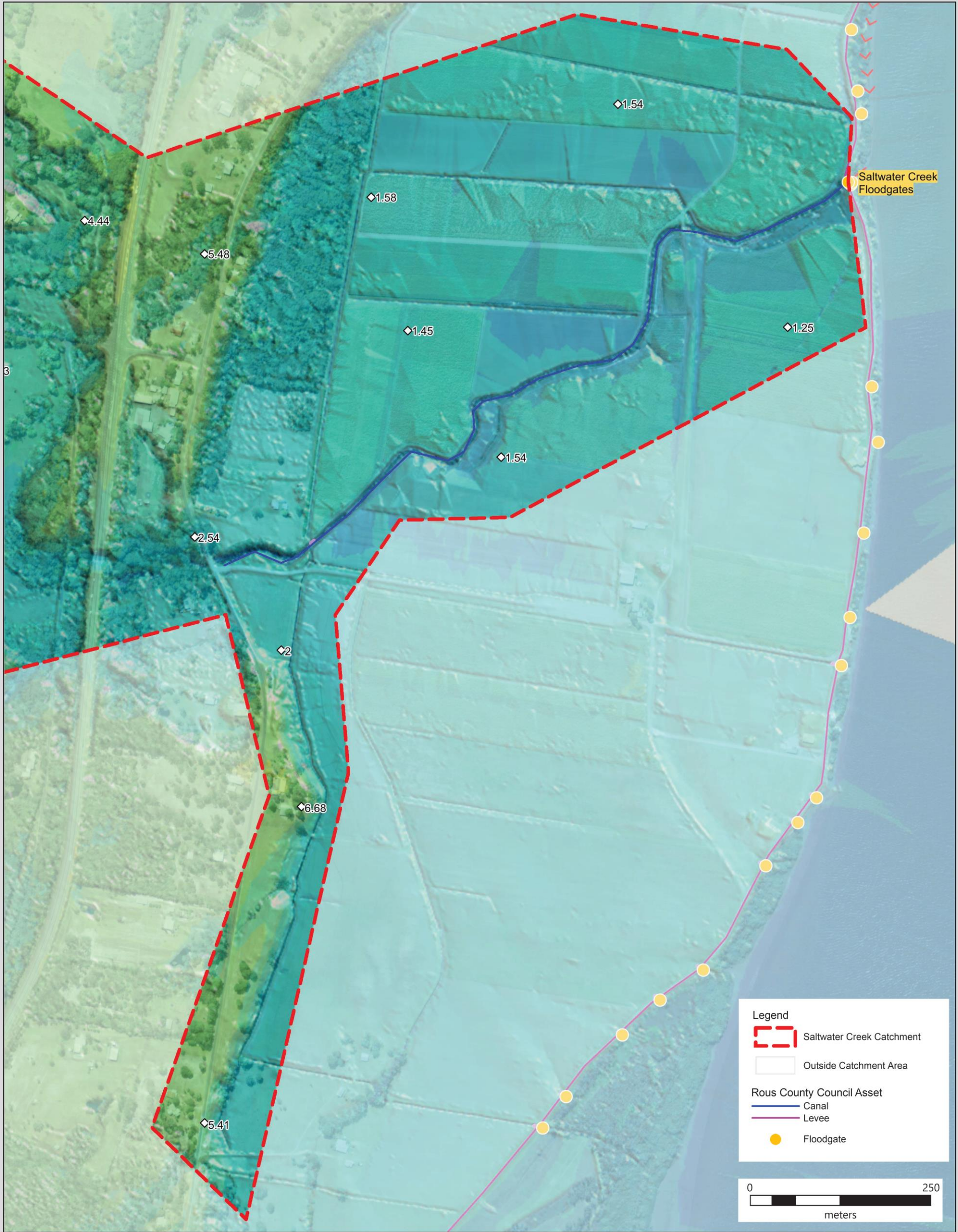
Saltwater Creek Catchment

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