

Rosetown Stormwater Investigation

Storm Surge Inundation Protection

Kingston District Council

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1 Introduction

The Rosetown area has been subject to significant recent inundation due to storm surges combined with high tides, flooding the area via the Maria Creek drain. Once the area has become inundated, there is no local drainage system that is able to drain the water away which therefore results in pooled water sitting in the area for a long time after the inundation event. The inundation has also resulted in road closures. Photos from a recent storm surge event can be found in Figure 1.1 below.

This report describes the investigation that focused on reducing the risk of inundation of the area due to storm surge while also looking at what options can be provided to give the area an improved drainage system. The measures proposed in this report have been done to a high-level only with no detailed design undertaken. The report also describes the interaction between the high-level measures with culturally sensitive areas, such as Maria Creek and areas to the west of Rosetown.



Figure 1.1 Photos from recent storm surge event in Rosetown



1.1 Data Availability

As outlined in Table 1.1 the investigation has been undertaken using a combination of publicly available information, Council photographs, information obtained during a site visit, and tidal information sourced from the Department for Environment and Water (DEW).

Table 1.1: Data sources

Data Type	Description	Source
Elevation data	SouthEastCoastalLiDAR2018	ELVIS
Tidal information	Tide information from Robe tide gauge for the requested dates	Department for Environment and Water
Photographs	Photos from storm surge events	Kingston District Council
Site visit notes	Notes taken during site visit	Tonkin



2 Study Area Description

2.1 Elevation

Rosetown is located just north of the main Kingston SE township and is approximately 290 km southeast of Adelaide. LiDAR based digital elevation model (DEM) for Rosetown was obtained using ELIVS, an online portal for obtaining Australian elevation data. Figure 2.1 below shows the elevation map for Rosetown. A review of the metadata files for the DEM indicate that the vertical accuracy of the elevation data is +/-15cm (95% confidence interval). The DEM shows that the urban area of Rosetown is relatively low-lying and is bounded by 2 elevated ridgelines to the east and west. There is also a swamp or marsh area located at the intersection of Dowdy Street and Bullocky Town Road. Along the northern bank of Maria Creek, the DEM indicates that there is an elevated earthen levee with levels between 1.4 mAHD to 2.2 mAHD.

2.2 Cultural Significance

Maria Creek / Pawur is a significant site for the Meintangk, Bunganditj and Potaruwutj People, with the Meintangk people occupying the land for thousands of years, caring for the natural environment and in return providing food and materials to allow the Meintangk People to be provided for and to sustain their community.

To the immediate west of the Rosetown area, a closed site exists, providing the Meintangk People a sacred place to gather and connect. The site plays an important part in continuing the connection to Country for the Meintangk People. It is understood that this site also experienced flooding during the recent storm events.

Planning, design and construction of any works should enhance cultural significance, in consultation with the Meintangk People.



Figure 2.1 Elevation map of Rosetown



2.3 Site Visit Observations

A site visit was undertaken by Tonkin on the 4th of September 2025, with a Council representative attending towards the end of the site visit. During the site visit, several observations were noted regarding where Council believed the storm surge likely entered the township as well as key impacted areas. Figure 2.2 below shows key observations from the site visit and through discussions with Council while on site.

There are two main areas where Council estimates the storm surge breaches the northern bank of Maria Creek to inundate Rosetown. These are denoted as location A and location B in Figure 2.2. At location A, the storm surge propagating up Maria Creek would likely result in wave action pushing water over the earthen levee and raised shared path into Rosetown. A photo taken of the raised shared path can be found in Figure 2.3.

At location B, Council observed that the storm surge caused water to overtop the ridges located to the west of Third Street. Inundation of the heritage area located to the west of Rosetown was also reported to Council. During the site visit, a depression in the terrain which encourages flows through the heritage area was noted. This area is denoted as location C in Figure 2.2 and a photo of this depression can be found in Figure 2.4. It should be noted that this depression has also been captured by the DEM.

Water entering Rosetown during the storm surge event would be conveyed along the two primary flow paths shown in Figure 2.2, formed by natural depressions in the terrain. These flow paths ultimately convey flows to a low-lying area on the corner of Bullocky Town Road and Dowdy Street (location D). Once flood depths in this area reach approximately 1.4 – 1.5 mAHD, floodwater will spill through a gully which runs around the rear of the properties fronting Bullocky Town Road to the north of the low-lying area. During the site visit, location D, among various other locations, were still observed to be inundated, with no available means for draining these areas. A photo taken of location D during the site visit is shown below (refer Figure 2.5). Areas that were still inundated during the site visit have been noted in Figure 2.2, which was over 6 weeks since the last inundation event (on July 22, 2025).

It is further understood that Council worked with the State Emergency Service (SES) to bring in a large scale pump to dewater the Rosetown area, and allow residents safe access to their properties. It is also further understood that the nominated FFL for all new development in Rosetown was above the inundation levels observed, and that no private structures were directly impacted by the inundation.

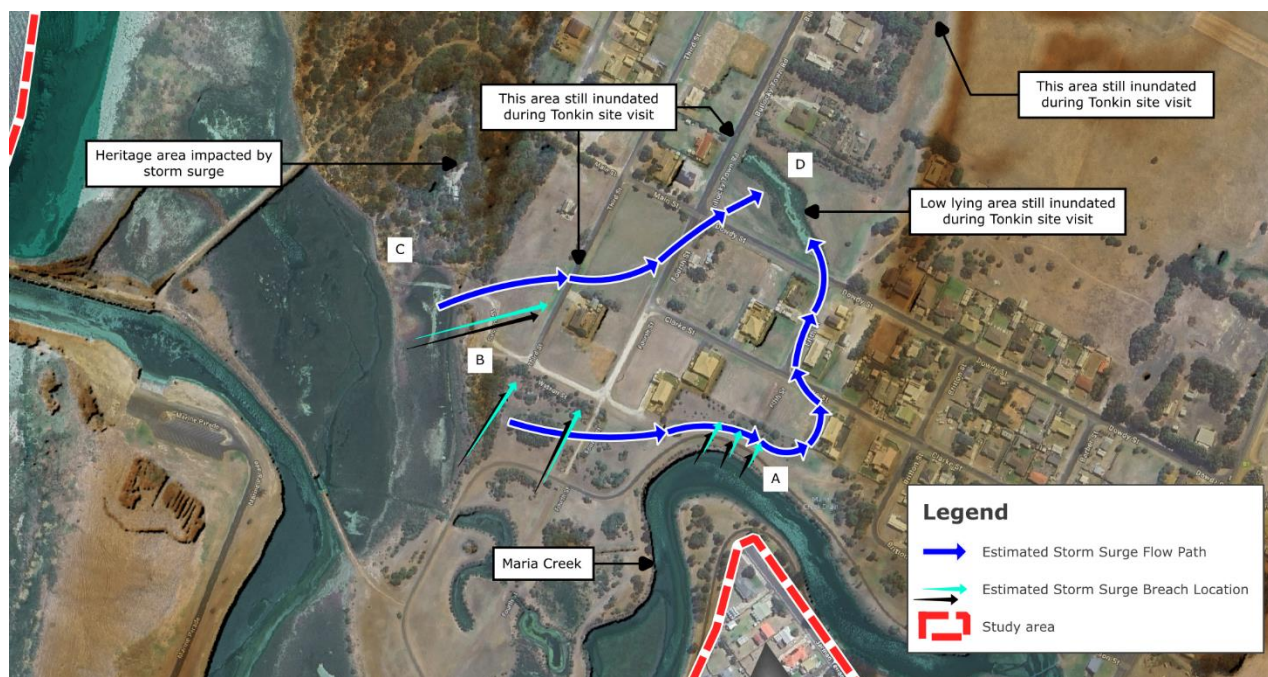


Figure 2.2 Key observations from Tonkin site visit



Figure 2.3 Elevated shared path on northern side to Maria Creek



Figure 2.4 Floodplain adjacent to heritage area



Figure 2.5 Low lying area adjacent to Dowdy Street



3 Tide Heights

According to Council, the storm surge events occurred on the 3 dates listed below.

- 26th to 27th May 2025
- 24th to 25th June 2025
- 22nd July 2025

To source tide height records for the dates corresponding to the storm surge events, the Department for Environment and Water (DEW) was contacted via email to determine data availability at nearby tide monitoring stations. Through discussions with DEW, it was identified that although Kingston and Cape Jaffa did previously have tide monitoring stations, these are understood to no longer be active. Given this, DEW advised that the Robe tide gauge located within the confines of the Lake Butler Marina would be the closest gauge to given an indication of tide data for Rosetown. DEW further advised that due to the distance between Robe and Kingston and the orientation of the embayment's topography the tide data may not always be representative of tidal heights at Rosetown. However, the Robe tide gauge remains the best indication of tide heights available in the region.

DEW provided tidal information from the Robe tide gauge for the three recent storm surge events listed above. Graphs of tidal heights relative to chart datum (CD) can be found in Figure 3.1 to Figure 3.3. The chart datum refers to the Lowest Astronomical Tide (LAT) level. Using the Australian Coastal Vertical Datum Transformation (AusCoastVDT)¹ software obtained from the Intergovernmental Committee on Surveying and Mapping (ICSM), the maximum recorded tide heights for the dates below were extracted from the data provided and converted to Australian Height Datum (AHD). A summary of the maximum tide heights can be found in Table 3.1. As shown in the table, the event which occurred in June 2025 resulted in the highest recorded tidal height (1.78 m AHD), followed by the event in May 2025 (1.63 mAHD) and July 2025 (1.57 mAHD). The estimated 1% annual exceedance probability (AEP) tide level and the estimated AEP for each of the 3 events are also provided in Table 3.1. These estimates have been derived using information from Canute3², a sea level calculator for projections based on tide gauges or climate model data, combined with statistical analysis and additional data.

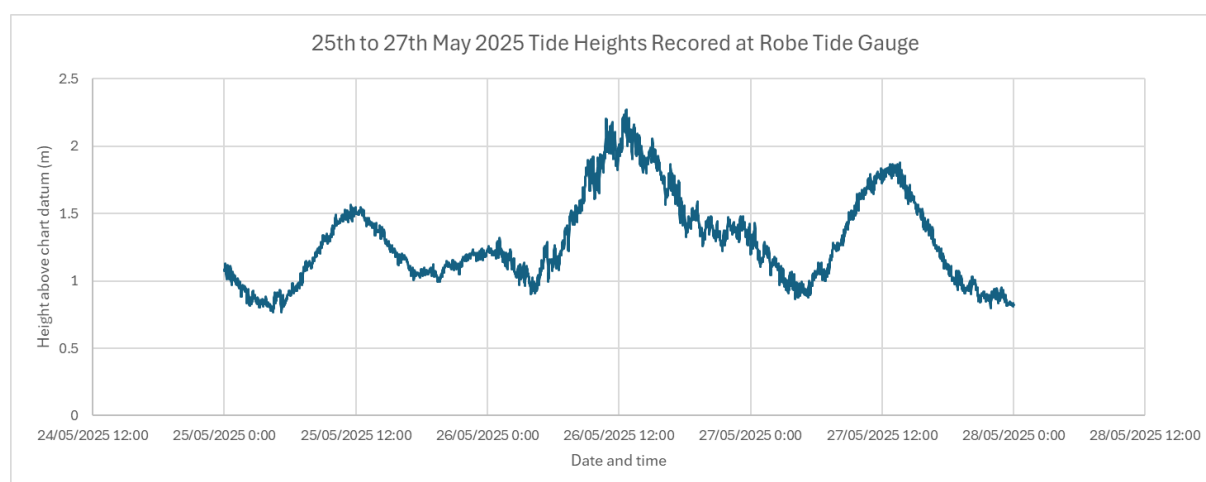


Figure 3.1 Recorded tide heights at Robe tide gauge from the 25th to 27th May 2025

¹ Australian Coastal Vertical Datum Transformation (AusCoastVDT) Software, Intergovernmental Committee on Surveying and Mapping (<https://www.icsm.gov.au/what-we-do/tides-and-sea-level>)

² Canute3 Software, Coastal extremes tools and data, CSIRO (<https://research.csiro.au/slrwavescoast/extremes/coastal-extremes-data/>)

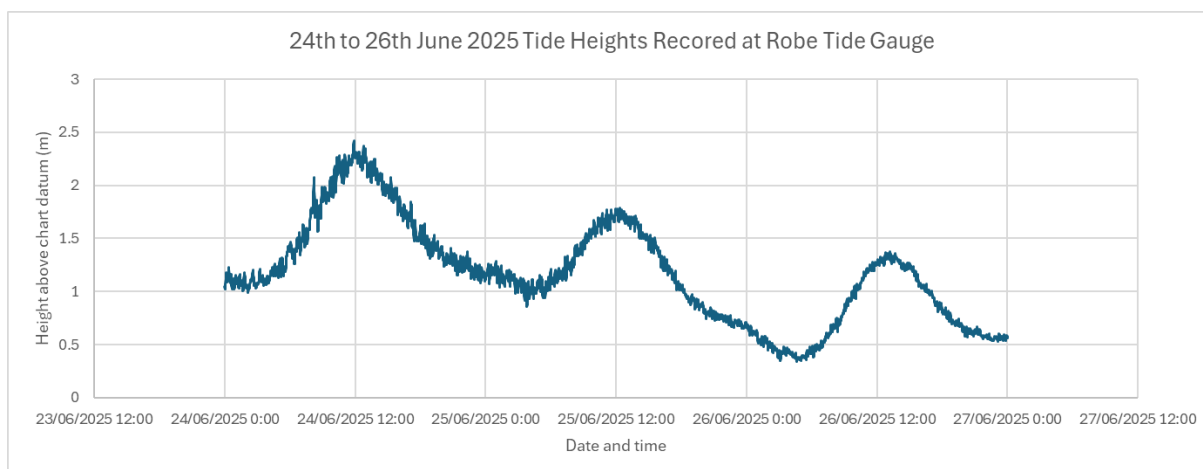


Figure 3.2 Recorded tide heights at Robe tide gauge from the 24th to 26th June 2025

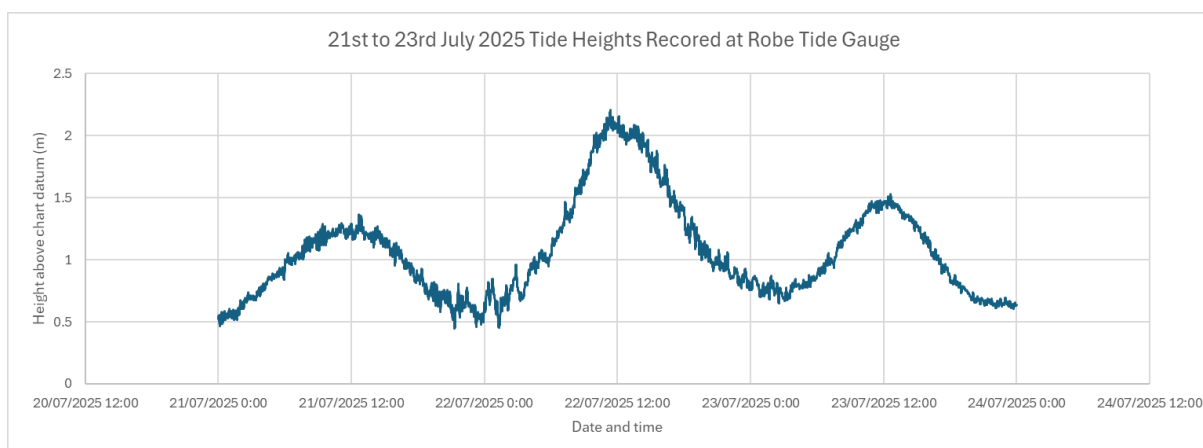


Figure 3.3 Recorded tide heights at Robe tide gauge from the 21st to 23rd July 2025

Table 3.1 Maximum recorded tide heights

Date range	Maximum tide height above chart datum	Maximum tide height as meters AHD	Estimated AEP for tide height [#]
25 th to 27 th May 2025	2.27	1.63	~10%
24 th to 26 th June 2025	2.42	1.78	~4%
21 st to 23 rd July 2025	2.21	1.57	~17%
-	-	1.97	1%

[#] Estimation of AEP for various tide levels are based on estimated tide levels from Canute3 for the SSP2-4.5 2025-time horizon

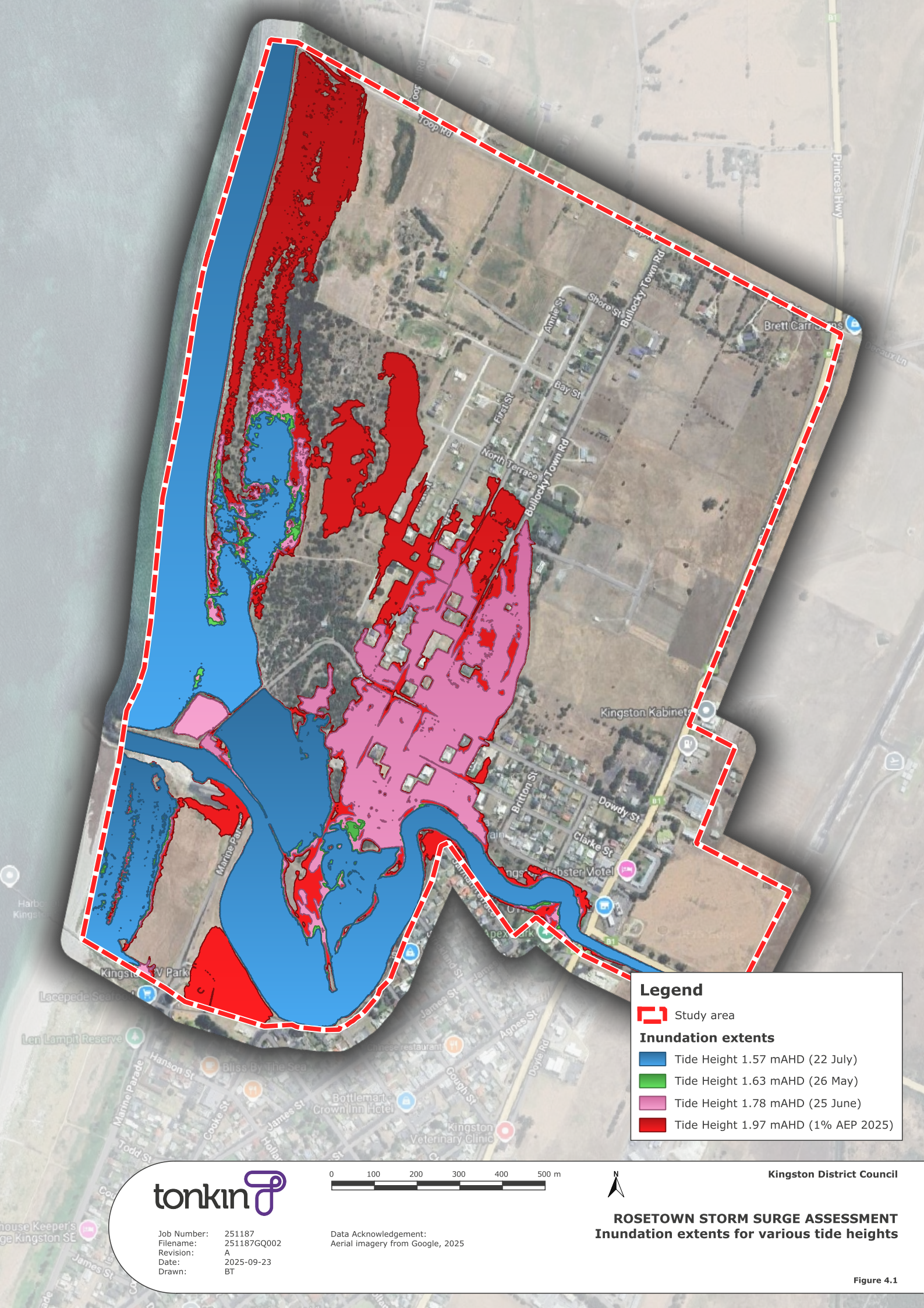


4 Storm Surge Inundation Assessment

An assessment for the extent of inundation for the various tide levels shown in Table 3.1 was undertaken. This was done by extracting areas within Rosetown where the elevation level in the DEM is less than the tide level being assessed. The inundation extents were then filtered to ensure that only the extents which are connected to the coast are considered. The resulting inundation extents are shown in Figure 4.1.

As can be seen in the figure, inundation of Rosetown and the western heritage area predominantly occurred for the event which occurred on the 25th of June, where the tide level reached 1.78 mAHD. The extent of inundation for this event is estimated to reach up to Eleventh Street. A comparison of the computed inundation extents shows a broad correlation with the areas noted to still be inundated during the site visit. The estimated 1% AEP tide level of 1.97 mAHD is shown to result in additional inundation further northwest of the main township area, extending up to North Terrace.

For the other 2 events, the available tide levels and DEM suggest that they are mainly contained to Maria Creek and adjacent floodplain and do not inundate Rosetown, even though inundation within Rosetown was observed during these events. This is potentially due to limitations with both the available tide data being from a tide gauge located relatively far away from Rosetown (see Section 3 for more details), as well as the available elevation data being from 2018. There are potentially areas within Rosetown whereby the terrain has changed between 2018 and 2025 which would not be captured in the DEM. Additionally, there is a possibility that the terrain may have changed as a result of the initial storm surge event washing away any ridges or earthen mounds acting as natural levees. This would in turn reduce the tide height needed for water to spill into and inundate Rosetown. Without undertaking detailed level survey at various locations within Rosetown, it is not possible to identify if this had occurred.



Legend

 Study area

Inundation extents

 Tide Height 1.57 m AHD (22 July)

 Tide Height 1.63 m AHD (26 May)

 Tide Height 1.78 m AHD (25 June)

 Tide Height 1.97 m AHD (1% AEP 2025)

tonkin

Job Number: 251187
Filename: 251187GQ002
Revision: A
Date: 2025-09-23
Drawn: BT



Kingston District Council

ROSETOWN STORM SURGE ASSESSMENT
Inundation extents for various tide heights

Figure 4.1



4.1 High-level mitigation options

Based on both the site visit observations and the storm surge inundation assessment undertaken, several mitigation options have been developed to:

- Prevent spill into Rosetown due to storm surge events
- Manage drainage within the identified low-lying areas.

The mitigation options developed are discussed in the following sections.

4.1.1 Storm surge management

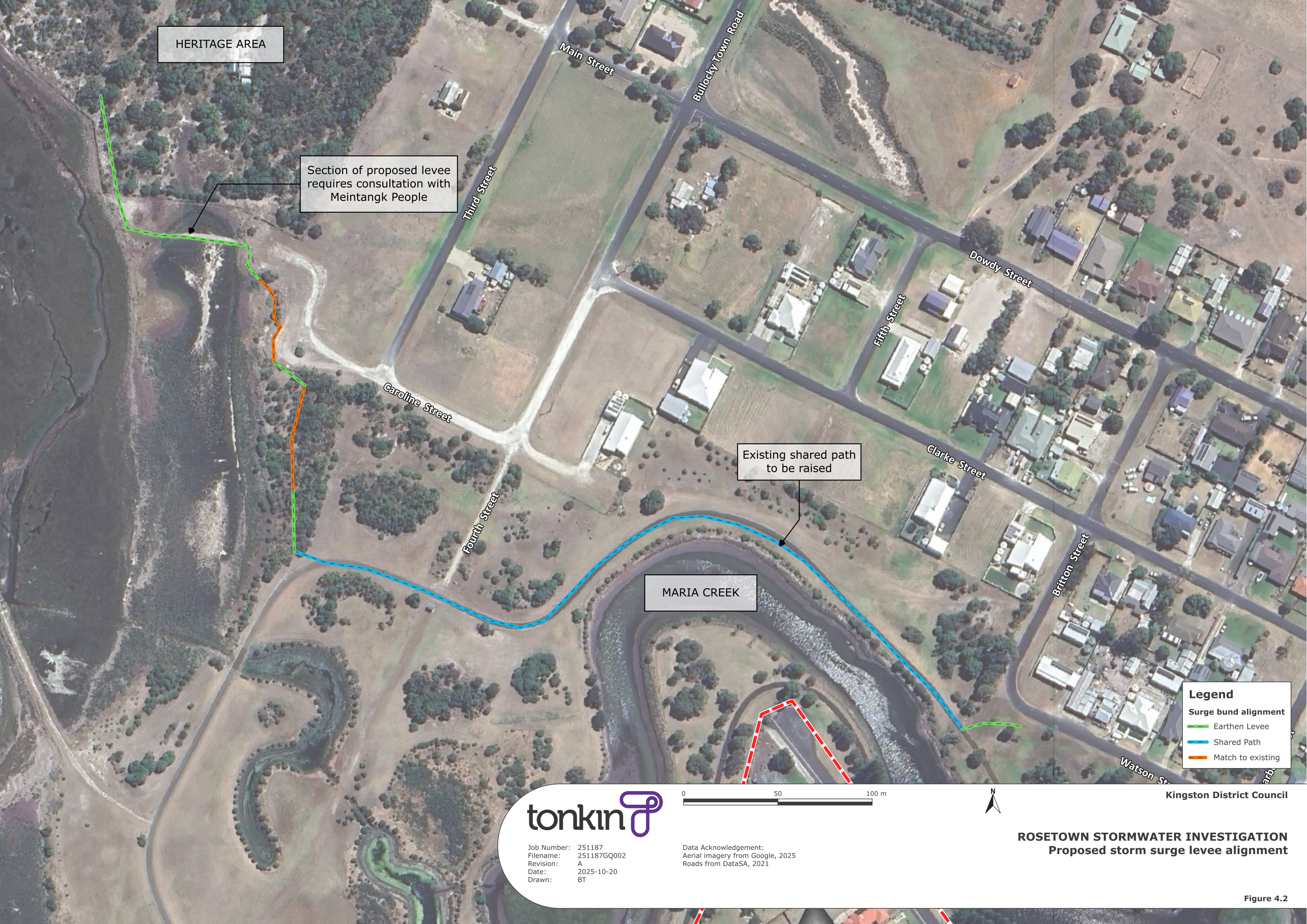
The proposed mitigation measure to protect Rosetown from storm surge related inundation is to construct a levee along Maria Creek. The levee is proposed to be constructed to protect against the 1% AEP peak tide level with an allowance for 300 mm of freeboard. This results in a top of levee level of approximately 2.3 mAHd. The proposed alignment is shown in Figure 4.2, with a primary aim of protecting the lower lying area of Rosetown to the west of Britton Street.

A review using Canute3 suggests the proposed top of levee level is nearly equivalent to the estimated 1% AEP peak tide level of 2.38 mAHd for the 2090-time horizon and SSP 2-4.5 climate change scenario. A level of 2.3 mAHd is proposed initially for the purposes of this assessment, with Council having the option to investigate raising the top of levee level further if Council wishes to front load the cost of the upgrade works, or have the levee raised in the future to coincide with asset renewal cycles.

The proposed storm surge levee consists of two main elements, earthen levees and increasing the height of an existing shared path. The extent of shared path shown in Figure 4.2 matches the alignment of the existing shared path. The shared path is currently raised, as shown in Figure 2.3 with an elevation cross section shown in Figure 4.3, but the height of the shared path would need to be raised further to match the proposed 2.3 mAHd top of levee level. Having the shared path act as the levee provides several benefits, including cost effectiveness of having a dual-purpose asset, as well as improving sight lines along the shared path to improve public amenity.

The remaining sections of the levee are proposed to be comprised of earthen levees. For the levees on the western side, the alignment has been developed to tie into existing ridges and high points in the natural terrain to minimise the extent of earthworks required. These ridges are denoted by the orange sections of the alignment. The western levee is also proposed to extend across the front and along the western boundary of the heritage area to ensure this area is protected against storm surge inundation. The alignment of the levee south of the heritage area broadly follows the access road off Second Street, which provides an additional benefit of ensuring access to the heritage area is maintained during storm surge events. It is highly recommended that the Meintangk People are consulted prior to works commencing. For the short section of earthen levee on the eastern side, this will match into the existing terrain along the southern side of Watson Street which has existing elevations above 2.3 mAHd.

Typical sections for the proposed levee for the shared path sections and the earthen levee sections are provided in Figure 4.4 and Figure 4.5, respectively. For safety reasons the shared use path has assumed 1 in 5 batter gradients and a relatively wide top width, while the earthen levees have assumed a steeper 1 in 4 batter gradient and narrower top width (1m).



HERITAGE AREA

Section of proposed levee
requires consultation with
Meintangk People

Existing shared path
to be raised

MARIA CREEK

Legend

- Surge bund alignment
- Earthen Levee
- Shared Path
- Match to existing



Job Number: 251187
Filename: 251187GQ002
Revision: A
Date: 2025-10-20
Drawn: BT

0 50 100 m

Data Acknowledgement:
Aerial imagery from Google, 2025
Roads from DataSA, 2021



Kingston District Council

ROSETOWN STORMWATER INVESTIGATION
Proposed storm surge levee alignment

Figure 4.2

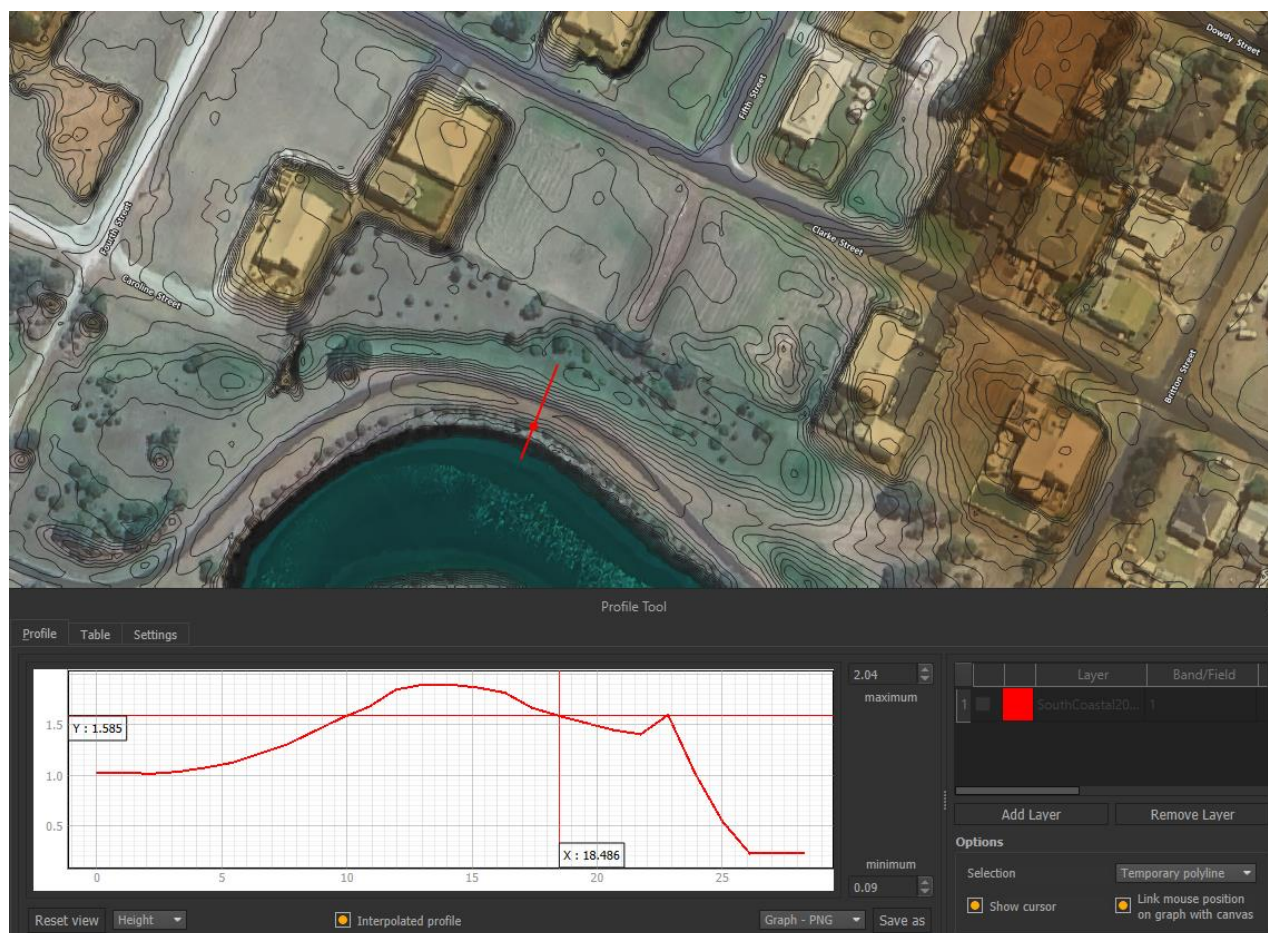


Figure 4.3 Cross section of raised shared path

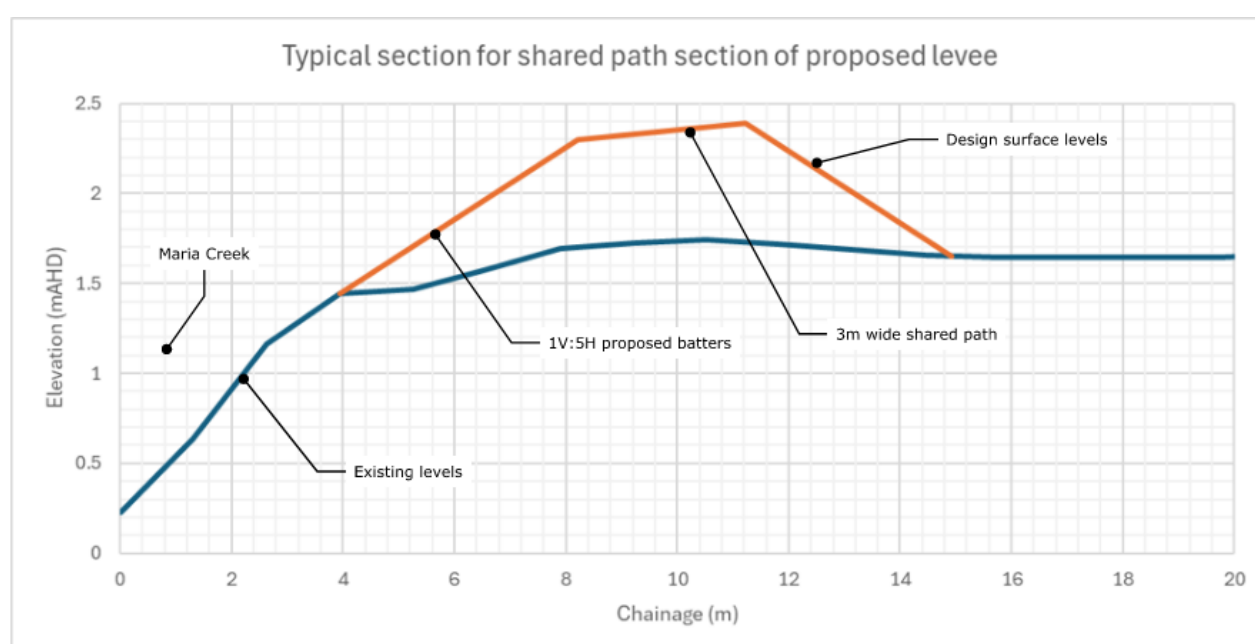


Figure 4.4 Typical section for shared path section of proposed levee

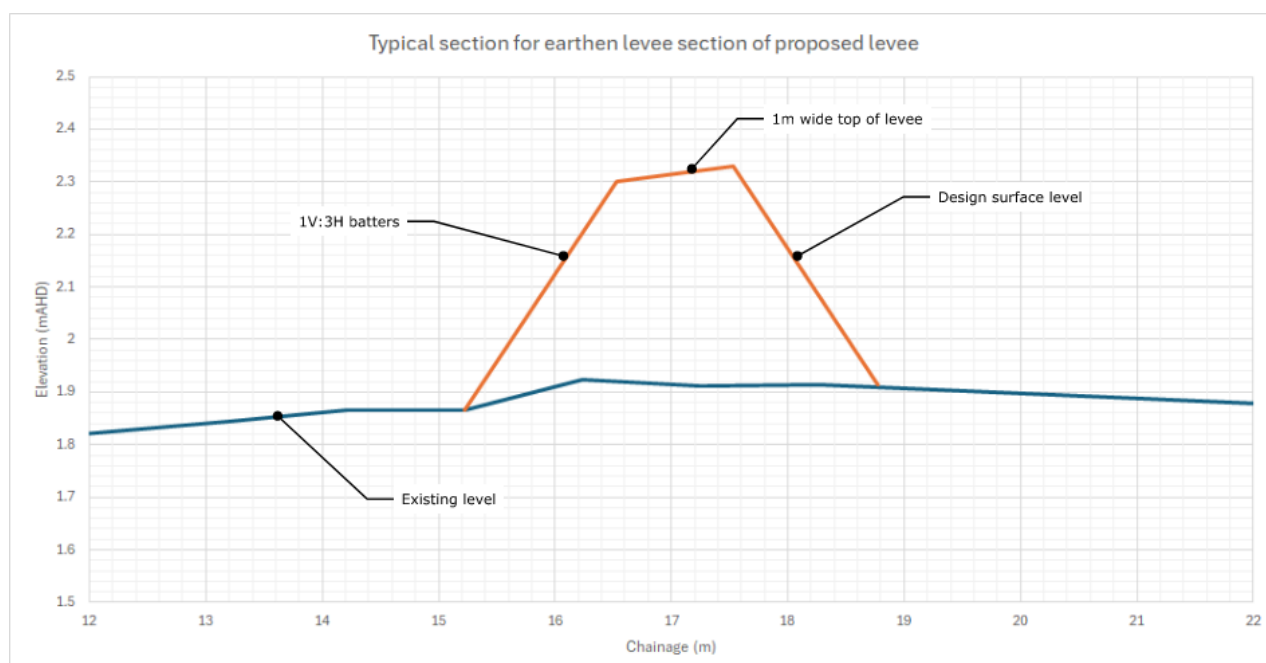


Figure 4.5 Typical section for earthen levee section of proposed levee

4.1.2 Drainage for low-lying areas

There are several areas around Rosetown which were noted to still be inundated during the Tonkin site visit, 6 weeks after the most recent inundation event. These locations, along with interrogating the DEM, were used to identify the key low-lying areas that would benefit from additional drainage infrastructure or would serve as natural low points in the terrain where floodwater could be detained. The main low-lying areas are those listed below. A figure showing the general drainage upgrades proposed for each area can be found in Figure 4.6 below.

- Area on the corner of Bullocky Town Road and Dowdy Street
- Third Street south of Main Street
- Area between Fifth Street and the shared path adjacent to Maria Creek

It should be noted however, that should the levee banks be installed and they provide the Rosetown with a high level of storm surge inundation protection, the need to provide drainage for the low-lying areas of Rosetown is likely to be a lower priority. However, as development within the area increases (currently sparsely developed), the local area in its own right will produce increasingly large volumes of runoff from the Rosetown area itself. This could trigger the need to improve the drainage of the local area.

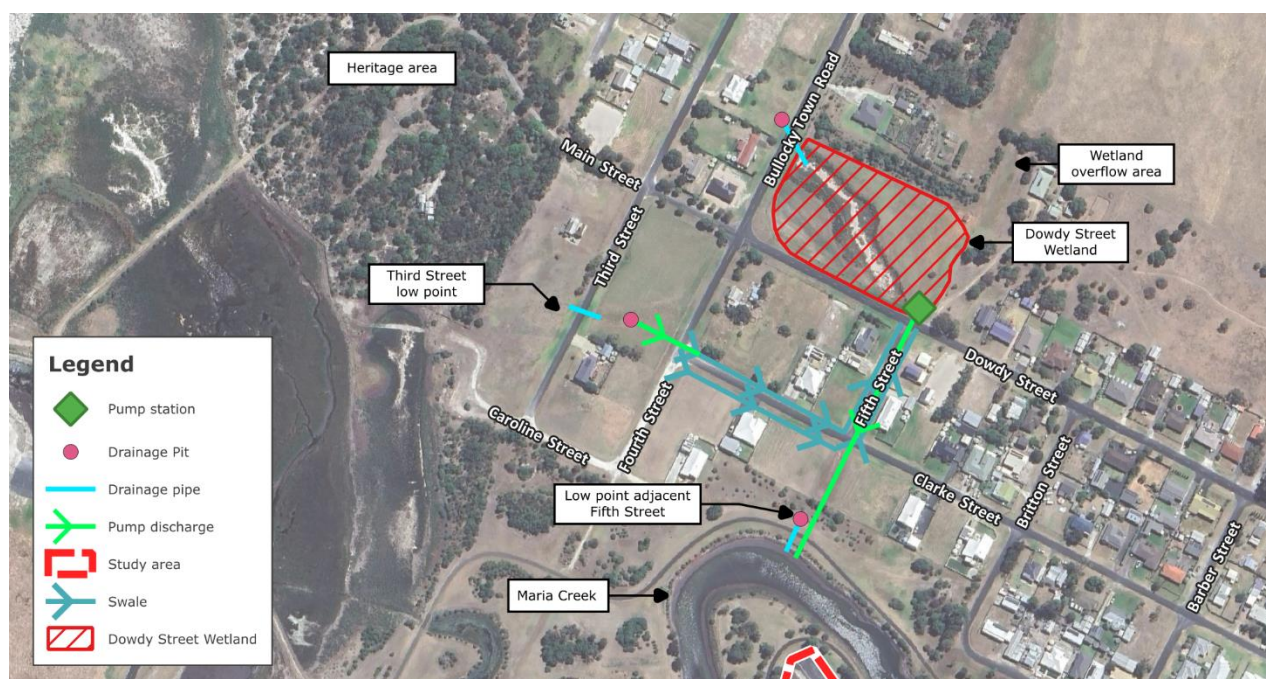


Figure 4.6 Drainage for low-lying areas

4.1.2.1 Dowdy Street Wetland

The land parcel at the corner of Dowdy Street and Bullocky Town Road currently contains a depression approximately 0.8–1.0 m deep that is landlocked. As shown in Figure 2.5, this area remains fully inundated following the storm surge event, with infiltration and evaporation being the only means of water removal. Because it lies lower than the surrounding land, this area could be formalised as a wetland. The indicative wetland footprint, shown in Figure 4.6, is approximately 1.1 ha. If excavated to a minimum depth of 0.8 m, the wetland could provide a total storage volume of about 8,000–9,000 m³, a substantial increase over the current estimated capacity of 2,600 m³ (up to 1.3 mAHD, based on the DEM).

The wetland would serve multiple functions, including retention storage for urban runoff, water quality treatment, acting as a public open space/amenity area, and as an overflow area for spill from future storm surge events to minimise inundation extents. Urban runoff could be directed to the wetland via roadside swales, similar to those along Clarke Street and Fifth Street (see Figure 4.6). Further discussion on roadside swales is provided in Section 4.1.2.4.

In the event of a forecasted storm surge event, the wetland could be pre-emptively drained either via a permanently installed pump or a temporary submersible pump, with a rising main discharging to Maria Creek as per the alignment shown in Figure 4.6. By draining in advance, the wetland would provide additional detention capacity to store storm surge spill, acting as a secondary line of defence should the proposed levee be overtopped.

The area to the northeast of the proposed wetland is a low-lying gully area which was noted to also still be inundated during the site visit. This area could potentially be incorporated as an overflow area for the wetland to further contain any excess spill and minimise inundation in the urban area.



4.1.2.2 Third Street Low Spot

There is a gully which runs southwest to northeast across Third Street. This gully is noted to be landlocked based on the DEM. To drain this low point, it is proposed that a culvert under Third Street be installed to direct floodwater to the eastern side, where the terrain is lower. A pump could then be installed (permanent or temporary) to drain this area. Figure 4.6 shows a proposed arrangement where the pump is used to discharge runoff to the proposed roadside swale along Clarke Street which drains to the proposed Dowdy Street wetland. Alternatively, the pump could be directed towards the south along Fourth Street to discharge to Maria creek.

4.1.2.3 Low Spot South of Fifth Street

Interrogation of the DEM suggests that there is a trapped gully along Fifth Street as shown in Figure 4.6. This gully was understood to form part of the flow path for spill from the storm surge event. A potential option for drainage water in this trapped gully is to install a grated inlet pit at the lowest point in the gully, as shown in Figure 4.6, and have a pipe to discharge flows to Maria Creek. A flap gate would need to be installed at the end of this pipe to prevent backflow from the creek.

4.1.2.4 Roadside Swales

The majority of Rosetown west of Britton Street has unkerbed roads. Given the area is relatively low-lying, it is proposed that roadside swales are formalised and installed. These swales would help guide floodwater towards designated areas, such as the proposed Dowdy Street wetland and reduce the duration at which roadways and urban areas are inundated should another storm surge event occur. In low-lying areas, these swales also provide additional detention storage and promote infiltration, thereby decreasing the frequency and volume of surface runoff.



5 Opinion of Cost

A high-level cost estimate was prepared for the proposed storm surge levee, as outlined in Section 4.1.1 of this report. Where possible, rates have been derived from Rawlinsons (2023) and other lists of rates supplied by contractors for Adelaide-based construction projects. Quantities have been estimated based on the proposed finished surface level and indicative existing site levels. The total estimated cost is approximately \$865,000. The estimated cost includes a 10% allowance for preliminaries, 10% allowance for design fees and survey and a 30% contingency. A high-level breakdown of costs is provided in Table 5.1, whilst full cost estimates are provided in Appendix A.

The cost estimates are based on a number of exclusions, most notably of which includes any temporary works or additional costs relating to the approximately 75 m section of earthen levee to the northern end, which passes through a suspected low-lying tidal area. Whilst it is anticipated that works within this area may be significantly more difficult and expensive, we are not able to provide an accurate quantum of this cost, which may be significant compared to the value of the earthen levee cost. It is therefore recommended that a civil contractor is consulted regarding construction cost estimates for this portion of the proposed works.

The cost estimate has only been in relation to the proposed levee bank works. No cost estimate has been made for the potential drainage options outlined in Section 4.1.2.

Table 5.1 Cost estimate summary.

Item	Estimated Cost (ex. GST)
Preliminaries (10%)	\$55,000
Design Fees (10%)	\$55,000
Shared Path Construction	\$485,000
Earthen Levee Construction	\$70,000 [#]
Contingency (30%)	\$200,000
Total	\$865,000

[#] Low level of confidence in this component of the cost estimate



6 Summary

Rosetown has been subjected to 3 storm surge events between the 26th of May to the 22nd of July 2025. Due to the absence of a local drainage system, floodwater which spills out of Maria Creek into the Rosetown township is observed to pool in the area for an extended period of time. The inundation has also resulted in road closures. Based on the nearest available tidal gauge located within the Lake Butler Marina in Robe, the storm surge tide heights were noted to range between 1.57 mAHD to 1.78 mAHD, with the highest tide height being approximately equivalent to a 4% AEP tide height.

To prevent future storm surge events from inundating Rosetown, it is proposed that a levee be constructed along the northern banks of Maria Creek. The levee is proposed to be constructed up to a minimum height of 2.3 mAHD, as this provides 330 mm freeboard above the estimated 1% AEP peak tide height for Kingston at 1.97 mAHD. The levee alignment is proposed to comprise of lifting the existing shared path which runs along the northern bank of Maria Creek, as well as constructing earthen levees which match into existing elevated ridges in the terrain. The levee is also proposed to extend further west to protect the heritage area used by the Meintangk People. Hence, this section of levee will require consultation and collaboration with the Meintangk People.

In addition to the levee, drainage infrastructure within Rosetown has been proposed to assist with improving local drainage, as well as act as a secondary line of defence against storm surge events. These proposed upgrades include introduction of pumps and roadside swales to encourage floodwater to flow towards the low spot within the township, which is the area on the corner of Dowdy Street and Bullocky Town Road. This area is also proposed to be converted to a wetland to provide water quality improvements, peak flow management, and to improve amenity within the area. The Dowdy Street wetland is proposed to discharge via a pump and rising main towards Maria Creek.

The measures proposed have been assessed at a high-level. The design of these elements should be reviewed during detailed design to ensure constructability and cost effectiveness of the proposed levee alignments can be optimised.



Appendix A – Cost Estimates

CONSTRUCTION COST ESTIMATE



Project: Rosetown Stormwater Investigation
Job No: 251187
Date: 9/10/2025
Revision: A
Summary of works: Storm surge protection levee
Estimated: BT / WG
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0 Preliminaries						
1.1	Preliminaries	Assumed to be 10% of estimate			\$	55,379.00
1.2	Design fees (inc. survey)	Assumed to be 10% of estimate			\$	55,379.00
Sub-Total						\$ 110,757.99
2.0 Shared Path						
2.1	Bulk fill	Assumed 1 in 5 batter slops and extra 30% for compaction	m ³	1493	\$ 43.00	\$ 64,181.10
2.2	Strip topsoil and stockpile	Assume 200 mm thick.	m ²	3310	\$ 20.00	\$ 66,194.92
2.3	Subgrade preparation		m ²	3310	\$ 3.00	\$ 9,929.24
2.4	Proof roll of subgrade		m ²	3310	\$ 0.60	\$ 1,985.85
2.5	Compaction of embankment material	Compact in layers 150 mm thick to 90%	m ²	7279	\$ 4.80	\$ 34,937.85
2.6	Removal and disposal of existing footpath	Assume 415 long, 3 m wide	m ²	1245	\$ 28.00	\$ 34,860.00
2.7	Footpath reinstatement	200mm PM2/20 sub base, 150mm PM1/20 base course, 40mm AC10 with prime coat.	m ²	1279	\$ 190.00	\$ 243,067.63
2.8	Topsoil spreading	Assumed 150 mm thick. Batters only for shared path	m ²	2071	\$ 11.00	\$ 22,777.19
2.9	Hydromulch	Spray grass seed compound. Batters only for shared path	m ²	2071	\$ 0.40	\$ 828.26
2.10	Tree removal	Number of trees to be removed based on high-level count from aerial imagery	each	12	\$ 470.00	\$ 5,640.00
Sub-Total						\$ 484,402.03
3.0 Earthen Levee						
3.1	Bulk fill	Assumed 1 in 3 batter slops and extra 30% for compaction	m ³	403	\$ 43.00	\$ 17,314.14
3.2	Strip topsoil and stockpile	Assume 200 mm thick.	m ²	775	\$ 20.00	\$ 15,508.13
3.3	Subgrade preparation		m ²	775	\$ 3.00	\$ 2,326.22
3.4	Proof roll of subgrade		m ²	775	\$ 0.60	\$ 465.24
3.5	Compaction of embankment material	Compact in layers 150 mm thick to 90%	m ²	1191	\$ 4.80	\$ 5,715.71
3.6	Topsoil spreading	Assumed 150 mm thick. Batters and top for earthen levee	m ²	565	\$ 11.00	\$ 6,212.58
3.7	Hydromulch	Spray grass seed compound. Batters and top for earthen levee	m ²	565	\$ 0.40	\$ 225.91
3.8	Tree removal	Number of trees to be removed based on high-level count from aerial imagery	each	46	\$ 470.00	\$ 21,620.00
Exc.	It is noted that an approximately 75 m section of the proposed levee passes through a tidal zone. Whilst it is anticipated that works within this area will be significantly more difficult and expensive to construct, we are not able to provide an accurate quantum of this cost, which may be significant compared to the value of the earthen levee cost. It is therefore recommended that a civil contractor is consulted in regards to this component of costs.					
Sub-Total						\$ 69,387.94

Sub-total	\$ 664,547.97
Contingency 30%	\$ 199,364.39
Grand Total	\$ 863,912.36

Note:

Cost estimates provided by Tonkin are based upon historic cost information and experience, and do not allow for:

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for approvals for these works
- No allowance for land acquisition
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance for land acquisition
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service deepthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin recommends that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.