



KEMPSEY
Shire Council

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Lower Macleay
Flood Levee Audit Report

Introduction

The Lower Macleay Flood Levee system was designed and constructed in the 1960's. Since this time, the condition of the levees has deteriorated due to a lack of maintenance.

In 2015/16 audits were conducted on all of the Lower Macleay levee systems to assess the current conditions of the levees and provide recommendations to remediate any issues found. This will enable the deficiencies to be identified and planning for remediation to commence.

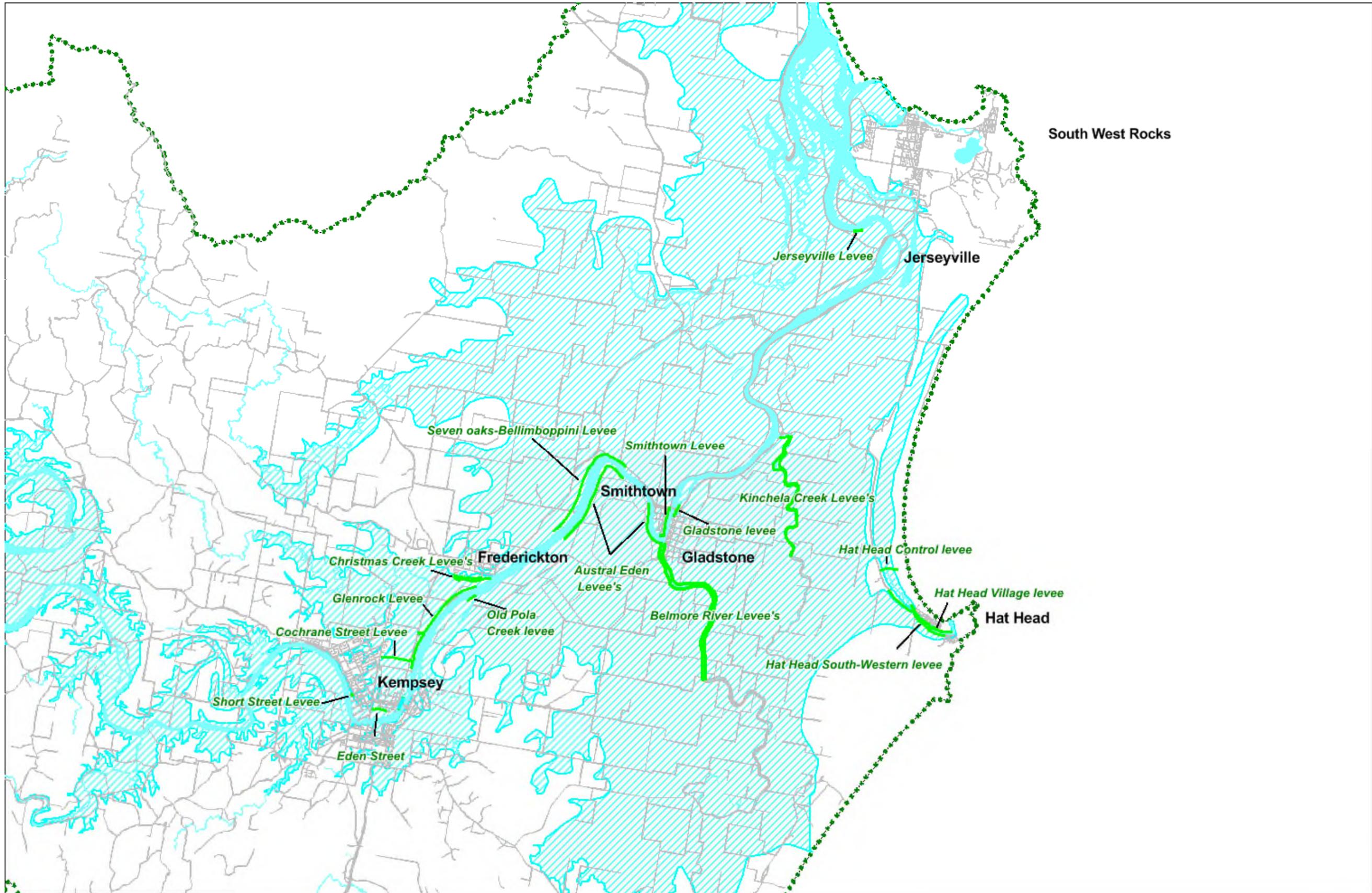
Scope of audit

The scope of the audit included but was not limited to:

1. Compilation of all the known reports and information available on the levee and a summary of their findings and recommendations.
2. Comparison of the levee design crest levels, existing crest levels and flood levels. This was undertaken by:
 - a. Obtaining the levee design crest levels and flood levels from either:
 - i. The original design plans,
 - ii. Previous flood studies, or
 - iii. Previous experience with road designs in the areas.
 - b. Completing a survey of the levee to confirm existing levels.
 - c. A defects inspection (visual) of the levee to identify areas of anomalies, such as missing levees, low sections, localised depressions, and signs of erosion/scour or instability.
3. Geotechnical testing and stability assessment of the urban levee's (no assessment was completed on the rural levee's).

The following items were not included in the scope of the audit although it is recommended they be carried out at a later date:

1. Preparation of a cost estimate for the remediation of all identified defects and a total cost to repair the levee.
2. Preparation of a condition rating for the levee based on the risk of failure and the likely consequence of failure.
3. Preparation of an Operation & Maintenance Manual. It is proposed that one document for the entire Lower Macleay flood levee system be developed.



Summary of findings

Hat Head village Levee

- Approximately 1.6 kilometres long
- Runs from the Korogoro Creek Bridge along the northern bank of Korogoro Creek
- Height varies between 2.4m to 2.9m AHD (1 to 1.5 m above natural surface level)
- Crest width varies between 2.4m to 2.9m
- Batter slopes are approximately 1 in 3 on the water side and 1 in 3 to 1 in 4 on the town side
- Water proof barrier within the levee structure, however not considered to be effective any more

Hat Head control Levee

- Approximately 500 metre earth bank
- Runs perpendicular across Korogoro Creek
- Located 2km upstream of the Korogoro Creek Bridge
- Ranges in height from 0m -1.0m
- Crest width of 3.2 m
- Fitted with a 7 cell 1.83m H x 2.44m W box culvert and control gates to “throttle” flows
- Batter slopes are approximately 1 in 5 on the water side and 1 in 8 on the town side
- Rock retaining wall that varies in height between 0.5m and 1.0m at the toe of the town side batter
- Erosion present around wing walls of the control culvert
- Geo-fabric cover behind the wing wall is failing

Cochrane Street Levee

- Approximately 1450m long over an earthen embankment
- Ranges in height between 2m and 4.5m
- Crest width between 2m and 3.5m
- Shoulders have a grade between 1(V):2.5(H) and 1(V):4(H)
- Erosion on protected face needs to be addressed

Eden Street Levee

- Approximately 530m long
- Positioned along southern side of Verge & Eden streets sports field
- Set back 190m from Macleay River to the south
- Trapezoidal shape approximately 1.2m high
- Crest width ranging between 2.2m and 3.8m
- Water side batter generally graded between 1(V):1.35(H)
- Protected side batter graded between 1(V):8(H) and 1(V):14(H)

Smithtown Levee

- Earthen embankment, 1180m in length
- Typically 0.5m high (above natural surface level)
- Located on the left bank of the Macleay River approximately 16.5km downstream of Kempsey
- Crest is generally 1.7m to 2.5m wide
- Shoulders are graded between 1V:2H and 1V:9H

Kempsey to Frederickton Levee

- Approximately 2.5 kilometres of constructed earth bank
- Typically between 0.3m and 1.0m high (above natural surface level)
- Crest width between 2m and 3m
- Shoulders are generally slightly rounded in sectional geometry with an overall batter grade between 1(V):2.5(H) and 1(V):4(H)

Christmas Creek Levee

- Comprised of two 1200m long earthen levee banks, situated on both the left and right Creek banks
- Commences at the mouth of Christmas Creek.
- Right bank levee maintains a relatively constant crest height, increases substantially approaching the head works abutment
- The left bank levee maintains a relatively constant crest height

Frederickton to Smithtown Levee

- Approximately 4km of constructed earth
- Typically between 0.3m and 1.5m high (above natural surface level)
- Typical crest width between 2m and 3m
- Shoulders are generally rounded in sectional geometry with overall batter grade between 1(V):2.5(H) and 1(V):4(H)

East Kempsey to Gladstone Levee

- 3.3 kilometres of constructed earthen levees
- Situated on the right hand bank of the Macleay River
- Trapezoidal or rounded in shape
- Height is mainly less than 1.0m above natural surface
- System includes 4 main sections:
 - Pola Creek Levee
 - Old Pola Creek Levee
 - Macleay River Right Bank Levee
 - Austral Eden Levees

Belmore River Levee's

- Constructed on the left and right banks of Belmore River approximately 6km (each)
- Comprised of:
 - A lift gate overflow structure (floodway) located approximately 6km upstream of the Macleay River junction
 - A barrage (headworks) structure crossing the creek at the upstream end of the system.
 - A number of earthen drains to remove flood-water from the floodplain.
 - Two earthen flood levees designed to create a consistent river bank level between the Macleay River junction and the flood structures.

- crest level constant 3.70m AHD (0.2m-0.3m above natural surface)
- batter slopes typically range between 1V:2H and 1V:3H

Kinchela Creek Levee

- Constructed on the left and right banks of Kinchela Creek approximately 6km (each)
- Comprised of:
 - Two lift-gate overflow structures (floodways) located on Kinchela Creek approximately 5km upstream of the Macleay River junction.
 - A barrage (headworks) structure crossing the creek at the upstream end of the system.
 - A number of earthen drains to remove flood-water from the floodplain.
 - Earthen flood levees designed to create a consistent river bank level between the flood structures.
- crest level constant 3.05m AHD (0.2m-0.3m above natural surface)
- Batter slopes typically range between 1V:2H and 1V:3H

Rainbow Reach Levee

- A trapezoidal earth bank levee approximately 450 meters in length
- Ranges in height from 0.5m -1.0m
- Typical crest width of 3.0m
- Batter slopes are typically 2.5(H):1(V) on the water side and 2.5(H):1(V) on the protected side

Smithtown to Jerseyville Levee

- Earth bank levee, 31.2km in length
- Almost entirely road formation
- Height ranges from 0m -1.0m
- Typical crest width of 6.0m
- The batter slopes are typically 2.5(H):1(V) on the water side and 2.5(H):1(V) on the protected side
- Rock protection has been placed at the water side toe along much of the road length

Defects Inspection Report

Levee	Defect #	Chainage	Description	Priority Level
Hat Head Village Levee	HHVL 1	-80	Large tree in upstream shoulder.	3
Hat Head Village Levee	HHVL 2	-45	Flood Gate: Concrete headwall surrounded the flood gate. The gate was not completely closed. A crack was present in the assembly. The concrete connection was cracked, contained a penetration as well as 'concrete cancer'.	2 (repair flood gate) 3 (repair head wall)
Hat Head Village Levee	HHVL 3	-45	Stormwater Inlet: The inlet comprised a 450mm diameter concrete pipe and contained leaf litter and eroded debris.	1 (investigate creek bank stabilisation) 2 (for clean out) 3 (for improvement)
Hat Head Village Levee	HHVL 4	-35	Two large trees in upstream shoulder.	1 (investigate creek bank stabilisation) 3 (for reconstruction)
Hat Head Village Levee	HHVL 7	50	Stormwater Inlet: The inlet comprised a 450mm diameter concrete pipe surrounded by a concrete headwall. Flood Gate: Concrete headwall surrounded the flood gate. The gate was closed. The concrete encasement surrounding the pipe outlet had broken off in some sections, revealing voids.	3
Hat Head Village Levee	HHVL 8	170	Stormwater Inlet: The inlet comprised a 375mm diameter concrete pipe surrounded by an ad-hoc dry stacked boulder wall. A 100mm diameter 'ag' pipe daylighted adjacent to the crown of the concrete pipe. Both inlets contained leaf litter and grass clippings. Flood Gate: Concrete headwall surrounded the flood gate. The gate was closed. Debris had accumulated in front of the gate however it did not appear to impede operation. The concrete encasement surrounding the pipe outlet had broken off in some sections, revealing voids.	2 (for clean out and CCTV inspection & treatment of 'ag' pipe) 3 (for repair/ improvement)
Hat Head Village Levee	HHVL 9	340	Frangipani tree on downstream shoulder.	3

Hat Head Village Levee	HHVL 10	380	<p>Stormwater Inlet: The inlet comprised a letterbox pit. To the south-west of the pit, adjacent to the tree, a 'low spot' existed. Leaf litter and debris were observed at the letterbox pit opening.</p> <p>Flood Gate: Concrete headwall surrounded the flood gate. The gate was closed and partially buried/obstructed by debris. The condition of the head wall and concrete surrounds to the pipe could not be observed due to dense vegetation.</p>	2 (for clean out and topping up of 'low spot')
Hat Head Village Levee	HHVL 12	455 to 485	Tree root, approximately 100mm diameter, extended over levee crest. The tree root most likely belonged to the gum tree located 2.5m beyond the downstream toe. Black builder's plastic exposed along levee crest.	3
Hat Head Village Levee	HHVL 14	493	Tree roots extended over levee crest.	3
Hat Head Village Levee	HHVL 15	497	<p>Stormwater Inlet: The inlet was completely blocked by debris and obscured by long grass.</p> <p>Flood Gate: Concrete headwall surrounded the flood gate. The gate was closed and partially buried/obstructed by debris. The condition of the head wall and concrete surrounds to the pipe could not be inspected due to the accumulated debris.</p>	2
Hat Head Village Levee	HHVL 16	554	Tree roots up to 80mm diameter extended over crest for a 13.5m length of levee.	3
Hat Head Village Levee	HHVL 18	670	<p>Stormwater Inlet: The inlet comprised a letterbox pit. The letterbox pit opening was partially buried by leaf litter and debris.</p> <p>Flood Gate: Concrete headwall surrounded the flood gate. The gate was closed. The head wall and concrete surrounds to the pipe appeared to be in good condition.</p>	2
Hat Head Village Levee	HHVL 19	700	<p>Stormwater Inlet: The inlet comprised a letterbox pit. The letterbox pit opening was mostly obstructed by (uncut) long grass.</p> <p>Flood Gate: In this area, the upstream toe of the levee had eroded out and was undercut. Despite the upstream shoulder being covered with dense grass, there was evidence of erosion and subsidence on the shoulder itself. A concrete headwall surrounded the flood gate. The erosion had exposed the back of the headwall. Debris had jammed open the flood gate.</p>	2
Hat Head Village Levee	HHVL 20	705 to 745	Riverbank Erosion: An approximately 40m length of riverbank had eroded. The erosion, which included soil slumping, had undercut the upstream toe of the levee. Some rock armour was observed along the riverbank.	1 (investigate creek bank stabilisation)

Hat Head Village Levee	HHVL 21	745 to 810	Riverbank Erosion: An approximately 65m length of riverbank had eroded but to a lesser extent than observed between CH705 & CH745 (Item 20). The erosion had undercut the upstream toe of the levee. Rock armour was present along the riverbank.	1 (investigate creek bank stabilisation)
Hat Head Village Levee	HHVL 22	770 to 810	Large Trees: Three large trees were located on the downstream shoulder. Along this 40m length of levee, tree roots extended over the crest. Black builder's plastic exposed along the crest was quite noticeable along this root affected section of levee.	3
Hat Head Village Levee	HHVL 24	875	Birds' Nest: A 100mm diameter horizontal nest hole was observed mid-slope on the upstream shoulder. The nest hole was 800mm deep when probed with a steel tape measure.	2
Hat Head Village Levee	HHVL 26	935	Stormwater Inlet on Town Side of Creek Street: The inlet comprised a letterbox pit. The letterbox pit opening was partly obstructed by (uncut) long grass. Stormwater Inlet on Creek Side of Creek Street: The inlet comprised a letterbox pit. The letterbox pit opening was partly obstructed by (uncut) long grass. Flood Gate: Concrete headwall surrounded the flood gate. The gate was closed. The head wall appeared to be in good condition. Debris had accumulated in front of the gate however it did not appear to impede operation.	2
Hat Head Village Levee	HHVL 27	995	Stormwater Inlet: The inlet comprised a letterbox pit. The letterbox pit opening was partly obstructed by (uncut) long grass. Flood Gate: The flood gate could not be found amongst the dense fern and leaf litter coverage.	2
Hat Head Village Levee	HHVL 28	1018 to 1038	Tree roots extended over crest for an approximate 20m length of levee.	3
Hat Head Village Levee	HHVL 29	1075 to 1085	Birds' Nests: Five 50mm diameter horizontal nest holes were observed mid-slope on the upstream shoulder. The nest holes ranged in depth between 50mm and 900mm when probed with a steel tape measure.	2
Hat Head Village Levee	HHVL 30	1113	Stormwater Inlets: Grated stormwater pits on either side of Creek Street. Flood Gate: Located approximately 10m beyond the upstream toe of the levee, within the creek inter-tidal zone. The gate was closed. Concrete headwall surrounded the flood gate and appeared to be in good condition. There was some erosion of rock fill/armour adjacent to the headwall.	2

Hat Head Village Levee	HHVL 31	1250	Stormwater Inlet: The inlet comprised a letterbox pit. The letterbox pit opening was partly obstructed by (uncut) long grass and litter. Flood Gate: The flood gate was located on the creek bank, within the inter-tidal zone. The gate was closed. The pipe behind the flood gate was surrounded by concrete which appeared to have been placed in an ad-hoc manner. The bank material surrounding the concrete had eroded out, resulting in cracking of the concrete.	2 (for clean out) 3 (for improvement)
Hat Head Village Levee	HHVL 32	1250	Crest erosion due to pedestrian/bicycle traffic.	3
Hat Head Village Levee	HHVL 33	1255	Fig tree at toe of downstream shoulder.	3
Hat Head Village Levee	HHVL 34	1262	Gouge in downstream shoulder of levee.	2 or 3
Hat Head Village Levee	HHVL 37	1515	Stormwater Inlet: Grated stormwater pit at downstream toe of levee. Flood Gate: Located approximately 7m beyond the upstream toe of the levee. The gate was closed. Concrete headwall surrounded the flood gate. The headwall was in poor condition with a vertical crack adjacent to the flood gate. There was faulting across the crack by approximately 10mm. Debris and leaf litter had accumulated in front of the gate however it did not appear to impede operation.	2 (for clean out) 3 (for improvement)
Hat Head Village Levee	HHVL 38	1540	Tree root up to 100mm diameter extended over levee crest.	3
Hat Head Village Levee	HHVL 40	1555	Stormwater Inlet: Grated stormwater pit at downstream toe of levee. Flood Gate: Located approximately 6m beyond the upstream toe of the levee. Concrete headwall surrounded the flood gate and appeared to be in good condition. The gate was closed and partially buried/obstructed by debris. Beyond the flood gate was an unlined drainage channel through the beach. Water was ponding in the channel.	2
Hat Head Village Levee	HHVL 41	1560 to 1578	Tree roots extended over crest for an approximate 18m length of levee. Large trees were located within 2.5m of the upstream toe.	3
Hat Head Village Levee	HHVL 42	1595	Stormwater Inlet: The inlet comprised a concrete pipe and appeared to be partially obstructed by vegetation, eroded debris, leaf litter and litter. The diameter of the pipe could not be measured as a campsite had been set up over the inlet. Flood Gate: Concrete headwall surrounded the flood gate. The flood gate was almost completely buried by debris and was forced closed.	2 (for clean out) 3 (for improvement)

Hat Head Village Levee	HHVL General	Various	Dense tree coverage adjacent to upstream toe of levee. Chainages -110 to -20, 0 to 50, 90 to 510, 675 to 710, 810 to 1070, 1570 to 1625	2
Hat Head Village Levee	HHVL General	-	Increasing the height of the levee where required.	3
Hat Head control Levee	HHCL 100	270-300	Box culvert investigation (if required).	1
Hat Head control Levee	HHCL 101	270-300	Timber plank protection above box culvert.	2
Hat Head control Levee	HHCL 102	0-550	Patchy tree coverage along downstream toe	2
Hat Head control Levee	HHCL 103	270	Erosion behind south-western wing wall of box culvert.	2
Hat Head control Levee	HHCL 104	0	Restricting vehicular access onto the levee	2
Hat Head control Levee	HHCL 105	0-550	Increasing the height of the levee and box culvert where required and construction of an unsealed access road	3
Cochrane Street	C 3	0-535 & 1070	Woody vegetation removal	2
Cochrane Street	C 4	950-1035	Cut off timber posts at base and remove star pickets	2
Cochrane Street	C 5	65	Rectification of erosion feature	2
Cochrane Street	C 6	0-1445	Clean off all flood debris	2
Cochrane Street	C 7	215-240	Interim levee raising and crest protection works	2

Cochrane Street	C 8	0-1445	Levee raising (where required) and stabilisation of downstream shoulder between CHO and CH1040	3
Cochrane Street	C 9	1217	Removal of weeds and re-grassing if the hydraulic assessment indicates that no levee raising is required along this 10m long section.	3
Eden Street	E 1	0-507	Hydraulic assessment by a competent hydraulic/water resources engineer to assess the appropriate design height of the levee	1
Eden Street	E 2	0-25	Detailed inspection of levee within ARTC land especially the transition point with rail embankment	2
Eden Street	E 3	160-507	Timber posts: Leave in place and inspect after each flood event, in accordance with the inspection and maintenance program	Not Applicable
Eden Street	E 4	0-25	Vegetation removal (following inspection) and levee reinstatement. Geotechnical inspection required during the removal and reinstatement process	3
Eden Street	E 5	40-55 365-400 430-507	Increase the height of the levee to the design height over the full length of the levee. Inspection and testing of representative borrow area samples Proof rolling inspection Density testing of all earth fill	3
Eden Street	E 6	0-507	Additional geotechnical investigations, seepage and stability analyses if the results of the hydraulic assessment indicate that the levee needs to be raised above the nominated design crest level of RL 7.5m	3
Smithtown	S 1	0-1183	Hydraulic assessment.	1
Smithtown	S 2	22-105	Additional geotechnical investigation.	1
Smithtown	S 3	227,242 290, 870	Removal of stormwater pipes, levee reinstatement and investigation of whether an additional buried pipe exists through the levee at 4 Morton Avenue.	2
Smithtown	S 4	196-242 457	Fence removal and levee reinstatement.	2
Smithtown	S 5	822-850	Investigation of the whereabouts of the reported pet cemetery.	2

Smithtown	S 6	710-750	Clean off stockpiled building rubble and rubbish, and re-survey levee.	2
Smithtown	S 7	102	Inspect, clean-out and maintain stormwater outlet structure.	2
Smithtown	S 8	595	Remove domestic tap and associated pipework from levee.	2
Smithtown	S 9	22-945	Design of improvement works and levee raising (where required).	3
Smithtown	S 10	22-945	Localised vegetation removal and re-grassing if the hydraulic assessment indicates that levee raising is not required	3
Kempsey to Frederickton	G 1	3245	Visible Low Point Possible low point where third lane intersects levee Average Condition	1
Kempsey to Frederickton	G 2	3575	Cattle Grid traversing Levee Low Point	1
Kempsey to Frederickton	G 3	3955	Excessive Cattle Grazing Crest eroded and very uneven Very Poor Condition	1
Kempsey to Frederickton	G4	140-180	Low section 120mm below design level	1
Kempsey to Frederickton	G5	590-680	Low section 160mm below design level	1
Kempsey to Frederickton	G6	890-900	Low section 110mm below design level	1
Kempsey to Frederickton	G7	2550	Major low Point 300mm below design level	1
Kempsey to Frederickton	G8	2610-2690	Low section 140mm below design level	
Kempsey to Frederickton	G9	3950-4170	Major low section up to 400mm below design level	

Kempsey to Frederickton	G10	4530	Low point 180mm below design level	
Christmas Creek	CCLB 1	-	Vegetation on levee. A number small and large trees are present on and around the levee bank over its entire length as well as thick vegetation on the levee between Ch: 100-520	1
Christmas Creek	CCLB 2	140	Pipe culvert under levee, monitor scouring. Pipe culvert appears to have been installed after levee construction. Excavations while laying the pipe may have caused local area of instability	1
Christmas Creek	CCLB 3	460	Pipe culvert under levee, monitor scouring. Pipe culvert appears to have been installed after levee construction. Excavations while laying the pipe may have caused local area of instability	1
Christmas Creek	CCLB 4	640	Pipe culvert under levee, mild scouring, monitor	2
Christmas Creek	CCLB 5	740-760	Minor erosion of levee crest	2
Christmas Creek	CCLB 6	-	Fence on Levee. A number of fences cross the levee bank that can be seen on the aerial photography in Appendix A of this report. Generally running perpendicular across levees posing low threat	3
Christmas Creek	CCLB 7	145	Low Point. Localised low point approximately 250mm lower than surrounding areas, still above design height	1
Christmas Creek	CCLB 8	-	A number of sections of the levee have uneven shoulders and crests due to minor erosion over time. The centre of the crest however, still generally remains at a consistent level.	2
Christmas Creek	CCRB 1	10-70	Low Area up to 500 mm below original design level. Given a lower priority level as this area of the levee is significantly higher than the rest of the surrounding levees. The main purpose of the height increase is most likely to provide access to the head works, rather than offering increased flood protection.	2
Christmas Creek	CCRB 2	-	Fence on Levee. A number of fences cross the levee bank that can be seen on the aerial photography in Appendix D of this report	2
Christmas Creek	CCRB 3	300	Pipe culvert under levee, mild scouring, monitor	2
Christmas Creek	CCRB 4	-	Woody weeds present on the levee to be removed	2

Frederickton - Smithtown Left Bank	FS1	1945	Low point 120mm below design level	1
Frederickton - Smithtown Left Bank	FS 2	2100- 2400	Major Low section up to 350 mm below original design level	1
Frederickton - Smithtown Left Bank	FS 3	2600- 2710	Low section up to 140mm below design level	1
Frederickton - Smithtown Left Bank	FS 4	3100- 3160	Low section up to 400mm below design level	1
Frederickton - Smithtown Left Bank	FS 5	3267	Low point 170mm below design level	1
Frederickton - Smithtown Left Bank	FS 6	3810- 3920	Low section up to 150mm below design level	1
Frederickton - Smithtown Left Bank	FS 7	5770	Low point 110mm below design level	1
Frederickton - Smithtown Left Bank	FS 8	5925	Low point 100mm below design level	1
Frederickton - Smithtown Left Bank	FS 9	2810	Large Dead Tree In Levee	1
Frederickton - Smithtown Left Bank	FS 10	2830	Drainage pipes through Levee	2
Frederickton - Smithtown Left Bank	FS 6	4040- 4120	Fence on Levee	2
Frederickton - Smithtown Left Bank	FS 7	4400- 4440 (Approx)	Fence on Levee	2
Frederickton - Smithtown Left Bank	FS 8	6100- 6180	Fence on Levee	2
Pola Creek	OPC 1	ALL	Vegetation - very long grass covering the levee, making it difficult to inspect. Mow more regularly	2

Old Pola Creek	OPC 1	0-40	Cattle track Erosion – Cattle use the levee as a bridge across the low lying land that often contains ponded water. This has created deep cattle tracks and an irregular levee profile	1
Old Pola Creek	OPC 2	40	Severe Erosion – A gate is present at the toe of the levee at this location. Cattle walk through the gate then up onto the levee in this location. This has caused significant erosion of the batter slope and levee crest	1
Old Pola Creek	OPC 3	85	Severe Erosion – Cattle appear to use this point to cross over the levee creating a low point and an uneven profile	1
Old Pola Creek	OPC 4	80-200	Cattle track Erosion – Cattle use the levee crest as a walkway. This has created deep cattle tracks and an irregular levee profile	1
RB Macleay Natural River Bank	RBM 1	350	Low point - Approximately 300mm below surrounding areas. Still 200mm above design level, therefore given lower priority	2
RB Macleay Natural River Bank	RBM 2	840-960	Low section 120m long – Approximately 300mm below the surrounding areas	2
RB Macleay Natural River Bank	RBM 3	1000-1300	Earthen mounds on the river bank creating an inconsistent crest level. Likely cause by excavations within the river	2
RB Macleay Natural River Bank	RBM 4	1550-1900	Earthen mounds on the river bank creating an inconsistent crest level. Likely cause by excavations within the river	2
RB Macleay Natural River Bank	RBM 5	2000-2140	Low section 140m long – Up to 300mm below design level	1
RB Macleay Natural River Bank	RBM 6	2445	Low point – Up to 500mm below design level. Highest point of riverbank at this section is hard to locate	1
RB Macleay Natural River Bank	RBM 7	3000-3600	This section of natural riverbank has a number of undulations including two low points noted in RBM 8 and RBM 9	2
RB Macleay Natural River Bank	RBM 8	3290	Low point – up to 130mm below the estimated design level	1
RB Macleay Natural River Bank	RBM 9	3580	Low point – up to 530mm below the design level. Low point only causes inundation of a small area surrounded by hills with no dwellings affected	3
RB Macleay Natural River Bank	RBM 10	4968	Low point – 110mm below the design level	1

RB Macleay Natural River Bank	RBM 11	5840	Major low point – up to 1300mm below the design level. Given the vegetation in the area the highest point on the river bank was difficult to identify. It is possible that this low point is not significant given that there may be continuous higher ground nearby. Council should investigate further prior to carrying out works.	1
RB Macleay Natural River Bank	RBM 12	7120	Low point – up to 120mm below the design level	1
RB Macleay Natural River Bank	RBM 13	10100-10340	Low section 240m long – up to 180mm below the design level	1
RB Macleay Natural River Bank	RBM 16	12500-12640	Low section 140m long – up to 130mm below design level	1
RB Macleay Natural River Bank	RBM 17	12880	Low point – up to 100mm below design level	1
RB Macleay Natural River Bank	RBM 18	13000-13060	Low Section 60m long – up to 230mm below design level	1
RB Macleay Natural River Bank	RBM 20	14380-14540	Low Section 160m long – up to 130mm below design level	1
RB Macleay Natural River Bank	RBM 21	16525	Low point - up to 230mm below design level	1
RB Macleay Natural River Bank	RBM 22	16507-16740	Low section 235m long – up to 230mm below design level	1
Austral Eden 1	AE1 - 1	9960-10020	Low section 60m long– up to 130mm below the design level	1
Austral Eden 2	AE2 – 1	10900-11080	High section 180m long – section appears to be up to 530mm higher than the surrounding levee	2
Austral Eden 2	AE2 – 2	11280-11400	Major low section 120m long – up to 530mm below design level	1
Austral Eden 2	AE2 – 3	10900-10940	Steep Water side batter slope – appears to be much steeper than the design slope	1

Austral Eden 2	AE2 – 4	10980	Cattle erosion	1
Austral Eden 2	AE2 – 5	11060	Crest and water side batter erosion	1
Austral Eden 2	AE2 – 6	11070	Visible low point (erosion)	1
Austral Eden 2	AE2 – 7	11100	Cattle trough on levee causing localised erosion	1
Austral Eden 2	AE2 – 8	11110	Cattle induced erosion at gate on levee	1
Austral Eden 2	AE2 – 9	ALL	Protected side batter far too steep – Protected side batter slope is steep than 1:1, appears to have been caused by road construction at the levee toe on protected side. May significantly reduce stability	1
Austral Eden 2	AE2 – 10	ALL	Fence on levee crest. Contributing to instability issues caused by steep protected side batter (See AE2-9)	1
Austral Eden 2	AE2 – 11	11240	Undulating crest and batters	1
Austral Eden 2	AE2 – 12	11340	Visible low point caused by cattle induced erosion at gate	1
Austral Eden 3	AE3 – 2	13560-13820	Low Section 260m long – up to 180mm below design level	1
Austral Eden 3	AE3 - 3	13900-14260	Low Section 360m long – up to 280mm below design level	1
Austral Eden 3	AE3 - 4	13320-13400	Thick grass and low height vegetation – makes inspection very difficult, needs mowing	1
Austral Eden 3	AE3 - 5	13600	Cattle induced erosion at gate	1
Austral Eden 3	AE3 - 6	13830	Lemon tree on levee toe - remove	1

Austral Eden 3	AE3 - 7	13920	Access road on levee crest has caused erosion	1
Austral Eden 3	AE3 - 8	14040	Hole on levee batter – approx. 600 dia. And 400mm deep unsure of cause, needs to be filled	1
Austral Eden 3	AE3 - 9	14070	Dog Kennels on levee – star pickets and hollowed logs used for dog housing on the levee bank causing erosion	1
Austral Eden 4	AE4 - 1	15020-16040	Major low section 1020m long – up to 230mm below design level over a long distance	1
Austral Eden 4	AE4 - 2	15520	Steep batter slopes	1
Austral Eden 4	AE4 - 3	15660	Medium to large trees on levee	1
Austral Eden 4	AE4 - 4	15880	Vegetation on levee	1
Austral Eden 6	AE6 – 1	16920	Timber stack on levee – should be removed to allow inspection and any necessary remedial works	1
Belmore River Left Bank	BRLB 1	600-700	Minor low area approximately 120mm below design level.	1
Belmore River Left Bank	BRLB 2	1690-1840	Localised low points caused by cattle and foot traffic.	1
Belmore River Left Bank	BRLB 3	1690-1840	Long grass preventing inspection of areas of the levee surrounding union drain.	1
Belmore River Left Bank	BRLB 4	1940	Low Point of 300mm	1
Belmore River Right Bank	BRRB 1	1180	Low Point 200mm	1
Belmore River Right Bank	BRRB 2	4740-4940	Low point between two bank corners. Still above design level but lower than surrounding levee.	1

Kinchela Creek Right Bank	KCRB 1	340	Low point 100mm	1
Kinchela Creek Right Bank	KCRB 2	700-1160	Low section up to 150mm	1
Kinchela Creek Right Bank	KCRB 3	1760	Low point 130mm	1
Kinchela Creek Right Bank	KCRB 4	1960-2020	Low section up to 120mm	1
Kinchela Creek Right Bank	KCRB 5	2080	Low point 130mm	1
Kinchela Creek Right Bank	KCRB 6	2320	Low point 100mm	1
Kinchela Creek Right Bank	KCRB 7	3240-3300	Low section up to 170mm	1
Kinchela Creek Left Bank	KCLB 1	260-460	Low section up to 150mm	1
Rainbow Reach	RR1	20	Low Point 100mm	1
Rainbow Reach	RR2	140-360	Major low section average of 200mm below design level. Caused by cattle tracks and apparent overtopping of flood or tidal waters	1
Rainbow Reach	RR 3	-	Cattle tracks on levee crest. A number of cattle tracks are present of the crest adding to the erosion of the crest	1
Rainbow Reach	RR5	0-470	Major scour of water side batter slope due to insufficient rock bank protection	1
Smithtown to Jerseyville	SJ1	1205-13350	Low Point 300mm – Plummers Lane – review and consider remediation as part of roadworks, but keep controlled overflow point	3
Smithtown to Jerseyville	SJ2	11950-12250	Low Point 300mm – Plummers Lane – review and consider remediation as part of roadworks, but keep controlled overflow point	3

Smithtown to Jerseyville	SJ3	All	Monitor rock protection and scour	3
Smithtown to Jerseyville	SJ14	McCabes Drain	Low points 100mm below design for short distance. Lowest at the flood structure where cattle have eroded bank when crossing floodgate structure.	3

The recommended priority levels are based on the following criteria:

Priority level description

Priority Level	Description
1	Very Poor Condition - Needs to be as a high priority action
2	Poor Condition – Needs to be actioned as soon as possible
3	Average Condition – Needs to be actioned when practical