FINAL MINUTES

Ordinary Meeting

Held at Council Chambers
Sir Albert Abbott Administration Building
73 Gordon Street, Mackay

On Wednesday 12 February 2020
**ORDER OF BUSINESS**

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His Worship the Mayor, Cr Williamson acknowledged the traditional custodians of the land on which we meet today, the Yuwibara and Yuibera people and paid his respects to their Elders past and present. He also extended his acknowledgement to all Aboriginal members of the Birri Gubba Nation.

Cr Williamson advised that the Council Meeting is being streamed live, recorded and published in accordance with Council’s Standing Orders, including publishing on Council’s web-site.

Cr Williamson advised those present in the public gallery that, by attending a public meeting of the Council they are consenting to their image, voice and comments being recorded and published, and comments will form part of the live stream and recording.

Attendees were also advised that they may be subject to legal action if their actions result in inappropriate and/or unacceptable behaviour and/or comments.

1. ATTENDANCE
His Worship the Mayor, Cr G R Williamson (Chairperson), Crs, A J Camm, F A Mann, M J Bella, L G Bonaventura, K J Casey, J F Englert, R C Gee, K L May, A R Paton and R D Walker were in attendance at the commencement of the meeting. Also present was Mr C Doyle (Chief Executive Officer) and Mrs P Jaenke (Minute Secretary).

The meeting commenced at 10:00 am.

2. OPENING PRAYER

Cr Williamson led those present in Prayer.

3. ABSENT ON COUNCIL BUSINESS

Nil

4. APOLOGIES

Nil

5. CONDOLENCES

Nil

6. CONFLICT OF INTEREST

Nil

7. CONFIRMATION OF MINUTES

7.1. CONFIRMATION OF MINUTES - 22 JANUARY 2020

Council Resolution ORD-2020-38
THAT the Ordinary Meeting Minutes dated 22 January 2020 be adopted.

Moved Cr Camm  Seconded Cr Mann

CARRIED

8. BUSINESS ARISING OUT OF PREVIOUS MINUTES

Nil

9. MAYORAL MINUTES

Nil

10. CONSIDERATION OF COMMITTEE REPORTS & RECOMMENDATIONS

10.1. DRAFT MINUTES - SUSTAINABILITY AND ENVIRONMENT ADVISORY COMMITTEE - 31 JANUARY 2020

Author  Manager Parks, Environment & Sustainability (Richard Brown)
Responsible Officer  Director Development Services (Aletta Nugent)
File Number  Sustainability and Environmental Advisory Committee (SEAC)
Attachments  1. 200131 - Minutes - Sustainability and Environment Advisory Committee - 31 January 2020 [10.1.1 - 5 pages]

Purpose

Attached is a copy of the draft meeting minutes of the Sustainability and Environment Advisory Committee (SEAC) meeting dated 31 January 2020, for noting.

Related Parties

- Central Queensland University – Judith Wake
- Linked Group - Peter Shaw and Jason Sharman
- North Queensland Bulk Ports (NQBP) – Simona Trimarchi and Luke Galea
- Reef Catchments – Katrina Dent and Traci Ellwood
- Sugar Research – Phil Ross

Corporate Plan Linkage

Priority: Environment
Strategy: Natural environment - Work in partnership with the community to protect and enhance the Mackay Region’s natural assets and its biodiversity.

Strategy: Sustainability - Promote sustainable practices and respond to climate change in council operations.

Background/Discussion
Council has the ability to appoint Advisory Committees (under the provisions of section 264 of the Local Government Regulation 2012). Such Advisory Committees may include non-Councillor representatives. Unlike Standing Committees, Advisory Committees do not have the ability to have delegated authority, and as standard practice, the associated minutes (and recommended outcomes) are presented to the Ordinary Meeting of Council for information and decision as needed.

The Sustainability and Environment Advisory Committee was formed to provide input into the development of relevant environment and sustainability policies and strategies, identify regional priorities and facilitate collaborative initiatives where possible including (and not limited to) co-operative investments, shared resources, strategic management and regional policy positioning and development, and to review and make recommendations on various regional programs and reports.

Consultation and Communication

The Committee’s membership consists of: Councillors Amanda Camm and Karen May, along with Director Development Services, Manager Parks Environment and Sustainability, Natural Environment Coordinator, Sustainability Officer and external representatives from Central Queensland University, Linked Group, North Queensland Bulk Ports, Reef Catchments and Sugar Research.

Resource Implications

Nil.

Risk Management Implications

Nil.

Conclusion

Nil.

Officer's Recommendation

THAT the minutes of the Sustainability and Environment Advisory Committee meeting held on 31 January 2020 be received.

Council Resolution ORD-2020-39

THAT the Officer's Recommendation be adopted.

Moved Cr Camm

Seconded Cr May

CARRIED

Cr Camm advised that at the last Advisory Committee Meeting strategic issues for Council's consideration had been discussed such as Council's carbon footprint. Cr Camm acknowledged the work staff have done in relation to sustainability measures which have been delivered across the Region.

Cr Camm urged the next Council to continue the membership of external stakeholders on this Committee, enabling the working relationships which have been established to continue.
Cr May thanked Cr Camm for her leadership as Chair of the Committee. Cr May also acknowledged the Director of Development Services, for the excellent working relationship established.
Mackay Regional Council  
Sustainability & Environment Advisory Committee  
MINUTES  
Friday, 31 January 2020 – 1:00pm – 2:30pm  
Jubilee Community Centre, Mirani room  

<table>
<thead>
<tr>
<th>Item No. / Requestor</th>
<th>Discussion</th>
<th>Actions</th>
</tr>
</thead>
</table>
| 1. Standing Item     | Welcome & Apologies  
  • The Deputy Chair welcomed attendees and noted apologies.  
  • The committee was informed due to caretaker period associated with the upcoming local government elections, that future meetings are on hold as all committees will be reviewed upon commencement of the new council term in April. |
| 2. Standing Item     | Conflicts of Interest  
  • Nil. |

ATTENDEES  
Mackay Regional Council  
Cr. Amanda Camm (Chair)  
Cr. Karen May (Deputy Chair)  
Aletta Nugent  
Lisa Kemode  
Richard Brown  
Timothy Ey  
Councillor  
Councillor  
Director Development Services  
Natural Environment Officer  
Mackay Regional Council - Manager Parks, Environment & Sustainability  
Sustainability Officer  
Representatives  
Katrina Dent  
Jason Sharman  
Judith Wake  
Reef Catchments Natural Resource Management Group  
Linked Group  
Central Queensland University  
Apologies  
Phil Ross  
Simona Trimarchi  
Sugar Research  
NQBP
3. **Standing Item**

**Adoption of Previous Minutes & Outstanding Action Items**

- Previous meeting held 5 September and minutes received at the Ordinary meeting of Council held 9 October 2019.
- Outstanding action items:

**NQBP Sustainability Plan**

<table>
<thead>
<tr>
<th>Meeting Date</th>
<th>4 December 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibility</td>
<td>Kevin Kane (NQBP)</td>
</tr>
<tr>
<td>Action</td>
<td>NQBP Senior Manager Sustainability to present at next SEAC meeting on the port's Sustainability Plan.</td>
</tr>
</tbody>
</table>

Carried over to next meeting.
In progress.

**MRC Environmental Sustainability Strategy 2017-2022**

<table>
<thead>
<tr>
<th>Meeting Date</th>
<th>28 June 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibility</td>
<td>Tim Ey</td>
</tr>
<tr>
<td>Action</td>
<td>Liaise with Economic Development and Tourism to see if MRC Environmental Sustainability Strategy 2017-2022 could possibly be aligned with the 2020-2025 Economic Development strategy which is being developed.</td>
</tr>
</tbody>
</table>

The draft 2020-2025 Economic Development Strategy has been reviewed and is now aligned with the Environmental Sustainability Strategy 2017-2022. Mackay Regional Council officers will continue to further assist implementing sustainability practices across the organisation.

Complete.

**SEAC Membership**

<table>
<thead>
<tr>
<th>Meeting Date</th>
<th>5 September 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibility</td>
<td>SEAC members</td>
</tr>
<tr>
<td>Action</td>
<td>SEAC members to contact suggested representative (Dalrymple Bay Coal Terminal) and confirm membership.</td>
</tr>
</tbody>
</table>

Suggested members have not been contacted and it was agreed membership will be reviewed pending continuation of committee upon new council term.
In progress.

4. **Standing Item**

**Strategic Funding Opportunities**

**Current Grant Opportunities**

- Great Barrier Reef Foundation Innovation (focused on water quality and system improvements)

Katrina Dent (Reef Catchments) and Richard Brown (MRC) recently met to discuss opportunities available for funding. An application will likely be lodged by Reef Catchments with support from Council as the funding opportunity is more agriculture focused.

Grants Submitted
- Great Barrier Reef Foundation – McCready Creek Regional Wetlands (*Expression of Interest submitted by MRC*)

Awarded Grants
Successful:
- Under the Communities Environment Program (available in each of the 151 electorates across Australia) up to $150,000 was made available to fund small, community-led environment projects. Reef Catchments was successful in receiving funding of $20,000 for a biocondition assessment across the Mackay region. The assessment will be of the coastal area and will provide an opportunity for training for Landcare and key stakeholders. The funding application was supported through the Dawson Electorate. The project will commence in the near future, and runs for approximately 12 months.

Unsuccessful:
- Nil.

5. Standing Item
   Presentations
5.1
   - Nil.

6. Standing Item
   Agenda Items
6.1 MRC
   - **Natural Environment Network Blueprint**
     A detailed assessment of native vegetation extent and ecological condition the Mackay region has been undertaken. The assessment provides essential baseline data on which to develop strategic environmental targets (30+ years) and assesses 39 metrics relating to biodiversity, vegetation extent, habitat connectivity, priority regional ecosystems, threatened ecological communities, wetlands & waters and conservation estate.

Some key findings of the assessment state that urban tree canopy cover is significantly lower than Cairns, Townsville and Rockhampton for the Mackay region, priority regional ecosystems show poor connectivity with encroaching urbanisation a key issue and opportunities for MRC to use state-based carbon offsets on council owned land or provide to developers to fund on-ground projects.
<table>
<thead>
<tr>
<th>Section</th>
<th>MRC</th>
<th>RC</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2</td>
<td></td>
<td></td>
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<tr>
<td>MRC Free Native Plant Giveaway Program</td>
<td>Highlights of the 2019 Free Native Plant Giveaway program included 11,037 plants given away to 2,090 ratepayers. A project is underway at the Gordon White Library as a demonstration site of plant species offered as part of the giveaway. The program has been well received by the community and the first giveaway for 2020 is scheduled for February.</td>
<td></td>
</tr>
<tr>
<td>6.3</td>
<td>Update on MRC corporate emissions inventory and National Carbon Offset Standard (NCOS) baseline assessment</td>
<td>MRC is continuing to review how to standardise the collection of data and obtain a baseline. An annual NCOS report is recommended. Discussed a green waste program in Newcastle where residents' green waste is collected in a separate bin. The green waste is processed in a separate area on-site into mulch which is then used for landscaping and rehabilitation works off-site. Newcastle also plans to introduce a food waste/organics recycling program.</td>
</tr>
<tr>
<td>6.4</td>
<td>Update on MRC community emissions profile and alignment with other LGAs and national carbon budget</td>
<td>MRC is continuing to refine the community emissions profile with an aim of adopting a community emissions target (e.g. net zero by 2050).</td>
</tr>
<tr>
<td>6.5</td>
<td>Update on Enterprise Project Management Framework review process – ensuring all capital projects demonstrate alignment with desired environmental sustainability strategy outcomes and policy requirements</td>
<td>Tim Ey (MRC) has been working with several programs within Council to align corporate documentation with the Environment Sustainability Strategy outcomes, Corporate Environmental Policy and Climate Change Adaptation Policy. These changes are to be endorsed by the Long-Term Financial Forecast working group and a multi-criteria assessment weighting for projects.</td>
</tr>
<tr>
<td>6.6</td>
<td>Great Barrier Reef Foundation EOI's for water quality across the Mackay Whitsunday region Reef</td>
<td>Reef Catchments have submitted multiple expressions of interests for various projects. MRC has also submitted an EOI for McCreadys Creek Regional Wetlands (see item 4 above).</td>
</tr>
<tr>
<td>7. Standing Item</td>
<td>General Business</td>
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<tr>
<td>7.1</td>
<td><strong>Meeting Venues:</strong></td>
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<td></td>
<td>• It was suggested a site tour at Council’s laboratory could be incorporated into a future meeting.</td>
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<tr>
<td></td>
<td><strong>Linked Group Update:</strong></td>
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<tr>
<td></td>
<td>• Linked Group Services recently opened a free public use electric vehicle charging station at their office. An article was featured in the Daily Mercury which has attracted the interest of schools wishing to arrange an educational site visit.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. Standing Item</th>
<th>Next Meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1</td>
<td>• To be confirmed post-election.</td>
</tr>
</tbody>
</table>

Minutes recorded by: Sarah Weston (*Executive Assistant – Development Services*)
11. CORRESPONDENCE AND OFFICER’S REPORTS

11.1. OFFICE OF THE MAYOR AND CEO

11.1.1. OFFICE OF THE MAYOR AND CEO MONTHLY REPORT - FEBRUARY 2020

<table>
<thead>
<tr>
<th>Author</th>
<th>Chief Executive Officer (Craig Doyle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsible Officer</td>
<td>Chief Executive Officer (Craig Doyle)</td>
</tr>
<tr>
<td>File Number</td>
<td>Office of the Mayor and CEO - Monthly Report</td>
</tr>
</tbody>
</table>

Purpose

To provide Council with the Office of the Mayor and Chief Executive Officer’s Monthly Report for the month of February 2020.

Related Parties

N/A.

Corporate Plan Linkage

N/A.

Background/Discussion

All departments within MRC prepare a monthly review which identifies activities undertaken and progress made during the specific month.

Consultation and Communication

The report contains input from relevant Programs across Council.

Resource Implications

As required to compile report, which is a routine task for multiple employees.

Risk Management Implications

Nil.

Conclusion

Council is kept informed of activities within the Office of the Mayor and Chief Executive Officer and of major initiatives and projects across Council.

Officer’s Recommendation

THAT the Office of the Mayor and Chief Executive Officers monthly report for February 2020 be received.

Council Resolution ORD-2020-40
THAT the Officer’s Recommendation be adopted.

The Chief Executive Officer (CEO) spoke to the report and provided an overview of the Office of the Mayor and CEO Monthly Report for February 2020.

Cr Bonaventura queried the large number of days lost. The CEO advised that staff member injured some considerable time ago was still off work which accounted for the majority of the days lost as indicated in the report.

Cr Mann queried the number of incomplete site safety inspections. The CEO advised that staff have the deadline of the end of each month so the expectation was that the site safety inspections would be completed with staff reminded not to leave their inspections to the last moment.

Cr Mann asked if the solar panel installation was complete and commented that she was keen to see energy efficient and solar lighting progressed. The CEO advised that solar hasn’t been connected at the Nebo Road water treatment plant yet but the equipment is ready to go. Solar was also not switched on at the Mirani sewerage treatment plant due to the move to the new plant however testing has been occurring in preparation.

Cr Englert sought information on the needle-stick injury. The CEO advised that a cleaner had received a needle-stick injury when cleaning the toilets located near the Council Administration Building car park. He advised that Council has the correct containers and procedures in place but the needle was facing upwards and the staff member unfortunately had their hands close to the top of the container and was pricked by the needle. All tests are clear so far but waiting for HIV results which takes three months.

Cr May queried if Council had heard anything further on the funding the new animal facility.

The CEO advised the Council had not heard anything as yet but were continuing to follow up.

Cr Mann queried if the Museum Strategy had commenced and the management of volunteers. The CEO advised that the process has started and Council has a Volunteer Strategy which would be considered.

THAT the Officer’s Recommendation be adopted.

Moved Cr Mann  
Seconded Cr Casey

Cr Mann noted the LTI and advised that Councillors thoughts are with the staff member as they recover. Cr Mann noted that key initiatives are on track, shovel-ready projects are progressing and was pleased to see the Member for Capricornia appointed as Assistant Minister for Northern Australia and looks forward to her working with GW3 in the future.

CARRIED
Office of Mayor and CEO

Monthly Review

Period - February 2020
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  3.1. Greater Whitsunday Council of Mayors (GWCoM’s) – formerly Whitsunday Regional Organisation of Councils (WROC) .......................................................... 19
OVERVIEW

This report is for the Office of the Mayor and CEO for February 2020.

- Safety continues to be a major focus and a full interrogation of recordable injury data took place in January with key actions have been identified going forward.

- We are undertaking a budget reforecast at this council meeting however in summary the operating result for Council remains relatively unchanged to original budget with a small surplus. There are multiple recommended changes to the capital program however overall the total forecast spend of $132M is slightly higher than the original budget.

- It was fantastic to see the Qantas CEO reconfirm their commitment to Mackay in late January as the second site for a Pilot Flight Academy and will continue to work with Qantas and Mackay Airport in coming months on this important project.

- The Resource Centre of Excellence project continues to progress well and remains on track for a May 2020 completion.

- The wet weather in January has caused some delay to some projects and while this has impacted cash flow timing for these projects, none have been pushed back past end of financial year as a result of this wet weather impact.

- Great to see the Priority development Area masterplan be finalised in January with scoping for future works our current focus.

- 12th February sees the last Council meeting prior to the 2020 local government elections. ECQ are conducting the election with regular liaison between the Returning Officer and Council staff. Caretaker Period expected to commence from 22 February 2020

- Given this is the last Council meeting of this term of Council, on behalf of myself and the staff of Council I would like to thank all councillors for their support and guidance over the last four years and wish all the very best for the future.
SAFETY

1.1. Overview

Thirty-six incidents were reported involving MRC employees, contractors, and members of the public.

During the month, one lost time injury was recorded. A worker suffered an ankle injury whilst alighting from a vehicle.

Incidents and Injuries

This graph shows the total number of safety-related incidents and injuries recorded across all of MRC.

The following injuries to MRC employees were reported in January:

- Needlestick injury whilst placing a needle into sharps container.
- Ankle injury whilst alighting from a vehicle. (Lost time injury).
- Shoulder and arm soreness over time in office environment.
- Shoulder pain after undertaking repetitive manual tasks.
- Wrist and hand injury when moving a heavy plate compactor.
- Neck strain while driving multi-tyred roller.
- Back strain after a day of repeatedly getting in and out of light vehicle.
- Heat stress while undertaking work in hot conditions.

Each incident is investigated, and appropriate corrective measures implemented to reduce future risks.
Lost Time injuries and Days Lost

<table>
<thead>
<tr>
<th>Department</th>
<th>2015-16</th>
<th>2016-17</th>
<th>2017-18</th>
<th>2018-19</th>
<th>2019-20</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LTI Days Lost</td>
<td>LTI Days Lost</td>
<td>LTI Days Lost</td>
<td>LTI Days Lost</td>
<td>LTI Days Lost</td>
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<tr>
<td>Capital Works</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Community &amp; Client Services</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Organisational Services</td>
<td>1</td>
<td>4</td>
<td></td>
<td>2</td>
<td>25</td>
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<tr>
<td>Development Services</td>
<td>3</td>
<td>29</td>
<td>3</td>
<td>55</td>
<td>1</td>
</tr>
<tr>
<td>Engineering &amp; Commercial</td>
<td>5</td>
<td>158</td>
<td>1</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>Infrastructure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mackay Regional Council</td>
<td>11</td>
<td>195</td>
<td>7</td>
<td>74</td>
<td>10</td>
</tr>
</tbody>
</table>

For the 2019-20 year, four lost time injuries have been recorded:

- While standing up from a crouching position an employee felt severe back pain. Three days were lost as the worker recovered.
- In late July, an employee fell as they were alighting from mobile plant, suffering from concussion. Two days were lost in July, 20 days were lost in August, 19 days lost in September, 21 days lost in October, 19 in November, 18 in December and 19 in January as they recover.
- While alighting from mobile plant an employee suffered a shoulder strain. Eight days were lost in December and 14 in January while they recover.
- An employee suffered an ankle injury whilst alighting from a vehicle. Thirteen days were lost in January as they recover.
Injury Frequency Rates 12 month rolling average

There have been four LTIs for the 2019-20 year.

Duration Rates 12 months rolling average

This graph shows the average severity of injuries which is based on the number of days lost divided by the number of lost time injuries.
Two inspections scheduled for January; one in Org Svs and one in ECI, were not completed in the month due to the absence of key staff. Both are re-scheduled to be undertaken in February.

Monthly Action Plans

Monthly Action Plans (MAP) are planned safety-related actions allocated to work groups over a 12-month schedule and are developed in response to identified risks.
Glossary

Group E Councils with wages greater than $50 million
Incident Any unplanned event resulting in or having a potential for injury or ill health.
Lost Time Injury (LTI) Incidents that resulted in a fatality, permanent disability or time lost from work of one day / part of a day or more
Lost time incident frequency rate (LTIFR) The number of lost-time injuries per million hours worked. Calculated as follows: 
\[
\text{No of LTI} \times \frac{1,000,000}{\text{total hours worked during period}}
\]
Duration rate Days Lost 
# of LTI
Reportable Injuries (RI) Incidents that result in a Lost Time Injury (LTI), Suitable Duties Injury (SDI) and Medical Treatment Injury (MTI)

**KEY INITIATIVES**

2.1. Summary of key projects and initiatives

This section provides a summary of key initiatives linked directly to the Office of the Mayor and CEO for 2019/20. Many of these initiatives utilise staff and resources from key areas of the business however are not necessarily reported through Standing Committee reports.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Action</th>
<th>Measure</th>
<th>Start Date</th>
<th>Est Complete Date</th>
<th>Status</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Safety in the workplace</strong></td>
<td>Practise a &quot;safety first&quot; attitude to ensure the safety and wellbeing of council employees, contractors and volunteers.</td>
<td>Implement the actions contained in the 2019-2020 Safety Action Plan</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td>✔</td>
<td>Actions on track and being implemented in accordance with the Safety Action Plan</td>
</tr>
</tbody>
</table>
| **Our culture**   | Foster a culture where staff willingly engage in council’s values and expected service delivery outcomes for our community. | Implement new Employee Value Proposition framework: 
- new marketing aspects of public recruitment activities;
- revised new starter packs;
- tailored inductions to job families; and
- new employee effectiveness survey regime. | Jul 19     | Dec 20            | ✔      | A business case for the alteration of timeframes of the People & Culture action plan was approved by SLPT in November 2019. Due to adjustments in priorities, this key initiative will now be completed by 31 December 2020. It is necessary for a number of other initiatives to be completed first as |
## Strategy

<table>
<thead>
<tr>
<th>Action</th>
<th>Measure</th>
<th>Start Date</th>
<th>Est Complete Date</th>
<th>Status</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Our people</strong></td>
<td></td>
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<tr>
<td>Implement industry-leading people management practices including recruitment, training and development, performance management, and workforce planning.</td>
<td></td>
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</tr>
<tr>
<td>Develop the 2020-2025 People and Culture Strategy</td>
<td>Strategy approved by SLPT</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td></td>
<td>The due date of this initiative was adjusted to 30 Jun 2020 in the SLPT business case referred to above. As at 31 Dec 2019, the plan was 50% complete. Slight delays in progress with this initiative have been incurred with planning 30% complete at this time. However significant advancement in research of contemporary people management strategies have been undertaken.</td>
</tr>
<tr>
<td>Implement a whole of business training needs analysis (TNA) system inclusive of cost analysis at strategic and operational levels</td>
<td>Whole of business TNA system implemented</td>
<td>Jun 19</td>
<td>Jun 20</td>
<td></td>
<td>This initiative is on schedule. The organisational learning needs is an integral element of the Job Evaluation major project which will elevate Council’s job analysis, job size &amp; levels, learning, and position description processes to best practice.</td>
</tr>
<tr>
<td>Undertake 2020 Enterprise Agreement negotiations</td>
<td>Complete EA negotiations by deadline with a fair and responsible outcome for employees and council</td>
<td>Aug 19</td>
<td>Jun 20</td>
<td></td>
<td>Certified agreement negotiations continue as planned. Logs of claims were exchanged on 11 December 2019 and clarified at a meeting with unions on 12 December 2019. The next meeting is scheduled for 27 February 2020, when</td>
</tr>
<tr>
<td>Strategy</td>
<td>Action</td>
<td>Measure</td>
<td>Start Date</td>
<td>Est Complete Date</td>
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<tr>
<td><strong>Governance and performance</strong></td>
<td>Deliver an internal audit program targeting areas of highest risk and greatest potential for business improvement gains</td>
<td>Audits completed in accordance with the approved Internal Audit Plan</td>
<td>Jul 19</td>
<td>Jun 20</td>
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<tr>
<td></td>
<td>Improve fraud control through the development and implementation of the Fraud Corruption and Prevention Action Plan</td>
<td>Percentage of actions completed in accordance with the Fraud and Corruption Prevention Action Plan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Annual review of Corporate Register of Strategies</td>
<td>Register reviewed and alignment with Business Plans/Action Plans complete</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provide efficient and cost-effective legal services to all MRC departments and functions</td>
<td>Proportion of legal services provided in-house in 2019-2020 is greater than 2018-2019</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Financial Governance</strong></td>
<td>Meet business budget target.</td>
<td></td>
<td>Jul 19</td>
<td>Jun 20</td>
<td></td>
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</tbody>
</table>

**Logs of claims will be discussed in detail.**
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Action</th>
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<th>Start Date</th>
<th>Est Complete Date</th>
<th>Status</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meet or better 19/20 budget targets for operational and capital. Ensure LTFF data and information is sustainable and accurate.</td>
<td>Stretch target to achieve/exceed full year budget</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td></td>
<td></td>
<td>operating result forecast to be near original budget.</td>
</tr>
<tr>
<td></td>
<td>Implement new processes to ensure all capital projects and inputs into LTFF are consistent applied across Council and fully implemented by Jul 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>New LTFF expanded Steering group meeting regularly with focus on defining key processes for any capital projects entry into LTFF. Good progress now being made</td>
</tr>
<tr>
<td>Capital Delivery</td>
<td>Deliver the capital works program for 19/20 as planned and introduce future years planning structure and review.</td>
<td>Percentage of the capital works program including carry-overs completed against the original budget including carry-overs considering scope changes, contingency and project savings and new or deferred projects ~95%</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td></td>
<td>Spend near on target YTD</td>
</tr>
<tr>
<td></td>
<td>- Business case identification process embedded for projects 2 years out form current</td>
<td>Jul 19</td>
<td>Mar 20</td>
<td></td>
<td></td>
<td>Review of Business cases completed</td>
</tr>
<tr>
<td></td>
<td>- Pre-design works projects approved and set for &gt; 70% of total works one year out</td>
<td>Jul 19</td>
<td>Jan 20</td>
<td></td>
<td></td>
<td>First and second list of pre-design projects has been approved</td>
</tr>
<tr>
<td>Asset management</td>
<td>Update Asset Management Development Plan to include actions relevant until June 2022</td>
<td>Asset Management Development Plan is updated and endorsed by the Asset Management Working Group</td>
<td>Apr 19</td>
<td>Jun 20</td>
<td></td>
<td>Asset Management Development Plan has been endorsed by the Asset Management Working Group with scheduled works for FY2020.</td>
</tr>
<tr>
<td></td>
<td>The corporate maintenance management</td>
<td>Maintenance management reports are generated from</td>
<td></td>
<td></td>
<td></td>
<td>Civil Operations Mobile Maintenance Management System</td>
</tr>
<tr>
<td>Strategy</td>
<td>Action</td>
<td>Measure</td>
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<td>Est Complete Date</td>
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</tr>
<tr>
<td>Services to the community.</td>
<td>System is used for the majority of works completed for the following asset classes: roads; drainage; water; waste water; and parks.</td>
<td>the corporate system, demonstrating that work orders have been completed</td>
<td></td>
<td></td>
<td></td>
<td>Implementation complete for sealed roads&lt;br&gt;Parks pilot project has commenced&lt;br&gt;Stormwater and Roads data cleanse under way</td>
</tr>
<tr>
<td>Environment</td>
<td>Increase recycling and reuse by diverting waste from landfill and raising community awareness to reduce the costs of providing waste services, gain the economic advantages of producing material for reuse and reducing the impact on the environment</td>
<td>Monitor and report the impacts of the current change to markets and government policy on MRC’s recycling service. Develop and agreed strategy on way forward.</td>
<td>Jul 19</td>
<td>Ongoing</td>
<td>●</td>
<td>Report on MIRF performance monthly through Department report and continue to work on possible future waste to energy and other options. Alternative uses for crushed glass in unsealed road maintenance works being trialed.</td>
</tr>
<tr>
<td>Disaster preparedness</td>
<td>Build community preparedness and responsiveness to emergencies and natural disasters.</td>
<td>Monitor existing disaster preparedness arrangements across all MRC programs and identify opportunities for improvement</td>
<td>Jul 19</td>
<td>Ongoing</td>
<td>●</td>
<td>Updates have taken place on evacuation plans and disaster readiness key documents</td>
</tr>
</tbody>
</table>

### 2.2 Summary of key projects and initiatives – Key Capital Projects

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Action</th>
<th>Measure</th>
<th>Start Date</th>
<th>Est Complete Date</th>
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<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economy – Activation of the Mackay Waterfront</td>
<td>Work in Partnership with the community, government agencies and other stakeholders to deliver an urban waterfront Priority</td>
<td>Finalise key projects within PDA that will be focus for next 2-3 years. Commence those projects to concept/detailed design phase</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td>●</td>
<td>Mackay Waterfront Master Plan was adopted by Council on 22 January 2019 following community consultation.</td>
</tr>
<tr>
<td>Strategy</td>
<td>Action</td>
<td>Measure</td>
<td>Start Date</td>
<td>Est Complete Date</td>
<td>Status</td>
<td>Comments</td>
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<tr>
<td>Development Area (PDA)</td>
<td>Seek external investment through marketing of PDA and placemaking initiatives</td>
<td>Complete Queens Park and BWL State funding ($8.8M) project</td>
<td>Jul 19</td>
<td>Jul 20</td>
<td></td>
<td>Promotional activities for the Mackay Waterfront and the masterplan were successfully held in Brisbane to coincide with the PDA Advisory Committee meeting. Works well advanced at Queens Park and on track for completion by mid-2020.</td>
</tr>
<tr>
<td>Camilleri Street Park Upgrade</td>
<td>Advocate, seek funding, commence works and complete key projects linked to the promotion and liveability of the Mackay region</td>
<td>Complete all works at Park by Jan 20</td>
<td>Jul 18</td>
<td>Jan 20</td>
<td></td>
<td>Complete.</td>
</tr>
<tr>
<td>Qantas Regional Pilot Academy</td>
<td>Finalise detail with Qantas and other stakeholders for the new pilot academy for Mackay</td>
<td>Finalise agreements with key stakeholders by June 2020</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td></td>
<td>Mayor and CEO inspected first Qantas Pilot Academy in Toowoomba on 18 November. Qantas CEO public comment on Mackay site during January, with further meetings planned with Qantas in coming months.</td>
</tr>
<tr>
<td>Resource Centre of Excellence</td>
<td>Advocate, seek funding, commence works and complete key projects linked to the promotion and liveability of the Mackay region</td>
<td>Complete Stage 1 of project by April 2020.</td>
<td>Mar 18</td>
<td>Apr 20</td>
<td></td>
<td>Construction is well underway and on schedule.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commence discussions on future stages with key stakeholders</td>
<td>Jul 19</td>
<td>Jul 20</td>
<td></td>
<td>Discussions commenced with RIN, GW3 and external parties re future stages.</td>
</tr>
<tr>
<td>Works for Queensland</td>
<td>Plan for delivery of public infrastructure and services to match the</td>
<td>Complete identified and approved projects under the</td>
<td>Jul 19</td>
<td>Jun 21</td>
<td></td>
<td>Round 3 funding list of projects has been approved and works</td>
</tr>
<tr>
<td>Strategy</td>
<td>Action</td>
<td>Measure</td>
<td>Start Date</td>
<td>Est Complete Date</td>
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</tr>
<tr>
<td>needs of our changing population</td>
<td>Works for Queensland (W4Q) Round 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>commenced on priority projects.</td>
</tr>
<tr>
<td>Shovel ready Projects</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Community facilities</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Provide community facilities to improve the liveability of the region ensuring equitable focus.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Northern Beaches Community Hub</td>
<td>Acquire site for Hub and commence detailed design in 19/20</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td></td>
<td></td>
<td>Acquisition of preferred site progressing on-track.</td>
</tr>
<tr>
<td>Sarina CBD Revitalisation</td>
<td>Seek external funding for project</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td></td>
<td></td>
<td>Business case draft focus with aim to look for external funding opportunities as they arise.</td>
</tr>
<tr>
<td>Mountain Biking</td>
<td>Complete feasibility study and if agreeable move into concept/detailed design phase by Jun 20</td>
<td>Jul 19</td>
<td>Jul 20</td>
<td></td>
<td></td>
<td>Following Council approval on 27 November, work has commenced on detailed design and managing land tenures. Land scoping exercise planned for early February.</td>
</tr>
<tr>
<td>New Mackay Animal Facility</td>
<td>Complete detailed design and finalise funding for project</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td></td>
<td></td>
<td>Building our Region’s grant Business Case has been submitted with confirmation of funding pending. The prerequisite application to convert the land from Reserve to freehold has also been submitted awaiting advice.</td>
</tr>
<tr>
<td>Mirani Heritage Precinct</td>
<td>Complete masterplan and feasibility and make decision on concept design phase and seek funding</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td></td>
<td></td>
<td>Masterplan now complete with move toward feasibility phase commenced.</td>
</tr>
</tbody>
</table>
2.3 Summary of key projects and initiatives – Key Economic Stimulus/Liveability Initiatives

<table>
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<tr>
<th>Strategy</th>
<th>Action</th>
<th>Measure</th>
<th>Start Date</th>
<th>Est Complete Date</th>
<th>Status</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Prioritise the promotion of the Mackay Region</td>
<td>Promote the Mackay Region through the development of a shared brand.</td>
<td>Provide funding support to Mackay Tourism Ltd for destination marketing and delivery of visitor information services</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td>●</td>
<td>On track</td>
</tr>
<tr>
<td>Sustainability</td>
<td>Promote sustainable practices and respond to climate change in council operations.</td>
<td>Implement the Environmental Sustainability Strategy (2017-2022)</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td>●</td>
<td>Actions on track to be completed as per the plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continue implementation of energy efficiency initiatives at MRC facilities to reduce energy costs and improve energy productivity, including:</td>
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<tr>
<td></td>
<td></td>
<td>replace existing lighting with</td>
<td>New initiatives to be added</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scheduled energy efficiency initiatives are completed on time and on budget</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td>●</td>
<td>Delays in solar panel installation for some sites has resulted in electricity savings for 2019/20 not being fully realised. All now on track</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Finalising key focus areas for remainder of financial year.</td>
<td>New initiatives to be added</td>
<td></td>
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</tbody>
</table>
### LED lighting as part of the scheduled maintenance program; and
- replace air conditioning systems at various MRC buildings and facilities

### Libraries, museums and art
Enhance lifelong learning opportunities that improve literacy and public access to information and knowledge, history and art.

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<tr>
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</table>

### Partnerships for a diversified economy
Champion the growth of globally competitive local industries by working with industry stakeholders. Support the economic development and viability of the Region by implementing the Mackay Regional Council Economic Development Strategy 2015–2020 (EDS) in partnership with key stakeholders including GW3, Mackay Tourism, RIN, Mackay Region Chamber of Commerce, Regional Development Australia, Urban Development Institute of Australia, universities, state and federal government agencies, and other business and industry groups.

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</thead>
<tbody>
<tr>
<td></td>
<td>Manage and promote the Facilitating Development in Mackay Region Policy</td>
<td>Undertake review of policy and monitor applications</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td></td>
<td>Review approved by Council on 27 November.</td>
</tr>
<tr>
<td></td>
<td>Implement Mackay Region Mountain Bike Strategy actions for which Economic Development &amp; Tourism is lead program</td>
<td>2019-2020 funded actions are delivered</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td></td>
<td>Council has approved the establishment of a Regional Mountain Bike Alliance to support the delivery of the Mackay Region Mountain Bike Strategy</td>
</tr>
<tr>
<td>Strategy</td>
<td>Action</td>
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<tr>
<td><strong>Strong local businesses with a global reach</strong>&lt;br&gt;Support stakeholder groups to assist Mackay and Regional business and industry to become export-ready and extend the global reach of their products and services.&lt;br&gt;Develop networks that capitalise on the government’s trading relationships and free trade agreements.</td>
<td>Develop relationships with key international trade related stakeholders in collaboration with Trade and Investment Queensland (TIO), GW3 and Regional Development Australia</td>
<td>Number of international trade related activities completed</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td>●</td>
<td>On going</td>
</tr>
<tr>
<td><strong>Facilitate development</strong>&lt;br&gt;Utilising the Planning Scheme to deliver an integrated approach to the facilitation of development and sustainable growth.&lt;br&gt;Facilitate catalytic land and infrastructure developments by attracting investment through joint ventures and partnerships with the private sector; and by working with State and Federal governments on joint initiatives.</td>
<td>Facilitate catalytic land and infrastructure development by • attracting investment through joint ventures and partnerships with the private sector; and • by working with state and federal governments on joint initiatives</td>
<td>Minimum of four advocacy activities undertaken for identified opportunities</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td>●</td>
<td>Identification of opportunities ongoing</td>
</tr>
<tr>
<td><strong>Mackay Ring Road</strong>&lt;br&gt;Support the construction of Mackay’s Ring Road network</td>
<td>Advocate for delivery of Stage 2 of the Mackay Ring Road which will connect the Bruce Highway north of Mackay to Harbour Road and the Mackay Port</td>
<td>Advocacy for State and Federal Government Stage 2 Mackay Ring Road funding is completed</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td>●</td>
<td>Ongoing advocacy to finalise full funding commitments for this project</td>
</tr>
<tr>
<td><strong>Bowen Basin Service Link</strong>&lt;br&gt;Support the implementation of the</td>
<td>Support Department of Transport and Main Roads in the design and</td>
<td>Preliminary design commenced</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td>●</td>
<td>We understand from the State this project is on track and an announcement of</td>
</tr>
<tr>
<td>Strategy</td>
<td>Action</td>
<td>Measure</td>
<td>Start Date</td>
<td>Est Complete Date</td>
<td>Status</td>
<td>Comments</td>
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</tr>
<tr>
<td>proposed Bowen Basin Service Link</td>
<td>construction phases of the Mackay to Bowen Basin Service Link</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>project commencement has now been formally issued.</td>
</tr>
<tr>
<td><strong>Northern Australia Alliance</strong></td>
<td>Participate as a strategic and active partner in the Northern Australia Alliance ensuring the Mackay Region maximises these opportunities to advocate for, and influence, government policies for the benefit of the Region.</td>
<td>Assist Greater Whitsunday Alliance (GW3) to participate as a strategic and active regional partner, ensuring the Mackay Region maximises opportunities to advocate for, and influence, government policies for the benefit of the region</td>
<td>Number of Mackay Regional issues that GW3 advocate on behalf of the region</td>
<td>Jul 19</td>
<td>Jun 20</td>
<td>Funding Agreement with GW3 signed. GW3 led a delegation to Canberra in November as part of the Northern Australia Alliance program to advocate for the region.</td>
</tr>
</tbody>
</table>

**2.4 Cyclone Debbie Update**

**Cyclone Debbie - Beach Restoration (Category D & Resilience)**

Revegetation work adjacent to both groynes at St Helens Beach has been completed and will be maintained for one month. In addition, some minor topsoiling is proposed to rectify a minor drainage issue.

Some drainage improvements have been undertaken at the Cape Hillsborough vehicular beach access to address issues with runoff eroding the access.

**NQ & FNQ Monsoon Trough – Road Restoration Works**

Construction of the restoration of the Boundary Creek causeway on Doughertsy Road is progressing, although no work was possible in the last week of January due to wet weather and creek flows. It is anticipated the causeway including the bitumen sealing of the approaches will be completed by late February. As a condition of the waterway barrier permit, the downstream fishway works, including the removal of the old causeway, cannot be undertaken until after the wet season.

The Dalrymple Road landslips roadworks tenders are being assessed and the contract should be awarded in early February. Works should commence early March. Tenders for the micropiling will be called in the first week of February. The pile installation will be dependent on the availability of the specialist contractor.
The gravel road submission is being assessed by QRA. Gravelling works are in progress and should be completed early in 2020. The final submission comprising minor works on 7 roads has been sent to QRA for assessment. Two of these projects have been completed with the balance to be finished by March 2020.

GREATER WHITSUNDAY COUNCILS OF MAYORS
(GWCoM’S)

3.1. Greater Whitsunday Council of Mayors (GWCoM’s) – formerly Whitsunday Regional Organisation of Councils (WROC)

Joint group in conjunction with the Councils of Isaac and Whitsunday.

Membership involves the Mayor and CEO of each of the three (3) Councils, supported by various staff.

A CEO’s Group has been established as part of the GWCoM’s. The intent of this group is to handle the ‘business’ matters and look for possible synergies between Councils at CEO level and allowing focus on higher level and strategic issues for the region by the wider group.

A CEO’s Group teleconference was held on Thursday 23 January 2020, at which time key matters in preparation for the upcoming GWCoM’s meeting in February were discussed.

A GWCoM’s meeting was last held on 21 November 2019 in Mackay as reported in the January CEO’s report. Another meeting has not been held since with the next one at the Isaac Regional Council offices Moranbah on 20 February 2020.

A number of agencies will again be in attendance for regional updates, as well as a discussion on possible Regional Deal proposal process to enable planning to be presented to individual Councils.
11.2. CAPITAL WORKS
11.2.1. CAPITAL WORKS MONTHLY REVIEW REPORT - JANUARY 2019

Author: Director Capital Works (Jim Carless)
Responsible Officer: Director Capital Works (Jim Carless)
File Number: Capital Works

Purpose

Corporate Plan Linkage
This links to various corporate objectives and strategies within the Corporate Plan.

Officer’s Recommendation
THAT the Capital Works Monthly Review for the period of 1 January 2020 to 31 January 2020, be received.

Council Resolution ORD-2020-41

THAT the Officer’s Recommendation be adopted.


Cr Bonaventura sought information on a near miss which occurred due to inadequate traffic controls on site.

The Director of Capital Works, James Carless advised that rather than an actual near miss incident, staff when visiting the site had noted that signage had not been set up and had reported this.

Cr Bonaventura queried a contract for signage which had been approved by Council asking if there had been any local companies who tendered for that work. The CEO advised that there had only been one tenderer who was from New South Wales. He advised that the tender price was within expectations of the market.

Cr Bonaventura asked if there was any information regarding when the brick drain shown in the report had been built and how many were in Mackay. The CEO advised that Council does not know but believes they are not uncommon.

Moved Cr May Seconded Cr Paton

Cr May noted that the majority of capital projects are on track which is a credit to the Department.

Cr Bonaventura congratulated the Director and team for ensuring the construction of the fishing platform was on track and would be ready for use by 28 February.

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OVERVIEW

This report is for Capital Works Department activities during the month of January 2020. Significant items in this period include:

- The capital spend to the end of January is $49.50M.
- Approximately $3.379M below the YTD forecast of $52.88M (93.61% of YTD forecast).
- Safety performance in Capital Works is good with no lost time days.
- Full review of enterprise project management framework (EPMF) commenced.

Jim Carless
Director Capital Works
SAFETY

1.1. Incidents and Injuries

Below is a summary of the Capital Works safety incident performance. Capital Works aspires to achieve zero harm with a stretch target of zero injuries.

![Incident Chart]

**January 2020 Summary:**

The following near miss incident involving a contractor was reported in January:

- Inadequate traffic controls implemented on work site – speed was not reduced as per the traffic control plan.
1.2. Lost time Injuries & Days Lost

Capital Works aspires to achieve zero Lost Time Injuries by improving safety performance by developing a proactive safety culture and implementing best practice safety management across all business areas.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Projects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Management Office</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport &amp; Infrastructure Projects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water &amp; Sewerage Projects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Capital Works Total</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

![Graph showing CW Total Days Lost and CW Total LTIs]
2.1. Capital Summary Report

Following is the capital financial summary for the YTD delivery to end of January 2020.

The approved 2019/20 budget is $138.78M. The YTD capital spend is $49.50M approximately $3.379M below the YTD forecast of $52.88M (approximately 94%). The top five projects underspent account for $1.678M of this variance. Context and comments on each variance can be found on page 7 of this report.

Note – The current forecast is approximately $8.5M under the approved budget for 2019/20 of which $6.6M will be accounted for in the pending December Budget Review budget adjustments.

2.2. Financial Performance

The table below summarises the year to date financial summary for the 2019/20 Capital program at the end of January 2020.

<table>
<thead>
<tr>
<th>Department</th>
<th>Original Budget</th>
<th>Approved Budget</th>
<th>Current Forecast</th>
<th>YTD Forecast</th>
<th>YTD Actual</th>
<th>% Spend of YTD Forecast</th>
<th>% Spend of Approved Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Services</td>
<td>68,712</td>
<td>525,138</td>
<td>101,681</td>
<td>78,326</td>
<td>72,781</td>
<td>93.9%</td>
<td>111.9%</td>
</tr>
<tr>
<td>Organisational Services</td>
<td>123,000</td>
<td>41,505</td>
<td>21,505</td>
<td>46,210</td>
<td>214.8%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Community &amp; Client Services</td>
<td>96,000</td>
<td>121,251</td>
<td>38,497</td>
<td>26,234</td>
<td>75.3%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>764,260</td>
<td>1,127,910</td>
<td>1,151,333</td>
<td>807,097</td>
<td>705,739</td>
<td>95.3%</td>
<td>66%</td>
</tr>
<tr>
<td>Commercial Infrastructure</td>
<td>389,902</td>
<td>349,002</td>
<td>349,002</td>
<td>334,672</td>
<td>98.3%</td>
<td>76%</td>
<td></td>
</tr>
<tr>
<td>Procurement &amp; Plant</td>
<td>12,498,053</td>
<td>10,786,406</td>
<td>4,188,411</td>
<td>3,709,617</td>
<td>81.0%</td>
<td>29%</td>
<td></td>
</tr>
<tr>
<td>Information Services</td>
<td>1,975,178</td>
<td>2,060,946</td>
<td>774,271</td>
<td>645,583</td>
<td>81.3%</td>
<td>31%</td>
<td></td>
</tr>
<tr>
<td>Works For Queensland Funding Project</td>
<td>3,031,406</td>
<td>3,053,406</td>
<td>703,618</td>
<td>626,532</td>
<td>88.4%</td>
<td>28%</td>
<td></td>
</tr>
<tr>
<td>Works For Queensland Round 2 Funding Project</td>
<td>27,244</td>
<td>49,133</td>
<td>22,481</td>
<td>22,481</td>
<td>100.0%</td>
<td>48%</td>
<td></td>
</tr>
<tr>
<td>NORMA</td>
<td>4,887,299</td>
<td>4,163,941</td>
<td>1,207,381</td>
<td>1,470,018</td>
<td>94.2%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Capital Works Management</td>
<td>0</td>
<td>0</td>
<td>136,957</td>
<td>136,957</td>
<td>100.0%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Design Program</td>
<td>6,214,022</td>
<td>7,046,281</td>
<td>7,083,762</td>
<td>3,096,938</td>
<td>98.3%</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td>Major Projects</td>
<td>48,728,956</td>
<td>48,728,956</td>
<td>25,725,077</td>
<td>20,707,629</td>
<td>95.3%</td>
<td>42%</td>
<td></td>
</tr>
<tr>
<td>Field Services</td>
<td>11,323,119</td>
<td>14,072,312</td>
<td>14,075,961</td>
<td>12,247,022</td>
<td>93.9%</td>
<td>42%</td>
<td></td>
</tr>
<tr>
<td>Contract Services</td>
<td>42,394,033</td>
<td>42,082,420</td>
<td>25,223,710</td>
<td>11,317,373</td>
<td>91.0%</td>
<td>28%</td>
<td></td>
</tr>
<tr>
<td>Portfolio Management Office</td>
<td>3,837,002</td>
<td>2,571,958</td>
<td>67,583</td>
<td>59,355</td>
<td>91.0%</td>
<td>32%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$138,458,242</td>
<td>$138,781,666</td>
<td>$130,385,409</td>
<td>$52,882,055</td>
<td>93.6%</td>
<td>36.6%</td>
<td></td>
</tr>
<tr>
<td>Capital Expenditure</td>
<td>224,676,467</td>
<td>225,905,312</td>
<td>221,356,427</td>
<td>224,905,312</td>
<td>99.3%</td>
<td>28.3%</td>
<td></td>
</tr>
<tr>
<td>Operational Expenditure</td>
<td>4,884,775</td>
<td>5,292,780</td>
<td>5,069,426</td>
<td>1,346,112</td>
<td>94.8%</td>
<td>27.7%</td>
<td></td>
</tr>
</tbody>
</table>
Capital Spend by Department for January 2020

Capital Expenditure Forecast 2019/20
The top five variances (underspend) between actuals and forecast for the month of January, are:

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Comments</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>51620</td>
<td>Spray Seal Resurfacing Works - FY 19/20</td>
<td>Delays to works initially due to obtaining plans and approvals. Contractor resumed in middle of Jan from shut down period and impending wet weather has slowed progress during the month. Anticipated that the package of works awarded will be completed this FY.</td>
<td>-$503,580</td>
</tr>
<tr>
<td>10390</td>
<td>Plant &amp; Equipment - Replacement Program</td>
<td>Delays with several large plant items, in part due to the impacts of the recent fires and floods on delivery of parts.</td>
<td>-$464,458</td>
</tr>
<tr>
<td>53961</td>
<td>Hospital Bridge Fishing Platform</td>
<td>A review of design drawings resulted in a change in materials which resulted in a negative variation on works valued during the month. Additionally, progress on the construction of the bridge and deck have slowed due to request for information on design but will not delay project completion expected end of Feb.</td>
<td>-$270,187</td>
</tr>
<tr>
<td>73040</td>
<td>Mirani Liquid Stream Upgrade</td>
<td>Delays because of several wet weather days slowed progress on construction of building slabs which has impacted installation of mechanical components.</td>
<td>-$251,929</td>
</tr>
<tr>
<td>55280</td>
<td>Upgrades to North Mackay Rotary Lookout</td>
<td>Delays to works initially due to obtaining plans and approvals. Contractor encountered rock which resulted in delays and required a revised construction methodology. Anticipated that works to be complete by this FY.</td>
<td>-$188,744</td>
</tr>
</tbody>
</table>

2.3 Capital Projects Status for January

The graph above shows the status of capital projects as at the end of January 2019.
2.3. Key Contracts Approved for January

A list of key contracts that have been finalised and approved for the month is given below. In total these contracts are valued at ~ $233,416.00 for January 2020. There are smaller packages of works (not included below) and ancillary contracts that have also been awarded for the month of December linked to capital.

<table>
<thead>
<tr>
<th>Contract</th>
<th>Design / Construction</th>
<th>Amount Award (ex GST)</th>
<th>Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quote 2020-042 Queens Park Signage</td>
<td>Construction</td>
<td>$174,465.00</td>
<td>Armsign Pty Ltd</td>
</tr>
<tr>
<td>and Wayfinding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quote 2020-044 Memorial and Mirani</td>
<td>Construction</td>
<td>$24,650.00</td>
<td>NQ Water Services Pty Ltd</td>
</tr>
<tr>
<td>Pool Upgrades</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SQ 2020-015 Shakespeare Street</td>
<td>Construction</td>
<td>$34,301.00</td>
<td>Concrete Products Australia and</td>
</tr>
<tr>
<td>Shoulder Upgrades</td>
<td></td>
<td></td>
<td>Rocla Mackay</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$233,416.00</td>
<td></td>
</tr>
</tbody>
</table>

PORTFOLIO MANAGEMENT OFFICE

3.1 Monthly Achievements

January saw a continuation of the focus on compilation of requests for funding for the 20/21 FY. This is managed through “The System” and the team is in the process of preparing lists for submission to SLPT.

Along with the normal monthly reports detailing the financial and schedule position of projects the team prepared additional information to assist Project Managers with assessing their requirements for the December budget review.

Work continues on developing a draft 2020/21 schedule to review resourcing and workforce requirements.

DESIGN SERVICES

4.1 Design Summary Report

Overview

Design Services undertook a large number of small projects this month, including stormwater gross pollutant traps to reduce the volume of large rubbish entering the Pioneer River, as well as footpath improvements for the City Centre.
Significant Projects Overview

Design was carried out for Mackay-Eungella Road shared path construction Stage 1 – Kenny’s Road to Collett Court, Marian. The project will provide a bicycle and footpath link from the adjoining residential subdivision to Marian school off-road via Mackay-Eungella Road. This will also formalise the overall entry and drop zone for all school users.

Recent Project Activities

Mackay- Eungella Road shared path design Stage 2 – has also commenced and will extend the vital link created in the Stage 1 Construction, significantly improving cycling and pedestrian safety and increasing the amenity of the area.

4.2 Survey Office Summary Report

Overview

Heading into the wet season, the Design Services Survey Team made the most of the fine weather in the first few weeks of January. Surveys for a variety of Capital Works projects were delivered, including: a project for installation of debris interceptors to protect the water quality in the Gooseponds, culvert replacements in West Mackay, and a number of new footpaths.

Significant Projects Overview

One of the larger projects this month was a detailed survey of the Mirani Community Precinct. This will allow Development Services to progress the next phase of this project. The Survey Team also took the opportunity to test the limitations of their scanner by scanning the buildings on Council’s Mirani Client Service Centre site. This will have the added benefit of reducing the number of trips back to site if more measurements are required on any of the buildings.
Recent Project Activities
In January the team continued surveying line marking – this time in the urban areas of Mackay – to ensure existing standards are retained as part of the region’s reseal program.

4.3 Estimating and Specifications

A Capital Works Coordinators Monthly forum has been initiated by the Estimating and Specification team with the goal of improving the feedback loop to ensure that the full lifecycle of projects is regularly interrogated at the supervisor level, and is moving forward effectively, with several issues being handed through to the management team and the remainder being put onto the scrum board for coordinators. Massive thanks to those who have taken the initiative to start working on areas within their realm of expertise.

Moving forward from the Task number reconciliation for PE&S, the estimating spreadsheet has been updated with the new task numbers along with a filter just for PE&S, which has been created and is soon to be rolled out. Meetings with Property Services have commenced, and there is an expected requirement of many new task numbers required to assist in full lifecycle asset cost management processes.

A Standard drawings review for PE&S has commenced which we plan to continue to build upon over coming months.
CONTRACT SERVICES

5.1 30305 – Mackay Tourism Kiosk

Overview

With the construction of the new Mackay Tourism office at the Field of Dreams in Sarina, Mackay Tourism will be closing their current offices at Nebo Rd and Council has agreed to construct a new Tourism Kiosk at the Blue Water Lagoon. This Kiosk is designed to capture visitors to Mackay that have already booked into local accommodation and are after more information on local attractions. The facility will include accommodation for six staff, two volunteers and the General Manager of Tourism Mackay.

Project Overview

<table>
<thead>
<tr>
<th>Activity</th>
<th>Delivery</th>
<th>Start Date</th>
<th>Completion Date</th>
<th>Budget</th>
<th>Actual</th>
<th>% Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Management</td>
<td>Internal</td>
<td>04/03/2019</td>
<td>30/04/2020</td>
<td>$304,285 + $177,000</td>
<td>$8,302</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>extra budget.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>External</td>
<td>04/03/2019</td>
<td>02/08/2019</td>
<td>$2,033</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Internal</td>
<td>05/08/2019</td>
<td>12/11/2019</td>
<td>$481,285</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>External / Internal</td>
<td>TBA once Contractor has been engaged</td>
<td>TBA once Contractor has been engaged</td>
<td>Total: $481,285</td>
<td></td>
<td>0%</td>
</tr>
</tbody>
</table>

Recent Project Activities

✓ Evaluation of tender submissions completed, submitted prices exceed available budget.
✓ Project funding requirements being reviewed.
✓ Council approved funding shortfall at the Council meeting on the 22nd of January 2020.
✓ Contracts have issued letter of recommendation for approval.
✓ Signed Award under Delegation 24/01/2020.

5.2 73068 Sewer Renewals and Stormwater Relining

The Project includes:

- Relining, Repair and CCTV condition inspection of sewer mains
- Structural relining of stormwater Reinforced Concrete Pipes (RCP) and Reinforced and Insitu Concrete Box Culverts (RCBC)

Relining, Repair and CCTV of Sewer and Stormwater Mains:

MRC undertakes ongoing condition assessment by CCTV of both stormwater and sewer networks. CCTV work identifies stormwater and sewer mains requiring rehabilitation by relining.

The cost-effective approach to sewer main renewals and stormwater mains is to insert a structural liner into the existing sewer and stormwater mains. Relining of sewer mains and stormwater drainage strengthens the
structure, prevents entry of foreign debris including infestation of tree roots and greatly reduces inflow and infiltration of ground water.

Repairing of sewer mains includes plugging infiltration from behind the existing liner at the maintenance hole, junction sealings and structural patch repair. The 19/20 FY package of works includes relining 137 sewer mains totalling 8.76km and a patch repair program of 21 sewer mains totalling 1.4km. The CCTV program for 2019/20 includes older AC, VC and RCP reticulation mains which have no asset condition data. This program includes CCTV of 483 sewer mains totalling 27.1km.

The stormwater drainage conduits to be relined vary in size from 375mm to 1500mm with an approximate total length of 800m.

The key Project Drivers are:

- Rehabilitation of deteriorating sewer and stormwater mains before structural failure.
- Identifying deteriorating sewer and stormwater mains before failure.
- Increasing knowledge of sewer and stormwater main asset condition and rate of degradation.

### Project Overview

<table>
<thead>
<tr>
<th>Activity</th>
<th>Delivery</th>
<th>Start Date</th>
<th>Completion Date</th>
<th>Budget</th>
<th>Actuals to date</th>
<th>% Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relining and repair of sewer mains</td>
<td>External</td>
<td>01/07/2019</td>
<td>30/06/2020</td>
<td>$2,931,028</td>
<td>$182,290</td>
<td>15%</td>
</tr>
<tr>
<td>CCTV of sewer mains</td>
<td>Internal</td>
<td>15/10/2019</td>
<td>30/04/2020</td>
<td>$471,116</td>
<td>$24,695</td>
<td>20%</td>
</tr>
<tr>
<td>Stormwater Main Relining</td>
<td>External</td>
<td>01/07/2019</td>
<td>31/05/2020</td>
<td>$1,850,000</td>
<td>$10,420</td>
<td>10%</td>
</tr>
</tbody>
</table>

### Recent Project Activities

- Contracts awarded for Stormwater relining and Sewer relining and rehabilitation works.
- Sewer mains relining and rehabilitation work has commenced on 15 January 2020 and progressing well.
- Stormwater RCP and RCBC relining works will commence in March 2020.
- CCTV inspections of sewer mains are currently being undertaken by MRC CCTV Crew and project managed by MRC Contract Services.

### 5.3 50820 2019/2020 - Resurfacing Reseal Program

**Overview**

The 2019/2020 Resurfacing and Rehabilitation Program comprises resurfacing works on various streets and roads around the Region. Resurfacing includes two types of treatments, one being Asphalt on urban streets and roads, the other Spray Resealing on rural roads. Resurfacing works are carried out to protect the pavement and extend the road pavement life.
Project Overview

<table>
<thead>
<tr>
<th>Activity</th>
<th>Delivery</th>
<th>Start Date</th>
<th>End Date</th>
<th>Budget</th>
<th>Actual</th>
<th>% Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asphalt Surfacing Program</strong></td>
<td>Internal</td>
<td>13/03/2019</td>
<td>18/10/2019</td>
<td>$3,400,000</td>
<td>$14,424</td>
<td>100%</td>
</tr>
<tr>
<td>Develop Scope of Works</td>
<td>Internal</td>
<td>05/11/2019</td>
<td>14/02/2019</td>
<td></td>
<td></td>
<td>80%</td>
</tr>
<tr>
<td>Tender &amp; Award (1 package)</td>
<td>External</td>
<td>10/03/2020</td>
<td>04/06/2020</td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>Asphalting Works</td>
<td>Internal</td>
<td>13/03/2019</td>
<td>18/10/2019</td>
<td>$3,400,000</td>
<td>$14,424</td>
<td>100%</td>
</tr>
<tr>
<td>Spray Reseal Program</td>
<td>Internal</td>
<td>13/03/2019</td>
<td>19/08/2019</td>
<td>$3,200,000</td>
<td>$250,227</td>
<td>100%</td>
</tr>
<tr>
<td>Package A</td>
<td>Internal</td>
<td>08/10/2019</td>
<td>04/11/2019</td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Tender &amp; Award</td>
<td>Internal</td>
<td>14/01/2020</td>
<td>19/02/2020</td>
<td></td>
<td></td>
<td>20%</td>
</tr>
<tr>
<td>Resealing Works</td>
<td>External</td>
<td>13/03/2019</td>
<td>19/08/2019</td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Package B</td>
<td>Internal</td>
<td>13/03/2019</td>
<td>23/09/2019</td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Tender &amp; Award</td>
<td>Internal</td>
<td>11/10/2019</td>
<td>22/11/2019</td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>Resealing Works</td>
<td>External</td>
<td>14/01/2020</td>
<td>28/02/2020</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Package C</td>
<td>Internal</td>
<td>13/03/2019</td>
<td>31/01/2020</td>
<td>$3,200,000</td>
<td>$250,227</td>
<td>100%</td>
</tr>
<tr>
<td>Tender &amp; Award</td>
<td>Internal</td>
<td>03/02/2020</td>
<td>06/04/2020</td>
<td></td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>Resealing Works</td>
<td>External</td>
<td>27/04/2020</td>
<td>23/06/2020</td>
<td></td>
<td></td>
<td>0%</td>
</tr>
</tbody>
</table>

Total Program                   | Internal | 13/03/2019  | 20/04/2020 | $6,600,000   | $264,651 |            |

Recent Project Activities

- Bitumen Reseal Package A (Southern), site works commenced mid-January 2020 upon Contractor returning from the Christmas Shutdown period. Delays to project progress due to wet weather. Expected project completion mid-February 2020, weather permitting.
- Bitumen Reseal Package B (Northern), site works expected to commence following Package A works in mid-February 2020 with completion expected start of March 2020, weather permitting.
- Bitumen Reseal Package C scope of works currently being developed by Transport & Drainage Infrastructure Planning. Scope expected to be provided to Contract Services at the end of January 2020.

5.4 50303 Ron Searle and Harbour Rd Shared Footpath

Overview

Following review to meet the Council’s Desired Standards of Service (DSS) and Walking & Cycling Network Plan, and to provide improved network connections between community suburbs filling in missing links between existing infrastructure, it was identified that the Ron Searle Drive and Harbour Road shared pathway projects will improve overall network connectivity and increase community usage of our Walking & Cycling Network.
The proposed 2.7 km off-road, arterial level shared path will provide connection to the broader walking and cycling network. The proposed route is often used in Council run events and are well utilised by the community.

The majority (75%) of the project is funded by the Transport & Main Roads (TMR) and a quarter of the project funded through Council’s Capital Works budget.

Construction will commence at the Vine’s Creek Bridge on Harbour Road (south bound side) and continue along to Ron Searle Drive, with the shared path consisting of concrete and elevated boardwalk (to preserve mangrove habitats).

Once completed, this project will provide a continuous footpath from the Mackay Harbour into the City Centre connecting to the existing Bluewater Trail.

## Project Overview

<table>
<thead>
<tr>
<th>Activity</th>
<th>Delivery</th>
<th>Start Date</th>
<th>End Date</th>
<th>Budget</th>
<th>Actual</th>
<th>% Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Management &amp; Supervision</td>
<td>Internal</td>
<td>1/11/2018</td>
<td>30/06/2020</td>
<td>19/20FY: $3,448,891</td>
<td>19/20 FY: $253,821</td>
<td>35%</td>
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<tr>
<td>Design</td>
<td>Internal</td>
<td>15/11/2018</td>
<td>21/05/2019</td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Internal</td>
<td>4/06/2019</td>
<td>06/09/2019</td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Construction</td>
<td>External</td>
<td>11/11/2019</td>
<td>30/05/2020</td>
<td></td>
<td></td>
<td>15%</td>
</tr>
<tr>
<td>Finalisation</td>
<td>Internal</td>
<td>30/05/2020</td>
<td>30/06/2020</td>
<td></td>
<td></td>
<td>0%</td>
</tr>
</tbody>
</table>

## Recent Project Activities

- Long lead procurement composite boardwalk components have started to arrive on site.
- Community engagement with media release and letter drops to the effected stakeholders (i.e. Cyclist/running groups) has been undertaken.
- Site establishment, clearing and grubbing and location of services has been completed.
- Clearing and grubbing activities are completed.
- Minor earthworks commenced.
- Concrete footpaths works commenced with approx. 160 metres completed to date
- Installation of piles for boardwalk commenced at Harbour Road roundabout area.
Figure 1 & 2 - Overall Shared Footpath route

Figure 3 - Crusher dust laid on East Point Drive portion of footpath
Figure 4 - Footpath at East Point Dr section prepped and poured

Figure 5 - Piles installed along future Harbour Rd boardwalk
6.1 Resources Centre of Excellence

Project Overview

<table>
<thead>
<tr>
<th>Activity</th>
<th>Delivery</th>
<th>Start Date</th>
<th>Completion Date</th>
<th>Budget</th>
<th>Actual</th>
<th>% Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed Design</td>
<td>External</td>
<td>May 2019</td>
<td>July 2019</td>
<td>$7.5M</td>
<td>$263,218</td>
<td>100%</td>
</tr>
<tr>
<td>Construction Procurement</td>
<td>Contracts</td>
<td>July 2019</td>
<td>August 2019</td>
<td>$2.12M</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Construction</td>
<td>External</td>
<td>September 2019</td>
<td>May 2020</td>
<td>$2.12M</td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>Finalisation</td>
<td>External</td>
<td>May 2020</td>
<td>June 2020</td>
<td>$7.5M</td>
<td></td>
<td>0%</td>
</tr>
</tbody>
</table>

Council in partnership with the Resource Industry Network (RIN) have secured funding of $3.6M through the State Government’s Jobs and Regional Growth fund. This will contribute to a proposed total project cost of $7.5M to construct the Resources Centre of Excellence training facility.

The aim of this centre is to bring together research, technology development, education, training and testing and showcase our region as a world leader in the mining equipment, technology and services sector.

Facilities for the Resources Centre of Excellence include:

- Underground Mining Simulator Facility
- Control Room
- Workshop
- Laboratory
- Class rooms
- Office space
- Indoor and outdoor function space

The underground mining simulator is a 6811m² facility set up to replicate the conditions of working underground. The simulator will provide students/trainees the opportunity to complete in-depth practical based training including the use of full-sized underground mining equipment such as shuttle cars and conveyors.

The facility is currently mid-construction with the roof complete and the internal walls in progress. The fit out of USMF is scheduled to begin next month.

Recent Project Activities

- Construction commenced
- All slabs down
- Structural steel complete
- Roof construction complete
- Internal walls in progress
- Stormwater in progress
- Ongoing stakeholder engagement

Figure 2 Santa Site visit during December
Figure 2 - Outside prior to sheeting

Figure 3 - Inside - internal walls being installed
6.2 North Mackay Rotary Lookout Upgrade

**Project Overview**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Delivery</th>
<th>Start Date</th>
<th>Completion Date</th>
<th>Budget</th>
<th>Actual</th>
<th>% Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed Design</td>
<td>Internal</td>
<td>April 2019</td>
<td>September 2019</td>
<td>$1.4M</td>
<td>$85,235</td>
<td>100%</td>
</tr>
<tr>
<td>Construction Procurement</td>
<td>Contracts</td>
<td>September 2019</td>
<td>October 2019</td>
<td>$1.4M</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Construction</td>
<td>External</td>
<td>December 2019</td>
<td>April 2020</td>
<td></td>
<td>$78,745</td>
<td>5%</td>
</tr>
<tr>
<td>Finalisation</td>
<td>Contracts</td>
<td>April 2020</td>
<td>July 2020</td>
<td></td>
<td></td>
<td>0%</td>
</tr>
</tbody>
</table>

Construction of the Rotary Lookout is now underway. The North Mackay Rotary Lookout Upgrade is a $1.38m project jointly funded by the Mackay Regional Council and Queensland Government as part of a Building Our Regions funding agreement.

The upgrade will modernise the presentation of the lookout, promoting the area as a tourist destination. The upgraded lookout will include a directional marker floor design with brass plaques highlighting key visible landmarks and identifying some of the regions ‘hot spots’.

The improved presentation will be complemented by the upgraded practical aspects of the design including improved landscaping, seating, drinking facilities, car parking and street lighting. The upgrade will include a shade structure that will be illuminated at night with led lighting.

**Recent Project Activities**

- Tender has been awarded
- Mobilisation to site commenced
- Demolition works have commenced
FIELD SERVICES

7.1 Paradise St Upgrade Stage 2A (Milton/George Intersection Upgrade)

Overview

The project scope consists of the upgrade of the intersection at Milton Street and George Street to a signalised intersection. Works also include provision of car parking spaces on Evan Street, upgrading stormwater drainage in Kemmis Park and construction of new footpath and concrete islands in a number of locations.

Project Overview

<table>
<thead>
<tr>
<th>Activity</th>
<th>Delivery</th>
<th>Start Date</th>
<th>End Date</th>
<th>Budget</th>
<th>Actual</th>
<th>% Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>External</td>
<td>9/12/2019</td>
<td>3/4/2020</td>
<td>$1,456,267</td>
<td>$270,655</td>
<td>30%</td>
</tr>
</tbody>
</table>

Recent Project Activities

- Parking area on Evan Street is nearly complete with the asphalt and linemarking to be completed in conjunction with similar works in other areas of the Project.
- Stormwater and conduit works across George Street (Eastern Side) is complete except Asphalt.
- The new footpath and median island along Milton Street are approx. 70% finished.
Figure 1 – Commencing pavement replacement in western section of George St.

Figure 2 – New Parking area and footpath on Evan St

7.2 Shakespeare Street, Moore St to Goldsmith St Subsurface Drainage and K&C

Overview

This project includes the upgrade of the northern Shakespeare St shoulder, with additional inlet gully pits feeding into the existing stormwater infrastructure, between Goldsmith Street and Moore Street. As well as the increased subsurface drainage capacity, the project also addresses safety and functionality issues associated with the steep grade within the on-street parking lane by raising the level in this area to allow for a standard profile.
Project Overview

<table>
<thead>
<tr>
<th>Activity</th>
<th>Delivery</th>
<th>Start Date</th>
<th>End Date</th>
<th>Budget</th>
<th>Actual</th>
<th>% Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Internal</td>
<td>06/01/2020</td>
<td>27/03/2020</td>
<td>$397,826</td>
<td>$43,000</td>
<td>25%</td>
</tr>
</tbody>
</table>

Recent Project Activities

- Installation of 225mm and 375mm pipes into associated pits between Goldsmith St and Bryon St.
- Clearing and Grubbing in preparation for pit construction/ Kerb and Channel bedding

*Figure 3 – Connection of new 375mm stormwater pipe into existing 1450x1100mm brick drain in middle of Shakespeare St*


11.3. COMMUNITY AND CLIENT SERVICES
11.3.1. COMMUNITY & CLIENT SERVICES MONTHLY REVIEW - JANUARY 2020

Author
A/Director Community & Client Services (Angela Hays)

Responsible Officer
A/Director Community & Client Services (Angela Hays)

File Number
CCS Monthly Review

Attachments
1. CCS MONTHLY REVIEW JANUARY 2020 [11.3.1.1 - 50 pages]

Purpose
Attached is a copy of the Community and Client Services Monthly Review for the month of January 2020.

Related Parties
N/A

Corporate Plan Linkage
This links to various corporate objectives and strategies within the corporate plan.

Officer's Recommendation
THAT the Community and Client Services Monthly Review covering 1-31 January 2020 be received.

Council Resolution ORD-2020-42

THAT the Officer's Recommendation be adopted.


Cr May asked if Council was looking at a contingency plan to rebut some of the fall off of economic activity that may be experienced by the Mackay Entertainment and Convention Centre (MECC) due to the coronavirus and the flow on economic effect it may have.

The CEO advised that the Manager of the MECC had noted that a lot of the large conferences which would normally go to capital cities are being cancelled which may mean that other conferences that would normally come to Regional Queensland may go to capital cities. The Manager of the MECC is looking at strategies to ensure we can still be competitive.

Cr Bella raised pest management and queried if Council has a program to continue to treat weeds when an infestation has been identified in an attempt to eradicate it or Council waits for further reports.

The question was taken on notice with a response to be provided.

Moved Cr Englert  Seconded Cr Camm
Cr Englert noted the increased work undertaken by Health and Regulatory Officers with the Vector Control Officers, the approval of 14 projects by Community and Lifestyle and the Volunteer Expo set for 24 May 2020. Cr Englert noted the success of the Sports Expo which saw 130 groups participating and over 9,000 attendees and congratulated staff and Councillors Bonaventura, Casey, Gee and Paton for being on the organising committee.

Cr Englert congratulated the library staff for meeting their KPI's and highlighted the success of Council's public programs. Cr Englert congratulated Corporate Communications and Marketing for the excellent work done for the Citizenship Ceremony and Community Hero's Recognition and offered congratulations to the Citizen and Young Citizen of the Year.

Cr Englert offered his recommendation to any future Council that they pursue the initiative of the SES Strategic Directions Group.

Cr Bella highlighted the impact of pests and weeds and noted that many weeds are recurrent and persistent and Council needs to be vigilant.

Cr Bonaventura offered congratulations to the staff at Sarina Youth Centre for engaging so many young people during the school holidays, noted the excellent initiative of the Mackay Community Directory Volunteer Portal and congratulated the library staff on the increase in digital loans. Cr Bonaventura noted that over 2,000 people had watched Council's live streaming since it commenced approximately twelve months ago.

CARRIED
Contents

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   Summary.......................................................................................................................................... 5
   Incidents and Injuries...................................................................................................................... 5
   Lost Time Injuries & Days Lost....................................................................................................... 6
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Convention Centre and Events........................................................................................................... 24
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## 1. Highlights of the Month

<table>
<thead>
<tr>
<th>PROGRAM</th>
<th>PROJECT</th>
<th>DETAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMUNITY LIFESTYLE</td>
<td>Mackay Libraries App</td>
<td>Mackay Regional Council Libraries recently launched the first Library app in Australia with a direct link to the Aurora Library Management system. More than 520 customers have now downloaded this app and feedback is ‘it’s fantastic’!</td>
</tr>
<tr>
<td></td>
<td>Sarina Youth Centre</td>
<td>Sarina Youth Centre has been a hub of activity over the school holidays with over 186 visits through the door with young people engaging in a variety of activities including baking, gardening, pool competition, board game marathons and a visit to the pool for a swim and picnic.</td>
</tr>
<tr>
<td></td>
<td>Exhibition Opening: Disquiet: Ecological Anxieties and Transformations</td>
<td>Cairns-based artists Barbara Dover and Robyn Glade-Wright’s touring exhibition examines the anxieties surrounding human generated pressures on the marine environment. The issue of the threatened ocean ecology is conveyed and highlighted through the artworks, which are made from discarded plastic and other debris that have been carried in from the sea and washed ashore along the Queensland coast.</td>
</tr>
<tr>
<td>MECC &amp; EVENTS</td>
<td>Planning for The Mackay Festival of Arts</td>
<td>Some great successes have been achieved in January, including approved funding for a large-scale installation at this year’s DBCT Illuminate event with a successful funding application via Festivals Australia.</td>
</tr>
<tr>
<td></td>
<td>Verification of competency</td>
<td>The MECC technical team have this month gone through the process of getting signed off as competent for our man lifts and forklift plant as part of the ongoing commitment it safety in council.</td>
</tr>
<tr>
<td>CORPORATE COMMUNICATIONS &amp; MARKETING</td>
<td>Australia Day Awards</td>
<td>More than 440 people attended the gala dinner held at the MECC on Australia Day eve. More than 100 nominees and winners across eight categories were honoured.</td>
</tr>
<tr>
<td></td>
<td>Australia Day citizenship ceremony</td>
<td>Nearly 100 people were welcomed as new citizens at Mackay’s Australia Day citizenship ceremony at the MECC.</td>
</tr>
<tr>
<td></td>
<td>Australia Day community events</td>
<td>Council helped fund 11 community events throughout the region on Australia Day. Although wet weather played havoc, many of the groups whose events had to be cancelled are planning to hold small community events in coming weeks.</td>
</tr>
<tr>
<td>EMERGENCY MANAGEMENT</td>
<td>Local Disaster Management Plan (LDMP)</td>
<td>The 2020 LDMP has been completed and endorsed by the LDMG.</td>
</tr>
</tbody>
</table>
**HEALTH & REGULATORY SERVICES**

| **Pest management** | Officers continued to respond to wild dog and pig complaints across the region over the period, in particular assisting land owners with baiting and trapping. This has helped reduce numbers during this period when wild dogs and pigs are highly mobile.

Spraying Giant Rats Tail (GRT) Grass and Parthenium on roadsides has also featured highly in the work that Officers have completed. |

| **Overgrown properties** | Customer requests received relating to overgrown properties increased by 156% in January compared to the previous month.

This % increase is in line with previous years because of increased rainfall and high temperatures, however, for the same period last year, the overall number of requests received for overgrown properties has decreased by 45% reflecting a higher number of property owners actively managing vegetation on their properties. |

| **Mosquito breeding areas** | Vector Control Officers have been working hard treating 631 hectares of mosquito breeding areas and responding to 25 mosquito nuisance requests from the public this month. This was higher compared to the previous month, December 2019, where Officers responded to 1 request.

The increase in requests and overall mosquito numbers was in response to higher rainfall volumes and higher tides. |

---

Angela Hays
Acting Director Community & Client Services.
2. Workplace Health & Safety

Summary
Six incidents were reported involving MRC employees and members of the public.

Incidents and Injuries

The following injury to an MRC employee was reported in January:
- Shoulder pain after undertaking repetitive manual tasks.

The following near miss incidents were reported in January:
- Stood on tack which had fallen off a noticeboard, which became stuck in footwear.
- Tripped on concrete kerb but didn’t fall.

The following incidents involving members of the public were reported in January:
- Patron became ill whilst at library, ambulance attended.
- Customer became verbally abusive towards staff.
- Contractor received minor electric shock whilst unplugging / plugging in appliance.

The following incidents involving a contractor was reported in January:
- Minor electric shock whilst unplugging / plugging in an appliance

Each incident is investigated, and appropriate corrective measures implemented to reduce future risks.
Lost Time Injuries & Days Lost

![Graph showing LTI and days lost by year]

<table>
<thead>
<tr>
<th>Department</th>
<th>2015-16</th>
<th>2016-17</th>
<th>2017-18</th>
<th>2018-19</th>
<th>2019-20</th>
</tr>
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<tbody>
<tr>
<td>Corporate Communications</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Community Lifestyle</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECC &amp; Events</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Emergency Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health &amp; Regulatory Services</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Community &amp; Client Services</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>1</td>
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</table>

<table>
<thead>
<tr>
<th>Department</th>
<th>2015-16</th>
<th>2016-17</th>
<th>2017-18</th>
<th>2018-19</th>
<th>2019-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Communications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community Lifestyle</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECC &amp; Events</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Emergency Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health &amp; Regulatory Services</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Community &amp; Client Services</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

**Glossary**

- **Incident**: Any unplanned event resulting in, or having a potential for injury or ill health.
- **Lost Time Injury (LTI)**: Incidents that resulted in a fatality, permanent disability or time lost from work of one day / part of a day or more.
- **Total Recordable Injuries (TRI)**: Incidents that result in a Lost Time Injury (LTI), Suitable Duties Injury (SDI) and Medical Treatment Injury (MTI).
## 4. Financial Performance - January 2020

### Financial Performance Report
Period Covered: 1 July 2019 to 31 January 2020

<table>
<thead>
<tr>
<th>Revised Budget</th>
<th>YTD Budget</th>
<th>Actual</th>
<th>YTD Variance</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.01 - Community &amp; Client Services Management</td>
<td>404,881</td>
<td>220,538</td>
<td>199,362</td>
<td>(21,176)</td>
</tr>
<tr>
<td>4.03 - Community Lifestyle</td>
<td>7,454,516</td>
<td>4,148,249</td>
<td>4,403,590</td>
<td>255,341</td>
</tr>
<tr>
<td>4.04 - MECC &amp; Events</td>
<td>2,621,133</td>
<td>1,570,994</td>
<td>1,723,962</td>
<td>152,968</td>
</tr>
<tr>
<td>4.05 - Corporate Communication &amp; Marketing</td>
<td>1,696,032</td>
<td>1,029,099</td>
<td>969,179</td>
<td>(59,920)</td>
</tr>
<tr>
<td>4.07 - Health &amp; Regulatory Services</td>
<td>3,042,799</td>
<td>1,002,161</td>
<td>1,022,161</td>
<td>(84,255)</td>
</tr>
<tr>
<td>4.08 - Emergency Management</td>
<td>17,571</td>
<td>(325,672)</td>
<td>(323,325)</td>
<td>2,347</td>
</tr>
</tbody>
</table>

Operating (surplus)/deficit: 15,236,922 / 7,729,623 / 7,974,930 / 245,307
5. Community Lifestyle

PLEASE USE ARIAL 10 font for the body of the report

5.1 Community Programs

Number of Community Enquiries – 386
Number of Emergency Relief Assistance Packages provided – 14
Number of Back to School Vouchers provided - 44
Sarina Neighbourhood Centre meeting rooms utilisation - 18 room bookings to support 49 members of the Sarina community.
Occasions of JP Services provided to community – 34
Number of external bookings in Jubilee Community Centre for the month – 60
Total Jubilee Community Centre usage (internal/external) – 181

Community Development

<table>
<thead>
<tr>
<th>Activity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>RADF</td>
<td>14 projects have been supported to the total value of $66,150 in the latest round of RADF Community Funding 19/20. The round proved very popular with 18 applications received. Round 3 is now open for applications and closes on Wednesday, 29 April. Planning and preparation is well under way by the Arts Development Officers for the 2020/21 RADF Bid to Arts Qld. RADF is a community funding program made possible by partnership between Mackay Regional Council and the State Government. Each year a new bid is prepared seeking funds to support the ongoing partnership. As part of the bid preparation process Community Programs will be hosting our annual RADF Showcase exhibition in the Jubilee Community Centre Foyer. The showcase exhibits work from past RADF recipients. The Showcase will open on Friday, 14 February. The RADF bid will close in March.</td>
</tr>
<tr>
<td>Sarina Youth Centre</td>
<td>The Sarina Youth Centre has been a hub of activity for young people over the school holidays with their school holiday program running from 10am-2pm, Monday to Friday all school holidays. January has seen 186 visits through the door with young people engaging in a variety of activities including baking, gardening, pool competition, board game marathons and a visit to the pool for a swim and picnic. The centre is back to usual operating hours and programming from Tuesday, 28 January including the kick-off of another Who’s in Charge program in partnership with Mackay Youth Support Services Inc. Who’s in Charge is a parenting program aimed at parents with young people in their homes.</td>
</tr>
<tr>
<td>Valley District Youth Council</td>
<td>The Valley District Youth Council, supported by the Community Programs team have held their first meeting for 2020, a planning workshop for the year ahead goals and activities. The group will be seeking local sponsorship to support the delivery of several community</td>
</tr>
</tbody>
</table>
113 meetings and events were held, highlights included:

**Learn to Skate**
Learn to Skate workshops, in partnership with the Australian Skateboarding Community Initiative continued to run over the holiday period with their January 20 workshop at the Sugar bowl attracting 21 young people to partake. The workshops provide support from beginner to intermediate level and a freeskate opportunity with observation and advice from coaches on hand. Learn to Skate workshops will continue to be held monthly at the Sugar bowl until June.

**Planning for Volunteers Expo 2020**
The date for Volunteers Expo 2020 has been set with the Senior Citizens Hall set to be filled to the brim with local volunteering organisations on Sunday, 24 May from 10am-2pm. Stallholder registration is now open with 15 stalls already confirmed. Interested stall holders are advised to contact Community Development Officer, Tamara Flynn at tamara.flynn@mackay.qld.gov.au

**Mackay Community Directory Volunteer Portal**
Community Programs, in conjunction with My Community Directory, have developed a Volunteers Portal that is embedded within the Mackay Community Directory platform. The portal provides an opportunity for all organisations and clubs with a listing on the directory to advertise their volunteer opportunities. It is envisaged the portal will be a one-stop-shop for anyone seeking volunteers or anyone seeking to volunteer. The portal can be accessed directly at [https://www.mycommunitydirectory.com.au/Queensland/Mackay/CouncilVolunteer](https://www.mycommunitydirectory.com.au/Queensland/Mackay/CouncilVolunteer) or through the Mackay Community Directory front page.

**Community Meetings / Events / Interagency Meetings.**

**Disability Service Provider Interagency meeting**
The first Disability Service Provider Interagency meeting was convened on Wednesday, 15 January. 15 attendees representing 12 services participated in the round table sharing, with Well Ways
### Sister Cities Program

<table>
<thead>
<tr>
<th>Activity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia Day Skype</td>
<td>Volunteers of Sister Cities Mackay held a Skype session with young people and supporters on Australia Day. The session provided an opportunity for young people in Matsuura to practice their English-speaking skills and to connect with Mackay citizens who have visited Matsuura previously. 25 volunteers attended the session held at the Dudley Denny City Library.</td>
</tr>
</tbody>
</table>
Sport & Recreation

<table>
<thead>
<tr>
<th>Activity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active in the City</td>
<td>The popular Active in the City program will recommence on 1 February and run through to 30 June. The program will feature Aqua Fitness, Tai Chi and Zumba classes for the community. In addition, a 20 week Live Life Get Active Program will commence on 11 February with registrations now open via the council website.</td>
</tr>
<tr>
<td>Sports Expo</td>
<td>The event preparation is coming to an end as the team prepares themselves for the onslaught of thousands of people at the MECC on 9 February. 122 local clubs and associations have registered for the day and an additional sponsor has also come on board. Harrup Park / Great Barrier Reef Arena have taken on the silver sponsor role which has provided them with naming rights on one of the Active Zones. Major sponsor this year is Optus. Be sure to attend the Expo between the hours of 9am and 1pm to witness the local talent on display, along with the historic Mascot Race.</td>
</tr>
</tbody>
</table>

Museums

All museums are presently closed for the Christmas period, re-opening in March.

Current activities for the museums include:

- An exhibition of the Karl Langer 1948 Mackay Town Hall is currently on display in the Jubilee Community Centre. It will remain in place until 7 February.
- A visit by palaeontologist and Senior Lecturer of Biological Sciences, University of Queensland, to Pioneer Valley Museum to view and photograph the Polemarchus fossil was undertaken. The extremely rare fossil is a highly significant item in the Pioneer Valley Museum collection and is considered the best and most intact specimen in existence.
- The 5-year Museum Strategy tender has opened, with a closing date 4 February.
- Recruitment of new Museum Services Officer position has been completed. Angela Isnor commenced with Council on 3 February.
- Museum Coordinator has participated in the judging of the Heritage Awards.
- An irrigation upgrade is currently underway at Greenmount Homestead.
- Aurecon have been awarded a contract to detail the requirements to repair the leaking dam at Greenmount.
- Initial work has begun on a new housekeeping plan for Greenmount Homestead focussing on preservation of artefacts in the homestead building.
- IT upgrades have been initiated for the Greenmount site to meet operational needs and allow staff to work from the homestead building as volunteer numbers are too low to service needs. Works by IT and Property Services are scheduled for completion prior to the Homestead reopening on 2 March.

Inkind Assistance requests

6 applications were processed for the month with a total value of $1,464.42.
Junior Sporting and Arts and Culture Grant

3 Junior Sporting Grants were received and processed in January, with a combined approval value of $1,050.00.

Better Community Building Fund

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Amount</th>
<th>On Track</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mackay Basketball Incorporated</td>
<td>$100,000</td>
<td></td>
<td>Prework has begun, with products being ordered and completion of the final plans. Construction will begin in early February.</td>
</tr>
<tr>
<td>Grandstand – Court 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mackay North Horse and Pony Club</td>
<td>$50,000</td>
<td>Complete</td>
<td>The project has been completed.</td>
</tr>
<tr>
<td>Completion of Stage 1 Upgrades/Minor Works</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pioneer Valley Golf Club</td>
<td>$75,000</td>
<td>Complete</td>
<td>The project has been completed.</td>
</tr>
<tr>
<td>Buggy Shed</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Jubilee Community Centre Exhibition Space

*Heritage Exhibition - Karl Langer - Mackay's Future Plan*
## 5.2 Libraries

### KPI Update

<table>
<thead>
<tr>
<th>Service / Activity</th>
<th>Annual KPI</th>
<th>YTD</th>
<th>Status</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library Loans</td>
<td>680,000</td>
<td>686,150</td>
<td>●</td>
<td>On target to exceed the annual KPI</td>
</tr>
<tr>
<td>Database Hits</td>
<td>20,000</td>
<td>57,047</td>
<td>●</td>
<td>KPI well exceeded for the financial year. Britannica statistics now available and included.</td>
</tr>
<tr>
<td>Social Media Followers</td>
<td>5,500</td>
<td>Instagram: 1,296 Facebook: 5,658</td>
<td>●</td>
<td>On target</td>
</tr>
<tr>
<td>eNewsletter subscribers</td>
<td></td>
<td>14,384</td>
<td>●</td>
<td>Subscribers to the eNewsletter continues to increase</td>
</tr>
<tr>
<td>In Person Visits</td>
<td>400,000</td>
<td>214,454</td>
<td>●</td>
<td>On target</td>
</tr>
<tr>
<td>Web Visits</td>
<td>300,000</td>
<td>171,693</td>
<td>●</td>
<td>On target</td>
</tr>
<tr>
<td>Volunteer Hours</td>
<td>N/A</td>
<td>1,495 hours</td>
<td>●</td>
<td>Volunteers continue to be a valued resource</td>
</tr>
<tr>
<td>Programs / Events</td>
<td>30,000</td>
<td>32,969</td>
<td>●</td>
<td>Exceeding annual KPI</td>
</tr>
</tbody>
</table>

### Print and Digital Loans

- Lending figures for January continue to demonstrate an increase in overall lending figures for the same time last year with digital loans continuing to trend highly.

![Print Loans by Month 2017-2019](chart.png)
New Library Members

Library Highlights

<table>
<thead>
<tr>
<th>Program</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Young People’s Services (incl. First 5 Forever) | Library staff conducted 10 programs for children aged 5 years and under across 5 branches during January. These sessions are designed to encourage early language and literacy in children and their families and provide an opportunity for socialisation.  
  Baby Bounce: 100 attendees at 3 sessions  
  Toddler Time: 40 attendees at 1 sessions  
  Story Time: 223 attendees at 6 sessions  
  Outreach programs designed to encourage and support early language and emergent literacy in the 0-5 age group and their families totalled 3 attendees at 45 sessions/events.  
  Over 487 children participated in 21 events and activities at 5 library branches over the three week January School holiday period. |
| School Holiday Activities     |                                                                                                                                              |
| Heritage Collection           | • Staff conducted 10 hours of information research and referral activities for 9 local and interstate clients during January.                                                                 |

ORDINARY MEETING - 12 FEBRUARY 2020

Attachment 11.3.1.1

Community and Client Services Monthly Review 1-31 January 2020

Digital Loans by Month 2017-2019

New Library Members

New Library Members

Library Highlights

<table>
<thead>
<tr>
<th>Program</th>
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</tr>
</thead>
</table>
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  Over 487 children participated in 21 events and activities at 5 library branches over the three week January School holiday period. |
| School Holiday Activities     |                                                                                                                                              |
| Heritage Collection           | • Staff conducted 10 hours of information research and referral activities for 9 local and interstate clients during January.                                                                 |
January marked 40 years conception of the Heritage Collection formerly known as the Local History Collection. Mrs Berenice Wright’s contribution to this collection over this time was recognised at a council morning tea where she was presented with a gift.

**Community Outreach**

During the month of January, the Community Outreach Team continued to work on their 2020 Program and Event Programming to ensure an inclusive approach to all residents of the Mackay Region.

With the start of a new year, we launched our Coffee with a Cop Program on 2 January at the Dudley Denny City Library. This program has been designed to encourage all residents of the Mackay Region which encompasses multiple demographics including: multicultural, low literacy, disability, youth and seniors, to engage with local law enforcement in a relaxed and inviting atmosphere where they can ask questions and obtain real answers to their questions. This program will alternate between the Dudley Denny City Library and Gordon White Library for the first six months of 2020. With the success of this program, the Police Department will then have their surrounding officers come into the other MRC Library’s and provide the program for their community residents.

Total Community Outreach attendees: **1,146**

- Book Clubs:
  - Between the Lines – 11 attendees
  - Valley Page Turners – 5 attendees
  - West End Readers – 3 attendees
- Home Library Service:
  - Delivered 332 items to 61 clients
  - Home Library Service volunteer donated 27 hours
- Craft and Conversation
  - 1 session with 12 attendees
- Cultural Services
  - English Conversation Circles restarted on 30 January – 15 attendees
  - Mackay Aboriginal Language Group
Programs
- Coffee with a Cop
- Night at the Library
- Talk about Dementia
- Afternoon at the Movies for Seniors: Strictly Ballroom
- UN Sustainable Development - Documentary Movie: Tashia's Turbine
- Un Sustainable Development Goal 7 – Affordable and Clean Energy
- Money Smart Program
- Drug Information Sessions
- Sensory Table
- English Conversation Circles
- Quiet Hour
- Dad’s Reading Program
- Craft and Conversation
- English Conversation Circles

Events
- Made by You – Book Covering
- Food Swap Day
- Soap Making Workshop
- CQU Student Tour
- Meditation Program
- Reminiscing Together

Community Engagement Workshops and Programs
- Mackay Private Hospital
- Disability Services Providers
- Selectability – New Mental Health Hub

Young Adult
Over the school holidays 25 local young adults had creative opportunities at the library including workshops on making a short film and professional puppeteering. “The Book”, being the result of the former can be viewed here [https://youtu.be/ecnWz94lskQ](https://youtu.be/ecnWz94lskQ) and a very entertaining Puppet Karaoke can be viewed here: [https://www.youtube.com/watch?v=ksihb_vnOPk](https://www.youtube.com/watch?v=ksihb_vnOPk)

We rounded the holidays off with a “Library After Dark” event where another 25 young adults chilled to the music of their local talented peers, played a few games, enjoyed pizza and snacks, and generally interacted with each other and the library.
And just in time for the new school year, 70 teachers at Mirani State High School enjoyed a Knowledge Navigators session, (modified from the student version) displaying all that the library has to offer to support teachers and their students. 20+ new library members resulted and enquiries for more sessions for students

<table>
<thead>
<tr>
<th>Systems News</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mackay Regional Council Libraries recently launched the first Library app in Australia with a direct link to the Aurora Library Management system. This exciting new app is a fantastic partnership with Solus and Aurora, which bring library services directly to the pocket of our customers. More than 520 customers have now downloaded this app and feedback is ‘it’s fantastic’!</td>
</tr>
</tbody>
</table>
### 5.3 Artspace Mackay

#### Public Programs

<table>
<thead>
<tr>
<th>Activity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Losing home, finding home: Mika Nakamura-Mather</td>
<td>Losing home, finding home: Mika Nakamura-Mather will open in the FIELD Engineers Gallery on Friday 29 November 2019. As a Japanese national living and working in Australia, Mika Nakamura-Mather’s work explores the concepts of home and belonging that lie at the heart of understanding our identity. From living and working in a different country to simply taking a holiday and finding yourself in a new location, past memories of home are the yardstick by which we measure our place in the present. The exhibition continues until Sunday 23 February 2020.</td>
</tr>
<tr>
<td>Sacred Ink: Connecting to culture</td>
<td>Sacred Ink: Connecting to culture is an Artspace Mackay photographic exhibition delivered in partnership with the Mackay and District Australian South Sea Islander Association (MADASSIA), which explores how the art of tattooing has been embraced by local Australian South Sea Islanders as a means of cultural connection to, and affirmation of, their South Sea Islander heritage. Sacred Ink investigates the stories of their tattoos and how they intersect with themes of family, heritage and identity. The exhibition is on display in the Foyer Gallery until Sunday 16 February 2020.</td>
</tr>
<tr>
<td>Focus on the Collection: Ceramics</td>
<td>A Focus on the Collection exhibition is currently on display in the Foyer gallery. Curated by new Assistant Curator Emily Wakeling, it features ceramics from the Mackay Regional Council Art Collection with visible traces of East Asian ceramic techniques and aesthetics that have been transferred</td>
</tr>
</tbody>
</table>
from abroad to this region. Many who are based in or have come through Mackay have explored ceramic making traditions that hark back centuries and even millennia, including the use of wood-fuelled, anagama (cave-like) kilns in which to fire their wares.

<table>
<thead>
<tr>
<th>DISQUIET: Ecological Anxieties and Transformations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disquiet: Ecological Anxieties and Transformations was open to the public with an evening Artists’ talk by Barbara Dover and Robyn Glade-Wright at 6pm, 18 visitors attended the event. Cairns-based artists Barbara Dover and Robyn Glade-Wright’s touring exhibition examines the anxieties surrounding human generated pressures on the marine environment. The issue of the threatened ocean ecology is conveyed and highlighted through the artworks, which are made from discarded plastic and other debris that have been carried in from the sea and washed ashore along the Queensland coast. This project is supported by the Queensland Government through Arts Queensland. Disquiet continues until Sunday 5 April 2020.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Touring exhibition: Violent Salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Artspace Mackay touring exhibition Violent Salt began its road trip with 7 weeks showing in Noosa Regional Gallery, 6 December 2019 to 26 January 2020. Artspace Mackay staff will continue their partnership and liaison with regional and metropolitan galleries across Australia, including Toowoomba, Lake Macquarie, Canberra, Swan Hill and Bundoora, Melbourne throughout 2020 and well into 2021. Curated by Yhonnie Scarce and Claire Watson, Violent Salt discusses issues surrounding racism and discrimination against First Nations peoples and minority groups as well as the lack of respect for, and desecration of culture and the natural environment.</td>
</tr>
</tbody>
</table>
## Public Programs

<table>
<thead>
<tr>
<th>Activity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORTH QUEENSLAND BULK PORTS</td>
<td>The Nth Qld Bulk Ports sponsored school holiday program commenced on the 16th December and ran until January 25. This FREE drop-in art activity program was designed for families, and people of all ages to experiment, create, and have fun using shiny aluminium embossing shim. Using very simple manual embossing tools and a variety of colourful craft materials, participants made their own mobile, wall decoration or small metallic masterpiece to take home. January visitation numbers during the all ages program were 1203.</td>
</tr>
</tbody>
</table>

---

*Image of children engaging in the art activity program.*
Self – Guided Art Trail

To support community engagement with the main gallery exhibition, Losing home, finding home: Mika Nakamura-Mather, Public Programs Officer Billie-Jo Ogilvie designed an interactive, self-guided tour brochure. The development of this resource was a great success with over 40 young people and adults enjoying a self-directed tour of the gallery during January.

Artist Floor Talk

DISQUIET: Ecological Anxieties and Transformations

On the 23rd of January Cairns based artists Barbara Dover and Robyn Glade-Wright presented a floor talk to discuss their touring exhibition, Disquiet: Ecological Anxieties and Transformations. Featuring large-scale sculptures made from discarded plastics and other ocean debris, the show highlights urgent ecological threats to the marine environment. The artists discussed their long-term engagement with environmental concerns in their art practices and the importance of raising awareness of the destructive impact of this ‘age of plastic’ we are living in.

This was a free all ages event attended by 21 people.
## Monthly KPI Update

<table>
<thead>
<tr>
<th>Service / Activity</th>
<th>Annual KPI</th>
<th>YTD January 2020</th>
<th>January 2020</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visitors: Artspace</td>
<td>28,000</td>
<td>15,790</td>
<td>1,965</td>
<td>Visitor numbers are consistently good and on target.</td>
</tr>
<tr>
<td>Web Visits</td>
<td>14,000</td>
<td>8,557</td>
<td>1,534</td>
<td>On target.</td>
</tr>
<tr>
<td>Total Number of e-Newsletter Subscribers</td>
<td>1,800</td>
<td>1,842</td>
<td>1,842</td>
<td>On target.</td>
</tr>
<tr>
<td>Facebook Subscribers</td>
<td>6,600</td>
<td>6,441</td>
<td>6,441</td>
<td>On target. Combined total for Artspace and Rock Paper scissors Facebook pages.</td>
</tr>
<tr>
<td>Exhibitions</td>
<td>12</td>
<td>11</td>
<td>1</td>
<td>In January a new travelling exhibition, <em>Disquiet: Ecological Anxieties and Transformations</em> opened in Gallery Three.</td>
</tr>
<tr>
<td>Public Program Participants</td>
<td>7,400</td>
<td>4,632</td>
<td>1,264</td>
<td>On target.</td>
</tr>
<tr>
<td>Public programs (inc. tours, BMA Kidspace, workshops, exhibition openings, markets, etc.)</td>
<td>140</td>
<td>70</td>
<td>3</td>
<td>On target</td>
</tr>
<tr>
<td>Volunteer hours</td>
<td>2,800</td>
<td>1,694</td>
<td>194</td>
<td>On target.</td>
</tr>
</tbody>
</table>
Convention Centre and Events

Overview

The MECC has been through a busy month throughout January during the annual shutdown period from 16 December 2019– 24 January 2020. Major maintenance has been undertaken internally through MECC staff including overall venue maintenance and cleaning, technical equipment safety checks including completion of actions via the recent Working at Heights (WAH) WHS audit.

The MECC team has also been liaising daily with the Capital Works & Property Services teams and contractors on the delivery of:

- North Foyer full carpet replacement
- Entertainment Centre door and frame replacement
- Lynette Denny Space sacrificial floor replacement
- Auditorium strip lighting replacement
- Convention Centre catwalk light replacement (house lighting)
- Convention Centre meeting rooms LED light replacement
- Entertainment Centre automatic doors and fire system interaction
- Maintenance – meeting rooms operable walls
- Centre firewall repairs and upgrades
- Centre fire plumbing replacements

Overall YTD attendance is lower than usual – down 15% and number of events overall down 19% due to the maintenance and capital works being undertaken within the venue but with February bookings this should level itself out to being back on track.

External ticket sales are also generally lower at this time of the year as it is the low season for both performing arts and business related events.

The MECC has achieved 57% of targeted attendance for 2019/20FY (155,000), the venue is on track to meet the end of year target with a number of events kicking off in February with high attendances expected through until June.

YOUTH + WORKSHOPS/ENGAGEMENT

MECC Educator’s Newsletter

The quarterly MECC Educator’s Newsletter was delivered on 30 January. The newsletter this term focuses on planning ahead for the 2020 school year, and upcoming opportunities in term one.

BHP & Pathways to Performance

The MECC have sent through the contract for sponsorship of the 2020/2021 Pathways to Performance program and are now waiting for invoicing and payment to finalise.

Community Radio Station Sponsorship 2020

Community Radio Stations have continued with their agreement for MECC sponsorship in 2020.

4CRM, My105FM and 4RFM (Moranbah Community Radio) have signed agreements which outlines support of MECC performances over the calendar year. My105FM have already supplied generic radio ad campaigns which they will schedule throughout the week. We are looking forward to working with them over the calendar year.
Blakdance Residency Week
The MECC Team have created collateral for schools who may be interested in participating in the Blakdance residency program and have begun distribution of these materials. Venue has been acquired for the culminating activity at the end of the week (Friday 6 March). This will be a BBQ at the Botanical Gardens 6pm to 8pm.

School Bookings 2020
Over January the MECC have taken 10 school bookings for various performances in the School Entertainment Program and are looking forward to taking more now the school year has officially commenced.

POST CODE DATA
Overall 5% of monthly ticket sales came from outside the LGA.

1 event attracted patronage from outside the LGA

<table>
<thead>
<tr>
<th>January 2020</th>
<th>LOCAL</th>
<th>OUTSIDE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020 Australia Day Awards</td>
<td>423</td>
<td>10</td>
<td>433</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>423</td>
<td>10</td>
<td>433</td>
</tr>
<tr>
<td>KPI</td>
<td>Target</td>
<td>as at JANUARY 2020</td>
<td>Comments</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>--------</td>
<td>-------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Number of Performances fully cost recovered</td>
<td>50%</td>
<td>66%</td>
<td>On Track</td>
</tr>
<tr>
<td>Minimum number of catered functions (excluding performances)</td>
<td>140</td>
<td>103</td>
<td>On Track</td>
</tr>
<tr>
<td>Average attendance at events</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auditorium 550</td>
<td></td>
<td></td>
<td>Under Target</td>
</tr>
<tr>
<td>Auditorium 321</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foyer/space 100</td>
<td></td>
<td></td>
<td>On Track</td>
</tr>
<tr>
<td>Foyer/space 174</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halls 600</td>
<td></td>
<td></td>
<td>Under Target</td>
</tr>
<tr>
<td>Halls 392</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One Hall only 200</td>
<td></td>
<td></td>
<td>Under Target</td>
</tr>
<tr>
<td>One Hall only 107</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of non-utilised days</td>
<td>90</td>
<td>59</td>
<td>On Track</td>
</tr>
<tr>
<td>Number of Performances at the MECC</td>
<td>200</td>
<td>162</td>
<td>On Track</td>
</tr>
<tr>
<td>Number of Conferences/Expos</td>
<td>20</td>
<td>9</td>
<td>On Track</td>
</tr>
<tr>
<td>Number of Events with Attendance from outside Mackay Region LG area (Post Code Data)</td>
<td>40</td>
<td>35</td>
<td>On Track</td>
</tr>
<tr>
<td>#Events at BB Print Stadium</td>
<td>-</td>
<td>9</td>
<td>New KPI</td>
</tr>
<tr>
<td>#in Attendance at BB Print Stadium</td>
<td>-</td>
<td>7434</td>
<td>New KPI</td>
</tr>
<tr>
<td>Number of Student Attendances</td>
<td>2,000</td>
<td>2,703</td>
<td>Exceeding Target</td>
</tr>
<tr>
<td>Number of workshops &gt; Youth</td>
<td>6</td>
<td>6</td>
<td>Reached Target</td>
</tr>
<tr>
<td>Number of engagement workshops/activities</td>
<td>5</td>
<td>17</td>
<td>Exceeding Target</td>
</tr>
<tr>
<td>Yearly occupancy of facility</td>
<td>155,000</td>
<td>89,796</td>
<td>On Track with forward bookings</td>
</tr>
<tr>
<td>Customer Hire Satisfaction</td>
<td>80%</td>
<td>95%</td>
<td>Exceeding Target</td>
</tr>
<tr>
<td>Number of regional events assisted through either financial or in-kind assistance</td>
<td>6</td>
<td>2</td>
<td>Below Target</td>
</tr>
<tr>
<td>Number of regional events ticketed</td>
<td>8</td>
<td>4</td>
<td>On Track</td>
</tr>
<tr>
<td>Friends of the MECC Volunteer Hours</td>
<td>N/A</td>
<td>5002</td>
<td>On Track</td>
</tr>
</tbody>
</table>
Festivals & Events

Mackay Festival of Arts
The Mackay Festival of Arts has enjoyed some great successes in the month of January, including approved funding for a large-scale installation at this year’s DBCT Illuminate event. The successful funding application via Festivals Australia will allow the Festival to deliver String Symphony by Spare Parts Puppet Theatre; a giant illuminated puppet suspended with a network of ropes waiting to come to life.

The team is delighted to be launching the Festival at Mackay Airport again this year with a collaboration with local artist, Vama Fatiaki. Garry Porter has also signed on as this year’s naming rights sponsor of our Grassroots Stage at Wine & Food Day, which missed out on a sponsor in 2019.

MI Scaffold has signed on as a brand-new sponsor for the Festival as naming rights sponsor of the popular Kidzone at Wine & Food Day. This sponsorship will allow us to offer a Circus Drop Zone that will include a Mini Big Top, juggling balls, hula hoops, spinning plates and unicycles, for free to the public.

Mackay City Centre will be supporting events of DBCT Illuminate, with potentially a few more sponsors to secure, including Festival Club and the Jack Sturgeon Stage at DBCT Illuminate. These are expected to be confirmed by the end of February with the expected total sponsorship of $87,000.

The Fringe Events program has had a successful few weeks with applications rolling in from a number of new venues and events this year from Harrup Park, The Grazing Goat Café and a Single launch from one our favourite young Mackay artists, Jonte Tupaea.

Global Grooves
The team has started early with our community consultation meetings kicking off in January, with monthly meetings leading all the way up to the October event. The team will be nurturing relationships with The Neighbourhood Hub and the delivery of Harmony Day, Binbi Tok and the Community Lifestyle team in order to draw further interest in attending Global Grooves as both patrons and potentially as performers, foodies, stalls or delivering cultural workshops.
7. Corporate Communications and Marketing

Community heroes honoured for Australia Day: There was an abundance of #mackaypride in the room at a gala awards dinner at the MECC on Australia Day eve, Saturday, January 25. Mackay’s 2020 Australia Day Awards winners were announced at the event, which featured a two-course Aussie-themed meal and honoured all nominees. More than 100 nominations were received for eight award categories and the gala dinner was attended by more than 440 people. The winners were:

> Citizen of the Year – Charles Symons
> Young Citizen of the Year – Olivia Swindells
> Lori Burgess Community Volunteer Award – Kathryn Andrews
> Senior Sports Award – Emma Forster
> Junior Sports Award – Cooper Whitestyles
> Community Group Award – Mackay Hockey Association
> Arts and Culture Award – Jana Bassan
> Environmental Achievement Award – Keith Day
Citizens welcomed on Australia Day: Nearly 100 new citizens were officially welcomed to Mackay on Australia Day. The new citizens originate from 22 countries around the world. They were welcomed by Mayor Greg Williamson at a Citizenship Ceremony at the MECC on Australia Day.

Rain fails to dampen spirits: Wet weather meant a change of plans for many of the 11 council-funded community events around our region on Australia Day. Some went ahead in scaled down versions while others were cancelled or postponed. Many of the groups who had events cancelled were planning to hold small community events in the weeks after Australia Day.
All website visits for January 2020

![Graph showing website visits for different sites including Artspace, MECC, Mackay City Centre, Botanic Gardens, Mackay Regional Council, and Sarina Sugar Shed.]

Trend of MRC website visits (mackay.qld.gov.au)

![Bar chart showing website visits from January 2019 to January 2020.]
MRC Facebook followers for January 2020

MRC social media for January 2020
Community and Client Services Monthly Review 1-31 January 2020

All facilities’ Facebook followers for January 2020

Council meeting live stream views

* June 12 meeting not live streamed due to global YouTube outage.
** Meeting views as recorded at the end of January. Views of each video can continue to increase as recordings are accessed via mackay.qld.gov.au or youtube.com/counciltv

eNewsletter Subscribers
Artspace: 1842 (Last month: 1843)
Botanic Gardens: 1199 (Last month: 1193)
Council Connect: 3431 (Last month: 3458)
Library: 14,119 (Last month: 14,190)
Recreation Services: 1138 (Last month: 1136)
MyMackay 1216 (Last month 1214)
Council featured in 70 new stories during January

![Pie chart showing media monitoring breakdown for January 2020]

- Seven Television: 54
- National Nine News: 16
- Daily Mercury: 0
- Courier Mail: 0

Advertising spend for January

![Bar chart showing advertising spend from January 2019 to January 2020]

- January 2019: $67,417
- February 2019: $64,689
- March 2019: $76,530
- April 2019: $124,963
- May 2019: $138,890
- June 2019: $192,641
- July 2019: $60,213
- August 2019: $72,636
- September 2019: $60,419
- October 2019: $68,847
- November 2019: $64,615
- December 2019: $87,015
- January 2020: $78,400
Community Engagement

Queens Park
Corflute signage notifying the public that Orchid House is now closed has been erected in the park. Stakeholder interactions are now focused on ensuring two representatives from the traditional owners’ group are available to be part of the signage committee. Their involvement is vital in ensuring all stakeholders have input on the permanent signage for the park.

A request from The Queensland Cricket Board and Executive Leadership Team for a park tour was also received. The tour was scheduled to take place on Tuesday, February 11.

Northview Park Playground
Notifications for the playground equipment replacement at Northview Park have been distributed. The Connecting Mackay page has also been published.

North Mackay Rotary Lookout
All residents have been informed of the start of construction in the area. Social media and media releases have also been distributed.

Bus Stop Improvement Programs
Letters to residents have been distributed to those either directly affected by the installation of the bus stop or in the vicinity.

Blacks Beach water main renewal
This is an urgent job that will see gardens and trees planted by residents removed at our request in order to work on the water main. Residents have been given the opportunity to remove the plants themselves or council will remove on their behalf.

Meeting have been conducted with all property owners and all are satisfied with the project. Work has now started on this project and due to be completed by the end of April, weather permitting.

Milton and George streets intersection traffic light installation
Initial notifications with residents and schools are now complete. Stakeholder interactions are now focused on updating notifications as the traffic conditions change.

Marzan Street and George Fordyce Drive traffic calming
Residents have been contacted to arrange a meeting to discuss the project.

Shakespeare Street kerb and channel Works
Works are currently under way. Residents and Victoria Park State School will be notified as necessary. Some driveway replacements are scheduled to begin next month and will be managed through a series of meetings with community engagement, the project lead and the site supervisor.

Notifications sent out to the community can be found on connectingmackay.com.au/letters

Below is a list of the larger, more significant Community Engagement projects.
<table>
<thead>
<tr>
<th>Project Name</th>
<th>Activity</th>
<th>Department</th>
<th>Plans and activities</th>
<th>Level of Engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Queens Park</td>
<td>Ongoing - Progressed to next stage of the project-construction commenced</td>
<td>Major Projects</td>
<td>Finalising members for signage committee</td>
<td>Inform/Consult</td>
</tr>
<tr>
<td>Milton and George St Traffic Lights</td>
<td>Ongoing</td>
<td>Capital Works</td>
<td>Ongoing engagement as traffic conditions change</td>
<td>Inform</td>
</tr>
<tr>
<td>North Mackay Rotary Lookout</td>
<td>Ongoing</td>
<td>Capital Works</td>
<td>Ongoing engagement being led by project manager</td>
<td>Inform</td>
</tr>
<tr>
<td>Northview Park Playground</td>
<td>Ongoing</td>
<td>Development Services</td>
<td>Connecting Mackay, posters, mail out etc to notify community of upgrade</td>
<td>Inform/consult</td>
</tr>
<tr>
<td>Campwin Beach Boat Ramp Upgrade</td>
<td>Ongoing</td>
<td>Capital Works</td>
<td>Continuing stakeholder interactions</td>
<td>Inform</td>
</tr>
<tr>
<td>Bus Stop Improvement Program</td>
<td>Ongoing</td>
<td>Community and Client Services</td>
<td>Report accepted</td>
<td>Consult</td>
</tr>
<tr>
<td>Black Beach Water Main renewal</td>
<td>Ongoing</td>
<td>Engineering and Commercial Infrastructure</td>
<td>Project page active</td>
<td>Inform</td>
</tr>
<tr>
<td>Marzan Street and George Fordyce Drive Traffic Calming</td>
<td>Ongoing</td>
<td>Capital Works</td>
<td>Ongoing – construction underway</td>
<td>Inform/Consult</td>
</tr>
</tbody>
</table>
8. Emergency Management

Overview

The Emergency Management program has taken advantage of a relatively mild severe weather season to date by updating and refining plans for Council and the Local Disaster Management Group. The 2020 Local Disaster Management Plan was completed and presented to the LDMG for endorsement. Others, such as the LDMG Activation Sub-Plan and Public Information & Warning Sub-Plan are currently being reviewed and tested.

A series of public safety videos are being developed to help the community better understand the risks and hazards associated with storm tides and an interactive instructional video on how to find and navigate the Disaster Dashboard.

Recruitment for the Emergency Management Project Officer is underway. This position is a state government funded position with the view to establish a series of operational plans with aged care and other service providers on what to do during a disaster situation.

We are in regular communication with Queensland Health, Mackay Hospital & Health Services and Maritime Safety Queensland in respect to Coronavirus. While there remain no cases outside of the Gold Coast, the program is actively monitoring the situation and advise the organisation accordingly. Regular meetings have been set up with district stakeholders on a weekly basis until further notice.

Mackay Regional Council is trialling a new IP phone system in the LDCC. Up to 100 phone numbers have been allocated to the new system with dedicated phone numbers for each of the functional areas within the LDCC. The update will revolve around moving from the hard fixed telephone setup to soft clients on the Laptops used with associated telephone audio hardware connected to them along with some IP handsets etc. This will allow the freedom to setup the centre in alternative locations where all that is needed is an active network location.

Bushfires Recovery - Eungella Community Art Day

Blacksmithing, woodturning, charcoal drawing, and felt making were some of the activities on offer at a community art day as part of the Eungella Community Creative Recovery Project. Held at the Eungella Hub on Australia Day, local residents could also contribute to a publication telling their stories about the 2018 Bushfires. This project has been funded by Mackay Regional Council, Regional Arts Development Fund, and the Regional Arts Services Network.
Communications Hub Finch Hatton – Finch Hatton Base

The Emergency Management team have completed the handover of the council building to the Finch Hatton Progress association for their communications hub. Testing of the communications facilities has been completed and multiple layers of redundancy have been made in the event of a full telecommunications outage.
SES

SES Operations

<table>
<thead>
<tr>
<th>Activity</th>
<th>Event</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activation</td>
<td>Rain/ Storm Event 25-27/01/20</td>
<td>Teams responded to TAMS requests over the long weekend.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Chainsaw team activated to clear tree that had brought down power lines and was blocking the driveway.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- WSAH team activated to tarp a leaking roof.</td>
</tr>
</tbody>
</table>

SES Membership - Active Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Dec 19</th>
<th>Jan 20</th>
<th>Membership notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armstrong Beach</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Calen</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Mackay</td>
<td>88</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>Mirani</td>
<td>32</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Sarina</td>
<td>16</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>144</td>
<td>144</td>
<td>New member intake due for March 2020. (40 EOI)</td>
</tr>
</tbody>
</table>

SES Membership - Non Active Groups #

These Groups are currently not actively training due to low membership numbers. A recommendation regarding the future viability of these Groups is pending a review by the SES Unit Strategic Direction Group. In the meantime, any members of these Groups may still train and take part in operations with other Groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Members</th>
<th>Vehicles</th>
<th>Equipped Trailer</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campwin Beach</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>Vehicle currently being garaged and utilised by Sarina Group</td>
</tr>
<tr>
<td>Koumala</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>Vehicle and trailer currently being garaged and utilised by Sarina Group</td>
</tr>
<tr>
<td>Midge Point</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>Vehicle currently being utilised by Mackay Group</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
SES Operational Capability

The Mackay Regional SES Unit has the capability to provide operators in all core SES functions throughout the Mackay local government area.

<table>
<thead>
<tr>
<th>Function</th>
<th>Members / teams available</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood boat</td>
<td>15 teams</td>
<td>1 team = 2 members</td>
</tr>
<tr>
<td>Storm damage</td>
<td>112 members</td>
<td>Teams usually 2-4 members</td>
</tr>
<tr>
<td>Chainsaw</td>
<td>16 teams</td>
<td>1 team = 2 members</td>
</tr>
<tr>
<td>Working at heights</td>
<td>12 teams</td>
<td>1 team = 4 members</td>
</tr>
<tr>
<td>Vertical rescue</td>
<td>10 members</td>
<td>Team size varies on task parameters. Operational performance target is 10 members per team</td>
</tr>
<tr>
<td>Land search</td>
<td>76 members</td>
<td>Team size varies on task parameters</td>
</tr>
<tr>
<td>Traffic control</td>
<td>39 members</td>
<td>Team size varies on task parameters, but usually 2-4 members</td>
</tr>
<tr>
<td>Incident management</td>
<td>37 members</td>
<td>Team size varies on task parameters</td>
</tr>
</tbody>
</table>

Should local incidents exceed the capacity of the Unit to manage, neighbouring Units such as Isaac and Whitsunday may be called upon for assistance. Where large scale events are likely to have an impact over neighbouring local government areas, e.g. cyclones, State / Regional coordination will deploy teams from other areas around the state to assist with the response.

SES Training undertaken in January

Courses: Nil

Refresher training & exercises:
Competency Maintenance Chainsaw.
Competency Maintenance Flood Boat

Mackay Regional SES Unit Hours

The following indicates hours put in by the volunteers. It does not include hours of the Volunteer Acting Local Controller.
Mackay Regional SES Unit Hours

Operations – SES Hours per Group 2019-2020

Training – SES Hours per Group 2019-2020

*"0" indicates no operations hours were recorded for these groups on those months

*"0" indicates no training hours were recorded for these groups on these months
Community and Client Services Monthly Review 1-31 January 2020

Maintenance – SES Hours per Group 2019-2020

Administration – SES Hours per Group 2019-2020

# "0" indicates no maintenance hours were recorded for these groups on these months

# "0" indicates no administration hours were recorded for these groups on these months
Community Education – SES Hours per Group 2019

*0* indicates no community education hours were recorded for these groups on these months
9. Health & Regulatory Services

Overview

Health and Regulatory Services has been busy over the past month. All service areas, including environmental health, environmental protection, pest management, vector control, development compliance, animal management, regulated parking and local laws have actively been responding to requests for service and assistance from the community and taking action to ensure public health, safety, order, equity and environmental values are being maintained.

Customer Requests

Throughout January 2020, 797 requests for service were received, compared with 744 requests for January 2019.

83% were completed in nominated timeframes for this month. Health and Regulatory Services aim to complete 85% of requests for service within nominated timeframes, however, depending on the circumstances of each individual matter and the speed at which compliance can be achieved using compliance processes, timeframes for completion can be influenced.
Customer Request Status Tracking

Animal Registrations - Number of Dogs & Cats Registered

<table>
<thead>
<tr>
<th>Animal Type</th>
<th>Registrations January 2020</th>
<th>Registrations January 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat</td>
<td>37</td>
<td>35</td>
</tr>
<tr>
<td>Dog</td>
<td>145</td>
<td>159</td>
</tr>
</tbody>
</table>

Proactive Patrols
Proactive Patrols are conducted at times when dog owners are most likely to be walking with their pets.

Proactive Patrols

<table>
<thead>
<tr>
<th>Date</th>
<th>Suburb</th>
<th># On leads</th>
<th># Impounded</th>
<th># Infringements</th>
<th>Cautions or Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/01/2020</td>
<td>North Mackay</td>
<td>12</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3/01/2020</td>
<td>Goopepons, Slade Point and North Mackay</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>4/01/2020</td>
<td>East Mackay</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5/01/2020</td>
<td>North Mackay - Slade point</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7/01/2020</td>
<td>Sarina</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11/01/2020</td>
<td>Dolphin Heads</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11/01/2020</td>
<td>East Mackay</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11/01/2020</td>
<td>Eimeo</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11/01/2020</td>
<td>North Mackay</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11/01/2020</td>
<td>Sarina</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11/01/2020</td>
<td>West Mackay</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12/01/2020</td>
<td>Northern Beaches</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13/01/2020</td>
<td>Sarina</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14/01/2020</td>
<td>South Mackay</td>
<td>26</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>15/01/2020</td>
<td>Sarina</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>16/01/2020</td>
<td>Sarina and Armstrongs Beach</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>19/01/2020</td>
<td>Slade Point</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>23/01/2020</td>
<td>Goopepons</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>23/01/2020</td>
<td>Northern Beaches</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Total: 148 3 1
Licensing and Approvals Summary for January 2020

<table>
<thead>
<tr>
<th>Premises</th>
<th>Premises Inspected</th>
<th>% Compliant</th>
<th>% Non-compliant</th>
<th>New and Renewal Applications Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation</td>
<td>8</td>
<td>75%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Swimming Pools</td>
<td>4</td>
<td>75%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Footpath Dining</td>
<td>3</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Premises</th>
<th>Premises Inspected</th>
<th>5 Star</th>
<th>4 Star</th>
<th>3 Star</th>
<th>2 Star</th>
<th>0 Star</th>
<th>New and Renewal Applications Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Business</td>
<td>43</td>
<td>10</td>
<td>6</td>
<td>24</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Basic summary of star rating meanings:

- **5 Star**
  - Excellent performer – Excellent record keeping, procedures, cleanliness and sustainable food safety practices.

- **4 Star**
  - Very good performer – Very good cleanliness, food safety practices and some records and procedures.

- **3 Star**
  - Good performer – Good level of compliance and overall acceptable standard. Clean and meeting legislation.

- **2 Star**
  - Poor performer – Low level of compliance, more effort required. I.e. Very unclean premises, poor hygiene practices.

- **Non-compliant performer** – A general failure to comply, with major effort required to rectify issues. Critical non-compliances. I.e. Very unclean premises, poor hygiene practices, incorrect temperatures and presence of pests and vermin.

*Note – Officers actively work with business operators to achieve compliance using appropriate regulatory tools.*
There are 12 Eat Safe audits remaining to be competed. These mostly relate to home-based businesses that operate intermittently or at specific times of the year.

Pest Management

The hours noted above include preparation activities and conducting baiting sessions. Baiting is not conducted in wet weather due to the ineffectiveness.
Surveying and spraying are conducted on roads. Surveying is also conducted on private property throughout the region.

**Monthly Infringements Activity**

The graphs below provide a summary of infringement activity for Health & Regulatory Services over the past 12 months.

### January 2020

<table>
<thead>
<tr>
<th>Local Laws Infringements</th>
<th>Environmental Services Infringements</th>
<th>Development Compliance Infringements</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Animal not registered within 14 days (9)</td>
<td>• Deposit litter – individual (1)</td>
<td>• Nil</td>
</tr>
<tr>
<td>• Animal wandering at large (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fail to comply with compliance notice (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fail to comply with minimum standards (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fail to comply with dangerous dog conditions (2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Officers regulate 2,525 on street car parks, off street car parks, loading zones and car parks designated for disabled people, daily.

Vector Control

The table below represents the mosquito control work carried out by the Vector Control team up to the end of January 2020.

<table>
<thead>
<tr>
<th>Sites Inspected</th>
<th>Sites Treated</th>
<th>Hectares Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>220</td>
<td>93</td>
<td>631 Ha</td>
</tr>
</tbody>
</table>
Education and Training Sessions

Food training sessions are conducted for non-profit organisations and for festival and events.

Summary of sessions conducted:

Most Food Safety Training occurs during January to July, in preparation for the Event season.

School education includes responsible pet ownership and dengue fever awareness. Most of the school sessions are carried out during January to June.
Off Street Car Parking – PayStay

Use of PayStay in January has raised $93 more revenue than January of 2019.
Use of meters for January 2020 has dropped by 50% in comparison to Jan 2019
11.3.2. LOCAL DISASTER MANAGEMENT PLAN (LDMP)

Author
Emergency Management Co-ordinator (Andrew Neil)

Responsible Officer
A/Director Community & Client Services (Angela Hays)

File Number
EM

Attachments
1. Public 2020 Local Disaster Management Plan [11.3.2.1 - 52 pages]

Purpose
To provide Council with the 2020 Mackay Local Disaster Management Plan for endorsement.

Related Parties
Mackay Local Disaster Management Group Members

Corporate Plan Linkage

Priority: Community Health & Wellbeing
Strategy: Disaster preparedness - Build community preparedness and responsiveness to emergencies and natural disasters.

Background/Discussion
The Draft 2020 LDMP review was in response to learnings from recent disaster events and changes in policy and direction at the local, district and state levels since the last review. This review was conducted by the Emergency Management Program in consultation with LDMG partner agencies.

The 2020 LDMP is not an exhaustive document rather, it is a document written with the intent to provide a high level process on how Mackay Regional Council and Local Disaster Management Group will prevent, prepare, respond and recover for disaster events.

This plan was peer reviewed by select members of the Mackay LDMG and was subsequently distributed to the full committee on the 11th December 2019 for consultation before being accepted by the Local Disaster Management Group on the 3rd of February 2020.

Consultation and Communication
The Draft 2020 Mackay Local Disaster Management Group was distributed to the Local Disaster Management Group for consultation with comments assessed and implemented as required.

Resource Implications
Nil

Risk Management Implications
The LDMP has been revised to not only be legislatively compliant but also effective for functional disaster management through integration of LDMG membership agency activities and resources.
The risk in not proceeding is that the Local Disaster Management Group may not be operating within the current framework or best practice.

**Conclusion**

The Local Disaster Management Plan is a public document as required under Section 60 Disaster Management Act and will be made available to the public via the Mackay Regional Council Website and Council operating locations.

**Officer’s Recommendation**

THAT Council resolves to endorse the 2020 Local Disaster Management Plan.

**Council Resolution ORD-2020-43**

THAT the Officer’s Recommendation be adopted.

Moved Cr Williamson   Seconded Cr Camm

CARRIED
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1. APPROVAL OF PLAN

This Local Disaster Management Plan has been prepared by the Mackay Local Disaster Management group on behalf of Mackay Regional Council as required under Section 57 of the Disaster Management Act 2003 (the Act). In accordance with Section 80(1)(b) of the Act, approval has been given to this plan by the Mackay Regional Council on ___________ when the plan was adopted by resolution _____________

_____________________________  __________/________/___________
Jason Devitt  
Local Disaster Coordinator  
Mackay Local Disaster Management Group  

_____________________________  __________/________/___________
Cr. Gregory Williamson  
Chairperson  
Mackay Local Disaster Management Group  

2. REVIEW AND RENEW PLAN

This plan will be reviewed or renewed at least once annually as per Section 59 of the Act with relevant amendments made and distributed.

In accordance with Section 59(2) of the Act, the effectiveness of the plan must be reviewed at least once a year. This may take the form of a disaster management exercise or in the event of the activation of the Local Disaster Management Group (LDMG) in response to an emergency.
3. DOCUMENT CONTROL

3.1 Amendment Control

Mackay Local Disaster Management Plan version history

<table>
<thead>
<tr>
<th>VERSION</th>
<th>DATE</th>
<th>COMMENTS</th>
</tr>
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<td>1.0</td>
<td>November 2011</td>
<td>First Edition</td>
</tr>
<tr>
<td>2.0</td>
<td>October 2012</td>
<td>Reviewed and Updated</td>
</tr>
<tr>
<td>3.0</td>
<td>May 2016</td>
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<tr>
<td>4.0</td>
<td>August 2016</td>
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</tr>
<tr>
<td>4.1</td>
<td>November 2017</td>
<td>Review and Updated</td>
</tr>
<tr>
<td>5.0</td>
<td>January 2020</td>
<td>Full review and update</td>
</tr>
</tbody>
</table>

3.2 Amendment Register

The current version of the Mackay LDMP is: Version 5.0 – January 2020.

Mackay Regional Council welcomes feedback from the residents, visitors and others regarding this disaster management plan. Feedback, recommendations and proposals to amend this plan should be forwarded to:

By mail: The Chief Executive Officer  
Attention: Emergency Management Program  
Mackay Regional Council  
PO Box 41  
MACKAY QLD 4740

In person: At the nearest Mackay Regional Council Client Service Centre.  
A list of the Centres can be found at: http://www.mackay.qld.gov.au/contact/contact_council

By email: council@mackay.qld.gov.au

Amendments to the plan must be endorsed by the Mackay LDMG and approved by Mackay Regional Council, under the provisions of the Act, before they can be implemented.

Once approved by Council, new and amended versions of the plan will be registered in the Amendment Record along the new version number. For minor and/or administrative amendments, only the number after the decimal point will change. For amendments incorporating significant change or rewrite, the primary version number will change.

Changes to contact details, position names or titles are considered only minor amendments and are not required to be endorsed by the LDMG or Council.
4. DISTRIBUTION LIST

<table>
<thead>
<tr>
<th>POSITION</th>
<th>COPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDMG Chair/Deputy</td>
<td>Electronic or Hard Copy</td>
</tr>
<tr>
<td>Local Disaster Coordinator</td>
<td>Electronic or Hard Copy</td>
</tr>
<tr>
<td>LDMG Executive Group</td>
<td>Electronic Copy</td>
</tr>
<tr>
<td>LDMG Members</td>
<td>Electronic Copy</td>
</tr>
<tr>
<td>LDMG Advisory Members</td>
<td>Electronic Copy</td>
</tr>
<tr>
<td>Mackay Regional Council Website</td>
<td>Uploaded to website</td>
</tr>
<tr>
<td>DDMG DDC/XO</td>
<td>Electronic Copy</td>
</tr>
</tbody>
</table>

This plan, excluding the confidential annexes and supporting documents, is available for public viewing online at https://www.mackay.qld.gov.au and can be downloaded from this website in read only portable document format (PDF).

Printed copies of the plan, excluding the confidential annexes and supporting documents, are available for viewing at Council Client Service Centres. A list of these Centres can be viewed online at http://www.mackay.qld.gov.au/contact/contact_council.

Printed copies of the plan, excluding the confidential annexes and supporting documents, are available for purchase at cost recovery, and may be ordered through:

Mail: The Chief Executive Officer
      Attention: Emergency Management Program
      Mackay Regional Council
      PO Box 41
      MACKAY QLD 4740

4.1 Information Management and Information Privacy

Recipients of this plan must take all reasonable steps to ensure that operational information is adequately safeguarded and that the confidentiality of operational information is maintained.

Operational information, including contact lists, must be stored securely and protected against unauthorised access, use, modification, disclosure or misuse.

Recipients must not intentionally access files, registers or any other document that contains operational information unless it is necessary for their duties. Where access is necessary for work purposes, recipients must not disclose operational information to an unauthorised person.

Recipients must ensure that documents or files containing operational information are not left where unauthorised persons can access the information.
5. ADMINISTRATION AND GOVERNANCE

5.1 Authority to plan

This plan has been prepared by the LDMG for the Mackay Regional Council under the provisions of Section 57(1) of the Act.

5.2 Responsibilities under the plan

Effective management of any disaster relies on strong coordination arrangements, consultative decision making, collaboration and a shared responsibility which is achieved through supporting relationships, trust and teamwork between individuals, agencies and the community.

For the purposes of this plan a disaster is defined as a serious disruption in a community caused by the impact of an event that requires a significant coordinated response by the state and other entities to help the community recover from the disruption. A serious disruption is defined as:

- Loss of human life or illness or injury to humans, or
- Widespread or severe property loss of damages, or
- Widespread or severe damage to the environment.

In accordance with Section 30(f) of the Act, the Mackay LDMG is responsible for managing disaster operations within the Mackay Region under the policies and procedures defined by the Queensland Disaster Management Committee (QDMC).

Under Section 34A of the Act, the Chairperson is responsible for managing the business of the group and to ensure, as far as practicable, that the group performs its functions, and to report regularly to the relevant district group and the Chief Executive of the department about the performance of the local group of its functions.

Under Section 36 of the Act, the Local Disaster Coordinator has the functions of coordinating disaster operations for the local group, reporting regularly to the local group about disaster operations and to ensure as far as practicable that any strategic decisions of the local group about disaster operations are implemented.

While there are no specific powers granted to the Chairperson under the Act, it is the responsibility both of this position and the Council to prepare and make available its resources in the event of a disaster. Additionally, external agencies will also make available their resources as referenced within the LDMG roles and responsibilities summary within this plan.

5.3 Purpose of the plan

The purpose of the LDMP is to detail the arrangements for the coordination and management of operations and resources and to minimise adverse impacts that threaten the safety of our community prior to, during and after a disaster event. This disaster management plan adopts comprehensive, all hazards, all agencies approach to disaster management.

The LDMP has not been developed for the management of commonly occurring incidents which are within the capacity of the functional lead agency with a threat specific role. However, if requested by the District Disaster Coordinator (DDC) or a functional lead agency, elements of the LDMP may be activated in support of a lead agency responding to a major incident.
5.4 Objectives of the plan

The overall objective of this plan is to outline the disaster management arrangements for the Mackay Regional Council area. This plan ensures a clear direction of disaster management priorities, resource allocation and accountability, supported through sound business continuity, performance management reporting and corporate risk management processes.

The individual objectives of this plan are:

Prevention

• Increase adherence to and introduction of systems and regulations that reduce disaster risks
• Investigate and implement strategies and initiatives to eliminate or reduce the impact of the effects of hazards on the community using emergency risk management processes

Preparedness

• To increase community safety and resilience through public awareness, information and education to encourage an all agency, all hazards approach to disaster management within the region
• To identify resources and initiatives to maximise the region’s disaster response capability
• Develop continuity plans to address response and recovery issues
• To enhance the capability of disaster management agencies by encouraging participation in training and exercises, equipment acquisition programs and the building of relationships

Response

• To provide effective, efficient and coordinated management of disaster response efforts during a disaster event to minimise the impact of a disaster event in the Mackay region
• To consider support to communities, other than Mackay, who may be impacted by a disaster, within the broader arrangements of the QDMA

Recovery

• To ensure that the recovery priorities of our community are identified and met across the functional areas of economy, environment, human and social, building and transport
• To ensure that recovery operations contribute to an increase in community resilience

5.5 Compliance of the plan

Mackay Regional Council is committed to ensuring that the region’s disaster management arrangements comply with the provisions of the Act.

Mackay Regional Council has ensured that this LDMP is consistent with the Queensland Prevention, Preparedness, Response and Recovery Disaster Management Guideline 2018 and is consistent with the Queensland State Disaster Management Plan, Mackay District Disaster Management Plan and any threat specific and functional policies, plans and guidelines issued by government agencies.

This LDMP is supported by various sub plans to support specific functional areas of responsibility of disaster management.
5.6 Strategic policy statement

This plan has been specifically developed to align to the Queensland Disaster Management 2016 Strategic Policy Statement, which is available for viewing online at: https://www.disaster.qld.gov.au/dmp/Documents/Strategic-Policy-Statement.pdf.

5.7 Emergency Management Assurance Framework

This plan aligns with the principles, standards and assurance activities found in the EMAF, available online at: https://www.igem.qld.gov.au/assurance-framework/Pages/default.aspx

5.8 Integration with Council’s Corporate Plan

Within the Mackay Regional Council’s Corporate Plan 2016-2021, Council has committed to continue to enhance community safety as part of its commitment to Community Health and Wellbeing which includes: Build community preparedness and responsiveness to emergencies and natural disasters.

The Mackay Regional Council Corporate Plan is available to view online at http://www.mackay.qld.gov.au/__data/assets/pdf_file/0009/213839/MRC_Corporate_Plan_2016-2021_WEB.pdf
6. MACKAY REGIONAL COUNCIL LOCAL DISASTER MANAGEMENT GROUP

6.1 Establishment

Under Section 29 of the Act, the Council has established the Mackay Regional Council Local Disaster Management Group.

6.2 Membership

The following members form the Executive Group for the Mackay LDMG.

<table>
<thead>
<tr>
<th>POSITION</th>
<th>ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mayor</td>
<td>Chairperson</td>
</tr>
<tr>
<td>Deputy Mayor</td>
<td>Deputy Chairperson</td>
</tr>
<tr>
<td>Director Engineering &amp; Commercial Infrastructure</td>
<td>Local Disaster Coordinator</td>
</tr>
<tr>
<td>Chief Executive Officer</td>
<td>Deputy Local Disaster Coordinator</td>
</tr>
<tr>
<td>Director Organisational Services</td>
<td>Deputy Local Disaster Coordinator</td>
</tr>
<tr>
<td>MRC Director Community &amp; Client Services</td>
<td>Local Recovery Coordinator</td>
</tr>
<tr>
<td>MRC Director Development Services</td>
<td>Deputy Local Recovery Coordinator</td>
</tr>
<tr>
<td>MRC Emergency Management Coordinator</td>
<td>Core Member</td>
</tr>
<tr>
<td>MRC Emergency Management Officer</td>
<td>Core Member</td>
</tr>
<tr>
<td>Councillor Karen May</td>
<td>Core Member</td>
</tr>
<tr>
<td>Councillor Kevin Casey</td>
<td>Core Member</td>
</tr>
<tr>
<td>Manager Corporate Communications &amp; Marketing</td>
<td>Core Member</td>
</tr>
<tr>
<td>Mackay State Emergency Service Local Controller</td>
<td>Core Member</td>
</tr>
<tr>
<td>Queensland Police Service Officer/s In Charge</td>
<td>Core Member</td>
</tr>
<tr>
<td>Queensland Fire &amp; Emergency Services (Area Commander)</td>
<td>Core Member</td>
</tr>
<tr>
<td>Officer in Charge Mackay Police Station</td>
<td>Core Member</td>
</tr>
<tr>
<td>Queensland Ambulance Service (Operations Manager)</td>
<td>Core Member</td>
</tr>
</tbody>
</table>

The following members form the Mackay Local Disaster Management Group.

<table>
<thead>
<tr>
<th>POSITION</th>
<th>ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mayor</td>
<td>Chairperson</td>
</tr>
<tr>
<td>Deputy Mayor</td>
<td>Deputy Chairperson</td>
</tr>
<tr>
<td>Director Engineering &amp; Commercial Infrastructure</td>
<td>Local Disaster Coordinator</td>
</tr>
<tr>
<td>Chief Executive Officer</td>
<td>Deputy Local Disaster Coordinator</td>
</tr>
<tr>
<td>Director Organisational Services</td>
<td>Deputy Local Disaster Coordinator</td>
</tr>
<tr>
<td>MRC Director Community &amp; Client Services</td>
<td>Local Recovery Coordinator</td>
</tr>
<tr>
<td>MRC Director Development Services</td>
<td>Deputy Local Recovery Coordinator</td>
</tr>
<tr>
<td>MRC Emergency Management Coordinator</td>
<td>Core Member</td>
</tr>
<tr>
<td>MRC Emergency Management Officer</td>
<td>Core Member</td>
</tr>
<tr>
<td>Councillor Karen May</td>
<td>Core Member</td>
</tr>
<tr>
<td>Councillor Kevin Casey</td>
<td>Core Member</td>
</tr>
<tr>
<td>Manager Corporate Communications &amp; Marketing</td>
<td>Core Member</td>
</tr>
<tr>
<td>Mackay State Emergency Service Local Controller</td>
<td>Core Member</td>
</tr>
<tr>
<td>Queensland Police Service Officer/s In Charge</td>
<td>Core Member</td>
</tr>
<tr>
<td>Queensland Fire &amp; Emergency Services (Area Commander)</td>
<td>Core Member</td>
</tr>
<tr>
<td>Officer in Charge Mackay Police Station</td>
<td>Core Member</td>
</tr>
<tr>
<td>Queensland Ambulance Service (Operations Manager)</td>
<td>Core Member</td>
</tr>
</tbody>
</table>
6.2.1 Chairperson

In accordance with Section 34 of the Act, there is to be a Chairperson appointed to the local group appointed by Council. The Chairperson of the LDMG is the Mayor of Mackay Regional Council.

Section 34A of the Act outlines the functions of Chairperson of a local group:

- To manage the business of the group;
- To ensure, as far as practicable, that the group performs its functions;
- To report regularly to the relevant district group, and the chief executive of the department, about the performance by the local group of its functions.

The following members are Advisory members of the group.

<table>
<thead>
<tr>
<th>POSITION</th>
<th>ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Red Cross</td>
<td>Advisor</td>
</tr>
<tr>
<td>Queensland Fire &amp; Emergency Services</td>
<td>Advisor</td>
</tr>
<tr>
<td>Coordinator</td>
<td></td>
</tr>
<tr>
<td>Department of Communities, Disability &amp; Seniors</td>
<td>Advisor</td>
</tr>
<tr>
<td>Department of Education</td>
<td>Advisor</td>
</tr>
<tr>
<td>Queensland Fire &amp; Emergency Services</td>
<td>Advisor</td>
</tr>
<tr>
<td>Rural Fire Area Director</td>
<td></td>
</tr>
<tr>
<td>Mackay Airport Pty Ltd</td>
<td>Advisor</td>
</tr>
<tr>
<td>Mackay Health &amp; Hospital Services</td>
<td>Advisor</td>
</tr>
<tr>
<td>Mackay Regional Council Water &amp; Waste Services</td>
<td>Advisor</td>
</tr>
<tr>
<td>Mackay Regional Council Community Lifestyle</td>
<td>Advisor</td>
</tr>
<tr>
<td>Maritime Safety Queensland</td>
<td>Advisor</td>
</tr>
<tr>
<td>Northern Queensland Primary Health Network</td>
<td>Advisor</td>
</tr>
<tr>
<td>North Queensland Bulk Ports</td>
<td>Advisor</td>
</tr>
<tr>
<td>Optus</td>
<td>Advisor</td>
</tr>
<tr>
<td>Telstra</td>
<td>Advisor</td>
</tr>
<tr>
<td>NBN Co</td>
<td>Advisor</td>
</tr>
<tr>
<td>Department of Transport &amp; Main Roads</td>
<td>Advisor</td>
</tr>
<tr>
<td>Sunwater</td>
<td>Advisor</td>
</tr>
<tr>
<td>The Salvation Army</td>
<td>Advisor</td>
</tr>
<tr>
<td>Queensland Parks and Wildlife Services</td>
<td>Advisor</td>
</tr>
</tbody>
</table>

The following members are Observers members of the group.

<table>
<thead>
<tr>
<th>POSITION</th>
<th>ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aurizon</td>
<td>Observer</td>
</tr>
<tr>
<td>RACQ CQ Rescue</td>
<td>Observer</td>
</tr>
<tr>
<td>Mackay Regional Council Governance &amp; Safety Manager</td>
<td>Observer</td>
</tr>
<tr>
<td>Councillor Justin Englert</td>
<td>Observer</td>
</tr>
</tbody>
</table>
6.2.2 Deputy Chairperson

Under Section 34 of the Act, Council appoints a Deputy Chairperson, to assist or act as the Chairperson as required. The Deputy Chairperson is the Deputy Mayor of the Mackay Regional Council.

6.2.3 Local Disaster Coordinator (LDC)

Under Section 35 of the Act, the Chairperson of the LDMG after consulting with the Chief Executive appoints a Local Disaster Coordinator for the group. In accordance with Section 36 of the Act, the LDC has the following functions:

• Coordinate the disaster operations for the local group;
• Report regularly to the local group about disaster operations;
• To ensure, as far as practicable, that any strategic decisions of the local group about disaster operations are implemented.

The Mackay Regional Council Director of Engineering & Commercial infrastructure, is the appointed Local Disaster Coordinator LDC for the Mackay LDMG.

6.2.4 Deputy Local Disaster Coordinator

In addition to the positions required under the Act, Council appoints persons as Deputy LDC's to ensure that the group has enough capacity to conduct and maintain 24 hour operations for extended periods. A Deputy LDC assumes the full responsibilities and authorisations of a LDC while undertaking the LDC role.

Council has appointed the following personnel as Deputy LDC's:

• Chief Executive Officer, Mackay Regional Council
• Director Organisational Services, Mackay Regional Council

6.2.5 Local Disaster Management Group Core Members

In accordance with Section 33 of the Act, the local group consists of the persons prescribed by a regulation to be members of the group. Along with the Chairperson and Deputy Chairperson of the group, Council appoints persons as members of the LDMG provided they have the necessary expertise or experience to assist the group to undertake its functions. Membership of the LDMG shall mean and include any person acting in the capacity of any of the appointed members.

Council’s Emergency Management Program maintains a register of the LDMG’s current membership and contact details.

In accordance with Section 37 of the Act, at least once a year the LDC will provide the Chief Executive (Commissioner, Queensland Fire and Emergency Services) and the Mackay District Disaster Coordinator with an updated membership list with contact details.
6.2.6 Local Disaster Management Group Advisors

In addition to its core members, the LDMG may invite participants from a range of entities, such as industry and community organisations to participate in the business of the group in an advisory capacity, as required.

While advisor input is considered by members in their decision making, meeting resolutions will only be carried by member consensus and advisors will not be included in the calculation of a quorum. While involved with the business of the group, these people will receive minutes and activation alerts issued during an event.

Council’s Emergency Management Program maintains a register of the LDMG’s advisors and their contact details.

6.3 Membership

The Mackay LDMG is part of Queensland’s tiered disaster management arrangements, which comprises local, district and state levels as shown below.

These disaster management arrangements enable a progressive escalation of support and assistance through each tier as required.
6.4 Functions of the group

In accordance with Section 30 of the Act, this group has the following functions:

(a) To ensure that disaster management and disaster operations in the Mackay Local Government Area are consistent with the State group’s strategic policy framework for disaster management for the State,

(b) To develop effective disaster management, and regularly review and assess the disaster management,

(c) To help the Council prepare a local disaster management plan,

(d) To identify, and provide advice to the District Disaster Management Group about support services required by the local group to facilitate disaster management and disaster operations within our Local Government Area,

(e) To ensure the Mackay community is aware of ways of mitigating the adverse effects of an event, and preparing for, responding to and recovering from a disaster,

(f) To manage disaster operations in the Mackay Local Government Area under policies and procedures decided by the state group,

(g) To provide reports and make recommendations to the District Disaster Management Group about matters relating to disaster operations,

(h) To identify, and coordinate the use of resources that may be used for disaster operations in the Mackay Local Government Area,

(i) To establish and review communications systems in the group, and with the Mackay District Disaster Management Group, for use in disaster management operations,

(j) To ensure information about a disaster in the Mackay Local Government Area is promptly given to the Mackay District Disaster Management Group,

(k) To perform other functions given to the group under the Disaster Management Act 2003,

(l) To perform a function incidental to a function mentioned in items (a) to (k).
6.5 Roles and Responsibilities

The LDMG recognises that agencies listed in this section have various disaster management responsibilities. Other departments and agencies not listed may also be involved to support response and/or recovery activities, as required.

Whilst the responsibilities are current at the time of publication of this plan, it is acknowledged that State Government departmental changes may alter these responsibilities.

<table>
<thead>
<tr>
<th>ORGANISATION</th>
<th>ROLES AND RESPONSIBILITIES</th>
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</thead>
</table>
| Local Disaster Management Group | Functions as allocated to the group  
Disaster management and support to agencies  
The collection, collation, evaluation and dissemination of information relating to the current and predicted status of the disaster  
The coordination of assessment activities to determine the impact of a disaster  
The acquisition and provision of human and physical resources, facilities, services and materials  
The making of local policy level decisions, where required, if existing arrangements are not enough to support the disaster response  
The briefing of elected and appointed officials on disaster related issues in the local area  
The various reporting of summary information to provide situational awareness to all involved in coordination and support activities  
The management of public information among agencies and other coordination groups to ensure consistency in messages |
| Local Recovery Group   | The provision of immediate and short term relief and recovery provisions for persons who may be threatened, distressed, disadvantaged, homeless, evacuated or otherwise affected because of a disaster event  
The coordination of activities beyond immediate welfare support and includes physical repair and reconstruction, personal rehabilitation |
| Mackay Regional Council | Responsibilities as documented within the Act  
Ensure continuity of essential local government services during events  
Appoint a Liaison Officer to maintain communication between Council and LDCC  
Request and provide assistance through the local group as required during disaster operations  
Provide support to the DDMG with performing the functions of the local group |
| Department of Agriculture and Fisheries | Functional Lead Agency for the containment and eradication of animal and plant diseases  
Coordinate efforts to prevent, respond to, and recover from plant and animal pests and diseases and invasive plants and animals  
Provide advice on livestock welfare  
Collaborate with stakeholders with shared responsibilities and other organisations to facilitate prevention, preparedness, response and recovery strategies and priorities for animal welfare management within a community  
Provide advice in relation to agriculture, fisheries and forestry disaster impacts  
Coordinate destruction of stock or crops in an emergency pest / disease situation  
Administer DRFA relief measures including agriculture industry recovery operations as required  
Lead the reporting on the disaster impact assessments on the agricultural sector, including economic losses and expected recovery  
Report on the possible impact seasonal conditions and climate events will have on the agricultural sector |
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<tr>
<th>ORGANISATION</th>
<th>ROLES AND RESPONSIBILITIES</th>
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<tbody>
<tr>
<td><strong>Department of Agriculture and Fisheries</strong></td>
<td>Coordinate the Agriculture Coordination Group with agricultural industry groups to provide information about the effect that a disaster event has on the agriculture, fisheries and forestry industries and the issues that individuals and businesses are facing in responding to and recovering from a disaster event. Engage with industry on preparedness for climate risks and aid with economic recovery. Assist agriculture and fishery industries in prevention and preparedness though normal business operations and service provision to industry and the communities. Participate in DDMGs.</td>
</tr>
<tr>
<td><strong>Department of Communities, Disability Services and Seniors</strong></td>
<td>Functional Lead Agency for human and social recovery. Advice and assistance to the LDMG as required during disaster operations. Coordinate and/or provide human and social recovery information and/or resources to support Local and District Disaster Management Groups. Enable access to information and/or coordinated government and non-government human and social recovery services through a range of service delivery channels which may include:  - promotion and/or referral to local community services  - 1800 recovery hotline  - grants portal  - multi-agency recovery hubs  - community recovery information and referral centres  - case coordination of vulnerable persons  - outreach teams. Purchase extraordinary human and social recovery services when local capacity is exhausted. Facilitate matching and enabling of EV CREW registered volunteers. Enable the matching of donated goods and offers of assistance. Enable access to emergency and temporary accommodation assistance. Administer SDRA and DRFA financial relief measures for eligible individuals. Manage the Queensland Government’s Community Recovery “Ready Reserve”.</td>
</tr>
<tr>
<td><strong>Department of Education</strong></td>
<td>Maintain the safety and wellbeing of students, staff and volunteers who work or participate in DoE schools, institutions and workplaces. Ensure that all state schools, regional offices and other workplaces have a documented emergency response plan. Ensure that all DoE regional offices and key workplaces have a tested business continuity plan. Ensure that DoE is prepared to respond to and recover from, disasters and emergencies. Facilitate the return of affected state schools to normal operations as soon as safe and practicable following an event. Facilitate the transition of DoE facilities to cyclone shelters, places of refuge and evacuation centres as required or directed (maintenance commitments for places of refuge and evacuation centres and other additional information can be found at det.qld.gov.au/emergency-management). Contribute to the state-wide response to disasters and emergencies as required. Provide workplace health and safety advice, information and awareness about electrical, chemical, asbestos and general safety matters in the lead up to, during and following cyclones, storms, floods and other disasters.</td>
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<tr>
<td><strong>Department of Natural Resources, Mines and Energy</strong></td>
<td>Regulate the operation of energy and water supply industries. Responsible for maintaining and developing a readiness for energy and water supply emergencies, regardless of the hazard type (all hazards). These energy emergency supply responsibilities cover the electricity, liquid fuels and natural gas sectors, and involves:  - Develop and implement energy policies and plans to improve the protection and resilience of Queensland energy systems  - Develop the capability to coordinate action to mitigate against energy supply deficiencies during any emergency event (including a terrorist incident)  - Facilitate actions within, and across, the energy sectors in response to an emergency event.</td>
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<td>ORGANISATION</td>
<td>ROLES AND RESPONSIBILITIES</td>
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| Department of Natural Resources, Mines and Energy | The Department’s water emergency responsibilities include:  
- Ensure emergency action plans are in place for referable dams to ensure appropriate action is taken in the event of incidents or failures of the dams  
- Exercise dam safety emergency powers if needed to minimize the risk of failure of a dam or to minimise the consequences of failure  
- Oversight of drinking water and recycled water incident management |
| Department of Environment and Science | Functional Lead Agency for the environmental recovery  
Provide oiled wildlife response, traditional owner liaison, environmental and shoreline assessments and waste management advice and approvals for ship-sourced pollution at sea  
Provide information and advice with respect to regulated (tailings, contaminated water) dam locations, and coordinate expert advice on regulated dam safety and integrity  
Provide expert environmental advice in disasters  
Provide for the safety of national parks and agency owned recreational centre users including issuing warnings in extreme conditions, closing areas where necessary and coordinating evacuations with QPS  
Provide advice on the management of national parks and expert knowledge of national parks to responding agencies  
Lead firefighting on the protected areas and State forest where there is no threat to life or property |
| Department of State Development, Manufacturing Infrastructure and Planning | Functional Lead Agency for economic recovery  
Advise the LDMG, request and provide assistance through the local group, as required, during disaster operations |
| Department of Transport and Main Roads | Functional Lead Agency for transport systems  
Functional Lead Agency of roads and transport recovery  
Functional Lead Agency for ship-sourced pollution where it impacts, or is likely to impact, on Queensland Coastal Waters  
Provide information and advice on the impact of disruptive events on road, rail, aviation and maritime infrastructure as it affects the transport system  
Enable an accessible transport system through reinstating road, rail and maritime infrastructure  
Assist with the safe movement of people as a result of mass evacuation of a disaster affected community  
Ensure the capability of logistics related industries are appropriately applied to disaster response and recovery activities |
| Energy Queensland (Ergon Energy) | Maintenance and/or restoration of electrical power supply  
Advise the LDMG and the public in relation to electrical power issues, including safety advice for consumers  
Request and provide assistance through the local group, as required, during disaster operations |
| Queensland Police Service | Functional Lead Agency responsible for terrorism response, crash and search and rescue  
Provide executive support to the QDMC  
Preserve peace and good order  
Prevent crime  
Management of crime scenes and potential crime scenes  
Provision of disaster victim identification capability  
Conduct investigation pursuant to the Coroners Act  
Provide for the effective regulation of traffic  
Coordinate evacuation operations |
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<th>ORGANISATION</th>
<th>ROLES AND RESPONSIBILITIES</th>
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<tr>
<td>Queensland Police Service</td>
<td>Control and coordinate search and rescue operations</td>
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<td>Manage the registration of evacuees and associated inquiries in conjunction with the</td>
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<td>Australia Red Cross</td>
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<td>Provide security for damaged or evacuated premises</td>
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<td>Respond to and investigate traffic, rail and air incidents</td>
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<td>Coordinate the review and renewal of the SDMP</td>
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<td>Command the SDCC on activation</td>
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<td>Command the SDCC capabilities of operations and intelligence on activation</td>
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<td>Advise the LDMG, request and provide assistance through the local group as required during</td>
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<td>disaster operations</td>
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<tr>
<td>Mackay Health &amp; Hospital</td>
<td>Lead agency for the response functions of Public Health, Mental health, medical services</td>
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<tr>
<td>Services</td>
<td>and mass casualty management</td>
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<td></td>
<td>Primary agency for heatwave, pandemic influenza, biological and radiological incidents</td>
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<td></td>
<td>Develop health-focused disaster and emergency preparedness, response and recovery plans</td>
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<td>with in the local context</td>
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<td></td>
<td>Develop and maintain disaster and emergency health response capability and capacity within</td>
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<td>the local area</td>
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<td>Implement business continuity plans and arrangements to maintain health services during</td>
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<td>disasters and emergencies</td>
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<td></td>
<td>Work across the local and district health sector including aged care facilities, private</td>
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<td>facilities, primary health and community care providers to ensure ‘whole of health’</td>
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<td>arrangements are in place</td>
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<td>Provide local health disaster and emergency incident information to the public and disaster</td>
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<td>management stakeholders and develop and disseminate public health messaging</td>
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<td>Provide a local clinical response to mass casualty management (with QAS)</td>
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<td>Provide recovery mental health support to affected communities (with DCDSS)</td>
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<td>Provide Public health and environmental health advice and support to local governments and</td>
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<td>affected communities and industries</td>
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<td>Provide environmental health risk assessment advice to other agencies, local government</td>
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<td>and industries</td>
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<td></td>
<td>Provide local communicable disease surveillance and response arrangements</td>
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<tr>
<td>Queensland Ambulance Service</td>
<td>Provide, operate and maintain ambulance services</td>
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<td>Access, assess, treat and transport sick and/or injured persons</td>
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<td></td>
<td>Protect persons from injury or death, during rescue and other related activities</td>
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<td>Coordinate all volunteer first aid groups during major emergencies and disasters</td>
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<td>Provide and support temporary health infrastructure where required</td>
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<td>Participate in search and rescue, evacuation and victim reception operations</td>
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<td>Participate in health facility evacuations</td>
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<td>Collaborate with Queensland Health in mass casualty management systems</td>
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<td></td>
<td>Provide disaster, urban search and rescue, chemical hazard, biological and radiological</td>
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<td>operations support with specialist logistics and specialist paramedics</td>
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<td>Queensland Reconstruction</td>
<td>Administer DRFA relief measures</td>
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<td>Authority</td>
<td>When requested, support the QFES with rapid damage assessments of housing in disaster</td>
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<td>impacted areas</td>
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<td>Undertake damage assessments of public infrastructure in collaboration with local</td>
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<td>governments</td>
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<td></td>
<td>Liaise with local governments and state agencies to gather information to ensure DRFA</td>
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<td>disaster activations meet Commonwealth Government criteria</td>
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<td>ORGANISATION</td>
<td>ROLES AND RESPONSIBILITIES</td>
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</table>
| Telecommunication providers (Optus/Telstra/NBN/Vodaphone) | Telephone and internet communication restorations  
Provision of communications facilities  
Advise the LDMG, request and provide assistance through the local group as required during disaster operations. |

Queensland Fire & Emergency Services  
Functional Lead Agency for structural, bushfire and chemical/hazmat incidents  
Provide advice, chemical analysis and atmospheric monitoring at relevant incidents.  
Provide mass and technical decontamination capability.  
Provide rescue and search functions and perform other operations to help and protect injured persons from danger or potential danger.  
Distribute and develop warnings to disaster management stakeholders and communities  
Facilitate and authorise Emergency Alert campaigns to provide advice and warnings to communities affected by disasters and emergency situations (when the functional lead agency)  
Prepare guidelines to inform local governments and district and state groups of disaster management related matters  
Establish and maintain arrangements between the state and the Commonwealth about matters relating to effective disaster management  
Ensure disaster management and disaster operations are consistent between plans, policies, standards and guidelines  
Ensure that persons performing functions under the Disaster Management Act 2003 in relation to disaster operations are appropriately trained  
Provide advice and support to the state group and local and district groups in relation to disaster management and disaster operations  
Ensure the collaborative development of the Queensland Emergency Risk Management Framework and the state-wide risk assessment  
Ensure the SDCC is maintained to a state of operational readiness  
Maintain situational awareness and reporting capability and capacity through the SDCC Watch Desk  
Lead the planning and logistics capabilities in the SDCC and support the staffing models of other capabilities  
Emergency supply acquisition and management of supplies and services in support of disaster operations  
Resupply of essential goods (food and basic commodities) to temporarily isolated communities, properties and individuals  
Ensure the capability and capacity of Disaster Assistance Response Teams (DART) to assist communities affected by disasters or emergency situations  
Undertake damage assessment function (residential and commercial structures) as soon as practical post disaster/emergency situation and provide findings to disaster management stakeholders  
Develop and distribute community warnings for bushfires, structure fires and chemical incidents  
Emergency supply to communities  
Resupply of communities, properties and individuals  
Damage assessments of structures  
Disaster Assistance Response Teams  
Rescue disciplines for, swift water, vertical, trench, confined space, road traffic crash and structural collapse  
Advice and support to local, district and state groups  
Ensure SDCC operational readiness  
Facilitation of emergency alert and SEWS
State Emergency Service

- Assistance to the community preparation for, response to and recovery from an event
- Public education
- Rescue of trapped or stranded persons
- Search operations for missing persons
- Emergency repair and protection of damaged or vulnerable buildings
- Assistance with debris clearance
- First aid support
- Traffic control support
- Assistance with communications
- Assistance with lighting
- Advice to the LDMG and assistance as required during disaster operations

6.6 Meetings and Quorum

In accordance to the Disaster Management Regulation 2014, the members of the LDMG must meet at least once in every six months at the times and places decided by the chairperson of the group.

Under Section 13 Disaster Management Regulation 2014, a quorum for the group is set at one half of the number of members plus one or, if one half of the number of members is not a whole number, the next highest whole number.

There are provisions for members to appoint a proxy member as prescribed under Section 14 Disaster Management Regulation 2014:

1) A member of a disaster management group may, with the approval of the chairperson of the group, appoint by signed notice another person as his or her deputy;

2) The deputy may attend a group meeting in the member’s absence and exercise the member’s functions and powers under this Act at the meeting;

3) A deputy attending a group meeting is to be counted in deciding if there is a quorum for the meeting.

The following details of actions taken, and issues discussed by the LDMG are distributed to Core, Advisory members and Observers of the LDMG:

- Meeting minutes
- Meeting schedules
- Meeting agendas
- Agency reports on emergency risk management and mitigation initiatives/strategies (e.g. disaster management studies), training, planning and other relevant disaster management activities.
6.7 Training and Exercising of Members and Others

In accordance with Section 33(2)(b) of the Act, all members of the LDMG are to ensure they have the qualifications and experiences to be a member of the LDMG group. The training offered to LDMG members will align to the Queensland Disaster Management Training Framework. Disaster management training and exercises develop the capability of all agencies with a role in disaster management through the acquisition and testing of knowledge, skills and competencies. Council’s Emergency Management Program, in partnership with other lead functional agencies, will provide a program of disaster related training and exercises.

6.8 Reporting

Agency representatives will provide agency specific information relative to disaster management to the local group for routine and disaster operations.

6.8.1 Routine Business Reporting

In accordance with Section 34 of the Act, there is to be a Chairperson appointed to the local group appointed by Council. The Chairperson of the LDMG is the Mayor of Mackay Regional Council.

• Changes in details for agency contact arrangements

• Submission of agency reports (written or verbal), in accordance with the State’s reporting template, for meetings of the LDMG, summarising:
  o Agency Status
  o Agency Operations or Mitigation Undertaken
  o Agency Disaster Management Training
  o Agency Risks/Gaps
  o Any Other Matters.

6.8.2 Disaster Operations Reporting

• Changes for LDMG members, agency representatives, advisors and/or invitees contact information

• Summary information regarding agency planning and preparation strategies

• Impact assessment information relative to the agency’s infrastructure and core business activities, including community impacts

• Agency resource availability, deployments (in and out of area), requirements, offers of support

• Short, medium and long term issues arising from disaster operations including recovery operations

• Situation reports (SITREPS) summarising the current and forecast hazard analysis, community impacts and strategies being undertaken to manage the disaster operation
7. DISTRICT DISASTER MANAGEMENT GROUP

Established under Section 22 of the Act, District Groups comprise of representatives from regionally based Queensland government agencies which can provide and coordinate whole of government support and resource gap assistance to communities.

The District Group performs a support function within the disaster management arrangements by providing support and assistance to the LDMG, when requested by the local group. In accordance to Section 23 of the Act, the District Group carry out a number of functions relating to disaster management. The primary functions are to:

- Ensure the disaster management and disaster operations in the Disaster District are consistent with the State Group’s strategic policy framework for disaster management for the state;
- Develop effective disaster management for the district, including a district disaster management plan and to regularly review and assess disaster management arrangements;
- Ensure the community is aware of ways of mitigating the adverse effects of an event, and preparing for, responding to and recovering from a disaster.

The Mackay Disaster District encompasses the Mackay, Whitsunday and Isaac Local Government Areas.

8. QUEENSLAND DISASTER MANAGEMENT COMMITTEE

The Queensland Disaster Management Committee (QDMC) is established under Section 17 of the Act and is the peak disaster management policy and decision making body in Queensland, directly responsible for outcomes to the Premier. Under the Act, the main functions of the State Group are to:

- Develop a strategic policy framework for disaster management for the State,
- Ensure an effective disaster management system is developed and implemented for the State,
- Ensure effective arrangements between the State and the Australian Government on matters relating to effective disaster management are established and maintained,
- Identify resources within and outside the State that may be used for disaster response operations,
- Provide reports and make recommendations to the Minister about matters relating to disaster management and disaster operations, and
- Prepare a State Disaster Management Plan.

9. QUEENSLAND DISASTER MANAGEMENT COMMITTEE

At an Australian Government level, the Department of Home Affairs is the responsible agency for coordinating assistance to States and Territories.

Further information on disaster management arrangements at the Australian Government level is available in the SDMP and can be found at www.disaster.qld.gov.au.
10. DESCRIPTION OF THE POPULATION AND ENVIRONMENT

10.1 Geography and Topography

10.1.1 Geography

The map below shows the local government area represented by the Mackay Regional Council. The Mackay region forms part of the Mackay Disaster District and is bound by the local governments of Isaac and Whitsunday Regional Councils.

![Map of Mackay Region](image)

10.1.2 Topography

Most of the populated Mackay region is low lying, having an average elevation of less than 10 meters AHD adjacent to the coast, leading westward to the Connors, Clarke and Broken Ranges, the latter supporting the community of Eungella with a sprinkling of mountainous peaks throughout the remainder. These ranges separate the upper range area where beef and dairy cattle are the main industry and the lower coastal rich soils where sugar cane growing is the main primary industry.

The significant topographical feature is the Pioneer River which is fed from a 1,500 sq.km catchment in the Pioneer Valley and includes the major tributary of Cattle Creek and discharges to the Pacific Ocean via a path through the centre of Mackay. Distribution of sand sediments discharging at the river mouth extend some 2.5 km offshore, south to Bakers Creek and north to Slade Bay.

Tide variation at Mackay is 6.58 metres, 150 km north of Broadsound which receives the highest tide on the east coast of Australia at 9.00 metres. A section of south east Mackay residential area can be subject to tide inundation, being up to 300 mm below Highest Astronomical Tide and rises to approximately 11.00 metres AHD at the Mackay Base Hospital.

As well as the Pioneer River, the region comprises other rivers and streams such as the O'Connell River, Bakers Creek, Sandy Creek, Alligator Creek and Plane Creek which passes through the township of Sarina with numerous other small streams discharging to the coast.

A system of earth and block wall levees have been installed along either side of the Pioneer River. As well, levees have been installed at Finch Hatton to protect the township from flooding in Cattle Creek.
10.2 Climate and Weather

A subtropical weather pattern historically of hot/wet summers and mild/dry winters produces an average temperature of 24°C which makes an ideal location for attracting tourists and permanent residents. Temperature range in winter is between 5°C and 22°C and summer 20°C to 38°C with atmospheric conditions generally very humid. Rainfall is seasonal, with the heaviest falls occurring during the summer months, November to April, extreme rainfall events are usually associated with tropical cyclones/lows. The Mackay region comes under the influence of tropical cyclones, on average, once every two years, though direct hit coastal crossings are not common. The average yearly rainfall for Mackay is 1,570mm.

Mackay Regional Council acknowledges that climate change is increasing the levels of risk within our area. Council actively promotes sustainable practices and responds to climate change in council operations and planning referencing the following documents:

- Mackay Regional Council Climate change Adaptation Policy
- Mackay Regional Council 2016 - 2010 Corporate plan
- Mackay Regional Council Corporate Environmental Sustainability Strategy
- Emergency Management Sector Adaptation Plan for Climate Change

10.3 Population

Prior to the coal mining boom commencing in the late 1960's, the Mackay region supported a stable population based around the sugar industry which covered a large proportion of the region due to its favourable topography and climate. Population growth was steady with most mining personnel being housed in their local townships, however with the demand for coal dictating expansion in the industry (existing mines, new mines and port expansions), new operational and industrial strategies have turned the focus to utilising Mackay as the residential centre and maintenance hub for the industry.

As at 30 June 2016:

- The estimated resident population of the region was 117,703 persons
- 20.6 per cent of persons in the region were aged 0 to 14 years, 66.2 per cent were aged 15 to 64 years and 11.7 per cent were aged 65 years and over.
- The median age for the region was 37 years, an increase of 1.3 year over the five year period from 30 June 2011 to 30 June 2016.
- The region had 5,909 persons who stated they were of Aboriginal or Torres Strait Islander origin, representing 5.1 per cent of the total population.
- The region had 23,360 persons who stated they were born overseas (20.3 per cent of the total population) and 91,609 persons who stated they were Australian born (79.7 per cent of the total population).
- The region had 3,204 persons born overseas who stated that they spoke a language other than English at home (13.7 per cent of the overseas born population).
- There was a total of 30,331 families in the region. Couple families with children was the dominant family type (13,150 families). There were 4,573 one parent families, accounting for 15.1 per cent of all families in the region.

Further demographic details can be found at Australian Bureau of Statistics - www.abs.gov.au
10.4 Society
As at 30 June 2016 the region had:

- 17,587 persons aged 15 years and over whose highest level of schooling was year 11 or 12 (or equivalent), representing 19.3 per cent of all persons aged 15 years and over.
- 37,141 students completing a Certificate III or higher educational course.
- 16,976 volunteers aged 15 years and over, representing 18.6 per cent of total persons aged 15 years and over.

10.5 Industry and Development
As at June 2016:

- The region had 40,674 occupied private dwellings. Of these private dwellings, 34,580 were separate houses, 3,425 were semi-detached and 1,878 were apartments. 27.9 per cent of the occupied private dwellings in the region were fully owned, 36.4 per cent were being purchased and 31.5 per cent were being rented.
- The region had 32,900 dwellings with an internet connection, or 80.9 per cent.
- The region had 2,015 occupied private dwellings with no motor vehicles, or 5 per cent of all occupied private dwellings.
10.6 Community Capacity

During disaster events Council has a significant response and recovery capacity, which includes:

- Employment of approximately 1,200 personnel including:
  - 3 Emergency Management staff
  - 1 Temporary Recovery Officer
  - 1 Temporary Resilience Officer
  - 1 SES Local Controller.

- A separate levy is collected to provide for the provision of emergency response facilities, supply of equipment and provide monies to undertake disaster mitigation works.

The following emergency services, which maintain stations within the region:

- Queensland Ambulance Service
- Queensland Fire and Emergency Services
- Queensland Police Service

There are numerous volunteer organisations that contribute to the region’s disaster management arrangements including:

- State Emergency Service (SES)
- Rural Fire Queensland
- Queensland Surf Lifesaving Clubs
- Voluntary Marine Rescue
- St John Ambulance
- RACQ CQ Rescue
- Australian Red Cross.

Community service organisations also provide a contribution to disaster management arrangements:

- Australian Red Cross
- Adventist Development and Relief Agency (ADRA)
- Lifeline
- RSPCA
- Salvation Army
- St Vincent de Paul Society
- Meals on Wheels
- Community Service Clubs
- North Queensland Primary Health Network.

In addition to maintaining a strong volunteer capacity, the Local Disaster Management Group encourages residents of the community to be self-reliant for at least three days during disaster events.
10.7 Major Industry

10.7.1 Business Sector

<table>
<thead>
<tr>
<th>Industry</th>
<th>Males</th>
<th>Females</th>
<th>Persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, Forestry and Fishing</td>
<td>1,389</td>
<td>455</td>
<td>1,844</td>
</tr>
<tr>
<td>Mining</td>
<td>5,691</td>
<td>827</td>
<td>6,516</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>2,653</td>
<td>776</td>
<td>3,425</td>
</tr>
<tr>
<td>Electricity, Gas, Water and Waste Services</td>
<td>402</td>
<td>112</td>
<td>516</td>
</tr>
<tr>
<td>Construction</td>
<td>3,287</td>
<td>636</td>
<td>3,922</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>1,475</td>
<td>492</td>
<td>1,969</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>1,719</td>
<td>3,535</td>
<td>5,252</td>
</tr>
<tr>
<td>Accommodation and Food Services</td>
<td>1,127</td>
<td>2,171</td>
<td>3,297</td>
</tr>
<tr>
<td>Transport, Postal and Warehousing</td>
<td>2,535</td>
<td>806</td>
<td>3,343</td>
</tr>
<tr>
<td>Information Media and Telecommunications</td>
<td>135</td>
<td>156</td>
<td>289</td>
</tr>
<tr>
<td>Financial and Insurance Services</td>
<td>174</td>
<td>523</td>
<td>701</td>
</tr>
<tr>
<td>Rental, Hiring and Real Estate Services</td>
<td>386</td>
<td>480</td>
<td>863</td>
</tr>
<tr>
<td>Professional, Scientific and Technical Services</td>
<td>1,004</td>
<td>1,163</td>
<td>2,161</td>
</tr>
<tr>
<td>Administrative and Support Services</td>
<td>629</td>
<td>903</td>
<td>1,532</td>
</tr>
<tr>
<td>Public Administration and Safety</td>
<td>1,173</td>
<td>1,147</td>
<td>2,318</td>
</tr>
<tr>
<td>Education and Training</td>
<td>769</td>
<td>3,165</td>
<td>3,933</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>819</td>
<td>4,823</td>
<td>5,647</td>
</tr>
<tr>
<td>Arts and Recreation Services</td>
<td>161</td>
<td>250</td>
<td>406</td>
</tr>
<tr>
<td>Other Services</td>
<td>1,594</td>
<td>1,009</td>
<td>2,604</td>
</tr>
<tr>
<td>Inadequately described/Not stated</td>
<td>1,409</td>
<td>794</td>
<td>2,202</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>28,518</strong></td>
<td><strong>24,213</strong></td>
<td><strong>52,732</strong></td>
</tr>
</tbody>
</table>

The Mackay region has several major business and shopping precincts, which are supported by restaurants and extensive clusters of high density living.

Major shopping centres in the Mackay region include:

- Caneland Central, Mangrove Road, Mackay
- Mount Pleasant Shopping Centre, Phillip Street, Mount Pleasant
- Northern Beaches Shopping Complex, Eimeo Road, Rural View
- Sydney Street Markets, Sydney Street, Mackay
- Parkside Plaza Mackay, Bridge Road, West Mackay
- Ooralea Shopping Centre, Boundary Road, Ooralea
- Walkerston Shopping Centre, Creek Street, Walkerston
- Sarina Shopping Centre, Sarina Beach Road, Sarina.
10.7.2 Industrial Sector

There are numerous industrial areas throughout the region, including but not limited to mining, manufacturing and agricultural. Major industrial sites include:

- Paget
- Mackay Harbour
- Glenella
- Slade Point
- Hay Point
- Sugar mill sites at Racecourse, Marian, Sarina, Farleigh and Pleystowe.

The Mackay Regional Council Director of Engineering & Commercial infrastructure, is the appointed Local Disaster Coordinator LDC for the Mackay LDMG.

10.7.3 Tourism Sector

The Mackay region is a regional, state and national tourism hub with tourism being economically significant at all levels. Visitors to the community pose additional challenges during a disaster in that:

- Potentially large numbers of visitors need to be considered during disaster and potential evacuation
- Cultural and linguistic diversity needs to be considered when communicating in the event of a disaster
- Their awareness to being prepared for any given disaster situation may be limited.

10.8 Education

10.8.1 Schools

The Mackay region has numerous schools, private and public, that offer educational services to young people.

<table>
<thead>
<tr>
<th>TYPE</th>
<th>STATE</th>
<th>NON-STATE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>35</td>
<td>8</td>
<td>43</td>
</tr>
<tr>
<td>Secondary/combined</td>
<td>7</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Special schools</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Early Childhood</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
<td><strong>15</strong></td>
<td><strong>92</strong></td>
</tr>
</tbody>
</table>

Source: https://schoolsdirectory.eq.edu.au/

10.8.2 Higher Education

Mackay is host to two providers of higher education:

- James Cook University, Mackay Campus, Bridge Road, West Mackay
- CQ University Mackay City, Sydney Street, Mackay
10.9 Sport and Recreation

The Mackay Region has numerous sporting and recreation facilities, including:

- Mackay Aquatic and Recreation Complex (Mackay ARC), Boundary Road, Mackay
- Sugar Bowl Mackay, Norris Road Park Access, North Mackay
- BB Print Stadium, Bridge Road, Mackay
- Mackay Multi Sports Stadium, Bridge Road, Mackay
- Pioneer Swim Centre, Malcomson Street, North Mackay
- Memorial Swim Centre, Milton Street, Mackay
- Mirani Swim Centre, Caroline Street, Mirani
- Sarina Swim Centre, Anzac Street, Sarina
- Bluewater Lagoon, River Street, Mackay
- Mackay Turf Club, Peak Downs Highway, Ooralea.

There are numerous smaller sporting facilities and fields and community centres located across the region.

10.10 Major Events

The Mackay Region plays host to many high profile events.

Major events for the region can pose challenges for evacuation and people management during disaster events. Regular annual events for the region include (but not limited to):

- Mackay / Pioneer Valley / Sarina Shows
- Mackay Festival of Arts
- Food and Wine Festival
- Global Grooves Multicultural Festival
- Mackay Marina Run
- New Year’s Eve Festivities
- ANZAC Day
- Sports Expo
- Numerous sporting and cultural events throughout the year.
11. CRITICAL INFRASTRUCTURE

11.1 Emergency Services

The Mackay region is serviced by the following emergency services:

• Queensland Fire and Emergency Services (Urban, Rural and State Emergency Services)
• Queensland Ambulance Service
• Queensland Police Service.

11.2 Medical Facilities

The Mackay region is serviced by the following medical facilities:

• Mackay Base Hospital
• Mater Misericordiae Hospital, Mackay
• Sarina Hospital & Primary Health Care Centre
• Mackay Private Hospital
• Extensive number of medical centres, day surgery and other specialist centres throughout the region.

11.3 Government Buildings and Facilities

The Australian Government, Queensland Government and Mackay Regional Council provide a number of buildings throughout the district to cater for local communities social and welfare needs.

11.4 Major Roads

The Mackay region is heavily reliant on its transportation links to the rest of the country. Major road links include:

• To the south, the Bruce Highway to Brisbane (970 km) and beyond, north to Cairns (735 km) and beyond and to the south west.
• The Peak Downs Highway to Clermont (274 km) with links to Rockhampton and Brisbane.

These main roads are subject to flooding during the wet season and can render areas of Mackay isolated.

11.5 Rail

A rail link south to Brisbane and north to Cairns provide regular passenger and freight services. The freight yards and Railway Station are located in the suburb of Paget and the coal ports of Hay Point and Dalrymple Bay (30 km to the south) are serviced by a heavy rail system to the hinterland coal mines and maintained through the Jilalan Rail Facility south of Sarina. An extensive network of cane tram lines also exists throughout the district.
11.6 Airport

A commercial airport, located adjacent the mouth of Bakers Creek in south Mackay, caters for regular domestic services. As it is situated at a level of 4.00m AHD, it is vulnerable to storm tide in the event of a cyclone.

11.7 Seaport

The Port of Mackay provides berths for general cargo, containers, bulk grain, tankers discharging both oil and LP Gas and a bulk sugar terminal. A commercial fishing base and a marina catering for charter vessels and other small craft are also located within the harbour. Some fishing vessels and pleasure craft use moorings in the Pioneer River below Forgan Bridge.
12. ESSENTIAL SERVICES

12.1 Water supply and dams

12.1.1 Referable Dams

<table>
<thead>
<tr>
<th>DAM</th>
<th>DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle Creek Dam</td>
<td>Located at Middle Creek Road, Sarina</td>
</tr>
<tr>
<td></td>
<td>Surface area of 17.5 ha</td>
</tr>
<tr>
<td></td>
<td>Catchment area of 7.4km²</td>
</tr>
<tr>
<td></td>
<td>Full supply capacity of 1,120 million litres</td>
</tr>
<tr>
<td></td>
<td>Managed by Mackay Regional Council</td>
</tr>
<tr>
<td>Teemburra Dam</td>
<td>Located approximately 53km West of Mackay</td>
</tr>
<tr>
<td></td>
<td>Purpose is to supply irrigation water to sugarcane farms in the Pioneer Valley</td>
</tr>
<tr>
<td></td>
<td>The dam also supplies water to town water supply and industrial users</td>
</tr>
<tr>
<td></td>
<td>Surface area of 1,040 ha</td>
</tr>
<tr>
<td></td>
<td>Catchment area of 67.45km²</td>
</tr>
<tr>
<td></td>
<td>Full supply capacity of 147,600 million litres</td>
</tr>
<tr>
<td></td>
<td>Managed by Sunwater</td>
</tr>
<tr>
<td>Eungella Dam</td>
<td>Located on Broken River, approximately 72km west of Eton</td>
</tr>
<tr>
<td></td>
<td>Purpose is to supply water for mining and irrigation to the surrounding areas</td>
</tr>
<tr>
<td></td>
<td>Surface area of 848 ha</td>
</tr>
<tr>
<td></td>
<td>Catchment area of 142.0km²</td>
</tr>
<tr>
<td></td>
<td>Full supply capacity of 112,400 million litres</td>
</tr>
<tr>
<td></td>
<td>Managed by Sunwater</td>
</tr>
<tr>
<td>Kinchant Dam</td>
<td>Located approximately 30km south west of Mackay</td>
</tr>
<tr>
<td></td>
<td>Purpose is to supply irrigation water to the Eton irrigation area</td>
</tr>
<tr>
<td></td>
<td>Surface area of 920 ha</td>
</tr>
<tr>
<td></td>
<td>Catchment area of 30.84km²</td>
</tr>
<tr>
<td></td>
<td>Full supply capacity of 65,875 million litres</td>
</tr>
<tr>
<td></td>
<td>Managed by Sunwater</td>
</tr>
<tr>
<td>Andrew Deguara Holding P/L</td>
<td>Private dam</td>
</tr>
</tbody>
</table>

12.1.2 Water Supply

Mackay's water supply is drawn largely from the Dumbleton Weir on the Pioneer River. The low concrete weir is located at Dumbleton Rocks and marks the limit of tidal influence on the Pioneer river, about 10 kms upstream. Water is also drawn from underground bores, between Mackay and Dumbleton Rocks.

Walkerston and Seaforth draw treated water from the Nebo Road Water Treatment Plant via rising mains, whilst other smaller townships rely on dams and underground bores to supply to treatment plants prior to reticulation. The construction of a rising main to Sarina provides for Nebo Road treated water to be supplied to the township.
12.1.3 Electricity
Power supply to the region is drawn from the state grid, via power stations at Stanwell (near Rockhampton) and Gladstone, situated 400 km and 500 km south of Mackay. Power distribution within the Mackay region is managed by the Mackay division of Energy Queensland.
This company has been and is continuing to be proactive with an ongoing disaster mitigation program of undergrounding supply to all essential services such as Disaster Coordination Centres, Hospitals, CBD and Water Treatment Plant.

12.1.4 Gas Supply
There is no underground reticulated gas supply in the Mackay region; however bottled gas is readily available from local distributors.

12.1.5 Sewerage
Sewerage treatment plants and sewage reticulation is installed in each of the towns of Mackay, Sarina, Walkerston, Mirani and Marian, whilst other communities within the region are supported by septic tank systems. In the event of loss of electricity power for an extended time, a planned generator backup is in place to minimise disruption and contamination that could arise.

12.1.6 Telecommunications
The Mackay region is serviced by a modern telecommunications network with services provided by Telstra, Optus, NBN and other providers with both landline and mobile services available. Copper cable network still exists with the majority of the trunk main network consisting of fibre optic cable. There are also dedicated telecommunications networks in the area for Police and Emergency Services.
A network of mobile towers has been installed throughout the region that provides a 4G network. Major Radio towers are located on Mount Blackwood and Black Mountain catering for Radio broadcast and VHF and UHF service. A list of critical telecommunications infrastructure has been identified and is currently being mapped onto Council’s GIS system.

13. HAZARDOUS SITES
Hazardous sites are located in the region but not in residential areas. Fuel oils such as diesel, petroleum and aviation fuels are stored at the Mackay Harbour and a Nitropril bulk storage facility is located at the harbour industrial site well away from fuel tanks. Both fuel and Nitropril are transported through the city enroute to the hinterland coal mines by means of road transport and rail.
Other hazardous chemicals and products are stored at many of the main industrial precinct facilities in south Mackay and Sarina for use in the production and maintenance of many industrial products, however all come under a strict licensing and QFES registration where required.
14. DISASTER RISK ASSESSMENT

14.1 Hazards
A number of natural and non-natural hazards, that have the potential to impact the Mackay region, have been considered, as summarised below.

<table>
<thead>
<tr>
<th>NATURAL HAZARD</th>
<th>NON-NATURAL HAZARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meteorological</td>
<td>Human Caused</td>
</tr>
<tr>
<td>Cyclone</td>
<td>Major Transport Infrastructure Outage</td>
</tr>
<tr>
<td>Flood</td>
<td>Terrorist Incident</td>
</tr>
<tr>
<td>Storm Tide</td>
<td>Marine Oil Spill</td>
</tr>
<tr>
<td>Bushfire</td>
<td>Arson</td>
</tr>
<tr>
<td>Severe Storm</td>
<td>Sabotage of Essential Services</td>
</tr>
<tr>
<td>Heatwave</td>
<td>Severe Civil Unrest</td>
</tr>
<tr>
<td>Drought</td>
<td>Bombing</td>
</tr>
<tr>
<td>Geological</td>
<td>Supply Chain Failure</td>
</tr>
<tr>
<td>Earthquake</td>
<td>Infrastructure</td>
</tr>
<tr>
<td>Landslide</td>
<td>Building Collapse</td>
</tr>
<tr>
<td>Tsunami</td>
<td>Failure of Essential Infrastructure</td>
</tr>
<tr>
<td>Biological</td>
<td>Hazardous Materials Incident</td>
</tr>
<tr>
<td>Human Epidemic</td>
<td>Bridge Collapse</td>
</tr>
<tr>
<td>Animal and Plant disease</td>
<td>Dam Failure</td>
</tr>
<tr>
<td>Insect or Vermin Plague</td>
<td>Industrial Accident</td>
</tr>
</tbody>
</table>

14.2 Risk Assessment
The hazards detailed above are routinely considered as part of ongoing risk assessment activities. Mackay Regional Council and partner agencies will develop a detailed risk assessment of the hazard events considered most likely to impact the Mackay region. The events assessed will be confirmed based on historical events and emerging risks.

In order to ensure a contemporary and consistent methodology, Mackay Regional Council has adopted the process of the Queensland Emergency Risk Management Framework.

The outcomes of the risk assessment inform the basis of this plan and associated sub plans. The risk assessment documentation is provided to the LDMG and partner agencies in order to assist them in the formation of their own respective operational and response plans.

In summary, the risk assessment process examines the risk of the hazard seriously disrupting the community and requiring a significant coordinated response by the LDMG. The process specifically considered the following:

- The hazard
- The exposed elements
- Treatment options
Risk Treatment

14.3 Risk Treatment

Functional lead agencies have the primary responsibility for hazard identification, assessment, treatment and hazard specific planning for which they are the Functional Lead Agency. In accordance with the State Disaster Management Plan, hazard specific plans are to form Sub-plans to this Local Disaster Management Plan. The LDMG will assist the Functional Lead Agency in the management of these sub plans.

15. PREVENTION

The LDMG is committed to reducing disaster risks wherever possible, by reducing the likelihood and/or consequence of disaster events.

The following strategies are promoted by the group to reduce disaster risk to the community.

15.1 Compliance with Legislation, Regulations and Standards

The LDMG is committed to implementing and promoting knowledge and awareness within the group’s members in respect to their applicable legislation/s.

The various acts, regulations and standards include provisions which work to reduce the risks associated with disasters and have been considered in the preparation of this LDMP.

15.2 Hazard Specific Planning

In accordance with the SDMP, Functional Lead Agencies are allocated for a range of identified hazards and are responsible for the development of a hazard specific plan. These plans are to support the functional agency to manage the hazard specific event.
15.3 Building Codes and Building-use Regulations and Standards

Buildings and structures within the Mackay Regional Council jurisdiction are approved by registered Building Certifiers and regulated by Council to ensure compliance with Australian building codes, regulations and standards.

These include:

- Building Act 1975
- Building Code of Australia 1996
- Building Regulation 2003
- Building Fire Safety regulations 1991
- Electrical Safety Act 2002
- Plumbing and Drainage Act 2002
- Fire and Rescue Service Act 1990
- Standard Building Regulations 1993
- Relevant Australian Standards

All building applications are assessed to ensure they comply with the relevant cyclone rating for their respective areas.

15.4 Land-use Planning

Managing land use is a key strategy to reducing disaster risks within the Mackay region. Through land-use planning, the potential for displacement, damage and disruption to communities can be reduced.

Council has prepared and maintains the Mackay Region Planning Scheme 2017 (Planning Scheme) and complies with the Planning Act 2016, Queensland Planning Provisions and the State Planning Policy.

The Planning Scheme is an evolving document and includes plans, reference for land use management, codes for development and requirements pertaining to the assessment of proposed developments.

As such, the Planning Scheme contributes to disaster risk reduction within identified hazard-prone/constraint areas, in particular it maps land subject to:

- Potential bushfire hazard areas
- Coastal erosion
- Landslide hazard
- Flood and the identification of appropriate development standards so that private and community infrastructure can be sited above recommended flood levels.
16. PREPAREDNESS

16.1 Event Coordination

Under Section 30 of the Act, the LDMG is responsible for:

• Managing disaster operations in the area (Section 30(f))
• Identifying and coordinating the use of resources that may be used for disaster operations (Section 30(h))
• Establishing and reviewing communication systems in the LDMG and with Council and Disaster District for use during disaster events (Section 30(i)).

Based on the definition of a disaster in Section 13 (1) of the Act, activation of the LDMG will be in response to an event or threat that has caused, or is likely to cause, serious disruption in the community or event that requires a significant coordinated response to help the community recover from the event.

Council has provided a primary Local Disaster Coordination Centre facility located at the Sir Albert Abbott Administration Building, Civic Centre, 73 Gordon Street, Mackay. Should the primary LDCC facility become inoperative, an alternate centre may be established in the Jubilee Community Centre and other Council owned facilities.

The activation and operation of the centre is the responsibility of the Local Disaster Coordinator who shall ensure staffing of the centre is adequate, fully trained and available as required. Activation or escalation of an activation of the LDMG will be by way of a general consensus of the LDMG Executive Group based off any credible intelligence known at that time assessed against pre-determined triggers. Hazard specific triggers can be located in the LDMG/ LDCC Activation Sub Plan.

Each member of the LDMG must ensure that their agency establishes a capacity to coordinate their agency's resources and actions and to provide a suitably trained, experienced and duly authorised liaison officer to the LDCC on request.
16.2 Capacity Building

16.2.1 Community Awareness and Education

Under Section 30(e) of the Act, the LDMG is to ensure that the Mackay community is aware of ways of mitigating the adverse effects of a disaster event, and preparing for, responding to and recovering from a disaster.

Community awareness and education is the process by which the community is made aware of identified threats and the means by which they, at an individual, business or household level, can mitigate the possible effects. This may be in the form of seminars, brochures, media releases etc.

The LDMG maintains a coordinated approach to community awareness and education, by way of:

- Increasing community awareness about disaster preparation and disaster warning systems through effective communication strategies and education programs
- Implementing effective strategies that will lead to behavioural change and community action by the community towards improved disaster preparedness
- Increasing community knowledge of Council’s disaster management arrangements
- Advocating for increases in state and federal government funding towards local disaster management community awareness and education initiatives
- Enhancing accessibility of disaster information available to the community through an established Emergency Liaison Officer program
- Increasing knowledge of relevant emergency telephone numbers and the role each agency plays in a disaster event
- Developing working relationships between Mackay’s disaster management agencies

Under this approach, community awareness and education programs will be regularly conducted by LDMG agencies. Community awareness and education strategies adopted by the group include:

- Publications explaining disaster preparedness and emergency procedures (e.g. Emergency Action Guide)
- Participation in the annual Cyclone Saturday event at Caneland Central
- Promotion of the Emergency Dashboard website as the one-stop-shop for emergency news and information. This website can be accessed via http://disaster.mackay.qld.gov.au/
- Involvement in Business Continuity Planning educational sessions
- Actively promote awareness and support of the SES Recruitment Campaign.
17. RESPONSE

The principal purpose of disaster response is the preservation of life, property and the environment. Response is defined as the “actions taken in anticipation of, during, and immediately after an emergency (disaster event) to ensure that its effects are minimised and that people affected are given immediate relief and support” (Emergency Management Australia, 2004).

Under Section 30 of the Act, the LDMG is responsible for:

- Managing disaster operations in the Mackay region under policies and procedures decided by the QDMC, noting that:
  - An agency may be nominated with responsibility for a specific hazard
  - The agency understands the requirements for identification of risks and developing hazard specific plans
  - The LDMG’s role is coordination and support with information and resources
- Identifying and coordinating the use of resources that may be used for disaster operations in the area.

Section 15 of the Act defines disaster operations as activities undertaken to help reduce loss of human life, illness or injury to humans, property loss or damage, or damage to the environment.

The LDMG recognises that the response to a disaster event:

- Incorporates all those actions that help reduce loss of human life, illness or injury to humans, property loss or damage, or damage to the environment, to a particular and specific disaster event
- May commence prior to the impact of an event, if advance warning is given and known
- Concludes once the risks of loss of human life, illness or injury, property loss or damage, or damage to the environment are reduced to an acceptable level.

In order to be effective during operations, LDMG members are to:

- Ensure that a liaison officer for their agency is present at the LDCC as the liaison point of contact (if required), and ensure plans are in place for continuity of agency representation in the LDCC during extended operations
- When possible, assess the likelihood of extended operations and the possible need to implement LDMG member relief arrangements
- Ensure that a suitably trained, experienced and duly authorised liaison officer for their agency is present at the LDCC as the liaison point of contact (if required), and ensure plans are in place for continuity of agency representation in the LDCC during extended operations
- Maintain a close liaison with all members of the LDMG including participating in briefings/meetings of the LDMG.

During disaster events, LDMG meetings will be conducted in accordance with the needs for the group to assemble to strategically plan for the management of the disaster.
17.1 Activation

Upon the directive to Stand Up, the LDCC is activated and staffed on a rotational basis with appropriately trained Mackay Regional Council personnel and liaison officers from external agencies. External agency liaison officers provide a single point of contact between the LDCC and their parent agency when required.

The Mackay LDMG is committed to providing a robust and efficient management disaster management framework that enables a seamless integration of activities and a coordinated multi-agency response to any disaster event and operated under five key principles:

- Ensuring that there is a unity of control by having only one Local Disaster Coordinator responsible at any one time for the coordination of the operations,
- Maintaining a satisfactory span of control level to ensure that personnel or functional areas don't get overwhelmed,
- Establishing functional management areas for Coordination, Planning, Intelligence, Operations, Logistics, Finance and Public Information,
- Maintain a consultative management approach where the Local Disaster Coordinator, in consultation with the other LDCC functional areas, determines the desired outcomes of the event,
- Adopt a flexible and scalable, all hazards approach across the full spectrum of the event.

17.2 LDMG Activation Levels

Activation of the LDMG has been based on the levels of activation in accordance with the State Disaster Management Plan.

<table>
<thead>
<tr>
<th>LEVEL OF ACTIVATION</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert</td>
<td>A heightened level of vigilance and preparedness due to the possibility of an event in the area of responsibility. Some action may be required, and the situation should be monitored by staff capable of assessing and preparing for the potential hazard.</td>
</tr>
<tr>
<td>Lean Forward</td>
<td>An operational state characterised by a heightened level of situational awareness of a disaster event (either current or impending), and a state of operational readiness. The LDCC is on standby – prepared but not activated.</td>
</tr>
<tr>
<td>Stand Up</td>
<td>Resources are mobilised, personnel are activated, and operational activities commenced. The LDCC is activated.</td>
</tr>
<tr>
<td>Stand Down</td>
<td>Transition from responding to back to normal core business operations. The event no longer requires a coordinated response.</td>
</tr>
</tbody>
</table>
17.3 LDCC Structure
The LDCC structure provides a scalable approach to staff, roles and resources based on the nature, complexity and size of the event.

Functional area roles and responsibilities are available in the LDMG Activation Sub Plan.

17.4 Public Warning Systems
Under Section 30 of the Act, the LDMG is responsible for ensuring the community is aware of ways of preventing an event from taking place, preparing for an event, responding to and recovering from the event. This involves raising awareness of identified threats and the means by which the public should respond at an individual and/or household level, and may include warnings and directions, as provided by functional lead agencies for warnings relating to the particular hazard.

Once the LDMG has activated, the Chairperson of the LDMG will ordinarily be the primary spokesperson of disaster related information in conjunction with function lead agency liaison officer.

The LDMG maintains a Public Information Sub Plan to support the dissemination of information to the public.

17.5 Capacity Building
17.5.1 Local Plans
The LDMG recognises the importance of planning for disaster events and actively promotes this amongst the region's disaster management agencies.

When preparing disaster plans, the LDMG will:

• Utilise risk management principles specified in the Queensland Emergency Risk Management Framework and AS/NZ ISO 31000 and the National Emergency Risk Assessment Guidelines,
• Adopt a comprehensive, all agency approach to disaster management,
• Consider community preparedness,
• Consult extensively with lead and supporting agencies and community stakeholders as appropriate.

17.5.2 Operational Sub Plans
Sub plans detailing the coordination and support arrangements for the LDMG are held by the Council Emergency Management Program and include:

• Activation of the Local Disaster Management Group
• Evacuation Sub Plan
• Evacuation/Cyclone Centre Sub Plan
• Logistics Sub Plan
• Public Information Sub Plan
• Recovery Sub Plan.
17.5.3 Functional Lead Agency Plans

The LDMG expects that Functional Lead Agencies will prepare and maintain written disaster plans to:

- Manage hazards for which they are responsible
- Manage the delivery of disaster management functions for which they are responsible.

Identified hazards, Functional Lead Agencies and relevant plans as outlined in the SDMP is as follows:

<table>
<thead>
<tr>
<th>HAZARD</th>
<th>PLAN</th>
<th>FUNCTIONAL LEAD AGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal and plant disease</td>
<td>Australian Veterinary Emergency Plan</td>
<td>Department of Agriculture and Fisheries</td>
</tr>
<tr>
<td></td>
<td>Australian Aquatic Veterinary Emergency Plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Australian Emergency Plant Pest Response Plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biosecurity Emergency Operations Manual</td>
<td></td>
</tr>
<tr>
<td>Biological (human related)</td>
<td>State of Queensland Multi Agency Response to Chemical, Biological and Radiological Incidents</td>
<td>Queensland Health</td>
</tr>
<tr>
<td>Radiological</td>
<td>State of Queensland Multi Agency Response to Chemical, Biological &amp; Radiological Incidents</td>
<td>Queensland Health</td>
</tr>
<tr>
<td>Bushfire</td>
<td>Wildfire Mitigation and Readiness Plans</td>
<td>Queensland Fire and Emergency Services</td>
</tr>
<tr>
<td>Chemical</td>
<td>State of Queensland Multi Agency Response to Chemical, Biological &amp; Radiological Incidents</td>
<td>Queensland Fire and Emergency Services</td>
</tr>
<tr>
<td>Heatwave</td>
<td>Heatwave Response Plan</td>
<td>Queensland Health</td>
</tr>
<tr>
<td>Pandemic</td>
<td>Pandemic Influenza Plan</td>
<td>Queensland Health</td>
</tr>
<tr>
<td>Ship Sourced Pollution</td>
<td>Queensland Coastal Contingency Action Plan</td>
<td>Department of Transport and Main Roads</td>
</tr>
<tr>
<td>Terrorism</td>
<td>Queensland Counter Terrorism Plan</td>
<td>Queensland Police Service</td>
</tr>
</tbody>
</table>

17.5.4 Community Emergency Plans

The LDMG encourages community groups, businesses, developers and others, to prepare emergency and business continuity plans. The group especially encourages organisations that care for vulnerable sectors of the community to prepare emergency plans in consultation with the appropriate agency.
17.6 Concept of Operations for Response

17.6.1 Communication

Communication during disasters is demanding and involves high levels of uncertainty and necessity for rapid decision making and response under increased time pressure, high demand for information and resource constraints.

The LDMG, emergency services and Council have identified resources available for the provision of communicating and distributing information on hazard awareness, household preparedness and emergency planning information about events and recommended actions. Where possible, mitigation strategies have been put in place to minimise the vulnerability of these assets to hazards. The LDMG works closely with other entities and agencies with responsibility for public information.

The Mackay Emergency Dashboard, broadcast radio, social media and live television interviews will be the primary mediums to disseminate warnings and advices. Information obtained from the monitoring of media and social networks will contribute to intelligence briefs.

If power and telecommunications are lost, respective agencies will communicate through two-way radio networks. The Council maintains a cache of spare radios for this purpose.

Manual distribution of information brochures and handouts will commence and, if required, this material will be made available in languages other than English through translation services.

The LDCC structure has a dedicated Public and Information cell that is managed by the Mackay Regional Council Corporate Communication staff. During activations, the Public Information Officer will coordinate all media activities, including the presence of media in the LDCC.

It is the role of the LDCC to coordinate information between the public, emergency services, non-government agencies, governments, businesses, community and volunteer groups to provide situational awareness and enhance interoperability.

Various methods and tools are used to coordinate and circulate information, such as:

<table>
<thead>
<tr>
<th>Situational Reports</th>
<th>Agency Reports</th>
<th>Emergency Dashboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>BoM Advices and Warnings</td>
<td>Requests for Assistance</td>
<td>Logs</td>
</tr>
<tr>
<td>Face to face</td>
<td>Minutes of Meetings</td>
<td>Teleconferencing</td>
</tr>
<tr>
<td>Radio</td>
<td>Email / SMS</td>
<td>Social Media / Internet</td>
</tr>
<tr>
<td>Newspapers</td>
<td>Television</td>
<td>Leaflets</td>
</tr>
<tr>
<td>Public Meetings</td>
<td>Posters / Notices</td>
<td></td>
</tr>
<tr>
<td>Landlines &amp; Mobiles</td>
<td>Damage Impact Assessments</td>
<td></td>
</tr>
</tbody>
</table>

17.6.2 Receipt of Warnings

In the event of a potential disaster situation, a warning may be issued by any agency that maintains monitoring devices, including the Bureau of Meteorology, Mackay Regional Council, Queensland Police Service, and/or any of the emergency services.

In addition to the provision of these warnings to the general public, all warnings should be directed to the Mackay Regional Council Emergency Management Program who will advise the LDMG Executive Group and where directed, members of the group as appropriate.
17.6.3 Issue of Warnings
For disaster events, the majority of warnings can be received via the Emergency Dashboard, email, text message, media outlets and if the risk is substantial and imminent, by telephone. These warnings are received by the LDMG members and relevant Mackay Regional Council staff. If a weather forecast shows the potential for a hazard to develop e.g. a tropical cyclone, the situation is monitored closely by the nominated LDMG members.

Dependent on the risk (likelihood of the event impacting the community and consequence if it does), the LDMG may activate and the details of the forecast or warning will be disseminated to all the LDMG members. Additionally, all media outlets will be notified according to the Communication Sub plan to distribute the information to the community.

17.6.4 Standard Emergency Warning System (SEWS)
The SEWS is intended for use as an alert signal to be played on public media to draw listeners’ attention to an emergency warning. It is meant to attract listeners’ attention to the fact that they should take notice of the emergency message. Responsibility for the management of the SEWS in Queensland rests with the Commissioner Queensland Fire and Emergency Services in conjunction with the Queensland Regional Director of the Bureau of Meteorology for meteorological purposes.

The LDMG have pre prepared emergency alert templates for hazard specific threats and locations available to authorised LDMG members.

17.7 Financial Considerations
All agencies are responsible for meeting and recording their own operational expenses incurred during a disaster event, and for claiming reimbursement of any expenses allowed under the State Disaster Relief Arrangements (SDRA) and the Disaster Recovery Funding Arrangements (DRFA), if activated. Details of these programs can be found at https://www.disaster.qld.gov.au/dmp/Financial-Support/Pages/default.aspx

Agencies in need of assistance with implementing procedures to capture operational costs in a manner acceptable for SDRA and DRFA purposes, can contact either Queensland Reconstruction Authority (QRA).

17.8 Coordination and Support Capability
The LDMG will coordinate and support the response capability of individual agencies. Agencies are to ensure they have appropriate resources to deliver their agreed roles and responsibilities. Where an agency’s local capacity is exceeded, they can request support through the LDMG.

Where the LDMG is unable to provide the required support for an agency, the established Request for Assistance process to the DDMG will be utilised.
17.9 Impact Assessments
There are primarily two types of damage assessments.

- Rapid Damage Assessment
- Comprehensive Assessment.

A Rapid Damage Assessment examines the ways in which an event has affected the community immediately after the event. This assessment will provide initial and often unconfirmed indicative information. The information collected is used to provide an assessment of the potential overall impact of the event and to set initial priorities.

Comprehensive damage assessment will commence as soon as possible following an event to accurately establish the impact of an event.

Response and recovery agencies will undertake detailed impact assessments relating to their area of jurisdiction and will submit Situation Reports to the LDMG through the LDCC.

Depending on need, the LDMG may coordinate the formation and operation of multi agency damage assessment teams to systematically collect and analyse impact assessment data.

17.10 Media Management
The LDMG will coordinate media activities with the support of functional lead agencies.

The Public Information Sub Plan details the arrangements and considerations for effective media management during disasters, coordinating with lead functional agency media management processes.

17.11 Accessing Support and Allocation of Resources
Requests for support may come from Functional Lead Agencies, supporting agencies or the community. Registration and actioning of these requests is to be logged within the Guardian IMS system.

The Local Disaster Coordinator will maintain regular communications with the District Disaster Coordinator during disaster events on the local resourcing status. Communication will also be maintained with local governments that share a boundary with Mackay.

Any requests for assistance that are not able to be found within local resources will be the subject of a request for assistance to the DDC. These requests must be endorsed by the Local Disaster Coordinator prior to the submission to the DDC. Requests passed to a DDC will be registered and monitored in accordance with the standard operating procedures of the LDCC along with information about goods and/or services received as a result of these requests for assistance.

In event that the request for assistance cannot be actioned by the DDC, the DDC will request assistance through the Chairperson of the QDMC.

17.12 Providing Support
The LDMG agencies may be requested to or can offer to provide support to agencies involved in disaster operations in the form of goods and/or services using the established processes of the Group.
17.13 Disaster declaration

Section 64 of the Act makes provision for the declaration of a disaster situation by the DDC, with the approval of the Minister, for a district or a part of a district, or by the Premier and the Minister for the State or a part of the State. A declaration may be made if the person/s responsible for making it are satisfied that a disaster has happened, is happening or is likely to happen and it will be necessary, or reasonably likely to be necessary, to exercise declared disaster powers to prevent or minimise the loss of human life, illness or injury to humans, property loss or damage, or damage to the environment.

A Declaration of a Disaster Situation may be requested by the LDMG, for example, where there is an identified need to undertake a managed evacuation.

When a Declaration of a Disaster Situation is enacted, the Chairperson and LDC will continue to align local strategies and arrangements with the DDC to ensure the appropriate utilisation of the powers within the local disaster management arrangements.

17.14 Resupply

Communities or individuals can become temporarily isolated which can cause significant hardship due to a depletion of their normal sources of food and basic commodities.

LDMG resupply arrangements are developed in accordance with the Queensland Resupply Guidelines and will be escalated to the Queensland Fire and Emergency Services, if the resupply exceeds local capacity.


17.15 Hazard Specific Arrangements

This disaster management plan is based on the all hazards, all agencies approach, which recognises that counter measures may vary with specific hazards. Each type of event will have its own special requirements.

Functional Lead Agency status is usually bestowed by legislation, common law, regulations, or by agreement of the LDMG.

When the LDMG is activated, the LDMG is responsible for the overall management of the disaster event in support of the Functional Lead Agency.

17.16 Hazard Specific Support Agency

A support agency supports the Functional Lead Agency in the management of a threat and subsequent response through actions or the provision of personnel and equipment.

While under the control of a Functional Lead Agency, support agencies retain responsibility for commanding their resources and ensuring that their own standard operating procedures are correctly implemented.
### 17.17 Functional Lead Agency

A Functional Lead Agency is the agency in overall control of the response function when this plan is activated. For example, when an evacuation centre is required, Mackay Regional Council is the Functional Lead Agency for this function and will control all agencies that are contributing to evacuation centre management. This may include giving directions and tasks to supporting agencies and opening and allowing access to centers.

A Functional Lead Agency will be supported by other agencies that have agreed roles to support the delivery of the disaster management function. For example, in the management of evacuation shelters/emergency shelters, Council is assisted by a number of agencies.

<table>
<thead>
<tr>
<th>HAZARD</th>
<th>LEAD FUNCTIONAL AGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accident aircraft – on airport</td>
<td>Queensland Police Service</td>
</tr>
<tr>
<td>Accident aircraft – off airport</td>
<td>Queensland Police Service</td>
</tr>
<tr>
<td>Accident – traffic [road, rail, marine]</td>
<td>Queensland Police Service</td>
</tr>
<tr>
<td>Building collapse – major</td>
<td>Queensland Fire &amp; Emergency Services</td>
</tr>
<tr>
<td>Bushfire</td>
<td>Queensland Fire &amp; Emergency Services</td>
</tr>
<tr>
<td>Dam failure</td>
<td>Dam Managers</td>
</tr>
<tr>
<td>Earthquake</td>
<td>Mackay Regional Council</td>
</tr>
<tr>
<td>Exotic diseases – flora and fauna</td>
<td>Agriculture and Fisheries</td>
</tr>
<tr>
<td>Fire – major building</td>
<td>Queensland Fire &amp; Emergency Services</td>
</tr>
<tr>
<td>Flood</td>
<td>Mackay Regional Council</td>
</tr>
<tr>
<td>Hazardous material/gas accidents</td>
<td>Queensland Fire &amp; Emergency Services</td>
</tr>
<tr>
<td>Heatwave</td>
<td>Queensland Health</td>
</tr>
<tr>
<td>Power</td>
<td>Ergon Energy</td>
</tr>
<tr>
<td>Water/sewer</td>
<td>Mackay Regional Council</td>
</tr>
<tr>
<td>Landslide</td>
<td>Mackay Regional Council</td>
</tr>
<tr>
<td>Oil spill – at sea</td>
<td>DTMR (MSQ)</td>
</tr>
<tr>
<td>Oil spill – on land</td>
<td>Queensland Fire &amp; Emergency Services</td>
</tr>
<tr>
<td>Public health epidemic/pandemic</td>
<td>Queensland Health</td>
</tr>
<tr>
<td>Severe weather (eg cyclone, storms, storm surge)</td>
<td>Mackay Regional Council</td>
</tr>
<tr>
<td>Terrorism</td>
<td>Queensland Police Service</td>
</tr>
<tr>
<td>Tsunami</td>
<td>Mackay Regional Council</td>
</tr>
</tbody>
</table>

### 17.18 Functional Support Agency

A support agency supports the Functional Lead Agency in the delivery of a disaster management function through actions or the provision of personnel and equipment. The agreed roles and responsibilities of response and recovery agencies are outlined below.

While under the control of a Functional Lead Agency, support agencies retain responsibility for commanding their resources and ensuring that their own standard operating procedures are correctly implemented.
**Threat and Functional Lead Agencies within the Mackay region:**

<table>
<thead>
<tr>
<th>COORDINATION AND SUPPORT - FUNCTIONAL SUPPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volunteering and Donations</td>
</tr>
<tr>
<td>Finance Management</td>
</tr>
<tr>
<td>Resupply</td>
</tr>
<tr>
<td>Recovery</td>
</tr>
<tr>
<td>Solid Waste</td>
</tr>
<tr>
<td>Logistics</td>
</tr>
<tr>
<td>Public Works</td>
</tr>
<tr>
<td>Public Information</td>
</tr>
<tr>
<td>Public Health</td>
</tr>
<tr>
<td>Impact Assessment</td>
</tr>
<tr>
<td>Evacuation</td>
</tr>
<tr>
<td>Evacuation Centre Management</td>
</tr>
<tr>
<td>Animal Emergency</td>
</tr>
</tbody>
</table>

**17.19 Coordination**

During a disaster, a number of agencies may be in operation at the same time. For example, a disaster may involve the management of a number of threats, and the delivery of a number of disaster management functions (such as evacuation centre management or public health).

The LDMG’s role in coordination is about ensuring all agencies have the resources and information needed to carry out their agreed roles. Coordination operates horizontally across agencies but does not extend to the control of threats or functions, or to the command of agency resources.

**18. RECOVERY**

The primary aim of recovery is to assist disaster affected communities to regain appropriate and acceptable levels of functioning both initially and in the long term.

It is important that any assistance provided, empowers the community to assist with their own recovery and does not take away individual autonomy. Recovery planning and activities should provide the impacted community opportunities to develop better capability and mitigation measures for future events.

The recovery phase should commence alongside the response phase, and due to the complex nature of rebuilding communities, the recovery phase may continue well after the response to a disaster event has concluded. In some cases, this may be several years.

The Act includes provision for the chairperson of the State group to appoint a State Recovery Coordinator (SRC). The functions of a SRC are as follows:

- To coordinate the disaster operations for the state group
- To report regularly to the state group about disaster recovery operations
• To ensure, as far as reasonably practicable, that any strategic decisions of the state group about disaster recovery operations are implemented
• To provide strategic advice on disaster recovery operations to government agencies performing disaster recovery operations.

At the local level, the Council’s Local Recovery Group has appointed the Director of Community and Client Services, Mackay Regional Council as the Local Recovery Coordinator with responsibility for coordinating recovery of the Mackay region, in conjunction with various state and local agencies, following a disaster event.

The Local Recovery Group will aim to:
• Ensure accurate and timely assessments of damage and recovery needs
• Ensure essential infrastructure and essential services are returned to normal operations as soon as possible
• Facilitate provision of welfare and assistance to residents and visitors in a fair and equitable manner that assists them to assist themselves
• Encourage the business community to resume trading as soon as possible by implementing business continuity plans
• Facilitate the rehabilitation of the environment wherever possible
• Identify opportunities during recovery to enhance the sustainability, safety and resilience of the community
• Align local recovery planning and arrangements with the State Plans and Recovery Guidelines.

The Local Recovery Group will organise its approach to recovery into four interdependent components:
• Human and social recovery
• Infrastructure recovery
• Economic recovery
• Environmental recovery.

18.1 Recovery Sub plan

The Recovery Sub Plan provides a framework for the coordination of recovery operations within the local government area and is supported by the procedures outlined in the Queensland Recovery Guidelines.

18.1.1 Scope

The Recovery Sub Plan is a whole of region Sub plan outlining the arrangements for the coordination of recovery operations.

This recovery plan has been developed to:
• Include all functions of recovery
• Define broad parameters for the effective coordination of recovery operations within the local government area
• Identify constraints to the coordination of recovery operations within the local government area
• Provisions for hazard or event specific recovery planning.
## 19. DEFINITIONS AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC</td>
<td>Australian Broadcasting Corporation</td>
</tr>
<tr>
<td>AHD</td>
<td>Above Height Datum</td>
</tr>
<tr>
<td>BoM</td>
<td>Australian Bureau of Meteorology</td>
</tr>
<tr>
<td>Cr</td>
<td>Councillor</td>
</tr>
<tr>
<td>Council</td>
<td>Mackay Regional Council</td>
</tr>
<tr>
<td>DDC</td>
<td>District Disaster Coordinator</td>
</tr>
<tr>
<td>DDCCC</td>
<td>District Disaster Coordination Centre</td>
</tr>
<tr>
<td>DDMG</td>
<td>District Disaster Management Group</td>
</tr>
<tr>
<td>DDMP</td>
<td>District Disaster Management Plan</td>
</tr>
<tr>
<td>DES</td>
<td>Department of Environment and Science</td>
</tr>
<tr>
<td>DoE</td>
<td>Department of Education</td>
</tr>
<tr>
<td>DNRME</td>
<td>Department of Natural Resources, Mines and Energy</td>
</tr>
<tr>
<td>Disaster Management (DM)</td>
<td>The arrangements for managing adverse effects of an event</td>
</tr>
<tr>
<td>Disaster Recovery Operations</td>
<td>Restoring and Rebuilding capacity following a disaster</td>
</tr>
<tr>
<td>DRFA</td>
<td>Disaster Recovery Funding Arrangements</td>
</tr>
<tr>
<td>DCDSS</td>
<td>Department of Communities, Disability Services and Senior’s</td>
</tr>
<tr>
<td>DTMR</td>
<td>Department Transport and Main Roads</td>
</tr>
<tr>
<td>EA</td>
<td>Emergency Alert</td>
</tr>
<tr>
<td>EMAF</td>
<td>Emergency Management Assurance Framework</td>
</tr>
<tr>
<td>IGEM</td>
<td>Inspector General Emergency Management</td>
</tr>
<tr>
<td>LDC</td>
<td>Local Disaster Coordinator</td>
</tr>
<tr>
<td>LDCC</td>
<td>Local Disaster Coordination Centre</td>
</tr>
<tr>
<td>LDMG</td>
<td>Local Disaster Management Group</td>
</tr>
<tr>
<td>LDMP</td>
<td>Local Disaster Management Plan</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Area</td>
</tr>
<tr>
<td>LRC</td>
<td>Local Recovery Coordinator</td>
</tr>
<tr>
<td>LRG</td>
<td>Local Recovery Group</td>
</tr>
<tr>
<td>MRC</td>
<td>Mackay Regional Council</td>
</tr>
<tr>
<td>MSQ</td>
<td>Marine Safety Queensland</td>
</tr>
<tr>
<td>PRRR</td>
<td>Prevention, Preparedness, Response and Recovery</td>
</tr>
<tr>
<td>QAS</td>
<td>Queensland Ambulance Service</td>
</tr>
<tr>
<td>QDMA</td>
<td>Queensland Disaster Management Arrangements</td>
</tr>
<tr>
<td>QDMC</td>
<td>Queensland Disaster Management Committee</td>
</tr>
<tr>
<td>QDMTF</td>
<td>Queensland Disaster Management Training Framework</td>
</tr>
<tr>
<td>QERMF</td>
<td>Queensland Emergency Risk Management Framework</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>QFES</td>
<td>Queensland Fire and Emergency Services</td>
</tr>
<tr>
<td>QLD</td>
<td>Queensland</td>
</tr>
<tr>
<td>QPS</td>
<td>Queensland Police Service</td>
</tr>
<tr>
<td>RSPCA</td>
<td>Royal Society for the Prevention of Cruelty to Animals</td>
</tr>
<tr>
<td>SDC</td>
<td>State Disaster Coordinator</td>
</tr>
<tr>
<td>SDRA</td>
<td>State Disaster Relief Arrangements</td>
</tr>
<tr>
<td>SDMP</td>
<td>State Disaster Management Plan</td>
</tr>
<tr>
<td>SES</td>
<td>State Emergency Service</td>
</tr>
<tr>
<td>SEWS</td>
<td>Standard Emergency Warning Signal</td>
</tr>
<tr>
<td>SITREP</td>
<td>Situation Report</td>
</tr>
<tr>
<td>SRC</td>
<td>State Recovery Coordinator</td>
</tr>
<tr>
<td>UHF</td>
<td>Ultra High Frequency</td>
</tr>
<tr>
<td>VHF</td>
<td>Very High Frequency</td>
</tr>
</tbody>
</table>
11.4. DEVELOPMENT SERVICES
11.4.1. DEVELOPMENT SERVICES MONTHLY REVIEW REPORT - JANUARY 2020

Author: Executive Assistant (Sarah Weston)
Responsible Officer: Director Development Services (Aletta Nugent)
File Number: Development Services Monthly Review Reports

Purpose
To provide Council with the Development Services Monthly Review for the period of 1 January to 31 January 2020.

Related Parties
Nil.

Corporate Plan Linkage
This Monthly Review links to various corporate objectives and strategies within the 2016-2021 Corporate Plan.

Background/Discussion
All directorates within MRC prepare a monthly review which identifies activities undertaken and progress made during the specific month.

Consultation and Communication
The report contains input from each program within Development Services.

Resource Implications
Nil.

Risk Management Implications
Nil.

Conclusion
Council is kept informed of activities within the Development Services directorate.

Officer's Recommendation
THAT the Development Services Monthly Review for the period of 1 January to 31 January 2020 be received.

Council Resolution ORD-2020-44
THAT the Officer's Recommendation be adopted.

Cr Mann queried the scheduled completion of the industrial land study.

The CEO advised that the tender has just been released and should be awarded in March with a completion in June or July.

Cr Mann queried the Italian Street Party and asked if Council was looking at funding outside the normal process.

The CEO deferred the question to the Director Development Services, Aletta Nugent.

The Director advised that the Italian Street Party is a City Centre project which is not funded through Invest Mackay.

Cr Williamson asked the Director to provide further information on its funding.

Cr Walker asked the extent of the Digital Infrastructure Study which is to be carried out by Aurecon as appointed by the Greater Whitsunday Alliance (GW3).

Cr Williamson advised that the digital infrastructure is about the community's ability to meet the demands of the next level of digital connection. A report would be presented to Council.

Cr Casey noted the development assessment time frames are well within range.

Cr May queried how the Mackay City Centre survey was progressing.

The CEO advised that he had met with the Mackay Chamber of Commerce this week to gain an understanding of their plans. He advised that the Chamber plan to establish a reference group of key businesses to use as a sounding board for initial survey responses and from that strategies will be determined.

Cr May asked what role Council would take.

The CEO advised that the Reference Group would like key Council staff to attend to explain Council's plans around infrastructure and other matters.

Cr Walker raised the Facade Improvement Scheme relaunch and asked if there were any major changes in it.

The CEO deferred the question to the Director Development Services, Aletta Nugent.

The Director advised that there were some minor changes and the outcome of the briefing would be recirculated to Councillors.

Cr Bonaventura noted there was a billboard going up at Bakers Creek and queried who was funding that and if there would also be a local media campaign.

Cr Williamson deferred the question to the Director Development Services, Aletta Nugent.

The Director advised that the billboard is being moved from another location to a site considered to be more visible. She advised there are other marketing activities planned.

**THAT the Officer's Recommendation be adopted.**
Moved Cr Englert

Cr Englert noted the application for additional residential lots at Plantation Palms Estate, that Mackay Tourism and the MECC are working together on shared actions identified in the Mackay Region Event Strategy 2020. Cr Englert noted that projects were on target.

Cr Englert recommended to any future Council that the Mountain Bike Strategy is a worthy endeavour to pursue.

Cr May noted that the Sarina Sugar Shed is featuring at the Australian Tourism Awards in March. She congratulated staff and wished them well at the Awards.

CARRIED
Executive Summary

DEVELOPMENT SERVICES

The rain in late December and January has resulted in the need for an increase in mowing and other park maintenance activities. The upcoming months will be busy for Council’s Parks crews, but every effort will be made to maintain acceptable levels of service to the community.

Another important milestone was achieved for the Mackay Waterfront project in January, with Council endorsing the Mackay Waterfront Master Plan. The Master Plan sets out the public realm vision and concepts for the Mackay Waterfront over the next 20 years, incorporating the community’s feedback and previous investigations completed by Council.

The Mackay Natural Environment Centre Nursery has been busy planning and propagating plants in preparation for the return of the Free Plant Giveaway program in 2020. The next free plant giveaway will occur in February.

A preliminary draft of the Camping Analysis being undertaken by consultant EarthCheck was received by Council in January. A briefing was held on the status of the project on 20 January, and officers are now providing feedback and additional information to the consultant to progress the analysis.

Invitations have been issued for the first Regional Mountain Bike Alliance meeting, to be held in February 2020. The Alliance will act as a key reference and coordination group supporting the delivery of Council’s Mountain Bike Strategy.

Aletta Nugent
Director Development Services

The MNEC nursery supplied local native plants for the Australia Day Citizenship Ceremony
Updates on Significant Developments Currently Being Assessed by Council

APPLICATION LODGED

DA-2020-5
L3 Production Drive PAGET

The application proposes the development of an industrial workshop, washdown bay and ancillary office building on a newly created lot in ‘Production Park’. The development will facilitate the relocation and expansion of an existing commercial and industrial cleaning business already operating within Paget.

APPLICATION LODGED

OW-2019-29
L975 Eimeo Road RURAL VIEW

The application is for Operational Works - Civil Works for Plantation Palms Estate Stage 5A1 & 5A2, which consists of 47 residential lots. Approved works to be carried out onsite include roadworks, drainage works, stormwater, earthworks, water and sewerage infrastructure, landscaping and signage.

APPLICATION APPROVED

DA-2019-31
28 Kay Court MOUNT PLEASANT

The approval allows for the development of a new car sales showroom within an existing outdoor sales premises in the Kay Court sales precinct. The new building will provide a showroom for the sale of Suzuki and MG vehicles and replaces an existing sales office in the same location.
Monthly Safety Review

Summary

Four incidents were reported involving MRC employees and contractors, including one lost time injury.

The following injuries to MRC employees were reported in January:

- Needlestick injury whilst placing a needle into sharps container.
- Ankle injury whilst alighting from a vehicle (lost time injury).

The following near miss incident was reported in January:

- The toolbox door on the tray of a vehicle failed, resulting in containers of paint falling from a vehicle and spilling onto the road.

The following asset damage incident was reported in January:

- While whipper snipping along a concrete path, a rock flicked up and smashed a glass door.

Each incident is investigated, and appropriate corrective measures implemented to reduce future risks.

For the 2019-20 year, three lost time injuries have been recorded:

- While standing up from a crouching position an employee felt severe back pain. Three days were lost as the worker recovered.
- While alighting from mobile plant an employee suffered a shoulder strain. Eight days have been lost in December and 14 in January while they recover.
- An employee suffered an ankle injury whilst alighting from a vehicle. Thirteen days have been lost in January as they recover.

Incidents and Injuries

Lost Time Injuries & Days Lost

<table>
<thead>
<tr>
<th>Department</th>
<th>2015-16</th>
<th>2016-17</th>
<th>2017-18</th>
<th>2018-19</th>
<th>2019-20</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LTI</td>
<td>Days Lost</td>
<td>LTI</td>
<td>Days Lost</td>
<td>LTI</td>
</tr>
<tr>
<td>Development Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development Assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parks, Environment &amp;</td>
<td>3</td>
<td>29</td>
<td>3</td>
<td>55</td>
<td>1</td>
</tr>
<tr>
<td>Sustainability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic Planning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic Development &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tourism</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development Services</td>
<td>3</td>
<td>29</td>
<td>3</td>
<td>55</td>
<td>1</td>
</tr>
</tbody>
</table>
Financial Report

The Development Services Management budget is on track with the negative variance arising from unused leave continuing to decrease. The Parks, Environment and Sustainability program budget is also tracking well.

A number of new material change of use applications received in late December/January has resulted in the Development Assessment program budget showing a positive variance at the end of January. The Development Engineering budget remains in surplus, with the original budget for survey plan endorsement fees already exceeded. This result in both the Development Assessment and Development Engineering budgets reflects the continuing improvement in development activity in the Region and the number of new lots being brought online.

The Strategic Planning budget continues to show a positive variance resulting from staff vacancies and some key projects being soon to commence. Expenditure for the Economic Development and Tourism program is slightly below budget projections for this month of the financial year, resulting in a positive budget variance.

<table>
<thead>
<tr>
<th>Operating Results</th>
<th>YTD budget</th>
<th>YTD actual</th>
<th>Variance</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Services Management</td>
<td>254,718</td>
<td>258,893</td>
<td>4,175</td>
<td></td>
</tr>
<tr>
<td>Strategic Planning</td>
<td>1,174,573</td>
<td>1,089,231</td>
<td>(85,342)</td>
<td></td>
</tr>
<tr>
<td>Development Assessment</td>
<td>(21,256)</td>
<td>(50,546)</td>
<td>(29,290)</td>
<td></td>
</tr>
<tr>
<td>Development Engineering</td>
<td>97,223</td>
<td>(260,759)</td>
<td>(357,982)</td>
<td></td>
</tr>
<tr>
<td>Economic Development &amp; Tourism</td>
<td>1,064,741</td>
<td>907,462</td>
<td>(157,279)</td>
<td></td>
</tr>
<tr>
<td>Parks, Environment &amp; Sustainability</td>
<td>9,241,245</td>
<td>9,083,590</td>
<td>(157,655)</td>
<td></td>
</tr>
<tr>
<td>TOTAL OPERATIONAL</td>
<td>11,811,244</td>
<td>11,027,870</td>
<td>(783,374)</td>
<td></td>
</tr>
</tbody>
</table>

Legend
- YTD Variance favourable of budget
- YTD Variance unfavourable, between 0% and 5% of YTD Budget
- YTD Variance unfavourable, more than 5% of YTD Budget

Operating Results
Review of Operations

DEVELOPMENT ASSESSMENT

Volume of Operations

Material Change of Use
Reconfiguration of a Lot
Concurrence Agency Referrals
Change Applications
Negotiated Decisions

Cumulative Number of Approved Development Assessment Applications

Development Assessment Performance Against Legislative Timeframes

<table>
<thead>
<tr>
<th>Application</th>
<th>Status</th>
<th>% Decided</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCU Code (85% in 35 Days)</td>
<td>●</td>
<td>100% decided in 35 days.</td>
</tr>
<tr>
<td>MCU Impact (50% in 35 Days)</td>
<td>●</td>
<td>0 to be decided in January.</td>
</tr>
<tr>
<td>ROL (85% in 35 Days)</td>
<td>●</td>
<td>100% decided in 35 days.</td>
</tr>
<tr>
<td>Concurrence Agency (85% in 10 Days)</td>
<td>●</td>
<td>100% decided in 10 days.</td>
</tr>
</tbody>
</table>
Development Services Monthly Review January 2020

DEVELOPMENT ENGINEERING

Volume of Operations

- Operational Works
  - 15 Under Assessment
  - 3 New
  - 4 Completed

- Operational Works - Construction Phase
  - 3 Under Assessment

- Subdivision Plans
  - 10 Under Assessment

- Minor Works Permits
  - 9 Under Assessment

- Signage Applications
  - 17 Under Assessment
  - 23 New

- Change Applications
  - 5 Under Assessment
  - 0 Completed

Cumulative Value of Approved Operational Works

No new Operational Works Applications were received for the month of January.
Four Operational Works applications were approved in January with a total value of works of $2,981,993

Development Engineering Performance Against Legislative Timeframes

<table>
<thead>
<tr>
<th>Application</th>
<th>Status</th>
<th>% Decided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Works (85% in &lt;20 Days)</td>
<td></td>
<td>80% decided in 20 days. One application took 26 days to approve over the Christmas period.</td>
</tr>
<tr>
<td>Signage Applications (85% in &lt;20 Days)</td>
<td></td>
<td>0 to be decided in January.</td>
</tr>
<tr>
<td>Operational Works (85% in 35 Days)</td>
<td></td>
<td>100% decided in 35 days.</td>
</tr>
<tr>
<td>Plan Sealing (85% decided in 20 days without action notice)</td>
<td></td>
<td>100% decided in 20 days without Action Notice.</td>
</tr>
</tbody>
</table>
### Regional and Local Area Planning

<table>
<thead>
<tr>
<th>Projects</th>
<th>Status</th>
<th>Description / Update of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarina Town Centre Revitalisation Study</td>
<td>•</td>
<td>The technical reports to support the development of a business case for the Sarina Town Centre have been completed. Council will continue to liaise with the State about including the project in future planning.</td>
</tr>
<tr>
<td>Mackay Region Industrial Land Provision Study</td>
<td>•</td>
<td>The long term study to consider development and infrastructure options for industry investigation precincts in the Mackay Region Planning Scheme will be ongoing in 2020. The investigations for the Glenella and Sarina industry investigation precincts are being completed in 2020. Council approved the preparation of an independent report on the current and future industrial land supply in November 2019. The report is scheduled for completion in 2020.</td>
</tr>
<tr>
<td>Mackay Waterfront Priority Development Area (PDA)</td>
<td>•</td>
<td>Council endorsed the Mackay Waterfront Master Plan on 22 January 2020. The master plan has been developed in conjunction with community and industry feedback and will assist council and will guide the development of the Mackay Waterfront. The master plan document is available to view and download on council’s <a href="#">Connecting Mackay website</a>. Council is currently prioritising preliminary design efforts on the Riverside Precinct. Infrastructure investigations are continuing and most projects under the Queensland Government Maturing the Infrastructure Pipeline program are now complete. Council has recently drafted a marketing plan for the Mackay Waterfront to better understand key economic development and investment attraction opportunities for the PDA. Actions from this plan are being considered for implementation in the coming months.</td>
</tr>
<tr>
<td>Mackay Region Planning Scheme - Planning Scheme Policy (PSP) review</td>
<td>•</td>
<td>Council adopted the proposed amendments to the Mackay Region Planning Scheme 2017 (planning scheme) under major amendment 1 (RV Grounds) and administrative amendment 6 (supporting major amendment 1 and Planning Scheme Policy (PSP) administrative Amendment 1) at the Ordinary Meeting on 11 December 2019. Major amendment 1 and administrative amendment 6 will commence on 3 February 2020 as version 3.0 of the planning scheme. Version 3.0 of the planning scheme and User guides relating to Self-contained recreation vehicle grounds are available to view on Council’s website. In addition, an initial review of PSP content is progressing through a governance process by relevant programs for the following PSPs: - Water supply and sewerage design PSP’s (to be replaced by CTM code) - Stormwater drainage design PSP - Landscape design PSP - Open Space PSP</td>
</tr>
<tr>
<td>Mackay Region Planning Scheme - Amendments (Major Amendment 1 and Administrative Amendment 6)</td>
<td>•</td>
<td>Council adopted the proposed amendments to the Mackay Region Planning Scheme 2017 (planning scheme) under major amendment 1 (RV Grounds) and administrative amendment 6 (supporting major amendment 1 and Planning Scheme Policy (PSP) administrative Amendment 1) at the Ordinary Meeting on 11 December 2019. Major amendment 1 and administrative amendment 6 will commence on 3 February 2020 as version 3.0 of the planning scheme. Version 3.0 of the planning scheme and User guides relating to Self-contained recreation vehicle grounds are available to view on Council’s website. In addition, an initial review of PSP content is progressing through a governance process by relevant programs for the following PSPs: - Water supply and sewerage design PSP’s (to be replaced by CTM code) - Stormwater drainage design PSP - Landscape design PSP - Open Space PSP</td>
</tr>
</tbody>
</table>
This review will be on-going with the view of undertaking PSP amendments in accordance with the Minister’s Guidelines and Rules amendment process in the second half of 2020.

**Mirani Master Plan**

The draft Master Plan for the Mirani Community Precinct and associated Pre-Feasibility Report have been completed. Council is reviewing the way forward on operational and design options for this precinct. A funding application to progress the masterplan and designs have been submitted. A Community Reference Group briefing is scheduled for February.

**Transport & Infrastructure Planning**

<table>
<thead>
<tr>
<th>Projects</th>
<th>Status</th>
<th>Description / Update of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth Allocation Model</td>
<td></td>
<td>The Growth Allocation Model allocates and maps future urban growth over a 20-year projection period based on growth scenarios. The model was updated in 2018 based on the published Queensland Government Population Projections, and will be reviewed in 2020. Lead and lag statistics are monitored to measure projections against actual population movements.</td>
</tr>
<tr>
<td>Mackay Region Transport Strategy</td>
<td></td>
<td>Following initial consultation with key stakeholder groups, drafting of the early components of the document has commenced.</td>
</tr>
<tr>
<td>Transport Modelling</td>
<td></td>
<td>Further transport modelling will be considered as part of preparing the Mackay Region Transport Strategy.</td>
</tr>
</tbody>
</table>

**Waterways**

<table>
<thead>
<tr>
<th>Projects</th>
<th>Status</th>
<th>Description / Update of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mackay Region Coastal and Inland Flood Hazard Adaptation Strategy (CIFHAS)</td>
<td></td>
<td>The current project stage to finalise the hazard assessments is progressing. Supporting GIS analysis are being finalised. The project will be on-going in 2020.</td>
</tr>
<tr>
<td>Mackay Floodplain Management Plan</td>
<td></td>
<td>A draft Flood Study has been completed and includes the identified and tested mitigation options. A technical peer review of the modelling used to inform the study have been completed and the third party review of the study recommendations is being considered.</td>
</tr>
<tr>
<td>Flood Studies for Tropical Cyclone Debbie affected communities</td>
<td></td>
<td>Draft flood studies prepared for the Sandy Creek, Rocky Dam Creek and Funnel Creek catchments are complete with community engagement finalised in December. A report to Council has been prepared for February 2020.</td>
</tr>
</tbody>
</table>
| Flood Intelligence Plan                                             |        | Project planning has commenced for the Mackay Flood and Stormwater Management Strategy’s Flood Intelligence Plan. The project includes:  
  - a strategic review of flood data, population and assets at risk;  
  - future stakeholder engagement with emergency management, Queensland Fire and Emergency Services, Bureau of Meteorology, Queensland Reconstruction Authority and other providers of services in flood emergencies;  
  - plans and actions to improve the management of flood emergencies such as local disaster management plans and community education.  
  The project will be completed by September 2020. This project has received funding from the Australian and Queensland Governments through the Far North and North Queensland Monsoon Trough Flexible Funding Grants Round One. |
Natural Environment Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Status</th>
<th>Description / Update of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free plant giveaway</td>
<td></td>
<td>Planning and propagating occurred in January ready for the return of the Free Plant Giveaway in February 2020.</td>
</tr>
<tr>
<td>Litter audit</td>
<td></td>
<td>Staff participated in a litter audit of the Gross Pollutant Traps in the Mackay CBD. This project will help identify the main sources of litter, to inform reduction strategies.</td>
</tr>
<tr>
<td>Gordon White Library gardens revitalisation</td>
<td></td>
<td>Work continued on the Gordon White Library gardens revitalisation project in January. Garden beds in the public area have been completed, including planting, mulching and irrigation. Signage will be installed soon and work will commence on the gardens around the staff car park.</td>
</tr>
<tr>
<td>Citizen Ceremony</td>
<td></td>
<td>The Mackay Natural Environment Centre Nursery supplied local native plants for the citizenship ceremony held on Australia Day.</td>
</tr>
</tbody>
</table>

Capital Works Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Status</th>
<th>Description / Update of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Play</td>
<td></td>
<td>Orders for the equipment, identified as needing priority replacement, have been issued. Ongoing replacement of smaller items of equipment, in playgrounds throughout the region, will continue to occur as it is received over the coming months. Approximately 75% of items identified as needing replacement have been completed to date.</td>
</tr>
<tr>
<td>Queens Park Revitalisation</td>
<td></td>
<td>Queens Park Revitalisation is an $8.86 million legacy upgrade project of Mackay’s historic Queens Park and works are now underway as part of Severe Tropical Cyclone Debbie recovery efforts. This revitalisation project will reinvigorate the park to reflect its iconic position in Mackay and turn it into a modern urban parkland. The project will involve park lighting to improve safety, renovation of existing cricket change rooms, new amenities adjacent to the adventure playground, improved car park facilities, protection and enhancement of Arboretum and Palmetum gardens, a yarning circle, a dog off leash park and additional picnic shelters, barbeques and seating. To date, Queens Park nursery has been moved to the Botanic Gardens and demolition of redundant structures completed. Works on storm water, new footpaths and electrical installation are currently well advanced. Construction of road network is in progress. Crusade Developments are in full construction mode in Queens Park with site establishment completed and construction commenced.</td>
</tr>
</tbody>
</table>
Irrigation works are under construction with the under-boring completed. Orchid House is now closed to the public and the Collection has been moved off site to the Botanic Gardens Nursery.

Planning for installation of effluent disposal Enviro System at Koumala amenities has been completed. Contractor has been engaged and installation works have been programmed for February.

A requirement for more in depth geotechnical surveying was highlighted during the surveying process which is expected to be available soon. Design work is expected to be completed mid-February. Construction due to start early May.

<table>
<thead>
<tr>
<th>Project</th>
<th>Status</th>
<th>Description / Update of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Entrance Sign</td>
<td>✔️</td>
<td>Solar up lights being investigated.</td>
</tr>
<tr>
<td>Desilting trial project</td>
<td>✔️</td>
<td>Desilting trial is in full swing with the aim to find a solution to create a usable product out of the silt which needs to be removed from the Lagoons at the Botanic Gardens. 8 sediment pits are in use; 4 under tarp to create an anaerobic mix and 4 open to the air for an aerobic mix. The silt samples, which have been removed from the Lagoons and placed in the sediment pits, have been mixed with varying ratios of organic matter and lime. Contractors have been to test leachate this month but got no usable data as the leachate sample was too small. Better results and a larger sample size will be attainable once heavier rain has occurred.</td>
</tr>
</tbody>
</table>
Requests for Maintenance Work

Results of Customer Survey (November / December 2019)

<table>
<thead>
<tr>
<th>Attitude of staff receiving request</th>
<th>Attitude of staff attending request</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage</strong></td>
<td><strong>Percentage</strong></td>
</tr>
<tr>
<td>Very Good</td>
<td>Very Good</td>
</tr>
<tr>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Very Poor</td>
<td>Very Poor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Satisfaction Level</th>
<th>Satisfaction Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Good</td>
<td>Very Good</td>
</tr>
<tr>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Very Poor</td>
<td>Very Poor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time taken to address request</th>
<th>Appearance of completed work</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage</strong></td>
<td><strong>Percentage</strong></td>
</tr>
<tr>
<td>Very Good</td>
<td>Very Good</td>
</tr>
<tr>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Fair</td>
<td>Fair</td>
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<tr>
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<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>Very Good</td>
<td>Very Good</td>
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<tr>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Very Poor</td>
<td>Very Poor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree work addresses request</th>
<th>Overall satisfaction with response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage</strong></td>
<td><strong>Percentage</strong></td>
</tr>
<tr>
<td>Very Good</td>
<td>Very Good</td>
</tr>
<tr>
<td>Good</td>
<td>Good</td>
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<tr>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>Poor</td>
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<tr>
<td>Fair</td>
<td>Fair</td>
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<tr>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Very Poor</td>
<td>Very Poor</td>
</tr>
</tbody>
</table>

Representative Comments

- Excellent
- As this occurred over the Christmas period I was very happy this job was seen to so quickly.
- Very neat and tidy
- 10/10
- Your staff went to a lot of trouble to tidy up after the job.
- Nothing has been completed.
- This is exceptionally poor – no action, no attempt to contact me at all.
- This was in relation to attending to apparently dying trees during drought. It should have been addressed earlier. Even if council officers deemed action unnecessary they should have been polite enough to explain.
- A skilled efficient work gang. Well done to all.
- I am very pleased with the job well done.

Trends

Overall rating trends

---

Page 13
**Events and Tourism**

Raise awareness of the Mackay region as a tourism destination, increasing the destination appeal, extended and return visitation

<table>
<thead>
<tr>
<th>Business Priority</th>
<th>Status</th>
<th>Update of Project</th>
</tr>
</thead>
</table>
| Attract events which bring economic benefit to the Mackay region | | Regional Events Strategy  
Economic Development will work closely with Mackay Tourism and MECC and Events on progressing shared actions identified in the Mackay Region Event Strategy 2020-2025. An implementation assistance meeting has been scheduled with the consultant Luminair for early-February to discuss the implementation of the Mackay Region Events Strategy 2020-2025. Internal meetings have also commenced to discuss the roll out of the 5-year action plan including delivery timeframes, measures and targets, which will be completed in collaboration with key stakeholders in the events and tourism industry.  
Invest Mackay Events and Conference Attraction Program  
Events / conferences held in January:  
No supported events were held in the month of January.  
Events / conferences approved in January:  
Seven new events and conference were approved through the program in January:  
- Grasstree Beach Motorbike Races  
- Confidential Event x 4  
- 2020 Mackay Marina Run  
- 2020 North Australia Championships |
| Identify new tourism experiences and business opportunities in conjunction with Mackay Tourism Ltd and existing tourism providers. | | Camping Analysis  
The Economic Development Program has appointed consultant EarthCheck to undertake the Mackay Region Camping Analysis. The purpose of this project is to establish a framework to guide the investment and development of Council’s camping facilities and to investigate future development opportunities for camping and recreational facilities at the three Sunwater operated dams. Council has been updated on the progress of this project on 20 January 2020 where first draft recommendations were proposed. The expected project completion date will be June/July 2020 to allow for further research and stakeholder engagement.  
Sarina Sugar Shed Business Review  
The Business Review of the Sarina Sugar Shed is currently underway and will review longer term manufacturing, marketing, and tourism opportunities and associated business models to support the facility to maximise its market potential and operational efficiency. The draft analysis is due for completion in February 2020.  
Strategy Implementation  
Economic Development will work closely with MTL on progressing shared actions identified in the Mackay Region Event Strategy 2020-2025 and Mackay Region Economic Development Strategy 2020-2025. |
| Promotion of the Mackay Region tourism brand | | Recreational Fishing  
The Economic Development Program continues to work with Mackay Tourism Ltd on opportunities to promote the Mackay Region. Economic Development has been working closely with Mackay Tourism Ltd on a campaign for visiting friends and relatives (VFR) and the development of a Business Case for a locally developed fishing event and marketing campaign. |
### Industry Development and Support
To facilitate collaboration and growth opportunities within and across industry sectors including resources, agriculture, health and tourism.

<table>
<thead>
<tr>
<th>Business Priority</th>
<th>Status</th>
<th>Update of Project</th>
</tr>
</thead>
</table>
| Maintain strong partnerships through communication networks with key industry and regional development stakeholders |  | Queensland Mining and Engineering Exhibition (QME)  
Initial meetings have been held with the Resource Industry Network (RIN), REED Exhibitions, AusIndustry, Trade and Investment Queensland and Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) to determine opportunities for regional collaboration for QME. The exhibition will be held from 21-23 July 2020 at the Mackay Showgrounds. |
| Identify and support delivery of industry sector priorities |  | Resource Centre of Excellence  
The tender for construction of the Resource Centre of Excellence was awarded to Fergus in early September and construction commenced in October. Economic Development is assisting the Capital Works Program with the ongoing stakeholder engagement. The completed Resource Centre of Excellence will be a key feature on the QME 2020 program with significant interest from industry to tour the facility. |
|  |  | Economic Development Strategy 2020-2025  
The Mackay Region Economic Development Strategy 2020-2025 was adopted by Council on 27 November. The adopted Strategy was printed for distribution to all stakeholders and interested parties.  
Economic Development will work closely with partners to progress shared actions identified in the Mackay Region Economic Development Strategy 2020-2025. |
|  |  | Greater Whitsunday Food Network  
Economic Development is assisting the Network in the delivery of the Regional Agritourism Development Project. The GWFN has appointed a Project Officer to coordinate and deliver the identified initiatives, with Economic Development providing ongoing support throughout the project. |
|  |  | Finch Hatton Art Trail  
Economic Development is assisting the Finch Hatton Progress Association to progress their ‘Finch Hatton Art Trail’ concept. The concept was undertaken by the Progress Association and provides a high-level concept focused on public realm upgrades in Finch Hatton to showcase local art and highlight the natural beauty of the Pioneer Valley. Economic Development is working with the Progress Association assisting with approval processes and funding sources for their Finch Hatton town entry art installation project. |
|  |  | Digital Infrastructure Study  
Greater Whitsunday Alliance (GW3) appointed Aurecon to conduct a Digital Infrastructure Study in the Mackay, Isaac and Whitsunday region. A draft report was submitted to the steering committee in January and the Economic Development Program will provide feedback. |
| Support industry sectors to access international markets in accordance with industry sector profile priorities. |  | MIW METS Export Hub  
The Economic Development Program is represented on the Project Advisory Group for the MIW METS Export Hub project. The tender for the Capability Mapping and Supply Chain Analysis is expected to be announced in early February 2020. The Export Hub Manager is working with Council, Trade and Investment Queensland and the Department of State Development, Manufacturing, Infrastructure and Planning, to coordinate an Export Ready Program for METS businesses to commence in March 2020. It is anticipated the program will culminate in a trade mission to Expomin 2020 in Santiago. |
Study Greater Whitsunday
Study Queensland is coordinating state-wide workshops over the next few months with the meeting for the Greater Whitsunday region to be held on 4 March 2020. The breakfast session will explore the skills and talent international students can bring to regional businesses and how they can fill skills gaps in regional Queensland. This will be followed by a strategy development workshop with study cluster members.

**Investment Attraction and Growth**
To attract new businesses, facilitate investment and support existing businesses to realise growth opportunities

<table>
<thead>
<tr>
<th>Business Priority</th>
<th>Status</th>
<th>Update of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support and facilitate investment in emerging industries and opportunities for diversification</td>
<td></td>
<td>Split Spaces Mackay Economic Development has provided funding support to MackHack which will be held on 6-8 March 2020. It is a weekend-long event where participants come together to solve mining and METS industry challenges.</td>
</tr>
</tbody>
</table>
| Support business growth and investment opportunities through the implementation of strategies such as the Mountain Bike Strategy, Recreational Fishing Strategy and Recreational Vehicle attraction. |  | Recreational Fishing Strategy Economic Development, in conjunction with Mackay Tourism, continues to deliver the ‘Hooked on Mackay’ marketing campaign which supports the promotion and awareness of the Mackay Region as a world-class fishing destination. Recent initiatives include:  
  - Ongoing promotion through Hooked on Mackay Facebook page including recently added fishing tips, share your catch to win and planning your next fishing trip advice.  
  - Economic Development is in the process of planning the annual Net Free Zone Fishing Forum to be held in Mackay in November 2020. The forum brings representatives from the Brisbane, Rockhampton and Cairns regions. |
| Proactive targeting and attracting business to the Mackay region. |  | Facilitating Development in Mackay Region Policy An overview of current applications under the Policy is as follows:  
  - Six Expression of Interest (EOI) applications are currently under assessment. All EoIs are on-hold until their development applications have progressed.  
  - Seven applications have progressed through the Expression of Interest assessment stage; however, Stage 2 applications have not yet been submitted.  
  - Two Stage 2 applications are currently under assessment.  
  |
### Liveability

To support and promote a vibrant, sustainable and affordable community which encourages people to live, work and play in the Mackay region.

<table>
<thead>
<tr>
<th>Business Priority</th>
<th>Status</th>
<th>Update of Project</th>
</tr>
</thead>
</table>
| Activate regional localities to achieve social, economic and environmental potential |  | **Activate My Place (AMP) Program**  
Promotion and launch of Round 2 of the AMP program to occur in early 2020 with assessment of applications and approval of funding to be undertaken by the newly elected Council in April 2020.  
AMP! guidelines have been reviewed with consideration given to refining scope and removing the funding limit. The launch of the round will occur on 10 February. |
| Activate Mackay City Centre |  | **Mackay Pride Façade Improvement Scheme**  
Expressions of interest opened on 11 July 2019 and are currently being assessed as received. Four applications have been funded in 19/20, with two applications approved with works to be completed. Economic Development is assisting a further 2 businesses with application submissions.  
The Economic Development Program completed a review of the scheme including proposed amendments which were supported by Council for implementation. Economic Development has finalised the amended scheme guidelines and a relaunch of the scheme will occur in early February. |
| Promote the Mackay Region |  | **Gold Coast Suns AFLW Match**  
Economic Development and Corporate Communications and Marketing is working closely with Gold Coast Suns and Harrup Park in preparation for the AFLW match being held on Friday March 6, 2020. |

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**Mackay Region Economic Snapshot** was published in November.
In addition to the broadcast game, the planned schedule of activities to celebrate the team's inaugural season includes a corporate tour of Mackay by Club Partners and Sponsors, as well as the International Women’s Day lunch featuring GC Suns CEO as guest speaker. Marketing has commenced to promote the free event.

Support for tertiary education

Economic Development continues to work with Central Queensland University and James Cook University as required. Current engagement with the tertiary education sector is focused on opportunities for the Resource Centre of Excellence, Study Greater Whitsunday projects and Economic Development Strategy 2020-2025.

Sarina Sugar Shed
To manage and operate a sustainable tourism facility, which provides a range of tourism products and experiences to promote the region’s heritage

<table>
<thead>
<tr>
<th>Strategy / Project</th>
<th>Status</th>
<th>Description / Update of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate a successful tourism facility which meets its performance targets</td>
<td>✔️</td>
<td>The January school holidays delivered steady visitation to Sarina Sugar Shed, with the facility being a popular holiday activity. There was an expected drop in retail sales following the pre-Christmas peak. Recruitment is currently underway for a casual Visitor Experience Officer and a Sarina Sugar Shed Coordinator.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Business Operations (excluding accruals)</th>
<th>Item</th>
<th>January</th>
<th>YTD</th>
<th>Annual Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔️</td>
<td>Tour Visitation (Paid)</td>
<td>495</td>
<td>6,823</td>
<td>10,000</td>
</tr>
<tr>
<td>✔️</td>
<td>Visitation (Total)</td>
<td>758</td>
<td>8481</td>
<td>-</td>
</tr>
<tr>
<td>✔️</td>
<td>Volunteer Hours</td>
<td>238.75</td>
<td>1967.85</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>January</th>
<th>YTD</th>
<th>Annual Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔️</td>
<td>Ticket Sales</td>
<td>$13,756</td>
<td>$116,560</td>
</tr>
<tr>
<td>✔️</td>
<td>Retail Sales</td>
<td>$29,794</td>
<td>$245,777</td>
</tr>
<tr>
<td>✔️</td>
<td>Total Income (incl. Ticket income)</td>
<td>$43,550</td>
<td>$319,740</td>
</tr>
<tr>
<td>✔️</td>
<td>Total Expenses</td>
<td>$59,682</td>
<td>$453,251</td>
</tr>
</tbody>
</table>

Economic Indicators (Quarterly)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Jun 19</th>
<th>Mar 19</th>
<th>Dec 18</th>
<th>Sep 18</th>
<th>Jun 18</th>
<th>Mar 18</th>
<th>Dec 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployment rate**</td>
<td>5.80%</td>
<td>4.4%</td>
<td>3.9%</td>
<td>3.7%</td>
<td>3.8%</td>
<td>4.3%</td>
<td>5%</td>
</tr>
<tr>
<td>Employed persons</td>
<td>56,751</td>
<td>62,527</td>
<td>65,291</td>
<td>66,678</td>
<td>65,790</td>
<td>65,359</td>
<td>64,288</td>
</tr>
<tr>
<td>Real Estate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median house sale</td>
<td>$340,000</td>
<td>$330,000</td>
<td>$343,000</td>
<td>$340,000</td>
<td>$342,000</td>
<td>$340,000</td>
<td>$330,000</td>
</tr>
<tr>
<td>Res vacancy rate</td>
<td>1.5%</td>
<td>2.9%</td>
<td>1.7%</td>
<td>0.9%</td>
<td>1.9%</td>
<td>3.6%</td>
<td>3%</td>
</tr>
<tr>
<td>Residential Lot Supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lots Approved</td>
<td>275</td>
<td>287</td>
<td>297</td>
<td>433⁺</td>
<td>128</td>
<td>27</td>
<td>51</td>
</tr>
</tbody>
</table>

Page | 18
Lots Endorsed

<table>
<thead>
<tr>
<th>Lots Endorsed</th>
<th>83</th>
<th>45</th>
<th>52</th>
<th>125a</th>
<th>74</th>
<th>46</th>
<th>27</th>
</tr>
</thead>
</table>

*Data relates to the Mackay Local Government Area and is updated on a quarterly basis as it is received by Council. There is often a 3-6 month lag from the receipt of data for a previous quarter.

*aChange in calculation method adopted from this reporting period.

**Figure undergoing further review.

<table>
<thead>
<tr>
<th><strong>e-Statistics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subscribers</strong></td>
</tr>
<tr>
<td>January</td>
</tr>
<tr>
<td>City Centre Business Network</td>
</tr>
<tr>
<td>City Centre Facebook Likes</td>
</tr>
<tr>
<td>City Centre Instagram Followers</td>
</tr>
<tr>
<td>City Centre Wi-Fi Sessions</td>
</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>

*Testing of the Sarina Field of Dreams Wi-Fi is being undertaken by the contractor to test for outages and signal strength of the service to investigate reasons for a decrease in users and number of sessions.

**UPCOMING EVENTS**

<table>
<thead>
<tr>
<th><strong>Date</strong></th>
<th><strong>Event</strong></th>
<th><strong>Location</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>21 and 22 February 17 and 18 April 26 and 27 June 21 and 22 August 16 and 17 October</td>
<td>Free native plant giveaway</td>
<td>MNEC</td>
</tr>
<tr>
<td>6 February</td>
<td>Heritage Awards</td>
<td>Jubilee Community Centre Foyer</td>
</tr>
<tr>
<td>7 February</td>
<td>PCL Guided Night Walk</td>
<td>MRBG</td>
</tr>
<tr>
<td>8 February</td>
<td>PCL and CVA walk at Slade Point Reserve for World Wetlands Week</td>
<td>Slade Point Reserve</td>
</tr>
<tr>
<td>13 February</td>
<td>Mirani Community Reference Group Briefing for the Mirani Heritage Precinct Masterplan</td>
<td>Mirani Board Room</td>
</tr>
<tr>
<td>Date</td>
<td>Event</td>
<td>Location</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>14-16 February</td>
<td>2020 Water polo QLD Country Championships – <em>Invest Mackay Funded</em></td>
<td>Mackay ARC</td>
</tr>
<tr>
<td>23-25 February</td>
<td>Catchment Solutions - Project Catalyst (Sugar Cane Growers) – <em>Invest Mackay Funded</em></td>
<td>MECC</td>
</tr>
<tr>
<td>24-26 February</td>
<td>Box Office and Marketing Network Conference (Stage Queensland) – <em>Invest Mackay Funded</em></td>
<td>MECC</td>
</tr>
<tr>
<td>28 February</td>
<td>Mackay Airport Twilight City Run <em>Sponsored by MCC</em></td>
<td>Mackay City Centre</td>
</tr>
<tr>
<td>6 March</td>
<td>AFLW - Gold Coast Suns Vs Geelong – <em>Invest Mackay Funded</em></td>
<td>Great Barrier Reef</td>
</tr>
<tr>
<td>1-3 May</td>
<td>2020 Rotary District 9550/9750 &quot;Emerge&quot; Conference – <em>Invest Mackay Funded</em></td>
<td>MECC</td>
</tr>
<tr>
<td>1-4 May</td>
<td>2020 Great Barrier Reef Arena Bash for Cash – <em>Invest Mackay Funded</em></td>
<td>Great Barrier Reef</td>
</tr>
<tr>
<td>7-10 May</td>
<td>2020 School Sports QLD AFL Championships (boys and girls 13-15 year old) – <em>Invest Mackay Funded</em></td>
<td>Great Barrier Reef</td>
</tr>
<tr>
<td>9 May</td>
<td>Zach Mach Adventure Challenge – <em>Invest Mackay Funded</em></td>
<td>Pinnacle</td>
</tr>
<tr>
<td>15-17 May</td>
<td>2020 Fox Superflow Seal by Stan Series (Mountain Bike Event) – <em>Invest Mackay Funded</em></td>
<td>Rowallan Park, Farleigh</td>
</tr>
<tr>
<td>18-20 May</td>
<td>Central Queensland Principals Conference – <em>Invest Mackay Funded</em></td>
<td>MECC</td>
</tr>
<tr>
<td>23 May</td>
<td>Mackay Italian Street Party- <em>Sponsored by MCC</em></td>
<td>Mackay City Centre</td>
</tr>
<tr>
<td>26-29 May</td>
<td>2020 Association of School Business Administrators Queensland (ASBAQ) Conference – <em>Invest Mackay Funded</em></td>
<td>MECC</td>
</tr>
<tr>
<td>30 May</td>
<td>Botanic Gardens Open Day and Botanic Endeavour 250 Celebrations</td>
<td>MRBG</td>
</tr>
<tr>
<td>4-7 June</td>
<td>2020 School Sports QLD AFL Championships (boys and girls 10-12 year old)</td>
<td>Great Barrier Reef</td>
</tr>
<tr>
<td>7 June</td>
<td>Mackay Marina Run - <em>Invest Mackay Funded</em></td>
<td>Mackay Marina</td>
</tr>
<tr>
<td>11-12 July</td>
<td>MAD Mountain Bike Mackay Cup – <em>Invest Mackay Funded</em></td>
<td>Rowallan Park, Farleigh</td>
</tr>
<tr>
<td>25 July</td>
<td>Mackay Scottish Bluewater Fling - <em>Sponsored by MCC</em></td>
<td>Bluewater Quay</td>
</tr>
<tr>
<td>1-2 August</td>
<td>2020 Rowing Qld North Qld Schools Championship Regatta – <em>Invest Mackay Funded</em></td>
<td>Mackay Rowing Club</td>
</tr>
<tr>
<td>28-29 August</td>
<td>NQ Rock’N Country – <em>Invest Mackay Funded</em></td>
<td>Mackay Showgrounds</td>
</tr>
<tr>
<td>8-11 September</td>
<td>2020 Bowen Basin Symposium – <em>Invest Mackay Funded</em></td>
<td>MECC</td>
</tr>
<tr>
<td>13 September</td>
<td>Motorcycle Beach Races at Grasstree Beach – <em>Invest Mackay Funded</em></td>
<td>Grasstree Beach</td>
</tr>
<tr>
<td>19 and 20 September</td>
<td>Orchid Extravaganza</td>
<td>Queens Park</td>
</tr>
<tr>
<td>21 – 26 September</td>
<td>Etnies Rumble on the Reef (Skateboarding) – <em>Invest Mackay Funded</em></td>
<td>Sugar Bowl Skate Park</td>
</tr>
</tbody>
</table>
11.4.2. TROPICAL CYCLONE DEBBIE FLOOD STUDIES – SANDY CREEK, ROCKY DAM CREEK AND FUNNEL CREEK

Author
Principal Engineer - Waterways (Robyn Birkett)

Responsible Officer
Director Development Services (Aletta Nugent)

File Number
SPSW-022

Attachments
1. Sandy Creek Catchment Flood Study (AECO M, 2020) [11.4.2.1 - 263 pages]
2. Rocky Dam Creek Catchment Flood Study (AECO M, 2020) [11.4.2.2 - 120 pages]
3. Submissions on Draft Flood Studies [11.4.2.3 - 5 pages]

Purpose
To adopt the Tropical Cyclone (TC) Debbie Flood Studies for Sandy Creek and Rocky Dam Creek catchments and progress the acquisition of improved terrain data (lidar and survey) for the Funnel Creek catchment prior to the adoption of the Funnel Creek Flood Study report.

Related Parties
Community and land owners within the study area and key stakeholders including:
• Queensland Reconstruction Authority (50% project funding)
• Progress & Community Associations
• Department of Transport and Main Roads (Bruce Highway, Peak Downs Highway, Sarina Range)
• Queensland Rail (Koumala)
• SunWater Ltd (Kinchant Dam)

Corporate Plan Linkage
Priority: Community Health & Wellbeing
Strategy: Disaster preparedness - Build community preparedness and responsiveness to emergencies and natural disasters.

Priority: Infrastructure and Transport
Strategy: Drainage Networks - Maintain and improve council’s drainage networks by delivering priority drainage capital works; and by developing more efficient delivery mechanisms.

Background/Discussion
Council has prepared draft flood studies for the Sandy Creek, Rocky Dam Creek and Funnel Creek catchments. The flood studies were prepared for Council by engineering consultants AECOM with funding assistance provided from the Australian and Queensland Governments through the 2017-2018 Natural Disaster Resilience Program (NDRP).

Several communities in the catchments were significantly impacted by flooding from the TC Debbie event in March 2017. The flood studies were prepared to understand the flood risk and improve planning, emergency management and disaster preparedness in the catchment.

The local community and key stakeholders have a valuable role to play in the development, implementation and success of a flood study. The community provided information on the flooding from the TC Debbie event during the community survey from March to June 2019. In some cases, the flooding was reported as being the worst flooding experienced in residents’ living memory. Residents provided a variety of information including rainfall
data, photos, videos and flood flow direction and depth. The information provided by residents was used to calibrate and validate the models used in the flood study.

The models developed for each catchment include:
- a hydrologic model to estimate the discharges into the river and its tributaries during the course of a flood; and
- a hydraulic model to simulate the passage of water through the catchment.

The flood studies were prepared using existing terrain data which included lidar for the Sandy Creek and Rocky Dam Creek catchments and Shuttle Radar Topography Mission (SRTM) for the Funnel Creek catchment. For the Sandy Creek and Rocky Dam creek studies, a two-dimensional TUFLOW hydraulic model based on lidar was developed to simulate flood hydraulics. The TUFLOW models were then used to define the design flood extents and patterns, with validation of the model to the TC Debbie.

For the Sandy Creek catchment, overall, the results of the model validation were inconclusive. Only 11 of the 29 surveyed points provided modelled results within 300mm of recorded levels. Modelled results did not match surveyed levels between Eton (including Drapers Siding) and the North Coast Rail line (upstream of the Bruce Highway). Although the available rainfall data provided coverage of the catchment, there is still significant distances and spatial variance between rainfall stations. This prevented localised intense bursts of rainfall within the catchment from being captured. The lack of detailed rainfall data was an issue in each catchment.

Following model calibration, design events were determined to understand the flooding that can be expected to occur. The events assessed in the flood studies include:
- Very frequent – 1 exceedance per year (EY) (63% Annual Exceedance Probability (AEP))
- Frequent - 39% (1 in 2) AEP, 18% (1 in 5) AEP
- Rare - 2% (1 in 50) AEP, 1% (1 in 100) AEP
- Very Rare - 0.5% (1 in 200) AEP and 0.2% (1 in 500) AEP
- Extreme – Probable Maximum Flood (PMF)
- Climate change – projected year 2100 1% and 0.2% AEPs

The TC Debbie rainfall (based on ARR methodology) was found to be greater than:
- a 0.2% (1 in 500) AEP design event for the Sandy Creek
- a 0.2% (1 in 500) AEP design event for Rocky Dam Creek
- a 0.5% (1 in 200) AEP design rainfall event for Funnel Creek

This indicates that the TC Debbie event was a very rare event.

A sensitivity analysis was undertaken on the Rocky Dam Creek catchment parameters that are subject to the greatest uncertainty – stream roughness and catchment roughness. Increasing the roughness by 20% did not significantly change the flood extents for the 1% AEP rainfall event. For the Sandy Creek catchment, increasing the Manning’s roughness values by +/- 20% had negligible flood extent increase/decrease.

In some parts of the Sandy Creek catchment, such as Drapers Siding, the hydraulic model could not match the flood levels experienced during the TC Debbie event. Increasing the roughness of the catchment and blockage of structures could not replicate the flooding experienced at Drapers Siding suggesting that an intense localised rain event occurred in the catchment. There are now two automatic rainfall gauging stations in the catchment (Antoneys crossing on Kinchant Dam Road and at Eton) to improve the capture of rainfall and improve calibration and validation of the flood models in the future.

Updated terrain data should be obtained prior to updating the new hydraulic models developed as part of these studies in the future. The current ground level data (from the 2009 lidar) is questionable in some areas and is mostly greater than 10 years old. Acquisition of new lidar for each catchment is expected to cost between $30,000 to $50,000 if acquired with assistance from the Queensland Government (through Department of Natural Resources, Mines and Energy) or around $90,000 if acquired independently. Note that the Sarina Range
area is not currently covered by lidar and would be a priority in considering the requirements of the next acquisition.

It is suggested that improved calibration and terrain data be procured over the next 5 years to improve the flood models. The flood models for Sandy Creek and Rocky Dam Creek however provide a good basis for an assessment of flood risk in the catchment. It is recommended that the flood study findings be adopted for use in Council’s flood hazard and emergency management systems to improve the understanding of flooding in the catchment.

Community input into the flood study was valuable and the flood studies provides a better understanding of the flood risk in the catchment.

Consultation and Communication

Consultation on the draft flood studies was undertaken from 14 November to 18 December. Key stakeholders were consulted during the preparation of flood studies and information sessions on the draft flood studies were held at North Eton, Koumala, Sarina Range and Mackay.

Two submissions were received on the draft flood studies from Sunwater and the Urban Development Institute of Australia (UDIA) Mackay Whitsunday Branch. A copy of the submissions is attached (Attachment 3). The UDIA was concerned about the terrain data used in the flood studies and recommended that the lidar and structures be ‘groundtruthed’ and incorporated into the base models prior to adoption. The Sunwater submission provided technical comments.

At the information session for the Sandy Creek Flood Study, a couple of residents were particularly concerned about the flooding at Antoneys crossing on Kinchant Dam Road and asked about the status of an upgrade. Antoneys crossing was investigated in 2014 and there are currently no plans for a future upgrade. It is recommended that when additional information becomes available from the rainfall and river height gauge at Antoneys crossing that an upgrade be re-assessed as a growing number of residents are likely to be isolated each year and in a rare storm event, such as Cyclone Debbie, isolated for more than 12 days.

The community members present at the consultation for the Funnel Creek Flood Study raised the most concerns at the information sessions. This was due to the inaccuracy of the terrain data. The terrain data from this flood study was from shuttle radar and can be out by 30 m horizontally. Residents at the information session in Sarina Range were concerned about the implications of the flood hazard mapping on their properties; particularly relating to insurance. In some instances, the mapping shows dwellings being impacted by the flooding in the Cyclone Debbie event which were not and it would appear that this relates to the ground levels being out spatially by up to 30 m. It is clear that in some locations, the flood hazard areas do not follow the creek lines. Due to the inaccuracy of the terrain data, it is recommended that the Funnel Creek Flood Study remain in draft form until more accurate ground level data is obtained as it is not appropriate for property level flood assessment.

A response will be provided to the submitters outlining the outcome of the consideration of their feedback. A response will also be provided to information session attendees on the outcomes from this report.

Resource Implications

The implementation of recommended activities will be undertaken according to priority, in line with available funding as allocated via the annual operational and capital budgeting processes. Business cases will be prepared for improved terrain data (lidar and survey) and new gauge stations for rainfall and river height data for consideration as part of Council’s normal budget prioritisation process. New lidar for each catchment is expected to cost around $30,000 to $90,000 depending on if the data is collected in partnership with the Queensland Government or undertaken independently.

Risk Management Implications
Approving the flood studies for Sandy Creek and Rocky Dam Creek will provide improved knowledge of flooding in the area. The risk of not endorsing the flood studies are:

- land owners and investors in the catchments are unaware of the flood risks.
- assets are constructed in the floodplain and subject to unnecessary damage from flooding which could render the assets un-insurable.

The risks of endorsing the flood studies are sufficiently mitigated through the following measures:

- the studies are fit for purpose using the best available information at the time and limitations and exclusions are documented in the flood studies.
- flood assessments for a specific project in the catchment (e.g., new roads or development) will be further investigated by proponents and decisions made on the models based on the specific project needs.
- the acquisition of improved terrain data (lidar and survey) and rainfall and river height data will be considered to further improve the flood studies over time.

Due to the issues with the inaccuracy of the terrain data in the Funnel Creek flood study, the risk management measure is for the study to remain in draft form until improved terrain data (lidar and survey) is acquired to re-run the hydraulic flood model. The draft flood study is not to be used for property flood hazard assessments.

**Conclusion**

The flood studies for Sandy Creek and Rocky Dam Creek are suitable for adoption and provide good flood hazard information. The flood studies are suitable for inclusion in the Mackay Region Planning Scheme and for use by other key stakeholders interested in flooding in these catchments.

Due to the inaccuracies of the terrain data at Funnel Creek, it is recommended that more accurate terrain data (lidar and survey) be obtained and the flood study updated prior to adoption. Obtaining this information relies on additional budget and it is recommended that this data be procured following the preparation of a business case and approval through the annual operational budgeting processes.

**Officer's Recommendation**

THAT Council adopt the flood studies for the Sandy Creek and Rocky Dam Creek catchments as shown in Attachments 1 and 2.

AND THAT Council commence the preparation of an amendment to the Mackay Region Planning Scheme 2017 to incorporate the adopted flood study hazards from the Sandy Creek and Rocky Dam Creek catchments.

AND THAT Council endorse the following actions to conclude the flood studies:

- the adopted flood studies be provided to key stakeholders such as the Department of Main Roads, Sunwater and Queensland Rail.
- the adopted flood study data be used in Council’s flood hazard and emergency management systems and provided to the Insurance Council of Australia.
- improved terrain data (lidar and survey) be acquired for the Funnel Creek catchment prior to finalising the flood study.
- new rainfall and river height gauges in the Funnel Creek and Rocky Dam Creek catchments be pursued in line with available funding as allocated via the annual operational and capital budgeting processes.
- Council respond to submissions made on the draft flood studies outlining how the submitters’ comments have been addressed and to attendees of previous information sessions on the outcomes of this report.

**Council Resolution ORD-2020-45**
THAT the Officer’s Recommendation be adopted.

Moved Cr Casey Seconded Cr Paton

Cr Casey congratulated the staff on the enormous amount of work which went into the study and report.

Cr Bonaventura noted the areas which were seriously impacted by flooding during Cyclone Debbie and thanked residents for providing feedback, information and photographs. Cr Bonaventura noted this information would provide good flood hazard information for Council, the Local Disaster Management Group (LDMG) and other key stakeholders.

Cr Camm acknowledged and passed on through the Director, her congratulations to Council’s Principal Engineer Robyn Birkett on her leadership and acknowledged the professionalism of Robyn and her team during their work with community and other stakeholders.

Cr Paton noted that most flood studies are based on urban areas so it was pleasing to see this study based on rural areas.

Cr Englert spoke of his personal experience during the flood event at Drapers Siding. He congratulated the Emergency Management team for their excellent work.

Cr Williamson expressed his congratulations on the presentation of the report and also congratulated Robyn Birkett and her team.

CARRIED
Quality Information

Document       Sandy Creek Catchment
Ref              M051-19
Date            21-Jan-2020
Prepared by     Hayden Brigg
Reviewed by     Trevor Corney / Wes Bailey

Revision History

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Explanatory Notes and Disclaimer

This report is to be viewed in conjunction with the mapping in the Sandy Creek Catchment – Tropical Cyclone Debbie Flood Study Volume 2 Report (AECOM, 2019).

Maps in this report have been developed to represent local catchment flood behaviour in the Sandy Creek area, particularly around the residential areas.

Information presented in this mapping may vary, depending upon development within the floodplain over time. It is suggested that the TUFLOW model and these associated maps be updated by Mackay Regional Council as development occurs.

The development of the TUFLOW hydraulic model is detailed in this report outlining input data, modelling assumptions and schematisation parameters adopted.

All information presented in tables and mapping is expressed in meters Australian Height Datum (AHD).

Hydraulic model results used in this report and associated mapping have been based on an 8-metre fixed Cartesian grid hydraulic model. Use of the mapping to determine hydraulic parameters in sub-grid scale applications is not recommended.

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Executive Summary

AECOM Australia Pty Ltd (AECOM) has been commissioned by the Mackay Regional Council (MRC) to conduct a flood study for the Sandy Creek catchment affected by Tropical Cyclone Debbie in March 2017.

Sandy Creek flows through the localities of Eton, Drapers Siding, Homebush and Chelona before flowing into Sandringham Bay (the Coral Sea) at Dunnrock approximately 15km to the south of the Pioneer River mouth at Mackay. Kinchant Dam is located in the upper headwaters of the catchment. Water is pumped from the Pioneer River into Kinchant Dam, which is distributed throughout the catchment via an extensive network of canals to irrigate the cane farms.

The main objectives of the Sandy Creek Catchment Flood Study are:

- To assess the flood flows and water elevations in the catchment for a range of events including the Tropical Cyclone (TC) Debbie event;
- Estimation of the probability of the TC Debbie rainfall compared with design rainfall events using AR&R methodology;
- Provide recommendations regarding non-structural flood mitigation options, to improve resilience within the study area;
- Liaison with community recovery officers and residents regarding 2017 TC Debbie flood elevations and use the information to assist in model calibration.

The drainage network of Sandy Creek and its major tributaries (Sandy Creek North Branch, Stony Creek, Oaky Creek, Ross Creek, Frenchmans Creek and B.L. Creek) has a total catchment area of 485 km² that extends from the Pioneer River near Mia Mia to the Coral Sea near McEwens Beach. The majority of the catchment consists of cane farms with remnant vegetation located only on topographically steep areas around the catchment boundary, and riparian corridors along the waterways.

In its lower reaches, Sandy Creek consists of a well-defined main channel that is about 40m wide and 5m deep. The channel meanders across a well-defined lower terrace floodplain that sits some 5m to 10m below the upper floodplain. Several remnant channels exist across the lower terrace suggesting that Sandy Creek is highly mobile and prone to lateral erosion. In the lower reaches, the main channel of Sandy Creek is tidal, with the lower terrace floodplain generally above the highest astronomical tide except along the more recent remnant channels.

In order to assess the existing flood behaviour within the Sandy Creek catchment, regional hydrologic models were utilised. Previous projects have warranted the creation of hydrologic models, which, over time have been developed to satisfy the technical requirements of the relevant project phase and investigation locations. An existing URBS hydrologic model was developed by SunWater, covering the Sandy Creek, Bakers Creek and Alligator Creek catchments as part of their dam failure impact assessment. The model was developed to derive the design flood hydrology for Kinchant Dam for flood events ranging from the 1EY to the Probable Maximum Flood (PMF).

A two-dimensional TUFLOW hydraulic model based on LiDAR topographic data was developed to simulate flood hydraulics within the study area. The purpose of the assessment was to define the design flood extents and patterns within the Sandy Creek catchment, with validation of the model to the Tropical Cyclone Debbie event that occurred in March 2017.

The floods associated with Cyclone Debbie (28-30 March 2017) were some of the most devastating on record at several locations through the Mackay Region. Some residents reported the flooding as being the worst flooding experienced in residents’ living memory.

The local communities were consulted during the data collection phase of the Sandy Creek study, using an on-line survey on the community engagement website “Connecting Mackay” and at workshops held at locations throughout the catchments in May 2019. Within the Sandy Creek catchment, the consultation was held on 19th May at the North Eton CWA Hall. The workshops were attended by Council officers from Strategic Planning, Emergency Management, Community Lifestyle and Community Engagement, AECOM and a representative from the Queensland Health Disaster Recovery team.
The engagement involved discussions with residents about where they witnessed flooding, the timing and length of the inundation and flooding depth. A large map (3.6m by 5m) of the Sandy Creek catchment was provided for an overview of the catchment boundary and streams and to identify points of interest where they identified flooding. Notes were written on the map identifying flow direction and key flood elevations observed by the community to assist in the validation of the TC Debbie flood model. Surveyed elevations, photos and anecdotal information from the consultation was provided by MRC.

A number of rainfall gauges across the catchment were operational during the TC Debbie rainfall event. These stations captured 3-day rainfall totals (27-30th March 2017) in excess of 600mm at the Greenmount Alert, Homebush TM and Marian Weir Alert. Comparison of the recorded rainfall to design IFD parameters indicated that the peak rainfall intensity occurring during the TC Debbie rainfall event, based on the data available, had an intensity greater than the 1% AEP design event at a number of stations. Further assessment into the rainfall data found that high intensity rainfall occurred on the 29th March 2017 at these stations that was not matched in other areas of the catchment suggesting that intense storms may have been localised.

The updated URBS model developed as part of this study was further calibrated to the Tropical Cyclone Debbie event (March 2017) as this was deemed the only significant rainfall event within the catchment post 2008. Overall the modelled flows provided a reasonable fit to gauged flows for the rising limb of the peak flow hydrograph. The URBS model produced a slightly higher peak than that of gauged records, however this was deemed to be acceptable due to the inability to model complex floodplain interactions and storages within a hydrologic model.

Validation of the TUFLOW hydraulic model was undertaken by simulating the estimated TC Debbie runoff hydrographs through the model and comparing the results to anecdotal flooding information. Limited datasets were available to assist with validation, with surveyed points provided by Council based off debris marks and/or anecdotal information.

In general, the hydraulic simulation of the TC Debbie event in the Sandy Creek catchment did not match the recorded flood levels in two locations – at Drapers Siding upstream of the Peak Downs Highway and on Sandy Creek approximately 4 kilometres upstream of the Bruce Highway crossing. Significant sensitivity modelling of possible floodplain behaviour was undertaken by simulating:

- Changes to stream behaviour by increasing blockage factors to exceptional percentages (approximately 60 % for bridges and culverts) which are considered outside of the norms;
- Changes to floodplain behaviour by increasing hydraulic roughness factors above accepted values;
- Changes to hydraulic factors to simulate the possibility of cane being blown down thus allowing increased flows at higher elevations than would be if the cane was standing; and
- Increasing the rain intensities are certain locations to potentially mimic the recorded flood elevations.

None of the above simulations either individually or collectively generated flood behaviour that appropriately matched the recorded flood elevations.

It is to be noted that the areas where there are significant differences in modelled and recorded flood elevation there are no rain gauging stations. A hypothesis is that in the areas where the hydraulic simulation is significantly different to the recorded elevations, there was a very localised and intense rain burst that was significantly in excess of the recorded rainfalls.

Floodplain management principles were identified and discussed within the report. Non-structural flood mitigation measures relate to the management of current, potential and residual flood risks, whereas structural measures targets the partial or complete elimination of flood risk. Whilst sound floodplain management is preferably achieved through land use and development planning this is not always feasible where development has already occurred within the floodplain.
The key findings from the TUFLOW hydraulic modelling and associated analysis undertaken for the Sandy Creek Catchment – Tropical Cyclone Debbie Flood Study are summarised as:

- The 1080-minute (18 hour) storm was found to result in the critical duration storm utilised for simulation of the 63.2%, 39%, 18%, 2%, 1%, 0.5% and 0.2% AEP events.
- Cyclone Debbie rainfall within the catchment was found to be greater than a 1% AEP design rainfall event based on AR&R methodology.
- The community feedback and surveyed flood heights identified flooding within the township of Eton, Drapers Siding and Homebush during the Tropical Cyclone Debbie rainfall event. Some of which could be replicated in hydraulic modelling.
- The shortfalls of the TUFLOW hydraulic model validation infers that an intense localised rain event occurred over the catchment and was not captured by a rain gauge.
- LiDAR data quality with respect to the processing of cane fields and heavy vegetation is of concern and it is believed that modelled flow patterns have been influenced by LiDAR data quality.
- Floodplain management principles as well as mitigation options for the Sandy Creek catchment were identified for further investigation to reduce property flooding and build community resilience.
- Adjusting the roughness values by ±20% had negligible flooding extent increase with no additional breakouts occurred within the creeks and no additional houses were affected.
1.0 Introduction

1.1 Study Location

AECOM Australia Pty Ltd (AECOM) has been commissioned by the Mackay Regional Council (MRC) to conduct a flood study for the Sandy Creek catchment affected by Tropical Cyclone Debbie in March 2017. Sandy Creek flows through the localities of Eton, Drapers Siding, Homebush and Chelona before flowing into Sandringham Bay (the Coral Sea) at Dunnrock approximately 15km to the south of the Pioneer River mouth at Mackay.

Kinchant Dam is located in the upper headwaters of the catchment. Water is pumped from the Pioneer River into Kinchant Dam, which is distributed throughout the catchment via an extensive network of canals to irrigate the cane farms.

The Pioneer River Flood Study notes that during flood events greater than the 1% AEP event, floodwater from the Pioneer River overflows into Sandy Creek near Marian.

Sandy Creek crosses a number of major transport networks within the catchment including:

- Marian – Eton Road near North Eton (Sandy Creek North Branch).
- Mirani – Eton Road near Brightly.
- Peak Downs Highway near Eton.
- Eton – Homebush Road near Homebush.
- North Coast Rail Line (QR) upstream of the Bruce Highway near Chelona.
- Bruce Highway near Chelona.

There are also a number of local road and cane railway crossings within the catchment.

The report by the Chief Scientist on the Flooding in Sandy Creek catchment following Cyclone Debbie notes that during the three-day event accumulated rainfall totals exceeding 500mm were recorded. The report also notes that that extensive flooding was experienced by communities including North Eton, Drapers Siding, Homebush, Chelona, and Balberra.

Figure 1 shows the extents of the Sandy Creek Catchment as well as a locality map.
1.2 Study Objectives

The main objectives of the Sandy Creek Catchment Flood Study are:

- To assess the flood flows and water levels in the catchment for a range of events including the TC Debbie event;
- Estimation of the probability of the TC Debbie rainfall compared with design rainfall events using ARR methodology;
- Provide recommendations to improve planning, emergency management and disaster preparedness in the catchment.
- Liaison with community recovery officers and residents regarding 2017 TC Debbie flood levels and use the information to assist in model calibration.
- Inform potential flood impacts within the broader community – changing community understanding and expectations to enable a more resilient community;
- Undertake hydrologic and hydraulic modelling of the Sandy Creek catchment using the latest hydrologic / hydraulic methodologies and data inputs that have been revised through the 2019 release of Australian Rainfall and Runoff;
- Updates to the existing URBS model and updated hydrologic analysis to establish the hydrographs for the 39%, 18%, 2%, 1%, 0.5%, 0.2% AEP, Probable Maximum Flood (PMF) and 1% & 0.2% AEP events with year 2100 climate change scenario in accordance with Australian Rainfall and Runoff;
- Development of a new hydraulic model for the Sandy Creek floodplain using the TUFLOW modelling platform (GPU HPC);
- Prepare reporting and mapping.

1.3 Notes on Flood Frequency

The frequency of flood events is generally referred to in terms of their Annual Exceedance Probability (AEP) or Average Recurrence Interval (ARI). For example, for a flood magnitude having 5% AEP, there is a 5% probability that there will be floods of equal or greater magnitude each year. As another example, for a flood having 5 year ARI, there will be floods of equal or greater magnitude of once in 5 years on average.

The correspondence between the two terminologies is shown in Table 1 below.

Table 1 Flood Frequency Classification

<table>
<thead>
<tr>
<th>Annual Exceedance Probability (AEP) %</th>
<th>Average Recurrence Interval (ARI) Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1EY*</td>
<td>1</td>
</tr>
<tr>
<td>39</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>0.5</td>
<td>200</td>
</tr>
<tr>
<td>0.2</td>
<td>500</td>
</tr>
</tbody>
</table>

* EY – Exceedance per Year

In this report, the AEP terminology has been adopted to describe the frequency of flooding.
1.4 Limitations and Exclusions

The following limitations and exclusions apply to the Sandy Creek hydrologic and hydraulic modelling:

- Design flood events have been assessed for only two critical durations, based on an analysis of multiple durations for the 1% Annual Exceedance Probability (AEP) event.
- Aerial survey data (in the form of LiDAR) used to develop the topography for the hydraulic model has a vertical accuracy of ± 0.15 m on clear, hard surfaces and a horizontal accuracy of ± 0.45 m.
- Bathymetry of stream inverts was not available for the study. The invert of streams has been represented as enforced gully lines within the TUFLOW hydraulic model. Culvert inverts have been modified where required to align with the available topographical information.
- The hydrologic model has been validated to Cyclone Debbie flood events occurred in March 2017.
- The hydrologic and hydraulic modelling undertaken as part of the study have been based on methods and data outlined in Australian Rainfall and Runoff (AR&R) 2019. The 2019 revision has been adopted as per MRC's request.
- Any use which a third party makes of this document, or any reliance on or decision to be made based on it, is the responsibility of such third parties. AECOM accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this document.
- Where information has been supplied by the Client or other external sources, the information has been assumed correct and accurate unless stated otherwise. No responsibility is accepted by AECOM for incorrect or inaccurate information supplied by others.

Australian Rainfall and Runoff (AR&R) Revision Project 15 outlines several fundamental themes which are also particularly relevant:

- All models are coarse simplifications of very complex processes. No model can therefore be perfect, and no model can represent all the important processes accurately.
- Model accuracy and reliability will always be limited by the accuracy of the terrain and other input data.
- Model accuracy and reliability will always be limited by the reliability / uncertainty of the inflow data.
- A poorly constructed model can usually be calibrated to the observed data but will perform poorly in events both larger and smaller than the calibration data set.
- No model is 'correct' therefore the results require interpretation.
- A model developed for a specific purpose is probably unsuitable for another purpose without modification, adjustment, and recalibration. The responsibility must always remain with the modeller to determine whether the model is suitable for a given problem.
- Recognition that no two flood events behave in exactly the same manner.
- Design floods are a best estimate of an “average” flood for their probability of occurrence.

1.4.1 Interpretation of Results

The interpretation of results and other presentations in this report requires an appreciation of the limitations in accuracy, as noted above.

Unless otherwise stated, presentations in this report are based on peak values of water surface level, flow, depth and velocity. Using flood levels as an example, the peak level does not occur everywhere at the same time and, therefore, the values presented are based on taking the maximum value which occurred at each computational point in the model during the entire flood.

Hence, a presentation of peak levels does not represent an instantaneous point in time, but rather an envelope of the maximum values that occurred at each computational point over the duration of the flood event.
1.5 Report Structure

The Sandy Creek Catchment – Tropical Cyclone Debbie Flood Study Report has been split into 2 volumes:

- Volume 1 → Study methodology, results, findings and recommendations.
- Volume 2 → A3 GIS results mapping associated with the Volume 1 report.

The structure of this Volume 1 report is as follows:

- Section 2.0 describes the characteristics of the local catchments including typical land use, rainfall characteristics and a summary of the Tropical Cyclone Debbie rainfall event.
- Section 3.0 describes the data available for the development of the hydrologic and hydraulic models.
- Section 4.0 outlines the hydrologic assessment approach.
- Section 5.0 outlines the hydraulic modelling approach and presents the results of the modelling.
- Section 6.0 presents the data available and the results from the Tropical Cyclone Debbie investigation.
- Section 7.0 presents the baseline design flood depths, levels and extents for the study area.
- Section 8.0 presents the results of the investigation with the effects of climate change on discharges and modelled flood extents.
- Section 10.0 summarises the floodplain management principles and the mitigation strategy options development.
- Section 11.0 provides recommendations of non-structural mitigation measures.
- Section 12.0 provides recommendations of preliminary high-level structural mitigation options.
- Section 13.0 summarises the key finding of the study.
2.0 Catchment Characteristics

2.1 General
The contributing sub-catchments of the Sandy Creek network have been identified for the study area and are shown in Figure 2 (upper catchment) and Figure 3 (lower catchment). The main channel of Sandy Creek (refer Section 2.2) is the key focus of the study with a number of minor creeks joining into Sandy Creek along its length. These include the sub-catchments of B L Creek, Frenchmans Creek, Perry Creek, Rock Creek, Sandfly Creek, Solway Gully, Ross Creek, Drapers Creek, Cut Creek and Stony Creek.

Kinchant Dam is located within the catchment upstream of Sandy Creek North Branch and serves as an irrigation source to nearby cane farms through an extensive network of canals. Further information on Kinchant Dam is provided in Section 2.3.

Figure 2 Catchment Boundaries and Streamlines – Upper Catchment
2.2 Sandy Creek

Sandy Creek flows through the localities of Eton, Drapers Siding, Homebush and Chelona before flowing into Sandringham Bay (the Coral Sea) at Dunnrock approximately 15km to the south of the Pioneer River mouth at Mackay.

The drainage network of Sandy Creek and its major tributaries (Sandy Creek North Branch, Stony Creek, Oaky Creek, Ross Creek, Frenchmans Creek and B.L. Creek) has a total catchment area of 485 km² that extends from the Pioneer River near Mia Mia to the Coral Sea near McEwens Beach. The majority of the catchment consists of cane farms with remnant vegetation located only on topographically steep areas around the catchment boundary, and riparian corridors along the waterways.

Kinchant Dam is located in the upper headwaters of the catchment (refer Section 2.3). Water is pumped from the Pioneer River into the dam, which is distributed throughout the catchment via an extensive network of canals to irrigate the cane farms. During flood events greater than the 1% AEP event, floodwater from the Pioneer River overflows into Sandy Creek near Marian (WRM, 2011), downstream of Kinchant Dam.

In its lower reaches, Sandy Creek consists of a well-defined main channel that is about 40m wide and 5m deep. The channel meanders across a well-defined lower terrace floodplain that sits some 5m to 10m below the upper floodplain. Several remnant channels exist across the lower terrace suggesting that Sandy Creek is highly mobile and prone to lateral erosion.

In the lower reaches, the main channel of Sandy Creek is tidal, with the lower terrace floodplain generally above the highest astronomical tide except along the more recent remnant channels. Table 2 provides a summary of the wetland systems within the Sandy Creek catchment.
Table 2  Sandy Creek Catchment - Wetland Area by System (Department of Environment & Science, 2013)

<table>
<thead>
<tr>
<th>System</th>
<th>Area (km²)</th>
<th>% Wetlands Area</th>
<th>% Total Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificial and highly modified</td>
<td>11.9</td>
<td>38.4%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Estuarine</td>
<td>8.7</td>
<td>28.1%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Lacustrine</td>
<td>0.1</td>
<td>0.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Palustrine</td>
<td>1.2</td>
<td>3.8%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Riverine</td>
<td>9.1</td>
<td>29.4%</td>
<td>1.8%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>31.0</strong></td>
<td><strong>100%</strong></td>
<td><strong>6.2%</strong></td>
</tr>
</tbody>
</table>

2.3  Kinchant Dam

Kinchant Dam is located on a tributary of the North Branch of Sandy Creek, some 27km north-west upstream of the Bruce Highway crossing of Sandy Creek. The dam stores 56,400 ML with a surface area of 916ha at full supply level (57.21m AHD). The catchment area upstream of the dam is approximately 32km².

The dam is owned and operated by SunWater Limited and was constructed in two stages between 1974 and 1986. Kinchant Dam was constructed as a 5,325m long earth and rockfill dam with a reinforced concrete uncontrolled ogee crest spillway (58.21m AHD) (values sourced from the Kinchant Dam Failure Impact Assessment Report, Engeny 2018).

2.4  Rainfall Regime

The Mackay Aero (at Mackay Airport) rainfall station has the longest period of rainfall on record near the Sandy Creek Catchment with data recorded from May 1950. This rainfall station has an average annual rainfall total of 1544mm per year with the highest mean monthly rainfall of 338mm occurring in February. The highest and lowest annual rainfall totals recorded at the Mackay Airport are 3522mm (in 1958) and 710 mm (in 2001) indicating significant variation in annual rainfall from year to year.

The highest total monthly rainfall of 1287 mm was recorded in February 1958 and the highest daily total rainfall of 510mm was recorded on 12th January 1951. The following graph (Figure 4) shows the distribution of the mean monthly rainfall through the year at the Mackay Airport compared to 2017 records. Other rainfall stations within the catchment that captured the Tropical Cyclone Debbie event are described Section 3.4.1.

![Mackay Aero (033045) 2017 Rainfall (millimetres)](image-url)
2.5 Sugar Cane

Sugar Cane cultivation is a dominant feature of the floodplains within the catchment. The growth patterns and response of sugar cane to flooding presents a challenge for flood modelling. It is difficult to apply a single suitable roughness parameter to represent sugar cane due to the variability in potential plant maturity throughout the wet season. To ensure a consistent approach, a representative roughness was applied uniformly while sensitivity analysis was undertaken to account for potential variability in roughness throughout the growing season.

A depth varying Manning’s roughness was applied to the TUFLOW model (refer Section 5.4.3). This allowed to assign a smoother value to sugar cane crops as the flood levels rose above a particular threshold. As shown in Figure 5, sugar cane tends to lay over in the direction of flow and hence creates less resistance than standing cane in the direction of flow.

![Figure 5 Fully Matured Sugar Cane Laying Over After Flooding (Image supplied by MRC)](image-url)
3.0 Available Data

3.1 General
Data collation was undertaken to ensure that all parameters contributing to the hydrologic and hydraulic characteristics of the study area could be accounted for and to ensure that the modelled baseline conditions match observations of historical flood events.

Available data for the development of the baseline flood modelling consisted of:

- Previous flood reports and historical accounts of flooding in the locations of interest;
- Collections of rainfall and stream flow/gauge data for the validation of the hydrological and hydraulic models;
- Topographical data for the digital representation of the ground levels in the model area; and
- Cross drainage structure details for road and rail corridors to inform the hydraulic modelling.

A summary of the available data reviewed and applied to the study is provided below.

3.2 Previous Reports
There are a number of historical studies that have been closely reviewed to help inform various aspects of the hydrologic and hydraulic model updates. The key reports used for this study include:

- Mackay Floodplain Management Plan – Volume 1 Flood Study report (WRM, 2017);
- Bakers Creek Walkerston Flood Study (WRM, 2013);
- Kinchant Dam Failure Impact Assessment Report (Engeny for Sunwater limited, May 2018);
- The Cyclone Debbie Review – Inspector-General Emergency Management (Qld Government, October 2017);
- Cyclone Debbie Sonification Background Report – Monash Climate Change Communication Research Hub;
- Flooding in Sandy Creek Catchment, Mackay, following Tropical Cyclone Debbie, An independent Assessment (Qld Chief Scientist, June 2017);

A brief synopsis of these historical reports, and the relevant information gained from them is given in the following subsections.

Other reports of interest in the areas that have been referenced in previous studies include:

- Anthony’s Crossing – Review of Upgrade Options (Cardno);
- Sandy Creek Flood Study (WRM 2012);
- BL Creek Bridge Replacement (Cardno).
3.2.1 Bakers Creek / Walkerston Flood Study (WRM, 2013)
Mackay Regional Council (MRC) engaged WRM Water & Environment Pty Ltd (WRM) to prepare a flood study of Bakers Creek. The Bakers Creek catchment includes the township of Walkerston and Bakers Creek.

The purpose of the study was to develop hydrologic and hydraulic modelling tools to determine the flood risk along Bakers Creek through the township of Walkerston to assist MRC with land use planning and development assessments. Design flood discharges, flood levels and flood extents were determined for the 5 year, 50 year, 100 year, 200 year and 500 year Average Recurrence Interval (ARI) events, and the Probable Maximum Flood (PMF). The potential impacts of climate change on flooding along Bakers Creek based on Queensland Government (2010) recommendations were also assessed.

3.2.2 Kinchant Dam Failure Impact Assessment Report (Engeny for Sunwater limited, May 2018)
Engeny Water Management was commissioned by SunWater Limited to update the failure impact assessment (FIA) for Kinchant Dam. Kinchant Dam has been identified as a Category 2 Failure Impact Rating referable dam.

A range of different dam failure scenarios (breach locations and flood events) were investigated to determine the maximum incremental failure Population at Risk (PAR) for the dam. PAR for the Kinchant Dam failure impact zone was estimated using flood inundation mapping derived from the hydraulic modelling. Potential loss of life (PLL) estimates were developed for the dam failure scenarios using the PAR and flooding characteristics determined from the hydraulic modelling of the dam failure flows.

An URBS hydraulic model was developed for the entire Sandy Creek and Bakers Creek catchments. The URBS model structure was developed using CatchmentSIM.

3.2.3 The Cyclone Debbie Review – Inspector-General Emergency Management (Qld Government, October 2017)
This report was prepared by the Queensland Government regarding how the disaster management system as a whole responded to the Tropical Cyclone Debbie event. Issues that arose during the event were examined and analysed to consider improvement strategies for the future. The views of the community were sought after to inform future strategies that could improve the integration of government services and deliver safer and inclusive communities.

The report uncovered a series of lessons for the disaster management sector, which, if acted on, will likely deliver greater public value and confidence through trust and empowerment. The findings include timely public messaging, continued need of information sharing, fatigue management for sustained events, coordinated exercises to prepare for disaster events and improved business continuity planning across state agencies including tourism and communities.

3.2.4 Cyclone Debbie Sonification Background Report – Monash Climate Change Communication Research Hub
This report was completed by the Monash Climate Change Communication Research Hub, discussing the history and background of Cyclone Debbie and comparison to other cyclone events that have occurred within Australia.

3.2.5 Flooding in Sandy Creek Catchment, Mackay, following Tropical Cyclone Debbie, An independent Assessment (Qld Chief Scientist, June 2017)
This report was conducted by the Queensland Chief Scientist and delivered an investigation into the Cyclone Debbie rainfall and its impact to the Sandy Creek catchment. The trigger for the report was community raised concerns regarding the operations of the dam and potential contribution to the magnitude of flooding experienced at the time.

The Chief Scientist engaged with relevant parties including local communities to source information for the investigation. The report concluded that rainfall was the dominant source of flow in the catchment which experienced considerable flooding.
Kinchant Dam, whilst not designed as a flood mitigation dam did achieve some attenuation of peak flood flows from its catchment. However, given both the relatively small proportion of the overall catchment upstream of the dam and the timing and size of the peak dam outflows, it was concluded that early release from the dam would have had little or no significant impact on subsequent flooding, due to the very heavy rainfall experienced.

3.2.6 Tropical Cyclone Debbie Technical Report (Bureau of Meteorology, 2018)

This report prepared by the Bureau of Meteorology (BoM) collated information related to Cyclone Debbie. This information included cyclone tracking, rainfall depths, peak river levels and tide levels. This information was taken in consideration when developing the hydraulic TUFLOW model.

3.3 Community Consultation

The floods associated with Cyclone Debbie (28-29 March 2017) were some of the most devastating on record at several locations through the Mackay Region. Some residents reported the flooding as being the worst flooding experienced in residents’ living memory.

The local communities were consulted at the data collection phase using an on-line survey on the community engagement website “Connecting Mackay” and at workshops held at locations throughout the catchments in May 2019. Within the Sandy Creek catchment, the consultation was held on 19th May at the North Eton CWA Hall. The workshops were attended by Council officers from Strategic Planning, Emergency Management, Community Lifestyle and Community Engagement, AECOM and a representative from the Queensland Health Disaster Recovery team.

The engagement involved discussions with residents about where they witnessed flooding, the timing and length of the inundation and flooding depth. A large map (3.6m by 5m) of the Sandy Creek catchment was provided for an overview of the catchment boundary and streams and to identify points of interest where they identified flooding. Notes were written on the map identifying flow direction and key flood elevations observed by the community to assist in the validation of the TC Debbie flood model.

Surveyed elevations, photos and anecdotal information was provided by MRC and how the information provided aligns with the TC Debbie model in discussed in Section 6.4.

Flood studies were prepared for the communities to assess the flood flows and water levels in the catchments for a range of events including the TC Debbie event. The flood study will make recommendations to improve planning, emergency management and disaster preparedness in the catchments.

3.3.1 Community Feedback on Draft Study

Council undertook a community engagement event on the 30 November 2019 at the North Eton CWA Hall to provide the opportunity to discuss with residents the draft report on the study focusing on the TC Debbie event that occurred over the Sandy Creek catchment in March 2017. A small number of local residents attended the session.

While the lack of correlation between simulation and recorded heights from TC Debbie event was evident to the residents present at the session, their anecdotal recounts from the event aligned well with findings of the study. This included observations of approximately 300mm overtopping the Kinchant Dam spillway and flooding around Drapers Siding coming from the Perry Creek system to the east of the residential area, rather than Drapers Creek itself. The recounts aligned with the hypothesis that in the areas where the hydraulic simulation is significantly different to the recorded elevations, there was a very localised and intense rain burst that was significantly in excess of the nearby recorded rainfalls.

3.4 Rainfall Data

The historical and design rainfall data used as part of the Sandy Creek catchment study was sourced from the following locations.
3.4.1 Historical Rainfall Data

Historical rainfall data was made available by Mackay Regional Council, the Bureau of Meteorology (BOM) and the Department of Natural Resources and Mines’ (DNRM) Water Monitoring Portal (WMP). The information was supplied as daily rainfall totals or pluviograph data depending on the type of station. Figure 6 shows the location of each station with Table 3 outlining the station type as well as 3-day totals for the Tropical Cyclone Debbie event.

Figure 6 Rainfall Stations with 3 Day Accumulated Totals from Tropical Cyclone Debbie Event

The total rainfall from the DNRM gauge located at Homebush along Sandy Creek (126001A) was extracted from the Queensland Government Water Monitoring Information Portal for the Tropical Cyclone Debbie event (March 2017) and has been shown in Figure 7.

Figure 7 Rainfall at DNRM Gauge 126001A for Tropical Cyclone Debbie Event (March 2017)
Table 3  Rainfall Stations with 3 Day Accumulated Totals (9am 27 March 2017 to 9am 30 March 2017)

<table>
<thead>
<tr>
<th>Station Number</th>
<th>Station Name</th>
<th>Description</th>
<th>Total (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>533063</td>
<td>Bakers Creek Alert</td>
<td>RN/RV : Alert</td>
<td>495</td>
</tr>
<tr>
<td>533154</td>
<td>Boldon Mirani Rd TM</td>
<td>RN : Telemeter</td>
<td>687</td>
</tr>
<tr>
<td>533127</td>
<td>Brightley TM</td>
<td>RN : Telemeter</td>
<td>172*</td>
</tr>
<tr>
<td>533058</td>
<td>Greenmount Alert</td>
<td>RN : Alert</td>
<td>649</td>
</tr>
<tr>
<td>126001A</td>
<td>Homebush TM</td>
<td>RN/RV : Telemeter</td>
<td>787</td>
</tr>
<tr>
<td>533124</td>
<td>Kinchant Dam TM</td>
<td>RN/RV : Telemeter</td>
<td>583</td>
</tr>
<tr>
<td>533145</td>
<td>Marian Weir Alert</td>
<td>RN/RV : Alert</td>
<td>899</td>
</tr>
<tr>
<td>533119</td>
<td>Marian – Eton Rd TM</td>
<td>RN : Telemeter</td>
<td>147*</td>
</tr>
<tr>
<td>033302</td>
<td>Mirani Weir Alert</td>
<td>RN/RV : Alert</td>
<td>587</td>
</tr>
<tr>
<td>533139</td>
<td>Mt Vince East TM</td>
<td>RN : Telemeter</td>
<td>581</td>
</tr>
<tr>
<td>533112</td>
<td>Mt Vince West TM</td>
<td>RN : Telemeter</td>
<td>246*</td>
</tr>
<tr>
<td>533128</td>
<td>Munburra Rd TM</td>
<td>RN : Telemeter</td>
<td>404</td>
</tr>
<tr>
<td>033299</td>
<td>Sarich’s Alert</td>
<td>RN/RV : Alert</td>
<td>612</td>
</tr>
<tr>
<td>533142</td>
<td>Walkerston Alert</td>
<td>RN/RV : Alert</td>
<td>667</td>
</tr>
<tr>
<td>033301</td>
<td>Whiteford’s Alert</td>
<td>RN/RV : Alert</td>
<td>599</td>
</tr>
<tr>
<td>533026</td>
<td>Whiteford’s TM</td>
<td>RN/RV : Telemeter</td>
<td>615</td>
</tr>
</tbody>
</table>

The spatial and temporal variability of rainfall across the catchment is evident from the sourced recorded rainfall depths. Due to this variability and limited cover of rainfall gauges within the catchment, calibration of hydrologic & hydraulic models to the Tropical Cyclone Debbie rainfall event was found to be problematic, refer Section 6.4.

3.4.2  Design Rainfall Data

Design rainfall data was acquired from the Bureau of Meteorology’s (BOM) Intensity Frequency Duration (IFD) online tool (sourced 31/05/2019). Design rainfall depths and intensities have been discussed in Section 4.3.4.

3.5  Stream Gauging Data

A DNRM stream gauge has been installed along Sandy Creek at Homebush (Site 126001A) within the study area (21°16'59.8"S / 149°01'21.0"E). The associated rainfall gauge is located approximately 100m north of the low flow control weir. Figure 8 shows the low flow control weir and instrumentation at the site.
The stream discharge and water levels were extracted from the Queensland Government Water Monitoring Information Portal for the Tropical Cyclone Debbie event (March 2017) and have been shown in Figure 9.

The data extracted from this gauge location was utilised for the calibration/validation of the TC Debbie rainfall event in both the hydrologic and hydraulic models. This process is discussed in Sections 4.0 and 5.0 respectively.

The latest rating curve (sourced 16/10/19) for the gauging station is shown in Figure 10, historical gaugings have also been plotted against the curve. From the plot, it can be seen that the rating curve has changed over time, this would most likely be due to geomorphic changes within the stream. As Sandy Creek does not break its banks at the gauging location, a reasonable level of confidence can be assumed with the rating curve. The DNRM WMIP does not provide confidence values for the rating curve and gaugings at set levels.
3.6 LiDAR Topographic Data

Topographic data was provided by MRC in the form of Light Detection and Ranging (LiDAR) survey. LiDAR survey was captured around the region in both 2009 and 2015. The spatial extents of the available LiDAR information is shown in Figure 11.

Due to the limited extent of the 2015 LiDAR data, the 2009 dataset was used to generate the digital representation of the surface topography for modelling purposes. This was due to the complete coverage of the 2009 dataset and limited differences between the two surveys when comparing the terrain at areas of interest. Stitching the two surveys together can create issues along the edges of the overlapping datasets where levels are slightly misaligned and was therefore avoided.

The use of the 2009 LiDAR survey was also consistent with the methodology undertaken as part of the Kinchant Dam Failure Impact Assessment (Engeny 2018). It should be noted that the use of the 2009 LiDAR does not allow for the inclusion of any topographical changes in the 8 years between the capture of the survey and the TC Debbie event. Although no major topographical changes are known, localised works on private property may have changed flow patterns and influenced flooding in the area.

3.6.1 Topographic Issues

LiDAR topographic surveys have a limited capability to determine ground levels through thick vegetation, developed sugar cane crops and standing water. A visual check and long section inspection was undertaken for major streams within the catchment. This was mainly due to thick vegetation on the banks and standing water in some locations. The check identified that the LiDAR provided a reasonable resolution of streams in the area.

Upon inspection of the LiDAR it was evident that there were errors in the filtering of data as shown in Figure 12. A clear divide line can in LiDAR data be seen through the middle of the image with poor triangulation of the ground surface to the north and incorrect filtering of sugar cane crops to the south. This poor-quality filtering is evident throughout most of the rural cane land that makes up the majority of the model extent. It is expected that these underlying topographic data issues will have impacts on the hydraulic results.
AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

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MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
LiDAR Extent

Data sources:
Base Data: (c) 20XX (data source)

PROJECT ID
LAST MODIFIED
CREATED BY
60598460
briggh
30/09/2019

VERSION 01

ORDINARY MEETING - 12 FEBRUARY 2020
Attachment 11.4.2.1

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VERSION: 1, VERSION DATE: 24/01/2020
DOCUMENT SET ID: 7869051

GDA 1994 MGA Zone 55

MACKAY REGIONAL COUNCIL
PAGE 220
3.7 Aerial Photography
Aerial photography of the Sandy Creek catchment and surrounding region was supplied by Council. The dataset was supplied as a three separate mosaic images that covered the extents of the study area. The imagery was captured in July 2018 (over the northeast urbanised areas of the catchment), August 2017 (rural areas downstream of Kinchant Dam) and July 2013 (rural areas upstream of Kinchant Dam).

The imagery was used to derive the land use roughness layer discussed in Section 5.4.3.

3.8 Hydraulic Structures
A comprehensive investigation was unable to be undertaken for the Hydraulic structures within the Sandy Creek catchment. This was mainly due to the quantum of culverts within the catchment and the availability of the data at the time of the study. To determine hydraulic structures within the study area aerial imagery was utilised.

Transport and Main Roads (TMR) culvert and bridge data and was made available for use in the hydraulic analysis. The following data was provided:

- Culvert and Bridge chainages along state-controlled roads within the catchment in the form of a csv and shapefile.
- Culvert and bridge drawings (for select locations, mainly along the Bruce Highway)

The SunWater irrigation channels from Kinchant Dam were included in the model as they were represented in the LiDAR survey. As the purpose of the model is to understand floodplain characteristics within the Sandy Creek catchment, refinement of the irrigation channels was not deemed necessary. Culvert crossings within the channel network were represented as outlined below.

3.8.1 Culverts
Culvert information along state-controlled roads was digitised using ArcGIS for application to the TUFLOW hydraulic model. Culvert information was unable to be obtained for all the majority of council road culverts.

Where invert level, slope, pipe diameter or inlet and outlet information was missing, the following assumptions were made:

- Inlet and outlet levels and locations based on LiDAR information;
• Minimum cover of 600mm, where practical;
• Culvert sizes based on surrounding culverts of similar open channel size;

It is recommended that survey be completed for all missing culvert data in future project stages.

3.8.2 Bridges

Bridge information (where available) along state-controlled roads was digitised using ArcGIS for application to the TUFLOW hydraulic model. Bridge crossing details were not available for the majority of council road crossings.

Where no bridge details were available, the following information was utilised to determine bridge requirements;

• Aerial imagery;
• Channel invert level, depth and width;
• Height of the road or rail;
• Surrounding known bridges of similar size.

It is recommended that survey or drawings be obtained of all missing bridge crossings in future project stages to determine the size and blockage that may impact flow through the bridge structure.

3.8.3 Rail Structures

Rail culverts and bridges were unable to obtained by the relevant departments and assumptions outlined in Sections 3.8.1 and 3.8.2 were made for missing information.
4.0 Hydrologic Assessment

4.1 Overview
In order to develop a hydraulic model across the study area, a hydrologic assessment was undertaken to estimate peak flows resulting from catchment rainfall events.

4.2 Adopted Methodology
In order to assess the existing flood behaviour within the Sandy Creek catchment, regional hydrologic models were utilised. Previous projects have warranted the creation of hydrologic models, which, over time have been developed to satisfy the technical requirements of the relevant project phase and investigation locations. However, recent advances in hydrologic methodologies and technologies required minor updates to the existing models to help address uncertainty and set a strong technical foundation for future mitigation infrastructure investigations.

Australian Rainfall and Runoff (AR&R) is a national guideline document, data and software suite that can be used for the estimation of design flood characteristics in Australia. AR&R is pivotal to the safety and sustainability of Australian infrastructure, communities and the environment. It is an important component in the provision of reliable and robust estimates of flood risk. Consistent use of AR&R ensures that development does not occur in high risk areas and that infrastructure is appropriately designed.

The new release of the AR&R guidelines presented several changes to the previous ‘best practice’ modelling advice. Key changes that are relevant to the revised modelling of the Sandy Creek catchment are listed below:

- Updates to design rainfall Intensity Frequency Duration (IFD) values based on the inclusion of nearly 30 years additional rainfall data since the estimation of the ARR 1987 IFDs.
- Changes to design hydrograph simulation approaches including the addition of the ensemble event approach where the magnitude of the design flood is estimated from the weighted average of a group (or ensemble) of design hydrographs. By using a set of design rainfall patterns to produce the estimates rather than a single pattern of variability, a reasonably unbiased estimate of the design flood is produced.
- Updates to catchment initial/continuing loss values based on regionalisation methods as well as the incorporation of pre-burst rainfall to simulate rainfall before the beginning of the design storm.
- Updates to Areal Reduction Factors (ARF) and the calculation process based on a more regionalised approach. ARFs convert the design point rainfall depth into a rainfall depth over the entire catchment.
- Climate change factors and calculations have also been updated based on the current industry best practise and knowledge.

4.3 Hydrologic Modelling
An existing URBS hydrologic model was developed by SunWater, covering the Sandy Creek, Bakers Creek and Alligator Creek catchments (refer Figure 1) as part of their dam failure impact assessment. The model was developed to derive the design flood hydrology for Kinchant Dam for flood events ranging from the 1EY to the Probable Maximum Flood (PMF). The model was reviewed at the beginning of the hydrological modelling phase to check for appropriateness to the updated study. The model was used to determine design hydrology for the TC Debbie study with only minor sub-catchment refinements made (refer Section 4.3.1).

4.3.1 CatchmentSIM
CatchmentSIM was utilised for analysis of the catchment terrain based on the LiDAR data available (refer Section 3.6). Individual sub-catchments were delineated to match those of the previous Kinchant Dam study (Engeny 2018). Some of the sub-catchments, particularly around Drapers Creek and Drapers Siding were refined into smaller sub-catchments to allow for peak flow reporting at key points.
of interest within the catchment. Delineation of sub-catchments within the study area is shown in Figure 15.

4.3.2 URBS

Hydrological modelling was undertaken to determine the design flood hydrographs for various design events and catchment runoff from the TC Debbie event. URBS software was used to model the rainfall-runoff processes of the catchments. This software was selected to be consistent with previous studies and also utilise the previously calibrated URBS model developed as part of the Kinchant Dam study (Engeny 2018). Minor refinements to sub-catchments (refer Section 4.3.1) did not impact previous calibration of the models.

The URBS software package is an event type rainfall-runoff hydrological model that calculates catchment flows based on design rainfall data and catchment characteristics.

The characteristics required for each catchment are:

- Sub-catchment area;
- Sub-catchment slope;
- Sub-catchment fraction impervious;
- Length/slope of channel.

The URBS model subcatchments network was as per the delineation from CatchmentSIM (refer Figure 15). Impervious fraction parameters were determined based on aerial imagery. Appendix A summarises the parameters applied to sub-catchments in the URBS model.

Initial and continuing storm losses are specified in AR&R data hub as 65.0mm and 4.7mm/hr respectively. Many other Mackay Regional Council local catchment studies utilise lower initial / continuing loss values due to the wet tropics region usually having antecedent rainfall before intense rainfall events, resulting in pre-saturation of soils. For consistency, similar losses to other local studies have been adopted in this study, continuing losses have been set as 2.5mm/hr for pervious areas.

4.3.2.1 Kinchant Dam Modelling

The URBS model included a reservoir routing module to simulate the routing effects through the Kinchant Dam storage. The storage characteristics of Kinchant Dam are shown in Figure 13. The spillway discharge characteristics for Kinchant Dam are shown in Figure 14. Tables containing model parameters around the reservoir routing within the URBS model have been provided in Appendix A.
Figure 13 Kinchant Dam URBS Model Storage Characteristics

Figure 14 Kinchant Dam URBS Model Spillway Discharge Characteristics
4.3.3 Storm Injector

The ensemble temporal patterns from the AR&R Data Hub for the Wet Tropics region were simulated through the URBS hydrologic model mentioned above. Storm Injector software serves as the interface between the existing hydrologic models and AR&R Data Hub, allowing for efficient employment of range of magnitude-duration-temporal pattern combinations. The Storm Injector software platform was also used to prepare hydrologic outputs for presentation, as well as inflow files for the TUFLOW hydraulic model.

Once the hydrological models were simulated for all ensemble temporal patterns, the design event hydrograph for each catchment was selected though statistical analysis of the results. AR&R does not provide definitive guidance regarding rationale behind selecting the representative design event hydrograph from an ensemble of storms. Based on current industry trend and MRC’s preference, the design hydrograph for this project was selected as the result of the temporal pattern that delivers a peak flow rate that is closest to the mean flow rate with a bias of 2 to those exceeding the mean from the critical duration flood. The critical duration is determined based on the ensemble of storms with the highest mean flow from all storm durations across the durations for the given storm probability.

Figure 16 shows a flow chart visualisation of the process described detailing how the design flow hydrograph was selected through the ensemble approach. The design flow hydrograph for each event at key sites was then prepared for input into the TUFLOW hydraulic model following completion of formal checking and verification processes.

Climate change hydrological investigations were also undertaken using the methodology stated in Section 8.0.
Figure 16  Ensemble approach to design flow hydrograph selection
### 4.3.4 Intensity Frequency Duration (IFD) Parameters

Site specific Intensity Frequency Duration (IFD) data was determined using the design rainfall database from the Bureau of Meteorology (BoM) as per advice within the AR&R guidelines. The design rainfall IFD input data was obtained at the nearest grid cell to the centroid of each sub-catchment. The 2016 IFD values were sourced (31/05/2019) and are as shown in Table 4 (extracted from centroid of the overall Sandy Creek catchment at 21.3083°S / 149.0249°E).

**Table 4 IFD Design Rainfall Intensities (mm/hr) (BoM, 2016)**

<table>
<thead>
<tr>
<th>Duration</th>
<th>Design Rainfall Depth (mm) – Sandy Creek Catchment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1% AEP</td>
</tr>
<tr>
<td>1 hr</td>
<td>45.0</td>
</tr>
<tr>
<td>3 hr</td>
<td>68.8</td>
</tr>
<tr>
<td>6 hr</td>
<td>88.5</td>
</tr>
<tr>
<td>9 hr</td>
<td>103</td>
</tr>
<tr>
<td>12 hr</td>
<td>114</td>
</tr>
<tr>
<td>18 hr</td>
<td>133</td>
</tr>
<tr>
<td>24 hr</td>
<td>148</td>
</tr>
<tr>
<td>36 hr</td>
<td>171</td>
</tr>
<tr>
<td>48 hr</td>
<td>189</td>
</tr>
<tr>
<td>72 hr</td>
<td>216</td>
</tr>
</tbody>
</table>

### 4.3.5 Ensemble Temporal Patterns

The revision of the AR&R guidelines introduced an ensemble approach to design flood peak flow estimation which aims to provide a more robust assessment than traditional methods (refer Section 4.3). The ensemble approach requires hydrological simulation of 10 separate temporal patterns for each combination of storm duration and probability, rather than the single temporal pattern approach from AR&R 1987.

A common difference between the old and new temporal patterns is how rainfall is distributed across a storm event. Almost three-quarters of each storm’s rainfall falls in the first half of the previous AR&R 1987 temporal patterns. Temporal patterns for AR&R 2019 have been determined based on updated analysis with a range of rainfall distributions, however rainfall is more often consistent throughout each storm duration compared with AR&R 1987 temporal patterns. Figure 17 illustrates the distribution of new temporal patterns against the AR&R 1987 temporal pattern for a 9-hour storm.
4.3.6 Areal Reduction Factors (ARF)

As the Sandy Creek catchment covers a large area, design rainfall intensities at a point are not representative of the areal average rainfall intensity across the catchment. The ratio between the design values of areal average rainfall and point rainfall, computed for the same duration and Annual Exceedance Probability (AEP), is called the Areal Reduction Factor (ARF). This allows for the fact that larger catchments are less likely than smaller catchments to experience high intensity storms simultaneously over the whole of the catchment area.

ARF values were calculated as per the AR&R 2019 guidelines. As the critical duration was found to be 18 hours (refer Section 4.3.9) which is mid-range between short and long storms (between 12 and 24 hours), the ARF was determined by interpolating between the results of long and short duration ARR equation.

The ARF was first calculated using the 1440-minute duration storm through the long duration ARF formula:

\[
ARF = \min \left\{ 1, \left[ 1 - a \left( \text{Area}^b - c \log_{10}(\text{Duration}) \right) \cdot \text{Duration}^{-d} + e \cdot \text{Area}^f \cdot \text{Duration}^g (0.3 + \log_{10}(\text{AEP})) \right] + h \cdot \frac{\text{Area} \cdot \text{Duration} (0.3 + \log_{10}(\text{AEP}))}{10} \right\}
\]

Where Area is in km², Duration is in minutes and AEP is a fraction (between 0.5 and 0.0005). And the coefficients for the Sandy Creek catchment are as follows:

<table>
<thead>
<tr>
<th>Zone</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Coast North</td>
<td>0.327</td>
<td>0.241</td>
<td>0.448</td>
<td>0.36</td>
<td>0.00096</td>
<td>0.48</td>
<td>-0.21</td>
<td>0.012</td>
<td>-0.0013</td>
</tr>
</tbody>
</table>

The ARF was then also calculated using the 720-minute duration storm through the short duration ARF formula.
\[ ARF = \min \left\{ \left[ 1 - 0.287 (Area^{0.245} - 0.439 \log_{10}(Duration)) \cdot Duration^{-0.36} + 2.26 \times 10^{-3} \times Area^{0.226} \cdot Duration^{0.125} (0.3 + \log_{10}(AEP)) + 0.0141 \times Area^{0.213} \times 10^{-0.021} \frac{(Duration - 180)^2}{1440} (0.3 + \log_{10}(AEP)) \right] \right\} \]

Where Area is in km², Duration is in minutes and AEP is a fraction (between 0.5 and 0.0005).

The results of each calculation above were then used to interpolate the ARF coefficients for a 1080 minute (18 hour) storm. The results of the interpolation and the ARF coefficients applied to the Sandy Creek hydrologic model are displayed in Table 6.

### Table 6 Sandy Creek Catchment Areal Reduction Factors

<table>
<thead>
<tr>
<th>Storm Duration</th>
<th>50% AEP</th>
<th>20% AEP</th>
<th>2% AEP</th>
<th>1% AEP</th>
<th>0.5% AEP</th>
<th>0.2% AEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 hours</td>
<td>0.8948</td>
<td>0.8917</td>
<td>0.8838</td>
<td>0.8815</td>
<td>0.8791</td>
<td>0.8760</td>
</tr>
</tbody>
</table>

#### 4.3.7 Embedded Bursts

Embedded bursts occur when the rainfall accumulated over a subset (the “burst”) of a storm’s temporal pattern has a depth (mm) that exceeds the IFD value for the burst’s duration for the same AEP. Consideration of ARFs (which vary by duration) also exacerbates problems with embedded bursts since ARFs tend to be lower (more reduction) for shorter durations which reduces the amount of rainfall that can occur in embedded bursts and, as such, increases the amount and severity of embedded bursts.

AR&R states that consideration should be given to filtering out (or excluding) embedded bursts of lower AEP by re-distributing rainfalls of high intensity to other time increments proportionally to their magnitudes. Embedded bursts smoothing was applied for all bursts that exceeded 2% of specified IFD depth value (mm).

#### 4.3.8 Design Event Rainfall Loss Parameters

URBS calculates a design rainfall excess time series for each storm probability (AEP) and duration to represent the local net precipitation for the study area. This rainfall excess was calculated by applying initial and continuing losses to the design rainfall to represent infiltration and storage of runoff in surface depressions.

The AR&R data hub provides a mean initial loss for the Sandy Creek catchment (from the East Coast North region) of 65.0 mm and a continuing loss of 4.7 mm/hr (refer Table 7).

### Table 7 Initial / Continuing Loss Values - ARR Data Hub

<table>
<thead>
<tr>
<th>Catchment</th>
<th>Initial Loss (mm)</th>
<th>Continuing Loss (mm/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy Creek</td>
<td>65.0</td>
<td>4.7</td>
</tr>
</tbody>
</table>

This is to be considered in conjunction with the preburst depth, which AR&R provides values for various percentiles of occurrence. For this project the median preburst depth has been adopted.

Where the initial storm loss exceeds the preburst depth, the difference is taken as the initial burst loss parameter. Where the preburst depth exceeds the initial loss the excess preburst rainfall was reduced to 0.

The median preburst depths for the Sandy Creek catchment are shown in Table 8.
### Table 8 Median Preburst Depths - Sandy Creek Catchment

<table>
<thead>
<tr>
<th>Storm Duration (hrs)</th>
<th>Design Event (AEP) Median Preburst Depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>1</td>
<td>8.6</td>
</tr>
<tr>
<td>1.5</td>
<td>13.3</td>
</tr>
<tr>
<td>2</td>
<td>20.9</td>
</tr>
<tr>
<td>3</td>
<td>26.1</td>
</tr>
<tr>
<td>6</td>
<td>29.3</td>
</tr>
<tr>
<td>12</td>
<td>27.5</td>
</tr>
<tr>
<td>18</td>
<td>16.8</td>
</tr>
<tr>
<td>24</td>
<td>10.4</td>
</tr>
<tr>
<td>36</td>
<td>3.5</td>
</tr>
<tr>
<td>48</td>
<td>1.4</td>
</tr>
<tr>
<td>72</td>
<td>0</td>
</tr>
</tbody>
</table>

The continuing loss value for each sub-catchment was set to 2.5 mm/hr. This was consistent with previously modelling undertaken in Bakers Creek immediately north of the study area. The AR&R data hub suggested a continuing loss value in excess of 4 mm/hr, this was deemed inappropriate based on previous models developed within the region and did not align with calibrated losses (refer Section 6.4.1).

#### 4.3.9 Critical Duration Assessment

A critical duration assessment was undertaken reviewing the results of the hydrologic modelling for the 1% AEP event. This assessment was undertaken using methodologies outlined in the AR&R guidelines. A box and whisker plot was produced at each sub-catchment to assess the statistical variation of the ensemble peak flows for each event.

The critical storm duration for the study area was assessed by simulating 270, 360, 540, 720, 1080, 1440, 1800, 2160 and 2880 minute durations for the 1% AEP event in the baseline hydrologic model.

The 1080, 2160 and 2440 minute storm durations were found to be critical across different areas of Sandy Creek. A visual representation of the critical storm durations for each sub-catchment is has been included in Figure 18.
The 1080 minute storm was found to result in the highest mean peak flow for the majority of the sub-catchments. The results of the critical duration assessment at Drapers Siding, where flooding was experienced during the TC Debbie event, are shown in Figure 19. The 1080 minute storm was selected for simulation through the TUFLOW hydraulic model.
4.3.10 Model Calibration

The methodology of the calibration process is discussed below. Results from the hydrologic model Tropical Cyclone Debbie calibration have been included in Section 6.0.

The URBS model used as part of the hydrologic assessment was previously calibrated as part of the Kinchant Dam Failure Impact Assessment (Engeny 2018). In this project the model was calibrated to the February 1979, February 1991 and February 2008 rainfall events. As only minor changes were made to the model (further refinement of some subcatchments) re-calibration to these events was not undertaken, a comparison of results pre and post changes was undertaken to ensure that subcatchments refinement (refer Section 4.3.1) did not impact results previously modelled.

The updated URBS model developed as part of this study was calibrated to the Tropical Cyclone Debbie event (March 2017) as this was deemed the only significant rainfall event within the catchment post 2008.

Stream slope and continuing loss factors were varied in URBS to match simulated peak flow with gauged peak flows for the calibration event. A calibration plot of simulated vs gauged flow for the Tropical Cyclone Debbie event has been included in Section 6.4.1.

4.4 Adopted Design Discharges

Design flood hydrographs were generated from the output of the hydrological model for boundary conditions and source flow inputs to the TUFLOW hydraulic model. A summary of the peak flows generated by the hydrological URBS model at key locations is presented in Table 9 the location of the URBS Sub-catchment ID can be seen in Figure 15.

<table>
<thead>
<tr>
<th>Location</th>
<th>URBS ID</th>
<th>63% AEP</th>
<th>39% AEP</th>
<th>18% AEP</th>
<th>2% AEP</th>
<th>1% AEP</th>
<th>TC Debbie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinchant Dam Inflow</td>
<td>1</td>
<td>34.89</td>
<td>49.57</td>
<td>96.59</td>
<td>200.09</td>
<td>280.66</td>
<td>163.48</td>
</tr>
<tr>
<td>Sandy Creek at Homebush Gauge</td>
<td>26</td>
<td>46.27</td>
<td>84.52</td>
<td>231.23</td>
<td>673.75</td>
<td>826.47</td>
<td>2158.60</td>
</tr>
<tr>
<td>Sandy Creek outflow at Sandringham Bay</td>
<td>96</td>
<td>64.83</td>
<td>112.20</td>
<td>269.94</td>
<td>738.74</td>
<td>903.96</td>
<td>2173.10</td>
</tr>
</tbody>
</table>
5.0 Hydraulic Model

5.1 Overview
A two-dimensional TUFLOW hydraulic model based on LiDAR topographic data has been developed to simulate flood hydraulics in the study area. The purpose of the assessment was to define the flooding within the Sandy Creek catchment, with validation of the model to the Tropical Cyclone Debbie event that occurred in March 2017.

The hydraulic model extent is shown in Figure 20 and extends from Kinchant Dam in the west to the mouth of Sandy Creek at the Coral Sea in the east.

5.2 Adopted Methodology
This section of the report documents the development of the hydraulic model used to simulate piped drainage and overland flows within the catchment. A TUFLOW hydraulic model was produced with parameters as per Table 8.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sandy Creek TUFLOW Hydraulic Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion Date</td>
<td>September 2019</td>
</tr>
<tr>
<td>AEP’s Assessed</td>
<td>63.2% 39%, 18%, 2%, 1%, 0.5%, 0.2% AEP, PMP</td>
</tr>
<tr>
<td>Hydrologic Modelling</td>
<td>URBS runoff routed local catchment inflows</td>
</tr>
<tr>
<td>IFD Input Parameters</td>
<td>AR&amp;R, Refer Section 4.3.4</td>
</tr>
<tr>
<td>Hydraulic Model Software</td>
<td>TUFLOW Version 2018-03-AE-iSP-w64</td>
</tr>
<tr>
<td>Grid Size</td>
<td>8m</td>
</tr>
<tr>
<td>DEM (year captured)</td>
<td>LiDAR (2009)</td>
</tr>
<tr>
<td>Roughness</td>
<td>Spatially varying and depth varying standard values (Refer to Section 5.4.3)</td>
</tr>
<tr>
<td>Eddy Viscosity</td>
<td>Smagorinsky</td>
</tr>
<tr>
<td>Model Calibration</td>
<td>Anecdotal flooding information from Council used to confirm model accuracy from Tropical Cyclone Debbie rainfall event. Refer to Section 6.0</td>
</tr>
<tr>
<td>Downstream Model Boundary</td>
<td>Height varying over time (HT) boundary at the Coral Sea. Set to MHWS level for design event modelling.</td>
</tr>
<tr>
<td>Inflow Model Boundary</td>
<td>Time-varying discharge (QT) inflow boundaries for all external catchments.</td>
</tr>
<tr>
<td>Timesteps</td>
<td>2.5 seconds (2D)</td>
</tr>
<tr>
<td>Wetting and Drying Depth</td>
<td>Cell centre 0.0002 m</td>
</tr>
<tr>
<td>Sensitivity Testing</td>
<td>Manning’s Roughness ± 20% (Refer Section 5.6)</td>
</tr>
<tr>
<td></td>
<td>Climate Change to year 2100 (Refer Section 8.0)</td>
</tr>
</tbody>
</table>
5.3 One-Dimensional Model Development

Representing hydraulic structures as 1D elements allows a more accurate representation of flow and associated head loss though the structures. Structures at road crossings were of critical importance to this study to understand the flood immunity of each access route.

A comprehensive investigation was undertaken to identify the hydraulic structures associated with the major road and rail networks within the study area. Important hydraulic structures were included in the one-dimensional model component. Assumptions that were made around the inclusion of structures where data was missing is included in Section 3.7.

All culverts were represented as dynamically linked 1D elements, with major sets of closely situated culverts being digitized using multi-cell links (CN-SX lines). Culvert roughness was set as 0.013 for RCPs and RCBCs.

The default culvert loss values applied to models are based on the TUFLOW user’s manual (WBM BMT) on satisfying conditions of cross drainage structures.

5.4 Two-Dimensional Model Development

5.4.1 Model Setup Parameters

The grid cell size selected for the model was 8m.

The time step for the 2D model domain was set to 2.5 seconds, however the TUFLOW HPC Solver utilises an adaptive time step and resultantly can wind down the time step to ensure model stability. The corresponding 1D time step was set at 0.5 seconds. These time steps are within the feasible time step range given the grid cell size.

The wetting and drying depth represents the depth of water on a cell which is the criteria for whether the cell is "wet" or "dry". The wetting and drying depth has been set to the default of 0.0002m for the centre of a cell.

5.4.2 Model Topography

Base model topography was derived from LiDAR survey flown in 2009 and supplied by MRC. The data was supplied as a 1m resolution Digital Elevation Model (DEM).

Due to limitations surrounding large-scale hydraulic modelling, the adopted grid cell size (8m) may not always adopt the peak level of road and rail features such as crown levels, culvert headwalls and small table drains. Given the hydraulic significance of these particular features within urban catchment flow paths, manual topography modifications were made in required areas using TUFLOW Z-Shape files that enforce set topography.

5.4.3 Hydraulic Roughness

The specified hydraulic roughness reflects the different types of development and ground cover that exists within the hydraulic model extent. The roughness categories adopted for the model were based on the latest aerial imagery and land use zoning information. Hydraulic roughness values were modified to try and improve model validation to the TC Debbie event (refer Section 6.4.2), however consistent changes to land use category roughness values were not able to achieve a reasonable comparison to all surveyed points.

Variable Manning’s ‘n’ values based on depth can be utilised within TUFLOW. Manning’s ‘n’ 1 is applied for all flow depths up to depth 1, between depths 1 and 2 the Manning’s ‘n’ utilised by TUFLOW is interpolated between Manning’s ‘n’ 1 and 2 and for all depths greater than depth 2 Manning’s ‘n’ 2 is applied. In the instance of road reserve and open water a single roughness has been applied.

Specific roughness values for each category as applied in the model are outlined in Table 11.
Table 11 Hydraulic Model Roughness Parameters

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Manning’s ‘n’ 1</th>
<th>Manning’s ‘n’ 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>0.10</td>
<td>0.070</td>
</tr>
<tr>
<td>Open Space and Recreational Areas</td>
<td>0.10</td>
<td>0.050</td>
</tr>
<tr>
<td>Roads</td>
<td>0.10</td>
<td>0.025</td>
</tr>
<tr>
<td>Rural Residential</td>
<td>0.10</td>
<td>0.070</td>
</tr>
<tr>
<td>Commercial / Manufacturing</td>
<td>0.10</td>
<td>0.060</td>
</tr>
<tr>
<td>Open Water</td>
<td>0.10</td>
<td>0.027</td>
</tr>
<tr>
<td>Cane Rail</td>
<td>0.10</td>
<td>0.072</td>
</tr>
<tr>
<td>Sugar Cane Crops</td>
<td>0.15</td>
<td>0.175</td>
</tr>
<tr>
<td>Short Grass Channel</td>
<td>0.10</td>
<td>0.035</td>
</tr>
<tr>
<td>Long Grass Channel</td>
<td>0.10</td>
<td>0.045</td>
</tr>
<tr>
<td>Light Vegetation</td>
<td>0.10</td>
<td>0.060</td>
</tr>
<tr>
<td>Medium Vegetation</td>
<td>0.10</td>
<td>0.075</td>
</tr>
<tr>
<td>Dense Vegetation</td>
<td>0.10</td>
<td>0.090</td>
</tr>
<tr>
<td>Upper Sandy Creek (north of confluence)</td>
<td>0.50</td>
<td>0.054</td>
</tr>
<tr>
<td>Sandy Creek (north of Elton – Homebush Rd)</td>
<td>0.50</td>
<td>0.046</td>
</tr>
<tr>
<td>Lower Sandy Creek</td>
<td>0.50</td>
<td>0.046</td>
</tr>
<tr>
<td>Frenchmans Creek</td>
<td>0.50</td>
<td>0.065</td>
</tr>
<tr>
<td>BL Creek</td>
<td>0.50</td>
<td>0.064</td>
</tr>
</tbody>
</table>

The spatial variation of hydraulic roughness within the TUFLOW model is shown in Figure 21.

5.4.4 Boundary Conditions

Sandy Creek local catchment and Kinchant Dam flows were derived from the URBS hydrological model. The discharge hydrographs associated with local flow located within the two-dimensional model extent were applied as local source nodes (2D SA inflows) within the model.

As bathymetry of Kinchant Dam was not available for the study, flows from the dam were applied at the spillway, referencing the outflow from the dam derived from the URBS reservoir routing parameters (refer Section 4.3.2.1). Water storage within the dam was set to a static full supply level (1m below spillway) for design events, with spillway outflows from URBS applied.

The downstream model boundary was modelled as a height over time varying (HT) boundary based on Mean High Water Springs (MHWS) tidal levels for the area. A static water surface level of 2.35mAHD was applied as the downstream boundary condition for consistency with other Council studies with tidal downstream boundaries.

5.5 Model Validation

Validation of the updated TUFLOW model was undertaken by simulating the historical Tropical Cyclone Debbie flood event (March 2017) and comparing the results to observed data. Limited datasets (rainfall, peak water surface and flow) were available to assist with validation.

Stream gauge records at the DNRM Station 126001A (refer Section 3.5) as well as 8 surveyed flood heights provided by Council were available to assist in the validation of hydraulic model results. The
remaining areas of the model domain were validated based on anecdotal observations and historical records to ensure modelled flood patterns generally matched observed flood patterns and behaviour. Details of the model validation and results are provided in Section 6.4.2. It is strongly recommended that more detailed flood extents and levels are captured throughout the catchment in future flood events for potential model validation / calibration in future stages of investigations.

5.6 Sensitivity Analysis

A series of sensitivity analyses were undertaken as part of the modelling work to assess the impact of changes to basic model set up parameters. The following sensitivity analyses were modelled for a 1% AEP event:

- Manning's Roughness increase / decrease (20%)

The results of the sensitivity analysis are presented in Volume 2 of the report as Maps 32 and 33 for the 20% increase and decrease respectively.

As shown, it was found that the main stream of Sandy Creek is somewhat sensitive to changes in hydraulic roughness between the Peak Downs Highway and Bruce Highway. It was found that adjusting the roughness values by 20% had negligible flood extent increase/decrease with no additional breakouts occurring from Sandy Creek and no additional housing impacts by the increase in roughness for the 1% AEP flood.

The increase in Manning’s roughness by 20% caused a maximum increase in PWSE less than 0.3m, with an average increase of 0.06m around the Eton community. Changes to the peak water surface near Drapers Siding were minimal (less than 0.02m). In turn, decreasing the Manning’s roughness by 20% caused a maximum decrease to peak water surface levels of 0.3m with the average decrease around the Eton community being approximately 0.055m.

The results of the sensitivity analysis have demonstrated that achieving model validation to the TC Debbie event (refer Section 6.4.2) through the modification of Manning’s roughness values would be unlikely, as a major uniform change (±20%) has resulted in negligible increases/decreases.
6.0 Tropical Cyclone Debbie

6.1 General

Tropical Cyclone (TC) Debbie first reached cyclonic strength on 25 March 2017, before developing over the next two days into a Category 2 cyclone. TC Debbie was forecast to increase rapidly in intensity before making landfall on the Queensland coast; this prediction was realised as TC Debbie made landfall as a Category 4 Severe Tropical Cyclone near Airlie Beach on 28 March 2017.

From Airlie Beach, TC Debbie tracked inland on a south-westerly track, losing tropical cyclone intensity at about 3.00am on 29 June. Ex-TC Debbie continued south, turning onto a south-easterly track and passing over the coast of northern New South Wales and out to sea on the 31 March. Figure 22 shows the movement of TC Debbie through MRC boundary.
After TC Debbie made landfall and moved across the central interior of Queensland, a band of slow-moving thunderstorms developed inland of the Mackay coast and produced heavy rainfall on the 29 March. Figure 23 shows the line of thunderstorms that become orientated north-south along the terrain inland from the coast.

Significant rainfall totals for the event were recorded across the Sandy Creek catchment and wider Mackay region. Rainfall totals between 500 to over 1000mm were common. The western parts of the Mackay region had the highest rainfall totals recorded at Mt William (1328mm), Clarke Range (1023-1157mm) and Hannaville (795mm). In the lower coastal region around Mackay, values ranged from 690mm (Walkerston) to coastal values of 467mm (Mackay), 478mm (Mackay Airport) and 510mm (Outer Harbour). The highest daily rainfall total occurred at Clark Range, in the upper catchment, where 646mm were recorded on the 29 March.

Riverine and flash flooding was recorded in a number of locations from the Mackay region all the way down to northern New South Wales. Around 100 people required assistance from floodwaters in Sandy Creek around Eton and Homebush, with tens of thousands of people evacuated from the Lismore and Murwillumbah areas (NSW).

Figure 24 shows the total daily rainfall for Queensland from 27th – 30th March 2017.
Figure 24  Queensland Daily Rainfall Totals 27th – 30th March 2017
6.2 TC Debbie Rainfall Gauges

A number of rainfall gauges across the catchment were operational during the TC Debbie rainfall event (refer Section 3.4.1). These stations are shown in Figure 6 with the 3-day accumulated rainfall totals (9am 27th March – 9am 30th March 2017) available in Table 3.

The cumulative rainfall totals for key stations is shown in Figure 25. It can be seen that high intensity rainfall occurred on the 29th March 2017 at the Greenmount Alert, Homebush TM and Marian Weir Alert station. This intensity was not matched at the Mirani Weir Alert and Whiteford’s Alert stations indicating that intense storms may have been localised.

![Cumulative Rainfall Totals for the TC Debbie Event](image)

Figure 25 Cumulative Rainfall Totals for the TC Debbie Event

6.2.1 TC Debbie Rainfall Intensity Comparison

Figure 26 indicates that the peak rainfall intensity that occurred during the TC Debbie rainfall event, based on the data available, had an intensity greater than the 1% AEP design event at both the Marian Weir Alert and Homebush TM.
Figure 26 Comparison of BoM Peak Rainfall Intensities with Cyclone Debbie Rainfall
6.2.2 Rainfall Kriging

To better understand the rainfall patterns across the entire catchment for hydrological and hydraulic modeling, the rainfall totals from each station were averaged across the entire catchment to develop a synthetic rainfall depth raster.

The ArcGIS Kriging tool was used to develop the rainfall depth raster presented in Figure 27. Kriging is an advanced geostatistical procedure that generates an estimated surface from a scattered set of points with recorded values. Kriging assumes that the distance or direction between sample points reflects a spatial correlation that can be used to explain variation in the surface. The Kriging tool fits a mathematical function to a specified number of points, or all points within a specified radius, to determine the output value for each location.

The TC Debbie rainfall depth raster (Figure 27) was used to determine rainfall depths applied to each sub-catchment in the hydrological model calibration.

![Figure 27 TC Debbie Rainfall Kriging](image)

6.3 TC Debbie Initial and Continuing Storm Losses

Initial and continuing losses were discussed with MRC for the TC Debbie rainfall event. Due to the long duration of the event (3 days) and antecedent rainfall in the days prior to the event, the initial loss was set to 0mm with a standard continuing loss of 2.5mm/hr (consistent with other MRC studies).

These values provided a good fit in the calibration of the hydrologic model (refer Section 6.4) and hence were deemed suitable for the catchment.
6.4 Model Calibration/Validation

6.4.1 Hydrologic Model Calibration

The URBS model used as part of the hydrologic assessment was previously calibrated as part of the Kinchant Dam Failure Impact Assessment (Engeny 2018). The updated URBS model developed as part of this study was further calibrated to the Tropical Cyclone Debbie event (March 2017) as this was deemed the only significant rainfall event within the catchment post 2008.

The water level in Kinchant Dam was set to 57.09m AHD at the beginning of the TC Debbie event in the URBS model, as per reported levels in the Flooding in Sandy Creek Catchment following Tropical Cyclone Debbie Report (Qld Chief Scientist, 2017). The modelled peak level in Kinchant Dam over the duration of the event reached 58.48m AHD, providing good correlation to the reported peak level of 58.5m AHD, suggesting that modelled dam characteristics matched the dam hydrology experienced during the TC Debbie event.

Rainfall depths determined through the Kriging of available data (refer Section 6.2.2) were applied to each sub-catchment in the hydrological model. Temporal patterns for design rainfall were applied based on the closest telemeter rainfall station (refer Figure 6 and Table 3). Catchment roughness and continuing loss factors were then varied within their acceptable limits to best match simulated peak flow with gauged peak flows for the calibration event. The final model calibration result is shown in Figure 28.

Overall the modelled flows provided a reasonable fit to gauged flows at the DNRM Gauge(126001A) for the rising limb of the peak flow hydrograph. The URBS model produced a slightly higher peak than that of gauged records, however this was deemed to be acceptable due to the inability to model complex floodplain interactions and storages within a hydrologic model. The falling limb of the modelled flow recedes quicker than that of modelled flow, this again could be attributed to the limitations of hydrologic modelling.

Figure 28 Calibration of URBS Model at Sandy Creek Gauge
The calibrated model was then used to simulate the hydrology for the catchment to develop the inflows for the TUFLOW hydraulic model.

6.4.2 Hydraulic Model Validation

Validation of the TUFLOW hydraulic model was undertaken by simulating the TC Debbie hydrological flows (refer Section 6.4.1) through the model and comparing the results to anecdotal flooding information.

Limited datasets were available to assist with validation, with surveyed points provided by Council based off debris marks and/or anecdotal information. The limitations with using these kinds of levels for model validation are discussed in Section 6.6.

Overall, the results of the model validation were poor, this was due to both factors that may have influenced the results of hydraulic modelling and the quality/availability of data used in the validation. A discussion of the limitations associated with the model has been included in Section 6.6.

The surveyed points available for validation have been plotted against the peak modelled depths for the TC Debbie rainfall event in Figure 29 and Figure 30.

Figure 29 Hydraulic Model Validation – Upper Catchment
Figure 30 Hydraulic Model Validation – Lower Catchment

Table 12 contains the details of the surveyed points used in the validation of the TUFLOW hydraulic model. Points with ‘LC’ and ‘LS’ prefix were captured immediately after the TC Debbie rainfall event, points with ‘SVY’ prefix were captured after the community consultation conducted as part of this study. It is to be noted that some points were located on the upstream side of the hydrologic inflow points in the TUFLOW model. These points returned a ‘dry’ result in the hydraulic model and hence were not used for comparison. These points have been shown as ‘Non Assessment Points’ in Figure 29 and Figure 30.

Table 12 TC Debbie Surveyed Flood Heights for Validation

<table>
<thead>
<tr>
<th>Point ID</th>
<th>Description</th>
<th>Surveyed Height (mAHD)</th>
<th>Modelled Height (mAHD)</th>
<th>Difference (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC24</td>
<td>Debris line near Sandy Creek Bridge</td>
<td>8.82</td>
<td>8.80</td>
<td>-0.02</td>
</tr>
<tr>
<td>LC25</td>
<td>Debris line near Sandy Creek Bridge</td>
<td>9.51</td>
<td>9.72</td>
<td>0.21</td>
</tr>
<tr>
<td>LC26</td>
<td>Debris line across road</td>
<td>7.49</td>
<td>7.51</td>
<td>0.02</td>
</tr>
<tr>
<td>LC29</td>
<td>Dirt line across road east of B. L. Creek</td>
<td>13.77</td>
<td>14.33</td>
<td>0.56</td>
</tr>
<tr>
<td>LC31</td>
<td>Debris line at rear of dwelling</td>
<td>18.94</td>
<td>16.70</td>
<td>-2.24</td>
</tr>
<tr>
<td>LC32</td>
<td>Debris line across road near B.L. Creek</td>
<td>22.99</td>
<td>22.66</td>
<td>-0.33</td>
</tr>
<tr>
<td>LC33</td>
<td>Dirt line alongside road</td>
<td>20.59</td>
<td>18.06</td>
<td>-2.53</td>
</tr>
<tr>
<td>LC36</td>
<td>Peak level at house</td>
<td>20.39</td>
<td>18.68</td>
<td>-1.71</td>
</tr>
<tr>
<td>LC37</td>
<td>Debris line on fence</td>
<td>19.03</td>
<td>17.27</td>
<td>-1.76</td>
</tr>
</tbody>
</table>
6.5 TC Debbie Sensitivity Analysis

A series of sensitivity analyses were undertaken for the TC Debbie model to determine whether changing selected parameters will change how the water performs, in terms of creek breakout points and cause the model to align with anecdotal and surveyed results. The parameters adjusted included:

- Manning’s roughness (increase/decrease)
- Bridge and culvert blockage (increase)

A Manning’s roughness increase/decrease sensitivity was undertaken as part of the development of the hydraulic model (refer Section 5.6). This analysis increased and decreased the hydraulic roughness of the entire catchment by 20%. The results of the sensitivity analysis demonstrated that achieving model validation to the TC Debbie event through the modification of Manning’s roughness values would be unlikely, as a major uniform change (±20%) resulted in negligible increases/decreases.

A bridge and culvert blockage sensitivity was also undertaken to try and modify stream behaviour by increasing blockage factors to exceptional percentages (60% for all bridges and culverts) considered outside of the norms. The 60% blocked scenario was simulated for the 1% AEP event and was found to have some significant impacts on peak water surface levels immediately upstream of major crossings, however did not achieve consistent results required to improve the validation of the TC

---

<table>
<thead>
<tr>
<th>Point ID</th>
<th>Description</th>
<th>Surveyed Height (mAHD)</th>
<th>Modelled Height (mAHD)</th>
<th>Difference (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC38</td>
<td>Debris line near Sandy Creek</td>
<td>35.28</td>
<td>34.88</td>
<td>-0.40</td>
</tr>
<tr>
<td>LC39</td>
<td>Debris line near Sandy Creek North Branch</td>
<td>34.50</td>
<td>34.52</td>
<td>0.02</td>
</tr>
<tr>
<td>LC41</td>
<td>Debris line near drain</td>
<td>32.82</td>
<td>32.08</td>
<td>-0.74</td>
</tr>
<tr>
<td>LC42</td>
<td>Water level near house</td>
<td>33.26</td>
<td>32.00</td>
<td>-1.26</td>
</tr>
<tr>
<td>LC43</td>
<td>Water level near Draper’s Siding</td>
<td>32.21</td>
<td>31.34</td>
<td>-0.87</td>
</tr>
<tr>
<td>LS33a</td>
<td>Debris line on top of bank B.L. Creek</td>
<td>57.86</td>
<td>58.88</td>
<td>1.03</td>
</tr>
<tr>
<td>LS33b</td>
<td>Debris line on top of bank</td>
<td>57.88</td>
<td>58.94</td>
<td>1.06</td>
</tr>
<tr>
<td>LS35</td>
<td>Trash wrapped around power pole at Rock Creek</td>
<td>21.52</td>
<td>22.13</td>
<td>0.61</td>
</tr>
<tr>
<td>LS36</td>
<td>Debris line under steps at Telstra Exchange</td>
<td>22.90</td>
<td>22.79</td>
<td>-0.11</td>
</tr>
<tr>
<td>LS37</td>
<td>Trash wrapped around guide post</td>
<td>23.12</td>
<td>23.02</td>
<td>-0.10</td>
</tr>
<tr>
<td>LS38</td>
<td>Debris line on road over Sandy Creek</td>
<td>22.76</td>
<td>22.77</td>
<td>0.01</td>
</tr>
<tr>
<td>LS40</td>
<td>Debris caught in fence</td>
<td>23.27</td>
<td>22.98</td>
<td>-0.29</td>
</tr>
<tr>
<td>LS45</td>
<td>Debris caught on steps of Telstra Exchange Hannas</td>
<td>32.31</td>
<td>31.61</td>
<td>-0.70</td>
</tr>
<tr>
<td>SVY_001</td>
<td>800mm high in the shed</td>
<td>16.80</td>
<td>14.56</td>
<td>-2.24</td>
</tr>
<tr>
<td>SVY_002</td>
<td>1m up our internal walls</td>
<td>32.90</td>
<td>31.34</td>
<td>-1.56</td>
</tr>
<tr>
<td>SVY_003</td>
<td>The water came up to the 6th step</td>
<td>32.60</td>
<td>31.34</td>
<td>-1.26</td>
</tr>
<tr>
<td>SVY_004</td>
<td>2nd Step inside house</td>
<td>32.60</td>
<td>31.34</td>
<td>-1.26</td>
</tr>
<tr>
<td>SVY_005</td>
<td>1 inch over the floor level</td>
<td>37.70</td>
<td>37.30</td>
<td>-0.40</td>
</tr>
<tr>
<td>SVY_006</td>
<td>80 - 100 mm over the slab</td>
<td>39.60</td>
<td>39.61</td>
<td>0.01</td>
</tr>
<tr>
<td>SVY_007</td>
<td>Approx 1.5m over Antoneys Crossing</td>
<td>34.50</td>
<td>34.53</td>
<td>0.03</td>
</tr>
</tbody>
</table>
Debbie rainfall event. The results of the sensitivity have been included in Map 34 of the Volume 2 Report and show that increasing blockage of bridges and culverts causes the increase of PWSE upstream and decrease of PWSE downstream of structures when comparing back to the baseline model results.

For example, the required increase in modelled peak water surface to validate the TC Debbie event at point SVY_001 is 2.24m. By increasing the modelled bridge and culvert blockage for all structures, the greatest increase in PWSE at this location is 0.36m for the 1% AEP event. Not only does increasing the blockage fall considerably short of the required change, but also throws out other areas that previously validated well, such as points LS38-LS41 around Eton-Homebush Road.

The results of these two sensitivities further validate the hypothesis is that in the areas where the hydraulic simulation is significantly different to the recorded elevations, there was a very localised and intense rain burst that was significantly in excess of the recorded rainfalls. As it is noted that areas where there are significant differences in modelled and recorded flood elevation there are no rain gauging stations.
6.6 TC Debbie Modelling Limitations

A number of limitations were presented when modelling the Cyclone Debbie rainfall event, these are summarised below:

- Although the available rainfall data provided coverage of the catchment, there are still significant distances and spatial variance between rainfall stations particularly between the confluence of the northern branch of Sandy Creek (approaching Drapers Siding) and the Bruce Highway. This prevents localised intense bursts of rainfall within the catchment from being captured and is most likely what occurred during the TC Debbie event as some reasonable degree of validation has been achieved in the upper and lower bounds of the model.

- The topographic dataset that was best suited to cover the entire model footprint was 2009 LiDAR survey. Any changes in terrain due to scouring, deposition or filling by land owners in the 8 years leading up to the TC Debbie event have not captured in the TUFLOW model. This introduces areas for potential discrepancy between modelled results and observed flooding.

- The supplied LiDAR dataset was found to have errors in the filtering of vegetation within the catchment (refer Section 3.6.1). These errors would most likely influence modelled peak flood heights across the catchment as a ‘false’ terrain has been produced in some areas.

- Surveyed flood levels supplied by MRC were that of surveyed debris marks and/or anecdotal levels within the catchment. Due to the nature of a cyclonic rainfall event, debris marks may not represent the true peak water surface level due to turbulent conditions and wave runup. Similarly, anecdotal levels captured post-event may vary slightly from the true peak experienced.
7.0 Baseline Assessment

7.1 Overview

The following section outlines the results of the baseline hydraulic modelling undertaken as per the methodology outlined in Section 5.0. It is important to note that the interpretation of results and other presentations in this report requires an appreciation of the limitations in accuracy, as noted in the sections above.

Results presented in this section of the report are based on peak values of water surface level, flow and depth. Using flood levels as an example, the peak level does not occur everywhere at the same time and, therefore, the values presented are based on taking the maximum value which occurred at each computational point in the model during the entire flood. Hence, a presentation of peak levels does not represent an instantaneous point in time, but rather an envelope of the maximum values that occurred at each computational point over the duration of the flood event.

GIS results mapping including peak flood elevations, depths and velocities and can be found in the Sandy Creek Catchment – Tropical Cyclone Debbie Flood Study Report (Volume 2).

The following sections present peak water surface elevations and peak flows at key points of interest within the TUFLOW hydraulic model boundary. Key points of interest are identified in Figure 31 and Figure 32 as follows:

- Figure 31 – point locations assessing peak water depths and surface levels.
- Figure 32 – cross sections assessing peak flow rates.

7.2 Baseline Peak Flood Depths, Levels and Extents

The TUFLOW model described in Section 5.0 was used to estimate the levels, extent and depth of flooding for the 1EY, 39%, 18%, 2%, 1%, 0.5% and 0.2% AEP design flood events. It is noted that these simulations did not include the effects of Climate Change.

Modelled peak flood depths have been included in Table 13 with the corresponding peak water surface levels in Table 14. The results have been extracted at key assessment locations as shown in Figure 31. GIS results mapping included the Sandy Creek Catchment – Tropical Cyclone Debbie Flood Study Report (Volume 2) show the extent of the design flood footprint.

7.3 Baseline Modelled Peak Discharges

The TUFLOW model described in Section 5.0 was used to estimate the design peak flow rate for the 1EY, 39%, 18%, 2%, 1%, 0.5% and 0.2% AEP flood events. It is noted that these simulations did not include the effects of Climate Change.

Modelled peak design flows have been included in Table 15. The results have been extracted at key assessment locations as shown in Figure 32.
AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Key Assessment Locations

Data sources:
Base Data: (c) 20XX (data source)
(additional data)

PROJECT ID
LAST MODIFIED
CREATED BY
60598460
briggh
30/09/2019

LEGEND
Key Assessment Location
TUFLOW Model Extent
State Controlled Road

VERSION 01

1:50,000
(within printed at A4)

GDA 1994 MGA Zone 55

Version: 1, Version Date: 24/01/2020
Document Set ID: 7869051

ORDINARY MEETING - 12 FEBRUARY 2020
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Table 13  Summary of Baseline Modelled Peak Flood Depths

<table>
<thead>
<tr>
<th>Location</th>
<th>Natural Surface (m AHD)</th>
<th>Peak Flood Depth (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P_BL_01</td>
<td>11.72</td>
<td>2.24  2.54  3.20  4.33  4.63  4.86  5.17  5.51</td>
</tr>
<tr>
<td>P_CUT_01</td>
<td>36.73</td>
<td>2.46  3.22  4.41  5.30  5.42  5.51  5.65  5.41</td>
</tr>
<tr>
<td>P_DRA_01</td>
<td>42.14</td>
<td>0.56  0.69  1.05  1.47  1.55  1.65  1.74  1.59</td>
</tr>
<tr>
<td>P_DRA_02</td>
<td>38.29</td>
<td>0.79  0.89  1.12  1.59  1.69  1.80  1.88  1.75</td>
</tr>
<tr>
<td>P_DRA_03</td>
<td>28.77</td>
<td>0.68  0.92  1.54  2.12  2.37  2.71  2.99  2.35</td>
</tr>
<tr>
<td>P_FRE_01</td>
<td>16.52</td>
<td>2.55  2.91  3.55  4.48  4.71  4.92  5.18  5.85</td>
</tr>
<tr>
<td>P_OAK_01</td>
<td>40.61</td>
<td>1.76  2.06  2.55  3.05  3.21  3.23  3.33  3.65</td>
</tr>
<tr>
<td>P_ROS_01</td>
<td>38.41</td>
<td>0.55  0.64  0.80  0.99  1.03  1.08  1.14  1.26</td>
</tr>
<tr>
<td>P_ROS_02</td>
<td>31.45</td>
<td>0.81  0.92  1.16  1.45  1.51  1.57  1.63  1.72</td>
</tr>
<tr>
<td>P_ROS_03</td>
<td>28.33</td>
<td>0.84  1.20  2.10  2.76  2.88  2.97  3.08  3.16</td>
</tr>
<tr>
<td>P_SDY_01</td>
<td>44.42</td>
<td>1.11  1.24  1.61  2.03  2.13  2.21  2.34  1.67</td>
</tr>
<tr>
<td>P_SDY_02</td>
<td>39.50</td>
<td>0.87  0.99  1.33  1.74  1.83  1.89  2.01  1.39</td>
</tr>
<tr>
<td>P_SDY_03</td>
<td>34.86</td>
<td>2.05  2.21  2.69  3.18  3.27  3.36  3.48  2.95</td>
</tr>
<tr>
<td>P_SDY_04</td>
<td>28.96</td>
<td>2.73  3.07  3.66  4.53  4.66  4.81  4.96  4.50</td>
</tr>
<tr>
<td>P_SDY_05</td>
<td>50.66</td>
<td>1.43  1.76  2.33  2.95  3.07  3.16  3.27  3.09</td>
</tr>
<tr>
<td>P_SDY_06</td>
<td>30.37</td>
<td>3.35  4.12  4.64  4.84  4.87  4.89  4.92  4.88</td>
</tr>
<tr>
<td>P_SDY_07</td>
<td>25.48</td>
<td>2.90  3.43  4.49  6.39  6.58  6.74  6.91  6.54</td>
</tr>
<tr>
<td>P_SDY_08</td>
<td>17.62</td>
<td>2.50  3.21  4.80  7.05  7.64  8.28  9.11  8.95</td>
</tr>
<tr>
<td>P_SDY_09</td>
<td>12.64</td>
<td>3.98  4.86  6.78  9.85  10.59 11.43 12.44 12.55</td>
</tr>
<tr>
<td>P_SDY_10</td>
<td>8.74</td>
<td>4.03  5.02  7.41 10.92 11.75 12.73 14.23 14.37</td>
</tr>
<tr>
<td>P_SDY_11</td>
<td>3.11</td>
<td>4.85  6.05  8.02 10.61 11.28 12.14 12.99 13.41</td>
</tr>
<tr>
<td>P_SDY_12</td>
<td>1.65</td>
<td>3.81  4.63  6.37  9.65 10.47 11.50 12.27 12.53</td>
</tr>
<tr>
<td>P_SDY_13</td>
<td>0.80</td>
<td>3.72  4.62  6.70 10.22 11.06 12.12 12.88 13.10</td>
</tr>
<tr>
<td>P_SDY_14</td>
<td>11.00</td>
<td>0.46  0.51  0.73  1.08  1.11  1.13  1.16  1.14</td>
</tr>
<tr>
<td>P_SDY_15</td>
<td>5.29</td>
<td>0.45  0.58  1.10  2.33  2.64  3.02  3.54  5.56</td>
</tr>
<tr>
<td>P_SDY_16</td>
<td>0.70</td>
<td>2.81  3.54  4.95  6.42  6.71  7.07  7.45  7.58</td>
</tr>
<tr>
<td>P_SDY_17</td>
<td>0.14</td>
<td>2.46  2.86  3.90  5.11  5.35  5.66  5.98  6.07</td>
</tr>
<tr>
<td>P_SDY_18</td>
<td>0.06</td>
<td>2.29  2.30  2.37  2.84  3.02  3.28  3.56  3.62</td>
</tr>
<tr>
<td>P_SDY_19</td>
<td>0.42</td>
<td>2.77  2.77  2.77  2.81  2.83  2.87  2.91  3.32</td>
</tr>
<tr>
<td>P_SDY_20</td>
<td>5.00</td>
<td>0.00  0.46  0.58  0.77  0.80  0.85  0.90  0.85</td>
</tr>
<tr>
<td>P_SDY_21</td>
<td>2.92</td>
<td>0.79  0.85  0.95  1.06  1.08  1.10  1.12  1.10</td>
</tr>
<tr>
<td>P_SDY_22</td>
<td>10.08</td>
<td>1.83  2.00  2.16  2.30  2.32  2.35  2.39  2.33</td>
</tr>
<tr>
<td>P_STO_01</td>
<td>30.28</td>
<td>0.79  0.88  1.21  2.11  2.60  2.64  2.80  3.23</td>
</tr>
</tbody>
</table>
Table 14  Summary of Baseline Modelled Peak Water Surface Levels

<table>
<thead>
<tr>
<th>Location</th>
<th>Natural Surface (mAHD)</th>
<th>Peak Water Surface Elevation (mAHD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1EY</td>
<td>39% AEP</td>
</tr>
<tr>
<td>P_CUT_01</td>
<td>36.73</td>
<td>39.18</td>
</tr>
<tr>
<td>P_DRA_01</td>
<td>42.14</td>
<td>42.70</td>
</tr>
<tr>
<td>P_DRA_02</td>
<td>38.29</td>
<td>39.08</td>
</tr>
<tr>
<td>P_DRA_03</td>
<td>28.77</td>
<td>29.45</td>
</tr>
<tr>
<td>P_OAK_01</td>
<td>40.61</td>
<td>42.37</td>
</tr>
<tr>
<td>P_ROS_01</td>
<td>38.41</td>
<td>38.96</td>
</tr>
<tr>
<td>P_ROS_02</td>
<td>31.45</td>
<td>32.26</td>
</tr>
<tr>
<td>P_ROS_03</td>
<td>28.33</td>
<td>29.17</td>
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<tr>
<td>P_SDY_01</td>
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<td>45.53</td>
</tr>
<tr>
<td>P_SDY_02</td>
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<td>40.37</td>
</tr>
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<td>P_SDY_03</td>
<td>34.86</td>
<td>36.91</td>
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<tr>
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</tr>
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<td>P_SDY_05</td>
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<td>52.09</td>
</tr>
<tr>
<td>P_SDY_06</td>
<td>30.37</td>
<td>33.72</td>
</tr>
<tr>
<td>P_SDY_07</td>
<td>25.48</td>
<td>28.38</td>
</tr>
<tr>
<td>P_SDY_08</td>
<td>17.62</td>
<td>20.13</td>
</tr>
<tr>
<td>P_SDY_09</td>
<td>12.64</td>
<td>16.63</td>
</tr>
<tr>
<td>P_SDY_10</td>
<td>8.74</td>
<td>12.78</td>
</tr>
<tr>
<td>P_SDY_12</td>
<td>1.85</td>
<td>5.45</td>
</tr>
<tr>
<td>P_SDY_13</td>
<td>0.80</td>
<td>4.53</td>
</tr>
<tr>
<td>P_SDY_14</td>
<td>11.00</td>
<td>11.45</td>
</tr>
<tr>
<td>P_SDY_15</td>
<td>5.29</td>
<td>5.74</td>
</tr>
<tr>
<td>P_SDY_16</td>
<td>0.70</td>
<td>3.51</td>
</tr>
<tr>
<td>P_SDY_17</td>
<td>0.14</td>
<td>2.60</td>
</tr>
<tr>
<td>P_SDY_18</td>
<td>0.06</td>
<td>2.35</td>
</tr>
<tr>
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<td>-0.42</td>
<td>2.35</td>
</tr>
<tr>
<td>P_SDY_20</td>
<td>5.00</td>
<td>0.00</td>
</tr>
<tr>
<td>P_SDY_21</td>
<td>2.92</td>
<td>3.71</td>
</tr>
<tr>
<td>P_SDY_22</td>
<td>10.08</td>
<td>11.91</td>
</tr>
<tr>
<td>P_STO_01</td>
<td>30.28</td>
<td>31.00</td>
</tr>
</tbody>
</table>
### Table 15 Summary of Baseline Modelled Peak Flow Rates

<table>
<thead>
<tr>
<th>Location</th>
<th>Peak Flow Rate (m³/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1EY</td>
</tr>
<tr>
<td>KINCH*</td>
<td>13.26 16.20 28.91 75.33 95.05 118.60 154.50 23.62</td>
</tr>
<tr>
<td>CUT_01</td>
<td>17.62 31.76 87.85 214.66 267.23 292.93 351.72 257.15</td>
</tr>
<tr>
<td>DRA_01</td>
<td>2.43 5.46 16.56 29.03 29.92 30.60 31.08 30.89</td>
</tr>
<tr>
<td>DRA_02</td>
<td>2.19 5.35 15.80 35.75 59.25 91.77 129.31 55.77</td>
</tr>
<tr>
<td>SDY_01</td>
<td>22.69 34.10 85.55 314.83 381.77 473.01 585.87 282.52</td>
</tr>
<tr>
<td>SDY_02</td>
<td>47.05 83.37 218.94 646.01 776.35 927.96 1132.70 743.44</td>
</tr>
<tr>
<td>SDY_03</td>
<td>22.10 36.18 86.16 222.47 284.27 361.06 560.39 741.49</td>
</tr>
<tr>
<td>SDY_04</td>
<td>62.19 118.77 311.08 915.57 1137.04 1392.25 1750.86 1525.37</td>
</tr>
<tr>
<td>SDY_05</td>
<td>68.74 133.47 351.28 996.68 1238.62 1537.21 1920.49 1970.23</td>
</tr>
<tr>
<td>SDY_06</td>
<td>69.83 135.17 356.43 1015.66 1256.00 1558.64 1933.61 1985.47</td>
</tr>
<tr>
<td>SDY_07</td>
<td>81.27 159.79 435.63 1226.89 1501.33 1879.83 2315.20 2615.74</td>
</tr>
<tr>
<td>SDY_08</td>
<td>81.16 160.29 445.25 1263.84 1537.91 1932.59 2433.41 2765.01</td>
</tr>
<tr>
<td>SDY_09</td>
<td>77.67 151.85 443.37 1285.24 1558.86 1956.81 2327.61 2478.32</td>
</tr>
<tr>
<td>SDY_10</td>
<td>80.23 153.14 455.22 1358.53 1651.29 2067.42 2552.26 2689.16</td>
</tr>
</tbody>
</table>

* outflow over Kinchant Dam spillway
8.0 Effects of Climate Change

8.1 General

Mackay Regional Council has used the Local Government Association of Queensland (LGAQ) and the Queensland Government’s (Qld Govt, 2010) advice on how to account for climate change in assessing flood risk since 2011. The study recommends a ‘climate change factor’ be included into flood studies in the form of a 5% increase in rainfall per degree of global warming. For the purposes of applying the climate change factor, the study outlines the following temperature increases and planning horizons:

- 2°Celsius by 2050;
- 3°Celsius by 2070; and
- 4°Celsius by 2100.

These increases in temperature equate to a 10% increase in rainfall depth by 2050, and 15% increase in rainfall depth by 2070 and a 20% increase in rainfall depth by 2100 (Qld Govt, 2010). ARR 2019 provides an interim climate change guideline in Book 1 Chapter 6 of ARR 2019 (Ball et al., 2019). The maximum consensus case for the high concentration pathway RCP8.5 predicts that by 2090, there will be an increase in temperature of 2.9°C, leading to a 15.4% increase in rainfall.

The increase in rainfall depth using ARR 2019 interim climate change guidelines is slightly lower but generally consistent with the Qld Govt (2010) findings. A conservative approach was used and a 20% rainfall increase was applied.

In addition to increased rainfall, climate change has the potential to increase sea levels. The most recent publication that relates to Queensland is the Queensland Coastal Plan (and more specifically the State Planning Policy Coastal Protection).

The second document outlines sea level rises that should be considered when planning for development in coastal areas of Queensland. Table 16 details the projected sea level rise up to 2100.

Table 16: Projected Sea Level Rise (SPP 3/11, 2012)

<table>
<thead>
<tr>
<th>Year of Planning Period</th>
<th>Projected Sea Level Rise (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050</td>
<td>0.3</td>
</tr>
<tr>
<td>2060</td>
<td>0.4</td>
</tr>
<tr>
<td>2070</td>
<td>0.5</td>
</tr>
<tr>
<td>2080</td>
<td>0.6</td>
</tr>
<tr>
<td>2090</td>
<td>0.7</td>
</tr>
<tr>
<td>2100</td>
<td>0.8</td>
</tr>
</tbody>
</table>

In addition to the Coastal Plan, the Australian Government Department of Climate Change and Energy Efficiency report Climate Change Risks to Australia’s Coast – A First Pass National Assessment for Australia (2009) identified that 1.1 m sea level rise by 2100 is a plausible value to adopt. Whilst this document is not a policy document, its recommendations should be considered.

Given the uncertainty in climate change and sea level rise projections, particularly with respect to changes in rainfall intensity, climate change sensitivity has been undertaken as part of this study. The hydrologic and hydraulic models have been used to assess the impact of climate change that would be expected to occur in 2100 for the 1% AEP design event. This included a sea level rise of 0.8m and rainfall intensity increase of 20%.

8.2 Hydraulic Model Results

The sensitivity result maps are available in the Sandy Creek Catchment – Tropical Cyclone Debbie Flood Study Report (Volume 2).
The sensitivity result maps (20% increase in rainfall & 0.8m increase in sea level) are available in the Sandy Creek Catchment – Tropical Cyclone Debbie Flood Study Report (Volume 2 Report). From the mapping it can be seen that the increase in rainfall and sea level due to climate change causes an increase in peak water surface levels across the catchment. A maximum of increase 1.0m is experienced on the downstream boundary for the 1% AEP event propagating upstream to an increase of approximately 0.4m around Drapers siding. As shown by the mapping, Eton is impacted by an increase of approximately 0.1-0.3m.

8.3 Planning Scheme Flood Mapping

To inform the current planning scheme the adopted approach was completed in accordance with Section 8.1 which includes a 20% increase in rainfall and increase in MHWS level at the downstream boundary by 0.8m to 3.15m AHD. Maps 34 – 41 contain the mapping results for the 1% and 0.2% AEP rainfall event with climate change.

The design flood depth and extent for the 1% AEP event with climate change to 2100 for Eton and Drapers siding communities has been included in Figure 33.

Figure 33 1% AEP with Climate Change Design Flood Depth and Extent – Eton and Drapers Siding
9.0 Flood Hazard Mapping

9.1 Overview

When dealing with specific floodplain management or emergency management analysis there may be a clear need to use specific thresholds. However, particularly in a preliminary assessment of risks or as part of a constraints analysis such as might be applied as part of a strategic floodplain management assessment, there is also an acknowledged need for a combined set of hazard vulnerability curves, which can be used as a general classification of flood hazard on a floodplain. A suggested set of curves based on the referenced thresholds presented above is provided in Figure 34.

![Combined Flood Hazard Curves (Smith et al, 2014)](image)

The combined flood hazard curves presented in Figure 34 set hazard thresholds that relate to the vulnerability of the community when interacting with floodwaters. The combined curves are divided into hazard classifications that relate to specific vulnerability thresholds as described in Table 17. Table 18 provides the limits for the classifications in Table 17.
Table 17 Combined Hazard Curves - Vulnerability Thresholds (Smith et al, 2014)

<table>
<thead>
<tr>
<th>Hazard Vulnerability Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Generally safe for vehicles, people and buildings.</td>
</tr>
<tr>
<td>H2</td>
<td>Unsafe for small vehicles.</td>
</tr>
<tr>
<td>H3</td>
<td>Unsafe for vehicles, children and the elderly.</td>
</tr>
<tr>
<td>H4</td>
<td>Unsafe for vehicles and people.</td>
</tr>
<tr>
<td>H5</td>
<td>Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.</td>
</tr>
<tr>
<td>H6</td>
<td>Unsafe for vehicles and people. All building types considered vulnerable to failure.</td>
</tr>
</tbody>
</table>

Table 18 Combined Hazard Curves - Vulnerability Thresholds Classification Limits (Smith et al, 2014)

<table>
<thead>
<tr>
<th>Hazard Vulnerability Classification</th>
<th>Classification Limit (D and V in combination)</th>
<th>Limiting Still Water Depth (D)</th>
<th>Limiting Velocity (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>$D \times V \leq 0.3$</td>
<td>0.3</td>
<td>2.0</td>
</tr>
<tr>
<td>H2</td>
<td>$D \times V \leq 0.6$</td>
<td>0.5</td>
<td>2.0</td>
</tr>
<tr>
<td>H3</td>
<td>$D \times V \leq 0.6$</td>
<td>1.2</td>
<td>2.0</td>
</tr>
<tr>
<td>H4</td>
<td>$D \times V \leq 1.0$</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>H5</td>
<td>$D \times V \leq 4.0$</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>H6</td>
<td>$D \times V &gt; 4.0$</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Importantly, the vulnerability thresholds identified in the flood hazard curves described above can be applied to the best description of flood behaviour available for a subject site. In this regard, the hazard curves can be applied equally to flood behaviour estimates from measured data, simpler 1D numerical modelling approaches, through to complex 2D model estimates with the level of accuracy and uncertainty of the flood hazard estimate linked to the method used to derive the flood behaviour estimate.

9.2 Mapping

To inform the current planning scheme flood hazard mapping (in accordance with Section 9.1) for the 18% and 1% AEP existing conditions and the 1% and 0.2% AEP events with climate change to 2100 (refer Section 8.0) were produced. Maps 25, 26, 38 and 42 contain the flood hazard mapping for the relevant events.

The flood hazard for the 1% AEP event with climate change to 2100 for Eton and Drapers siding communities has been included in Figure 35.
Figure 35  1% AEP with Climate Change Flood Hazard – Eton and Drapers Siding
10.0 Floodplain Management Principles

10.1 Framework

This study aligns to current best practice guidelines, including the Australia Disaster Resilience Handbook Collection, Handbook 7 – Managing the Floodplain: a Guide to Best Practice in Flood Risk Management in Australia (Commonwealth of Australia, 2017).

For a government agency with primary responsibility for managing flood risk in their area, the flood risk management framework provides a basis to improve management of flood risk for their community. The purpose of the framework is to assist Flood Management Agencies (FMA), like Council, to:

- Understand roles and responsibilities related to flood risk management.
- Identify and engage with relevant stakeholders and agencies.
- Identify and understand relevant legislation, policies, regulations and guidelines.
- Identify vulnerable and high-risk areas of the community.
- Collate the best available information and use it appropriately.
- Identify knowledge gaps and risks, to inform the decision-making process related to these issues.
- Develop plans to improve knowledge and manage flood risk, including implementation guidance.
- Make informed development decisions related to flood prone areas.
- Conduct community and stakeholder engagement related to flood risk and management.

A well formulated floodplain management plan enables informed communities, flood risk managers, land-use planners and emergency managers to make sound floodplain management decisions. The full range of potential flood risk treatment options must be carefully considered, in relation to the specific flood risk associated with the area, to ensure suitability and resilience.

Figure 10.1 (reproduced as Figure 36 below) of Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia (Commonwealth of Australia, 2017), illustrates the current best practice floodplain management process. Figure 36 demonstrates how this report fits within the overall process.
Figure 36 Floodplain Specific Management Process
Reproduction of Figure 10.1 from Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia (Commonwealth of Australia, 2017).
10.2 Floodplain Mitigation Measures

Floodplain management measures can be broadly grouped into Non-Structural and Structural options, as follows:

- **Non-Structural (refer Section 11.0):**
  - Community awareness.
  - Land use planning and development control.
  - Emergency management planning.

- **Structural (refer Section 12.0):**
  - Property buyback.
  - Levees (both permanent and temporary).
  - Detention basins.
  - Improved conveyance through channel works and culverts.
  - Development planning – Raising of dwellings.
  - Development planning – Flood proofing of dwellings.
  - Backflow prevention devices.
  - Diversion channels.

Non-structural flood mitigation measures relate to the management of current, potential and residual flood risks, whereas structural measures target the partial or complete elimination of flood risk.

Whilst sound floodplain management is preferably achieved through land use and development planning, this is not always feasible where development has already occurred within the floodplain.

Where development has occurred within flood prone areas, a reduction in flood risk can be achieved through the application of structural measures.
11.0 Non-Structural Flood Mitigation Measures

11.1 Overview

A summary of non-structural flood mitigation measures are outlined below for Council's consideration.

11.2 Community Awareness

It is critical that community living in the flood-prone areas of the Sandy Creek Catchment be made aware – and remains aware – of their role in the overall floodplain management strategy for the region, including defence of their communities and their personal evacuation. Sustaining an appropriate level of flood awareness involves continuous effort by Council and the emergency services which can significantly increase the community’s resilience to future flood events.

Irrespective of flood warnings, there can be widespread variation in flood awareness in a community which can result in a high degree of variation in flood damages. Within the Sandy Creek catchment area, more recent flood events (i.e. 2008 event & TC Debbie) have raised flood awareness in the community. However, as time passes, this awareness will reduce.

Council can enhance flood awareness through, for example, regular public education programs via newspaper, videos, pamphlets, meetings, community events and other media outlets. Community awareness brochures have been widely adopted and many followed the successful implementation of NSW SES’s ‘Flood Safe’ brochures.

These brochures can include material specific to the local region and provide the following information:

- What floods are and the history on flooding within Sandy Creek.
- Flood behaviour within the Sandy Creek Catchment.
- Flood warnings.
- What to do before, during and after a flood.
- Preparation of a household emergency plan.

It is recommended that Council develop a communications plan to explain existing flood risk to the Sandy Creek community using outputs from this report. This should be incorporated into Council’s current Coastal and Inland Flood Hazards Adaption Study (CIFHAS) community awareness campaign.

11.3 Land Use Planning Development Control

Through suitable land use planning, the likelihood and consequence of flooding can be managed by guiding appropriate future development, removing existing inappropriate development and selecting land use zoning which is flood compatible. Sound land use planning goes hand in hand with sound development planning.

Appropriate development and building controls can significantly reduce flood risk and the amount of damage to flood prone properties when a flood occurs. The level of protection provided by the Planning Scheme should be a consequence of an analysis of the risks and consequences of flooding and the opportunities provided by sustainable land uses.

An underlying factor of community vulnerability is the degree of exposure to flooding. Where people have chosen to live is their own decision however, they may not be aware of the flood risk and hazard to which they are exposed.

Planning schemes are a key element to prevent increasing the number of people, business and assets exposed to flooding from events less than the Defined Flood Event (DFE). It is therefore fundamental that future development is guided so that people and their property have limited exposure to flood hazard and/or the development uses flood resilient building material and practices and adopts/accepts a flood impact philosophy of shelter in place.
Several broad recommendations are provided below for further consideration by Council’s Planning and Development officers:

- This study has assessed existing flood risk for local and Sandy Creek catchment events. Storm surge events should be considered in conjunction with the results of this study, when undertaking development planning and assessments, particularly in the lower catchment.
- Council needs to have regard to the cumulative impacts of developments, i.e. the consideration of the impacts of a development in combination with other developments.
- A key component of previous land use planning is the adoption of a DFE. This has traditionally been adopted as the 1% AEP flood however there is considerable evidence that rainfall intensity will increase during current planning horizons.
  - In application, a DFE being the 1% AEP flood with an allowance for the adverse impacts of climate change as represented by an increase in design rainfall intensities of 20% (being a 5% per degree Celsius rise in mean global temperature of 4°C to the year 2100) is recommended.
- In consideration of the results of the sensitivity tests, and minimal data on which to base model calibration, it is recommended that a freeboard of 0.3m be applied to the model results from this report, when using them for development control purposes.
- Council should ensure the key overland flow paths identified are considered as part of future capital works to promote preferred overland conveyance routes.
- A comprehensive suite of development assessment measures is recommended, that not only includes the direct impact of development, but also the indirect impacts regarding flood warning and evacuation.
- Relevant Council staff should be appropriately trained in assessing flood study reports with respect to the development control measures selected.

The aim of land use planning and development control is to:

- Not unnecessarily sterilising land on the floodplain.
- Manage future development.
- Be ecologically, socially and culturally sustainable.
- Provide a balanced and integrated mix of management measures.
- Obtain best value.
- Provide direction for implementation.
- Promote community awareness, seek and take into account public comment.
- Meet legislative requirements and act in good faith.

There are a range of methods that can also be considered for future development and or future planning scheme controls. Methods include:

- Internal Council Policy to guide development assessments including draft conditions for stormwater flooding prevention and control.
- Preparing more up to date Flood Hazard Overlay Mapping, using the flood maps prepared for this study.
- Planning maps easily accessible by the public to find out if Council has planning controls for flooding on the subject property.
- Ensuring in development control provisions that any portion of a structure below flood planning levels will be built from materials that minimise potential damage due to inundation and impact from flood velocities.
Planning scheme controls can also provide Performance Criteria & Acceptable Solutions that seek to achieve the following objectives:

- Habitable floor areas for residential developments to be above the defined flood event plus freeboard.
- Increase housing density that makes use of prefabricated or tilt up concrete panels.
- Basement carparks prohibited in areas where the 1% (or lower) AEP event extends above to top of existing kerb and channel flood areas.
- Major electrical equipment (switchboard, lift controls, etc.) for the buildings to be above the defined flood event.
- Major plumbing and house drainage equipment (switchboard, pump controls, etc.) for the buildings to be above the defined flood event.
- Maximum site discharge to be no greater than 39% AEP - to be triggered by development application.
- Avoid filling to minimise cumulative impacts on floodplain storage.
- Maximise use of non-stud frame dwellings to reduce contents damage.
- Place electrical outlets approximately 1m minimum above floor height.
- Build all external wall and load bearing internal walls below the DFE plus freeboard of masonry construction e.g. double brick, concrete block, concrete panel rather than brick veneer or framed walls.
- Use timber framed walls with sheet cladding only for non-load-bearing internal partitions.
- Building foundations to be flood impact and inundation resilient, taking account of anticipated flow velocities.
- For structural purposes use materials that are dimensional stable and not weakened by immersion.
- Use of water resistant bracing materials – e.g. steel straps, fibre cement or waterproof plywood sheets.
- Ignore bracing contribution from plasterboard wall lining.
- Use medium of heavy-duty side fixed brick ties.
- Use insulation with minimal absorption that dries- e.g. polystyrene panels.
- Ensure adequate ventilation to cavities.
- Staircases should be designed to facilitate the relocation of contents from the ground floor to the upper floor.

11.3.1 Habitable Floor Level

Council currently set habitable floor levels based on the highest of:

- 300mm above the 1% AEP (annual likelihood) flood level or defined storm tide event.
- 225mm above natural ground level;
- 300mm above the greater of top of the kerb level or the crown of the adjacent bitumen road.
11.4 Emergency Management Planning

Council's Local Disaster Management Group (LDMG) is responsible for coordinating local planning and response for flood events. A lack of available data can be a limiting factor for a LDMG's ability to plan for the event and to communicate the expected impacts to local residents / media.

11.4.1 Flood Emergency Plan

It is recommended that Council further develop or amend their existing Flood Emergency Plan (FEP) following the completion of this study. The FEP should be a detailed document containing an agreed set of roles, responsibilities, functions, actions and management arrangements to deal with flood events of all sizes.

The primary aim of the FEP is to reduce risk during an actual flood. Essential issues addressed in the plan are flood forecasting, flood warning, location of vulnerable people/communities and evacuation and initial recovery. A local FEP forms an essential component of a floodplain management plan and requires close liaison between emergency management staff.

Typically, a FEP has several trigger points that result in the activation and implementation of the plan as the actual flood event develops. The flood emergency plan should include activities to protect and reinstate essential infrastructure services required during clean-up and in the recovery phase. Flood modelling results from this study can be used to determine appropriate triggers and actions within the FEP.

11.4.2 Assessment of Critical Infrastructure

A list of critical infrastructure should be prepared, with an identification of the potential and triggers for being exposed to the flood hazard identified. This could include infrastructure such as:

- Emergency services facilities (e.g. ambulance, police, fire, hospital).
- Facilities for evacuation of vulnerable groups (e.g. child care, education, retirement, nursing care, caravan parks).
- Key evacuation routes.
- Key water and sewerage infrastructure.
- Roads / bridges.
- Airport facilities.

A flood forecasting system could be used to evaluate the potential for critical infrastructure to be impacted as part of real time flood forecasting.

11.5 Summary of Non-Structural Flood Mitigation Measures

A summary of non-structural flood mitigation measures is shown in Table 19, with a brief discussion on the various types of mitigation measures also provided.
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<thead>
<tr>
<th>Measure</th>
<th>Mitigation Option</th>
<th>Description</th>
<th>Advantages / Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community awareness</td>
<td>Community and Stakeholder</td>
<td>Engagement throughout the floodplain management process, to inform the</td>
<td><strong>Advantages</strong>&lt;br&gt;- Creates a flood resilient community.&lt;br&gt;- Gives the community a sense of 'buy in' related to flood risk.&lt;br&gt;- Allows for informed debate regarding flood mitigation strategies.&lt;br&gt;- Consequence of flooding may be reduced.&lt;br&gt;<strong>Disadvantages</strong>&lt;br&gt;- May result in negative community feelings towards flood prone areas.&lt;br&gt;- Likelihood of flooding remains the same.</td>
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<tr>
<td></td>
<td>consultation</td>
<td>consultation to inform the community on flood risk and develop flood</td>
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<td>resilience within the community.</td>
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<td>Land use planning</td>
<td>Zoning</td>
<td>Appropriate land use zoning to guide future development away from flood</td>
<td><strong>Advantages</strong>&lt;br&gt;- Discourages future development in areas affected by flooding.&lt;br&gt;- Reduces future flood risk. <strong>Disadvantages</strong>&lt;br&gt;- Re-zoning of existing developments may take time to have an effect on flood risk, as existing residents may not move on for some time.&lt;br&gt;- May reduce land values, particularly on the flood fringe areas.</td>
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<td></td>
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<td>future development away from flood prone areas.</td>
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<td></td>
<td></td>
<td>Re-zoning of existing developments within flood prone areas, to flood</td>
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<td>compatible land uses (e.g. parks and open spaces).</td>
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<tr>
<td>Buyback / Purchase</td>
<td>Voluntary or forced purchase of</td>
<td>Voluntary or forced purchase of existing buildings within high hazard flood</td>
<td><strong>Advantages</strong>&lt;br&gt;- Eliminates flood risk.&lt;br&gt;- Links with re-zoning. <strong>Disadvantages</strong>&lt;br&gt;- Costly.&lt;br&gt;- May cause distress if residents resist the purchase.&lt;br&gt;- Could take a long time, particularly if there is isolated resistance within a larger group of buybacks.</td>
</tr>
<tr>
<td></td>
<td>existing buildings within high</td>
<td>areas, to eliminate the flood risk.</td>
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<tr>
<td>Development planning</td>
<td>Planning Scheme</td>
<td>An overarching plan for the city / region to guide areas of development</td>
<td><strong>Advantages</strong>&lt;br&gt;- Provides a clear picture of areas where development should not take place, due to flood risk. <strong>Disadvantages</strong>&lt;br&gt;- Could sterilise areas on the flood fringe.</td>
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<tr>
<td>and building controls</td>
<td></td>
<td>outside flood prone areas.</td>
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<tr>
<td>Measure</td>
<td>Mitigation Option</td>
<td>Description</td>
<td>Advantages / Disadvantages</td>
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</tbody>
</table>
| Development planning and building controls | Minimum floor levels                   | Habitable floor levels are set based on a minimum height (freeboard) above the DFE. | Advantages: Provides a level of flood resilience, up to the DFE.  
Disadvantages: Residual risk remains for flooding in events larger than the DFE.  
- There may be issues with flood free access / egress to buildings. |
| Raising of dwellings          | Lifting of the habitable floor level of an existing dwelling, based on a minimum height (freeboard) above the DFE. | Advantages: Provides a level of flood resilience, up to the DFE.  
- May prove to be cost effective, when compared to other building controls.  
Disadvantages: Not possible for all types of buildings.  
- Residual risk remains for flooding in events larger than the DFE.  
- There may remain issues with flood free access to the building. |
| Flood proofing of dwellings   | Improving the flood resistance of a building to inundation and velocities, through the use of appropriate materials. This is done by retrofitting to existing buildings or designing into new buildings. | Advantages:  
- Structural damage is reduced during flooding.  
Disadvantages:  
- Other detrimental effects of flooding remain, including access, clean up, etc. |
| Raising of services – electrical and plumbing | Improved flood resilience of building to loss of services if major electrical equipment (lifts and switchboards) and major plumbing items (pumps) are above the DFE. | Advantages:  
- Loss of service is reduced during flooding.  
Disadvantages:  
- Other detrimental effects of flooding remain, including access, clean up, etc. |
| Emergency management planning | Response planning                       | Planning associated with managing flood forecasting, flood preparedness, emergency response and flood recovery. | Advantages:  
- Provides clear details on the responsibilities and actions to be taken prior to, during and after a flood event.  
- Identifies areas that require improvement, in relation to flood response.  
Disadvantages:  
- Flood risk remains. |
<table>
<thead>
<tr>
<th>Measure</th>
<th>Mitigation Option</th>
<th>Description</th>
<th>Advantages / Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Forecasting and warning</td>
<td>Relates to the prediction of flood severity, flood extent and flood timing for a specific area, and the methods by which affected persons are informed.</td>
<td>Advantages:</td>
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<tr>
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<td>- Provides advanced warning of a flood event, which allows for flood preparedness and flood response.</td>
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<td>Disadvantages:</td>
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<td>- Flood risk remains.</td>
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<td></td>
<td>Flood preparedness</td>
<td>Refers to the awareness of affected parties (community and agency alike) of what they need to do prior to the arrival of a flood.</td>
<td>Advantages:</td>
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<tr>
<td></td>
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<td>- Reduces incidental flood damage.</td>
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<td>- Reduces social impacts.</td>
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<td>- Allows for effective flood response.</td>
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<td>Disadvantages:</td>
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<td></td>
<td></td>
<td></td>
<td>- Flood risk remains.</td>
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<tr>
<td></td>
<td>Flood Response</td>
<td>Refers to the response by agencies and individuals affected by the flood, to reduce the hazard. This could include road closures, evacuations and rescue.</td>
<td>Advantages:</td>
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<td></td>
<td></td>
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<td>- May reduce the consequences of flooding.</td>
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<td></td>
<td></td>
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<td>Disadvantages:</td>
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<td></td>
<td></td>
<td></td>
<td>- Flood risk remains.</td>
</tr>
<tr>
<td></td>
<td>Recovery</td>
<td>Once flood waters recede, the recovery process includes clean-up, services restoration, financial assistance and other activities to ensure safe access is available to flood affected areas.</td>
<td>Advantages:</td>
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<tr>
<td></td>
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<td>- Good planning will accelerate the recovery process.</td>
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<td></td>
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<td>- Clearly defines the roles and responsibilities related to flood recovery.</td>
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<td></td>
<td></td>
<td></td>
<td>Disadvantages:</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Flood risk remains.</td>
</tr>
</tbody>
</table>
12.0  Structural Mitigation Options

12.1  Overview
The following broad principles should be applied when developing preliminary structural mitigation options.

- Improvements to existing open channels, including regrading and widening;
- Incorporation of additional stormwater pipework, where possible.

As outlined in Section 3.3 risk areas have been identified by the communities and baseline mapping. It is proposed that further investigation is required in the area around the Eton, Drapers Siding and Homebush areas, where several properties were flooded and brought to Council’s attention by the community.

12.2  Drapers Siding Resilience
Following the impacts of flooding from Tropical Cyclone Debbie particularly around the Drapers Siding area. There is opportunity for Council to liaise with the local community into opportunities for building resilience to flooding within the household.

Findings from this study and potential future hydraulic investigations can be used to inform the community of design flood heights and identify potential localised mitigation strategies. These local strategies may incorporate provisions such as (but not limited to) moving household items to higher locations during flood and/or the incorporation of resilient building materials below flood heights.

12.3  Emergency Access to Localities
The findings of this study can be used to identify primary emergency access routes for residents living within the Sandy Creek catchment. From this identification process, potential structural mitigation options to improve the immunity or resilience of the access corridor can be further investigated.

Findings can also be input into the community awareness non-structural mitigation measures.
13.0 Conclusion

13.1 Key Findings

The key findings from the TUFLOW hydraulic modelling and associated analysis undertaken for the Sandy Creek Catchment – Tropical Cyclone Debbie Flood Study project is summarised below:

- The 1080-minute (18 hour) storm was found to result in the highest mean peak flow for the majority of the sub-catchments and was utilised as the critical duration for 63.2%, 39%, 18%, 2%, 1%, 0.5% and 0.2% AEP events.
- Cyclone Debbie rainfall within the catchment was found to be greater than a 1% AEP design rainfall event based on AR&R methodology.
- The community feedback and surveyed flood heights identified flooding within the township of Eton, Drapers Siding and Homebush during the Tropical Cyclone Debbie rainfall event. Some of which could be replicated in hydraulic modelling.
- The shortfalls of the TUFLOW hydraulic model validation infers that an intense localised rain event occurred over the catchment and was not captured by a rain gauge.
- LiDAR data quality with respect to the processing of cane fields and heavy vegetation is of concern and it is believed that modelled flow patterns have been influenced by LiDAR data quality.
- The impacts of cane on the hydraulic roughness is of concern in that it is not fully known the extent of cane laying over and thus reducing the impedance of floodplain flows.
- Floodplain management principles as well as mitigation options for the Sandy Creek catchment have been identified for further investigation to reduce property flooding and build community resilience.
- Adjusting the roughness values by ±20% had negligible flooding extent increase with no additional breakouts occurred within the creeks and no additional houses were affected.

13.2 Recommendations

It is recommended that the following be completed prior to executing future model calibration or hydraulic investigations within the Sandy Creek catchment:

- Survey all hydraulic structures such as bridges and culverts for MRC, Mackay Sugar and QR owned assets.
- Revise the LiDAR survey over the entire catchment, whether by flying new survey or investigating the filtering and triangulation of the current data.
- Install additional rainfall gauges throughout the catchment for future rainfall events to assist in calibration.

It is strongly recommended that more detailed flood extents and levels are captured throughout the catchment in future flood events for potential model validation / calibration in future stages of hydraulic investigations. The use of low-cost flood height gauges has significant potential; to improve the confidence in the quality of the flood level data.
14.0 References

- Australian Rainfall and Runoff: A Guide to Flood Estimation 1987 [Institution of Engineers Australia, 1998];
- Mackay Floodplain Management Plan – Volume 1 Flood Study report [WRM, 2017];
- Bakers Creek Walkerston Flood Study [WRM, 2013];
- Kinchant Dam Failure Impact Assessment Report [Engeny for Sunwater limited, July 2016];
- Kinchant Dam Failure Impact Assessment Report [Engeny for Sunwater limited, May 2018];
- The Cyclone Debbie Review – Inspector-General Emergency Management [Qld Government, October 2017];
- Flooding in Sandy Creek Catchment, Mackay, following Tropical Cyclone Debbie, An independent Assessment [Qld Chief Scientist, June 2017];
Appendix A

URBS Model Parameters
Appendix A  URBS Model Parameters

The following tables outline the parameters used in the Sandy Creek Catchment URBS hydrologic model.

### Table A1  URBS Model - Catchment File

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Sandy Creek Catchment
Tropical Cyclone Debbie Flood Study

Client: Mackay Regional Council
ABN: 56 240 712 069

Prepared by
AECOM Australia Pty Ltd
Level 1, 162 Victoria Street, PO Box 11176 Mackay QLD 4740 Australia
T +61 7 4965 9800  F +61 7 4957 6097  www.aecom.com

21-Jan-2020
Job No.: 60598460

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Revision 0 – 21-Jan-2020
Prepared for – Mackay Regional Council – ABN: 56 240 712 069

Quality Information
Document Sandy Creek Catchment
Ref M052-19
Date 21-Jan-2020
Prepared by Hayden Briggs
Reviewed by Trevor Coney / Wes Bailey

Revision History

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AECOM
Explanatory Notes and Disclaimer

These maps are to be viewed in conjunction with the Sandy Creek Catchment – Tropical Cyclone Debbie Flood Study Report (AECOM, 2019). Study methodology and assumptions are outlined in the Volume 1 report. This mapping has been developed to represent local catchment flood behaviour in the Sandy Creek area, particularly around the residential areas.

Information presented in this mapping may vary, depending upon development within the floodplain over time. It is suggested that the TUFLOW model and these associated maps be updated by Mackay Regional Council as development occurs.

The development of the TUFLOW hydraulic model is detailed in Sandy Creek Catchment – Tropical Cyclone Debbie Flood Study Report – Volume 1 (AECOM, 2019). This report outlines input data, modelling assumptions and schematicisation parameters adopted.

All information presented in this mapping is expressed in meters Australian Height Datum (AHD).

Hydraulic model results used in this mapping is based on an 8-metre fixed Cartesian grid hydraulic model. Use of the mapping to determine hydraulic parameters in sub-grid scale applications is not recommended.

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2. Using the maps and associated data for any purpose not agreed to in writing by Mackay Regional Council.

Notes on Flood Frequency

The frequency of flood events is generally referred to in terms of their Annual Exceedance Probability (AEP) or Average Recurrence Interval (ARI). For example, for a flood magnitude having 2% AEP, there is a 2% probability that there will be floods of equal or greater magnitude each year. As another example, for a flood having 5-year ARI, there will be floods of equal or greater magnitude once in 5 years on average. Events more frequent than 50% AEP should be expressed as X Exceedances per Year (EY). The correspondence between the two systems is below. The frequency flood events from 10% AEP to 0.02% AEP used in this study.

<table>
<thead>
<tr>
<th>Annual Exceedance Probability (AEP), %</th>
<th>Average Recurrence Interval (ARI), Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>63 (1EY)</td>
<td>1</td>
</tr>
<tr>
<td>39</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>0.5</td>
<td>200</td>
</tr>
<tr>
<td>0.2</td>
<td>500</td>
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Table 1 Flood Frequency Comparison
Hydraulic Model Results Mapping

### Existing Conditions Model Results Mapping

<table>
<thead>
<tr>
<th>Map Number</th>
<th>Map Title</th>
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<tbody>
<tr>
<td>1</td>
<td>Peak Water Surface Elevation (PWSE) – 63% AEP (1 EY) – 18 Hour Storm</td>
</tr>
<tr>
<td>2</td>
<td>Peak Water Surface Elevation (PWSE) – 39% AEP (2 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>3</td>
<td>Peak Water Surface Elevation (PWSE) – 18% AEP (5 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>4</td>
<td>Peak Water Surface Elevation (PWSE) – 2% AEP (50 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>5</td>
<td>Peak Water Surface Elevation (PWSE) – 1% AEP (100 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>6</td>
<td>Peak Water Surface Elevation (PWSE) – 0.5% AEP (200 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>7</td>
<td>Peak Water Surface Elevation (PWSE) – 0.2% AEP (500 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>8</td>
<td>Peak Water Surface Elevation (PWSE) – PMF Event – 48 Hour Storm</td>
</tr>
<tr>
<td>9</td>
<td>Peak Flood Depth – 1EY (63% AEP) – 18 Hour Storm</td>
</tr>
<tr>
<td>10</td>
<td>Peak Flood Depth – 39% AEP (2 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>11</td>
<td>Peak Flood Depth – 18% AEP (5 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>12</td>
<td>Peak Flood Depth – 2% AEP (50 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>13</td>
<td>Peak Flood Depth – 1% AEP (100 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>14</td>
<td>Peak Flood Depth – 0.5% AEP (200 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>15</td>
<td>Peak Flood Depth – 0.2% AEP (500 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>16</td>
<td>Peak Flood Depth – PMF Event – 48 Hour Storm</td>
</tr>
<tr>
<td>17</td>
<td>Peak Depth Averaged Velocity – 1EY (63% AEP) – 18 Hour Storm</td>
</tr>
<tr>
<td>18</td>
<td>Peak Depth Averaged Velocity – 39% AEP (2 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>19</td>
<td>Peak Depth Averaged Velocity – 18% AEP (5 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>20</td>
<td>Peak Depth Averaged Velocity – 2% AEP (50 Year ARI) – 18 Hour Storm</td>
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<tr>
<td>21</td>
<td>Peak Depth Averaged Velocity – 1% AEP (100 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>22</td>
<td>Peak Depth Averaged Velocity – 0.5% AEP (200 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>23</td>
<td>Peak Depth Averaged Velocity – 0.2% AEP (500 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>24</td>
<td>Peak Depth Averaged Velocity – PMF Event – 48 Hour Storm</td>
</tr>
<tr>
<td>25</td>
<td>Flood Hazard Mapping – 18% AEP (5 Year ARI) – 18 Hour Storm</td>
</tr>
<tr>
<td>26</td>
<td>Flood Hazard Mapping – 1% AEP (100 Year ARI) – 18 Hour Storm</td>
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### Tropical Cyclone Debbie Model Results Mapping

<table>
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<th>Map Number</th>
<th>Map Title</th>
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<tbody>
<tr>
<td>27</td>
<td>Peak Water Surface Elevation – Tropical Cyclone Debbie Event</td>
</tr>
<tr>
<td>28</td>
<td>Peak Flood Depth – Tropical Cyclone Debbie Event</td>
</tr>
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<td>29</td>
<td>Peak Velocity and Flow Direction – Tropical Cyclone Debbie Event</td>
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### Sensitivity Mapping

<table>
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<tr>
<td>30</td>
<td>Difference in Peak Water Surface – Climate Change Sensitivity – Climate Change Scenario minus Existing Conditions 1% AEP (100 Year ARI)</td>
</tr>
<tr>
<td>31</td>
<td>Difference in Peak Water Surface – Climate Change Sensitivity – Climate Change Scenario minus Existing Conditions 0.2% AEP (50 Year ARI)</td>
</tr>
<tr>
<td>32</td>
<td>Difference in Peak Water Surface – Manning’s Roughness Sensitivity (+20%) – Increased Roughness minus Basecase 1% AEP (100 Year ARI)</td>
</tr>
<tr>
<td>33</td>
<td>Difference in Peak Water Surface – Manning’s Roughness Sensitivity (-20%) – Decreased Roughness minus Basecase 1% AEP (100 Year ARI)</td>
</tr>
<tr>
<td>34</td>
<td>Difference in Peak Water Surface – Blockage Sensitivity – Increased Blockage Scenario minus Basecase 1% AEP (100 Year ARI)</td>
</tr>
</tbody>
</table>

### Planning Scheme Flood Hazard Overlay

<table>
<thead>
<tr>
<th>Map Number</th>
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<tbody>
<tr>
<td>35</td>
<td>Peak Water Surface Elevation (PWSE) – Climate Change Scenario – 1% AEP (100 Year ARI)</td>
</tr>
<tr>
<td>36</td>
<td>Peak Flood Depth – Climate Change Scenario – 1% AEP (100 Year ARI)</td>
</tr>
<tr>
<td>37</td>
<td>Peak Depth Averaged Velocity – Climate Change Scenario – 1% AEP (100 Year ARI)</td>
</tr>
<tr>
<td>38</td>
<td>Flood Hazard Mapping – Climate Change Scenario – 1% AEP (100 Year ARI)</td>
</tr>
<tr>
<td>39</td>
<td>Peak Water Surface Elevation (PWSE) – Climate Change Scenario – 0.2% AEP (50 Year ARI)</td>
</tr>
<tr>
<td>40</td>
<td>Peak Flood Depth – Climate Change Scenario – 0.2% AEP (50 Year ARI)</td>
</tr>
<tr>
<td>41</td>
<td>Peak Depth Averaged Velocity – Climate Change Scenario – 0.2% AEP (50 Year ARI)</td>
</tr>
<tr>
<td>42</td>
<td>Flood Hazard Mapping – Climate Change Scenario – 0.2% AEP (50 Year ARI)</td>
</tr>
</tbody>
</table>
Refer Sub-Map 1, Sub-Map 2, Sub-Map 3.

Mackay - Eungella Road
Bruce Highway
Peak Downs Highway
Marian - Eton Road
Sarina - Homebush Road
North Eton Road
Eton - Homebush Road
Mirani - Eton Road

Filename: P:\605x\60598460\900_CAD_GIS\920_GIS\02_MXDs\Sandy\Sandy_001_Basecase_PWSE_001y.mxd

03,1006,2001,550 Metres
1:125,000 (when printed at A3)

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Water Surface Elevation (PWSE) 1EY Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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VERSION: v01

MACKAY REGIONAL COUNCIL
Ordinary Meeting - 12 February 2020

Attachment 11421

Page 288
MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Water Surface Elevation (PWSE)
1EY Event - 18 Hour Storm

Data sources:
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Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN and the GIS User Community

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CREATED BY: briggh
LAST MODIFIED: 28/09/2019
LEGEND
TUFLOW Model Boundary
State Controlled Road
Cadastre
PWSE (mAHD)
High: 110.836
Low: 8.07351

GDA 1994 MGA Zone 55

ORDINARY MEETING - 12 FEBRUARY 2020

Attachment 11.4.2.1
PAGE 290
MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Water Surface Elevation (PWSE)
1EY Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN and the GIS User Community

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Water Surface Elevation (PWSE)
39% AEP Event - 18 Hour Storm

Data sources:
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LAST MODIFIED: briggh 28/09/2019
CREATED BY: 60598460

LEGEND
- TUFLOW Model Boundary
- State Controlled Road
- Cadastre

PWSE (mAHD)
High: 107.232
Low: 2.35

GDA 1994 MGA Zone 55
MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Water Surface Elevation (PWSE)
39% AEP Event - 18 Hour Storm

Locality Map

LEGEND

- TUFLOW Model Boundary
- State Controlled Road
- Codakle
- PWSE (mAHD)
  - High: 66.2525
  - Low: 24.6837

GDA 1994 MGA Zone 55

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Water Surface Elevation (PWSE)
39% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
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LEGEND
TUFLOW Model Boundary
State Controlled Road
Gdaeste
PWSE (mAHD)
High : 33.7255
Low : 2.35

GDA 1994 MGA Zone 55

ORDINARY MEETING - 12 FEBRUARY 2020

Attachment 11.4.2.1
MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Water Surface Elevation (PWSE)
18% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN and the GIS User Community

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28/09/2019

LEGEND
TUFLOW Model Boundary
State Controlled Road
Coastline
PWSE (mAHD)
High : 66.8004
Low : 20.950

GDA 1994 MGA Zone 55

ORDINARY MEETING - 12 FEBRUARY 2020
Attachment 11.4.2.1

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MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Water Surface Elevation (PWSE)
18% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
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Sub-Map 1
Sub-Map 2
Sub-Map 3

Mackay - Eungella Road
Bruce Highway
Peak Downs Highway
Marian - Eton Road
Sarina - Homebush Road
North Eton Road
Mirani - Eton Road

LEGEND

TUFLOW Model Boundary
State Controlled Road
Coastal PWSE (mAHD)

High : 107.687
Low : 2.35

GDA 1994 MGA Zone 55

A3 size

Data sources:
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LEGEND

TUFLOW Model Boundary
State Controlled Road

PWSE (mAHD)

High : 107.687
Low : 2.35

GDA 1994 MGA Zone 55

A3 size

Data sources:
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LEGEND

TUFLOW Model Boundary
State Controlled Road

PWSE (mAHD)

High : 107.687
Low : 2.35

GDA 1994 MGA Zone 55

A3 size

Data sources:
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TUFLOW Model Boundary
State Controlled Road

PWSE (mAHD)

High : 107.687
Low : 2.35

GDA 1994 MGA Zone 55

A3 size

Data sources:
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LEGEND

TUFLOW Model Boundary
State Controlled Road

PWSE (mAHD)

High : 107.687
Low : 2.35

GDA 1994 MGA Zone 55

A3 size

Data sources:
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TUFLOW Model Boundary
State Controlled Road

PWSE (mAHD)

High : 107.687
Low : 2.35

GDA 1994 MGA Zone 55

A3 size

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LEGEND

TUFLOW Model Boundary
State Controlled Road

PWSE (mAHD)

High : 107.687
Low : 2.35

GDA 1994 MGA Zone 55

A3 size

Data sources:
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29/09/2019
Sarina-Homebush Road
Marian-Eton Road
Peak Downs Highway
North Eton Road
Eton-Homebush Road
Miran-Eton Road

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Metres
1:50,000 (when printed at A3)

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Water Surface Elevation (PWSE)
2% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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LEGEND
TUFLOW Model Boundary
State Controlled Road
Chanel
PWSE (m AHD)
High: 119.97
Low: 13.6142

GDA 1994 MGA Zone 55

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Water Surface Elevation (PWSE)
2% AEP Event - 18 Hour Storm

Map
04.2

Attachment 11.4.2.1
ORDINARY MEETING - 12 FEBRUARY 2020
PAGE 302
Mackay - Eungella Road
Bruce Highway
Peak Downs Highway
Marian - Eton Road
Sarina - Homebush Road
North Eton Road
Eton - Homebush Road
Miran-Eton Road
Mackay-Eungella Road
Marian - Eton Road
Peak Downs Highway
Eton Road
Mirani-Eton Road

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Water Surface Elevation (PWSE)
1% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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PROJECT ID: 05.1
Version: 1, Version Date: 24/01/2020
Document Set ID: 7869074

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Attachment 11.4.2.1

Locality Map
Version: 1, Version Date: 24/01/2020

ORDINARY MEETING - 12 FEBRUARY 2020
Attachment 11.4.2.1

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MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Water Surface Elevation (PWSE)
1% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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PROJECT ID
CREATED BY
LAST MODIFIED
60598460
briggh
29/09/2019

LEGEND
TUFLOW Model Boundary
State Controlled Road
PWSE (mAHD)
High: 41.2924
Low: 2.35

GDA 1994 MGA Zone 55

Map

VERSION: v01

Document Set ID: 7869074

ORDINARY MEETING - 12 FEBRUARY 2020

Attachment 11.4.2.1

PAGE 307
MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Water Surface Elevation (PWSE)
0.5% AEP Event - 18 Hour Storm

LEGEND

TUFLOW Model Boundary
State Controlled Road
Cadastre
PWSE (mAHD)

HIGH: 67.752
LOW: 26.750

GDA 1994 MGA Zone 55

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics,
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PROJECT ID
LAST MODIFIED
CREATED BY
60598460
briggh
29/09/2019

VERSION: v01

Document Set ID: 7869074

ORDINARY MEETING - 12 FEBRUARY 2020
Attachment 11.4.2.1
MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Water Surface Elevation (PWSE)
0.5% AEP Event - 18 Hour Storm

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LEGEND
- TUFLOW Model Boundary
- State Controlled Road
- Cadastre
- PWSE (m AHD)
  - High: 41.3557
  - Low: 2.35

GDA 1994 MGA Zone 55

06.3
Map

Ordinary Meeting - 12 February 2020
Attachment 11.4.2.1

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MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Water Surface Elevation (PWSE)
0.2% AEP Event - 18 Hour Storm

LEGEND

- TUFLOW Model Boundary
- State Controlled Road
- Coastline
- PWSE (mAHD)
  - High: 41.623
  - Low: 2.35

GDA 1994 MGA Zone 55

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MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Flood Depth
SEY Event - 18 Hour Storm

LEGEND
TUFLOW Model Boundary
State Controlled Road
Cadastral
Peak Flood Depth (m)
0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1.0 - 1.5
1.5 - 2.0
2.0 - 3.0
3.0 - 4.0
4.0 - 5.0
>5.0

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PROJECT ID
60598460
CREATED BY
briggh
LAST MODIFIED
29/09/2019

DOCUMENT SET ID: 7869074
Document Set Date: 24/01/2020
Version: 1

MACKAY REGIONAL COUNCIL
ORDINARY MEETING - 12 FEBRUARY 2020

ORDINARY MEETING - 12 FEBRUARY 2020

PAGE 321
MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Flood Depth
1EY Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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PROJECT ID: 09.3
Map Version: 1
Project Date: 24/01/2020

MACKAY REGIONAL COUNCIL
ORDINARY MEETING - 12 FEBRUARY 2020

Attachment 114.21

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MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Flood Depth
39% AEP Event - 18 Hour Storm

LEGEND

TUFLOW Model Boundary
State Controlled Road
Cadastre
Peak Flood Depth (m)
0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1.0 - 1.5
1.5 - 2.0
2.0 - 3.0
3.0 - 4.0
4.0 - 5.0
>5.0

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Mackay-Eungella Road

Marian - Eton Road

North Eton Road

Miran-Eton Road

Filename: P:\605x\60598460\900_CAD_GIS\920_GIS\02_MXDs\Sandy\Sandy_010_Basecase_Depth_002y.mxd

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1:50,000 (when printed at A3)

MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies

Sandy Creek Catchment

Peak Flood Depth

3% AEP Event - 18 Hour Storm

Data sources:

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LAST MODIFIED:

CREATED BY:

60598460
briggh
29/09/2019

LEGEND

TUFLOW Model Boundary
State Controlled Road
Cadastre
Peak Flood Depth (m)
0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1.0 - 1.5
1.5 - 2.0
2.0 - 3.0
3.0 - 4.0
4.0 - 5.0
>5.0

GDA 1994 MGA Zone 55

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Map

VERSION: v01

Version: 1, Version Date: 24/01/2020

Document Set ID: 7869074

ORDINARY MEETING - 12 FEBRUARY 2020

Attachment 11.4.2.1

MACKAY REGIONAL COUNCIL

PAGE 325
Sarina-Homestead Road
Marien-Eton Road
Peak Downs Highway
North Eton Road
Eton-Homestead Road

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Flood Depth
39% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Flood Depth
39% AEP Event - 18 Hour Storm

Legend
- TUFLOW Model Boundary
- State Controlled Road
- Cadastre
- Peak Flood Depth (m)
  - 0 - 0.2
  - 0.2 - 0.4
  - 0.4 - 0.6
  - 0.6 - 0.8
  - 0.8 - 1
  - 1 - 1.5
  - 1.5 - 2
  - 2 - 3
  - 3 - 4
  - 4 - 5
  - >5

GDA 1994 MGA Zone 55

Map

10.3

A3 size
MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Flood Depth
18% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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PROJECT: Tropical Cyclone Debbie Flood Studies
SANDY CREEK CATCHMENT

Peak Flood Depth
18% AEP Event - 18 Hour Storm

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LEGEND

- TUFLOW Model Boundary
- State Controlled Road
- Cadastre
- Peak Flood Depth (m)

0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1.0 - 1.5
1.5 - 2.0
2.0 - 3.0
3.0 - 4.0
4.0 - 5.0
>5.0

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Flood Depth
18% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Flood Depth
2% AEP Event - 18 Hour Storm

LEGEND
- TUFLOW Model Boundary
- State Controlled Road

Peak Flood Depth (m)
- 0 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1
- 1 - 1.5
- 1.5 - 2.0
- 2.0 - 3.0
- 3.0 - 4.0
- 4.0 - 5.0
- >5.0

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Map

PROJECT: 12.0
Update: Date: 25/01/2020

MACKAY REGIONAL COUNCIL
ORDINARY MEETING - 12 FEBRUARY 2020

Attachment 11.4.2.1

PAGE 332
MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Flood Depth
2% AEP Event - 18 Hour Storm

LEGEND

- TUFLOW Model Boundary
- State Controlled Road
- Culvert
- Peak Flood Depth (m)
  - >5.0

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Flood Depth
2% AEP Event - 18 Hour Storm

LEGEND

TUFLOW Model Boundary
State Controlled Road

Peak Flood Depth (m)
0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1.0 - 1.5
1.5 - 2.0
2.0 - 3.0
3.0 - 4.0
4.0 - 5.0
>5.0

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MACKAY - Eungella Road
Marian - Eton Road
North Eton Road
Miran - Eton Road
Peak Downs Highway

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Flood Depth
0.5% AEP Event - 18 Hour Storm

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PROJECT ID: 60598460
LAST MODIFIED: 29/09/2019
CREATED BY: briggh

LEGEND
TUFLOW Model Boundary
State Controlled Road
Cadastre
Peak Flood Depth (m)
0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1.0 - 1.5
1.5 - 2.0
2.0 - 3.0
3.0 - 4.0
4.0 - 5.0
>5.0

GDA 1994 MGA Zone 55

Map

VERSION: v01

Locality Map
Version: 1, Version Date: 24/01/2020
Document Set ID: 7869074

ORDINARY MEETING - 12 FEBRUARY 2020
Attachment 11.4.2.1

MACKAY REGIONAL COUNCIL

PAGE 341
Mackay - Eungella Road
Marian - Eton Road
PeakDowns Highway
North Eton Road
Miran - Eton Road

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Flood Depth
0.2% AEP Event - 18 Hour Storm

LEGEND
TUFLOW Model Boundary
State Controlled Road
Coastline
Peak Flood Depth (m)
0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1 - 1.5
1.5 - 2.0
2.0 - 3.0
3.0 - 4.0
4.0 - 5.0
>5.0

GDA 1994 MGA Zone 55

Project ID: 60598460
Last Modified: 01/12/2019
Created By: briggh

Document Set ID: 7869074
Version: 1, Version Date: 24/01/2020

ORDINARY MEETING - 12 FEBRUARY 2020
Attachment 11.4.2.1

PAGE 345
Peak Flood Depth
0.2% AEP Event - 18 Hour Storm

LEGEND
- TUFLOW Model Boundary
- State Controlled Road
- Cadastre
- Peak Flood Depth (m)
  - 0 - 0.2
  - 0.2 - 0.4
  - 0.4 - 0.6
  - 0.6 - 0.8
  - 0.8 - 1
  - 1 - 1.5
  - 1.5 - 2.0
  - 2 - 3.0
  - 3 - 4.0
  - 4 - 5.0
  - >5.0

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Peak Depth Averaged Velocity (m/s)

- < 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00

GDA 1994 MGA Zone 55

Mackay - Eungella Road
Bruce Highway
Peak Downs Highway
Marian - Eton Road
Sarina - Homebush Road
North Eton Road
Eton - Homebush Road
Mirani - Eton Road

Location Map

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Depth Averaged Velocity
39% AEP Event - 18 Hour Storm

LEGEND
TUFLOW Model Boundary
State Controlled Road
Cadastre
Peak Depth Averaged Velocity (m/s)

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Refer to Sub-Map 1, Sub-Map 2, and Sub-Map 3.

Mackay - Eungella Road
Bruce Highway
Peak Downs Highway
Marian - Eton Road
North Eton Road
Miran - Eton Road
Sarina - Homebush Road
Eton - Homebush Road

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Depth Averaged Velocity
18% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics,
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Mackay - Eungella Road
Marian - Eton Road
PeakDowns Highway
North Eton Road
Miran - Eton Road

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Depth Averaged Velocity
18% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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LAST MODIFIED
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60598460
briggh
30/09/2019

LEGEND
TUFLOW Model Boundary
State Controlled Road
Directional Velocity Vector
Cadastre
Peak Depth Averaged Velocity (m/s)
< 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
> 2.00

GDA 1994 MGA Zone 55

19.1
Map

ORDINARY MEETING - 12 FEBRUARY 2020

Attachment 11.4.2.1
Sarina-Homebush Road
Marian-Eton Road
Peak Downs Highway
North Eton Road
Mirlani-Eton Road

Filename: P:\605x\60598460\900_CAD_GIS\920_GIS\02_MXDs\Sandy\Sandy_019_Basecase_Velocity_005y.mxd

01, 2002, 400600
Metres
1:50,000 (when printed at A3)

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Depth Averaged Velocity
18% AEP Event - 18 Hour Storm

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30/09/2019

LEGEND
TUFLOW Model Boundary
State Controlled Road
Directional Velocity Vector
Cadastre
Peak Depth Averaged Velocity (m/s)
< 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
> 2.00

GDA 1994 MGA Zone 55

Map
VERSION: v01

Document: 19.2
Version Date: 2.2020

ORDINARY MEETING - 12 FEBRUARY 2020
Attachment 11.4.2.1
PAGE 362
MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Depth Averaged Velocity
18% AEP Event - 18 Hour Storm

LEGEND
- TUFLOW Model Boundary
- State Controlled Road
- Directional Velocity Vector
- Cadastre

Peak Depth Averaged Velocity (m/s)
- < 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00

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PROJECT ID: 60598460
LAST MODIFIED: 30/09/2019
CREATED BY: briggh

LEGEND
TUFLOW Model Boundary
State Controlled Road
Directional Velocity Vector
Cadastre

Peak Depth Averaged Velocity (m/s)
< 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
> 2.00

GDA 1994 MGA Zone 55

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PROJECT ID: 60598460
LAST MODIFIED: 30/09/2019
CREATED BY: briggh

LEGEND
TUFLOW Model Boundary
State Controlled Road
Directional Velocity Vector
Cadastre

Peak Depth Averaged Velocity (m/s)
< 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
> 2.00

GDA 1994 MGA Zone 55

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LEGEND

TUFLOW Model Boundary
State Controlled Road
Cadastral
Peak Depth Averaged Velocity (m/s)
< 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
> 2.00

Map

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PROJECT ID
CREATED BY
LAST MODIFIED
VERSION: v01
Document Set ID: 7869074
LEGEND
TUFLOW Model Boundary
State Controlled Road
Cadastral
Peak Depth Averaged Velocity (m/s)
< 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
> 2.00

GDA 1994 MGA Zone 55

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Depth Averaged Velocity
2% AEP Event - 18 Hour Storm

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Depth Averaged Velocity
2% AEP Event - 18 Hour Storm

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ATTACHMENT 11.4.2.1

ORDINARY MEETING - 12 FEBRUARY 2020

PAGE 368
Sandy Creek Catchment

Peak Depth Averaged Velocity
1% AEP Event - 18 Hour Storm

Legend:
- TUFLOW Model Boundary
- State Controlled Road
- Directional Velocity Vector
- Cadastre
- Peak Depth Averaged Velocity (m/s)
  - < 0.25
  - 0.25 - 0.50
  - 0.50 - 1.00
  - 1.00 - 1.50
  - 1.50 - 2.00
  - > 2.00

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Depth Averaged Velocity
0.5% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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MACKAY REGIONAL COUNCIL

ORDINARY MEETING - 12 FEBRUARY 2020

Attachment 11.4.2.1

MACKAY REGIONAL COUNCIL

PAGE 374
LEGEND

TUFLOW Model Boundary
State Controlled Road
Directional Velocity Vector
Cadastre
Peak Depth Averaged Velocity (m/s)
< 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
> 2.00

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Depth Averaged Velocity
0.2% AEP Event - 18 Hour Storm

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Legends:
- TUFLOW Model Boundary
- State Controlled Road
- Directional Velocity Vector
- Cadastre
- Peak Depth Averaged Velocity (m/s)
  - < 0.25
  - 0.25 - 0.50
  - 0.50 - 1.00
  - 1.00 - 1.50
  - 1.50 - 2.00
  - > 2.00

GDA 1994 MGA Zone 55
Location Map

Legend
- TUFLOW Model Boundary
- State Controlled Road
- Directional Velocity Vector
- Cadastre

Peak Depth Averaged Velocity (m/s)
- < 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00

Data sources:
- Base Data: (c) 2019 (MRC)
- Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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Refer Sub-Map 1

Refer Sub-Map 2

Refer Sub-Map 3

Mackay - Eungella Road
Bruce Highway
Peak Downs Highway
Marian - Eton Road
Sarina - Homebush Road
North Eton Road
Eton - Homebush Road
Miran - Eton Road

Filename: P:\605x\60598460\900_CAD_GIS\920_GIS\02_MXDs\Sandy\Sandy_024_Basecase_Velocity_PMF.mxd

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Metres
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MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Depth Averaged Velocity
PMF Event - 48 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC) Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN and the GIS User Community

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17/10/2019
LEGEND
TUFLOW Model Boundary
State Controlled Road
Coastline
Peak Depth Averaged Velocity (m/s)
< 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
> 2.00

GDA 1994 MGA Zone 55

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Peak Depth Averaged Velocity
PMF Event - 48 Hour Storm

Map
24.0

ORDINARY MEETING - 12 FEBRUARY 2020

PAGE 380
Mackay-Eungella Road
Bruce Highway
Peak Downs Highway
Marian - Eton Road
Sarina - Homebush Road
North Eton Road
Eton - Homebush Road
Miran-Eton Road

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Flood Hazard Mapping
18% AEP Event - 18 Hour Storm

GDA 1994 MGA Zone 55

MACKAY REGIONAL COUNCIL
ORDINARY MEETING - 12 FEBRUARY 2020

Document Set ID: 7869074
Version: 1, Version Date: 24/01/2020

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MACKAY REGIONAL COUNCIL

Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Flood Hazard Mapping
1% AEP Event - 18 Hour Storm

Data sources:
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LEGEND

- State Controlled Road
- Peak Flood Hazard Category 1
- Category 2
- Category 3
- Category 4
- Category 5
- Category 6

MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Flood Hazard Mapping
2% AEP Event - 18 Hour Storm

Data sources:
Base Data: (c) 2019 (MRC)
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics,
CNES/Airbus DS, USDA, USGS, AeroGRID, IGN

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PROJECT ID: 60598460
CREATED BY: briggh
LAST MODIFIED: 30/09/2019

LEGEND:

- State Controlled Road
- Peak Flood Hazard Category 1
- Category 2
- Category 3
- Category 4
- Category 5
- Category 6

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Flood Hazard Mapping
2% AEP Event - 18 Hour Storm

Legend:
- TUFLOW Model Boundary
- State Controlled Road
- Coastal
- Peak Flood Hazard
- Category 1
- Category 2
- Category 3
- Category 4
- Category 5
- Category 6

GDA 1994 MGA Zone 55

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment

Peak Flood Depth
TC Debbie Rainfall Event (March 2017)

LEGEND
- TUFLOW Model Boundary
- State Controlled Road
- Cadastre
- Peak Flood Depth (m)
  0 - 0.2
  0.2 - 0.4
  0.4 - 0.6
  0.6 - 0.8
  0.8 - 1
  1.0 - 1.5
  1.5 - 2.0
  2.0 - 3.0
  3.0 - 4.0
  4.0 - 5.0
  >5.0

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LEGEND

\[ \text{TUFLOW Model Boundary} \]
\[ \text{State Controlled Road} \]
\[ \text{Cadastre} \]
\[ \text{Difference in Peak Water Surface (m)} \]

\[ < -0.3 \]
\[ -0.3 \text{ to } -0.225 \]
\[ -0.225 \text{ to } -0.15 \]
\[ -0.15 \text{ to } -0.075 \]
\[ -0.075 \text{ to } -0.02 \]
\[ -0.02 \text{ to } 0.02 \]
\[ 0.02 \text{ to } 0.075 \]
\[ 0.075 \text{ to } 0.15 \]
\[ 0.15 \text{ to } 0.225 \]
\[ 0.225 \text{ to } 0.3 \]
\[ > 0.3 \]

Was Dry Now Wet

Was Wet Now Dry

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Climate Change Sensitivity
Difference in PWSE - Climate Change Scenario minus Basecase (1% AEP)

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LEGEND
-1:00,000 (when printed at A3)

Difference in Peak Water Surface (m)

-0.3
-0.3 to -0.225
-0.225 to -0.15
-0.15 to -0.075
-0.075 to -0.02
-0.02 to 0.02
0.02 to 0.075
0.075 to 0.15
0.15 to 0.225
0.225 to 0.3
> 0.3

Was Dry Now Wet
Was Wet Now Dry
MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Climate Change Sensitivity
Difference in PWSE - Climate Change Scenario minus Basecase (0.2% AEP)

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Mannings Roughness Decrease (-20%)
Difference in PWSE - Decreased Roughness minus Basecase (1% AEP)

Data sources:
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Marian-Eton Road
Hummocks Road
Eton-Homebush Road
North Eton Road
Marian-Eton Road
SARINA HOMEBUSH ROAD
MARIAN-ETON ROAD
HUMMOCKS ROAD
ETON-HOMEBUSH ROAD
North Eton Road
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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Climate Change Scenario
Peak Water Surface Elevation (PWSE)
2% AEP Event - 18 Hour Storm

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LEGEND
1. TUFLOW Model Boundary
2. State Controlled Road
3. Coastal
PWSE (m AHD)
High: 115.772
Low: 15.2682

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MACKAY REGIONAL COUNCIL
Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Climate Change Scenario
Peak Water Surface Elevation (PWSE)
1% AEP Event - 18 Hour Storm

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Climate Change Scenario
Peak Flood Depth
2% AEP Event - 18 Hour Storm

LEGEND

- TUFLOW Model Boundary
- State Controlled Road

Peak Flood Depth (m)
0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1.0 - 1.5
1.5 - 2.0
2.0 - 3.0
3.0 - 4.0
4.0 - 5.0
>5.0

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LEGEND
- TUFLOW Model Boundary
- State Controlled Road
- Directional Velocity Vector
- Grid
- Peak Depth Averaged Velocity (m/s)
  - < 0.25
  - 0.25 - 0.50
  - 0.50 - 1.00
  - 1.00 - 1.50
  - 1.50 - 2.00
  - > 2.00

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Climate Change Scenario
Peak Depth Averaged Velocity
2% AEP Event - 18 Hour Storm
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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Climate Change Scenario
Peak Depth Averaged Velocity
2% AEP Event - 18 Hour Storm

Data sources:
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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Flood Hazard Mapping
1% AEP Event - 18 Hour Storm

LEGEND
- TUFLOW Model Boundary
- State Controlled Road
- Coastal
- Peak Flood Hazard
  - Category 1
  - Category 2
  - Category 3
  - Category 4
  - Category 5
  - Category 6

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Sandy Creek Catchment
Climate Change Scenario
Peak Water Surface Elevation (PWSE)
0.2% AEP Event - 18 Hour Storm

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TUFLOW Model Boundary
State Controlled Road

PWSE (mAHD)
High: 42.1109
Low: 3.25

Map

LEGEND

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Sandy Creek Catchment
Climate Change Scenario
Peak Flood Depth
0.2% AEP Event - 18 Hour Storm

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TUFLOW Model Boundary
State Controlled Road
Peak Flood Depth (m)
0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1 - 1.5
1.5 - 2
2 - 3
3 - 4
4 - 5
>5

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Sandy Creek Catchment
Climate Change Scenario
Peak Flood Depth
0.2% AEP Event - 18 Hour Storm

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LEGEND

- TUFLOW Model Boundary
- State Controlled Road
- Cadastre
- Peak Flood Depth (m)

- 0 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 3.0
- 3.0 - 4.0
- 4.0 - 5.0
- >5.0

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Tropical Cyclone Debbie Flood Studies

Sandy Creek Catchment

Climate Change Scenario

Peak Flood Depth

0.2% AEP Event - 18 Hour Storm

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Bruce Highway
Peak Downs Highway
Marian - Eton Road
North Eton Road
Eton - Homebush Road
Mirani-Eton Road
Sarina - Homebush Road

Filename: P:\605x\60598460\900_CAD_GIS\920_GIS\02_MXDs\Sandy\Sandy_041_Climate_Hazard_500y.mxd

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Metres
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Sandy Creek Catchment
Climate Change Scenario
Flood Hazard Mapping
0.2% AEP Event - 18 Hour Storm

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LEGEND
TUFLOW Model Boundary
State Controlled Road
Cadastre
Peak Flood Hazard
Category 1
Category 2
Category 3
Category 4
Category 5
Category 6

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Climate Change Scenario
Flood Hazard Mapping
0.2% AEP Event - 18 Hour Storm

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Tropical Cyclone Debbie Flood Studies
Sandy Creek Catchment
Climate Change Scenario
Flood Hazard Mapping
0.2% AEP Event - 18 Hour Storm

LEGEND
TUFLOW Model Boundary
State Controlled Road

Category 1
Category 2
Category 3
Category 4
Category 5
Category 6

References:
- MRC: Mackay Regional Council
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Reviewed by: Wesley Bailey

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<td>21-Jan-2020</td>
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<td>Trevor Corney Principal Project Manager</td>
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Explanatory Notes and Disclaimer

This report is to be viewed in conjunction with the mapping in the Rocky Dam Creek Catchment – Tropical Cyclone Debbie Flood Study Volume 2 Report (AECOM, 2019).

Maps in this report have been developed to represent local catchment flood behaviour in the Rocky Dam Creek area, particularly around the residential areas.

Information presented in this mapping may vary, depending upon development within the floodplain over time. It is suggested that the TUFLOW model and these associated maps be updated by Mackay Regional Council as development occurs.

The development of the TUFLOW hydraulic model is detailed in this report outlining input data, modelling assumptions and schematisation parameters adopted.

All information presented in tables and mapping is expressed in meters Australian Height Datum (AHD).

Hydraulic model results used in this report and associated mapping have been based on an 5-metre fixed Cartesian grid hydraulic model. Use of the mapping to determine hydraulic parameters in sub-grid scale applications is not recommended.

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Executive Summary

AECOM Australia Pty Ltd (AECOM) has been commissioned by the Mackay Regional Council (MRC) to conduct a flood study for the Rocky Dam Creek – Koumala catchment affected by Tropical Cyclone Debbie in March 2017.

Rocky Dam Creek study area encompasses a 15-kilometre section of the Bruce Highway, the North Coast Rail line and Wilmar’s southern cane rail. The catchment headwaters are in the Connors Range with the general discharge patterns eastwards to the coastal plains and then the Coral Sea. The road and rail corridors are generally north-south across the catchments. The Goonyella-Hay Point Rail line traverses some of the upper catchment areas.

The main objectives of the Rocky Dam Creek – Koumala Catchment Flood Study are:

- To assess the flood flows and water elevations in the catchment for a range of events including the Tropical Cyclone (TC) Debbie event;
- Estimation of the probability of the TC Debbie compared with design rainfall events using AR&R methodology;
- Provide recommendations regarding non-structural flood mitigation options, to improve resilience within the study area;
- Liaison with community recovery officers and residents regarding 2017 TC Debbie flood elevations and use the information to assist in model calibration.

Rocky Dam Creek is the main stream of interest with other minor creeks entering the watercourse including Cameron Creek, Station Creek, Little Station Creek, Devil Flat Creek Waterfall Creek and their tributaries. Rocky Dam Creek and all upstream tributaries within the catchment have a total catchment area of approximately 388 km². The upper catchments contain dense vegetation before transitioning to sugar cane land which encompasses a large percentage of the catchment.

Hydrologic inputs to hydraulic models have been applied using inflow hydrographs extracted from XP-Rafts and direct rain on grid approach utilised in TUFLOW. The model has been developed primarily using CatchmentSIM, XPRAFTS and Storm Injector software utilising data from Australian Rainfall and Runoff (AR&R) that was used for the estimation of design flood characteristics in Australia.

The closest rainfall gauges which contained sub-daily data for TC Debbie are located within Sarina at the Sucrogen Weir Alert (MRC Station Number 533143) and Murray Creek at Undercliff (Queensland Government Station Number 130416A) located approximately 25 km southwest of Koumala. Both rainfall gauges were modelled to compare the results from anecdotal information and surveyed supplied by the community and MRC. The Undercliff rainfall TUFLOW model flood elevations provided the best representation of the flooding that occurred during the TC Debbie event based on anecdotal and survey information provided. Peak rainfall intensities that occurred during the Cyclone Debbie event was identified to be greater than a 0.2% AEP rainfall event when compared with BOM design rainfall data.

TC Debbie was modelled from 27th March 2017 12:00pm to 30 March 12:01am and found an intense storm occurred after 1:00pm on 29/03/2017, with approximately 430mm of rain falling over a 5-hour period between 1:00pm and 6:00pm on 29th March 2017.

Community consultation was held on the 25th of May 2019 in Koumala to discuss resident accounts of what occurred during the Cyclone Debbie Event. The community identified flooding within the township of Koumala outside the hotel, photographs of flooding within Koumala were taken on the 29th March 2017 between 3pm and 5pm. The times shown on the photos align with the intense rainfall period that occurred on the Undercliff rainfall station.

While flooding observations were provided by the community, they were relatively limited in terms of quantity and elevations or water depths. Key Cyclone Debbie flooding observation provided by the community included flooding up to the step of the Koumala hotel; with no water entering the building. The flooding observations were able to be replicated at the Koumala hotel within the TC Debbie hydraulic model.
Three points were surveyed by MRC within the TUFLOW model boundary. This included the bottom of the rail sign southwest of Koumala (Survey Point A) approximately 600 metres west of the Bruce Highway, Rocky Dam Creek flooding extent seen by property owner (Survey Point B) and flooding to the side of a house located on the bank of Rocky Dam Creek (Survey Point C).

In general, the hydrological and hydraulic simulation of the TC Debbie event in the Rocky Dam Creek catchment was within 300mm of two survey points (B and C) and was approximately 1 metre at survey Point A. Significant modelling of possible floodplain behaviour was undertaken by simulating:

- Changes to stream behaviour by increasing blockage factors to exceptional percentages (approximately 60% for bridges and culverts) which are considered outside normal values;
- Changes to floodplain behaviour by increasing hydraulic roughness factors above accepted values;
- Changes to hydraulic factors to simulate the possibility of cane being blown down thus allowing increased flows at higher elevations than would be if the cane was standing;
- Increasing the rain intensities are certain locations to potentially mimic the recorded flood elevations.

None of the above simulations either individually or collectively generated flood behaviour that approximately matched the recorded flood elevations. It is to be noted that the areas where there are significant differences in modelled and recorded flood elevation there are no rain gauging stations.

An hypothesis is that in the areas where the hydraulic simulation is significantly different to the recorded elevations, there was a very localised and intense rain burst that was significantly in excess of the recorded rainfalls.

The critical storm duration for the study area was assessed by simulating 180 (3 hrs), 270 (4.5 hrs), 360 (6 hrs), 540 (9 hrs), 720 (12 hrs), 1080 (18 hrs), 1440 (24 hrs), 1800 (30 hrs), 2160 (36 hrs), 2880 (48 hrs) and 4320 (72 hrs) minute durations for the 1% AEP event (1 in 100) in the baseline hydraulic model. The 540-minute storm was found to result in the highest mean peak flow for the majority of the subcatchment and was selected as the critical design storm duration.

A summary of non-structural mitigation measures identified to improve resilience within the study area includes:

- Community engagement to inform the community on the Rocky Dam Creek flood risk and protective actions they can make in the event of flooding;
- Emergency management planning such as flood forecasting (prediction of flood severity), flood preparedness and flood response guidelines should be provided to the community;
- Increase in community connectivity after the flood event by having a communication device (such as satellite phone) available at community centres to assist in informing Council of community requirements.

The main limitations that apply to the Rocky Dam Creek catchment is the availability of reliable data such as flood elevations and Cyclone Debbie rainfall information. The following information is recommended to be completed prior to executing future calibration flood studies within the Rocky Dam Creek catchment:

- Survey of railway hydraulic structures such as bridges and culverts;
- Installation of point rainfall gauges located throughout the catchment for future rainfall events to assist in calibration;
- More current topographic data;
- Surveyed flood elevations and the collation of anecdotal information of all major rainfall events that can be utilised for calibration of the model.
1.0 Introduction

1.1 Study Location

AECOM Australia Pty Ltd (AECOM) has been commissioned by the Mackay Regional Council (MRC) to conduct a flood study for the Rocky Dam Creek – Koumala catchment affected by Tropical Cyclone Debbie in March 2017.

The study area encompasses a 15-kilometre section of the Bruce Highway, the North Coast Rail line and Wilmar’s southern cane rail. The catchment headwaters are in the Connors Range with the general discharge patterns eastwards to the coastal plains and then the Coral Sea. The road and rail corridors are generally north-south across the catchments. The Goonyella-Hay Point Rail line traverses some of the upper catchment areas.

The study area catchments are broadly described as:

- Steep forested upper sections;
- Generally well-defined watercourse systems;
- Flatter coastal plain areas of predominately cane farming interspersed with local road network;
- Farming activities giving way to tidal flats and mangroves towards the coast.

The study area includes the watercourses of Cameron Creek, Duff Creek, Cherry Tree Creek, Station Creek, Little Station Creek, Leichhardt Creek, Tedlands Creek, Rocky Dam Creek, Bull Creek, Devil Flat Creek and Marion Creek.

The study area is approximately 28600 ha (286 km²). The TUFLOW model extents were agreed with council to cover from approximately 2 km upstream to 2 km downstream of the Bruce Highway. Upstream catchments outside of the TUFLOW model boundary were modelled as inflow boundaries and were outside the area of interest for the hydraulic model results.

The hydraulic study area consists of forested areas on the steeper slopes with the lower slopes and creek flats mainly for pastoral, agricultural use or small rural holdings.

The road network in the study area and adjacent precincts experienced disruption from weather events such as Cyclone Debbie event which resulted in the closure of Bruce Highway.

Figure 1 shows the Rocky Dam Creek – Koumala Catchment Map and Locality Plan.
1.2 Study Objectives

The main objectives of the Rocky Dam Creek - Koumala Catchment Flood Study are:

- To assess the flood flows and water elevations in the catchment for a range of events including calibration to the Tropical Cyclone (TC) Debbie event;
- Estimation of the probability of the TC Debbie rainfall compared with design rainfall events using AR&R methodology;
- Liaison with community recovery officers and residents regarding 2017 TC Debbie flood elevations and use flood information to assist in model calibration.
- Undertake hydrologic and hydraulic modelling of the Rocky Dam Creek catchment using the latest hydrologic / hydraulic methodologies and data inputs that have been revised through the 2016 release of Australian Rainfall and Runoff;
- Development of XPRAFTS models and updated hydrologic analysis to establish the hydrographs for the 39%, 18%, 2%, 1% (1 in 100), 0.5% (1 in 200), 0.2% (1 in 500) Annual Exceedance Probability (AEP), Probable Maximum Flood (PMF) and 1% & 0.2% AEP events with year 2100 climate change scenario in accordance with Australian Rainfall and Runoff;
- Development of a new hydraulic model for the Rocky Dam Creek catchments using the TUFLOW modelling platform (GPU HPC);
- Inform potential flood impacts within the broader community to enhance community understanding and therefore empowerment to enable a more resilient community;
- Provide recommendations to improve planning, emergency management and disaster preparedness in the catchment.
- Prepare reporting and mapping.

1.3 Notes on Flood Frequency

The frequency of flood events is generally referred to in terms of their Annual Exceedance Probability (AEP) or Average Recurrence Interval (ARI). For example, for a flood magnitude having 5% AEP, there is a 5% probability that there will be floods of equal or greater magnitude each year. As another example, for a flood having 5-year ARI, there will be floods of equal or greater magnitude of once in 5 years on average.

The correspondence between the two systems is shown in Table 1 below.

<table>
<thead>
<tr>
<th>Annual Exceedance Probability (AEP) (%)</th>
<th>Average Recurrence Interval (ARI) in Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>63 (1EY)</td>
<td>1</td>
</tr>
<tr>
<td>39</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>0.5</td>
<td>200</td>
</tr>
<tr>
<td>0.2</td>
<td>500</td>
</tr>
</tbody>
</table>

In this report, the AEP terminology has been adopted to describe the frequency of flooding as recommended in AR&R.
1.4 Limitations and Exclusions

The following limitations and exclusions apply to the Rocky Dam Creek Catchment hydrologic and hydraulic modelling updates.

- The 1% AEP critical duration was adopted for all events from 1 EY up to and including the 1% AEP event. Critical duration for events rarer than the 1% AEP event were nominated individually.
- Aerial survey data was captured in 2009/2014 in the form of Light Detection and Ranging (LiDAR) used to develop the topography for the hydraulic model has a vertical accuracy of ± 0.15 m on clear, hard surfaces and a horizontal accuracy of ± 0.3 m.
- Bathymetry of stream inverts was not available for the study. The invert of streams has been represented as enforced gully lines within the TUFLOW hydraulic model. Culvert inverts have been modified where required to align with the available topographical information.
- The hydrologic model has been compared to anecdotal information from Cyclone Debbie flood event occurred in March 2017, based on current available data at the time of this study.
- The hydrologic and hydraulic modelling undertaken as part of the study has been based on methods and data outlined in Australian Rainfall and Runoff (AR&R). The 2016 revision has been adopted as per MRC’s request.
- Any use which a third party makes of this document, or any reliance on or decision to be made based on it, is the responsibility of such third parties. AECOM accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this document.
- Where information has been supplied by the Client or other external sources, the information has been assumed correct and accurate unless stated otherwise. No responsibility is accepted by AECOM for incorrect or inaccurate information supplied by others.
- While every effort has been made to simulate the provided flood elevations with only two sub-daily gauges located at the northern and southern extremities of the study area, the likelihood of not capturing a localised intense rain burst is relatively high.

Australian Rainfall and Runoff (AR&R) Revision Project 15 outlines several fundamental themes which are also particularly relevant:

- All models are coarse simplifications of very complex processes. No model can therefore be perfect, and no model can represent all of the important processes accurately.
- Model accuracy and reliability will always be limited by the accuracy of the terrain and other input data.
- Model accuracy and reliability will always be limited by the reliability / uncertainty of the inflow data.
- A poorly constructed model can usually be calibrated to the observed data but will perform poorly in events both larger and smaller than the calibration data set.
- No model is ‘correct’ therefore the results requires interpretation.
- A model developed for a specific purpose is probably unsuitable for another purpose without modification, adjustment, and recalibration. The responsibility must always remain with the modeller to determine whether the model is suitable for a given problem.
- Recognition that no two flood events behave in exactly the same manner.
- Design floods are a best estimate of an “average” flood for their probability of occurrence.
1.4.1 Interpretation of Results

The interpretation of results and other presentations in this report requires an appreciation of the limitations in accuracy, as noted above.

Unless otherwise stated, presentations in this report are based on peak values of water surface elevations, flow, depth and velocity. Using flood elevations as an example, the peak elevation does not occur everywhere at the same time and, therefore, the values presented are based on taking the maximum value which occurred at each computational point in the model during the entire flood.

Hence, a presentation of peak elevations does not represent an instantaneous point in time, but rather an envelope of the maximum values that occurred at each computational point over the duration of the flood event.

1.5 Report Structure

The Rocky Dam Creek – Koumala Flood Study Report has been split into 2 volumes:

- Volume 1 → Study methodology, results, findings and recommendations;
- Volume 2 → A3 GIS results mapping associated with the Volume 1 report.

The structure of this Volume 1 report is as follows:

- Section 2.0 describes the characteristics of the local catchments including typical land use, rainfall characteristics and a summary of historical flood events;
- Section 3.0 describes the data available for the development of the hydrologic and hydraulic models;
- Section 4.0 outlines the hydrologic assessment approach;
- Section 5.0 outlines the hydraulic modelling approach and presents the results of the modelling;
- Section 6.0 presents Tropical Cyclone Debbie Information;
- Section 7.0 presents the design flood depths, elevations and extents for the study area;
- Section 8.0 presents the results of the investigation with the effects of climate change on discharges and planning scheme flood mapping;
- Section 10.0 provides summary of non-structural flood mitigation measures;
- Section 11.0 provides a summary of the high-level structural mitigation options;
- Section 12.0 summarises the key finding and recommendations of the study.
2.0 Catchment Characteristics

2.1 General
The catchments of the Rocky Dam Creek, Cherry Tree Creek, Tedlands Creek, Waterfall Creek and Green Swamp Creek are identified as the contributing catchments for this study area. (refer Figure 1). Rocky Dam Creek is the main catchment of interest and drains an area of 387.86 km². It includes the sub-catchments of Cameron Creek, Station Creek, Little Station Creek, Devil Flat Creek Waterfall Creek and their tributaries. Sub-catchments and boundaries are shown on Figure 1.

2.2 Rocky Dam Creek
Rocky Dam Creek main stream originates from the southern area of the catchment and flows north towards the coastline. The main stream originates to the west of the Bruce Highway adjacent to Cone Creek Road with a stream length of approximately 52 km before its confluence with the coastline. The upper catchment is steep and well vegetated. The stream meanders to the northeast and flattens out as it approaches the Bruce Highway. Land surrounding this area is mainly used for pastoral and sugar cane purposes.

Rocky Dam Creek collects the minor watercourse of Arrowroot Creek prior to crossing the Bruce Highway approximately 7.8 km south of Koumala at Rocky Dam Creek bridge. Rocky Dam Creek crosses the highway from west to east. The eastern catchment contains sugar cane cultivation near the highway and transitions to pastoral and mangrove areas further downstream.

Green Swamp Creek is a large tributary of approximately 41.85 km², which enters Rocky Dam Creek approximately 10 km downstream from the Bruce Highway. The southern portion of the Green Swamp Creek catchment consists of flat pastoral and sugar cane land while northern portion consists of hilly forested land.

2.2.1 Cherry Tree Creek
Cherry Tree Creek is the northern most major watercourse that drains to Rocky Dam Creek approximately 3 km from the coastline. The stream length is approximately 21 km from the top of the catchment to the Rocky Dam Creek confluence. Minor watercourses that enter Cherry Tree Creek include Cameron Creek, Station Creek and Duff Creek which are all north of Koumala. The catchments comprise cane farming land and with vegetation along the creek banks.

2.2.2 Tedlands Creek
Tedlands Creek is a major watercourse that contributes 43.56 km² to Rocky Dam Creek approximately 9 km from the coastline. Stream length is approximately 14 km from the top of the catchment to Rocky Dam Creek. The catchment comprises cane farming land in the upper reaches, with pastoral land in the lower reaches.

Minor watercourses that enter Tedlands Creek includes Little Station Creek, Coalters Creek and Leichhardt Creek. Koumala is located within Little Station Creek catchment. Little Station and Coalters Creeks cross the Bruce Highway approximately 1.3 km and 1.7 km south of Koumala before converging and then joining to Tedlands Creek, 3.6 km downstream of the Bruce Highway.

2.3 Rainfall Regime
Rainfall alert stations closest to the study area are:
- Koumala Hatfields Road (BOM Station Number 33038) contains an incomplete rainfall data set from 1914 to current. The station is within the catchment and is approximately 2.5 kilometres south-west from the township of Koumala. The data available consists of daily total rainfall.
- Sucrogen Weir Alert (MRC Station Number 533143) rainfall was provided by MRC with rainfall recorded from 2013 to 2017. The station is located 20 km to the north of the township of Koumala within Sarina outside of model boundary. This alert station contains tipping bucket rainfall data during the Cyclone Debbie Event.
- Murray Creek at Undercliff (Queensland Government Station Number 130416A), the site is located approximately 25 km south of Koumala. The Queensland Government Water Monitoring Information Portal website indicates that this site has been active since 2011 and has tipping bucket rainfall data available.

- Members of the community record daily totals within Koumala which were limited to the year 2016/17 and during the Cyclone Debbie Rainfall Event;
Koumala Hatfields station contained the longest period of rainfall on record within the study area with data recorded from October 1914. The rainfall station has an average annual rainfall total of 1521mm per year (January to December). The highest mean monthly rainfall of 321.7mm occurs in February. The highest and lowest annual rainfalls recorded at the alert station are 3138mm (1918) and 672mm (1923) which shows significant variation in annual rainfall from year to year.

The highest monthly rainfall of 2217mm was recorded in January 1918 and 1570mm in January 1951. The highest daily rainfall of 567mm was recorded on the 23rd January 1918. Figure 3 shows the distribution of the mean monthly rainfall through the year at the Koumala Hatfields station compared to 2017 (Cyclone Debbie) records.

2.4 Sugar Cane

Sugar Cane cultivation is a dominant feature of the floodplains in the area. The growth patterns and response of sugar cane to flooding presents a challenge for flood modelling. It is difficult to apply a single suitable roughness parameter to represent sugar cane due to the variability in potential plant maturity throughout the wet season.

To ensure a consistent approach, a representative varying roughness was applied uniformly across all Sugar Cane while sensitivity analysis was undertaken to account for potential variability in roughness throughout the growing season. Adopted hydraulic roughness is shown in Table 17.
3.0 Available Data

3.1 General
Comprehensive data collation was undertaken to ensure that all parameters contributing to the hydrologic and hydraulic characteristics of the project area could be fully accounted for and to ensure that modelled baseline conditions match observations of historical flood events.

Available data for the development of the baseline flood modelling consisted of:

- Collections of rainfall data for the validation of the hydrological and hydraulic models;
- Topographical data for the digital representation of the model area;
- Bruce Highway (10G) 2017 road centreline elevations;
- Bridge and culvert drawings.

A summary of the available data reviewed and applied to the study is provided below.

3.2 Previous Reports
There are a number of historical studies that have been closely reviewed to help inform various aspects of the hydrologic and hydraulic model updates. The key reports used for this study include:

- The Cyclone Debbie Review – Inspector-General Emergency Management (Qld Government, October 2017);
- Tropical Cyclone Debbie Technical Report (Bureau of Meteorology, 2018);
- Koumala Flood Study – Modelling Summary Memorandum (Water Modelling Solutions, August 2018)

A brief synopsis of these historical reports, and the relevant information gained from them is given in the following subsections.

3.2.1 The Cyclone Debbie Review – Inspector-General Emergency Management (Qld Government, October 2017)

The report was prepared by the Inspector General of Emergency Management (IGEM) Queensland regarding the effectiveness of the disaster management system in response to the event across the state of Queensland. Issues that arose during the event were examined and analysed to consider improvement strategies for the future. The views of the community were sought to inform future strategies that could improve the integration of government services and deliver safer and inclusive communities.

The report uncovered a series of lessons for the disaster management sector, which, if acted on, will deliver greater public value and confidence through trust and empowerment. The findings include timely public messaging, continued need of information sharing, fatigue management for sustained events, coordinated exercises to prepare for disaster events and improved business continuity planning across state agencies including tourism and communities.

The above-mentioned report investigated overall disaster management system for Cyclone Debbie.; This study prepared for MRC investigates the local risk areas associated with the Rocky Dam Creek catchment to support MRC in addressing the recommendations of the IGEM review.

3.2.2 Tropical Cyclone Debbie Technical Report (Bureau of Meteorology, 2018)

The report prepared by the Bureau of Meteorology (BoM) collated information related to Cyclone Debbie. This information includes cyclone tracking, rainfall, peak river elevations and tide elevations.

This information was utilised in Section 6.0 and was taken in consideration when developing the XP-RAFTS and TUFLOW models.
3.2.3 Koumala Flood Study – Modelling Summary Memorandum (Water Modelling Solutions, August 2018)

The report prepared by Water Modelling Solutions for Queensland Rail compared the Cyclone Debbie rainfall with ARR87 rainfall for an area south of the Koumala township (approximately 64.7km²). Analysis of the rainfall confirms the March 2017 event was in excess of the 100-year ARI event. The modelling shows that the flooding within the township was primarily governed by the significant size of the event, the event was in excess of the Bruce Highway cross-drainage and lowering the northern coast line embankment in the sensitivity scenarios showed no change to flood levels within the township.

This was used as background information when comparing ARR16 design rainfall intensities with Cyclone Debbie rainfall in Section 6.2

3.3 TUFLOW Model Extent

The catchment extent and TUFLOW extent were discussed with Council at the beginning of the project. Council required the TUFLOW model extents to include key areas that are to be included within the model. Catchment extent is shown on Figure 1 and TUFLOW model extent in Figure 6 below.

3.4 Topographic Data

Topographic data available within the Rocky Dam Creek study area is Digital Elevation Model (DEM) of Australia extracted from Department of Natural Resources and Mines (DNRM). The data covering the site is in the form of LiDAR and is a combination of data captured in 2009 and 2014.

The 2009 LiDAR information covered the entire catchment, with more recent 2014 LiDAR captured at the southern portion of the catchment, as shown in Figure 4. 2009 LiDAR and 2014 LiDAR was provided in 2 kilometre tiles and 1 kilometre tiles respectively.
The 2009 LiDAR was utilised for the entire catchment to ensure uniformity. Figure 5 shows the inconsistency when using LiDAR captured at different times, which can cause sudden terrain changes across the merge line, that could impact water flow direction.

The LiDAR points were used to generate a base Digital Elevation Model (DEM) with a grid spacing of 1 m. It is stated in the metadata provided by DNRM that the vertical accuracy is ±0.15 m on clear, hard surfaces and the horizontal accuracy of ±0.3.
3.5 Design Rainfall Data

Design rainfall data was acquired from the Bureau of Meteorology (BOM) on 23rd July 2019.

3.6 Rainfall Gauges

Rainfall data was available within the Rocky Dam Creek catchment from the Bureau of Meteorology (BOM) and Queensland Government Water Monitoring Portal (WMP).

Available Daily rainfall depth for the area around Koumala are listed in Table 2 below. The daily rainfalls are measured from 9.00am to the following day at 9.00am, with numbers contained within the brackets showing 24-hour totals between 12.00am and 12.00am.
Table 2  Daily Rainfall Depth

<table>
<thead>
<tr>
<th>Location</th>
<th>TC Debbie Daily Rain Depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>27/03/2017</td>
</tr>
<tr>
<td>Sarina</td>
<td>226</td>
</tr>
<tr>
<td>Sucrogen Weir</td>
<td>(136)</td>
</tr>
<tr>
<td>Orkabie West</td>
<td>105</td>
</tr>
<tr>
<td>Koumala Hatfields Road</td>
<td>138</td>
</tr>
<tr>
<td>Murray Creek at Undercliff</td>
<td>118 (483)</td>
</tr>
<tr>
<td>Carmila Beach</td>
<td>84</td>
</tr>
<tr>
<td>Carmila</td>
<td>66</td>
</tr>
<tr>
<td>Koumala (Community Rainfall Information)</td>
<td>179</td>
</tr>
</tbody>
</table>

\(^{[1]}\) – Amount of rainfall above 415mm is not known

There are no sub-daily rain gauges within the study area. The nearest sub daily rain gauges to the study area are listed in Table 3 and Figure 2.

Table 3  Closest Rainfall Sub-daily rainfall gauges to Koumala

<table>
<thead>
<tr>
<th>Rainfall Gauge (Station)</th>
<th>Distance to study from Koumala (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sucrogen Weir (533143)</td>
<td>20</td>
</tr>
<tr>
<td>Undercliff (130416A)</td>
<td>25</td>
</tr>
</tbody>
</table>

Application of the TC Debbie hydrology is discussed in Section 6.2.

### 3.7 Community Consultation

The floods associated with Cyclone Debbie (28-29 March 2017) were some of the most devastating on record at several locations through the Mackay Region. Some residents reported the flooding as being the worst flooding experienced in residents’ living memory.

The local communities were consulted at the data collection phase using an on-line survey on the community engagement website “Connecting Mackay” and at workshops held at locations throughout the catchments in May 2019. At Koumala, the consultation was held on 25\(^{th}\) May at the Community Hall with a smaller listening post near the Hotel a week later. The workshops were attended by Council officers from Strategic Planning, Emergency Management, Community Lifestyle, and Community Engagement, AECOM and a representative from the Queensland Health Disaster Recovery team.

The engagement involved discussions with residents about where they witnessed flooding, the timing and length of the inundation and flooding depth. A large map (3.6m by 5m) of the Koumala and Rocky Dam Creek catchments was provided for an overview of the catchment and streams and to identify points of interest where they identified flooding. Notes were written on the map identifying flow direction and key flood elevations observed by the community to assist in the validation of the TC Debbie flood model.

Surveyed elevations, photos and anecdotal information was provided by MRC and how the information provided aligns with the TC Debbie model in discussed in Section 6.4.

Flood studies were prepared for the communities to assess the flood flows and water levels in the catchments for a range of events including the TC Debbie event. The flood study will make recommendations to improve planning, emergency management and disaster preparedness in the catchments.

#### 3.7.1 Community Feedback on Draft Study

Council undertook a community engagement event on the 1 December 2019 with a stall at the Koumala Christmas Fair to provide the opportunity to discuss with residents the draft report on the...
study focusing on the TC Debbie event that occurred over the Koumala and Rocky Dam catchments in March 2017. The opportunity to discuss the study was part of Council’s broader emergency management engagement with the community at this event.

While there was a general interest in Council’s community engagement, there was only a small number of residents who were interested in the study outcomes. There were no negative responses to the study from the interested parties.

3.8 Hydraulic Structures

Transport and Main Roads (TMR) culvert and bridge data and was made available for use in the hydraulic analysis. The following data was provided:

- Culvert and Bridge chainages along the Bruce Highway in the form of a csv;
- Culvert and bridge drawings.

3.8.1 Culverts

Culvert information along the Bruce Highway was digitised using ArcGIS for application to the TUFLOW hydraulic model. Information was unable to be obtained for local council roads.

Where invert level, slope, pipe diameter or inlet and outlet information was missing, the following assumptions were made:

- Inlet and outlet levels and locations based on LiDAR information;
- Minimum cover of 600mm, where practical;
- Culvert sizes based on surrounding culverts of similar open channel size;

It is recommended that survey be completed of all missing culvert data.

3.8.2 Bridges

Where no information was obtained the following the utilised to determine bridge requirements;

- Aerial imagery;
- Channel invert level, depth and width;
- Height of the road or rail;
- Surrounding known bridges of similar size.

It is recommended that survey or drawings be obtained of all missing bridge data to determine the size and blockage that may impact flow through the bridge.

3.8.3 Rail Structures

Rail culverts and bridges were unable to obtained by the relevant departments and assumptions outlined in Sections 3.8.1 and 3.8.2 were made for missing information.
4.0 Hydrologic Assessment

4.1 Overview

In order to estimate peak flood elevations, flood extents and flood risk across the study area, a hydrologic assessment was undertaken to estimate flood flows resulting from catchment rainfall events.

4.2 Adopted Methodology

Hydrologic inputs to hydraulic models have been applied using a combined approach of runoff-routing modelling upstream of the TUFLOW model with a direct rain on grid approach, within the bounds of the TUFLOW model. The direct rainfall method involves the application of rainfall directly to the 2D model domain with TUFLOW. The rainfall depth in each timestep is applied to each individual hydraulic model grid cell, and the 2D model calculates the runoff for each cell.

Australian Rainfall and Runoff (AR&R) is a national guideline document, data and software suite that can be used for the estimation of design flood characteristics in Australia. AR&R is pivotal to the safety and sustainability of Australian infrastructure, communities and the environment. It is an important component in the provision of reliable and robust estimates of flood risk. Consistent use of AR&R ensures that development does not occur in high risk areas and that infrastructure is appropriately designed.

The new release of the AR&R guidelines presented several changes to the previous ‘best practice’ modelling advice. Key changes that are relevant to the revised modelling of the Rocky Dam Creek catchments are listed below:

- Updates to design rainfall Intensity Frequency Duration (IFD) values based on the inclusion of nearly 30 years additional rainfall data since the estimation of the AR&R 1987 IFDs;
- Changes to design hydrograph simulation approaches including the addition of the ensemble event approach where the magnitude of the design flood is estimated from the weighted average of a group (or ensemble) of design hydrographs. By using a set of design rainfall patterns to produce the estimates rather than a single pattern of variability, a reasonably unbiased estimate of the design flood is produced;
- Updates to catchment initial/continuing loss values based on regionalisation methods as well as the incorporation of pre-burst rainfall to simulate rainfall before the beginning of the design storm;
- Updates to Areal Reduction Factors (ARF) and the calculation process based on a more regionalised approach. ARFs convert the design point rainfall depth into a rainfall depth over the entire catchment;
- Climate change factors and calculations have also been updated based on the current industry best practise and knowledge.

4.3 Hydrologic Modelling

Hydrologic models were developed over the study area as shown in Figure 1. The model has been developed primarily using CatchmentSIM, XPRAFTS and Storm Injector software. The hydrologic assessment utilises the ensemble approach.

4.3.1 CatchmentSIM

CatchmentSIM was utilised for analysis of terrain based on SRTM data to delineate the Rocky Dam Creek catchment into subcatchments. Individual sub-catchment values for area and slope parameters were defined using SRTM data. The catchment delineation of sub-catchments within the study area is shown in Figure 8.
4.3.2 XP-RAFTS Modelling

Hydrological modelling was undertaken to determine the design flood hydrographs for various design events. XP-RAFTS software was used to model the rainfall-runoff processes of the catchments. The XP-RAFTS software is an event type rainfall-runoff hydrological model that calculates catchment flows based on rainfall data for application to flood simulation. Within the hydrological model, catchments are represented by nodes that are inter-connected by links. Each node in the model represents the characteristics of a sub-catchment and each link represents flow path routing between sub-catchments.

The model parameters required for each catchment are:

- Sub-catchment area;
- Sub-catchment slope;
- Sub-catchment surface roughness;
- Sub-catchment fraction impervious.

The XP-RAFTS model network is shown in Figure 8. Impervious fraction parameters were determined based on aerial imagery. Appendix A summarises the parameters applied to the nodes in XP-RAFTS to define sub-catchments.

Initial and continuing storm losses are specified in AR&R data hub as 54.0mm and 3.2mm/hr. Many other Mackay Regional Council local catchment studies utilise lower initial / continuing loss models due to the tropics having high saturation of soils before intense rainfall events occur. For consistency, similar losses have been adopted in this study, continuing losses are specified as 2.5mm/hr. Losses are further discussed in Appendix A.

4.3.3 Storm Injector

The ensemble temporal patterns and rainfall from the AR&R Data Hub for the Wet Tropics region were simulated through XP-RAFTS. Storm Injector software serves as the interface to efficiently employ the range of magnitude-duration-temporal pattern combinations required for the ensemble approach. The Storm Injector platform was also used to prepare hydrologic outputs for inflow files to the TUFLOW hydraulic models. Separate 2016 BoM rainfall depths was utilised for each sub-catchment to represent the spatial variance of rainfall.

Once the hydrological models were simulated for all ensemble temporal patterns, the design event hydrograph for each catchment will be selected through statistical analysis of the results. AR&R does not provide definitive guidance regarding rationale behind selecting the representative design event hydrograph from an ensemble of storms. Based on current industry ‘best practice’ and MRC’s preference, the design hydrograph for this project was selected as the result of the temporal pattern that delivers a peak flow rate that is closest to the mean flow rate with a bias of 2 to those exceeding the mean from the critical duration flood. The critical duration is determined based on the ensemble of storms with the highest mean flow from all storm durations across the given storm probability.

Figure 7 shows a flow chart of the process described detailing how the design flow hydrograph was selected through the ensemble approach.

The design flow hydrograph for each event at key sites will then be prepared for input into the TUFLOW hydraulic models following completion of formal checking and verification processes.

Climate change hydrological investigations were undertaken using the methodology stated in Section 8.0.
Figure 7  Ensemble approach to design flow hydrograph selection
LEGEND

- Subcatchment Node Links
- Rail Line
- State Controlled Road
- Cadastre
- Subcatchment

MACKAY REGIONAL COUNCIL
Rocky Dam Creek - Koumala
Subcatchment Delineation

PROJECT ID: 60598460
CREATED BY: reitanod
LAST UPDATED: 20/09/2019

DATA SOURCES:
Base Data: (c) 2017 Qld Gov

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Version: 1, Version Date: 24/01/2020

Figure 08

A3 size
4.3.4 Direct Rainfall Modelling

Rainfall total hyetograph time series for each design storm were created to represent the local rainfall for the study area from 2016 BOM IFD data. Design rainfall losses parameters are discussed further in Section 4.3.9.

The time series rainfall hyetographs were developed for a range of design events for magnitudes of 63% AEP, 39% AEP, 18% AEP, 2% AEP, 1% AEP, 0.5% AEP and 0.2% AEP (total of seven events).

4.3.5 Intensity Frequency Duration (IFD) Parameters

Site specific Intensity Frequency Duration (IFD) data was determined using the design rainfall database from the Bureau of Meteorology (BoM) (accessed 26th June 2019). The relevant Design Rainfall IFD values are as shown in Table 4.

Table 4 IFD Koumala Design Rainfall Intensities (mm/hr) (BoM, 2016)

<table>
<thead>
<tr>
<th>Duration</th>
<th>63.2% AEP</th>
<th>50% AEP</th>
<th>20% AEP</th>
<th>2% AEP</th>
<th>1% AEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 hr</td>
<td>43.2</td>
<td>48.4</td>
<td>64.0</td>
<td>95.7</td>
<td>105</td>
</tr>
<tr>
<td>3 hr</td>
<td>22.3</td>
<td>25.4</td>
<td>34.8</td>
<td>55.0</td>
<td>60.9</td>
</tr>
<tr>
<td>4.5 hr</td>
<td>17.3</td>
<td>19.8</td>
<td>27.7</td>
<td>45.0</td>
<td>50.2</td>
</tr>
<tr>
<td>6 hr</td>
<td>14.5</td>
<td>16.7</td>
<td>23.6</td>
<td>39.1</td>
<td>43.9</td>
</tr>
<tr>
<td>9 hr</td>
<td>11.2</td>
<td>13.0</td>
<td>18.8</td>
<td>32.3</td>
<td>36.6</td>
</tr>
<tr>
<td>12 hr</td>
<td>9.35</td>
<td>10.9</td>
<td>16.0</td>
<td>28.2</td>
<td>32.3</td>
</tr>
<tr>
<td>18 hr</td>
<td>7.25</td>
<td>8.52</td>
<td>12.7</td>
<td>23.4</td>
<td>27.1</td>
</tr>
<tr>
<td>24 hr</td>
<td>6.04</td>
<td>7.13</td>
<td>10.8</td>
<td>20.5</td>
<td>24.0</td>
</tr>
<tr>
<td>30 hr</td>
<td>5.24</td>
<td>6.2</td>
<td>9.5</td>
<td>18.5</td>
<td>21.7</td>
</tr>
</tbody>
</table>

4.3.6 Ensemble Temporal Patterns

The revision of the AR&R guidelines introduced an ensemble approach to peak flow estimation which aims to provide a more robust assessment than traditional methods (refer Section 4.3). The ensemble approach requires hydrological simulation of 10 separate temporal patterns for each combination of storm duration and probability, rather than the single temporal pattern approach from AR&R 1987.

A common difference between the old and new temporal patterns is how rainfall is distributed across a storm event. Almost three-quarters of each storm’s rainfall falls in the first half of the previous AR&R 1987 temporal patterns. Temporal patterns for AR&R2016 have been determined based on updated analysis with a range of rainfall distributions, however rainfall is more often consistent throughout each storm duration compared with AR&R 1987 temporal patterns. Figure 9 illustrates the distribution of new temporal patterns against the AR&R 1987 temporal pattern for a 9-hour storm.

Comparison of the temporal patterns for each storm was extracted from Storm Injector for a single subcatchment and is located in Appendix B.
4.3.7 Areal Reduction Factors (ARF)

As the catchments within the study area are large, design rainfall intensities at a point are not representative of the areal average rainfall intensity across the catchment. The ratio between the design values of areal average rainfall and point rainfall, computed for the same duration and Annual Exceedance Probability (AEP), is called the Areal Reduction Factor (ARF). This allows for the fact that larger catchments are less likely than smaller catchments to experience high intensity storms simultaneously over the whole of the catchment area.

ARF values were calculated as per the AR&R guidelines. As the critical duration was found to be short (less than 12 hours), the short duration ARF equation was used.

\[
ARF = \min \left\{ 1, 0.287(\text{Area}^{0.265} - 0.439 \log_{10}(\text{Duration})), \frac{2.26 \times 10^{-3} \times \text{Area}^{0.226} \times \text{Duration}^{0.125}(0.3 + \log_{10}(\text{AEP})) + 0.0141 \times \text{Area}^{0.213} \times 10^{-0.021} \times (\text{Duration} - 180)^2}{1440(0.3 + \log_{10}(\text{AEP}))} \right\}
\]

Where Area is in km\(^2\), Duration is in minutes and AEP is a fraction (between 0.5 and 0.0005).

4.3.8 Embedded Bursts

Embedded bursts occur when the rainfall accumulated over a subset (the “burst”) of a storm’s temporal pattern has a depth (mm) that exceeds the IFD value for the burst’s duration for the same AEP. Consideration of ARFs (which vary by duration) also exacerbates problems with embedded bursts since ARFs tend to be lower (more reduction) for shorter durations which reduces the amount of rainfall that can occur in embedded bursts and, as such, increases the amount and severity of embedded bursts.

AR&R states that consideration should be given to filtering out (or excluding) embedded bursts of lower AEP by re-distributing rainfalls of high intensity to other time increments proportionally to their magnitudes. Embedded bursts smoothing was applied for all bursts that exceeded 2% of specified IFD depth value (mm).
4.3.9 Design Event Rainfall Loss Parameters

Both TUFLOW and XP-RAFTS calculate a design rainfall excess time series for each storm probability (AEP) and duration to represent the local net precipitation for the study area. This rainfall excess was calculated by applying initial and continuing losses to the design rainfall to represent infiltration and storage of runoff in surface depressions.

The AR&R data hub provides a mean initial loss for the catchments (from the East Coast North region) of 54.0 mm (refer Table 5).

Table 5 Initial / Continuing Loss Values – AR&R Data Hub

<table>
<thead>
<tr>
<th>Catchment</th>
<th>Storm Initial Loss (mm)</th>
<th>Continuing Loss (mm/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocky Dam Creek</td>
<td>54.0</td>
<td>3.2</td>
</tr>
</tbody>
</table>

This is to be considered in conjunction with the preburst depth, which AR&R provides values for various percentiles of occurrence. For this project the median preburst depth has been adopted for consideration of initial loss.

Where the initial storm loss exceeds the preburst depth, the difference is taken as the initial burst loss parameter. Where the preburst depth exceeds the initial loss the excess preburst rainfall was reduced to 0.

The median preburst depth for the catchment are shown in Table 6.

Table 6 Median Preburst Depth – Rocky Dam Creek Catchment

<table>
<thead>
<tr>
<th>Storm Duration (hrs)</th>
<th>Design Event (AEP) Median Preburst Depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%</td>
<td>20%</td>
</tr>
<tr>
<td>1</td>
<td>13.3</td>
</tr>
<tr>
<td>1.5</td>
<td>4.5</td>
</tr>
<tr>
<td>2</td>
<td>6.4</td>
</tr>
<tr>
<td>3</td>
<td>14.1</td>
</tr>
<tr>
<td>6</td>
<td>31.8</td>
</tr>
<tr>
<td>12</td>
<td>21.5</td>
</tr>
<tr>
<td>18</td>
<td>7.1</td>
</tr>
<tr>
<td>24</td>
<td>4.3</td>
</tr>
<tr>
<td>36</td>
<td>0.3</td>
</tr>
<tr>
<td>48</td>
<td>0.9</td>
</tr>
<tr>
<td>72</td>
<td>0.0</td>
</tr>
</tbody>
</table>

The continuing loss values for each external sub-catchment were set to 2.5 mm/hr. This was consistent with previously modelling undertaken in Sarina approximately 20 kilometres north of the study area. Vegetation surrounding Sarina comprises of sparse vegetation, rural holdings and agricultural land such as cane and grazing fields, which is consistent with the land within the model boundary. The AR&R data hub suggested a continuing loss value in excess of 4 mm/hr, this was deemed inappropriate based on previous models developed within the region.
4.3.10 Critical Duration Assessment

A critical duration assessment was undertaken reviewing the results of the hydrologic modelling for the 1% AEP event. This assessment was undertaken using methodologies outlined in the AR&R guidelines. A box and whisker plot was produced at each subcatchment to assess the statistical variation of the ensemble peak flows for each event.

The critical storm duration for the study area was assessed by simulating 180 (3 hrs), 270 (4.5 hrs), 360 (6 hrs), 540 (9 hrs), 720 (12 hrs), 1080 (18 hrs), 1440 (24 hrs), 1800 (30 hrs), 2160 (36 hrs), 2880 (48 hrs) and 4320 (72 hrs) minute durations for the 1% AEP event in the baseline hydraulic model.

The 180, 270, 360, 540, 720, 1080-minute storm durations were found to be critical across different areas of Rocky Dam Creek.

The 540-minute (9 hrs) storm was found to result in the highest mean peak flow for the majority of the subcatchment. The results of the critical duration assessment at Koumala, which is the township within the catchment and experienced flooding (Subcatchment_67). The 540-minute storm was selected for simulation through the TUFLOW hydraulic model.

Figure 10 Critical Duration Assessment – Rocky Dam Creek - Koumala (Subcatchment_67)

The critical duration was applied to the 63.2%, 39%, 18%, 2% and 1% (1 in 100) AEP events. Separate critical duration storm durations were completed for the 0.5% (1 in 200) and 0.2% (1 in 500) AEP events, which were also found to be 540 minute storm duration.
1% AEP Rainfall Event
Critical Duration Map

Data sources:
Base Data: (c) 2017 Qld Gov

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Figure 11

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Rocky Dam Creek - Koumala

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Attachment 11.4.2.2

MACKAY REGIONAL COUNCIL
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4.4 Adopted Discharges

Design flood hydrographs were generated from the output of the hydrological model for boundary conditions and source flow inputs to the TUFLOW hydraulic model. A summary of the peak flows generated by the hydrological Storm Injector model at key locations are presented in Table 7.

Table 7 Peak Design Discharges at Key Locations (9 Hour Storm Event)

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>Design Event (AEP and Temporal Pattern)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63% AEP</td>
</tr>
<tr>
<td>Sub100</td>
<td>4.83</td>
</tr>
<tr>
<td>Sub101</td>
<td>8.21</td>
</tr>
<tr>
<td>Sub104</td>
<td>4.27</td>
</tr>
<tr>
<td>Sub105</td>
<td>23.84</td>
</tr>
<tr>
<td>Sub21</td>
<td>18.32</td>
</tr>
<tr>
<td>Sub22</td>
<td>63.35</td>
</tr>
<tr>
<td>Sub23</td>
<td>64.54</td>
</tr>
<tr>
<td>Sub45</td>
<td>10.54</td>
</tr>
<tr>
<td>Sub49</td>
<td>7.69</td>
</tr>
<tr>
<td>Sub50</td>
<td>18.41</td>
</tr>
<tr>
<td>Sub7</td>
<td>4.82</td>
</tr>
<tr>
<td>Sub8</td>
<td>57.07</td>
</tr>
<tr>
<td>Sub92</td>
<td>20.70</td>
</tr>
<tr>
<td>Sub93</td>
<td>4.19</td>
</tr>
</tbody>
</table>

4.5 Sensitivity Analysis

A sensitivity analysis was undertaken on catchment parameters that are subject to the greatest uncertainty including:

- Stream roughness;
- Catchment roughness;

Increasing the catchment roughness by 20% within the model increased the water elevations within Rocky Creek of approximately 200-500mm during a 1% AEP rainfall event. This increase does not significantly change the flooding extents within the creeks, seen on Maps 31 and 32 in Volume 2 of the report.
5.0 Hydraulic Model

5.1 Overview

A two-dimensional TUFLOW hydraulic model based on LiDAR topographic data has been developed to simulate flood hydraulics in the study area. The purpose of the assessment was to define the flooding within the Rocky Dam Creek floodplain, with calibration of the model to Cyclone Debbie event.

The hydraulic model extent is shown in Figure 12 and extends from Cameron Creek to the north to Marion Creek to the south.

5.2 Adopted Methodology

This section of the report documents the development of the hydraulic model used to simulate piped drainage and overland flows within the catchment. A TUFLOW hydraulic model was produced with parameters as per Table 8.

Table 8 TUFLOW model Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rocky Dam Creek TUFLOW Hydraulic Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion Date</td>
<td>August 2019</td>
</tr>
<tr>
<td>AEP's Assessed</td>
<td>63.2% 39%, 18%, 2%, 1%, 0.5%, 0.2% AEP</td>
</tr>
<tr>
<td>Hydrologic Modelling</td>
<td>XP-RAFTS runoff routed inflows and direct rainfall on 2D grid</td>
</tr>
<tr>
<td>IFD Input Parameters</td>
<td>AR&amp;R, Refer Section 4.3.4</td>
</tr>
<tr>
<td>Hydraulic Model Software</td>
<td>TUFLOW Version 2018-03-AD-iSP-w64</td>
</tr>
<tr>
<td>Grid Size</td>
<td>5m</td>
</tr>
<tr>
<td>DEM (year captured)</td>
<td>LiDAR (2009)</td>
</tr>
<tr>
<td>Roughness</td>
<td>Spatially varying and depth varying standard values (Refer to Figure 13)</td>
</tr>
<tr>
<td>Eddy Viscosity</td>
<td>Smagorinsky</td>
</tr>
<tr>
<td>Model Calibration</td>
<td>Anecdotal flooding information from Council used to confirm model accuracy from Tropical Cyclone Debbie rainfall event. Refer to Section 6.4.</td>
</tr>
<tr>
<td>Downstream Model Boundary</td>
<td>Rocky Dam Creek Catchment downstream boundary conditions were height varying discharge (HQ) based on catchment slope (Manning’s equation-based rating curves), each creek utilises its own boundary. Refer to Section 5.3.5.</td>
</tr>
<tr>
<td>Inflow Model Boundary</td>
<td>Time-varying discharge (QT) inflow boundaries for all external catchments.</td>
</tr>
<tr>
<td>Timesteps</td>
<td>1 second (2D)</td>
</tr>
<tr>
<td>Wetting and Drying Depth</td>
<td>Cell centre 0.0002 m</td>
</tr>
<tr>
<td>Sensitivity Testing</td>
<td>Manning’s Roughness ± 20% (Refer Section 5.4) Climate Change to year 2100 (Refer Section 8.0)</td>
</tr>
</tbody>
</table>

A visual representation of the model setup including the 2D model extent, inflow and downstream model boundaries is shown in Figure 12. Direct rainfall was applied over the entire model boundary of the 2D model domain.
Figure 12 - TUFLOW Model Extent

1:60,000 (when printed at A3)

MACKAY REGIONAL COUNCIL
Rocky Dam Creek - Koumala
Model Setup and 1D Network Map

Data sources:
Base Data: (c) 20XX (data source)
(additional data)

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PROJECT ID
LAST MODIFIED
CREATED BY
60598460
DR
20/09/2019

LEGEND
TUFLOW Model Boundary
1D Pipe
Rail Line
1D Bridge
State Controlled Road

TUFLOW Boundary Condition
QT
HQ

Topography (mAHD)
High : 447.027
Low : -2.06841

GDA 1994 MGA Zone 55

VERSION: v01
Version: 1, Version Date: 24/01/2020
Document Set ID: 7869087

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Rocky Dam Creek - Koumala

Hydraulic Roughness Delineation

---

LEGEND

- TUFLOW Model Boundary
- Rail Line
- State Controlled Road
- Cadastre

Material
- Minimal Vegetation
- Moderate Vegetation
- Dense Vegetation
- Creek
- Creek - Reedy Vegetation
- Agricultural (Sugar Cane)
- Rail Corridor
- Road Corridor
- Rural Residential
- Rocky Dam Creek

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GDA 1994 MGA Zone 55

Version: 1, Version Date: 24/01/2020
Document Set ID: 7869087

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5.3  Two-Dimensional Model Development

5.3.1  Model Setup Parameters

The grid cell size selected for the model was 5m. The minimum time step for the 2D model domain was set to 1.0 seconds, the TUFLOW HPC Solver utilises an adaptive time step and can adjust the time step to ensure model stability.

The wetting and drying depth represents the depth of water on a cell which is the criteria for whether the cell is “wet” or “dry”. Direct rainfall modelling applies rainfall to each cell in small increments, so the wetting and drying values must also be very small, or rainfall below the wetting depth will not be applied. The wetting and drying depth has been set to the default of 0.0002m for the centre of a cell.

5.3.2  Model Topography

Base model topography was derived from 2009 and 2014 LiDAR and was downloaded from Geoscience Australia. The data is a 1m resolution Digital Elevation Model (DEM).

5.3.3  Adopted Blockage

Assessment of culvert blockage was undertaken in accordance with Queensland Urban Drainage Manual 4th Edition 2017 (Table 10.4.1). QUDM suggests a design blockage of 20% for culverts less than 3 metres high, or 5 metres wide and 10% blockages for larger culverts.

5.3.4  2D Modelling Roughness

Roughness Delineation within the TUFLOW model boundary is shown on Figure 13 and roughness values shown in Table 17.

5.3.5  Boundary Conditions

Upstream boundary conditions were specified as time varying discharge hydrographs (QT Boundaries) to represent the flows from catchments upstream of the hydraulic model boundary.

Inflow discharge hydrographs were applied at the boundaries shown in Figure 12. These discharge hydrographs were extracted from the Storm Injector hydrologic models.

The downstream model boundaries was modelled as a height-varying discharge (HQ boundary) outflow boundary based on surface slope for flows leaving the model. HQ type boundaries allow flood waters to discharge from the model relative to the water surface elevation.

5.3.6  Bridge Form Loss Coefficient

Bridge drawings were obtained for Cherry Creek Bridge, Rocky Dam Creek Bridge and Duff Creek bridge. Form Loss Coefficient (FLC) was completed in accordance with Hydraulics of Bridge and Waterways – Figure 4 Incremental Backwater Coefficient for Piers.
5.4 Sensitivity Analysis

5.4.1 Design Model

A series of sensitivity analyses were undertaken as part of the modelling work to assess the impact of changes to basic model set up parameters. The following sensitivity analyses were modelled for a 1% AEP event:

- Manning’s Roughness increase by 20%;
- Manning’s Roughness decrease by 20%.

The results of the sensitivity analysis are presented in Volume 2 of the report as Maps 31 and 32 for the 20% increase and decrease respectively.

As shown, it was found that the model is quite sensitive to changes in hydraulic roughness, mainly due to the dominant grazing and agricultural land. Changes of 20% to the hydraulic roughness values saw an increase/decrease peak water levels by up to 250mm at some locations. Table 9 identifies the changes in Peak Water Surface Levels due to the increase/decrease in hydraulic roughness, key locations are shown in Figure 20.

It was found that adjusting the roughness values by 20% had negligible flood extent increase with no additional breakouts occurred within the creeks and no additional houses affected by the increase in roughness for the 1% AEP flood. It was found that reducing the hydraulic roughness causing an increase in Peak Water Surface Elevation at Little Station Creek (PT_LIT_us) due to water reaching the road crossing faster with reduced roughness values.

It is recommended that these roughness values be further investigated through calibration of future flooding events within the catchment when they occur.

### Table 9: Increase/Decrease in Peak Water Surface Elevation (+20% Hydraulic Roughness)

<table>
<thead>
<tr>
<th>Location</th>
<th>Change in Peak Water Surface Elevations (mAH)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1% AEP -20% Roughness</td>
</tr>
<tr>
<td>PT_BUL_ds</td>
<td>-0.03</td>
</tr>
<tr>
<td>PT_BUL_us</td>
<td>0.01</td>
</tr>
<tr>
<td>PT_CAM_ds</td>
<td>-0.08</td>
</tr>
<tr>
<td>PT_CAM_us</td>
<td>0.03</td>
</tr>
<tr>
<td>PT_CHE_ds</td>
<td>-0.22</td>
</tr>
<tr>
<td>PT_CHE_us</td>
<td>-0.03</td>
</tr>
<tr>
<td>PT_COA_ds</td>
<td>-0.12</td>
</tr>
<tr>
<td>PT_COA_us</td>
<td>-0.02</td>
</tr>
<tr>
<td>PT_COA2_ds</td>
<td>-0.01</td>
</tr>
<tr>
<td>PT_COA2_us</td>
<td>-0.02</td>
</tr>
<tr>
<td>PT_COA3_ds</td>
<td>-0.04</td>
</tr>
<tr>
<td>PT_COA3_us</td>
<td>-0.02</td>
</tr>
<tr>
<td>PT_DUF_ds</td>
<td>-0.13</td>
</tr>
<tr>
<td>PT_DUF_us</td>
<td>-0.05</td>
</tr>
<tr>
<td>PT_hwy</td>
<td>-0.04</td>
</tr>
<tr>
<td>PT_LEI_ds</td>
<td>-0.02</td>
</tr>
<tr>
<td>PT_LEI_us</td>
<td>0.00</td>
</tr>
<tr>
<td>PT_LEI2_ds</td>
<td>0.00</td>
</tr>
<tr>
<td>Location</td>
<td>Change in Peak Water Surface Elevations (mAHD)</td>
</tr>
<tr>
<td>-----------</td>
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6.0 Tropical Cyclone Debbie

6.1 General

Tropical Cyclone (TC) Debbie first reached cyclonic strength on 25 March 2017, before developing over the next two days into a Category 2 cyclone. TC Debbie was forecast to increase rapidly in intensity before making landfall on the Queensland coast; this prediction was borne out as TC Debbie made landfall as a Category 4 Severe Tropical Cyclone near Airlie Beach on 28 March 2017.

From Airlie Beach, TC Debbie tracked inland on a south-westerly track, losing tropical cyclone intensity at about 3.00am on 29 June. Ex-TC Debbie continued south, turning onto a south-easterly track and passing over the coast of northern New South Wales and out to sea on the 31 March.

Figure 14 shows the movement of TC Debbie through MRC boundary.
After TC Debbie made landfall and moved across the central interior of Queensland, a band of slow-moving thunderstorms developed inland of the Mackay coast and produced heavy rainfall on the 29 March. Figure 15 shows the line of thunderstorms that become orientated north-south along the terrain inland from the coast.

Figure 15 29th March 2017 Radar, Major Thunderstorm occurred over Mackay (Tropical Cyclone Debbie Technical Report, Bureau of Meteorology, 2018)

6.2 TC Debbie Rainfall Gauges

6.2.1 Sucrogen Weir Alert and Koumala Hatfields Road

Closest rainfall data available is approximately 3 km south-west of Koumala at the Koumala Hatfields Road (33038) which contains daily rainfall amounts. The closest working rainfall gauge which contained sub-daily data was provided by MRC and is located within Sarina at the Sucrogen Weir Alert (533143) to the north.

The rainfall distribution was extracted from the Sucrogen Weir Alert and the daily rainfall at Koumala Hatfields Road station was applied to allow for the best representation from the Cyclone Debbie Event. Reviewing the rainfall data at the station found that no TC Debbie rainfall occurred from the 31th March 2017. Rainfall that occurred during the days of 27th – 29th March 2017 (925mm) was utilised in the model and applied to the rainfall distribution from Sucrogen Weir Alert station between 12:13am on 27/03/2017 to 12:13am on 30/03/2017 (72 hours), cumulative rainfall distribution shown below on Figure 16.

6.2.2 Murray Creek at Undercliff Station

Undercliff station (130416A) is the next closest rainfall gauge after Sucrogen Weir which contained sub-daily rainfall totals. Undercliff Station TC Debbie rainfall was utilised as a sensitivity run as it contained the maximum rainfall depths over the three daily totals as indicated in Table 2.
Figure 16 Cyclone Debbie – Undercliff Cumulative Rainfall

Comparison between the rainfall gauges is shown on Figure 16 shows the Undercliff has a more intense peak after 29/03/2017 1:00pm, with approximately 430mm of rain falling over a 5-hour period between 1:00pm and 6:00pm on 29/03/2017.

6.2.3 TC Debbie Rainfall Intensity Comparison

Figure 17 indicates that the peak rainfall intensity that occurred during the Cyclone Debbie event based on the rainfall data available, the Sucrogen Weir Alert and Koumala Hatfields Road was greater than a 1% AEP rainfall event and Undercliff rainfall data greater than a 0.2% AEP rainfall event, based on BoM 2016 Rainfall data at Koumala (Latitude -21.6094, Longitude 149.2457).

6.3 TC Debbie Initial and Continuing storm losses

Initial and continuing losses were discussed with MRC for the TC Debbie rainfall event. Due to the duration of the event (3 days), initial and continuing losses were both set to 0, due to the constant wetting of the catchment across the 2-day period leading up to the peak which occurred towards the end of day 3 after 12:00pm.
Figure 17 Comparison of BoM Peak Rainfall Intensities with Cyclone Debbie Rainfall
6.4 Community Consultation

6.4.1 Surveyed Elevations

In August 2019, MRC surveyed flood surface elevations identified by the community. Three points were surveyed within the TUFLOW model boundary. This included the bottom of the rail sign southwest of Koumala (Survey Point A), Rocky Dam Creek flooding extent seen by property owner (Survey Point B) and flooding to the side of a house located on the bank of Rocky Dam Creek (Survey Point C). The locations of these survey points are shown in Figure 18.

Upon conducting the survey, MRC identified that the rail sign (Survey Point A) was located within a drain and was bent at the time of survey. Surveyed levels may not reflect actual TC Debbie flood level due to the changes that may have occurred since the cyclone event.

Surveyed elevations provided were compared to the constructed TUFLOW model. Both the Sucrogen Weir Alert Station (with Koumala rainfall) and Undercliff Station models utilising separate rainfalls (as discussed in Section 6.2) were compared in Table 10.

<table>
<thead>
<tr>
<th>Surveyed Point</th>
<th>Surveyed Elevation</th>
<th>Sucrogen Weir Rainfall</th>
<th>Undercliff Station Rainfall</th>
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<td>B</td>
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<td>33.33</td>
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<tr>
<td>C</td>
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</table>

Based on the surveyed points provided by MRC and the rainfall data available, Undercliff Station rainfall data provided the best representation of what occurred within the Rocky Dam Creek Catchment. The difference between the surveyed point A and the modelled storm (920mm), indicates an isolated storm near Koumala may have occurred that was not identified on the rainfall gauges, or the terrain flow conditions have been altered since the capture of the 2009 LiDAR.

6.4.2 Photography

Photos were provided by the community with timestamps of when they were taken. Photos of flooding within Koumala were taken on the 29th March 2017 between 3pm and 5pm. The times shown on the photos align with the intensity rainfall as shown in Figure 16. Photos provided could not be provided within the report due privacy concerns.