Option I – Dams in the upper catchment

Option I involves construction of dam(s) in the upper Burnett River catchment to temporarily store floodwaters. No specific sites have been chosen.

Stage 2 of the Bundaberg flood protection study involves assessing 11 flood mitigation options, including those identified through consultation with the Bundaberg community in late 2015.

Option overview

Option I aims to protect properties on the lower Burnett River floodplain by constructing dams in the upper catchment, somewhere upstream of Mundubbera. No specific dam location has been investigated at this stage. This assessment has been carried out to determine whether dams in the upper catchment could provide enough flood mitigation to create significant benefits for the Bundaberg township.

Dams in the upper catchment could mitigate flood flows from the Upper Burnett, Auburn and/or Boyne catchments. This option could lower flood levels for a range of AEP events for all properties downstream of the dam.

It would involve construction of a large 1.7 million megalitre dam built across the Burnett River floodplain or a number of smaller dams located in each of the Upper Burnett, Auburn and Boyne catchments. The aim would be to reduce the 1% AEP flood flow in Bundaberg from 17,000 m$^3$/s to 9,500 m$^3$/s which is similar to a 5% AEP flood event.

This option would require acquisition of land inundated by the dam and immediately downstream of the spillway.

Figure 1: Option layout

Note: The outcome depicted is a potential only of the implications associated with this option – and this outcome may not occur or eventuate.

1% AEP flood is the name given to a flood event which has a 1 in 100 or 1% chance of occurring in any year. It would be similar to the January 2013 flood.

5% AEP flood is the name given to a flood event which has a 1 in 20 or 5% chance of occurring in any year. It would be similar to the December 2010 flood.
Technical Discussion Paper

What would this option achieve?

Constructing several smaller dams, or one large dam with similar capacity, could reduce flooding to properties downstream from Burnett River flooding for a range of flood events. The creation of the dams or dam could lower flood levels for a 1% AEP event to the 5% AEP flood event levels. This option:

- Avoids over-floor flooding for about 1,450 properties in Bundaberg in a 1% AEP flood event, of which 580 are located in Bundaberg North, and 660 in Bundaberg East.

However, large areas of inundation would occur upstream of the dams which could affect residential dwellings and large areas of productive farmlands. Additional land downstream of the dams would also need to be resumed.

Velocity of the floodwater due to releases could become significant downstream of the dams and could increase the hazard of the floodwater. Also, overtopping or failure of the dams would pose a risk for the community downstream.

Changes to flood levels for the 1% AEP flood event are shown in Figure 2.

Figure 2: Likely change in flood extent (m)

DISCLAIMER: Jacobs has implemented reasonable, current commercial and technical measures using the usual care and thoroughness of a professional firm in the creation of these maps from the spatial data, information and products provided to it by the Department of Infrastructure, Local Government and Planning (DILGP), Bundaberg Regional Council (BRC), GHD and other consultants, and data custodians including Department of Natural Resources and Mines (DNRM) and data obtained from the Queensland Spatial Catalogue (Q spatial) under the Creative Commons Attribution 3.0 Australia licence. Jacobs has not independently verified the quality, content, accuracy and completeness of the Data. Jacobs is not responsible or liable for any costs, losses and/or damages suffered as a result of reliance on these maps. All information shown on these maps (including the nature, alignment and extent of any works) is preliminary and provided only for discussion purposes.
Viability
A key step in the options assessment involves identifying issues that may mean construction or implementation of the option is not viable. These relate to matters such as:

- The likelihood of obtaining environmental approvals, due to unacceptable environmental impacts
- Significant or unaffordable costs of construction or ongoing maintenance
- Potential for unacceptable impacts on other areas.

An option is considered to be unviable where the assessment identifies one or more of these matters are ‘unlikely to be achieved’.

The assessment of Option I found that this option is unviable with significant issues identified in all matters considered.

<table>
<thead>
<tr>
<th>Likelihood of obtaining environmental approval</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Affordability</td>
<td></td>
</tr>
<tr>
<td>Tolerable impacts outside benefited area</td>
<td></td>
</tr>
</tbody>
</table>

Costs and benefits
Initial cost estimates indicate that construction and maintenance of this option would be approximately $1300 million. This is based on the unit costs (i.e. cost per megalitre of volume) to construct other dams in Queensland.

The estimated reduction in flood damages (i.e. the tangible benefits) for this option is around $90 million.

Summary of assessment against key criteria
Each option has been assessed against a set of 16 criteria. These criteria, if achieved by an option, indicate a strong link between the option and the overall objectives of the Bundaberg Flood Protection Study.

The performance of this option against the 16 criteria is presented on the next page. These assessments will be used to derive an overall multi-criteria analysis score for this option. This score is then used in conjunction with other assessments to compare this option against the other options.

A summary of the performance of this option against the criteria as well as the costs, benefits and viability issues is presented below.

- This option would temporarily detain floodwater from the Burnett River and could reduce flood levels from the 1% AEP flood event to the 5% AEP flood event level.
- This would reduce flooding for about 3000 properties in the 1% AEP flood event and prevent over-floor flooding in 1450 properties in the 1% AEP flood event.
- Environmental approval of this option would be unlikely due to the environmental impacts in the impounded area.
- The temporary impounding of floodwaters would require the acquisition of large areas of agricultural and forested land.
- The costs would be very high ($1300 million) and more than 14 times the benefits realised through reduced damages.
- Benefits (in terms of reduced flood damages) would be in the order of $90 million.
- There is a risk that people downstream of the dam become complacent about flood risk and become less resilient during events which overtop/exceed the dam wall.
### Evaluation criteria

<table>
<thead>
<tr>
<th>Objective</th>
<th>Criteria</th>
<th>How does it perform against the criteria?</th>
<th>Preliminary Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce flood risk to life and reduced flood impacts on people</td>
<td>Improves people’s safety during flood events and people’s ability to evacuate</td>
<td>• Reduced flooding for about 1,450 properties in Bundaberg in the 1% AEP event.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lower flood levels would improve evacuation.</td>
<td></td>
</tr>
<tr>
<td>Reducing the occurrence of flood deaths and injury and improving people’s ability to plan for and recover after a flood</td>
<td>Reduces the impacts on people for very large / rare floods (larger than say Jan 2013 flood)</td>
<td>• Less dwellings and commercial properties with above-floor flooding in events greater than the 1% AEP flood event.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Increase people’s resilience to flooding by improving their preparation for flood events and ability to recover after flood events</td>
<td>• Reduced number of properties inundated increasing ability to recover for flood events.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Targets vulnerable community members or areas (e.g. elderly, poor)</td>
<td>• Would benefit communities in Bundaberg North and East.</td>
<td>✓</td>
</tr>
<tr>
<td>Reduce flood risk to property</td>
<td>Reduces damages and costs to residential property caused by floods</td>
<td>• High decrease in flood damages.</td>
<td>✓</td>
</tr>
<tr>
<td>Reducing flood damages and properties and improving the recovery of businesses after floods</td>
<td>Reduces damages and costs to business / industry / government caused by floods</td>
<td>• High decrease in flood damages.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Reduces the impacts on property for very large / rare floods (larger than say Jan 2013 flood)</td>
<td>• In very large events the dam wall could be overtopped/fail and properties will be inundated.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Increase a property’s “flood resilience” (improving a property so it is less affected by a flood event and recovery after an event is faster)</td>
<td>• Decreases over floor level flooding for properties downstream.</td>
<td>✓</td>
</tr>
<tr>
<td>Achieve a balanced investment approach that considers social, economic and environmental issues</td>
<td>Economic benefits (increased confidence leading to economic growth) for the broader region</td>
<td>• Increased confidence resulting from mitigation works.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Environmental benefits: Terrestrial, aquatic, riverine benefits, effects upon heritage</td>
<td>• Dam construction and temporary storing of water is likely to have impacts on riverine habitat.</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Social Health benefits: Effects upon mental health, psychological issues, stress</td>
<td>• Reduced stress due to reduced frequency of flooding.</td>
<td>✓</td>
</tr>
<tr>
<td>Considering social, economic and environmental issues (independent of the improvements to flooding)</td>
<td>Community benefits: Effects upon “livability” of the area, urban amenity, social cohesion</td>
<td>• Dam will require large areas to be resumed to account for the inundation areas upstream of the wall and immediately downstream.</td>
<td>✗</td>
</tr>
<tr>
<td>Long term reduction in flood risk and adaptable levels of protection</td>
<td>Adaptable flood performance with respect to climate change</td>
<td>• Costly to raise dams to deal with increased flows.</td>
<td>✗</td>
</tr>
<tr>
<td>A focus on the long-term benefits and adaptability of options and also the impact on future development land</td>
<td>Long term benefits</td>
<td>• Benefits of the dam would be realised over the long term.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Decreases flood damage to areas of future development</td>
<td>• Decreased flood damage to areas identified as &quot;emerging Communities&quot; or green fill urban residential land.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Staged benefits with staged construction / investment</td>
<td>• If multiple dam sites, possible to stage, so partially meets criteria.</td>
<td>✗</td>
</tr>
</tbody>
</table>

- ✓ Achieves the criteria
- ✗ Partially achieves criteria or has no change to current status
- ✗ Does not achieve the criteria
Technical Discussion Paper

Find out more about this option
Community consultation on the flood mitigation options and the findings of the options assessment will take place from 24 October to 20 November 2016. To find out more about the flood mitigation options and to provide your feedback:

Visit the website
www.qld.gov.au/bundabergfloodstudy
Interactive mapping is available on the website so that you can see how the flood mitigation options would change flooding in your area.

Contact the project team
Email: bundabergfloodprotection@jacobs.com
Telephone: 1800 994 015 (during business hours)

Next steps
The Bundaberg flood protection study is due to be completed later this year. Engagement on the 10-year action plan will occur in 2017. It is important to note that the flood mitigation options have not yet been considered by the State government and are not government policy. No commitment will be made on any of the options until the State government has consulted with the community and stakeholders on the 10-year action plan.
The Queensland Government will continue to engage with the Bundaberg community as the action plan develops.