Thabeban Master Drainage Strategy

A wholistic approach to reducing flooding and increasing development yield in flat terrain

IPWEAQ Annual Conference
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Project Summary

- Project background
- Site characteristics
- Drainage Philosophy
- Flood Behaviour
- Whole of System Approach / Assessment
- Mitigation Strategy Options
- Benefit Cost Analysis
- Project Outcomes and Lessons Learnt
Project Background

Existing Retention Basin

Future Development Site
Study Area – Site fall from North West to South East
Goodwood Road Cross-section
Example – Lack of capacity in road reserve
Drainage Philosophy

• All elements of the solution would need to be cognisant of:
  – The standard of service which would be required/expected for any new development;
  – the current community concerns;
  – the cost of construction and maintenance over the life of the drainage assets;
  – ability to offset costs of the project through potential development yield; and
  – an understanding of the risk associated with asset failure and/or storm events larger than the design event.
Flood Behaviour
Existing Case
Flood Depths
50% AEP
Flood Behaviour
Existing Case
Flood Depths
10% AEP
Flood Behaviour
Existing Case
Flood Depths
1% AEP
Wholistic Approach and Assessment

• The following options were investigated
  – Flow Diversion;
  – Storage;
  – High flow conveyance;
  – Improved downstream conveyance.

• Retention Basin Modifications
  • Increase storage volume;
  • Reconfiguration of forebay structure;
  • Non-return valves;
  • Actuated penstocks;
  • Inclined turbine pumps;
  • Radar level sensors with smart PLC controls;
Mitigation Strategy Options

- Three (3) Mitigation Strategy options were investigated
- A focus on storage and improved conveyance through existing infrastructure.
Mitigation Strategy 1
Mitigation Strategy 1

10% AEP

Afflux (mm)
- Less than -100
- -100 to -50
- -50 to -10
- -10 to 10
- 10 to 25
- 25 to 50
- 50 to 100
- More than 100
- Was wet now dry
- Was dry now wet
Mitigation Strategy 2
Mitigation Strategy 2

10% AEP

Afflux (mm)
- Less than -100
- -100 to -50
- -50 to -10
- -10 to 10
- 10 to 25
- 25 to 50
- 50 to 100
- More than 100
- Was wet now dry
- Was dry now wet
Mitigation Strategy 3

Low Flow Connection Pipe
2 x 500 mm RCP

Detention Basin 1
L: RL 24.20 m
10% AEP Depth: 0.40 m

Detention Basin 2
L: RL 23.20 m
10% AEP Depth: 0.00 m

Detention Basin 3
L: RL 23.10 m
10% AEP Depth: 1.10 m

Detention Basin 4
L: RL 23.00 m
10% AEP Depth: 1.20 m
Wastewater discharge to Andrews St
Well crest: RL 24.20 m

Pit Inlets on Kellys Rd - say
Pipe connection to Detention Basin 3
4 x 600 mm RCP

Pit inlets on Nykiet & Wiscohe St
Pipe connection to Wetland
1 x 600 mm RCP each

Turf Channel
Top Width: 9m
UL RL 21.40 m
DS RL 21.80 m

Remove existing minor embankment and bypass foreshore.
Mitigation Strategy 3

10% AEP

Afflux (mm)
- Blue: Less than -100
- Light Blue: -100 to -50
- Green: -50 to -10
- Gray: -10 to 10
- Yellow: 10 to 25
- Orange: 25 to 50
- Red: 50 to 100
- Brown: More than 100
- Magenta: Was wet now dry
- Blue: Was dry now wet

Global environmental and advisory solutions
Water Balance Model
# Pump Scenario Results

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
<th>Days Basin is Empty</th>
<th>Days Basin is Full</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>210 l/s</td>
<td>27 l/s</td>
</tr>
<tr>
<td>1</td>
<td>Pump on between 19 m &amp; 22 m only after overtopping event</td>
<td>905</td>
<td>904</td>
</tr>
<tr>
<td>2</td>
<td>Pump on between 20 m &amp; 22 m only after overtopping event</td>
<td>890</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Pump on between 20 m &amp; 22 m any time</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Pump on between 21 m &amp; 22 m any time, pumps down to 19m if basin is overtopped.</td>
<td>874</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Pump on between 21 m &amp; 22 m any time, pumps down to 20m if basin is overtopped.</td>
<td>625</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Pump on between 19 m &amp; 22 m any time</td>
<td>21291</td>
<td>16228</td>
</tr>
</tbody>
</table>
Project Outcomes

- Understanding of flood mechanisms;
- Determination of mitigation options = level of service being achieved for current residents;
- Understanding of infrastructure required to allow development of the brownfields site;
- Understanding of retention basin impact and degree of influence;
- Recommendation to undertake Mitigation Strategy 3 and not undertake any upgrade to the pump out arrangements in the retention basin.
Lessons Learnt

• **Understand the problem** - the flow behaviours and reasons for flooding for sub-areas of the project area to understand how mitigation options should be used.

• **Wholistic Approach** – all drainage elements in the catchment were investigated to understand whether the system operated effectively and efficiently

• **Communication** – of interim results, potential conflicts and changes to potential solutions were communicated throughout the project to enable the final deliverable to be of most use to Council for decision making.
Acknowledgements

SLR would like to thank Timothy Fichera and David Fulton for their assistance and support throughout the project