Assessing and Increasing Rockhampton’s Water Supply Security

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Outline

- Rockhampton’s Water Supply History
- The Fitzroy Basin and the Barrage
- RWSSA – Collaboration with DEWS
- Options for Increasing Water Supply Security
- Barrage Gate Height Raising Project
- Progress to date and future work
- Concluding Remarks
Some Water Supply History

• 1861 - Water sourced from Yeppen Lagoon using carts and brandy!
• 1875 - Athelstane Range Reservoir and a pump station built near Yeppen lagoons (~1400 houses)
• 1926 - Mt Charlton WTP built, water pumped from Yaamba then gravity to R’ton
• 1970 - Fitzroy River Barrage opened
• 1971 - Glenmore WTP commissioned
• 2005-06 - Water meters ($$) 30% lower demand!
• 2010 – R’ton to Yeppoon Pipeline commenced (1000-3000 ML/a) supply from Barrage/Glenmore
Fitzroy Basin and Fitzroy River Barrage

- 142,000 km² of catchment area
- 2nd largest in Australia, largest on east coast!
- Very reliable catchment with annual flows
- Average annual discharge 5,000-6,000 GL
- Peak annual discharge ~32,000 GL (2011)
- Floods on average about every 5 years!
- Barrage separates estuary from freshwater
- Barrage storage volume ~80,000 ML?
- Council high priority allocation of 50,383 ML
- Never failed to fill each year since built!
- Seems very reliable abundant water supply...
- But is it really?
Regional Water Supply Security Assessments

RWSSA Program
Commenced Feb 2014

Regional Context
for bulk water supplies
to urban centres

Partnership
Opportunity to achieve shared understanding of existing water supply capability and risk, future population growth and water demand

Assistance
Some Local Governments (LGs) have requested assistance with water security planning

Background
Scope of RWSSA

- Quantify supply volumes/rainfall/flows
- Quantify demand past/current/future
- Make numerous assumptions (no restrictions, no unbuilt dams or weirs)
- Apply mathematical modelling using IQQM (historical and stochastic)
- Predict likelihood of supply failures
- Test different demand scenarios (Eden Bann)
- Present results to Council for endorsement
- Moving Forward – what to do next?
Barrage Bathymetric Survey

- Previous 1998 survey used to generate Full Supply Volume of 81,300 ML
- Uncertainty given time since last survey and recent major flood events
- Bathymetric survey completed by FRW in 2014
- More than 40 km of river channel every 250 m versus the previous interval of every 2 km
- New storage curve prepared and key storage volumes calculated

<table>
<thead>
<tr>
<th>Attribute</th>
<th>1998 Survey</th>
<th>2014 Survey</th>
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</thead>
<tbody>
<tr>
<td>Fully Supply Volume</td>
<td>81,300 ML</td>
<td>74,390 ML</td>
</tr>
<tr>
<td>Commandable Volume</td>
<td>59,400 ML</td>
<td>49,821 ML</td>
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<tr>
<td>Dead Storage Volume</td>
<td>21,900 ML</td>
<td>24,569 ML</td>
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</tbody>
</table>
Quantifying Water Demand

- Network extraction last 5 years average 19300 ML/a (625 l/c/d, 330 l/p/d).
  - By comparison – Gladstone 270 l/p/d, Bundaberg 228 l/p/d, T’ville 588 l/p/d
- Rainfall last 5 years above longer term average.
- Rainfall last 5 years includes period below average (but above longer term min)
Projected Water Demand

Dry condition projection (Green Data)
- Critical period full to empty in say 18 months for the Barrage with no annual filling event
- In dry year have higher demand than in average year
- Demand of 700 l/c/d R’ton, 450 l/c/d Cap Coast with 2400 ML/a from Water Park Creek
- Assumes demand behaviour unchanged from present (including non residential)
Historical Performance for Barrage

- Simulated over the period from 1900 to 2012 for “current” demand of 45,000 ML
- 1902 extreme water scarcity event although somewhat limited available data
Stochastic Modelling for Barrage

- Simulated over 10,000 year period based on permutations of known data
- Three demand scenarios considered, duration of supply failure estimated
Water Security Findings

Current Scenario (2015) – 45,000 ML
At current demand the Barrage storage level may be at or below minimum operating level for up to 1 month on average about 1 in every 108 years.

Future Scenario (2035) – 74,000 ML
At full allocation usage the Barrage storage level may be at or below minimum operating level for up to 1 month on average about 1 in every 24 years.
Options for Improved Security

**Improved Demand Management**
- Water efficiency and waterwise initiatives
- Water restrictions to limit excessive usage
- Pricing to prevent excessive usage
- System (and storage) water loss reduction
- Recycled water use to replace potable use

**Possible Outcome**
Reduce the per capita consumption and stretch the available storage volume to improve security.
Options for Improved Security

**Increased Storage Level (Volume)**
- Raise the Barrage control setpoint (ROP, PLC)
- Raise Barrage sill/gate top level (Structural)
- Deepen/widen the storage to increase volume
- Purchase additional storage infrastructure
- Purchase additional water allocation

**Possible Outcome**
Increase the available water supply volume to increase water security.
Options for Improved Security

**Maximise Minimum Operating Level (Barrage)**
- Modify pumping to enable lower extraction level
- Connect separated dead storages (transfer)
- Assess options for desalination/blended supply
- Assess options for groundwater/surface water blended supply

**Possible Outcome**
Create contingencies to maximise or extend water security during emergency events.
Barrage Gate Height Increase Project

Feasibility Study, FIA, Modelling Completed

- Gate augmentation possible without compromising structural design
- Similar to previous modification used for bulkhead “spare gate”
- Gate modification limited to ~0.5 m before conflict with bridge structure
- Increase of 0.5 m to Full Supply Level equal to almost 10,000 ML increase
- Increase in Full Supply Level does not make the Barrage a referable dam (*WSSR Act*)
- Increase of 0.5 m (10,000 ML) halves the frequency of supply failure at full allocation use from 1 in 53 years to 1 in 107 years
Barrage Gate Height Increase Project

Current and Future Work
- Qld Gov approval process underway – still!
- Due diligence to ensure legislative obligations are met (Water Act, Planning Act)
- Detailed design of Barrage modifications underway
- Preliminary inundation mapping completed and field proofing of mapping to commence
- Community consultation to commence in coming months to include all relevant stakeholders (e.g. landholders, irrigators etc.)
- Possibly commence construction in late 2019
- Possibly commence staged increase in 2021
Concluding Remarks

• RWSSA an excellent collaboration with DEWS/DNRME
• RWSSA a formal framework for pursuing options to improve water security
• Excellent opportunity for a cost-effective change to be made to the Barrage to significantly improve water security
• Good engagement with regulators and stakeholders very important
• Additional benefit of mitigating risk due to forecast sea level rise impacting Barrage
• Maximising the value of the >$70 M Barrage to benefit the region for another 50 years!
Acknowledgements

DEWS/DNRME (Queensland Government)
Craig Gordon, Jinaraj Rajakaruna, Darren Thompson, Linda Dobe

GHD
Nicholas Thomas-Kinsella, Rob Saunders

FRW/RRC
Paul Dean, Angus Russell