Townsville

TOWNSVILLE CITY COUNCIL

INTEGRATED WATER SUPPLY STRATEGY

Executive Summary

2012

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Executive Summary

Townsville's population is expected to grow from the current 191,000 to up to 300,000 by 2032 (Queensland Treasury and Trade, Office of Economic and Statistical Research 2012). A key factor in servicing such growth is ensuring the security of the water supply system by managing the infrastructure on a long term basis. This Integrated Water Supply Strategy (IWSS) was developed to assess the future water supply and the infrastructure requirements to best meet the growing needs of the city.

The IWSS is based on meeting a defined Level of Service (LOS) for Townsville's bulk water supply system. The LOS targets used within the IWSS are as follows:

- Level 3 Restrictions are not to occur more frequently than 1 in 10 year time period, for a duration of no longer than 2 months; and,
- Level 4 restrictions are not to occur more frequently than 1 in 25 year time period, for a duration of no longer than 4 months.

These restriction levels are selected based on benchmarking with other Council's and judgement as to what was considered to be an acceptable level of risk of restrictions, which enables the sustainable implementation of water supply infrastructure to meet increased demands. This risk of restrictions can be reduced, but at considerable cost.

Modelling Data

The IWSS used an Integrated Bulk Water Model (IBWM) to determine the most efficient operation of the future supply sources. The IBWM is a water balance model that combines hydrological models for the Ross and Paluma Dam supply systems, bulk water transfer infrastructure, and bulk water treatment infrastructure to assess the water supply system's ability to meet future demand scenarios. The model assesses the capacities of both the raw water and the treated water systems to ensure that the delivery of water can be maintained to the city over the next 50 years.

Various scenarios were modelled within the IBWM to establish baselines for the existing system. The modelling scenarios used the historical rainfall data and stochastically generated rainfall data for the assessment of the current operation of the system.

The current LOS for the water supply system

- Was shown to have an average restriction frequency of 1 in 9.2 years and an average duration of 6 months using the historical rainfall data; and,
- Was shown to have an average restriction frequency of 1 in 10.8 and an average duration of 5 months years using the stochastically generated rainfall data.

It should be noted that the above figures are the average frequency based on 200 separate 50 year runs. If the next 50 year period is actually drier than average then this will result in more frequent and longer restrictions to the desired LOS.

The water supply system is currently operating at the limit of the acceptable LOS, however with the growth and associated demand the LOS will fall. Modelled data for the existing system under 2021 and 2031 demands without system augmentation are shown in Figure E 1 below

and indicate that average time between restrictions will decrease below the acceptable LOS if no changes or upgrades are made to the infrastructure operations. Figure E 2 highlights the same trend with increasing duration of restrictions as demand increases. It is noted that the average duration of restrictions exceeds the LOS of 4 months. The stochastic analysis shows a longer time between restrictions than the historical rainfall analysis, as the historical rainfall records for the Townsville area are generally considered a dry rainfall period.

Figure E 1 Restriction Frequencies for Future Demand Under Current Infrastructure Conditions

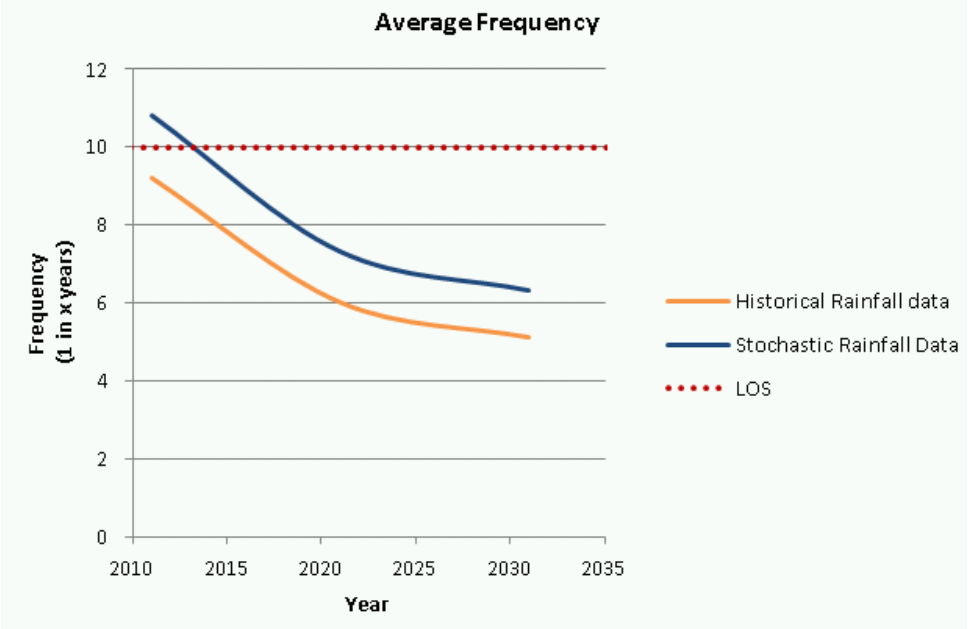
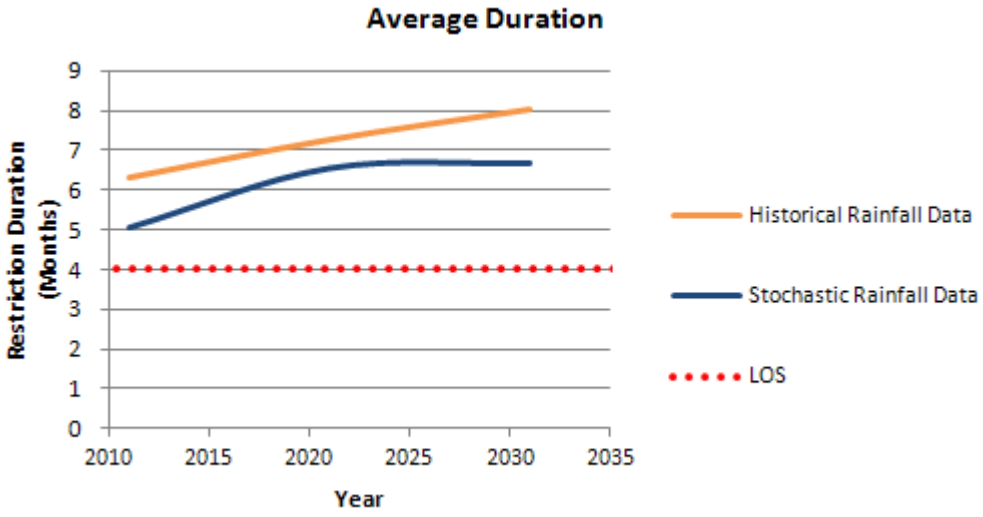


Figure E 2 Restriction Durations for Future Demand Under Current Infrastructure Conditions



The “frequency” used to determine the comparison to LOS criteria was regarded as the gap of time between the end of the last restriction and the start of the next one. The frequencies above

were considered as “back to back” restrictions. That is if restrictions occur within 18 months of previous restrictions they are considered as one period of restriction.

Infrastructure Strategy

The preferred infrastructure strategy based on the outcomes of the modelling assessments is:

- Haughton pumping is triggered when the capacity of the Ross River Dam reaches 10% levels (current operations pump at 5% level) - required immediately;
- Installation of a clarifier at Douglas Water Treatment Plant to ensure the treatment capacity of the plant can be maintained during periods of high turbidity within the Ross River Dam - required within next 5 years;
- A second Haughton Pipeline and pump station upgrade to enable a pumped capacity of 190ML/day to the Ross River Dam catchment (currently 130ML/day pumped capacity) to improve water supply security - required in approximately 8-10 years; and,
- Installation of Toonpan Treatment Plant in 3 stages with a capacities of 40ML/day, 40ML/day and 50ML/day respectively, with the 1st stage required beyond 10 to 15 years once demands exceeds the existing capacity of our water treatment plants;
- Effluent Re-use hasn't been identified as an effective solution for providing additional water security, but may be worthy of more consideration once the 1st stage of the installation of Toonpan Treatment Plant is required.

The performance of the water supply system for the preferred strategy is shown by graphing the frequency and duration of restrictions as in Figure E 3 and Figure E 4 below.

Figure E 3 The Frequency Performance of the Preferred Infrastructure Strategy

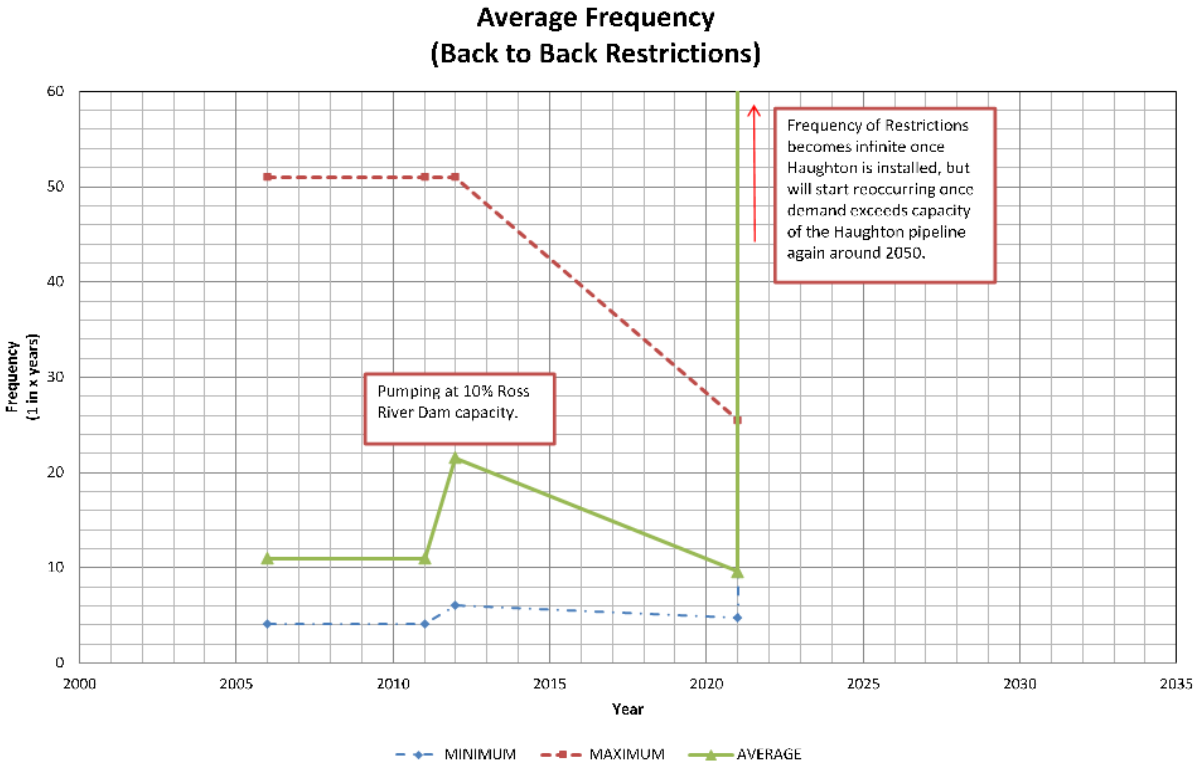
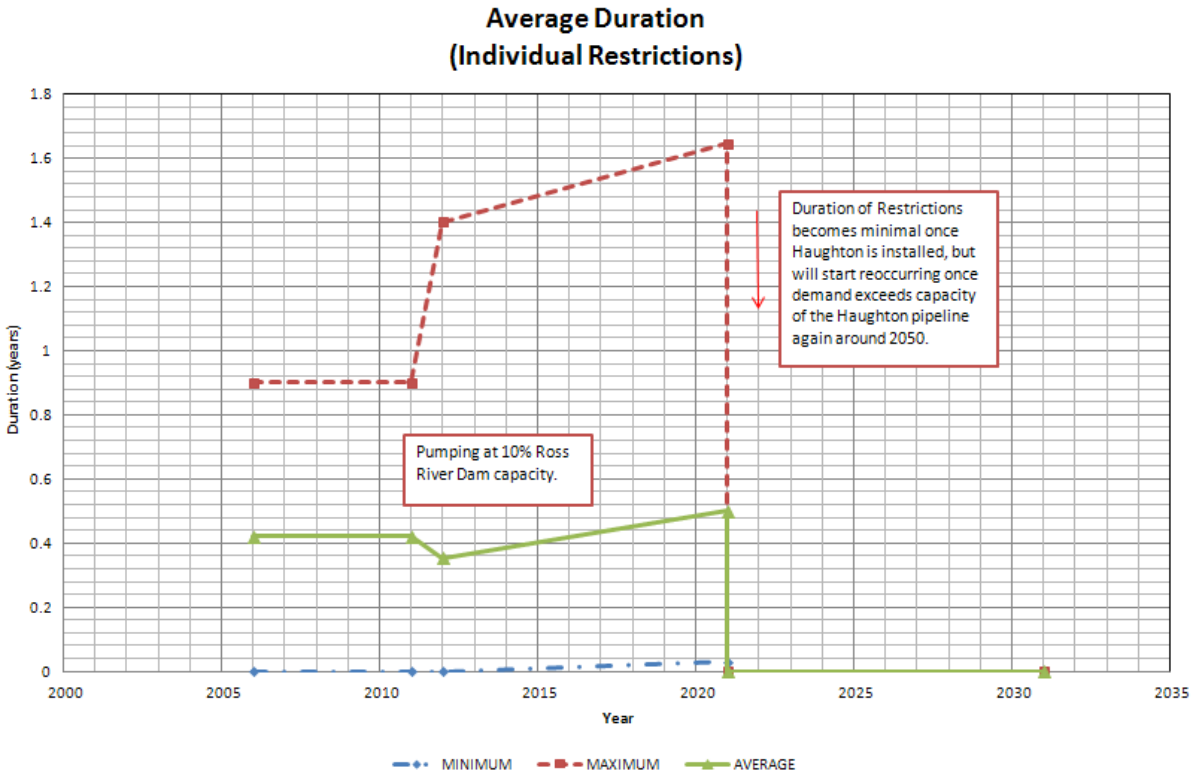


Figure E 4 The Duration Performance of the Preferred Infrastructure Strategy



The preferred infrastructure strategy was based on numerous modelling scenarios and option comparison undertaken during the course of the project. The Net Present Value (NPV) cost of the preferred strategy including operations over the 50 year horizon and a 3% discount rate was $578.2M.

Whilst the preferred infrastructure strategy has the least NPV cost, a number of other options had an NPV within 10%. The preferred option of duplicating the Haughton pipeline has the added benefit of effectively removing the need for significant restrictions for the foreseeable future.

Further details of the cost comparisons for the other strategy options are detailed within the report.

Restrictions

This strategy assumes the current restriction regime below will achieve the required reductions in water consumption detailed in Table E 1:

Table E 1 Current Water Restrictions

Restriction Level	Ross River Dam Level	Water Restrictions
1	>10%	• Ban on sprinklers between 9am and 4pm on all days. • Handheld watering permitted anytime
2	10%	• Ban on sprinklers between 9am to 4pm on all days. • Handheld watering permitted anytime. • Increased policing and enforcement
3	5%	• Sprinklers permitted between the hours of 6.30am to 7.30am and 6.30pm to 7.30 pm. • Handheld watering permitted anytime.
4	3.5%	• Sprinklers not permitted. • Handheld watering permitted between the hours of 6.30am to 7.30am and 6.30pm to 7.30pm.

No documented evidence is available to determine how quickly the community responds to new restriction regimes, and as to whether the required reductions are achieved. The restriction practices may need to be more severe than those currently indicated to achieve the level of reductions required as per Table E 2:

Table E 2 Percentage Water Reductions.

Restriction Level	% Reduction on Average Water Use	Maximum % reduction required during a drought year
1	0%	18%
2	10%	26%
3	17%	32%
4	25%	38%

These reduction figures correspond to an outdoor usage reduction of 71% on the current usage during drought periods. Finally, the trigger levels for Level 3 and Level 4 are 5% and 3.5% respectively, which in terms of time could be as little as 2 weeks, particularly if desired reductions aren't achieved immediately. Consideration of introducing level 3 restrictions at a

higher level is recommended to ensure more time to respond with more severe controls if required to meet the water usage reduction target.

Demand Management

Demand management as a strategy to delay the need to install infrastructure and provide substantial cost savings within the system has been demonstrated as a significant opportunity over the strategy horizon.

Studies by Price Waterhouse Coopers (PWC, 2012) and MWH (MWH, 2008) to review potential water demand reductions were used as the basis for a series of modelled scenarios investigating the long term infrastructure implications and costs of reducing water demands in the city over the 50 year strategy.

The scenarios modelled for the overall long term reduction in demand have shown the following potential cost savings for the 50 year period:

- 3.2% reduction in demand – Potential cost saving $ 12M;
- 8% reduction in demand – Potential cost saving $ 62M;
- 10% reduction in demand – Potential cost saving $ 80M; and,
- 15% reduction in demand – Potential cost saving $112M;

Action Plan

Immediate Action

- Preparation of a detailed Haughton Pipeline Project Plan. This should cover
    - Permitting requirements. Projection of the timeframes and permits required for construction; and,
    - Scheduling of, and investigate the ability to fast track, pipeline construction in the event of drought, which may include communications with pipeline suppliers regarding timeframe and the ability to supply, environmental approvals etc
- Detailed study into improving treatment capacity of Douglas Water Treatment Plant during high turbidity inflows;
- Changes to operational procedures to ensure that the Haughton pumping is triggered when the capacity of the Ross River Dam reaches 10% levels (current operations pump at 5% level);
- Discussions with Department of Energy and Water Supply with regards to the securing of additional High Priority allocation, which is expected to be exceeded by 2020;
- Discussions with Department of Energy and Water Supply to ensure they address the long term security of the Burdekin Dam system, which may include the need for stage 2 construction of the Burdekin Falls Dam;
- Discussions with Department Environment Heritage and Planning regarding the outcomes of the strategy with respect to satisfying local licence conditions at wastewater treatment plants, and in particular that effluent reuse isn't the preferred strategy;
- Revise council's 10 year financial plan to include strategy costings;
- Revise restriction triggers to allow more time to respond with more severe restriction controls if required to achieve the order of 71% reduction in outdoor usage required in severe droughts;
- Ongoing data collection for system monitoring and model calibration; and,
- Further investigation into demand management strategies.

2013-2014

- Detailed Design of Douglas Water Treatment Plant clarifier options;

2014-2015

- IBWM recalibration with the release of Australian Rainfall and Runoff Guidelines expected in 2014-2015;
- Detailed design of Haughton Pipeline Duplication;

Future Works

- 5 Yearly Integrated Water Supply Strategy Review;
- 2020/21, Installation of Haughton Pipeline;
- 2033, Installation Toonpan Stage 1;
- 2045, Installation Toonpan Stage 2; and,
- 2057, Installation Toonpan Stage 3.

The Townsville City Council will review and update the strategy at least every 5 years, following a year of low rainfall, or as changes in the key assumptions of the strategy occur. Reporting on the implementation of the strategy will be conducted annually.