

# EVOLUTION OF SEWAGE TREATMENT PLANTS UPGRADE STRATEGY – THE FITZROY WATER PERSPECTIVE



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# EVOLUTION OF SEWAGE TREATMENT PLANTS UPGRADE STRATEGY - THE FITZROY WATER PERSPECTIVE

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## ABSTRACT

Rockhampton City Council own and operate three sewage treatment plants that service the 60,000 residents of Rockhampton as well as a number of minor industrial customers. The three plants utilise varying treatment technologies and as such the operational performance varies significantly between plants especially in regards to the removal of nutrients. Therefore when new discharge conditions were introduced in 1998 to regulate the level of Nitrogen and Phosphorus being released to the environment it appeared some major changes would need to be made.

It is now 2006, discharge conditions are yet to be finalised and no significant plant upgrades or modifications have been carried out despite the best intentions of all parties involved. The evolution of the Fitzroy River Water Sewage Treatment Plant Upgrade strategy is an example of how operators and service providers are often at the mercy of external forces.

## KEYWORDS

Sewage treatment plants, Licensing, Nutrient removal, Environmental Protection Agency

## 1.0 INTRODUCTION

Since July 1998 Fitzroy River Water (FRW) has been operating as a commercialised business unit of Rockhampton City Council, responsible for the provision of water and sewerage services to the City and parts of surrounding shires. In this role FRW is responsible for the operation and maintenance of water and sewage assets totalling approximately \$434 million with one of the key functions of the business being the treatment of collected sewage totalling approximately 18 ML/d.

This treated sewage is currently discharged to the tidal reaches of the Fitzroy River below the Fitzroy River Barrage and as such has been subject to the increased regulatory focus that has been placed on management of sewage in recent years.

## 2.0 SEWAGE TREATMENT PLANT INFORMATION

FRW operates three sewage treatment plants (STP's) that service the residents of Rockhampton and a number of minor industrial customers. The plants vary in age and technology utilised from a 1.5ML/d trickling filter up to a 11.5 ML/d oxidation ditch extended aeration configuration with a 6.5ML/d conventional activated sludge plant somewhere in between.

As such the quality of effluent produced is significantly different from plant to plant. Table 1 presents the major unit operations of each plant and Table 2 provides an indication of the nutrient treatment performance of each plant. Figure 1 identifies where the various plants are located around the city.

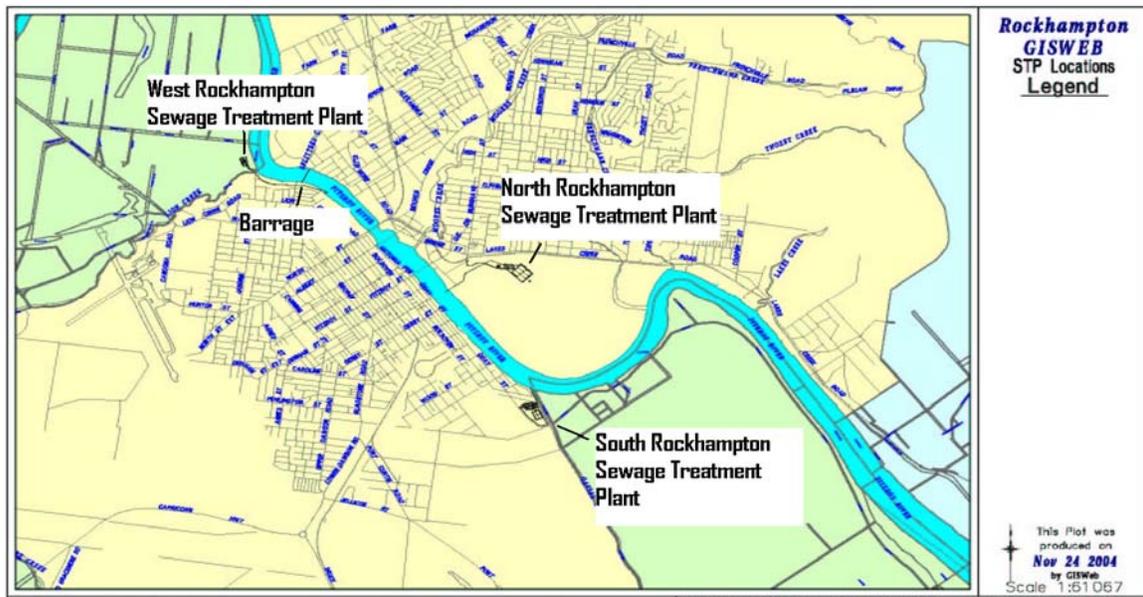
**Table 1:** *Rockhampton Sewage treatment plant characteristics*

Unit Operation	STP		
	North Rockhampton	South Rockhampton	West Rockhampton
Design Capacity * EP * Flow m <sup>3</sup> /d	47 000 12 700	34 000 (28 000) <sup>1</sup> 10 700	11 000 4 700
Throughput * ADWF ML/d	11.7 ML	6.5 ML	1.4 ML
Secondary treatment technology	Oxidation ditch extended aeration	Conventional activated sludge	Trickling filter
Constructed (Current Technology)	1988	1983	1976

1 ( ) value = organic load EP

**Table 2:** *Rockhampton sewage treatment plant nutrient removal performance 2004-2005*

Nutrient	STP		
	North Rockhampton	South Rockhampton	West Rockhampton
Median Nitrogen concentration (mg/L)	3.5	15	28
Median Phosphorus concentration (mg/L)	7.8	7	8.7



**Figure 1:** *Rockhampton sewage treatment plant locality map*

### 3.0 UPGRADE STRATEGY EVOLUTION

#### 3.1 *New Discharge Licence Conditions for Sewage Treatment Plants*

In 1998 the EPA issued new licence requirements for the STPs that defined an absolute limit for both nitrogen (N) and phosphorus (P) concentrations in effluent discharges.

Previously the concentration of nutrients had not been covered as a condition of the existing discharge license. Under the proposed conditions, for the release of effluent to the Fitzroy River estuary to continue, it would be necessary to substantially upgrade all three STPs or alternately implement 100% reuse.

The new licence conditions were such that generally only high cost biological/chemical nutrient removal methods gave cost effective solutions to meet the prescribed limits. The licence conditions generally made effluent reuse schemes unviable for larger plants and it could be argued that they did not guarantee that environmental values of the receiving waters would be met.

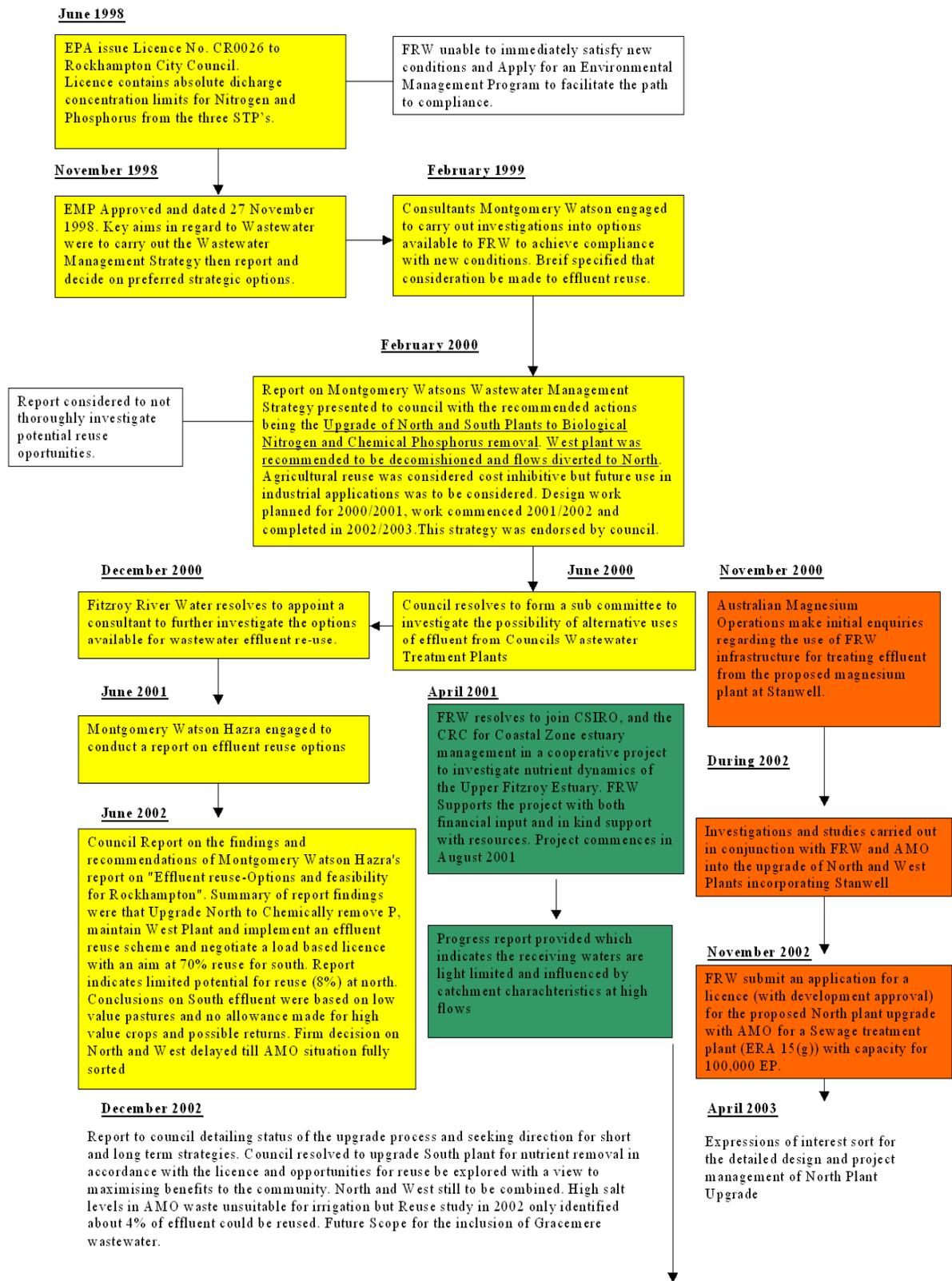
After the introduction of the new conditions there were a number of key developments, which are detailed in Table 3 and Figure 2, which have ultimately resulted in the sewage treatment plant upgrade strategy not being finalised during this time.

Essentially the key developments were as follows in Table 3.

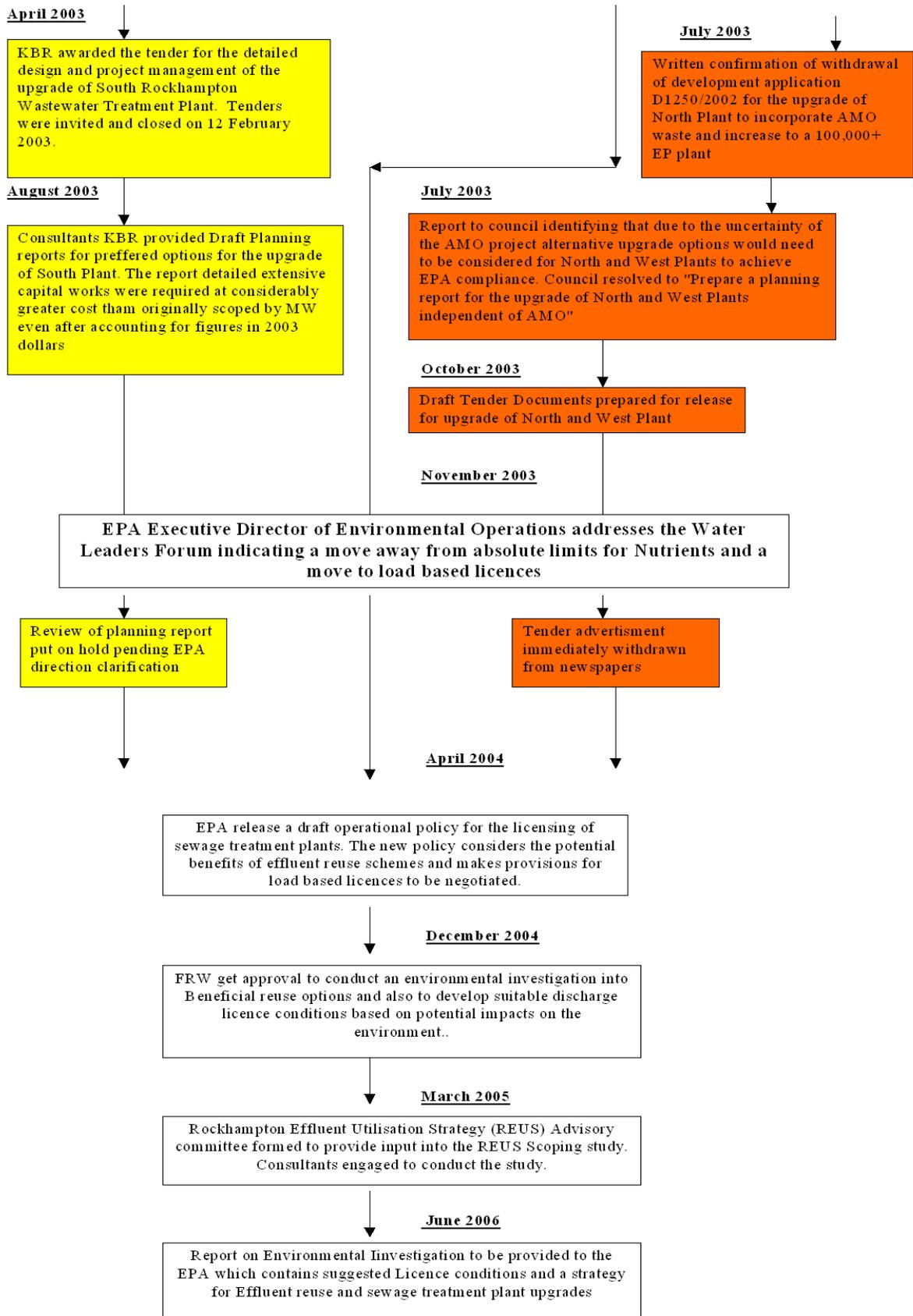
**Table 3:** *Key developments in the formation of an upgrade strategy for Rockhampton sewage treatment plants*

<b>Key development</b>	<b>Timing</b>
New discharge licence conditions released by EPA.	1998
Australian Magnesium Operations (AMO) begins final planning and development of a multi billion-dollar project at Stanwell, which could ultimately utilise North Rockhampton STP.	2000
AMO Project identified as no longer being likely to proceed.	2003
Queensland Environmental Protection Agency release a revised strategy for licensing discharges from Sewage treatment plant which could potentially allow for the provision of load based licences.	2004
EPA approves an Environmental Evaluation that requires FRW to revisit beneficial reuse options and revised discharge limits for FRW's three STPs.	2004

The following Figure 2 presents a timeline and flow chart of events that have impacted on the development of a sewage treatment plant upgrade strategy.



**Figure 2 (part1): Timeline of Events Regarding Sewage Treatment Plant Upgrade Strategy**



**Figure 2 (part2): Timeline of Events Regarding Sewage Treatment Plant Upgrade Strategy**

## **4.0 DISCUSSION**

While the STP upgrade strategy to date has faced numerous challenges the belief has always been that due to the natural characteristics of the river, the existing discharge is having no discernable environmental impacts on the Fitzroy estuary. This view has subsequently been supported by the results of scientific studies into the nutrient dynamics of the upper estuary.

As such it has been put forward that the primary focus on managing effluent should be based on the optimal use of this valuable resource not purely removal of the discharge.

The most recent developments from the regulatory perspective are believed to facilitate this view and even though it has taken almost 8 years to develop, the final outcomes should provide optimum benefit for both the environment and community as a whole.

While the drawn out process has caused headaches for managers and planning staff, operators have also felt the effects as the continued uncertainty of a final direction has meant non essential plant upgrade and improvement works were continuously being delayed awaiting the conclusion of the overall strategy.

## **5.0 CONCLUSIONS**

It is often required that the interests of various parties are balanced appropriately when formulating strategy and implementing long-term projects. Due to the dynamic nature of these tasks a certain level of flexibility and preparedness for the unexpected is required.

In the case of FRW the influencing factors have been significant and in all could not realistically be accounted for or predicted. While FRW approached the AMO project cautiously the failure of the entire project caught many parties by surprise, while the changes in EPA policy were a significant redirection from what was previously considered to be the paradigm for managing STP effluent into the future.

As for the latest stage in the development of a strategy for FRW, the current deadline is the 30 June 2006 to provide a report to the EPA on what beneficial reuse options have been identified and what discharge licence conditions are considered appropriate for the plants.

Whichever strategic direction is endorsed, the decision will be made knowing that best endeavours have been made to meet the requirements of the current time, while considering the future, but all the time knowing that nothing in this world is for certain.

## **6.0 ACKNOWLEDGEMENTS**

- To staff at FRW who have been involved with the many stages of the upgrade strategy and also the patience and understanding during its evolution.
- To the members of the Rockhampton Effluent Utilisation Strategy scoping study technical reference committee for making their time available and providing invaluable input into the study.