THE NEW DUBBO SEWAGE TREATMENT PLANT UPGRADE

Paper Presented by:

Glenn Clifford

Author:

Glenn Clifford, *Water Operations Treatment Supervisor,*

Dubbo City Council

6th Annual WIOA NSW Water Industry Engineers & Operators Conference
Tamworth Regional Entertainment & Conference Centre,
27 to 29 March, 2012

THE NEW DUBBO SEWAGE TREATMENT PLANT UPGRADE

Glenn Clifford, *Water Operations Treatment Supervisor,* Dubbo City Council

ABSTRACT

Dubbo's Projected population reaching 55 000 by 2021 means a greater capacity for Sewage Treatment for the city is required. Dubbo City Council proposes to augment the Dubbo STP to meet current and future environmental standards and projected population growth requirements by extending the existing Sewage Treatment Plant to an adjacent, vacant part of the current STP site, to the east of the existing STP facilities.

In 2009 Dubbo STP was originally called the Troy Junction STP, so based on the options investigation report, *Troy Junction Sewage Treatment Plant Augmentation Options development* prepared for Council in July 2009 by Hydroscience, Council has resolved to pursue Option 4 as the preferred augmentation strategy including a 55 000 EP continuous bioreactor plant.

1.0 INTRODUCTION

Dubbo is located in Central NSW approx 400kms west of Sydney, current population is approx 40 000 and has doubled within the last 35 years.

Dubbo City Council (DCC) owns and operates the Sewage infrastructure. The only site to treat sewage to meet DECCW license limits within the Dubbo Local government area is the Dubbo Sewage treatment plant, which is located approx 6 kms north of Dubbo on Boothenba rd and has a treatment capacity of 38 000 EP (Equivalent persons).

1.1 Overview of Dubbo STP

The First STP built in Dubbo was located in West Dubbo on the Bunglegumbie Road in the early 1930's. In the 1970's a decision was made to direct all Sewage to a new STP to be built approximately 6 Km North of Dubbo on Boothenba Rd at the site where the Dubbo STP stands today.

The Dubbo STP was previously known as the Troy Junction STP and was commissioned in 1986.

Dubbo had two STP's operating for a period of 18 years.

The Bunglegumbie STP was decommissioned in June 2004 and the entire city's sewage was transferred to the Troy Junction STP for treatment.

Troy Junction STP was again upgraded to ensure it could cope with the increased Sewage flows from Bunglegumbie STP in 2003

After the construction of two 500 ML effluent storage ponds in 1999 and 2003, the Green grove effluent Irrigation facility was commissioned in December 2004.
The Troy Junction STP was renamed the Dubbo STP in 2009.

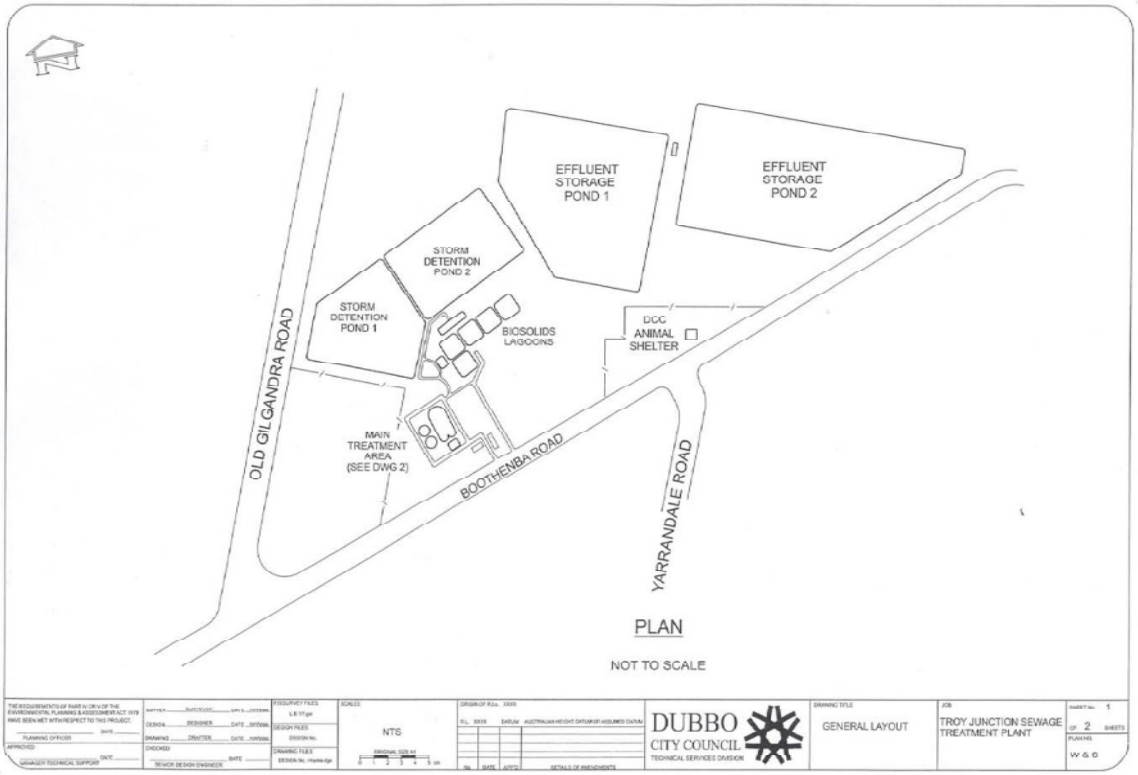

Figure 1: ***Schematic diagram of the current Dubbo STP***

1.2 Waste Water Collection System

The Dubbo STP receives Sewage from four separate upstream pumping stations.

1 Bumblegumbie SPS, max flow rate of 500 L/s
2 Troy Gully SPS, max flow rate of 500 L/s.
3 Brocklehurst SPS, max flow rate of 5.6 L/s.
4 Troy Junction industrial area, max flow rate 2.1 L/s

A septic receival station is currently being built on site to accept any septic sludge ect via tanker.

1.3 Description of Existing Treatment System

The plant consists of the following main components:

- A dual-channel inlet works including two 5mm step screens, Pista-type grit removal system, flow control flume, screenings and grit handling equipment and storm overflow facilities.
- An oxidation ditch with a combination of brush and fine-pore diffused aeration.
- Two Secondary settling tanks (Clarifiers).
- An in Channel UV system
- An effluent lift pumping station and two large treated effluent storage ponds
- Five sludge lagoons and dewatering facility via Centrifuge.
- Associated pumping stations (RAS,WAS,Centrate,first Flush, Supernatant) and pipe work.
- Site facilities, including power and Water Supply, amenities and access.

1.4 Project Drivers.

- Existing Plant is Overloaded and Structurally Unsound
- Need to Plan for Future Growth of the Area.
- Scope of Works Concept Design of a 12 ML/d STP
- Detailed Design.

1.5 Design development.

Stage 1 works is expected to start in early 2012 and would include the provision of two 6Ml/day bioreactor trains for a total of 12ML/day capacity to meet the 2021 projected load. Two secondary clarifiers for solids separation and removal would also be provided, as well as chemical storage unit and a UV unit. The existing inlet works, effluent management and sludge management facilities are not being augmented as part of these works. The existing carousel, Clarifiers and UV disinfection would not continue to be utilised on commissioning of Stage 1 works.

1.6 The New Upgrade will consist of:

A 4-stage Bardenpho process which comprises of:

- A flow splitting structure to allow isolation of flow to the bioreactor trains.
- Two 6 ML/d continuous activated sludge process trains with biological denitrification consisting of two (common walled) rectangular, reinforced concrete tanks.
- Compartmentalized anoxic zones with submersible mixers.
- Compartmentalized aerobic zones with a submerged fine-bubble diffused aeration system to satisfy process oxygen requirements at a design load of 55000 EP.
- An internal recycle pumping station (IRPS) to recycle the nitrate rich stream from the aerobic to the anoxic zone.
- A waste activated sludge pumping station to waste Mixed Liquor from the Bioreactor.
- Chemical addition points for P removal and alkalinity adjustment.
- A flow junction and flow splitting box to feed mixed liquor to the Clarifiers.
- Two centre feed Clarifiers with peripheral effluent collection channel.
- Return activated sludge pumping station.
- Scum removal mechanism and pumping station.
- Clarified effluent disinfected through an in-channel UV system before interfacing with the existing treated effluent line.

1.7 Future Expansion Area

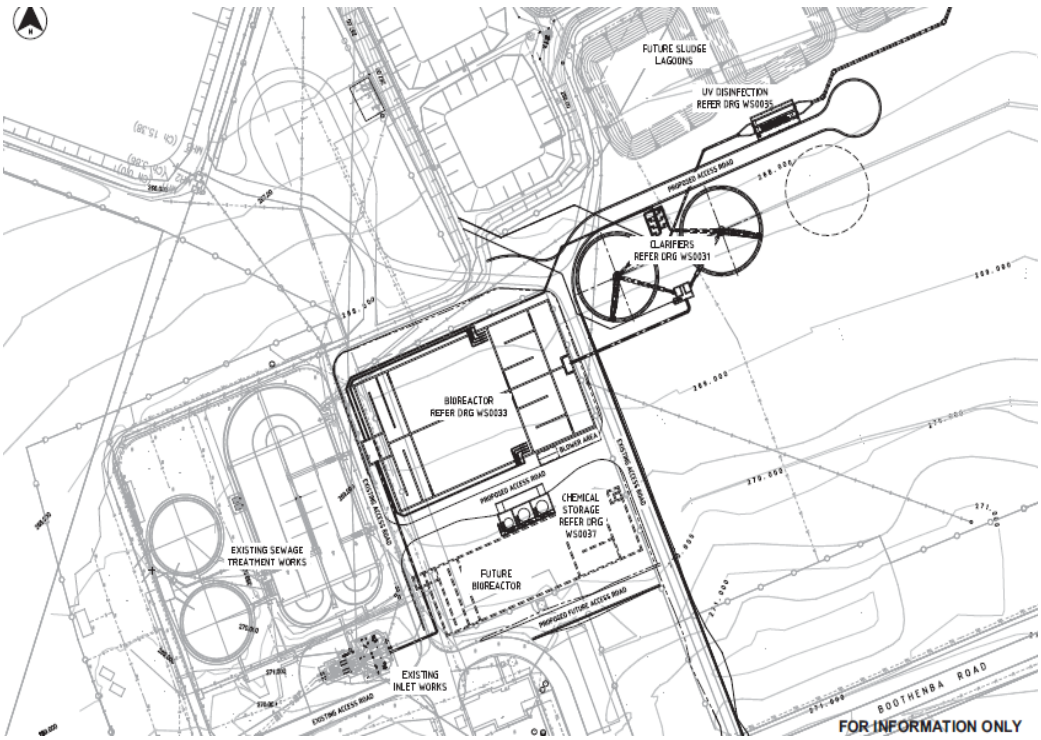

Figure 2: ***Schematic diagram of the future Dubbo STP***

1.8 Flow Process

The liquid stream path will change significantly from the existing situation at the plant. All flows from the existing inlet works will be redirected to the new Bioreactor. Return flows from the storm return line, Dewatering plant Centrate pumping well and Sludge lagoon Supernatant well will be redirected to the head of the new bioreactor. Waste Activated sludge (WAS) from the bioreactor will be interfaced with the existing wasting system to the sludge lagoons.

Mixed liquor from the bioreactor will flow to a set of two new Clarifiers where solids and liquid fractions of the mixed liquor will be separated.

Settled solids will be returned to the head of the bioreactor via the return activated sludge (RAS) pumping station with the clarified effluent disinfected through an in-channel UV system before interfacing with the existing treated effluent line.

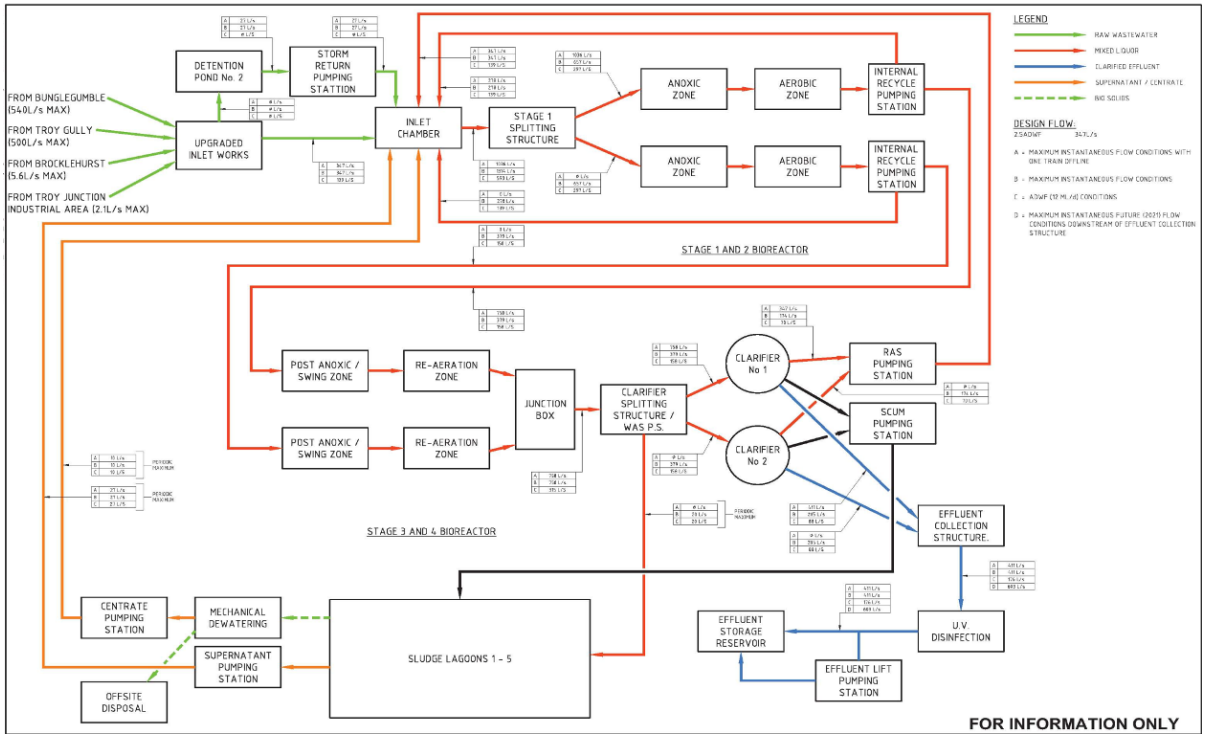

Figure 3: ***Flow process diagram of the future Dubbo STP***

Flow from the upstream pumping stations to the inlet works will be measured by the existing level sensors placed above the flumes in both the inlet work channels. Any flows greater than 411L/s will be diverted by weir to the storm detention pond. The existing operational philosophy of the inlet works equipment will remain. Screened and degritted influent will gravitate from the inlet works to the proposed bioreactor with the flow to the bioreactor measured by an in- pipe flow meter prior to entering the inlet structure.

1.9 Capital Cost Estimate.

- Civil Works - $7,867,000
- Pipe works – 4,215,000
- Electrical and control works - $2,525,000
- Contractor Design – $220,000
- Contractor indirects –$2,922,000
- Contractor Contingency – $439,000
- Contractor Margin – $1,461,000
- Design – $1,376,000
- Tender – $197,000
- Planning and Enviromental – $295,000
- Project Management – $983,000
- Insurance and Financing - $158,000
- Contingency – $3,398,000
- Escalation – $907,000

Total of Estimate - ***$26,963,000***

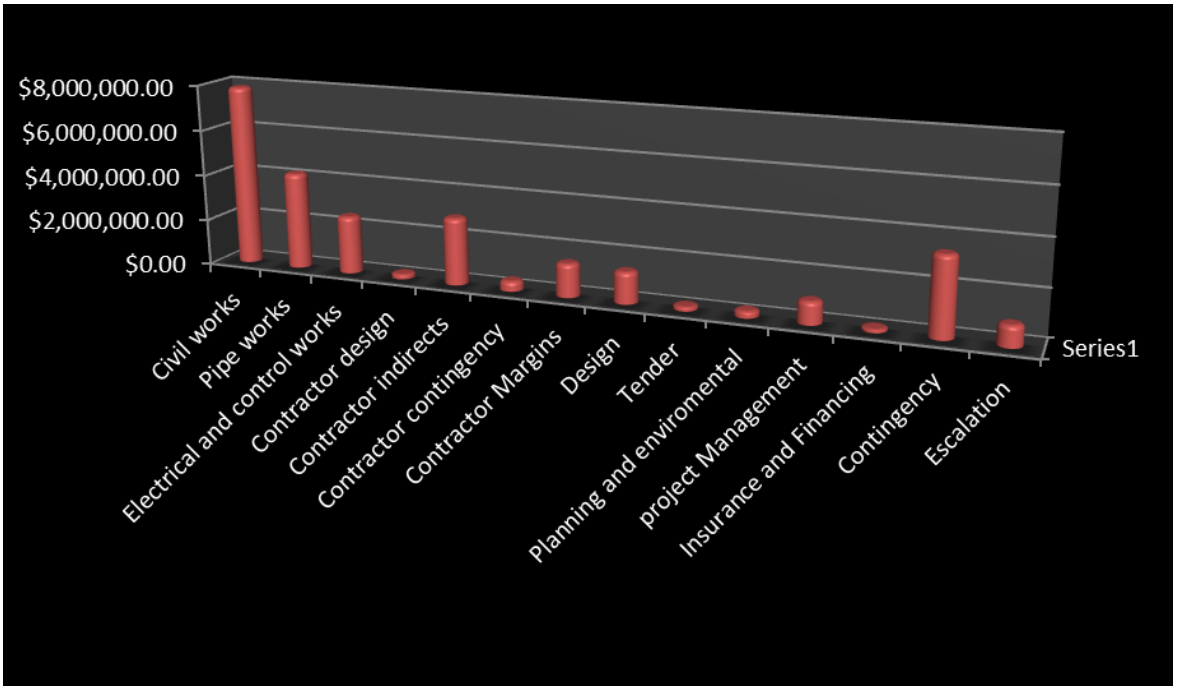

Figure 4: ***Capital cost estimate chart of the future Dubbo STP***

2.0 ACKNOWLEDGEMENTS.

AECOM Australia Pty Ltd (Dubbo Sewage Treatment Plant Augmentation) Special thanks to David Graham

Dubbo City Council staff.

Hydroscience.