WESTDALE WWTP AUGMENTATION AND REUSE FARM

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BACKGROUND

Tamworth is the regional hub with a population of over 50,000 and has been historically served by the Westdale and Swan St Wastewater Treatment Plants (WWTP). The first sewage treatment plant in Tamworth was a trickle filter plant at Swan Street and was built in 1928 and WWTP serviced the northern and eastern areas of the city (northern side of the Peel River).

A second sewage treatment plant, Westdale Wastewater Treatment Plant was built in 1975, upgraded in 1982 and again in 1994 and it treated wastewater by both trickle filter and extended aeration methods. It serviced the development located on the southern side of the Peel River including most of the industrial trade waste customers and discharged directly to the Wallamore Anabranch. At that time the treatment capacity of Swan St STP was 18,000 EP (EP = Equivalent Persons) and Westdale STP was 33,000ep. With both of these plants running at over capacity, the need for an upgrade was urgent and had been 'in the pipeline' for a long time.

1.0 THE NEED FOR AUGMENTATION

Although the Swan St WWTP still maintained a level of treatment that produced effluent meeting EPA requirements, it was an aging plant and in need of considerable investment to continue its operation. It was also outdated and running at capacity with 4ML/day passing through it. At the same time, the development of the neighbouring residential areas meant that there were increasing numbers of odour complaints. Consequently, the need to centralise wastewater treatment at Westdale was realised (the site was more remote and had available room for expansion).

Westdale WWTP was also overloaded, receiving around 7.5ML/day and could not handle any higher flows, struggling to treat current flows to our EPA licensing standard. The consequence of this is that the NSW Office of Water would not be able to approve any new industries in Tamworth which would discharge to the Westdale WWTP – ie the industrial areas of Tamworth and all the area to the south of the Peel River. This situation had the potential to curtail the growth and development of Tamworth.

In the 1990s, there was concern about eutrophication of waterways. Blue green algae blooms were of great concern in river systems at this time, and particularly in the Murray-Darling river system. Additionally, the salt load in the Murray-Darling was becoming an issue. Note that at 600mg/L in our wastewater, at 11 ML/day, this means we would be putting about 6½ tonnes of salt into the river each day. Load-based-Licencing was introduced in 1999. Initial projections anticipated a steep escalation in these costs and, at the time, LBL charges were going to be in the order of hundreds of thousand dollars per year. This left us with either a Farm disposal option (with high establishment costs) or nutrient removal prior to river discharge (with high annual operation (chemical) costs). The Farm disposal option allowed us to generate economic return for the community by putting the water to a good use rather than returning it to the river.

2.0 THE AUGMENTATION COMPOSITION

The augmentation of Westdale WWTP was completed through an Alliance contract between:

- Tamworth Regional Council
- United Group Infrastructure as the constructor
- MWH as the primary designer.

The design of the augmented plants needed take the combined flow of both Swan St and Westdale WWTP's as well as providing a capacity for future flows. Westdale's EP would be increased form 33,000EP to 61,000EP, basically doubling its capacity. This would cater for flows up until 2025, at this time the projected flows will be 14.8ML/day. The current flows passing through the augmented plant is approximately 11.4ML/day. The projected flows of 2025 include provision for the growth of industry, including two new large industries contributing a total of 2.5 ML/day.

The Swan St WWTP would be fully decommissioned and converted into a pump station, sending all of its flow to Westdale for treatment. The eight Humus tanks were converted into overflow tanks, with a design capacity for eight hours ADWF storage if the pump station was to lose power or in the event that both pumps were out of service for some reason or another.

The Extended Aeration Tanks (EAT's) at Westdale were not included in the design, and were subsequently taken out of service, with their diffuser banks and pipe work removed, and access to the empty tanks condemned. Their three sludge lagoons were to be kept in service to be used for the storage of sludge from the new aerobic digester. One digester was also taken out of service along with its obsolete sludge drying beds.

Westdale receives industrial wastewater which includes a number of major trade waste dischargers including Cargill Abattoir, Baiada Oakburn Rendering and Peel Valley Lamb Exporters. All these companies discharge to a common Abattoir Main. Pre-treatment was designed for "roughening" the industrial wastewater before it is combined with domestic wastewater for regular treatment, reducing its strength and removing fat. For this reason, the primary sedimentation tanks and biological trickling filters were to be kept in service to undertake the treatment, while their humus tanks were decommissioned.

3.0 ABOUT THE NEW PLANT

The design of the new plant caters for full treatment for average dry weather flows (ADWF), partial biological treatment for >4.8ADWF. >4.6ADWF receives full mechanical screening, while between 4.6 and 8ADWF will bypass a manual screen in the inlet works. Flows greater than 8ADWF back up in the pump station and will gravitate down into maturation pond 1, through a final manual screen. "Degritting" happens in the Maturation Pond.

The new inlet pump station consists of two wet wells, split to divide the industrial from the domestic wastewater. Three large variable speed submersible pumps are in the domestic wastewater well, which pump the water up into the main inlet works where it is combined with the incoming flow from the Swan St pump station. The industrial side of the pump station uses two smaller variable speed submersible pumps for transfer to the industrial treatment via a packaged plant for screenings and grit removal.

The combined domestic flow at the headworks then passes through two 5mm perforated band screens, working on a differential water level for operation. The screens use reclaimed effluent to wash themselves out and wash their screenings into a WashPactor. The WashPactor then washes the screenings, and the clean screenings are then screwed and compacted through a chute and dropped into a skip bin for removal to landfill.

Beyond the screens, the wastewater travels through a vortex-style grit chamber. The flows travel around almost 360 degrees which allows the heavier grit to settle out be and removed by venturi to a grit classifier. The grit is separated from the water and is also dropped into a skip bin for removal to landfill. The inlet pump stations and headworks have pipework extracting foul air to remove gases, forcing them upwards through an odour bed of organic material (wood chips and compost).

The flow then travels by means of gravity to Intermittently Decanted Aeration Lagoons (IDAL's). The flow first enters the distribution chamber where it is directed uniformly to each of the four IDAL anoxic zones where it is combined and mixed with Returned Activated Sludge (RAS) to give the treatment a head start in the Nitrification/De-nitrification process.

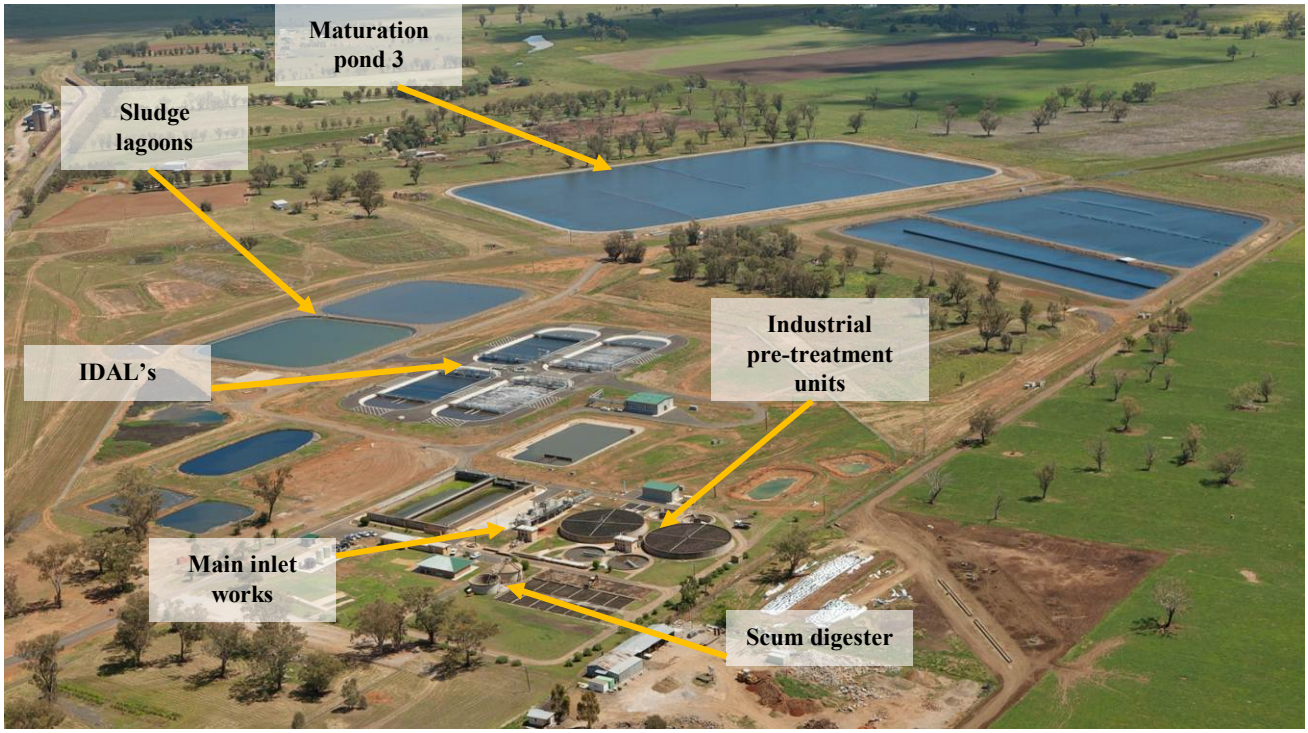
The water then travels into the main zone, the largest section of the IDAL reactor with a capacity of 7,290 m^3 at top water level, where biological treatment is undertaken. The process is run through its regular treatment cycles (Aeration-Settle-Decant-Idle). The aeration is provided by a bank of six centrifugal magnetic bearing blowers, controlled by either direct dissolved oxygen (DO), intermittent, or diurnal modes. A supplementary carbon dosing system doses acetic acid or liquid sugar upstream of the flow distribution chamber to assist in denitrification if required.

Secondary effluent from the IDAL process is discharged into the Maturation Ponds. There are three Maturation Ponds at Westdale which operate in series. The storage volume in these maturation ponds is designed to give 25 days of retention time (at 2025 ADWF) for disinfection & helminth control plus 6.5 days of flow balancing. Maturation ponds one and two have a capacity of 121ML combined. Pond three, built in the augmentation, has a capacity of 250ML. All three ponds work on an operating level of 3m.

After the effluent has made its way through all three maturation ponds, it is then pumped from the Effluent Transfer Pump Station (ETPS) to the Farm Dam via a 7.5km rising main. The ETPS consists of 3 fixed speed submersible pumps in a Duty/Assist/Assist arrangement. There is a provision for a fourth pump to be installed in the future. The pumps operate to maintain a minimum required volume in the maturation ponds to minimise the risk of environmental discharge to the Wallamore Anabranch at Westdale WWTP.

Should the situation arise where the Farm Dam is full, the Effluent Transfer Pump Station also acts as a controlled overflow point for effluent to make its way to Wallamore Anabranch. These flows are all measured for reporting to the EPA.

In addition to the three large transfer pumps, the ETPS also contains two smaller pumps. These pumps return effluent to the head of the WWTP. This effluent is chlorinated and the Recycled Effluent is then used on site for process water, wash-down, watering, etc.



4.0 REUSE FARM DAM

Swan St WWTP disposed of its effluent to an evapotranspiration area between the Peel River and the Wallamore Anabranch, and Westdale discharged to the Wallamore Anabranch, which incurred significant LBL costs. The farm dam was designed to take and reuse 100% of effluent generated by Westdale WWTP; this is 4250ML/year at present and 6000ML/year in 2025. This reuse enables us to allow a slightly higher nutrient level in the treatments effluent, as it will not incur any costs from LBL, and being reused for crops, these nutrients are preferred.

The Effluent Storage Dam holds 1500 ML. (For interest, that is ¼ the volume of Dungowan Dam – one of two water sources for Tamworth, owned and operated by TRC) The dam covers approximately 30 hectares, is over ¾ kilometres long and ½ kilometre wide. From empty (if there is no irrigation), the Dam can take more than 100 days flow at the 2025 flow rate.

Infrastructure at the farm include a pump station with a filter system and five pumps capable of pumping 53ML/day onto crops through 13 centre pivot irrigators. At present there are 600 hectares under centre pivot irrigators. The residual area is dry-land farmed. The irrigation is to be operated on a moisture deficit basis with the effluent applied to each pivot monitored and controlled. At all times there is to be a 10mm moisture deficit so that, if it rains, the first 10mm of rain can be absorbed immediately. This means, if the top 15mm of soil is dry, 5mm may be applied. The centre pivots have this capability. (They can run fast, slow, forward, backward, etc.). There is also pipework for two future centre pivot point irrigators.

An aerial view of the farm dam, showing some of the center pivot irrigation areas

Seven catch ponds have been installed. The primary purpose of the catchponds is to provide a back-up for a broken effluent supply pipe. The secondary purpose of the catchponds is to allow sediment which washes from the farm during rain events to settle out prior to leaving the property. Each catch pond has an overflow weir with flow measurement. There are valves in each catch pond to release stormwater after settlement of sediment.