CASE STUDY

WELLCAMP AIRPORT AND BUSINESS PARK - SEWAGE TREATMENT PLANT

TRUEWATER COMMUNITY

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Exclusive Partner of

For Earth, For Life

Kubota

The Wellcamp Airport and Business Park opened in 2014 becoming Australia's largest privately owned international airport. The Business Park is intended to become the business hub of Toowoomba and regional Queensland. The development consists of more than 250 industrial lots and an international airport which currently sees more than 10,000 passengers per month. The airport is expected to handle in excess of 500,000 passengers annually by 2019.

Wagner's developed Environmentally Friendly Concrete (EFC), a low-carbon cement free concrete for use in the construction of the airport. The opening of the Wellcamp airport provided new infrastructure for a region which previously did not have a jet capable airport.

Figure 1 – The entrance to the Wellcamp International Airport

The development is located approximately 15km West of Toowoomba, beyond existing sewerage service networks. Therefore it required a Sewage Treatment Plant (STP). The development posed several key challenges for effective sewage management.

Key Project Considerations

Hydraulic Flows

Flows will vary significantly with seasonal influxes of passengers, therefore the STP must be capable of reliably managing and treating varying flow volumes.

Scalability

The Wellcamp Airport and Business Park will be delivered over a period of several years across several stages. The STP must have the capability to be delivered in line with the staging requirements. This ensures the STP is always sized adequately for daily flows and reduces up front capital costs.

Influent Strength

The Wellcamp Airport and Business Park includes more than 250 industrial lots. While some pre-treatment will be performed, the STP must be capable of handling influent with contaminant concentrations beyond domestic levels.

Reliability

The Wellcamp Airport and Business Park is essential infrastructure for the region and requires continuity of essential services. The STP must be highly reliable and include contingency and safe guards to ensure continuity of service at all times.

Figure 2 – Aerial View – Wellcamp Airport

Figure 3 – Artists Impression – Wellcamp Business Park adjacent to Wellcamp Airport

Wagners Corporation

Owners and developers of Wellcamp Airport and Business Park, Wagners is an Australian family-owned infrastructure, construction and materials company.

Wagners specialises in transport, logistics, cement, pre-cast concrete, contract crushing and mining and building supplies for the construction and mining industry both within Australia and internationally.

The Toowoomba-based company's larger projects include roads and tunnels, bridges, airports, mining and gas plants, dams and major infrastructure.

Figure 4 – Aerial Photo – Wellcamp Airport Runway Construction

Assessment of STP Options

Wagners undertook extensive research and assessed all sewage treatment solutions and providers available in Australia to find the best outcome for their development.

The assessment took more than 2 years involving investigation into multiple treatment technologies, performance history, company background, operational practices and multiple site visits. Additional factors that were assessed included scalability, capital and operational costs, configuration and aesthetics (visual, odour and noise).

Wagners concluded that the only solution that would meet their requirements and which presented as superior to all other options was the Kubota sewage treatment plant with design, delivery and operation by True Water Australia.

Infrastructure Delivery

Tender

The tender process for the project took place over two years. Wagner Corporation was focused on delivery of the best product and finding the right company to form a long term relationship. The Wellcamp Airport and Business Park STP project included multiple lifecycle stages; infrastructure design, project delivery, STP expansion, and infrastructure management.

The Kubota treatment system was most capable of delivering project outcomes and scalable growth. True Water was awarded the project t deliver a 500kL Kubota K-HC-R STP delivered in stages as required by Wagners Corporation.

Design

Concept and detailed design, including system configuration, is completed for each True Water STP to ensure the STP is suited to project specific requirements. For the Wellcamp Airport and Business Park project, True Water designed a system to provide the best cost and operational outcome, with the ability to stage the infrastructure delivery in line with the growth of the project.

Kubota Corporation mass produce three series of onsite STP's under ISO:14001 & ISO:9001 certification. The three series of STP can be applied to various applications globally and provide certainty through proven operation and surety of manufacture. After considering the scale of the project, the strength of influent and the quality of treated water, the most suitable STP is chosen and the size and scale of the plant confirmed. A Moving Bed Biological Reactor (MBBR) type STP was best suited treatment process for the Wellcamp Airport and Business Park specification.

A key consideration of the design for this project was the need to expand the facility in line with the growth and development of site. The initial (Stage 1) installation was designed to be expanded in further stages with no interruption to the operation of the infrastructure.

The final design demonstrates a best practice outcome for a commercial sewage treatment plant. This means the system balances technical specification, operational performance and technology complexity to achieve compliance treatment performance over the long term with a financially viable solution.

Manufacturing and Fabrication

The MBBR STP was manufactured by Kubota Corporation under ISO:14001 & ISO:9001 certification. All components including controller, pumps and blowers are manufactured to Kubota Corporations specifications by global manufactures to specifically satisfy the Kubota STP design. Mass production, standardisation, and uniformity provide surety of operation. Kubota therefore provide a strong warranty covering the entirety of the STP and a Performance Guarantee covering operation and performance.

True Water fabricate and assemble all additional componentry including STP controller, telemetry, airlines, transfer piping and pump sets prior to dispatch to site. Manufacture and assembly were completed adhering to strict quality assurance processes, minimising risks associated with onsite fabrication.

Installation

Following factory manufacture and assembly, installation of the STP is completed promptly and efficiently. The STP is installed below ground to eliminate visual and odour impacts, minimise temperature fluctuations and reduce deterioration caused by exposure to weather. Design drawing and installation photographs are provided on the following pages.

Design

Figure 5 – STP Location Relative to Wellcamp Airport and Business Park

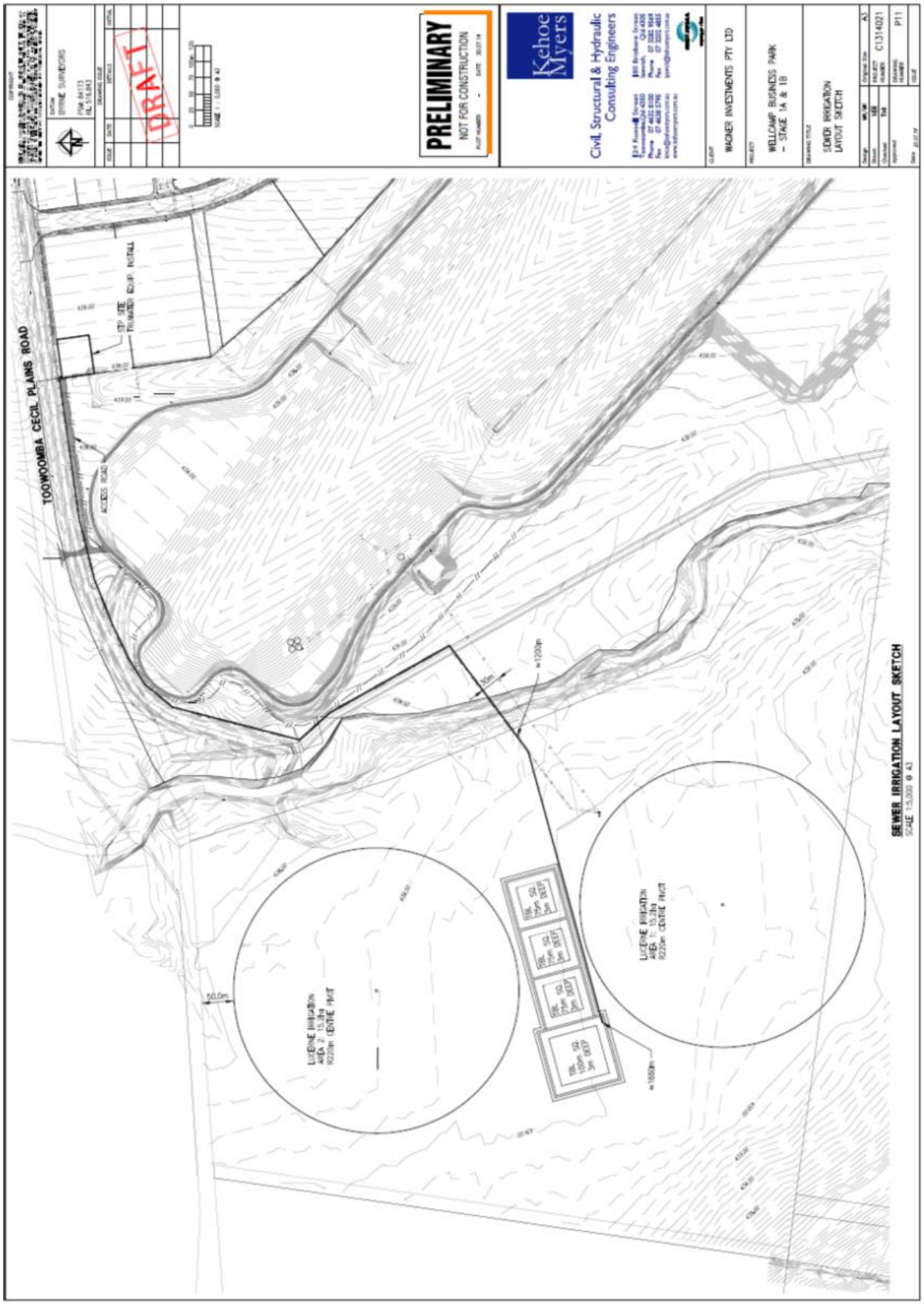

Figure 6 – Final STP Plan – Wellcamp Airport and Business Park

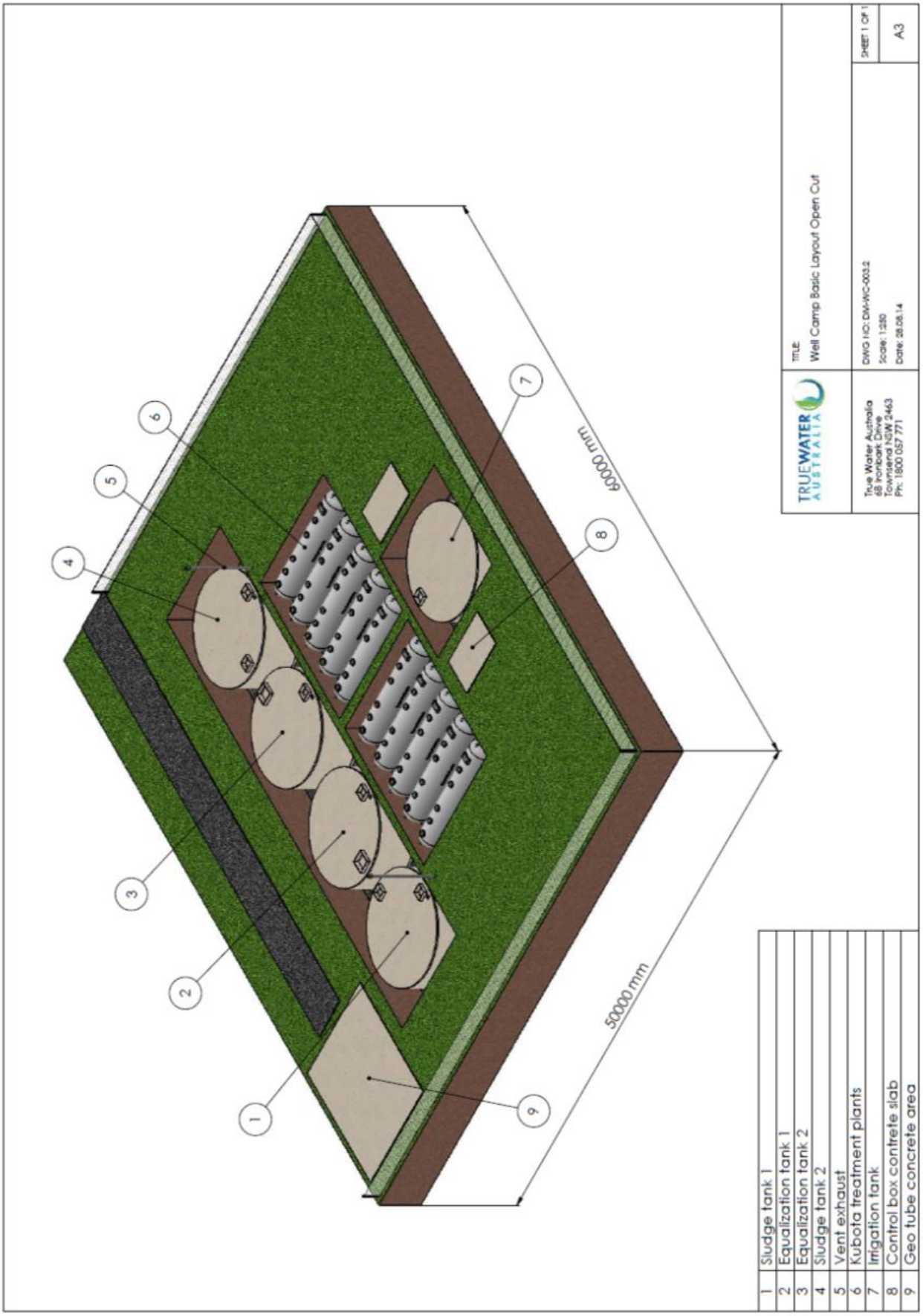

Figure 7 – 3D STP configuration and Layout – Wellcamp Airport and Business Park

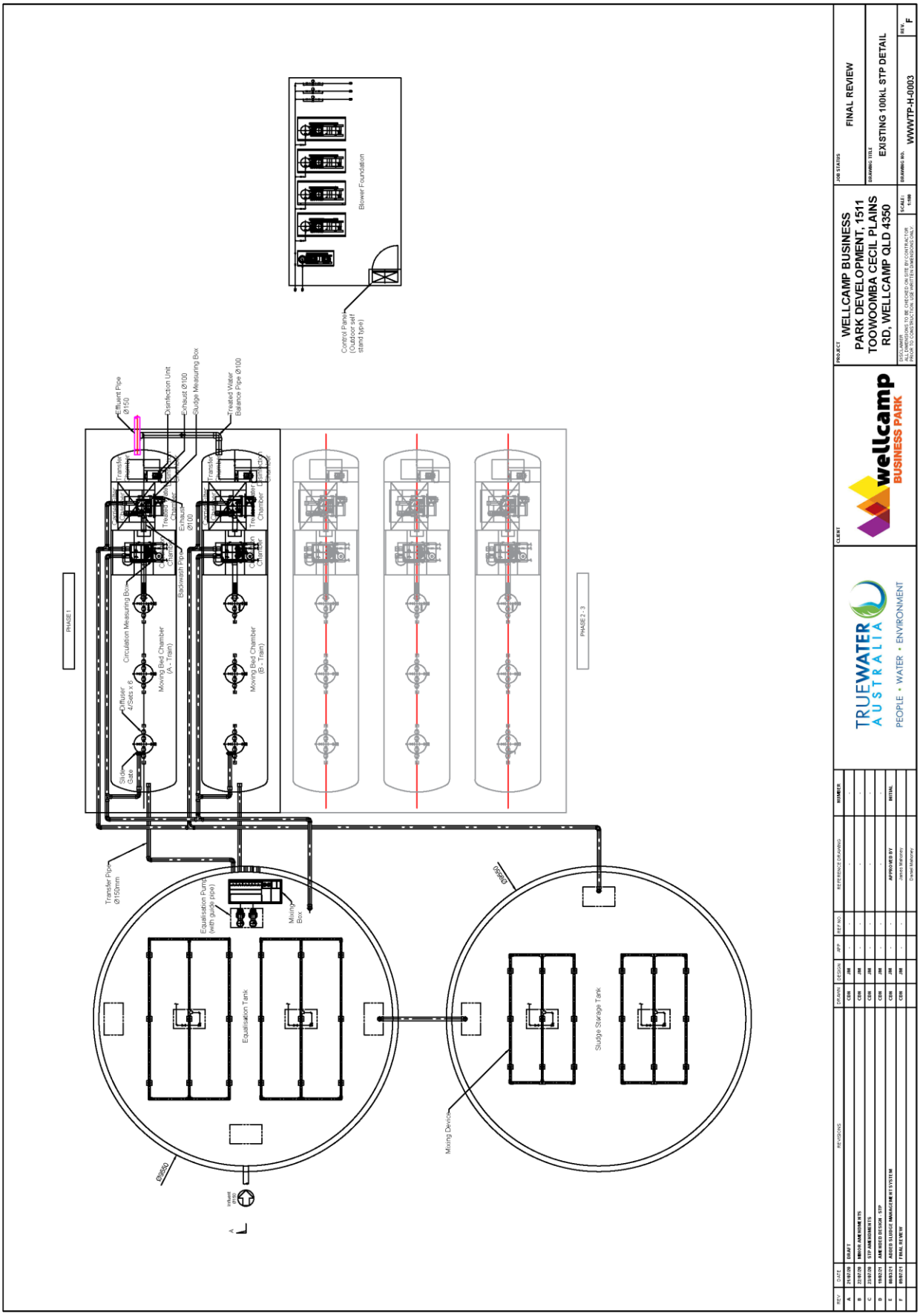

Figure 8 – Stage 1 STP Installation – 100kL

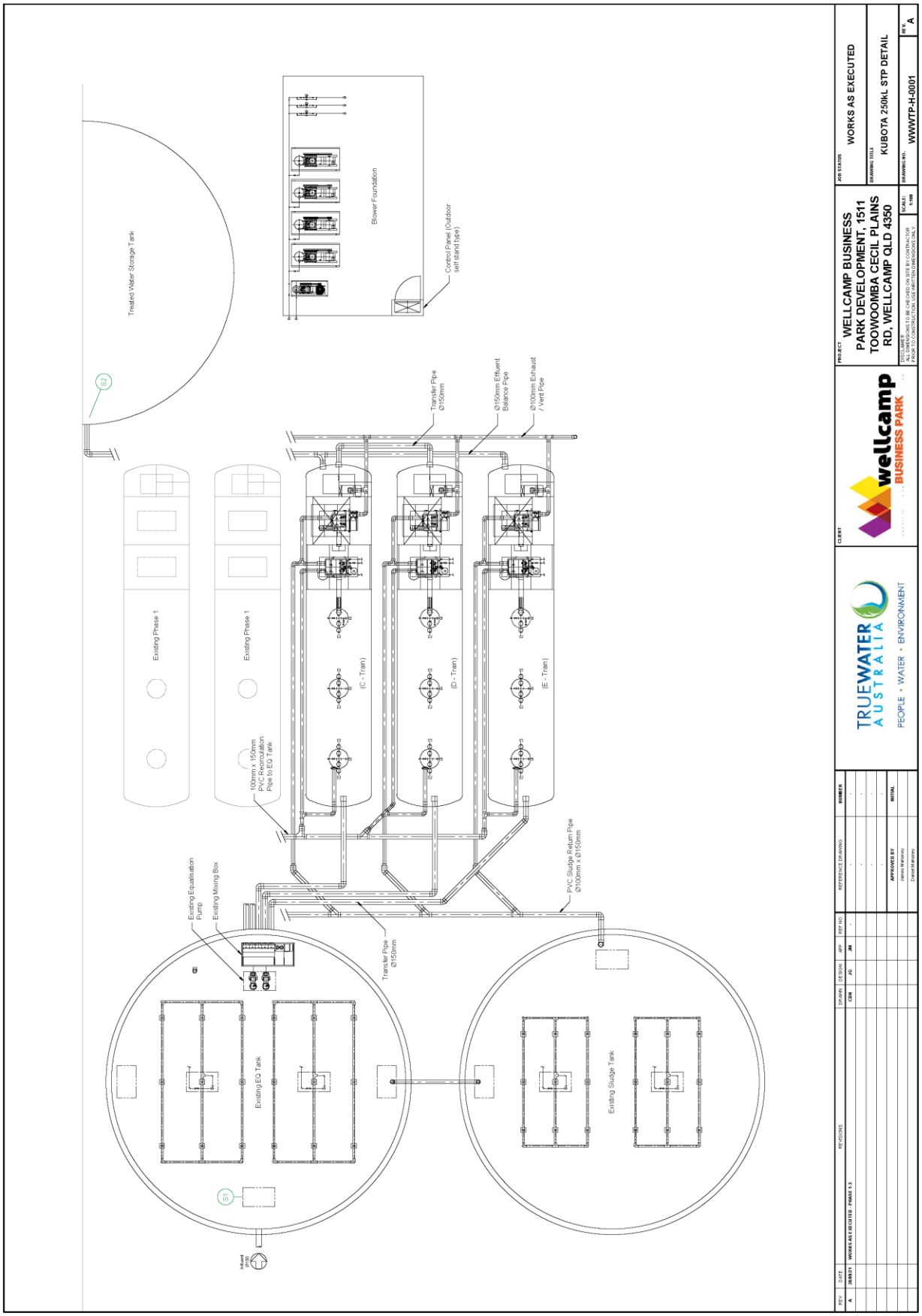

Figure 9 – Stage 2 &3 STP Installation - 250kL

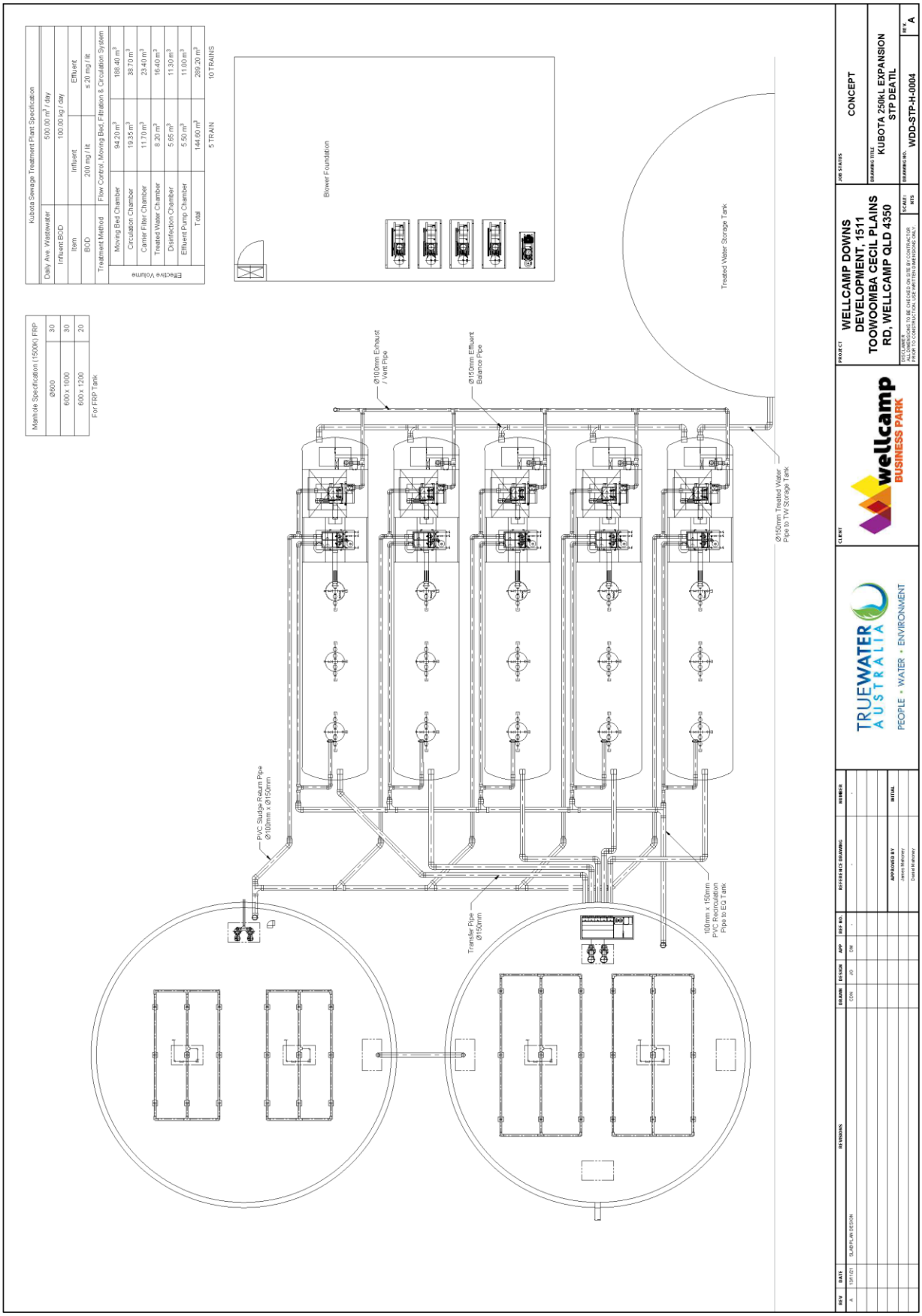

Figure 10 – Stage 4 Proposed STP Installation Detail – 500kL

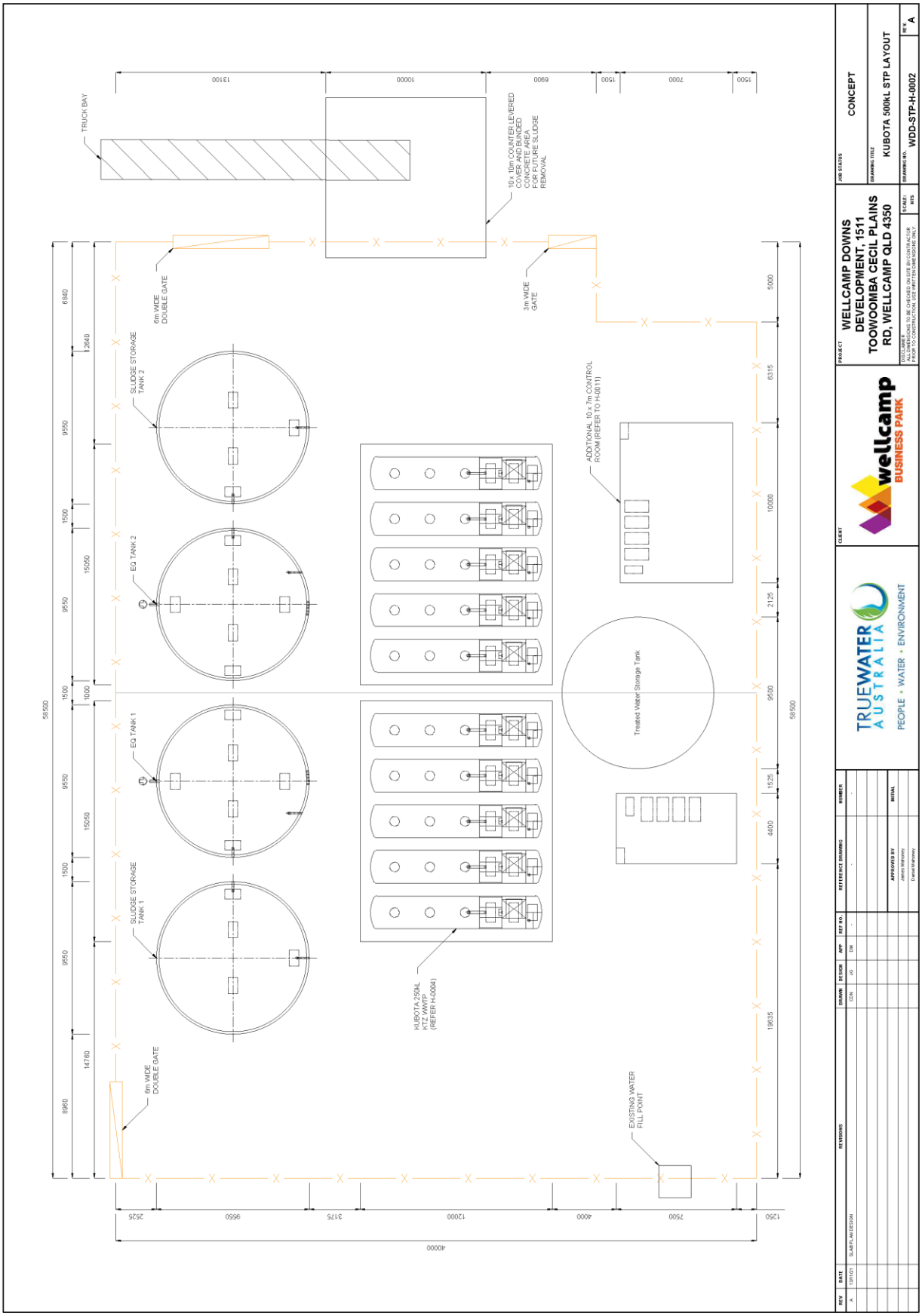

Figure 11 – Proposed System Configuration – Wellcamp Airport and Business Park 500kL STP

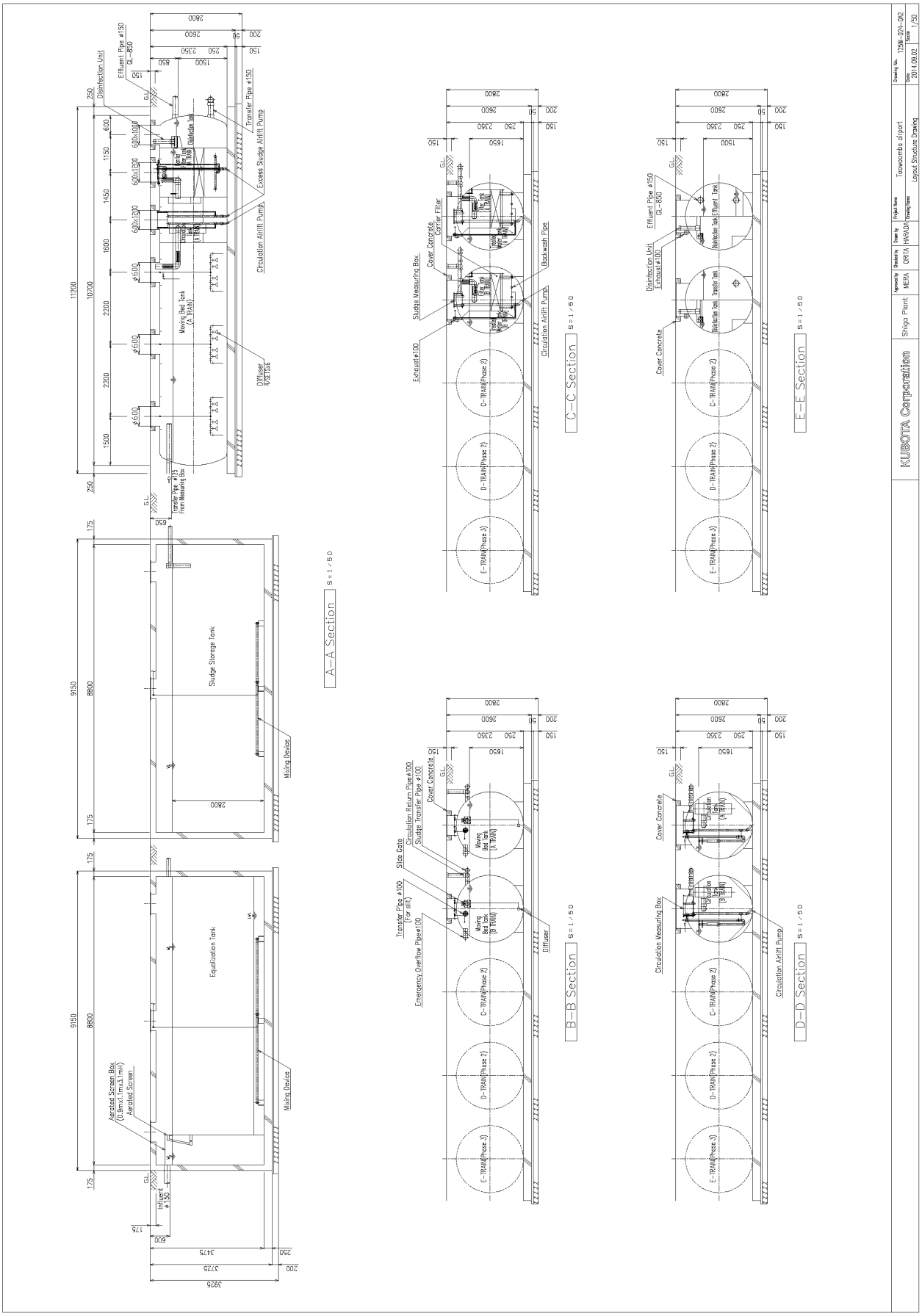

Figure 12 – Kubota STP Schematic – Wellcamp Airport and Business Park STP

Sewage Treatment Plant

The Sewage Treatment Plant selected for the Wellcamp Airport and Business Park is a 500kL Kubota K-HC-R STP delivered in stages.

- Stage 1 – 100kL
- Stage 2 &3 – 250kL
- Stage 4 – 500kL

Treatment Design and Process

Influent Flow

Influent flow	40m3/day	General Influent time	12 hours
Peak flow factor	4		

Water Quality

Item	Average Influent	EA Discharge Licence
pH	6-8.5	6-8.5
BOD (mg/L)	200	<30
SS (mg/L)	250	<20
E.Coli (cfu/100ml)	-	<1000
EC (µs/cm)	<1800	<1600

Specifications

Treatment Method: Moving Media Bed process

Moving Bed Media – Polyethylene skeleton type (28mmØ x28mmH)

Structure and Material: Solid Liquid Separation – Reinforced Concrete (RC)

STP Body – Fibre Reinforced Plastic (FRP)

Submersible pump - vortex type

Submersible pump casings - stainless and plastic compound

Submersible pump impeller – plastic

Aeration Blower – Rotary Vein (3phase 415V, 50Hz)

Aeration Strength (Moving Bed Chamber) – 1.6$m^3/m^3/hr$

Backwash Strength (Carrier Filter Chamber) – 8$m^3/m^3/hr$

Airlines – Stainless and UPVC

Piping – Stainless and UPVC

Process Flow Diagram

The below diagram details the treatment process employed within the Kubota K-HC-R STP.

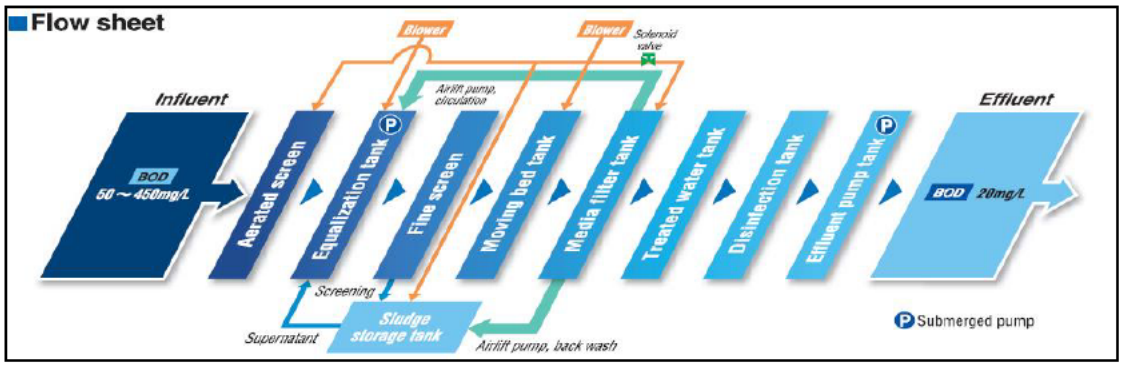

Figure 13 – Kubota K-HC-R STP Treatment Process Flow

Installation Photos – Stage 1


D141085

Installation Photos – Stage 1


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Sewage Treatment Plant Overview

Collection

Sewage and wastewater is collected from the Airport and industrial lots using a pressurised main which pumps to the Primary Equalisation Tank (EQ Tank).

Equalisation Tank

The 150kL Reinforced Concrete EQ Tank is aerated via timer at 30minute intervals using a mixing blower. The EQ Tank has a set of low, medium and high floats and contains two pumps (Duty/Standby) which transfer wastewater to the mixing box.

Mixing Box

The mixing box contains V-Weirs which evenly distribute wastewater to each of the Kubota treatment trains.

The mixing box has an overflow function which aids in:

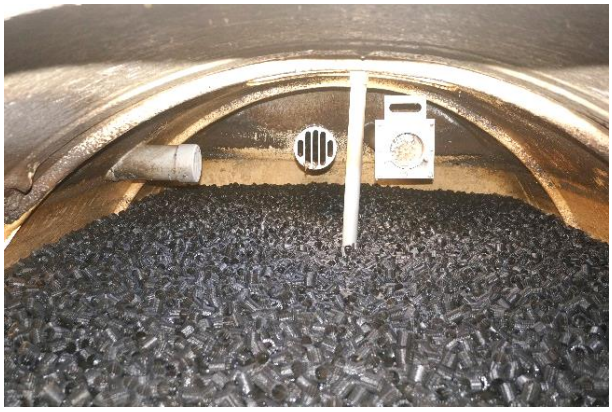
- self-cleaning, ensuring larger particles will be circulated back to the EQ Tank
- adjustment of flows ensuring consistent standard flow to treatment trains

Aerobic Media Chamber (Moving Bed)

Wastewater flows from the Mixing Box to the Aerobic Media Chamber. Access to this chamber is via three inspection openings.

This chamber contains cylindrical Polyethylene skeleton type media which is 28mm in diameter and 28mm in height.

Secondary treatment commences in this chamber prior to wastewater flowing to the Circulation Chamber.



Circulation Chamber

The Circulation Chamber provides a continuous circulation of wastewater back to the EQ Tank and the Sludge Tank.

Recirculation automatically adjusts to suit incoming flows. This chamber includes a suction tube used to collect floating objects and return them to the Sludge Tank.

Wastewater flows from the Circulation Chamber to the Carrier Filter Chamber.

Carrier Filter Chamber

The Carrier Filter Chamber contains caged media in the centre of the chamber. Water must pass through this small media as it flows through to the next chamber for disinfection.

The Carrier Filter Chamber is aerated each night between 12am and 2am to degas media.

Treated Water Chamber

Water passes through a chlorine contact chamber eliminating any residual pathogens as it enters the Treated Water Chamber.

Treated water flows to the Irrigation Tank for transfer to land application.

Irrigation Tank

The Irrigation Tank is a 150kL Reinforced Concrete tank used to store treated water prior to transfer to storage lagoons.

Other STP Components

Control Panel

The control panel used is manufactured by Mitsubishi in Japan. The control panel is user friendly, incorporating an LCD touchscreen connected to the PLC, and monitors all operation and faults for the STP.

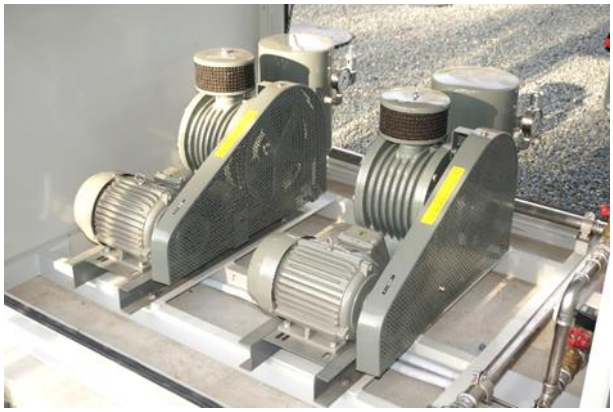
Telemetry

The STP includes real time monitoring through the integration of a 3G telemetry module.

The telemetry module reports operation, alarms and faults as they occur. Data collected by the module may also include operation of blowers, pump, power, backwash flows and daily flow information.

Blowers

The STP uses Tohin, rotary vein, oil lubricated blower for aeration of the EQ Tank and the Kubota treatment trains. The blowers are specified due to their low operating cost, simplicity and longevity. For safety purposes, the blowers are housed within powder coated steel housings.

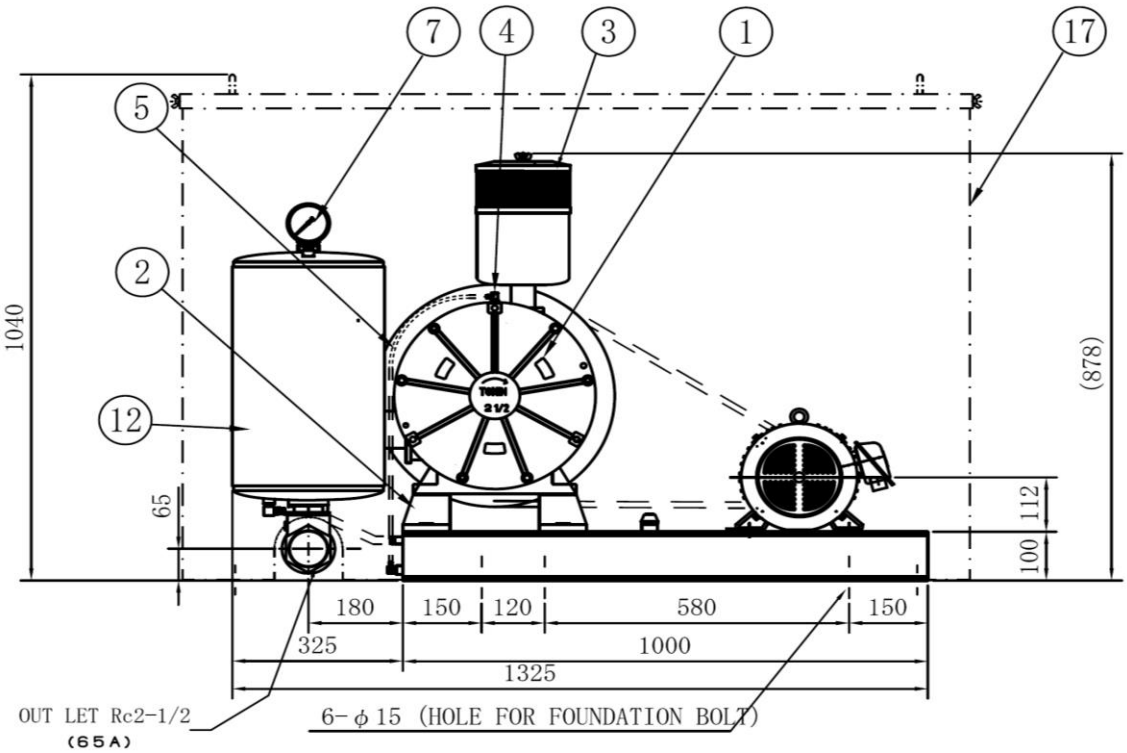


Mixing Blower

The blower for the aeration of the EQ Tank is sized for 1.42m^3 per min. The blower runs on a 30 minute cycle, however it will aerate constantly when the EQ Tank shows a high level.

Aeration Blower

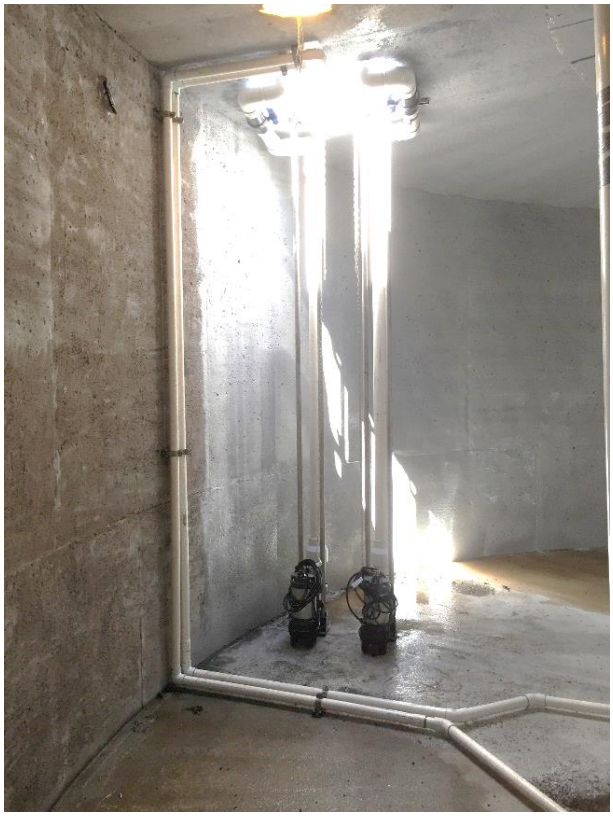
The blowers for aeration to the Kubota treatment trains are sized for 2.74m^3 per min. Additional aeration blowers are installed with each STP installation Stage.

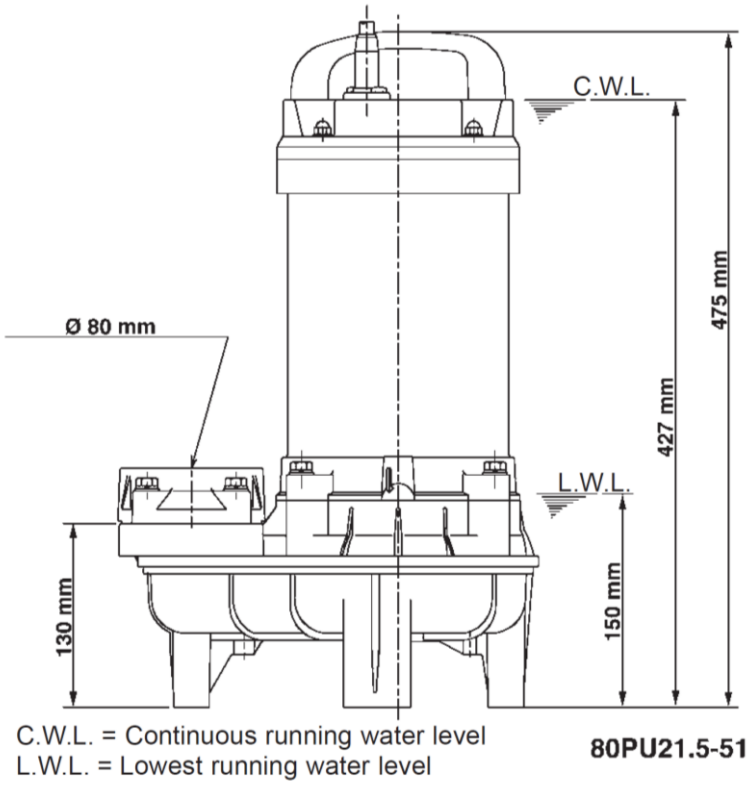


Equalisation Pump

Tsurumi 80PU Vortex Sewage pumps are used in a duty/standby configuration within the EQ Tank. The equalisation pumps transfer wastewater from the EQ Tank to the Mixing Box.

The pumps are installed using standard rail kits and require 3phase power.

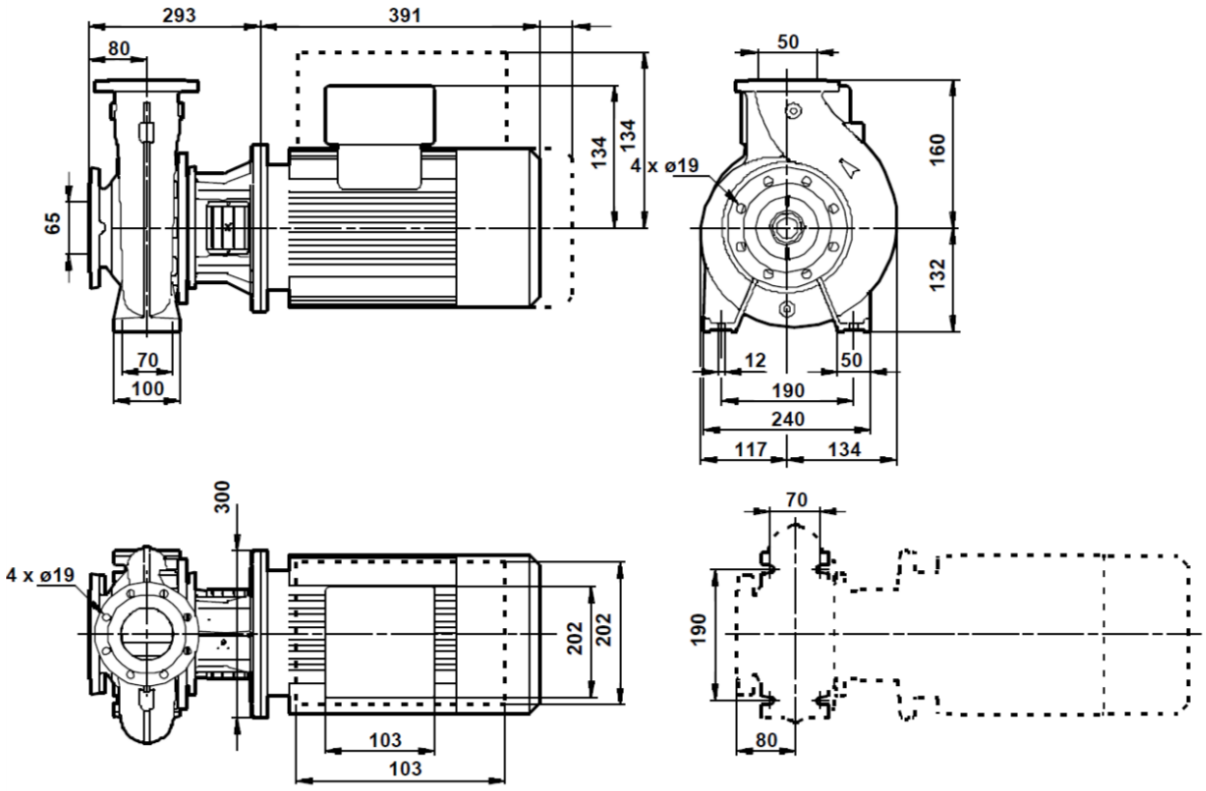




Irrigation Pumps

The STP utilises Grundfos centrifugal pumps in a duty/standby configuration. The dual pump controller alternates between each pump for even wear.

The irrigation pumps transfer treated water from the Irrigation Tank to the storage lagoons.



Land Application – Irrigation

Treated water from the STP is stored in an Irrigation Tank. A dual pump set transfers treated water to storage lagoons and irrigation fields on the far side of the airport.

The irrigation area is 30.4ha utilising travelling irrigators. Grazing and cropping is undertaken in accordance with the site management plan.

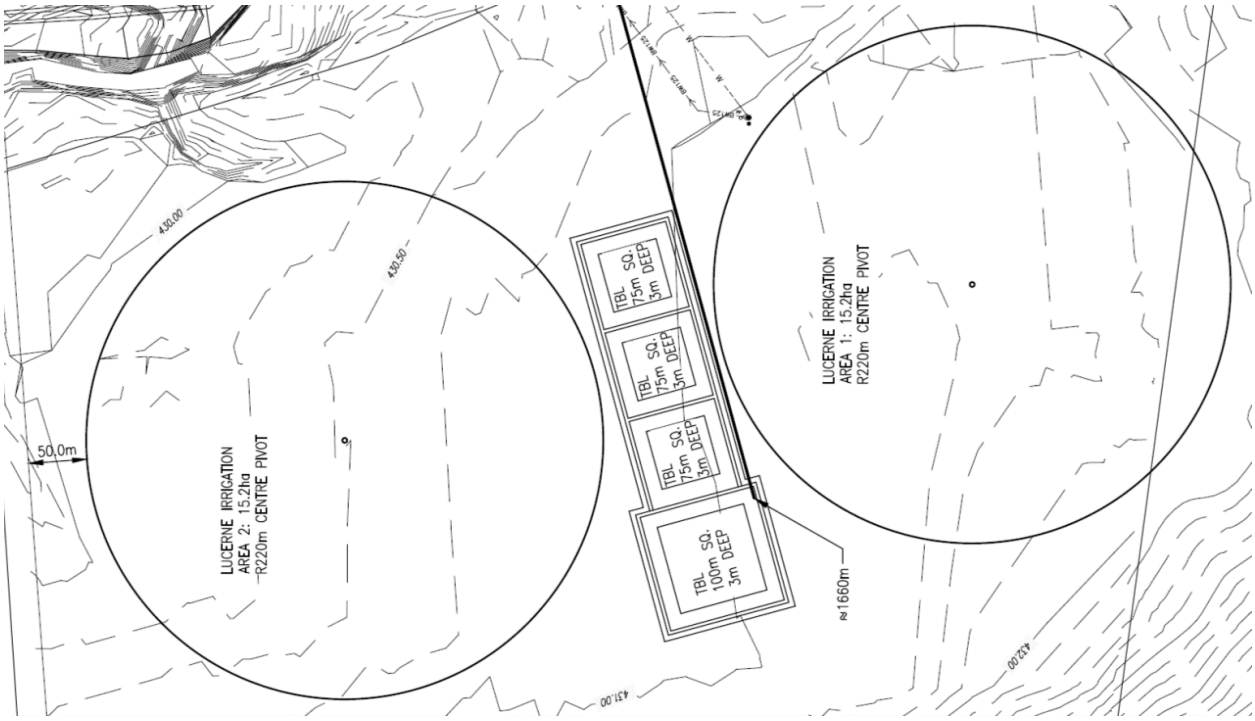


Figure 14 – Wellcamp Airport and Business Park Irrigation Area

Figure 15 – Example of Rolling Irrigation Infrastructure

Sludge Management

Sludge generated will be stored within the Sludge Storage Tank. The Reinforced Concrete 150kL Tank has capacity for up to 90 days storage at design capacity. During early stages of development stored sludge is removed by pump truck to an offsite waste management facility. The ultimate solution incorporates sludge management onsite.

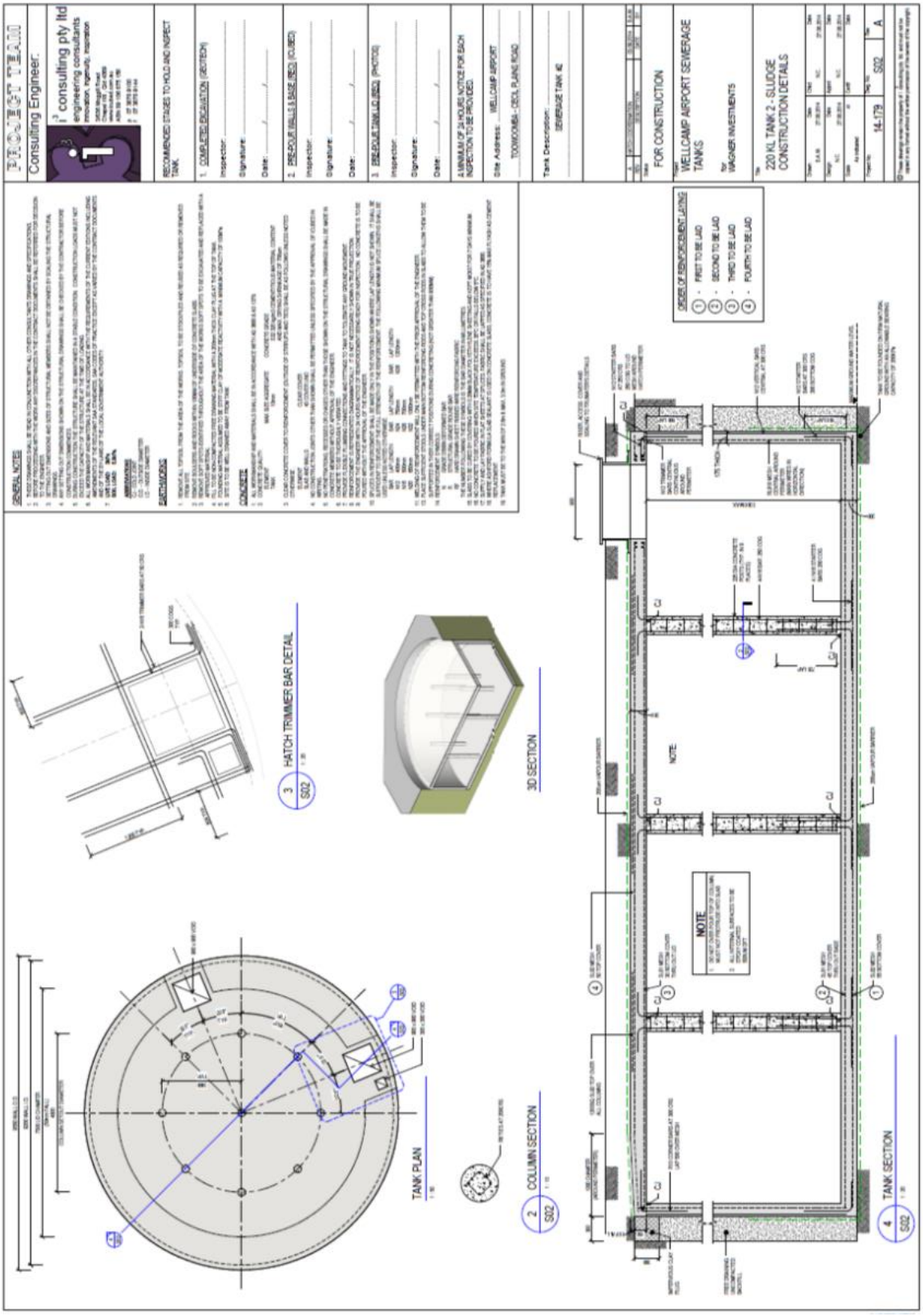


Figure 17 – STP Sludge Tank Design – Wellcamp Airport and Business Park

Current Installation - Stage 4

Wagner Corporation is partnering with the Queensland Government to provide the first purpose-built, dedicated quarantine facility in Australia. Construction has commenced on site with the facility expected to be operational by April 2022.

True Water will undertake Stage 4 of the installation of the Wellcamp Airport and Business Park STP to increase the sewage treatment capacity to 500kL. This will secure the capacity required to service the various facilities.

Figure 18 – Artist's Impression – Wellcamp Regional Quarantine Facility

"We needed the world's most reliable, high quality sewage solution for the Brisbane West Wellcamp Airport. True Water Australia was chosen after discussions with each of the leading providers in Australia. True Water displayed many of the traits that made Wagner's successful, namely innovation, attention to detail, focus on quality, dedication and customer service.

Wagner's is extremely happy with the quality and performance of True Water Australia's works and the Kubota STP."

Denis Wagner, Wagner Corporation, CEO

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