Environmental Assessment

APPENDIX A

FIT FOR PURPOSE REPORT

SPRING FARM BIOTREATMENT FACILITY

FIT FOR PURPOSE REPORT

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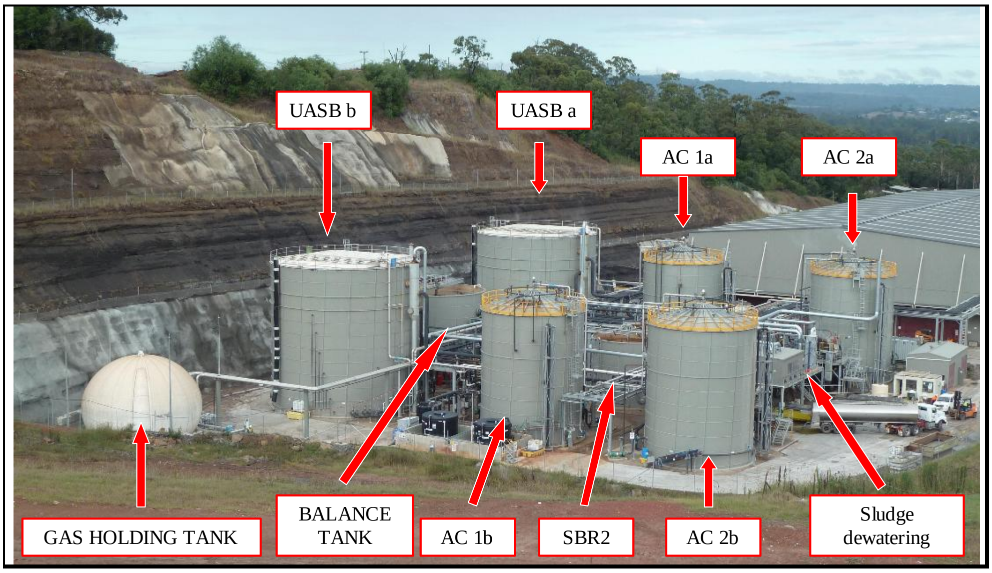
INTRODUCTION

The proposed Spring Farm Biotreatment Facility, formerly known as the Jacks Gully mixed solid waste treatment and recycling facility, is currently the subject of a development application with the NSW Department of Planning and Infrastructure, as submitted by SITA Australia. The objective of this document is to provide a brief technical summary of the proposed design configuration for treatment of both high organic liquid trade waste and leachate, so as to demonstrate that the site is “fit for purpose” in support of consent approval for the project.

The original Jacks Gully facility was constructed in 2008 by WSN on a site shared by an existing landfill. The process was comprised of two identical treatment trains operating in parallel and was sized for a total design capacity of 90,000 tons/year. The original treatment process consisted of numerous automatic screening and manual sorting stages, for separating and recycling plastics, ferrous metals, aluminium, paper and textiles from household waste. The organic fraction was extracted for additional screening and biological treatment (anaerobic digestion) for the production of biogas which was subsequently converted into electricity via two 1.4MW gas engines (combined heat and power systems). The digested pulp was dewatered via belt press and the solids treatment process was completed by a green waste composting scheme. The dewatering filtrate was treated biologically via Sequencing Batch Reactor (SBR) to eliminate ammonia nitrogen prior to recycling for use within the sorting hall. A general overview of the original facility is shown below.



Tank farm general overview

Management and operation of the Jacks Gully Mixed Solid Waste Treatment and Recycling facility was assumed by SITA AUSTRALIA on February 1, 2011. A detailed functional audit of the treatment process was conducted in March, 2011, which revealed a number of significant operational difficulties due to various design and infrastructure issues despite process operations at a waste loading well below the design capacity.

A key aspect of the investigation focused on the fact that some of the core equipment, notably the anaerobic reactors, did not correspond to their usual applications, directly leading to major operating difficulties. The Upflow Anaerobic Sludge Blanket (UASB) reactor technology is typically used for treating dissolved organic streams having a maximum suspended solids of 1 g/L and not a concentrated pulp stream as was installed at the Jacks Gully facility. In fact, this design “deficiency” was also highlighted in a report prepared by the University of Queensland. Furthermore, the UASB reactors received a large quantity of non-fermentable materials, hindering biological treatment and reducing the working volume of the tank.

A project was therefore launched by SITA AUSTRALIA in order to determine the optimal direction for the future design and operation of the facility to ensure a robust and efficient process while complying with the site’s organic matter recycling and energy recovery objectives.

MODIFIED PROCESS DESIGN PROPOSAL

The modified process design which was ultimately selected by SITA AUSTRALIA was to discontinue the production of organic pulp within the sorting hall and to adapt site treatment objectives to process two parallel waste streams:

- anaerobic treatment of high organic liquid trade waste to produce a maximum amount of biogas and subsequent electricity generation; and
- aerobic treatment of leachate from SITA operated facilities such as landfills or other leachate-generating activities.

The modified biotreatment facility will be designed to ensure the treated effluent meets the acceptance standards for sewerage connection to inland sewage treatment plants, as defined by Sydney Water. A discharge permit of 520 m^3 per day is currently under discussion with effluent concentration limits of $<$ 600 mg/L BOD and $<$ 100 mg/L ammonia as regards the future sewage connection. The project design will ensure achievement of this performance standard from facility start-up when treated effluent will be removed from site by tanker for delivery to a trade waste system for disposal. The modified design will allow sufficient flexibility such that either waste stream can be handled up to a maximum capacity of 520 m^3 per day, as a function of waste availability.

The advantage of the proposed modified biotreatment facility design includes the ability to provide improved operating stability while maximizing the use of existing infrastructure and minimizing the necessary site modifications. A brief description of the various treatment stages is presented below along with a schematic illustration of the proposed process configuration and the quality of the various process streams (Figure 1).

High Organic Liquid Trade Waste Treatment (320 m^3/d design capacity)

One of the existing UASB reactors (3000 m^3) will be used to treat liquid trade waste having a high level of dissolved organic carbon, such as effluents from the agri-food industry, breweries, sugar mills, dairies, distilleries and starch transformation plants. Typically, such trade wastes will have a low level of suspended solids while varying in COD concentration between 20 and 60 g/L. For the purposes of the project design calculations a value of 40 g/L COD was used.

The high organic liquid trade waste will be transported to the site via tanker truck with one of the existing anaerobic tanks (Acetogenic 1 – Line 1; 1000 m^3) transformed into a storage / buffer tank in order to provide a constant feed to the anaerobic reactor.

Based upon the effluent discharge target of 320 m^3/day and assuming 40 000 mg/L COD influent yields a design loading of approximately 4.3 kg COD/m^3/day, a rather conservative value.

The high organic wastewater undergoes anaerobic biological treatment via naturally occurring microorganisms (granulated methanogenic sludge) which transform simpler organic acid and fatty acids into biogas (methane, carbon dioxide and water).

The typical performance efficiency observed with a UASB reactor is approximately 80% COD removal, however, as the site plans to specifically target highly biodegradable liquid wastes a digestion performance of 90% COD removal at a working temperature of 35°C has been taken as the design guideline.

A three-phase separator at the top of the units allows for collection of biogas from the treated effluent and the sludge. The typical volume of biogas produced for this type of application is approximately 0.6 Nm^3 per kg of COD eliminated (based upon a biogas composition of 60% methane). This yields a daily biogas production of approximately 6,384 Nm^3/d, representing an hourly flow of pure methane of approximately 160 m^3/h.

Double Jenbacher 1400 kW CHP

One of the existing CHP units will be dedicated to anaerobic digester biogas while the second CHP unit will continue to run as presently using landfill gas collected on-site. Excess biogas will be flared using the existing flare, designed for 1400 m^3/h, well above the maximum production capacity of a single UASB treating high organic liquid trade waste.

The liquor from the UASB will contain residual carbonaceous pollution that will be transferred to the existing SBR units, SBR1 (300 m^3) and SBR2 (400 m^3), for aerobic biological treatment. SBRs operate in batch mode with aeration and sludge settling occurring within the same vessel. Based on 90% removal of COD in the UASB reactor the existing SBRs will have to eliminate a total of 1,216 kg COD per day. As the pollution to be treated is essentially carbonaceous, with little requirement for nitrification, the oxygen demand will be reduced accordingly.

SBR 1 (300 m^3)

SBR 2 (400 m^3)

In this treatment configuration, the SBRs are the limiting factor. The existing SBRs exhibit an aeration capacity of 900 and 1800 Nm^3/h, respectively for SBR1 and SBR2, however the SBR1 aeration system is undersized as regards the future design loading and therefore will be replaced with a system identical to that of SBR2, thereby improving the treatment capacity for SBR1.

<u>Leachate treatment (200 m^3/d design capacity)</u>

Design guidelines for the leachate treatment system were based upon typical characteristics observed for landfills (ammonia = 900 mg/L / COD = 1500 mg/L).

One of the existing anaerobic tanks (Acetogenic 1 – Line 2; 1000 m^3) will be transformed into an additional SBR reactor (SBR3) dedicated for the aerobic treatment of leachate generated at various SITA operated facilities. SBRs operate in batch mode with aeration and sludge settling occurring within the same vessel. This aerobic reactor will be primarily used for ammonia removal at a working temperature of 24°C. The reactor will likely require alkalinity addition to support nitrification.

One of the existing anaerobic tanks (1000 m^3) will be used as a buffer tank to store leachate prior to aerobic treatment in SBR3.

One of the existing anaerobic tanks (Acetogenic 2 – Line 1; 1000 m^3) will be converted to a treated wastewater storage tank. The treated leachate will be transferred to the treated wastewater storage tank prior to discharge from site.

Residual solids treatment

Excess sludge from the UASB reactor and SBR systems will be sent to the existing balance tank prior to dewatering. The existing Siemens Belt filter press will be used to dewater residual solids as originally planned.

The dewatered cake may be used as a quality soil conditioner or as an additive for the Garden Organics Facility on-site. It shoud be noted that the present facility licence currently authorises up to 5000 tonnes per year of biosolids (digestate) entry.

Supernatant from the dewatering system will be recycled back to the leachate receival tank for further treatment or to the treated wastewater storage tank for disposal.

Belt filter press (Siemens)

Air Quality

Historic issues with nuisance odours generated via the original Jacks Gully facility design were strongly correlated to the treatment of mixed solid waste and the preparation of an organic pulp which was incompatible with the objective of anaerobic digestion in a UASB type reactor.

Nuisance odour issues are typically not a primary concern with conventional UASB applications for biological degradation of high organic liquid trade waste as the vessels are fully enclosed, with a dedicated system for biogas collection and relatively little fermentable organics remaining for treatment in the subsequent aerobic stage. Furthermore, the high organic liquid trade waste to be treated is expected to contain very low concentrations of sulfate (precursor to H_2S production).

As regards the leachate treatment line, the leachate storage / buffer tank is an enclosed vessel and while SBR3 is an open, well-aerated tank thereby creating conditions for stripping of volatile odorant compounds potentially present in leachate, this phenomenon will be mitigated via application of odour neutraliser agents using dedicated horizontal spray systems.

In any event, SUEZ ENVIRONNEMENT has developed the NOSE approach (No Odours for SUEZ ENVIRONNEMENT) to manage nuisance odours which may be associated with industrial facilities. The NOSE approach delivers a sustainable control of nuisance odours by addressing both technical and human approach.

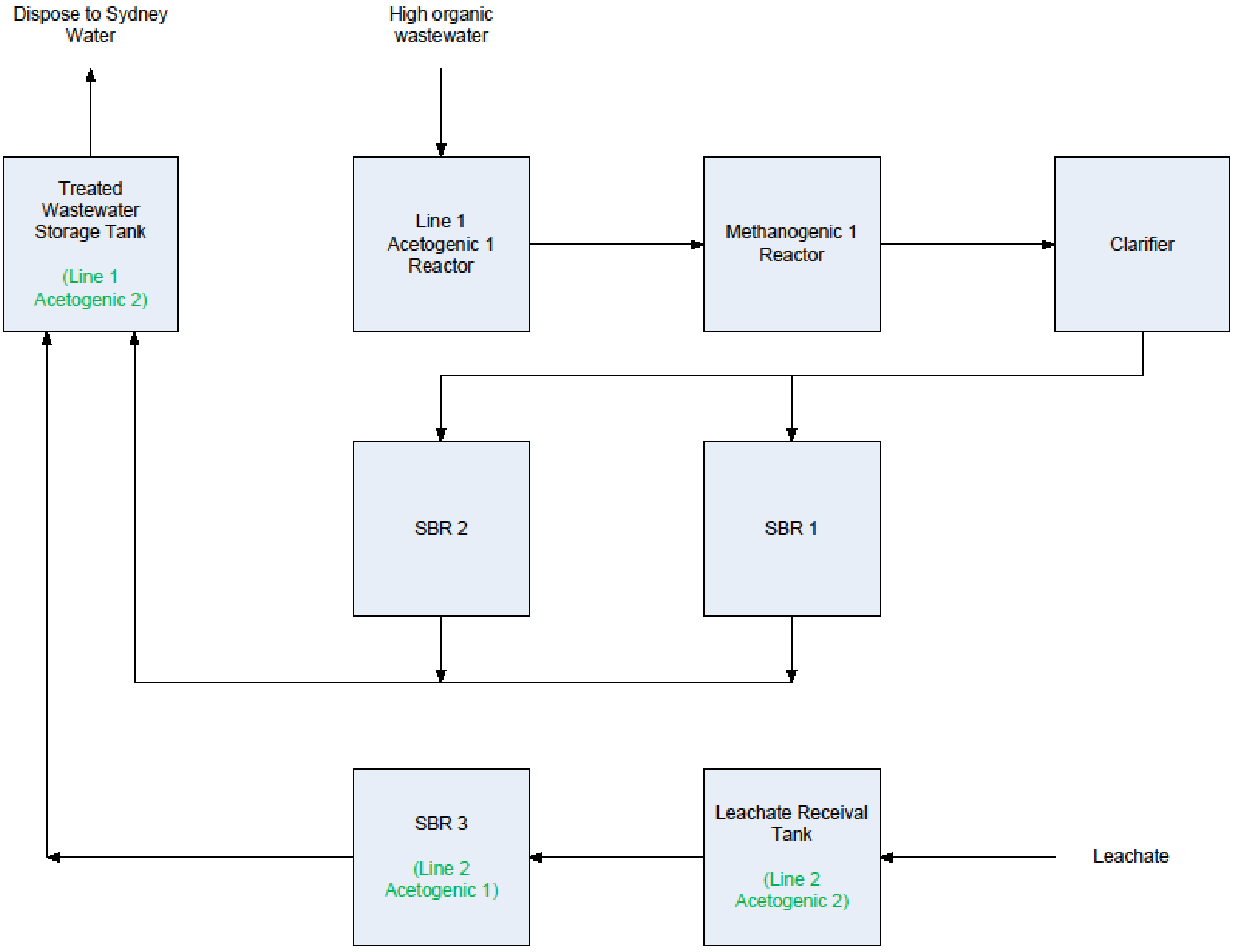
CONCLUSIONS

It can be concluded that the SPRING FARM Biotreatment Facility is indeed “fit for purpose” for site operations in line with those outlined in SITA AUSTRALIA’s proposal to the NSW Department of Planning and Infrastructure, specifically to process two parallel waste streams:

- anaerobic treatment of high organic liquid trade waste to produce a maximum amount of biogas and subsequent electricity generation; and
- aerobic treatment of leachate from facilities such as landfills or other leachate-generating activities.

The site may be ready to operate upon completion of the site / equipment modifications as described herein.

FIGURE 1



Process Flow Diagram – Spring Farm Biological Treatment System - 060913

APPENDIX

SUEZ ENVIRONNEMENT REFERENCE SITES

KRONENBOURG BREWERY (France)

- Industrial STP operated by Lyonnaise des Eaux.
- Plant capacity of 350,000 population equivalent.
- Anaerobic Digestion of yeast-laden water and waste beer yields 18% of site energy requirements.
- 3 methanisation reactors produce 16,000 MWh (thermal).
- Produced biogas powers industrial boilers.

MEISTRATZHEIM (FRANCE)

- Plant operations by Lyonnaise des Eaux.
- Plant capacity varies from 60,000 to 205,000 population equivalent based upon sauerkraut waste volumes.
- Anaerobic Digestion of sauerkraut production waste.
- On-site production of 5,500 MWh of primary biogas (85% methane content).