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Quality Assurance and Quality Control by Approved Methods

4th November 2016

Allied Mills Pty Ltd
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Attention: Ms Stephanie Vass

Allied Mills – Picton (DA 3180-12-2004 MOD3) - Response to Submissions

I refer to your request to respond to the technical issues addressed in the Response to Submissions for the above project at the Picton Mill. I authored the "*Review of wastewater treatment and effluent application to land Allied Mills Pty Ltd – Picton Mill*" dated 31st July 2016, hereafter called "the Review (2016)" that provides the background data.

I have been provided with the covering letter from Planning and Environment and the four submissions received by the closing date 12th October 2016, as presented on the Department's major projects website.

1. Department of Planning and Environment, dated 18th October 2016 – covering letter to Ms Stephanie Vass, General Manager Corporate Services/Company Secretary.
2. Department of Primary Industries – OUT16/37962 dated 12th October 2016
3. Department of Industry Resources and Energy – (RMB): OUT16/36377 dated 10th October 2016.
4. NSW EPA, DOC16/492220-08:PB dated 5th October 2016.
5. Letter from Chris Ritchie of the Department of Planning and Environment to Allied Mills dated 18 October 2016 attaching email from Mike Kelly of Wollondilly Shire Council (**Council**).

The DPI submission (Reference 2) has "*no objections, comments or recommendations in relation to the proposal*".

Industry, Resources and Energy (Reference 3), while pointing to adjacent mining interests "*GSNWS have no specific issues to raise with the Modification to DA-318-12-2004-1*".

EPA Comments

The EPA submission (Reference 4) provides comments "*to assist the Department in the assessment and determination of this modification*".

DEC Guidelines

The EPA refer to the DEC (2004) *Environmental Guidelines: Use of Effluent by Irrigation* (**DEC Guidelines**).

It is important to consider that those Guidelines are educational and advisory in nature. The Executive Summary of that document states "*This Guideline is educational and advisory in nature. It is not a mandatory or regulatory tool and it does not introduce new environmental requirements.*" (page x, para.2).

Further, they are not guidelines which are prescribed as relevant considerations in relation to systems of sewage management under the *Local Government Act 1993* and the *Local Government (General) Regulation 2005* (See clause 29(3)).

Table 3.1 of the DEC Guidelines provides classification of effluent, the strength of which is presented as concentrations of nitrogen, phosphorus, 5-day biochemical oxygen demand (BOD_5) and total dissolved solids (TDS). Compliance with Table 3.1 as reflected in the EIS does not ensure a sound environmental outcome.

The requirements for concentration in Table 3.1 are easily and efficiently manipulated by dilution. To meet the values of Table 3.1, as presented in the EIS (2004), one simply needs to add clean water to the system until the effluent is within the concentration limits. Such action would lead to the wastage of water with no corresponding beneficial environmental outcome. The correct units of measure are load, that is concentration (in milligrams per litre) multiplied by volume (litres).

The Review (2016) clarified that significant error in the EIS (2004) in so far as it adopted the criteria in Table 3.1. It also concluded that the current operation of the wastewater management system was acceptable.

<u>Environmental performance objectives</u>

The EPA has requested confirmation that the design, installation, operation and maintenance of the wastewater system satisfies the environmental performance objectives in paragraph 1.2 of the DEC Guidelines.

In my view the environmental performance objectives are achieved by the existing system:

(1) Protection of surface waters

The existing system is constructed to ensure that surface waters are not unacceptably contaminated by any flow from irrigation areas. The proposed conditions of consent ensure that this environmental outcome will be maintained.

(2) Protection of Groundwater

There will be no impact on current future or beneficial uses of groundwater. The groundwater is at a depth of approximately 50 metres and there could be no adverse impact associated with irrigation because there is adequate treatment through the clay soil over depth. There is evidence that the nitrogen is not leaching beyond 600 mm deep and the very high phosphorus adsorption capacity prevents off-site movement of phosphorus for 200 years at the current application rate.

(3) Protection of lands

The existing system ensures that the capacity of the irrigated land to grow plants is maintained. It also ensures that there will be no degradation in soil quality. The DEC Guidelines suggest that *"minimum areas are calculated using a water, nitrogen and phosphorus balance, and the largest*

area determined as the minimum irrigation area needed (with adequate storage) for the system to be sustainable". The nutrient balance for nitrogen, phosphorus and low salinity effluent were performed in the Review (2016) (section 8) and are shown to be within the capacity of the land application area to assimilate in a sustainable manner.

(4) Protection of plant and animal health

The existing system does not compromise the health and productivity of plants, domestic animals, wildlife or any aquatic ecosystem. The proposed conditions of consent ensure adequate maintenance and management of the system to ensure that this situation is maintained.

(5) Protection of public health risks

The discharge of effluent is environmentally sound and is not considered to compromise public health. The chlorination of effluent from the Econocycle provides a low-risk spray effluent, within the same criteria as applies to irrigation of AWTS effluent around a dwelling.

(6) Resource use

In the Review (2016), potential resources in the effluent were identified. An appropriate management regime was identified in the Review (2016) to ensure that the associated agronomic systems are developed and implemented for effective use. The proposed conditions of consent ensure that this management regime is maintained.

(7) Community amenity

The existing system does not result in unreasonable interference with any commercial activity or the comfortable enjoyment of life and property off-site. In particular, there are no unreasonable odour, dust, insect or noise impacts.

<u>Paragraph (i) - Site suitability constraints</u>

Paragraph (i) of the EPA letter requests an assessment of the site specific constraints.

In the Review (2016), the site specific constraints were measured and evaluated in detail with respect to the current operation. The measurement and evaluation included:

- a detailed soil survey to 1 m deep over the land application area plus its buffers;
- an assessment of the nitrogen, phosphorus and salinity regime as it exists today; and
- an assessment of the potential for the area to continue sustainably treating the effluent was also carried out.

The Review (2016) determined that the site was acceptable for the system and showed no signs of overloading or leaching nutrients beyond the land application area from effluent that has been discharged to the same area for over a decade.

<u>Paragraph (ii) - Irrigation Area</u>

Paragraph (ii) of the EPA letter raises the adequacy of the irrigation area as a matter to be assessed.

While the original document (EIS 2004) included a 10 000 m^2 area suitable for irrigation, the whole of that area is not required for the treatment of 2000 L/day as the water balance in the Review (2016) demonstrated using the equivalent rainfall data to the 83rd annual percentile ranking.

The 83rd annual percentile ranking is an extremely conservative monthly model and far exceeds the modelling suggestions in the DEC Guidelines. The suggestions from the DEC Guidelines as proposed in the EIS (2004) are that for the 'low strength' waste and the median rainfall values are used to determine wet-weather storage. For 'low strength' waste the DEC Guidelines provide that the irrigation area requirements are based on the 50th percentile (median) storage requirements. The median rainfall values for that area at Picton are the 22rd percentile annual rainfall.

The Review (2016) applies the conservative model to show that only 900 m^2 of irrigation area is required to satisfy a nil wet-weather storage strategy. The irrigation area of 1270 m^2 significantly exceeds that minimum requirement, as required to address the nitrogen load.

Paragraph (iii) - Wet weather storage

Paragraph (iii) of the EPA letter raises wet weather storage as a matter to be considered.

As noted above, even on a conservative view, the Review (2016) determines that an irrigation area of 900 m² is sufficient for wet weather events where no wet weather storage is provided. The irrigation area is 1250 m². In those circumstances no wet weather storage is required.

Furthermore, there are significant health and environment issues with retaining chlorinated effluent, from a treatment system such as the Econocycle, in wet-weather storage. Over a period of more than two days the effluent will rapidly degrade as the free chlorine is lost within the first day and microbial regrowth commences. The practical issues involve the timing of the irrigation of this retained effluent together with normal irrigation when the weather is suitable, and the loss of microbiological security. At such a small scale, the problems are easily averted by increasing the size of the irrigation area, based upon a water balance, to store the excess effluent in the soil. The Review (2016) addressed this issue by using the equivalent of the 83rd percentile annual rainfall.

The DLG *et al*. (1998) *Environment and Health Protection Guidelines: On-site sewage management for single households* have been prepared for the purposes of the *Local Government (General) Regulation 2005.* However, those Guidelines are relevant to single households only. The recommendation for a minimum storage capacity under those Guidelines is therefore not applicable to the subject development. However, the same issues with storage of chlorinated effluent for later discharge to an irrigation field have lead to an acceptance of using the land application area to store the effluent. Domestic systems mostly do not have wet weather storage because of the health and environmental issue related to storage.

Paragraph 2 - Connection to sewerage scheme

Paragraph 2 of the EPA letter raises the question of whether the connection to the Picton Sewerage Scheme is feasible.

The connection to the Picton Sewerage scheme is in excess of four kilometres and in my view is not a viable alternative for such a small daily volume, particularly in circumstances where the impacts of the existing scheme are environmentally sound.

Paragraph 3 - Environment Protection Licence

Paragraph 3 of the EPA letter raises the matter of compliance with EPL 12498.

The system will maintain compliance with EPL 12498. The only potentially relevant condition under EPL 12498 is condition L1 which requires compliance with section 120 of the *Protection of the Environment Operations Act 1997* (**POEO Act**). In my view the system is adequately designed so as to avoid the pollution of waters under the POEO Act.

Audit findings

Paragraph 4 of the EPA letter notes that audit findings are relevant to the assessment of the modification application.

The subject section 75W application has been prepared in direct response to the findings of the Annual Environmental Management Report dated November 2015 (**AEMR**) prepared in response to condition 6.3 of the development consent. The AEMR disclosed that the effluent did not meet the effluent criteria nominated in the EIS and the Soil and Water Management Sub-Plan.

I determined that the criteria nominated in those documents was not suitable and did not ensure an acceptable environmental impact and conservation of water. The assessment and conditions suggested in the Review (2016) were put forward as a means of addressing this issue.

The Review (2016) set out the requirements for monitoring of the Econocycle Wastewater Treatment System and the annual review of the effluent irrigation area. Those requirements have been put forward in suggested conditions of consent to ensure that environmental performance is maintained into the future.

Council Comments
The matters raised in the email from Mike Kelly of Council are addressed as follows:

Operation of Econocycle System

Paragraph 3 of the Council's comments refers to the flow rates associated with the Econocycle Maxi treatment system.

I can confirm that the treatment in the Econocycle is achieving the objectives of removal of solids, reduction of bacteria and final chlorination and maintaining an aerobic environment, as reported in the Review (2016). The consideration of the treatment of nitrogen and phosphorus is related to the type of inputs to the system and not any implicit failure of the Econocycle. The Econocycle is performing its functions very well.

Aerated Wastewater Treatment Systems (AWTS) are NOT designed to treat wastewater that is primarily from toilets with little inputs from other domestic services (showers, laundry, kitchen). The input to the Allied Mills Econocycle is from about 40 staff with varied use of toilet facility and very little dilution from showers and handbasins and no contribution from laundry.

In a normal household, toilet wastewater is about 25% of the daily wastewater flow. If we took the wastewater generate by Allied Mills (2000 L/day) and added another 6000 L/day from other sources equivalent to low nitrogen shower and laundry water, the current nitrogen level would be 25% of that measured in July 2016.

Irrespective of the operation of the Econocycle, no AWTS is capable of reducing high urine inflows – sure they can reduce domestic effluent nitrogen, but mostly because of the dilution factor. No AWTS has the chemical capacity to reduce phosphorus.

As is demonstrated by the Review (2016), the Econocycle System has ensured that acceptable environmental outcomes are achieved in any event. Those outcomes can be maintained in accordance with the recommendations of the Review (2016).

Effluent Disposal Area

The Council's comments refer to nitrogen and phosphorus levels and the relationship with the effluent disposal area. The Council's comments also note that all nitrogen and phosphorus would be absorbed into the soil.

The Review (2016) addresses the adequacy of the current irrigation area with respect to nitrogen and phosphorus adsorption and establishes that acceptable environmental outcomes are achieved.

There was strong evidence that nitrate-nitrogen (the most easily transportable form of nitrogen) was not leaching beyond 600 mm below the surface (page 6, para.3). Similarly, phosphorus has been immobilised by the very high phosphorus adsorption capacity and provides protection to the irrigation area for hundreds of years.

Sub-surface irrigation

The final paragraph of the Council's comments relates to sub-surface irrigation.

The reconfiguration of the effluent application area to sub-surface irrigation is not warranted. A significantly larger pump would be required to deliver the minimum hydraulic head of 12 m to the drippers, plus an operational component.

Since there is no human interface with the irrigation area, spray irrigation is preferred as it allows management to monitor the effectiveness of the distribution of the effluent. Spray irrigation of chlorinated effluent is permitted by NSW Health in domestic situations, in and around the family's home.

The use of spray irrigation allows management to monitor the effective distribution of effluent over the land application area and react rapidly when systems require management. Sub-surface system requires more intense management and are prone to blockages without the knowledge of the manager.

Neither sub-surface nor surface irrigation will affect the treatment of nitrogen or phosphorus and with the land application area designed for the 83rd percentile annual rainfall and further enlarged to the existing 1270 m^2 to address nitrogen assimilation, sufficient risk management has been built into the size of the irrigation area, particularly with the very large buffer between the land application area and the nearest waterway.

Conclusion

The treatment and irrigation of sewage effluent at the Picton site is covered by the *Local Government (General) Regulations 2005* and is not an industrial effluent.

The management of the treatment of the wastewater in the Econocycle can be governed by the proposed conditions of consent which would include requiring three-monthly servicing of the AWTS and formal reporting. The maintenance and sustainability of the effluent irrigation area can be addressed by annual site inspection and soil analyses, and comparative analysis from year to year.

These proposed conditions will ensure that the acceptable environmental outcomes associated with the system are maintained into the future.

Yours faithfully

Dr Robert Patterson FIEAust, CPSS, CPAg
Professional Soil Scientist and Environmental Engineer