1 November 2018

Department of the Environment
Attention; Pamela Morales
320 Pitt Street,
Sydney NSW 2000

Our ref: 2316318-22491
Your ref:

Dear Pamela,

North Byron Parklands wastewater investigation submission from BVM / W&A – revised commentary after reviewing receipt of further submissions from 25 Oct 2018

1 Background and scope of the assessment

GHD has been engaged by the Department of Environment and Planning (DPE) to undertake a third party review of the wastewater treatment and onsite irrigation scheme proposed for the continuation and expansion of the North Byron Parklands (NBP) cultural events site. GHD has provided a number of sequential reviews and comments related to the Wastewater Assessment (as prepared by Whitehead and Associates Pty Ltd (W&A), July 2018). In response to GHD's last round of comments on the Revised Wastewater Assessment (GHD, September 2018), W&A responded with a further letter report providing comments on some of the items raised by GHD. The DPE subsequently requested that GHD consider the latest rounds of comments provided by W&A (3 October 2018) with the aim of:

- Identifying items for final clarification with W&A and the development Proponent
- Recommending Conditions of Approval that must be met for the project to proceed.

A meeting was held between all parties in Sydney on Friday 19 October to clarify outstanding issues, and further responses have since been provided by NBP as an outcome from the discussions held on 19 October 2018.

GHD's assessment of W&A's letter (3 October 2018) and suggested approval conditions provided by NBP (23 October 2018) following the meeting on 19 October 2018 is provided below. GHD have provided recommendations related to the progression of the proposed development inclusive of proposed approval conditions, with consideration to all available information in Section 4.

2 Review of NBP and W&A's responses to GHD's last assessment and draft version of this memo

GHD has reviewed the letter provided by W&A (3 October 2018) which comments on some of the issues raised by GHD (September 2018) in response to the Revised Wastewater Assessment (W&A, July 2018). In addition, GHD has considered a further response from NBP and W&A received by DPE on 23 Oct 2018.

Table 1 provides the details of GHD's review, with reference to the Revised Wastewater Assessment and other documents related to the project, as appropriate.

A summary of remaining items for clarification is provided in Section 3 and recommended Conditions of Approval (for the consideration of the DPE) are provided in Section 4.

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Table 1 GHD's feedback of W&A's response to comments on the Revised Wastewater Assessment

Item	Current information/W&A comment(s)	GHD response	Reference
1	Nominated flow rates based around festival data. Conference centre flow rate of 16 kL/d	While we believe the flow rates nominated for the festival are low, it is accepted that the flows are based on actual data. However, the main point of contention is the nominated flow from the conference centre. Based on general allowances and occupancy rate for overnight accommodation and day attendance for events, the allowance of 16 kL/d is low. Even if this figure is accepted, this flow represents some 45% of the total daily flow to the proposed treatment system. *GHD recommends that the allowance for wastewater volume for the conference facility should be closer to 24 kL/d.*	
2	Staged approach	No real comment, apart from GHD would prefer to see the wastewater system built initially.	
3	Continued burial of compost on the property poses health and environmental risks	The continued burial of compost material at the site is feasible, provided that certain conditions are met (see Section 4).	
4	Nutrient build up in the land application area MEDLI is best practice for irrigation modelling and involves a comprehensive water balance to ensure the design assumptions are achievable. It was shown that the application of treated effluent is sustainable at NBP over at least 27 year lifecycle over the 3.6 Ha irrigation area. The WWA presented additional suitable area of 26 ha that is available for irrigation, which increases the lifespan of the land application for nutrients to 200 years. All land application systems for wastewater have a nutrient build up lifecycle. It is an assumed condition for approval of the OSMS. The actual lifespan of an OSMS can be increased by reducing the	The 'MEDLI' modelling system is an appropriate method for irrigation modelling for recycled water. It is noted in Section 4.1 (bullet points) of GHD's latest assessment (September 2018) that GHD is not concerned with the MEDLI model, which when considered in isolation, seems to indicate the irrigation scheme is feasible and sustainable. The main concern the assessor has in regards to the proposed irrigation regime, <u>is not the area of the land available as such, but the risk to the receiving environment, especially groundwater.</u> W&A (3 October 2018) did not addressed the concerns raised by GHD (September 2018) in regards to groundwater and surface water impacts. Risk to groundwater and nearby surface water is still considered to be the greatest limiting factor for irrigation at this site. This is a risk that cannot be addressed by the MEDLI model alone. There will need to be amendment to the irrigation rates, timing and areas, to protect groundwater and surface water at the site, along with monitoring, as discussed further in Section 4. Annual monitoring of effluent quality is not sufficient to qualify the risk to land, groundwater and surface water. A more holistic approach which considers the source and all receptors has been recommended in Section 4. **Further comments following review of information and proposed approval conditions from NBP and W&A (23 October 2018)** The Proponent has provided proposed approval conditions including the requirement to establish a groundwater and surface monitoring program. The approval conditions	NSW DEC Use of Effluent for Irrigation Australian Guidelines for Water recycling (NRMMC et al, 2006) Item 8 in W&A response, 3 October 2018

Item	Current information/W&A comment(s)	GHD response	Reference
	nutrient concentrations in the wastewater and/or increasing the footprint. It has been shown that the footprint of the land application can be increased. In addition, the WWA recommended at least annual monitoring of the effluent quality, such that if output quality is not being met then adjustments to wastewater processing could be made.	suggested by the Proponent are generally appropriate, however, GHD has amended the suggested approval conditions slightly to require the results from the monitoring to be reviewed with regards to set trigger limits and baseline data. Analysis and evaluation of monitoring data is a key component of effective environmental management to allow for reporting to management and continuous improvement and is a requirement of AS/NZ ISO 14001:2016 – Environmental Management Systems – requirements with guidance for use.	
5	Use of flood prone land for land application 'The application of irrigated wastewater on the extensive flat grassed northern portion of the NBP was considered appropriate by W&A as this area is located in less sensitive location with extensive farmland down gradient to the north, no significant waterways in the vicinity, good drainage ability in the underlying sands, safety and ease of land application and robust application method.'	In GHD's latest response (September 2018, final paragraph, section 4.1) the following was raised as one of the main concerns related use of 'flood prone land' for irrigation: '*For instance, the figures in the Revised Wastewater Assessment indicate a very small portion of the available area for irrigation within the camping area as selected for irrigation. The area selected EMA2 is located at the north-eastern extent of the site, corresponding to the areas where the shallowest groundwater was encountered and therefore the highest risk of waterlogging. This area is also the closest portion of the site to existing waterways. The report is not explicit as to why these areas were selected for irrigation rather than areas further to the west within the camping ground*'. This comment made by GHD above is one of the aspects we would most like clarification on from the proponent. To clarify our perspective, GHD notes that the actual EMA2 area in Figure 5 of W&A's Revised Wastewater Assessment (July 2018) covers most of the east and northern part of the site. GHD would like clarification on why the cross-hatched areas located in the far-northern corner of EMA2 site (in Figure 5 of the Revised Wastewater Assessment) is the preferred irrigation area. GHD notes that this area does not have any planned amenities (i.e., toilet blocks and showers for campers) and this may be why this area was selected as preferred for spray irrigation. Table 8 in W&A's Revised Wastewater Assessment (July 2018) notes that groundwater has been encountered at depths of 0.65 m below ground level in June 2018 (H18-606/2) in the north-eastern area where irrigation is proposed (black hatched areas in Figure 5) and similarly more shallow than one metre in BH22 and BH23 in this same area (as monitored in 2010). There are other boreholes in EMA2, further west, that have indicated deeper groundwater (> 1 m).	Australian Guidelines for Water recycling Item 8 in W&A response, 3 October 2018

Item	Current information/W&A comment(s)	GHD response	Reference
		On review, it would seem that areas somewhat further west within EMA2 (more in the middle of this area in vicinity of H18-606/3, GSBH21 GBSH18) are better suited for irrigation. These areas are still sufficiently far from the mapped 1 in 20 and 1 in 100 flood extent to the south (as well as the forested areas) and further from waterways near the site. It is considered that if the microbial water quality is as proposed (under C above), that the risk from irrigation to public health in this area can be sufficiently controlled through irrigation practices (i.e., subsurface or low level sprays) or access restrictions (i.e., night irrigation). The risks to groundwater and surface water is harder to control in areas where there is very shallow groundwater and nearby waterways. If there are concerns about heavier sub-soils beneath some areas, this may be able to be offset by application of lower rates of irrigation over a larger area. GHD notes that the MEDLI model has taken into account the very shallow groundwater in this area as part of the model. However, irrigating areas where the groundwater is less than 1 m below ground level is not best practice and there is insufficient information on the groundwater condition and the local hydrogeology to adequately assess the risk to groundwater and nearby surface waters. This was discussed in detail in GHD's response to the revised wastewater assessment (September 2018). **Further comments following review of information and proposed approval conditions from NBP and W&A (23 October 2018)** NBP and W&A provided their own list of recommend approval conditions for GHD to review following the preparation of the draft version of this document for discussion at the meeting on 19 October 2018. The list of recommended approval conditions provided by NBP and W&A states that MEDLI modelling shall be used to determine the area required for the disposal of recycled water and that the Proponent shall size the irrigation area based on: 'a) selection of an area where depth to groundwater is typically 0.6 m or greater below ground level'. This proposed condition has been provided by NBP and W&A without any further written communication as to why the Proponent insists that they must irrigate the area where the most-shallow groundwater persists at the site, which directly contradicts the queries and advise provided by GHD herein and, best practice for recycled water irrigation with consideration to the risk of waterlogging and impacts to groundwater. Given that no further justification for this approach has been provided, and based on observations that there is sufficient area onsite to avoid the areas where groundwater has been measured at > 1 m, GHD has amended this condition to require irrigation to be limited to areas where groundwater is typically 1 m or greater below ground level. *GHD has recommended conditions of approval for irrigation areas and timing of irrigation, as well as monitoring requirements, to protect soil, land and groundwater in Section 4 below*.	

Item	Current information/W&A comment(s)	GHD response	Reference
6	Kitchen sullage transport to Summerland waste facility	Provided the Facility has the capacity to cater for all sullage, then GHD has no issue, although the treatment process at Summerland is not divulged.	
7	Treatment efficiency	GHD does not dispute the ability of reed bed systems to cater for wastewater. However, our main issue is the apparent adopted ability of the proposed systems. The reductions of contaminants allowed for by the aseptic tanks is not correct and consequently the loading to the reed beds will be higher than stated. However, GHD concurs with the proposed current sizing of the reed beds. Nevertheless, there will be increased N and P loadings which impacts on the feasibility of irrigation with this wastewater.	
8 a	Wastewater is being generated onsite and will remain onsite. As such the OSMS does not fall under the Australian Guidelines for Water Recycling, the NSW DPI Recycled Water Management Systems, or the NSW DEC Use of Effluent for Irrigation. All of these guidelines refer to wastewater generation on one property, and its beneficial reuse on another property such as for golf course irrigation, horticulture, etc.	The wastewater generated needs to meet certain criteria to minimise public health risks and off-site impacts. Australian Guidelines for Water Recycling and the NSW DEC Use of Effluent for Irrigation (Guidelines) do not specifically limit the use of these guidelines to schemes where the water is generated at one site and disposed to another. Both documents mention that they are advisory in nature and do not impose legislative requirements that must be adhered to. The application of other guidelines and standards of treatment is acceptable provided that there is sufficient evidence to show that the environment and public health can be protected. Irrespective of the applicability of any guideline referenced, it is an offence under the NSW's *Protection of Environment Operations Act 1997* to pollute any water. Based on this and our experience of best practice, an approach that reduces perceived risks to an acceptable level is the basis for the assessment made by GHD.	NSW DEC Use of Effluent for Irrigation Australian Guidelines for Water Recycling Item 8 in W&A response, 3 October 2018
8 b	It is our view that generation of wastewater and land application of treated effluent on the NBP (at allowable rates) whether by subsurface of surface means, is permissible under the NSW Local Government Regulation and Act. Surface irrigation of secondary treated effluent is allowed as long as the parameters meet the 20/30/30 rule.	GHD assumes that 20/30/30 rule mentioned by W&A is the following: • 20 mg/L BOD • 30 mg/L SS • 30 org/100 mL faecal coliforms The above standards (as indicated by the table in the response under item 8 by W&A, 3 October 2018) is acceptable for wastewater irrigation and better than the minimum standard for municipal use of recycled water stated in a number of guidelines, including the Australian Guidelines for Water Recycling. *GHD has recommended minimum treatment standards that must be met and verified by regular monitoring. It has also been recommended that specific controls be enforced to protect public health. These recommendations are captured in the suggested conditions of approval in Section 4.*	Australian Guidelines for Water Recycling Item 8 in W&A response, 3 October 2018

Item	Current information/W&A comment(s)	GHD response	Reference
		It is noted that the Local Government Act, Section 60, refers specifically to the obligations that a council has in regards to the implementation of a recycled water scheme. A detailed risk assessment forms the cornerstone of any recycled water scheme, as well as a detailed (and approved) management plan governing the use of the recycled water as part of a scheme. These requirements have been considered as part of the conditions of approval recommended in Section 4. **Further comments following review of information and proposed approval conditions from NBP and W&A (23 October 2018)** The Proponent responded to queries made by GHD in the draft revision of this letter to state that they will commit to the above treatment standard for disposal to land, and, if these standards are not met, then the wastewater will be removed from site for suitable offsite disposal. GHD accepts this approach and the associated approval conditions provided by the Proponent for the minimum recycled water quality, which has been incorporated into Section 4.	
8 c	S6 Regulations and Standards. Suggested that the OSMS would be considered "effluent recycling", and that the output quality should be BOD < 20 mg/L, TSS <30 mg/L, Faecal Coliforms <1000 cfu/100 ml. TN typically < 40 mg/L, TP < 7 mg/L	"Effluent recycling" in this context refers to recycled water (i.e., sewage water (influent) treated to a suitable standard for irrigation), which is applicable to the scope of this assessment. The TSS, BOD and coliform values quoted by GHD are consistent with the minimum requirements from Australian Guidelines for Water Recycling (for municipal schemes where strict access controls are applied). In regards to the values given for TN and TP, GHD's stated that these are *typical* values to provide a point of reference. Irrigation with recycled water with higher concentrations is feasible, depending on site conditions and mitigation measures put in place. GHD has assessed the advice provided by W&A's independent reviewer regarding likely wastewater quality from the proposed onsite treatment systems. In the submission of 25 October, the treatment system has been enhanced to include aeration of the storage tanks to achieve some volatilisation of ammonia, recirculation from reed beds, denitrifying filters and provision for implementation of a final zeolite system for further ammonia removal. There is also a clause stating *"If, at the final process modelling stage it becomes apparent that developing such a system cannot meet the higher effluent quality limits or the costs are found to be commercially prohibitive, then Parklands would dispose of effluent to a suitable licensed treatment facility"*. While GHD does have concerns over the actual process to achieve the ammonia levels, and rather than debate further if this treatment quality is feasible, or consider case of trucking off site, GHD suggests that some additional modelling be completed (using	Australian Guidelines for Water Recycling Item 8 in W&A response, 3 October 2018

Item	Current information/W&A comment(s)	GHD response	Reference
		MEDLI). This would demonstrate ability of land to cater for proposed effluent quality and also the scenario that of higher nitrogen and phosphorus (TN 100 mg/L and TP 30 mg/L). The outcome of that would be review the irrigation area with a view reduce the risk to land, groundwater and nearby surface waters. These recommendations are provided in Section 4 below. **Further comments following review of information and proposed approval conditions from NBP and W&A (23 October 2018)** The Proponent insists that the treatment standard proposed can be met and 'if at the final process modelling stage it becomes apparent that developing such a system cannot meet the higher effluent quality limits, or the costs are found to be commercially prohibitive, then Parklands would dispose of effluent to a suitable licenced treatment facility, which is common practice for most outdoor arts and music festival venues' (W&A, 23 October 2018). GHD also considers that if regular monitoring at any stage of the operation of the system shows that the required treatment standard is not being met, then the Proponent must: a) assess the suitability of the achieved standard for irrigation with consideration to the risks to public health and the environment and applicable guidelines; b) undertaken offsite disposal of the recycled water until the required standard is achieved, or, alternatively approval is obtained to dispose of recycled water of a lesser standard to land, subsequent to the completion of revised nutrient and water balances. GHD has made some slight amendment to the proposed approval conditions to better capture the requirement for contingency disposal methods during operation of the scheme.	
9	Storage of wastewater	GHD's main concern is the storage of wastewater in the new large tanks (2.3 ML), which is not currently practised (we are not referring to the wheelie bins), and vector and odour mitigation will be required. In the recent submission from W&A aeration is proposed.	
10	Chlorine disinfection	GHD is not disputing the effectiveness of chlorine as a disinfectant, rather the point is made that if effluent quality is poor (say BOD > 30 mg/L), and then chlorine disinfection will be ineffective. Furthermore, careful management of chlorine dosing is required as too much chlorine will be detrimental to vegetation, and too little chlorine will result in inadequate disinfection.	

3 Remaining issues for clarification in discussion with DPE

3.1 Wastewater volumes

As noted in the table above, the estimated allowance for the conference centre should be uprated. This is likely to have some impact on treatment plant sizing and treated wastewater volumes for disposal.

3.2 Treatment system

The overall system is potentially suitable for the stated effluent volume, and it is noted that a revision of proposed system (incorporating increase of size of reed bed system from 467 m^2 to 2,100 m^2) might be suitable for appropriate treatment of the wastewater for irrigation.

In the submission form W&A (23 October 2018) there has also been some additional processing / treatment has been proposed to achieve further nitrogen reduction. While there are likely benefits and contaminants will likely be reduced, GHD still considers the target effluent quality (from inflow TN > 300 mg/L) to be ambitious. However, in the interest of expediting the approvals process, rather than debating the likely final water quality further, GHD has made recommendations for conditions of approval to mitigate risks to the environment in the event that the final wastewater does not meet the standard predicted by W&A. These recommended conditions of approval specifically relate to the need to verify the quality of the wastewater on an ongoing basis. It will also be important for the Proponent to undertake some further modelling to account for the irrigation area and irrigation practices required to dispose of the recycled water safely, in the event the actual recycled water is closer to a 'worst case scenario' (see Section 4).

3.3 Burying of compost material at the site

The site is largely sufficient in size that burying of compost material should be able to continue provided adequate controls are in place subject to the following:

- No burying of compost to occur in areas prone to flooding (1:20 and 1: 100 flood extent modelled for the report)
- Compost areas must not be established in low lying areas with shallow groundwater
- No irrigation with recycled water in or near areas where composting is occurring
- Development and approval of a management plan for composting and management of biosolids at the site.

These conditions are captured in Section 4.

3.4 Nutrient accumulation in the irrigation area

W&A has referred to the MEDLI model used for the site to determine the area required to dispose of recycled water. The output from this model suggests that no net accumulation of nitrogen is predicted and that based on an irrigation area of 3.6 ha, there is 28 years of phosphorus storage capacity, after which time irrigation may need to cease on this area and commence in another area to prevent leaching of phosphate to groundwater. W&A notes that there is approximately 26 ha where irrigation may occur, indicating that the proposed irrigation scheme is sustainable. W&A goes on to note that the model is 'conservative' in that it restricts the irrigation depth based on the depth to groundwater at the shallowest point of 0.6 m below ground level to prevent ingress of irrigation water to the water table. However, GHD

notes that no error margin has been built into the nutrient concentrations used in the model by W&A (i.e., model based on 19.8 mg/L phosphorus and 48 mg/L nitrogen, as was the expected quality at the time the Revised Wastewater Assessment was prepared).

As mentioned in Section 3.2, the ability of the wastewater treatment process to meet the proposed treatment standards cannot be confirmed until the scheme is operational. In the draft version of this letter, GHD noted that given the shallow groundwater under the site and the presence of nearby drains and creeks, it is considered reasonable that nutrient balances should be completed using 'worst case' nutrient concentrations to identify the minimum area required to dispose of the recycled water in the event that the treatment standards outlined by W&A cannot be met. The Proponent has re-iterated (at discussion on 19 October 2018, and, in W&A's letter, 23 October 2018) that they will meet the stated treatment quality or dispose of recycled water to an offsite, licenced facility. GHD has amended the suggested approval conditions to provide for contingency offsite disposal and/or recalculation of nutrient loads if at any stage of the operation of the scheme the stated quality cannot be met.

3.5 Use of flood prone land for irrigation

On further review of the Revised Wastewater Assessment (July 2018), GHD notes the following:

- The areas in the south of the site are heavily vegetated and not suited for the irrigation approach outlined in the Wastewater Assessment and thus are not preferred irrigation areas.
- Given the mapped extent of 1:20 and 1:100 flood levels, periodic flooding of areas in the south of EMA2 (as mapped in Figure 5 of the Revised Wastewater Assessment) means this area is not likely to be well suited for irrigation.
- W&A suggest in their latest response that the northern area is more desirable as the proponent also owns the farmland to the north and there are less sensitive receptors in this direction than to the south of the site.

GHD's main concerns related to use of land onsite for irrigation are as follows:

- Specific, isolated areas have been selected for spray irrigation in the north-eastern corner of the site (these areas are cross-hatched black on figures in the Revised Wastewater Assessment). It is not made clear in available reports why these smaller areas within EMA2 are proposed as the preferred areas given that these areas have reported the shallowest groundwater and are at closer proximity to nearby offsite waterways that other parts of EMA2.
- Soils in EMA2 have been reported in the Revised Wastewater Assessment as highly acidic, moderately dispersive and strongly sodic (ESP = 27%). These factors indicate moderate to major restrictions for irrigation in this area, selecting the portion of this site where the most-shallow groundwater persists further increases the risk to soil health, waterlogging and drainage of nutrient-bearing water to the underlying water table. Such risks will also be exacerbated by soil conditioning that will be required to elevate the pH and reduce sodicity (i.e., lime and gypsum).

It has been assumed that W&A have suggested these areas as preferred as the maps show there are no planned amenities in these areas, making this area easier to manage using spray irrigation methods (pivot irrigator) outlined in Section 9.3 of the Revised Wastewater Assessment. GHD considers that the areas selected need to be planned to minimise risks to the environment first with 'operational' considerations (i.e., type of irrigator) built around the primary objective of environmental protection. The health risks associated with recycled water of the nominated quality are considered easier to manage than the risk to groundwater, waterlogging and nearby surface waters associated with irrigating the north-

eastern corner of the site. This is further supported by the absence of detailed groundwater quality data to confirm the baseline quality of the groundwater (as discussed in our letter report, September 2018) and no detailed knowledge of groundwater contours or regional flows and risk to nearby receptors.

The Proponent has not provided any further feedback as to why they wish to irrigate the areas with the shallowest groundwater and other limitations described above. GHD maintains that irrigation of areas where groundwater is less than 1 m below ground level poses a risk to groundwater and increased onsite waterlogging and has provided suggested approval conditions on this basis.

Recommended actions

GHD recommends that the preferred irrigation area within EMA2 be reassessed and areas positioned further west around the middle portion of the camping area, nominally areas where groundwater is typically > 1 m below ground level. The nominated irrigation area should be re-sized to achieve an irrigation 'deficit' so that soils are always irrigated to less than available field capacity (readily available water) to further reduce the risk of drainage to underlying groundwater. A percentage 'deficit' (i.e., 85% of field capacity) can be built into the MEDLI model. The preferred irrigation method should be adapted if necessary to allow the selection of the most appropriate area for irrigation.

3.6 Risks to groundwater and surface water

In GHD's previous assessment (September 2018) it was noted (Section 5.3) that 'in the current form, GHD have determined that there is insufficient information provided in the Revised Wastewater Assessment to accurately determine risks to groundwater'.

No additional information was provided in relation to groundwater in the latest correspondence from W&A (3 October 2018), or, in response to the draft version of this letter in the correspondence provided to the DPE by W&A and NBP on 23 October 2018.

Recommended actions

GHD considers that a groundwater monitoring network must be established and be operational, prior to irrigation commencing at the site. The groundwater monitoring network must be designed in consultation with a qualified hydrogeologist and be sufficient to assess the following:

- Establish baseline groundwater quality in the shallow aquifers beneath the site
- Complete a hydrogeological conceptual model and contours to determine groundwater flow direction
- Provide for regular groundwater level and chemistry monitoring with level results reported in mAHD and depth below ground level and chemistry assessed by a NATA accredited laboratory
- Monitoring at a 'high' frequency initially, may be decreased over time when no impact is confirmed. 'High frequency should be determined in consultation with a hydrogeologist, but as an indicator, may include weekly level monitoring (or, monthly, with one or two continuous loggers in selected locations where groundwater is predicted to be very shallow in irrigation areas) and quarterly chemistry monitoring including collection of field data (DO, EC, pH, redox) and laboratory data (TDS, phosphorus, nitrogen, nitrate).

3.7 Environmental management

W&A notes that an Irrigation Management Plan and a Compost Management Plan will be prepared for the site, which is appropriate. GHD considers that, given the limitations associated with irrigation at this

site in terms of soil chemistry of EMA2 (i.e. sodicity, acidic soils, potential for poor drainage and waterlogging and a shallow water table), any management plan for the site should consider the main components of the Australian Guidelines for Water Recycling to holistically manage risks to the environment associated with operation of the planned recycled water scheme. The Interim NSW Guidelines for Management of Private Recycled Water Schemes (DWE, 2008) and the Australian Guidelines for Water Recycling provide a framework against which a WMP for the site can be developed to facilitate a process where the performance of the scheme (in terms of meeting key environmental objectives) is continuously evaluated and improved. The Irrigation Management Plan and the Compost Management Plan could be integrated into the WMP or be provided as attachments (i.e., in the form of sub-plans). The WMP must contain environmental controls that will protect the site and surrounding environment from harm as well as any contingency measures that must be implemented when nominated trigger levels are reached.

4 Recommended conditions of approval

This section summarises the recommended Conditions of Approval for DPE to consider. The approval conditions suggested by the Proponent (23 October 2018) have been considered in the development of the conditions.

1. Odour control / management

Although it is noted that aeration of the stored wastewater has been included in the proposed treatment design, it is still important for the Proponent to implement **odour and vector** control on these tanks.

2. Final quality of the treated wastewater

The final quality of the treated wastewater for disposal shall be:

- BOD < 20 mg/L,
- SS < 30 mg/L,
- TN = <50 mg/L,
- P = <20 mg/L, and
- *E. coli* (or, thermotolerant coliforms) < 30 cfu/100 mL.

The Proponent must validate the quality of the final treated wastewater as suitable for application to land by monitoring to occur as described in the WMP.

3. Wastewater Management Plan

The Proponent shall prepare a Wastewater management Plan (WMP) to manage the operation of the on-site treatment system for approval by DPE. The WMP should be prepared with reference to the Interim NSW Guidelines for Management of Private Recycled Water Schemes (DWE, 2008) and the Australian Guidelines for Water Recycling to include the following:

- Wastewater treatment system description
- Irrigation system description
- Environmental policy and organisational roles, responsibilities and authorities
- Environmental and health risk assessment
- Compliance obligations

- Measurable performance standards (including, but not limited to, trigger limits for quality parameters with reference to baseline monitoring and relevant guidelines)
- Competence and awareness
- Internal and external communications and reporting
- Control of documented information
- Operational planning and controls
- Emergency preparedness and response
- Evaluation of performance (monitoring and measurement, analysis and validation)
- Evaluation of compliance (by inspections, internal and external audit)
- Non-conformity and corrective action
- Management review and continuous improvement.

4. Reed bed harvesting

On-going monitoring of the reed bed effluent must completed at least monthly in accordance with processes and criteria within the approved WMP environmental criteria to demonstrate compliance with quality criteria and suitability for irrigation. The WMP must include procedures for the regular harvesting of reed bed plants to maintain the reliability in TN reduction.

5. Irrigation Management

The Proponent shall prepare an Irrigation Management Plan (IMP) for the site for approval by DPE, as part of the WMP. The IMP must address:

- Methods of irrigation application (i.e., spray or drip) and approach to irrigation scheduling
- Design controls (i.e. to prevent irrigation in high winds or following rainfall)
- Soil moisture monitoring methods water and nutrient balances and nominated deficits or leaching to be applied. Monitoring shall be initially undertaken as determined by the hydrogeologist and, may be decreased over time as specified by the IMP (after due consideration of results);
- Required soil, groundwater and recycled water testing and limits based on guideline values
- Scheduled testing and maintenance of the system
- Mitigation measures to protect the soil, groundwater and public health based on relevant guidelines, and
- Contingency measures to be applied if triggers are reached including alternative methods for wastewater disposal if the site is saturated and onsite storages are near capacity, including provision to truck water from site to a licenced facility for disposal when monitoring indicates quality does not meet the requirements of this approval and the WMP.

6. Irrigation controls for environment and public health

The IMP must include site-specific controls to manage risks to environment and public health from recycled water irrigation, controls in the IMP must include, but not be limited to, the following:

- The final method of irrigation (i.e., drip or high or low volume spray) selected to protect human health adopting a risk-based approach.
- Irrigation scheduling to occur in response to soil moisture levels to meet the requirements stated in IMP and records shall be maintained and made available to the Council, DPE, EPA on request.

- Irrigation must not occur within 48 hours of forecasted significant rainfall (i.e., rainfall > 10 mm) or when soil moisture monitoring determines that the soil is saturated, or the site is flooded.
- No irrigation of public access areas within 48 hours of a scheduled event at the site, or, longer if soil moisture monitoring indicates that the soils will be saturated at the time of the event if irrigated (potentially exposing patrons to pooled recycled water).
- Real-time soil moisture monitoring within the nominated irrigation area prior to the commencement of irrigation. Irrigation scheduling to occur in response to soil moisture levels to meet the requirements stated in the Irrigation Management Plan and records maintained and made available to DPE, EPA or their nominated representative on request.

7. Irrigation Scheme Modelling

MEDLI modelling shall be used to determine the area required to dispose of recycled water. The Proponent shall size the irrigation area based on:

a. selection of an area where depth to groundwater is typically 1.0 m or greater below ground level, and
b. sufficient size to demonstrate sustainable operation and to accommodate water and nutrient loads for recycled water concentrations of TN 50 mg/L, TP 20 mg/L and an alternative scenario of TN 100 mg/L and TP 30 mg/L.

The revised irrigation scheme modelling must be completed to refine the irrigation area and methods for inclusion in the IMP.

8. Groundwater and surface water monitoring

A groundwater and surface water monitoring program needs to be prepared and submitted to DPE for approval. This does not need to be a separate document and can be part of the IMP or WMP. Groundwater and surface water monitoring sites and baseline monitoring must be completed at the site and provided to DPE prior to irrigation commencing. The groundwater monitoring network shall be designed and be sufficient to:

a) Establish baseline groundwater quality in the shallow aquifers beneath the site
b) Permit the development of a hydrogeological conceptual model with contours to determine groundwater flow direction
c) Provide for regular groundwater level and chemistry monitoring with level results reported in mAHD and depth below ground level, and chemistry assessed by a NATA accredited laboratory
d) Validate (through analysis of results) that there are no impacts to groundwater and surface water with reference to baseline conditions and relevant guideline values.

9. Compost management

As stated in W&A's letter response (dated 22 May 2018) "*Compost management and any stormwater management measures would be detailed in the Wastewater Management Plan.*" Therefore, the Proponent shall prepare a Compost Management Plan (CMP) for the site for approval by DPE, as part of the WMP.

Note though that the following requirements apply to compost management:

a) No burying of compost to occur in areas prone to flooding (1:20 and 1:100 flood extent modelled for the report)

b) Compost areas must not be established in low lying areas with shallow groundwater

c) No irrigation with recycled water in or near areas where composting is occurring

d) Development and approval of a management plan for composting and management of biosolids at the site.

10. Reporting

The Proponent must prepare an annual report for Council and DPE related to the operation of the on-site treatment system and recycled water scheme. The annual report must detail irrigation volumes, findings of any soil, water or groundwater monitoring, incidents and complaints and mitigation measures applied and an assessment of compliance against the requirements of plans or programs required by this approval.

11. Independent audit

By the end of the first year of the operation of the recycled water irrigation scheme, the Proponent shall commission and pay the full cost of an Independent Audit of the recycled water irrigation scheme. This audit must:

a) be conducted by a suitably qualified, experienced and independent auditor whose appointment has been mutually agreed to by the proponent and DPE

b) include consultation with relevant agencies

c) assess the environmental performance of the project and assess whether it is complying with the requirements of this approval (and any plans or programs required under this approval)

d) recommend appropriate measures or actions to improve the environmental performance of the project and/any assessment, plan or program required under this approval, and

e) recommend the frequency of any future audits for approval by DPE.

Within six weeks of completing the audit, the Proponent shall submit a copy of the audit report to Council and DPE, with its response to any recommendations contained in the audit report.

Sincerely
GHD

Jo Stephens
Senior Environmental Scientist
&
Mitch Laginestra
Principal Engineer - Water, Wastewater Treatment & Odour Control