

Water Supply & Wastewater Assessment

Linnaeus Property Eco Tourism Mixed Use Proposal



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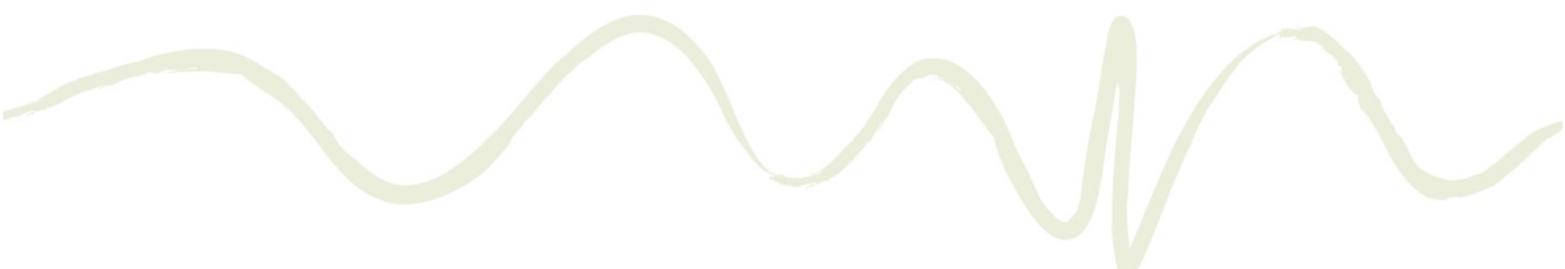
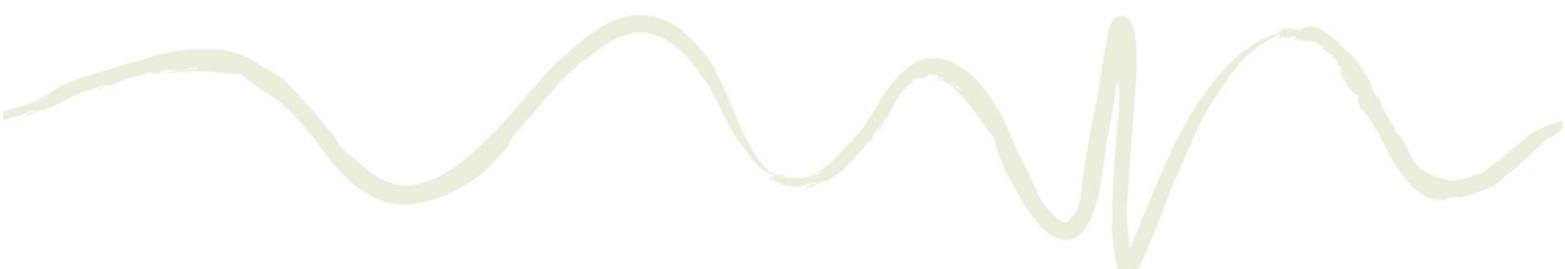


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Appendix A Estimated Wastewater Generation



1. Introduction

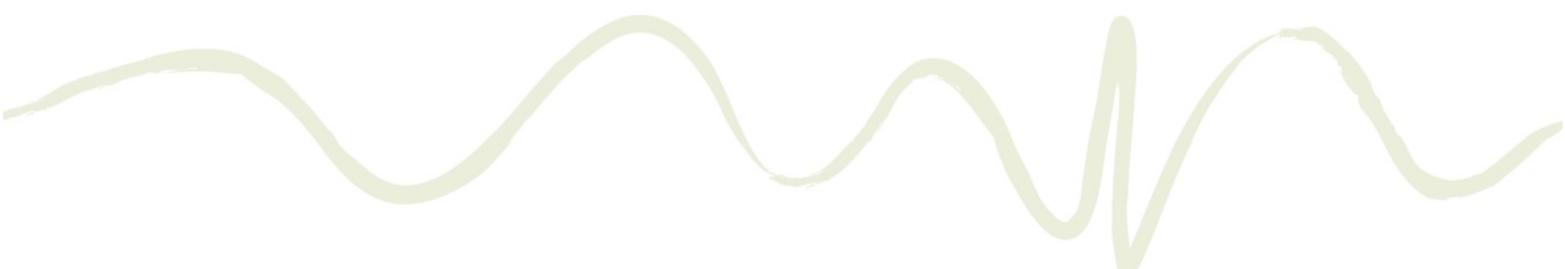
1.1 Background

This water supply and wastewater assessment has been prepared to accompany a development application (DA) prepared by Planners North to be lodged with Byron Shire Council (BSC) for a proposed mixed use development at the Linnaeus estate at 951 Broken Head Road, Lot 1 DP 1031848, Broken Head.

The proposed mixed use development would permit some of the existing facilities to continue to be used for private education; allowing the remaining existing facilities to be used for eco-tourism and providing further new facilities for eco-tourism purposes. The development involves a number of new tourist accommodation cabins, associated internal infrastructure upgrades and back-of-house facilities, supplementing existing infrastructure and facilities at the site.

1.2 Purpose of this Report

The Linnaeus estate does not have connections to a town water supply or a town sewer. As such, the estate has on-site facilities for water supply and wastewater management. The purpose of this report is to present the estimated water demand and wastewater generation associated with the proposed development and compare these to the capacities of the existing facilities.



2. Wastewater

2.1 Existing Facilities

Wastewater is currently collected from the accommodation units and community buildings in 100 mm and 150 mm nominal diameter gravity mains that deliver the wastewater to the sewage pump station. There is also a separate single pressure sewer unit servicing building CB.08 (Crab community building). This pressure sewer also delivers wastewater to the sewage pump station. The existing pump station has a pumping capacity of 3.0 L/s based on curves of the original design pumps provided by the supplier.

The wastewater is pumped to the wastewater treatment plant where it is treated through an Intermittent Aeration Tank with a minimum operating volume of 18.2 kL. The Hydraulic Retention Time (HRT) through this tank varies depending on the number of people on the site and the associated wastewater load. The estate currently has an approval to treat 16.8 kL/d, subject to compliance with approval conditions. As of early 2020, the average wastewater generation rate of the estate had not exceeded 6 kL/d. At 6 kL/d, the HRT is approximately 3 days.

The system is designed for sludge to be pumped onto the drying beds and the decanted treated water to be stored in a 1.5 ML pond until conditions are suitable for irrigation. Prior to being pumped to the irrigation site, the water is chlorinated in the chlorine contact tank. The effluent irrigation system has a current capacity of approximately 50 kL/d, according to a report entitled *Linnaeus Estate: Land Capability Report – Treated Wastewater Disposal* by Australian Wetlands Consulting (ref: 1-16804_04_b, Rev B, dated 02/11/2017).

The approved treatment rate of 16.8 kL/d (subject to conditions being met) equates to 150 L/p/d for the maximum limit of 112 people currently approved to be accommodated on the site. The capacity of the treatment plant (as designed) has previously been assessed as 18.1 kL/d.

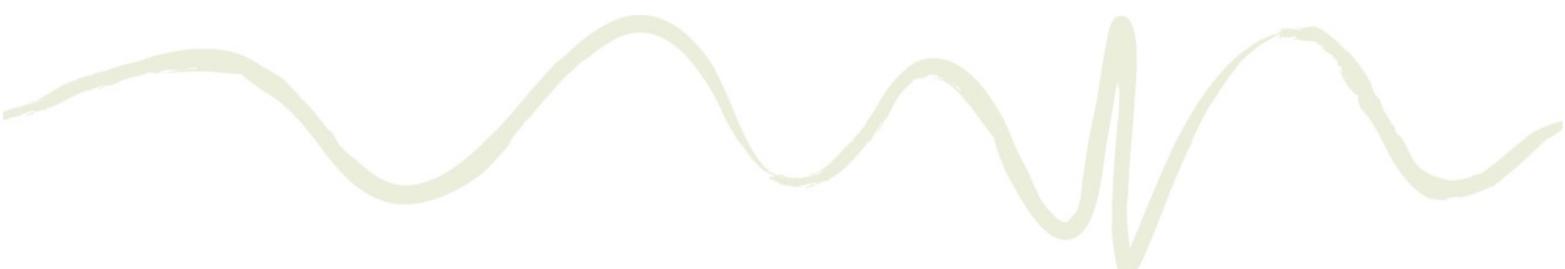
2.2 Current Operation

Based on advice from the site manager, as well as periodic site visits and information reviews completed over the past ten years, it is understood that the wastewater treatment system is appropriately operated and maintained. The key challenge is that the system requires a relatively high level of management due to the relatively low and intermittent inflow of wastewater from the estate.

The wastewater treatment system is designed to enable sludge to be pumped from the intermittent aeration tank to the sludge drying beds after the settling phase. The site manager has advised that the sludge pump and the sludge drying beds have not been utilised and alternative measures have been implemented.

2.3 Assessment of Proposed Development

The estimated wastewater generation associated with the proposed development is presented in **Appendix A**. The total average daily wastewater generation rate has been estimated as 22.6 kL/d. This exceeds both the approved treatment limit of 16.8 kL/d and the previously assessed capacity of the wastewater treatment plant of 18.1 kL/d. As such, the wastewater treatment plant would require an upgrade to increase capacity and the approved treatment limit would need to be increased.



A revision to the existing approved wastewater treatment plant design has been prepared by Aerofloat and is presented in the report entitled *BHCF Pty Limited: Process Mechanical and Electrical Design Sewage Treatment Plant Upgrade* (dated July 2018). The Aerofloat design would increase the treatment capacity to 30 kL/d and would be accommodated within a similar footprint to the approved plant.

As noted above, the treated effluent irrigation system has a current capacity of approximately 50 kL/d, which is sufficient to accommodate the increased flow.

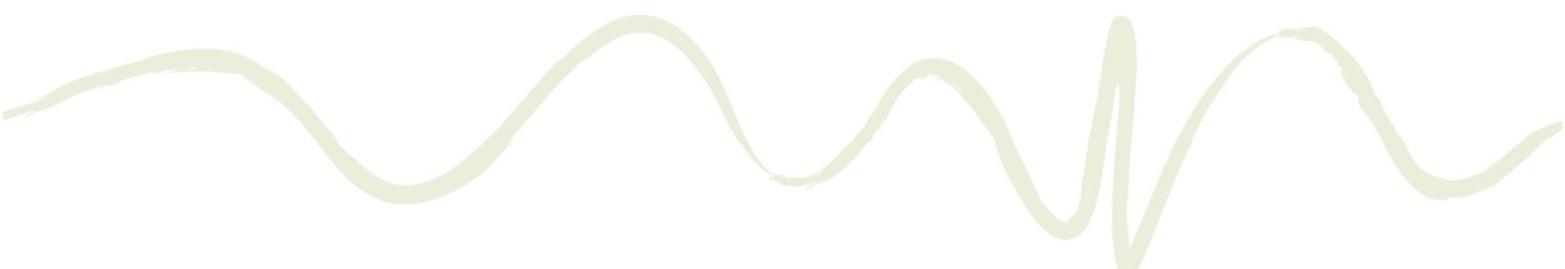
The sewage pump station has a current theoretical pumping capacity of 3.0 L/s. The calculated Peak Wet Weather Flow (PWWF) rate for the proposed development is 2.7 L/s. Given the emergency storage volume available (10.8 kL) and the expected storm duration of any single event, it is expected that the existing pump station will have capacity to accommodate the increased wastewater flows associated with the proposed development.

The existing gravity reticulation has a capacity in excess of 5 L/s in the 100 mm nominal diameter pipework and in excess of 10 L/s in the 150 mm nominal diameter pipework. These capacities are therefore able to accommodate the expected Peak Wet Weather Flow of 2.7 L/s for the proposed development.

The filter backwash wastewater from the pools and spas is not included in the wastewater generation calculations presented in **Appendix A**. It is proposed that the filter backwash wastewater, which is estimated at an average of 1.1 kL/d, would be collected, treated and discharged via a separate system. This system would be designed and assessed at the detailed design stage.

2.3.1 Depot (Building CB.07)

The proposed depot building (CB.07) is located a substantial distance from the other buildings and the wastewater treatment plant. As such, it is impractical to incorporate wastewater from the depot building into the centralised wastewater management system. It is proposed that the depot building would be serviced by a stand-alone on-site sewage management system, with a capacity of 1 kL/d. Given that there are relatively large areas of cleared land in close proximity to the proposed depot building, it is expected that a suitable land application area can be readily accommodated.



3. Water Supply

3.1 Existing Facilities

Raw water is currently abstracted from a raw water dam on the property with a reported capacity of 10 ML. It is understood that secure yield (security of supply) calculations for the existing dam have been undertaken on behalf of the site manager. The water is pumped from the dam to a storage tank at the water treatment plant. The site manager has advised that the water treatment plant has a design capacity of 41 kL/d. From the treatment plant, the potable water is pumped through a 63 mm nominal diameter (51 mm ID) Class 12.5 MDPE rising main approximately 200 m long, with a current pumping capacity of 2 L/s, to six (6) x 45 kL water supply storage tanks. The storage tanks have a combined storage volume of 270 kL and a top water level (TWL) of 50.97 m. From these storage tanks, the water gravitates to the reticulation network. This network has a flow capacity of 10 L/s at a discharge pressure of 250 kPa according to a hydrant flow test undertaken in April 2020.

3.2 Current Operation

The estate reports a free chlorine residual of 0.1 mg/L at the extremities of the system. This is reportedly tested twice per week. Overall, it is understood that the system has been operating well with no serious supply or water quality issues reported. Bacteriological testing is carried out once per week on the site in order to ensure water quality supplied is in line with the Australian Drinking Water Guidelines.

3.3 Assessment of Proposed Development

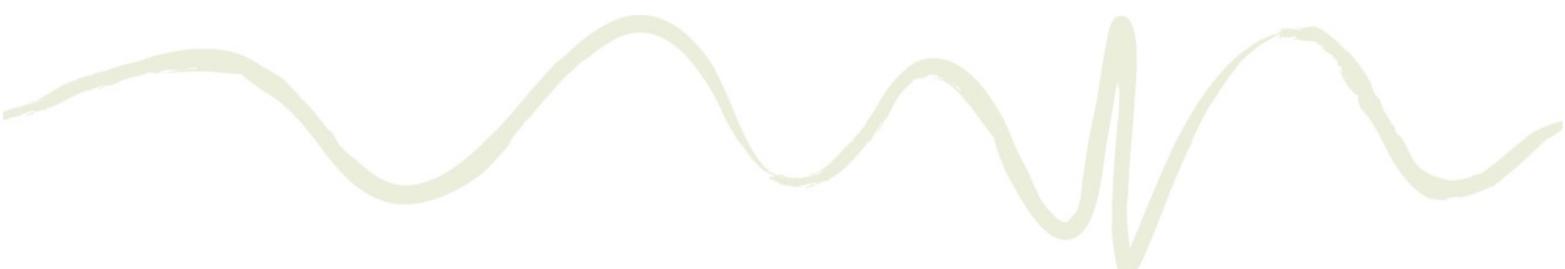
The water demand of the proposed development has been estimated as 29.2 kL/d. This comprises the estimated daily wastewater generation rate of 22.6 kL/d, plus an additional 6.6 kL/d to account for water use that does not get collected in the wastewater collection system (e.g. outdoor taps/ showers, garden irrigation, pool top-up, pool filter backwash, leakage).

The estimated water demand is less than the water treatment plant capacity of 41 kL/d, so the plant has sufficient capacity for the proposed development. Secure yield calculations are required to confirm that the existing water supply dam (or other available water sources) has sufficient capacity and, as noted above, it is understood that such an assessment has been undertaken.

It is not anticipated that there would be any negative impacts on the existing water distribution infrastructure due to increased demand requirements. The existing reticulation network will be able to meet the required peak instantaneous demand of 6.9 L/s. The increased water demand would have a positive impact on water quality in that the water age would potentially be reduced.

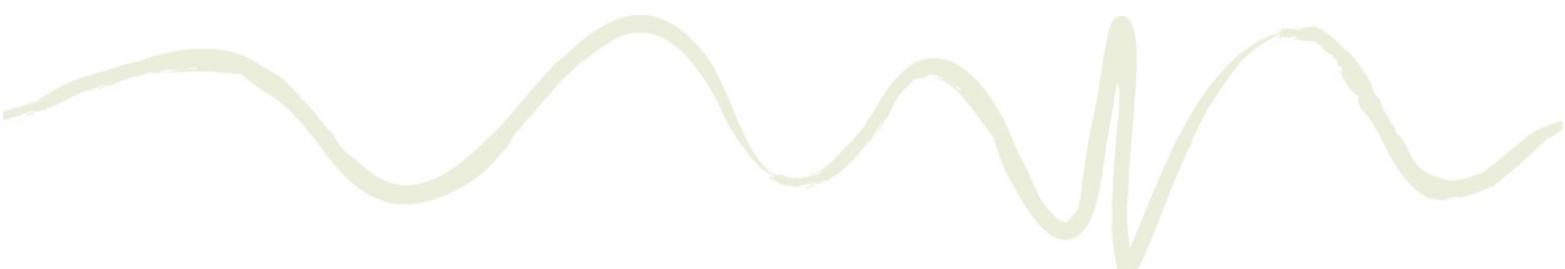
3.3.1 Fire Fighting

Several new hydrants will be required to comply with bushfire and structural fire fighting requirements to ensure the existing and proposed structures can be adequately protected in case of fire. Each new building will have access to a fire fighting water supply (hydrant) with suitable access by fire fighting vehicles in accordance with *Planning for Bush Fire Protection* (NSW RFS, 2019). All faces of new and existing structures will be reachable by fire hoses connected to the nearest hydrant.



3.3.2 Depot (Building CB.07)

As per Section 2.3.1, the proposed depot building (CB.07) is located a substantial distance from the other buildings and the water supply infrastructure. It is proposed that the depot building would be serviced by a stand-alone water supply system comprising rainwater tanks with a total capacity of approximately 50 kL.



References

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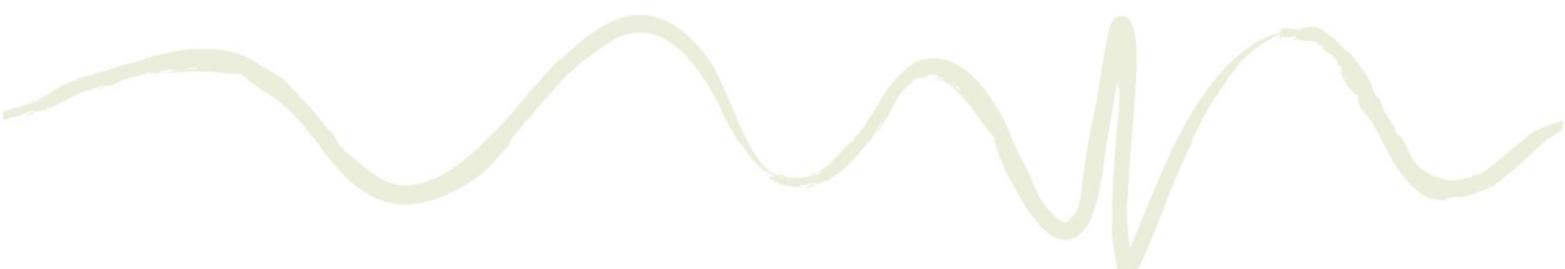
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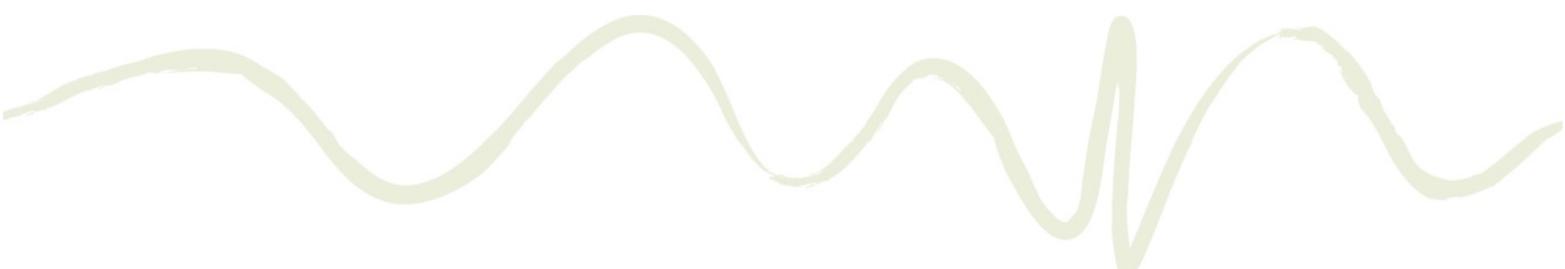


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Appendix A

Estimated Wastewater Generation

Wastewater Generation Calculations

Existing wastewater treatment plant capacity 18,100 L/d
 Existing pump station capacity 3 L/s

Design criteria / assumptions

Wastewater generation 150 L/d/EP (as per AS1547)
 Assumed occupancy for ecotourism 1.7 EP per bedroom (for resort room)
 1.5 EP per bedroom (for 3 bed Type A)
 Resort staff 49 staff
 0.13 EP/staff

Proposed Ecotourism w Educational Facility									
No.	Name	Number of Buildings	Category	Calculation Unit	EP per Calculation Unit	Calculation Units per Building	EP	Avg. Daily Wastewater Generation (L)	
2, 34	Hill House	2	Residence	Bedroom	1.5	3	9.0	1,350	
12-16 & 18	Accommodation Type A - education	6	Accommodation 3 beds	Bedroom	1.5	3	27.0	4,050	
3-11 & 17	Accommodation Type A - resort	10	Accommodation 3 beds	Bedroom	1.5	3	45.0	6,750	
24-27	Accommodation Type B - resort	4	Resort room	Bedroom	1.7	1	6.8	1,020	
A.1-A.8	Beach Cabin	8	Resort room	Bedroom	1.7	1	13.6	2,040	
A.9-A.22	Treehouse Cabin	14	Resort room	Bedroom	1.7	1	23.8	3,570	
B.1-B.4	Rainforest retreat	4	Resort room	Bedroom	1.7	1	6.8	1,020	
C.1	Treehouse retreat	1	Resort room	Bedroom	1.7	1	1.7	255	
	Resort staff						6.4	956	
CB.1	Centre (kitchen)	<i>from ET calculations based on Council's Policy - Water and Sewer Equivalent Tenements 2018</i>							614
CB.4	Pool amenities - existing	<i>estimated additional wastewater generation (above 150 L/p/d allowance)</i>							40
CB.4	Pool - food offering	<i>from ET calculations based on Council's Policy - Water and Sewer Equivalent Tenements 2018</i>							378
CB.4	Pool - day spa	<i>estimated additional wastewater generation (above 150 L/p/d allowance)</i>							560
Total							140.1	22,602	