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WATER SUPPLY ASSESSMENT FOR TWO TAILS WINERY, 963 ORARA WAY NANA GLEN (0160/19DA)

This letter reports on a water supply assessment for the proposed Two Tails Winery development at the above address.

An inspection of the existing water supply arrangements was undertaken on 24 November 2021. The existing water supply is a combination of tanked roof water with bore water as backup.

Roof Water Tanks and Catchment

There are three permanent buildings on the property from which roof water is harvested into several tanks as shown in Figure 1. The figure shows the location of the tanks which are colour coded to their approximate roof catchment. Note, stated capacities and roof areas are only approximate, likely to ± 10%

The restaurant's primary tank is a 22,000 L above ground poly tank. However, it only currently captures 48 sq.m of the restaurant's 265 sq.m of roof. The remaining roof is plumbed towards, but not currently connected to, twin 900 L concrete tanks under the restaurant's deck. The supply from the primary tank is treated through canister filters and UV disinfection before plumbed to all fixtures in the restaurant.

The shed has two 3,200 L ploy tanks, both with 101 sq.m of roof. This water is mostly used for general agricultural uses. Note, there is no installed irrigation on the property.

The house has three tanks. The smallest is not connected. The remaining two, a 4,400L poly and 20,000 L concrete which is partly in the ground, share the 304 sq.m roof.

There is also a concrete paved area with a marquee used for outdoor functions although no water is captured.

The roof gutters, down pipes and roof water plumbing are in fair to poor condition. The number of down pipes is also insufficient by current plumbing standards. Significant gutter overflows in heavy rain is likely, although this would still be only a small percentage of runoff volume.

The tank overflows are not interconnected. Overflow from any tank is lost. There is also no permeant connection of supply from building to building. It is understood that temporary connection, by means of hoses and pumps can be arranged if needed to transfer water from tank to tank, but this generally hasn't been done.

Figure 1 – Arrangement of Roof Water Tanks

Bore Water

A bore is located at the north-west corner of the property, some 180 m from the buildings. A fixed line from the bore runs to the Restaurant's 22,000 L primary tank and to the house's 20,000 L tank. The operation of the bore is not automated. A person is required to attend the bore to start and stop flow to the tanks.

Proposed Development

The proposed development includes:

- Additional 45 sq.m of roof over the restaurant's deck.
- An outdoor lawn area to expand the outdoor function area. Increased patronage is proposed.
- New carpark pavements.
- A two-bedroom farm stay accommodation within the shed. No additional roof area.
- Extension to the house including an attached garage, pool, laundry and office, of 200 sq.m additional roof.

Water Demand

Water demands were estimated as follows:

- Restaurant and Functions:
  - Anticipated peak patronage, by others, is 312 customers day over all sittings. The average stay for a meal or wine tasting will be in the order of 2 hours.
  - 0.5 L of water consumed per person.
  - 5 L of water need in the kitchen to prepare meals and clean dishes per customer.
  - On average one visit to the bathroom averaging 4 L (3/6L cisterns plus hand washing).
  - Sums to 9.5 L per customer per day = 2,964 L/day peak. Note, this is significantly less than used in the wastewater assessment report (ref 1), but considered more realistic for the type of development.
  - Staff, max 8 at 30 L/day = 240 L/day peak.
- Shed/Farm Stay:
  - Full occupancy of 4 at 120 L/day = 480 L/day peak.
- General uses:
  - Cleaning of equipment, say 20 L/day constant.
  - No fixed irrigation of crop. Possible hand garden watering, say 20 L/day on average.
  - Pool care, say 50 L/day constant.
- House:
  - 4 Bedroom, average 5 occupants at 120 L/day = 600 L/day constant.

The assumed monthly demand distribution is summarised in Table 1.

Table 1 – Monthly Demand Distribution

Month of Year	Restaurant / Functions Peak demand 3204 L/day Patonage Week end	Week day	Combined	**Average Demand (L/day)**	Accommodation Peak demand 480 L/day Patonage Week end	Week day	Combined	**Average Demand (L/day)**	House/ General Use **Demand (L/d)**
Jan	100%	70%	79%	**2517**	100%	70%	79%	**377**	**690**
Feb	80%	60%	66%	**2105**	80%	60%	66%	**315**	**690**
Mar	60%	50%	53%	**1694**	60%	50%	53%	**254**	**690**
Apr	80%	60%	66%	**2105**	80%	60%	66%	**315**	**690**
May	50%	30%	36%	**1144**	50%	30%	36%	**171**	**690**
Jun	40%	25%	29%	**938**	40%	25%	29%	**141**	**690**
Jul	40%	25%	29%	**938**	40%	25%	29%	**141**	**690**
Aug	40%	25%	29%	**938**	40%	25%	29%	**141**	**690**
Sep	50%	30%	36%	**1144**	50%	30%	36%	**171**	**690**
Oct	60%	40%	46%	**1465**	60%	40%	46%	**219**	**690**
Nov	70%	50%	56%	**1785**	70%	50%	56%	**267**	**690**
Dec	80%	60%	66%	**2105**	80%	60%	66%	**315**	**690**
Yearly Demand (kL)				**574**				**86**	**252**

The assumed average customer patronage was 49%, similar to that used in the wastewater report, which is noted as being optimistic.

It should be noted that water demand estimations can, and often are, fairly inaccurate. Much depends on the users. That estimated above is conservative in that is assumes high patronage and little water conservation practices.

Modelling

A spreadsheet model was established using historic daily rainfall records over the past 116 years from Coffs Harbour. The rainfall at Nana Glen is expected to be similar. The model assumed:

- The first 1 mm of rainfall in a day on the roof is lost to evaporation.
- A runoff coefficient of 90% - 10% by volume overflows the roof gutters.
- Effective tank capacity is 90% of total volume.
- When tanks drop to effective empty, bore water is used, but only to satisfy the daily demand. Tanks are not filled with bore water. This maximise roof water supply.

This modelling finds:

- If all the expanded restaurant roof of 310 sq.m is connected to the existing 22,000 L primary tank, and the two 900 L tanks are abandoned, rainwater will supply approximately 44% of demand. Bore water will supply the remaining 56%.

- The existing twin 3,200 L tanks and roof area of the shed can supply 93% of the farm stay accommodation needs. The remaining 7% by bore water.
- The expanded house with 504 sq.m of roof drained to its existing tanks can supply 89% of its needs. The remaining 7% by bore water.

Conclusion and Discussion

The primary potable water supply is to be rainwater collected off roofs and stored in tanks. Allowing for evaporation and gutter overflows, possible roof water capture is still some 1.54 times the estimated conservative water demand. Subsequently, it is possible to ensure 100% of supply by roof water alone without any interruption to the business.

However, the tank storage required to do so is likely to be uneconomic. Assuming most of the existing tanks remain and their overflow is plumbed down to new tank storage, Table 2 summarises the new additional storage required to achieve various levels of roof water supply.

Table 2 – Benefit of Additional Roof Water Tanks

	Tank Storage		
Existing (L)	Additional (L)	Combined (L)	Roof Water Supply (%)
47,500	80,000	127,500	89.4%
47,500	160,000	207,500	95.8%
47,500	240,000	287,500	98.5%
47,500	320,000	367,500	99.44%
47,500	400,000	447,500	99.73%
47,500	480,000	527,500	99.84%
47,500	560,000	607,500	99.93%
47,500	640,000	687,500	100.0%

The table shows the additional storage in increments of 80,000 L, being the effective capacity on an in-ground concrete tank by Coolamon Tanks – an economical tank solution used widely in the district. The table shows a case of diminishing returns. Each additional tank provides an ever-smaller benefit. To achieve 100% surety of supply (based on 116 years of rainfall records), eight additional tanks would be required.

It is understood that the existing bore on the property may not be licensed for potable supply and should not be relied upon for back-up supply. Subsequently, the following is proposed:

- Initial installation of a single in-ground 90,000 L Coolamon concrete water tank, located below (west) of the house, with provision for a second Coolamon tank at the same level.
- Abandon the twin 900 L tanks under the restaurant's deck. Any benefit of these small capacity tanks is not worth the complication of their inclusion.
- Plumb the new garage, Laundry & office, plus the overflow from the remaining tanks to the new Coolamon tank.

- Install a submersible (silent) commercial grade pump in the Coolamon tank to provide supply back to the buildings.

These works are shown on drawing WD01.

The analysis above suggest that such works will achieve 89.4% supply. However, there are many conservative assumptions in the water demand estimation, specifically:

- High customer patronage with a year-round average of 49%. Actual rates are more likely to be around 35% if not lower.
- Five occupants in the house – there is currently only two.
- No water conserving practices in the restaurant or by the residents.

When less conservative and more realistic assumptions are modelled, the supply with just one additional Coolamon tank increases to 99.3%.

Ultimately, it is a business decision as to what risk of business interruption can be tolerated verses the cost of additional tanks. It is recommended that one Coolamon tank be installed with provision for a second. Water usage and tank levels be monitored and should the risk of business interruption be considered too great, the second tank be installed.

The option of trucking supplementary water to the property is unlikely to be economic or reliable enough for the operation of the business. It is however available and is appropriate for emergency supply of the smaller volume needed for the residents. This is the practice adopted by many rural properties.

It is subsequently concluded that, with respect to clause 7.11 (a) of Council's 2013 LEP, adequate arrangements have been made to make water supply available.

Yours sincerely

Graham Knight