1. EPL DETAILS

LICENSEE:	LORIS H HASSALL TRADING PTY LTD
PREMISES:	NEWELL HIGHWAY 812 PARKES ROAD
LICENSE NUMBER:	12765
LICENSE CONDITION	R 1.8
DATE COMPLETED	17 DECEMBER 2017
REPORTING PERIOD:	11 NOVEMBER 2017 - 12 NOVEMBER 2018

2. INTERPRETATION OF RESULTS

IRRIGATION EFFLUENT - 2014 TO 2018 WITH 2017 FOR COMPARISON

Chloride levels in effluent water have trebled over the 4-year period although it is back a little (15%) on last year's (2017) high.

Sodium levels in effluent is up nearly 20% from 2014, but down 25% from 2017

Oil and grease levels in effluent water are down by two thirds since 2014, although this level had been achieved by 2017 with 2018 levels several times above last year's level

Average BOD in effluent is up 14% on 2014 but down about 25% on 2017

Nitrogen levels in effluent are up 60% on 2014 and up 4% on last year

Potassium levels are up 30% since 2014 but down just over 50% since last year

Phosphorus levels have risen 18% since 2014 but are down 32% on last year

Calcium and magnesium in effluent have only been monitored since 2017 and are down 40% and 500% respectively over the 12-month recording period.

Effluent conductivity readings have doubled since 2014 from average 14.5 ms/cm to 29.2 ms/cm. Little change from 2017 (29.8 ms/cm)

pH of effluent averages 11 in 2018, 10.5 in 2017 and 10 in 2014; a slightly rising alkalinity trend.

SOIL TEST RESULTS - 2014 TO 2018 WITH 2017 FOR COMPARISON

14 tests are undertaken so a summary will be used, based on **the comparative analysis provided by the consultancy e.g. low, medium, high, extreme**

pH: In 2014 'medium acidity' and 'slight acidity' were the dominant descriptive terms with one 'neutral'. By 2017 'medium' and 'slight acidity' were still the dominant terms (about equal numbers) but 3 'strongly acidic' descriptors were used. In 2018 there were only 3 'slight acidity' terms, while 'medium' and 'strong acidity' shared the remainder of the 14 tests.

Conductivity: In 2014 'Extreme' and 'Very High' descriptors shared the majority of EC terms with 'high' (1) the only other indicator. Salinity levels based on these same indicators in 2017 showed an equal spread across "low', 'high', 'very high' and 'extreme' (3-4 descriptors each). The 2016 wet season has diluted salts and washed them to depth. By 2018 'Extreme' had become the majority indicator with 'high' & 'very high' making up most of the remainder.

Soil Nitrates: in 2017 are up again (average 75 mg/kg over 14 tests) after the leaching of the very wet 2016 season. In 2017 nitrates averaged 27 mg/kg whist back in 2014 they averaged 68 mg/kg over 14 sites.

The sodium absorption ratio also showed the impact of 2016 with 2017's average down. However, over the 4-year period, the average of the sites increased 38% from average 13.45 to 18.38. The impact of the extremely dry 2018 season is a causal factor too.

The individual elements and ions tend to jump around depending on recent irrigation and dryness. The tendency of an element like magnesium to translocate to depth is visible in 3 bays but not across the 7. Similar pattern in 2014. These bays had likely been recently irrigated. Magnesium and potassium levels have increased since 2014, over all samples, surface and depth. Magnesium by 20% and potassium by 48%. (See above for potassium in effluent)

As would be anticipated in soils showing rising acidity, hydrogen and aluminum levels are showing rises, although hydrogen has only recently added to the monitoring list.

Water to effluent: A 2012 figure is the baseline. Water usage to create an effluent stream has risen 25% (16 megaliters in 2018). This is down 11% on water usage last year.
Figures have remained reasonable steady overall years.

Discussion & Actions to be taken:

Increasing chloride, sodium and EC levels are concerns that have been addressed. Complete segregation of brine water from effluent, cleaning up fugitive salt spills and seeking out and sealing brine leaks are having effects with EC readings in the effluent line down by 50%. A target of 10 EC units is set in the short term with 3 EC units in the long term.

Extra water (under-used river allocation) will be added to the effluent stream in the short term to dilute salt in the stream and in the soil. Note: This will see the effluent stream increase from 16 megs this year to 32 to 50 megs next year

A recent in-depth analysis of soil salts records revealed the irrigation farm returned to 'normal', during the not so normal 2016 season. Then the 2018 drought escalated the salinity problem quickly. Readings back to 2008 showed salt levels were declining (from the highs set by the "millennial drought") indicating that the issue can be managed with the plans mentioned above.

Soil nitrate levels are concerning as they may translocate into groundwater. Re-establishment of permanent irrigation pasture is a medium term (6 month) goal to utilize this and the other nutrients which are high in proportions in effluent.

Soil and water pH are both higher than desired. Several processes involving alkaline materials (NaOH and lime) are being tested in the effluent stream, for other "tanning" processes. They will begin addressing acidity in the effluent stream and soil. 'Dosing' to add extra lime is an option close to implementation.

Fats and grease in the stream and Biological Oxygen Demand (BOD) are being addressed by mechanical means to set a downward trend. Drains from the factory have several screen traps to pick up flesh and fat. In 2019 a batching plant will be added to the effluent line to remove more organic matter.

As with nitrates, the "nutrient" elements will be utilized by a rejuvenated sward of pasture and crops to use and export these elements.

3. DOCUMENT HISTORY

AUTHOR	REVIEWER(S) NAME	APPROVED FOR ISSUE BY	SIGNATURE	DATE PUBLISHED	SUMMARY OF CHANGES
Gary Sutton	Ian Rousell Mark Churchill	Gary Sutton		21 December 2018	Initial document