

Dairy Green Ltd

Practical Engineering Solutions
Consent, Effluent, Stock water, Irrigation
Design through to Installation

8 August 2022

Sealach Ltd

C/o Nathan McLachlan
47 Dip Hill Road
RD 12c
Oamaru, 9491

Dear Nathan

Drop Test Results: Sealach Ltd, Effluent Pond, 9 - 10 July 2022

1. Background

As required by the Otago Regional Council, to confirm your effluent pond is not leaking, a drop-down test was carried out between the 9th – 10th July 2022.

Site and Set Up

The farm is located at Harveys Road, Island Cliff 9491.

Effluent flows by gravity from the dairy shed to a sump. It then flows to two sludge beds. Liquid effluent flows through the weeping walls and into a clay lined storage pond.

The pond has been emptied and sludge removed in the last 12 months. There was no crust on the pond and the surface was not frozen during testing.

The pond surface area at water level during the test period was 1218.1 m² and the total catchment area was 1592.1 m².

The total pond catchment area was 30.7 % greater than the wetted area during the test.

The pond depth was measured and found to be 2.5 m including 0.5 m of freeboard. At the time of the test the liquid level was 0.8 m below the maximum design depth, i.e. 85 % full.

Below is an aerial photo that shows pond and dairy shed. The laser drop test unit was installed at the west corner of the pond, as marked.



3. Test Methodology

You were notified when the test was to be run and confirmation was received that there would be no liquid inflow or outflow during the test period.

The monitoring equipment was set up at the pond by Sven Thelning, as described below. NIWA provide a service of independently hosting all the data collected by the monitoring equipment. After set up the NIWA Neon website was checked to confirm that data was being recorded and sent to the website.

3.1. Water Level Monitoring Unit

A laser distance measuring unit was set up vertically over the pond surface. A reflective disc was placed on the pond surface to ensure constant, repeatable readings.

The laser was set up within a PVC pipe which acts as a stilling well.

Distance readings to the pond surface were taken at 10 second time intervals and sent to NIWA's Neon logging system.

3.2. Meteorological Station

A weather station orientated to the North was also set up and the data it collected sent to NIWA's Neon system at 10 second intervals. It measured:

- Air temperature
- Wind speed
- Wind direction
- Solar Radiation

3.3 Evaporation Loss Monitoring

To record evaporation and rainfall in real time a bucket was installed suspended from a strain gauge with 9.0 L of effluent in it, on the pond bank.

4. Results Recording

Recording of results was carried out to comply with Otago Regional Council, Final Plan Change 8 Part B: Animal waste storage and application, schedule 18, Schedule of pond drop test requirements and criteria.

Recording details are summarized below:

- The minimum test period has to be 24 hours.
- Twenty four hours of data where the wind speed is less than 14m/s must be collected for the test to be valid.
- Readings are to be taken every 10 seconds.
- For maximum accuracy the wind velocity has to be very low, in the order of 1m/s. This is because wind at the test site has been observed to have two effects, the first being to cause waves and the second to push water to one side of the pond from the other, (a seiche effect). The accuracy of the laser distance recorder is such it will detect changes as small as 0.2 mm. To accurately determine the true pond level requires calm conditions at the start and end of the test period.
- When a period of 24 hours or more has lapsed the information is downloaded and the results interpreted.
- The GPS location of the pond and equipment set up is recorded. For this test the equipment was located at E1418581.21 N5023629.45, at the west corner of the pond.

Laser at the west corner of the pond.



5. Results Summary

The results for the test are summarised in Table 1 and discussed below. The plot of wind speed and pond height shows that at times wind caused waves on the pond surface, but the wind speed did not exceed 14m/s. A period was identified at the start and end of the test period when the pond surface was stable and accurate height readings were established.

The start time was assumed to be at 06:29:20 hours on the 9 July 2022.

The distance from the laser to the reflective disc on the pond surface was 272.7 mm and the wind speed 0.54 m/sec.

The finish time was assumed to be at 07:17:10 hours on the 10 July 2022.

The distance from the laser to the reflective disc on the pond surface was 268.6 mm and the wind speed 1.09 m/sec.

The total time elapsed was 24 hours and 47 minutes, 50 seconds.

The laser measured a change in distance to the pond surface of 4.1 mm decrease. Therefore, the pond surface rose 4.1 mm over the test period.

During the test the load cell that would normally provide rain and evaporation data had technical problems and the data collected from it was unreliable. Instead, the weather data was sourced from weather stations situated on farm.

The total rainfall recorded by the Willowcliff (D17450) weather station during the test period was 5.6 mm. This rainfall depth was used in the calculations and not corrected for the 30.7% larger pond catchment because the pond depth appeared to change by 5.3mm which is in close agreement with the depth of rain. Further, the 5.6 mm falling on the exposed pond batters is unlikely to cause run-off into the pond considering the time-period it fell over, the batters are covered in grass, the soil was dry and cattle hoof depressions potentially stopping or slowing runoff into the pond.

Evaporation data from the SCADA farm weather station shows 0.5 mm of evaporation for the 24 hours of the test.

During the test period the pond should have risen 5.6 mm due to rainfall and fallen 0.5 mm due to evaporation, a net change of 5.1 mm increase. The net change in pond height for the duration of the test was an increase of 4.1 mm, the difference of 1.0 mm is assumed to be leakage.

The following table summarises the results.

TABLE 1: DROP TEST RESULTS SUMMARY, Sealach Ltd, Effluent Pond

Start Time	9 July, 06:29:20	
Finish Time	10 July, 07:17:10	
Total Time	24 hrs, 47 minutes, 50 seconds	
Start Depth (mm)	272.7	
Finish depth (mm)	268.6	
Change in depth (mm)	+ 4.1	
Rainfall (mm)	+ 5.6	
Evaporation (mm)	- 0.5	
Net Change in Depth After		
Rain and Evaporation (mm)	- 1.0	
Net Change per 24 Hours (mm)	- 1.0	
Pond Level, % of Design Depth	85	
Net Change if Pond at 75% of	- 0.9	
Design Height. (mm/24hrs)		

6. Conclusion

The pond complies with the requirements of the Otago Regional Council, Final Plan Change 8, Part B: Animal waste storage and application, Schedule 18, Schedule of pond drop test requirements and criteria, with a leakage rate of less than 2.0 mm/24 hours.

The pond is suitable for storing effluent as the infiltration rate from the pond is less than 2.0 mm per 24 hours.

Yours faithfully

JOHN SCANDRETT

Agricultural & Engineering Consultant

Appended

Depth and wind speed graph for the test period.

Depth and rainfall/evaporation graph for the test period.

Depth and wind speed for the start of the test period.

Depth and wind speed for the end of the test period.