# On-site Effluent Treatment National Testing Programme (OSET NTP)

**PERFORMANCE CERTIFICATE**
**Hydrozone Pureflow**
**OSET NTP Trial 13, 2017/2018**

## System Tested

The Hydrozone Pureflow treatment plant, comprising a recirculating packed bed biofilter (RPB), participated in Trial 13 of the On-site Effluent Treatment National Testing Programme (OSET NTP). This commenced on 23 October 2017 and ran over ten months (44 weeks) during which the treated effluent discharge was monitored generally every six days. The Hydrozone Pureflow treatment system tested had a rated capacity of 1,400L/day and was constructed from a single 8,000L concrete tank with 4 chambers comprising Primary (4,000L), Recirculation (500L), Media bed (0.96m$^2$), Pump chamber (0.22m$^2$) with the pump chamber interconnected with the base of the media bed. The is a 3mm effluent filter in the primary chamber . The packed bed media comprises 1m3 of Bio-coir. Treated effluent is recirculated to both the media bed and the recirculation chamber at a ratio of approximately 3:1. Recirculation chamber effluent is dose loaded to the media bed via a bell siphon. The emergency storage provided is 1,290L.

The manufacturers service manual requires 6 monthly service by a qualified service agenta d monthly inspections and clean of the effluent filter by the homeowner.

## Test Flow Rate

The Hydrozone Pureflow treatment system was tested at 1,000L/day (equivalent to servicing a 3-bedroom 5 to 6 person household) over an 10 month (40 week) period November 2017 to August 2018 including a 1 month (4 week) high load effects test involving 5 days at 2,000L/day then 1,000L/day over the following 3 weeks. Note that the manufacturer's advised design capacity for this plant is 1,400L/day.

## Testing and Evaluation Procedures

A two-month (eight-week) media development and settling-in period was initially proposed, but this was extended to 12 weeks due to an unscheduled discharge of geothermal waste into the Rotorua reticulation system on 23 November, followed by extreme weather events impacting on the testing facility control system in early December. The Hydrozone Pureflow treatment system plant did not appear to cope with the geothermal influent so was cleaned and restarted on 21 December 2018.

The performance evaluation testing programme involved a three-month pre-benchmarking period (20 samples over Weeks 13 to 28), and a three-month benchmarking period (19 samples over Weeks 29 to 40). The OSET-NTP Management and Audit Group (MAG) decided that five sets of readings from Weeks 36-40 should be excluded from analysis due to the effluent filter clogging as they considered this would not have occurred if the manufacturers service requirements had been undertaken.

A total of 34 treated effluent samples of organic matter ($BOD_5$) and suspended solids (TSS) at generally six day intervals during weeks 13 to 35 were tested and evaluated against the secondary effluent quality requirements of the joint Australia/NZ standard AS/NZS 1547:2012.

A total of 13 treated effluent samples of organic matter ($BOD_5$), total suspended solids (TSS), total nitrogen (TN), ammonia nitrogen ($NH_4$-N), total phosphorus (TP) and faecal coliforms (FC) at generally six day intervals during weeks 28 through 35 were tested and the results benchmarked and rated on their median values.

## General Performance

During the trial, the plant had the following equipment failures and attendance requirements:

- a leak in the discharge pipework, which was repaired prior to commencement of evaluation testing;
- a perished venturi tube, which was replaced on 8 January;
- a leak in the alarm panel which was repaired on 8 January; and
- a high-level alarm due to a clogged effluent filter, requiring attendance on 2 July.

**On-site Effluent Treatment National Testing Programme,**
**c/- Technical Manager 10 Tide Close, Mount Wellington, AUCKLAND 2013**
**Mob: 021 626 772 E-mail: ray@hedgland.co.nz**

# On-site Effluent Treatment National Testing Programme (OSET NTP)

The plant did not appear to cope with the unscheduled geothermal waste influent on 23 November 2017, but after a clean and restart the plant quickly stabilised and performed well, with low $BOD_5$ and TSS for six months until mid-June when the effluent filter began to clog.

Overall (excluding the impact of the filter blockage), the plant achieved good nitrification with low levels of $NH_4N$, but poor denitrification with high levels of TOXN and TN, and moderate bacteria reduction. Flows during the high flow test were the same as the manufacturer's advised peak capacity, however the high flow results may have been impacted by the blocked filter so these results are considered by SWANS-MAG to be invalid and no assessment can be made on the plants performance at flows greater than 1,000L/d. Bacteria removal declined by some two orders of magnitude due to the clogged filter. The plant's power usage, at 2.2kWh/day, was average for a package secondary treatment plant.

## AS/NZS 1547:2012 Secondary Effluent Quality Requirements

These requirements are that 90% of all test samples must achieve a $BOD_5$ of $\leq$ 20 g/m$^3$ and TSS of $\leq$ 30 g/m$^3$ with no one result for $BOD_5$ being >30 g/m$^3$ and no one result for TSS being >45 g/m$^3$. This assessment excludes 5 sets of results due to the impact of a clogged effluent filter with the approval of SWANS-MAG subject to the manufacturers standard service requirements being undertaken.

The Hydrozone Pureflow plant, therefore, had **100% of $BOD_5$** results and **100% of TSS** results within the **Secondary Effluent Quality** requirements for both the 90 percentile and maximum limits above. **The Hydrozone Pureflow plant thus achieved AS/NZS 1547 secondary effluent quality performance requirements** when operated at 1,000L/day, which is 71% of the manufacturer's advised normal flow design capacity. This assessment is subject to the plant being serviced in accordance with manufacturer's requirements, which are: service by a qualified service agent at six-monthly intervals, and monthly inspections of the effluent filter by the homeowner with cleaning as appropriate.

## Benchmark Ratings

The Hydrozone Pureflow system achieved the following effluent quality ratings (when operated at 1,000L/day, which is 71% of the manufacturer's advised normal flow design capacity):

| Indicator Parameters | Median | Std Dev | Rating | Rating System | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | *A+* | *A* | *B* | *C* | *D* |
| *BOD (mg/L)* | *2* | *4.1* | A+ | *<5* | *<10* | *<20* | *<30* | *≥30* |
| *TSS (mg/L)* | *2.2* | *3.0* | A+ | *<5* | *<10* | *<20* | *<30* | *≥30* |
| *Total Nitrogen (mg/L)* | *28* | *9.0* | C | *<5* | *<15* | *<25* | *<30* | *≥30* |
| *$NH_4$- Nitrogen (mg/L)* | *2.4* | *7.0* | A | *<1* | *<5* | *<10* | *<20* | *≥20* |
| *Total phosphorus (mg/L)* | *4.3* | *0.6* | B | *<1* | *<2* | *<5* | *<7* | *≥7* |
| *Faecal Coliforms (cfu/100mL)* | *9,000* | *298,100* | B | *<10* | *<200* | *<10,000* | *<100,000* | *≥100,000* |
| Energy (kWh/d) (mean) | *2.2* | *1.0* | C | *0* | *<1* | *<2* | *<5* | *≥5* |

This Certificate of Performance only applies to a Hydrozone Pureflow treatment plant, comprising a recirculating packed bed biofilter (RPB), with a rated capacity of 1,400L/day as described in the 'System Tested' above.

The certificate is valid for 5 years from the date below. For the full OSET NTP report on the performance of the Hydrozone Pureflow wastewater treatment plant contact Matt Fergusson, Phone: 06 756 8482, Mobile 027 252 2001 or Email: matt@hydrozone.co.nz

**Authorised By:**

Ray Hedgland, Technical Manager, OSET NTP

**On-site Effluent Treatment National Testing Programme,**
**c/- Technical Manager 10 Tide Close, Mount Wellington, AUCKLAND 2013**
**Mob: 021 626 772 E-mail: ray@hedgland.co.nz**

# On-site Effluent Treatment National Testing Programme (OSET NTP)

27 November 2018

**On-site Effluent Treatment National Testing Programme,**
**c/- Technical Manager 10 Tide Close, Mount Wellington, AUCKLAND 2013**
**Mob: 021 626 772 E-mail: ray@hedgland.co.nz**