Hawea Wastewater Treatment Plant

Annual Report 2015 - 2016

December 2017

QUEENSTOWN LAKES DISTRICT COUNCIL
www.qldc.govt.n

CONTENTS

1. Background 1
2. Purpose and Scope of Report 2
3. Monitoring Requirements 3
4. Results, Discussion and Resource Consent Compliance 4
4.1 Wastewater Discharge to Land 4
4.2 Spray Irrigation System 9
4.3 Resource Consent Requirements and Compliance 9
4.4 WWTP Performance & Future Works 12
5. Summary and Conclusions 13
Glossary of Terms 14
Appendix A Resource Consents 15
Appendix B Effluent Results Tables 22
Appendix C Watercare Laboratory Certificates 25
Appendix D Daily Effluent Flow Data 26

LIST OF TABLES

Table 2-1 : Discharge Permits 2
Table 3-1 : Wastewater Quality Parameters to be Analysed 3
Table 4-1: Summary of Wastewater Monitoring Results for 2015/16 5
Table 4-2: Discharge to Air Permit RM.10.308.01 Conditions 10
Table 4-3: Discharge to Land Permit RM10.308.02 Conditions 10

LIST OF FIGURES

Figure 1-1 : Hawea Oxidation Pond, Associated Pump Stations and Reticulation 1
Figure 4-1: Wastewater Flow to the Disposal Field 4
Figure 4-2: E. *coli* in Wastewater 5
Figure 4-3: Total Ammoniacal Nitrogen in Wastewater 6
Figure 4-4: Total Nitrogen in Wastewater to Land 6
Figure 4-5: BOD_5 in Wastewater to Land 7
Figure 4-6: Total Suspended Solids in Wastewater to Land 8
Figure 4-7: Total Phosphorus in Wastewater to Land 8

DOCUMENT CONTROL SHEET

Project	Hawea Wastewater Treatment Plant				
Report	2015 - 2016 Annual Monitoring Report				
Date	December 2017				
		Document Reference:			
Version	**Author**	**Reviewed**	**Signature**	**Date**	**Distribution**
Draft	J McGirr (QLDC)	D Lind (QLDC)		04/12/17	
Final	J McGirr (QLDC)	D Lind (QLDC)		06/12/17	S Mason (QLDC), R Bond (Veolia), Otago Regional Council Compliance Team

1. Background

The Hawea Oxidation Pond started operation in 1988 and treats wastewater from wastewater originating from the Hawea township and the Tims Field subdivision. Discharge Permits RM10.308.01 and RM10.308.02 were issued by the Otago Regional Council (ORC) on the 15 November 2010 and took effect immediately.

The Hawea Oxidation Pond is located adjacent to the true left bank of the Hawea River, approximately 600m south of the intersection of Domain Road and Cemetery Road. The legal description of the land at the point is discharge is Lot 1 DP 20555. The map reference for the oxidation ponds is NZMS 260 G40: 128-137.

The wastewater is discharged to land via a spray irrigation system, with a low pressure disposal trench also utilised during the winter months.

Veolia operates and maintains the oxidation ponds as part of the 3-Waters operations and maintenance contract.

Figure 1-1 : Hawea Oxidation Pond, Associated Pump Stations and Reticulation

2. Purpose and Scope of Report

The purpose of this report is to report to the ORC in accordance with Condition 13 of Resource Consent RM10.308.02 and covers the period 1 December 2015 to 30 November 2016 (refer to Table 2-1).

The scope of the Annual Report comprises of the following:

- Summary of the yearly analytical results of the wastewater from the ponds, and an interpretation of the wastewater quality results in context of Resource Consent RM10.308.02 trigger levels;
- Comments on compliance with the conditions of the discharge permits;
- Summary of any malfunctions or breakdowns and the corrective action taken; and
- Summary of any complaints received, the validity of each complaint and the corrective action taken.
- Condition 13 of RM10.308.02 also requires "*details of the cut and carry operation, including the calculations for nitrogen loading in the spray irrigation land, number of harvests, dry matter and total nitrogen content of the harvest and nitrogen balance for this site*". This has been addressed within a separate report, as described in Condition 12.

Table 2-1 : Discharge Permits

Consent No.	Description	Issue Date	Expiry Date	Conditions
RM10.308.01	To discharge contaminants to air for the purpose of discharging treated wastewater.	15 Nov 2010	12 Nov 2022	Refer to Appendix A
RM10.308.02	To discharge contaminants to land for the purpose of discharging treated wastewater.	15 Nov 2010	12 Nov 2022	Refer to Appendix A

3. Monitoring Requirements

Resource Consent RM10.308.02 Condition 10 requires that the wastewater discharged from the outlet of the oxidation pond is sampled for a total of six parameters on a monthly frequency (Table 3-1). Condition 9 requires that a record of daily volumes of wastewater discharged to the disposal field is kept.

Table 3-1 : Wastewater Quality Parameters to be Analysed

Parameter	Frequency	Resource Consent Trigger Level	Reporting Requirements
Flow (wastewater)	Daily	N/A	Annual
Total Nitrogen	Monthly*	Mean: 35 mg/L 95th percentile**: 40 mg/L	Monthly
Ammoniacal Nitrogen	Monthly*	Mean: 25 mg/L 95th percentile**: 30 mg/L	Monthly
Total Phosphorus	Monthly*	Mean: 8 mg/L 95th percentile**: 10 mg/L	Monthly
BOD_5	Monthly*	N/A	Monthly
Total Suspended Solids	Monthly*	N/A	Monthly
Escherichia coli	Monthly*	95th percentile: 250,000 cfu/100 mL	Monthly

**Last week of each month ** Rolling 12 month 95th percentile*

All sample collection for the wastewater prior to discharge is carried out by Watercare to the required Standards specified in Condition 11 (Watercare Laboratory Services is IANZ accredited to NZS/ISO/IEC 17025).

Resource Consent RM10.308.02 does not require any surface water monitoring and analysis.

4. Results, Discussion and Resource Consent Compliance

4.1 *Wastewater Discharge to Land*

The results of the wastewater quality monitoring for the 2015/16 sampling period is presented in tabular format in Appendix B.

A copy of the laboratory results received from Watercare Laboratories for the 2015/16 period is presented in Appendix C.

The daily wastewater flow rates (m^3/day) from the oxidation pond are tabulated in Appendix D and graphically represented in Figure 4-1. Appendix D also provides the breakdown of wastewater volumes discharged via the trench method and the spray irrigation method.

The wastewater discharge flow rate shall not exceed 775 cubic metres per day. A peak of 506 m^3/day was recorded in July 2016, and the annual average was 172 m^3/day for the 2015/16 monitoring period.

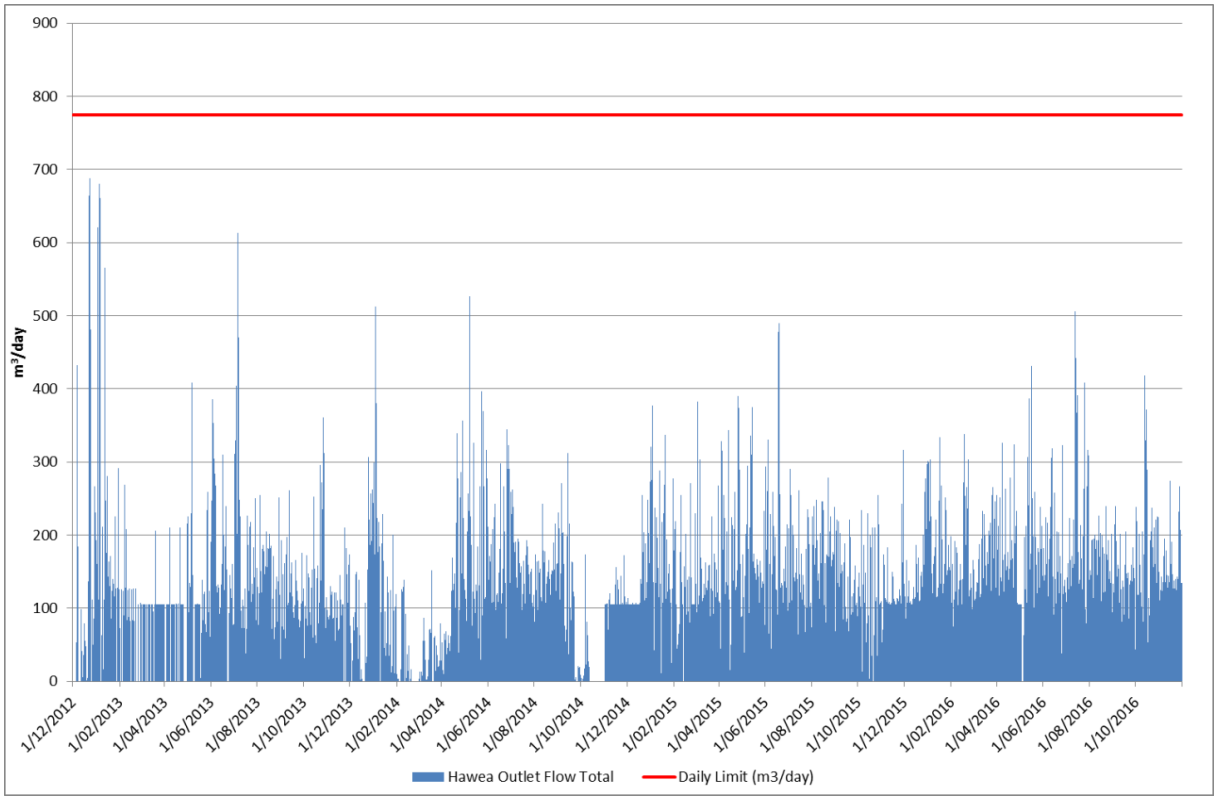


Figure 4-1: Wastewater Flow to the Disposal Field

The treated wastewater from the outlet is required to have a representative sample analysed for a total of six parameters (total Ammoniacal nitrogen, total phosphorus, total nitrogen, total suspended solids, BOD5 and E. *coli*) as per Resource Consent RM10.308.02. Those parameters that have trigger levels in the Resource Consent RM10.308.02 are presented in tabular (refer to Table 4-1) and graphical (Figure 4-2 and 4-7) format.

Table 4-1: Summary of Wastewater Monitoring Results for 2015/16

Parameter	Consent Limit	Rolling Percentile mg/L	Annual Mean mg/L	Max mg/L	Min mg/L
Total Nitrogen	Mean: 35 mg/L 95th percentile*: 40 mg/L	55	36	57	17
Total Phosphorus	Mean: 8 mg/L 95th percentile*: 10 mg/L	9	7	10	6
Ammoniacal Nitrogen	Mean: 25 mg/L 95th percentile*: 30 mg/L	44	24	48	0.1
E. *coli*	95th percentile: 250,000 cfu/100 mL	72,800	40,417	75,000	10,000

** Rolling 12 month 95th percentile*

The rolling 12 month 95th percentile for E. *coli* remained well within the consent limit of 250,000 CFU/100ml during the 2015/16 monitoring period (refer to Figure 4-2). The maximum concentration of E. *coli* over the year was 75,000 cfu/100 mL with an annual mean of 40,417 cfu/100 mL. This is a similar to previous years.

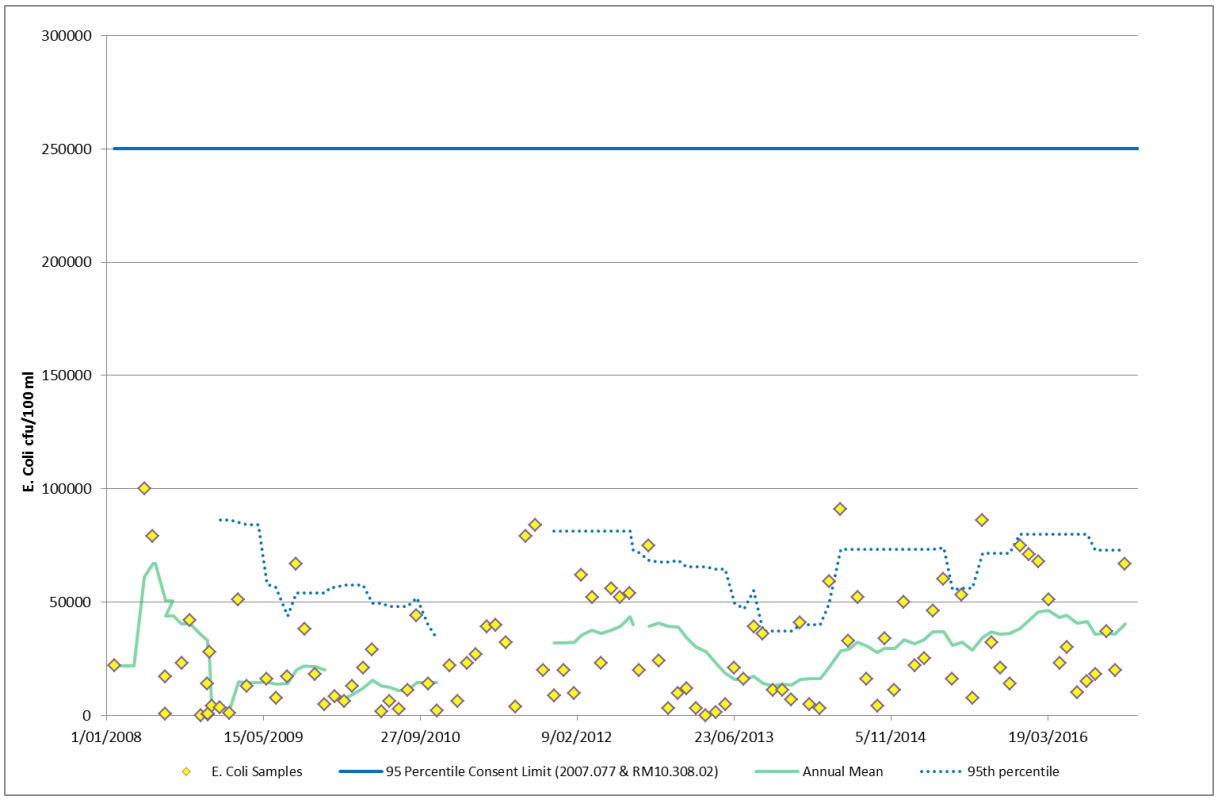


Figure 4-2: E. *coli* in Wastewater

The rolling 12 month 95th percentile of 44 mg/L for total Ammoniacal nitrogen exceeded the consent limit (30 mg/L) in the 2015/16 monitoring period (refer to Figure 4-3). The annual mean of 24 mg/L was just within the consent limit of 25 mg/L.

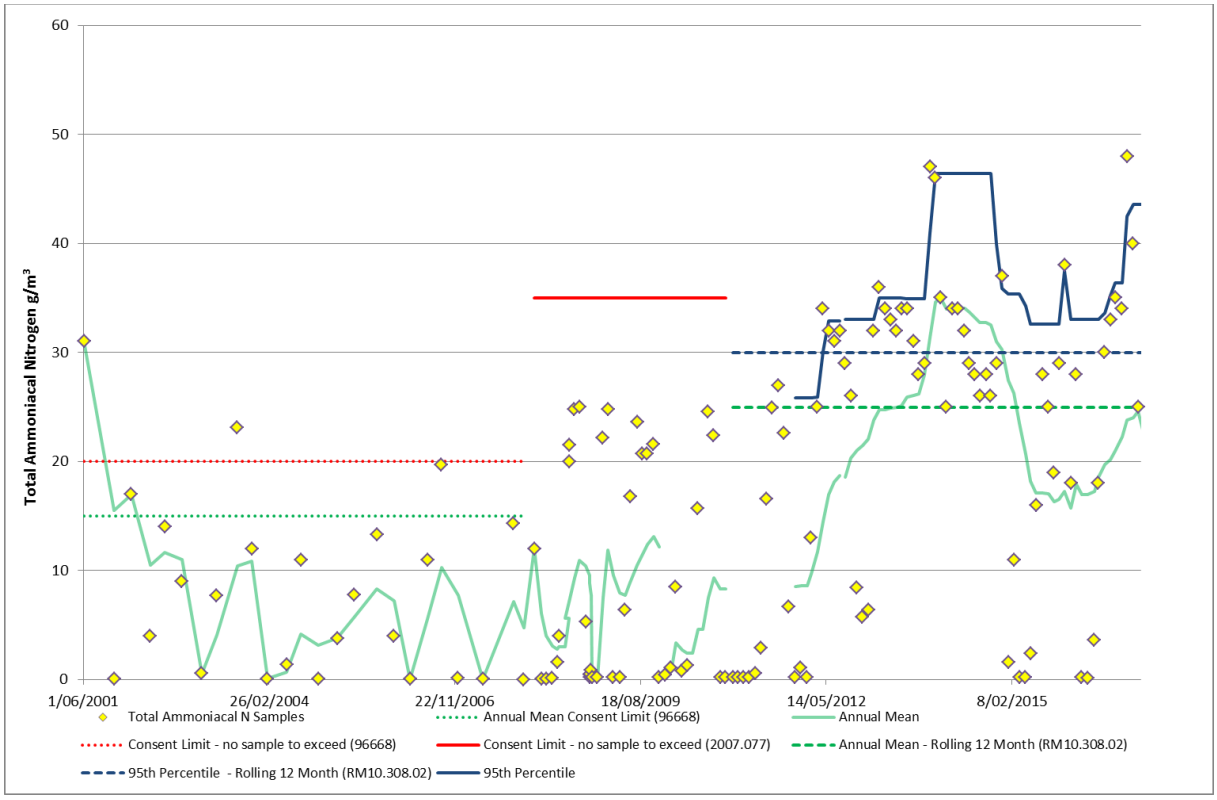


Figure 4-3: Total Ammoniacal Nitrogen in Wastewater

The rolling 12 month 95th percentile of 55 mg/L for total nitrogen exceeded the consent limit (40 mg/L) in the 2015/16 monitoring period (refer to Figure 4-4). The maximum concentration of total nitrogen over the year was 57 mg/L with an annual mean of 36 mg/L, slightly in excess of the consent limit of 35 mg/L.

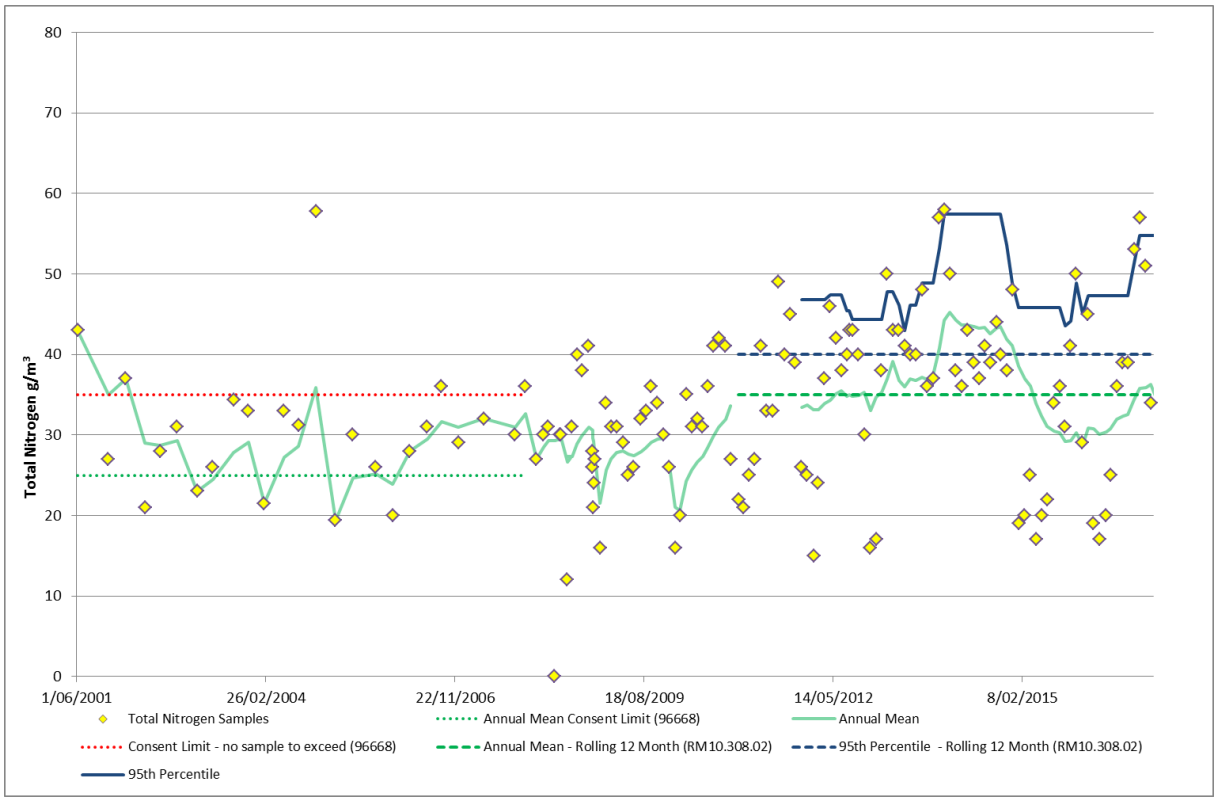


Figure 4-4: Total Nitrogen in Wastewater to Land

Total suspended solids, total phosphorus and BOD_5 are consistent with the results in previous years (refer to Figure 4-5 to 4-7). There are no Resource Consent trigger levels to meet for total suspended solids and BOD_5. Previous Resource Consent (96668) trigger levels are presented in the graphs as reference for the years the trigger levels are applicable to. Total phosphorus remained compliant with the rolling 95th percentile and the annual mean.

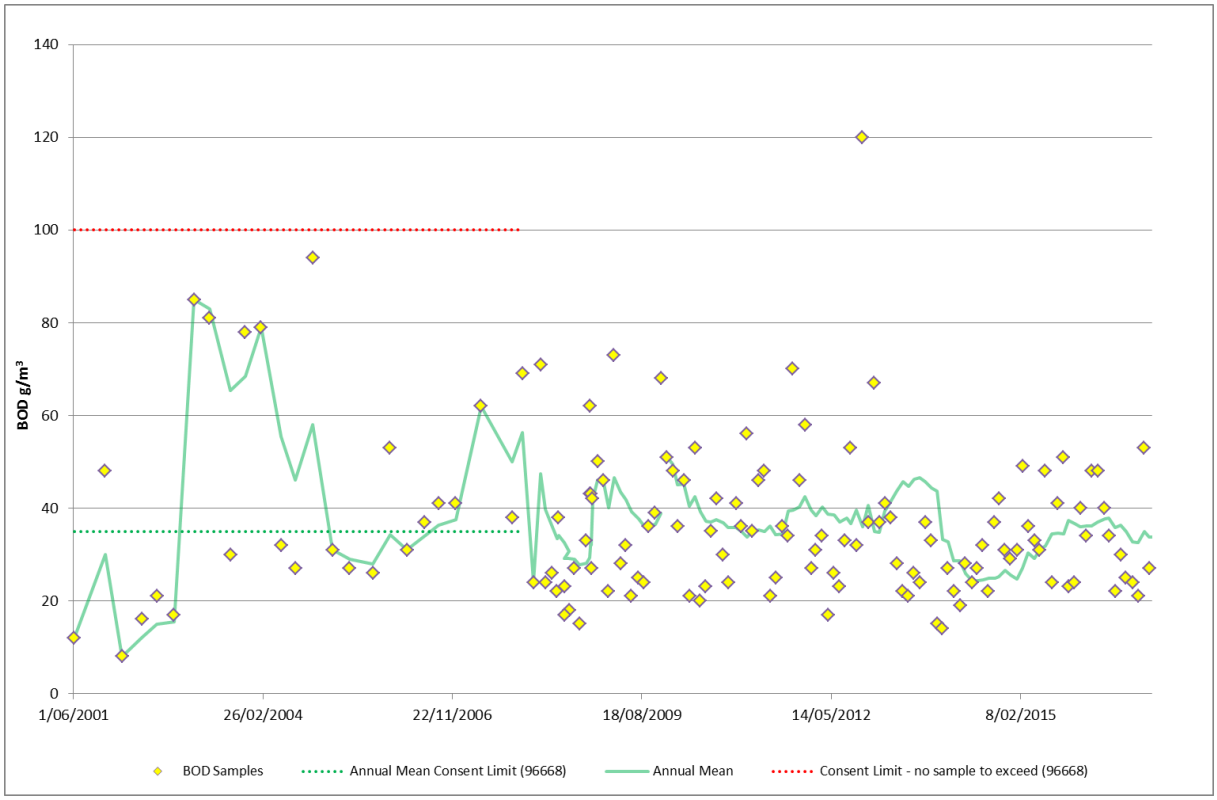


Figure 4-5: BOD_5 in Wastewater to Land

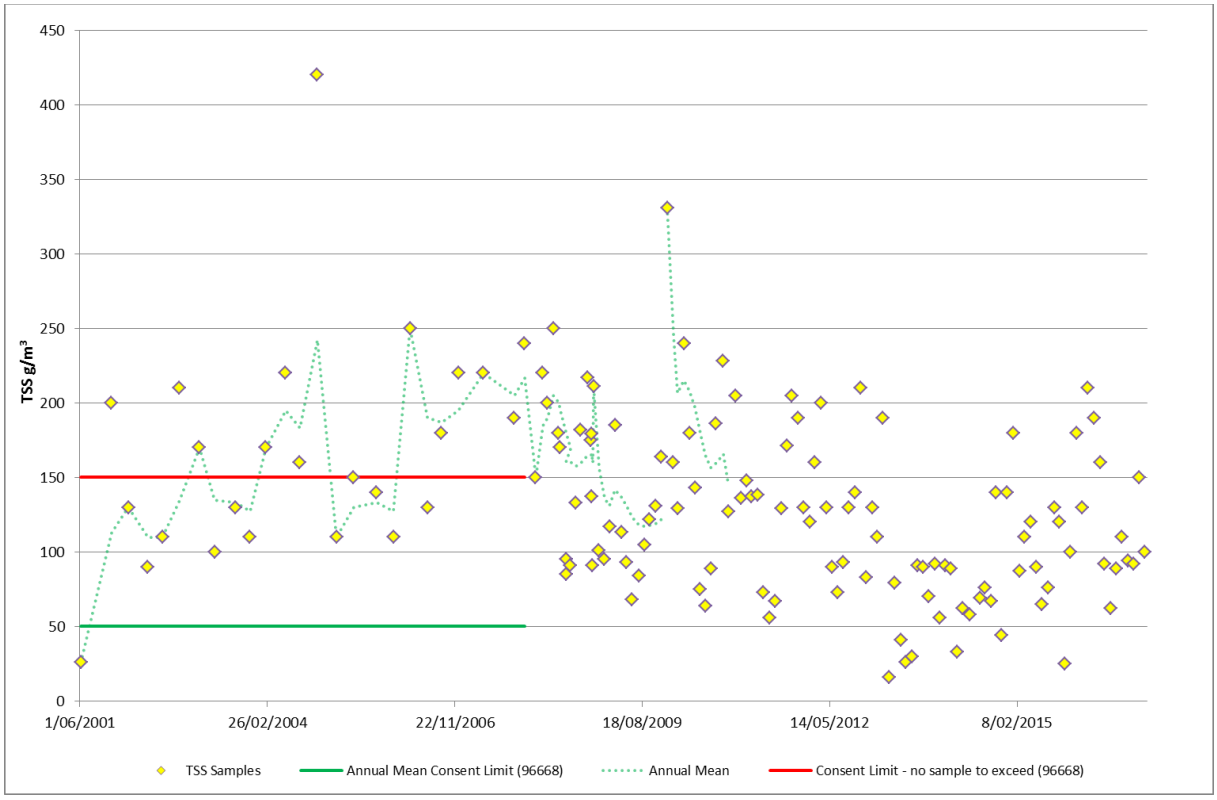


Figure 4-6: Total Suspended Solids in Wastewater to Land

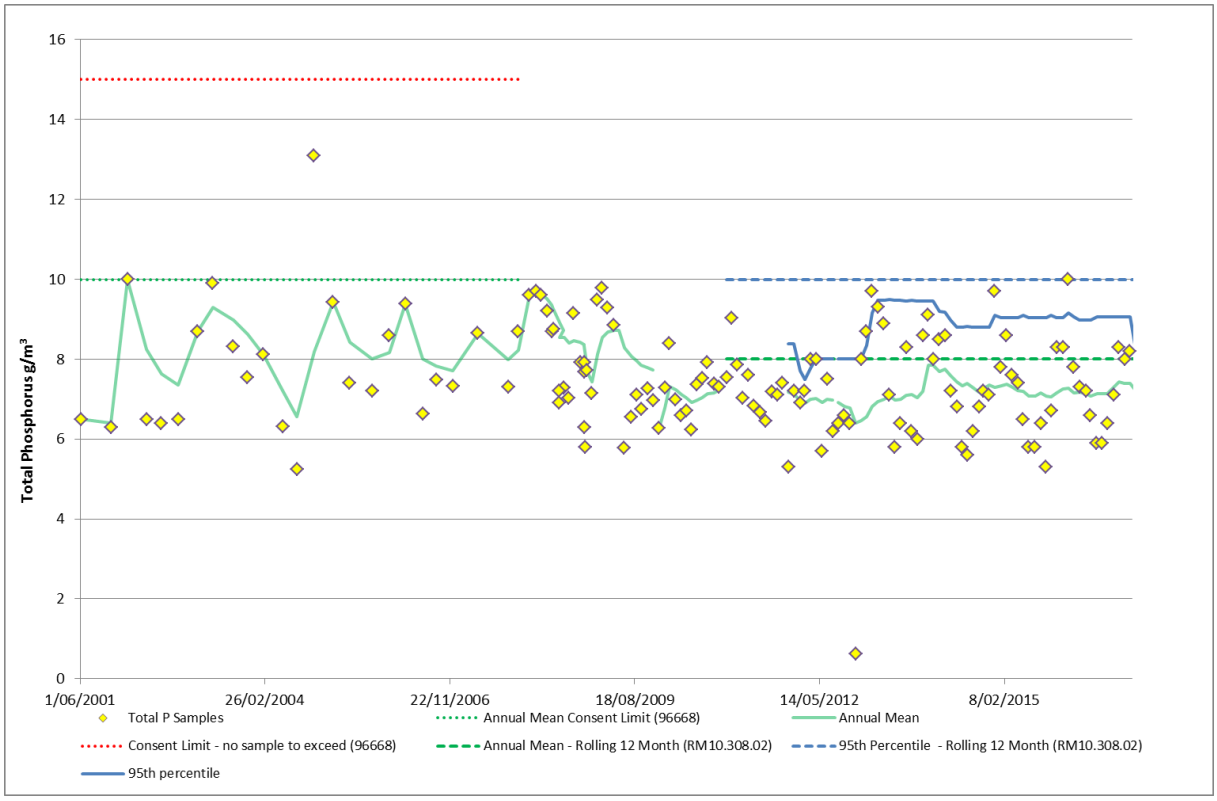


Figure 4-7: Total Phosphorus in Wastewater to Land

4.2 *Spray Irrigation System*

Condition 12 of Resource Consent RM10.308.02 requires that a nitrogen mass balance for the spray irrigation land application area is prepared annually. This is to include the following:

- *The nitrogen mass balance shall consist as a minimum the total nitrogen applied to land and crop removal of nitrogen.*
- *The total nitrogen applied to the spray irrigation land shall be estimated from the total volume of wastewater applied and the average of monthly concentration of total nitrogen in the land applied wastewater.*
- *The crop removal of nitrogen from the spray irrigation land shall be estimated by obtaining dry matter content and total nitrogen content after each crop/plant harvest.*
- *The nitrogen mass balance from condition 12(a) and any other factors such as ammonia volatilisation and denitrification shall be used to calculate the mass of nitrogen leached from the site, using a model acceptable to the consent authority.*

This information is presented in a separate report completed by Lowe Environmental Impact, as per previous years.

4.3 *Resource Consent Requirements and Compliance*

Compliance with Resource Consents RM10.308.01 and RM10.308.02 is displayed in Tables 4-2 and 4-3 by condition.

Table 4-2: Discharge to Air Permit RM.10.308.01 Conditions

Condition #	Clause Condition	Comments	Compliance
1	This consent shall only be exercised in conjunction with Discharge Permit RM10.308.02.		**Achieved**
2	The discharge to air shall be as described in the consent application submitted to the Consent Authority on 31 August 2010 and any subsequent information provided.		**Achieved**
3	Wind cloth shall be installed on the western, southern and eastern-most boundaries of the area on which treated wastewater is to be applied by spray irrigation. This wind cloth shall be maintained until the screen foliage required under condition 4 is fully established.	Installed prior to 1 December 2012.	**Achieved**
4	Suitable screening foliage, that shall be at least 3 metres high but not exceed 6 metres in height, shall be planted on the western, southern and eastern-most boundaries of the area on which treated wastewater is applied by spray irrigation.	Planted and irrigated prior to 1 December 2012.	**Achieved**
5	A weather station shall be installed in an appropriate location to record, as a minimum, rainfall and wind conditions at the site where treated wastewater is to be applied by spray irrigation.	Installed in August 2011.	**Achieved**
6	The spray irrigation system shall not be operated in conditions where wind speed, as measured at the on-site station installed under condition 5, exceeds 29.9 km/hour.	Control system installed to meet this condition.	**Achieved**
7	The consent holder shall keep a record of any complaints received regarding discharges of odour from the site. The record shall, as a minimum, include the following: (a) the time and place at which the complaint was generated; (b) the nature of the complaint; (c) operating conditions at the time of the complaint, including any malfunctioning or breakdown of control equipment; (d) wind and weather conditions at the time of the complaint; and (e) corrective action taken by the consent holder to minimise the risk and extent of the recurrence of the causes of the complaint. The consent holder shall submit a copy of the written record of the complaint to the consent authority within two weeks after any complaint occurring, together with the details of the corrective actions taken.	No odour complaints from the Hawea Oxidation Ponds in the 2015/16 year.	**Achieved**
8	There shall be no discharge of odour, as a result of the exercise of this consent, that is noxious, dangerous, offensive or objectionable to the extent that it causes an adverse effect beyond the boundary of the site, in the opinion of an authorised officer of the Consent Authority.	No odour complaints from the Hawea Oxidation Ponds in the 2015/16 year.	**Achieved**

**Conditions 1 and 9 are 'general' resource consent conditions that do not require compliance monitoring*

Table 4-3: Discharge to Land Permit RM10.308.02 Conditions

Condition #	Clause Condition	Comments	Compliance
2	The volume of effluent discharged shall not exceed 775 cubic metres per day.	No exceedance. Refer to Appendix D.	**Achieved**
3	The distance the site boundary from any part of the wastewater treatment and disposal system shall no less than 5 metres.	Compliant.	**Achieved**
4	By no later than 1 December 2012, the consent holder shall ensure that the trench utilised for wastewater disposal: a) is at least 150 metres long and 2 m wide in total; and b) is intermittently dosed; and c) is not used for the disposal of wastewater for more than 4 months in total in any one calendar year.	The trench is utilised for more than 4 months per calendar year.	**Non-compliant**
5	By no later than 1 December 2012, the consent holder shall install and commission a spray irrigation system for the land application of treated wastewater. The spray irrigation system shall meet the following criteria: (a) the total area on which treated wastewater is applied by spray irrigation shall be no less than 2.5 hectares; (b) treated wastewater shall be applied evenly by spray irrigation to the area defined in appendix I only; (c) the area on which treated wastewater is applied by spray irrigation shall be fenced with a 2 metre high deer fence with appropriate signage warning the general public of the hazard; (d) a weather station shall be installed in an appropriate location to record, as a minimum, rainfall and wind conditions at the site where treated wastewater is to be applied by spray irrigation; (e) wastewater shall not be applied to land by spray irrigation system during the hours outside of 11 pm to 5 am; (f) nozzle pressure must not exceed 400 kilopascals (kpa); (g) there shall be no irrigation of treated wastewater using k-line irrigation systems.	Spray irrigation system installed 5 December 2012. The system was commissioned 20 December 2012 after pump failures. This extension (to January 2013) was agreed upon with Sarah Ibbotson and Martin King of the ORC. The spray irrigation continues to operate within this criteria.	**Achieved**
6	The area on which treated wastewater is to be applied using spray irrigation shall be planted in high growth and nitrogen uptake vegetation (such as Lucerne or ryegrass) and shall be managed as far as practicably possible to optimise nutrient removal. A minimum of three harvests per year shall be undertaken.	Harvests occurred in November 2015 (not reported for previous period), March 2016 and November 2016.	**Non-compliant**
7	The total nitrogen applied to the spray irrigation area shall not exceed 1,223 kilograms of nitrogen per hectare per year.	The nitrogen mass balance is provided in a separate report.	**Achieved**
8	The treatment and disposal system shall be constructed and installed in accordance with the details and plans supplied with the consent application submitted to the consent authority on 31 August 2010, and attached to this consent as appendix I.	Spray irrigation system installed 5 December 2012.	**Achieved**
9	The consent holder shall install a flow meter on the outlet pipe from the treatment system and continually measure and record the daily volume (based on a no more than weekly average) of effluent being discharged to the disposal field. The consent holder shall forward the record for the previous 12-month period to the consent authority by 1 December each year, and upon request.	Refer to Appendix D.	**Achieved**

Condition #	Clause Condition	Comments	Compliance
10	(A) from the first exercise of this consent, the consent holder shall collect representative samples of the treated wastewater from the outlet of the oxidation pond in the last week of each month. The samples shall be analysed for: (i) five day total biochemical oxygen demand (bod_5); and (ii) total suspended solids; and(iii) total nitrogen; and (iv) total Ammoniacal nitrogen; and (v) total phosphorous; and (vi) *Escherichia coli.* (b) from the first exercise of this consent, wastewater discharged from the oxidation pond shall comply with the following criteria: | | Mean* | 95th percentile (mg/l)* | | Ammoniacal nitrogen | 25 (mg/l) | 30 (mg/l) | | Total nitrogen | 35 (mg/l) | 40 (mg/l) | | Total phosphorous | 8 (mg/l) | 10 (mg/l) | | Escherichia coli | - | 2.5 x 10^5 cfu/100 ml | *the mean and 95th percentile applies to a rolling 12 month period. (c) the analytical sample results from the sampling under condition 9(a) of this consent shall be submitted to the consent authority by 1 Dec each year &upon request.	Refer to Appendices A and B for all results. Elevated results received for 95th percentile and annual mean for total nitrogen and total Ammoniacal nitrogen.	**Non-compliant**
11	All sampling techniques shall be acceptable to the consent authority. All analysis carried out in connection with this consent shall be performed by a laboratory that meets ISO 17025 standards, or otherwise as specifically approved by the consent authority.	Sampling and lab analysis performed monthly by Watercare Laboratories to meet required standards.	**Achieved**
12	The following information shall be provided in writing to the consent authority by 1 December each year, and upon request, following the commencement of the exercise of the consent: (a) the nitrogen mass balance for the spray irrigation land application area, which shall be determined annually. the nitrogen mass balance shall consist as a minimum the total nitrogen applied to land and crop removal of nitrogen. (b) the total nitrogen applied to the spray irrigation land shall be estimated from the total volume of effluent applied and the average of monthly concentration of total nitrogen in the land applied effluent. (c) the crop removal of nitrogen from the spray irrigation land shall be estimated by obtaining dry matter content and total nitrogen content after each crop/plant harvest. (d) the nitrogen mass balance from condition 12(a) and any other factors such as ammonia volatilisation and denitrification shall be used to calculate the mass of nitrogen leached from the site, using a model acceptable to the consent authority	The nitrogen mass balance is presented in a separate report.	**Achieved**
13	The consent holder shall forward an annual report in writing to the consent authority by 1 December each year. The annual report shall cover the preceding 12 month period (from 1 December the preceding year until 30 November of the current year) and shall report on compliance with this consent. As a minimum, the report shall include: (a) a summary of all analytical results for the year; and (b) a summary of the year's monitoring results, in context of previous years' results; and (c) comments on compliance with the conditions of this discharge permit; and (d) a summary of any complaints received, the validity of each complaint and the corrective action taken; and (e) a summary of any malfunctions of breakdowns and the corrective action taken; and (f) details of the cut and carry operation, including the calculations for nitrogen loading in the spray irrigation land, number of harvests, dry matter and total nitrogen content of the harvest and nitrogen balance for this site. (g) any other issues considered relevant by the consent holder.	Annual Report submitted for the period 1 December 2015 – 30 November 2016 on 6th December 2017.	**Non-compliant**
14	By no later than 1 December 2012, the consent holder shall prepare and forward to the consent authority an operations and management manual for the wastewater treatment and disposal system to ensure its effective and efficient operation at all times. The system shall be operated in accordance with this manual, which shall be updated as appropriate. The manual and include, as a minimum,: (a) a brief description of the treatment and disposal system, including a site map indicating the location of the treatment and disposal system, points of discharge and any monitoring sites; (b) key operational matters, including weekly, monthly and annual maintenance checks; (c) monitoring requirements and procedures including a nitrogen balance sheet for the purpose of managing nitrogen inputs and outputs including nitrogen leaching losses; (d) a management plan for the cut and carry operation including procedures for harvesting grass from the site, and maximising grass growth and nitrogen uptake by grass such as soil tests, supplementary nutrient additions and pest and weed control; (e) management and dosing of trenches (f) contingency plans in the event of system malfunctions or breakdowns; and (g) the means of receiving and dealing with any complaints; and (h) emergency contact phone numbers.	The first O&M manual was sent to the ORC on the 7 May 2008, with an updated O&M manual sent 8 August 2008. A revised O&M manual by VW was sent to the ORC in April 2010 with the Annual Report 2009/10. Updated O&M Manual submitted to the ORC on 6th December 2017.	**Achieved**
15	No ponding or surface run-off of effluent shall occur as a result of the exercise of this consent.	No ponding or surface run-off of wastewater.	**Achieved**
16	There shall be no odour emission resulting from the treatment and disposal system that is offensive or objectionable to such an extent that it has an adverse effect on the environment beyond the boundary of the property on which the consent is exercised	No odour complaints received.	**Achieved**
17	This permit does not authorise the discharge of sludge to land or water.	No sludge discharged to land or water.	**Achieved**

**Conditions 1 is a 'general' resource consent conditions that do not require compliance monitoring*

4.4 *WWTP Performance & Future Works*

Veolia is the 3-waters (water, wastewater and storm water) operators and maintenance contractor for QLDC. In the 1 December 2015 to 30 November 2016 period there were no major breakdowns. Veolia manages programmed maintenance and work orders/ requests for service for breakdowns.

During December 2015, the disposal field was cleared of large stones that were impeding harvest efforts. Broom was also cleared from the field in August 2016.

QLDC employed the services of Gilles Altner of Global Environmental Engineering Ltd in December 2015 to carry out a plant performance investigation. A number of short to mid-term recommendations were made. Veolia also completed a performance review of the plant in 2015. Following the recommendations of these reports, efforts have been made to optimise the operation of the plant to reduce nutrient levels.

As stated in previous reports, it has been determined that the plant is not suitable for the current resource consent conditions. There is no design basis for it to remove nutrients reliably. Consideration needs to be given to significant capital upgrade to this facility. Some options to consider for cost-effectiveness would be to:

- Pipe the waste to Project Pure (refer to 2013/14 Annual Report).
- Retrofit additional treatment into existing site.

QLDC is committed to implementing a long term solution. The draft QLDC Long Term Plan includes budget to either upgrade the Hawea WWTP or pipe the waste to Project Pure, in 2021 – 2023.

5. Summary and Conclusions

The interpretation of and conclusion about, the monitoring results from the Hawea WWTP are as follows:

- The volume of wastewater discharged remained below the consent limit of 755 m^3/day, with a maximum of 506 m^3/day recorded in July 2016 and an annual average of 172 m^3/day.

- The rolling 12 month 95th percentile of 44 mg/L for total Ammoniacal nitrogen exceeded the consent limit (30 mg/L) in the 2015/16 monitoring period, while the annual mean remained below the consent limit throughout the year.

- The rolling 12 month 95th percentile of 55 mg/L for total nitrogen exceeded the consent limit (40 mg/L) in the 2015/16 monitoring period. The annual mean was compliant initially, but exceeded in the last quarter of the monitoring period.

- The results for E. *coli* remained below the consent limit. Total phosphorus, total suspended solids and BOD5 are consistent with results from previous years. Total phosphorus was compliant with consent limits, while total suspended solids and BOD5 do not have consent limits.

Compliance with Resource Consents RM10.308.01 and RM10.308.02 was achieved in the 2015/16 monitoring year for a number of the consent conditions, however a number of issues still remain. The monitoring results for total nitrogen and total Ammoniacal nitrogen were elevated above consent limits, as in previous years, despite efforts to optimise plant performance.

There have been no odour complaints for the Hawea oxidation ponds during the 2015/16 year.

Veolia and QLDC will continue to monitor the plant and improve performance where possible. It may be possible to discharge greater volumes of wastewater via the spray irrigation, to further minimise usage of the trench. This will be investigated further and implemented when possible.

The longer term solution for Hawea wastewater compliance, is to either upgrade the existing treatment facility, or construct a pipe to Project Pure, and this has been budgeted for 2021-2023.

Glossary of Terms

BOD	Biological Oxygen Demand (BOD) measures the rate of oxygen uptake by micro-organisms in a sample of water at a temperature of 20°C and over an elapsed period of five days in the dark.
cfu	Colony Forming Units (cfu) is a measure of the concentration of bacteria usually expressed as per 100 millimetre sample.
COD	The Chemical Oxygen Demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water (e.g. lakes and rivers), making COD a useful measure of water quality. It is expressed in milligrams per litre (mg/L), which indicates the mass of oxygen consumed per litre of solution.
Conductivity	An indication of the level of dissolved salts in a sample, usually measured at 20^{o}C and expressed in mS/m
Wastewater	Discharge from the WWTP (in this case, treated wastewater).
g/m^3	grams per cubic meter, equivalent to milligrams per litre (mg/L). In water this is also equivalent to parts per million (ppm).
pH	pH is a numeric measure of the acidity or basicity of a solution. It is defined as the cologarithm of the activity of dissolved hydrogen ions (H^+). Neutral is pH 7. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength, for example, a pH of 4 is 10 times more acidic than a pH of 5.
Resource Consent	refers to Section 87 of the RMA. Resource consents include land use consents, coastal permits, water permits and discharge permits.
RMA	Resource Management Act 1991 and subsequent amendments.
WWTP	Wastewater Treatment Plant (WWTP) is the process of removing contaminants from wastewater and household sewage, both runoff and domestic. It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a waste stream (or treated wastewater) and a solid waste or sludge suitable for discharge or reuse back into the environment.

Appendix A Resource Consents

Consent No. RM10.308.01

Our Reference: A296715

DISCHARGE PERMIT

Pursuant to Section 104B of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Queenstown Lakes District Council

Address: 10 Gorge Road, Queenstown

To discharge contaminants to air for the purpose of discharging treated wastewater.

For a term expiring: 12 November 2022

Location of consent activity: Lake Hawea, approximately 600 metres south of the intersection of Domain Road and Cemetery Road

Legal description of consent location: Lot 1 DP 20555

Map Reference: NZTM E1302846 N5052016 NZ260 G40 128 137

Conditions

Specific

1. This consent shall only be exercised in conjunction with Discharge Permit RM10.308.02.

2. The discharge to air shall be as described in the consent application submitted to the Consent Authority on 31 August 2010 and any subsequent information provided

3. Wind cloth shall be installed on the western, southern and eastern-most boundaries of the area on which treated wastewater is to be applied by spray irrigation. This wind cloth shall be maintained until the screen foliage required under Condition 4 is fully established.

4. Suitable screening foliage, that shall be at least 3 metres high but not exceed 6 metres in height, shall be planted on the western, southern and eastern-most boundaries of the area on which treated wastewater is applied by spray irrigation.

5. A weather station shall be installed in an appropriate location to record, as a minimum, rainfall and wind conditions at the site where treated wastewater is to be applied by spray irrigation.

6. The spray irrigation system shall not be operated in conditions where wind speed, as

measured at the on-site station installed under Condition 5, exceeds 29.9 km/hour;

Performance Monitoring

7. The consent holder shall keep a record of any complaints received regarding discharges of odour from the site. The record shall, as a minimum, include the following:
(a) The time and place at which the complaint was generated;
(b) The nature of the complaint;
(c) Operating conditions at the time of the complaint, including any malfunctioning or breakdown of control equipment;
(d) Wind and weather conditions at the time of the complaint; and
(e) Corrective action taken by the consent holder to minimise the risk and extent of the recurrence of the causes of the complaint.

The consent holder shall submit a copy of the written record of the complaint to the Consent Authority within two weeks after any complaint occurring, together with the details of the corrective actions taken.

General

8. There shall be no discharge of odour, as a result of the exercise of this consent, that is noxious, dangerous, offensive or objectionable to the extent that it causes an adverse effect beyond the boundary of the site, in the opinion of an authorised officer of the Consent Authority.

9. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent within three months of each anniversary of the commencement of this consent, for the purpose of:
(a) Determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the consent; or
(b) Ensuring the conditions of this consent are consistent with any National Environmental Standards; or
(c) Requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment arising as a result of the exercise of this consent.

Notes to Consent Holder

1. *If you require a replacement consent/permit upon the expiry date of this permit, any new application should be lodged at least 6 months prior to the expiry date of this permit. Applying at least 6 months before the expiry date may enable you to continue to exercise this permit until a decision is made, and any appeals are resolved, on the replacement application.*

Issued at Dunedin this 15th day of November 2010
Marian Weaver
RM Procedural Specialist

Our Reference: A296715

Consent No. RM10.308.02

DISCHARGE PERMIT

Pursuant to Section 104B of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Queenstown Lakes District Council

Address: 10 Gorge Road, Queenstown

To discharge contaminants to land for the purpose of discharging treated wastewater.

For a term expiring: 12 November 2022

Location of consent activity: Lake Hawea, approximately 600 metres south of the intersection of Domain Road and Cemetery Road

Legal description of consent location: Lot 1 DP 20555

Map Reference: NZTM E1302846 N5052016 NZ260 G40 128 137

Conditions

Specific

1. The discharge shall only be treated domestic wastewater, as described in the consent application submitted to the Consent Authority on 31 August 2010 and any subsequent information provided.

2. The volume of effluent discharged shall not exceed 775 cubic metres per day.

3. The distance the site boundary from any part of the wastewater treatment and disposal system shall no less than 5 metres.

4. By no later than 1 December 2012, the consent holder shall ensure that the trench utilised for wastewater disposal:
   a) is at least 150 metres long and 2 m wide in total; and
   b) is intermittently dosed; and
   c) is not used for the disposal of wastewater for more than 4 months in total in any one calendar year.

5. By no later than 1 December 2012, the consent holder shall install and commission a spray irrigation system for the land application of treated wastewater. The spray irrigation system shall meet the following criteria:
   (a) The total area on which treated wastewater is applied by spray irrigation shall be no less than 2.5 hectares;
   (b) Treated wastewater shall be applied evenly by spray irrigation to the area defined in Appendix I only;
   (c) The area on which treated wastewater is applied by spray irrigation shall be fenced with a 2 metre high deer fence with appropriate signage warning the general public of the hazard;
   (d) A weather station shall be installed in an appropriate location to record, as a

minimum, rainfall and wind conditions at the site where treated wastewater is to be applied by spray irrigation;
(e) Wastewater shall not be applied to land by spray irrigation system during the hours outside of 11 pm to 5 am; (f) Nozzle pressure must not exceed 400 kilopascals (kPa);
(g) There shall be no irrigation of treated wastewater using K-Line irrigation systems.

6. The area on which treated wastewater is to be applied using spray irrigation shall be planted in high growth and nitrogen uptake vegetation (such as Lucerne or Ryegrass) and shall be managed as far as practicably possible to optimise nutrient removal. A minimum of three harvests per year shall be undertaken.

7. The total nitrogen applied to the spray irrigation area shall not exceed 1,223 kilograms of nitrogen per hectare per year.

Performance Monitoring

8. The treatment and disposal system shall be constructed and installed in accordance with the details and plans supplied with the consent application submitted to the Consent Authority on 31 August 2010, and attached to this consent as Appendix I.

9. The consent holder shall install a flow meter on the outlet pipe from the treatment system and continually measure and record the daily volume (based on a no more than weekly average) of effluent being discharged to the disposal field. The consent holder shall forward the record for the previous 12-month period to the Consent Authority by 1 December each year, and upon request.

10. (a) From the first exercise of this consent, the consent holder shall collect representative samples of the treated wastewater from the outlet of the oxidation pond in the last week of each month. The samples shall be analysed for:
(i) Five day total biochemical oxygen demand (BOD_5); and
(ii) Total suspended solids; and (iii) Total nitrogen; and (iv) Total Ammoniacal nitrogen; and (v) Total phosphorous; and (vi) *Escherichia coli*.

(b) From the first exercise of this consent, wastewater discharged from the oxidation pond shall comply with the following criteria:

	Mean*	95th Percentile (mg/L)*
Ammoniacal Nitrogen	25 (mg/L)	30 (mg/L)
Total Nitrogen	35 (mg/L)	40 (mg/L)
Total Phosphorous	8 (mg/L)	10 (mg/L)
Faecal Coliforms	-	2.5 x 10^5 cfu/100 mL

*The mean and 95th percentile applies to a rolling 12 month period.

(c) The analytical sample results from the sampling under Condition 9(a) of this consent shall be submitted to the Consent Authority by 1 December each year, and upon request.

11. All sampling techniques shall be acceptable to the Consent Authority. All analysis carried out in connection with this consent shall be performed by a laboratory that meets ISO 17025 standards, or otherwise as specifically approved by the Consent Authority.

12. The following information shall be provided in writing to the Consent Authority by 1 December each year, and upon request, following the commencement of the exercise of the consent:
(a) The nitrogen mass balance for the spray irrigation land application area, which shall

be determined annually. The nitrogen mass balance shall consist as a minimum the total nitrogen applied to land and crop removal of nitrogen.

(b) The total nitrogen applied to the spray irrigation land shall be estimated from the total volume of effluent applied and the average of monthly concentration of total nitrogen in the land applied effluent.

(c) The crop removal of nitrogen from the spray irrigation land shall be estimated by obtaining dry matter content and total nitrogen content after each crop/plant harvest.

(d) The nitrogen mass balance from Condition 12(a) and any other factors such as ammonia volatilisation and denitrification shall be used to calculate the mass of nitrogen leached from the site, using a model acceptable to the Consent Authority

13. The consent holder shall forward an annual report in writing to the Consent Authority by 1 December each year. The annual report shall cover the preceding 12 month period (from 1 December the preceding year until 30 November of the current year) and shall report on compliance with this consent. As a minimum, the report shall include:

(a) A summary of all analytical results for the year; and
(b) A summary of the year's monitoring results, in context of previous years' results; and
(c) Comments on compliance with the conditions of this discharge permit; and
(d) A summary of any complaints received, the validity of each complaint and the corrective action taken; and
(e) A summary of any malfunctions of breakdowns and the corrective action taken; and
(f) Details of the cut and carry operation, including the calculations for nitrogen loading in the spray irrigation land, number of harvests, dry matter and total nitrogen content of the harvest and nitrogen balance for this site.
(g) Any other issues considered relevant by the consent holder.

14. By no later than 1 December 2012, the consent holder shall prepare and forward to the Consent Authority an Operations and Management Manual for the wastewater treatment and disposal system to ensure its effective and efficient operation at all times. The system shall be operated in accordance with this manual, which shall be updated as appropriate. The manual and include, as a minimum,:
(a) A brief description of the treatment and disposal system, including a site map indicating the location of the treatment and disposal system, points of discharge and any monitoring sites;
(b) Key operational matters, including weekly, monthly and annual maintenance checks;
(c) Monitoring requirements and procedures including a nitrogen balance sheet for the purpose of managing nitrogen inputs and outputs including nitrogen leaching losses;
(d) A management plan for the cut and carry operation including procedures for harvesting grass from the site, and maximising grass growth and nitrogen uptake by grass such as soil tests, supplementary nutrient additions and pest and weed control;
(e) Management and dosing of trenches
(f) Contingency plans in the event of system malfunctions or breakdowns; and
(g) The means of receiving and dealing with any complaints; and
(h) Emergency contact phone numbers.

General

15. No ponding or surface run-off of effluent shall occur as a result of the exercise of this consent.

16. There shall be no odour emission resulting from the treatment and disposal system that is offensive or objectionable to such an extent that it has an adverse effect on the

environment beyond the boundary of the property on which the consent is exercised

17. This permit does not authorise the discharge of sludge to land or water.

18. If the consent holder:
(a) discovers koiwi tangata (human skeletal remains), waahi taoka (resources of importance), waahi tapu (places or features of special significance) or other Maori artefact material, the consent holder shall without delay:
(i) notify the Consent Authority, Tangata whenua and New Zealand Historic Places Trust and in the case of skeletal remains, the New Zealand Police.
(ii) stop work within the immediate vicinity of the discovery to allow a site inspection by the New Zealand Historic Places Trust and the appropriate runanga and their advisors, who shall determine whether the discovery is likely to be extensive, if a thorough site investigation is required, and whether an Archaeological Authority is required.
Any koiwi tangata discovered shall be handled and removed by tribal elders responsible for the tikanga (custom) appropriate to its removal or preservation. Site work shall recommence following consultation with the Consent Authority, the New Zealand Historic Places Trust, Tangata whenua, and in the case of skeletal remains, the New Zealand Police, provided that any relevant statutory permissions have been obtained.
(b) discovers any feature or archaeological material that predates 1900, or heritage material, or disturbs a previously unidentified archaeological or heritage site, the consent holder shall without delay:
(i) stop work within the immediate vicinity of the discovery or disturbance and
(ii) advise the Consent Authority, the New Zealand Historic Places Trust, and in the case of Maori features or materials, the Tangata whenua, and if required, shall make an application for an Archaeological Authority pursuant to the Historic Places Act 1993 and
(iii) arrange for a suitably qualified archaeologist to undertake a survey of the site. Site work shall recommence following consultation with the Consent Authority.

19. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent within three months of each anniversary of the commencement of this consent, for the purpose of:
(a) determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the consent; or
(b) ensuring the conditions of this consent are consistent with any National Environmental Standards; or
(c) requiring the consent holder to adopt the best practicable option, in order to remove or reduce any adverse effect on the environment arising as a result of the exercise of this consent.

Notes to Consent Holder

1. If you require a replacement consent/permit upon the expiry date of this permit, any new application should be lodged at least 6 months prior to the expiry date of this permit. Applying at least 6 months before the expiry date may enable you to continue to exercise this permit until a decision is made, and any appeals are resolved, on the replacement application.

Issued at Dunedin this 15th day of November 2010
Marian Weaver
RM Procedural Specialist

Appendix I – Area on which Treated Wastewater is to be applied using Spray Irrigation

Appendix B Effluent Results Tables

	TSS	BOD5		Total Phosphorus			Total Nitrogen			Ammoniacal Nitrogen			*E. Coli*		
	mg/L	mg/L		mg/L			mg/L			mg/L			cfu/100 mL		
				Annual Mean	95th percentile		Annual Mean	95th percentile		Annual Mean	95th percentile		Annual Mean	95th percentile
Consent Limit				8	10		35	40		25	30			250,000
30/12/2010	205	41	7.6			22			0.2			22,000		
25/01/2011	136	36	9			21			0.2			6,300		
24/02/2011	148	56	7.9			25			0.2			23,000		
24/03/2011	137	35	7			27			0.2			27,000		
27/04/2011	138	46	7.6			41			0.6			39,000		
27/05/2011	73	48	6.8			33			2.9			40,000		
28/06/2011	56	21	6.7			33			16.6			32,000		
27/07/2011	67	25	6.5			49			24.9			3,700		
31/08/2011	129	36	7.2			40			27			79,000		
30/09/2011	171	34	7.1			45			22.6			84,000		
25/10/2011	205	70	7.4			39			6.7			20,000		
28/11/2011	190	46	5.3	7	8	26	33	47	0.2	9	26	8,600	32,050	81,250
28/12/2011	130	58	7.2	7	8	25	34	47	1.1	9	26	20,000	31,883	81,250
31/01/2012	120	27	6.9	7	8	15	33	47	0.2	9	26	9,900	32,183	81,250
23/02/2012	160	31	7.2	7	7	24	33	47	13	10	26	62,000	35,433	81,250
28/03/2012	200	34	8	7	8	37	34	47	25	12	26	52,000	37,517	81,250
27/04/2012	130	17	8	7	8	46	34	47	34	15	30	23,000	36,183	81,250
28/05/2012	90	26	5.7	7	8	42	35	47	32	17	33	56,000	37,517	81,250
26/06/2012	73	23	7.5	7	8	38	36	47	31	18	33	52,000	39,183	81,250
26/07/2012	93	33	6.2	7	8	40	35	45	32	19	33	54,000	43,375	81,250

6/08/2012						43	35	45					40,136	73,000
24/08/2012	130	53	6.4	7	8	43	35	44	29	19	33	20,000		71,900
25/09/2012	140	32	6.6	7	8	40	35	44	26	20	33	75,000	39,318	68,500
26/10/2012	210	120	6.4	7	8	30	35	44	8	21	33	24,000	40,718	67,850
26/11/2012	83	37	0.6	6	8	16	33	44	6	21	33	3,100	39,182	67,850
27/12/2012	130	67	8	6	8	17	35	44	6	22	33	9,600	39,155	68,500
23/01/2013	110	37	8.7	7	8	38	35	44	32	24	33	12,000	34,609	65,500
22/02/2013	190	41	9.7	7	9	50	37	48	36	25	35	3,000	30,155	65,500
26/03/2013	16	38	9.3	7	9	43	39	48	34	25	35	*45*	28,068	65,500
26/04/2013	79	28	8.9	7	9	43	37	46	33	25	35	1,400	23,104	64,500
27/05/2013	41	22	7.1	7	10	41	36	43	32	25	35	4,700	18,804	64,500
25/06/2013	26	21	5.8	7	9	40	37	46	34	25	35	21,000	15,804	49,500
25/07/2013	30	26	6.4	7	9	40	37	46	34	26	35	16,000	15,820	46,950
26/08/2013	91	24	8.3	7	9	48	37	49	31	26	35	39,000	17,404	55,200
24/09/2013	90	37	6.2	7	9	36	37	49	28	26	35	36,000	14,154	37,350
25/10/2013	70	33	6	7	9	37	37	49	29	28	35	11,000	13,070	37,350
25/11/2013	92	15	8.6	7	9	57	41	53	47	31	41	11,000	13,729	37,350
23/12/2013	56	14	9.1	8	9	58	44	57	46	35	46	7,100	13,520	37,350
20/01/2014	91	27	8	8	9	50	45	57	35	35	46	41,000	15,937	39,900
20/02/2014	89	22	8.5	8	9	38	44	57	25	34	46	4,900	16,095	39,900
25/03/2014	33	19	8.6	8	9	36	44	57	34	34	46	3,000	16,342	39,900
23/04/2014	62	28	7.2	8	9	43	44	57	34	34	46	59,000	21,142	49,100
29/05/2014	58	24	6.8	7	9	39	44	57	32	34	46	91,000	28,333	73,400
24/06/2014		27	5.8	7	9	37	43	57	29	34	46	33,000	29,333	73,400
23/07/2014	69	32	5.6	7	9	41	43	57	28	33	46	52,000	32,333	73,400
21/08/2014	76	22	6.2	7	9	39	43	57	26	33	46	16,000	30,417	73,400
24/09/2014	67	37	6.8	7	9	44	43	57	28	33	46	4,200	27,767	73,400
16/10/2014	140	42	7.2	7	9	40	44	57	26	33	46	34,000	29,683	73,400

17/11/2014	44	31	7.1	7	9	38	42	54	29	31	40	11,000	29,683	73,400
17/12/2014	140	29	9.7	7	9	48	41	49	37	30	36	50,000	33,258	73,400
20/01/2015	180	31	7.8	7	9	19	39	46	2	27	35	22,000	31,675	73,400
19/02/2015	87	49	8.6	7	9	20	37	46	11	26	35	25,000	33,350	73,400
20/03/2015	110	36	7.6	7	9	25	36	46	*0.2*	23	35	46,000	36,933	73,400
22/04/2015	120	33	7.4	7	9	17	34	46	*0.2*	21	34	60,000	37,017	73,950
20/05/2015	90	31	6.5	7	9	20	32	46	2	18	33	16,000	30,767	55,600
19/06/2015	65	48	5.8	7	9	22	31	46	16	17	33	53,000	32,433	56,150
24/07/2015	76	24	5.8	7	9	34	31	46	28	17	33	7,600	28,733	56,150
24/08/2015	130	41	6.4	7	9	36	30	46	25	17	33	86,000	34,567	71,700
22/09/2015	120	51	5.3	7	9	31	29	44	19	16	33	32,000	36,883	71,700
20/10/2015	25	23	6.7	7	9	41	29	44	29	17	33	21,000	35,800	71,700
19/11/2015	100	24	8.3	7	9	50	30	49	38	17	37	14,000	36,050	71,700
22/12/2015	180	40	8.3	7	9	29	29	45	18	16	33	75,000	38,133	79,950
20/01/2016	130	34	10.0	7	9	45	31	47	28	18	33	71,000	42,217	79,950
18/02/2016	210	48	7.8	7	9	19	31	47	*0.2*	17	33	68,000	45,800	79,950
22/03/2016	190	48	7.3	7	9	17	30	47	0.1	17	33	51,000	46,217	79,950
26/04/2016	160	40	7.2	7	9	20	30	47	4	17	33	23,000	43,133	79,950
19/05/2016	92	34	6.6	7	9	25	31	47	18	19	33	30,000	44,300	79,950
21/06/2016	62	22	5.9	7	9	36	32	47	30	20	34	10,000	40,717	79,950
22/07/2016	89	30	5.9	7	9	39	32	47	33	20	35	15,000	41,333	79,950
18/08/2016	110	25	6.4	7	9	39	33	47	35	21	36	18,000	35,667	72,800
22/09/2016	94	24	7.1	7	9	53	34	51	34	22	36	37,000	36,083	72,800
20/10/2016	92	21	8.3	7	9	57	36	55	48	24	43	20,000	36,000	72,800
21/11/2016	150	53	8.0	7	9	51	36	55	40	24	44	67,000	40,417	72,800

Italic and underlined = results below the detection limit and halved for analysis

Appendix C Watercare Laboratory Certificates

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:151222-103

Attention:	Operations .	*Final Report:*	**164906-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**29-Dec-2015**
Address:		*Received Date:*	**23-Dec-2015**
Client Reference:	**Hawea Ponds Monthly December 2015**		
Purchase Order:	**PO522426**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**151222-103-1**
Client Sample ID:	
Sample Date/Time:	22/12/2015
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	18
CBOD5	mg/L	40
Total Nitrogen (as N)	mg/L	29
Total Phosphorus (as P)	mg/L	8.3
Total Suspended Solids	mg/L	180
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	75000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	MEWAM, HMSO 1981, ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J, 4500-NO3 F (modified)	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/D	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher.

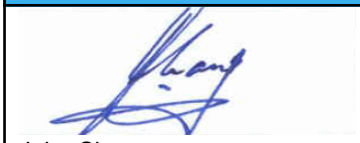
Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited.

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 29/12/2015



John Chang
KTP Signatory

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:160120-094

Attention:	Operations .	*Final Report:*	**169831-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**10-Feb-2016**
Address:		*Received Date:*	**21-Jan-2016**
Client Reference:	**Hawea Ponds Monthly Jan. 2016**		
Purchase Order:	**PO522690**	*Quote Reference :*	**42**

Sample Details		WATERS
Lab Sample ID:		**160120-094-1**
Client Sample ID:		
Sample Date/Time:		20/01/2016
Description:		Hawea Effluent (RM 10.308.02)
General Testing		
Ammoniacal Nitrogen (as N)	mg/L	28
CBOD5	mg/L	34
Total Nitrogen (as N)	mg/L	45
Total Phosphorus (as P)	mg/L	10
Total Suspended Solids	mg/L	130
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	71000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	MEWAM, HMSO 1981, ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J, 4500-NO3 F (modified)	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/D	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher

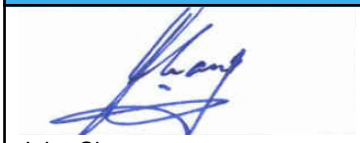
Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited.

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 10/02/2016



John Chang
KTP Signatory

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:160218-086

Attention:	Operations .	*Final Report:*	**171770-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**24-Feb-2016**
Address:		*Received Date:*	**19-Feb-2016**
Client Reference:	**Hawea Ponds Monthly Feb. 2016**		
Purchase Order:	**PO522690**	*Quote Reference :*	**42**

Sample Details		WATERS
Lab Sample ID:		**160218-086-1**
Client Sample ID:		
Sample Date/Time:		18/02/2016
Description:		Hawea Effluent (RM 10.308.02)
General Testing		
Ammoniacal Nitrogen (as N)	mg/L	<0.4
CBOD5	mg/L	48
Total Nitrogen (as N)	mg/L	19
Total Phosphorus (as P)	mg/L	7.8
Total Suspended Solids	mg/L	210
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	68000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	MEWAM, HMSO 1981, ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J, 4500-NO3 F (modified)	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/D	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited.

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 24/02/2016

Geeta Hariharaputran
KTP Signatory

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:160322-096

Attention:	Operations .	*Final Report:*	**177022-0**	*Replaces Report*	**176402-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**05-Apr-2016**		
Address:		*Received Date:*	**23-Mar-2016**		
Client Reference:	**Hawea Ponds Monthly March 2016**				
Purchase Order:	**PO523213**	*Quote Reference :*	**42**		

Sample Details

	WATERS
Lab Sample ID:	**160322-096-1**
Client Sample ID:	
Sample Date/Time:	22/03/2016
Description:	Hawea Effluent (RM 10.308.02)

General Testing

Ammoniacal Nitrogen (as N)	mg/L	0.14
CBOD5	mg/L	48
Total Nitrogen (as N)	mg/L	17
Total Phosphorus (as P)	mg/L	7.3
Total Suspended Solids	mg/L	190

Microbiology

Escherichia coli by Membrane Filtration

Escherichia coli	cfu/100 mL	51000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	MEWAM, HMSO 1981, ISBN 0117516139	0.005 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J, 4500-NO3 F (modified)	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/D	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher.

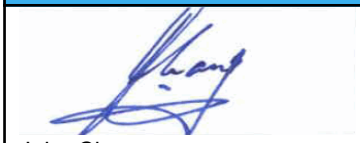
Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited.

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 05/04/2016



John Chang
KTP Signatory

Watercare
Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Auckland, 2150
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
Queenstown, 9349
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:160426-080

Attention:	Operations .	*Final Report:*	**180836-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**04-May-2016**
Address:		*Received Date:*	**27-Apr-2016**
Client Reference:	**Hawea Ponds Monthly April 2016**		
Purchase Order:	**PO523472**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**160426-080-1**
Client Sample ID:	
Sample Date/Time:	26/04/2016
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	3.6
CBOD5	mg/L	40
Total Nitrogen (as N)	mg/L	20
Total Phosphorus (as P)	mg/L	7.2
Total Suspended Solids	mg/L	160
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	23000

*Results marked with * are not accredited to the MPI Recognised Laboratory Programme*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	MEWAM, HMSO 1981, ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J, 4500-NO3 F (modified)	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/D	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Operations Manager.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited.

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 04/05/2016

Chandra Sharma
KTP Signatory

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Auckland, 2150
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
Queenstown, 9349
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:160519-091

Attention:	Operations .	*Final Report:*	**183581-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**25-May-2016**
Address:		*Received Date:*	**20-May-2016**
Client Reference:	**Hawea Ponds Monthly May 2016**		
Purchase Order:	**PO523750**	*Quote Reference :*	**42**

Sample Details		WATERS
Lab Sample ID:		**160519-091-1**
Client Sample ID:		
Sample Date/Time:		19/05/2016
Description:		Hawea Effluent (RM 10.308.02)
General Testing		
Ammoniacal Nitrogen (as N)	mg/L	18
CBOD5	mg/L	34
Total Nitrogen (as N)	mg/L	25
Total Phosphorus (as P)	mg/L	6.6
Total Suspended Solids	mg/L	92
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	30000

*Results marked with * are not accredited to the MPI Recognised Laboratory Programme*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	MEWAM, HMSO 1981, ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J, 4500-NO3 F (modified)	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/D	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Operations Manager.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited.

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 25/05/2016

John Chang
KTP Signatory

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Auckland, 2150
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
Queenstown, 9349
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:160621-097

Attention:	Operations .	*Final Report:*	**188352-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**06-Jul-2016**
Address:		*Received Date:*	**22-Jun-2016**
Client Reference:	**Hawea Ponds Monthly June 2016**		
Purchase Order:	**PO524038**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**160621-097-1**
Client Sample ID:	
Sample Date/Time:	21/06/2016
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	30
CBOD5	mg/L	22
Total Nitrogen (as N)	mg/L	36
Total Phosphorus (as P)	mg/L	5.9
Total Suspended Solids	mg/L	62
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	10000

*Results marked with * are not accredited to the MPI International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	MEWAM, HMSO 1981, ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J, 4500-NO3 F (modified)	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/D	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Operations Manager.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited.

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 06/07/2016

John Chang
KTP Signatory

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:160722-062

Attention:	Operations .	*Final Report:*	**190995-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**28-Jul-2016**
Address:		*Received Date:*	**23-Jul-2016**
Client Reference:	**Hawea Ponds Monthly July 2016**		
Purchase Order:	**PO524293**	*Quote Reference :*	**42**

Sample Details		WATERS
Lab Sample ID:		**160722-062-1**
Client Sample ID:		
Sample Date/Time:		22/07/2016
Description:		Hawea Effluent (RM 10.308.02)
General Testing		
Ammoniacal Nitrogen (as N)	mg/L	33
CBOD5	mg/L	30
Total Nitrogen (as N)	mg/L	39
Total Phosphorus (as P)	mg/L	5.9
Total Suspended Solids	mg/L	89
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	15000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/D	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher

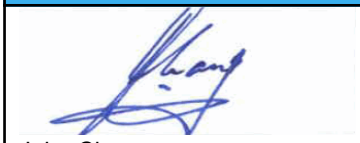
Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited.

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 28/07/2016



John Chang
KTP Signatory

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Auckland, 2150
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
Queenstown, 9349
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:160818-097

Attention:	Operations .	*Final Report:*	**194508-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**29-Aug-2016**
Address:		*Received Date:*	**19-Aug-2016**
Client Reference:	**Hawea Ponds Monthly August 2016**		
Purchase Order:	**PO524534**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**160818-097-1**
Client Sample ID:	
Sample Date/Time:	18/08/2016
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	35
CBOD5	mg/L	25
Total Nitrogen (as N)	mg/L	39
Total Phosphorus (as P)	mg/L	6.4
Total Suspended Solids	mg/L	110
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	18000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Di	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Operations Manager.

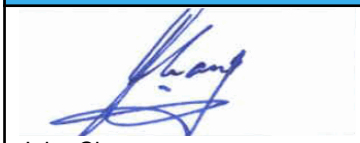
Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited .

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ACCREDITED LABORATORY

Report Signatory 29/08/2016



John Chang
KTP Signatory

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:160922-090

Attention:	Operations .	*Final Report:*	**198512-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**02-Oct-2016**
Address:		*Received Date:*	**23-Sep-2016**
Client Reference:	**Hawea Ponds Monthly September 2016**		
Purchase Order:	**PO524822**	*Quote Reference :*	**42**

Sample Details		WATERS
Lab Sample ID:		**160922-090-1**
Client Sample ID:		
Sample Date/Time:		22/09/2016
Description:		Hawea Effluent (RM 10.308.02)
General Testing		
Ammoniacal Nitrogen (as N)	mg/L	34
CBOD5	mg/L	24
Total Nitrogen (as N)	mg/L	53
Total Phosphorus (as P)	mg/L	7.1
Total Suspended Solids	mg/L	94
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	37000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Di	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher

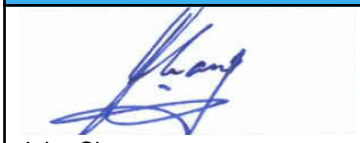
Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited .

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 02/10/2016



John Chang
KTP Signatory

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:161020-088

Attention:	Operations .	*Final Report:*	**202243-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**02-Nov-2016**
Address:		*Received Date:*	**21-Oct-2016**
Client Reference:	**Hawea Ponds Monthly October 2016**		
Purchase Order:	**PO525054**	*Quote Reference :*	**42**

Sample Details		WATERS
Lab Sample ID:		**161020-088-1**
Client Sample ID:		
Sample Date/Time:		20/10/2016
Description:		Hawea Effluent (RM 10.308.02)
General Testing		
Ammoniacal Nitrogen (as N)	mg/L	48
CBOD5	mg/L	21
Total Nitrogen (as N)	mg/L	57
Total Phosphorus (as P)	mg/L	8.3
Total Suspended Solids	mg/L	92
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	20000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Di	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher

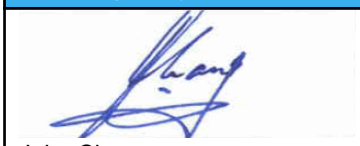
Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited .

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 02/11/2016



John Chang
KTP Signatory

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:161121-095

Attention:	Operations .	*Final Report:*	**206110-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**01-Dec-2016**
Address:		*Received Date:*	**22-Nov-2016**
Client Reference:	**Hawea Ponds Monthly November 2016**		
Purchase Order:	**PO525337**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**161121-095-1**
Client Sample ID:	
Sample Date/Time:	21/11/2016
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	40
CBOD5	mg/L	53
Total Nitrogen (as N)	mg/L	51
Total Phosphorus (as P)	mg/L	8.0
Total Suspended Solids	mg/L	150
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	67000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Di	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited .

This report may not be reproduced, except in full, without the written authority of the Operations Manager.

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 01/12/2016

Chandra Sharma
KTP Signatory

Appendix D Daily Effluent Flow Data

Date	Discharge to trench (m3)	Irrigation discharge (m3)	Total discharge (m3)
1/12/2015	116	0	116
2/12/2015	86	0	86
3/12/2015	56	110	166
4/12/2015	11	105	116
5/12/2015	3	105	108
6/12/2015	11	105	116
7/12/2015	33	105	138
8/12/2015	3	105	108
9/12/2015	5	105	110
10/12/2015	0	105	105
11/12/2015	0	105	105
12/12/2015	8	105	113
13/12/2015	24	105	129
14/12/2015	8	105	113
15/12/2015	10	105	115
16/12/2015	81	105	186
17/12/2015	56	105	161
18/12/2015	17	105	122
19/12/2015	64	105	169
20/12/2015	5	105	110
21/12/2015	6	105	111
22/12/2015	39	105	144
23/12/2015	45	105	150
24/12/2015	24	105	129
25/12/2015	96	105	201
26/12/2015	54	105	159
27/12/2015	20	105	125
28/12/2015	154	105	259
29/12/2015	172	105	277
30/12/2015	103	105	208
31/12/2015	192	105	297
1/01/2016	196	105	301
2/01/2016	194	105	299
3/01/2016	114	105	219
4/01/2016	199	105	304
5/01/2016	121	105	226
6/01/2016	43	105	148
7/01/2016	15	105	120
8/01/2016	55	105	160
9/01/2016	66	105	171

10/01/2016	78	105	183
11/01/2016	116	105	221
12/01/2016	10	105	115
13/01/2016	11	105	116
14/01/2016	23	105	128
15/01/2016	142	105	247
16/01/2016	229	105	334
17/01/2016	29	105	134
18/01/2016	163	105	268
19/01/2016	89	105	194
20/01/2016	15	105	120
21/01/2016	13	105	118
22/01/2016	28	105	133
23/01/2016	56	105	161
24/01/2016	146	105	251
25/01/2016	129	105	234
26/01/2016	40	105	145
27/01/2016	47	105	152
28/01/2016	82	105	187
29/01/2016	51	105	156
30/01/2016	152	0	152
31/01/2016	198	0	198
1/02/2016	107	0	107
2/02/2016	161	0	161
3/02/2016	75	0	75
4/02/2016	112	0	112
5/02/2016	192	0	192
6/02/2016	123	0	123
7/02/2016	183	0	183
8/02/2016	176	0	176
9/02/2016	104	0	104
10/02/2016	126	0	126
11/02/2016	138	0	138
12/02/2016	161	0	161
13/02/2016	139	0	139
14/02/2016	105	0	105
15/02/2016	140	0	140
16/02/2016	123	0	123
17/02/2016	272	0	272
18/02/2016	336	2	338
19/02/2016	248	6	254
20/02/2016	186	0	186
21/02/2016	266	0	266
22/02/2016	236	0	236

23/02/2016	303	0	303
24/02/2016	11	105	116
25/02/2016	20	105	125
26/02/2016	42	105	147
27/02/2016	23	105	128
28/02/2016	97	2	99
29/02/2016	166	0	166
1/03/2016	153	0	153
2/03/2016	6	105	111
3/03/2016	8	105	113
4/03/2016	18	105	123
5/03/2016	31	105	136
6/03/2016	30	105	135
7/03/2016	62	105	167
8/03/2016	83	105	188
9/03/2016	10	105	115
10/03/2016	14	105	119
11/03/2016	59	107	166
12/03/2016	90	105	195
13/03/2016	128	105	233
14/03/2016	36	105	141
15/03/2016	124	105	229
16/03/2016	94	105	199
17/03/2016	53	105	158
18/03/2016	26	105	131
19/03/2016	72	105	177
20/03/2016	56	105	161
21/03/2016	101	105	206
22/03/2016	96	105	201
23/03/2016	112	105	217
24/03/2016	19	105	124
25/03/2016	150	105	255
26/03/2016	161	105	266
27/03/2016	63	105	168
28/03/2016	117	105	222
29/03/2016	141	105	246
30/03/2016	23	105	128
31/03/2016	150	105	255
1/04/2016	75	105	180
2/04/2016	108	105	213
3/04/2016	115	2	117
4/04/2016	251	0	251
5/04/2016	117	0	117
6/04/2016	37	105	142

7/04/2016	32	105	137
8/04/2016	221	105	326
9/04/2016	52	114	166
10/04/2016	18	105	123
11/04/2016	69	105	174
12/04/2016	158	105	263
13/04/2016	47	105	152
14/04/2016	52	105	157
15/04/2016	72	105	177
16/04/2016	34	105	139
17/04/2016	49	105	154
18/04/2016	174	105	279
19/04/2016	61	105	166
20/04/2016	88	105	193
21/04/2016	63	105	168
22/04/2016	23	105	128
23/04/2016	219	105	324
24/04/2016	84	105	189
25/04/2016	107	105	212
26/04/2016	128	105	233
27/04/2016	3	105	108
28/04/2016	0	105	105
29/04/2016	0	105	105
30/04/2016	0	105	105
1/05/2016	0	105	105
2/05/2016	0	105	105
3/05/2016	0	105	105
4/05/2016	0	0	0
5/05/2016	0	0	0
6/05/2016	63	0	63
7/05/2016	197	0	197
8/05/2016	126	0	126
9/05/2016	212	0	212
10/05/2016	108	0	108
11/05/2016	307	0	307
12/05/2016	241	0	241
13/05/2016	387	0	387
14/05/2016	153	0	153
15/05/2016	175	0	175
16/05/2016	431	0	431
17/05/2016	250	0	250
18/05/2016	198	0	198
19/05/2016	101	0	101
20/05/2016	259	0	259

21/05/2016	197	0	197
22/05/2016	159	0	159
23/05/2016	121	0	121
24/05/2016	114	0	114
25/05/2016	182	0	182
26/05/2016	177	0	177
27/05/2016	128	0	128
28/05/2016	238	0	238
29/05/2016	181	0	181
30/05/2016	212	0	212
31/05/2016	144	0	144
1/06/2016	182	0	182
2/06/2016	138	0	138
3/06/2016	145	0	145
4/06/2016	224	0	224
5/06/2016	161	0	161
6/06/2016	217	0	217
7/06/2016	116	0	116
8/06/2016	167	0	167
9/06/2016	195	0	195
10/06/2016	238	0	238
11/06/2016	306	0	306
12/06/2016	319	0	319
13/06/2016	143	0	143
14/06/2016	91	0	91
15/06/2016	258	0	258
16/06/2016	140	0	140
17/06/2016	106	0	106
18/06/2016	83	0	83
19/06/2016	205	0	205
20/06/2016	150	0	150
21/06/2016	204	0	204
22/06/2016	121	0	121
23/06/2016	171	0	171
24/06/2016	147	0	147
25/06/2016	38	0	38
26/06/2016	323	0	323
27/06/2016	119	0	119
28/06/2016	130	0	130
29/06/2016	139	0	139
30/06/2016	122	0	122
1/07/2016	109	0	109
2/07/2016	142	0	142
3/07/2016	162	0	162

4/07/2016	126	0	126
5/07/2016	223	0	223
6/07/2016	166	0	166
7/07/2016	130	0	130
8/07/2016	171	0	171
9/07/2016	155	0	155
10/07/2016	221	0	221
11/07/2016	161	0	161
12/07/2016	92	0	92
13/07/2016	506	0	506
14/07/2016	442	0	442
15/07/2016	367	0	367
16/07/2016	391	0	391
17/07/2016	177	0	177
18/07/2016	133	0	133
19/07/2016	139	0	139
20/07/2016	214	0	214
21/07/2016	168	0	168
22/07/2016	126	0	126
23/07/2016	198	0	198
24/07/2016	263	0	263
25/07/2016	409	0	409
26/07/2016	99	0	99
27/07/2016	79	0	79
28/07/2016	267	0	267
29/07/2016	317	0	317
30/07/2016	309	0	309
31/07/2016	139	0	139
1/08/2016	152	0	152
2/08/2016	145	0	145
3/08/2016	193	0	193
4/08/2016	194	0	194
5/08/2016	114	0	114
6/08/2016	195	0	195
7/08/2016	177	0	177
8/08/2016	201	0	201
9/08/2016	181	0	181
10/08/2016	193	0	193
11/08/2016	145	0	145
12/08/2016	193	0	193
13/08/2016	227	0	227
14/08/2016	170	0	170
15/08/2016	203	0	203
16/08/2016	110	0	110

17/08/2016	200	0	200
18/08/2016	183	0	183
19/08/2016	122	0	122
20/08/2016	175	0	175
21/08/2016	123	0	123
22/08/2016	240	0	240
23/08/2016	173	0	173
24/08/2016	166	0	166
25/08/2016	193	0	193
26/08/2016	140	0	140
27/08/2016	151	0	151
28/08/2016	135	0	135
29/08/2016	202	0	202
30/08/2016	94	0	94
31/08/2016	134	0	134
1/09/2016	77	0	77
2/09/2016	122	0	122
3/09/2016	215	0	215
4/09/2016	240	0	240
5/09/2016	192	0	192
6/09/2016	143	0	143
7/09/2016	159	0	159
8/09/2016	154	0	154
9/09/2016	108	0	108
10/09/2016	202	0	202
11/09/2016	126	0	126
12/09/2016	82	0	82
13/09/2016	138	0	138
14/09/2016	129	0	129
15/09/2016	91	0	91
16/09/2016	155	4	159
17/09/2016	205	0	205
18/09/2016	148	0	148
19/09/2016	141	0	141
20/09/2016	149	0	149
21/09/2016	86	0	86
22/09/2016	132	0	132
23/09/2016	138	0	138
24/09/2016	159	0	159
25/09/2016	137	0	137
26/09/2016	107	0	107
27/09/2016	183	0	183
28/09/2016	155	0	155
29/09/2016	141	0	141

30/09/2016	44	0	44
1/10/2016	239	0	239
2/10/2016	219	0	219
3/10/2016	118	0	118
4/10/2016	118	0	118
5/10/2016	202	0	202
6/10/2016	159	0	159
7/10/2016	122	0	122
8/10/2016	102	0	102
9/10/2016	205	0	205
10/10/2016	82	0	82
11/10/2016	173	0	173
12/10/2016	418	0	418
13/10/2016	329	0	329
14/10/2016	372	0	372
15/10/2016	289	0	289
16/10/2016	53	0	53
17/10/2016	114	0	114
18/10/2016	90	0	90
19/10/2016	193	0	193
20/10/2016	187	0	187
21/10/2016	205	0	205
22/10/2016	237	0	237
23/10/2016	183	0	183
24/10/2016	156	0	156
25/10/2016	210	0	210
26/10/2016	161	0	161
27/10/2016	111	110	221
28/10/2016	30	105	135
29/10/2016	225	0	225
30/10/2016	119	105	224
31/10/2016	45	105	150
1/11/2016	6	105	111
2/11/2016	20	105	125
3/11/2016	38	105	143
4/11/2016	19	105	124
5/11/2016	31	105	136
6/11/2016	66	105	171
7/11/2016	90	105	195
8/11/2016	31	105	136
9/11/2016	74	105	179
10/11/2016	40	105	145
11/11/2016	20	108	128
12/11/2016	39	105	144

13/11/2016	31	105	136
14/11/2016	0	28	28
15/11/2016	188	86	274
16/11/2016	56	105	161
17/11/2016	86	105	191
18/11/2016	41	105	146
19/11/2016	22	105	127
20/11/2016	33	105	138
21/11/2016	22	105	127
22/11/2016	35	105	140
23/11/2016	20	105	125
24/11/2016	38	105	143
25/11/2016	33	107	140
26/11/2016	127	105	232
27/11/2016	162	105	267
28/11/2016	102	105	207
29/11/2016	30	105	135
30/11/2016	30	105	135