Wellington Water

Martinborough Wastewater Treatment Plant Overflow Incident Investigation and Report: January 2020

Our water, our future.

Document Control

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1. Introduction

Background

The Martinborough Wastewater Treatment Plant (WWTP) is being progressively upgraded to reduce discharges to the Ruamahanga River. The first stage of irrigation to land was installed a few years ago, although there have been some operational and maintenance issues with this equipment.

In October 2019, SWDC tasked Wellington Water with managing, maintaining and operating the three waters services for their Council and with the recent challenge to eliminate, in the long term, wastewater overflows to the environment. We strive to improve all the time and have been working towards getting a better understanding of the maintenance, operational requirements of the facility and wider system, along with the expected management of environmental outcomes.

Under recent consents the Martinborough Wastewater Treatment Plant is in the early stages of moving from discharge to river to discharge to land. The aim is to minimise discharges to the river. At present an area immediately adjacent to the plant has been established with land irrigation, this is improvement stage 2 of 4. In this stage it was understood there would be some level of discharge to the river, when river flow conditions permitted (i.e. high flow).

The original facility is 45 years old, with some upgrades in the more recent years. The facility has limited redundancy. This makes it vulnerable to changes in environmental conditions and failures of critical equipment.

Event Overview

The Martinborough Wastewater Treatment Plant has had two overflow incidents which may have been non-compliant with resource consent conditions. The events leading up to and including these discharges happened between 14-15 January and 26-27 January 2020, respectively.

Around 15 January 2020, a discharge of partially treated wastewater has occurred from the Martinborough WWTP. An estimated volume of 90 cubic metres discharged to the Ruamahanga River over a 12.5 hour period between 9:45pm on 14 January to 10:00am on 15 January 2020. The dilution factor was calculated as at least 8600:1. There was also an estimated 45 cubic metres of partially treated wastewater discharged onto adjacent land at the treatment plant near where treated wastewater is normally spread through irrigation.

On 27 January 2020, a discharge of partially treated wastewater happened again. The estimated discharge was approximately 100 cubic metres between 4:30am on 26 January and 11:30am on 27 January. There was also a discharge of 300 cubic metres of fully treated wastewater to the Ruamahanga River from 11:30am to 5:30pm since the land irrigator could not operate due to the strong wind velocity conditions on site.

Cause and Contributing Factors

The primary causes of each incident are outlined below:

15 January 2020: The primary cause was human error due to not putting the temporary bung (in lieu of the mechanical valve that was out of service for maintenance) in place after the flow of river had decreased below the minimum permitted for discharge of treated wastewater.

27 January 2020: The primary cause was the failure of the temporary inflatable bung between the primary and maturation ponds. This resulted in the maturation ponds exceeding capacity and a discharge to the Ruamahanga at flows beneath those permitted by consent.

Other factors which contributed to the incidents are:

- An earlier failure of the mechanical valve between the oxidation and maturation ponds
- Multiple failures of the land irrigator
- Unsuccessful corrective maintenance of the land irrigator carried out by the supplier
- Lack of risk assessment for the actions to be taken to remedy the equipment problem
- Inadequate operating and maintenance manuals and processes for the plant

Resource Management Act Considerations

The plant is operated under consent from GWRC (WAR120258). This 2016 consent sets the environmental performance requirements for operating the plant, in accordance with the 83 conditions of consent.

The consent allows the discharge of treated wastewater to the Ruamahanga River and the discharge of treated wastewater to land adjacent to the plant and the Pain Farm (Lake Ferry Road).

Both incidents may have breached the consent's General Conditions Schedule 1 Condition 1 (in general accordance with the application etc.) and schedule 2 condition 6 (UV treatment) as partially treated wastewater was discharged to land and the river, while the authorised operation of the plant anticipates full treatment (including UV) prior to any discharge. The over-topping of the maturation ponds was also not anticipated in the application for the discharge consented, and would also be a breach of 'in general accordance' conditions.

Both incidents may have breached condition 2 (b) of WAR120258 [31707] whereby wastewater was discharged to the Ruamahanga River at flows below those permitted (24930 L/s). In the incident on the 27 January the discharge was initially partially treated, and then later fully treated.

Schedule 1 Condition 40 may also have been breached as the plant was not maintained in an efficient operating condition. This was evidenced by the system failures and WAR120258 [31707] Schedule 2 due to discharge of partially treated wastewater. Condition 40 requires Wellington Water (as operator of the plant on behalf of SWDC) to do the following:

- Take immediate steps to remedy and mitigate the adverse effects of the incident
- Notify the Manager, Environmental Regulations within 24 hours of the incident
- Notify the members of the Community Liaison Group within 48 hours
- Notify Regional Public Health within 24 hours of the malfunction being detected

Wellington Water complied with the above conditions within the stipulated consent timeframes.

Due to the accumulation of wastewater in the plant and the need to prevent further overflows to the river, the discharge to land via the irrigator has at times exceeded WAR120258 [32044] Schedule 4 Condition 2a: *"hydraulic loading 35mm depth per week and no more than 15mm in any 24 hour period during stage 1"*.

2. Scope

The scope of this report:

- Cause of the incidents
- Mitigation taken to control the incident
- Recommendations to avoid similar incidents from happening again

3. Purpose

To investigate and report on the events and causes that led to the incidents and identifiy opportunities for improvement.

This report also covers the requirement of Condition 40 (d) of Resource Consent No. WAR120258 for Martinborough Wastewater Treatment Plant which states:

"(d) Forward an incident report to the Manager, Environmental Regulation, Wellington Regional Council, within seven (7) working days of the incident occurring, unless otherwise agreed with the Manager, Environmental Regulation, and Wellington Regional Council. The report shall describe the manner and cause of the incident, measures taken to mitigate/control the incident (and/or illegal discharge), and measures to prevent recurrence;"

4. Investigation Details

Facility Background

The Martinborough WWTP (the plant) is located off the northern end of Weld Street with access through the Palliser Estate Vineyard. The major components of the plant are an oxidation pond, four maturation (tertiary) ponds connected in series, UV disinfection unit and land irrigation unit. In normal operation the wastewater flows into the primary (oxidation) pond. The oxidation pond is where most of the pollutant removal takes place, it then it goes to the maturation ponds for further treatment.

The levels between the primary and maturation ponds are controlled by a mechanical valve. The opening of the mechanical valve depends on the level in the maturation ponds (i.e. higher level at the maturation ponds would have a reduced opening of the valve to reduce flow to the maturation ponds). The partially treated wastewater then undergoes UV disinfection to reduce pathogens and the treated wastewater is discharged to land via land irrigator or to the river (depending on the river flow). The pond was constructed in 1975 and has a volume of approximately 23,000 m^3. The plant data is outlined in Table 1 (refer to Appendix A & B for site location and schematic diagram)

Table 1: Martinborough WWTP Flow Data

Parameter	Value
Dry weather flow	340 m^3/day
Peak wet weather flows	1,460m^3/day
Calculated average daily flow	440 m^3/day
Days storage	25-30 days
Residence time within the pond	52 days

The facility was under the operation of South Wairarapa District Council and CityCare prior to the hand over to Wellington Water on 1 October 2019.

When the irrigator is not operational wastewater is stored within the ponds on-site and when permitted (under high river flow) discharged to the river.

Incident Details

2 December 2019

As an alternative to the faulty mechanical valve between the primary and maturation ponds, a temporary inflatable bung was installed in the transfer structure between the ponds The issue with the mechanical valve was known as it had been identified when the operation was still under CityCare. The issue had remained unresolved due to what was defined at the time as unsafe access.

31 December 2019

An irrigator control system and hose failure was identified. The irrigator supplier was contacted by the WWL South Wairarapa Service Delivery team (the team) to help resolve the issues with the irrigator system controls. The plant requires the irrigation system to operate to discharge treated wastewater to land during summer low river flow conditions.

There is limited storage available in the primary (oxidation) pond In addition, the four storage tanks used were already full. The operator tried to operate the irrigation system but a supply hose ruptured. The supplier was notified of the incident and advised that repair will be carried out on 3 January 2020. This meant that the primary pond continued to fill.

3 January 2020

The irrigator was manually operated to discharge treated wastewater to land The supplier did not arrive onsite as expected. This was urgently followed up by the team, given the reducing ability to store wastewater in the plant and not being able to discharge to the river.

6 January 2020

The supplier arrived and attempted to repair the hose, but the first repair failed. The operator on duty re-attached the repair made by the supplier to allow the irrigator system to operate.

7 January 2020

The team manually operated the irrigator intermittently between 4:30pm – 5:00pm and 7:30pm – 7:50pm. This was achieved by staff turning the irrigator on and off, rather than relying on the automatic controls. The automatic controls were un-reliable and the operators wanted to ensure the irrigator did not cause ponding.

9 January 2020

The team tried to operate the irrigator system but a new problem occurred with the failure of the irrigator pipeline. This required the irrigator to be taken out of service until a repair could be properly carried out.

13 January 2020

Seeking to reduce the build-up of stored wastewater, the operators discharged treated wastewater to the Ruamahanga River at 11:00pm in accordance with consent conditions as a rainfall event increased river flows to authorised flows (24,930 L/s).

14 January 2020

At 3:30pm, the team removed the temporary inflatable bung from the transfer structure to allow flow from the primary pond to the maturation ponds.

At 9:59pm, the discharge of treated wastewater to the river automatically stopped due to the river flow reducing below consented discharge levels.

At 10:45pm, the water level in the maturation ponds reached the overflow pipe which caused the discharge of partially treated wastewater (not UV disinfected) to the river.

15 January 2020

At 10:15am, the WWL Service Delivery Manager (the manager) attended the plant. He saw the maturation pond flowing into the overflow pipeline. The maturation pond also overflowed to the adjacent disposal field.

At 10:20am, the temporary inflatable bung was returned to the transfer structure to prevent flow from the primary pond to the maturation ponds and store flow in the primary pond.

At 10:41am, the manager notified Wellington Water management regarding the incident.

At 11:30am – 2:00pm, the team tried to operate the irrigator system to reduce the accumulated volume in the ponds. The irrigator has been operated intermittently due to recurring system faults.

At 2:53pm, the supplier has been notified of the overflow incident and was able to arrive onsite at 3:40pm. The technician found faults with the controls of the irrigator, but was not sufficiently trained to fix it.

16 – 25 January 2020

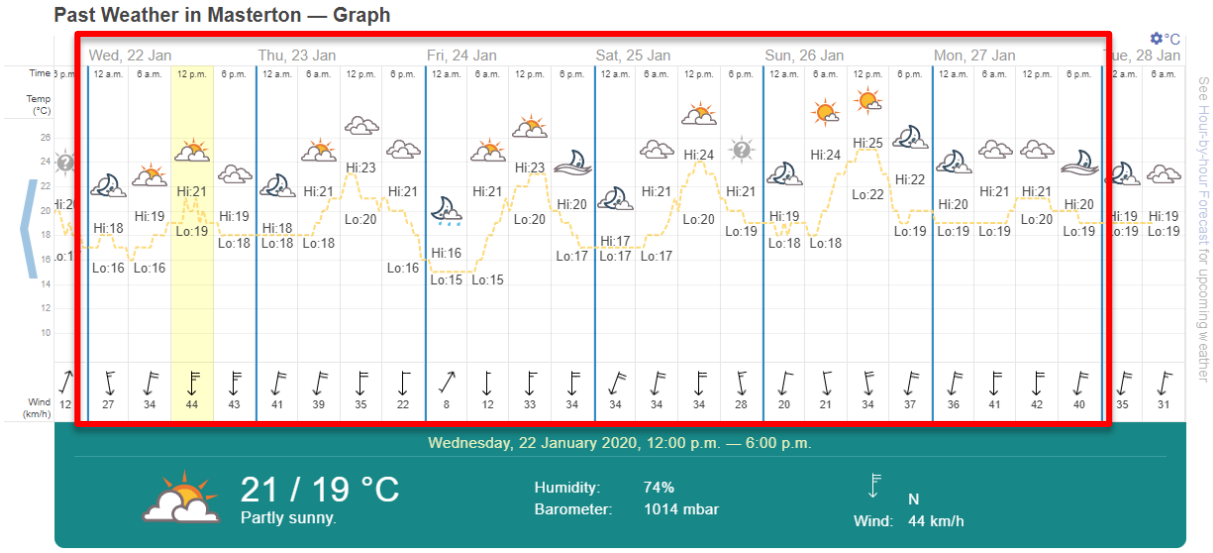
The team and the supplier coordinated to repair the irrigator and get it working as it should. Following the 19 January repairs the team was able to resume wastewater discharge to land.

However during the period from the 19th to the 25th high winds limited the ability to use the irrigation equipment. This meant the pond levels remained high and limited storage was available.

26 January 2020

Plant monitoring data indicates, the land irrigator stopped about 3:00am, during a high wind period. This meant that we were continuing to use the limited storage in the ponds. The irrigator is configured to only operate at a wind velocity below 12 km/hr to prevent treated wastewater from being carried off-site by the wind in accordance with consent conditions. Figure 1 (below) shows the wind conditions from an independent monitoring site in Masterton.

Figure 1: Wind Conditions 22 to 27 January 2020



27 January 2020

At 9:20am, the operating staff advised that the temporary bung installed in the transfer structure failed. The incident had caused the level in the maturation ponds to rise and eventually caused a discharge to the river through the overflow pipe.

At 9:30am, Wellington Water Senior Engineer instructed the operating staff to operate the land irrigator to lower the levels in the maturation pond.

At 11:00am, Due to high winds, the irrigator was not discharging.

At 11:30am, Discharge of partially treated wastewater had stopped. The operating staff were advised to manually operate the UV system and discharge fully treated wastewater to river until wind conditions allowed the irrigator to operate or until a new bung is in place.

At 3:17pm, the operating staff were able to put an inflatable bung in place.

At 5:27pm - onwards, the manual operation of the UV was terminated and land irrigator was made operational due to the favourable wind conditions.

30 January – 3 February 2020

Existing mechanical valve abandoned and a new permanent isolation valve installed in a safe position for maintenance and operation.

5. Analysis

The incident can be be attributed to several contributing factors. The following categories have been defined for analysis of the root causes:

- Machine / Equipment
- Systems and Processes
- Personnel
- Environment

15 January 2020 Incident Specific Factors

Land Irrigator Failure
Category: M S

The land irrigator is required by the plant to discharge treated wastewater to adjacent land during low river conditions. The failure of the irrigator system has caused the plant to accumulate excessive volumes of treated wastewater in the ponds. Considering that the plant currently has only a single irrigator, a high standard of maintenance should be in place to ensure that the equipment is available.

To avoid discharge to river while the land irrigator was out of service, the operating staff installed the temporary bung to allow the pond to store the wastewater.

Delayed in the reinstallation of the bung after the river flow has decreased
Category: P S

The temporary bung was used to store wastewater in the primary pond while the irrigator was not available.
The operator did not attend the site and return the bung after the river flow decreased. There was also no provision for an alarm/signal to notify the operator for the condition changes of the river or the overflow from the maturation ponds.

Lack of risk assessment to the action taken to mitigate the problem
Category: P

The operator decided to remove the bung to allow greater flow of the treated wastewater to the river during the consented discharge window. The risks involved with this action (e.g. partially treated wastewater might overflow during reduced river flow) were not properly assessed and not sufficiently managed.

Issues with the Existing Supplier/ Maintenance Provider
Category: P S

The maintenance of the plant's irrigator has been entrusted to the supplier. The team was coordinating with the supplier regarding the support needed to fix the irrigator but the supplier failed to recognise the urgency of the request.

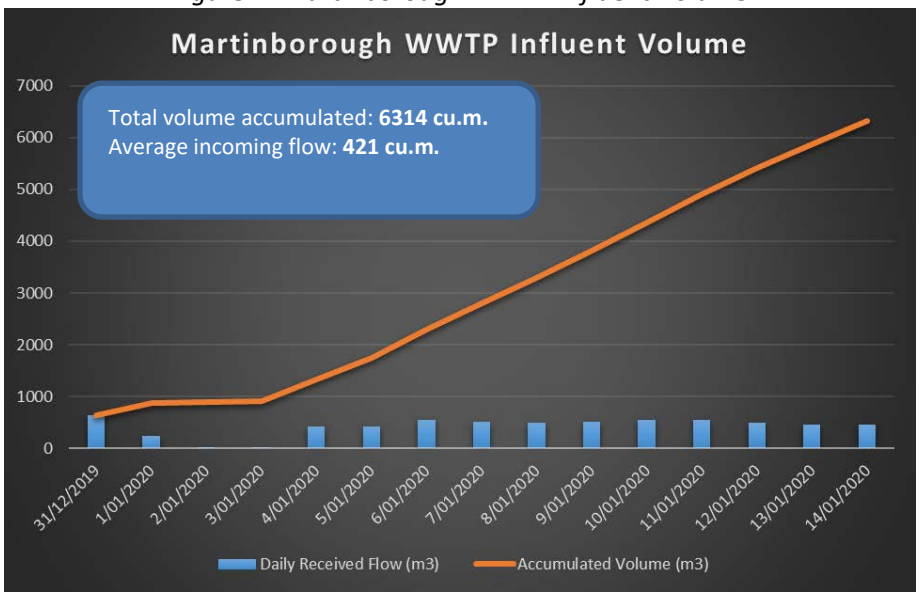
When the supplier's technician was able to attend on site, the repairs carried out were temporary, which led to the recurrence of irrigator failure.

It was identified, the supplier was unaware that there is a need for service reports to be completed after maintenance works and handed to the team. There was a knowledge gap between what work has been done and issues that needed to be looked after by the operations team.

Wastewater Volume Accumulation
Category: S

The accumulated incoming wastewater volume from December 31, 2019 to January 14, 2019 was 6314 cubic metres which is about 27% of the total capacity of the pond and exceeded the capacity of the available storage. The inability of the system to irrigate treated wastewater to land eventually led to an overflow from the maturation pond's overflow pipe and over the pond's bank. The graph for the inflow data is shown in Figure 2.

Figure 2: Martinborough WWTP Influent Volume



Incomplete Plant's Logbook
Category: P S

The facility has an electronic infrastructure diary (ID) wherein the operators note the significant events that happened during the day. An extract from the diary showed that the log was incomplete, which caused an information gap regarding the significant events that happened in the plant.

27 January 2020 Incident Specific Factors

Failure of the Inflatable Bung
Category: M

The inflatable bung was put in place to temporarily manage the function of the faulty mechanical valve. Its failure was due to a pinhole found in the bung which resulted in excessive wastewater flow to the maturation pond. This incident caused the maturation pond level to rise and eventually led to overflow and the discharge to river.

Climate Condition Issues
Category: E

The irrigator cannot operate when the wind velocity is above 14 km/hr, which means wastewater must be stored on-site. This led to the already full storage ponds exceeding capacity and discharging to the river.

Factors Common to Both Incidents

Knowledge gap on the plant's current asset conditions

Category: P S

Wellington Water assumed responsibility for the operation of the facility in October 2019. To date, there is no updated asset register with respective condition and criticality. The lack of this data means the team is unable to proactively plan maintenance procedures to prevent any impending plant problems.

Inadequate process and plans for the Plant's operations

Category: P S

The facility was previously operated by South Wairarapa District Council (SWDC) with CityCare and the operation was transferred to Wellington Water in October 2019.

The current Operations & Maintenance Manuals are incomplete and the level of staff training is variable. The current knowledge gap in the part of the operating staff poses a risk on how to effectively manage the facility especially during abnormal conditions i.e. irrigator failure.

Staff Workload Issue

Category: P S

The current operating staff are balancing competing demands from managing different water and wastewater facilities in South Wairarapa. Currently, there are only three Wellington Water staff who are overseeing all water services in South Wairarapa making immediate incident response to every facility difficult.

Storage Capacity

Category: M S

The plant has maturation ponds used for storage of treated wastewater prior to land irrigation. Their purpose is to provide a balance between the discharge from the irrigator and the flow from the UV disinfection. The volume capacity from the tanks provide enough buffer to prevent frequent on/off mechanism in the UV system thus prolonging its service life.

The current capacity of the plant storage should be assessed to determine if there is a need to provide additional holding capacity, in case the irrigator is not operational.

Lack of Alarm Notifications to the Operating Staff

Category: S

The facility currently lacks an alarm mechanism especially in case the pond level rises. This notification would be necessary since the operating staff are looking after multiple sites and cannot immediately detect any abnormalities onsite.

6. Effects on the Environment

15 January 2020 Incident River Quality Effects

For the 15 January 2020 incident, Wellington Water have done an initial assessment of the environmental impacts.

The discharge of partially treated wastewater is estimated to be 2 L/s to the river while the discharge to land is estimated to be 1 L/s.

The river flow taken at 10:15am on 15 January was 17200 L/s. This provides a minimum dilution factor of around 8600:1, during the discharge incident.

The key potential environmental impact indicator was the increased level of E. Coli in the discharge (of about 60 times the consented level). This was due to the absence of UV disinfection. The E. Coli level indicates a potential increase in the pathogen load in the receiving water. The incident was preceded by a rainfall event, and it is anticipated that the river was already adversely affected by upstream run-off. The estimated contribution of the discharge to the E. Coli level in the river would have been very minor (~1 E. Coli/100mL). Public health impact is considered to be minimal given the incident happened during the night hours; and was below the MoH/Mfe recreational bathing guidelines after reasonable mixing.

Other parameters are estimated to be within the consented values based on the plant's historic monitoring data. The tabulated values for the monitored parameters are outlined in Table 2.

Table 2: Contaminant comparison

Parameter	Consented	Overflow – estimate from historic monitoring	Comment
E. coli	100 cfu/100mL average	6,000 cfu/100mL	2 log removal in UV Expected no more than 10,000 cfu/100mL
NH_3-N	30 mg/L average	17 mg/L	No change with UV
BOD_5	60 mg/L average	29 mg/L	No change with UV
DRP	7 mg/L average	6 mg/L	No change with UV
TN	35 mg/L average	26 mg/L	No change with UV
NO_3-N	No limit	1 mg/L	No change with UV
TP	No limit	7 mg/L	No change with UV
TSS	90 mg/L average	44 mg/L	No change with UV

On 16 January 2020, an external laboratory conducted grab water sampling from the oxidation pond and maturation pond. The values from the maturation pond from which are within consent limits except the total nitrogen wherein the value is 38.6 mg/L versus the consented average value of 35 mg/L. Considering the dilution factor, the exceedance in the total nitrogen value would have a very little/ minimal effect to the river quality.

The effect of the discharge of partially treated wastewater is also considered minimal since the volume of discharge can easily be absorbed by the land within 24 hours. Notable effects would be increase in the soil moisture content of the affected area and increase in nutrient content.

The full initial impact assessment of the 15 January incident and laboratory analysis has been included in Appendies C and D respectively.

27 January 2020 Incident River Quality Effects

For the 27 January incident, the team was able to visually inspect on site. The impact of the overflow could be visually distinguished at point of the discharge's river entry and was quickly unnoticeable at 30m downstream. Photos taken for this incident are in Appendix G.

The estimated discharge of partially treated wastewater was estimated to be 1 L/s (100 cubic meters estimated total discharge for 29 hours). The river flow at from January 26 to 27, 2020 was between 6300 L/s – 5900 L/s. This would result to a minimum dilution factor of 6145:1 as compared to a minimum dilution value of 2266:1 based on the consented discharge conditions. The key environmental impact would be an increase in the E.coli level in the river which would also be estimated to be 60 times the consented level based on the historic data from Table 2.

The discharge of fully treated wastewater to the river was estimated to be 14 L/s (50 cubic metres per hour for 6 hours) with a minimum dilution factor of 425:1. The concentration of the pollutants present is estimated to be within the consent discharge.

Wellington Water organised river sampling during the day of the incident with the results summarised on the table below:

Table 3: 27 January Sampling Contaminant comparison

Parameter	Consented Values	Martinborough WWTP discharge point	Martinborough WWTP Upstream of discharge (Site A)	Martinborough WWTP 250 m downstream (Site B)	Martinborough WWTP Post UVT
E. coli	100 cfu/100 mL average	2,100 cfu/100 mL	16 cfu/100 mL	48 cfu/100 mL	500 cfu/100 mL
NH_3-N	30 mg/L average	23.5 mg/L	<0.01 mg/L	0.26 mg/L	26.0 mg/L
BOD_5	60 mg/L average	67 mg/L	<1 mg/L	1 mg/L	20 mg/L
DRP	7 mg/L average	5.94 mg/L	0.008 mg/L	0.069 mg/L	7.85 mg/L
TN	35 mg/L average	38 mg/L	0.13 mg/L	0.53 mg/L	33.7 mg/L
NO_3-N	No limit	0.05 mg/L	0.01 mg/L	0.02 mg/L	0.02 mg/L
TP	No limit	8.19 mg/L	0.013 mg/L	0.101 mg/L	9.11 mg/L
TSS	90 mg/L average	99 mg/L	<3 mg/L	<3 mg/L	30 mg/L

The concentration of E.coli, BOD_5, TN and TSS in the discharge point are higher compared to the consented values as expected with the release of partially treated wastewater in the river. The effects of the discharge are minimal due to the dilution factor as shown on the river sample at 250 meters downstream of the wastewater treatment plant which is within the consented values. The complete laboratory results is included in Appendix F.

In summary, the incidents effects in the Ruamahanga River are expected to be temporary and would not have any significant adverse effects. The river is expected to have recoverred quickly after the termination of the discharge.

Incident Land Quality Effects

Due to the accumulation of wastewater in the plant, the facility may exceed WAR120258 [32044] Schedule 4 Condition 2a: *"hydraulic loading 35mm depth per week and no more than 15mm in any 24 hour period during stage 1"*. Considering that the facility was not able to discharge continuously beforehand and the effect of summer, it is expected that the land would be "bone dry" and the effect of this expected increase in discharge would be minimal.

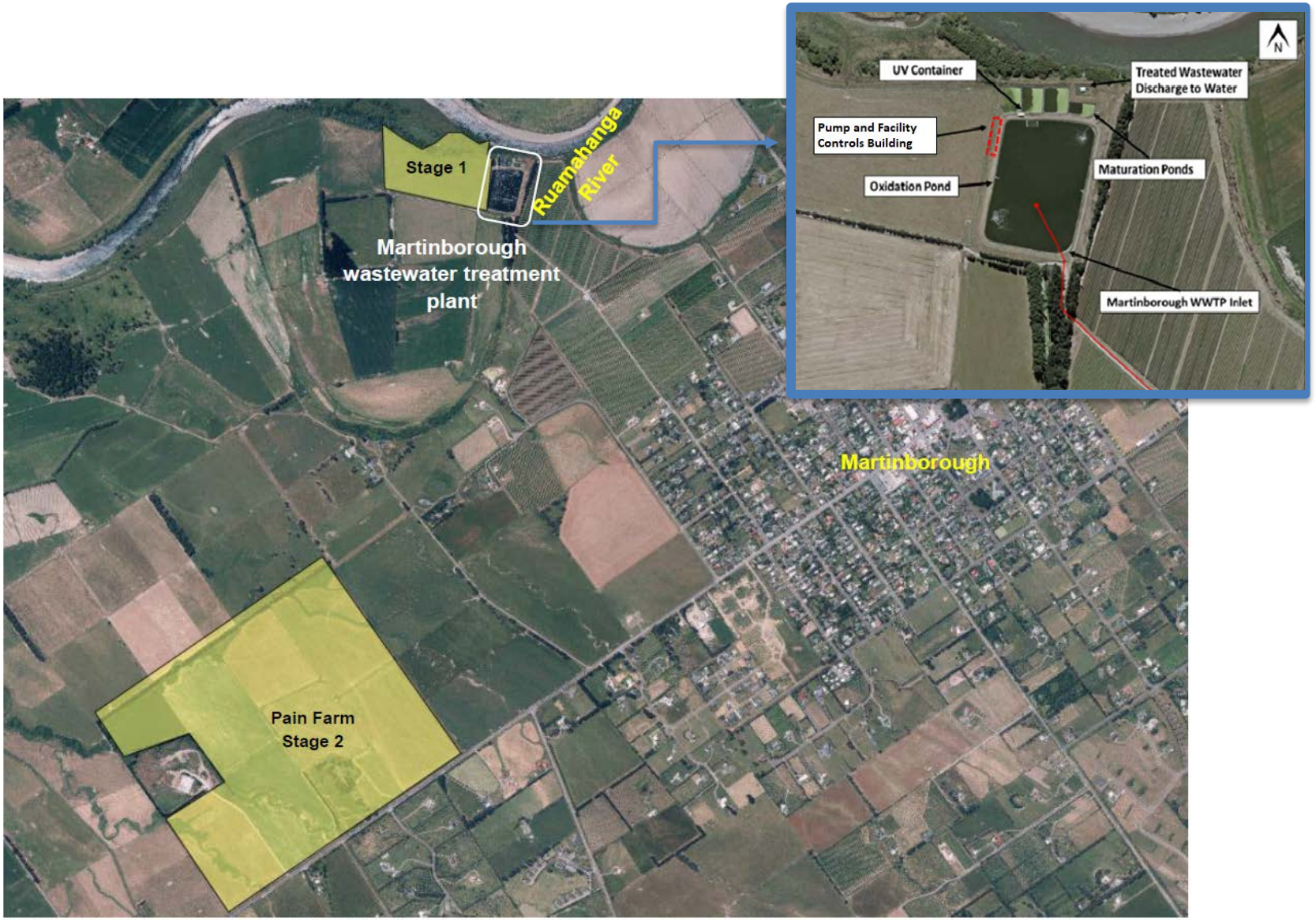
7. Recommendations

Wellington Water has committed to be respectful of the environment but in this incident we have failed. Recommendations to prevent this incident occurring again are detailed below.

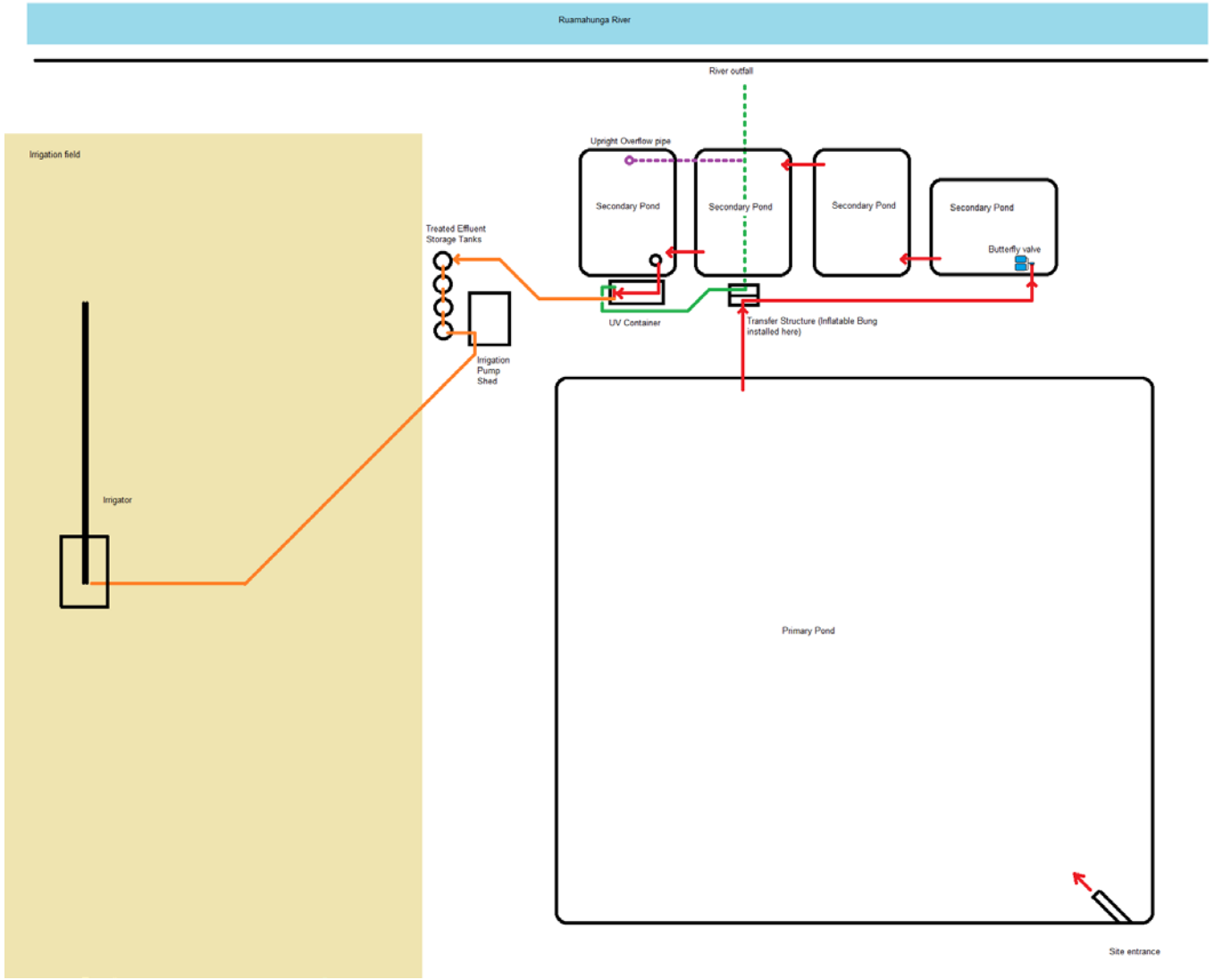
Issue / Opportunity for Improvement	Recommendation	Status
1. Work with Iwi on utu	Work with Iwi on apporopriate restorative justice.	In progress
2. Delay in the reinstallation of the bung after the river flow decreased	Installation of permanent mechanical valve between the primary pond and the maturation pond. Review option of using automatic valves to control pond levels i.e. between primary and maturation ponds.	Completed In progress
3. Lack of risk assessment to the action taken to mitigate the problem and alerting	Develop critical control point operating processes to ensure risk management is appropriate. Review the mechanisms and systems for alerting operators.	In progress In progress
4. Land Irrigator Failure	Conduct immediate repair with the irrigator to allow wastewater land discharge. Review the suitability of the existing irrigator and operational configuration including the supply contract.	Completed In progress

5. Wastewater operational storage capacity	Review options for providing additional storage when the irrigation is unavailable.	In progress
6. Knowledge gap regarding the current condition of assets	Carry out a full asset condition assessment of wastewater facilities.	In progress
7. Inadequate processes and plans for the Plant operations	Develop full operation and maintenance plans for the wastewater facilities including operator competency requirements and record keeping disciplines.	In progress
8. Staff Workload Issue	Review the operational workload of staff.	In progress

Appendix A – Site Location



Appendix B – Schematic Diagram



Appendix C – January 15 Incident Initial Environmental Impact Assessment

Wellington Water

MEMO

TO	Steve Hutchison
COPIED TO	Paul Gardiner, Erin Ganley, Ian McSherry
FROM	Lawrence Stephenson
DATE	15/1/20

FILE NOTE

Preliminary Assessment of Environmental Effects for partially treated wastewater overflow from Martinborough Wastewater Tertiary ponds

Purpose

This memo provides an initial assessment of the likely impact of the temporary discharge from the Martinborough Tertiary ponds on 14-15 January 2020, that were not in accordance with consent conditions. It is understood that there were two discharges; the primary discharge through an overflow pipe in the tertiary pond and a secondary discharge over the side of the last of four tertiary pond's bund into the adjacent paddock.

Background

The current stage of the consent for Martinborough is considered a Combined Land and Water Discharge (CLAWD). Since the implementation of the land discharge irrigator in December 2017 as much treated water as possible is discharged to land over the summer months (December to March each year). The discharge to water is excluded during low flow conditions, which is defined in the consent as 24.95m^3/s measured at the Ruamahanga River at the Waihenga bridge (condition 2 (b).

If the river levels are low, the volume available in the ponds is generally sufficient to store the treated wastewater being treated until the land discharge field is available or river levels increase.

Incident

The wastewater going into the oxidation pond is treated and then flows into four tertiary ponds for further treatment before it is pumped through UV disinfection either to the land discharge field during low flows and

http://graphs.gw.govt.nz/?siteName=Ruamahanga%20River%20at%20Waihenga%20Bridge&dataSource=Flow

when soil moisture permits or out to the river when river levels are above 24.95 m^3/s. Prior to the incident the wastewater being treated was stored for longer than normal due to a malfunction of the irrigator.

Rain over the period of 13th January increased the Ruamahanga River flow up above 25m^3/s, allowing discharge to river. The operators changed to river discharge to reduce the amount of stored water as permitted by the consent and were relying on a control system that ceases river discharge when the flow drops below consented levels. The river dropped below that level at about 9.45pm 14th January, at which stage river discharge should have ceased.

The Wellington Water operator attended site on the on the morning of 15th January and saw that the tertiary ponds were overflowing into the river at about 10.15 am. This discharge was promptly rectified by placing an inflatable bung in the discharge of the primary pond. We are uncertain why the control system did not function as designed, and this is being investigated further.

Between 9pm and 10am the UV disinfection was not operating, as the pumps would have automatically stopped, meaning the water only received secondary treatment through the oxidation pond and "tertiary" ponds system.

Assessment of Effects

My estimate based on the levels of the pond and the size of the overflow pipe is that 2L/s overflowed to river and that 1L/s went to land over the side of the tertiary pond during the period of discharge. These discharges in the worst case would have been for 12.5hr as it is unlikely that the water level was at the overflow point when the pumps stopped. Further checks based on a mass balance for the pond also support this estimate.

This discharge to river is the equivalent of 90m^3 over the 12.5hours. When considering the likely effects the key factor is the dilution within the river, so the relative instantaneous flow rates are compared. See Tables 1 and 2

The WWTP discharge flow limit permitted in the consent is 11L/s between river flow of 24,930 and 49,860L/s which equates to a dilution of at least 2,266:1. During the overflow discharge the river flow was about 17,200 L/s. This is the equivalent of 8,600:1 dilution during the incident.

Table 1 – Dilution comparison between consent and overflow incident

Parameter	Consented	Dilution (minimum)	River Flow
Discharge rate	11L/s	2,266:1	At minimum 24,930 L/s
Overflow	2L/s	8,600:1	17,200 L/s at 10:15am

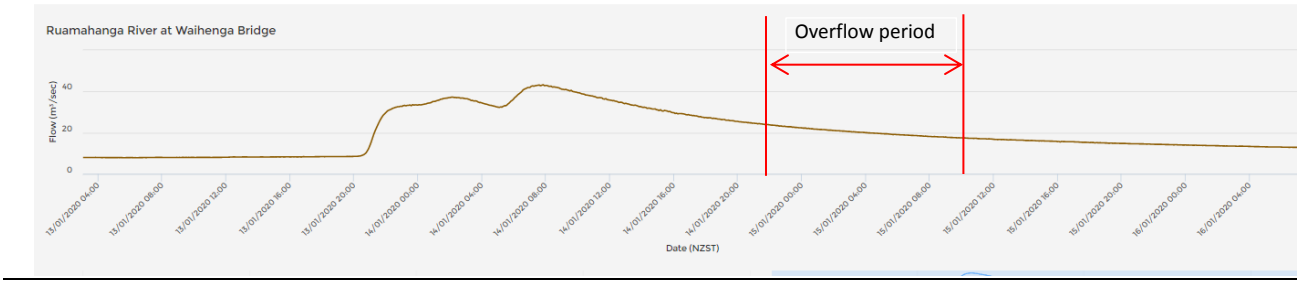


Figure 1- hydrograph for Ruamahanga River at Waihenga

Table 2 – Contaminant comparison

Parameter	Consented	Overflow – estimate from historic monitoring	Comment
E. coli	100 cfu/100mL average	6,000 cfu/100mL	2 log removal in UV Expected no more than 10,000 cfu/100mL
NH_3-N	30 mg/L average	17 mg/L	No change with UV
BOD_5	60 mg/L average	29 mg/L	No change with UV
DRP	7 mg/L average	6 mg/L	No change with UV
TN	35 mg/L average	26 mg/L	No change with UV
NO_3-N	No limit	1 mg/L	No change with UV
TP	No limit	7 mg/L	No change with UV
TSS	90 mg/L average	44 mg/L	No change with UV

Figure 2: Aerial map of Martinborough WWTP

In summary, the only significant effect is expected to have been from elevated E.coli levels. The discharge is likely to have been about 60 times the consented average concentration, however the relative level of dilution in the river (due to the low rate of discharge) was about 4 time better than the Assessment of Effects on the Environment assumed. The net effect is that the 12.5 hour discharge was at a concentration of E.coli of about 15 times higher than the average consented discharge allows for. The levels of E. coli can vary significantly (refer Appendix 2) with a 90 percentile of 26,500 and a maximum of 190,000. The consented 90th percentile is 1,400cfu/100mL.

The effects on the Ruamahanga River were temporary and is not expected to have resulted in any significant adverse effect. A short period of elevated E.coli was discharged however this was immediately after a period of rainfall during which the water quality in the Ruamahanga River will have already been adversely affected, by upstream runoff. The fact that the discharge was overnight and immediately following a rain event mean that public health risk from contact was very low. The river water quality will have recovered very quickly following the discharge cessation.

Lawrence Stephenson

Senior Engineer, Network Engineering Team

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lawrence.stephenson@wellingtonwater.co.nz

Reviewed and accepted:

Steve Hutchison
Chief Advisor, Wastewater
17 January 2020

Appendix 1 Mass Balance calculation

Volumes
Normally the tertiary ponds operate at approximately 400mm below the overflow at top water level which is 160m³ (0.4ha area).

The pumps operated for 24 hours at approximately 11L/s, which equates 950m³.

There is only currently level monitoring in the primary pond which recorded a drop of 50mm in the pond which equates approximately 800m³ (1.6ha area).

The inlet flow meter recorded an average flow of 5L/s incoming flow which to 430m³.

This leaves approximately 130m³ unaccounted for which will be the combined overflow to river and land.

Evaporation has not been considered, by the weather station onsite, indicates even with the rainfall event the plant is in deficit.

Residence time
The volume of the primary pond is approximately 23,000m³, so the residence time for the inlet flow above is likely to be in excess of 50 days.

This doesn't include any consideration of greater storage with increased levels and before flowing to the tertiary ponds.

Appendix 2 – Historic discharge quality results

Table 8: MWWTP (all data - 1994 to 2011)) seasonal treated effluent composition (summer = 6 months from November – April inclusive; winter = May to October inclusive)

Parameter		n	Min	Median	Goemetric Mean	Max	90%ile
pH	Summer	164	6.9	7.7	7.7	8.9	8.2
	Winter	139	6.9	7.7	7.7	8.8	8.1
Suspended solids (mg/L)	Summer	165	5	44	44	346	105
	Winter	126	5	40	37	150	81
BOD_5 (mg/L)	Summer	134	8	29	30	106	64
	Winter	157	16	31	31	83	54
Total P (mg/L)	Summer	164	1.7	7.6	6.4	13.2	10.6
	Winter	149	1.7	7.7	6.7	67.4	10.1
DRP (mg/L)	Summer	163	1.7	6.2	5.3	16.8	9.3
	Winter	145	1.3	6.3	5.4	16.8	9.1
Ammoniacal N (mg/L)	Summer	164	0.11	16.6	11.8	62	33.8
	Winter	154	0.2	20.7	16.2	42	31.8
Nitrate+Nitrite N (mg/L)	Summer	33	0.02	0.74	0.80	9.1	7.1
	Winter	32	0.01	0.31	0.26	8.4	5.5
Total N (mg/L)	Summer	121	5.8	25.6	23.5	50.1	40.3
	Winter	107	9.6	27.6	25.6	50.1	40.7
Oil and Grease (mg/L)	Summer	60	<1	4	4	60	8
	Winter	49	<3	6	5	28	19
Faecal coliforms (cfu's/100 mL)	Summer	163	3	9,300	6,400	296,000	39,200
	Winter	157	720	13,300	13,000	185,000	58,700
E.coli (cfu's/100 mL)	Summer	145	28	6,000	4,600	190,000	26,500
	Winter	121	675	10,500	8,900	190,000	40,900

Appendix D – January 16 Primary and Tertiary Pond Laboratory Results

Eurofins ELS Limited

South Wairarapa District Council- Martinborough Waste Water
South Wairarapa District Council
c/- Wellington Water
Private Bag 39-804
Wellington Mail Centre 5045
Attention: Nick Hewer-Hewitt

Analytical Report

Report Number: 20/2886

Issue: 2

23 January 2020

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/2886-01	Miscellaneous Sample		16/01/2020 07:40	16/01/2020 09:00	P1069264

Notes: Martinborough Primary Pond

	Test	Result	Units	Test Date	Signatory
0002	Suspended Solids - Total	77	g/m³	16/01/2020	Marylou Cabral KTP
0081	Chemical Oxygen Demand	227	g/m³	17/01/2020	Marylou Cabral KTP
0085	BOD5 - Total	36	g/m³	17/01/2020	Gordon McArthur KTP
0760	Ammonia Nitrogen	30.9	g/m³	22/01/2020	Athena Cao
2088	Dissolved Reactive Phosphorus	5.97	g/m³	22/01/2020	Athena Cao
2127	Total Nitrogen	41.8	g/m³	22/01/2020	Athena Cao
P1859	Sample Filtration	Completed		17/01/2020	Daniel Fitzpatrick

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/2886-02	Miscellaneous Sample		16/01/2020 07:45	16/01/2020 09:00	P1069264

Notes: Martinborough Tertiary Pond

	Test	Result	Units	Test Date	Signatory
0002	Suspended Solids - Total	56	g/m³	16/01/2020	Marylou Cabral KTP
0081	Chemical Oxygen Demand	209	g/m³	17/01/2020	Marylou Cabral KTP
0085	BOD5 - Total	35	g/m³	17/01/2020	Gordon McArthur KTP
0760	Ammonia Nitrogen	27.6	g/m³	22/01/2020	Athena Cao
2088	Dissolved Reactive Phosphorus	6.12	g/m³	22/01/2020	Athena Cao
2127	Total Nitrogen	38.6	g/m³	22/01/2020	Athena Cao
P1859	Sample Filtration	Completed		17/01/2020	Daniel Fitzpatrick

Comments:

Sampled by customer using ELS approved containers.

This report cancels and replaces report 20/2886-1. Please dispose of all previous versions.

Test Methodology:

Test	Methodology	Detection Limit
Suspended Solids - Total	APHA Online Edition Method 2540 D	3 g/m³
Chemical Oxygen Demand	APHA Online Edition Method 5220 D.	15 g/m³
BOD5 - Total	APHA Online Edition Method 5210 B.	1 g/m³
Ammonia Nitrogen	Flow Injection Autoanalyser following APHA Online Edition Method 4500 NH3-H.	0.01 g/m³
Dissolved Reactive Phosphorus	Flow Injection Autoanalyser following APHA Online Edition Method 4500-P G.	0.005 g/m³
Total Nitrogen	Flow Injection Autoanalyser following APHA Online Edition Method 4500-NO3 I. Persulphate digestion follows APHA Online Edition 4500-N C.	0.05 g/m³
Sample Filtration	Sample filtered through 0.45 micron filter following APHA Online Edition Method 3030B.	n/a

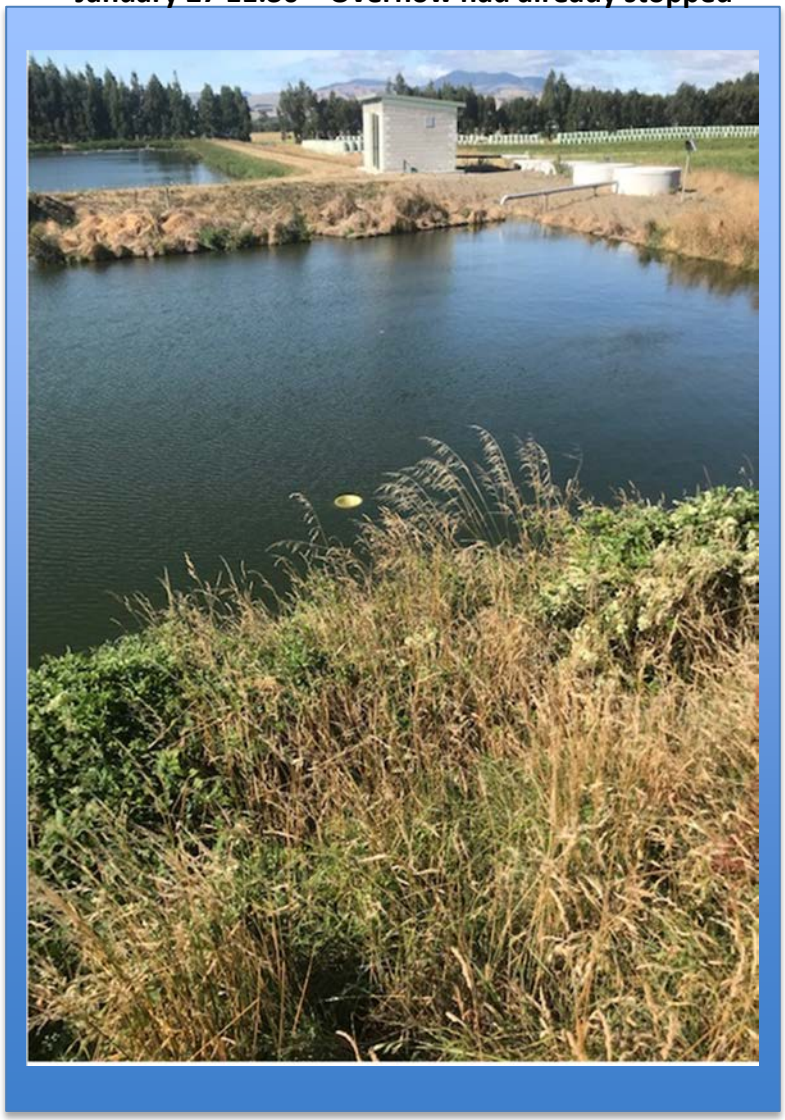
Unless otherwise stated, all tests are performed in Wellington.
The laboratory is not responsible for the information provided by the customer which can affect the validity of the results.
"<" means that no analyte was found in the sample at the level of detection shown. Detection limits are based on a clean matrix and may vary according to individual sample.
g/m3 is the equivalent to mg/L and ppm.
Samples will be retained for a period of time, in suitable conditions appropriate to the analyses requested.

Report Released By
Rob Deacon

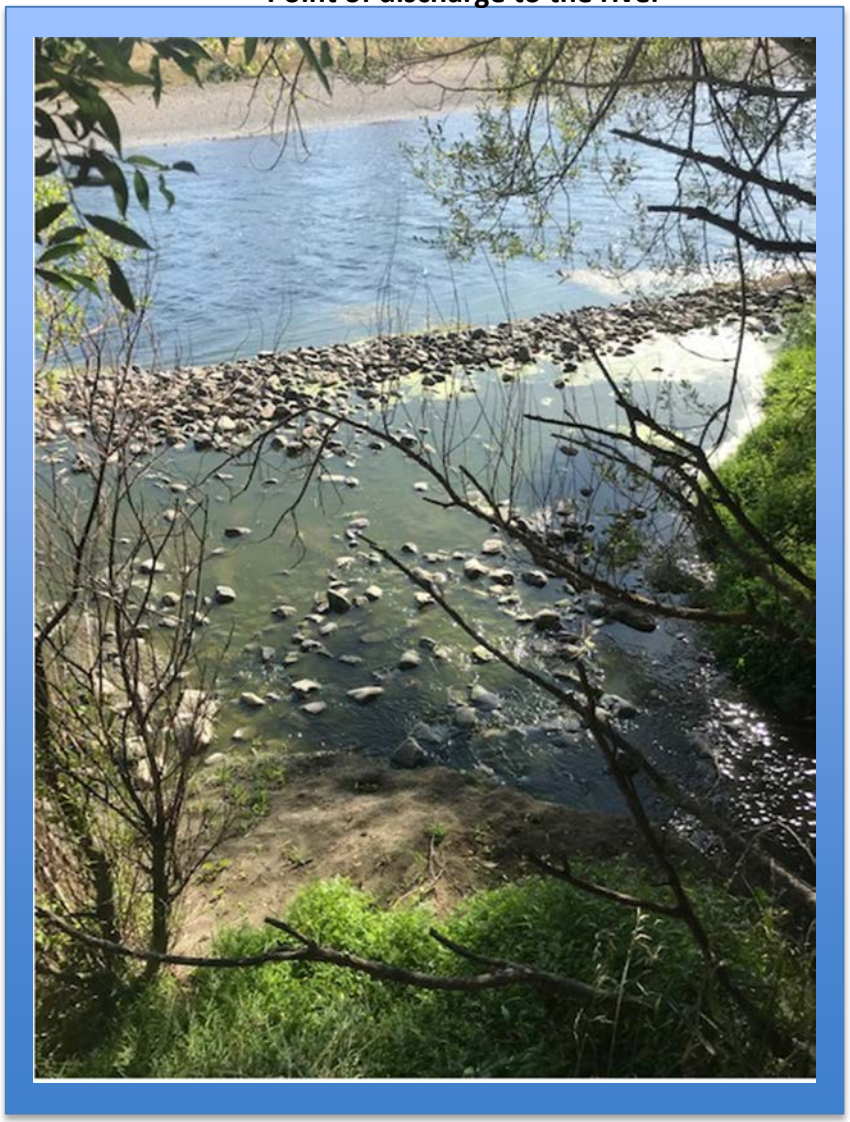
This laboratory is accredited by International Accreditation New Zealand and its reports are recognised in all countries affiliated to the International Laboratory Accreditation Co-operation Mutual Recognition Arrangement (ILAC-MRA). The tests reported have been performed in accordance with our terms of accreditation, with the exception of tests marked "not IANZ", which are outside the scope of this laboratory's accreditation.

Appendix E – January 27 Incident Site Inspection

January 27 11:30 – Overflow had already stopped



Point of discharge to the river



Visual Status of the River within 30m from point of discharge

Visual Status of the River 30m downstream

Visual Status of the River 30m downstream

Appendix F – January 27 Result of Laboratory Analysis

eurofins | ELS

Eurofins ELS Limited

South Wairarapa District Council- Martinborough Waste Water
South Wairarapa District Council
c/- Wellington Water
Private Bag 39-804
Wellington Mail Centre 5045
Attention: Nick Hewer-Hewitt

Analytical Report

Report Number: 20/4676

Issue: 1

04 February 2020

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/4676-01	Martinborough Sewage from Discharge		27/01/2020 14:05	28/01/2020 07:48	P1069264

Notes: Green discharge. Mild odour. No foam. (Original Discharge sample point overgrown with weeds. Sample taken at a clear point 15m further downstream in discharge creek)

	Test	Result	Units	Test Date	Signatory
0001	pH	7.9		28/01/2020	Jennifer Mont KTP
0002	Suspended Solids - Total	99	g/m³	28/01/2020	Gordon McArthur KTP
0085	BOD5 - Total	67	g/m³	29/01/2020	Gordon McArthur KTP
0302	Volatile Suspended Solids	93	g/m³	28/01/2020	Gordon McArthur KTP
0603	Nitrite - Nitrogen	0.16	g/m³	27/01/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	0.05	g/m³	27/01/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	23.5	g/m³	29/01/2020	Athena Cao
2080	Total Phosphorus	8.19	g/m³	29/01/2020	Athena Cao
2088	Dissolved Reactive Phosphorus	5.94	g/m³	29/01/2020	Athena Cao
2127	Total Nitrogen	38.0	g/m³	29/01/2020	Athena Cao
M0104	E. coli	2,100	cfu/100mL	28/01/2020	Juana Tamayo KTP
P1859	Sample Filtration	Completed		28/01/2020	Daniel Fitzpatrick

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/4676-02	Martinborough STP Upstream of Discharge (Site A)		27/01/2020 13:30	28/01/2020 07:48	P1069264

Notes: River clear. River level very low

	Test	Result	Units	Test Date	Signatory
0001	pH	8.5		28/01/2020	Jennifer Mont KTP
0002	Suspended Solids - Total	< 3	g/m³	28/01/2020	Gordon McArthur KTP
0085	BOD5 - Total	< 1	g/m³	29/01/2020	Gordon McArthur KTP
0302	Volatile Suspended Solids	< 3	g/m³	28/01/2020	Gordon McArthur KTP
0605	Nitrate - Nitrogen	0.01	g/m³	27/01/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	< 0.01	g/m³	29/01/2020	Athena Cao
2080	Total Phosphorus	0.013	g/m³	29/01/2020	Athena Cao
2088	Dissolved Reactive Phosphorus	0.008	g/m³	29/01/2020	Athena Cao
2127	Total Nitrogen	0.13	g/m³	29/01/2020	Athena Cao
M0104	E. coli	16	cfu/100mL	28/01/2020	Juana Tamayo KTP
P1859	Sample Filtration	Completed		28/01/2020	Daniel Fitzpatrick

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/4676-03	Martinborough STP 250 m Downstream (Site B)		27/01/2020 14:20	28/01/2020 07:48	P1069264

Notes: River clear. River levels very low

	Test	Result	Units	Test Date	Signatory
0001	pH	8.6		28/01/2020	Jennifer Mont KTP
0002	Suspended Solids - Total	< 3	g/m³	28/01/2020	Gordon McArthur KTP
0085	BOD5 - Total	1	g/m³	29/01/2020	Gordon McArthur KTP
0302	Volatile Suspended Solids	< 3	g/m³	28/01/2020	Gordon McArthur KTP
0605	Nitrate - Nitrogen	0.02	g/m³	27/01/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	0.26	g/m³	29/01/2020	Athena Cao

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/4676-03	Martinborough STP 250 m Downstream (Site B)		27/01/2020 14:20	28/01/2020 07:48	P1069264

Notes: River clear. River levels very low

	Test	Result	Units	Test Date	Signatory
2080	Total Phosphorus	0.101	g/m³	29/01/2020	Athena Cao
2088	Dissolved Reactive Phosphorus	0.069	g/m³	29/01/2020	Athena Cao
2127	Total Nitrogen	0.53	g/m³	29/01/2020	Athena Cao
M0104	E. coli	48	cfu/100mL	28/01/2020	Juana Tamayo KTP
P1859	Sample Filtration	Completed		28/01/2020	Daniel Fitzpatrick

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/4676-04	Martinborough WWTP Post UVT		27/01/2020 13:50	28/01/2020 07:48	P1069264

Notes: Mild odour. Green discharge, no foam.

	Test	Result	Units	Test Date	Signatory
0002	Suspended Solids - Total	30	g/m³	28/01/2020	Gordon McArthur KTP
0085	BOD5 - Total	20	g/m³	29/01/2020	Gordon McArthur KTP
0302	Volatile Suspended Solids	28	g/m³	28/01/2020	Gordon McArthur KTP
0603	Nitrite - Nitrogen	0.01	g/m³	27/01/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	0.02	g/m³	27/01/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	26.0	g/m³	29/01/2020	Athena Cao
2080	Total Phosphorus	9.11	g/m³	29/01/2020	Athena Cao
2088	Dissolved Reactive Phosphorus	7.85	g/m³	29/01/2020	Athena Cao
2127	Total Nitrogen	33.7	g/m³	29/01/2020	Athena Cao
M0104	E. coli	500	cfu/100mL	28/01/2020	Juana Tamayo KTP
P1859	Sample Filtration	Completed		28/01/2020	Daniel Fitzpatrick

Comments:

Sampled by customer using ELS approved containers.

Test Methodology:

Test	Methodology	Detection Limit
pH	Dedicated pH meter following APHA Online Edition Method 4500 H.	0.1
Suspended Solids - Total	APHA Online Edition Method 2540 D	3 g/m³
BOD5 - Total	APHA Online Edition Method 5210 B.	1 g/m³
Volatile Suspended Solids	APHA Online Edition Method 2540 G	3 g/m³
Nitrite - Nitrogen	Ion Chromatography following APHA 4110B.	0.01 g/m³
Nitrate - Nitrogen	Ion Chromatography following APHA 4110B.	0.01 g/m³
Ammonia Nitrogen	Flow Injection Autoanalyser following APHA Online Edition Method 4500 NH3-H.	0.01 g/m³
Total Phosphorus	Flow Injection Autoanalyser following APHA Online Edition Method 4500-P G. Persulphate digestion follows APHA Online Edition 4500-P B.	0.005 g/m³
Dissolved Reactive Phosphorus	Flow Injection Autoanalyser following APHA Online Edition Method 4500-P G.	0.005 g/m³
Total Nitrogen	Flow Injection Autoanalyser following APHA Online Edition Method 4500-NO3 I. Persulphate digestion follows APHA Online Edition 4500-N C.	0.05 g/m³
E. coli	APHA 9222I:Online Edition	1 cfu/100mL
Sample Filtration	Sample filtered through 0.45 micron filter following APHA Online Edition Method 3030B.	n/a

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g/m3 is the equivalent to mg/L and ppm.

Samples will be retained for a period of time, in suitable conditions appropriate to the analyses requested.

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Rob Deacon

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