**Lake Okareka Resource Consent Application Summary**

The following provides a brief summary of the Lake Okareka discharge resource consent application. The information is taken from the full application. . However the whole application and supporting reports should be read to gain a full understanding of the proposed activities, potential effects, mitigation measures and scientific/engineering background to the proposal.

The resource consent application is to;

* **Discharge up to 500** **litres per second** (L**/s) of water from the Lake Okareka outflow via a canal and existing pipe system and to use a second pipe and pump with both pipes discharging into the headwaters of the Waitangi Stream.**
* **Undertake stream protection works in the Waitangi Stream to prevent erosion and habitat damage which could result from the increased flow.**

In 2001 RC 60776 was issued to allowed for the discharge of water from Lake Okareka via a controlled outlet at a rate of up to 239L/s. A series of significant rainfall events beginning in February 2017 lead to a rapid increase in lake level. These events and subsequent modelling showed that the existing pipe configuration and consent discharge limit of 239L/s was unlikely to have the capacity to discharge the water volumes resulting from large and more numerous rainfall events, particularly when considering the additional effects of climate change.

The 2017 events lead to flooding of the lakeside margins and damage to lakeside paths and structures and risk to dwellings. Without intervention to increase the discharge flow the lake level would have continued to increase and it is highly likely that it would have resulted in damage to property.

In June 2017 Bay of Plenty Regional Council invoked s330 (Emergency Works) of the Resource Management Act to increase the discharge from Lake Okareka to 360 L/s through the existing pipe and to add a second pipe and pump to give a total discharge rate of up to 500L/s and to undertake stream protection works to prevent erosion caused by the increased flow. This resource consent is currently in place alongside consent 60776.

This consent application is to formalise the provisions in the emergency works consent into a long term resource consent. It is proposed that the emergency works consent and consent60776 will remain in place until this long term consent is granted.

The outflow from Lake Okareka discharges into the headwaters of the Waitangi Stream which flows into Lake Tarawera. Until June 2017 the rate of discharge was regulated by a valve which controlled flow rate of between 100L/s and 239L/s to maintain the lake level within the consent target range of 353.5 to 353.9 metres.

Since February 2017 the region has been hit by a number of major rainfall events interspersed with smaller events. Between 1 March and 13 July 2017 (144 days) there have been 15 days with rainfall exceeding 50mm/day and 6 days exceeding 100mm/day. The events during the period February to September 2017 are equal to or exceed 100 year events for up to 150 day duration, 50 year events for 150-250 day duration and a 15 year event for 300 day duration. Figure 1 shows that on 10 February 2017 the lake level was close to the lower consent limit of 253.5m. It reached the upper consent limit on 13th March and exceeded the upper consent limit by 404mm on 17 April 2017. The lake reached its highest level in the current series of events on 3 September 2017 at 354.56m (666mm above the consent maximum target).

To put the increased flow into context, the consent provision is for discharge rate of UP TO 500L/s. The graph attached (Fig 2) shows the lake level in blue and the discharge rates in the coloured line along the bottom of the graph. The graph end date is 1 September 2018 but since then to 20 October 2018 the discharge has been less than 300L/s. Since the 500L/s discharge facility became available under the emergency works consent (4 August 2017), the discharge rate has been at 500L/s for approximately 35% of the time and most of this was at the start of the pumping programme when lake level was at its highest (August - November 2017). Since 2nd December 2017, pumping @500L/s has only occurred for approximately 7% of the time.

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Figure 1

The maximum discharge rate under Resource Consent 60776 was 239 L/s, but the maximum flow capacity of the pipe is 360 litres per second. The control valve had been operating at the maximum resource consent limit from 19th March 2017. This was not sufficient to maintain the lake level below the upper limit, so on 23 June 2017 the valve was opened to its full capacity which has increased the discharge to approximately 360L/s. This was carried out under RMA Section 330 provision - Emergency Works. For this flow rate to be continued, a resource consent application was lodged within 20 working days of the Emergency power being invoked ( 21st July 2017). Opening the valve to full capacity could reduce the lake level by approximately 5mm per day if there is no rainfall. With average rainfall the lake level would reduce by approximately 1mm per day. Clearly this wasn't sufficient to reduce the level of the lake and given current weather patterns, it is likely that the level could increase further. Within the current discharge system, there is no way of increasing the discharge rate beyond the current 360L/s.

As part of the s330 application, BOPRC added a second pipe (450mm diameter) and pump system to convey water from the outflow channel to the current pipe discharge dissipator and into the Waitangi Stream. This increased the potential flow by 140 L/s to give a combined maximum of up to 500L/s. Once the lake level returned to the normal range, the pump was switched off but the control valve remained fully open to allow up to 360L/s to be discharged.

BOPRC is now seeking a long term resource consent to continue to operate the exiting discharge pipe at maximum capacity 360 litres per second and to retain the second pipe to provide a combined discharge capacity of up to 500L/s. In the future it is likely that the two pipes will be replaced with one larger pipe which will discharge up to 500L/s by gravity feed.

Figure 2 Lake level and Discharge rates July 2017 to September 2018

It should be noted that since the 2001 resource consent was issued, the consented flow limit of 239L/s has been adequate to maintain the lake level within the range 353.3m to 353.9m for most of the time and where this was exceeded, there was not the risk of damage to property that was experienced in 2017. Modelling shows that for most of the time it is likely the discharge rate will be below 360L/s, but the additional physical and consented discharge capacity of up to 500L/s will greatly reduce the likelihood that lake levels reach the 2017.

**Potential Positive Environmental Effects**

In September 2017, the lake level was at its highest since the 1960s. There was an increasing risk to property if the lake level remained at that level or increased. In addition to private property damage on the lake margins, two footpaths with public access( the Okareka Boardwalk and the Boyes Beach Camp Site path) were partly submerged and suffered damage. Most of the lake jetties were under water including the jetty adjacent to the public boat ramp.

Increasing the discharge rate will allow a controlled reduction of the lake level and will provide more tools for maintaining the lake at manageable level in anticipation of and during future rainfall events. The effects of climate change mean that large rainfall events are likely to be more frequent and of larger scale. Modelling of the lake response to major rainfall events included adjustments for the effects of climate change.

**Potential Adverse Effects**

**Pipe Discharge**

The addition of a second abstraction pipe into the current discharge structure has had minimal (if any) effect at the inlet, but the increased discharge from the existing pipe and addition of a second pipe into the open stream channel at the same location of the current discharge could increase the risk of erosion and sediment discharge.

**Mitigation:** The discharge site from the current energy dissipator and the second pipe has had additional protection by the placement of large boulders and riprap. This will reduce the velocity and erosive power of the water exiting the pipes and flowing into the Waitangi Stream.

**Waitangi Stream Channel**

The potential flow rate in the upper Waitangi Stream could increase at times from 239L/s to 500L/s during periods of high lake levels or anticipated severe rainfall events. With this increase there is potential for accelerated down-cutting and increased stream bed and bank erosion.

**Mitigation:**  An engineering assessment of the channel was undertaken before the flow rate was increased to identify existing erosion areas and areas of future risk. These areas have been protected by placement of riprap, plywood shuttering and gabion baskets. Further protection works are planned.

To ensure that there are no unacceptable adverse effects, the following is proposed;

An ecological assessment of the stream was undertaken. This identified potential effects of increased flows. This report concluded that the effects of increased flow would be no more than minor if the recommended mitigation measures were put in place. The proposed mitigation measures were incorporated into the engineering design which was further reviewed and approved by the ecologist. The key mitigation measures are;

* Manage the discharge in accordance with an approved management plan which has been produced based on modelled rainfall and flow data. This will manage the discharge rate based on lake level and weather predictions to increase flow rates gradually to minimise the duration of high flow discharge. This will be a live document and can be modified based on experience of actual events.
* The BOPRC Environmental Data Services Department (EDS) has installed a permanent flow gauge which will allow for more accurate calibration of the valve settings to allow specified flow rates.
* Open the valve incrementally and monitor downstream. If any effects are observed they are managed.
* Downstream monitoring will consist of visual inspections at the start and at regular intervals when the valve is operating beyond 360L/s. In the first week there will be daily inspection. Monitoring will include making a photographic record at key points.
* As the lake level falls, the discharge rate will be managed the ensure that the discharge rate is the minimum required to ensure continuous fall in lake level to optimum levels. At the same time, weather forecasts will be closely observed to ensure the lake has capacity to contain a major rainfall event and retain the lake level within the consent target range. It should be noted that the pipes may not flow at the controlled rate unless lake levels are high due to lack of head pressure. e.g With a pipe capacity of 360L/s the discharge rate cannot physically exceed 300L/s until the lake level reaches approximately 354.9m which is the current consent target maximum. This provided additional restriction of the time that the discharge will be at higher rates.
* Minimal flow rates will be managed in conjunction with Fish and Game, but if the lake level falls below the outlet the minimum target flow rates will not be achievable. Management will include restricting the flow to minimum levels as lake levels fall towards the lower target level.
* BOPRC will also notify the Lake Okareka community, Fish and Game, iwi and downstream land owner when valve settings are changed.

**Downstream Structures**

There are three culvert crossing between the Lake Okareka discharge and Lake Tarawera. These are;

* Spencer Road 1150mm
* Private Right of Way 1150mm
* Lower culvert close to the lake 900mm

An engineering assessment of pipe capacity indicates that the 1150mm pipes are large enough for a 500L/s discharge. When the system was discharging at 500L/s, the pipes were flowing at 50% capacity.

The 900mm pipe close to the lake was operating close to capacity, with the lake discharge set at 360L/s, so a smaller addition pipe has been installed to take higher level flows.

**Effects on Fisheries**

The lower Waitangi Stream is a trout spawning area. Increasing the flow could increase bed erosion and sediment discharge into the lower Waitangi Stream or cause erosion within the spawning areas.

**Mitigation;** BOPRC is currently in discussion with Eastern Region Fish and Game and the landowner and a mitigation plan has been drawn up to protect the fishery in this area. Protection measures include

* Erosion protection in vulnerable areas upstream of and within the spawning area
* Create low energy areas (e.g. J hooks) where fish can rest during times of high flow
* Open or close the valve incrementally and monitor to prevent sudden changes in flow. The rate will be agreed with Fish and Game and may be varied based on observations during ramping.

**Effects on Lake Tarawera**

The water quality parameters between the two lakes are very similar. Increasing the discharge from 239L/s to 500L/s won't increase the risk of pest species passing from Lake Okareka to Lake Tarawera. Any species present in Okareka will already be present in Tarawera.

There is a small delta where the Waitangi Stream enters Lake Tarawera. This comprises fine solid material. Since the increased flow, a layer of larger particles have been deposited in the delta area. This material is unconsolidated and likely to be dissipated by wind and wave action. Once the engineering protection works have been completed it is not anticipated that any bed and/or bank erosion will be no more than minor.

**Cultural Effects**

BOPRC is in consultation with tangata whenua and Te Arawa Lakes Trust to ensure that cultural values are taken into account in the design and operation of the additional discharge capacity. Tuhourangi tribal authority has provided support for the proposed works.

**Affected parties**

Affected parties have been identified and the consultation process initiated. From the initial discussion around the emergency works consent, it was clear that there were wider issues around the management of the lake level and discharge via the Waitangi Stream. It was decided that following full consultation with affected parties, a second 'long term' resource consent application will be made. This is the application covered by this summary. A working party has been established to consider the proposed changes to control measures. The long term consent will seek continuation of the 500L/s provision and will also include a review of the current operating guidelines.

**Summary**

BOPRC is seeking a long term resource consent of 35 years duration to formalise the activities covered under the emergency works consent which has a limited duration. The application is to increase discharge from the existing pipe and to retain the second discharge pipe from the Lake Okareka outlet. This has increased the allowable discharge rate from 239L/s to 500L/s - when required. Measures will be taken to ensure that any adverse effects will be managed. Any increase in flow rate will be incremental and fully monitoring during periods when the discharge exceeds 360L/s. Protection works in the Waitangi Stream have started and will continue in 2019. It is proposed that the operating conditions under the emergency consent will be incorporated into a long term consent which will ultimately replace the consent issued in 2001.

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