

TAG Meeting held in Environment Bay of Plenty Offices, Rotorua on 20 July 2009 commencing at 9:30 am

In Attendance: Max Gibbs; Piet Verburg; Warwick Silvester; David Hamilton; Trevor Stuthridge; Clive Howard-Williams; Paul Scholes; Peter Dine; John McIntosh; Paul White; Andy Bruere

Apologies: Rob Donald; Roku Mihinui; Hera Smith; Julie Hall; Eddie Grogan; Kit Rutherford

Clive Howard-Williams confirmed that Julie Hall is no longer involved with the Water Quality TAG and is to be replaced by Piet Verburg.

1 Matters arising

A number of matters were indicated for further discussion on the agenda. Those that apply to later agenda items were left for discussion at that point.

1.1 Ohau Diversion - ADCP monitoring

David presented the latest monitoring results of water currents within the diversion channel and in Lake Rotoiti adjacent to the channel. The monitoring period in March/April 2009 corresponded to the period of most likely underflow when temperature of Lake Rotorua was considerably cooler than Rotoiti.

Aerial photography of algae concentration showed clear pathway of algae from Rotorua down Ohau Channel into Okere Arm.

Monitoring showed some possible underflow of water from the Ohau Channel towards Lake Rotoiti, but this appeared to be related to wind direction rather than an underflow effect. A very small percentage of water may circulate around the wall into Lake Rotoiti at this time of year, and less so on a whole-year basis. David to provide a more detailed report for autumn circulation as a follow up to the first report relating to a spring circulation.

Action: Andy to circulate web connection to last report.

Action: David to complete report on ADCP monitoring.

It was agreed at this stage no further monitoring required. This matter would be reconsidered at a later date if needed to assess any future monitoring methods required.

1.2 Okataina/Tarawera groundwater monitoring programme

Paul White reported that no progress had been made on this proposal recently, however some discussions have taken place with Rob and Janine. Their proposal is to develop the draft proposal into a work plan for groundwater investigation. Paul reported that this would be taking place over the next month.

Action: Progress work plan for groundwater work Okataina/Tarawera.

Paul also mentioned that Lake Rotoma had been dropping water level about 100 mm per month since Christmas 2008. The TAG agreed that this was not particularly unusual in conditions of low rainfall and that seepage from Rotoma through the mire may be contributing to maintaining water level in Lake Rotoehu.

Paul was also asked whether there was now agreement between himself and Kit Rutherford regarding the catchment boundaries for ROTAN. Paul indicated that meetings had taken place and that his understanding was that the ROTAN boundaries are now agreed. Andy commented that Kit has informed us that the model is now ready to run and presumed he would not have indicated that if the boundaries were still in doubt.

1.3 **David indicated that he did not recall circulating the articles on aeration to the TAG**

Action: David to send Andy aeration articles for Andy to circulate.

David also commented that he had seen a number of papers on aeration while overseas at a conference and commented that aeration was quite successful at reducing nutrient release but that running costs were high. He also made the comment that once oxygenation was started it may need about one and a half times the sediment oxygen demand in the early stages of operation.

Max commented that NIWA are looking at long-term running of aerators in the Auckland water supply reservoirs. He noted that if circulation starts before stratification it can reduce the energy requirements significantly (i.e. prevent stratification).

Paul Scholes commented that the Rotoiti inflow work had started. One year of sampling will be conducted to update similarly detailed sampling of Rotoiti inflows in the early 1990s. Paul also noted that the Sullivan Lake report was completed

Action: Paul to circulate Sullivan Lake Report to TAG.

2 **Sediment capping**

The cost comparison work of the various capping agents has not yet been undertaken. This is covered in a later item.

2.1 **Allophane work**

Andy and John outlined the progress on the allophane proposal. This is to put allophane in the watercourse between the Okaro Wetland and Lake Okaro to adsorb phosphorus. Six tonnes of allophane have been purchased to apply to the bed of the stream and in three possible applications during October, November and December 2009.

Andy also commented that he had been talking to Landcare Research about the commercial availability of allophane. If allophane is to be continued to be used in sediment capping trial work then Environment Bay of Plenty needs to be assured that it will be commercially available at the time of any full-scale capping project.

Action: Andy to progress. Work with Landcare Research looking into the sources, quantity and quality of allophane. If this is positive then will follow up at a later date regarding the commercial availability for any of our projects.

2.2 Cost comparison of alum

John raised that he was concerned that alum had been eliminated from our trial work for sediment capping and believed that for accountability reasons we need to consider more carefully why it was eliminated and undertake cost comparison with other products. He commented that if we're going to do sediment capping in Lake Rotoehu we need to include alum in the proposal.

He suggested putting a brief to Peter Browne (Chemical Engineer who has assisted with planning and design of alum dosing projects in Utuhina, Puarenga and Soda Springs). This would cover issues involved with lake capping and do a cost comparison, and would add an element of independence to the project. It was mentioned that we need to ensure pH adjustment combined with the use of alum needs to be included in the project. It was also mentioned that we need to consider the cost comparison of using a slurry versus pellets.

Action: John to invite Peter Browne to a meeting of the sediment group in Hamilton to formulate a brief for a cost comparison of four products for sediment capping including application costs.

Action: David to organise a meeting time and venue.

Action: John to put proposal to sediment group to provide brief to Peter Brown or other expert to look into cost comparison of four products including application costs.

(Note from Andy after meeting: suggest project should cover cost of sediment capping for Rotoehu and Lake Rotorua.)

2.3 Lake Okaro sediment capping preparation

Some discussion on technical issues regarding Lake Okaro sediment capping preparation was covered. The more logistical matters were to be discussed at the meeting on Thursday, 23 July, in preparation for the application project. Trevor briefly outlined that the 20 tonnes of product Environment Bay of Plenty had in store was currently being combined with some material which Blue Pacific Minerals had partly processed previously to produce 65 tonnes of capping material meeting specifications including passing a sieve size of 1 mm or less.

Max then commented that a sediment sample had been taken recently to check phosphorus in the top 4 cm of sediment (the active layer). Prior to the last capping event two grams per square metre of phosphorus were available in that layer. More recently sampling indicated 0.9 grams phosphorus per square metre. This translates to a requirement to add 25 to 30 tonnes evenly across the lake. It was agreed that due to the availability of 53 tonnes of material and the opportunity to apply this material, we would continue with the application of 53 tonnes to the lake bed. This would reduce occurrence of application rates across the lake bed that are lower than those recommended by Max.

It was also raised that we need to ensure monthly water samples were collected. It was confirmed that Environment Bay of Plenty and University of Waikato sampling currently collectively covers fortnightly monitoring of lake water quality and this will continue. David did raise an issue with regard to different methodologies for treatment of samples. The University of Waikato was undertaking filtration of samples in the field and this could be contributing to some differences in analysis between Environment Bay of Plenty and University of Waikato samples. It was agreed that it was better not to make a change in method for Environment Bay of Plenty but a comparison could be made if an adjustment to the data was needed.

2.4 Rotorua trial progress

Andy updated the group on consultation with the community and iwi around the Rotorua trial work. He commented that he needed a plan showing the more precise location of the trial area to provide to iwi. David and Max to provide location of test site to Andy including full area of the site.

It was discussed that the site needs to be large enough to include three trial plots including possible drift of the application.

Max raised that to resolve the drift movement issue some monitoring needs to be undertaken with ADCP meter during October/November. The ADCP meter cannot do real time monitoring so there is a need to look at possible modelling of the results with wind effect. This can be used on the day of application to determine the risks of going ahead with application on any particular day and possible drift. It was commented that P concentration (by dry weight) for Rotorua is around one-half of that of Okaro; application rates should be based around one-half of what is required to control P release in Okaro but may need to account for greater burial rates in Rotorua.

Action: Further discussion on the Rotorua sediment trial work will take place at the Sediment Working Group including specifically:

- ADCP meter work
- Decision on area for the trial (location)
- Product specification
- Amount of material required
- Cost comparison as detailed in previous items

There was some discussion on the critical depth of sediment being targeted to account for the possible diffusion of phosphorus into top layers of sediment. It was commented also that Lake Rotorua's sediment is different to Okaro as it is easily disturbed. Max commented that Lake Okaro cores show Z2 had travelled down five to seven centimetres into the sediment. It is expected that during the second Okaro dosing and the Rotorua trials the product will not sink to that level as it will be finer.

3 Lake Rotoehu modelling work

David stated that the 3D model for Lake Rotoehu is now operational. With the planning for sediment capping trial work for Rotoehu he suggested undertaking a run doing sediment dosing to establish where the product would sink to. To undertake this work he requires sedimentation rate of material and the application method.

Some rough lake calculations indicated that sediment capital for Lake Rotoehu would be around ten times larger than Lake Okaro project and that this could be a logical step up in size before attempting full-scale capping of Lake Rotorua.

John McIntosh indicated that he thinks only the centre of Lake Rotoehu stratifies an area of probably greater than 10 metres deep. This gives an indication of the area which would need to be treated (Surface area: 760 ha, below 10 m: 390 ha).

Max stated phosphorus levels are high in the water column as well as in the sediment of Rotoehu. He made the suggestion that we could possibly use a small sidearm to test for performance.

Action: Take the proposal back to the Sediment Working Group and get an objective for Lake Rotoehu capping and then any trial experimentation work required leading to the capping objective.

4 Optimising land use

Andy presented concerns that with the high cost of some interventions we need to ensure we understand their value in the programme as funds could be diverted to other projects within the programme. With the establishment of three models the lake model, groundwater flow model and the ROTAN model, we now have the opportunity to more clearly understand the implications of each of the interventions planned. In addition these models should be used to attempt to establish the optimum time and sequencing of various interventions to get best possible results. The main example of concern is that there needs to be some consideration of the impact of various levels of land use change prior to undertaking sediment capping. For example, with no land use change prior to sediment capping, how long will sediment capping last? And alternatively, how much land use change may be necessary to ensure the success of sediment capping?

Action: Andy to bring together a group to work on optimising land use change and sequencing of interventions. The group consists of David, Kit, Paul White, Simon Park, Andy and Liam Dagg from RDC (and a planner from EBOP involved in the RPS).

The aim is to investigate scenarios for optimisation of land use and to find impact of various scenarios linking the various intervention combinations specified in the Rotorua/Rotoiti Action Plan.

Peter Dine requested that we need to include in this work the removal of wetlands at Ngapuna through to Hinemoa Point due to a possible subdivision effect. Warwick commented that the effects of land use change reaching the lake would take some time and the TAG position is: that we should not delay land use change even with the benefits of sediment capping.

It was also commented that we need to ensure we model the changes for each part of the catchment.

5 Awahou P Locking

Andy wanted to confirm with the TAG that Awahou was still the next best option for phosphorus locking within the programme. He presented information from the GNS work which indicated that this was the case if Hamurana Diversion was to go ahead. The alternative is to possibly shift sediment capping to the Hamurana Stream if modelling indicates through a combination of interventions Hamurana is not going to be of significant benefit. Other points were raised included:

- How successful is the Utuhina P Locking? John explained that it removes 100% of phosphorus during base flows but during high flows it was difficult to dose enough alum. Suggested that we only design for base flows as it will get the majority of phosphorus locked anyway.
- David suggested that Hamurana Stream could be treated off line using gravity flow. John indicated that DoC (Phil Alley) had once suggested using the adjacent golf course for a wetland so perhaps the idea is feasible. Suggested there should be a possible change to plant design to take water off line, collect sludge and this would give the opportunity to regenerate alum and collect phosphorus for fertiliser which may have some value. This had been proposed originally and could still be looked at

in final design. Perhaps another proposal we could get Peter Browne to examine i.e. the cost and feasibility of regenerating alum and capturing phosphorus for commercial benefit.

- The final suggestion made was that perhaps we could undertake P locking in Awahou and Hamurana and get significant traction on phosphorus removal for Lake Rotorua. The combined phosphorus input for Awahou and Hamurana are 6.5 plus 3.3 tonnes per year. It was agreed that from the GNS work undertaken that significant quantities of phosphorus is contained in the older groundwater reaching the lake and coming from streams particularly Awahou and Hamurana.

Action: Andy to continue forward with consultation with Ngati Rangiwewehi and discuss proposals with respect to P locking in Awahou and Hamurana Stream.

Action: Andy to include these scenarios in the modelling work with David and the Land use Optimisation Group.

5.1 Monitoring buoys

David presented work to date on the monitoring buoys for Rotorua, Rotoiti and Tarawera. Explained there are three in place currently with a further buoy to be installed in Rotoiti in the very near future. The project has consumed about 140K over 3 to 4 years.

The main questions which need to be considered are ensuring we keep these buoys maintained so we can develop a long term record of lake monitoring and do we need further monitoring buoys for other lakes.

Cost per buoy is about \$55,000, however we need to ensure we have sufficient funding for maintenance and reporting of existing buoys.

It was discussed that the monitoring buoys were more important in the polymictic lakes where changes in water quality conditions occur more rapidly and real time monitoring is of a significant advantage. It was agreed that the next lake which probably requires a monitoring buoy would be Lake Rotoehu, particularly if we are going down the route of sediment capping on it. The idea of a roving buoy to be shifted between lakes was discussed, however it was, at this stage, not considered necessary. At this stage no other lakes were identified as requiring a real-time monitoring buoy.

Action: Andy and David to discuss proposal for monitoring buoy at Lake Rotoehu.

Action: Andy to follow up with Rob Donald re depreciation and replacement as the value of data collected increases with length of the monitoring programme.

6 Tikitere update

Andy and Peter gave an update on the Tikitere project. Included that the pilot plant design is well underway and expect construction to start by the end of the year. Also discussed the LentiKats biotechnology product which basically contains nitrification and de-nitrification bacteria in a capsule with capsules retained within the plant and not entrained in the treatment stream. This product is to be supplied by the manufacturers for a parallel pilot scale experiment alongside the tracking filter and woodchip de-nitrification bed.

These trials would run for a year to 18 months to provide design information and also the opportunity change to the most effective method as a result of the pilot plant operation.

Trevor Stuthridge raised the point that Scion has a containerised pilot plant which may be available for use in our LentiKats proposal.

Action: Trevor to follow up with Peter whether this plant is available.

It was also raised, is there anything in the geothermal water that will affect the catalyst? The pilot trial work will determine this of course, however RDC has already undertaken lab-scale aeration trials and there was nothing within the geothermal water, once pH was adjusted, to prevent the nitrification step.

It was also raised that this technology did not appear to have been widely applied in other areas and that we should attempt to check the success of projects already undertaken.

Andy raised was it possible that this product could be applied to lake beds to enhance de-nitrification in the lakebed. Discussion around this indicated that there was unlikely to be any shortage of bacteria in the bed of any lake for de-nitrification. The limiting factor in de-nitrification is the availability of nitrate.

7 Project update from Andy – Lake Okaro

- Sediment capping going ahead August
- Wetland monitoring continuing with NIWA
- Allophane project discussed earlier
- Land use change progressing, negotiations taking place with farmers in the catchment.

7.1 Lake Rotoehu

- Weed harvesting over autumn. Very successful removing about 4 tonnes of nitrogen and 500 to 760 kilograms of phosphorus from the lake contained in the weed.

Action: Andy to circulate report to TAG.

- Soda Springs P Locking Plant Design and consultation well underway with an objective of removing about 700 kilograms of phosphorus per year from inflows.
- Floating wetland trial up and running to demonstrate performance over the next year. Report expected by August 2010 to assist in the justification for funding around floating wetlands for Rotoehu.
- Maori landowners group has been set up for Rotoiti, Rotoehu and Rotoma. They have been working with Scion to develop a proposal for land use optimisation within those catchments and lead land use change in the Ngati Pikiao rohe.

7.2 Lake Okareka

- Sewage reticulations progressing with tenders for contract installation to be called soon.
- Completion of the scheme October 2010.
- Land use changes progressing with negotiations with a number of landowners.

- 200 ha required.
- It is expected that in the near future we will have an agreement with one landowner for 56 ha. Have been looking at a number of forestry joint ventures which could contribute to the 200 ha required.

7.3 Lake Tikitapu

- Reticulation of the motor camp and toilets will be included in Lake Okareka reticulation.
- Only about 20 ha of land use change within the catchment which can be targeted.
- Some small stormwater inflows could be addressed by preventing direct flow to the lake.

Action: Andy and Peter to discuss the possibility of addressing these with soakage areas and possible inclusion of phosphorus locking material (allophane) to remove phosphorus

7.4 Lake Rerewhakaaitu

The sustainable farming project around Lake Rerewhakaaitu has finished. However the farmers seem keen to engage in a programme to take steps to protect water quality from their activities.

Environment Bay of Plenty is awaiting feedback from farmers as to whether this would be formation of a group to start a management plan or other forum.

- John outlined some of the other projects such as the melter slag socks and wood chips. A proposal which was never installed. It was commented that these projects were of limited value although they did have the benefit of engaging the farmers in thinking about the water quality issues and how they may contribute to addressing these.

8 The DairyNZ Report

Andy outlined that on the positive side the DairyNZ report has started some engagement between the Dairy Industry and Environment Bay of Plenty on how they may assist in meeting the nutrient targets set in the Rotorua-Rotoiti Plan. Andy explained that Rob Donald had put together a report on the science comments around the DNZ proposal and that planning were going to do the same regarding planning issues.

It was expected that scientists from DNZ would meet with TAG representatives to explore whether the issues of disagreement could be resolved.

Action: Andy to circulate the Science summary prepared by Rob Donald using TAG notes and advice.

9 Matters arising

Warwick mentioned that the permanent forest sinks initiative provided potential for farmers on some land to gain from carbon credits related to forest planting. He also stated that there are look up tables available for determining carbon sequestration of various crops.

David discussed a consistent set of research findings that indicate that as Rotorua lakes became more eutrophic (with greater anoxia) their losses of N to denitrification increase. As a consequence there is a relationship between increasing catchment nitrogen loads and losses of N to denitrification within the lakes. This relationship could be misconstrued that ramping up denitrification rates in lakes was a benefit, when in fact it did not compensate for the overall increase in catchment nitrogen loads and the associated eutrophication of the lakes.