

# FILE NOTE



File Note From: Andy Bruere  
Lakes Operation Manager

File Reference: Date: 4 December 2009

Subject: Meeting notes of Water Quality TAG - 3 December 2009, Environment Bay of Plenty Office, Rotorua

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Those in attendance were:

Rob Donald, David Hamilton, Warwick Silvester, Max Gibbs, Robert Lei, John McIntosh, Paul White, Paul Scholes, Peter Dine, Andy Bruere and Simon Park for Land Use Change presentation, Anna Heap for DNZ Work Update.

## 1 **Apologies**

Piet Verburg, Clive Howard Williams, Kit Rutherford, Trevor Stuthridge.

## 2 **Matters arising from the last meeting**

Paul White outlined the progress on Point 1 and Point 2 regarding Okataina and Tarawera groundwater. Drilling sites have been identified within Environment Bay of Plenty staff. He is now in the process of preparing a proposal on the science for the drilling site.

The objectives are:

- 1 Identify the underlying geology
- 2 Investigate the water chemistry
- 3 Monitor water age
- 4 Investigate aquifer properties

He stated that a long term monitoring site would be achieved with one of the bores drilled. The drilling is expected to start soon after Christmas. He made the point that there were concerns regarding possible land use intensification at the northern and at the southern end of Tarawera.

There was some discussion around the flow monitoring undertaken by Terry Beckett for the University.

### **Action:**

**David to present Terry Beckett monitoring information at the next TAG meeting.**

John McIntosh indicated that there was also data available for the Wairua Stream from the 1970s.



## 2.1 Allophane update

Andy updated the TAG on the allophane investigation project with Landcare Research. The job brief from Landcare was circulated to the group. It is expected this work will be completed in early to mid 2010 and will be available to the sediment capping group to assist in evaluations around potential capping products.

It was commented that work on local capping agents had been undertaken by Nick Miller in the past and that this would build on that good foundation.

Discussion on the Ohau diversion ADCP results was deferred until No.6 Okere Control Gates.

## 3 Sediment capping

- 3.1 John McIntosh presented the brief for cost comparison of the four potential sediment capping products. It was pointed out that there needs to be included in the work cost pelletisation of any material and the cost of any pre-cursor (buffer) to assist in the management of any adverse effects.

It was also discussed that the analysis was probably just a cost comparison rather than a cost benefit comparison and that the title should be changed to reflect that.

It was also discussed that with the work Nick Miller had already undertaken for Environment Bay of Plenty around this project, consideration should be given to at least conferring with him on aspects of the project and possible inclusion in the project.

### Action:

**John McIntosh to complete the project brief and discuss with Andy as to whether there is a need to include or confer with Nick Miller on the project.**

Max Gibbs raised a question about the comment by Andy in the notes attached to the brief. It was pointed out that the comment may not be correct and that Robert Lei's reference to testing of allophane and Z2 at various concentrations would be brought back to the sediment group for discussion at a later date.

It was also clarified that the proposal is to identify costs for capping each of both Rotorua and Rotoehu.

## 3.2 Okaro update

David outlined the main discussions from the sediment group notes.

Max updated the group on the sediment Z2 application in August 2009. His presentation is attached. Some comments in summary from Max were:

- There was spatial variability due to the slurry method of application.
- He sees the need for getting the product rapidly down through the water column to reduce variability in application.
- The Okaro application has exceeded the minimum dose rate per square metre so met the objectives of the application; however
- There is a requirement to achieve a better level of evenness of coverage if we are to minimise product costs in next large scale applications.

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**Action:**

**Andy is to follow up with Geoff Angel (the contractor) to get the GPS trace of the application.**

- 3.3 Andy presented the update on Rotoehu/Rotorua proposals and outlined the objectives for that work from the Sediment Group. Clive Howard Williams' email was read out regarding the need for full evaluation on the Okaro work before scaling up to another lake. The TAG group agreed with this position, however there was a need to continue with preliminary work such as cost comparison and the allophane investigation work with Landcare to assist in the decisions around future capping exercises.

- 3.4 Max updated the group on the NIWA sediment capping mesocosms work with a NIWA handout as attached. The intention is to use Z2 and alum in the mesocosms. Andy commented that allophane is available and we would provide it to NIWA for their work.

**Action:**

**Andy to provide Max with allophane from storage shed.**

It was also commented that Environment Bay of Plenty could assist with communication with iwi regarding the mesocosm work for Rotoehu through the use of Joe Tahana, a local consultant who assists regularly on these types of matters.

Warwick Silvester re-stressed that we need to assess the performance of Okaro sediment capping before going forward with a decision on Lake Rotoehu capping.

**Action:**

**Sediment Group to confirm suitable analysis of Okaro work before making decisions on any future Rotoehu capping.**

The general consensus at the TAG was that any further sediment capping work on another lake should remain on hold until such time as the group is satisfied that we have made suitable progress in reducing nutrients in Lake Okaro and an associated improvement in water quality.

**3.5 Phoslock poster – fish kill information**

Max presented the Phoslock poster which had been received recently from a conference in Australia. He made the comments that:

- The fish kill following 3 days after the treatment of the lake with 55 tonnes of Phoslock was attributed to the lanthanum release in the low alkalinity water. We observed low level lanthanum releases in our lab test work using Lake Rotorua water.
- In an email from Phoslock, they stated that they would not apply their product at 200 grams per square metre. This seems to be in contrast to their commercial recommended application rate.
- New Zealand lakes have low alkalinity and this creates issues with releases of lanthanum.

There was discussion around Phoslock having ERMA certification and a need to check is there any limit to the application rate under that certification.

**Action:**

**Max is to investigate the ERMA certification and see if it has any application rate limitations. This should be compared with the application documented in the Phoslock poster and Phoslock's own recommendations for application.**

**4 Rotoehu modelling update**

David gave a brief update on the Rotoehu modelling work undertaken by Mat Allen, a PhD student. He stated that he was validating this work with remote sensing. He also stated that it could be useful for our sediment capping work as he could model addition of particular material to water surface and predict the settling location.

Mat is also currently modelling geothermal flows within the lake.

**5 Optimising land use change and lake interventions**

A presentation was given by Simon Park around the Rotan scenarios and scenarios for the lake DC model. He explained that the scenarios presented were an initial set of scenarios. These could be added to at a later date with experience and further questions.

It was raised that we need to consider the time scale for the lake DC model. David commented that he could model in blocks of five years and separate these in time say for example doing 2003 to 2009 and then shifting to 2050 for a block and then 2100 etc. However Rotan can be run continuous over long times periods in order to examine times to reach equilibrium. It was also raised that aeration could be a possible sediment treatment option that may need to be considered.

**Action:**

**It was agreed to add aeration to the scenarios as an alternative to sediment capping.**

Paul White also raised that the groundwater flow model has a role to play in refining the outcome of some scenarios. He pointed out that he had agreed with Kit on the external catchment boundaries but still had concern regarding internal boundaries and the groundwater time of travel in some sub-catchments.

**Action:**

**Paul to approach Kit in the near future and discuss issues around internal sub-catchment boundaries with a view to determining whether the GNS modelling work can improve ROTAN model predictions and address groundwater age differences in sub-catchments.**

It was also raised as to how the lake DC model apportions nitrogen load between internal and external sources. David commented that there is a need to adjust sediment releases in the model in response to this.

David also commented that we are going to make some assumptions around phosphorus reductions and was concerned as to the basis of this; Simon commented that it could be possible to get some expert advice from Richard McDowell to assist in that.

Note: this is discussed further in Point 10.3 around Rotap.

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## 6 Okere control gates

Robbin Britton gave his presentation on Okere control gates. He commented that he had a draft AEE prepared by OPUS however it needed further work to be undertaken for completion. The main conclusions were as follows:

- A new operating regime is being developed.
- It is likely to have on average, a lower lake level and a wider range of fluctuation.
- The fluctuation range called the blue band will be around about 800 mm (compared with 150 mm range currently).
- The proposed operation is likely to have less peaking and not as high flood levels.

It was discussed that this change in operation could have some impact on performance of Ohau diversion wall. There was still some work to be undertaken to determine exactly what the new operating regime would look like, however when that is available the results can be presented to David so that he can undertake modelling of the impact on Lake Rotoiti water quality.

### **Action:**

**Once lake operating regime has been set by Environment Bay of Plenty engineers this information is passed to David for water quality modelling.**

David Hamilton presented his latest ADCP flow meter monitoring information to the group. This is a draft report which will be available in the near future. This confirmed that there is some minor escape of Rotorua water around the wall. It was raised that because it is flowing relatively slowly in comparison to the more direct flow from Rotorua before the diversion wall, it is likely the impact is quite low as it would mix and then be entrained back into the Rotoiti outflow. The main concern for the flow of water around the wall, was when there was an objective of increasing the level of Lake Rotoiti. It was discussed that effectively any time the lake is increasing in level where the flow down the Ōhau Channel exceeds the outflow from the control gates, there would be some pushing of water into Lake Rotoiti.

It was pointed out by the TAG that modelling the effects of a change in operating regime were important so that any issues around it could be discussed with some certainty at any future hearing.

## 7 Monitoring buoys

David presented an update on lake monitoring buoys. The main question immediately is which monitoring buoy is now the highest priority, a second monitoring buoy in the main basin of Lake Rotoiti or a new monitoring buoy in Lake Rotoehu? It was agreed that the monitoring buoy for Rotoehu was more critical and would assist in decisions around Rotoehu possible sediment capping.

### **Action:**

**David to prepare cost estimate of second buoy for Rotoiti for Environment Bay of Plenty.**

**David to get an outline of maintenance schedule for Environment Bay of Plenty and Andy and Rob to follow up with Environment Bay of Plenty EDS regarding maintenance of existing buoys.**

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It was also discussed how Environment Bay of Plenty may need to receive the data from the University of Waikato. At this stage it was agreed that UoW continue to note the times when the Buoys are not functioning and report that with the data to EBOP.

## 8 Tikitere update

Andy presented to the group an update on the Tikitere denitrification project. In short, resource consent has been obtained; pilot scale design is ready to go for the wood chip denitrification and the Lentikats de-nitrification process. The lease of a two hectare site is close to being finalised and the contract for construction of the two pilot plants will be let in early 2010.

## 9 Update on implementation of other projects

Andy updated the following list of projects:

- Puarenga P-locking which will be commissioned during December 2009.
- P-locking at Rotoehu Soda Springs. Design is completed, resource consent is being applied for currently and a lease is nearly settled. This project will be constructed during early 2010.
- Discussions with Rangiwewehi on Awahou P-locking are still not progressing. Further attempts at initiating engagement are continuing.
- Floating wetlands project progressing with the tank scale trial at Rotoehu. John outlined progress on the trial, resource consent application for possible floating wetlands on 11 of our 12 lakes has also been made.

## 10 Dairy NZ work update

- 10.1 Rob Donald updated the group on progress with the DNZ work as a result of the DNZ position paper presented to Environment Bay of Plenty earlier in the year. He pointed out that their focus was on management of Lake Rotorua and that one of their recommendations was that our focus should be on locking internal loads with some more emphasis on phosphorus rather than nitrogen external loads. He explained there had been an initial meeting and the two parties were still trying to resolve what areas we agree on the science and identify any areas of disagreement.

### Action:

**It was pointed out that Environment Bay of Plenty should be showing the scenarios for land use modelling to DNZ to ensure that they are informed as to what we are doing and assist in getting buy-in to the results of this modelling work.**

**Anna Heap also pointed out that Suzy Greenhalgh had prepared a report for Environment Bay of Plenty and DNZ on intervention options for reducing land use nutrient change. Andy to ensure the group has link to this report on our website.**

- 10.2 The group discussed the proposal put forward by DNZ to have a DNZ representative on the water quality TAG. A number of issues were raised which are summarised by the following:
- This group is a group of scientists employed to advise on the science programme around the Rotorua Lakes programme. As such it has no representatives of any interest groups so that it is seen as an independent advisory group.

- It was pointed out that Rick Pridmore is a scientist of some standing.
- The dairy sector could be considered a key group and an invite to the TAG meeting could assist in buy-in into the programme.
- This group is a water quality TAG and as such does not get involved in any actions which are directly related to activity farmers would need to be involved in.
- Some concern was raised re who might attend if Rick was unavailable.

It was suggested that in the first instance Environment Bay of Plenty provide the minutes of previous meetings to Rick Pridmore and see if he still sees a role in joining the group. This offer could be provided on an ongoing basis so that the meeting notes and all reports associated are available.

If there is still desire to be involved in the group, then it was suggested the proper way for this to happen would be other than having a DNZ scientist representative on the group; this should be taken through the Land Use Futures Board. This is for two significant reasons:

- Firstly, the LUF Board is the representative board of landowners within the region which has been appointed to advise the Rotorua Te Arawa Lakes Strategy Group on land use change matters.
- Secondly if we appoint a person representing DNZ to come to the group, then there is potential for a number of other groups to want to have their representative on the board and the matter could very quickly become unmanageable with a large group of people.

If a representative is to be appointed then the TAG saw this as very much the second option and that it should come along with a set of terms of reference which include the following:

- This person is not an advocate for farming interests.
- The aim is to have scientist input and contribute to input in a science capacity.
- That this person feed back information to the LUF Board as a result of their participation.
- That on occasions, the group may need to discuss some information in confidential and the person would be excluded for those periods.

**Action:**

**Andy to progress this proposal with Group Manager and DNZ.**

### 10.3 Rotap proposal

Kit sent some specific comments by email as he was unable to attend the meeting. His suggestion was that if we are to look at a Rotap modelling (catchment phosphorus model) proposal then it needs proper consideration through an issues and options paper to be presented at some future Rotan meeting.

David Hamilton made the point that he was concerned that there will be a need to have a phosphorus input to the lake model and that he would prefer to be in a position where this was modelled in some way rather than us taking an educated guess at what the phosphorus levels may be. He reiterated that there was some concern particularly in view



of the DNZ point of view that if the lake is seen as P limited, then we need to be fairly careful about how we estimate P inputs.

He suggested a possible way around this would be for a student project around the Rotan scenarios which could do parallel modelling of phosphorus. This could use a programme such as Clues.

There was a comment about the need to calibrate over four Rotorua catchments; a PhD study by Jonathon Abell will involve collection of storm samples from three tributaries to Rotorua.

**Action:**

**David and Andy to report back on how P should be modelled after discussions in December.**

**Note: also possible P modelling could be assisted by Paul W and the mudflow model.**

#### 10.4 **Mesocosm work for the three Rotorua Lakes**

David outlined the issue with respect to the debate around nitrogen and phosphorus limitation which has been raging over the last year. This also has been highlighted by the DNZ position paper. He also outlined the presentation by Dennis Özkundakci around P limitation in Lake Ōkaro. Effectively we have reduced P levels in Lake Ōkaro significantly but we need to continue to reduce these to a lower level before we can achieve continuous P limitation in Lake Ōkaro.

In line with this a Masters student has mesocosm trials in Lakes Rotomā, Tarawera and Rotorua, testing various combinations of phosphorus, nitrogen or phosphorus and nitrogen additions. It is aimed at attempting to resolve this question for each of these lakes. A copy of Hannah Meads study synopsis was circulated to the group.

#### 11 **Allophane project update**

John McIntosh outlined the latest update on the allophane project. He explained that initially they were going to do three applications of allophane to the stream between the wetland and Lake Ōkaro. However since resource consent had only recently been granted, it is likely that all of the allophane will be applied in December-January 2010. The aim is to monitor upstream and downstream concentrations for phosphorus and also place a series of bags with allophane in the stream to test absorption within the allophane in those bags.

It was also raised that we could put the material in some porous bags such as dialysis bags and then string that down the stream so the material could be moved or lifted out in time. It was pointed out that we had been thinking about this early on in the project or some other way of providing more filtration, however nothing had eventuated that would allow rapid flow through of water through the material.

John also mentioned that there was some significant P uptake in the wetland from the latest NIWA report. He also pointed out there was a meeting with Ōkaro farmers on the 15<sup>th</sup> and they would like an update on the capping.

**Action:**

**David to request Deniz Özkundakcii to present an update on the capping work on 15 December at 2.00 pm, to Ōkaro farmers.**

It was also stated that a preliminary monitoring report on the wetland was available on our website.

**Action:**

**Andy to check that this is on the website and provide link to TAG group.**

## 12 **Lake bed harrowing**

John McIntosh raised the issue that after seeing the Ōkaro sediment capping video. The small frame of the video camera appeared to be knocking the sediment in a way similar to harrowing and that raised the idea of possible harrowing of lake bed to encourage more aerobic activity particularly during full lake mixing. John mentioned that previously he had thought that harrowing may be a large energy consumer requiring a significant amount of power to get the system to work. However this video work had demonstrated that it could possibly be of fairly low energy requirement.

Max commented that he undertook some modelling of harrowing in Lake Horowhenua in 1993. The outcome of that modelling work was to reduce phosphorus release and improve denitrification. It was discussed that harrowing could be undertaken in a lake over winter to get maximum O<sub>2</sub> diffusion.

**Action:**

**John is to feed back the feasibility of undertaking harrowing on a lake to the sediment group at its next meeting. This should include some discussion around a particular lake which may be suitable for harrowing.**

## 13 **Update on Proof of Concept Zeolite Study undertaken by Craig Mowatt**

Andy explained that this was just being reported back to the TAG to close off the matter however the denitrification plant progress at Tikitere had overtaken matters and it was unlikely that we would be doing any further work in absorption of ammonia from geothermal flows at Tikitere with zeolite.

**Action:**

**Andy is to get the final report on the website and notify TAG of its location.**

### 13.1 **Aeration**

Paul Scholes presented an update on the aeration work which has been undertaken by Hans Burggraaf. At this stage there is a confidentiality agreement around the technology being used for aeration. However, he was able to explain to the group some of the main advantages around aeration. Hans has done a costing for placing aerators in Lakes Rotorua, Rotoehu and Ōkaro. For Lake Rotorua he is estimating the worst case scenario is 22 units at a total capital cost of \$3.8m and a 10 year electricity and maintenance cost of about \$1.5m, the total 10 year operational capital cost is \$5.3m. It was commented that if this is a realistic costing then it is around about a fifth to a quarter of the cost of sediment capping and it is certainly a technology the sediment group should be looking at. Another proposal to put a test device in Lake Rotoehu positioned in the main southern basin is predicted to have sufficient capacity to prevent stratification for a significant part of Lake

Rotoehu. This is a potential opportunity for a trial prior to undertaking any sediment capping in Lake Rotoehu. The cost of bringing a machine in for that operation is about \$175,000 capital cost with electricity and maintenance cost of around about \$5,000 per year. It was mentioned that although Hans has also devised an aeration type device to aerate the hypolimnium stratified lakes such as Ōkaro. At this stage Environment Bay of Plenty is not keen to interfere with the existing interventions already commenced on Lake Ōkaro.

The technology presented by Hans is being peer reviewed by AWT engineer Jason Ewart. He will be looking at the feasibility of the technology and aeration requirements, the capital costs and the operational cost. This information will be fed back to the sediment group early next year when available.

**Action:**

**Environment Bay of Plenty complete review of aeration and destratification techniques with AWT and report back to the sediment group in the New Year.**

There was some discussion around the permanence of sediment capping versus aeration. The discussion really centered around the costs and had been worked out for 10 years operation of aeration and that as soon as it is turned off the lake tends to revert back to pre-aeration conditions. It was commented however that, with sediment capping, the advice we are obtaining is the longest term for effectiveness may be about 13 years. It was then discussed that many in-lake interventions such as bio-manipulation, dredging and so on have limited lives and in some cases where bio-manipulation has been used within five years the authorities are having to restart the process to have continued lake water improvement. John McIntosh suggested that it would be a good idea to capture this type of information because there was some comment from some parts of the farming sector that we are not looking at bio-manipulation. It would be good to provide information on various bio-manipulation attempts so that the cost and success of these measures could be put in perspective.

**Action:**

**David Hamilton is to follow up this matter particularly with bio-manipulation information from Jeppesen so that it can be presented to appropriate farming groups in due course.**

### 13.2 Algae harvest

Andy outlined the algae harvest investigations which Environment Bay of Plenty have been engaged in. They have recently met with Aqualink, a company in Nelson, New Zealand. They have algae harvesting machinery on sewerage ponds in Blenheim. Their aim is to harvest algae and use it for various high value N products such as bio-fuels, activated carbon etc. Environment Bay of Plenty was looking at comparing the effectiveness of algae harvest with weed harvesting. There has been significant success with weed harvesting in Lake Rotoehu, in terms of equivalent nutrient removal, and this may be extended to include harvesting of Okawa Bay in 2009 and perhaps other areas of Lake Rotoiti and Rotorua. However recent approaches from NZ Trade and Enterprise have indicated that they are willing to fund some algae harvest experiment, with the objective of seeing if there are opportunities to improve environmental quality by undertaking such projects. Environment Bay of Plenty is meeting with NZTE on 15 December to discuss a way forward. At this stage that may be a feasibility study on undertaking the work. The general consensus from the TAG was that some work had been done on the possibility of algae harvesting a couple of years ago and that had indicated that significant quantities of water needed to be pumped to get any nutrient reduction. It was suggested that before

going into any trials, there needed to be some clear objectives of what was trying to be achieved. For example were we trying to achieve a nutrient reduction by harvesting algae or simply improvement in water quality by removing algae?

Andy explained that one of the motivators for getting involved at least initially in a feasibility investigation was that the Rotorua Rotoiti Action Plan had a key intervention of investigating biomass harvesting and that as a result of the algal bloom flowing down Ōhau Channel and into Okere Arm over Autumn 2009, the community would be fairly critical of Environment Bay of Plenty if we did not at least engage on this matter and look at the possibility of algal harvesting.

**Action:**

**Paul and Andy to continue investigations on algal harvesting and report back to TAG on progress in due course.**

14 **Other matters**

David raised a very positive site called the Kainui Lakes north of Hamilton where a dairy farmer was undertaking a lot of specific actions on his property in an attempt to address water quality issues. He believed there was a very positive demonstration of a farmer attempting to address issues and thought it was worthwhile mentioning to the group. Andy agreed to follow up with his own staff and see whether we could make contact with the farmer to see the site.

**Action:**

**David to send Andy contact details for farmer so that communication can commence.**

David also raised with the group that a strong supporter for lakes water quality improvement Rick Vallance had been diagnosed with terminal cancer and commented that it was appreciated the efforts he had taken over the previous years to support and promote the programme of water quality improvement.

Andy Bruere  
**Lake Operations Manager**