

Report No.	21-123
Decision Required	

LAKE HOROWHENUA WEED HARVESTING

1. PURPOSE

- 1.1. This item seeks to inform council of progress on the Lake Horowhenua weed harvesting project and requests further Council decisions in relation to the next steps for the project.

2. EXECUTIVE SUMMARY

- 2.1. Harvesting lake weed in Lake Horowhenua has been identified as a key action to reduce toxicity of the lake to the aquatic life in the lake and to increase the frequency the lake is suitable for recreational use. Introduced lake weeds have a significant impact on the chemistry and internal processes of Lake Horowhenua including impacting the pH of the lake. The impact on pH can influence the occurrence and frequency of ammonia concentrations in the lake that can be toxic to fish and other aquatic life. Further, the lake weed influences the occurrence of cyanobacterial blooms in Lake Horowhenua. Cyanobacterial blooms can impact on both aquatic life and suitability of the lake and downstream environments (estuary and coast) for recreational use.
- 2.2. Research completed by the **National Institute of Water and Atmosphere (NIWA)** for **Horizons Regional Council (Horizons)** in [2011](#) and [2012](#) identified lake weed harvesting as one of the potential interventions to improve water quality and aquatic health in Lake Horowhenua as a part of a broader restoration plan. Lake weed harvesting is one of the interventions identified in the [Lake Horowhenua Accord 2013 \(Lake Accord\)](#) and the [Lake Horowhenua Accord Action Plan \(2014\)](#). Horizons has actively been progressing lake weed harvesting; purchasing equipment, establishing resource consents, undertaking science and monitoring and establishing an access road and boat ramp to enable lake weed harvesting. The weed harvesting activity has been one part of the work programme for the Lake Accord. Other key interventions have included constructing a fish pass at the outlet weir of the Lake to enable improved accessibility between the lake and sea for native fish to complete their lifecycles and improve fish populations and diversity of fish in the lake. Further, a sediment trap has been established to reduce inputs of sediment and phosphorus into the lake from the Arawhata Stream.
- 2.3. The lake weed harvesting programme has a phased introduction over the first two years of the LTP, with a trial required by resource consent conditions in the first year, to inform a fuller programme of harvesting in future years if certain resource consent conditions are met. The programme has encountered additional costs in its first 'trial' year to those originally anticipated. The costs for the first year include one-off set up costs, costs to meet consent conditions, costs related to disposal of the weed, security costs and costs for Tangata Tiaki involvement for the **Lake Horowhenua Trust (Lake Trust)** and **Muaūpoko Tribal Authority (MTA)**, potential legal costs, compliance monitoring costs and the costs of the harvesting itself. This item is seeking Council's decision on providing an additional \$223,600 of funding to enable the lake weed harvesting trial to continue in the 2021-22 financial year, or a decision to delay the trial until the 2022-23 financial year, or to cease pursuing the activity of lake-weed harvesting. The additional budget to enable the weed harvesting trial is for weed disposal, Tangata Tiaki, security, legal costs, compliance monitoring costs and a contingency of 30% on these costs.
- 2.4. The request for a decision on funding for the lake weed harvesting trail is further to the investment in Lake Accord projects to date and the future investment included in the Long-term plan over the next 10 years. Horizons Lake Accord related budgets show an

investment of \$11.45 million in total with over \$6.384 million or 56% from the **Ministry For the Environment (MfE)** and other sources. Horizons has contributed over \$5.067 million or 44% of these costs. As a result of this investment Horizons has both completed work and secured assets. Horizons assets as a result of the co-investment in the programme include a dairy farm valued at \$6.75 million and land for the area of the sediment trap and land access track (\$157K). Other assets include the sediment trap, access road, boat ramp, weed harvester and trailer.

- 2.5. Overall, the lake weed harvesting programme is estimated to have cost over \$2.843 million to date including capital and operational costs. Horizons share of this has been over \$2.718 million, excluding the consenting/appeal costs (see below). Capital costs within Horizons Lake Accord financial accounts for the weed harvesting project total over \$1.682 million for the combination of the weed harvester and trailer purchase, access road and boat ramp construction. It is difficult to single out the costs for the weed harvesting alone, as the consents were sought as a package referred to as the "Lake Restoration Consents". This included a range of consents and other permissions e.g. from Heritage New Zealand, for the weed harvesting, sediment trap and fish pass. The establishment of the resource consents was challenged through to the High Court. The combined costs for these permissions, including appeals, exceeded \$506,000. This is additional to the \$2.718 million amount identified above and has been capitalised. Horizons has been awarded costs by the Courts for some of these costs. However, has recovered very little of the amounts owed to Horizons (over \$160,000). Horizons other budgets, mainly the science programme and freshwater and partnerships programmes, have contributed to the funding for costs associated with the restoration of Lake Horowhenua including staff time, science and monitoring costs, vehicle mileage etc.
- 2.6. It is acknowledged that as is the nature of a trial year, there will be considerable learnings about the operation in the trial year that will inform budgeting for future years. Further, the many unknown factors prior to the trial being completed raise the potential for unforeseen costs as the harvesting trial is undertaken. Such costs could include legal challenges, or increased operational expenses. A budget for contingency is identified in this item, with the caution that it is difficult to quantify contingency requirements due to a range of operational unknowns. It is noted that the funding shortfall for the trial year is likely to continue into the following years. Budgets for future years are not anticipated to have the one-off costs of the trial year, providing savings. These savings will potentially be more than offset by the project seeking to harvest an increased area of the lake. The trial results are predicted to provide significant new information to better enable more accurate budgeting for future years. Horizons is currently working with other project partners with a view to trying to secure additional funding toward the future years of the harvesting operation.
- 2.7. As noted above, weed harvesting is one of the Lake Accord interventions and is part of a larger work programme. Weed harvesting is viewed as the key restoration measure to reduce toxicity in the lake and is predicted by NIWA to improve 4 out of 5 key parameters of the National Policy Statement for Freshwater Management, in Lake Horowhenua to above national bottom lines. Other planned interventions include stormwater improvements that **Horowhenua District Council (HDC)** have committed over \$6.677 million for in their [LTP](#). Further, Horizons and MfE have committed \$12.5 million to the Jobs for Nature project. The Jobs for Nature project is phase one of a longer term work programme to establish a wetland complex to reduce sediment and nutrient inputs to the lake. It is noted that the science indicates that neither the wetland complex project nor stormwater project will address the in-lake processes that the lake weed harvesting project targets. These three projects combined are viewed as important implementation projects to improve water quality and aquatic life, while further progress is made on the [Plan Change 2](#) and [Oranga Wai](#) planning processes for the catchment, broader freshwater management unit and region.

3. RECOMMENDATION

It is recommended that Council:

- a. receives the information contained in Report No. 21-123 and Annex.
- b. acknowledges the uncertainties around budgeting for the weed harvesting trial and longer-term operation.
- c. approves a further budget of \$223,600 to enable the lake weed harvesting project to progress in the 2021-22 financial year.

Or

directs the Chief Executive to delay the weed harvesting trial for a further year and to undertake establishment works this year to enable this, within the available budget.

Or

directs the Chief Executive to cease pursuing the lake weed harvesting project.

- d. directs the Chief Executive to prepare further information on potential costs for the weed harvesting operation in the 2022-23 financial year to inform the Annual Plan process.

4. FINANCIAL IMPACT

- 4.1. This item may have financial impact. It is noted that the project has been preparing for a trial to occur this year and has incurred and committed further costs this financial year within the available budget.

5. COMMUNITY ENGAGEMENT

- 5.1. This item is a public item and Council may deem that sufficient to inform the public. Should the lake weed harvesting trial occur in the 2021-22 year, further external communication around the project is recommended.

6. SIGNIFICANT BUSINESS RISK IMPACT

- 6.1. This item is not deemed a significant risk impact.

7. CLIMATE IMPACT STATEMENT

- 7.1. The lake weed harvesting programme seeks to remove plant material from Lake Horowhenua. The process to do this will reduce the impact of that vegetation on the chemistry of the lake; however, it will also remove vegetation that has sequestered carbon. Machinery will be utilised to harvest and transport the weed, further contributing to carbon emissions. This operation does sit in the context of the wider Lake Horowhenua Accord project and other Freshwater and Partnerships and Land Management programmes that actively support the establishment of riparian planting and trees on farms.

8. BACKGROUND

- 8.1. Council have received regular updates on the work as a part of the Lake Accord through a dedicated section in Environment Committee reports (generally quarterly) and in specific papers such as the Lake Horowhenua update papers in [September 2018](#) and [March 2020](#). The papers have provided updates on the Lake Horowhenua Accord, Lake Horowhenua Action Plan and progress on these and at times sought council guidance on matters related to these programmes. The annexes to these reports ([September 2018](#) and [March](#)

2020) have provided information including a [Lake Horowhenua Report Card](#), information on [state and trends of water quality](#), and [kakahī in Lake Horowhenua](#) as well as other topics. The most recent update to Council on Lake Horowhenua activity was presented to Council as a part of the [Environment Committee report](#) in September 2021.

- 8.2. Over time, Council has been updated on the four major central government co-funded programmes that have contributed to implementation of the Accord. Each of these projects also have their own Governance Groups and reporting requirements to the Ministry for the Environment. These projects are:
- a Freshwater Clean-up Fund Project;
 - a Te Mana o te Wai Fund project;
 - a Freshwater Improvement Fund project; and
 - a Jobs for Nature project.
- 8.3. Over the course of the work of the Lake Horowhenua Accord, Council have regularly received information on the financial management of the Lake Horowhenua projects, including as a part of regular reporting to Councils Audit and Risk committee, Annual Reports and in specific items to Council, including some public excluded items. Council has made financial decisions on Lake Horowhenua through Annual Plans, Long-term Plans and in response to specific papers on financial matters in relation to the Lake Horowhenua Accord. Some councillors have also had roles in attending the Lake Horowhenua Accord meetings and as Governance Group members for specific projects e.g. the Te Mana o te Wai project and the current Jobs for Nature project. The Freshwater Clean-up Fund and Jobs for Nature projects for Lake Horowhenua, led by Horizons Regional Council, have been/are independently audited on an annual basis as a part of contractual requirements.
- 8.4. This item does not seek to repeat the information in the previous reporting, rather provides a brief update on the rationale for weed harvesting and how the weed harvesting programme links in with other planned activity to contribute to improved water quality and aquatic health in Lake Horowhenua. This item also updates on the work to establish the weed harvesting operation and the budgets for the trial year (and beyond) to inform Council's decision in relation to this item.

9. WHY WEED HARVEST IN LAKE HOROWHENUA

- 9.1. Weed harvesting has been identified as one of a range of actions within a broader restoration programme for Lake Horowhenua. The weed harvesting intervention specifically targets in-lake processes that lead to the occurrence of toxic levels of ammonia (Figure 1, Figure 2, Table 1) in the lake. Weed harvesting also targets in-lake processes that contribute to the cyanobacteria blooms (Figure 3) that occur in the lake. Cyanobacteria can make the lake and estuary unsuitable for recreational use and can also have detrimental impacts on aquatic life.
- 9.2. Ammonia toxicity in Lake Horowhenua is driven by the continuous release of non-toxic ammonium from organic matter breakdown. This under normal pH conditions this would be oxidised (nitrified) to nitrate. At pH levels above 9, the predominate form of nitrogen is ammonia; this is not nitrified and accumulates, raising the risk of toxicity. The introduced lake weeds in the lake (*Potamogeton* and *Elodea*) concentrate bicarbonate in their cells and are capable of raising the Lake pH above 10.5. Note a neutral pH is 7.
- 9.3. Dr Gibbs, in his report to the Environment Court for the lake weed harvesting consents, presented data from Lake Horowhenua (Figure 1) showing regular events that would impact on the 20% of most sensitive species (reduced survival). It is noted that this monthly sampling data is likely missing some occurrences of high ammonia. An indication of this is that more regular lake buoy data in 2013-14 showed a pH >9 for 5 months and indicated that nitrification has stopped for more than 3 months. Subsequent to this 2016 report, the National Policy Statement for Freshwater Management has been revised and

the national bottom line changed from an annual median of 1.3 to 0.24 mg/l TAN and lowering the toxicity limit for the annual maximum to 0.4 mg/L (Table 1). Therefore, all of the samples that are on Figure 1 above 0.4 mg/L TAN do not comply with the NPS-FM 2020 national bottom line, i.e. all samples plotting on the yellow and orange backgrounds.

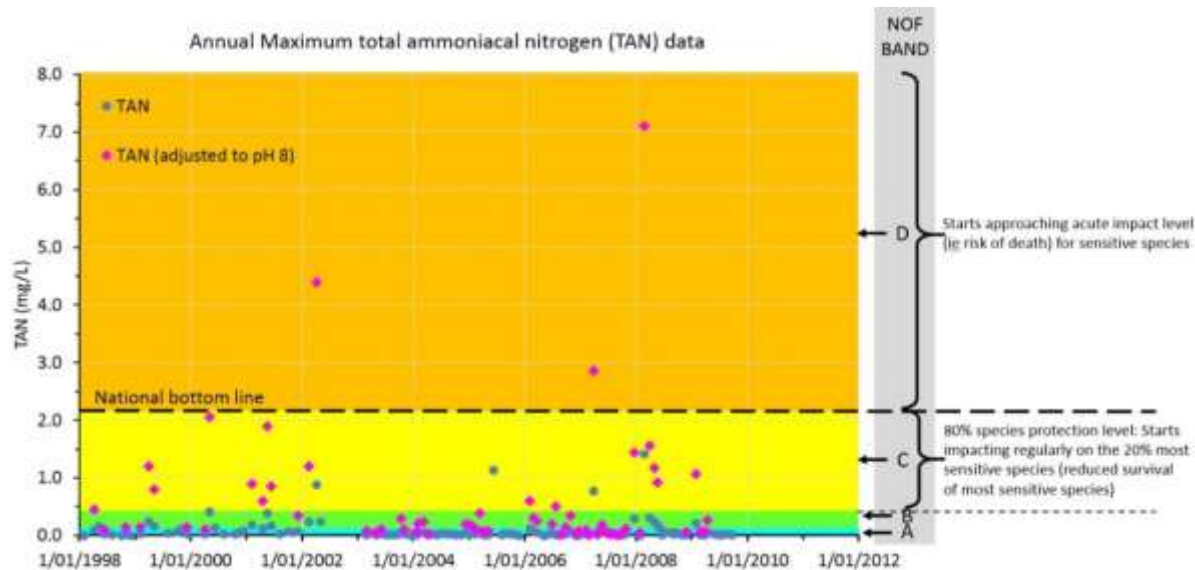


Figure 1: Lake Horowhenua total ammoniacal nitrogen data (TAN) from January 1998 to January 2012 normalised to the NOF bands at pH 8 and temperature of 20°C. Source: Evidence of Dr Max Gibbs to the Environment Court, May 2016.

- 9.4. Figure 2 shows more [recent data](#) for Lake Horowhenua including exceedances of the new national bottom line for annual maximum ammonia concentrations of 0.4 mg NH₄-N/L. It is noted that there are gaps in the monthly data during this period of record due to issues with lake access related to Health and Safety.

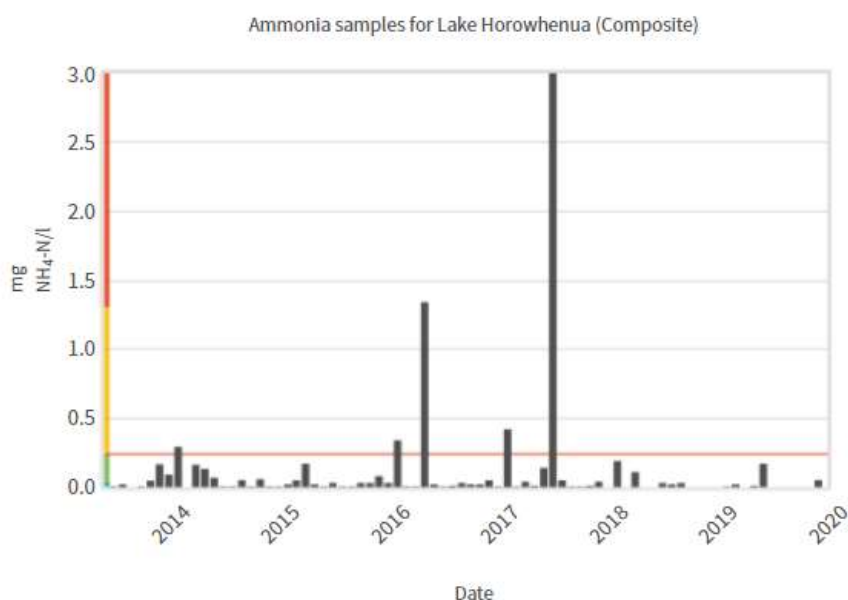


Figure 2: Ammonia concentrations in Lake Horowhenua. Source www.lawa.org.nz.

Table 1: Table from the National Policy Statement for Freshwater (2020) for the ammonia (toxicity) attribute.

Table 5 – Ammonia (toxicity)

Value (and component)	Ecosystem health (Water quality)	
Freshwater body type	Rivers and lakes	
Attribute unit	mg NH ₄ -N/L (milligrams ammoniacal-nitrogen per litre)	
Attribute band and description	Numeric attribute state	
	Annual median	Annual maximum
A 99% species protection level: No observed effect on any species tested.	≤0.03	≤0.05
B 95% species protection level: Starts impacting occasionally on the 5% most sensitive species.	>0.03 and ≤0.24	>0.05 and ≤0.40
National bottom line	0.24	0.40
C 80% species protection level: Starts impacting regularly on the 20% most sensitive species (reduced survival of most sensitive species).	>0.24 and ≤1.30	>0.40 and ≤2.20
D Starts approaching acute impact level (that is, risk of death) for sensitive species.	>1.30	>2.20

Numeric attribute state is based on pH 8 and temperature of 20°C. Compliance with the numeric attribute states should be undertaken after pH adjustment.



Figure 3: Examples of cyanobacteria blooms in Lake Horowhenua. Left: an aerial view of the lake, 9 March 2011 (Source google earth). Right: a view at the outlet of the lake on 25 January 2018, showing the transfer of cyanobacteria out of the lake down the Hokio stream to the estuary and coastal environment.

- 9.5. To further describe the water quality in the lake, the graphs in Figure 4 show the range of Total Nitrogen, Total Phosphorus and Chlorophyll *a* (indicator of algae) and *E. coli* (indicator of bacteria) for composite samples from Lake Horowhenua. The purpose of including these graphs is to show the regular exceedance of targets and also the fluctuations in the nutrients, algae and *E. coli* over time in the lake.
- 9.6. In Lake Horowhenua peak concentrations of Total Phosphorus typically occur in the summer, when inputs via streams are typically lower. One mechanism for the phosphorus being in water column of the lake is the release of phosphorus into the lake from the lake bed sediments. This occurs when pH is high, impacting the chemistry of the lake creating conditions that enable release of phosphorus from the sediments on the bed of the lake. A further mechanism for phosphorus release from lake bed sediments is low oxygen levels near/at the bed of the lake. One mechanism for low oxygen conditions at the bed of the lake is the lake weed biomass collapsing onto the lake bed at the end of its lifecycle, creating anoxic (low oxygen) conditions.
- 9.7. In summary, there a store of phosphorus in the lake bed sediments. The streams that flow into the lake bring sediment with phosphorus bound to it into the lake. This sediment settles on the lake bed adding to the store of phosphorus in the lake bed. When high pH conditions and/or low dissolved oxygen conditions occur in the lake, some of this phosphorus can be released into the water column, making it available for algae/cyanobacteria growth.

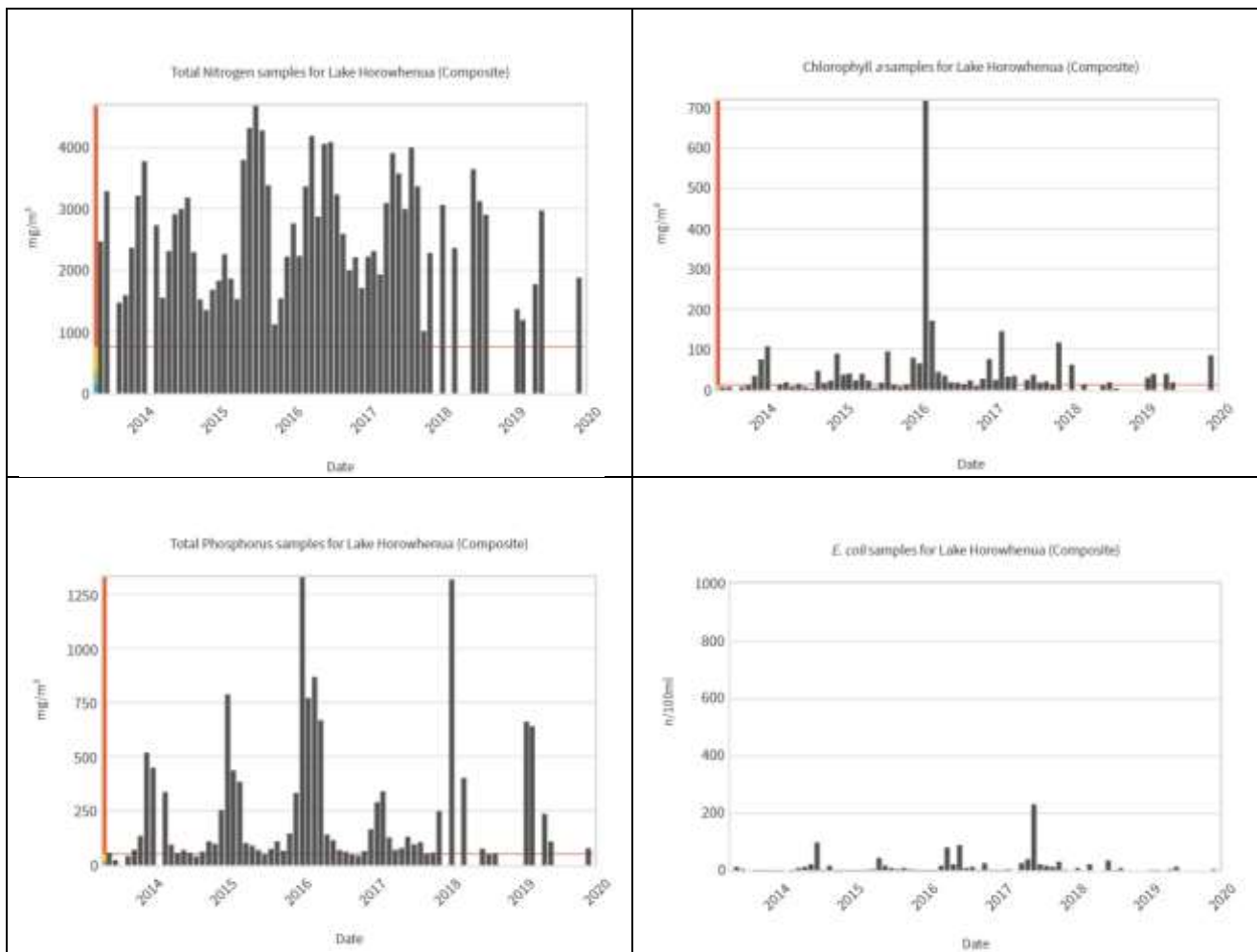


Figure 4: Graphs of Total Nitrogen, Total Phosphorus, *chlorophyll a* and *E. coli* in Lake Horowhenua. Source www.lawa.org.nz. Note, there are gaps in the data due to interruptions to sampling the lake.

10. PREDICTED OUTCOMES OF LAKE WEED HARVESTING

- 10.1. It is important to note that the weed harvesting operation is not about removing nutrient from the lake. A small amount of nutrient will be removed. The weed harvesting is targeting the mechanisms described above related to maintaining lower pH to reduce the impact of high pH on the form of nitrogen present in the lake (ammonia at high pH and nitrate at lower pH) and the reduction of the mechanisms that release phosphorus from the lake bed sediment. The intervention logic for the lake weed harvesting is shown in two page summary with diagrams that describe how weed harvesting influences outcomes in the lake in **Annex A**. It is important to note when assessing the outcomes of the weed harvesting programme is that it is one part of a larger restoration programme.
- 10.2. To summarise the predicted outcomes from weed harvesting a section from the [Lake Horowhenua Report Card](#) is provided in Figure 5. In summary, Dr Max Gibbs in 2016 presented to the Environment Court that Lake Horowhenua water quality is below national bottom lines for 5 key parameters. Dr Gibbs analysis predicted that with the sediment trap and weed harvesting interventions the lake would be above national bottom lines for four out of five of these parameters (Ammonia, Cyanobacteria, Chlorophyll a, and Total Phosphorus). However, would still be below national bottom lines for Total Nitrogen.

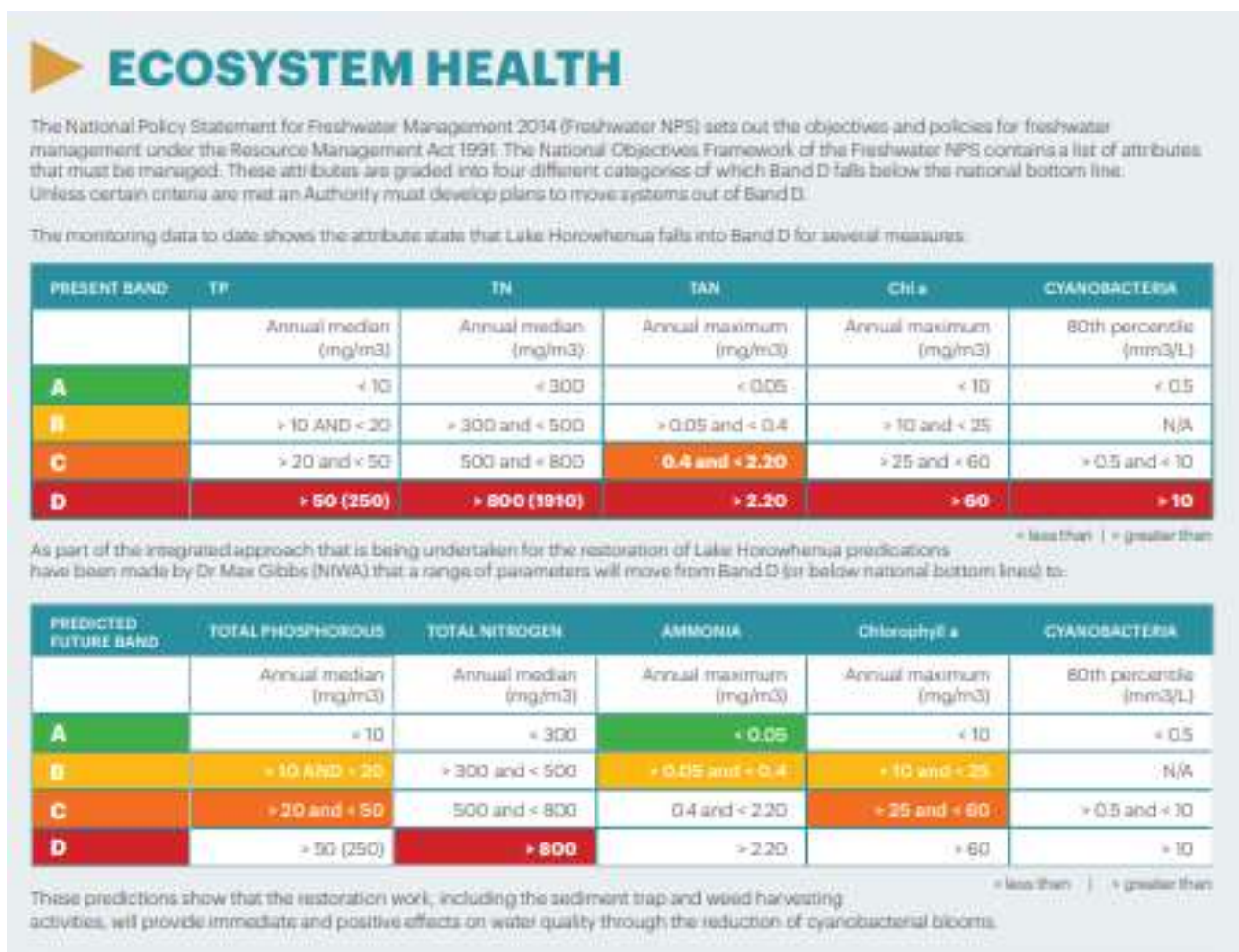


Figure 5: Summary of the impact of the integrated approach for restoration of Lake Horowhenua including the installation of the sediment trap and weed harvesting activity as predicted by Dr Gibbs of NIWA. Source Lake Horowhenua Report Card.

11. WEED HARVESTING AS PART OF A BROADER RESORATION PROGRAMME

- 11.1. The context for the weed harvesting is that it is one of many interventions in Lake Horowhenua as a part of the Accord. As outlined above the weed harvesting part of Lake Horowhenua restoration is targeted to reduce toxicity in the lake from Ammonia and Cyanobacteria.
- 11.2. An overview of the projects completed during the first five years of the Accord was presented to Council as a part of the item in [September 2018](#). The September 2018 also overviews the science and monitoring and the policy context that includes the Lake Horowhenua and Hokio Stream Catchment Management Strategy (1997), the One Plan, the Lake Accord and the National Policy Statement for Freshwater Management.
- 11.3. Water quality interventions currently underway include stormwater improvements that Horowhenua District Council (HDC) have committed over \$6.677 million for in their [LTP](#) (page 60). Further, Horizons and MfE have committed \$12.5 million to phase one of the project to establish a wetland complex to reduce sediment and nutrient inputs to Lake Horowhenua. It is noted that the science indicates that neither the wetland complex project nor the stormwater project will address the in-lake processes that the lake weed harvesting project targets. The wetland complex and stormwater projects target reducing inputs to the lake. These three projects combined are viewed as important implementation projects to improve water quality and aquatic life, while further progress is made on the Plan Change 2 and the Oranga Wai planning processes for the catchment, broader freshwater management unit and region.
- 11.4. Figure 6 illustrates how the proposed work programmes dovetail together to improve water quality and aquatic health in Lake Horowhenua.

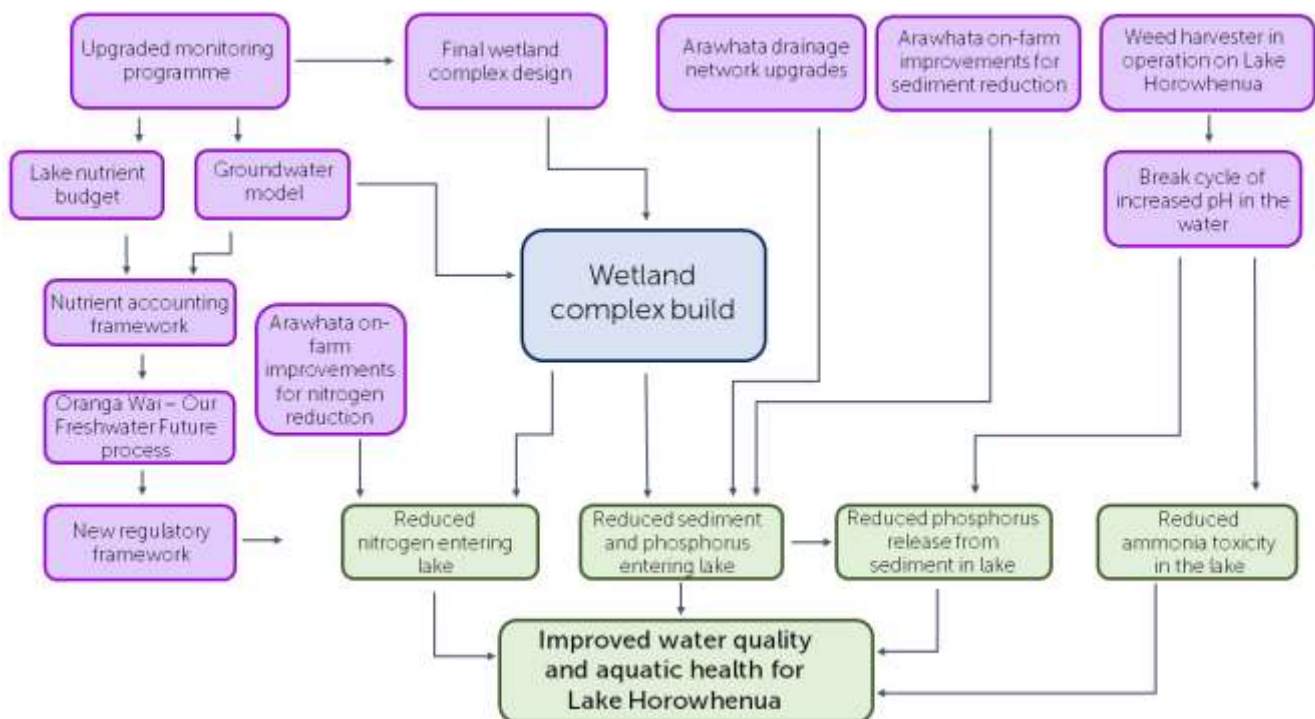


Figure 6. Diagram demonstrating how work streams in the Lake Horowhenua Catchment work towards improved water quality and aquatic health for the lake. Horowhenua District Council are also planning consenting and upgrades for stormwater in the catchment.

12. LEVEL OF INVESTMENT

- 12.1. Horizons sought co-funding to enable the weed harvesting from MfE in an application to the Freshwater Clean-up Fund in 2013, with the funding being announced in February 2014. In the 2014-15 financial year, Horizons established a Lake Weed Harvesting rate to fund the lake weed harvesting programme. Council later changed the name of the rate to the Lake Horowhenua Restoration Rate to reflect the wider range of activity that the rate supports. Eighty percent of this rate is targeted to the over 17,700 properties in the Horowhenua District (noting this is much broader than the Lake Horowhenua Catchment). Last year, this rate was \$12.18 per property including GST and this was almost doubled to \$23.07 per ratepayer including GST in this 2021-22 financial year. This increase includes additional costs for the repayments of the boat ramp costs and land purchase costs for the [Jobs for Nature project](#).
- 12.2. The investment in weed harvesting sits within the context of the work to restore Lake Horowhenua, which includes regulatory work through the One Plan, Plan Change 2 and the Oranga Wai planning process to implement the requirements of the National Policy Statement for Freshwater Management 2020.
- 12.3. Horizons non-regulatory investment to restore Lake Horowhenua has over recent years been aligned to the Lake Accord. Horizons Lake Accord related budgets, including lake-weed harvesting expenses, record an investment of over \$11.452 million. This includes a contribution from the Ministry for the Environment, or other sources, of \$6.384 million or 56% of the overall budget. Horizons has contributed \$5.067 million or 44% of these costs.
- 12.4. The majority of the investment has been in land purchase for both the Jobs for Nature project (\$6.75 million) and for the land for the sediment trap and access road to the boat ramp (\$157K). Both land purchases were co-funded by the Ministry for the Environment and Horizons Regional for assets that are now in Horizons Regional Council ownership.
- 12.5. Horizons has contributed over and above these costs through monitoring, science, staff time etc. There has also been additional co-funding through projects managed by other agencies. For example the Lake Trust led the [Te Mana o Te Wai project](#) that was allocated \$980,000 from central government and the Lake Trust currently has a [Freshwater Improvement Fund](#) budget allocation of \$842,750. It is noted that some of the crown funding for the Te Mana o Te Wai Project is included in the summary of Horizons Lake Accord expenses, as Horizons was subcontracted to undertake some of the projects. Further investment has been made via aligned science funding from other agencies, including Massey University and NIWA.
- 12.6. Central Government through MfE contributed \$125,000 to the weed harvester purchase costs. Overall, the lake weed harvesting programme is estimated to have cost over \$2.843 million to date including capital and operational costs, with Horizons share of this being over \$2.718 million (excluding consent and appeal costs, see below).
- 12.7. Capital costs within Horizons Lake Accord financial accounts total over \$1.682 million for the combination of the weed harvester (\$255K), trailer (\$68K), access road (\$451K) and boat ramp construction (\$908K).
- 12.8. The establishment of the resource consents was challenged through to the High Court. It is difficult to single out the costs for the weed harvesting alone, as the consents were sought as a package referred to as the "Lake Restoration Consents". This included a range of consents and other permissions e.g. from Heritage New Zealand, for the weed harvesting, sediment trap and fish pass. The combined costs for these, including appeals, exceeded \$506,000. This is additional to the \$2.718 million amount identified above and has been capitalised.
- 12.9. Horizons has been awarded costs by the Courts for some of these costs. However, has recovered very little of the amounts owed to Horizons (over \$160,000).

- 12.10. Horizons other budgets, mainly the science programme and freshwater and partnerships programmes, have contributed to the funding for costs associated with the restoration of Lake Horowhenua including staff time, science and monitoring costs, vehicle mileage etc.
- 12.11. Horizons has allocated in the **Long-term Plan (LTP)**, future investment in weed harvesting and other lake restoration activity. The weed harvesting programme is budgeted as part of the Lake Horowhenua restoration budget. The Lake restoration rate budget is \$408,483 in the current 2021-22 financial year. This includes budget allocation related to the weed harvesting of \$290,353, comprising of \$48,863 for the boat ramp loan repayments, \$81,490 for depreciation and \$160,000 for the lake weed harvesting operation.

13. ESTABLISHING LAKE WEED HARVESTING

- 13.1. Weed harvesting was identified as one of a range of water quality interventions in a [report](#) in 2011 as a part of an assessment of opportunities to restore water quality in Lake Horowhenua. In the 10 years that have transpired since, there has been a range of activity related to the Accord. An [item](#) to Council in March 2020 provides a detailed timeline for the broader Lake Accord projects, some of the key points on the timeline related to lake weed harvesting are:
- The weed harvesting concept was refined into a restoration plan in 2012;
 - Weed harvesting was included in the Lake Accord as a management Action in 2013;
 - Funding committed to weed harvesting by Horizons and MfE in 2014 as a part of the Freshwater Clean-up Fund project alongside 7 other projects;
 - Lake weed harvesting was included in the Lake Accord Action Plan 2014;
 - The lake weed harvester was purchased in 2014;
 - Resource consents were applied for and granted in December 2015;
 - The consents were appealed in January 2016 and heard by the Environment Court in May 2016;
 - The Environment Court granted the consents in September 2016.
 - The Environment Court Decision was appealed to the High Court in October 2016;
 - The Environment Court confirmed the resource consent conditions in April 2017;
 - The High Court dismissed the appeal, in favour of Horizons, in June 2017;
 - In August and September 2017, court decisions awarded costs that when combined total \$135,222.66 to Horizons;
 - In April 2018 an injunction was filed to the Maori Land Court to prohibit the construction of a boat ramp and access way forming part of the weed harvesting consent;
 - In May 2018 the Maori Land Court dismissed the injunction, in favour of Horizons.
 - In July 2018 an appeal was lodged against the Maori Land Court decision;
 - In June 2019 the Maori Appellate Court dismissed the appeal in favour of Horizons;
 - Court decisions in July 2019 and October 2019 awarded a combined sum of \$25,000 of costs to Horizons;
 - In December 2019 the access track to the boat ramp site was completed; and
 - In June 2021 the new boat ramp construction was celebrated with a blessing.
- 13.2. As a part of the establishment of the weed harvesting activity, there have been significant court processes related to the Lake Accord work programme. This has included processes that have not involved Horizons. There has been significant amounts of work done on the ground in partnership with the Lake Trust, Muaupoko Tribal Authority and Kohuturoa

Marae. This has strengthened relationships between project partners and contributed to new improved ways of working together. The context of the court processes and new ways of working together has increased the overall costs for the weed harvesting operation. For example:

- The additional regulatory processes (Environment Court, High Court etc.) have added additional regulatory costs including costs for obtaining consents, as well as for the implementation of the consent conditions and monitoring of these. These additional costs include additional monitoring and reporting and requirements for particular infrastructure or methodologies;
- The additional court processes have added costs for Horizons and other project partners, but also increased the caution with which both Horizons and project partners proceed. This has resulted in a greater level of partnership and increased the need for continued presence of Tangata Tiaki during on-the-ground works (including on-the-lake works).
- Incidents during delivery of works in the catchment and as a part of court processes have included Horizons staff being directly harmed or threatened while working on Lake Accord projects. For example a Tangata Tiaki employed by Horizons was punched in the face during the boat ramp construction late last year. In another incident a Horizons staff member was threatened following a court proceeding, which resulted in charges being pressed by police. Further, staff have been confronted on a range of occasions in the field by aggressive behaviour. As a consequence additional health and safety processes have been implemented, including presence of security staff in some circumstances.

13.3. With the boat ramp established and operational, from late June 2021, Horizons has been working further toward the implementation of the first trial season of the weed harvesting project. This has included:

1. Purchasing spare parts for the harvester. These were budgeted for in this financial year (\$50K capex) and an order has been placed within this budget;
2. Additional monitoring. This has included deployment of two additional lake monitoring buoys and the completion of a weed harvesting management plan as required by resource consent conditions. The monitoring plan requires lake weed mapping, monitoring of turions (propagules of the lake weed) and searching for fish in the harvested weed. The additional water quality monitoring costs (approx. \$50K) and weed harvesting management plan costs (approx. \$52K), including a lake weed survey are being paid for from Horizons science budgets and are already underway or contracted to occur. The fish monitoring is planned to be completed by members of Horizons Freshwater Team as a part of staff budgets (total cost estimated to be approximately \$10K) and the Tangata Tiaki. Note this is being termed “additional monitoring” as standard monitoring programme information will also be used;
3. Weed harvester and trailer compliance. This includes operationalising the harvester, from its in-storage state and achieving compliance with Maritime New Zealand requirements. There is similar work for the trailer, which includes obtaining a certificate of fitness. These budgets are being paid for as vehicle costs, similar to the way other Horizons vehicle costs are managed. It is noted this also includes supply of health and safety equipment. Overall, these costs are estimated to be approximately \$20,000. However, cost estimates may need to be amended, for example if the weed harvester survey identifies any issues that require additional work. It is noted that achieving compliance for the harvester is one of the risks for the project proceeding this year;
4. Weed transport and disposal. The longer term aim is to work with the local growers for disposal, and discussions are underway. In this first year, while the weed is further characterised, the weed will be transported to a composting operation and there will be

cost for transport, weed analysis and disposal. The transport will be paid for as mileage similar to that done for other freshwater programmes and the disposal fees are a part of the costs identified for additional funding. It is noted that exact quantities of weed are difficult to predict in this trial year. Combined, the cost for this part of the activity is estimated at \$20K. The disposal fees have been estimated at less than \$5K based on the predicted weed quantity. Given the uncertainty, a budgetary amount of \$10K is being budgeted for weed disposal;

5. Site establishment costs. These include water installation to the site, storage ponds and portacom hire. This combined, is estimated at approximately \$30K to \$40K; however, is subject to change as quotes are received. This is recommended to be a corporate cost associated with the land that was purchased for the sediment trap and weed harvesting access track, noting the purchase of that land was co-funded by the Ministry for the Environment. The water installation at the site has been commissioned with a projected cost of \$5,500;
6. Weed harvesting operational costs. These are estimated to align with the original budget of \$160,000. The project is budgeted on 40 days of harvesting to provide for days where harvesting does not occur due to weather or other factors. It is noted that if the harvester does not operate on a particular day in the season, there are still costs related to equipment hire and staffing. It is also noted that in this trial year there will be learnings about the operation, timing, rates of harvesting in terms of ha/week and tonnes/week, how weather impacts the operation etc. These unknowns make budgeting less certain prior to the trial being completed;
7. Security. Given the history of work at Lake Horowhenua and at the site, having security on site is viewed as essential when staff and contractors are on-site. There are also potentially risks to the safety of the equipment when staff/contractors are not on-site. The budget presented in this item has budgeted for 24/7 security on-site during the period of the operation. This has an estimated budget in the order of \$72,000 noting this needs to cover nights and weekends. This is an unbudgeted cost and would require funding if the project is to proceed with this level of security. There is an option for Council to scale back this potential cost if security staff are limited to just when staff/contractors are on-site. If Council would like to increase security further, allowance could be made for camera's and other increased security measures;
8. Lake Trust/ iwi involvement. Tangata Tiaki presence in the activity of weed harvesting is a continuation of the long-term partnership with the Lake Trust and Muaupoko Tribal Authority to enable weed harvesting. A successful model was developed through the boat ramp construction and this is an essential part of the partnership model of working. Having Tangata Tiaki as a part of the delivery of the harvesting enables appropriate tikanga to be utilised and ensures someone is on site in the unlikely event that there are archaeological finds etc. Further, it provides for greater communication, collaboration and shared understanding between the project partners around the lake and work programme. Based on the planned 40 days of harvesting, this component is estimated at \$60,000, based on discussions with the Lake Trust and MTA. Please note these costs include wananga with a wider group than those who will be involved in the day to day operations. The Lake Trust/iwi involvement is an unbudgeted cost and would require funding if the project is to proceed with this level of involvement; and
9. Legal, planning and consent monitoring costs. There have been some legal costs to date in relation to contract drafting etc and there are likely to be some costs related to compliance checking. It is difficult to predict if there will be further injunctions or other actions that will require legal input e.g. issuing of trespass notices etc. Costs to date are estimated to be in the order of \$10K for legal work and it is difficult to put a figure on potential legal costs. For the purpose of this paper a nominal estimate of a total of \$30K has been used as an estimate of legal and consent monitoring costs, with the caution that this is a very uncertain estimate.

- 13.4. In total, the weed harvesting trial is estimated to have a total cost of \$564,000 (excluding boat ramp loan repayments and depreciation which combined total \$130,353). If these costs are included the total cost estimate is \$694,353.
- 13.5. A total of \$172,000 of additional funding would be required to operationalise the harvesting activity this year (Table 2). Adding a 30% contingency to these additional costs increases the estimate to \$223,600 providing a contingency of \$51,600 with represents less than 10% of the cost of the overall projected cost for the trial.
- 13.6. It is noted that the estimates in Table 2 exclude the majority of internal staff costs. It is also reiterated that there are a range of uncertainties in the estimates of these budgets. The proposed resolutions seek Councils acknowledgement of these uncertainties and consideration of providing additional funding for the trial to occur this year.

Table 2: Estimated budget for the weed harvesting trial*.

Item	Estimated budget	Additional funding required
Spare parts	50,000	
Monitoring	112,000	
Survey	20,000	
Weed transport & disposal	20,000	10,000
Site establishment	40,000	
Harvesting operation	160,000	
Security	72,000	72,000
Lake Trust/MTA/Tangita Tiaki	60,000	60,000
Legal/consent monitoring	30,000	30,000
Total	564,000	172,000
30% contingency	169,200	51,600
Total including 30% contingency	733,200	223,600

*note excludes \$130,353, for the boat ramp loan repayments (\$48,863) and depreciation (\$81,490).

- 13.7. A further question in relation to resourcing is what are the likely budget requirements for future years? If the project meets the requirements of the resource consent and is able to expand in future years, the harvesting may be able to expand to 80 to 100 ha, or potentially more. The trial year will provide some learnings about the scale of operation that is required and is feasible within the timeframes of the weed growth cycle. This will include further information on the area that can be harvested each day, how much weed is collected, how much down time should be allowed for weather etc. One part of the trial is to determine what depth to harvest to. This and other information will provide for improved ability to budget the operation.
- 13.8. A key driver of the costs for any future years, will be the area of the harvesting required in order to maintain the lower pH and also the area that can be feasibly harvested in the available season. The trail year is targeting 40 ha at an estimated cost for the harvesting component of this of \$160,000. This includes contingency for down time due to weather and other factors included. The area that may be harvested in future years is difficult to estimate and may be in the order of 60, 80, 100 ha or more. It is difficult to know how to scale up costs to such an area of harvesting without the trial information around pace of the operation, downtime etc. It is recommended that budgets for future years are estimated post the trial. It is also acknowledged that there are likely to be seasonal variations in the weed growth, weather etc. The proposed resolutions include a direction to the Chief Executive to prepare more information on the potential weed harvesting costs for future years after the trial is completed.

14. DISCUSSION

- 14.1. This item presents Council with further information on the lake weed harvesting programme as one of the key interventions to improve water quality and aquatic health in Lake Horowhenua. Council has a range of options in relation to next steps. For the purposes of this report three options are identified as outlined below.
1. Allocate an additional sum of funding to enable the trial to occur this year; or
 2. Defer the trial for a year, aiming for next year and doing some further preparatory work this year within the available budget; or
 3. To cease pursuing the weed harvesting interventions.
- 14.2. Should Council choose to allocate additional funding for the trial this year, staff will work to initiate the trial. It is acknowledged that the Covid lockdown and raised Covid alert levels along with delays in confirming the funding availability has put pressure on the ability to undertake the trial this year. The ability to do so will be reliant on a range of factors including the condition of the lake weed when it is surveyed, lake conditions, and availability of contractors (including Tangata Tiaki). Progressing the work will also be subject to the weed harvester achieving compliance with Maritime NZ requirements.
- 14.3. Should Council choose not to allocate the additional funding and endorse preparatory works for a trial next year (spring 2022), works are proposed continue to set up for the trial next year, within the available budget. This option would aim to complete a full scale weed harvesting operation in spring 2023. It is noted that while some work has already been commissioned, there are options as to how much further work is done this year.
- 14.4. Should Council choose not to allocate the additional funding and direct the Chief Executive to cease pursuing weed harvesting, staff would welcome guidance from Council on the next steps for this option and could follow up this item with further documentation regarding options for next steps for Council to consider.
- 14.5. If Council do choose to continue with the trial this year or next, it is recommended that council endorse further discussions with project partners around potential funding for the weed harvesting into the future.

15. CONSULTATION

- 15.1. The Chair and staff have undertaken some consultation on this item with members of the Lake Horowhenua Trust, Muaūpoko Tribal Authority and Horowhenua District Council. The weed harvesting activity has been consulted on in Annual Plan and Long-term Plan processes and been subject to a publicly notified resource consent processes.

16. SIGNIFICANCE

- 16.1. This is not considered to be a significant decision according to the Council's Policy on Significance and Engagement.

Logan Brown

FRESHWATER AND PARTNERSHIPS MANAGER

Adrian Smith

CHIEF FINANCIAL OFFICER

Dr Jon Roygard

GROUP MANAGER NATURAL RESOURCES & PARTNERSHIPS

ANNEXES

- A Rationale for lake weed harvesting