



SCIENCE & INNOVATION

1 ACTIVITY OVERVIEW

Horizons' Science and Innovation Team works in partnership with other teams across the NRP Group and wider organization to inform decision-making and support Horizons' natural resource management functions.

The team's main activities include co-ordinating a range of environmental monitoring and research programmes covering air, land and water. This involves collecting, analysing and reporting on data and information collected by Horizons and others. This information helps prioritise and focus the implementation efforts of the wider NRP Group, and supports policy and plan development and implementation. The teams work also informs other functions such as river management and emergency management.

Research is carried out in-house and in partnership with government, industry and independent researchers. Key projects currently underway include the five-year Smarter Targeting of Erosion Control programme, led by Manaaki Whenua, and the development of a National Water Model, led by NIWA. Horizons is also one of a few Councils eligible for external funding through the Ministry of Business, Employment and Innovation's Envirolink scheme, which enables us to receive science advice relating to environmental management. The team currently has a number of Envirolink-funded projects underway:

Other key activities, recently introduced through Horizons' Long-term Plan 2018-28 include research into the effects of climate change and drinking water security. The team also works closely with Horizons Communications team to share data and information via Horizons' and Land, Air, Water Aotearoa (LAWA) websites, as well as provide annual State of Environment reporting, a summer swim spot campaign, and public information around topics such as air quality.

The August 2019 Environment Committee report provides an annual summary of the 2018-19 Science and Innovation work programme, as well as outlining science activities for the 2019-20 year in the NRP Operational Plan. This October 2019 report provides a summary of progress to date for the 2019-20 year (from 1 July 2019 to 31 October 2019).

1.1 Activity Update

Water Allocation

- 1.1.1 The regional water allocation framework, introduced via Horizons' One Plan, established limits for surface water allocation in a number of Water Management Zones (WMZs). Some of these zones became over-allocated when these limits were set and staff have been working with water users since that time to reduce water use in over-allocated zones.
- 1.1.2 An updated map of surface water allocation has recently been released (Map 1). Over the past five years the number of over-allocated water management zones (WMZ) has reduced from 15 in 2014 (Map 2) to just eight WMZs in 2019. The most recent change is the Lower Tamaki which recently reduced from 111% to 95% of the catchment allocation limit. This is the result of Horizons staff working with a consent holder to move a water take from the over-allocated Tamaki River to the Manawatū River (Mana_2a).
- 1.1.3 While water use in many WMZs has come within One Plan limits, the Middle Moawhango (Rang-2d) recently became over-allocated. In this case, this was the result of recent riparian fencing preventing stock access to surface water, requiring land-owners to seek resource consent. Stock drinking water is considered an essential use, and it is possible that this may result in other WMZs becoming over-allocated as future riparian fencing reduces stock access to drinking water sources.

Swim Spot Monitoring

- 1.1.4 Monitoring of over 80 popular swim spots around the region gets underway from 3 November 2019. The programme is delivered in collaboration with MidCentral District Public Health Service and local Territorial Authorities, with staff recently meeting to kick start the season. Recruitment for swim spot monitoring staff is now complete and planning for the swim spot public campaign, delivered with Horizons Communications team, is also underway. Monitoring results are reported weekly, as they become available, via both Horizons' and the LAWA websites.

National Pesticides Survey and PFAS

- 1.1.5 Horizons contributed to the 2018 National Pesticide Survey, a four-yearly survey that Horizons has participated in since the early 1990's. A summary report of the national survey results, commissioned by the regional sector and delivered by ESR was recently released publically.
- 1.1.6 For the 2018 survey, Horizons staff sampled a total of 20 groundwater bores (referred to in the report as wells), slightly less than the previous survey (23) to enable the analysis of a broader range of variables while remaining within the approved budget. This additional analysis included

glyphosate (Roundup) and emerging organic contaminants – the first time these potential contaminants were analysed as part of this survey.

- 1.1.7 Results showed low-level detections, below health guidelines, of pesticides in 68 (24.4%) of the 279 wells surveyed nationally, and two (10%) of the 20 surveyed regionally. Just one well (0.7%) of the 139 tested nationally, returned a low-level detection of glyphosate. The well was located in the Otago Region and was thought to be the result of poor well-head security. Extremely low levels (parts per trillion) of organic contaminants were detected in (70%) of wells tested nationally, and six out of eight (75%) wells tested in the Horizons' Region.
- 1.1.8 All affected bore owners in the Horizons Region were contacted by staff to notify them of the results. All detections in the Horizons Region were well below drinking water maximum acceptable values (MAVs) and/or World Health Organisation (WHO) guideline values, where these apply however, the results do highlight the ability for a range of contaminants to make their way into groundwater systems and identify a need for ongoing monitoring and research. Consideration of these contaminants will be made in the up-and-coming review of Horizons' monitoring network, and further discussion with the regional sector Groundwater Forum around ongoing national monitoring is also planned.
- 1.1.9 A report on the results of the Bulls PFAS (per- and polyfluoralkyl substances) study is now complete. A copy of the report will be available to Council via the hub, to accompany a presentation to Council at the 12 November Strategy and Policy Committee meeting.

One Plan Changes and Policy Support

- 1.1.10 Horizons' Science and Innovation team are currently working with the Policy team to provide technical support for plan change and policy implementation/review processes. A workshop with technical experts was held in late October to report on progress to date, and scope the work programme for the reporting year. This includes four key work-streams: (1) Completing a recent analysis and reporting on water quality state, trends, loads and drivers; (2) Providing technical support for Horizons' Plan Change 2 process; (3) Developing a plan for science support for implementation of the National Policy Statement for Freshwater Management (NPS-FM); and (4) A review of Horizons' monitoring network.

Land and Fluvial Activity

- 1.1.11 Fluvial surveys to be carried out this year include the first survey of the Whangaehu catchment and completion of the Eastern Ruahine catchments.
- 1.1.12 Work to complete a sedimentation and drainage implementation plan for the Arawhata catchment has been contracted to Tonkin + Taylor and will begin within the next few weeks.

This project aims to develop a set of recommended mitigation options that both maintain (or enhance) the current drainage network and reduce sediment loss from farmland in the catchment. This work is funded through the Lake Horowhenua Restoration rate and will draw on expertise and advice from the River Management Southern team as well as the Freshwater team and Environmental Data.

- 1.1.13 Horizons continues to support several other projects focused on the Arawhata catchment. The Sustainable Farming Fund project Future Proofing Vegetables, which focuses on improving on farm practices to reduce nitrogen loss will continue this year; a Massey University PhD student Fernando Avendano will be completing his research study on quantifying nitrogen loss from different vegetable crops; and the Foundation for Arable Research will continue their ongoing fluxmeter trails to measure nitrogen and phosphorus loss across the country, with sites in the Arawhata and Ohakune.
- 1.1.14 In recent years Horizons has invested in furthering our understanding of river geomorphology and sedimentation in the Lower Manawatū and Oroua Rivers. Research to date has explored the linkages between hill country erosion, climate change, water quality and flood protection and we are ready to explore which sedimentation mitigation tools will be most suitable for these rivers and their wider catchments. An internal staff workshop exploring sedimentation issues and potential solutions for the Lower Manawatū was held on Thursday 19 September 2019. Staff from across the organisation contributed ideas and knowledge to help inform the development of a sedimentation strategy.

Biodiversity and Biosecurity Activity

- 1.1.15 The team is continuing to provide support to the Biodiversity Team for planning, data entry and data management of the ground-truthed priority biodiversity sites.
- 1.1.16 Work to identify opportunities for alignment with other NRP teams to increase protection at high value biodiversity sites is underway. The science and biosecurity pest animals team have been working collaboratively to identify high value biodiversity sites that may benefit from additional possum control. Work on this project is continuing.
- 1.1.17 Management Prescriptions are a key focus of this year's biodiversity programme, enabling staff to determine the level of ongoing investment required at a number of high value biodiversity sites. The process involves a) identifying ecological integrity targets, b) identifying the pressures required to be management, and c) developing management prescriptions and indicative cost information to reduce pressure to required levels. Initial workshops to develop management prescriptions are scheduled for early November.

- 1.1.18 This year is the third and final year for Tōtara Reserve Bird Monitoring. This work is contracted externally, with field work in early December and analysis of three years of monitoring data and a final report due in the early new year.

Air Quality Monitoring

- 1.1.19 Air quality monitoring equipment at Horizons' designated airsheds, Taihape and Taumarunui is urgently in need of replacement. Staff have continued to maintain these sites with replacement sensors and servicing however, these sites are not at the stage where ongoing failures are compromising the integrity of the data and requiring additional cost to maintain. Our recommendation is to replace the existing units with equipment that will cover both PM₁₀ and PM_{2.5} to enable us to maintain our long-term monitoring record and bring the sites into line with the proposed National Environmental Standard for Air Quality. Staff are currently investigating options and pricing for this.

Drinking Water

- 1.1.20 Ensuring the security of drinking water supplies requires collaboration between territorial authorities, water suppliers, public health offices and Horizons. A new work programme initiated during 2017-18 seeks to ensure that all parties are aware of any risk associated with each supply, that their roles and responsibilities are understood, and that there is adequate flow of information to ensure each agency is meeting its requirements. Source protection zones for council-operated drinking water supplies serving over 500 people in the region have now been delineated. A final summary report is now available and staff are scoping the next phase of this work programme. A report on this work will be provided to Horizons' Strategy and Policy Committee in December 2019.

Climate Change

- 1.1.21 A report commissioned by Horizons and delivered by NIWA 'Climate change implications for the Manawatū- Whanganui Region' was completed in June 2019. Results were discussed in the August 2019 Environment Committee report, and a copy of the full report will be made available to the public via Horizons' website.
- 1.1.22 The procurement process is underway to contract a regional greenhouse gas (GHG) inventory to improve our understanding of the contributions different activities in our region make to greenhouse gas emissions. Quantifying the region's emissions and their sources will help identify opportunities and risks at a district scale, and help determine Horizons role in the mitigation aspect of climate change in the region. Assuming a successful procurement process, this work is expected to get underway prior to Christmas.

- 1.1.23 At a Council level, an internal cross-organisational team are working on a draft set of objectives and policies for Horizons' Climate Change Strategy, and have been working alongside Territorial Local Authorities to produce an action plan for the region.

LAWA

- 1.1.24 LAWA is a regional council-driven initiative to present data and information about New Zealand's environment and natural resources to the public. Horizons provides science support for the continued evolution of the website, in addition to data required for annual updates. Further information can be found at www.lawa.org.nz. On World Rivers Day (22 September 2019) Horizons, along with the rest of the regional sector, published the most recent water quality data which now enables trend analysis for 5, 10 and 15 year periods. This data complements real-time water quantity and air quality data, as well as land cover and the popular 'Can I Swim Here' module that provides communities with access to the most up-to-date monitoring data for popular river, lake and beach recreation sites across Aotearoa.

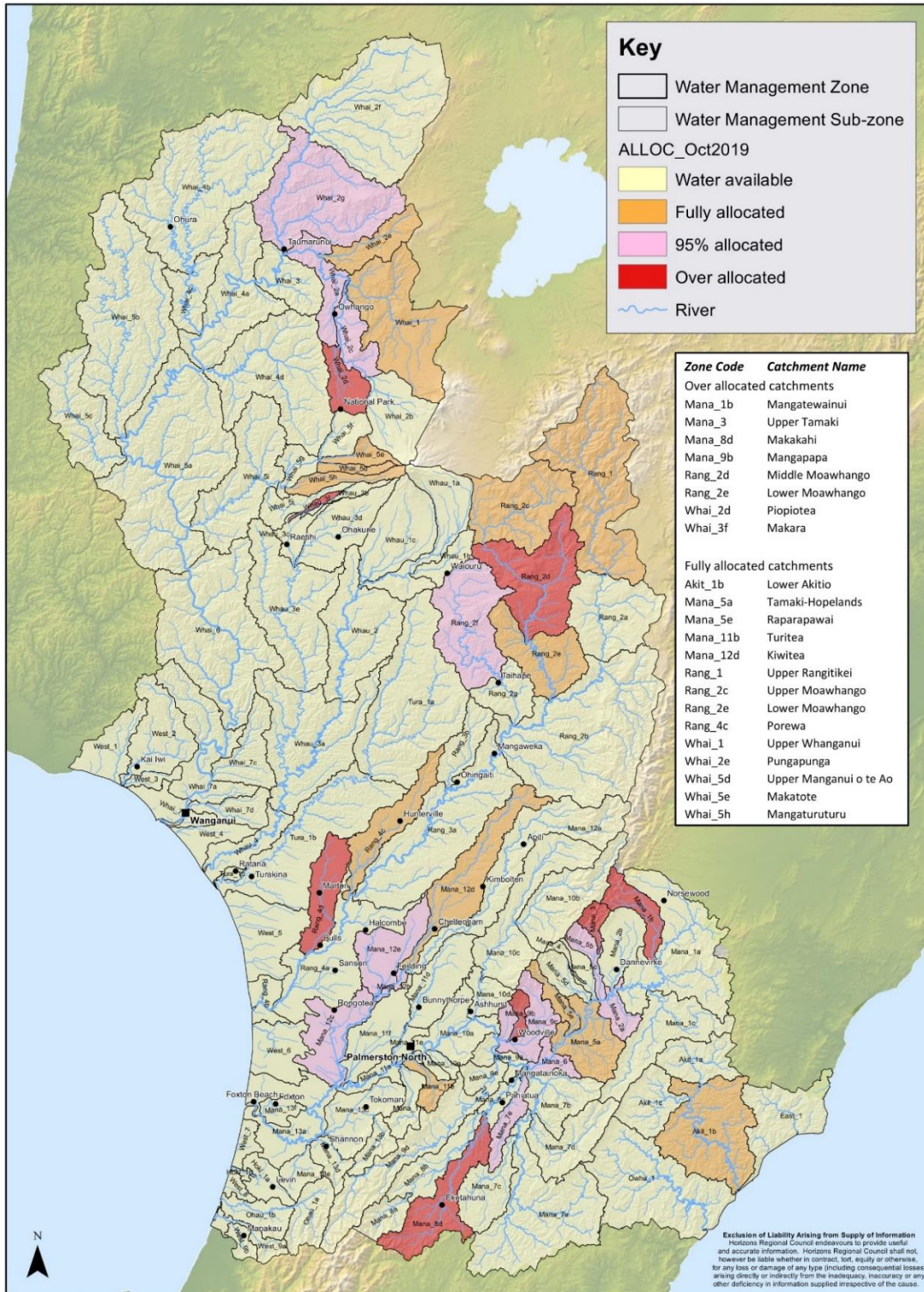
Science Communication

- 1.1.25 An action plan for science communication is currently in development. This document complements Horizons' Science Communication Strategy, which outlines a core set of principles for the communication of science and research. The objective of the strategy is to maximise science uptake, and ensure up-to-date and relevant science information is effectively communicated to Horizons staff, councilors, iwi, the public, external agencies, and any other parties interested in aspects of natural resource management. The action plan sets out key science communication activities for the reporting year to help prioritise resourcing and identify new opportunities.
- 1.1.26 Staff recently hosted Manawatu Science and Technology Fair Horizons' special prize winners at an internship day at Totara Reserve on Monday 21 October (Photo 1 and Photo 2). This is an annual activity where we are able to share our knowledge and provide young scientists with an opportunity experience environmental monitoring in action.

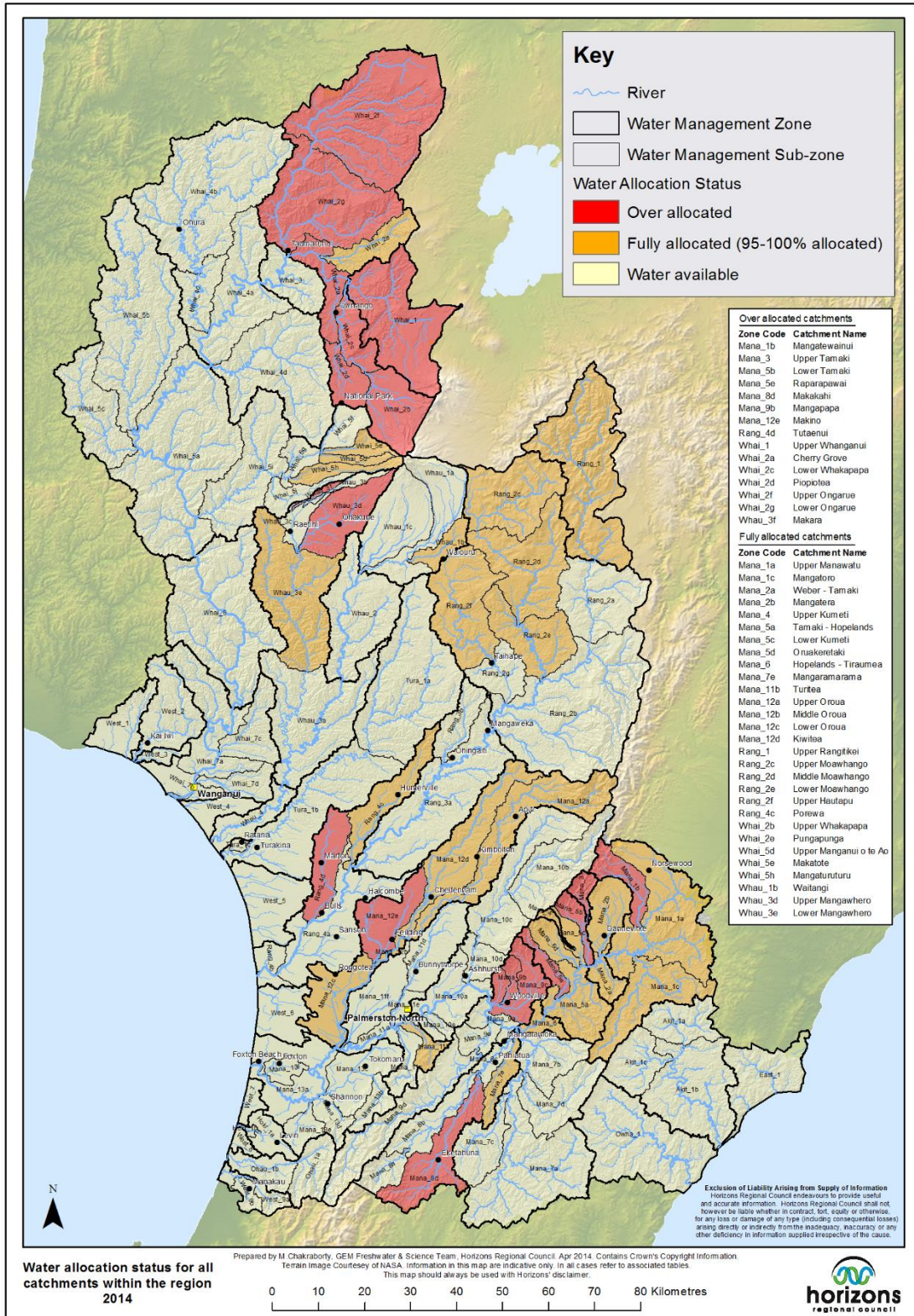
1.2 Annual Plan Targets

Table 1 Progress reporting for Science and Innovation Long-term Plan targets for 2019-20.

Performance Measures for Levels of Service	Target 2018-19	Progress Update
Water Quantity and Quality Activity		
Water quantity and water quality information is made available to the public via LAWA (www.lawa.org.nz) and Horizons' websites.	Data provided to LAWA as required	Data is available on the LAWA website. The latest water quality data was published on the website on World Rivers Day – 22 September 2019.
Annual report on water quantity and quality monitoring and research activity.	1	An annual report on water quantity and quality activity will be produced and presented to Council in June 2020.
Land Management Activity		
Annual report on the land and fluvial monitoring and research activity.	1	An annual report on land and fluvial activity will be developed and presented to Council in June 2020.
Annual report on biodiversity monitoring and research activity.	1	An annual report on biodiversity research activity will be developed and presented to Council in June 2019
Environmental Reporting and Air Quality Monitoring Activity		
Provide an annual summary report on the state of the environment.	1	Annual State of Environment – Catchment Summary reports were completed for each Freshwater Management Unit (FMU) in September 2019.
Develop and implement a science communication strategy.	Report progress to Council annually	A strategy for science communication was developed mid-2019 and an action plan is currently in development.
Complete drinking water supply research with a focus on Council-operated drinking water supplies and complete an annual report on this to Council.	1	Staff are currently scoping a programme for drinking water research for 2019-20. An annual progress report to Council has been scheduled for Horizons' Strategy and Policy Committee in December 2019.
Investigate one aspect of climate change impact in the Region and report on this to Council.	1	Procurement for climate change research for 2019-20 (regional greenhouse gas inventory) is currently underway.
Air quality is monitored in Taihape and Taumarunui and reporting is made available to the public via LAWA and the annual State of Environment report.	Completed	Monitoring is ongoing and data is made available to the public via the Horizons and LAWA websites. Horizons' ability to accurately report on air quality at Taihape and Taumarunui is now compromised with equipment due for replacement.
Undertake an annual public education air quality campaign.	1	The next public campaign is scheduled for December 2019



Map 1 Surface water allocation map for the Horizons Region, October 2019.



Map 2 Surface water allocation map for the Horizons Region, September 2014.



Photo 1 and Photo 2 Staff hosting Manawatu Science and Technology Fair Horizons' special prize winners at an internship day at Totara Reserve on Monday 21 October.

1.3 Activity Summary

Project	Key Deliverables	YTD Progress
Water Quality and Quantity Activity		
Monitoring Programmes	Carry out core monitoring of water quality, quantity, ecosystem health.	Monitoring is progressing to schedule. Minor changes to the monitoring programme have occurred as a result of the recent landslide in the Whangaehu catchment. Swim spot monitoring gets underway from Sunday 3 November 2019.
	Undertake a review of our water monitoring network.	A project proposal and work plan for this review is now being developed, with input from a cross-organisational group including Emergency Management, River Management, Environmental Data and Science.
Catchment Characterisation	Improve our understanding and better characterise the region's catchments.	NIWA's 5-year water national water model project continues. Two PhD studies are currently progressing, exploring the fate and transport of nutrients in the sub-surface environment.
One Plan and Policy Support	Provide science support to One Plan review programme and 'Our Freshwater Future'.	Staff are supporting policy through the provision of technical advice, including PC2. A key deliverable is the development of a science programme to support future plan changes and implementation of regional and national policy.
Lakes Research	Continue to advance lake research that prioritises and informs monitoring and implementation programmes to improve the water quality and ecological condition of the region's lakes.	A groundwater investigation in the Lake Horowhenua catchment is progressing, with the recent installation of flow monitoring in major inflows and additional groundwater monitoring. Annual Lake SPI monitoring is scheduled for early December with related reporting due at the end of financial year. The national MBIE-funded Lakes 380 programme continues, for which 22 lakes in the region have been selected for sediment core analysis. The project aims to uncover the environmental history of 380 lakes in New Zealand.
Coastal and Estuarine Environments	Continue to advance our understanding of the region's coast and estuaries.	Estuary habitat monitoring is contracted and scheduled for this coming summer. Key deliverables include the second year of fine scale monitoring for the Whanganui Estuary, sediment monitoring in the Whangaehu Estuary, and monitoring at the Ohau and Waikawa Estuaries. An Envirolink-funded project investigating the use of an ocean glider to collect in situ

Project	Key Deliverables	YTD Progress
		measurements of physical ocean properties to inform future monitoring of river plumes from high rainfall events is now underway.
Land Management Activity		
Gravel use monitoring and reporting	Track annual gravel use and allocation to support consent decision making and flood scheme management.	First quarter gravel levies have been processed.
Fluvial surveys	Complete fluvial surveys of the Whangaehu and Eastern Ruahine Catchments.	Surveys are planned and due to be undertaken during summer 2019-20.
Sediment source and transport research	Advance and report on sedimentation transport investigations.	The development of a sedimentation and drainage plan for the Arawhata catchment is now contracted to Tonkin + Taylor, and scheduled to get underway in coming weeks.
Wastewater management	Assist with the implementation of the One Plan regarding on-site wastewater performance.	Staff continue to provide support through consent technical assessments and working with Territorial Authorities to ensure systems are installed in-line with One Plan requirements.
Nutrient management research	Support research into the fate, transport and management of nutrients in the region.	A range of nutrient management investigations are underway, including three Sustainable Farming Fund projects 'Future Proofing of Vegetable Production', 'Innovative Drainage Management Technologies', and 'Taranua Plantain Project'. Other work underway includes investigations of nutrient loss from horticulture and arable farming, and a pilot study investigating nutrient loss from intensive winter grazing.
Biodiversity and Biosecurity Activity		
NRP support	Identify opportunities for alignment with other NRP teams e.g. biosecurity animals and land teams.	Opportunities identified with biosecurity animals team, initial information provided. This workstream will continue to be refined. Opportunities for alignment with land team are being pursued.
Priority site management	Support the biodiversity team to complete assessments at 100 putative ¹ priority biodiversity sites.	This work is ongoing.
	Continue to refine the activity monitoring for priority biodiversity sites.	A process for this has been developed. Biodiversity staff need to be trained in its use.
	Develop management prescriptions for 10 high priority sites.	The first workshops for this project are scheduled for early November.

¹ Putative sites are those which have been inferred from a model although, for the majority of these, no direct evidence of their status is available.

Project	Key Deliverables	YTD Progress
Tōtara Reserve	Complete the third year of bird monitoring programme in Tōtara Reserve, and report on findings.	Bird monitoring at Tōtara Reserve is scheduled to be undertaken during summer 2019-20.
Environmental Reporting and Air Quality Monitoring		
Air quality	Deliver the core monitoring programme for air quality and undertake an annual public education campaign around air quality.	Monitoring is ongoing and data is made available to the public via the Horizons and LAWA websites, noting that there are ongoing issues with the current infrastructure, as discussed earlier in the report. An annual public education campaign is due to get underway during summer 2019-20.
Climate change	Investigate one aspect of climate change and report to Council.	Procurement of technical services to develop a regional greenhouse gas inventory is currently underway. This work is expected to be delivered within the reporting year.
Drinking water	Continue to work with city and district councils to improve management of public drinking water supplies.	A presentation of outputs from the 2018-19 drinking water programme will be presented to Horizons Strategy and Policy committee on 12 November 2019. Scoping of the 2019-20 programme is now underway.
State of Environment report	Provide an annual report on the State of the Environment (SoE) via catchment summaries	Annual State of Environment – Catchment Summary reports were completed for each Freshwater Management Unit (FMU) in September 2019. Planning for 2020 SoE catchment summary reporting will get underway during early-mid 2020.
LAWA	Ensure environmental data is made available to the public via the LAWA website.	Data is available on the LAWA website. The latest water quality data was published on the website on World Rivers Day – 22 September 2019. Proposed future modules include groundwater quality, which is currently in development.
Science communication	Implement Horizons' science communication strategy	An action plan to complement the science communication strategy is currently being developed. The action plan will set out key science communication activities for the reporting year, to help prioritise resourcing and identify new opportunities. Public information and RMA advice continue to be provided as necessary. Community engagement has included judging and awarding students at the Manawatū Science and Technology Fair, presenting on SoE report at Awapuni Library, and eel trapping with Mount Biggs School.

