



# EDENDALE

## AQUIFER GROUP

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# OUR PURPOSE

*“To support local communities in our catchment to connect, learn and adopt practical, sustainable environmental practices”*



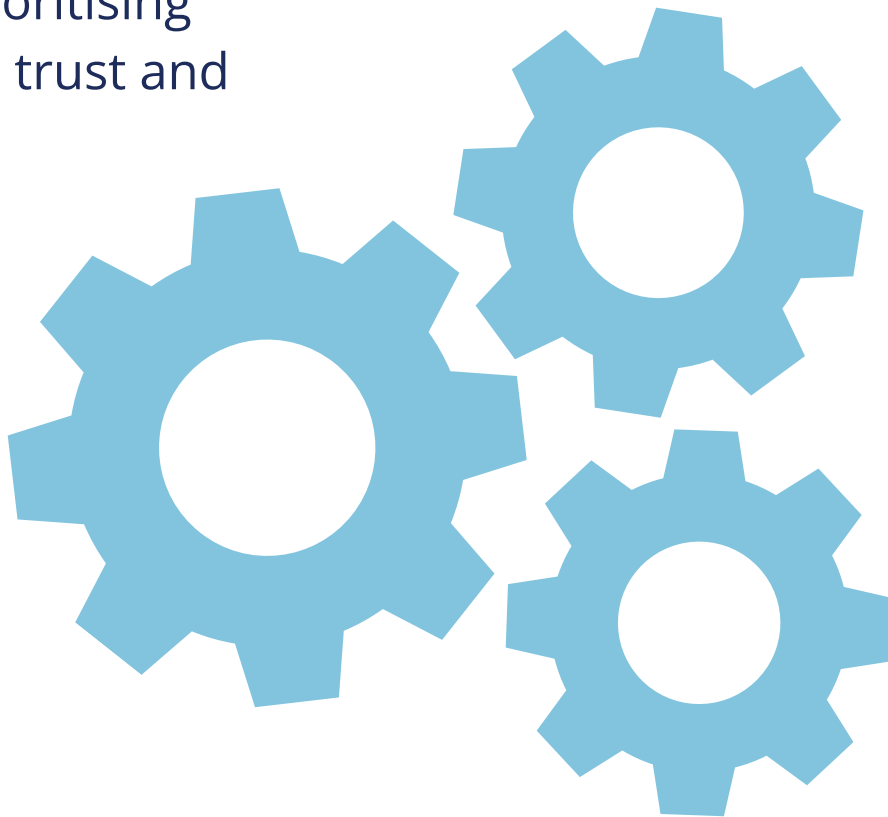
# EDENDALE AQUIFER GROUP CORE VALUES

## INTEGRITY

Creating ownership and accountability within our community while prioritising honesty, trust and respect.

## PIONEERING INNOVATION

Embracing new ideas, taking smart risks, and continuously learning to enhance our practices.



## INCLUSIVITY AND SUSTAINABILITY

Promoting collaboration and implementing sustainable solutions for long-term benefits for our community and the environment.



# EDENDALE AQUIFER GROUP

## PROJECT: UNDERSTANDING NITROGEN



### **Understanding Nitrogen | Foundation Project**

Understanding the movement, interactions, and monitoring of nutrients, particularly nitrogen, through the Edendale Catchment

Practical tools to find long-lasting solutions for our farming businesses

<p><b>Project Name</b></p>	<p><b>Understanding the movement, interactions, and monitoring of nutrients, particularly nitrogen, through the Edendale Catchment.</b></p>
<p>Objectives of the Project</p>	<p>To comprehensively tackle the challenge of nutrient management, with a specific focus on nitrogen leaching in the Edendale area, our project aims to integrate community engagement, scientific research, and practical interventions.</p> <p>Led by the Edendale Aquifer Group (EAG) in collaboration with a range of stakeholders including DairyNZ, Fonterra, FlowPath, Environment Southland, Land and Water Science, John Scandrett (Wetland Designer), and Miranda Hunter (Economic Impact Assessor), our project aims to understand, mitigate, and manage nitrogen movement and its impacts on the local aquifer and the Mataura River.</p> <p>In addition, the project will contribute to the development of a comprehensive catchment plan to ensure the adoption of sustainable management practices in the long term. By addressing these components in a coordinated manner, our project aims to mitigate nitrogen leaching and create sustainable practices for the enduring health of the Edendale catchment and its surrounding environment.</p>
<p>Project Description</p>	<p>The project comprises several interconnected parts:</p> <ul style="list-style-type: none"> <li>- Community Engagement and Understanding (Part One): Facilitating community connection and knowledge sharing to enhance comprehension of nitrogen movement within the catchment and its effects on aquifers and waterways.</li> <li>- Nitrogen Mitigation at the Source (Part Two): Leveraging existing trials and studies to develop effective strategies for mitigating nitrogen inputs, concentrating on practical tools tailored for farmers in the Edendale Catchment.</li> <li>- Edge-of-Field Mitigations (Part Three): Exploring the effectiveness of edge-of-field mitigations, particularly wetlands, in reducing nitrogen losses, and scaling up successful approaches across the Edendale Terrace.</li> <li>- Live Water Quality Monitoring (Part Four): Improving real-time monitoring of water quality within the catchment to inform decision-making and assess intervention effectiveness, utilizing Fonterra's backing for installing additional monitoring sites.</li> <li>- Nutrient Output Modelling (Part Five): Collaborating with FlowPath to pioneer an innovative modelling approach that transforms nutrient output modelling, providing a comprehensive understanding of nutrient dynamics within the catchment.</li> </ul>

# Edendale Aquifer Group (EAG) Project Overview

The Edendale Aquifer Group boundary was set due to the large area of the Edendale Districts with relatively shallow soils overlying an aquifer system. This area is also unique due to the long (42km terrace) running along the western boundary. This terrace is known to have many seeping areas, contributing to high nitrate levels in the local aquifer and ultimately the Mataura River. Local bore assessments have also confirmed elevated nitrate concentrations.

The Edendale terraces have been highlighted in a recent AGMARDT project which highlighted the complexities of nitrogen dynamics in the farm system, and the wider the catchment, emphasising the need for refining approaches to monitoring and management. Proposed interventions from the AGMARDT study on a local dairy farm ranged from small changes such as adjusting fertiliser types, stocking rates and plant species, to larger scale initiatives like wetland development across the entire terrace length. However, the unique soil profiles, hydrological patterns, and ecological processes present significant challenges in mitigating nutrient, particularly nitrogen outputs while ensuring economic sustainability for farming businesses. This means that the EAG's project extends beyond the identification of issues, to the design and implementation of innovative, context and catchment-specific solutions that meet a delicate balance between environmental conservation and agricultural productivity within the catchment.

The Edendale Aquifer Group (EAG) aim to collaborate with multiple stakeholders including DairyNZ, Fonterra, Reimagining the Mataura, FlowPath, Environment Southland, Land and Water Science (Environmental Consultant), John Scandrett (Wetland Designer) and Miranda Hunter (Economic Impact Assessor). Significant capital contribution has already been generously provided through the Fonterra Hapori Fund, and Reimagining the Mataura.

## **Our project encompasses several interconnected parts:**

**Community Engagement and Understanding (Part One):** Facilitate community connection and knowledge sharing of the Edendale Aquifer Catchment. Connecting the community with the state of the aquifer, bores, and subsequently, the Mataura River, to enhance understanding of nitrogen movement within the catchment and the effect on aquifers and waterways.

**Nitrogen mitigation at the source (Part Two):** Our objective in this part is to capitalise on existing trials and studies conducted within the Catchment and the Region to formulate effective strategies for mitigating nitrogen inputs. We aim to leverage insights from previous initiatives, notably the AGMARDT study and DairyNZ's plantain trial, to inform our approach.



Following discussions with the Edendale Aquifer Group (EAG) committee, DairyNZ has committed to designating the Edendale Catchment as a Priority Catchment Area for a Plantain trial. This initiative will entail the implementation of four case studies across different typologies within the catchment. Utilising tools such as Overseer and Farmax, we will assess both the environmental and economic implications of integrating plantain into the farm system. As well as this, there is potential for the incorporation of DairyNZ's 'Low N' Workstream into this study, allowing for the stacking of nitrogen reduction mitigation strategies to demonstrate overall reductions.

In addition to the plantain trial, the EAG aims to collaborate with Environment Southland on a comprehensive study of land use within the catchment. This study will seek to evaluate the impact of various land uses on nitrogen leaching, providing valuable insights for our mitigation efforts.

These combined efforts underscore our commitment to developing evidence-based solutions that address the pressing issue of nitrogen leaching within the Edendale Catchment.

**Edge-of-Field Mitigations (Part Three):** Our objective is to thoroughly investigate the effectiveness of edge-of-field mitigations, particularly wetlands, in reducing nitrogen losses. Building upon insights from the AGMARDT funded Maitara project, specifically the case study on Steven Clarke's property, which demonstrated the potential of wetlands in capturing and treating water from seeps and springs along the terrace edge, we aim to scale this approach across approximately 42km of the Edendale Terrace. Working closely with Land and Water Science, the project will identify significant seeps and springs along the terrace edge, crucial sources of higher nitrate water entering the Maitara River. High-resolution hydrology analysis derived from LiDAR data, and aerial radiometric surveys (gathered from past research projects) will inform the optimal location and placement of proposed wetlands, initially targeting up to 10 sites.



To ensure comprehensive evaluation, the project will adopt a multi-disciplinary approach, engaging specialists such as hydrology specialists (Land and Water Science), wetland engineering specialists (John Scandrett), and economic impact specialists (Miranda Hunter) to optimise the placement and design of these mitigations and complete economic and environmental impact assessments, assessing up to 3 priority sites. Additionally, Fonterra's contribution of \$20,000 towards the capital costs of two pilot wetlands—\$10,000 for a wetland on Fonterra's property along the terrace and \$10,000 for another wetland on a farm in the catchment area—further strengthens our efforts in implementing and evaluating these vital mitigations. We are also investigating other streams for capital funding. *Update as of July 2024:* This now includes a \$70,000 contribution from Reimagining the Maitai to support development of wetlands along the Edendale Terrace.

**Live Water Quality Monitoring (Part Four):** Our objective is to enhance real-time monitoring of water quality within the catchment to inform decision-making and evaluate the effectiveness of interventions. Fonterra's initiative to install one live water quality monitoring site (Eco-detection) in the catchment, alongside their offer of two additional live water quality monitoring kits (Adroit) from the North Island, presents a significant opportunity\*. These kits will capture real-time data on water quality parameters, with a particular focus on nitrogen levels. This data will be instrumental in guiding intervention strategies and assessing their impact. Additionally, the pilot wetland on the Fonterra property will have additional water quality data to add to the project. Collaborating closely with Land and Water Science, insights gained will inform the strategic placement of the Adroit water quality kits and the development of a comprehensive water quality monitoring programme for the community. This programme will determine the most relevant water quality parameters to measure and include laboratory water tests and community monitoring through 'quick N tests' to further enrich our understanding and inform decision-making processes.

\* The Eco-Detection kit's installation costs, approximately \$80,000, and annual maintenance costs of \$50,000, have been generously provided by Fonterra as in-kind contributions. Similarly, the Adroit kits (combined, \$80,000) will be provided to the project as an in-kind contribution by Fonterra, further demonstrating their commitment to improving water quality within the catchment.

*Update as of July 2024:* The Edendale Aquifer Group is currently in the process of buying a Portable Nitrogen Sensor, which will help to quickly assess the nitrogen content of the water across the catchment. The Group plan to hold nitrogen testing events where locals can bring their water quality samples to be tested. Further details are to be worked through, ensuring that data remains anonymous and a clear plan and outcomes are in place.



**Nutrient Output Modelling (Part Five):** Collaborate with FlowPath\* to develop an innovative modelling approach that revolutionises nutrient output modelling. By integrating continuous monitoring of water quality parameters in streams with environmental and seasonal data, alongside factors influencing water quality changes, FlowPath aim to provide a comprehensive understanding of nutrient dynamics within the catchment. This part of the project will leverage advanced mathematical modelling techniques, including data assimilation and probability-based modelling, to identify the main drivers behind changes in water quality, with a particular focus on the impacts of land use, landscape features, and climate variability. It's important to note that while the Edendale Aquifer Group will work alongside this project, the learnings from the wider project may inform FlowPath's broader initiatives but FlowPath is not the guiding focus of this project.

\*FlowPath are a consultancy lead by Tony Pleasants of Massey University, focussed on developing a nutrient output model which can handle farm, land and climate interaction in a dynamic way.

**Whole of Catchment Plan:** Additionally, the project will contribute to the development of a whole of catchment plan.

*Overall: By addressing these components in a coordinated manner, our project seeks to not only mitigate nitrogen leaching but also develop sustainable management practices for the long-term health of the Edendale catchment and its surrounding environment.*

**R.**

*We would like to thank Resolution Farming App for supporting our Catchment Group with software which can help to communicate, keep our documents in one place, and share information easily.*

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