Mackenzie
DISTRICT COUNCIL

Date: **Wednesday, 2 February 2022**
Time: **3.00pm**
Location: **On Zoom**

AGENDA

Late Item

Tekapo Community Board Meeting

2 February 2022

Order Of Business

1 REPORTS

1.1 TEKAPO WASTEWATER PLANNING STUDY

Author: **Mike Davies, Program Manager - 3 Waters**

Authoriser: **David Adamson, General Manager Operations - Acting**

Attachments: **1. Takapō Wastewater Planning Study - SLIDES**

STAFF RECOMMENDATIONS

That the information be noted.

BACKGROUND

Tim Scott has joined the Council to take up the position vacated by Mike Davies. This roles principle responsibility is to deliver the projects funded by central government as part of the Three Waters Stimulus package.

Tim will be attending the meeting and has organised for Helen Barclay of GHD to give the attached presentation on planning for Tekapo waste water treatment plant.

Takapō Wastewater Planning Study

→ Community Board Meeting

02 February 2022

Agenda

1. Introductions
2. GHD Scope and summary of work to date
3. Options assessment and Multi Criteria Analysis
4. Field assessment results
5. Concept of new scheme and costings

Purpose and Objectives :

- Develop the likely long-term wastewater treatment and disposal solution for Takapō.

Timeframe and Stages

- The study is to be completed by March 2022.
- 4 Stages – Project Initiation, Develop Options, Options Analysis and Preferred Option
- Current Stage of concept development of preferred option

Project Drivers

Capacity Constraints

- The current plant does not have enough capacity to treat the estimated future flows in 2050.

Cultural Impact

- Arowhenua Rūnanga are concerned about the risk of pond failure during a seismic event causing untreated wastewater to enter the Takapō River, and the potential effect of the irrigation fields on the river
- Sites of cultural significance around the Takapō area

Protecting environment of natural significance

- Protection of the receiving environment, particularly Lake Takapō and Takapo River

Social Impact

- Potential for residential developments to move towards the current site as the population grows

Seismic Risk

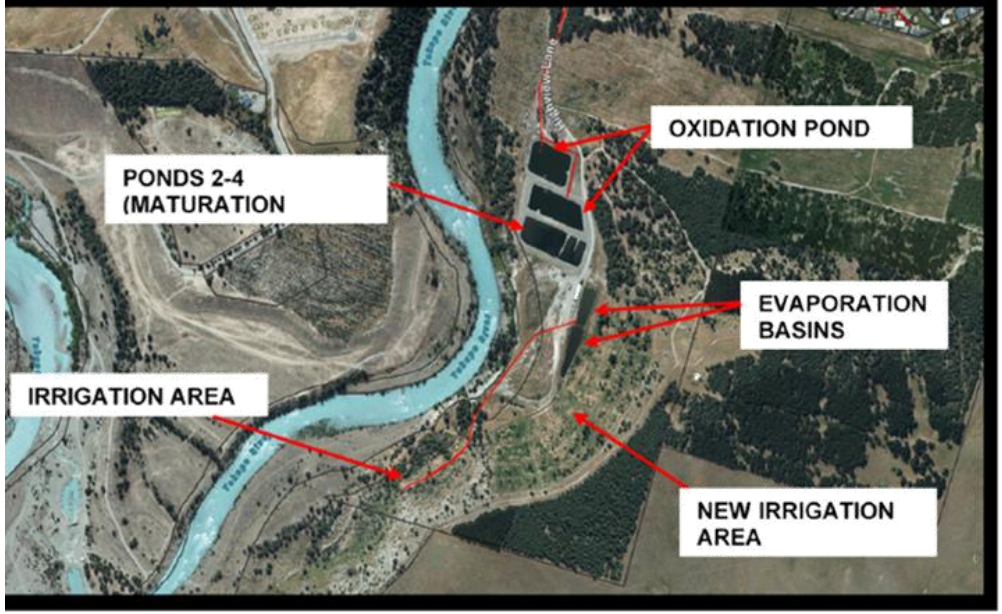
- There are multiple active faults in the area which could potentially cause damage to the plant

Summary of GHD Work to Date

- Information review and basis of design
- Constraints analysis exercise
- Long list of options
- Multi criteria analysis
- Water quality monitoring
- Field assessment of preferred site

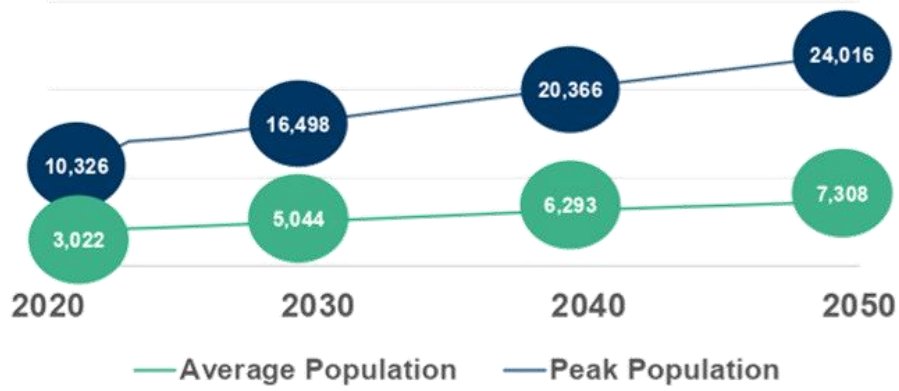
Overview

- Takapō WWTP treats wastewater from Takapō village
- Oxidation pond based treatment system
- Treated effluent is discharged to land via two irrigation areas



Key Issues Identified

- The existing ponds and irrigation system have limited capacity remaining
- Takapō population is forecast to more than double by 2050
- High loading of the lower irrigation area during winter
- Risk of a seismic event damaging the plant
- Potential for town to expand toward WWTP

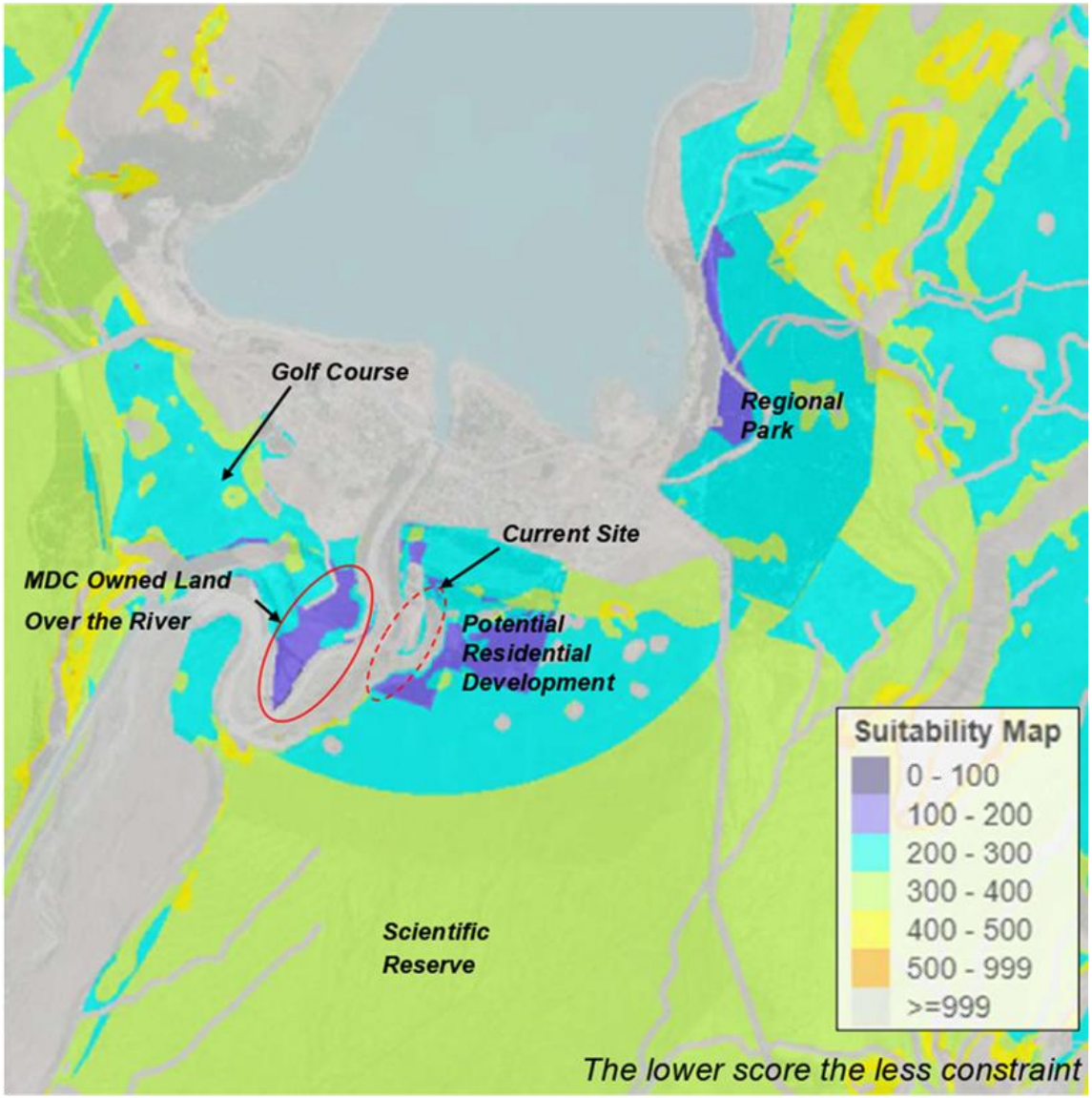


Source: MDC Growth Projection 2020

Land Options

Constraints Analysis

- Resource Zone
- Proximity to roading
- Distance from township
- Distance from residential
- Land ownership
- Gradient of land
- Land cover
- Proximity to surface waters
- Proximity to areas of cultural significance
- Proximity to areas of heritage significance
- Irrigated land
- DOC land
- Community drinking water zones
- Existing resource consents
- Soil type and geology
- Groundwater zones
- Groundwater wells
- Seismic risk
- Contaminated land



Remain at Existing Site

Status Quo – Not Preferred

Continue to operate the plant in its current configuration.

No additional capital costs but treatment performance will decline.

Upgrade Existing WWTP

The existing WWTP process can be optimised by implementing upgrades such as adding an inlet screen, additional aeration, tertiary filtration, and extending the irrigation field

Replace Ponds with a new Plant

Replace existing ponds by constructing a new treatment plant (such as MBR) on site adjacent or reclaimed part of existing ponds. Similar schemes to Turangi and Te Aroha WWTP.

Aeration Upgrade at Cambridge WWTP

Te Aroha WWTP, Reactor Tank Adjacent to Original Ponds

Move to a New Site

A new WWTP can be constructed at a different site in the area. The following sites have been identified as potential options:

Site Across the River (Tekapo Power House Rd)

- Land owned by Mackenzie District Council, ~ 20 ha
- Scored well in GIS assessment
- Modern mechanical plant such as membrane bioreactor (MBR) or sequencing batch reactor (SBR)
- New irrigation area

Next to Golf Course, Airfield or a new site further south

- Land privately owned
- New mechanical plant and irrigation would be installed

Area Required

- Approximately **20 – 50 ha** of land required to irrigate flows up to 2056 (TBC by field investigation)

Multi Criteria Analysis

Criteria	Option 1 - Existing Site - Do Nothing/Do Minimum		Option 2 - Upgrade Existing Site and extend irrigation site		Option 3 - Replace with a new plant onsite and extend irrigation		Option 4 - Relocate to a site for a new plant and land-based discharge scheme over the opposite site of river		Option 5 - Relocate to a site for a new plant and land-based discharge scheme in the vicinity of the golf course		Option 6 - Relocate to a site further south of Takapō		Option 7 - Relocate to the Tekapo Airport	
Investment objectives	Score		Score		Score		Score		Score		Score		Score	
Criteria: *Long term consentability,* *Long Term Growth Accommodation,* *Enhancing health and environmental outcomes,* *Affordability and Sustainability*	37	Lowest score option – associated with poor consentability and inadequate future proofing.	52	Low scores associated with concerns over long term consentability and ability to cater for long term growth	56	Low score associated concern over long term consentability and ability to cater for long term growth	79	One of the top scoring options	81	Highest score option - scores well against most criteria except on cost	54	Low score associated with concern over construction and ongoing access requirements through the Scientific Reserve	79	One of the top scoring options
Environmental/cultural/social factors	Score		Score		Score		Score		Score		Score		Score	
Criteria: *Impact on river and groundwater,* *Impact on adjacent land use,* *Cultural and community likely acceptance*	36	Lowest score option – low acceptance by iwi and community members expected due to no improvement and site location	40	Low scores associated with unsuitable as a long term option and small improvement in discharge quality	44	Low scores associated with unsuitable as a long term option	76	One of the top scoring options	76	One of the top scoring options	72	Good score reflect positive attributes with some concerns related to easement and access through Scientific Reserve	82	Highest score option - associated with further away from river and high value lands
Critical Success Factors	Score		Score		Score		Score		Score		Score		Score	
Criteria: *Resilience, Ability to stage/flexible to different growth scenarios,* *Constructability/ease of implementation and* *Risk Factors*	30	Multiple significant risks, unlikely to success	42	Low scores reflects limited chance of success Potential a stop-gap option in the interim.	44	Low score - associated with unsuitable for high growth scenario and seismic risk of pond embankments	90	Highest score – Good attributes with risks are known and mitigation identified	85	High score – a strong alternative to Option 4	65	Lower score – associated with risks/concerns around easement and construction in the Scientific Reserve	75	High score – another strong alternative to Option 4
Overall Score and Rank	34	7th	42	6th	50	5th	**82**	1st	**81**	2nd	64	4th	**78**	3rd
Carry forward for further analysis	No		No		No		**Yes**	Highest rank option - recommend to carry forward	**Yes**	High score option - good alternative or complementary option to Option 4	No		**Yes**	High score option – another good alternative to Option 4

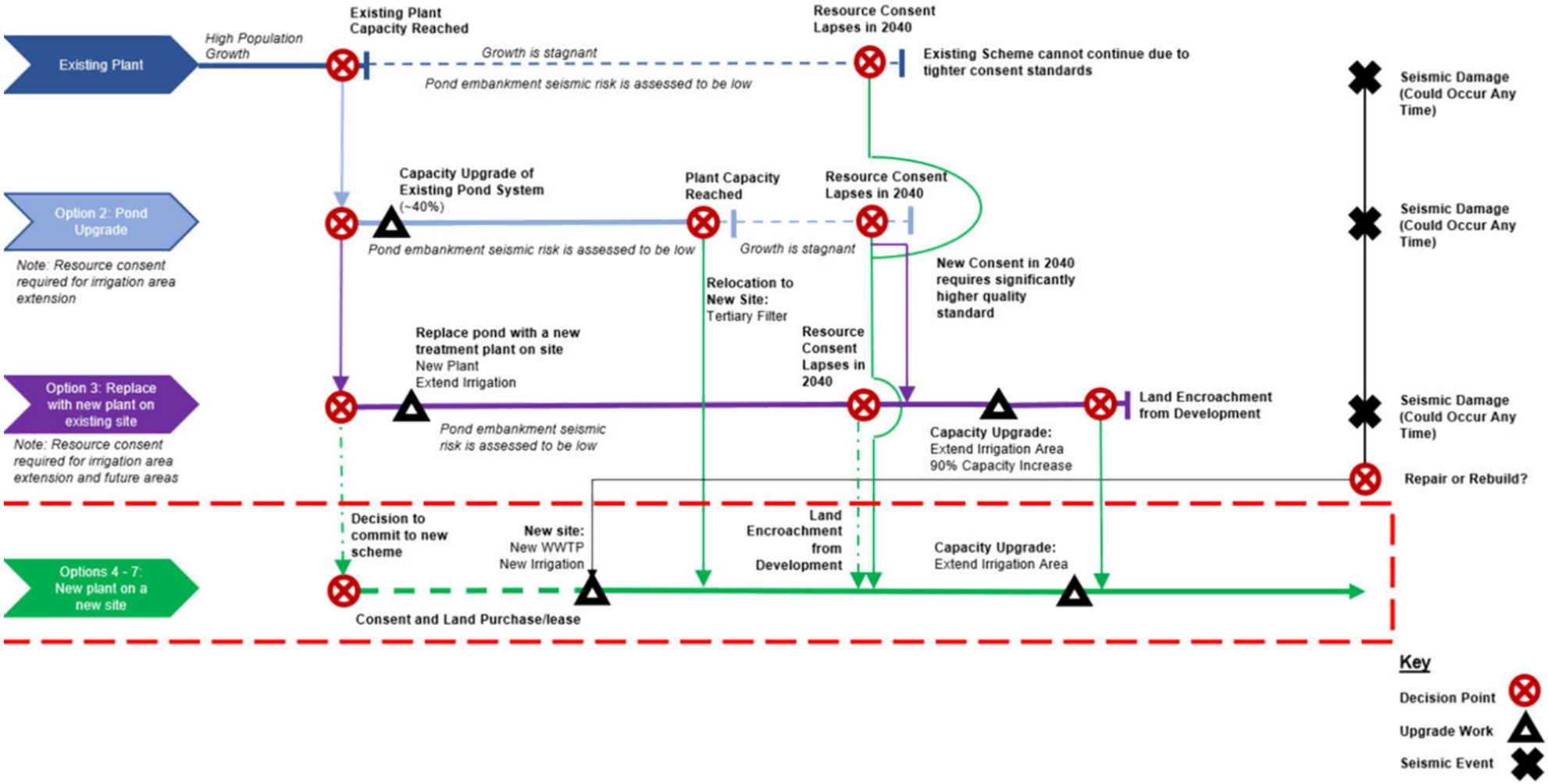
MCA Results

Option 4 (New WWTP at site over the river) has been identified as suitable for further investigation due to the following:

- Land is already owned by MDC
- New WWTP will be able to reliably achieve high quality effluent
- The upgrade can be staged according to population growth requirements
- The site is expected to be more culturally suitable for discharge of treated wastewater than the current site

Preliminary fieldwork at the MDC site was conducted in December 2021 to provide an initial understanding of the site's suitability

Adaptive Pathways Map



Field Assessment

Surface Water Quality Data

- Required for any future consent where the Tekapo River is a potential receptor
- Circumstantial evidence of potential current impact via seepage
- Complicated by Tekapo River 'unusual' flow regime

- Data collection over recent December / January period

Field Assessments

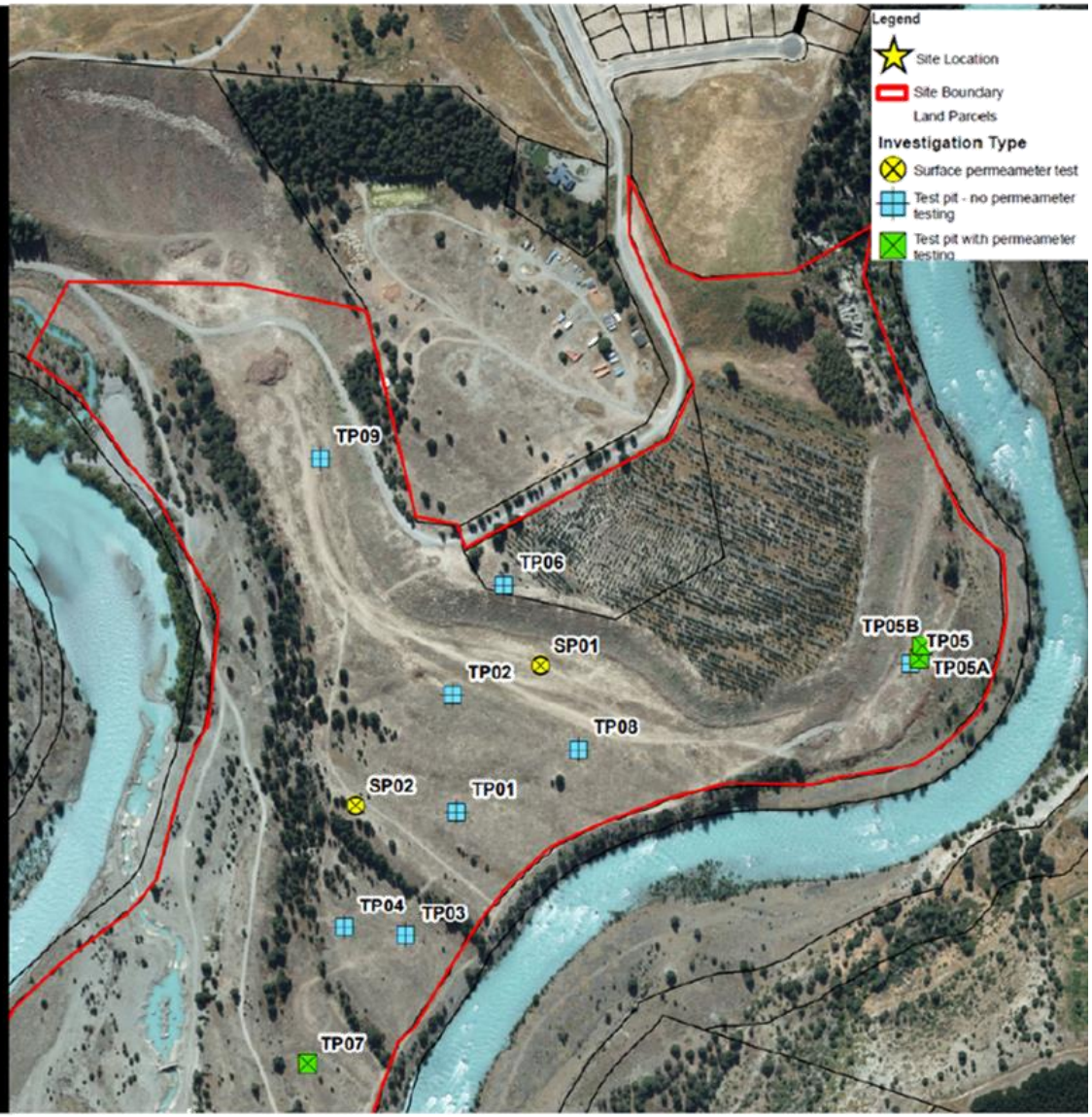
Test Pits and Infiltration Testing

- Undertaken in December 2021

Aim:

– Confirm the geology of the MDC owned land

– Confirm infiltration rates for discharge to land

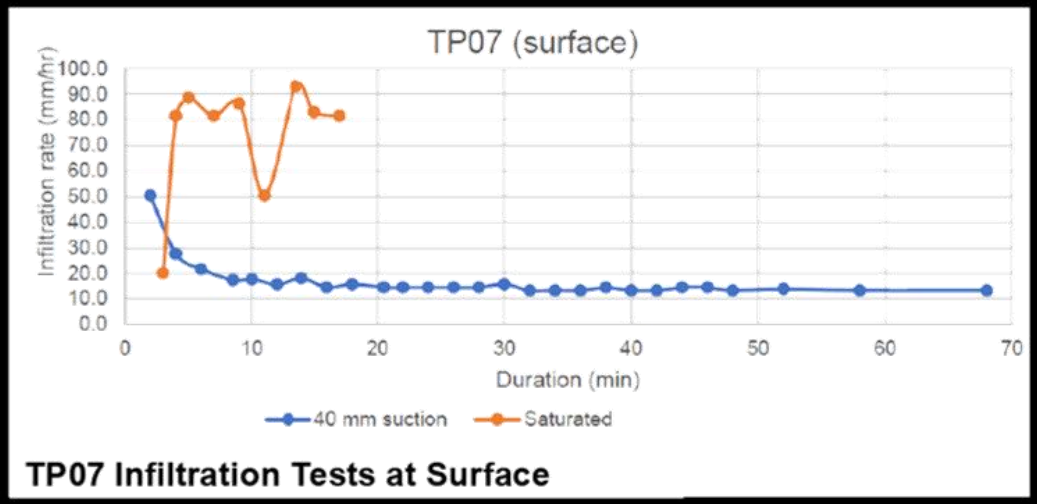


Field Assessment

Test Pits and Infiltration Testing Results

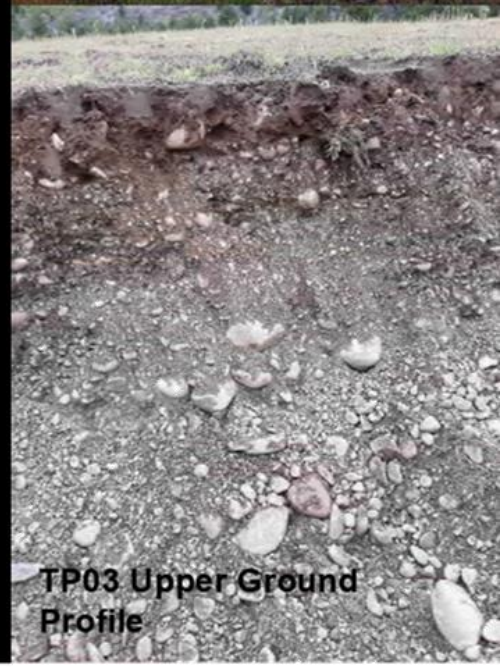
- Ground conditions were generally a thin sandy topsoil layer overlying sandy gravels, cobbles and boulders – **High Infiltration Rates**

- Three locations in the northern area of the site had glacial till at depths from 2.5 – 4 m below ground level – **Low Infiltration Rates**



TP07 Infiltration Tests at Surface

View of Main Terrace



TP03 Upper Ground Profile

WWTP Location Options

Locations 1 & 2

Advantages:

- Land already owned by MDC

Disadvantages:

- Significant land preparation required
- Lost irrigation area
- Near to stargazing site

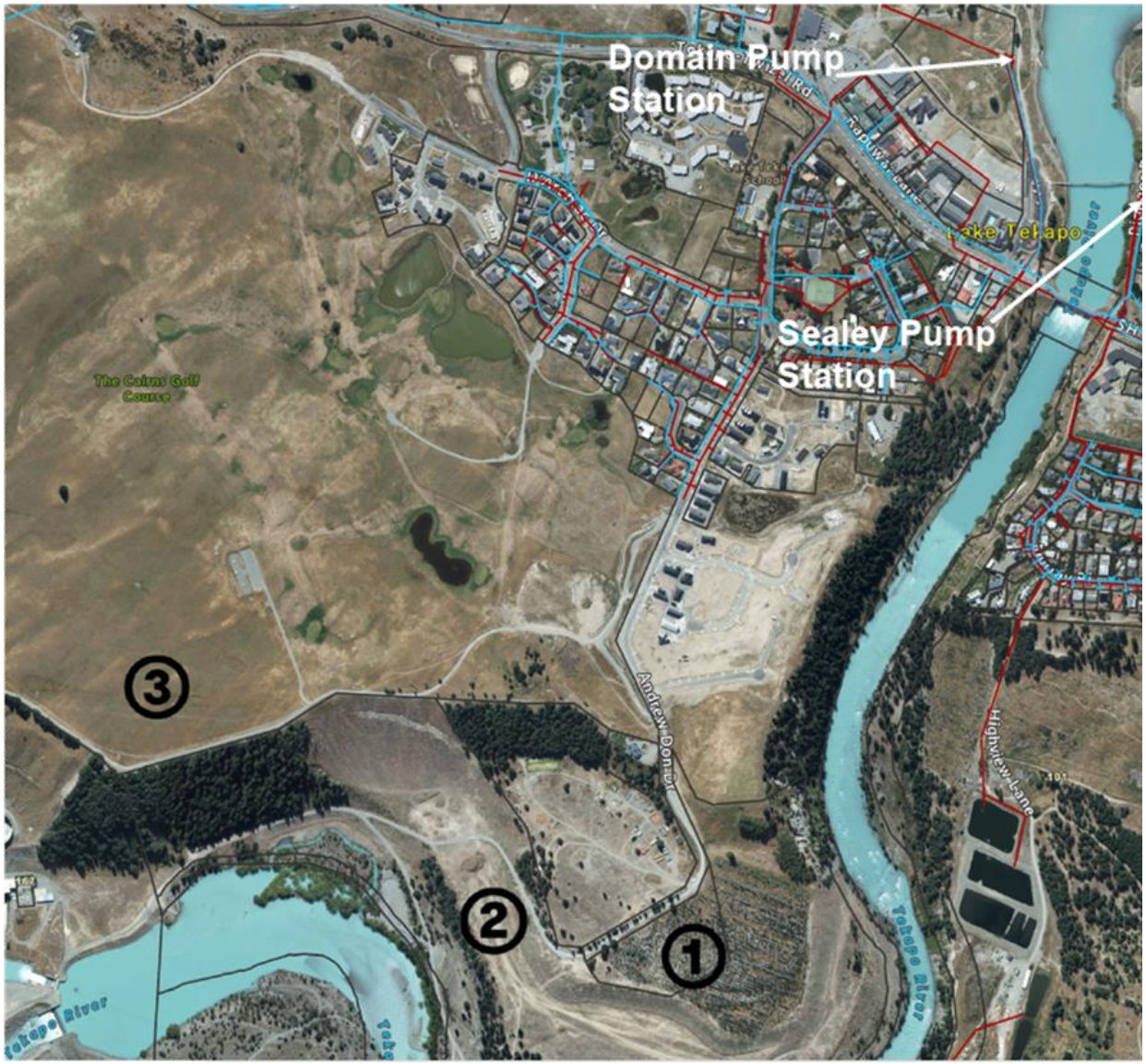
Location 3

Advantages:

- Further from residential areas
- Maximise irrigation area at MDC site
- Easier access for trucks

Disadvantages:

- Private land; purchase/lease will need to be negotiated



A New Treatment Plant

Description

A new treatment plant could be a Sequencing Batch Reactor (SBR) or Membrane Bioreactor (MBR). Both are proven to produce high quality effluent, and there are also other configurations.

What is SBR?

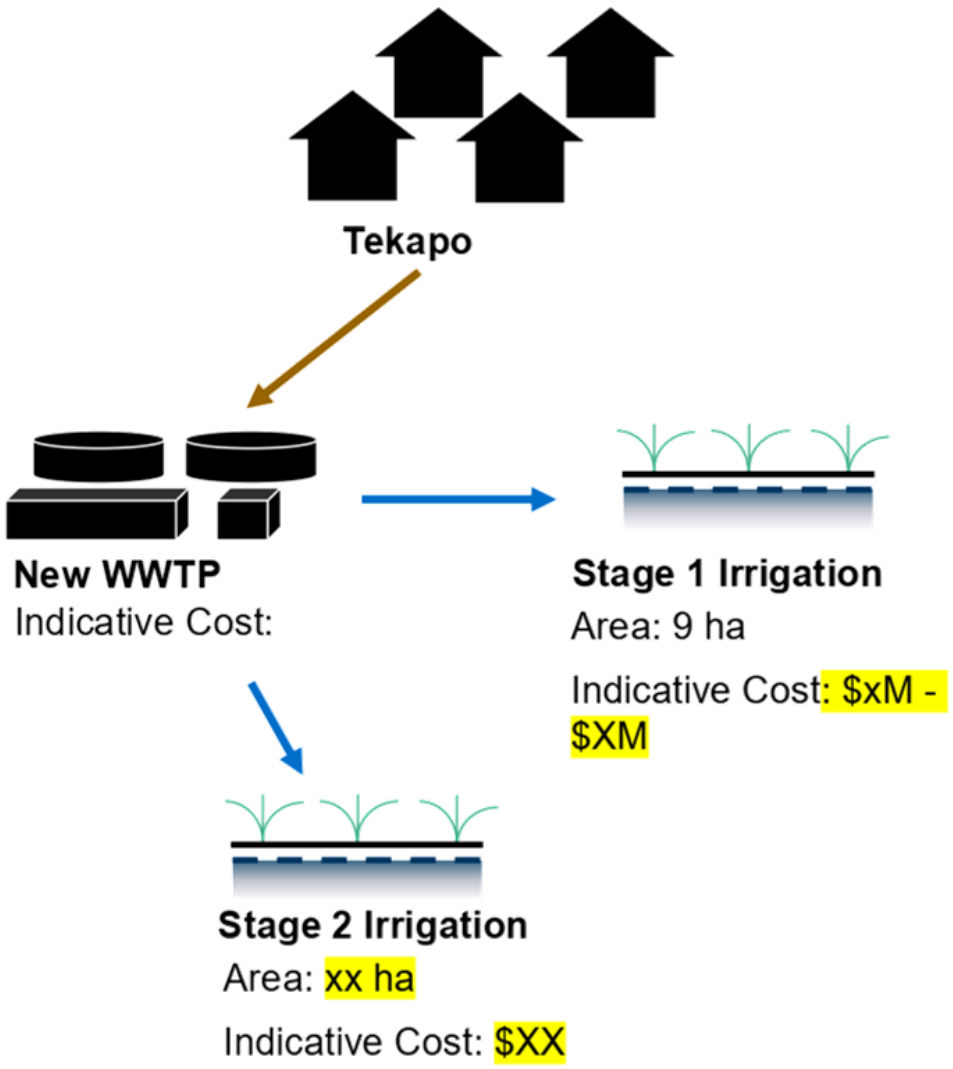
In SBR, the biological treatment, sedimentation and decanting of effluent all occur in the same tank. For a seasonal location like Takapō, one SBR tank in operation during normal flow conditions, two tanks operating during peak flow. This was practised in Thames Coromandel peninsula where summer population could be over 4 to 8x the permanent population.

What is MBR?

Membrane bioreactor (MBR) uses membrane filtration instead gravity separation, which makes the reactor tank more compact. MBRs are also used in seasonal locations where additional process flexibility is desired. Similar to SBR, part of the treatment tanks will be idle during winter months.

Concept

-Concept overview (storage 5,000 m3)
-Costing
-Required Areas (5-10 Ha current)



Next Steps

This Project:

- Feedback from today
- Feedback from other potentially affected parties
- Council meeting March 2022
- Submission of report on study detailing methodology, findings and recommendations

Future:

- Confirm potential of MDC owned land and/or additional irrigation areas:
  - Potential increased infiltration (>10 mm/day); Rapid Infiltration (>30 mm/day)
  - Confirmation of soil type / layers below 4-5 m bgl
  - Confirmation of groundwater depth and interconnectivity with Tekapo River
  - Leaching limit implications

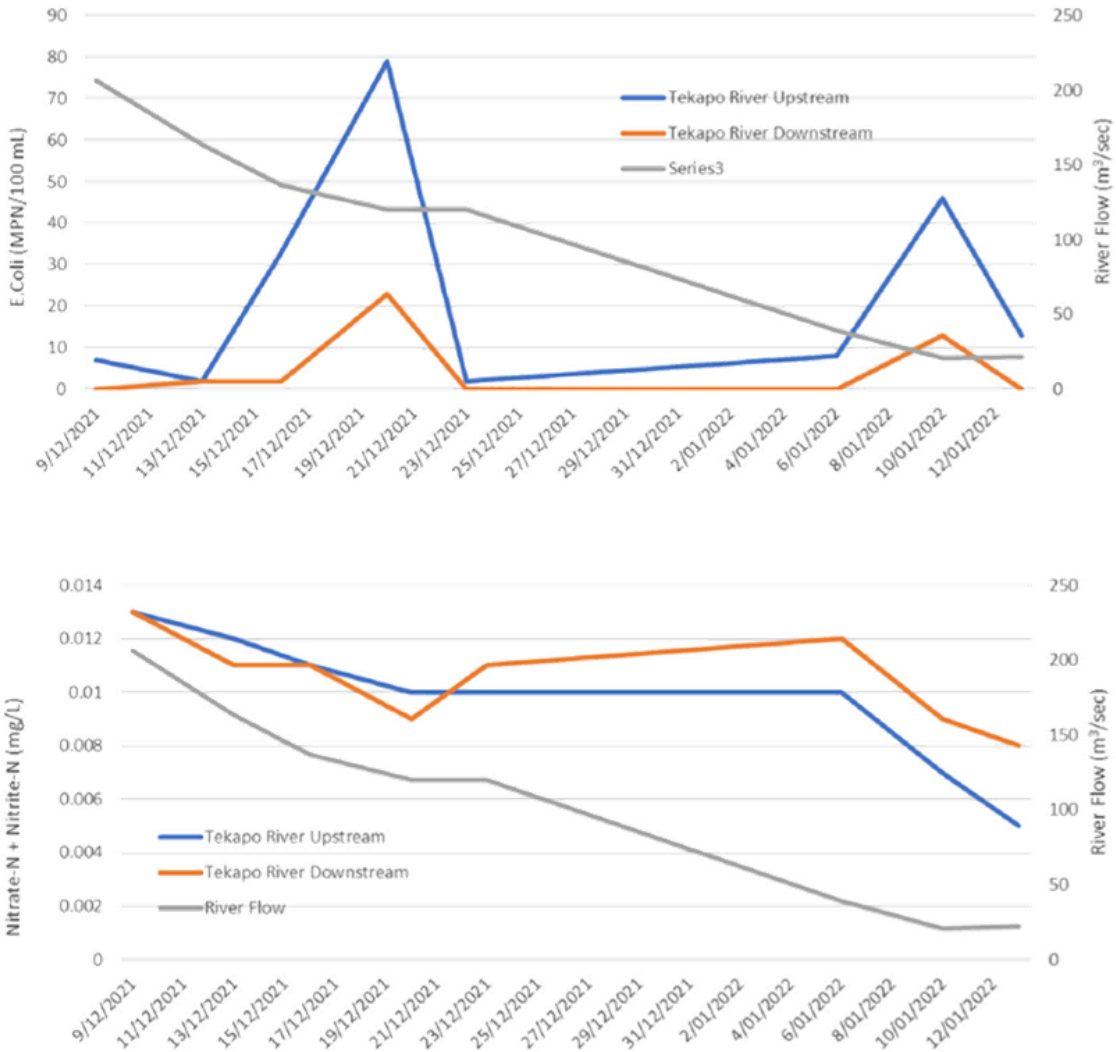
Questions / Discussion

Extra Slides

Field Assessment

Surface Water Quality Data

- Tekapo River upstream and downstream water quality was monitored over the 2021/22 summer holiday period
- No evidence of impact on Tekapo River from current WWTP during relatively high flow period (75% of flows are recorded as 0 m^3/sec)
- Potential system leakage in Tekapo area (not WWTP)



Conceptual Irrigation Water Balance

Discharge

Slow Rate Application (10 mm/day)

Estimated for Hydraulic Loading:

	Annual Loading (m^3)	Estimated Application Requirements (Ha)	Leaching Loss (kg/N/Ha)
Current	191,990	5	206
Future (+50%)	287,985	8	206
Future (+100%)	383,980	11	206

Estimated for Nitrogen Loading:

	Annual Loading (m^3)	Estimated Application Requirements (Ha)	Leaching Loss (kg/N/Ha)
Current	191,990	10	36
Future (+50%)	287,985	15	36
Future (+100%)	383,980	20	36

Usable MDC owned land ≈ 8-10 Ha

Potential N limiting loadings per Ha (dependent on effect of discharge on g/water – s/water)

Leaching potentially reduced by baleage / volatisation

Based on TN discharge 10 mg/L; conservative leaching calculations