Presentation to ATWIS Hearing Panel

Gaiety Hall

11 February 2025

Presented by:
Jan Cook
Suky Thompson
Brent Martin
for Friends of Banks Peninsula Inc

FRIENDS of Banks Peninsula Inc.

Akaroa's Community Environment Society since 1990

Friends position

- We oppose ATWIS
- We ask the Panel to decline the application
- Our concerns and opposition are supported by other Akaroa organisations and we believe by the majority of the community

Topics

- Background to current Application
- Application as it stands
- Receiving Environment
- Issues with the Proposal including Expert Evidence
- Assessment of Effects
- Consideration of Alternatives
- Consideration of Positive Effects
- Conclusion
- Relief Sought

Section 3

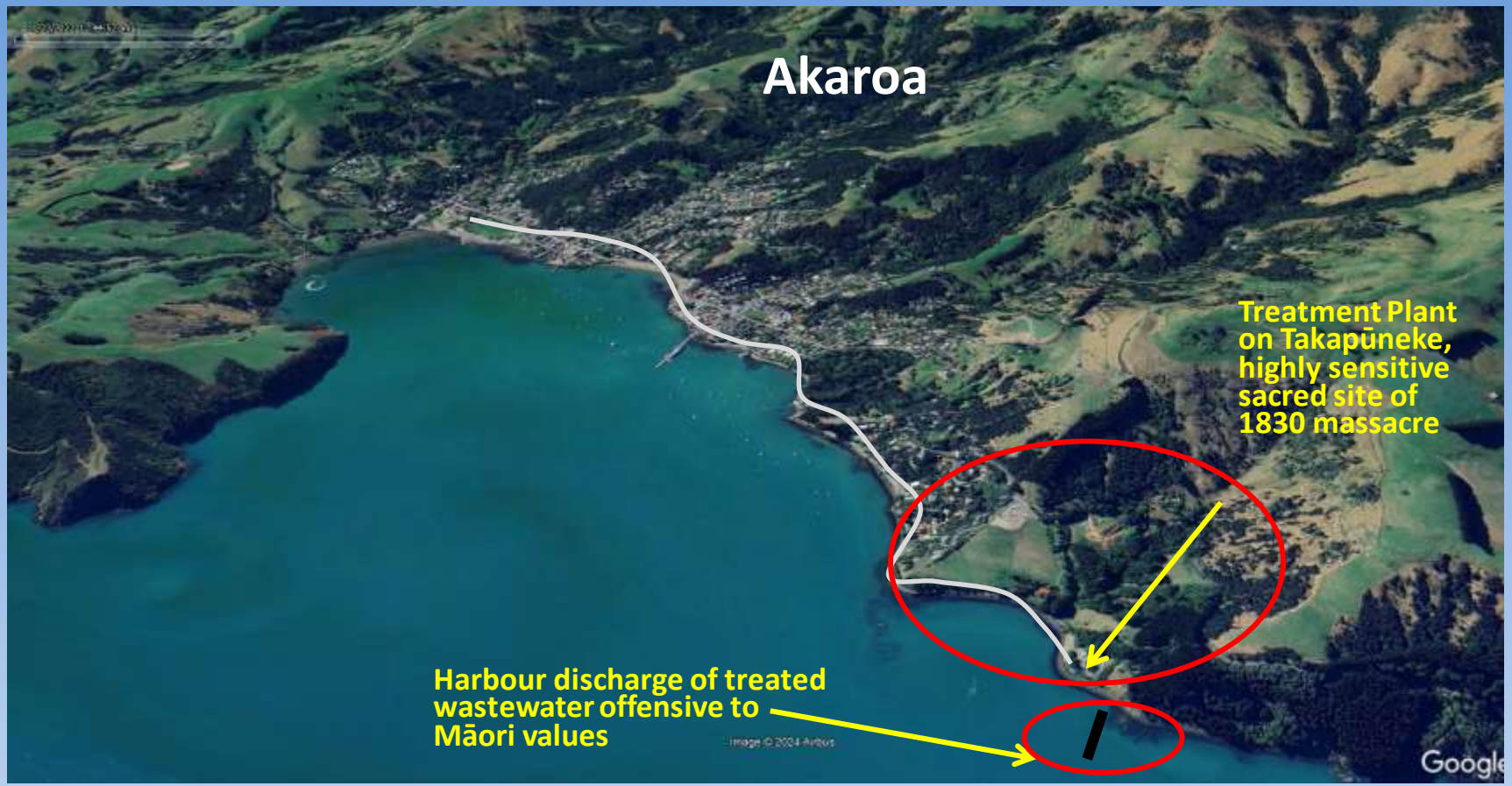
Evolution of Akaroa Wastewater proposal since 2007

Akaroa's current simple system

FRIENDS of Banks Peninsula Inc.

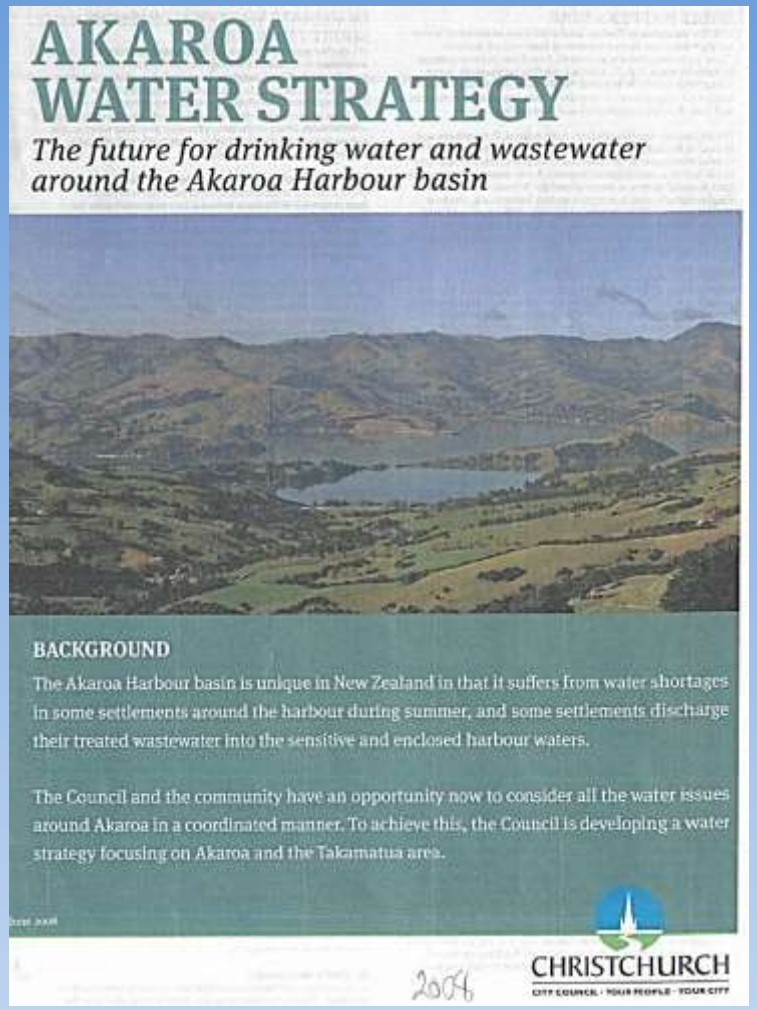
Akaroa's Community Environment Society since 1990

Ngāi Tahu cultural issues drive change



From a technical perspective the treatment plant is 1km from the town centre and at normal pumping heads and monitoring show there is not a problem with water quality around the outfall.

2007 Consent conditions



AKAROA WATER STRATEGY

The future for drinking water and wastewater around the Akaroa Harbour basin

BACKGROUND

The Akaroa Harbour basin is unique in New Zealand in that it suffers from water shortages in some settlements around the harbour during summer, and some settlements discharge their treated wastewater into the sensitive and enclosed harbour waters.

The Council and the community have an opportunity now to consider all the water issues around Akaroa in a coordinated manner. To achieve this, the Council is developing a water strategy focusing on Akaroa and the Takamatua area.

2004

CHRISTCHURCH

Takapuneke near Green Point. This short term consent (five years) has been sought to allow the Council time to develop an integrated water strategy, based on the best options for providing water supply and wastewater services in a holistic, sustainable and affordable manner that has community support.

LONGER TERM WASTEWATER OPTIONS

The feasible longer term options include discharge of an improved standard of wastewater to the harbour; land application by irrigating to a closed area such as a forestry block or a private property; or reuse by the community for non-potable purposes such as toilet flushing. Combinations of some of these options are also feasible. A long outfall pipe under the harbour past the heads may also be technically feasible, this has not yet been investigated.

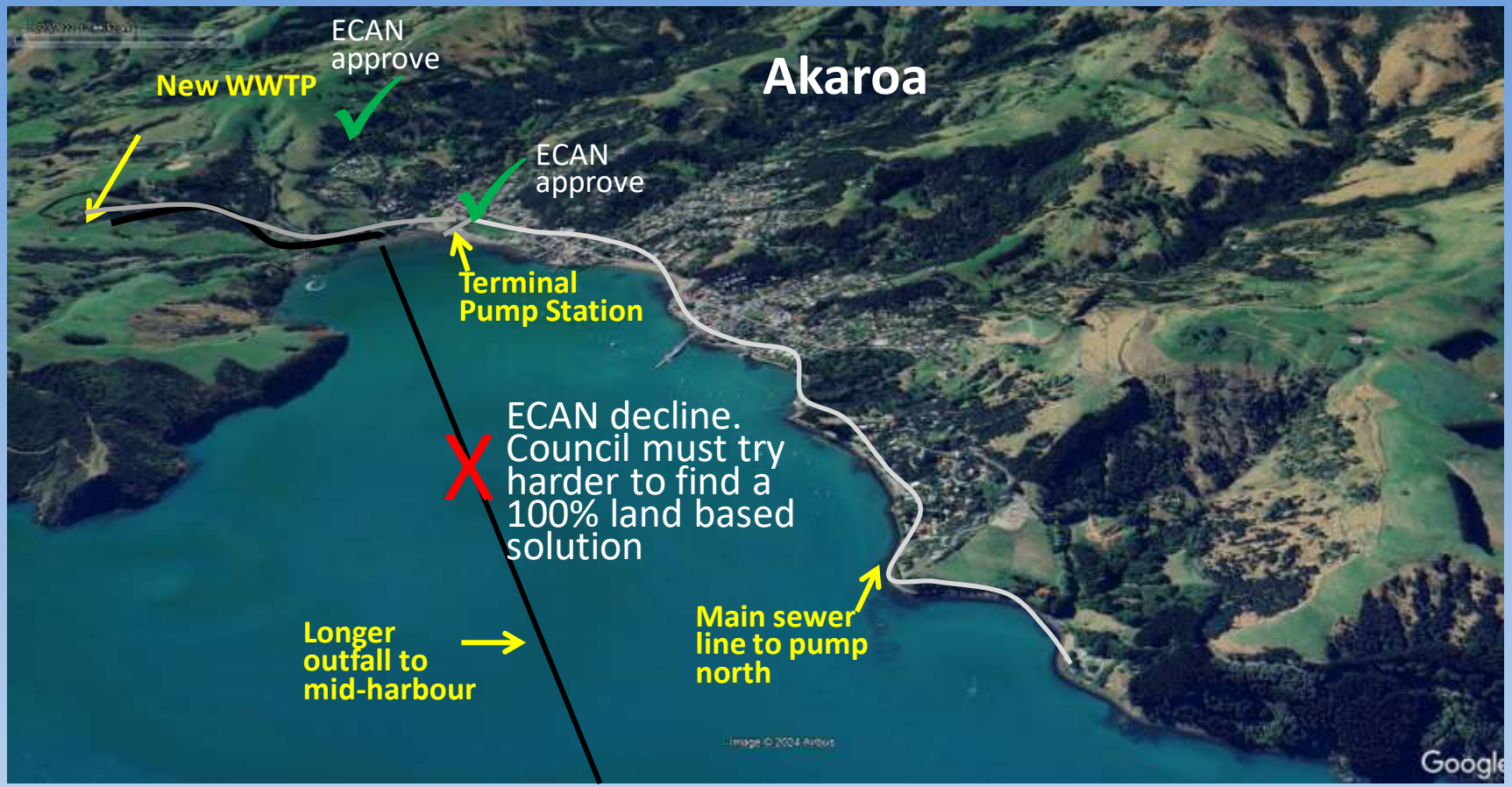
Early studies

- 2008 MWH
  - Consider options for moving plant
  - Site area required 2,500m^2-3,000m^2.
  - Conduct a desktop costing for an ocean outfall
- 2010 - Harrison Grierson, EcoEng, Geotech Consulting investigated land based irrigation
  - Geotech Consulting - *Landslides can and do occur most winters, but a series of wet winters that steadily build groundwater levels is the pre-requisite to widespread movement*
  - EcoEng - Year round irrigation considered infeasible. Harbour discharge needed during wet weather or winters even with large storage volume
  - Harrison Grierson report the flow meter needs calibrating

First Working Party recommendation

- Friends of Banks Peninsula represented on the first Working Party
- Turangi visit critical juncture
  - Group experienced quality of membrane filtration
- Working Party concludes in 2011 recommending:
  - Treatment plant south of current site
  - High level of treatment
  - Mid harbour outfall with cultural pre-treatment
  - Outfall could be extended to heads if needed
  - Land trials to commence
  - Seen as a pragmatic solution
- Rūnanga do not support
- CCC resolved to proceed with
  - Mid-harbour outfall with measures to address cultural concerns,
  - To look for a different site for the treatment plant
- Eventually purchased current site north of Akaroa
  - Tightly constrained site, smaller than MWH recommended

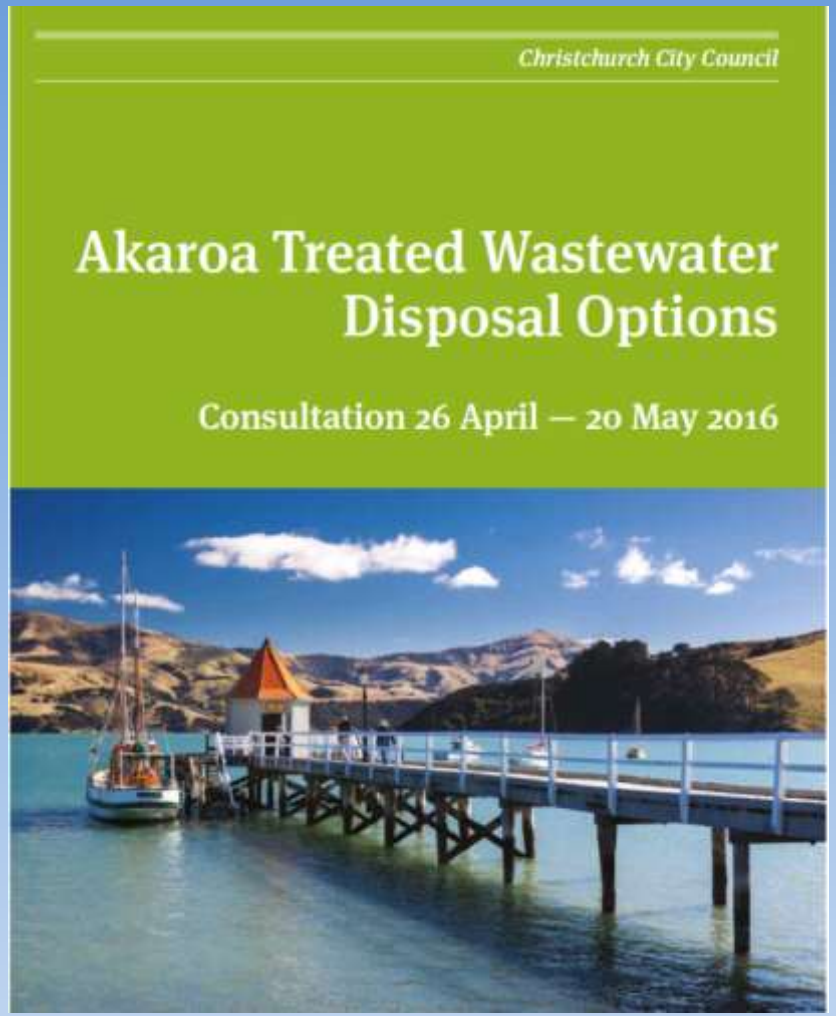
2015 partial solution approved



2015 solution did not include cultural treatment. No reason for this omission stated.

2016 consultation

- All options in Takamatua
- Include coastal infiltration after passing through wetland
- No public support for coastal infiltration
- Ngāi Tahu only support irrigation option
- Submitters raise land stability issues
- **Consultation withdrawn** after geotechnical issues found on irrigation sites



Search for land widened

- Friends of Banks Peninsula becomes involved again at community request
- Community Strategy
  - Takes a positive approach to finding a solution
  - Notes wastewater flow figures do not match Akaroa's weekend and summer peak patterns and suspects I&I
- Second Working party set up
- Technical experts group meets in parallel and issues a joint statement after 3 meetings
  - Friends of Banks Peninsula engage Andrew Dakers, Eco Eng to participate in this group

Long Term Acceptance Rates

- Technical Experts state
  - **A particular aspect that requires checking is the Long Term Acceptance Rate (LTAR) of wastewater within the soil.**
  - **LTAR is the terminal rate at which treated wastewater moves vertically downwards through sub-soils after a period of time (which could be months, or even years) once a stable soil ecology (usually referred to as biozone) has established in the soil due to residual wastewater components.**
  - **If the rate at which wastewater is applied to the land is greater than the LTAR and the evapotranspiration rate, then there is a high risk of the upper soils becoming saturated and possibly resulting in surface ponding and runoff.**
  - **Clearly rainfall events will also have an impact on these risks.**
  - **LTAR values depend not only on the quality of the treated effluent but also on soil texture, structure and soil profile anomalies such as less permeable soil layers (or "pans")**

Reference: Technical Experts Joint statement 2, 16/2/17

Land selection based on slope

- Slope criteria maximum of 19° rules out steeper land even if very low irrigation rates used
- Mr Offer confirms this in his recent evidence.

Land Stability Selection Criteria

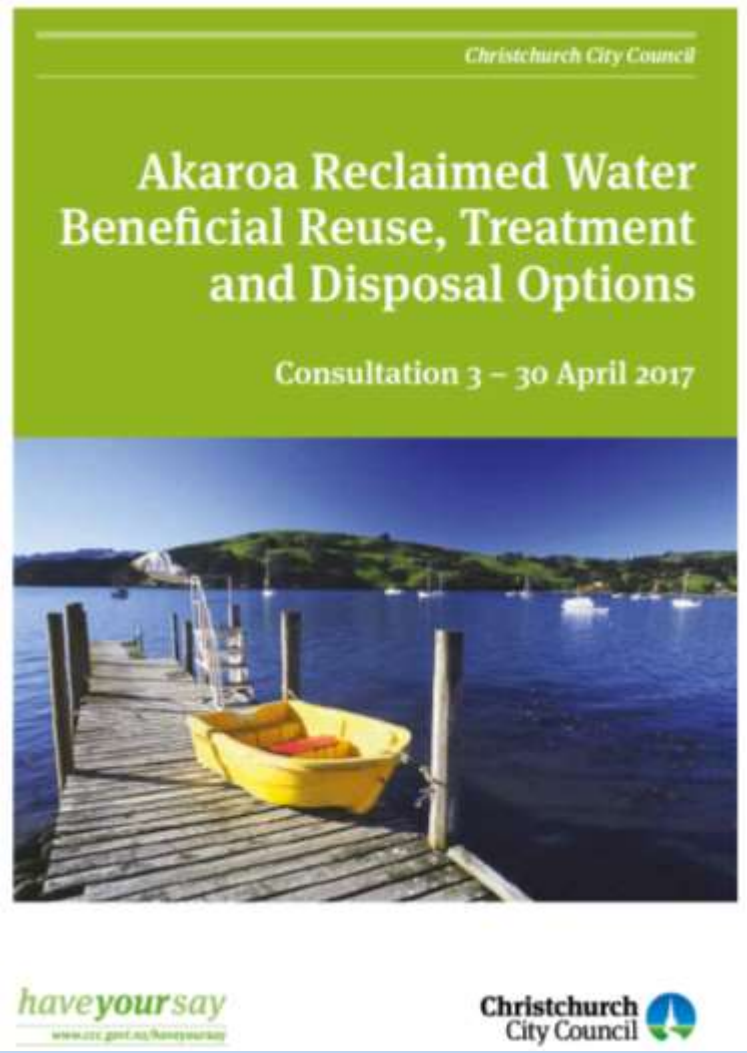
Selection Aspect	Criteria Adopted
Land Stability	- Less than 15 to 19 degrees and downslope to coastline same grade or less - No identified instability below - Account for downslope residences, infrastructure and runout distance - Site aspect ratio (width to length)
Historical Instability Zones	Tonkin & Taylor 2008 erosion zones excluded

Christchurch City Council – pdp – CH2M beca

Reference: Applicant's Evidence, Offer, Cl 3.33, p10

2017 consultation

- Dr Martin (FBPI submission) compares drinking water flows with wastewater flows
- Concludes garden watering could use all the WW flows
- **Consultation withdrawn again**



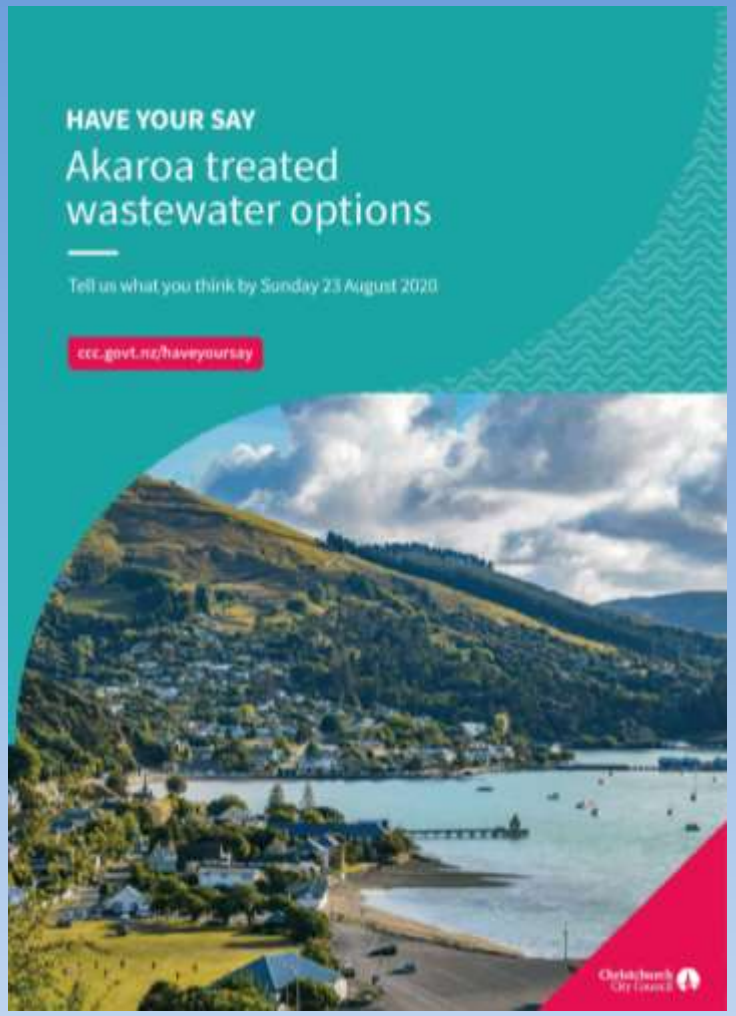
Faulty Flow Meter

- FPBI submission leads to discovery that the single meter measuring Akaroa wastewater flows is faulty
  - No idea of when it failed, and no historic data from the previous Banks Peninsula Council
  - All work to date had been on invalid data
- Flow meter replaced mid-2017
  - Hence only a very short data set measuring WW flow volume
- Understanding volume is critical to sizing fixed capacity land based system

2020 design– reworked with new data

- WW volume double previously thought
- Necessitates purchase of extra land opposite WWTP site for raw wastewater storage
- Treated storage volume now prohibitive
  - overflow to Childrens Bay stream added to bring down storage in the worst case years
- Irrigation rates determined by PDP after 2016/17 geotech work
  - stated as below LTAR
- Working Party not given information on
  - Wastewater flow modelling
  - LTAR

2020 consultation



- Options
  - Inner Bays option
  - Pompeys Pillar – large farm on outer coast
  - Goughs Bay– large farm on outer coast
  - Harbour outfall via purple pipe
- Working party Joint Statement
  - Restricted to commenting on land options only
  - did not favour any of the land options due to lack of re-use
- Consultation document stated Inner Bays option favoured by CCC staff and Ngāi Tahu

I&I emerges as key issue

- Just prior to consultation Beca technical report reveals 60% of flows are I&I

- 2020 Consultation submissions
  - Submitters overwhelmingly requested I&I reduced
  - Majority of submitters opposed land irrigation
  - Ngāi Tahu parties support Inner Bays with I&I reduction
  - FBPI propose a reduce, recycle and reuse scheme
    - Engaged expert advice from Tektus Consulting - their extensive report has been supplied to the Panel
    - Submission endorsed by 324 people

CCC 2020 decision/resultant action

- Proceed with Inner Bays ✓
- Recommendation to reduce I&I to 20% in Council network and property owners to repair pipes ☒
- Bring in water metering and charging to reduce water use ☒
- Regularly report on repairs and conservation measures to community ☒
- Set up a community Reference Group to ensure community concerns are listened to and where possible addressed ✓ ☒
  - Community group set up but terms of reference restrict discussion points
- Requests staff to investigate wetland sites to reduce size of ponds and improve biodiversity ☒
- Size of storage reduced with water conservation and I&I to reduction ✓ ☒
  - Some I&I reduction work, but reducing to 20% target never adopted by staff
  - Storage has not reduced
- Local employment for planting and maintenance of trees ☒
- Approves irrigating public parks and public toilets as part of scheme ✓ ☒
  - Jubilee Park irrigation but not toilets

Significant events after decision

- Problems at Akaroa drinking water plant lead to
  - Discovery plant discharges high volumes of retentate into the wastewater network
  - Council gains experience with large storage tanks
- Decision to use storage tanks instead of open dams
  - removes rainwater incursion
- Inner Bays land purchased, but not Takamatua irrigation area
- Limited I&I reduction
  - Not the $6 million funding requested by community

2023 Application lodged

2020 proposal approved by CCC	2023 application
40ha irrigable land- Upper Robinsons, Hammond, Takamatua	35.7ha land – Upper Robinsons and Hammond
19,500m^3 storage	12,000m^3 storage
Overflow mechanism from wetland	100% land based
I&I reduced to 20%	I&I reduced by 20%
Upper areas identified as too wet by previous land owner not included	Upper areas now included

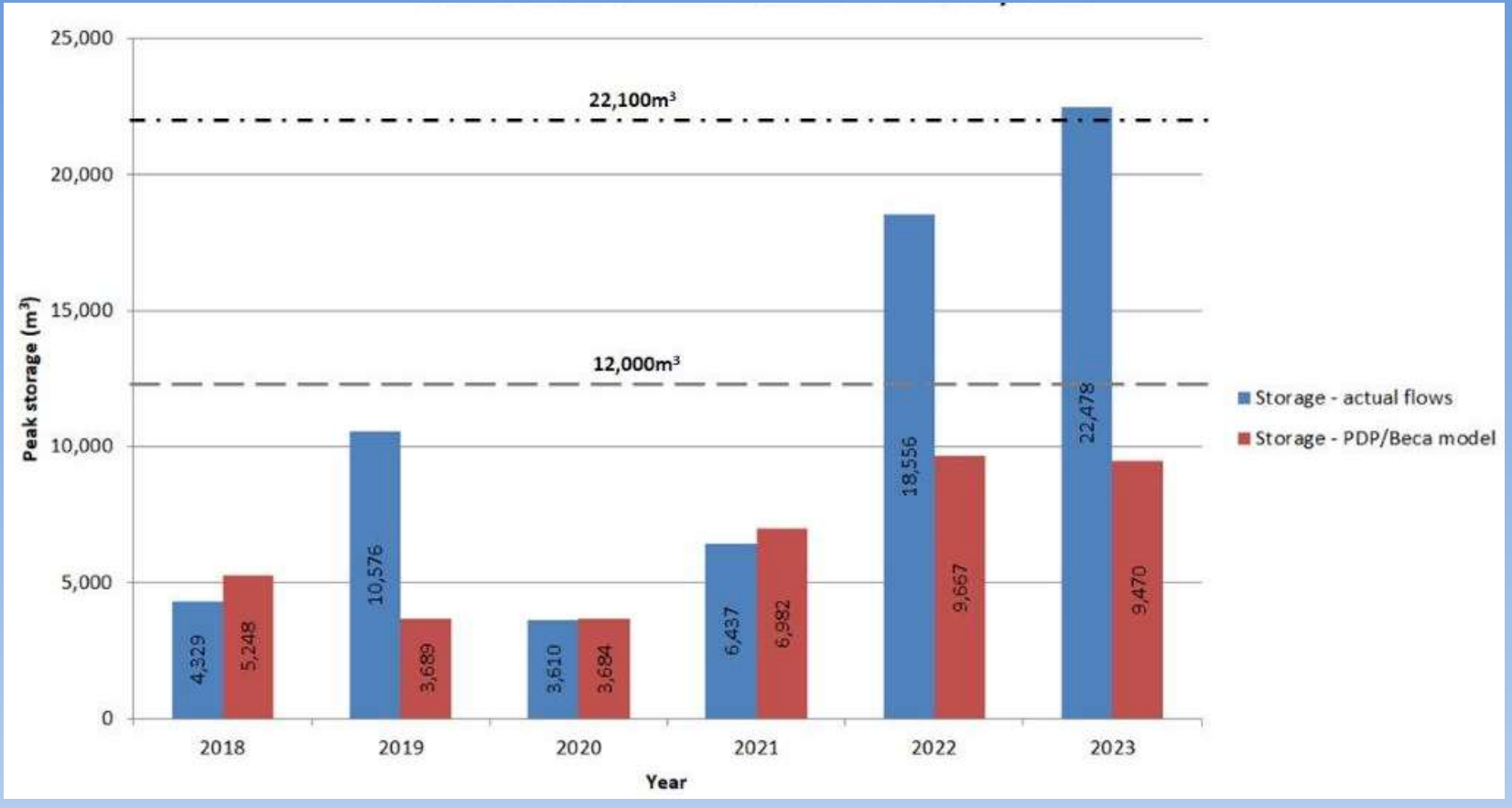
FBPI wonder how can this work?

- First discover irrigation rates increased by 12%
  - Not obvious as the original rates still used in Appendix F/U – the storage modelling calculations
  - Rate increased by Aqualinc to make up for reduced land size
  - Still stated as below LTAR but no information as to what LTAR is
- Little information in AEE on what I&I reduction has been achieved
- Not enough to explain the reduction in storage and lack of overflow

Dr. Martin examines modelling

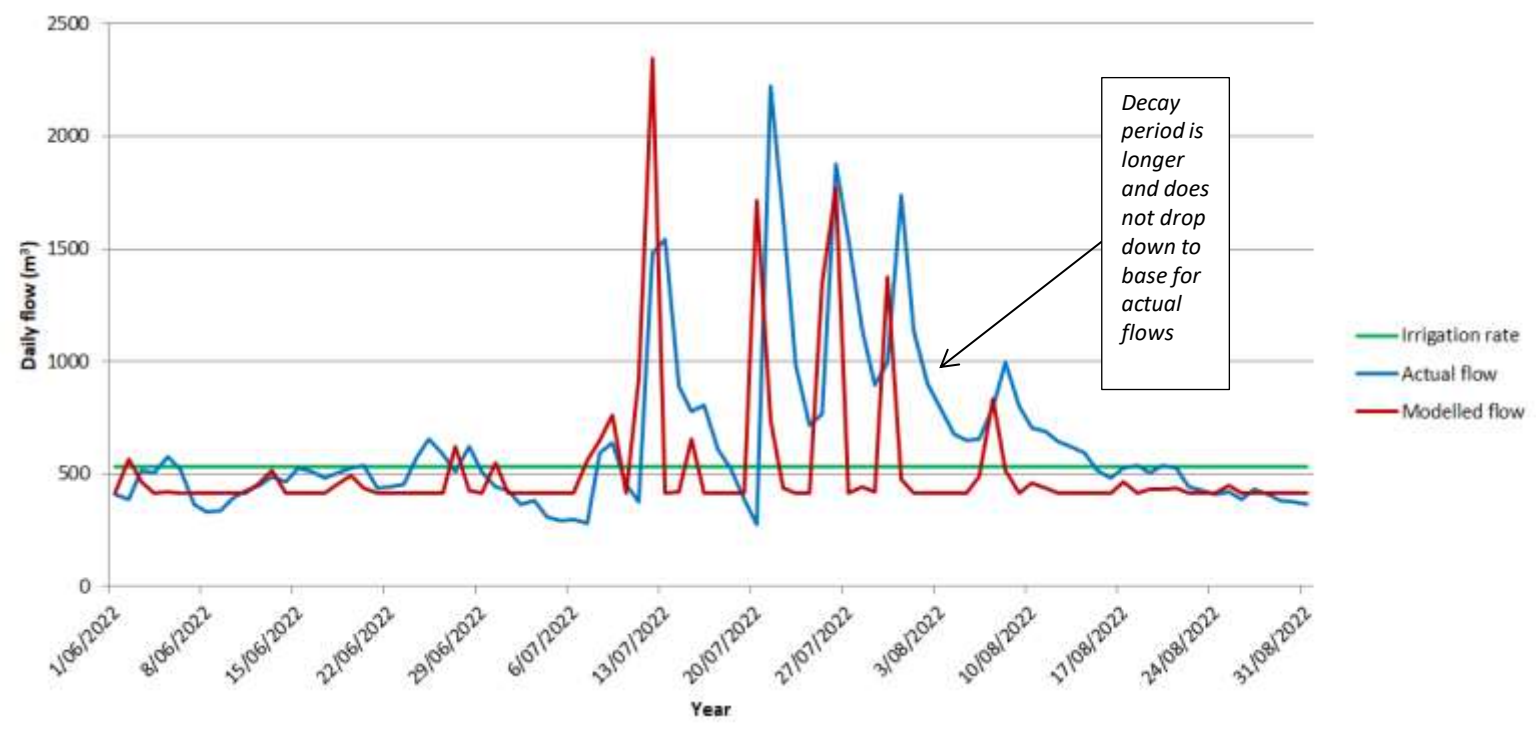
- Application was based on a flow model developed based on data from mid 2017-2021
- Beca/PDP calculate the storage requirement based on the modelled flows
- Dr. Martin replicated their modelling using the information in the AEE Appendix U Figure 6 to validate his accuracy
- Applied his storage model using actual flow data from mid-2017 to mid-2023 – the full data set now available
  - 2017 to 2021 had been dry years
  - 2022 and 2023 were wet years

Reveals storage undersized



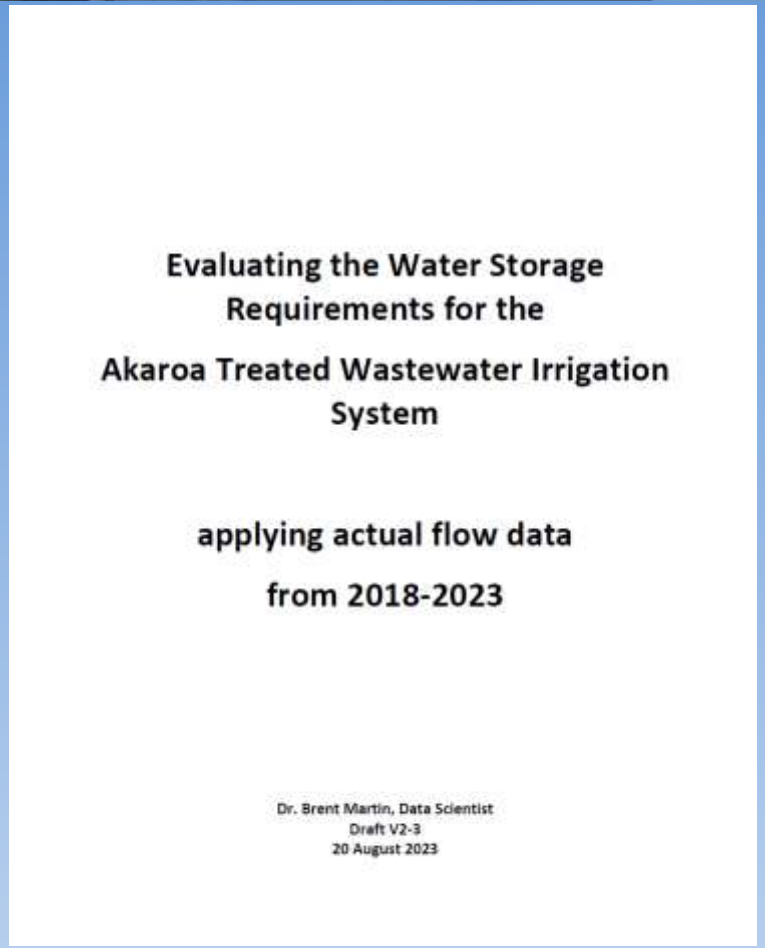
"There is sufficient evidence to warrant the Council re-evaluating its storage size modelling". Dr Martin Evaluation storage report

Actual vs modelled flows



- Dr Martin identifies source of error on this graph
- Beca/PDP modelled flows do not adequately capture the long period it takes for soil to drain in prolonged wet weather
- Elevated I&I during this period but has not been accounted for

Reaction from CCC


Evaluating the Water Storage Requirements for the

Akaroa Treated Wastewater Irrigation System

applying actual flow data

from 2018-2023

Dr. Brent Martin, Data Scientist
Draft V2-3
20 August 2023

- Dr Martin's report sent to CCC
  - *Evaluating the Water Storage Requirements for the Akaroa Treated Wastewater Irrigation System applying actual flow data from 2018-2023*
  - Supplied with our submission
- CCC response
  - WWTP outflow flow meter used in the report was faulty
  - Cannot be relied on back to 2021
- Data from this meter had been
  - published on the CCC website
  - Supplied to CRC to report wastewater volumes as required by the conditions of the discharge consent for the Akaroa WWTP
- CCC therefore supplied data from meter at PS616

Dr Martin's report addendum

Addendum to

Evaluating Water Storage Requirements for Akaroa Treated Wastewater Irrigation System Using Actual Flow Data from 2018-2023

29 November 2023
Dr. Brent Martin
Data Scientist

1 Actual flows based on Inflow rather than Outflow meter

On 13 November 2023 Christchurch City Council informed Dr. Martin that the Akaroa Wastewater outflow meter he had used in his work to evaluate the water storage requirements for the Akaroa Treated Wastewater Irrigation System had malfunctioned, and supplied data from the inflow meter PS616 to be used instead from 1 January 2022 onward.

Dr. Martin therefore re-worked his analysis to make use of the new data, and this addendum presents the key findings from his re-analysis.

While there are interesting differences between the inflow meter and outflow meter data, the conclusion of the original evaluation that the storage has been undersized stands, exceeding 20,000m^3 in 2023, and coming very close to that in 2022.

The Inflow data also reveals that the 3,562 m^3per day maximum capacity of the proposed network, which had not been reached with the previous Outflow data, would have been exceeded in July 2023 leading to raw as well as treated wastewater overflows to the harbour.

2 Storage requirement in 2022 using Inflow meter data

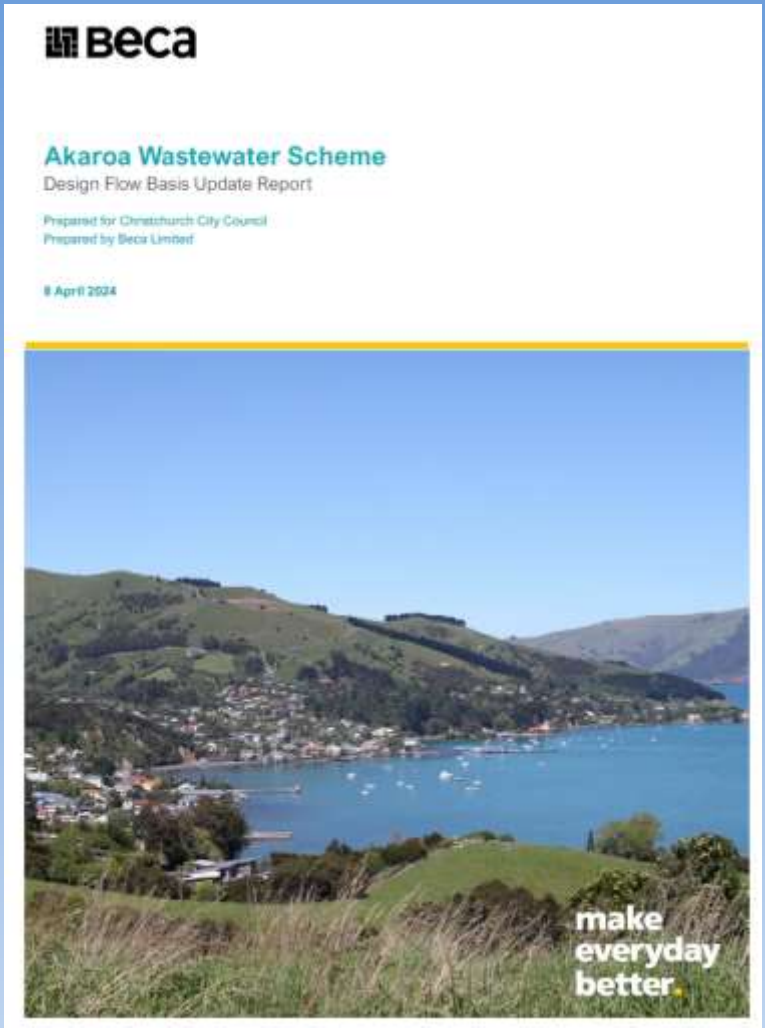
For 2022, the storage requirements based on the Inflow data increase slightly from those previously calculated using the Outflow data from 18,558m^3 to 19,629m^3. The chart below compares the old and new storage requirements.

As with the original analysis, the storage has been calculated using the raw data, the data adjusted down for the 75% drinking water retentate reduction that the system sizing is predicated on but the Council has yet to achieve and then for the 20% I&I reduction on which the system is also predicated. Although the Council completed I&I work in 2022, whether any substantive reduction in I&I has been achieved from these works is yet to be determined. The green line including both reductions is therefore the best possible case, it deducts the full 20% from the actual flow data. If the Council determines it has already achieved some or all of this 20% reduction through its work, then applying an additional 20% reduction to the data underestimates the flows.

As with the previous analysis, no population growth over the life of the scheme is assumed, which would increase flows and storage further.

- Modelling repeated with PS616 data
  - Did not change treated storage volume conclusions
- Revealed a new problem with raw WW volumes
  - the Terminal Pump Station capacity limit stated in the Application meant it would not be able to deliver very high flows to the new WWTP currently delivered to the existing WWTP
- Addendum also supplied with our submission

Akaroa Design Flow Basis Update report



- BECA/PDP rework WW flow model to include drainage tail
- Confirms Dr. Martin's findings
- Storage increased from 12,000m^3 to 20,000m^3
- With 20,000m^3 of storage, treated overflows now expected in 11-21 of 50 years modelled.
- TPS pump needs to be increased to cope with incoming flows
  - CCC stipulate a 1 in 5 ARI
  - Pump needs to increase from 65L/s to 86L/s to achieve this

Separate Duvauchelle proposal collapses

- Proposal to retain separate Duvauchelle treatment plant and irrigate Golf Course scrapped due to land instability above the plant
- 4,000m^3 storage added to Robinsons Bay
- Treated overflows acknowledged and CRC informed discharge consent would be bundled with Duvauchelle application


Duvauchelle Treatment Plant


Golf Course at Duvauchelle

I&I situation 2024

- I&I determines sizing of ATWIS
  - TPS pump capacity and untreated overflows
  - WWTP raw buffer
  - Selection of treatment plant type to handle high variability volume
  - Treated storage requirement and overflows
  - Irrigation land area
- Current Akaroa harbour outfall consent CRC204086 requires I&I to be reduced:
  - below 50% by October 2022
  - below 40% by October 2025

Consent formula to calculate I&I

The inflow and infiltration percentage shall be determined as follows:

$$\% \text{ Inflow and Infiltration Flows} = 100 \times \frac{\text{Inflow and Infiltration Flows}}{\text{WWTP Flows}}$$

Where:

- **Inflow and Infiltration Flows = WWTP Flow – Legitimate Wastewater Flow.**
  - The WWTP Flow shall be as measured at the WWTP outfall flowmeter.
- **Legitimate Wastewater Flow = Commercial Flow + Residential Flow + Water Treatment Plant Backflush Flow.**
  - The Commercial Flow shall be measured as the boundary water meter flow for commercial properties connected to the Akaroa wastewater network. Where the meter read dates do not align with the period of assessment, the average daily flows from the most recent meter reads must be used.
  - The Residential Flow shall be calculated as the permanent Akaroa population (refer to Statistics New Zealand for the most recent census data) multiplied by a factor of 240 litres per person per day.
  - The Water Treatment Plant Backflush Flow shall be calculated as 10% of the total water abstracted from streams and bores to supply the water treatment plant until permanent metering is commissioned at which point the flowmeter data shall be used.

Annual Averages presented by Applicant

CCC Financial Year (Jul – Jun)	Akaroa Network Flow (m^3/year)	Akaroa I&I (% of total WW flow)	Akaroa weather station (mm/year)
FY18	231,888	42%	1,366
FY19	227,824	21%	1,225
FY20	178,449	7%	1,099
FY21	147,202	10%	1,041
FY22	163,951	10%	1,030
FY23	234,172	33%	1,184
FY24	170,857	24%	1,149

Table 4 Annual I&I rates (% basis) for the Akaroa network.

- Annual averages appear to meet consent requirements
  - consent does not specify annual averages are to be reported
  - annual averages mask the problem periods – winter months
- Wet winters are when I&I is critical to system sizing
  - Mr Hills stated that in July 2022 and July 2023 the I&I monthly averages were 69% and 72% respectively.

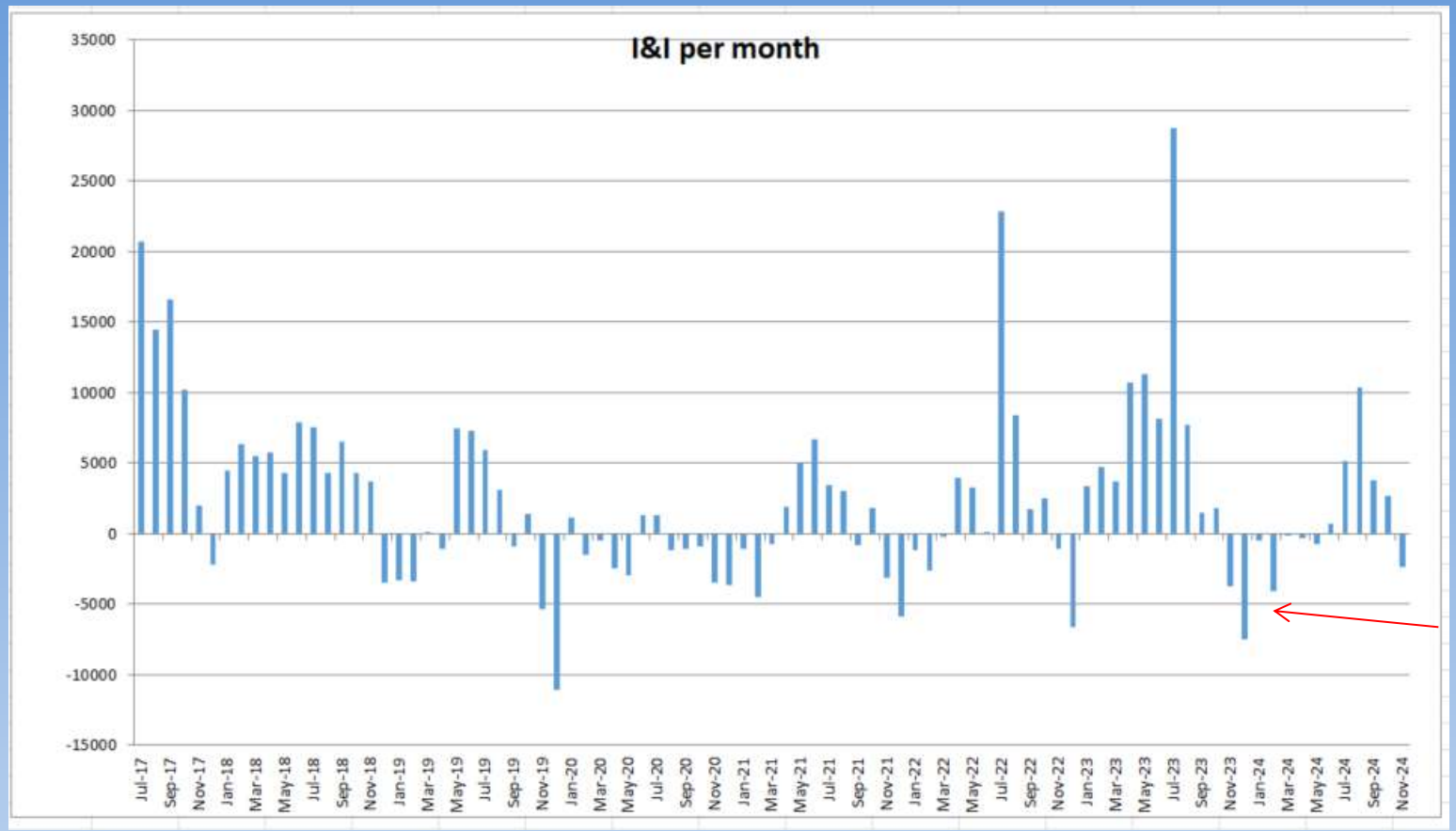
Reference: Applicants Evidence, Hills

Recent spreadsheet reveals major anomaly

I&I = Total WWTP Flow – Legitimate Flow
Legitimate flow = Commercial flow + Population flow + Drinking plant retentate

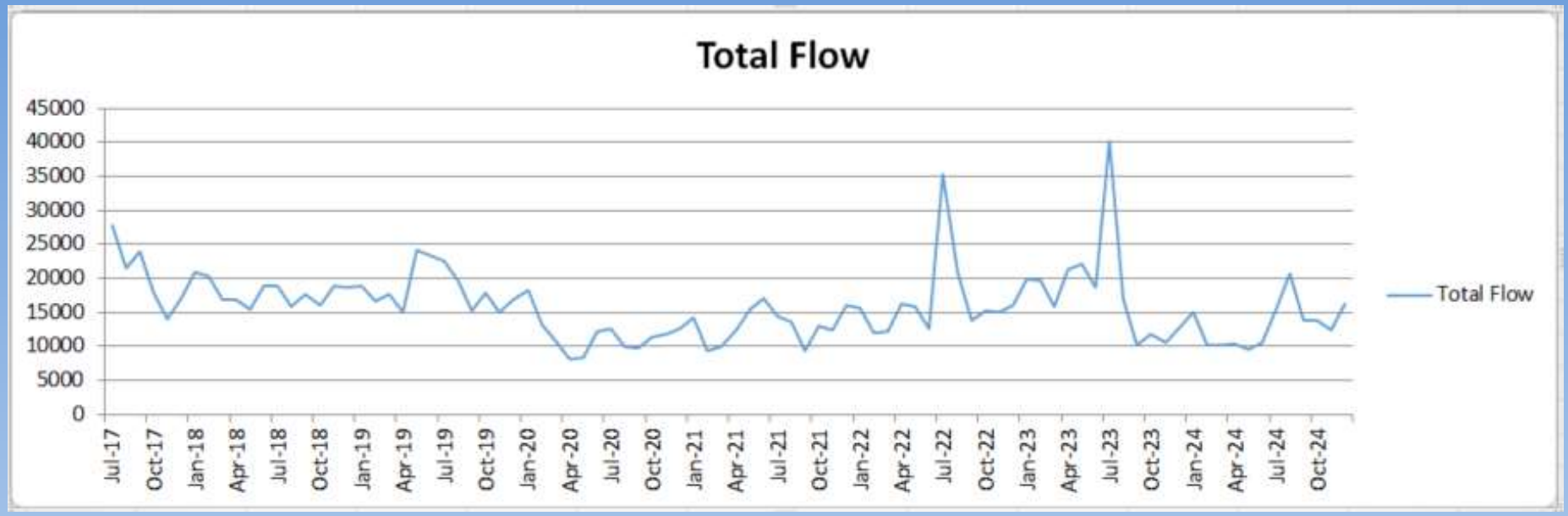
- All legitimate flow figures are based on estimates.
  - Seasonal population is crudely estimated for all years
  - Commercial and retentate flows are estimated until metering installed
- Anomaly - I&I is calculated as a negative number in 36 out of 89 months (40%)
- Annual averages reported in evidence are not qualified with this anomaly
  - Instead I&I is set to 0 for negative months in spreadsheet
  - Excel formula is: =MAX(0,F9-S9) where F9 is total flow and S9 is legitimate flow
- How can I&I be calculated as negative?
  - Legitimate Wastewater flow used is too high because Population flow, Commercial flow and/or Drinking plant retentate have been overestimated, or,
  - The pipes leak water out

I&I monthly amounts



Negative I&I calculated

WW flows show high I&I peaks



- System capacity still driven by I&I peaks

Methodology poor

- Understanding WW flows is critical to managing a fixed capacity disposal system
- A better methodology is needed
  - Does not rely on highly inaccurate population commercial and backflush estimates to "calculate" I&I
  - Does not rely on wet weather to measure the extent of I&I
- Wastewater flow figures show more work is needed to bring I&I down

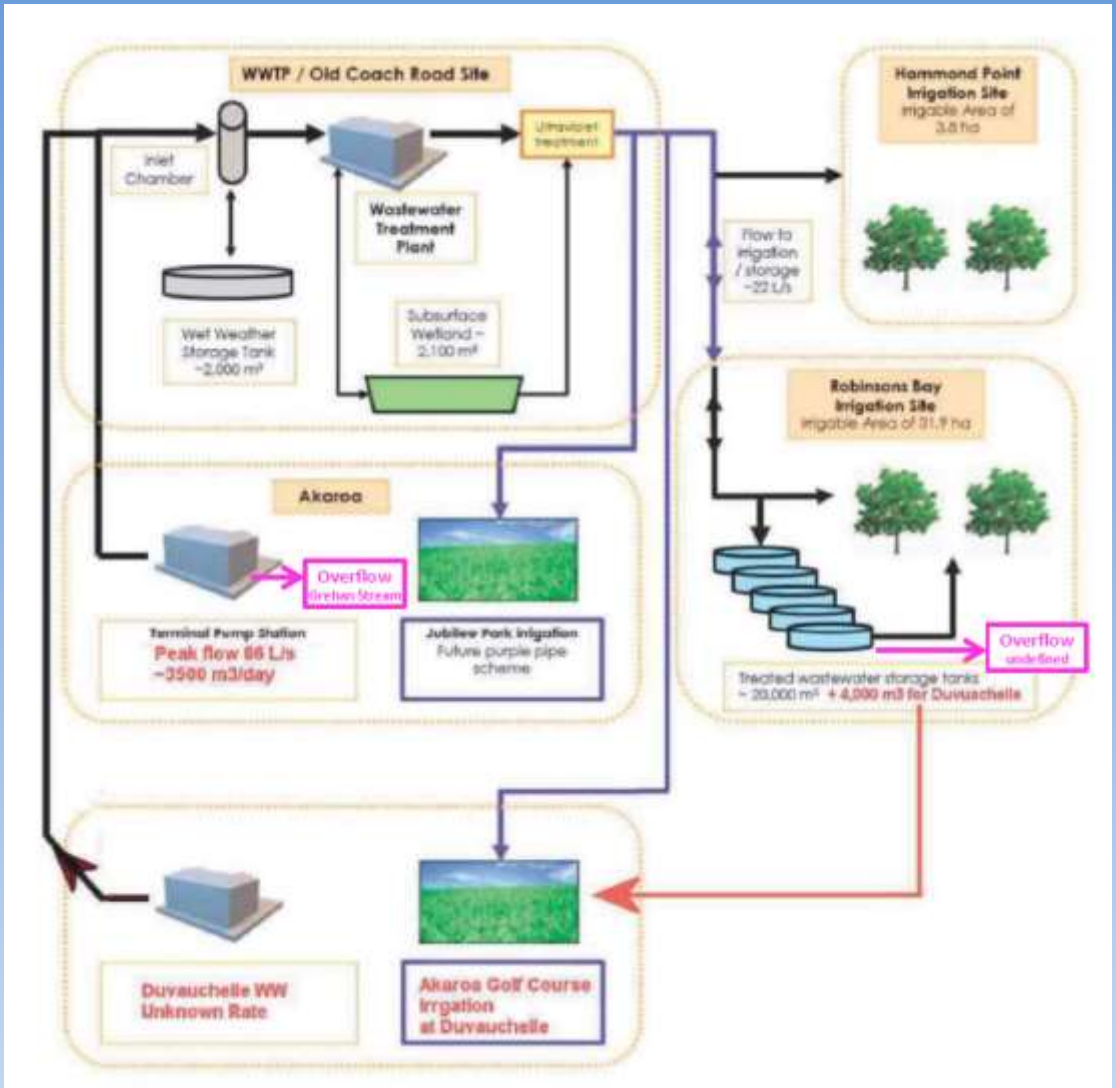
Learnings from the 17 year search

- CRC does not check whether data reported is valid
  - Accepted data from faulty meters for years without checking
  - Have not examined I&I reduction figures
  - Did not request further information about treated storage capacity in the Application until after receiving Dr Martin's report and FBPI questions about RFI responses
- Experts and CCC staff have based designs on incorrect data and modelling
  - Years of design based on faulty flow meter information including 2015 consent
  - 2023 application based on incorrect modelling because modelling not checked against actual data
  - I&I reduction level not known – measurement method is too inaccurate
- FBPI has played a pivotal role
  - Checking whether data underpinning claims is valid
  - Data analysis exposing flow meter, level of I&I and capacity issues
  - Assisting CCC to find errors and improve modelling
  - Keeping community informed
  - All work done on a voluntary basis
  - Additional experts engaged where possible using funds donated by our concerned community

Section 4

Application as it now stands

Amended Schematic from AEE



Akaroa - Terminal Pump Station

Artist's impression sourced from 2014 AEE and adjusted to show more realistic height. Does not show biofilter in front of building

- Location – Recreation Ground car park
- Purpose – Primary Filtration Treatment, Pumping to WWTP
- Capacity 86L/s maximum
- ARI 1 in 5 year raw overflows based on historical weather patterns

TPS Part consented

- CRC152184 – construction discharges
- CRC150059 – discharge of odour
  - 2015 conditions relaxed on appeal
- No land use consent to operate under LWRP and no application made for this
- No consent to discharge to water

Overflow from Terminal Pump Station is at tidal Grehan stream mouth

WWTP

- Part consented
  - CRC152184 – construction discharges
  - CRC150050 – discharge of odour and land use to store effluent (consent has incorrect address and unclear if tank sizing met)
  - No land use consent to operate under LWRP and no application for this
- Method – IDAL SBR
  - Sequenced Batch Reactor
  - Not MBR ultra-filtration as set out in 2015 and 2020
  - SBR uses gravity separation rather than a physical barrier membrane
- IDAL only introduced through Applicants evidence.
  - Not described in 2023 AEE
- Treatment standards not known for
  - pathogens, nutrients and emerging contaminants
  - compared to ultrafiltration
- Micro plastics will not be filtered

What Google AI found

When to use SBR:

- When a basic level of wastewater treatment is needed.
- Situations where handling variable flow rates is important.
- Where cost-effective operation is a priority.

When to use Ultrafiltration:

- When a high level of water quality is required, such as for water reuse applications.
- To remove very small particles, including bacteria and viruses.
- Situations where consistent effluent quality is critical.

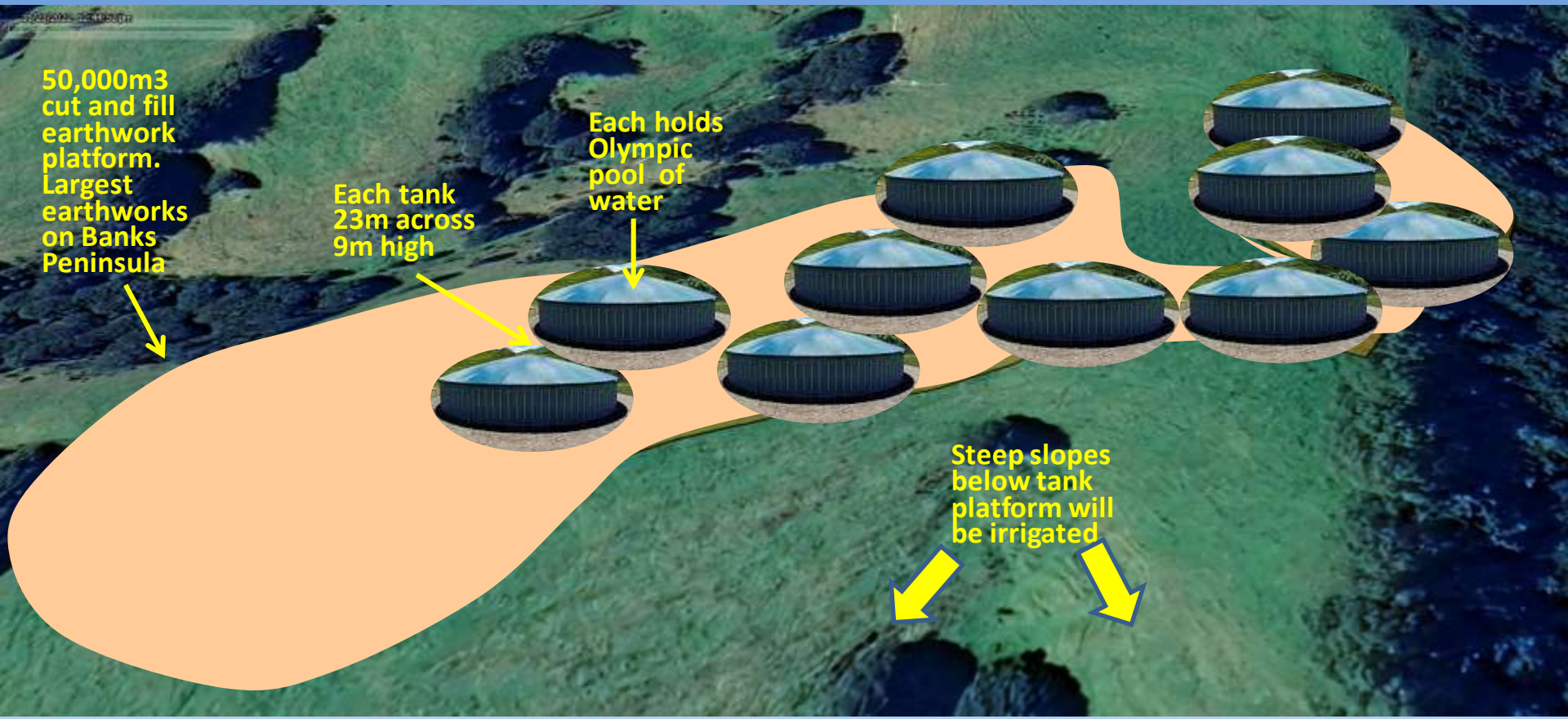
Raw Buffer Tank

- Holds raw wastewater prior to treatment when WWTP cannot keep pace with inflow
- Unconsented and part of current application
- 6,000m^3 in 2020 reduced to 2,000m^3 in application
  - No explanation of difference.
  - Size reduction occurred prior to choice of IDAL WWTP

Treated storage

- Holds treated wastewater when inflows exceed the amount that can be irrigated
- Unconsented and part of current application
- Application lodged stated 12,000m^3 more than sufficient but sought up to 20,000m^3 for headroom
- Total now sought is volume now is 24,000m^3 to include Duvauchelle flows and its acknowledged this is not sufficient
- Seismic level not stated whether IL2 or IL3
  - Seismic level 3 tanks are steel cylinders and require concrete base
  - All imagery supplied is of IL2 domed tanks
- Cut and fill platform 50,000m^3

Size of tank farm



Constructed wetland

- Provides additional storage for treated wastewater when Robinsons Bay full
- Provides cultural treatment prior to harbour discharge via an outflow
  - Function added after Application lodged
- Unconsented and part of current application
- Capacity 2,208m^3
  - 408m^3 is occupied by permanent water to maintain the plants
  - Additional capacity for treated storage is 1,800m^3 maximum
  - may be less if rain has entered the wetland
- Requires substantial earthworks

Questions regarding wetland

- How does the changing design of the wetland described by Ms Tikao effect wetland capacity?
- Is the rock channel described now part of the Application?
  - If not, when would it be consented?
- Will the treated wastewater need to pass through the Treatment Plant again to meet discharge standards?
  - PDP have advised this be done and provided a plan*
- Can the harbour discharge be used to the extent described by Mr Hills under emergency powers?

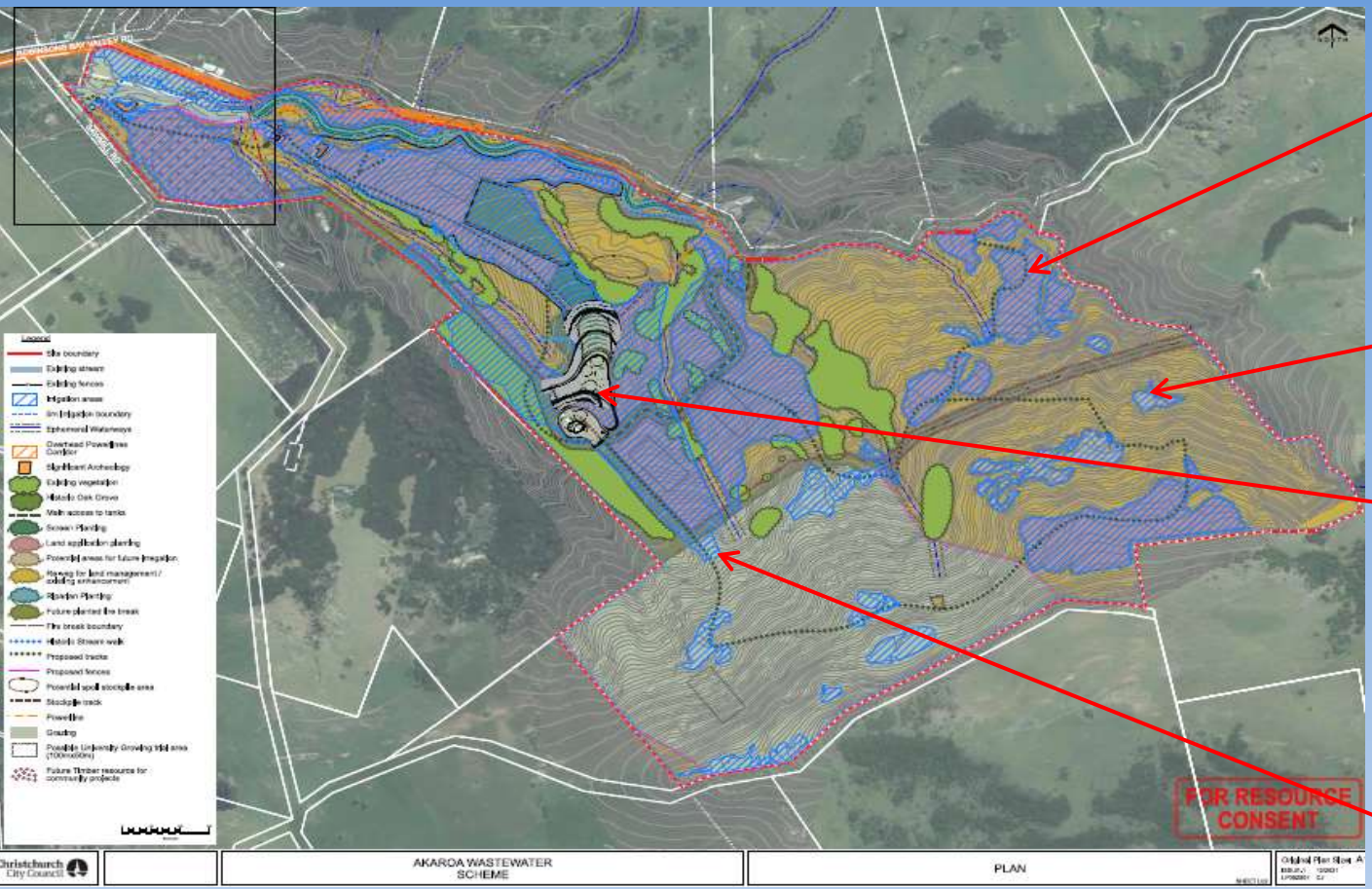
***Reference: PDP Combined Storage Exceedances, Nov 2024**

Pipes and pumps

- Application contains very little information on pipes and pumps.
- No descriptions of key pumps
  - WWTP to Treated Storage
  - Treated storage to upper irrigation fields
- Network diagram* indicates a 22L/s flow capacity for pipes from WWTP to Treated Storage
  - No information on why constraint exists
  - Is this the pump capacity to Robinsons Bay?
  - Does it still apply with IDAL?
- Pipes will include gas release vents
  - Are these part of consent or permitted activity?
- Is there is a return pipeline from the tanks to the WWTP?

***Reference: AEE Fig 3-1, p8**

Irrigable areas



- Application for irrigation is areas crosshatched blue and coloured purple
- Less suitable areas cross hatched blue no longer included?
- Areas around tanks not to be irrigated?
  - areas need to be defined
- Wetlands in irrigation areas not shown
- Minor discrepancies with irrigation map need to be resolved

Reference: Map sourced from Visual Aids distributed at hearing

Irrigation pipes and drippers

- Irrigable area = 35.7ha
- Irrigation lines 0.5m apart = 700kms line

- Irrigation drippers 0.3m to 0.5m apart =1.43 million to 1.28 million drippers

Irrigation Rates and Maximums

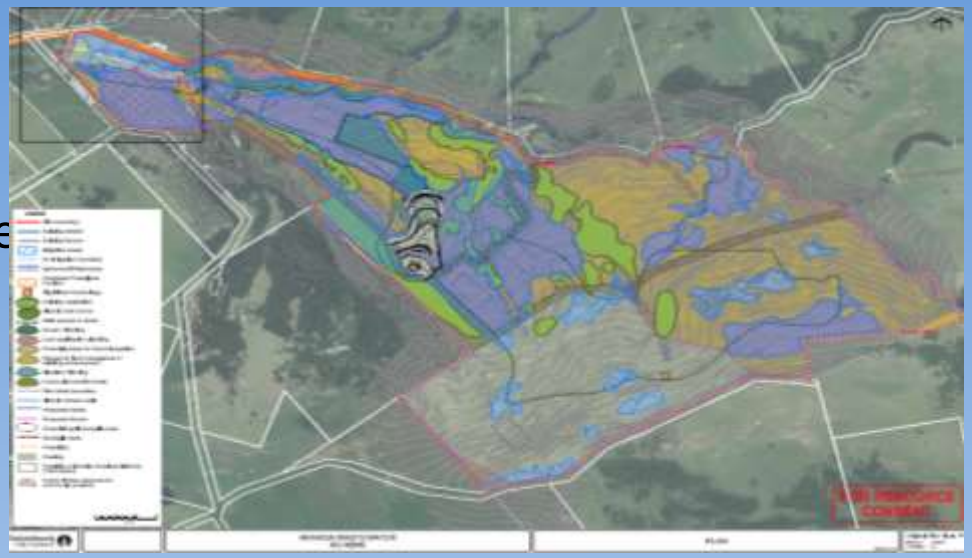
- Irrigation planned on a non-deficit basis
- Irrigation rates are monthly averages

Season	Rate
Summer	3.08mm/d
Autumn and Spring	2.41 mm/d
Winter	1.68mm/d

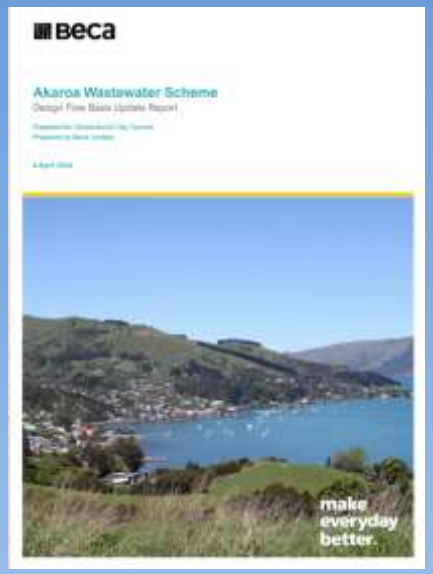
- AEE gives maximums across entire field as:
  - Maximum daily limit of 1,100m^3
  - Maximum annual limit of 220,800m^3 per year

Additional planted areas unclear

- 23ha of riparian and infill planting is anticipated to uptake nitrogen
  - Key does not refer to these are what areas and not clear on the map
- Mr Pizzey stated destocking and planting will take place over 82ha.
  - What are these areas? (This is more than 35.7ha+23 ha)
- Will any grazing remain on the site
- Are the other planted areas to be fenced from grazing given they will contain palatable species
- Will existing native forest patches and wetlands be fenced from grazing?

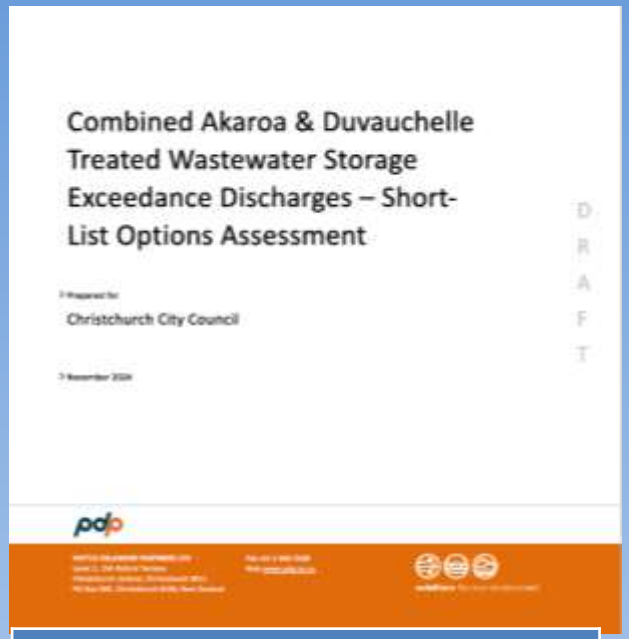


Establishing Storage Exceedances



Duvauchelle flows and storage 13 Feb 2024	**Akaroa& Duvauchelle combined flows and storage** 13 Feb 2024	**Akaroa flows and storage only** 8 April 2024	**Akaroa flows only combined storage** 8 Nov 2024
4,000m^3 storage 6.4ha irrigation 17 overflow seasons 1 in 3 years	24,000m^3 storage 35.7+6.4ha irrigation 21 overflow seasons 1 in 2.5 years	22,208m^3 storage 35.7ha irrigation 21 overflow seasons 1 in 2.5 years	28,000m^3 storage 35.7ha irrigation 12 overflow seasons 1 in 4.3 years
No wetland No raw buffer included	Wetland included? No raw buffer included	Wetland included No raw buffer included.	Wetland included Raw buffer included

PDP give complete picture



Akaroa& Duvauchelle combined flows and storage
8 November 2024
25,800 m3 storage 35.7+6.4ha irrigation 21 overflow seasons 1 in 2.5
Wetland included No raw buffer included

- The ATWIS system will only experience Akaroa flows only with storage for both Akaroa and Duvauchelle (24,000m^3)for a very short time, if ever
- Applicant's intent is to combine Akaroa and Duvauchelle
- PDP *Combined Akaroa & Duvauchelle Treated WW Storage Exceedances* sets out the complete picture
  - 21 overflows in 52 years
  - **Overflow seasons 1 in 2.5 years**
- Report sets out the overflow options and report from workshopping these with Ōnuku rūnanga
- Supplied to Panel with our submission and we urge you to read it

PDP Table 6 Overflow years and volumes

- PDP report 21 overflows seasons in 52 years
- Equates to 1 in 2.5 years overflow seasons will occur
- Max volume 40,000m^3
- Highest % of total flows = 13%

Table 6: Modelled Annual Discharges as Proportion of Total Flows

Year Modelled	Total Annual Exceedance Discharge Volumes [a] (m^3)	Exceedance Discharges as a Proportion of Total Annual Treated Wastewater Volume
1974	17,900	6%
1975	12,500	4%
1976	7,300	3%
1977	17,500	6%
1978	40,000	13%
1981	3,400	1%
1983	4,800	2%
1986	19,800	6%
1992	13,000	5%
1994	6,100	2%
1999	900	0.3%
2000	1,400	0.5%
2008	900	0.3%
2010	23,500	9%
2012	12,800	5%
2013	9,500	3%
2014	4,500	2%
2017	10,300	4%
2021	3,900	2%
2022	11,100	4%
2023[2.]	6,100	3%

Notes:
a) To nearest 100 m^3
b) 2023 data only available to 01/08/2023.

Missing information in Application

Missing information/consent	Impact
Treated overflow discharge application	Location and effects undefined
TPS land use consent	Volume and effects of raw overflows undefined
WWTP land use consent to operate	Effects of IDAL standards including during high flows not known Whether there is space tertiary not known
Duvauchelle application	Treated storage requirement ambiguous Treated overflows not definitive
Capacity analysis at each stage	Unable to analyse bottlenecks in the treatment train
Irrigation Management Plan	Unclear what areas to be irrigated, whether rates vary,
Ambiguities around what is to be planted and what is included	Where will nitrogen removal take place Whether less suitable 5ha are included
Odour discharge consent	Location and effects undefined

We submit the intent of LWRP Rule 5.84 is that a community wastewater treatment system including its discharges and the effects of the scheme is considered as a whole.

Section 5

Receiving environments

Recreation Ground and car park

- Main visitor carpark
- Entrance to beautiful historic tourist town
- Major events location
- Freedom camping area popular
  - Can be 30 to 40 vans
  - Used year round
  - No other suitable location in Akaroa
- Focal point for marine activities
- Myriad of local uses

Flood prone location

Floods in summer as well as winter

The Recreation Ground is reclaimed land, and hence drainage of this area is more difficult. It has flooded and ponded so many times in the past that shallow winter ponding on the ground alone was neither newsworthy or memorable, but just part of the normal experience of Akaroa

Reference: Akaroa Historic Flooding and Mapping Project 2008

Robinsons Bay terrain

Multiple slips – dates unknown

July 2022 slip

Slip images

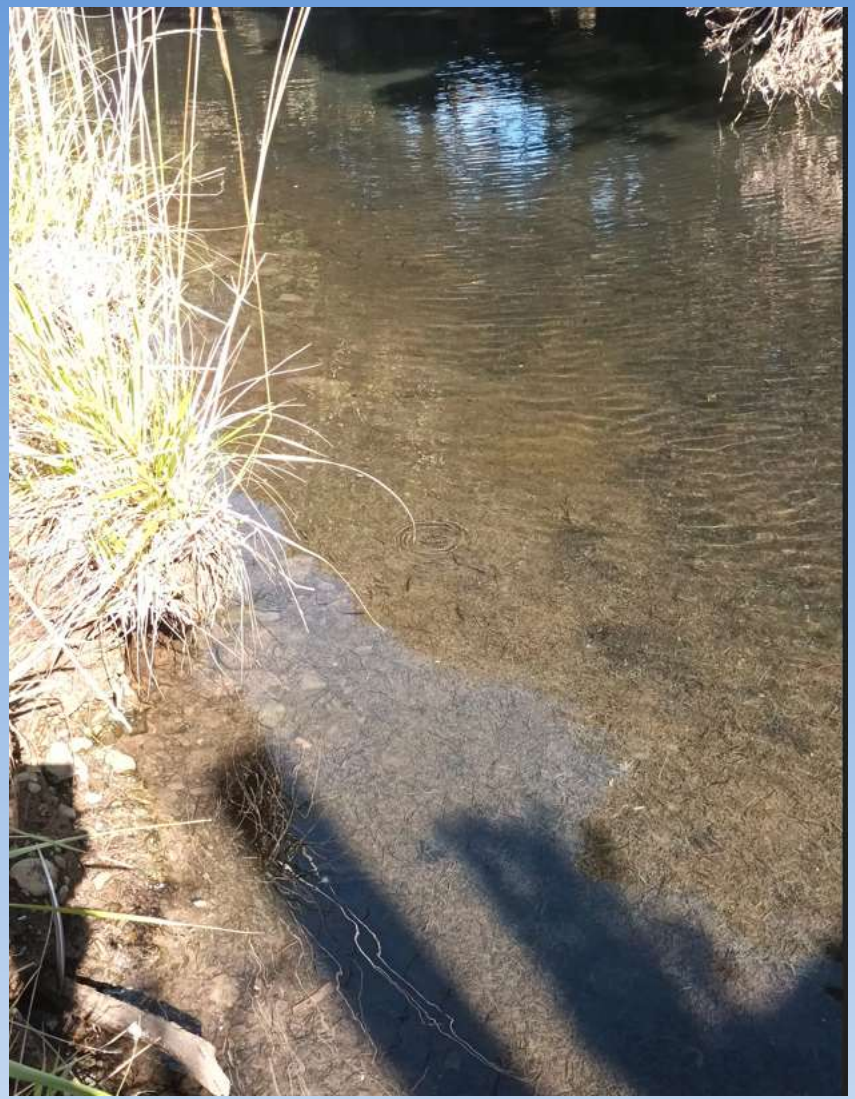
July 2022 slip
25m across at top
200m extent downhill

Old slip above highway on gently sloping ground

Robinsons Bay amenity

- Rural community
  - Private water supplies
  - Septic tanks
- Mix of farming, lifestyle and holiday homes
- Valued for its
  - natural beauty,
  - fishing and whitebaiting,
  - heritage,
  - boating and swimming recreation and
  - close community
- Quiet and peaceful
- No odours including from Bay

Robinsons Bay stream in good health



- Stream popular with whitebaiters
- AEE states
  - stream supports four regionally endemic species classified as threatened/nationally endangered
- CRC S42a Ms Hayward states
  - Stream Moderate to High Ecological values

- Stream drains to shallow tidal estuary mudflats
- J Burns CCC and M Burns CRC agree
  - Ecological values of Robinsons Bay estuary high due to seagrass and macroinvertebrate communities

Bathymetry of Receiving environments

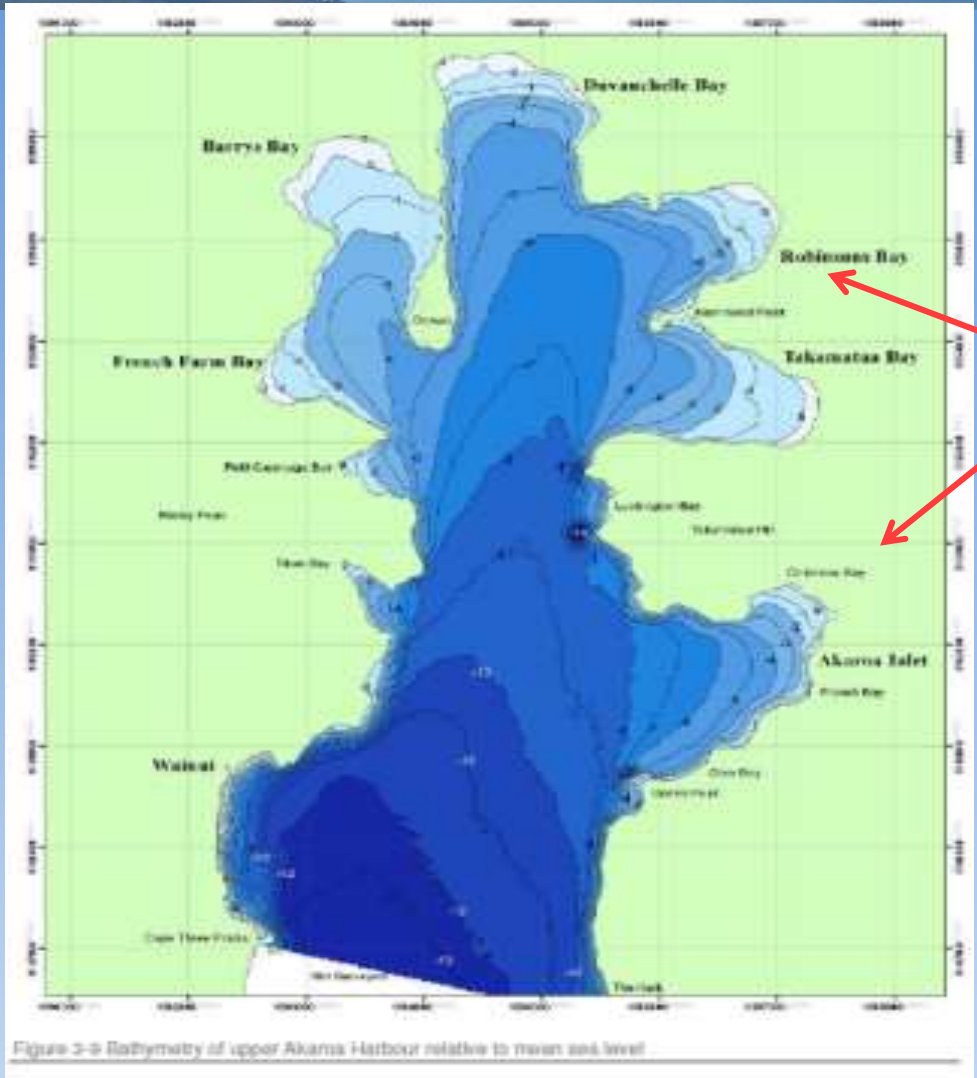
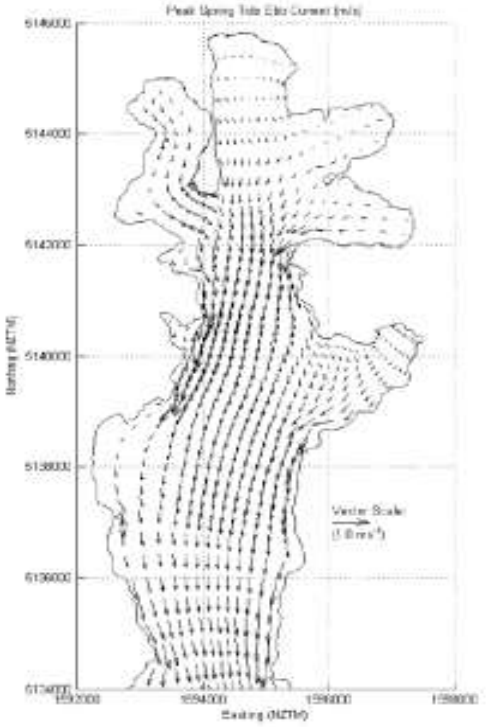


Figure 3-8 Bathymetry of upper Akaroa Harbour relative to mean sea level

Shallow
Robinsons Bay and
Childrens Bay

Reference: 2014 AEE Figure 3-8

Poorly flushing bays



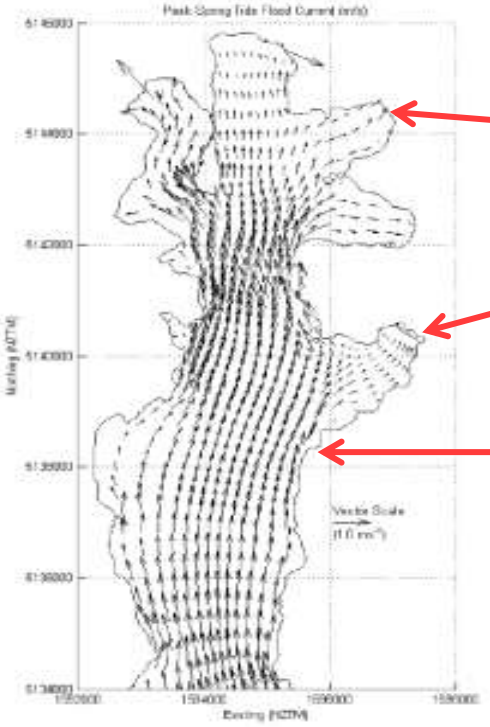


Figure 3-10 Peak and Ebb Tide Current Patterns for a Spring Tide

Weak tidal currents in Robinsons Bay and Childrens Bay

There is a stronger ebb-tide flow around Green Point where the existing short outfall is located south of the township. 2014 AEE

A consequence of the Application is that treated wastewater currently discharged to a location with strong tidal currents will now be released to high quality environments in the upper harbour draining to estuaries that are shallow and poorly flushing

Reference: 2014 AEE Figure 3-10

Section 6

Overarching concerns

ATWIS expensive high risk world first

- High cost - $107million+ for 950 connections
- Sprawling intrusive footprint
- Year round irrigation to sloping highly slip-prone loess soils
- No other WW systems irrigate to NZ native trees
- Irrigation areas drain to high quality stream feeding a shallow poorly flushing estuary
- Design based on modelling

Therefore

- we would expect that modelling and the assumptions underpinning it to be thoroughly scrutinised.
- They have not been

Key assumptions

- Wastewater will be treated to a high standard
- Slope stability will be maintained for the irrigation areas and tank platform
- Nitrogen uptake will be as anticipated
- Non-deficit irrigation elevating soil moisture levels by 53% on average annually will be safe for 30+ years

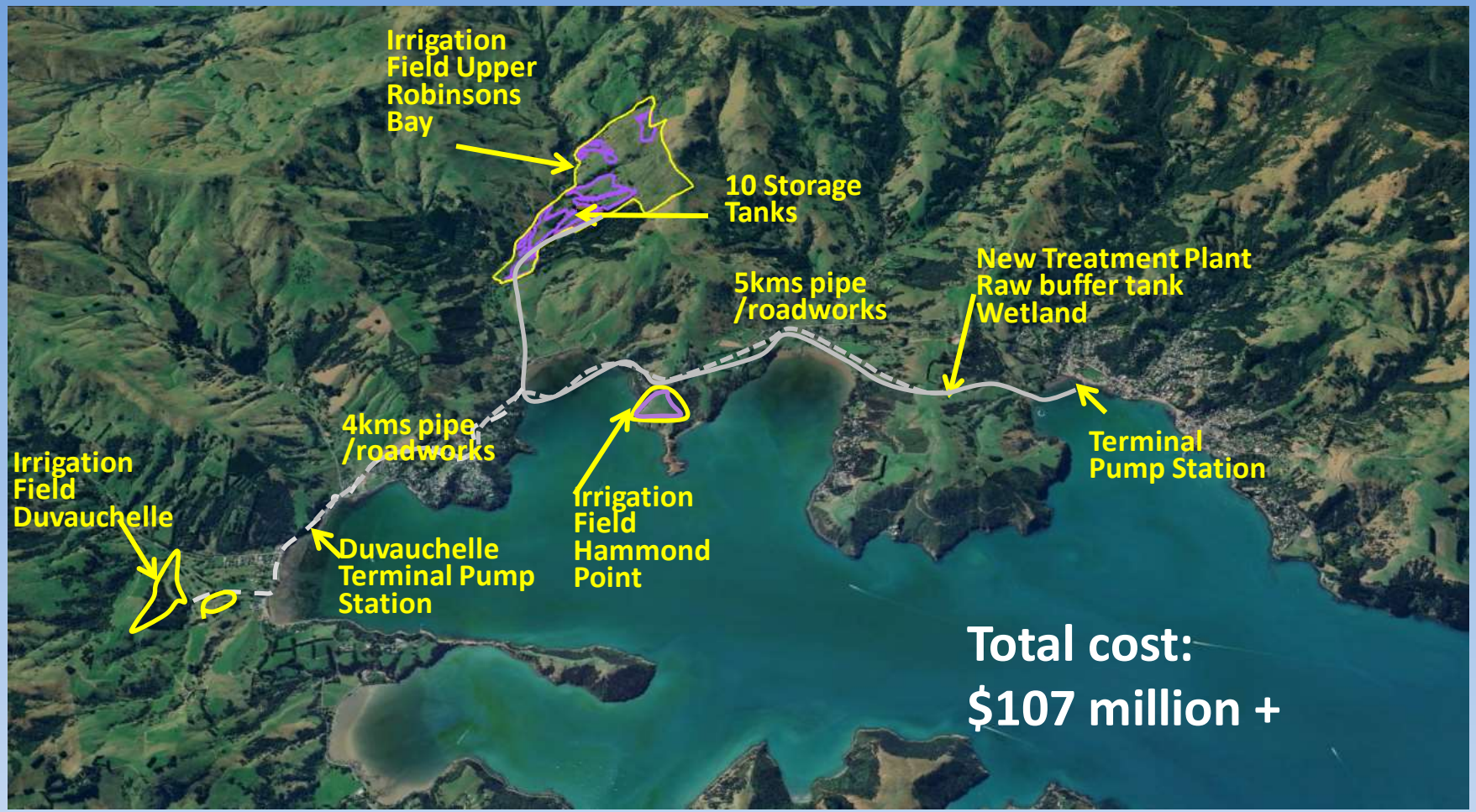
Compounding concerns

- Proposal already lacks capacity and there will be treated overflows
- Design ARI for raw overflows is 1 in 5 years based on weather patterns
  - Doesn't include blockages, breakdowns or unforseen events
- Land based irrigation system is more vulnerable to climate change than current harbour outfall
- No backup plan for a major system failure (such as climate change damage)
- Complex to operate, manage and monitor
- Piecemeal approach to consenting
- AEE out of date
- CRC s42A report fails to analyse risks or consider system and its discharges as a whole under LWRP 5.84
- Cumulatively these concerns present substantial risks and uncertainties

Section 7

Extensive footprint
Amenity values

Footprint


Irrigation Field Upper Robinsons Bay
10 Storage Tanks
5kms pipe /roadworks
New Treatment Plant
Raw buffer tank
Wetland
4kms pipe /roadworks
Irrigation Field Duvauchelle
Duvauchelle Terminal Pump Station
Irrigation Field Hammond Point
Terminal Pump Station
Total cost:
$107 million +

Large intrusive infrastructure

- Roadworks along 9km of State Highway to construct system – years of disruption
- Extensive earthworks required for raw buffer and wetland beside main highway and will be visible
- Raw buffer tank and wetland will be visible from Long Bay Road and upper parts of Akaroa
- Tourist town needs to retain its reputation as a beauty spot

Terminal Pump Station

- Sparks Road Pump station dimensions
  - Height -= 5.5m
  - Width = 7.0m
  - Length = 15.6m
- Terminal pump station dimensions excluding generator
  - Height -= 7.8m
  - Width = 13mm
  - Length = 17.5m
- Opened twice weekly in summer
- No consent condition controlling building design
- Odour conditions in decision have been relaxed on appeal
- Visual and odour impacts likely in high public use area

Treated Storage Tanks

- CCC landscape architect states: *"The introduction of the tanks and associated earthworks may not be entirely unexpected, with tanks commonly seen throughout the rural landscape."*
- We totally disagree
  - No tanks or tank farms anywhere in the Akaroa Harbour rural environment anything like this scale
  - No other built development at this scale
  - No other earthworks on anything like this scale

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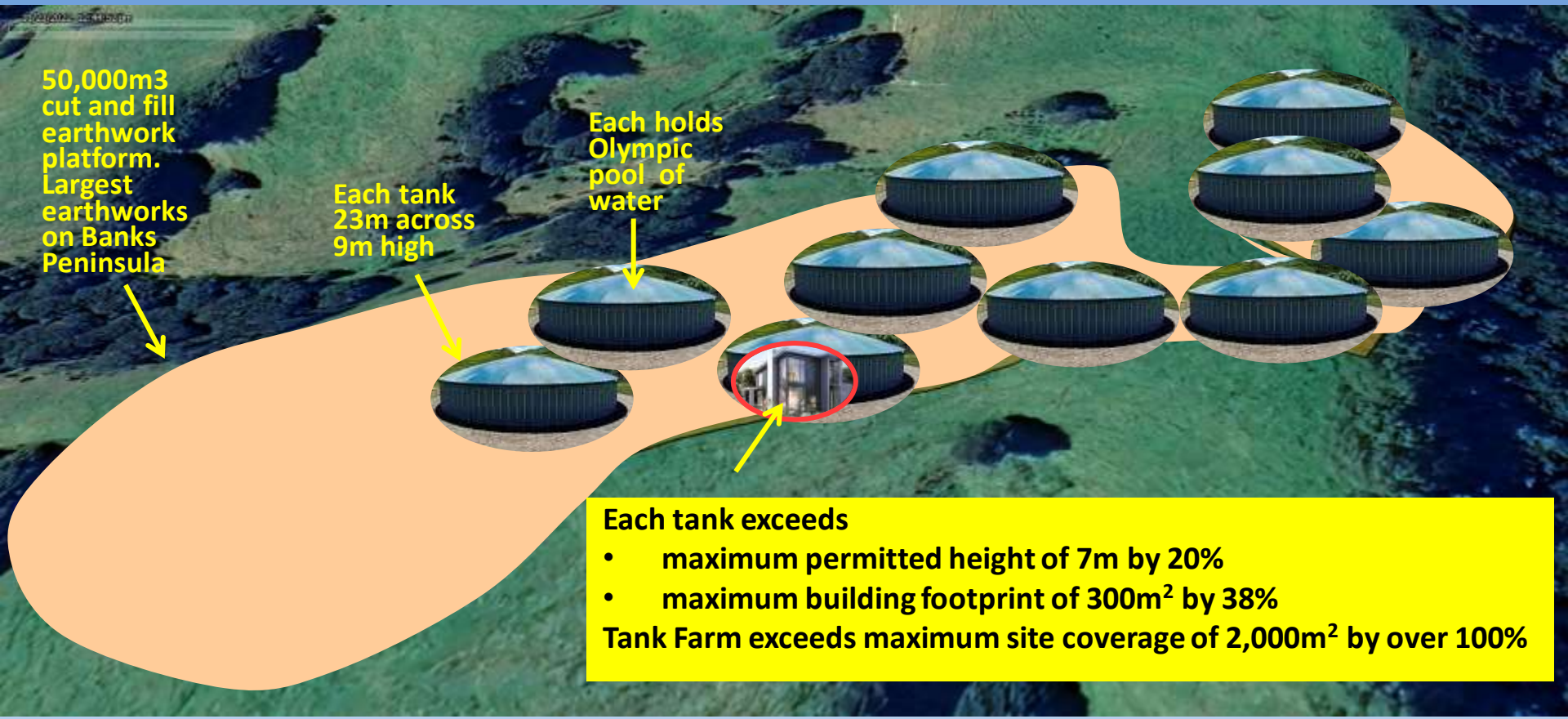
Tank Farm grossly exceeds standards



CCC stating the effects are minor undermines the intent of the built form standards that have been painstakingly developed for the rural amenity landscape

Offensive overflows

Boat store at main car park and foreshore below.

Treated overflows released between arrows

Raw overflows flow to beach at right arrow

- Frequent and large volumes of treated wastewater overflows into popular recreation area
- Compounding issue of raw overflows

Section 8

Highly treated wastewater assumption

WWTP treatment standard

- AEE: high level of treatment required to mitigate against nitrogen and phosphorus
- Claim of high treatment not supported by proposed nitrogen and phosphorus standards
  - Nitrogen:
    - proposed 10mg/L (~80% removal)
    - Rotorua: 5.4mg/L (~90% removal)
      - plan to reduce to 4.3mg/L
  - Phosphorus: no removal
- IDAL claimed to remove 90-95% of nitrogen (Mellish)
  - Not reflected in proposed standards
  - Not backed up by literature
  - Typically reported nitrogen removal is around 60-70%?

IDAL treatment standard

- IDAL adjusts to changing flows by reducing processing time
- High summer flows have high organic, nutrient and contaminant load
- No evidence given on treatment levels for these flows
- No maximum throughput figures provided
- Does not include Duvauchelle flows

IDAL treatment process

- Russell uses IDAL process. A recent review (PDP November 2023) identified issues:
  - Overloading during high flows reduces treatment standard
  - Filter media overload from solids carry-over results in UV treatment being bypassed
  - Standards breached for E. Coli, TSS, BOD5 and nitrogen
- Other contaminants (POPs, PFAS, microplastics) not removed
  - Baseline should commence immediately and will take two years (Mellish)
- Additional treatment could be added
  - Room on the small site for this?
  - Impact on treatment plant throughput?
  - Operational and environmental impacts?

Untreated wastewater buffer tank

- Critical to operation of the IDAL process
- Reduction from 6,000m^3 in 2020 to 2,000m^3
  - Prior to IDAL selection, no explanation given
- Calculations of size and usage are out-of-date:
  - Remodelled flows increase peak volumes
  - Duvauchelle adds up to 1040m^3 per day (22%)
  - TPS capacity increased from 65L/s to 86L/s
- Buffer size to be reviewed during design (Mellish)
  - What is being consented? What effects?
  - Will it be physically feasible on the site?

WWTP process requires review

- IDAL process late stage change
  - Lack of detail about performance
  - Tightly constrained by site size
- Uncertainty around potentially undersized untreated wastewater buffer tank
  - Sized based on out-of-date information
  - Undersizing would impact WWTP capacity and/or treatment standard
- Review needed to verify updated design parameters can be accommodated on the site

Section 9

Slope stability assumption

Loess soil geotechnical challenges

- Soils rapidly lose strength with added moisture
- Non-deficit irrigation beyond field capacity exacerbates this risk (also tunnel gullies)

When dry, the strength and stability of in situ loess is controlled by discontinuities in the soil mass. Cuttings within loess can stand vertically (Figure 2), however, the shear strength of the soil matrix can weaken rapidly upon small (2% – 3%) increases in moisture content (Hughes, 2002; Jowett, 1995; McDowell, 1989). This, and susceptibility to clay dispersion and erosion, can make loess subject to instability on slopes, particularly during and after intense rainfall events (Alley, 1966; Bell et al., 1986; Bell and Trangmar, 1987; Hutchinson, 1975). Wetting of the soil mass leads to a variety of slope failures related to internal erosion (tunnel gullying) and rapid loss of shear strength (debris flows and soil slides).

New Zealand geotechnical society symposium 2020
https://www.nzgs.org/libraries/nzgs20_yates/

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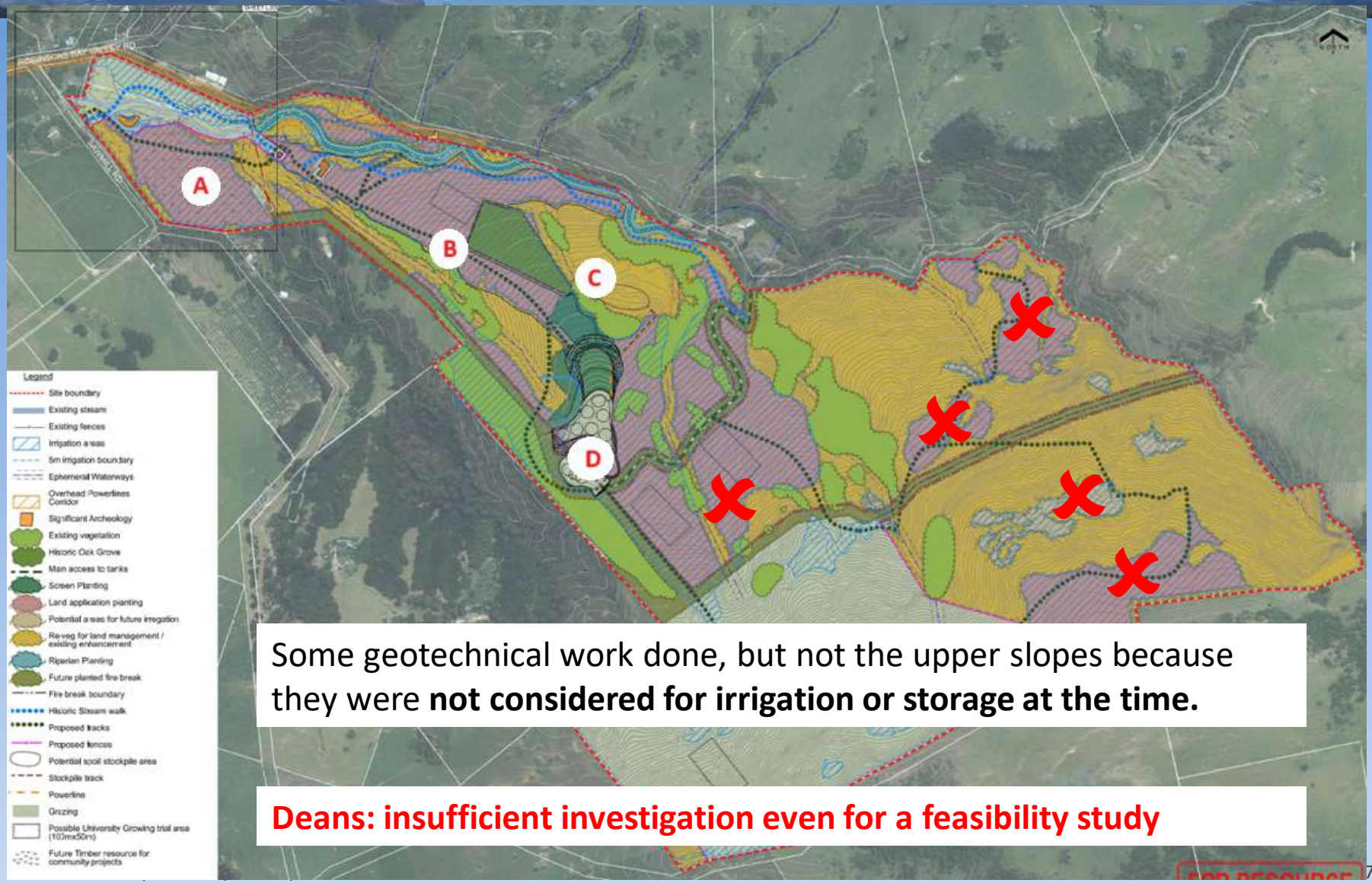
Limited geotechnical assessment



Some geotechnical work done, but not the upper slopes because they were **not considered for irrigation or storage at the time.**

Deans: insufficient investigation even for a feasibility study

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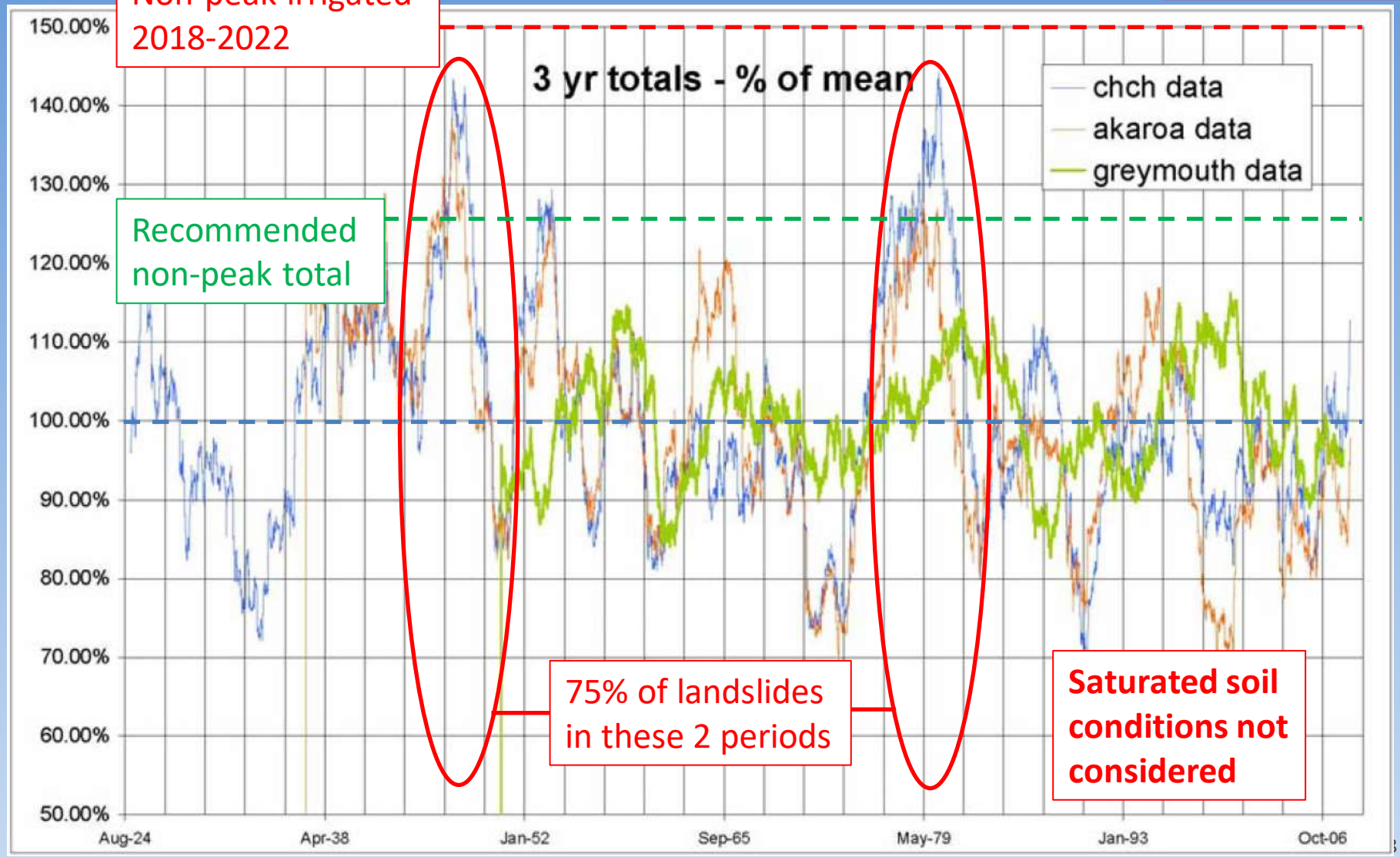
Soil moisture and slips

165% proposed non-peak total



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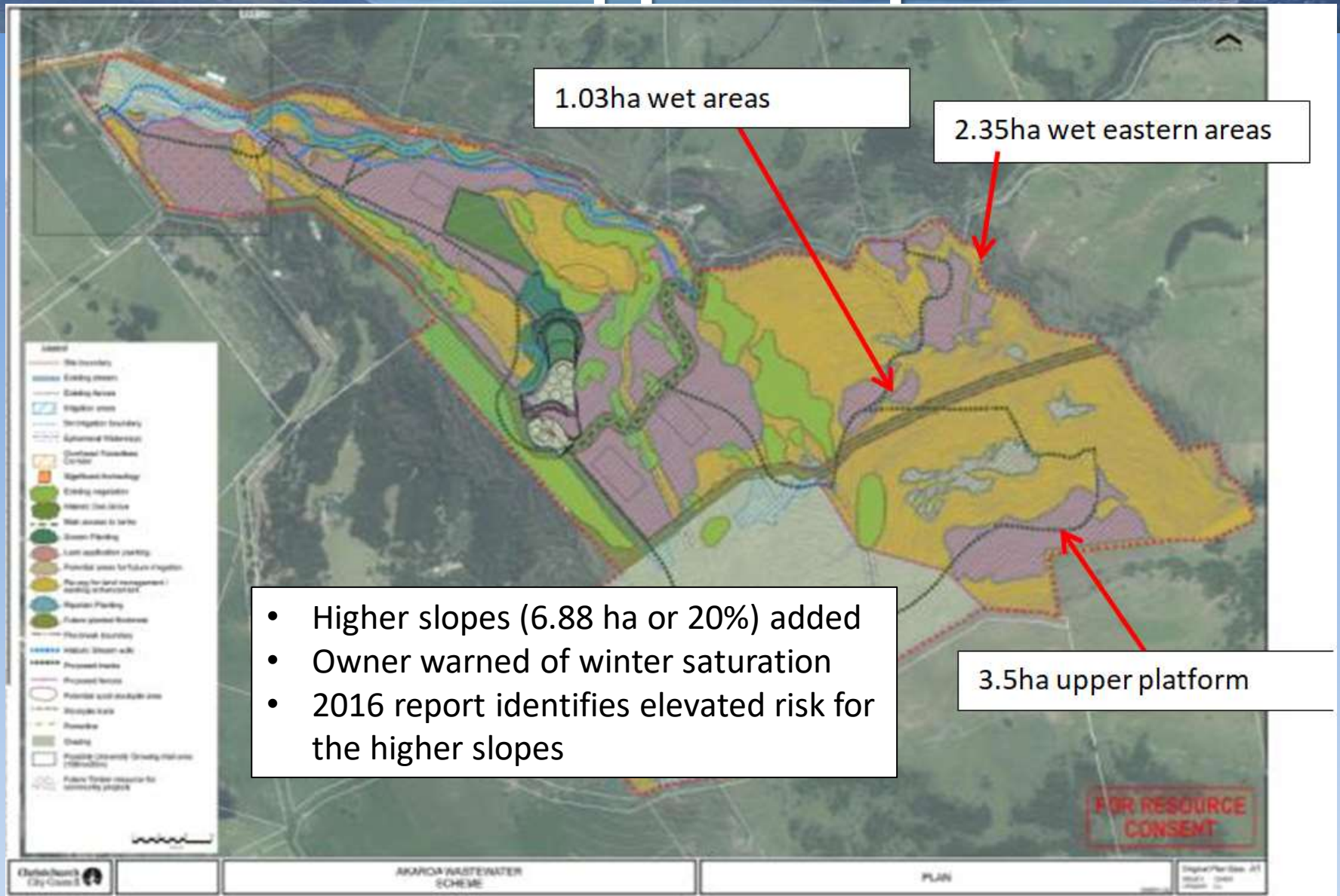
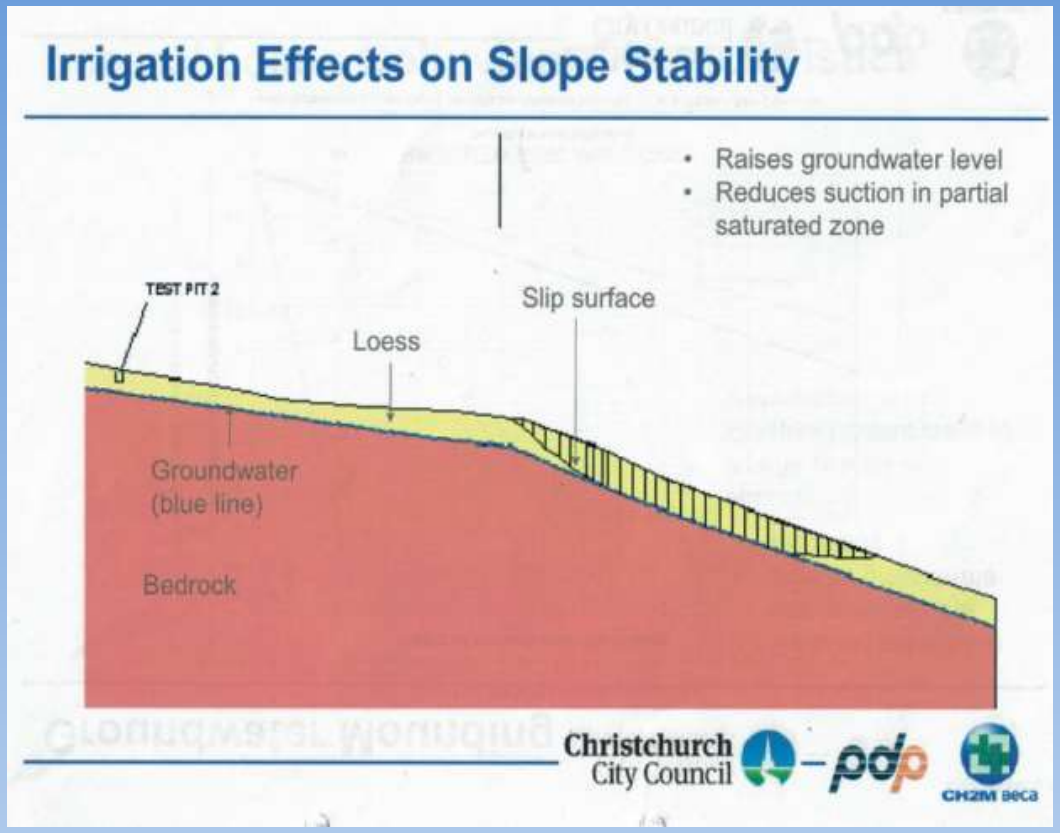
Use of upper slopes



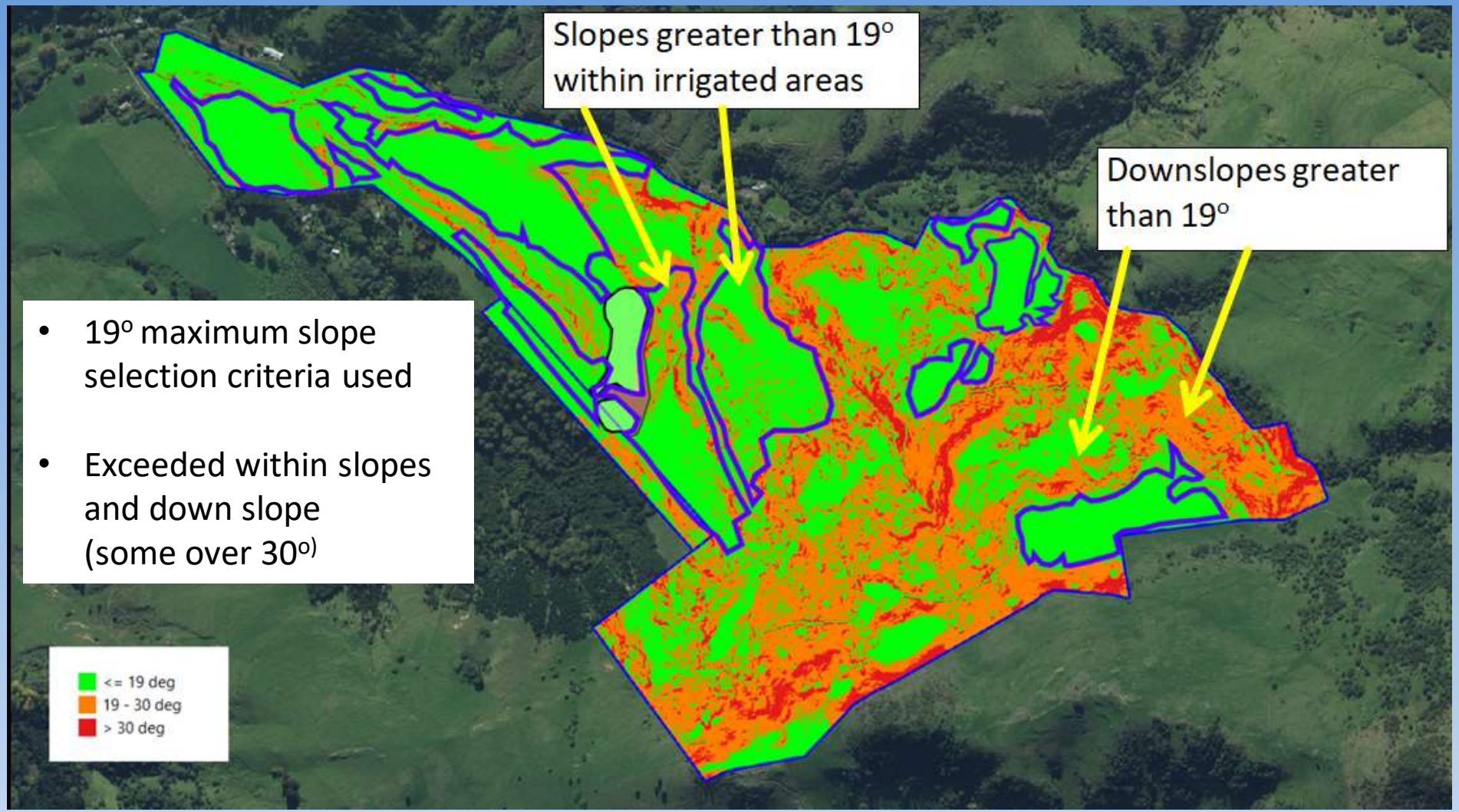
- Higher slopes (6.88 ha or 20%) added
- Owner warned of winter saturation
- 2016 report identifies elevated risk for the higher slopes

Slope considerations



- Original site selection excluded areas with downslope > 19°
- Took account of downslope residences, infrastructure (tanks, irrigation pipes), runout distance
- These considerations appear to have been relaxed for the upper slopes

Slopes now greater than 19 degrees



- 19° maximum slope selection criteria used
- Exceeded within slopes and down slope (some over 30°)

Susceptibility to additional drainage

"Both types of loess *[loess cohesion and loess colluvium]* ***are extremely susceptible to changes in moisture content, with minimal increases sufficient to significantly reduce shear strength properties"***

(Applicant's AEE Appendix Q p20)

"The application of wastewater onto loess soils already at field capacity can result in the generation of conditions needed for tunnel gullies to form. This movement of water erodes tunnels in the hillside which eventually give way, resulting in gullies. ***Tunnel gully erosion and slips in general are possible with constant wastewater application onto wet, steeper areas at Robinsons Bay***"

(S42A Riddle)

Increased groundwater drainage

- Irrigation rates initially determined by PDP
- Irrigation rates were increased by Aqualinc in response to reduction in area available
- Drainage estimated to increase by 83% (Aqualinc)
- Increased drainage increases moisture in subsoil and increases risk of slips and tunnel erosion (Van Dijk)

Risks identified by applicant

A hillshade model for the Sawmill Road site is presented in Figure 10. Both the area of historic hummocky landsliding in Area C and the saddle adjacent to Area D are clearly visible, as annotated in Figure 10. Some slope instability was noted in the gullies below and to the northeast and south of Area D.

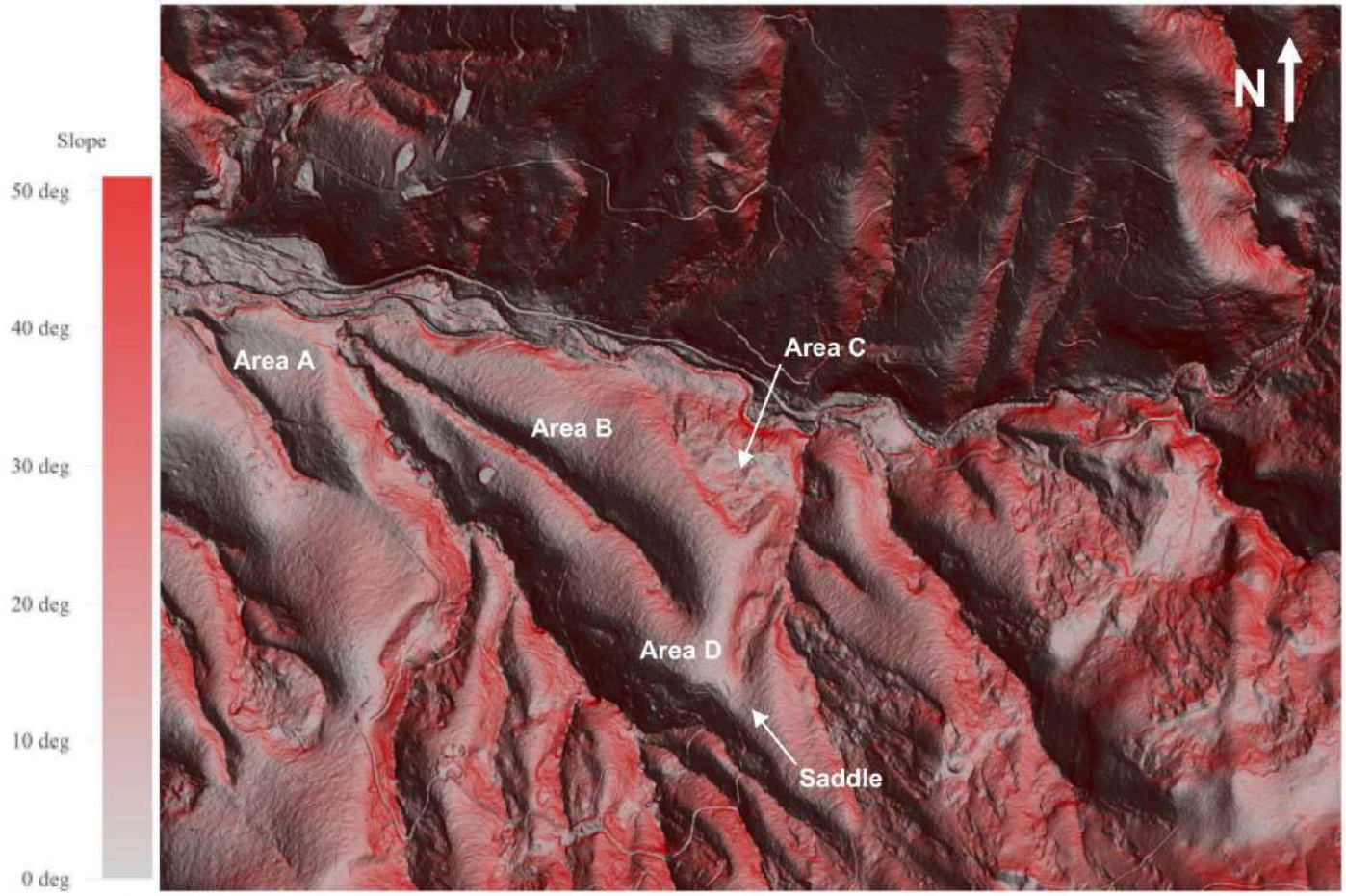
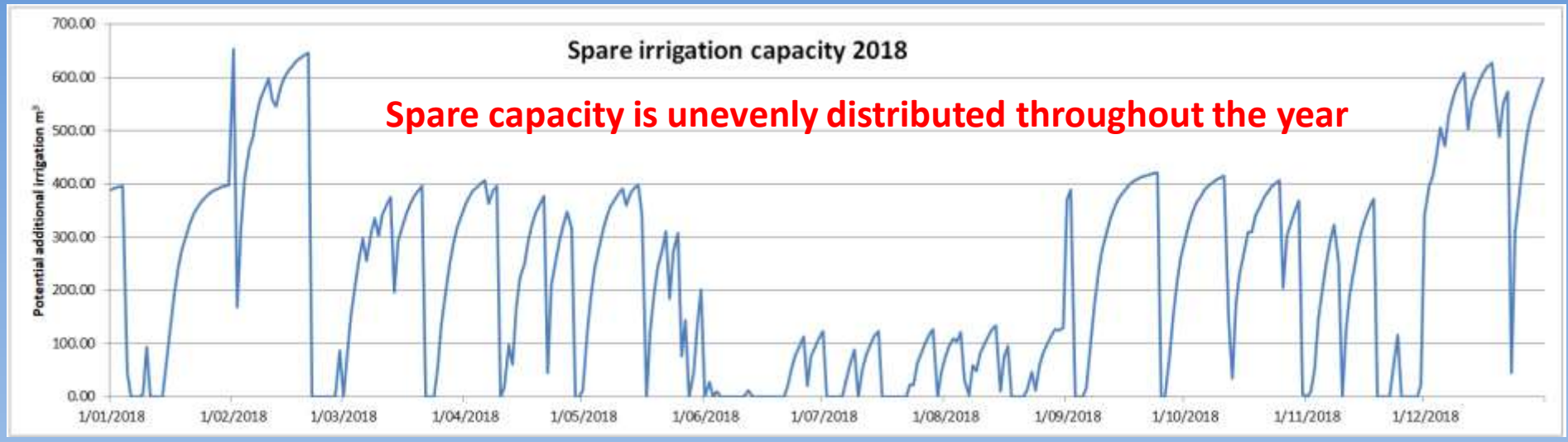
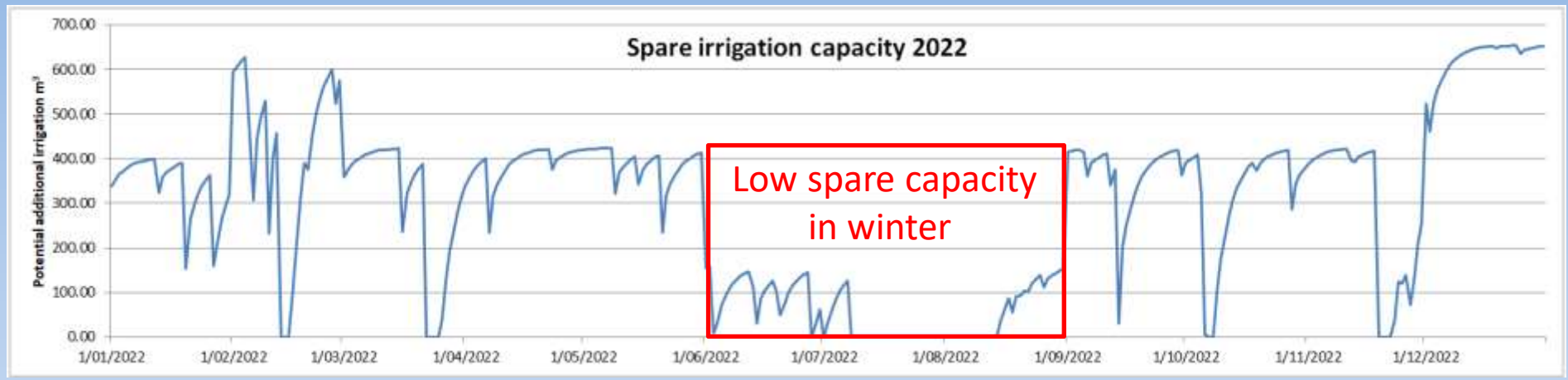


Figure 10: Hillshade model of Sawmill Road site highlighting topographical features

71% spare capacity seasonal





Source: PDP modelled flows

Risks not mitigated

- Dean notes risks have been identified by the applicant
- Moving irrigation from problematic to functioning areas reduces the overall area and increases the burden on those areas
- Suggested "spare capacity" of 29% as a solution is overstated because it is dependent on the time of year
- Removing problematic areas may significantly reduce irrigation area and place scheme in doubt (Dean)

Storage tank platform risk

- 24,000 tonnes of weight when full

- Heaviest during prolonged high rainfall
- Dean: cut angles unlikely to have sufficient safety margin
- Proposed monitoring may not detect problems early enough
- Moving tanks away from edge may not be possible without reduction in number

Storage tanks seismic rating

- IL 2 (typical residential, commercial, and industrial buildings)
  - plastic, aggregate base
- IL 3 (… wastewater treatment facilities and other public utilities)
  - steel, concrete base

Slope stability summary - issues

- Key risks are slope stability failure and tank platform failure
- Slope instability may reduce irrigation area available, leading to increased storage requirements/overflow
- Proposed monitor and adapt regime does not consider potential impacts of reduced irrigation field capacity
- Tank platform failure has not been considered

Slope stability summary - mitigation

- Greater assessment needed
- Reduce number/size of storage tanks
- Greater setbacks around tanks
- Reduce irrigation to below field capacity
- Assessment of impacts of reduced irrigation area

Section 10

Nitrogen removal assumption

Fate of nitrogen

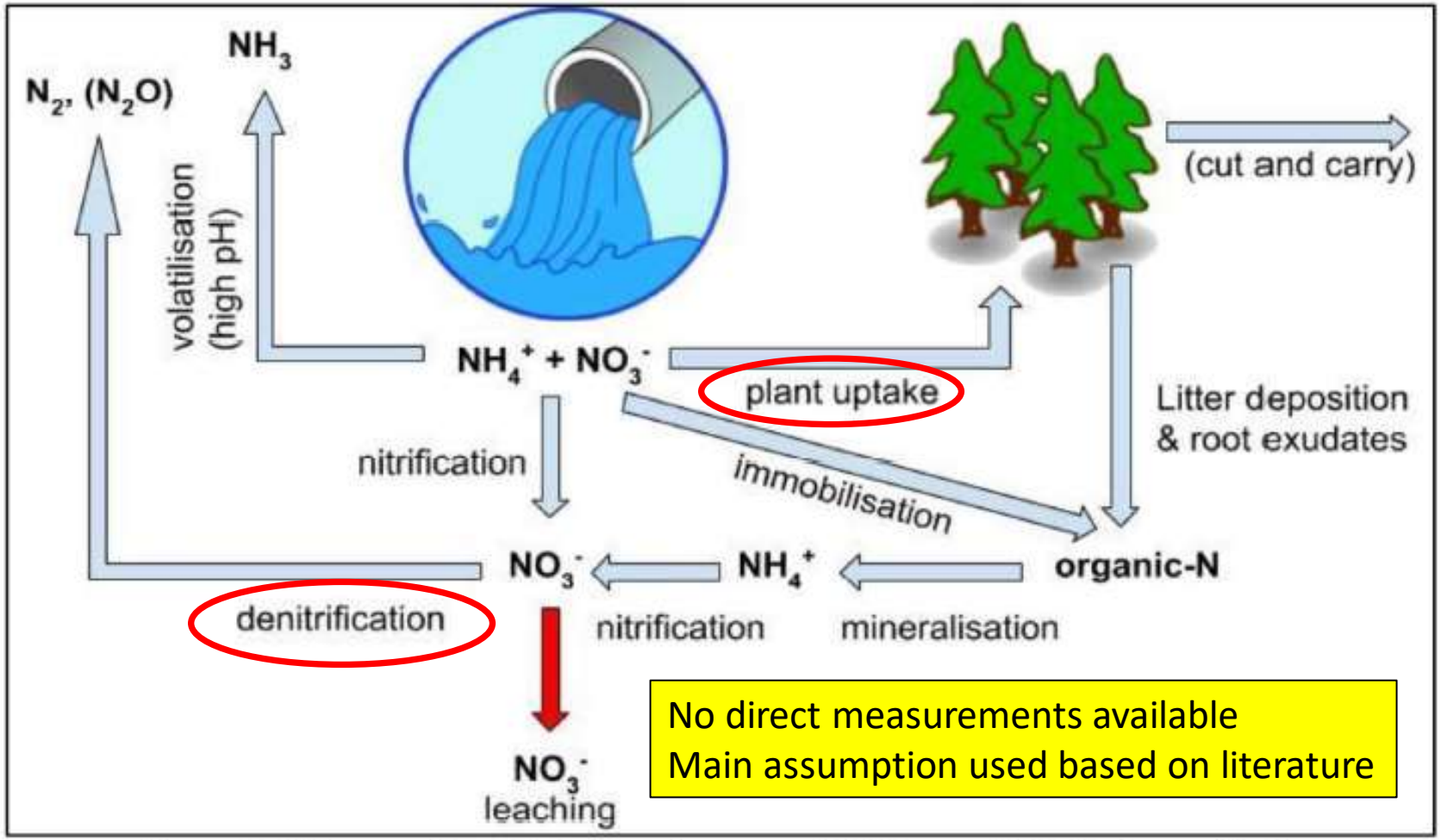


Figure 10: Nitrogen fluxes in irrigated systems (Meister et al. 2019, Appendix 2).

LWRP nitrogen limit

- LWRP Schedule 5 receiving water standards

Water quality class	DOC*	Temperature	pH	Visual clarity	Colour	DIN*
	Change shall be less than (mg/l)	Average change shall not exceed (°C)	Shall be between (no units)	% change shall not exceed	% change shall not exceed (Munsell units)	Shall be less than (mg/l)
Rivers and artificial watercourses						
Alpine-upland	2.0	2.0	6.5 – 8.5	20	5	0.08
Alpine-lower						0.18
Hill-fed – upland				20	5	0.21
Hill-fed – lower						0.47
Hill-fed – lower – urban						0.47
Lake-fed				20	5	0.21
Banks Peninsula				35	10	0.09
Spring-fed - upland				20	5	0.10
Spring-fed - lower basin				35	10	0.47
Spring-fed - plains				35	10	1.50
Spring-fed - plains - urban				20	5	1.50

Wastewater nitrogen load

- Nitrate-N contamination identified as a key concern for water body health (Dark)
- Robinsons Bay stream currently in good condition with low nitrate levels (0.03mg/L cf LWRP limit for BP of 0.09mg/L)
- Wastewater average dissolved inorganic N load of 1,580kg per year
- If all N leached, levels would easily exceed LWRP limit

Nitrogen reduction assumption

	Existing Stream Nitrate-N (g/m^3)	Change in concentration (g/m^3)	Resulting concentration (g/m^3)	
Existing land use	0.030	0.000	0.030	
~~Preferred scenario~~ Base case	0.030	0.086	0.116	LWRP
~~Destocking 1~~ Preferred	0.030	0.057	0.087	~ 0.09
Destocking 2	0.030	0.047	0.077	
Conservative No N reduction	0.030	0.126	0.156	>> 0.09

- "Preferred" case reduction in N is required to achieve the LWRP limits for Banks Peninsula

Nutrient risk assessment

- Nutrient risk has not been adequately assessed
- Preferred scenario is based on assumed reduction of 13.5kg/ha (Meister and Robinson)
  - high uncertainty in this assumption
- CCC and CRC have not applied the LWRP fresh water nitrogen limits for receiving environments
- Monitoring and adaptation will not avoid environmental harm (too slow)

Soil denitrification assumption

- Assumed to be 10 kg/ha/yr, based in part on literature review of (limited) denitrification rates in other wastewater irrigation schemes (Meister and Robinson)
- No indication of how 10 kg/ha was arrived at

Disclaimer: A robust quantification of N fluxes from TMW-irrigated native vegetation in Robinsons Bay would require experiment(s) to determine the rate of denitrification. As such, the numbers provided in this report should be considered as estimates only.

Soil denitrification - literature

Site	Soil	TMW rate (kg N/ha/yr)	Denitrification rate (kg N/ha/yr)
Whakarewarewa (NZ)	Pumice	298	1.7-2.4
Falmouth, Massachusetts (USA)	Inceptisols(mesic Typic Dystrochrepts and mesic Typic Udipsa-ments)	370-480	2-21 (as N_2O), total N will be higher
Central Appalachians (USA)	fine-loamy, silicious, mesic, Typic Hapludult	62.9	22.1
Geogria (USA)	Typic Kanhapludults with A horizon textures ranging from fine-sandy loam to sandy-clay loam	407	5-10
Shepparton (Australia)	Brown Sodosol (clay loam)	123-160	17.0-77.7

- Some denitrification rates are out of context (not the difference between irrigated and non-irrigated)
- Some include flooded or waterlogged soils
- Highly variable nitrogen loads
- Not supported by the paper conclusions

Whakarewarewa

- Denitrification rate is (2.4-1.7) = 0.7 kg/ha/yr (0.25% of 298 kg/ha/yr), not 1.7 to 2.4 as reported

"Upland denitrification accounted for <1% of total wastewater N applied annually."

"Even under optimum laboratory conditions, potential denitrification rates at 25°C were 13.4 kg N ha-1 yr -1 in the irrigated soil." (4.5%)

"Potential rates would be expected to be less at average field temperature than at [the ideal laboratory temperature]."

Appalachians, USA

- The quoted denitrification figure of 22.1 kg/ha/yr is misleading
  - The quoted denitrification figure of 22.1 kg/ha/yr is the total denitrification, not the difference
  - The irrigation rate was much higher at 1400mm/yr
  - Total leaching was 87.2kg/ha/yr compared to only 54 kg/ha/yr in the wastewater, i.e. the high irrigation rate forced existing soil N to leach
- A more comparable example is 40.2 kg/ha/yr with an irrigation rate of 700mm:
  - Total leaching was 72.6 kg/ha/yr, again higher than the N applied in the wastewater, caused by increased leaching

"During the 2-year period, the forest ecosystem experienced a net leaching loss of N that ranged from 14.8 to 105 kg N/ha/year, depending on the application rate."

"It is likely that this mature hardwood forest will continue to lose N, and that little or no additional N will be sequestered."

Shepparton, VIC Australia

"The soils have very low saturated hydraulic conductivity of 1–5 mm per day in horizon B"

"Trees were flood irrigated with secondary treated municipal effluent during the drier months of the year (October–April) starting in December 1993. High rainfall and low evaporation from May to September precluded effluent application to the soil." [lower rainfall, higher PET]

"[Brown Sodosol soils] generally have a bleached subsurface (A2) horizon leached of most of its nutrients and often waterlogged as water builds up on top of the dispersive subsoil after heavy rains" (Soil Science Australia)

- Soil type (Brown Sodosol) has very low infiltration rate
- This level of saturation will not be able to be maintained at Robinsons Bay – would cause runoff and slips
- **This study is not comparable**

Falmouth, USA

- Higher denitrification rate of 21 kg/ha/yr is for a non-vegetated area that was highly compacted by vehicle movements, so is not comparable.
- Actual denitrification rate for forest is 2-3kg/ha/yr (< 1%)

"Soil was a major sink for wastewater N in year 1, but in year 2 soil N retention fell to near zero, and N leaching losses greatly increased"

"Even at relatively low loading rates N saturation will eventually occur"

"Once an ecosystem has become overloaded with N, wastewater application rates would have to be drastically reduced for several years in order for the ecosystems to recover the capacity to retain added N"

Georgia, USA

- Reported denitrification rate of 5-10 kg/ha is from a much higher load of 407 kg/ha/yr (cf 57.5kg/ha/yr for Robinsons Bay)

"The contribution of denitrification to the removal of wastewater applied N was estimated to be only 2.4% on a landscape basis"

Revised denitrification rates

Site	N load Kg/ha/yr	Denitrification Kg/ha/yr	Denitrification (percent)
Whakarewarewa	298	0.7	**0.25%**
Falmouth	370-480	2-3	**< 1%**
Appalachians	62.9	< 0 (N leached exceeded N added)	**< 0%**
Georgia	407	5-10	**1.25 – 2.5%**

- There is no support from these papers for the assumed denitrification rate of **20-25%**.

Other nitrogen removal

MC	MC	MC
3W	2W	1W
1C	3C	2C
2W	3W	1W
2C	1C	3C
1W	2W	3W
3C	2C	1C
3W	2W	1W
1C	3C	2C

C: control
W: TMW irrigation
1/2/3: vegetation type
M: mixed vegetation

Figure 2: Recent satellite photo of the field site with visible treatment blocks (left) and schematic overview of the trial (right).

- Assumption that 23ha of unirrigated trees will remove wastewater nitrogen contradicted by the Duvauchelle tree trial design
- Uptake by vegetation:
  - Trial used a higher planting density
  - Decreases as the trees mature, eventually reaching equilibrium

Nitrogen assumption is unreliable

- The application is reliant on nitrogen removal of 13.5 kg/ha/yr in both irrigated and un-irrigated areas, to keep within freshwater nutrient limits.
- This removal assumption is contradicted by the applicant's own evidence: the actual removal rate is likely to be much lower.
- Under a more realistic nitrogen removal rate, the LWRP freshwater N limit is easily exceeded.
- The nutrient load relied on for assessment of freshwater and coastal impact is not reliable, meaning impacts are likely to be higher than assumed and need to be re-assessed.

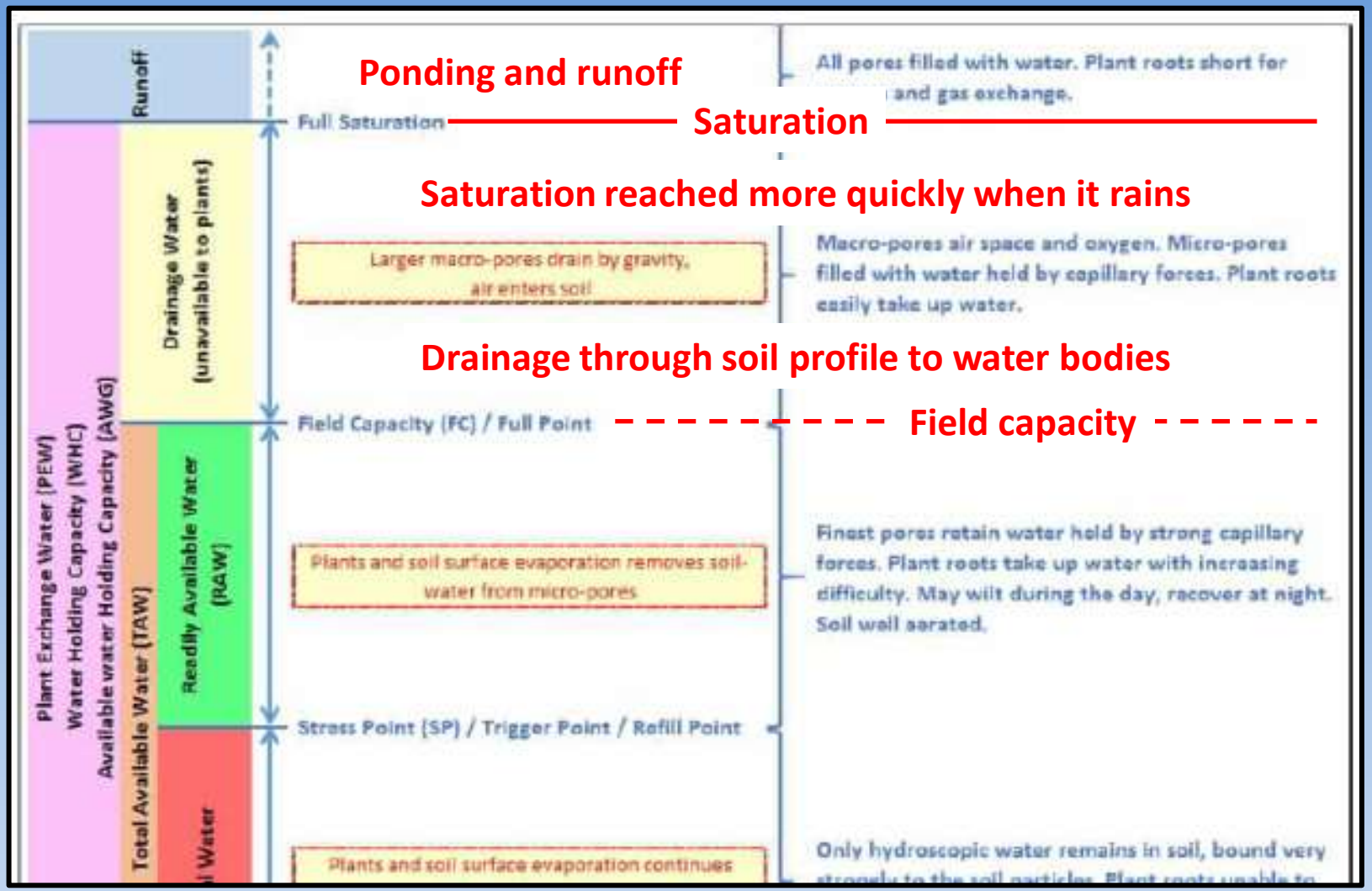
Summary of nitrogen issues

- Several experts highlight the risk to the environment from nitrogen
  - A conservative approach is recommended
- The "preferred" scenario used likely overstates nitrogen removal so is not reliable
  - "Conservative" scenario (no removal) easily exceeds the LWRP nitrogen limit
- Suggested monitoring and adaptation is not sufficient:
  - Nitrogen build-up can take many years
  - Mitigations will take time to implement
- Mitigation requires removal of around half of the nitrogen load:
  - Improve the treatment standard, or
  - Dispose of half of the treated wastewater outside the catchment

Section 11

Non-deficit irrigation assumption

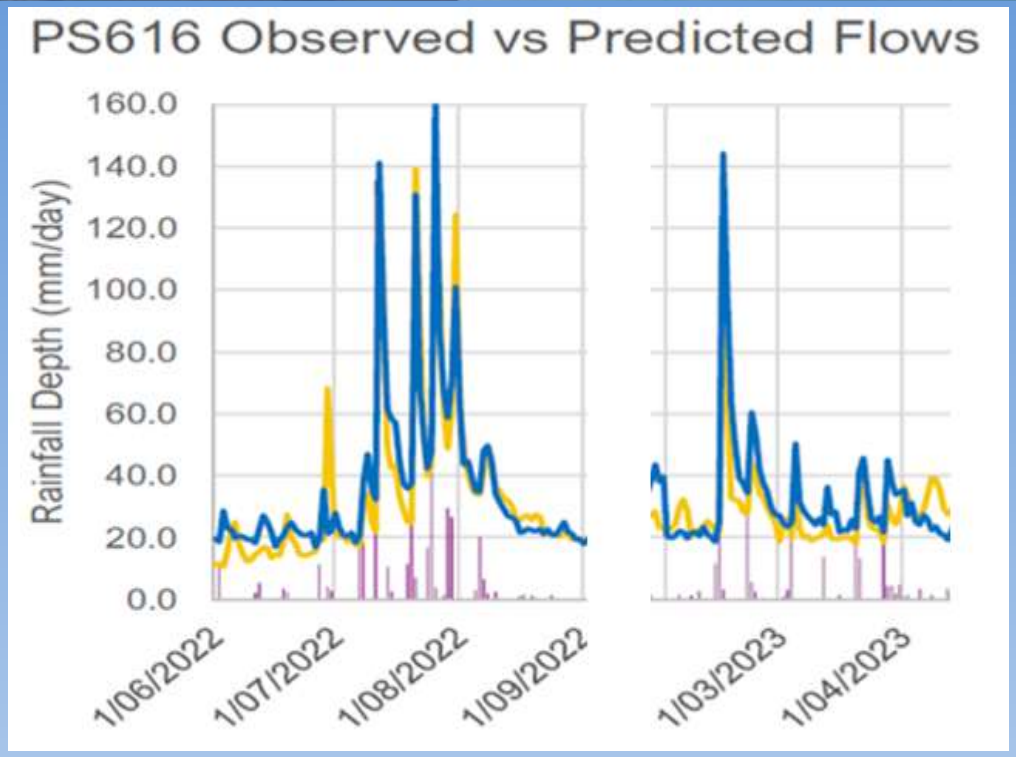
Terminology



Over-irrigation concerns – CRC s42A

- M. Burns: risk of adverse effects on coastal water quality and estuarine ecology low provided that wastewater is applied at low rates to unsaturated soils
- Hayward: some risk of overland flow and run-off to waterways on occasions
- Scott: health risks to private drinking water supplies is low if wastewater is applied at low rates to unsaturated soils
- Riddle: risk of tunnel gullies if irrigate soils already at field capacity, requiring soil moisture monitoring
- Ellwood: soil likely to be at/above field capacity allowing irrigated wastewater to flow to ephemeral streams.
  - lack of detail on soil condition monitoring increases the risk of irrigation water running off and entering surface water
- Applicant (van Kekem) assumes conditions to avoid ponding (odour)
- Mahaanui Iwi Management Plan: avoid over-saturation and therefore the contamination of soil and/or run off and leaching

When to cease/start irrigation



- Soil moisture remains elevated for extended periods after heavy rainfall
- Soil moisture accumulates over wet winters
- Ellwood recommends irrigation scheduling based on soil moisture and rain forecast (CRC s42A)

Monitoring/adaptation insufficient

- Delay in problems becoming apparent:
  - Slope instability not apparent until slip/tunnel gully collapse
  - Nutrient build-up in soil masks lack of attenuation
- Difficulty finding alternatives
  - More land
  - Other disposal alternative (e.g. outfall)
  - Resource consents needed
- Having a management plan does not guarantee the outcome; conditions need to specify the outcomes, regardless of how they are achieved (MacKenzie)

Additional capacity overstated

- "Less suitable" 5ha not being consented so cannot be relied upon
- Claim that potential irrigation rate is 7 X the maximum (summer) rate does not account for slope stability
  - Uses assumed soil characteristics
  - PDP found large variation over the Robinsons Bay site and stated that the lowest infiltration rate should be applied
- Claim that system is only at 71% capacity (wrt irrigation rates) ignores that this "spare" capacity is mostly in summer when it is not needed; no advantage to storage requirements/exceedance frequencies/volumes (see earlier)
- **If there is significant spare capacity, why wasn't it used to reduce/eliminate exceedances?**

Appropriate mitigation

- Conditions requiring CCC to water to soil moisture level difficult to monitor and enforce
- Van Dijk recommends to apply precautionary limits to avoid over-irrigation: do not water above field capacity
  - Cease when heavy rain forecast (50mm)
  - Do not restart until sufficient deficit to do so
- Watering to soil conditions supported by CRC (Ellwood, s42A)
- Does not fundamentally change the system
  - Frequent exceedances already anticipated
  - Alters the frequency and volume of exceedances/second discharge path [Van Dijk now]

Section 12

Treated wastewater storage exceedances

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Frequency of exceedances

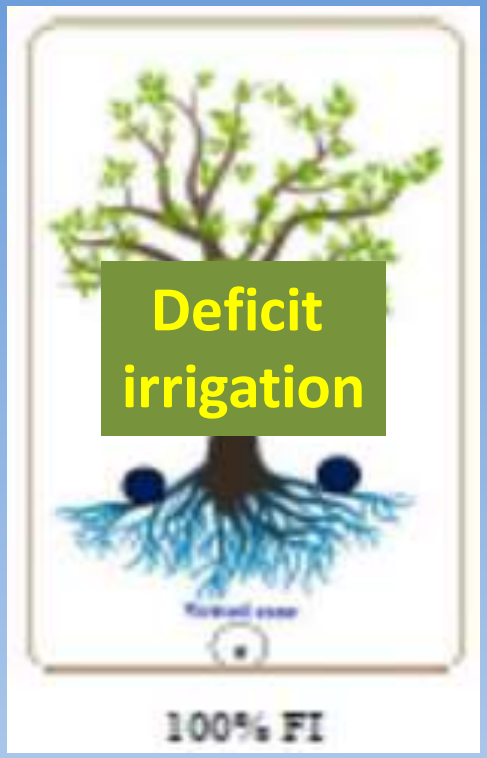
Scenario	Storage	Exceedance (ARI)
Original application, modelled on dry years, I&I reductions	12,000m^3	0
FBPI analysis, **modelled to 2022**, I&I reductions	20,000m^3	6
FBPI analysis, modelled to 2022, I&I reductions	12,000m^3	22
CCC response to CRC RFI, adjusted modelling, I&I reductions	*12,000m^3*	*5*
Beca update report, **updated model, wetland, no I&I reductions** (adjusted and raw model results)	22,208m^3	11-21
Offer, updated model, **Akaroa + duvauchelle** storage + wetland + **raw buffer, no adjustment**	28,000m^3	12
PDP Combined Akaroa and Duvauchelle Treated wastewater storage exceedance discharges - shortlist options report, Akaroa + Duvauchelle combined storage, irrigation and flows + wetland freeboard, no raw buffer	**25,800m^3**	**21 (1 in 2.5 years)**
FBPI, updated model, **Akaroa only + wetland freeboard**	21,800m^3	21

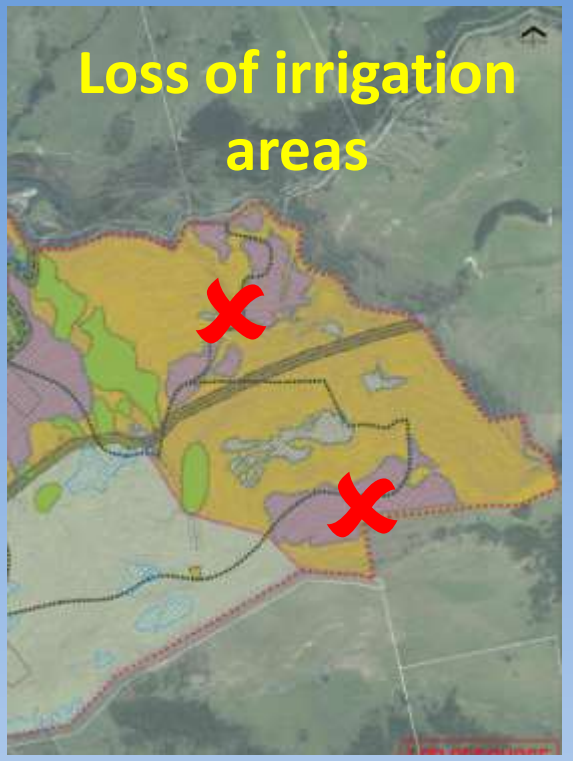
Frequency of exceedances depends on storage and I&I reduction assumptions

Mismatch between model and reality

- Storage model: cease if 50mm in a day, resume after 24hrs without rain
  - Ellwood: modelling does not consider effects of cumulative rainfall
- Management: avoid soil saturation, cease if ponding or runoff observed
- July 2023 rainfall event: Robinsons Bay irrigation field still saturated 8 days after last rainfall (11 days after the storm)

Sensitivity modelling





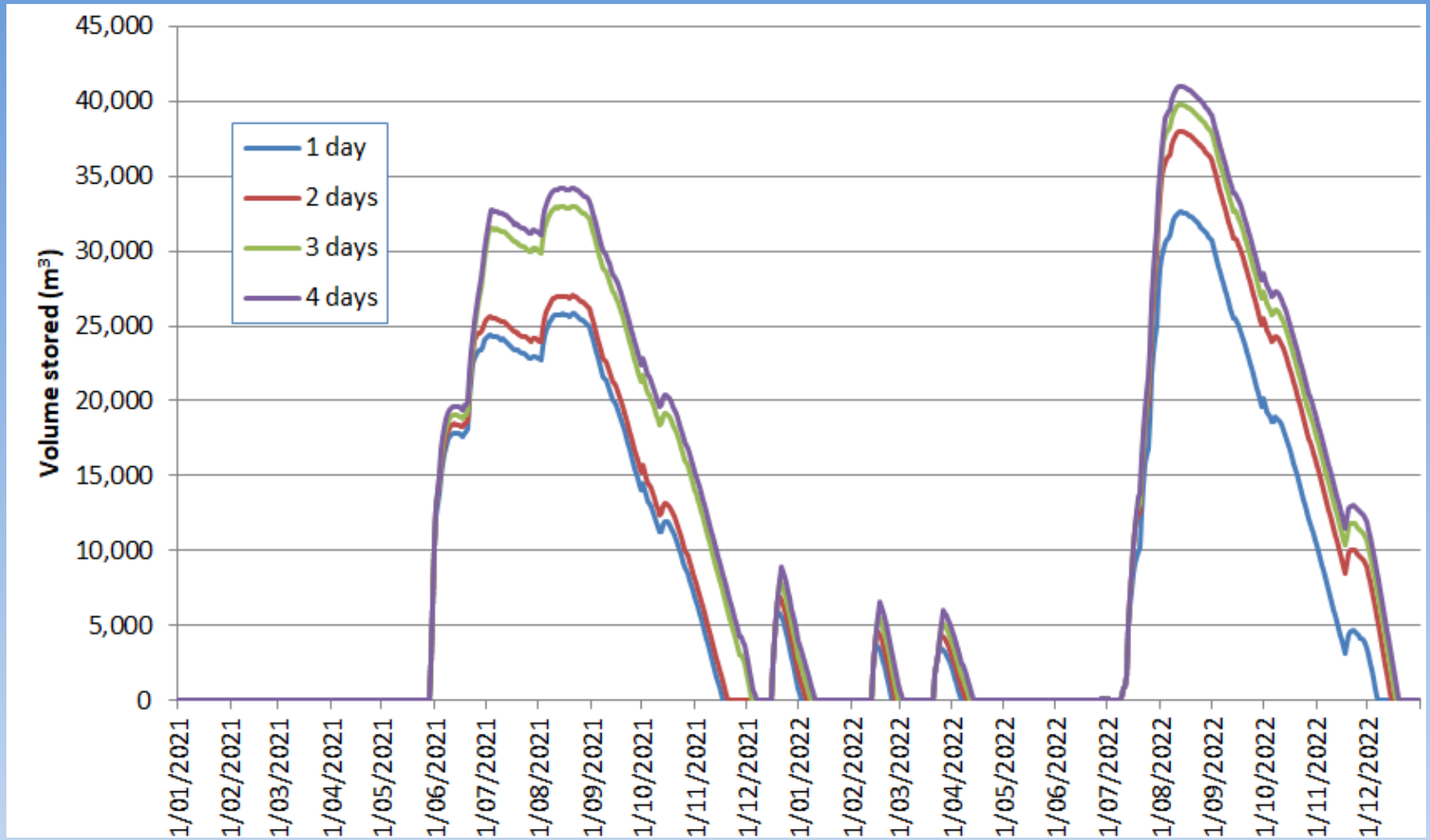
- Using realistic parameters will increase storage requirement or exceedances

Storage calculation

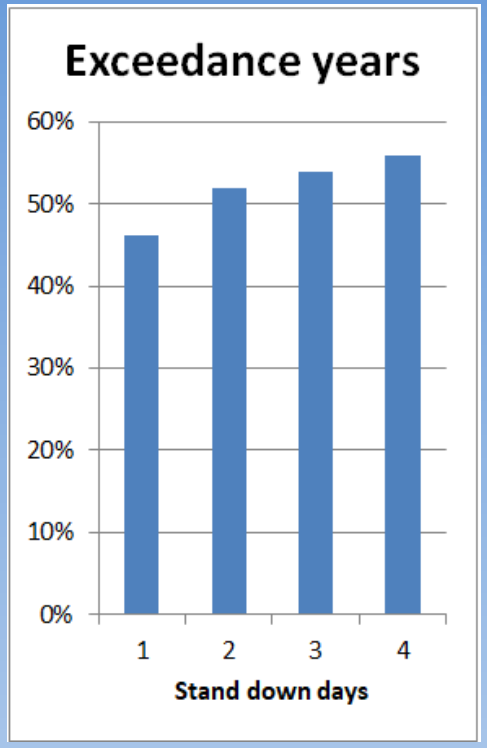
For each day:

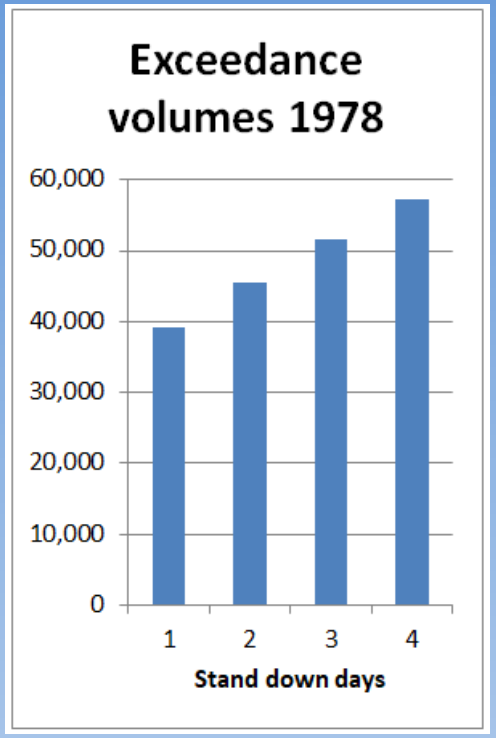
- Add today's wastewater flows to storage
- Decide whether or not irrigation can take place:
  - Cease when 50mm or greater recorded in one day
  - Restart when **STAND_DOWN_DAYS** [1] dry days experienced or the daily flow is lower than **NORMAL_FLOW** [N/A]
- Calculate how much can be irrigated:
  - No irrigation if wet (above)
  - No irrigation on 1st October (maintenance)
  - Otherwise the lesser of:
    - storage volume
    - this month's irrigation rate * **HECTARES** [35.7])
- Subtract this amount from storage
- Adjust the storage for wetland impact:
  - Add rainfall collected in wetland (if raining)
  - Subtract evapotranspiration from wetland
- If storage is greater than **STORAGE_AVAILABLE** [21,208], the difference is the overflow volume

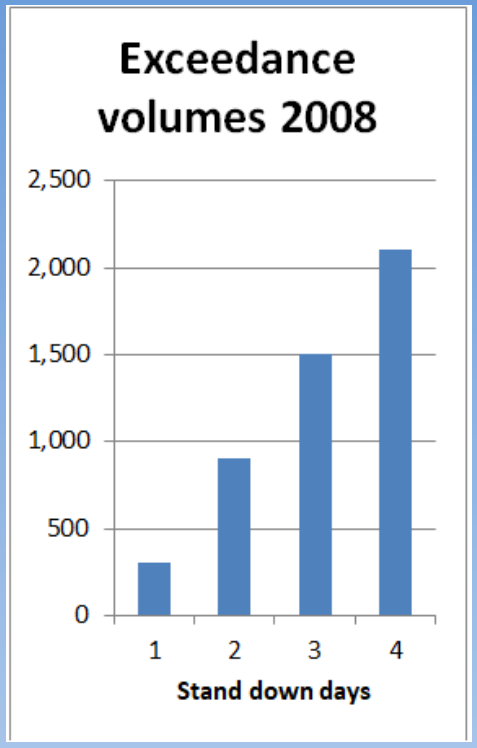
Scenario 1: varying restart days

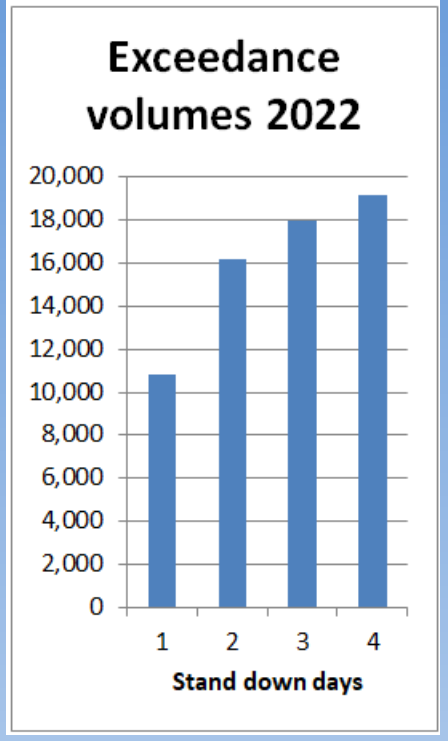


Effect of delayed restart



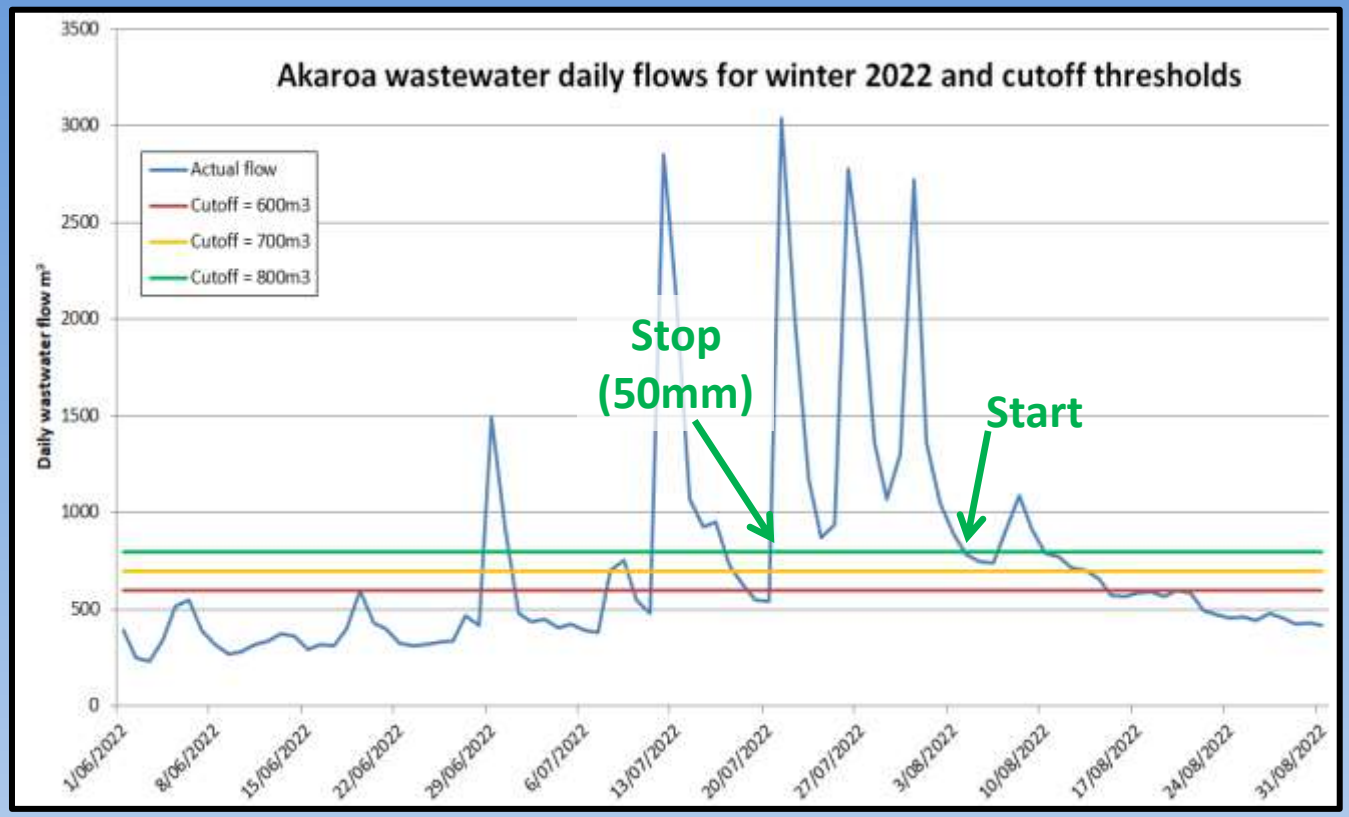






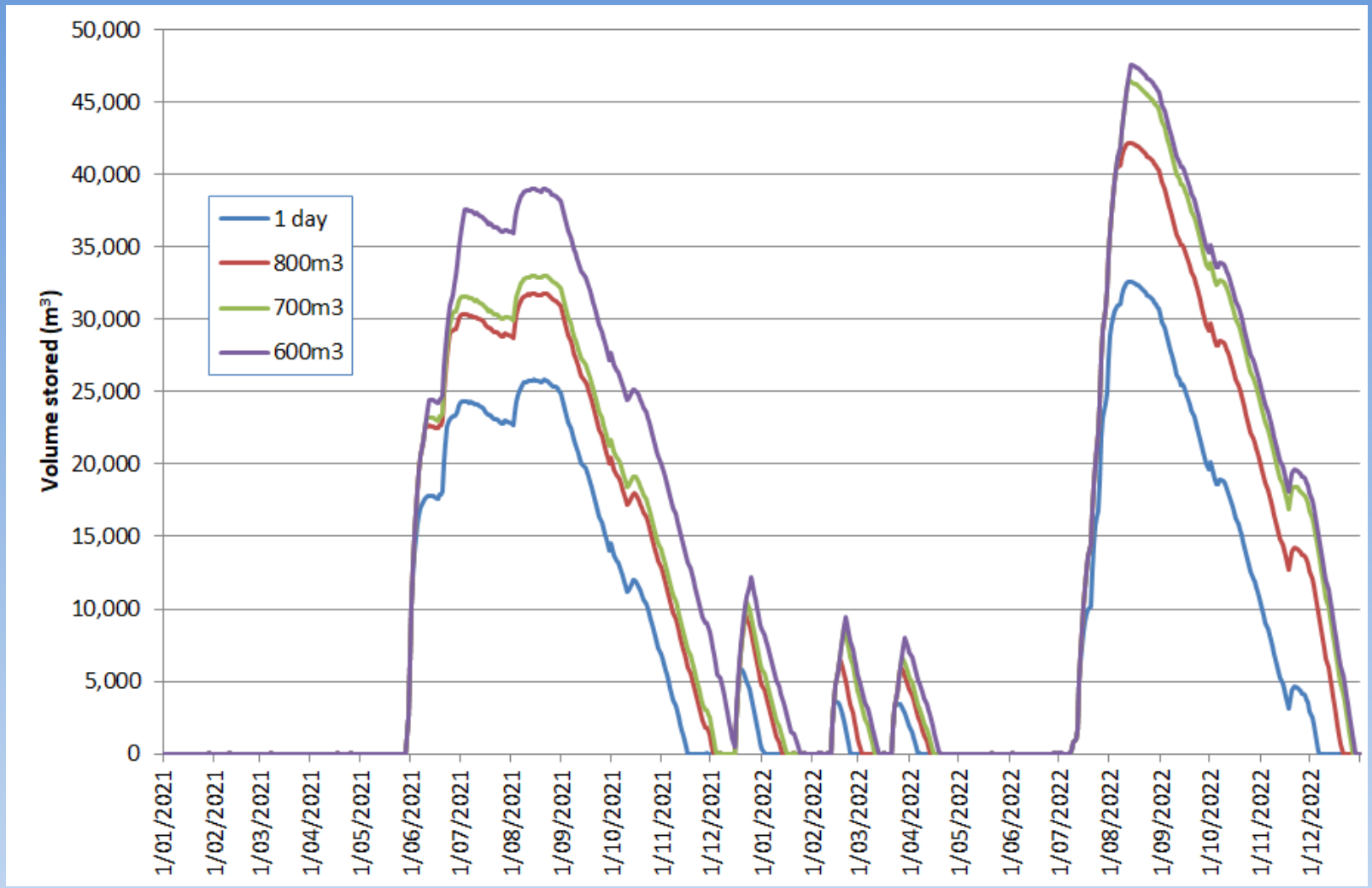
- Irrigating to soil moisture increases exceedances
- Size of effect varies by year and cutoff

Field capacity proxy

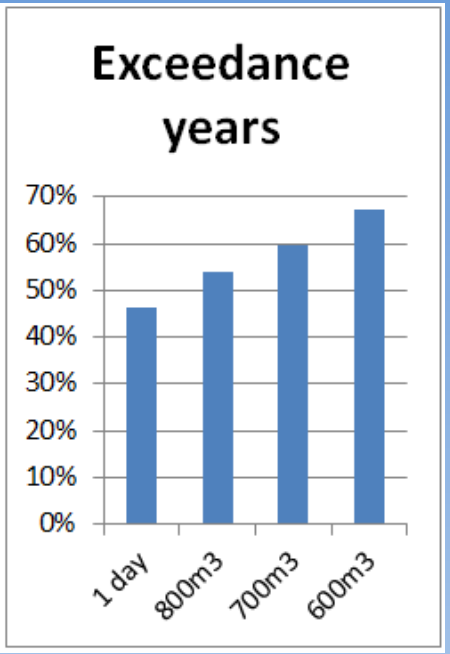


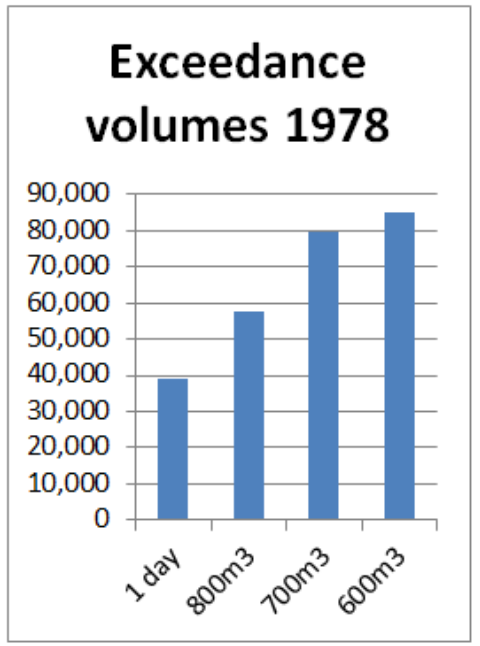
- Rising winter flows likely caused by increased infiltration from rising groundwater
- Use as a proxy for soil moisture level at irrigation sites
- Restart when daily flows drop back to "normal" levels

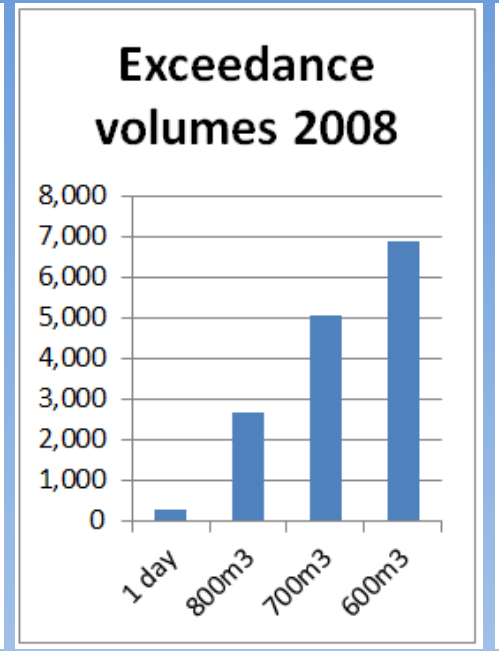
Scenario 2: field capacity proxy

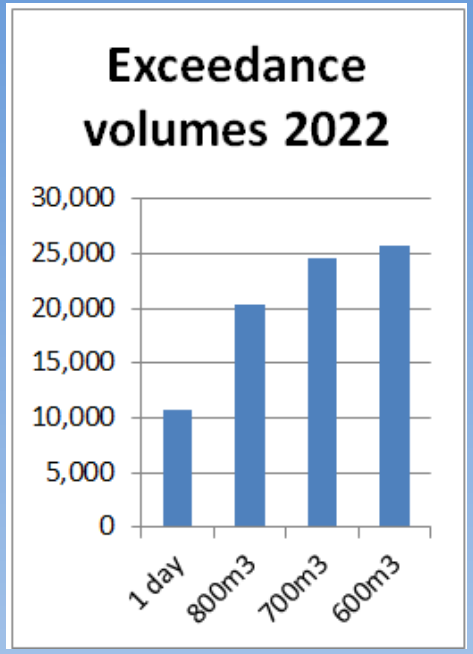


Effect of irrigating to field capacity









- With 800m^3 cutoff exceedances are similar to 4-day standown
- With 600m^3 cutoff the effect is doubled

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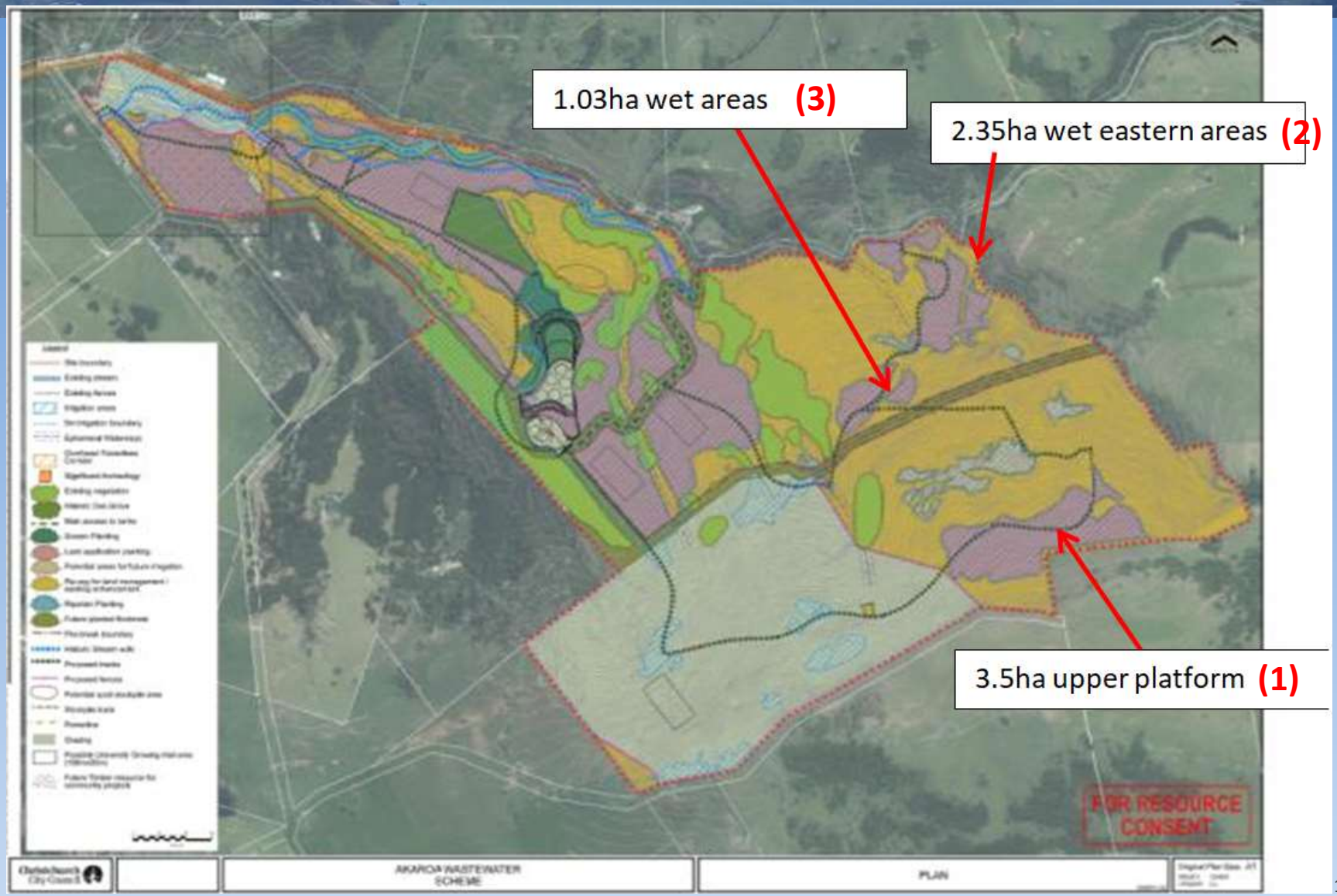
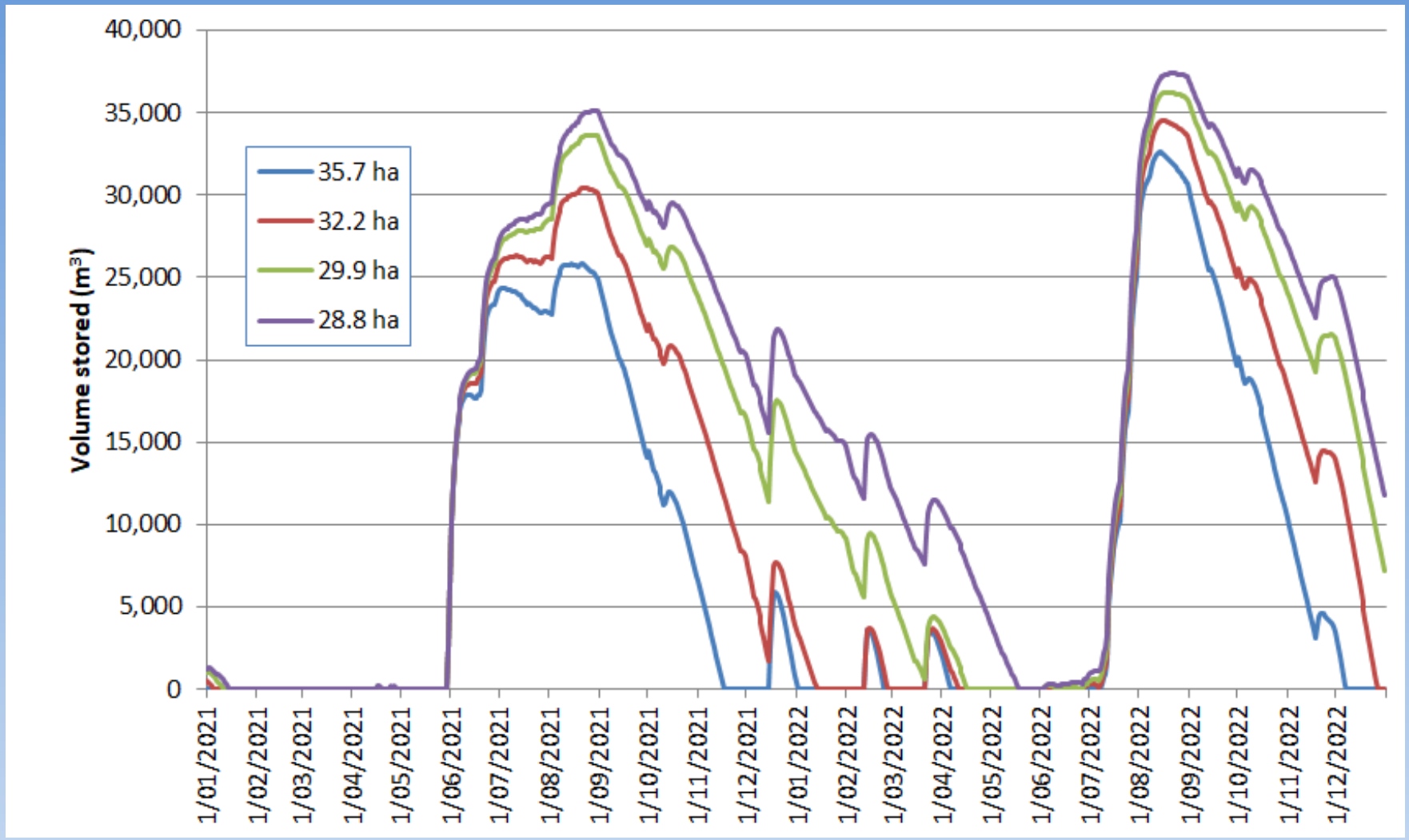
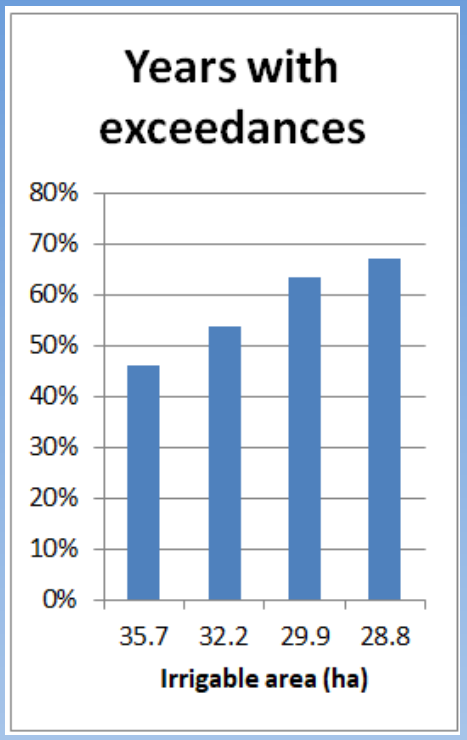
Scenario 3 less land available

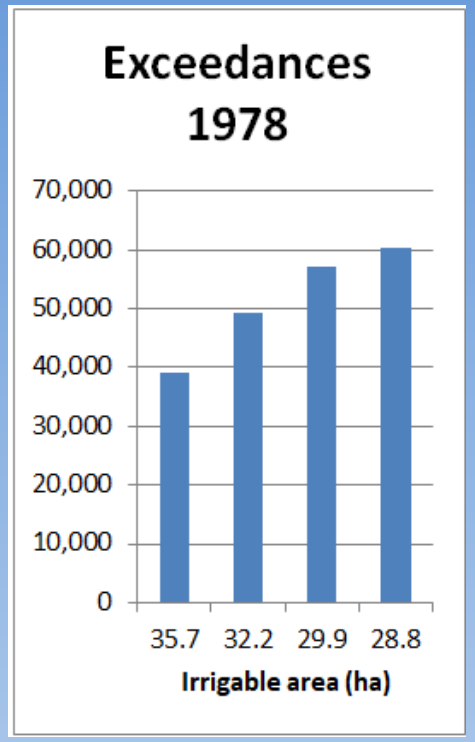


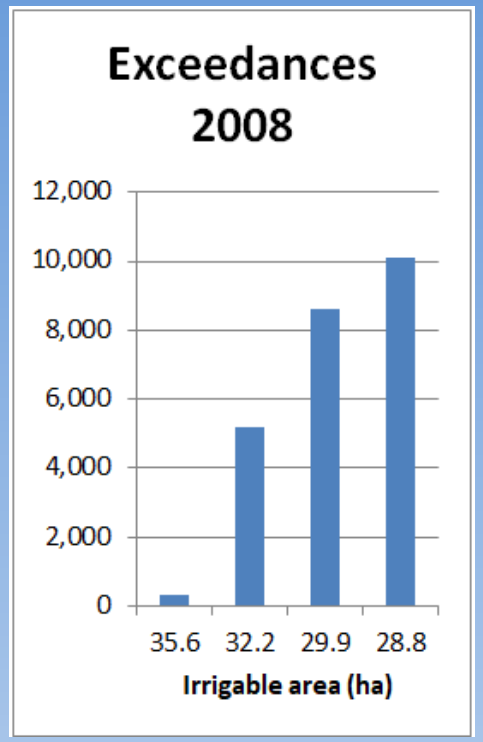
Less land effect

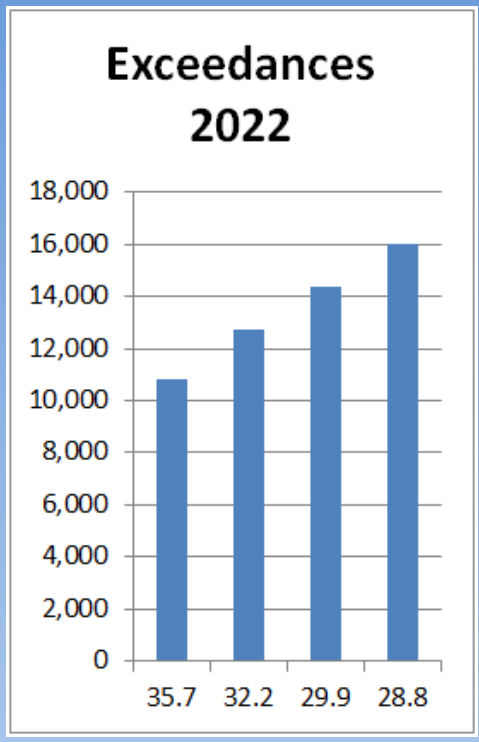


Effect of reduced area



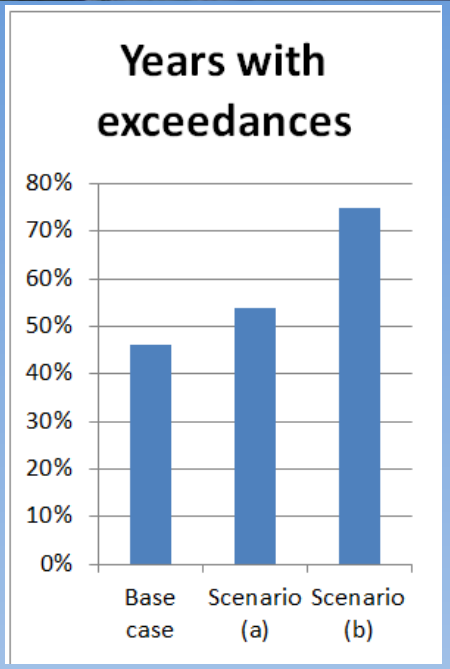


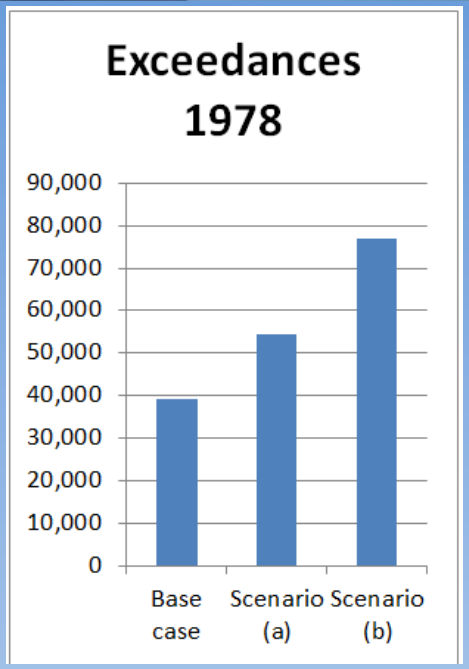


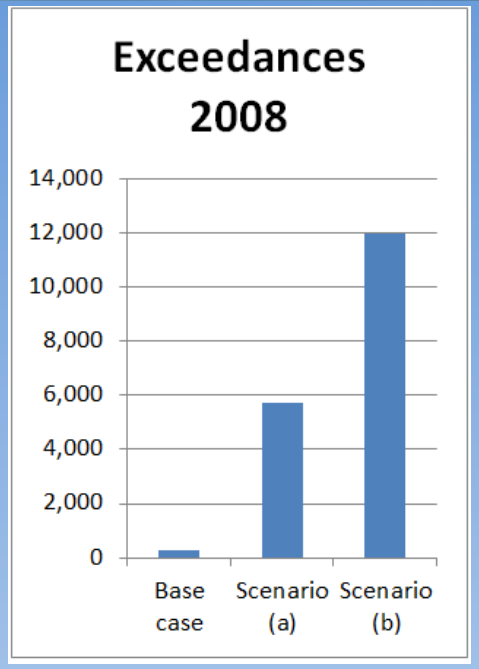


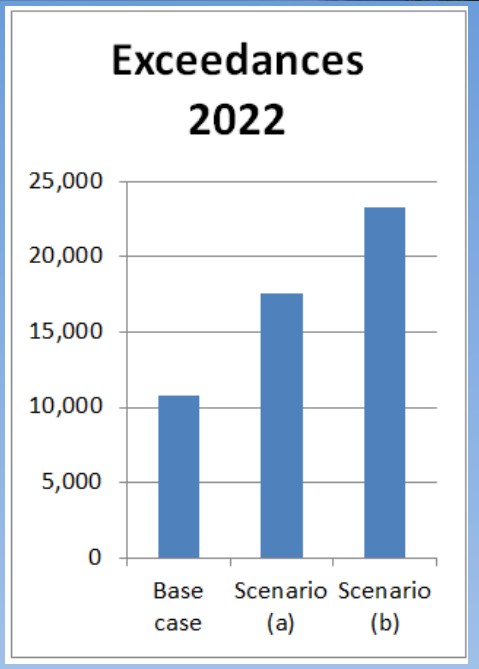
- Loss of all upper areas increases exceedances to 67% of all years
- Exceedance volumes for wet years increase by 50%

Combined parameter effects



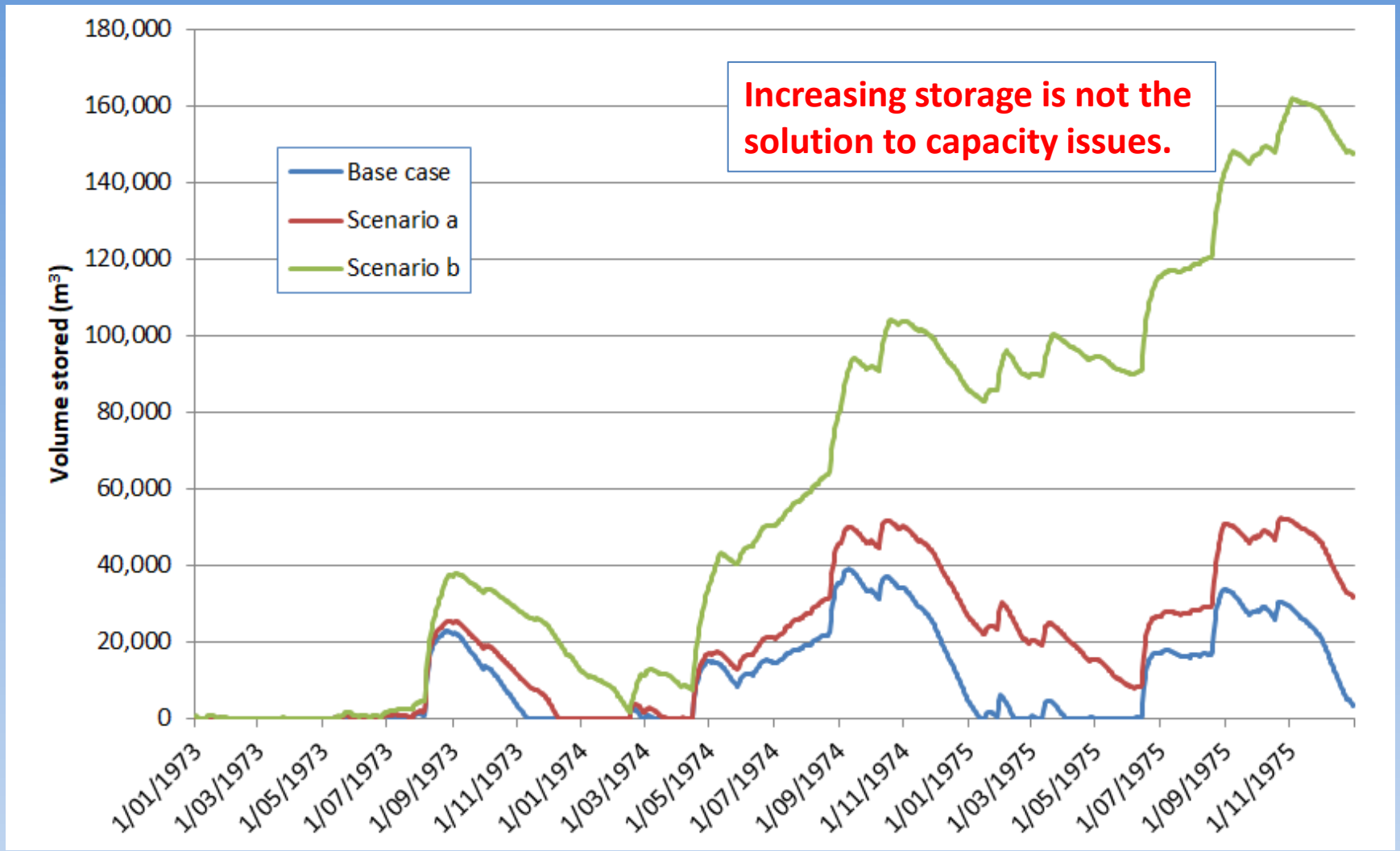






- Three combinations:
  - Base case: 35.7 ha, restart next dry day
  - Scenario (a): 32.2 ha, restart after 2 days
  - Scenario (b): 28.8 ha, restart when flows below 800m3
- Scenario (b):
  - Increases Exceedance years from 46% to 75% of all years
  - Doubles exceedances volumes

Combined effects



Exceedances require consideration

- Exceedances likely to be higher than anticipated by application
- Currently favoured discharge option is the Childrens Bay sea wall
  - Same location as the TPS raw overflows
  - Potential for greater health and environmental impacts than the current harbour outfall
  - Unacceptable to many members of the community
- Need to consider the effects of the exceedances as a secondary discharge
  - Can't control the "demand" (flow) if adverse effects found

Dual discharge system

- Coutinho: proposal is a dual discharge system
- Same situation as described by Eco Eng (Andrew Dakers) in 2010
- Primary discharge (irrigation) and secondary discharge (exceedances) need to be considered together
  - Required by LWRP rule 5.84: land use and discharges
  - ATWIS may lead to adverse effects via the secondary discharge
- Recommend replace foreshore discharge with a long harbour/ocean outfall with cultural treatment:
  - Continue use of existing Akaroa outfall
  - 2015 mid-harbour proposal
  - 2020 consultation proposal: purple pipe to Glen Bay and new outfall
  - Ocean outfall beyond Akaroa heads

Summary – treated wastewater exceedances

- Exceedances for entire system including Duvauchelle anticipated at 1 in 2.5 years (21 out of 52 years or 40%)
  - Likely to be higher once realistic management rules taken into account
  - Impractical to alleviate through increased storage and/or irrigation area
  - Occur when treatment plant running at reduced treatment level to cope with flows
- Childrens Bay discharges not acceptable to the community
  - No consultation on this has been carried out
- ATWIS is effectively a "dual discharge" system. To be consented under LWRP rule 5.84, the impacts of the system as a whole need to be considered:
  - Land use and discharges
  - Includes the WWTP and TPS (consent to store wastewater only)
  - Duvauchelle should be included also as it is intrinsically linked and will operate as a single system.

Section 13

Untreated wastewater capacity issues

Terminal Pump Station

- Part of the community wastewater treatment system of which ATWIS is a part:
  - Primary treatment (screening)
- Modelled discharges are not emergencies:
  - Anticipated at 1 in 5 years
  - Twice the frequency as the rest of the network
- Should be treated as part of the ATWIS application (Ellwood, Coutinho):
  - Requires consent under LWRP rule 5.84 (CRC s42A)
- Discharges also require consent – status is unclear
  - Emergency (spill, overflow, or equipment failure) untreated sewage discharges are non-complying (LWRP 5.87)
  - Non-emergency untreated sewage discharges are a **prohibited** activity (LWRP 5.88)
  - ATWIS cannot function without the TPS

Wastewater treatment plant

- Part of the community wastewater scheme of which ATWIS is a part, including pond site 10:
  - Raw buffer storage
  - Sub-surface wetland
- Influences the frequency of raw wastewater overflows at the TPS:
  - Size of the raw buffer storage
  - Processing capacity and flexibility of the IDAL treatment plant
- Requires land use consent under LWRP rule 5.84
  - Contribution to raw and treated wastewater discharges needs to be considered
  - Cumulative effects of raw and treated wastewater discharges need to be considered together

Section 14

Natural hazards and climate change

Natural hazards

- AEE identifies multiple hazards:
  - Geological and seismic
  - Flooding and erosion
  - Fire
- Slope stability risk from irrigation: insufficient geological investigation (upper slopes)
- Alpine fault high probability of rupture during ATWIS lifetime
  - Loss of irrigable areas from landslides
  - Partial or total failure of storage tanks

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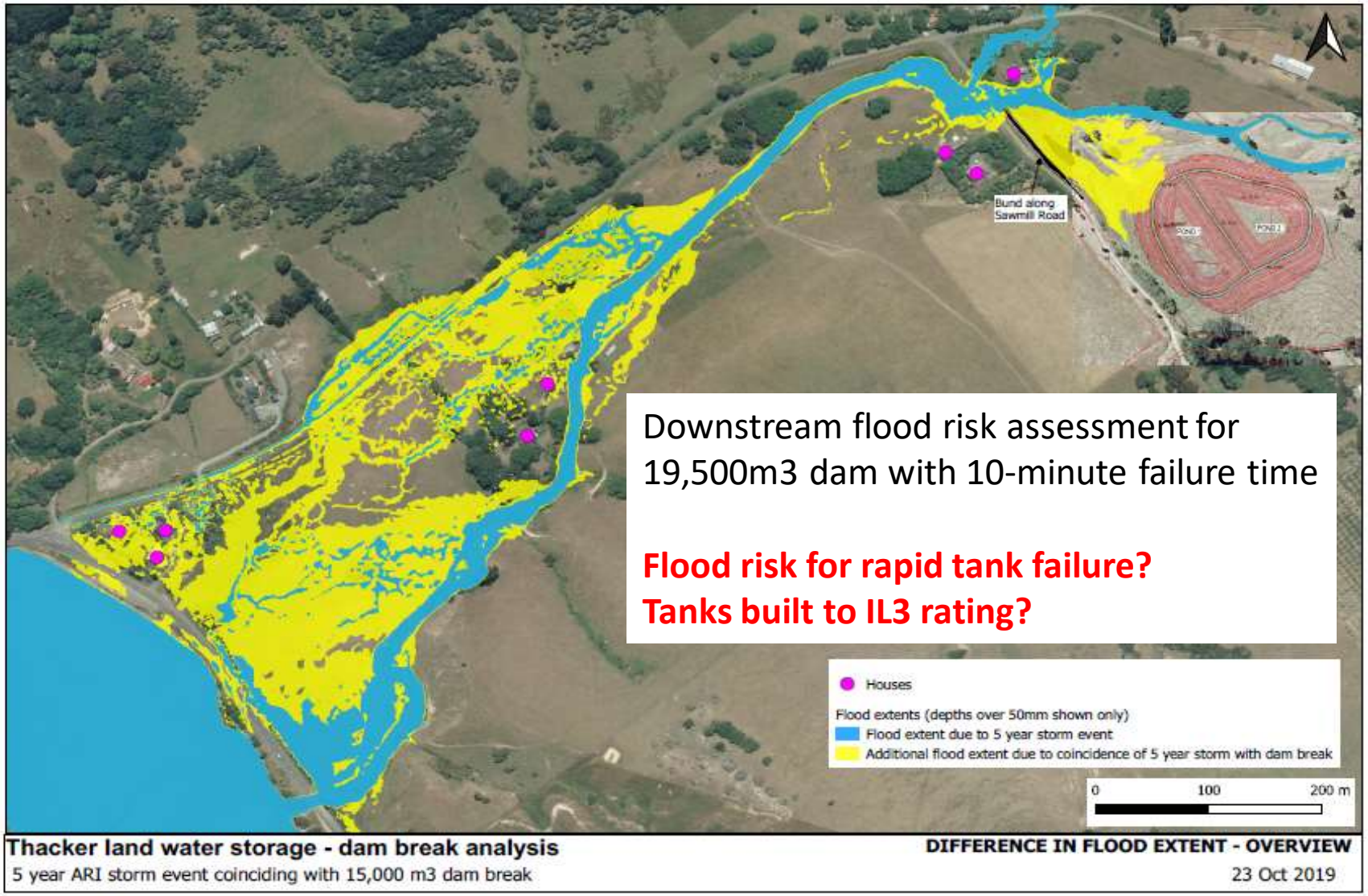
Natural hazards - flooding



Downstream flood risk assessment for 19,500m3 dam with 10-minute failure time

Flood risk for rapid tank failure?
Tanks built to IL3 rating?

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Climate change vulnerability

Climate crisis

Climate change target of 2C is 'dead', says renowned climate scientist

5h ago

Climate crisis Temperatures at north pole 20C above average and beyond ice melting point

December 2021 slips Hinewai Reserve

"Biggest slip disaster we have ever had in 30 years… 280mm of rain fell on waterlogged soil."
Hugh Wilson, Reserve Manager

Reference: https://www.stuff.co.nz/national/weather-news/127346745/canterburys-hinewai-reserve-scarred-by-slips-after-dramatic-floods

Increased climate risks

- Multiple exposures to increased climate risk
  - More extensive footprint
  - Two pump stations near the coast
  - Loess soil slopes in irrigation fields weakened by long-term increase in moisture levels
  - Storage tanks on loess soil platform in irrigation field
  - Critical reliance on electricity supply for pumps
- I&I issues exacerbated by increased storm intensity will lead to more overflows

Climate effects not mitigated

The Extreme Weather Event Risk Attribution Machine research project, which received funding from the Ministry for Business, Innovation and Employment's (MBIE) Endeavour Fund, studied the effects of climate change on severe weather events in New Zealand.

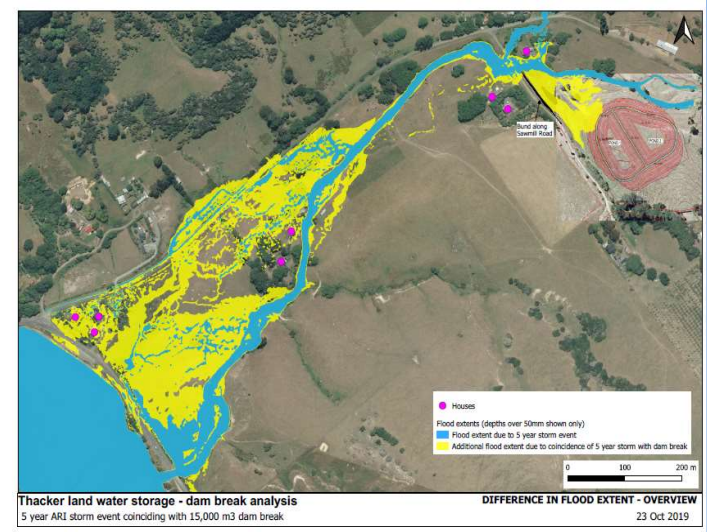
- In 2021, it found that extreme rainfall events causing flooding in Canterbury were 10 to 15 per cent more intense as a result of climate change.

https://environment.govt.nz/news/the-science-linking-extreme-weather-and-climate-change/

- BECA update report acknowledges increased storm frequency and intensity are a feature of climate change
- Climate adjustments in modelling reduced rainfall in winter without adjusting for severe events
- No capacity margin despite the BECA update report recommending it
  - Already undersized and will have exceedances
  - based on optimistic assumptions for irrigation, storage capacity requirements and geotechnical risk
- Headroom implicit in the original application has now been used and exceeded as a result of corrected flow modelling

Potential impacts

- Loss of irrigation area through slips
- Tank platform failure causes infrastructure damage and floods downstream settlement
- Storm surge/tsunami damage to one or both terminal pump stations



Re-use to address water shortages

- Akaroa's water shortages will likely worsen under climate change
- Jubilee park sub-surface irrigation does not materially reduce shortages
  - Labelled "future purple pipe"?
  - Concerns raised by experts about irrigating the capped landfill
- Strong community support for re-use in 2020
  - Flushing public toilets
  - Private non-potable use
  - Major omission in the proposal

Resilience should be primary driver

Napier City Council's wastewater plant at Awatoto was inundated with floodwater and silt. Raw sewage has been pumped into the sea since 14 February because of the damage to the plant.[8]

Wastewater plants were impacted in other affected areas such as Dannevirke where the plant was "overwhelmed" [9] and Wairoa where floodwaters were treated as contaminated due to wastewater system overload.[10]

In summary, Cyclone Gabrielle has provided additional lessons on how the country has neglected building resiliency into its water infrastructure. More work is needed to establish a clear picture of the vulnerability of water infrastructure, and both central and local government need to invest far more in upgrading such infrastructure if it is to provide the most essential of public health needs under intensifying climate disruption.

Public Health Communication Centre Aotearoa (PHCC)
https://www.phcc.org.nz/briefing/water-infrastructure-failures-cyclone-gabrielle-show-low-resilience-climate-change

Lack of resilience

- Fixed capacity irrigation system decreases resilience
  - Loss of irrigation area or storage leads to treated wastewater discharges until remedied
- Loss of TPS leads to untreated wastewater discharges until remedied
- Discharge to foreshore at Childrens Bay is not an acceptable alternative for prolonged disruption
  - A longer harbour outfall as a secondary discharge provides resilience
- Necessary, not unreasonable, to build resilience into the scheme (instead of removing it) as urged by PHCC Aotearoa

Section 15

Operational feasibility

Operability

- Large extent:
  - 35.7ha X 10,000m2 X 2 lines per m = 714,000m of irrigation line (714km)
  - Drippers at 0.3 to 0.5m X 714,000m = 1.4-2.5 million drippers
- Challenging to operate and maintain
  - Hydraulic pressure balancing
  - Kānuka and understory will be difficult to inspect
- Comprehensive monitoring of soil conditions required to effectively control irrigation rates
  - Challenging terrain to quickly inspect
- Environmental monitoring adds to expense

Native vegetation challenges

Small leaf copromosma creates a low dense branch tangle

Vines smother trees from the ground up in thick canopies

Ongaonga – NZ stinging nettle colonises bush margins

Mahoe grows in dense thickets in light wells

Bio-diverse colonising species often create a dense and impenetrable understorey making access to irrigation infrastructure very difficult and would need to be removed for access

Complexity increases risks

- CCC struggles with running the current systems
  - Flow meter failures undetected
  - Lack of real action (or enforcement) over I&I
  - Raw sewage overflows at the current treatment plant
  - Water supply reservoir and retentate issues
  - Difficulty retaining expertise?
- Systems needed to ensure compliance
  - Risks of over-irrigating need to be mitigated
  - Monitoring information should be available for public scrutiny

Increased management load

- Significantly higher operational management requirements compared to the current scheme, including:
  - Monitoring the irrigation areas for:
    - actual and potential slope stability
    - ponding and runoff
    - damage to infrastructure from storm events, such as slips
  - Monitoring the tank platform for geotechnical issues
  - Monitoring Robinsons Bay stream and estuary for evidence of degradation by nutrients and other contaminants
  - Monitoring the treated wastewater for contaminant levels including nutrients and emerging contaminants
  - Inspecting the 700km of irrigation lines for damage or blockages and mitigating as necessary
  - Maintaining the irrigation lines, including flushing and replacement
- Operational costs likely to be significantly higher than for the current system

Financial pressures

Measures of success (What our community can expect)	LTP 2024-34 Performance Targets/Outputs			
	2024/25	2025/26	2026/27	2027-34
Percentage of total wastewater gravity network pipework length at condition grade 5 (very poor) (11.0.1.18)	≤ 17%	≤ 18%	≤ 19%	≤ 19% to ≤ 26%

Te Mahere Rautaki Kaurera | Our Long Term Plan 2024-2034 – Volume 1 | Ōtautahi Christchurch

- CCC current maintenance targets assume a degradation in performance.
- Climate change adds to financial strain on Councils
  - Fires, floods and other natural disasters
  - Infrastructure strain and damage
- Operational cost of the new scheme is relevant to potential environmental effects

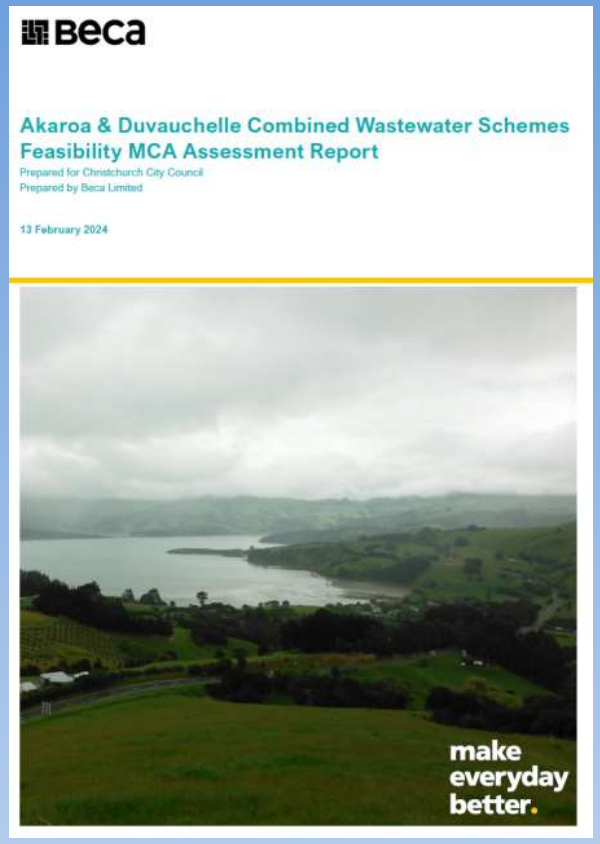
Section 16

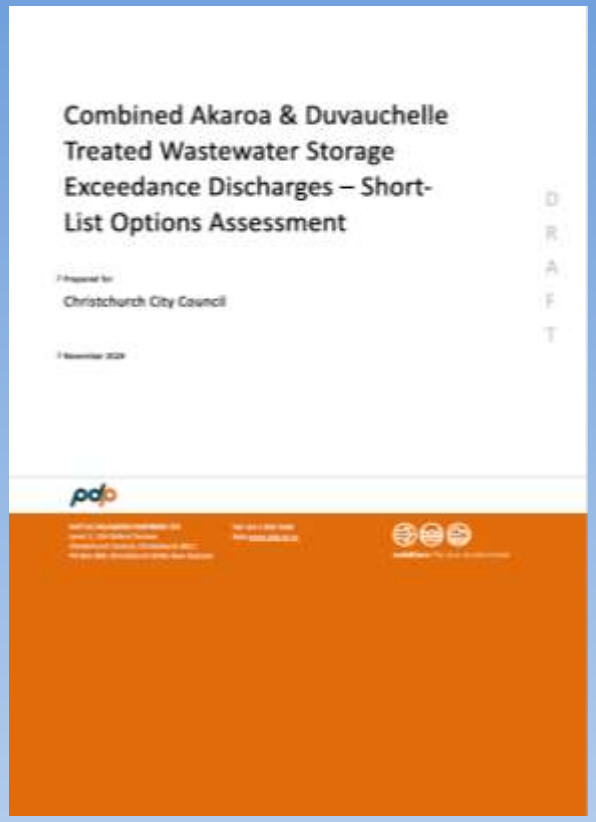
Piecemeal approach to obtaining consents

Deferral discussion

- In Minute 9 Panel has stated *that while it is proceeding with the hearing, it remains vigilant to reconsidering deferral if further matters are raised*
- We now present new information relevant to this consideration
  - Akaroa and Duvauchelle are a single community wastewater treatment system
  - Duvauchelle may have run into difficulty
  - The whole system and its discharges need to be considered as a Community Wastewater Treatment System

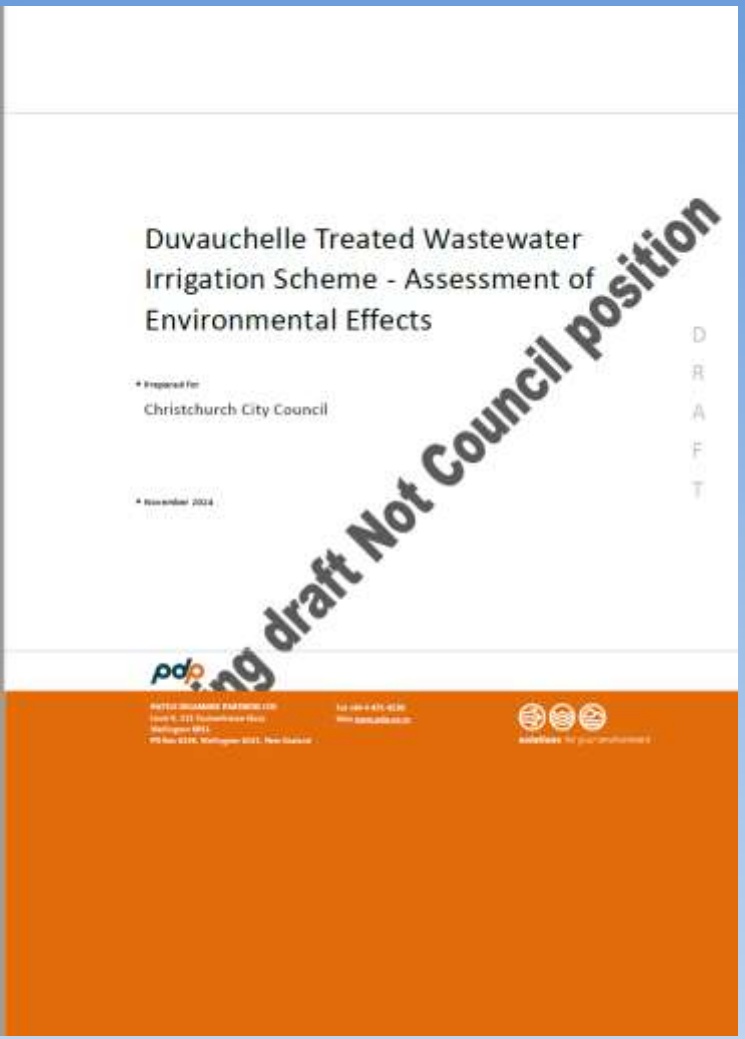
Reports document combined system





- Feasibility assessment completed
- Combined overflows assessed
- Duvauchelle relies wholly on ATWIS for treatment, storage, overflow and some piping
- ATWIS storage exceedances affected and increased by Duvauchelle flows
- Unclear how treated WW will be allocated between irrigation fields given Duvauchelle has different irrigation cut-offs and rates

State of Duvauchelle application



- Originally to be lodged October 2024
  - Reason CRC proceeded with ATWIS processing
- Community receives update in December stating application will be lodged February 2025
  - Project Manager Tim Ure informs via email to Dr Martin lodging likely mid year
- Dr Martin then sent draft AEE

Confirms a single combined scheme

Section 3.4 ATWIS

Although the ATWIS project and resource consents are separate to this application for the DTWIS, the ***decision to combine treatment at the new Akaroa WWTP means that the two projects and irrigation schemes are connected.*** *All matters regarding wastewater quality treatment at the Akaroa WWTP will be managed through the ATWIS application, as that application has already been lodged with and notified by CRC. Section 4 of this AEE explains how the irrigation will be managed across the four irrigation fields*

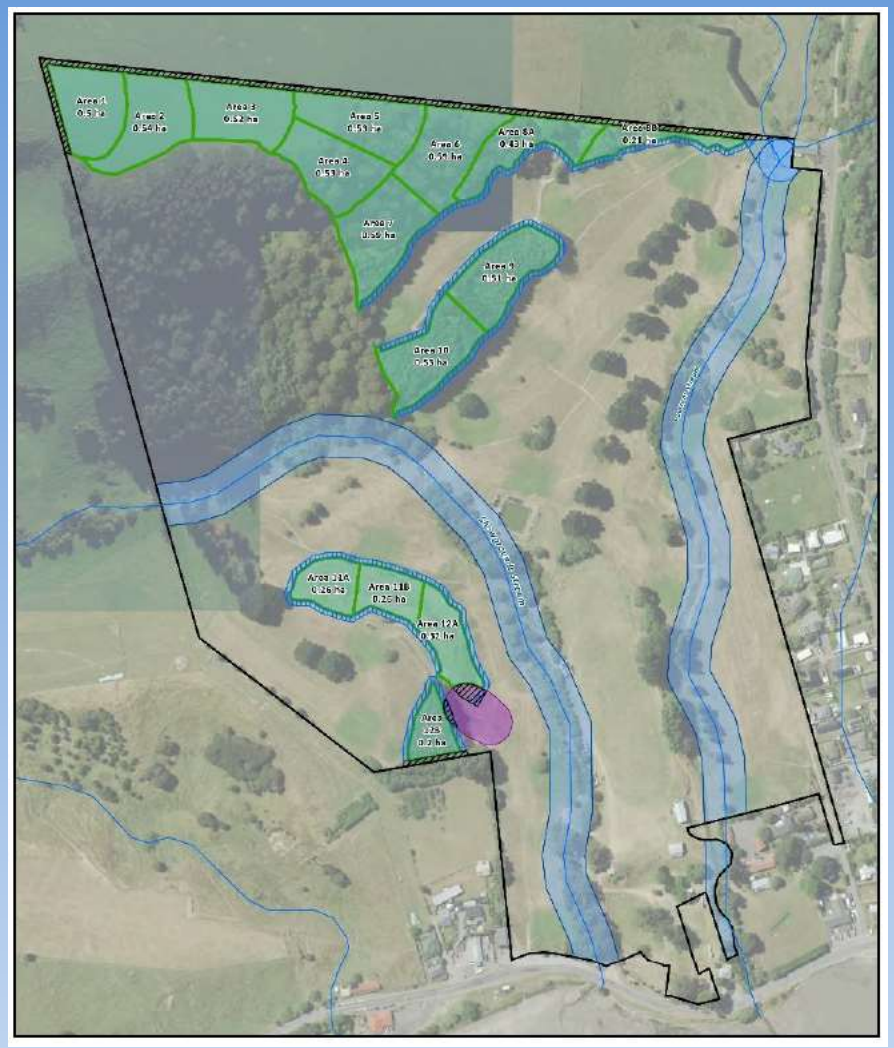
Section 4.3 Storage and Disposal of Treated Wastewater

The irrigation SMB model links the irrigation sites at the Duvauchelle scheme and the Akaroa scheme (i.e. Robinsons Bay and Hammond Point) to optimise the irrigation capabilities based on rainfall trigger levels adopted for the model (i.e. stop irrigation when 30mm/day of rain is reached at Duvauchelle and 50mm/day of rain at Robinsons Bay/Hammond Point.)

Information missing

- Piecemeal approach continues
- No information about pipes or pumps to send Duvauchelle WW to the WWTP or back from the storage
- No discharge consent for storage exceedances

Potential challenges



- Groundwater mounding means that substantial site drainage improvement in conjunction with current stream bank stabilisation works is needed
- Nutrient flow into Duvauchelle Bay is a concern
- Nutrient deficit irrigation is proposed for the Showground stream catchment
- Will it be consentable?

Treated discharge consent

- Storage exceedances predicted by modelling are 1 in 2.5 years once the flows from both Akaroa and Duvauchelle are combined.
  - The 1 in 4.3 years figure given by the Applicant only applies for the time before Duvauchelle is added- a maximum of 1 year
- Storage exceedances are likely to be greater than this once irrigation cut-offs and restart are better matched to soil moisture conditions
- Storage exceedance discharges DO affect management of the land system
  - In a properly designed Dual Discharge system they are used as part of the management to minimise environmental effects on the land system – eg to enable deficit irrigation or cease irrigating risky areas in wet weather
  - In a poorly designed system they are an afterthought
  - If the environmental effects of the secondary discharge are worse than the primary, then usage must be minimised, resulting in additional irrigation and adverse effects on the land

Is there really a hard deadline?

Consent	Condition Milestones for replacement	
Akaroa Outfall CRC204086 Expires 24 May 2030	**Condition 25** Construction milestones based on lodging replacement system application by November 2024	Condition met
	Condition 26 Existing outfall ceases 24 May 2030	5 years away
Duvauchelle Outfall CRC23058 Expires 26 July 2031	**Condition 27** Construction milestones based on lodging replacement system application by January 2025	Condition not met
	Condition 28 Existing outfall ceases 26 July 2031	6 years away

- CRC has been extending the outfall consent since 2007
- It won't shut down the Akaroa sewage system

Risk of proceeding without consent

- Applicant has stated it is prepared to take the risk of proceeding with ATWIS without a discharge consent
- It would *"find a way forward if the discharge consent is declined"* – possibly previously explored options
- We consider this reckless – this is public money
- We note CCC has to date been prudent in not constructing the WWTP and TPS in the absence of a discharge consent

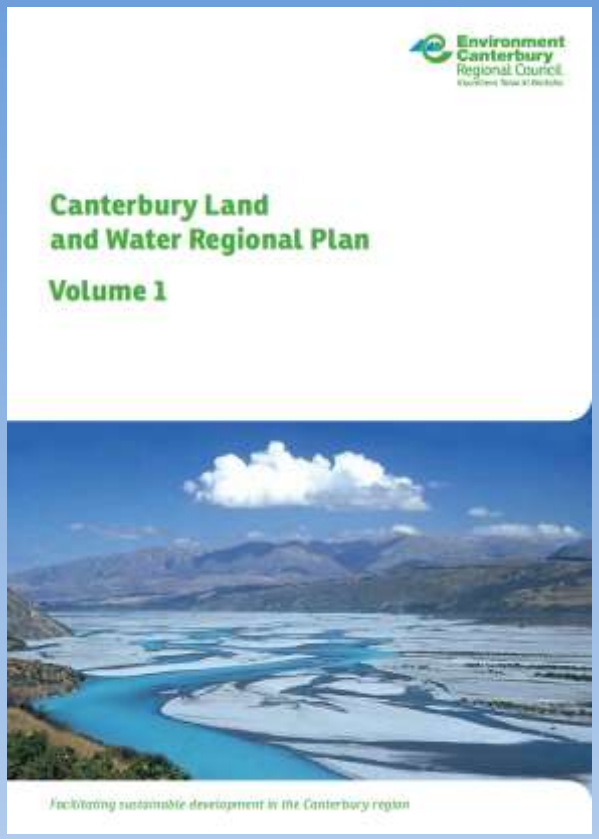
Untreated consent needed

- Applicant has acknowledged consent needed for untreated overflows at TPS
- LWRP Rule 5.84 applies and under 5.87 untreated overflows are a non-complying activity
- ATWIS cannot operate without the TPS. It is an intrinsic component of the Community Wastewater Treatment system
- Approving ATWIS would trigger construction of the TPS and therefore unlawful overflows

Staged transition

- Staged transition concept put forward by Applicant at Deferral hearing
  - Some flows could go to the existing plant, others to new plant
  - Given the linear network in Akaroa this may be feasible
- We support the concept of staged transition should ATWIS proceed – and over years, not weeks
- Refer Andrew Daker's advice in Appendix B

LWRP 5.84



Sewerage Systems

5.84 The use of land for a community wastewater treatment system and the discharge of sewage sludge, bio-solids and treated sewage effluent from a community wastewater treatment system and the discharge of sewage sludge and bio-solids from an on-site wastewater treatment system into or onto land, or into or onto land in circumstances where a contaminant may enter water are discretionary activities.

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What does LWRP 5.84 apply to?

LWRP definition of Community wastewater treatment system

Community wastewater treatment system	means a wastewater treatment system owned and operated by a group, institution, territorial authority or company that primarily treats domestic effluent and serves more than one site, but does not include the pipework and sewers running from individual sites to the collection and treatment system.

Planners interpretation

Our interpretation of this rule is that it applies to facilities that treat domestic effluent i.e. a WWTP. The definition specifically excludes '*the pipework and sewers running from individual sites to the collection and treatment system.*'. The TPS is not a treatment system, but as noted above is part of the wastewater network required to convey wastewater to a WWTP for treatment. Accordingly, we consider that the definition and therefore Rule 5.84 applies only to the WWTP site and irrigation areas as a community wastewater treatment system. The scope of Rule 5.84 does not, in our view apply to the TPS. Land use consent is therefore not required for the TPS under the scope of Rule 5.84, or by any other LWRP rule.

Our interpretation

- The definition excludes the pipes and sewers running from individual **sites** to the collection and treatment system
- The distinction here is between the pipes from individual sites and the collection and treatment system – in other words the private/individual property side of the network and the community or public side of the network

What does "collection" mean?

Google what does collection mean in terms of sewers

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AI Overview

In the context of sewers, collection refers to the process of gathering wastewater from a community and transporting it to a treatment facility.

How does collection work?

- **Pipes**: A network of underground pipes, including collector sewers, interceptor sewers, and force mains
- **Manholes**: Access points for inspection and maintenance
- **Tanks**: Store wastewater before it's treated
- **Lift stations**: Move wastewater to higher elevations
- **Control structures**: Manage the flow of wastewater

Why is collection important?

Collection systems are vital to preventing contamination of the environment and water sources. They are one of the largest and most valuable infrastructure assets in most communities.

USEPA definition

collection system

A system of collector and/or interceptor sewers that collects wastewater from a community.

Does LWRP cover "collection"

- LWRP does not include a definition of collection system or any other rules referring to a community collection system
- It seems unlikely that the LWRP has omitted consideration of one of the largest and most valuable community infrastructure assets and one that is vital to preventing contamination of the environment and water
- Therefore the term "wastewater treatment system" in the first part of the definition of a community wastewater treatment system should be interpreted as including both the collection and the treatment elements

TPS provides collection and treatment

- The TPS would therefore come under the definition as it forms part of the collection system in regard to its function as a lift station
- The TPS also comes under the definition of a treatment system as it provides the primary filtration of raw wastewater prior to pumping it up the hill:
- Section 4 in the 2014 AEE states:
  - *features include roller shutter doors for Hiab/truck access and an enclosed electrical switch room.*
  - *When operational the facility is likely to require one visit a week in autumn to spring and 2 visits a week in summer from maintenance staff.*
  - *Material collected by the screens and grit removal facilities will be stored in wheeled bins to allow transport to the door for removal from site.*

LWRP 5.84 is the BIG PICTURE

- CCC and CRC have said it is not the Panel's job to consider the Big Picture
- ATWIS and all components needed for it to function are part of a single Community Wastewater Treatment System
- Intent of LWRP Rule 5.84 is that a community wastewater treatment system including its discharges is assessed as a discretionary activity
  - This includes all components except the pipework and sewers running from the individual sites to the first collection point
- The effects of this scheme, including its discharges, must be considered as a whole.
  - This includes all components and all discharges, including those that are currently partially consented and Duvauchelle which is now partially included

Section 17

Revisiting CRC Assessment of Environmental Effects

CRC s42a deficiencies

- Application not considered as a Community Wastewater Treatment system with discharges under LWRP 5.84
  - s42A inconsistent in its application of LWRP 5.84
  - Use of land for community wastewater treatment, discharge to land and air discharges are bundled. Discharges to water are ignored.
- Concludes effects are minor piece by piece without looking at the whole system together
- Experts raised many concerns and uncertainties
  - s42A hasn't analysed whether assumptions relied on by experts to classify effects as minor can be met

Effects: System Design

- Panel has identified in Minute 13 the issues with system capacity regarding storage, overflows and the raw buffer tank and with irrigation management
- Further work is needed to show how each stage of the treatment train handles peak flows to identify bottlenecks

Effects: groundwater

Dr Scott identifies:

- Contaminants may seep to groundwater impacting water supplies
- Managing concentration of contaminants and water crucial to mitigate

Expert assumptions used to conclude effect as minor	Will the assumption be met?
High standard of treatment	IDAL treatment standards lower than MBR –pathogens, viruses, PFAS, POPS and microplastics remain Standard lower when incoming volume is high
Reliant on conservative approach to nitrogen	13.5kg removal over both irrigated and unirrigated areas is not supported by evidence
Low irrigation rates to unsaturated soils	Irrigation beyond field capacity increases drainage

Assumptions unlikely to be met
Effects more than minor

Effects on surface water

Ms Hayward identifies:

- Nitrogen concentrations in stream affecting periphyton and cynanobacteria growth
- Using a lower base flow than the mean would result in higher N concentrations
- Contaminants such as pathogens, phosphorous and metals not assessed
- Risk of runoff if heavy rain coincides with recent irrigation
- Overflows of treated and untreated wastewater will have short term acute effects

Expert assumptions used to conclude effect as minor/moderate	Will the assumption be met?
High standard of treatment	IDAL treatment – limited removal, lower standard in high flows, no phosphorous removal
13kg N removal across 58.7ha	13.5kg n removal not supported by evidence
Monitoring, mitigation and management will mitigate	No spare capacity to reduce irrigation if issues occur
Was not aware of frequency of overflows	Overflows of treated and untreated will occur

Assumptions unlikely to be met

CRC conclusion does not concur with expert concern that nitrogen induced plant growth is a moderate risk

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Effects on soil quality and stability

Dr Riddle identifies:

- Lack of geotechnical assessment of irrigation areas
- Steeper areas with erosion scars not investigated to determine infiltration capacity
- Soils sometimes at or above field capacity in summer and most of winter
- Rainfall induced surface runoff may occur
- Tunnel gully erosion when wastewater applied to loess soils already at field capacity
- Modelling based on irrigation occurring regardless of soil moisture
- Phosphorous build up in loess and in runoff leading to increase in waterways
- Greater understanding of storage required to avoid irrigating to saturated soils

s42A conclusion	Is this justifiable?
Soil moisture monitoring will prevent application to saturated soil mitigating preferential flow and surface runoff risk	Soil moisture monitoring approach not supported by Applicant Irrigation to occur above field capacity increases risk of tunnel gullying
Nitrogen losses will be comparable to other high productivity land in Canterbury	Nitrogen removal not supported by evidence High productivity land in Canterbury not relevant. N levels in Robinsons Bay stream likely to exceed LWRP Banks Peninsula limit
Planting trees lessens erosion potential	Unirrigated land with trees can slip and with worse consequences than bare land

Expert does not state effects will be minor
CRC report reaches this conclusion based on mitigations not currently required by conditions

Effects on wetlands

Dr Greenep identifies:

- No clear indication whether irrigation will avoid wetlands within irrigated areas

We identify

- Irrigation of wetlands (irrespective of size etc) is non-complying activity LWRP 5.86

s42A conclusion	Is this justifiable?
No wetlands in irrigated land	Contradicts Dr Meurk's map and Dr Greenep's conclusion that wetlands are in irrigated areas. No information states they have been excluded from irrigation
Classifies application as discretionary	No consideration of potential non-complying status under LWRP 5.86

Clarification needed on whether wetlands are excluded from irrigation

Review of activity status recommended

Effects on Marine Quality /Ecosystems

Ms M Burns identifies:

- Uncertainty because of changes to the application including overflows
- Discharging to land in saturated conditions
- Irrigation on steeper areas
- Uncertainty of modelled effects of nitrogen on freshwater
- Mobilisation of contaminants
- Increased effect of nitrogen, pathogens, and heavy metals etc entering ground and surface water and coastal marine area
- Potential for nutrients to stimulate growth of nuisance algae in Robinsons Bay affecting intertidal ecology and seagrass beds

Expert assumptions used to conclude risks are low	Will the assumption be met?
Wastewater is treated to a high standard	IDAL treatment – limited removal, lower standard in high flows
No direct discharges to coastal area	Discharges will occur
Irrigation at low rates to unsaturated soils	Irrigation planned to saturation level
Recommendations for monitoring and management are implemented	Still under discussion
Trigger vales for adaptive management	Still under discussion. No consideration given whether adaptations feasible

s42A concludes effects will be minor despite concerns raised by expert, the existing of direct discharge of treated and untreated wastewater and irrigation beyond field capacity.

Effects on landscape and amenity

CRC relies on Applicant's view
Applicants expert Mr Greenshields

Applicants assumptions used to conclude effect as minor	Will the assumption be met?
Robinsons Bay tanks will have low effects. Tanks are common in rural environments.	No other tanks in the rural environment are anything like this scale or number. Tanks break all built form standards in CDP Max height of 7m exceeded by 20% Max building footprint 300m3 exceeded by 38% Max site coverage of 2000m3 exceeded by 100%
Old Coach Road raw buffer tank will be mitigated by planting	Tanks also breaks the building footprint standard

Cumulative effects of storage tanks, buffer tank, WWTP, irrigation fields and TPS not considered.

In our view the visual effects of the scheme will be intrusive in many locations and significant.

Effects on Public Health /Recreation

CRC relies on Applicant's view
AEE gives Applicants view

Applicants assumptions used to conclude effect as minor	Will the assumption be met?
Fully land based scheme	Treated and untreated overflows now acknowledged
Positive effect from removing existing harbour discharge	Existing harbour discharge to area with currents and high mixing. Proposed discharges to shallow mudflats with poor currents, low mixing and in recreation areas.
Recreation enhanced with access tracks	Walking tracks not included in conditions. Unlikely to eventuate as public contact with treated wastewater is a health risk

Assumptions now incorrect
Effects more than minor due to overflows

Effects on Heritage/Archaeology

CRC relies on Applicant's view
Mr Cable gives Applicant's view

Applicants assumptions used to conclude effect as minor	Will the assumption be met?
Fencing off a small area is sufficient to protect heritage in Robinsons Bay	Conditions with this site not yet available
Heritage site plan must be provided prior to commencement of works	Extensive works undertaken prior to hearing and prior to heritage plan being developed Road constructed over principal archaeological site

We disagree with the Applicant and CRC.
The Applicant has already had significant effects on the heritage and archaeological site. Without improved conditions the effects will be significant

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Natural Hazards

CRC relies on Applicant's view and Dr Greenep. CRC considers consent duration to 2054 is appropriate
AEE gives Applicants view

Expert assumptions used to conclude effect as minor	Will the assumption be met?
Geological risk – walkovers adequate	Adequate geotechnical assessment not carried out risk of elevating moisture levels in loess soils
Seismic risk – no known faults within scheme land	Does not consider effect of large earthquakes in the region – ie Alpine Fault
Flooding and erosion. No water bodies near tanks. Loess to be stabilised on a site dependent basis	No consideration of impacts of heavy rain and slips above tanks
Fire risk – Dr Greenep misrepresented	Dr Greenep did not say fire risk was minimal – she confirmed kanuka was highly flammable, but common

Assumptions don't consider the real risks. Earthquakes (including Alpine Fault rupture) extreme storms and fires (exacerbated by climate change) are high probability and high risk over next 30 years

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Climate Change

CRC relies on Applicant's view
AEE gives Applicants view

Applicant assumptions used to conclude effect as minor	Will the assumption be met?
Adequate storage will be able to accommodate high rainfall events and avoid the need for a secondary discharge path to the harbour	No – storage exceedances not acknowledged. Former 8,000m^3 of headroom anticipated in AEE no longer exists. No headroom for increased frequency and intensity of rainfall events Secondary discharge path now part of system, but without consultation, assessment of effects, or consent s42A acknowledges storage capacity issues need to be discussed by experts
Planting of trees would reduce land instability	Local evidence is that native forest can slip with disastrous consequences. Does not take into account that this forest will be irrigated with more than 50% of the average annual rainfall

Our view – There is an extreme risk from climate change as land is to be irrigated at levels 50% above average annual rainfaill every year for at least 30 years

Section 18

Consideration of positive benefits

Mana whenua cultural and spiritual

- We understand and appreciate the importance to mana whenua of moving the treatment plant from Takapūneke and support this
- We appreciate that mana whenua have cultural objections to the disposal of any form of human wastewater to the harbour, treated or not

Harbour water quality

- Monitoring demonstrates that current outfall is meeting water quality standards (except feacal coliforms) and complies with guidelines for shellfish consumption
- Current outfall is in a place of strong currents where rapid dilution and mixing occur
- Robinsons Bay stream and treated overflows to Childrens Bay enter the harbour across coastal mudflats in shallow poorly flushing estuaries with much lower dilution and mixing
- Both estuaries have high recreational usage.
- Cannot just assume that effects on harbour water quality will be less. They may be greater.
- There is not necessarily therefore a benefit to the harbour from an environmental perspective

Effects on climate change and ecology

- Plantings will be a carbon sink, but not necessarily offset the carbon costs of the scheme
- We support efficient ecological restoration generally through natural regeneration
  - achieved with far less expense than planting
  - results in higher biodiversity outcomes

Landscape and amenity

- Any landscape improvement from the planting will be at best neutral
- It may be offset by negative visual impacts of the tank farm, terminal pump station and other infrastructure

Public recreation

- We support public access to the irrigation properties for public transparency and monitoring
- We support public walking tracks that connect to or enable longer routes, including over Hammond Point
- We are concerned that the opportunity for a meaningful Heritage Reserve in Robinsons Bay has not been embraced by the Applicant

Reuse

- We do not support the irrigation of Jubilee Park
  - Flood prone area on a capped land fill
  - Expensive
- We seek meaningful re-use such as flushing toilets
- We are concerned that the IDAL treatment plant may not be compatible with future re-use

Section 19

Consideration of Alternatives

Consideration of Alternatives required

- Applicant relies on consideration of alternatives in the AEE done prior to 2020
- The AEE envisages a 100% land based system.
  - Now it is a part land-based, part discharge to harbour
  - The overflows have occupied much of the discussion at the hearing and are a key effect
- NCPS Policy 23 triggered by overflow discharges requires consideration of alternatives

ATWIS is not BPO

- Costs have escalated since 2020
  - Nearly doubled at $107million for 950 connections
  - Over $100,000 per connection.
- Alternatives previously eliminated on cost grounds need to be reconsidered

Land disposal options

- Steep slopes and loess soils make year round land irrigation infeasible on Banks Peninsula
  - Gently slopes suitable for irrigation are only near inhabited valley floors or remote outer coast headlands
  - 114 ha Upper Robinsons property has 31.9ha suitable (probably less) due to all the gullies, existing slips, steep slopes, rocky areas, springs and wetlands, setbacks
  - Storage requirements are too high
  - More land does not solve the problem – when its too wet too irrigate, its too wet everywhere
  - More storage is expensive, provides diminishing returns and needs siting.
    - PDP state: *Increasing storage to mitigate all exceedances was not viewed as possible*
- After 17 years of searching, 100% land based irrigation for current wastewater flows has not proved feasible

 Ref; PDP Combined Storage Exceedances, Nov 2024, Table 2 P 5

Same conclusion for Lyttelton basin

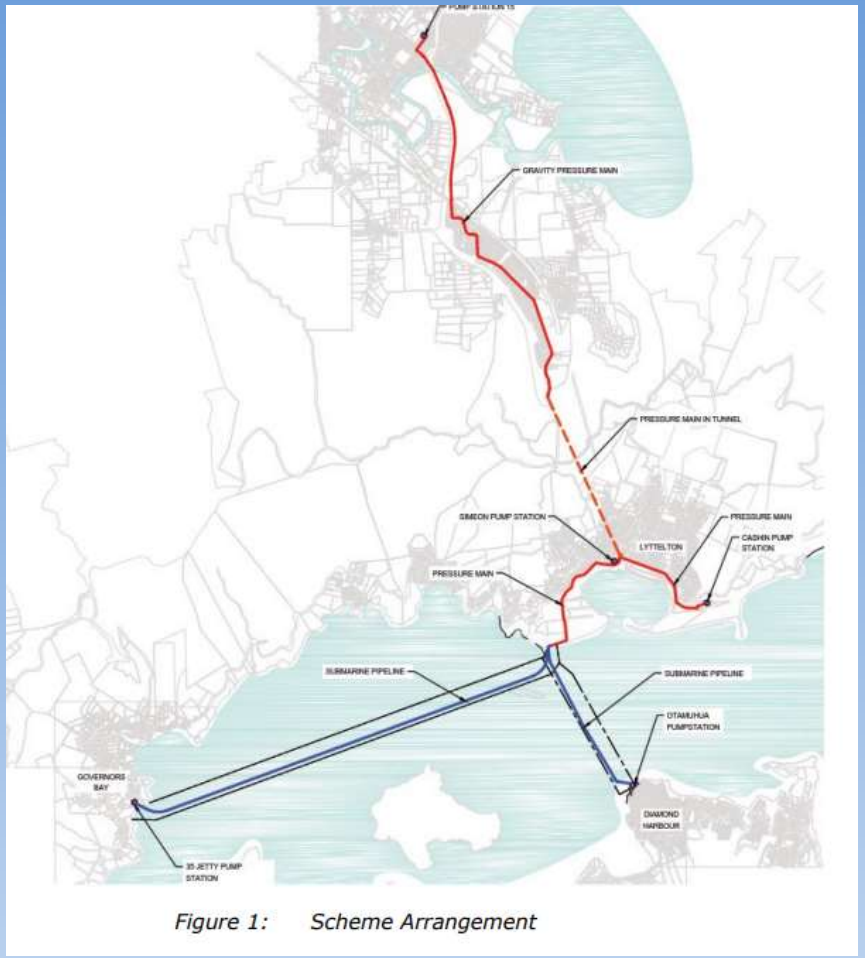


Figure 1: Scheme Arrangement

Photograph 1: Launch of Governor Bay Submarine Pipeline

- Land irrigation not feasible in the Lyttelton basin
- Wastewater from Lyttelton harbour communities is piped up and across the harbour and pumped to Bromley

I&I reduction alternative

- In 2020 FOBP commissioned and provided CCC with research from Tektus Consultants
  - We have now appended this to our submission
- Tektus stated that the then planned reduction by 20% was insufficient and outside of Water NZ guidelines.
- Hence the Council resolution to reduce I&I to 20%
- Tektus recommended CIPP (Cured in Place Pipe) or Low Pressure sewer replacement – either in part or all of the town
  - Costs - $4.5M for full CIPP to $23.5M for full pressure system

Cost benefit of I&I reduction

- Applicant has failed to properly consider the option of substantially reducing I&I and constructing and operating a smaller land based system with fewer (or no) exceedances.
- No cost benefit has been carried out of the cost of CIPP or a low pressure system bringing I&I down to the level where a smaller 100% land based system could be developed
- The Applicant has not developed a robust method to assess I&I reductions
- In our view very low I&I is **critical and fundamental** to a fixed capacity system such as land disposal or re-use

Wetland to mid-Harbour outfall dual discharge system (1)

- 2 days in wetland, preferably also with rock channel, is now considered by Ōnuku rūnanga to provide sufficient cultural treatment for discharge to Childrens Bay foreshore
- This is a significant reduction from the previous 14 day requirement
- Wetland treatment discharging to a mid-harbour outfall would remove effects associated with the foreshore discharge.
- **This option needs to be seriously re-considered as the dual discharge for the land based system**
  - It was not on the Long List of options that PDP workshopped with Ōnuku rūnanga

Wetland to mid-Harbour outfall dual discharge system (2)

- Enables optimal management as described by Mr Coutinho
  - No tidal or seasonal restrictions compared with foreshore
  - Optimal management can ensure wetland retention times to meet cultural requirements instead of uncontrolled releases when storage is full
  - Storage tanks can be kept with headroom enabling the system to cope during storms or prolonged wet weather without compromising wetland retention times
- De-risks and take the pressure of the land based discharge
  - Potential to reduce storage volume
  - Provide a backup (Plan B/mitigation) if the land system experiences slips or monitoring reveals problems
- Lower risk to environment and public health than Childrens Bay foreshore overflow
- Much more acceptable to community
- Design work has largely been done (2014 application)
- Greater resilience than the current proposal

Re-use with mid-Harbour outfall

- We support cultural treatment via wetland discharging to a mid-harbour outfall either
  - as a safe and acceptable dual discharge for the land based system as previous slide, or,
  - in tandem with a re-use system
- Our preference is for re-use system
  - We consider the sunk cost of a land based system as too high and that investing in it now will preclude future investment in re-use

Ocean outfall

- Cost and methodology has not been revisited since MWH desktop study in 2008
- Ruled out since on basis of costings and work done 17 years ago
- Engineer Bruce McLean has researched it with colleagues and it appears feasible
- We consider this option must now be fully reconsidered and costed

Integrated Re-use – BPO

- Staged transition to full re-use through
  - Substantial I&I reduction
  - Highest possible treatment – reverse osmosis
  - Cultural wetland treatment with harbour outfall discharge as interim measure and long term backup
  - Purple pipe re-use as practical now – eg public toilets and some gardens
  - Stream or aquifer recharge to replace water extracted for potable supply developed over time
- Creates resilience to climate change by recharging the drinking water
- Achieves the intent of the first outfall extension in 2007
- If not done now, the high capital and operational cost of ATWIS will preclude further development of re-use

Section 20

Conclusion

A long search goes round in a circle

- Applicant has been searching for a solution to meet **cultural requirements** since 2007
- Our submission seeks to ensure the **environmental impacts** are not overlooked in the search for a cultural solution
- Land disposal is very difficult on Banks Peninsula loess soils and steep sloping land
- Applicant has been under great pressure to find a land irrigation system since the 2015 decision declining harbour outfall
- Role of Friends of Banks Peninsula has been pivotal in analysing data underpinning various version of the system

Application is not what CCC approved

- 2020 Council decision approving Inner Bays recommended I&I reduced to 20%
  - Application lodged based on reduction by 20%
  - Failure to reduce I&I means that the proposed system will not be 100% land based as claimed
  - Instead will experience predictable overflows of treated and untreated wastewater
- Separate Duvauchelle system is also now combined with the ATWIS system
- Costs have doubled since the 2020 decision

Application should have been withdrawn

- Major changes to lodged Application made in April 2024
  - System not 100% land based
  - Duvauchelle is to be amalgamated
- Application should have been withdrawn.
  - Instead the Applicant has continued with an incomplete AEE and a deficient application
- The lack of information and the piecemeal approach have dominated the hearing process
- Friends do not support Applicant's willingness to take risks.
  - It is our environment and the community that lives here that will suffer the effects if ATWIS proves inadequate.
  - This is already apparent with objectionable overflows planned for Childrens Bay foreshore

Adverse Effects substantial

- Amenity of tourist town reduced by visible and potentially odorous infrastructure in high use locations
- Increased risks of
  - land instability
  - Nitrogen pollution of Robinson Bay stream and bay
- Negative impacts on environment and public health at Childrens Bay
- Climate change will exacerbate issues
- Unsustainable to operate as Council budgets are further squeezed by climate impacts

Poor quality of CRC assessment

- Monitoring and adaptive management are an unrealistic solution
  - Problems such as nitrogen saturation may not show up until its too late
  - There is no spare capacity, so adaptation may take years
- CRC s42A report fails to assess this as a community wastewater system with various discharges under LWRP 5.84
  - has not considered the uncertainty of the assumptions
  - concludes all effects identified by expert will be minor because they are mitigated by a myriad of conditions

Consider the Big Picture

- We ask the Hearing Panel to make a Big Picture consideration
- Consider the risks, adverse effects and high impact of this community wastewater system as a whole
- Do not approve the application in front of you

Section 21

Relief sought

Decline application

- Proposal does not remove all human effluent from Akaroa Harbour
- No acceptable solution for treated storage exceedances
- Untreated wastewater discharges triggered if this application approved
- Applicant relies on extensive monitoring and adaptive management to address may risks but has not providing spare capacity for this
- Highly vulnerable to climate change because of high levels of I&I, complexity and reliance on electricity
- Does not address chronic water shortages
- Is not an efficient use of resources
- Insufficient consideration of alternatives since cost rose and major changes to Application have been made

Decline for a new approach

- Decline with a directive to Applicant to consider alternatives that balance cultural concerns with environmental risks and pragmatic realities
- Find a solution that addresses the cultural requirements but is safer, more resilient, more cost effective and facilitates re-use

If not declined then deferred

- This is a single community wastewater treatment system
  - Common WWTP and raw storage
  - Common treated storage
  - Common treated storage exceedance mechanism
  - 3 irrigation fields operated in common
- Defer until all relevant consents can be considered together
  - Duvauchelle irrigation field
  - Treated storage exceedances
  - Terminal Pump Station and untreated overflows
  - WWTP and potential untreated overflows
  - All pipes, pumps, air discharges and other associated components need to make the system function

Failure to consider together risks

- Applications being assessed with a less onerous activity status,
- Not all relevant matters considered when making decision s
- Environmental effects of the whole system not fully assessed
- Consent authority compromising its position consent by consent
- Consents for individual aspects unlikely to be publicly notified
- Applicant and community left with uncertainty as to whether the necessary consents will be obtained
- The system will not be properly designed

Informed decision

- Having all the Applications enables an informed decision
- Enables sensible tradeoffs between primary and secondary discharges that minimise risks and environmental effects of both
- We acknowledge Council and rūnanga want to move ahead, but this is not a reason to make a decision in the absence of full information
- We do not see the current harbour outfall consent deadline as a hard deadline, but one that can be flexible if progress is being made
- Environment and community health should not be traded off against an artificial deadline

Precautionary approach if approve

- If Panel is of a mind to approve, we request a precautionary approach.
- We do not support a scheme that frontloads risks, relies on conditions to monitor and adapt to problems as they arise
  - CRC fails to cross check information provided by CCC
  - We have little confidence that issues will always be picked up by monitoring
- Once system in place there will be no easy answers or capacity to resolve.
  - Problems could exist for years harming the environment

Missing information needed first

- Flow diagram showing each stage of the treatment train and the capacity limits including Duvauchelle flows
- Geotechnical assessment including
  - revised plan siting tanks further from platform edge
  - seismic rating of tanks to be used
  - flooding risk analysis to the irrigation field and properties down hill and downstream from tank platform collapse
  - each irrigation area or block within area to determine any additional constraints applying to its irrigation
- Irrigation Management Plan rules around ceasing and restarting irrigation, and the maximum application rates for each block
- Timetable of different project stages, including when grazing is to be withdrawn from different areas and when irrigation is to start
- Operational Management Plan showing how the system (Treatment Plant, pump stations and the irrigation fields) are to be operated, managed and maintained.

Precautionary approach

- Risk averse in initial stage.
  - Loadings can be gradually increased over time if montoring shows all is well
- Clarity about what is being is being consented
  - All components in the Community Wastewater system need to be identified
  - Clear and unambiguous maps showing areas to be used for
    - Irrigation
    - Non-irrigated but nutrient uptake
    - Firebreaks
    - Excluded wetlands
    - Heritage Area
  - List needed of the consents being granted and consents outstanding

Directives for missing consents

- Clear list of each missing consent
- All further consents to be bundled and publicly notified
- Raw and treated discharge consents require full public consultation
  - including involvement in longlisting and shortlisting of options before applications are developed.

Section 22

Conditions to support a pre-cautionary approach

Draft conditions

- Developed in conjunction with:
  - Akaroa Ratepayers and Residents Association
  - Akaroa Civic Trust
  - Robinsons Bay Ratepayers and Residents Association
  - Robinsons Bay Community Heritage Trust
- Prior to receiving the planner's latest conditions
  - We see value in CRC experts conditions but reserve judgement until we have had time to work through the planners' draft
  - Our proposed conditions are a draft indicating our intent and how it could be achieved, not final wording

Preliminary comments on Planners Conditions

4. (a) The operational storage capacity of the scheme shall consist of:
   i. No less than 2,000 cubic metres of untreated wastewater storage in a covered storage tank located at Old Coach Road;
   ii. No less than 2,100 cubic metres of treated wastewater storage in a subsurface wetland located at Old Coach Road; and
   iii. No less than 24,000 cubic metres of treated wastewater storage in covered tanks located within the Robinsons Bay Valley Irrigation site.

   (b) The consent holder shall provide certification from a suitably qualified and experienced party confirming the storage capacity required in condition (4(a)).

- Conditions with no upper bound may suit the applicant, but they provide no containment of the negative impacts
- They negate the assessment of the negative impacts such as geotechnical risks and visual amenit

Missing consents conditions

- All outstanding consent applications for components of the ATWIS system, including the Duvauchelle irrigation, are to be bundled and publicly notified.
- Prior to operating the new ATWIS consents for all components have been obtained.

Discharges to water conditions (1)

- Prior to operating the new ATWIS, either:
  - the existing Akaroa harbour outfall consent (CRC2024086 has been modified to provide the secondary discharge for storage exceedances via the current outfall at Green Point and the outflow pipe has been connected to the ATWIS, or,
  - a secondary discharge which has the same or lesser environmental effects has been consented and constructed. The same or lesser environmental effects means the same or higher standard of wastewater treatment and the same or greater degree of dilution and mixing as the Greens Point outfall.

Discharges to water (2)

- Prior to operating the new ATWIS I&I reduction that meets the conditions in the existing Akaroa harbour outfall consent has been achieved, meaning a reduction in I&I to below 40%.
  - Consent condition 6 stating how I&I is to be measured must be clarified to state that 40% is the daily maximum.
  - A revised methodology must be in place to more accurately estimate the Legitimate Wastewater Flow used to assess the percentage of I&I.
- Prior to operating the new ATWIS, a land use consent for the Terminal Pump Station has been issued.
  - The design of the TPS should be for an ARI for untreated overflows of 1 in 10 years to match the rest of the network upgrade.

Irrigation conditions (1)

- Irrigation is conducted on a deficit basis to field capacity only, measured by soil moisture meters.
  - Irrigation is to cease if the moisture meters indicate that an irrigation block is at field capacity.
  - Irrigation is only to restart when moisture has dropped to below 85% of field capacity.
  - Irrigation is to cease if heavy rain (greater than 50mm in a day) is forecast and soil moisture is at or above 85% of field capacity.

Irrigation conditions (2)

- The irrigation fields at Robinsons Bay and Hammond Point are to be used to irrigate that portion of the wastewater volume originating from Akaroa only, and not Duvauchelle flows, as measured on a rolling weekly basis.
- Irrigation is to cease if the annual irrigation amount applied to the irrigation fields at Robinsons Bay and Hammond Point, and measured as a rolling 12 month total has reached the lesser of:
  - 220,800m^3, or,
  - the total wastewater flows derived from the Akaroa community during that 12 month period

Treatment Standard conditions

- There are absolute limits set on the quality of treated wastewater from the WWTP for nutrients, chemical and biological contaminants emanating from the treatment plant, *to enable it to be suitable for irrigation and future re-use* including a reduction in total nitrogen from 10mg/L to 5mg/L as measured on a daily basis.
- Current and future wastewater flows shall be sampled for emerging contaminants and micro plastics
- Wastewater quality results must be checked and audited by a qualified independent third party.

Treated storage tank conditions

- The number and/or size of the 2,400m^3 treated storage tanks in Robinsons Bay is reduced to fit on the platform well back from the edges and with a safety margin around each (to prevent catastrophic failure).
- The seismic rating of the tanks is IL3

Monitoring conditions (1)

- Monitoring of the Robinsons Bay stream should occur in the following locations:
  1. Opposite the northeastern boundary where the first tributary draining the irrigation field enters the stream
  2. at the point where the stream enters the property (just below the Foley farmhouse),
  3. at the point where it enters the proposed heritage area and,
  4. at the Sawmill Road bridge.
- The comparator estuary for coastal monitoring should be Takamatua
- Reporting is to also include all storage exceedances, including the volume and number of days of the exceedance and all untreated discharges, including the volume, number of hours and location.

Map for stream monitoring

Monitoring conditions (2)

- To ensure accountability and the timely provision of information, as a general principle all monitoring outcomes must be publicly available as soon as possible.
  - All results from the monitoring of flows, irrigation limits and sampling are to be made public by the Applicant as soon as practicable and no later than within 1 month of collection (via the website or similar future mechanism).
  - For other monitoring and inspections relating to the irrigation fields, storage tanks and geotechnical matters, any identified issues must be reported to the Community, and where appropriate directly to affected parties, as soon as they are identified.
  - All data made publicly available should be raw as well as aggregate data. All data should be retained and archived indefinitely
- CCC should establish a direct point of contact for the Community to report or enquire about issues that may arise.

Amenity conditions (1)

- All hours of work on all the sites, including during construction and operation are Monday to Friday 7:00am to 5:00pm, except for emergency work, with the exception that construction on or along public roads may take place outside these hours, including at night, provided it is at least 100m from the nearest dwelling. Particular care needs to be taken with the opening of the Terminal Pump Station.
- Construction is not to take place on public holidays or during the Akaroa peak season – December 23 to January 31 and Easter Week.
- Residents of areas where construction is taking place are to be informed by the Applicant at least 1 month prior to commencement, with a statement of the activities to be carried out, times of operation and duration of construction work.
- All alarms on machinery are to be Broadband, not Tonal alarms to reduce disturbance

Broadband alarms leaflet (1)

Specifications

All contractors are responsible for ensuring the reversing alarms on their vehicles are of an appropriate specification to ensure a safe working environment. As a guide, the following reversing alarm requirements are likely to be appropriate on most Transport Agency projects:

- Broadband
- Directional
- Automatic level adjustment over a range of approximately 20dB
- Maximum rated level approximately 97dB.

This guideline is appropriate for medium vehicles on typical urban sites. A higher or lower rated level may be appropriate for other vehicles and sites.

Fitting

Reversing alarms require two wires to be connected. In many cases, they are a standard size, allowing them to be directly swapped with the alarm originally supplied with a vehicle.

As broadband alarms produce a 'beam' with the loudest noise in one particular direction, it is important that the alarms are fitted with an unimpeded view facing backwards from the vehicle.

Alarms should always be fitted by a suitably qualified technician.

A broadband reversing alarm

MORE INFORMATION

Website
www.nzta.govt.nz

Facebook
www.facebook.com/nzta

Twitter
twitter.com/NZTA or **twitter.com/nzta**

Call
0800 822 422 (driver licensing)
0800 4 HIGHWAYS (0800 44 44 49)

CONSTRUCTION NOISE: REVERSING ALARMS

Tonal beeping alarms on reversing construction vehicles are a common cause of noise complaints. All construction vehicles on NZ Transport Agency projects in urban areas should preferably be fitted with broadband reversing alarms to minimise disturbance to residents.

Broadband alarms leaflet (2)

Tonal alarms

Traditionally, all construction vehicles have been fitted with a tonal alarm that makes a loud beeping noise as the vehicle reverses. The noise from these alarms is distinctive due to the single frequency (tone) of noise being produced.

Consequently, as well as achieving the goal of attracting the attention of construction workers behind the vehicle, the alarms can be disturbing for nearby residents.

In many situations such as at ports and quarries, as well as road construction projects, tonal reversing alarms are the most common reason for noise complaints, particularly at night. Other noise sources may last longer and are often louder, but the distinctive characteristics of tonal reversing alarms usually cause greater disturbance.

Broadband alarms

Broadband reversing alarms generate noise across a range of frequencies. The noise level varies and these are sometimes described as 'squawkers' or 'quackers'.

Close to a vehicle, these alarms can be as loud as traditional beepers, but at a distance the noise does not have the same distinctive characteristics as a tonal alarm and therefore causes significantly less disturbance.

Broadband alarms generally produce a beam of noise, and are significantly louder in one direction compared with other directions. When correctly fitted with the beam facing backwards, the alarm will be loud behind the vehicle where workers need to be made aware of the vehicle reversing, but less noise will be 'spilled' in other directions towards residents. The noise in neighbouring areas can therefore be reduced while maintaining the safety of workers.

Broadband alarms generate warning noise in the danger zone but less spilled noise than tonal alarms

VICTORIA PARK TUNNEL 2009–12

The Victoria Park Tunnel project in Auckland was the first Transport Agency project where broadband alarms were made mandatory for all vehicles on-site. The project team procured a bulk order of broadband reversing alarms for contractors to fit to their vehicles. Also, one of the larger contractors separately purchased and fitted broadband alarms to all their vehicles.

No health and safety issues arose from the use of the broadband alarms on this project, and when standing behind vehicles, the alarms appeared subjectively to be at least as loud as traditional beepers.

Residents expressed a clear preference for the broadband alarms.

NEWMARKET VIADUCT, 2009–12

For the Newmarket Viaduct project in Auckland, the use of broadband alarms was also made mandatory at night. All contractors were required to procure and fit alarms to their own vehicles. This proved to be successful in reducing disturbance to residents, with a stark comparison evident when complaints arose from tonal alarms on the adjacent Greenlane widening project.

For both the Victoria Park Tunnel and Newmarket Viaduct projects, the biggest challenge was ensuring that all subcontractors had alarms fitted, including trucks visiting the site on a one-off basis. For future projects, tight controls are recommended to ensure all subcontractors adhere to reversing alarm requirements.

FUTURE PROJECTS

All construction vehicles on Transport Agency projects in urban areas, or projects involving night works close to houses in other areas, should preferably be fitted with broadband reversing alarms to minimise noise disturbance to residents.

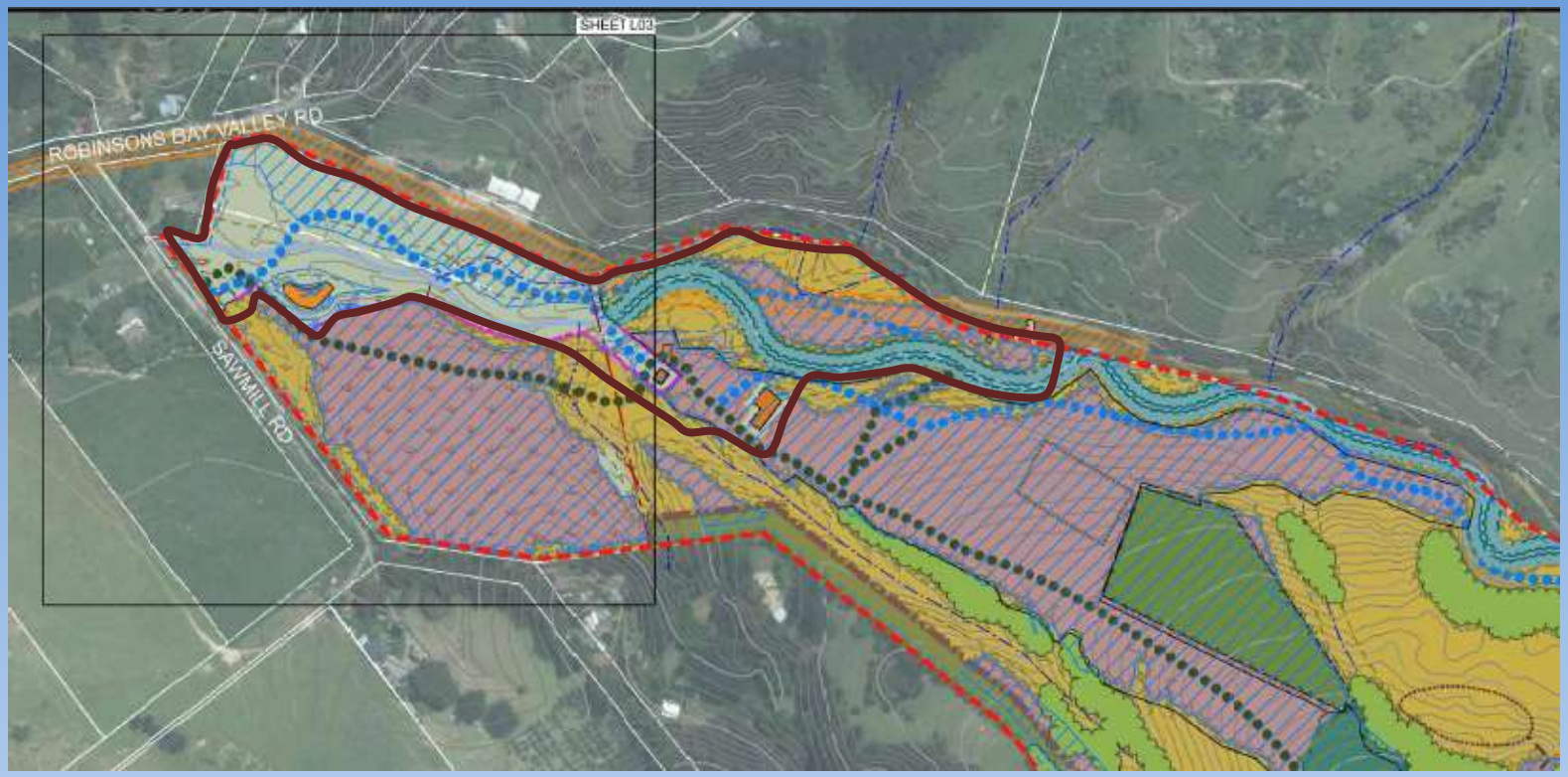
Amenity conditions (2)

- Access to the Upper Robinsons Bay site is via the main entrance off the Valley Road, and not across the Sawmill Site from Sawmill Road.
- Any pumps are to be situated so that no noise can be heard outside on other properties, including when the wind direction is from pumps toward neighbouring properties.
- Odour monitors are to be installed on the site between the closest irrigation area and the boundary with each adjoining property containing a dwelling, the entrance to the land at Hammond Point from the State Highway, at the WWTP and at the Terminal Pump Station. No odours are to be detected.

Heritage Conditions

- The heritage area is to be fenced and managed for its archaeological, heritage values and amenity values, and will not be planted for irrigation, irrigated, or used for irrigation related construction. Grazing will be light and only with sheep. Willow windrows are to be removed.
- The current site access at the Sawmill site is to be removed and returned to a grass track and restricted to use by light vehicles in dry weather only

Heritage area 11 Sawmill Road



Positive effect conditions

- The heritage area in Robinsons Bay is to be developed and managed in conjunction with the Robinsons Bay Community Heritage Trust.
  - The area is to be developed with full public access, walking tracks, interpretation and associated facilities and interpretation.
- Walking tracks are to be constructed on Hammond Point and 11 Sawmill Road.
  - These walking tracks are to be designed in conjunction with the Robinsons Bay community, CCC Regional Parks team and optionally Rod Donald Banks Peninsula Trust.
  - Walking Tracks are to be maintained by CCC.
  - Walking tracks are to facilitate public monitoring of the scheme and to improve connectivity with other walking routes.

Potable water supply conditions

- CCC shall provide a potable water supply, without restriction, to properties with water supplies affected by the irrigation sites.
- CCC shall guarantee that such properties will not be charged water rates or for the supply, and this shall be recorded on the LIM for such properties.

Fire risk conditions

- Fire breaks to be planted with low flammability species or kept open.

Pest and weed control conditions

- The Applicant is required to develop a pest and weed control strategy for all properties used by the ATWIS system, and to fully fund this strategy for the lifetime of the system
- The strategy will, at a minimum, aim for eradication of Old Mans Beard, sycamore, gorse and control of possums and rats.

Conclusion

- **Environmental impacts** must not be overlooked in the search for a cultural solution
- ATWIS as proposed will have high negative effects on amenity, poses significant risks to the environment and lacks resilience to climate change
- Cost effective alternatives with lower impacts and greater resilience have not been sufficiently considered
- The Application should be declined to enable a solution that meets both cultural and environmental requirements and provides resilience.