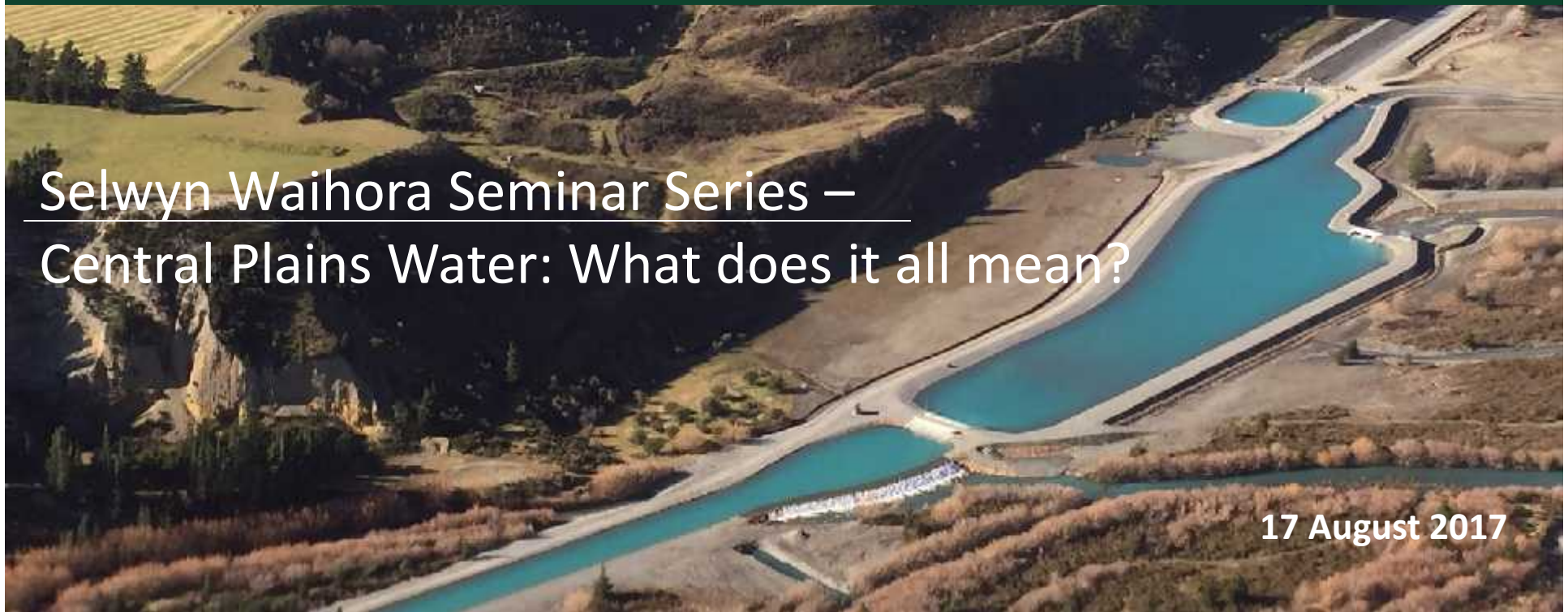




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Selwyn Waihora Seminar Series –
Central Plains Water: What does it all mean?

17 August 2017





What we will cover today:

Background to CPW consents – purpose of Scheme

Scheme overview

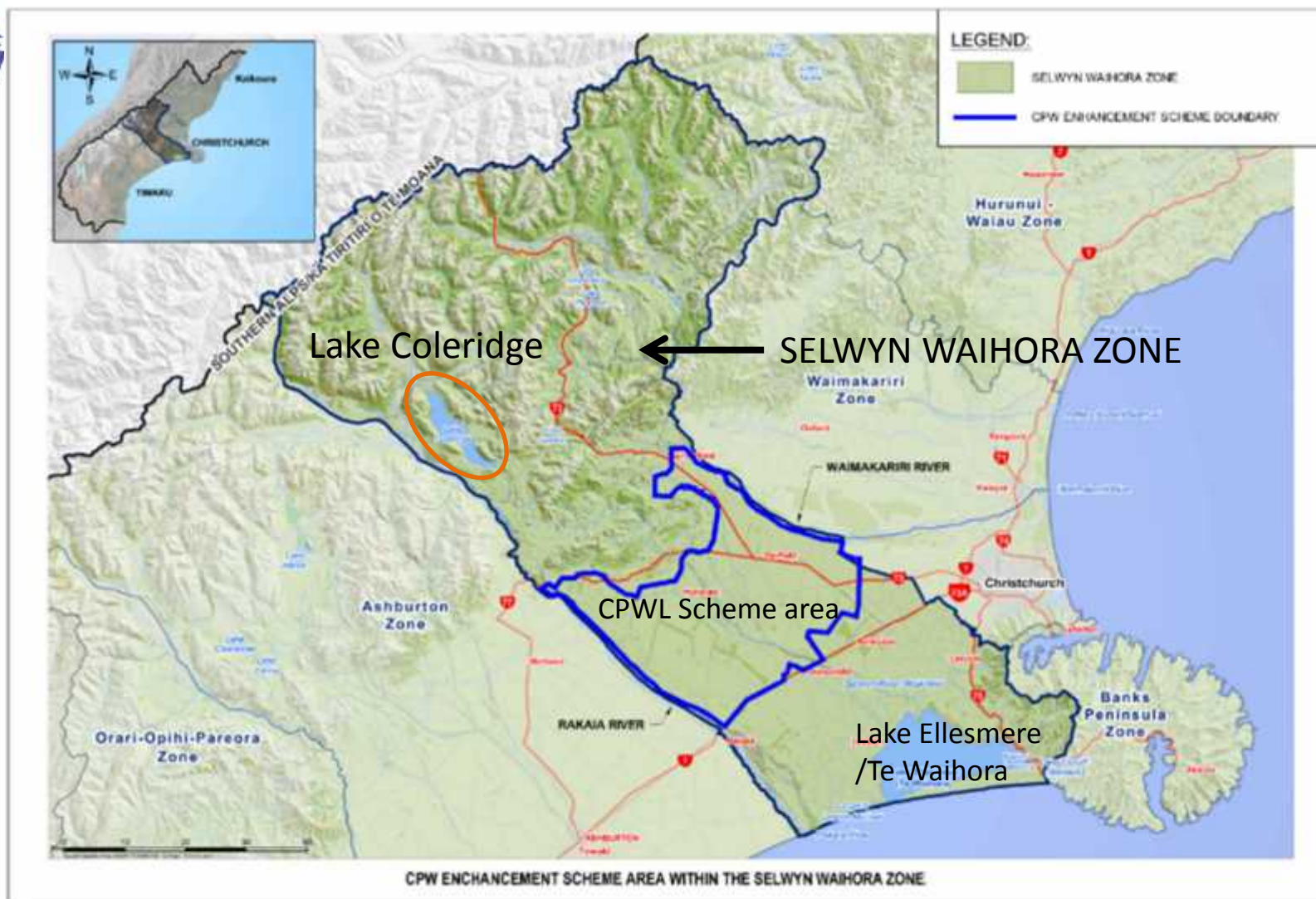
- infrastructure (headrace canal, distribution network and storage)
- development stages
- land use mix – existing and proposed

Conditions of Consents – farming to inputs VS farming to limits (N loss)

- Water take
- Water Use including Nitrogen Discharge Consent

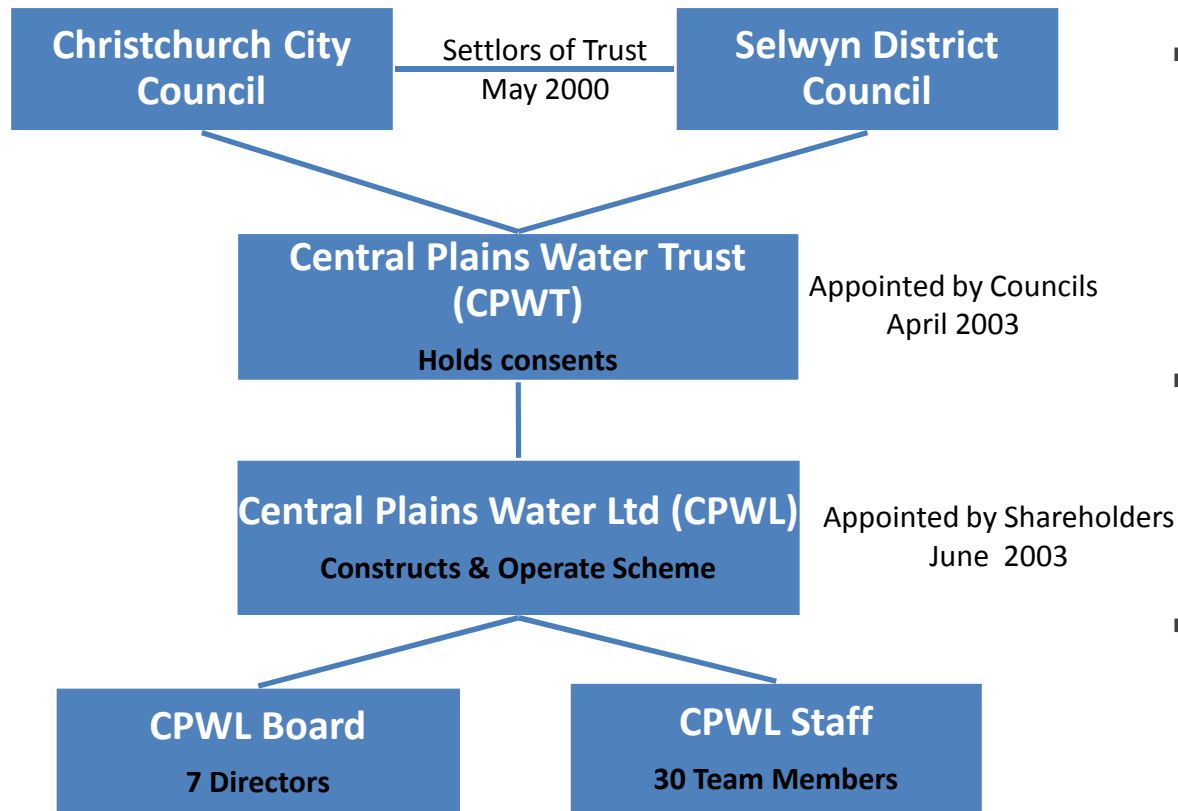
Impact on aquifers and lowland streams

Impact on Nitrogen load to lake and nitrates in shallow groundwater





CPW Trust and CPW Ltd



- CPWT (a public charitable trust) = consent holder - owns consents to irrigate **60,000ha (lodged 2008, granted 2012)**
- CPWL = farmer shareholder entity (390) – established to raise funds to obtain and implement consents.
- MOA between CPWT and CPWL – licences use of the consents to CPWL
- CPWL - Cost recovery model



CPW - Purpose

- Purpose of the Scheme is to provide a **reliable supply of run-of-river water to irrigators**. This enables the abstraction of groundwater to be discontinued resulting in replenishment of aquifers and improved flows in lowland streams.
- **Why run-of-river water?** Rakaia and Waimakariri Rivers' flows are dependant on alpine rainfall and snow melt. Dry and Drought conditions on the Canterbury plains do not impact flows of these two rivers. We can have drought conditions, but high river flows – hence run of river is a sustainable water source over groundwater which depends on aquifer recharge via rain on the plains.



CPW Trust objectives:

- The **Central Plains Water Trust** objectives are to enhance:
 - Environmental, economic and social values of the communities in central Canterbury.
- This ensures ownership of the consents will never pass to overseas or commercial/corporate interests; and
- Most importantly, it ensures that water users cannot act 'inappropriately'.



CPW Trust oversight of Scheme Operations

Sustainability Protocol (2008)

(Environment Management Strategy) To ensure all activities are carried out with a high standard of environmental care. Focus on active management and prevention of problems.

Water User Agreement (WUA)

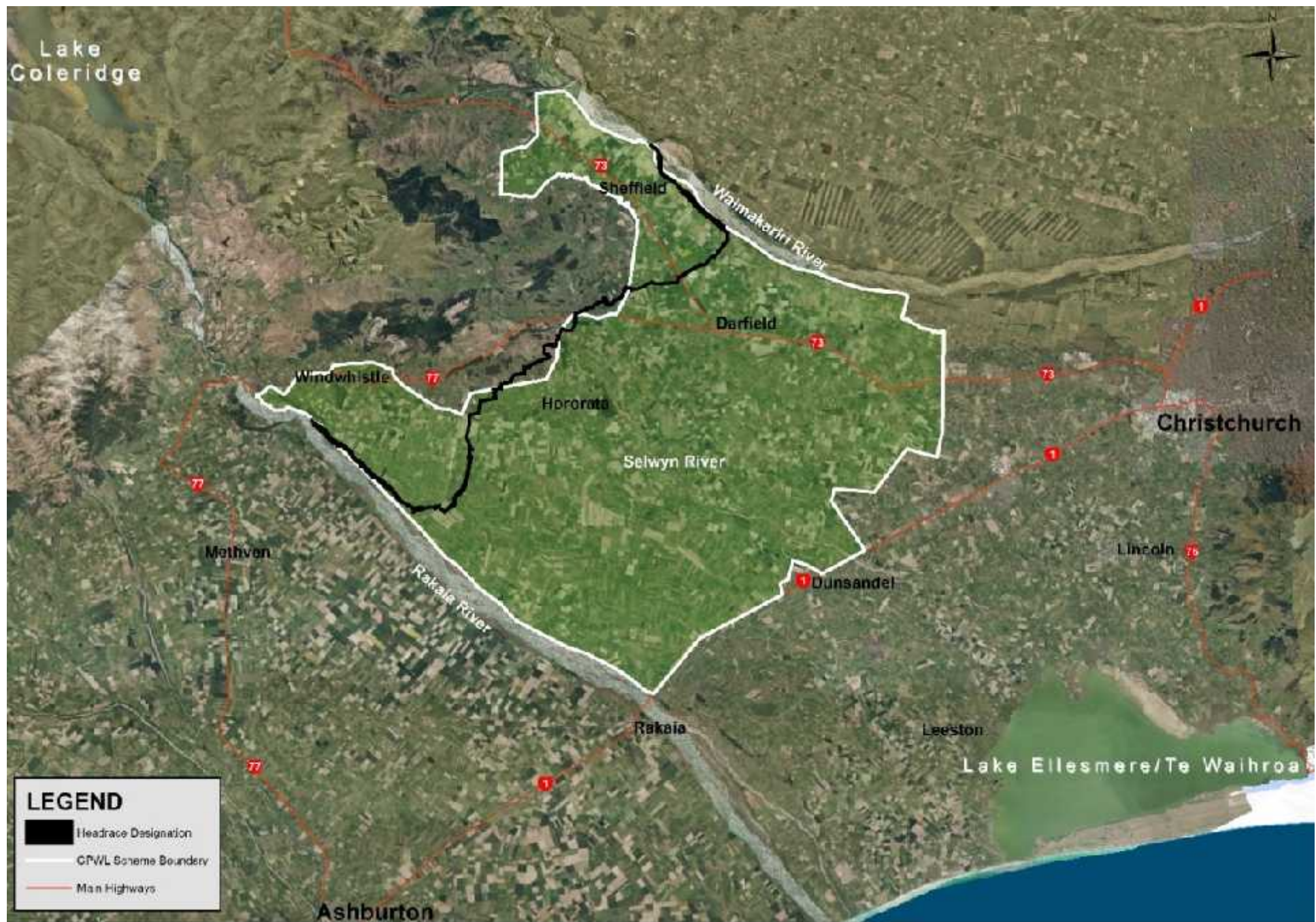
The contractual arrangement for use of CPW water (enables CPW to turn off water)

Farm Environment Plan (FEP) and FEP Audits

Methods/tools of implementing sustainability policy at farm level, included in the WUA.

Ground and Surface Water Monitoring Plan

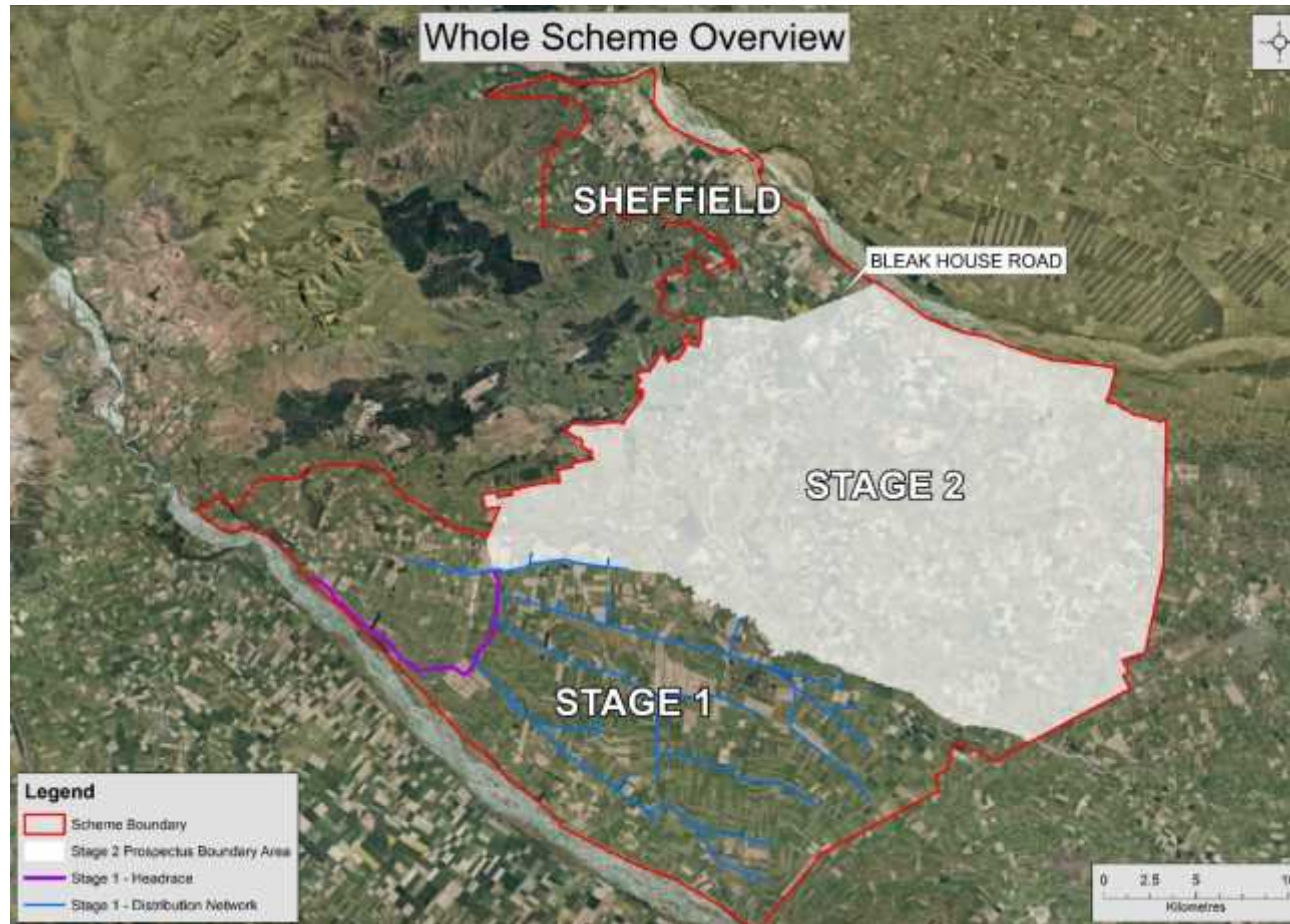
Details extensive ground and surface water monitoring programme certified by panel of independent experts who have an ongoing role of review.



CPW Consented Proposal – what has changed



Scheme implemented in Stages



» **Stage 1** 23,000ha
successfully
completed 1 Sept
2015;

Currently under
Construction:

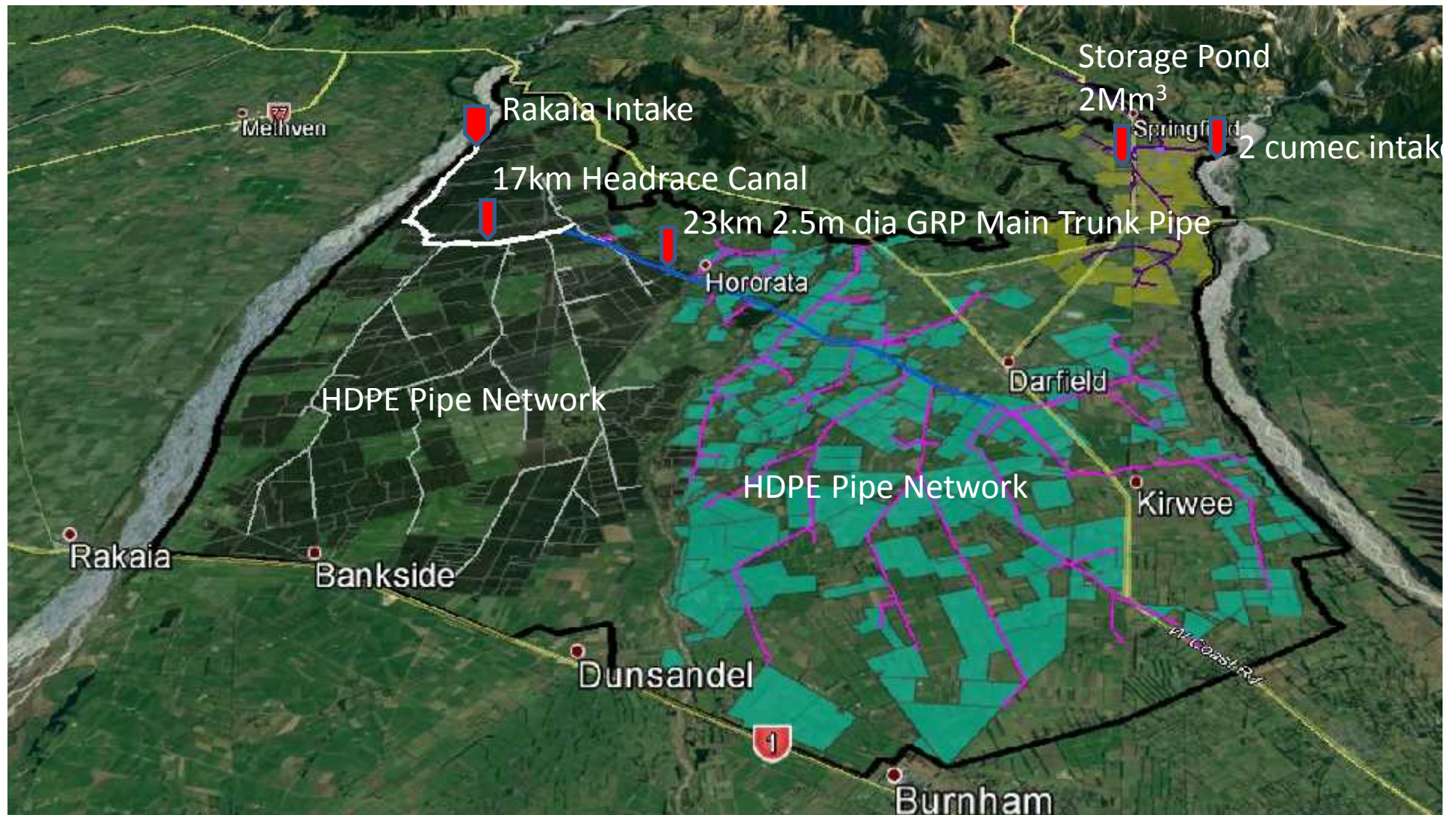
» **Sheffield** (incl. 2Mm³
storage pond)
» 4,300ha
October 2017

» **Stage 2**
» 20,000ha
1 September 2018

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CPWL Scheme Infrastructure layout





CPWL STAGE 1 & 2 INTAKE – Rakaia River





Completed Canal prior to Watering up



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GRP pipe – Glass reinforced plastic



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HDPE Pipe – High density polyethylene



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HDPE installation



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**Turn
out**



Pump station



PRV



**Valve
s**



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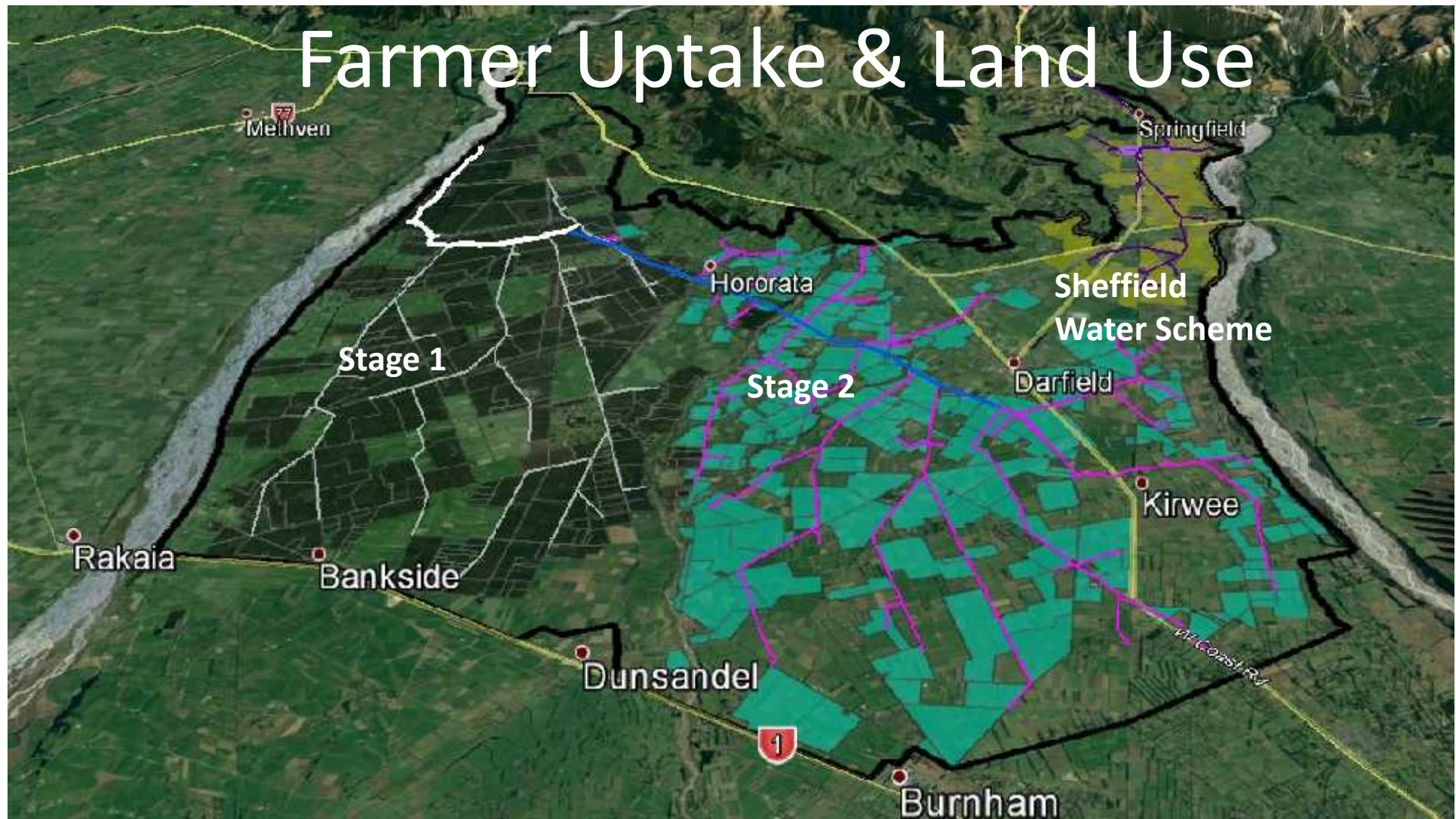
Offtake 5



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Farmer Uptake & Land Use



Stage 1 (23,000ha) Pre CPW = 60% shareholder land irrigated via groundwater;
predominantly Dairy/dairy support, some mixed arable/stock

Stage 2 & Sheffield (24,300ha): Pre CPW = 50% shareholder land irrigated via groundwater;
arable, sheep/beef finishing and dairy support
approx. 20% or 5,000ha = existing dairy



What do we expect new irrigated land use to be?

- **Stage 1 (23,000ha): New irrigation** = 7,000ha - predominantly dairy support for existing dairy farms; 27% new dairy + ~2000ha mixed arable/stock farm systems
- **Stage 2 (20,000ha): 50:50 existing irrigation/new irrigation**
- Based on farmer feedback – intentions are to continue with mixed arable farm systems (includes some existing dairy support);
- Of new irrigation area (10,000ha); low indication of new dairy (12%)
- **Sheffield (4300ha)** – mostly dryland arable farming community, intention to continue arable (includes some existing dairy support);



CPW's 'Use' Consent addressed Nitrogen

- CPW's consent to use water (granted 2012) addressed the impacts of irrigating up to 30,000ha of dry land;
- Consent included conditions to **manage, monitor and mitigate** adverse effects should they occur such as:
 - Specified Nitrogen application rate (200kg/ha/yr); and limits on drainage concentrations of N
 - Required all farms to have a **Farm Management Plan** (FMP (now called FEP's)) in place;
 - FMP to be **audited annually**
 - **Sustainability Protocol** – Governance and operations of the scheme based on sustainable practices.
 - Scheme to implement systems and processes to **track the schemes environmental performance**;
 - Irrigators levied annually to contribute to an **Environmental Enhancement Fund** and a **Te Waihora Enhancement Fund** (combined total of \$320,000/yr once scheme is fully operational); plus -
 - establishment of extensive **ground and surface water monitoring programme**.



Water quality and quantity – Selwyn Waihora Zone

- Dec 2011, community consultation process in relation to the limit setting process commenced. CPW was actively involved in this process.
- **Selwyn Waihora Zone** – key issues are:
 - Water quantity: Overallocated groundwater (abstractions for irrigation) – impacting on achieving environmental flows required to sustain healthy ecosystems – if no CPWL, clawback on all groundwater consents to reduce take to 25% of what is typically used annually.
 - Water quality: Increasing nitrates and phosphates in groundwater and surface waterways, including Lake Ellesmere/Te Waihora.



How did this process affect CPW?

- V1 pLWRP – set Nitrogen limits in the form of kgN/ha/yr.
- This was measuring outputs i.e. N lost below the root zone. CPW's consent didn't measure N in this way.
- During plan change process for Selwyn Waihora, CPW was considered 'part of the existing environment', due to holding a consent which allowed dryland to be irrigated.
- However, the requirement to set output limits of N meant a load had to be calculated to represent the dryland CPW would irrigate.

Nitrogen allocation – A risky business getting it right

- Variation 1 proposed a total Scheme load of ~2000t, for existing and new irrigation.
- Establishing an accurate N loss number for existing irrigation was challenging via modelling – needed to be accurate as it determined viability of the scheme.
- CPW opted for an allocation for new irrigation only.
- Existing irrigated farmers (~33,000ha) joining CPW are treated as per other non-shareholder irrigated farmers i.e. farm to 2009-2013 N baseline + make reductions to achieve 2022 targets.
- to establish a realistic N load for new irrigation, CPW modelled 40 existing farms (OVERSEER v6.1.3)

CPW's 'Use' Consent updated to a 'Discharge' Consent

- 979t was granted to CPW to convert dryland to irrigated land.
- CPW was granted a Discharge Consent in early 2016 to replace original Use Consent;
- All FEP/Audit/water monitoring etc conditions were carried over.
- **979t IS NOT ALL 'NEW' NITROGEN.**
 - 621t is the existing/current dryland farming baseline
 - 358t is the new Nitrogen required to convert dryland to irrigation
 - This equates to 7% of the catchment load



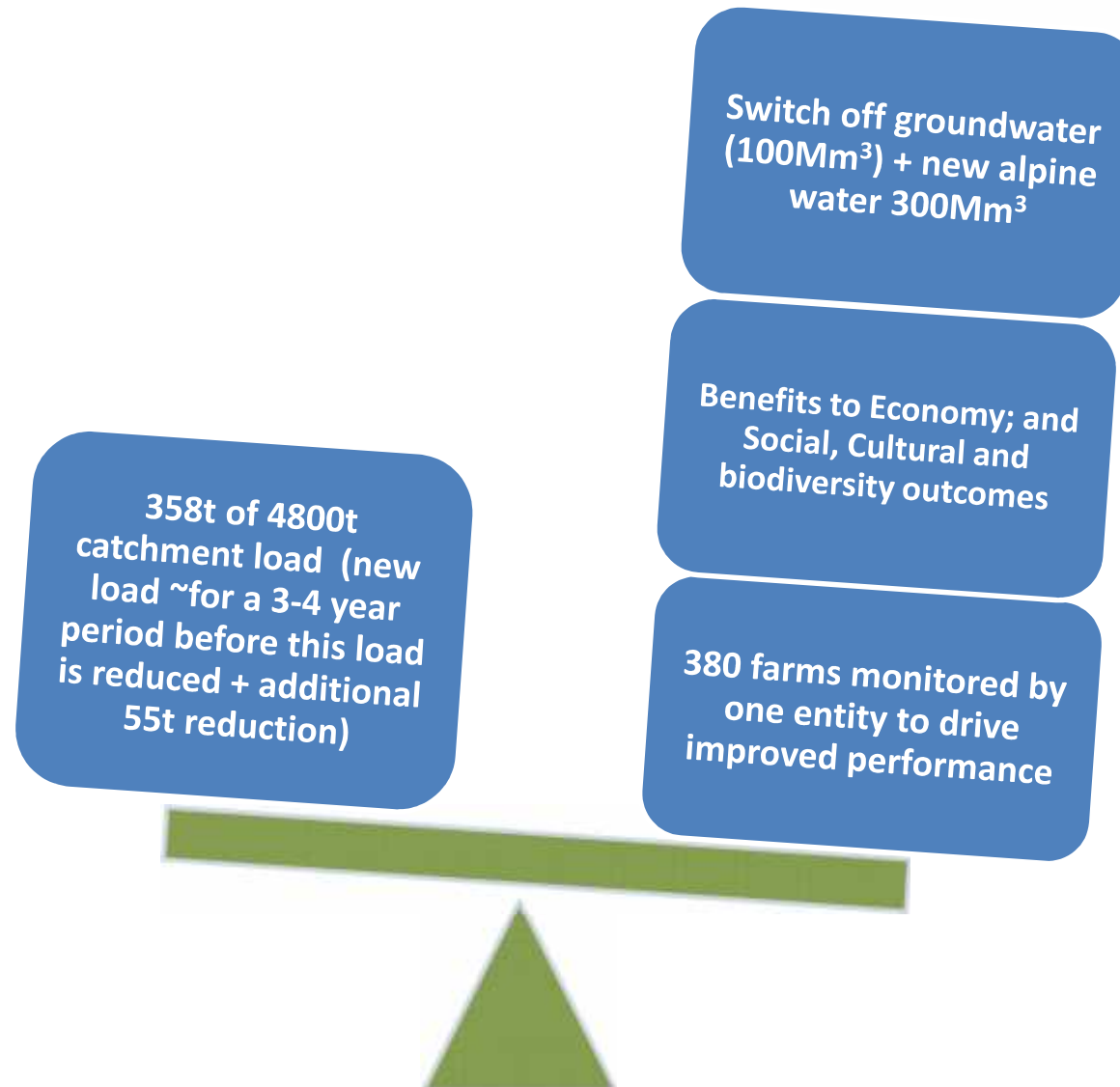
Reductions of N via CPW

- CPWL will manage ALL reporting and compliance of farm management for Stage 1, 2 and Sheffield i.e. 47,000ha
- By 2022 CPW irrigators = reduced the total N loss by 23%, this is 55t more than the load granted for new irrigation.

Total N managed by CPW at Sept 2018 (47,000ha operational)	Total N at 2022, once % reductions across farm systems has been achieved.
~1802t (includes 1444t existing farming N loss + 358t new allocation)	1389t (reduced by ~413t/23%)

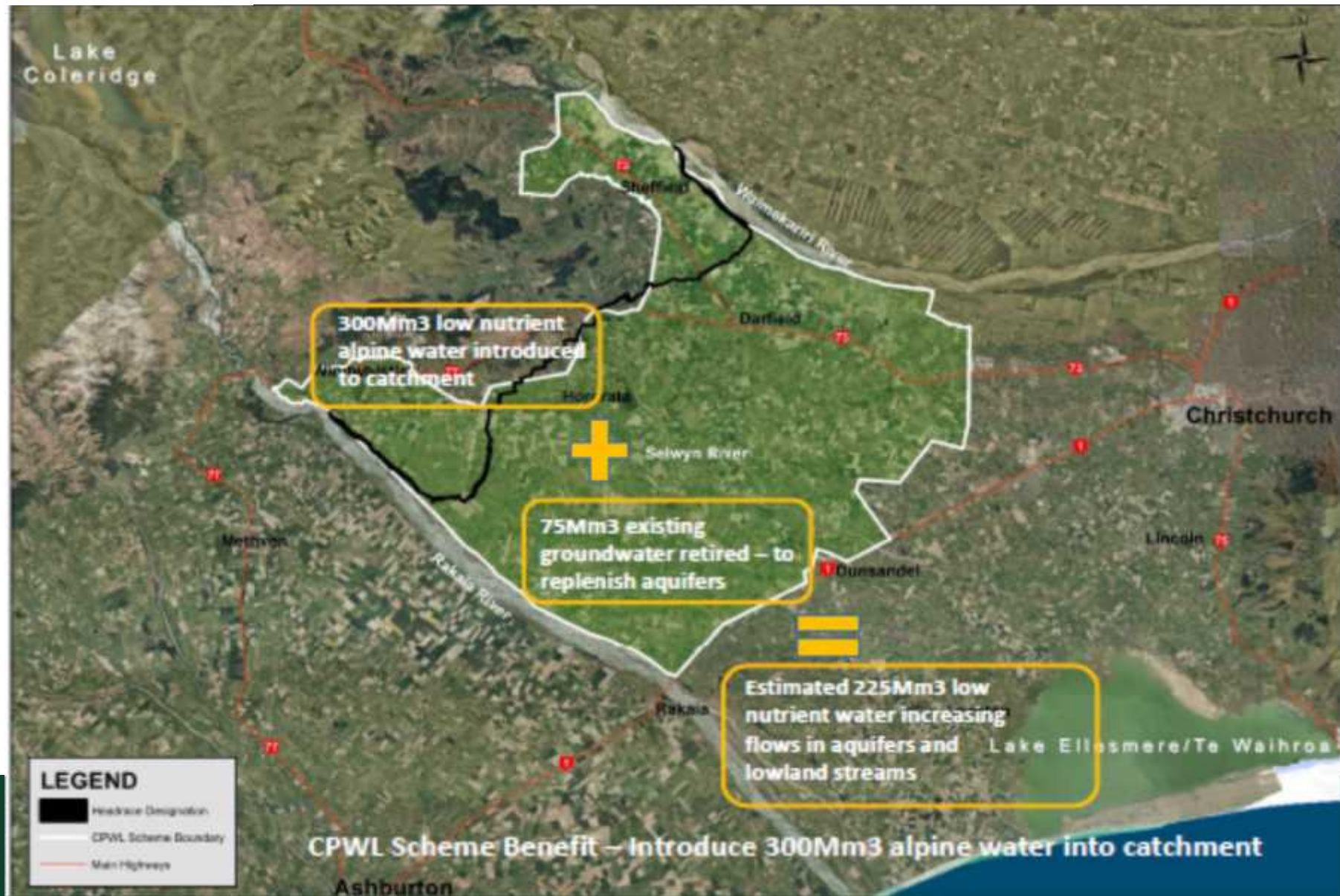


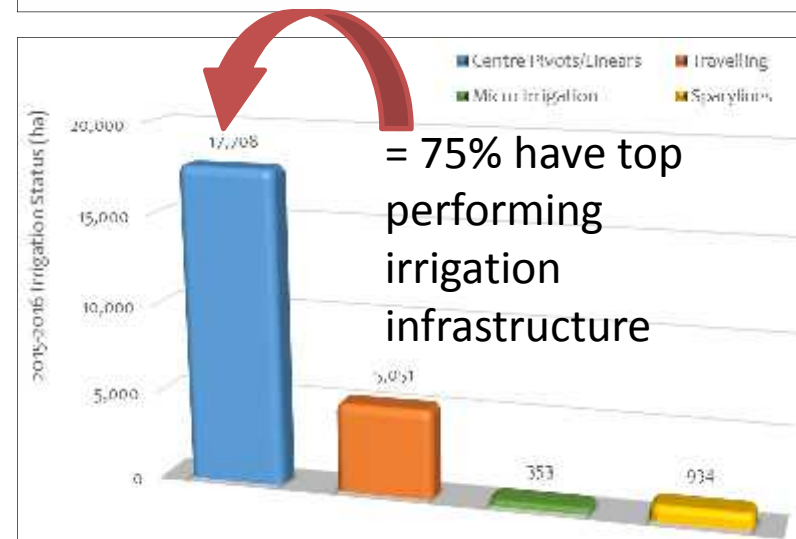
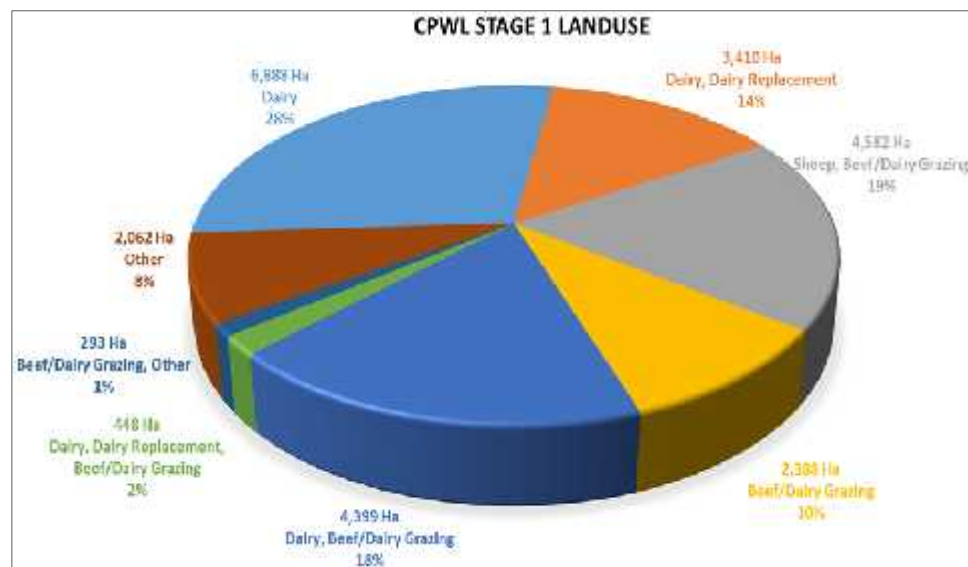
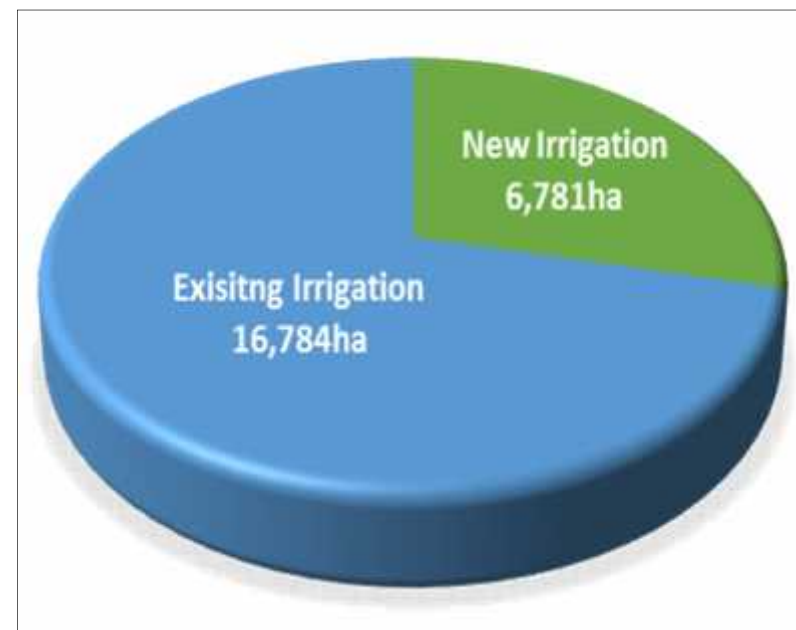
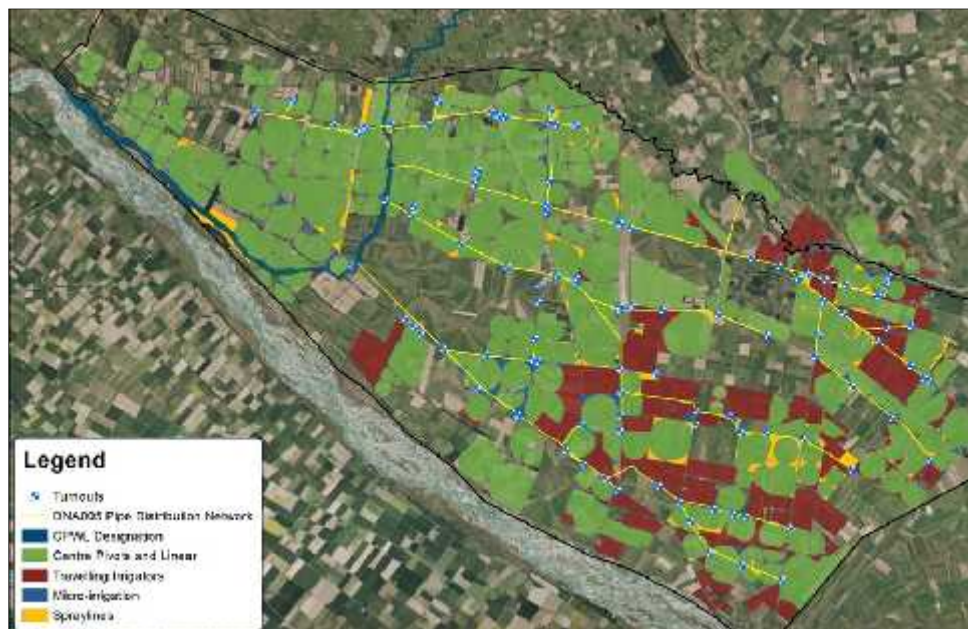
Weighing it all up.....is it worth it?





Increasing water in aquifers & lowland streams

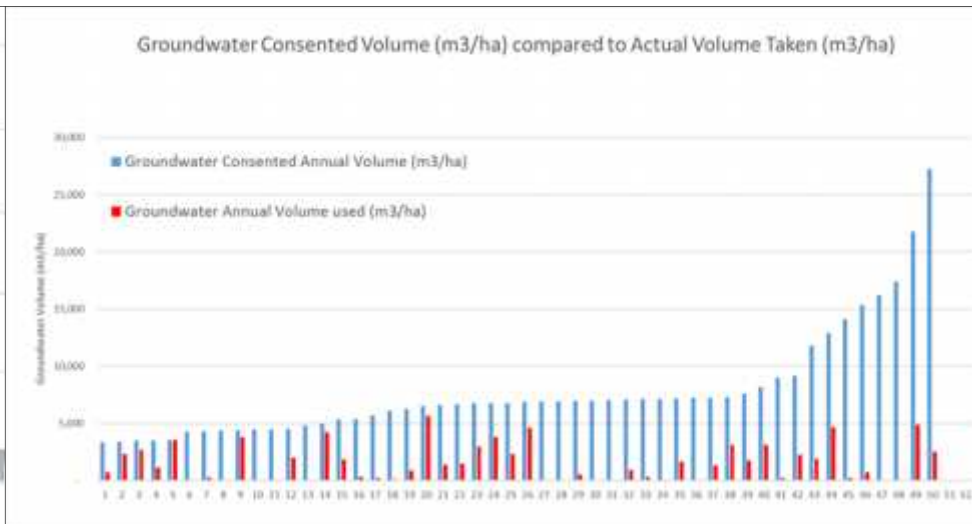
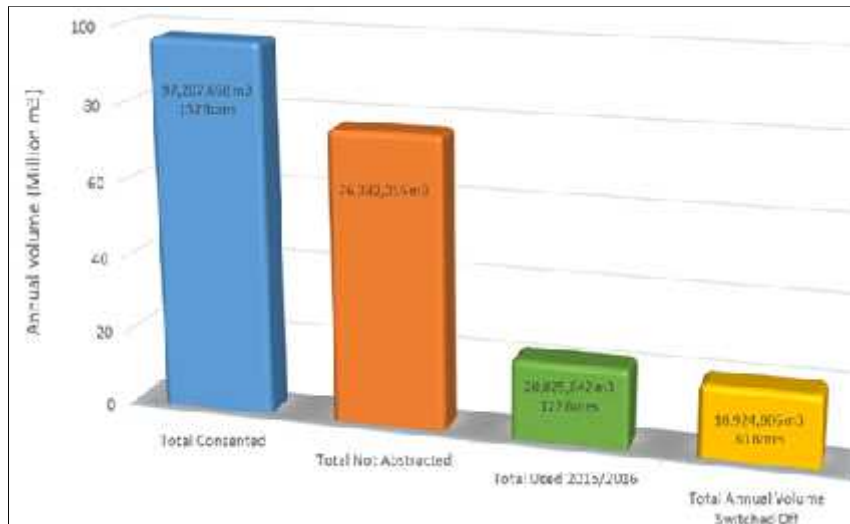






Stage 1: 2015/2016 Water Usage

- » Selwyn Waihora catchment is over allocated – Groundwater abstraction and Nitrogen discharge.
- » 75% or 60Mm³ of groundwater was not abstracted as farmers switched to CPW run of river scheme.
- » S1 recharge occur. 4 bores. Apr→ July, Mar→July, May→Aug, Apr→Sept.





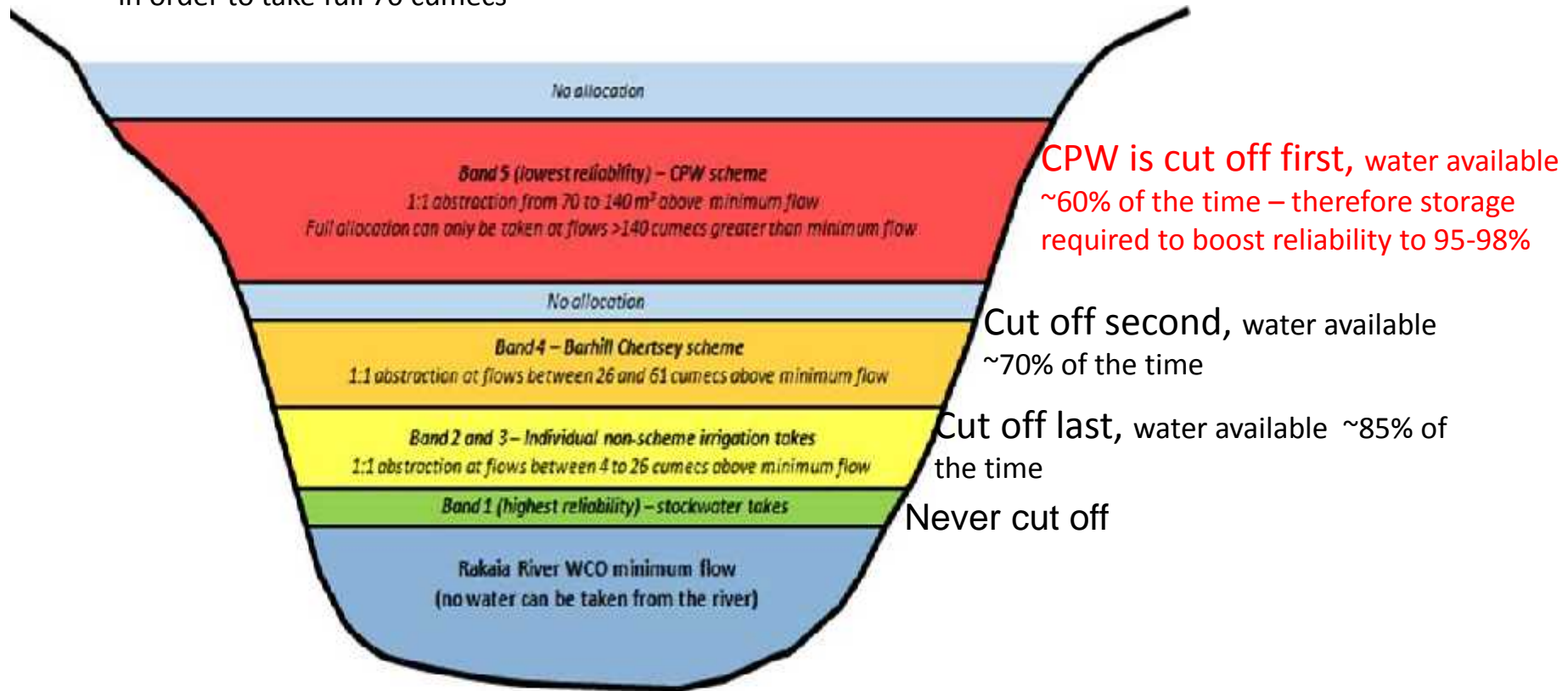
Stage 1 2015/2016 Total Water Usage





Controlling water abstracted from the Rakaia River

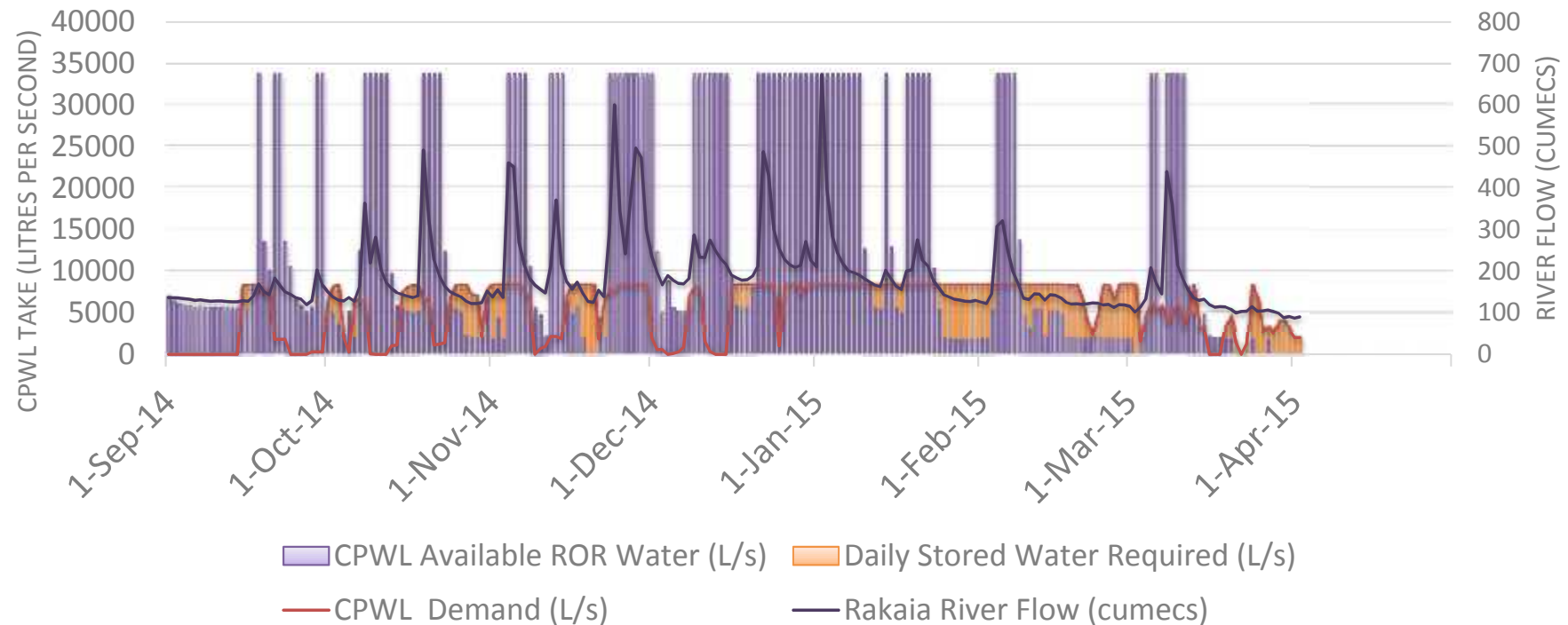
- Total consented take on Rakaia River = 70 Cumecs, 1:1 therefore 140 cumec flow required in order to take full 70 cumecs



- When high flows occur, or when CPW does not take consented water, TrustPower take excess (consented) water above 140 cumecs and stores it for release back into the river when abstraction is restricted. Abstractors can take this water without affecting the flows in the Rakaia River.



Run of River Water + Stored Water = key solution to overallocated groundwater



- 1000 cumecs in a 'fresh', i.e. as a result of north west rain in the Alps
- Intake designed for 6000 cumecs = 1 in 100 year flood;
- 1:1000 year flood = 7875 cumecs (i.e. an increase 300mm across 2km above 1:100 level)
- River flow restrictions not connected to groundwater restrictions.
- Drought on the plains (prevailing north easterly conditions, often goes hand in hand with westerly/rain conditions in the Alps.



Ground and Surface Water Quality Monitoring



Figure 29. CPWL Surface Water Quality Compliance Monitoring Sites



Figure 33. Location of CPWL groundwater quality monitoring sites

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What WQ parameters do we test for?

<u>Determinand</u>	<u>Units</u>	<u>Surface Water</u>	<u>Groundwater</u>
E. coli	MPN/100ml	✓	✓
Turbidity	NTU	✓	
Bromide	mg/L		✓
Nitrate Nitrogen	mg/L		✓
Nitrite+Nitrate Nitrogen	mg/L	✓	
Total Nitrogen	mg/L	✓	✓
Total Ammoniacal Nitrogen	mg/L	✓	
Dissolved Reactive Phosphorus	mg/L	✓	✓
Total Phosphorus	mg/L	✓	
pH	pH units	✓	✓
Electrical Conductivity	micro Siemens/cm	✓	✓
Dissolved Oxygen	% Saturated	✓	✓
Temperature	Degrees Celsius	✓	✓
Alkalinity	mg/L		✓
Chloride	mg/L		✓
Sulphate	mg/L		✓

Monitoring since 2012.

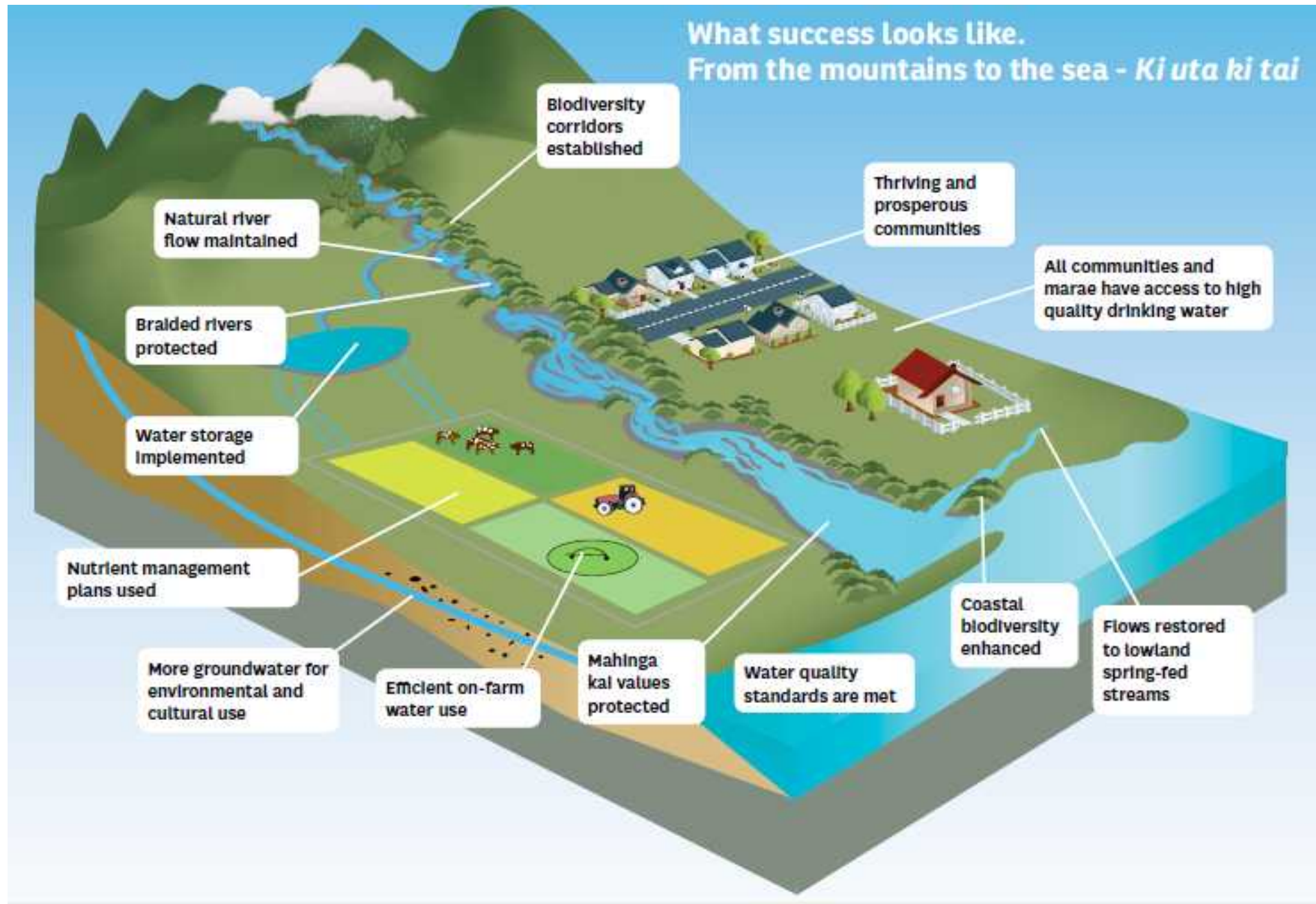
Nitrate levels in bores and at surface water sites continue to be consistent with results from last 3-5 years.

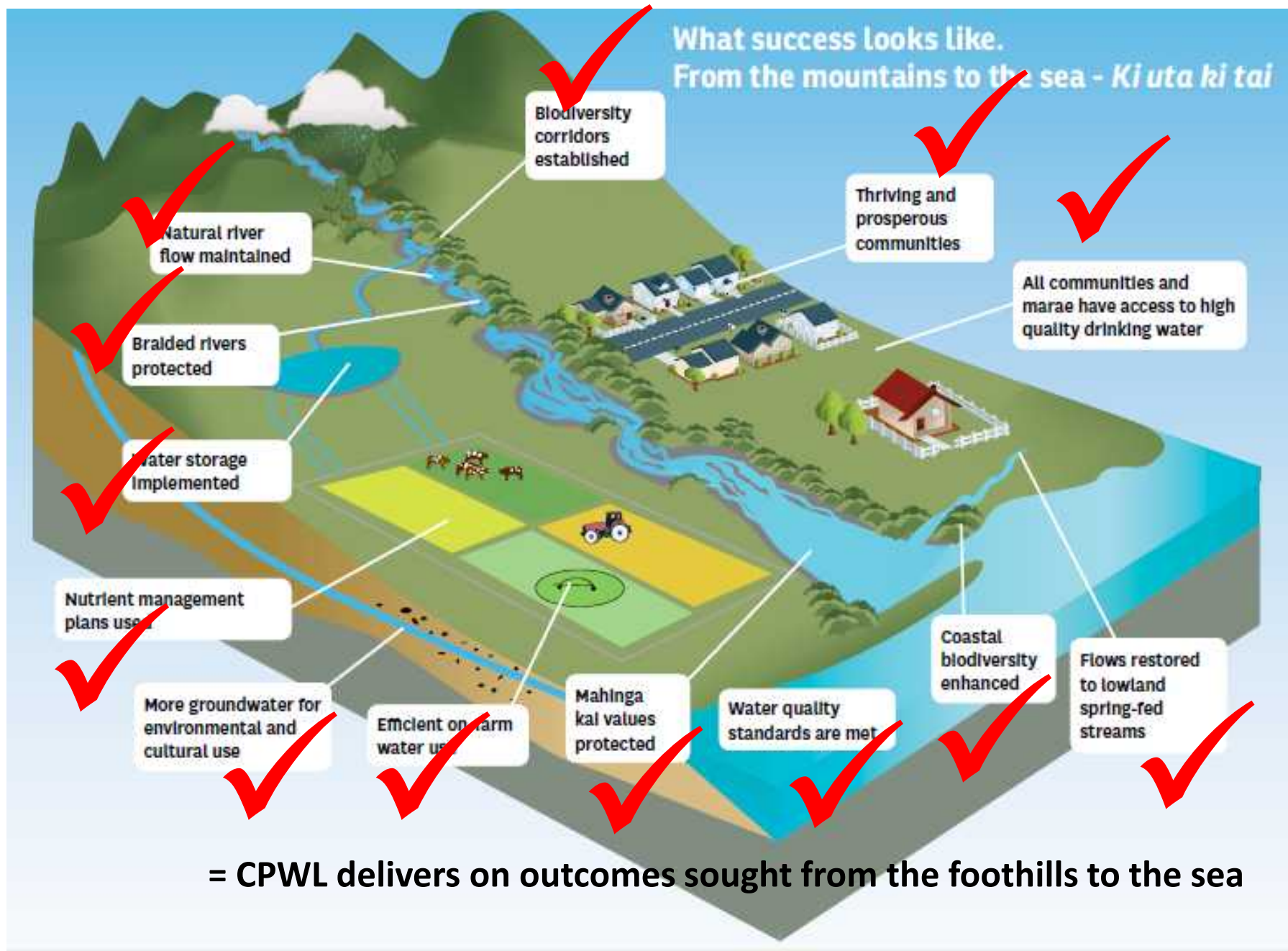
No spikes outside of range since Stage 1 commencement.

Have noted incidences/spikes of *E. coli*, predominantly in Stage 2 area (not yet operational).

Report to Ground & Surface Expert Review Panel Annually.
No specific evidence of any trends attributed to CPW.

What success looks like.
From the mountains to the sea - *Ki uta ki tai*







Achieved benefits

- Stage 1: 110 FEP's implemented at 1 Sept 2015; All audited during 2016/17 season
- 90+% farmers in Stage 1 are at GMP.
- 60Mm3 of consented groundwater was not abstracted from Aquifers in 2015/16 and 2016/17 seasons (farmers switched to CPW run of river water);
- Biodiversity enhancement programme underway 2017 – Inaugural plant out by Te Ara kakariki scheduled for September 2017, Y2 of fund opens for applications end August 2017;
- Targeted River Augmentation -approved to be implemented as part of Stage 2 construction (3.5 cumecs to augment Selwyn River)
- Ecological; and Archaeological and Heritage surveys completed across scheme – identified existing sites of significance and value - CPW ensured design was altered to avoid impacting these sites.

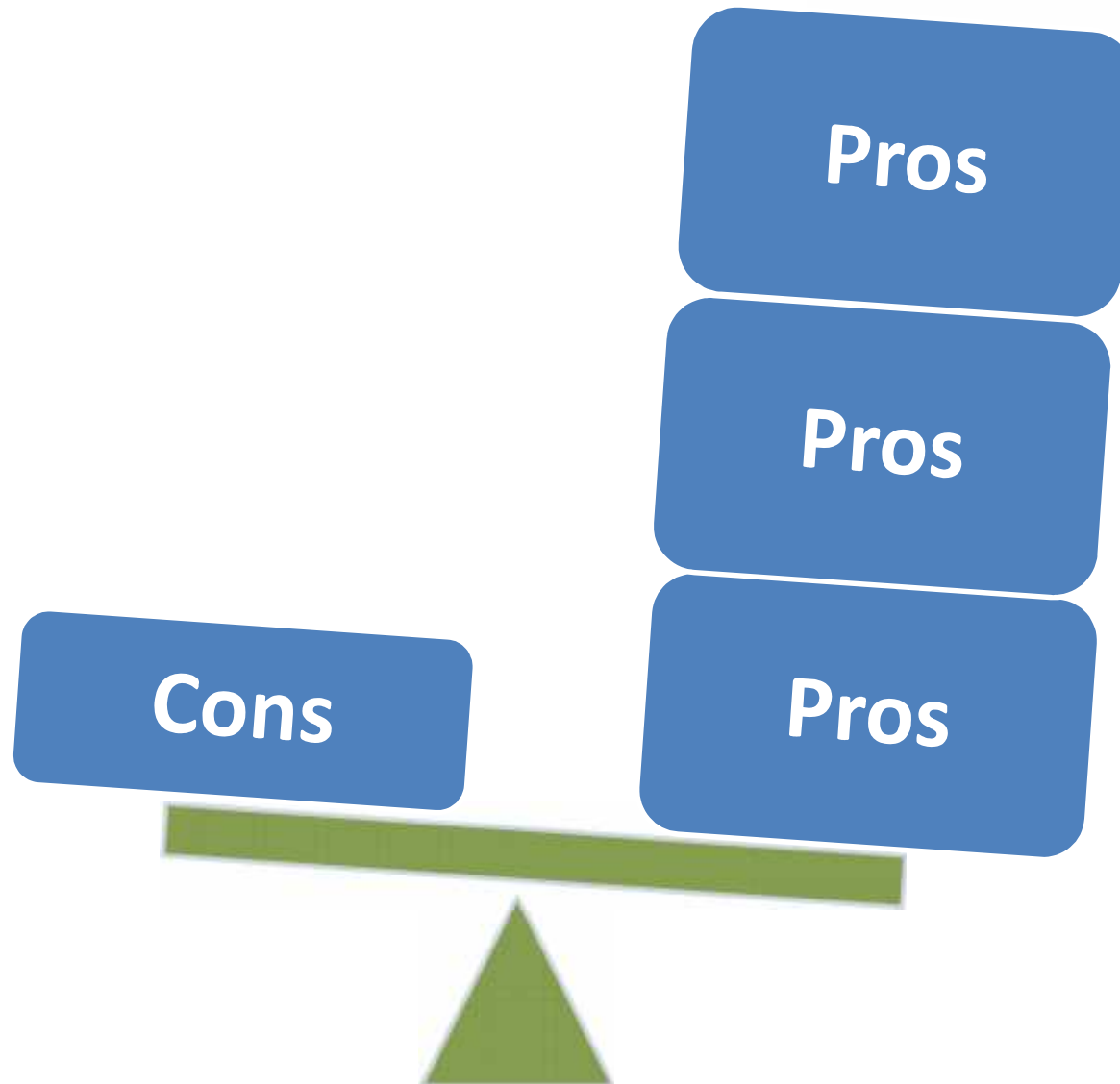


Achieved benefits

- New business established during construction and ongoing operations of Stage 1, 2 and SWS;
- Reported boost to school role (Hororata),
- Sheffield Scheme includes pipes to deliver water to the SDC community drinking treatment stations; and delivery of piped stock water.
- Providing water to 110 Stage 1 farms – delivering under pressure to farmers gates has enabled 4MW of electricity supply to be discontinued (groundwater pumping).
- Having oversight of up to 60,000ha of farm systems, practices, N loss etc is considerable. The ability to review performance, provide transparent reporting based on independent auditing is a significant benefit for the Selwyn Waihora Zone



Thank you





CPWL's role in achieving success

– Water quantity

What Success Looks Like	CPWL's contribution
Natural river flows maintained Braided rivers protected	River water abstracted under Water Conservation Order (WCO) limits/rules. Low flow restrictions and cut off adhered to and reported to ECan daily.
Water storage implemented	Use of existing Lake Coleridge to increase run of river reliability from ~70% up to 98%
Efficient on-farm water use	Good Management Practice+ required, 80% efficiency water use targets
Flows restored to lowland spring fed streams	Existing groundwater abstractors switch to CPW surface water – replenishing flows in aquifers and lowland streams Introducing 300 millions cubic metres of low nutrient alpine water into the catchment
More groundwater for environmental and cultural use	Abstractors ceasing use of groundwater, taking up CPW surface water

CE



CPWL's role in achieving success

– Water quality

What Success Looks Like	CPWL's contribution
Water quality standards are met	<p>CPW's extensive ground and surface water monitoring programme commenced in 2012 (29 Surface water sites = monthly, 23 groundwater bores = quarterly).</p> <p>Trigger levels for water quality and quantity set in accordance with those developed by Variation 1 to the LWRP.</p> <p>CPWL can deliver supplementary Targeted Stream Augmentation for lowland streams where required (increase flows and dilute nitrate concentrations) (3.5 cumec TSA infrastructure confirmed to be included in Stage 2 construction at Selwyn River)</p> <p>Ground and Surface Water Expert Review Panel – established to review monitoring results, review causes (CPW or not) and confirm mitigation strategies (if drinking water is affected, CPW required to install a new bore or alternative supply)</p> <p>Requirement to monitor for 10 years, then subject to review.</p> <p>A independently appointed (2014) Community Liaison Group to feed back the community voice to CPWL.</p> <p>Farm Environment Plans are implemented on ALL CPWL farms before taking water. Training and support is organised by CPW to ensure farmers are informed and understand their role in minimising nitrogen losses, and phosphate as a result of run off. Independent Annual Audits to establish compliance and monitor performance – results reported to ECan and Te Runanga o Ngai Tahu.</p>
Nutrient management plans are used	
Mahinga Kai values are protected	
All communities have access to high quality drinking water	
Coastal Biodiversity enhanced	



CPWL's role in achieving success

What Success Looks Like	CPWL's contribution
Biodiversity corridors established	<p>Establishment of an Environmental Management Fund (\$160,000/year), managed and administered by an independent committee.</p> <p><u>plus</u></p> <p>a Te Waihora Enhancement Fund (\$160,000/year) for enhancement projects outside those required by the FEP's, managed by Te Runanga o Ngai Tahu.</p>



CPWL's role in achieving success

What Success Looks Like	CPWL's contribution
Thriving and prosperous communities	<ul style="list-style-type: none">• Annual direct and indirect regional agricultural output expected to increase by \$592m per annum, which includes \$328m per annum of agricultural output that is processed.• The wider economic impact is assessed at approx. \$1b to \$1.4b per annum.• Employment is expected to increase by 1130 jobs – 416 from expansion in farm output, 714 from related off farm activity.• Construction phase 180 jobs directly, plus 1700 indirect• The construction of Stage 1 of the Scheme has created over 500 jobs over an 18 month period• The Canterbury Economic Development Strategy lists irrigation development as key to the sustainability of the post quake recovery of Canterbury. Stage 1 construction in 2014/15 and Stage 2 in 2017/18 is a material and very timely step in delivering on this regional (and national) goal.