AGENDA FOR THE

ORDINARY MEETING OF SELWYN DISTRICT COUNCIL

TO BE HELD IN THE COUNCIL CHAMBERS

SELWYN DISTRICT COUNCIL ROLLESTON

WEDNESDAY 10 MARCH 2021

COMMENCING AT 1 PM

Council Meeting - 10 March 2021

Attendees: Mayor (S T Broughton), Councillors, M A Alexander, J B Bland, S N O H Epiha, J A Gallagher, D Hasson, M P Lemon, M B Lyall, S G McInnes, G S F Miller, R H Mugford & N C Reid

10 March 2021 01:00 PM - 05:00 PM

Public portions of this meeting area audio-recorded and livestreamed via the Council's website and YouTube channel.

Whakataka te hau ki te uru	Cease the winds from the west
Whakataka te hau ki te tonga	Cease the winds from the south
Kia mākinakina ki uta	Let the breeze blow over the land
Kia mātaratara ki tai	Let the breeze blow over the sea
E hī ake ana te atakura	Let the red-tipped dawn come with a sharpened air
He tio, he huka, he hau hū	A touch of frost, a promise of a glorious day
Tīhei mauri ora!	

COUNCIL AFFIRMATION

Let us affirm today that we as Councillors will work together to serve the citizens of Selwyn District.

To always use our gifts of understanding, courage, common sense, wisdom and integrity in all our discussions, dealings and decisions so that we may solve problems effectively.

May we always recognise each other's values and opinions, be fair minded and ready to listen to each other's point of view.

In our dealings with each other let us always be open to the truth of others and ready to seek agreement, slow to take offence and always prepared to forgive.

May we always work to enhance the wellbeing of the Selwyn District and its communities.

MINUTES OF AN ORDINARY MEETING OF THE SELWYN DISTRICT COUNCIL HELD IN THE COUNCIL CHAMBERS ON WEDNESDAY 10 MARCH 2021 COMMENCING AT 1PM

PRESENT

Mayor (S T Broughton), Councillors, M A Alexander, J B Bland, S N O H Epiha, J A Gallagher, D Hasson, M P Lemon, M B Lyall, S McInnes, G S F Miller, R H Mugford and N C Reid

IN ATTENDANCE

Messrs. D Ward (Chief Executive), K Mason (Group Manager Organisational Performance), S Hill (Group Manager Communication and Customers), M Washington (Group Manager Infrastructure), D Marshall (Group Manager Property), G Morgan (Service Delivery Manager, Infrastructure), A Mazey (Asset Manager Transportation), M Chamberlain (Team Leader Transportation), R Allen (Acquisitions, Disposals and Leasing Manager), M England (Asset Manager Water Services), M Rykers (Manager Open Space and Strategy), R Raymond (Communications Advisor), R Love (Team Leader Strategy and Policy), and S Tully (Mayor’s Advisor), Mesdames D Kidd (Group Manager Community Services and Facilities), E McLaren (Water Service Delivery Manager), R Carruthers (Strategy & Policy Planner), and N Smith (Executive Assistant) and Ms T Davel (Governance Coordinator) and Miss T Bain (Tuia Representative)

The meeting was livestreamed.

Councillor Reid opened the meeting with the karakia and Councillor Affirmation.

APOLOGIES

None

IDENTIFICATION OF ANY EXTRAORDINARY BUSINESS

None identified.

CONFLICTS OF INTEREST

Standard conflicts were applied to this meeting.

CONFIRMATION OF MINUTES

1. Minutes of an Ordinary meeting of the Selwyn District Council held in the Council Chambers on Wednesday 10 February 2021

Councillor Alexander noted one grammatical correction in relation to Item 10 (*Darfield and Kirwee Wastewater – Working Party Update*) to replace the word '*likely'* with '*lightly'*.

Moved – Councillor Alexander **/ Seconded –** Councillor Epiha

'That the Council confirms the minutes of the ordinary meeting of the Selwyn District Council held on Wednesday 10 February 2021'

CARRIED

CURRENT MATTERS REQUIRING ATTENTION

Item	Meeting referred from	Action required	Report Date / Action
None currently			

REPORTS

1. Chief Executive
Chief Executive's Report

The Chief Executive noted the recent Fitch AA+ rating which was something to be proud of and it reflected the positive growth in the District.

Regarding the Long Term Plan process, the Chief Executive noted the audit field work was just done. The next step in the process was a hot review by the Office of the Auditor General, which takes place over a 24 – 48 hour period. He mentioned relevant dates in the submission period with hearings scheduled for 13 & 14 May. Deliberations will follow in the week thereafter with Council scheduled to adopt the (*draft*) Long Term Plan on 23 June 2021.

The Chief Executive elaborated on the Council staff values developed by the Executive Leadership Team in 2018. He said he was proud of the way staff have been embracing the values with it being displayed through all the offices.

The Selwyn Sports Centre will have a soft opening in April and will boast a high-tech interactive sports wall, the first of its kind in New Zealand.

Moved – Councillor Lyall / **Seconded** – Councillor Bland

'That Council receives the Chief Executive's report for information.'

CARRIED

2. Asset Manager Water Services, and Water Service Delivery Manager
Water Services Bill Submission

The Mayor asked staff to add something around Three Waters to the submission.

Councillor Miller said it needs to be reiterated to ratepayers that Council submits in support of the current status quo. He said Selwyn has a practical, good solution and wants to continue with that. He said a concern was the requirements when you had more than one building on a supply and you are responsible to make sure there was good quality water for all farm works, for example, living in buildings on the property. He was also concerned with advice from the Canterbury District Health Board (CDHB) to chlorinate in the first instance – the question was when – now or a later date.

Staff said Council's submission requests a time for applying for exemption as it seems counterproductive and not cost effective to chlorinate and then having to take it out again a short while later. Councillor Alexander agreed saying he was concerned that Councils are often left as the last man standing, and said if Government wanted to add this to Council responsibilities, the appropriate cash should be made available also.

Councillor Epiha noted the perceived conflict regarding Te Mana o Te Wai with staff noting there was a fine balance between providing and protecting water.

The Mayor said the Canterbury Mayoral Forum (CMF) will also put forward a submission.

Moved – Councillor Alexander / **Seconded** – Councillor McInnes

'That Council:

(a) Approve the draft submission.

(b) Delegate the Chief Executive the authority to sign the final submission.

(c) Agree to staff making any amendments to fix any typographical, formatting or other minor errors.

(d) Approve the Council's oral submission to the Health Select Committee, to be represented by (to be agreed at the meeting) and supported by appropriate staff.'

CARRIED

3. Manager Open Space and Strategy
Reserves Charging Proposal

The Manager Open Space and Strategy said the report was the culmination of work presented to Council in August of 2020. He said the report contains all the information about existing charges, presents a rationale for going forward and will be included as part of the consultation.

Schools will be incorporated and treated the same as any other sport users. There was a brief discussion about Selwyn user groups viz non-Selwyn user groups and charges, as well as long term leases from e.g. golf clubs, and speciality seasonal rates for specialist services, including hockey, softball and other needing artificial surfaces for their sport.

Councillors agreed the facilities were put in for people to use them and that health and wellbeing should be encouraged. The Mayor thanked staff for the work that went into the report.

Moved – Councillor Mugford / **Seconded** – Councillor Reid

'That Council:

a) Supports the introduction of a fair and consistent charging approach for use and occupation of reserves that can be applied across the network of Council reserves;

b) Approves the Reserves Charging Policy that forms the basis for charging for use and occupation of Council reserves;

c) *Endorses the draft schedule of fees and charges for reserves for inclusion in the draft 2021-31 Long Term Plan;*

d) *Seeks and considers feedback from the community on the draft schedule of fees and charges for reserves as part of the 2021-31 Long Term Plan process.'*

CARRIED

4. Team Leader Strategy and Policy
Plan Change 67 – Decision on how to consider the Private Plan Change Request received from G W Wilfield Ltd

Moved – Councillor Alexander / **Seconded** – Councillor Bland

'That in respect to Plan Change 67 to the Selwyn District Plan lodged by GW Wilfield Ltd, Council resolves to accept the request for notification pursuant to Clause 25 (2)(b) of the Resource Management Act 1991.'

CARRIED

5. Solid Waste Manager
Solid Waste Monthly Update

Staff pointed to key highlights such as the success of the recycling and decontamination crew currently at work. Improvements to the recycling facilities at Pines Resource Recovery Park were also taking shape.

Staff reassured Council that tagged bins are still continued to be collected. The tag was for information and educational purposes. Councillor Hasson asked what Council's sustainability policy was around disposing of laptops and phones. Staff said they had just started working with the Christchurch City Council on developing a sustainability programme.

There was a question about landfills around Selwyn and whether this posed a risk to the communities around them. Councillor Lemon noted the Audit and Risk Subcommittee had undertaken a review of this issue and will do so again this year.

Staff also assured Councillor Mugford that there was a good uptake of interest between Windwhistle to Coleridge around increasing recycling and although distance was a deterrent, positive dialogue was continuing.

Councillors also thanked staff for the waste days, and the education that happens with their work e.g. tagging of bins.

Moved – Councillor Mugford / **Seconded** – Councillor Gallagher

'That the Council receives the report 'Solid Waste Monthly Update' for information.'

CARRIED

6. Asset Manager Transportation and Team Leader Transportation
Transportation Monthly Update

Council's Asset Manager Transportation said that the NZTA was in general supportive of Council's Transport Activity Management Plan. The Regional Transport Committee adopted the Draft Regional Land Transport Programme. It details the strategic direction and key priorities for the region and lists Council's programme eligible for NZTA funding compared to others, including the Rolleston Inter-Connection Improvement. The Mayor said although the draft plan included updates on the District's highways the plan looks very city-heavy and it would be important to make sure the rest of the network was fit for purpose.

There was a discussion about the future possibilities of public transport and development of a transport hub. Councillor Miller said Council had a small window of opportunity of 'no regret' and it was logical with the growth in Rolleston to start discussing how this might be rolled out. The Mayor asked Council to start thinking about this and staff noted Council was fortunate to own land along the line of the flyover, adding that those early conversations needed to start happening now.

Staff also spoke about the continuing challenge of having appropriate funding for road maintenance. They asked Council for direction around dealing with reduction of speed limits around the District before the Bylaw changes. There were a number of requests for consideration and Council agreed it was a good reason to have an interim review, asking for a report back with more information.

There was also mention made of possible warning signs advising people when they go onto shingle roads to slow down due to corrugation issues. Staff said there were only gravel road warning signs, but no signs warning against corrugation. Councillors also asked staff about possible tiered rates for some of the larger logging trucks and staff said it would be hard to implement.

Councillors discussed intersection accidents and calming features, e.g. on Birchs Road from Lincoln coming into Prebbleton. Staff said a roundabout will be installed at the Springs / Hamptons Road intersection. Temporary traffic audit will be included in the next report.

Councillor Epiha said that Selwyn had the most unsealed roads in the region and from a governance perspective it should be discussed again as priority. It also had major health side effects with the dust from unsealed roads.

Moved – Councillor Reid / **Seconded** – Councillor Lemon

'That Council receives the report Transportation Monthly Update for information.'

CARRIED

7. Group Manager Property
Property Transaction Update – 31 January 2021

Councillor Miller raised the significant expenditure for work on the SAC when clearly some of the work was unacceptable. Councillor Lyall agreed and queried how it has been allowed to get this far. The Mayor rules that the matter will be discussed further in the public excluded portion of the meeting.

Regarding the green star rating for Te Ara Atea, staff were asked to bring information before Council to clearly show the building has all the necessary components of a green star building. It was agreed that the certification for a green star rating was not worth the cost but that documentation in this regard would be sufficient proof.

Regarding the Selwyn Hut licenses, Councillor Miller reiterated his previous concerns that the last statement hut owners will always make was why Council did not tell them 20 or 30 years ago that they would need to leave. He added that Council was now in the space to state what the future might look like. Staff said that all hut owners received letters on 21 August and 20 November 2020 advising them of the current position with wastewater and licence upgrades/renewals. The 21 August 2020 letter was in form a Question and Answer format with the future licence period being a maximum of 15 years which links to the likely length of a resource consent for wastewater being highlighted.

Moved – Councillor Lyall / **Seconded** – Councillor Epiha

'That the Commercial Property Transactions Updated report, as at 31 January 2021, be received for information.'

CARRIED

GENERAL BUSINESS

RESOLUTION TO EXCLUDE THE PUBLIC

Moved – Councillor Hasson / **Seconded** – Councillor Lyall

'That the public be excluded from the following proceedings of this meeting. The general subject matter to be considered while the public is excluded, the reason of passing this resolution in relation to the matter, and the specific grounds under Section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution are as follows:

General subject of each matter to be considered		**Reasons for passing this resolution in relation to each matter**	**Ground(s) under Section 48(1) for the passing of this resolution**	**Date information can be released**
1.	Public Excluded Minutes	*Good reason to withhold exists under Section 7*	*Section 48(1)(a)*	
2.	Property Transactions Update			

This resolution is made in reliance on Section 48(1)(a) of the Local Government Official Information and Meetings Act 1987 and the particular interest or interests protected by Section 6 or Section 7 of that Act or Section 6 or Section 7 or Section 9 of the Official Information Act 1982, as the case may require, which would be prejudiced by the holding of the whole or the relevant part of the proceedings of the meeting in public are as follows:

1, 2	Enable the local authority holding the information to carry out, without prejudice or disadvantage, commercial activities; or	Section 7(2)(h)
1, 2	Enable the local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations); or	Section 7(2)(i)

2. that appropriate officers remain to provide advice to the Committee.'

CARRIED

The public meeting ended at 2.46pm for a brief break before moving into Public Excluded at 3.00pm.

The meeting resumed in open meeting at 3.58pm.

The meeting ended at 3.58pm.

DATED this day of 2021

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MAYOR

1

REPORT

TO: Council

FOR: Council Meeting – 10 March 2021

FROM: Mayor Sam Broughton

DATE: 2 March 2021

SUBJECT: **MAYOR'S REPORT – FEBRUARY 2021**

RECOMMENDATION

'That Council receives the Mayor's Report for February 2021 for information.'

1. PURPOSE

To advise Council of meetings attended by the Mayor.

2. MEETINGS

3 February	Audit & Risk Subcommittee meeting. Councillor Briefing Workshop. Ministry of Education Briefing.
4 February	Canterbury Regional Transport Committee. Speaker at Canterbury Employers Chamber of Commerce "Back to Business" event.
5 February	Hosted Canterbury Mayoral Forum Mayors & Chairs Canterbury's Papatipu Rūnanga joint meeting.
9 February	Selwyn Waihora Zone Committee start up 2021.
10 February	Sicon and SDC Governance meeting. Representative Review Subcommittee meeting. Council meeting.
11 February	Global Bus Ventures Hydrogen bus launch.
12 February	Greater Christchurch Partnership Committee meeting. Welcomed Meng Foon, Race Relations Commissioner at his presentation.
16 February	Video with Waka Kotahi about the new Southern Motorway CSM2.

17 February	Opened the New Zealand Flying nationals which were held at West Melton airfield. Council workshop.
18 February	Canterbury Mayoral Forum and Regional Transport Committee Freight Tour to Christchurch Airport, Lyttelton Port and Move Logistics. Meeting with freight companies Sorted Logistics and Temuka Transport in Timaru
19 February	Mayoral Forum in Timaru. Labour “Back to Work Party“.
22 February	Attended Earthquake Memorial Service for the 10 year anniversary and laid a wreath on behalf of the Canterbury Mayoral Forum.
23 February	Opened the Selwyn Business Breakfast with Chamber of Commerce presenters. Ministry of Transport meeting with their CEO as a follow up to Mayoral Forum work. Lincoln University ground breaking event for flagship science facility. Lincoln Rotary event where I presented an award to a recipient on their behalf and became an honorary member.
24 February	Met with Teghan Bain, the new TUIA representative for 2021. Council meeting.
25 February	Met with St John members regarding the future of their building in Darfield. Christchurch, West Melton, Selwyn-Waihora and Banks Peninsula Joint Zone Committees Workshop.
26 February	Sod turning event for Te Rōhutu Whio (Rolleston East School). Farewell event for Jim Palmer who is retiring as Chief Executive at Waimakariri District Council. Met Andy England, the new Principal of Darfield High School.

Sam Broughton
MAYOR

REPORT

TO:	Chief Executive Officer
FOR:	Council Meeting – 10 March 2021
FROM:	Gail Shaw – Senior Administrator District Licensing Committee Malcolm Johnston – Chief Licensing Inspector Billy Charlton – Regulatory Manager (Secretary of District Licensing Committee)
DATE:	3 February 2021
SUBJECT:	**Joint District Licensing Committee and Chief Licensing Inspector Monthly Report for period 1 December 2020 to 31 December 2020**

RECOMMENDATION

'That the Council receives the report on the activities of the District Licensing Committee and the Chief Licensing Inspector for December 2020.'

1. PURPOSE

The purpose of the report is to inform the Council of activity in the Alcohol Licensing section.

2. SIGNIFICANCE ASSESSMENT/COMPLIANCE STATEMENT

As this report is for information only it is not considered to be significant in the context of Council's Significance Policy.

3. PROPOSAL

Licences issued in December 2020.

Special Licences for December 2020:

- SP201448 – Lincoln Fire Brigade – Lincoln Events Centre
  On Site Licence: Saturday 23 January 2021 from 6.00pm to 1.00am.
- SP201447 – Jacquesy Rocks Limited – The Rock Rolleston
  On Site Licence: Friday 1 January 2021 from 12.00am to 1.00am.
- SP201446 – Leeston Bowling & Tennis Club – Leeston Bowling & Tennis Club
  On Site Licence: Thursday 10 December 2020 from 4.00pm to 10.00pm.
- SP201445 – Braided River Wines Limited – Market @ 254
  On & Off Site Licence: Wednesday 16 December 2020 from 4.00pm to 9.00pm
  Saturday 19 December 2020 from 9.30am to 1.30pm.

- SP201452 – Lincoln Bowling Club Inc – Lincoln Bowling Club
  On Site Licence: Friday 11 December 2020 from 1.00pm to 5.30pm.
- SP201382 – Tasman Regional Young Farmer of the Year – Darfield Recreation and Community Centre
  On Site Licence: Saturday 27 March 2021 from 5.00pm to 11.30pm.
- SP201454 – Sarah van Hoof – Willows Café
  On Site Licence: Saturday 12 December 2020 from 5.30pm to 9.30pm.
- SP201458 – Black Door Bar & Eatery – Black Door Bar & Eatery
  On Site Licence: Friday 1 January 2021 from 12.00am to 1.00am.
- SP201455 – The Thirsty Caravan Limited – Klondyke Corner
  On Site Licence: Friday 12 February 2021 from 10.00am to 10.00pm.
- SP201457 – Serena Holm – Broadfield Community Hall
  On Site Licence: Saturday 30 January 2021 from 6.00pm to 11.00pm.
- SP201459 – Malvern Collie Club – Springvale, Springfield
  On Site Licence: Friday 26 February 2021 from 10.00am to 12.00am
  Saturday 27 February 2021 from 10.00am to 12.00.
- SP201460 – Karma Rae – Yoga by Karma
  On Site Licence: Friday 15 January 2021 from 7.30pm to 9.00pm
  Friday 26 February 2021 from 7.30pm to 9.00pm
  Friday 16 April 2021 from 7.30pm to 9.00pm.
- SP201453 – Daniela Olphert – Lincoln University
  On Site Licence: Tuesday 26 January 2021 from 5.30pm to 10.30pm
  Wednesday 27 January 2021 from 5.30pm to 12.00am.

New Managers Certificates for December 2020:
- R961675 – Rhiannah Allen – New World Lincoln.
- R961678 – Rebecca Dodson – New World Lincoln.
- R961677 – Zara Mullally – Liquorland Tennyson Street.
- R961687 – Samantha Budd – Mrs O’s Lincoln University.
- R961684 – Christine Tatterson – Mrs O’s Lincoln University.
- R961639 – Courtney Hyde – Robert Harris Café.
- R961681 – Rupert Smith – Porters Alpine Lodge.
- R961679 – John Dunne – Porters Alpine Lodge.
- R961682 – Kuldeep Randhawa – Thirsty Liquor Darfield.
- R961629 – Grant Hatton – Freshchoice Prebbleton.
- R961685 – John van Wijk – Mrs O’s Lincoln University.
- R961676 – Stefan Rottl – Oktoberfest Eatery & Bar.

Renew Managers Certificates for December 2020:
- R961683 – Paul Robinson – Countdown Rolleston.
- R961594 – Hayley Olsen – Liquorland Rolleston Drive.
- R961596 – Sumudu Gedara – Hachi Hachi Rolleston.
- R961595 – Lizette Hart – Flock Hill Lodge.
- R961432 – Sapinder Singh – Super Liquor Leeston.

New On Licence for December 2020:
- R910154 – The Milk Bar Limited
  The Milk Bar – Unit 8, 736 Weedons Ross Road, West Melton.

Renew On Licence for December 2020:

- R910145 – Donut Incorporated Limited
  Little India Rolleston - Shop 3, 63-67 Tennyson Street, Rolleston.
- R910146 – RR18 Limited
  The Kingfisher Restaurant, Bar & Takeaway - Unit 5, 5 Robert Street, Lincoln.
- R910144 – The Bealey Arthurs Pass Limited
  The Bealey Hotel – 12858 West Coast Road, Arthurs Pass.

Renew Off Licence for December 2020:

- R920119 – BR & LK Little Limited
  Four Square West Melton – 1/736 Weedons Ross Road, West Melton.
- R920135 – The Bealey Arthurs Pass Limited
  The Bealey Hotel – 12858 West Coast Road, Arthurs Pass.

Temporary Authority Off Licences for December 2020:

- R920001 – KP999 Enterprises Limited
  Darfield Hotel – 37- 39 South Terrace, Darfield.

Temporary Authority On Licences for December 2020:

- R910031 – KP999 Enterprises Limited
  Darfield Hotel – 37- 39 South Terrace, Darfield.
- R910126 – Kedar Sai Limited
  A Pocket Full of Spices – 55 Faringdon Boulevard, Rolleston.

Licences currently being processed in December 2020:
A total of 20 applications are currently being processed and awaiting issue, which can be broken down into the following categories:

On Licence: 2 New applications

- R910157 – Canterbury Brands Limited (Turkish Grill).
- R910158 – Kedar Sai Limited (A Pocket Full of Spices).

On Licence: 1 Renewal application

- R910117 – Kick For Touch Limited (Silver Dollar Bar & Restaurant).

Club Licence: 2 Renewal applications

- R900046 – Kirwee Bowling Club Incorporated (Kirwee Bowling Club).
- R900030 – Southbridge Bowling Club Incorporated (Southbridge Bowling Club).
-

Managers Certificate: 12 New applications

Managers Certificate: 1 Renewal applications

Special Licence: 2 Applications

There are three of these applications on hold:

Managers:

- R961639 – Courtney Hyde – New M – Needs 6 month's experience.
- R961644 – Will Freeman – New M – On Hold until next ski season.
- R961645 – Bhavik Patel – New M – Needs 6 month's experience.

4. COMMENTS FROM THE DISTRICT LICENSING COMMITTEE

Waivers requested and approved in December:

- Lincoln Bowling Club – Christmas Function
  The applicant didn't receive confirmation for the event booking within the 20 working day period.
- Sarah van Hoof – Christmas Function
  The applicant had never applied for a special licence and was not aware of the 20 working day period.
- Black Door Bar & Eatery – Extension of New Years' Eve hours
  The applicant did not take into account the non-working day period between 20 December to 16 January.

5. INSPECTORS REPORT FOR DECEMBER 2020

A special licence application was received from Lincoln University Students' Association to hold a music festival on Wednesday 24 February 2021 as part of the University's orientation week.

A focus on monitoring of licensed premises prior to Christmas saw the Chief Licensing Inspector undertake 24 licensed premises inspections for the month of December. A high degree of compliance was observed.

Monitoring:

During December 2020 the Chief Licensing Inspector carried out monitoring at Kirwee Bowling Club, Southbridge Bowling Club, Southbridge Superette, Dunsandel Tavern, Silver Dollar Restaurant & Bar, Dunsandel General Store, Straight 8 Estate Winery, Phenix Restaurant, Tai Tapu Hotel, Blackdoor Restaurant & Bar, Kingfisher Restaurant, Famous Grouse Hotel, Springston Hotel, Crate and Barrell, Hororata Village Bar & Café, Coalgate Tavern, Darfield Hotel, West Melton Tavern, Liquorland Rolleston Avenue, The Rock Tavern, Rolly Inn Tavern, Thirsty Liquor Darfield, Sheffield Hotel and Springfield Hotel.

Gail Shaw
SENIOR ADMINISTRATOR
DISTRICT LICENSING COMMITTEE

Malcolm Johnston
CHIEF LICENSING INSPECTOR

Billy Charlton
REGULATORY MANAGER (SECRETARY DISTRICT LICENSING COMMITTEE)

Endorsed For Agenda

Tim Harris
GROUP MANAGER ENVIRONMENTAL AND REGULATORY SERVICES

SDC Licences Report

Licences Aggregate Report for the period 2020-12-01 to 2020-12-31

Licence Type	# Issued	% in time*	Avg Days
Club Licence	0	0%	0
On Licence	4	100%	9
Off Licence	2	100%	8
Special Licence	11	100%	3
Manager's Certificate	18	100%	3

* = 'In time' is 15 days for Special licences and 20 days for other licences

REPORT

TO: Chief Executive Officer

FOR: Council Meeting – 10 March 2021

FROM: Gail Shaw – Senior Administrator District Licensing Committee
Malcolm Johnston – Chief Licensing Inspector
Billy Charlton – Regulatory Manager (Secretary of District Licensing Committee)

DATE: 4 February 2021

SUBJECT: **Joint District Licensing Committee and Chief Licensing Inspector Monthly Report for period 1 January 2021 to 31 January 2021**

RECOMMENDATION

'That the Council receives the report on the activities of the District Licensing Committee and the Chief Licensing Inspector for January 2021.'

1. PURPOSE

The purpose of the report is to inform the Council of activity in the Alcohol Licensing section.

2. SIGNIFICANCE ASSESSMENT/COMPLIANCE STATEMENT

As this report is for information only it is not considered to be significant in the context of Council's Significance Policy.

3. PROPOSAL

Licences issued in January 2021.

Special Licences for January 2021:

- SP210001 – Canterbury Aero Club Inc – Canterbury Aero Club
  On Licence: Tuesday 16 February 2021 from 4.00pm to 8.00pm
  Wednesday 17 February 2021 from 4.00pm to 8.00pm
  Thursday 18 February 2021 from 4.00pm to 8.00pm
  Friday 19 February 2021 from 4.00pm to 8.00pm.
- SP210002 – Leeston Bowling & Tennis Club – Leeston Bowling & Tennis Club
  On Site Licence: Thursday 28 January 2021 from 4.00pm to 8.00pm.

New Managers Certificates for January 2021:

- R961689 – Akshay Gulati – Super Liquor Lincoln.
- R961688 – Naoko Kelly – Hachi Hachi Roleston.

- R961695 – Michelle Wallace – The Bealey Hotel.
- R961693 – Amanda Orpwood – Yello Shack Café.
- R961696 – Blair Wallace – Springfield Hotel.

Renew Managers Certificates for January 2021:
- R961318 – Arieta Jackson – Arthurs Pass Café & Store.
- R961440 – John Renall – Lincoln Golf Club.
- R961602 – Sahil Luther – Southbridge Hotel.
- R961608 – Lesley Edwards – The Store @ Tai Tapu.
- R961607 – Peter Edwards – The Store @ Tai Tapu.
- R961598 – Ryan Jackson – Otahuna Lodge.
- R961299 – Kyle Austin – West Melton Rugby Club.
- R961579 – Maharamba Rizan – Hachi Hachi Rolleston.

Renew Club Licence for January 2021:
- R900046 – Kirwee Bowling Club Incorporated
  Kirwee Bowling Club – 40 High Street, Kirwee.
- R900030 – Southbridge Bowling Club Incorporated
  Southbridge Bowling Club – 12 Cryer Street, Southbridge.

Temporary Authority On Licences for January 2021:
- R910151 – Barrett Pont Enterprises Limited
  Hororata Village Bar & Café – 2 Hobbs Street, Hororata.

Licences currently being processed in January 2021:
A total of 39 applications are currently being processed and awaiting issue, which can be broken down into the following categories:

On Licence: 4 New applications
- R910157 – Canterbury Brands Limited (Turkish Grill).
- R910158 – Kedar Sai Limited (A Pocket Full of Spices).
- R910159 – Smoke Incorp Limited (Smoke).
- R910160 – Barrett Pont Enterprises Limited (Hororata Village Bar & Café).

On Licence: 3 Renewal applications
- R910117 – Kick For Touch Limited (Silver Dollar Bar & Restaurant).
- R910148 – A&J Rolleston Limited (The Phenix Restaurant).
- R910120 – Hickman Hospo Limited (Two Fat Possums).

Off Licence: 1 Renewal application
- R920138 – The Canterbury Hospitality Group Limited (The Pedal Pusher).

Managers Certificate: 15 New applications

Managers Certificate: 1 Renewal applications

Special Licence: 16 Applications

There are three of these applications on hold:

Managers:
- R961643 – Neil Foote – New M – On Hold until next ski season.
- R961644 – Will Freeman – New M – On Hold until next ski season.
- R961645 – Bhavik Patel – New M – Needs 6 month's experience.

4. COMMENTS FROM THE DISTRICT LICENSING COMMITTEE

Waivers requested and approved in January:
- Dhirend Prasad – 65th Birthday Celebration
  Additional information was requested from the applicant. Once received it was outside the 20 working day period.
- Greystone Wines – Selwyn Wine & Beer Festival
  Applicant received late notification for the event from the organiser.
- Leeston Bowling & Tennis Club – Rolleston Primary School Staff Function
  The applicant was not aware of the non-working day period from 20 December to 16 January.

5. INSPECTORS REPORT FOR JANUARY 2021

There were 13 special licence applications received over January 2021 from a variety of wineries and breweries in relation to the upcoming Selwyn Wine & Beer Festival. The Festival is set to take place at Larcomb Vineyard on 20 February 2021.

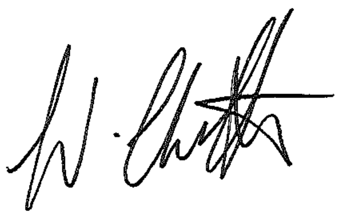
Lincoln University have confirmed their 'O-week' music concert set down for 24 February 2021 is on schedule. Online concert sales have been strong. 1,000 attendees are expected.

The Hororata Village Bar & Café changed ownership on 25 January 2021. The business has been taken over by two local business operators.

Monitoring:
During January 2021 the Chief Licensing Inspector carried out monitoring at Cross Hares Vineyard, Corianders, Pocket Full of Spices and Thai Terrace.

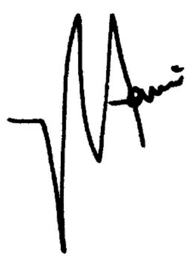
Gail Shaw
SENIOR ADMINISTRATOR
DISTRICT LICENSING COMMITTEE

Malcolm Johnston
CHIEF LICENSING INSPECTOR



Billy Charlton
REGULATORY MANAGER (SECRETARY DISTRICT LICENSING COMMITTEE)

Endorsed For Agenda



Tim Harris
GROUP MANAGER ENVIRONMENTAL AND REGULATORY SERVICES

SDC Licences Report

Licences Aggregate Report for the period 2021-01-01 to 2021-01-31

Licence Type	# Issued	% in time*	Avg Days
Club Licence	2	100%	18
On Licence	1	100%	9
Off Licence	0	0%	0
Special Licence	2	100%	3
Manager's Certificate	19	100%	19

* = 'In time' is 15 days for Special licences and 20 days for other licences

REPORT

TO: Council

FOR: Council Meeting on 10 March 2021

FROM: **C**hief Executive

DATE: 3 March 2021

SUBJECT: **ALTERNATE HEARINGS PANEL MEMBER TO THE BYLAW FOR KEEPING ANIMALS, POULTRY AND BEES**

RECOMMENDATION

'That Council agrees to the appointment of Councillor Jenny Gallagher as an alternate member of the Hearings Panel for the Selwyn District Council Bylaw for Keeping Animals, Poultry and Bees.'

1. PURPOSE

The purpose of this report is to appoint an alternate (back-up) Councillor to the Hearings Panel for Submissions to the Selwyn District Council Bylaw for Keeping Animals, Poultry and Bees to be held on 11 and 12 March 2021.

2. BACKGROUND

At the Council meeting of 9 September 2020, Council passed the following resolution:

'That the Council resolve:

a) To commence the special consultative procedure for the adoption of the Selwyn District Council Bylaw for Keeping Animals, Poultry and Bees.

b) To adopt the Statement of Proposal excluding cats.

c) That the Statement of Proposal be made available for public inspection at all Council Service Centres, Libraries and on the Council's website.

d) That the period within which written submissions on the Bylaw for Keeping Animals, Poultry and Bees may be made be between Monday 5 October 2020 and Friday 6 November 2020.

e) That submissions on the bylaw be heard by a hearing panel comprising of Councillor Lemon, Councillor Mugford and Councillor Miller to be appointed, who shall report to the Council with its recommendations as soon as practicable following the hearing of submissions.'

Due to the current Alert Level status, and the requirement to have an extra member available should any of the currently appointed members (Councillor Mugford, Councillor Miller or Councillor Lemon) become unavailable, it was agreed it was necessary to appoint an alternate Panel Member.

3. PROPOSAL

That Councillors agree to resolve that Councillor Jenny Gallagher be appointed as an alternate member to the Hearings Panel for the Selwyn District Council Bylaw for Keeping Animals, Poultry and Bees.

4. OPTIONS

The options available to Council are to:

a) To approve the recommendation of this report, or

b) To decline the recommendation of this report.

David Ward
CHIEF EXECUTIVE

REPORT

TO: Chief Executive

FOR: Council Meeting – 10 March 2021

FROM: Strategy and Policy Planner, Rachael Carruthers

DATE: 25 February 2021

SUBJECT: **PRIVATE PLAN CHANGE 59 – REZONING OF LAND IN WEST MELTON**

RECOMMENDATION

'That the Council:

a. accepts the recommendation of the independent Commissioner in regards to Plan Change 59 from GW Wilfield Limited to rezone land in West Melton;

b. pursuant to Clause 29(4) of the First Schedule of the Resource Management Act 1991, approves Plan Change 59 subject to the modifications described and for the reasons given in the Commissioner's recommendation dated 25 February 2021;

c. approves the public notification of Council's decision that establishes that the Operative Selwyn District Plan is deemed to have been amended in accordance with the decision in (b) above from the date of the public notice in accordance with Clause 11 of the Resource Management Act;

d. delegates the Team Leader Strategy and Policy to take any steps necessary to give effect to recommendation (b) and (c) above; and

e. delegates the Team Leader Strategy and Policy to take any steps necessary to give effect to make Plan Change 59 operative at the conclusion of the appeal period where no appeals are filed.'

1. PURPOSE

This report seeks a decision from Council that Plan Change 59 be approved in accordance with the Commissioner's recommendation dated 25 February 2021 (**Attachment 1**) and that it be confirmed for inclusion in the Operative Selwyn District Plan.

2. SIGNIFICANCE ASSESSMENT/COMPLIANCE STATEMENT

This report does not trigger the Council's Significance Policy. Considering to accept the Commissioner's recommendation as Council's decision is a procedural requirement of the Resource Management Act 1991 (the Act).

3. HISTORY/BACKGROUND

The request relates to existing residential zoned land on the south side of West Melton known as 'Wilfield'. The request seeks to rezone approximately 73.5 hectares of Living 2 and 2A zoned land to a Living WM South Zone. Its location is indicated on the aerial photograph in Figure 1 below:

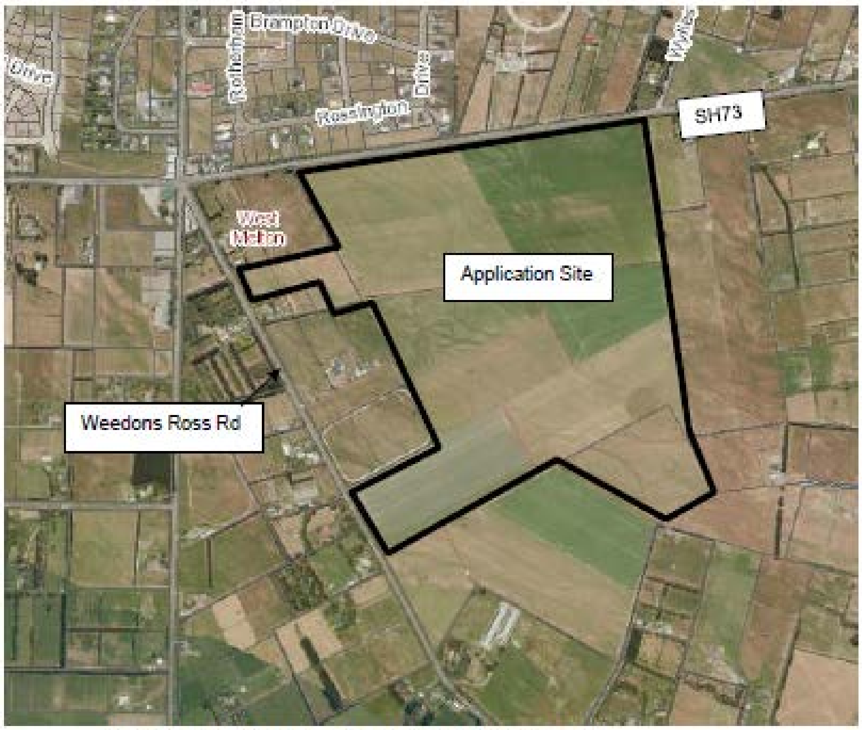


Figure 1: Aerial photograph of site (Source: Canterbury Maps)

Changes sought to the District Plan rules include:

- Rezone the Wilfield area from Living 2 and Living 2A to Living West Melton South, and consequential renaming of the Gainsborough area from Living West Melton to Living West Melton North
- Introduce a new Outline Development Plan for the Wilfield area.
- Require fencing on reserve boundaries to be low and open
- Provide for a range of site coverage requirements that reflect the size of the site
- Provide for smaller lot areas across much of the site (1100m^2 to 3000m^2), while maintaining lot areas of between 3000m^2 and 5000m^2 in identified low density areas
- Remove redundant rules for the existing Living 2A zone
- Remove redundant requirements for a pedestrian/cycle underpass beneath State Highway 73

Since lodging the Plan change application, and following discussions between NZTA, the Council, and the developer, an additional rule has been proposed requiring that:

No completion certificate shall be issued under Section 224 of the Act within the Living WM South Zone (other than for a boundary adjustment or creation of an allotment solely for utility purposes), until such time as the State Highway 73/Weedons Ross Road intersection is signalised

The current Wilfield area has, through a number of resource consent applications, generally developed at a greater density than permitted by the current zoning, resulting in a number of larger balance-lots awaiting future development. The increased density sought in this plan change for the undeveloped areas is generally similar to the density of development that has already occurred.

Plan Change 59 was publicly notified on 5 March 2019. The plan change attracted 20 submissions and 1 further submission. The plan change has been the subject of further requests for information, and discussions with NZTA about traffic light controls for the State Highway 73 and Weedons Ross Road intersection. With that later matter resolved, the Plan Change was ready for hearing, which took place on Tuesday 9 February 2021.

The appropriateness of the proposal is discussed in the Officers report, (which is available for viewing on Council's website) and referenced in the Commissioner's recommendation.

4. PROPOSAL

An independent Planning Commissioner, Mr Ken Lawn, was appointed to consider all the relevant material in respect of the plan change and to make a recommendation to the Council on the plan change and the submissions received.

This recommendation relates to whether the plan change should be approved, approved with modification (in accordance with the scope provided by the plan change) or declined. The final decision on whether or not this recommendation and, as a consequence the plan change, should be adopted is the responsibility of the Council.

For the reasons set out in his recommendation, the Commissioner recommends that Plan Change 59 be approved subject to the modifications set out in his recommendation and that the matters raised in submissions are accepted, accepted in part or rejected.

5. OPTIONS

In accordance with Clause 29(4) of the First Schedule of the Act, Council may decline, approve, or approve with modifications, the plan change.

a. Approve

Through the Resource Management Act processes, the Commissioner has considered that Plan Change 59 is generally appropriate in terms of the s32 tests and meets the purpose and principles set out in Part 2 of the Act in promoting sustainable management. Specifically, the Commissioner considered that the plan change incorporates appropriate methods to ensure any future land uses are appropriate and will result in a number of positive social, economic and environmental outcomes.

However, the Commissioner considered that modifications are necessary in order to achieve good planning practice. This is discussed below.

b. Approve with modifications

The Commissioner's recommendation is that Plan Change 59 be approved, subject to the modifications described in his recommendation. The primary modification is the inclusion of an additional property within the plan change area, so that it is not left as the only property in West Melton zoned Living 2, with the other modifications being primarily grammatical to ensure consistency with the text of the Operative District Plan. The Commissioner considered that, subject to the specified modifications the plan change will implement the policies, and is appropriate in achieving objectives, of the District Plan.

As such, it would be inappropriate for the Council to amend any of the findings contained in the Commissioner's recommendation in the absence of hearing the submissions and considering the substantive material that has been considered.

c. Decline

It is considered that it would be inappropriate for the Council to decline the plan change, as this wold be contrary to the recommendation of the independent Commissioner who has determined, through the statutory processes, that the plan change is appropriate.

Recommended Option:

It is recommended that Council accepts the Commissioner's recommendation and approve Plan Change 59 subject to the modifications set out in the recommendation.

If the Council accepts the Commissioner's recommendation and approves Plan Change 59, then Plan Change 59 will continue along the statutory RMA process, with the decision being publicly advertised and notice being served on all submitters. A 30 day appeal period is provided to lodge an appeal against the decision to the Environment Court. If no appeal is received within this timeframe then Plan Change 59 will be deemed to be operative and the District Plan amended accordingly.

6. VIEWS OF THOSE AFFECTED / CONSULTATION

(a) Views of those affected

These matters are addressed in the recommendation of the Commissioner, with the mandatory public notification, serving of the notice of the request on potentially affected parties and submissions processes required under the RMA having provided appropriate opportunity for interested parties to participate in the private plan change process.

(b) Consultation

The mandatory public notification and submissions processes required under the RMA has provided the wider public an opportunity to participate in the private plan change process

(c) Māori implications

Mahaanui Kurataiao Limited, who provide mana whenua environmental services that are endorsed by local Rūnanga, have reviewed the plan change, and this review formed a component of the notified version of the plan change. The review did not identify any wahi tapu or wahi taonga sites of cultural significance within the plan change area.

(d) Climate Change considerations

Plan Change 59 will assist in responding to climate change by providing for a consolidated urban form, and providing pedestrian and cycle linkages to community infrastructure

7. FUNDING IMPLICATIONS

The funding implications are limited to any appeal proceedings. All costs incurred in notifying the decision are on-charged to the private plan change proponent.

8. PROPOSED DISTRICT PLAN

Council approved the notification of the Proposed District Plan at the meeting on 23 September 2020. The submission period commenced on 5 October 2020 and ran until 4 December 2020.

As the plan change is not yet approved, the area of the plan change request has been zoned a combination of General Residential and Large Lot Residential under the Proposed District Plan. The boundary between the proposed zones is inconsistent with the requested plan change. The plan change proponent has made a submission to have the plan change area rezoned to reflect a zoning pattern more consistent with the plan change.

It is noted that, in the early stages of a district plan change process, the objectives and policies of the Operative District Plan hold greater weight. The Proposed District Plan is afforded greater weight the further though the process it is. It is considered that the private plan change is not inconsistent with the objectives and policies of the Proposed District Plan in that it provides for residential activity, albeit a differing density.

RCarruthers

Rachael Carruthers
STRATEGY AND POLICY PLANNER

Endorsed For Agenda

Tim Harris
GROUP MANAGER ENVIRONMENTAL AND REGULATORY SERVICES

THE RESOURCE MANAGEMENT ACT 1991

SELWYN DISTRICT COUNCIL

SELWYN DISTRICT PLAN

PROPOSED DISTRICT PLAN CHANGE NUMBER 59

BY G W WILFIELD LTD

TO REZONE LIVING 2 AND LIVING 2A TO A NEW ZONE LIVING WEST MELTON SOUTH

RECOMMENDATION BY COMMISSIONER KEN LAWN

APPEARANCES

Applicant
Andrew Metherell, Traffic
Andrew Hall, Engineering
David Compton–Moen, Urban design
Hamish Wheelans, Applicant
Kim Seaton, Planner

Council
Rachael Carruthers, Strategy and Policy Planner

Introduction

1. I have been appointed by the Selwyn District Council as a Commissioner to conduct a hearing and make a recommendation to the Selwyn District Council on proposed Pan Change 59 to the Selwyn District Plan.

2. Plan Change 59 is a privately requested plan change by G W Wilford Ltd to rezone the residential area to the south east of the township (known as Wilfield), from Living 2 and Living 2A to a new zone called Living West Melton South. The Plan change seeks to provide for a greater density of development, allowing approximately an additional 72 residential properties in the area currently zoned for residential purposes (Living 2 and 2A).

3. The requested plan change does not seek changes to the objectives and policies of the Selwyn District Plan, other than to change the zone nomenclature, and to amend explanations.

4. Changes sought to the District Plan rules include

   - Rezone the Wilfield area from Living 2 and Living 2A to Living West Melton South, and consequential renaming of the Gainsborough area from Living West Melton to Living West Melton North
   - Introduce a new Outline Development Plan for the Wilfield area.
   - Require fencing on reserve boundaries to be low and open
   - Provide for a range of site coverage requirements that reflect the size of the site
   - Provide for smaller lot areas across much of the site (1100 to 3000m^2), while maintaining lot areas of between 3000 and 5000m^2 in identified low density areas
   - Remove redundant rules for the existing Living 2A zone
   - Remove redundant requirements for a pedestrian/cycle underpass beneath State Highway 73

5. Since lodging the Plan change application, and following discussions between NZTA, the Council, and the developer, an additional rule has been proposed requiring that;

   No completion certificate shall be issued under Section 224 of the Act within the Living WM South Zone (other than for a boundary adjustment or creation of an allotment solely for utility purposes), until such time as the State Highway 73/Weedons Ross Road intersection is signalised

6. The current Wilfield area has, through a number of resource consent applications, generally developed at a greater density than permitted by the current zoning, resulting in a number of larger balance-lots awaiting future development. The increased density sought in this plan change for the undeveloped areas is generally similar to the density of development that has already occurred.

7. Plan Change 59 was publicly notified on 5 March 2019. The plan change attracted 20 submissions and 1 further submission. I note that two of the submissions received were late. I will deal with that matter later. I also note that one submission (PC59-S01), and the further submission, both from Peter Stafford have been withdrawn. The plan change has been the subject of further requests for information, and discussions with NZTA about traffic light controls for the State Highway 73 and Weedons Ross Road intersection. With that later matter resolved, the Plan Change was ready for hearing, which took place before me on Tuesday 9 February 2021.

Section 42A Report

8. Pursuant to Section 42A of the Resource Management Act Ms Rachael Carruthers produced a report addressing the proposed plan change, which was pre-circulated to all parties.

9. In that report, Ms Carruthers described the West Melton township, and the significant growth that has occurred over the life of the Selwyn District Plan, and she described the background to the proposed plan change.

10. She described the submissions received. She summarised the matters raised as;

    - The extent of the plan change area (she recommended the inclusion of an additional property in the zone as sought by submitter Laurel Linton)
    - Sense of spaciousness and township character (she concluded that the proposed site sizes are consistent with the outcomes sought for West Melton)

- Transport effects (the agreed NZTA intersection upgrade (SH73 and Weedons Ross Roa) answers most of the concerns, with a volunteered rule that prevents the completion of any further residential subdivision until such time as the intersection is upgraded with traffic signals
- Three waters (she relied on advice from Murray England (Selwyn Council's Asset Manager Water) that the plan change area can be appropriately serviced for water, wastewater, and stormwater)
- Reserves and open space (she concluded that the Outline Development Plan shows the indicative location of reserves within the development area, and the quantum actually provided is guided by Council's Reserve Policy
- Reverse sensitivity West Melton Range (she concluded that the plan change area is outside the area where New Zealand Defence Force has provided evidence to the Council of reverse sensitivity effects).

11. Ms Carruthers assessed the proposed plan change against the objectives and policies of the Selwyn District Plan. She concluded that the plan change request is consistent with almost all of the relevant objectives and policies of the Selwyn District Plan. The one issue she identified is that the proposed site sized are too large to achieve a minimum net density of at least 10 lots or household units per hectare (Policy B4.3.8), but that smaller lot sizes would maintain the lower density residential density of the existing West Melton township (Policy B4.3.101). She considered that the more specific West Melton policy should be given more weight than the more general density policy.

12. She assessed the proposed plan change in light of the Canterbury Regional Policy Statement. She concluded that the plan change is able to give effect to the Canterbury Regional Policy Statement at a strategic level.

13. She considered the plan change in the light of Our Space: Greater Christchurch Settlement pattern Update Whakahāngai O Te Hōrapa Nohoanga. She concluded that the proposed plan change does not challenge the intent of Our Space.

14. She considered the Canterbury Land and Water Regional Plan. She concluded that the proposed plan change can be effectively and efficiently serviced in a manner that maintains water quality and quality, as is consistent with the outcomes sought by the Land and Water Regional Plan.

15. She considered that Mahaanui Iwi Management Plan. She concluded that the proposed plan change will not compromise the values set out in the Mahaanui Iwi Management Plan 2013.

16. She considered the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES-CS). While the NES-CS does not strictly apply to plan changes, she concluded that the appropriateness of residential use for the area has been established to an appropriate level.

17. She considered the National Policy Statement on Urban Development (NES-UD). While the site sizes proposed are larger than generally anticipated in Selwyn's residential zones, they are consistent with or larger than other West Melton zones, and contribute to a range of site sizes in West Melton, and across the district. She considered the proposed plan change is consistent with the outcomes sought by the NES-UD.

18. She concluded that the proposed plan change falls within Council's functions (s31RMA), falls within the ambit of the content of a district plan (s74 and s75 RMA), is the best approach (s32 RMA), and achieves the purposes of the Act (Part II RMA).

19. With some minor amendments she concluded that the changes sought to the Selwyn District Plan through this requested plan change should be accepted.

Evidence from the Applicant at the Hearing

The Applicant

20. Mr Andrew Metherell spoke to his pre-circulated traffic evidence. In that evidence he supported the proposal to introduce a new rule (Rule 12.1.3.59) to prevent the completion of further subdivision until SH73/Weedons Ross Road intersection upgrade is completed. He concluded that the additional traffic resulting from the proposed plan change will readily be able to be accommodated on the surrounding arterial road network. He also concluded that the existing Wilfield subdivision roading network and an extension to Ridgeland Way (an internal road within Wilfield) will be able to accommodate the small additional traffic volumes resulting from the plan change.

21. At the hearing, Mr Metherall confirmed the conclusions in his evidence. He advised that the intersection signal upgrade is scheduled for late 2021, including local works on Weedons Ross Road, West Melton Road, and the Kingsdowne Drive roundabout and extension.

22. Mr Andrew Hall spoke to his pre-circulated engineering evidence. In that evidence he concluded that the additional residential sites can be appropriately serviced for sewer, water supply, stormwater, power, telecommunications, street lights and roading. At the hearing he expanded on the solutions available for those services.

23. Mr David Compton-Moen spoke to his pre-circulated landscape and urban design evidence. In that evidence he concluded that the residual adverse effects on landscape character, landscape values, and visual amenity, resulting from the proposal, will be minor at most, with the area retaining a sense of openness albeit with more lots than envisaged in the current zoning. He considered that the plan change area will be viewed as an extension of Wilfield residential development, and not as a stand-alone settlement. At the hearing he repeated those conclusions. He commented that the reserve development will be implemented through the subdivision process, and that there is sufficient space within individual sections to provide some of the functions provided by reserves.

24. Mr Hamish Wheelans, Director and General Manager of the Wilfield development spoke to his pre-circulated evidence. In that evidence he considered that demand for residential land in West Melton is clear by the uptake in sections, with West Melton growing from an original township of 42 houses to a town now in excess of 700 residential properties, and a retail precinct. The Canterbury earthquakes injected a great deal of activity, but demand to live in West Melton has continued. He confirmed that there has been more demand for sections of a smaller size (1100 to 1800 m^2) than of a larger size (3000m^2). He considered that the proposed plan change affords the opportunity to provide approximately 72 new residential sections to cater for demand from within West Melton, the greater Selwyn District, or from those who wish to move to the District.

25. At the hearing he expanded on the demand for more, and smaller sections. He commended the co-operation between NZTA, Selwyn District Council, and the applicant to bring forward the construction time for the SH73/Weedons Ross Road intersection.

26. Ms Kim Seaton spoke to her pre-circulated planning evidence. In that evidence she provided a summary of the provisions of the proposed plan change. She commented on the issues raised by submitters, and in the Section 42A report. Overall, she concluded that Plan Change 59 will better achieve the District Plan's objectives than the existing provisions of

the Plan, thereby ensuring that the overriding purpose of the sustainable management of the natural and physical resources continues to be achieved.

27. At the hearing, Ms Seaton (and Ms Carruthers) worked through some changes to the detailed rules that have been agreed between the applicant and the Council. I will detail those later in this recommendation.

Submissions

28. This Application attracted 20 submissions and one further submission.

29. Two of those submissions were late (Narelle Souness and Kerry Ring of 44 and 65 Silver Peaks Drive, and New Zealand Defence Force). In line with Selwyn District Policy in respect of submissions to any plan change request, Ms Carruthers recommended to me that those two late submissions be accepted. I agree with that recommendation. I formally **accept the two late submissions** of Narelle Soulness and Kerry Ring, and of the New Zealand Defence Force to Plan Change 59.

30. The issues raised in those submissions are summarised in the evidence of Ms Carruthers, and I included a description of those issues earlier in this decision.

31. None of the submitters attended the hearing before me. That does not surprise me. The resolution of the traffic issues at the intersection of SH73 and Weedons Ross Road will have satisfied many of the submitters. With the passage of time concerns about sense of spaciousness and township character will have subsided. The answering of concerns about the provision of services will have also eased concerns. The pre-circulated comprehensive officer's Section 42A Report, and evidence produced by the applicant, will also have eased concerns, or answered issues.

32. However, except for the submission and further submission of Peter Stafford, relating to water supply, none of the other submissions have been withdrawn, and so I will still need to undertake an assessment and reach conclusions on the matters raised in submissions.

Issues raised in Submissions

Extent of Plan Change area

33. Laurel Linton submitted that her property at 690 Weedons Ross Road, Valuation No 2354179100, be included in the area rezoned. Ms Carruthers advised that while the property is outside the plan change request area, it is the only property in the existing Living 2/Living 2A area that is not within the plan change request area. She considered it would be poor planning practice to leave this single property zoned Living 2A. I agree with that, and have concluded that the property at 690 Weedons Ross Road should be included in the Living West Melton South Zone, and that the Outline Development Plan should include this property.

Sense of spaciousness and township character

34. 14 of the submissions referred to a sense of spaciousness and township character. Most raised concerns that the proposed site sizes are too small to retain the existing spacious and semi-rural character of the area. One submission suggested the area of the zone be expanded to allow for more properties, another suggested the 1100m^2 minimum be a minimum average, and one submission requested that properties that are larger than 3000m^2 should be protected by a minimum site size of 3000m^2 adjoining them.

35. Ms Carruthers considered that the site sizes are consistent with the outcomes sought for West Melton, including larger section sizes than in other larger townships, and with larger sites proposed along the rural/urban interface (low density area on the ODP).

36. Mr Compton-Moen, for the applicant considered that with the proposed changes, the area would still retain a sense of openness, and together with proposed fencing controls, will ensure that an open area is maintained.

37. I also note that the proposed section sizes are in the order of the subdivision lot sizes already approved in the Wilfield area through resource consents, leaving large areas as balance undeveloped areas. It is these balance lots that will be able to be developed though this plan change, generally at the same density as the area already developed.

38. I also consider it relevant that none of the submitters attended the hearing. While that cannot be taken as an approval or support for the proposed plan change, it at least represents an acceptance that the development will proceed.

39. I also comment that even the section sizes now proposed have some tension with the Regional Policy Statement (seeking greater density) and the National Policy Statement for Urban Development (intensification of urban areas).

40. My overall conclusion is that the pattern of development, and section sizes will still have a sense of spaciousness, and will be appropriate for the form of development envisaged in the Selwyn District Plan.

Traffic effects

41. 13 of the submissions were concerned about the safe functioning of the State Highway 73/Weedons Ross Road intersection, and many of those submissions sought the upgrading of the intersection with traffic lights. The agreement of NZTA to fund and implement traffic lights at the intersection, and the agreement of the applicant for the plan change to have a condition that there is no further subdivision until the lights are installed, has resolved most of the traffic concerns raised in the submissions.

42. The proposed traffic improvements also include an upgrading of Weedons Ross Road, a roundabout and road extension from Kingsdowne Drive through to West Melton Road, and cul-de-sac closure of the link from West Melton Road to State Highway 73. Those further works are not subject to the proposed rule that no further subdivision takes place until the traffic lights are installed, although I understand that they will also be implemented by NZTA.

43. Three submissions were concerned about additional vehicles on roads within the Wilfield development, raising concerns about additional parking, restricted vision, speeding, and impact on safety for children to play outside. Mr Metherell noted that most properties have two or three car garages, with driveways, and he considered that on street parking would not be widespread. He considered that as the balance of the development took place, the perception of open space and possibly higher speeds will lessen. He considered the additional properties would increase any safety concerns. I agree that the addition properties will not have adverse effects on the traffic use and safety of the Wilfield road network.

Three waters

44. Four submissions, and the one further submission, raised issues related to infrastructure, mainly about water supply and sewer capacity. I heard evidence from Mr Andrew Hall for the applicant, and I had written comments from Mr Murray England for the Council. Both engineers are satisfied that there are viable methods to provide drinking water, to manage stormwater, and to discharge wastewater, for the proposed further development of the Wilfield area. I accept that professional advice.

Reserves and open space

45. Two submissions raised concerns that there will be insufficient greenspace in the Wilfield development. One submission supported the pylon corridor and recreation reserves, and the open style fencing proposed.

46. Ms Carruthers noted that Outline Development Plans show the indicative location of reserves within a development area, but that the quantum actually provided is guided by the Council's Reserve Policy.

47. Mr David Compton-Moen considered the current design is appropriate considering the number and size of residential lots existing and proposed. He noted that each lot is large with residents having access to their own large yard which lessens the need for the provision of public open space.

48. I agree that the provision of reserves and open space is sufficient, and will be determined through the subdivision process.

Reverse sensitivity West Melton Range

49. The New Zealand Defence Force lodged a submission noting the nationally important training facility, which is noise generating. The submission sought District Plan provisions which recognise the rifle range, and provide adequate protection for the Range from the adverse effects of reverse sensitivity.

50. Ms Carruthers advised that the plan change area is outside the area where NZDF has provided any evidence to Council of reverse sensitivity effects that require management through the District Plan. On that basis she considered that the submission was not "on" the plan change, and that it should not be accepted.

51. I accept the advice of Ms Carruthers, and agree that this plan change is not an appropriate vehicle to introduce provisions into the Selwyn District Plan to provide protection against reverse sensitivity effects of the West Melton Range.

Conclusions on Submissions

52. I have set out my recommendations in respect of each of the submissions in Appendix B to this Decision.

Objectives and Policies of the Selwyn District Plan

53. This requested plan change, other than some minor amendments to explanations and nomenclature identified earlier in this decision, does not seek any changes to the objectives and policies of the Selwyn District Plan.

54. Ms Carruthers assessed the proposed plan change against the objectives and policies of the Selwyn District Plan. As I described earlier, she concluded that the plan change request is consistent with almost all of the relevant objectives and policies of the Selwyn District Plan. The one issue she identified is that the proposed site sized are too large to achieve a minimum net density of at least 10 lots or household units per hectare (Policy B4.3.8), but that smaller lot sizes would not maintain the lower density residential density of the existing West Melton township (Policy B4.3.101). She considered that the more specific West Melton policy should be given more weight than the more general density policy.

55. Ms Seaton in her evidence agreed with those conclusions.

56. I agree that overall the plan change is consistent with the relevant objectives and policies of the Selwyn District Plan.

Other Plans

57. I agree that Plan Change 59 is able to give effect to the Canterbury Regional Policy Statement at a strategic level. There are issues with Policy 6.3.7 which seeks a minimum 10 households per hectare yield, but I agree that the proposed development does provide a consolidation of the existing zoned land at West Melton that also maintains the spacious character and amenity of West Melton.

58. I agree that Plan Change 59 does not challenge the intent of Our Place 2018-2048: Greater Christchurch Settlement Pattern Update Whakahāngai O Te Hōrapa Nohoanga. That document recommends changes to the CRPS to accommodate rezoning for additional growth in Rolleston, Rangiora and Kaiapoi to meet shortfalls in housing capacity, but does not recommend any changes relating to West Melton.

59. I agree that the development can be effectively and efficiently serviced in a manner that maintains water quality and quantity and is consistent with the outcomes sought in the Land and Water Regional Plan.

60. I agree that the Plan Change will not compromise the values set out in the Mahaanui Iwi Management Plan 2013.

61. I agree that Plan Change 59 has some tension with the National Policy Statement on Urban Development. The policies of the NPS-UD anticipate, subject to design considerations, that there will be intensification of existing urban areas. Ms Carruthers considered that although the site sizes are larger than generally anticipated in residential zones, they are consistent with the other West Melton zones. No doubt this tension will be considered through Selwyn District Council determining how it implements the NPS-UD, and through the Review of the Selwyn District Plan. I am satisfied that Plan Change 59 can proceed notwithstanding the NPS-UD.

Amendments to the Selwyn District Plan

62. This requested plan change proposes a number of amendments to the rules of the Selwyn District Plan, in order to accommodate the additional allotments sought through this change.

63. I set out a summary of the changes sought in paragraph 4 of this Decision, and I repeat them here;

- Rezone the Wilfield area from Living 2 and Living 2A to Living West Melton South, and consequential renaming of the Gainsborough area from Living West Melton to Living West Melton North
- Introduce a new Outline Development Plan for the Wilfield area.
- Require fencing on reserve boundaries to be low and open
- Provide for a range of site coverage requirements that reflect the size of the site
- Provide for smaller lot areas across much of the site (1100 to 3000m^2), while maintaining lot areas of between 3000 and 5000m^2 in identified low density areas
- Remove redundant rules for the existing Living 2A zone
- Remove redundant requirements for a pedestrian/cycle underpass beneath State Highway 73

64. Since lodging the Plan change application, and following discussions between NZTA, the Council, and the developer, an additional rule has been proposed requiring that;

    12.1.3.59 No completion certificate shall be issued under Section 224 of the Act within the Living WM South Zone (other than for a boundary adjustment or creation of an allotment solely for utility purposes), until such time as the State Highway 73/Weedons Ross Road intersection is signalised.

65. At the hearing Ms Seaton sought changes to the wording related to reserve boundaries so as to clarify the details of the fence as "a single fence, of post and wire construction", rather than an unintended "one post and rail". Ms Carruthers agreed with that change. The revised rule will be as follows;

    4.17.2 Any fencing parallel or generally parallel to and within 5m of any Council reserve in the Living WM South zone, shall be limited to a single fence of post and rail ~~fence~~ construction, with a maximum height of 1.2m and at least 50% open.

66. The full set of recommended amendments to the District Plan, including amendments to the objectives and policies, is set out in Appendix A to this Decision. The Applicant and the Council officers are in agreement with the recommended amendments set out in Appendix A.

Other statutory considerations

67. I agree with the conclusions of Ms Carruthers that in respect of Section 31 of the Resource Management Act, Plan Change 59 incorporates appropriate methods to ensure any future land uses are appropriate and will result in a number of positive social, economic and environmental outcomes.

68. I agree with Ms Carruthers' conclusion, that Plan Change 59 is the best approach when considered against Section 32 of the Resource Management Act.

69. I agree with Ms Carruthers' conclusion that the matters proposed in Plan Change 59 are all matters that fall within the ambit of the content of a district plan, and that the plan change request process has had appropriate regard to all the relevant matters set out in Section 74 and 75 of the Resource Management Act.

70. For the reasons set out by Ms Carruthers, I agree that Plan Change 59 will achieve the purposes set out in Part II of the Resource Management Act.

RECOMMENDATION

71. For the foregoing reasons I **recommend** to the Selwyn District Council as follows

1. That pursuant to clause 10 of Schedule 1 to the Resource Management Act 1991 the Council approve Plan Change 59 to the Selwyn District Plan as set out in Appendix A.

2. That for the reasons set out above the Council accordingly either accept, accept in part, or reject the submissions as listed in Appendix B.

Ken Lawn
Independent Commissioner
25 February 2021

APPENDIX A

Recommended Amendments to the Selwyn District Plan

<table>
<tr><th>Provision</th><th>Proposed amendment</th></tr>
<tr><td rowspan="2">Planning maps</td><td>Rename the Living WM Zone ‘Living WM North’</td></tr>
<tr><td>Rezone all land at West Melton zoned Living 2 or Living 2A to ‘Living WM South’</td></tr>
<tr><td>A4.5 Townships and Zones, Table A4.4 Description of Township
Zones</td><td>Add a new row to the table:
<table>
<tr><th>Zone</th><th>Description</th></tr>
<tr><td>Living WM</td><td>A living zone specific to West Melton township. Provides for a range of residential densities. The Living WM North Zone, located north of State Highway 73, provides for medium and low density residential areas. The Living WM South Zone, located south of State Highway 73, provides for a predominantly lower building density than other parts of West Melton.</td></tr>
</table></td></tr>
<tr><td>B4.1 Growth of Townships, Residential Density</td><td>Amend the Anticipated Environmental Results:
The following results should occur from implementing Section B4.1:
• Living 2 and WM South Zones are low density residential areas
• Integrated development, in the Living WM North zone, achieving high quality urban design whilst also allowing residential growth to occur to meet target household numbers.</td></tr>
<tr><td>Policy B4.3.98</td><td>Amend the Explanation and Reasons:
West Melton has developed with community facilities on both the northern and southern sides of State Highway 73. Residential development has taken place north of the highway centred on Westview Crescent, and to a lower density south of State Highway 73 east of Weedons Ross Road. ~~The primary focus for future growth of the township is to be provided for north of the State Highway. Limited n~~New residential growth will be enabled south of the highway but will be limited in extent and density to minimise effects on the safety and efficiency of the highway. A pedestrian/cycle link has ~~will also be~~ been provided ~~under~~ across the highway to provide an alternative connection between the two areas. This pattern of growth is consistent with maintaining a consolidated form for the future growth of the township, and with Policy B2.1.18 and Town Form Policy B4.3.6.</td></tr>
<tr><td>Policy B4.3.101</td><td>Amend the Policy and the Explanation and Reasons:
Promote new residential areas in West Melton that maintain the lower residential density of the existing village, where practical, whilst providing for the efficient and effective development of the Living WM North zone.
Explanation and Reasons
West Melton village is an area with larger section sizes than those found in most townships in Selwyn District, particularly those close to Christchurch. Policy B4.3.101 recognises the character of the existing village and the support for larger section sizes in the Township survey results for West Melton (November 1998). A wide variety of lot sizes in response to market demand, have been provided for, but recognising the potential for West Melton to provide a lower density alternative living environment near Christchurch. However, the efficient and effective development of the Living WM North zone must be provided for to achieve the anticipated residential growth for this zone.</td></tr>
<tr><td rowspan="2">Rule 4.6
Buildings and Building Density</td><td>Permitted Activities — Buildings and Building Density
4.6.2.1 The erection of any dwellings in the Living WM Zone shall comply with the building densities and locations shown on the Outline Development Plan and associated Layer Plans (Appendix 20 and 20A) for this zone.</td></tr>
<tr><td>Discretionary Activities — Buildings and Building Density</td></tr>
</table>

11

<table>
<tr><td></td><td>4.6.5 Except as provided in Rule 4.6.6, the erection on any allotment of any building (other than an accessory building) which does not comply with Rule 4.6.1, 4.6.2.1 or Rule 4.6.3 shall be a discretionary activity in Living 1 zones and the Living WM North Zone.</td></tr>
<tr><td></td><td>Non-Complying Activities — Buildings and Building Density

4.6.6 The erection on an allotment of any building (other than an accessory building) which does not comply with Rule 4.6.1 shall be a non-complying activity in the Living Z, 1A, 1A2, 1A3, 1A4 and Living 1A6 Deferred zones at Prebbleton and all Living Z, 2, 2A, WM South and Living 3 zones.</td></tr>
<tr><td>Rule 4.7 Buildings and Site Coverage</td><td>Permitted Activities — Buildings and Site Coverage

4.7.1 Except as provided in Rule 4.7.2, the erection of any building which complies with the site coverage allowances set out in Table C4.1 below shall be a permitted activity. Site coverage shall be calculated on the net area of any allotment and shall exclude areas used exclusively for access, reserves or to house utility structures or which are subject to a designation.

Table C4.1 Site coverage allowances
<table>
<tr><th>Zone</th><th></th><th>Coverage</th></tr>
<tr><td rowspan="3">Living WM North</td><td>Including garage</td><td>40%</td></tr>
<tr><td>Excluding garage</td><td>40% minus 36m^2</td></tr>
<tr><td>Emergency Services only</td><td>50%</td></tr>
<tr><td rowspan="3">Living WM South</td><td>Site size <1200m^2</td><td>30%</td></tr>
<tr><td>Site size 1200m^2 – 1800m^2</td><td>25%</td></tr>
<tr><td>Site size >1800m^2</td><td>Lesser of 20% or 500m^2</td></tr>
</table></td></tr>
<tr><td>Rule 4.9 Buildings and Building Position</td><td>4.9.20 Any dwelling within the area shown in Appendix 20 (Living 1B and Living ~~2~~ WM South zones) or Appendix 20A (Living WM North Zone) shall be set back at least 40 metres from State Highway 73.

4.9.21 *Removed, Plan Change 59*

~~4.9.21 Any dwelling in the Living 2A Zone at West Melton shall have:~~

~~4.9.21.1 A setback from any internal boundary of not less than 6 metres.~~

~~4.9.21.2 A setback from any road boundary of not less than 10 metres~~</td></tr>
<tr><td>Rule 4.17 Fences Adjoining Reserves</td><td>Permitted Activities – Fences Adjoining Reserves

4.17.1 All development located within the Living Z zone or the High Street, Southbridge Outline Development Plan area (Appendix 45) that shares a boundary with a reserve or walkway shall be limited to a single fence erected within 5m of any Council reserve that is at least 50% visually transparent where it exceeds 1.2m in height (which shall be applied to the whole fence in its entirety).

4.17.1A Any fencing erected parallel to or generally parallel to and within 5m of any Council reserve in the Living WM South Zone, shall be limited to a single post and rail fence with a maximum height of 1.2m and be at least 50% open.

Restricted Discretionary Activities – Fences Adjoining Reserves

4.1.7.2 Any activity which does not comply with Rule 4.17.1 or Rule 4.17.1A shall be a restricted discretionary activity. Council shall restrict the exercise of its discretion to the following:</td></tr>
<tr><td>Rule 12.1 Subdivision – General</td><td>Size and Shape

12.1.3.7 Any allotment created, including any balance allotment, complies with the relevant allotment size requirements set out in Table C12.1

Table C12.1 – Allotment Sizes
<table>
<tr><th>Township</th><th>Zone</th><th>Average Allotment Size Not Less Than</th></tr>
<tr><td>West Melton</td><td>Living 1</td><td>1,000m^2</td></tr>
</table></td></tr>
</table>

12

Living 1B	2,800m^2
~~Living 2~~	~~5,000m^2~~
~~Living 2A~~	~~Maximum number of allotments is 10, and a minimum allotment size of 1 ha.~~
Living WM North Medium Density	Minimum lot area of 500m^2 and maximum lot area of 3000m^2 (Appendix 20A)
Living WM South Medium Density	Minimum lot area of 1,100m^2 and maximum lot area of 3,000m^2 (Appendix 20)
Living WM North Low Density Living WM South Low Density	Minimum lot area of 3000m^2 and maximum lot area of 5000m^2 (Appendix 20, Appendix 20A)

West Melton

12.1.3.55 Any subdivision of land within the area shown in Appendix 20 (Living 1, Living 1B, ~~Living 2, Living 2A~~ Living WM South or Rural Zones) or Appendix 20A (Living WM North Zone) at West Melton complies with the layout and contents of the Outline Development Plan shown in Appendix 20 and Appendix 20A respectively; and

West Melton

12.1.3.56 Any subdivision of land within the area shown in Appendix 20 and 20A shall:

(a) provide a bund for mitigation of traffic noise along the frontage of State Highway 73 to a height of not less than 2 m and a width of not less than 8.5 m, which shall be landscaped by retention of existing hedges or new planting of sufficient height to visually screen dwellings from the highway;

(b) *Removed, Plan Change 59*

~~if it is within the area shown in Appendix 20, provide a pedestrian/cycle underpass beneath State Highway 73 between the Living 1 and Living 2 Zones, prior to titles being issued for more than 30 dwellings in the Living 2 Zone.~~

(c) if it is within the area shown in Appendix 20A, be subject to an Accidental Discovery Protocol where in the event of any discovery of suspected cultural/archaeological remains (e.g. concentrations of shell, charcoal or charcoal-stained soil, fire-fractured stone, bottles, pieces of glass or ceramics, bones etc) during the undertaking of earthworks and/or the installation of services, the following protocol shall be followed by the consent holder, or his/her representative:

- Cease all earthworks immediately; and
- Contact the local Rūnanga being Te Taumutu Rūnanga; and
- Contact the Regional Archaeologist at the Christchurch office of ~~the New Zealand Historic Places Trust~~ Heritage New Zealand Pouhere Taonga (03 365 2897); and
- Do not commence earthworks until approval in writing has been given by the Regional Archaeologist of the ~~New Zealand Historic Places Trust~~ Heritage New Zealand Pouhere Taonga, as required under the ~~Historic Places Act 1993~~ Heritage New Zealand Pouhere Taonga Act 2014.

West Melton

12.13.57 *Removed, Plan Change 59*

13

	~~12.1.3.57 In the Living 2A Zone at West Melton, the maximum number of allotments is 10.~~
	West Melton 12.1.3.58 No subdivision of land in the Living WM North Zone shall take place until:
	12.1.3.58A No completion certificate shall be issued under section 224 of the Act within the Living WM South Zone (other than for a boundary adjustment or creation of an allotment solely for utility purposes), until such time as the State Highway 73/Weedons Ross Road intersection is signalised.
	Non-Complying Activities — Subdivision – General 12.1.7 Except as provided for in Rules 12.1.5 and Rules 12.1.6, the following activities shall be non-complying activities: 12.1.7.1 Any subdivision subject to Rule 12.1.1 which does not comply with Rule 12.1.3. 12.1.7.10 Any subdivision that does not comply with Rule 12.1.3.59.
Appendix 20 ODP West Melton	Delete the existing Outline Development Plan and replace it with: In relation to the Living 1B land to the north of the plan change area, the ODP included in Attachment 2 to the application: https://www.selwyn.govt.nz/__data/assets/pdf_file/0005/290921/PROPOSED-ODP-11.2.19-Application-for-notification-proposed-ODP.pdf In relation to the plan change area, the ODP text and plans included in the 18 December 2018 response to the request for further information: (https://www.selwyn.govt.nz/__data/assets/pdf_file/0005/290912/Applicant-response-to-the-further-information-request-18-December-2018.pdf)
Appendix 20A ODP West Melton	Amend headings as follows: Outline Development Plan & Layer Plan – Living WM North (West Melton North) Zone Appendix 20A – Living WM North Zone – Outline Development Plan Appendix 20A – Living WM North Zone – Movement Network Plan Appendix 20A – Living WM North Zone – Green Blue Network Plan Appendix 20A – Living WM North Zone – Outline Development Plan Appendix 20A – Living WM North Zone – Movement Network Plan Appendix 20A – Living WM North Zone – Green Blue Network Plan

APPENDIX B

Plan Change 59
Recommended Decisions on Submissions

Submissions to be accepted

Sub No	Submitter	Submission topic(s) to be accepted
PC59-S02	Laurel Linton	Whole submission
PC59-S03	Simon Burge	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S04	Andrew Cowan	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S05	Gregory and Alse Boaz	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S08	Alex Setz	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S09	Melanie Cotter	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S11	Michael Dillon	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S12	Helen Conaghan	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S13	Amy and Hamish Osborne	Reserves and open space
PC59-S14	Courtney Hurring	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S15	Scott Ashby and Hanna Coysh	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S16	David Bennett	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S17	Katie Bryce	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S18	NZTA	Safe functioning of the SH 73/Weedons Ross Road intersection
PC59-S19	Narelle Souness and Kerry Ring	Safe functioning of the SH 73/Weedons Ross Road intersection

Submissions to be rejected

Sub No	Submitter	Submission topic(s) to be rejected
PC59-S01	Peter Stafford	Withdrawn, including further submission
PC59-S03	Simon Burge	Infrastructure generally
PC59-S04	Andrew Cowan	Sense of spaciousness/township character Transport effects within the Wilfield development
PC59-S06	Michael Harvey	Sense of spaciousness/township character

PC59-S07	Lucy Bell	Transport effects within the Wilfield development
PC59-S08	Alex Setz	Sense of spaciousness/township character
PC59-S09	Melanie Cotter	Sense of spaciousness/township character
PC59-S10	Andrew Dyson	Sense of spaciousness/township character Transport effects within the Wilfield development Reserves and open space
PC59-S11	Michael Dillon	Sense of spaciousness/township character
PC59-S12	Helen Conaghan	Sense of spaciousness/township character
PC59-S13	Amy and Hamish Osborne	Sense of spaciousness/township character
PC59-S14	Courtney Hurring	Reserves and open space
PC59-S15	Scott Ashby and Hanna Coysh	Sense of spaciousness/township character
PC59-S16	David Bennett	Sense of spaciousness/township character
PC59-S17	Katie Bryce	Sense of spaciousness/township character
PC59-S19	Narelle Souness and Kerry Ring	Sense of spaciousness/township character Water and sewer
PC59-S20	New Zealand Defence Force	Whole submission

OUTLINE DEVELOPMENT PLAN - WEST MELTON

18 December 2018

Novo Group Limited
Level 1, 279 Montreal Street
PO Box 365, Christchurch 8140
O - 03 365 5570
info@novogroup.co.nz

Selwyn District Council
ROLLESTON

Attention: Rachael Carruthers

BY EMAIL: RACHAEL.CARRUTHERS@SELWYN.GOVT.NZ

Dear Rachael,

PC180059: GW WILFIELD LTD PRIVATE PLAN CHANGE REPLYTO REQUEST FOR FURTHER INFORMATION

1. Thank you for your letter dated 28 November 2018. We reply as follows, using the headings from your letter.

Infrastructure

2. A response to the sewer question re the practicality of upgrades is attached as Attachment 1.

Outline Development Plan and Connectivity

3. An amended Outline Development Plan (ODP) is attached as Attachment 2, as requested. The amendment is in the requested format and includes an indication of connectivity.

4. In regard supporting text, we provide the following:

   OUTLINE DEVELOPMENT PLAN – LIVING WEST MELTON (LIVING WM) SOUTH ZONE

   <u>Introduction</u>

   This Outline Development Plan (ODP) area comprises 73.5 ha and is bound State Highway 73 to the north and Weedons Ross Road to the west.

   The ODP embodies a development framework and utilises design concepts that are in accordance with:

   - The Land Use Recovery Plan (LURP)
   - Canterbury Regional Policy Statement
   - The Greater Christchurch Urban Development Strategy (UDS)

- The Ministry for the Environment's Urban Design Protocol
- 2009 Subdivision Design Guide

A single Overall ODP is accompanied by four more specific plans that reference the Density (Land Use), Movement Network, Green and Blue Networks.

Land Use Plan

The majority of the ODP area will provide for sites with a minimum lot area of 1,100m^2 and a maximum lot area of 3,000m^2. A low density area is located on the eastern periphery of the ODP, with a minimum lot area of 3,000m^2 and a maximum area of 5,000m^2. The low density area will provide a buffer between the higher density residential areas located centrally within the ODP area, and the adjoining rural areas to the east and south.

An interface treatment will be required along the south eastern boundary of the ODP area. The interface treatment will comprise a single row of trees planted on the boundary with the Rural Zone, with centres no further apart then 3m, and maintained at a height of not less than 2m. Suitable species include fast growing species such as Cupressus leylandii 'ferndown' or similar. The interface treatment is intended to achieve a substantial screen without creating adverse shading conditions for future residents.

Movement Network

For the purposes of this ODP, it is anticipated that the built standard for a "Primary Route" will be the equivalent to the District Plan standards for a Local-Major Road, and a "Secondary Route" will be the equivalent to the District Plan standards for a Local-Major or Local-Intermediate Road.

The ODP provides for an integrated transport network incorporating:

- A primary route that follows the existing circular alignment of Silver Peaks Drive, connecting to Kingsdowne Drive. The primary route also provides for an extension to Ridgeland Way;
- A secondary route that is anticipated to loop through the adjoining Rural Zone;
- Shared pedestrian and cycle connections throughout the ODP area, and including existing connections to the north and west of the ODP area, to enhance safe walking and cycling opportunities to other parts of West Melton township.

The remaining internal roading layout must provide for long term interconnectivity once full development is achieved. An integrated network of tertiary roads must facilitate the internal distribution of traffic, and if necessary, provide additional property access.

Green Network

One neighbourhood park is required centrally within the ODP area. Remaining reserves provide open space and facilitate attractive pedestrian connections.

An east-west orientated reserve follows the alignment of an existing high voltage transmission line corridor and will serve the dual purpose of providing open space whilst also ensuring that buildings and other structures on private land are set back safe distances from the transmission lines and supporting structures. The high voltage transmission line corridor reserve will have a minimum width of 12m from any tower foot and 12m from the centre line of the transmission line (e.g. a total width of 24m adjoining the transmission line, with additional width adjoining a tower).

Opportunities to integrate stormwater collection, treatment and disposal into the open space reserves also exist, where appropriate.

The proposed reserve network provides an opportunity to create an ecological corridor. Plant selection in new reserves should include native tree and shrub plantings, such as Olearia adenocarpa, Sophora prostrata, Muehlenbeckia ephedroides, Carex comans, Poa cita and Aciphylla subflabellata.

<u>Blue Network</u>

Water race - An existing water race is located on the western edge of the ODP area, adjoining Weedons Ross Road, and the northern edge of the ODP adjoining State Highway 73. Any subdivision and road design will account for the presence of the water race, ensuing its ongoing function is not compromised.

Stormwater - the underlying soils are relatively free-draining and support the discharge of stormwater to ground. Stormwater will be discharged to ground directly via a system of soakpits and swales. Detailed stormwater solutions will be determined by the developer in collaboration with Council at the subdivision stage and in accordance with Environment Canterbury requirements.

Sewer – All new sites are intended to be serviced by Low Pressure Sewer, with a network of pipes transferring wastewater to the existing Council Pump Station on Silver Peaks Drive. A new wastewater storage facility may be required, to provide emergency storage and to act as a buffer for additional flows entering the system from the ODP area. The storage facility may be located underground, adjacent the Rossington Drive Pump Station and within land owned by Selwyn District Council.

Water – The water reticulation will be an extension of existing reticulation within the ODP area. Upgrades of existing pipes may be required to ensure adequate water supply. The requirement for upgrades will be determined at the subdivision stage.

Building Setbacks

5. No specific building setbacks are proposed other than the State Highway 73 setbacks. The site will otherwise be subject to existing internal and road boundary setbacks specified for the Living West Melton Zone. No additional setbacks are proposed adjoining the high voltage transmission line corridor, as the requirement for a reserve in this location (as stipulated in the ODP) will to a large extent address the setbacks recommended by Transpower. Any additional setbacks or assessment required by NZECP34 can be addressed at the time of building consent (see further comment below).

Road Boundary Fencing

6. The Plan Change area is an existing residential area. There are currently no rules requiring specific road boundary treatments in this area and this will continue to be the case. That is also the case in the nearby West Melton (Living WM) North Zone. The applicant implements private covenants at the time of subdivision, preventing fences from being erected within 3m of the road boundary.

Reserve/Pylon Corridor/Setbacks

7. Transpower generally recommends a building/structure setback of 12m from any tower foot and 12m from the centreline of the transmission line under the National Grid Yard. Those setbacks have effectively been implemented by the requirement for a reserve to be established, with a minimum 24m dimension, along the alignment of the high voltage transmission line. The applicant advises that a reserve width of 32m-35m is actually proposed. Further, internal boundary building setbacks of 2m typically apply to residential properties, additional to the setback created by the reserve.

8. In regard the NZECP, where engineering advice is not sought, setbacks of up to 22.5m may be required from conductors during construction (for voltage lines exceeding 110kV but not exceeding 220 kV). Sufficient space is anticipated to be available in the allotments adjoining the transmission line, to ensure that these setbacks can be achieved, if necessary. In reality however, it is anticipated that engineering advice will be sought prior to undertaking construction near the transmission line corridor, allowing for reduced safe distances.

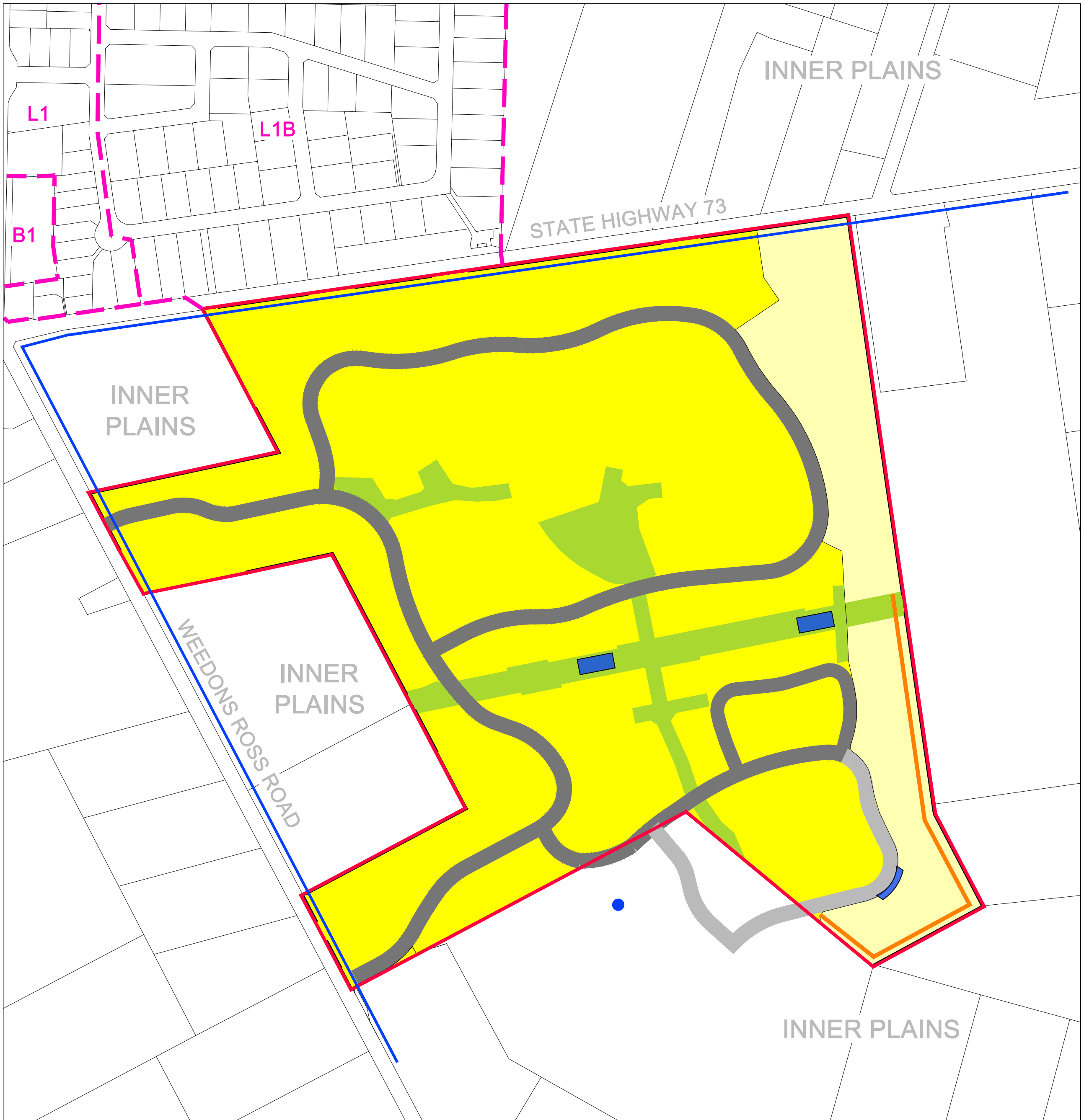
9. Commentary from Acoustic Engineering Services, in regard noise from conductor lines, is attached as Attachment 3.

10. For your reference, we also include commentary from Xteriorscapes in regard the purpose of the proposed reserves, and including in relation to the transmission lines (see Attachment 4)

Consultation

11. Consultation undertaken to date is set out on Page 9 of the Proposed Plan Change. Additionally, please find attached in Attachment 5, the response of Mahaanui Kurataiao Limited in respect of consultation with runanga. That response notes no objections to the proposal and includes three recommendations, being the implementation of an accidental discovery protocol, and the use of locally sourced indigenous vegetation in landscape and stormwater soakpit/swale design. The requirement for adherence to accidental discovery protocol is already routinely included in subdivision consents in this area and that is anticipated to continue to be the case. The applicant also routinely utilises indigenous plantings within its landscaping areas and where possible within stormwater designs. The proposed ODP text noted above includes specific reference to native tree and shrubs recommended within new reserves. No further amendments to the Plan Change proposal are considered necessary in response to this consultation.

Attachment 2: Amended Outline Development Plan



Legend

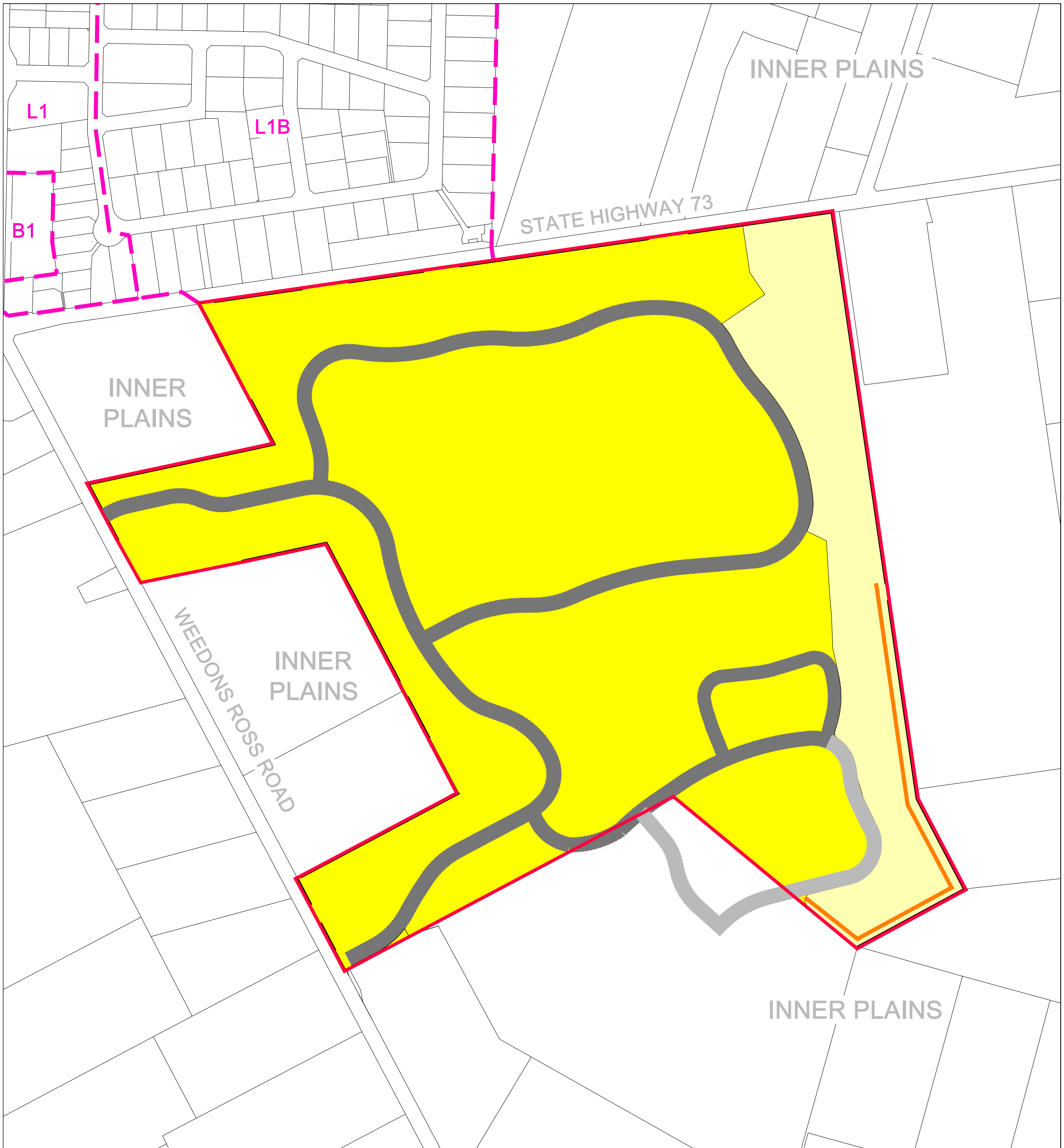
- ODP boundary
- Parcel
- Indicative location for water bore
- Primary Route
- Secondary Route
- Existing water race
- Low Density
- Medium Density
- Soakage Areas
- Neighbourhood Park
- Interface Treatment

Note:
All sections adjacent to Inner Plains zoned land will have a notice on their LIM referring to any potential reverse sensitivity issues between Residential and Rural landuses.
Interface treatment includes having larger residential sections as perimeter blocks where sections immediately adjoin a boundary with Inner Plains.

Outline Development Plan
OVERALL Plan

Living West Melton
(Living WM) South Zone

Scale: 1:7500@A4



Legend

ODP boundary	Primary Route	Low Density	Interface Treatment
Parcel	Secondary Route	Medium Density	

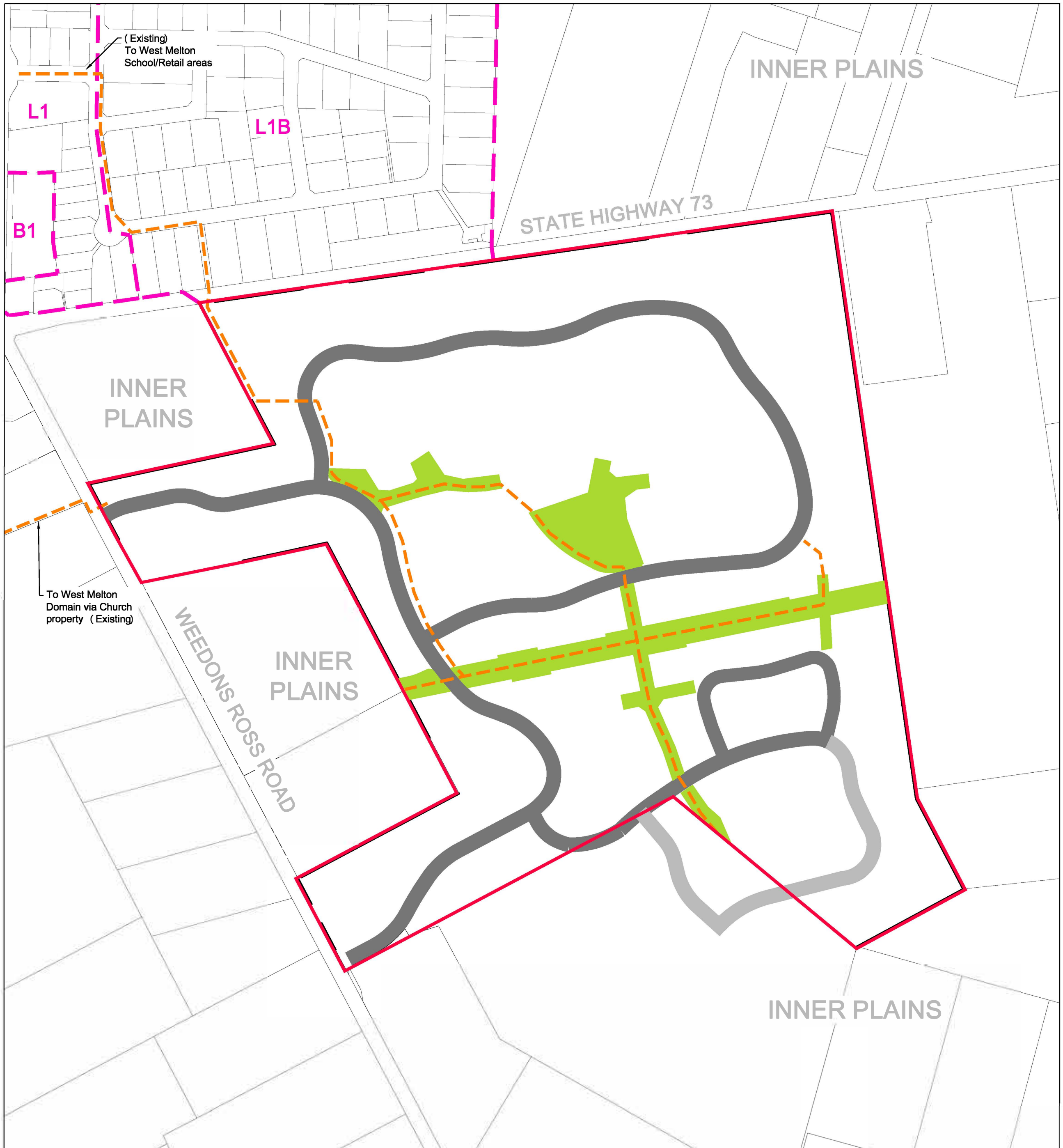
Note:

All sections adjacent to Inner Plains zoned land will have a notice on their LIM referring to any potential reverse sensitivity issues between Residential and Rural landuses.
Interface treatment includes having larger residential sections as perimeter blocks where sections immediately adjoin a boundary with Inner Plains.

Outline Development Plan
LANDUSE Plan

Living West Melton
(Living WM) South Zone

Scale: 1:7500@A4



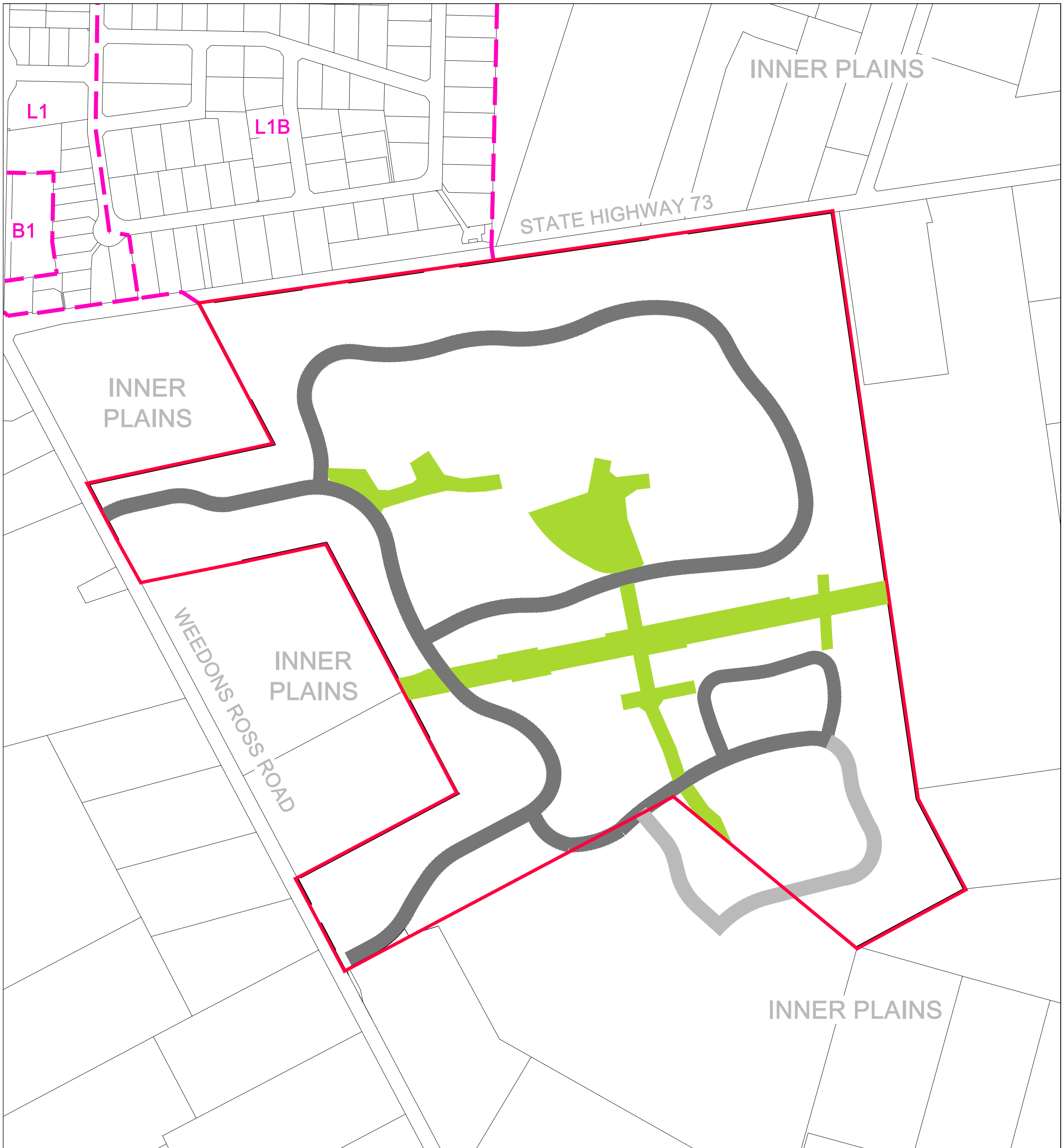
Legend

- ODP boundary
- Parcel
- Primary Route
- Secondary Route
- Neighbourhood Park
- Shared pedestrian/cycle lane

Outline Development Plan
TRANSPORT Plan

Living West Melton
(Living WM) South Zone

Scale: 1:7500@A4



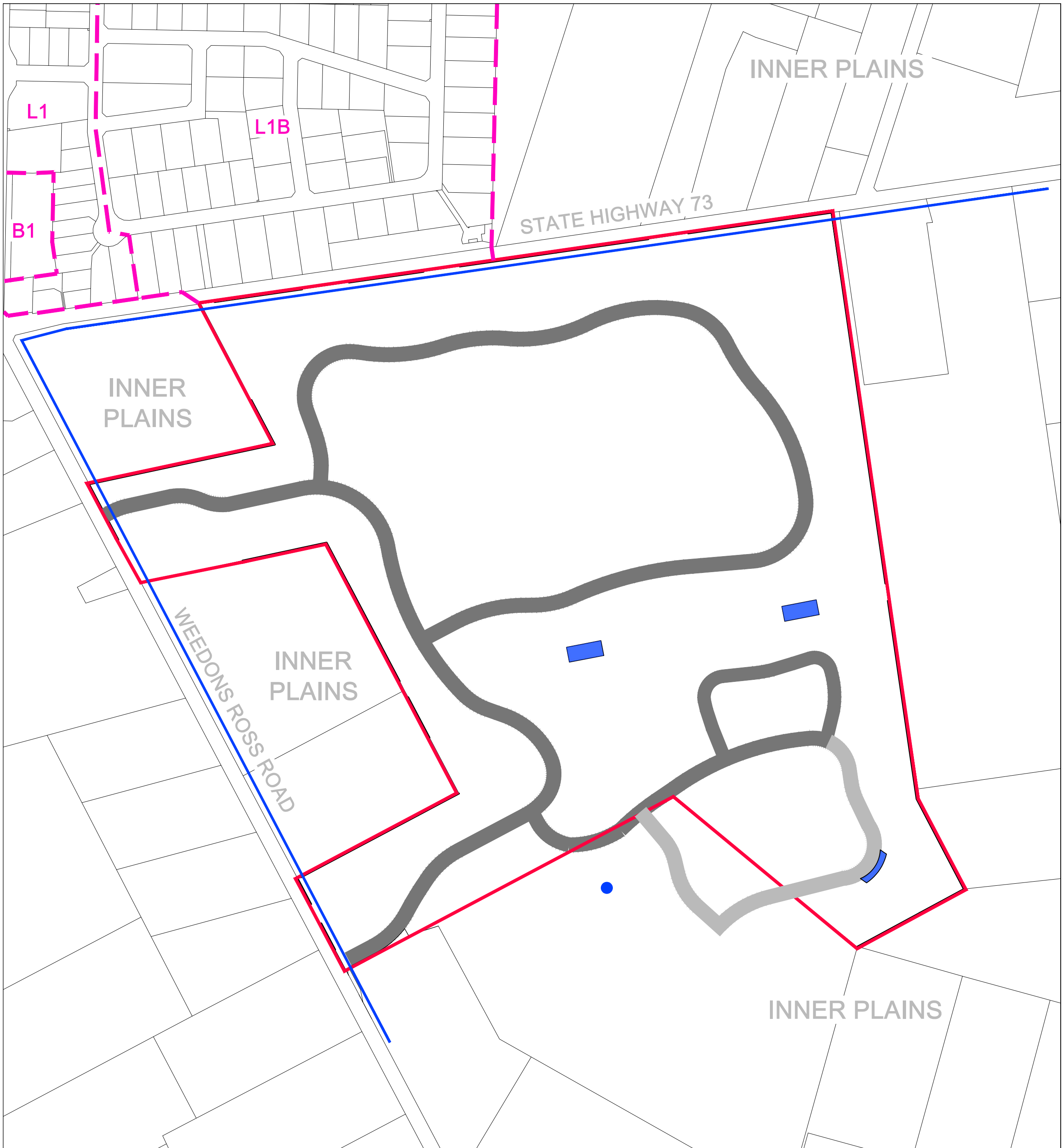
Legend

- ODP boundary
- Parcel
- Primary Route
- Secondary Route
- Neighbourhood Park

Outline Development Plan
GREEN NETWORK Plan

Living West Melton
(Living WM) South Zone

Scale: 1:7500@A4



Legend

ODP boundary
Primary Route
Indicative location for water bore
Soakage Areas
Parcel
Secondary Route
Existing water race

Outline Development Plan
BLUE NETWORK Plan

Living West Melton
(Living WM) South Zone

Scale: 1:7500@A4

REPORT

TO: Chief Executive

FOR: Council Meeting – 10 March 2021

FROM: Strategy and Policy Planner, Jocelyn Lewes

DATE: 26 February 2021

SUBJECT: **PLAN CHANGE 73 ROLLESTON – DECISION ON HOW TO CONSIDER THE PRIVATE PLAN CHANGE REQUEST FROM ROLLESTON WEST RESIDENTIAL LTD**

RECOMMENDATION

'That, in respect to Plan Change 73 to the Operative Selwyn District Plan lodged by Rolleston West Residential Ltd, Council resolves to accept the request for notification pursuant to Clause 25(2)(b) of the Resource Management Act 1991.'

1. PURPOSE

This report assesses the Rolleston West Residential Ltd (the proponent) plan change request (PC 73) against the relevant Resource Management Act 1991 (RMA) provisions.

This assessment has been provided to assist Council to make a decision on how to proceed with the request. This is a mandatory decision that must occur within 30 working days of receiving the request and any subsequent additional information necessary to enable a reasonable understanding of what is being proposed.

2. SIGNIFICANCE ASSESSMENT/COMPLIANCE STATEMENT

This report is a procedural requirement of the RMA and does not trigger the Council's Significance and Engagement Policy, pursuant to Section 5 of the policy.

3. HISTORY/BACKGROUND

The PC 73 request was formally received by Council on 18 November 2020.

The request relates to two parcels of land on the western side of Rolleston, as shown in the aerial photograph below. These were formally plantation forestry blocks owned by the Selwyn Plantation Board and are commonly referred to as the 'Holmes Block' and the 'Skellerup Block'. Collectively, they are referred to as 'the site' in the balance of this report and comprise approximately 160 hectares.

The site has frontage and access to/from Dunns Crossing Road to the east. Dunns Crossing Road is an arterial road extending from Selwyn Road to the south to Main South Road (State Highway 1) to the north. The Holmes Block also has access to Burnham School Road, a local road which connects to Dunns Crossing Road.

To the east of the site is the existing Rolleston township, including recently constructed and progressively developing residential subdivisions. On the western side of Dunns Crossing Road, between the two areas that comprises the site, are West Rolleston Primary School, a child care centre, a small number of residential properties that are zoned Living 2, and an intensive farming activity (poultry sheds), situated to the north of the Skellerup Block.

The balance of land to the south and west of the site is zoned Rural (Outer Plains), and there are number of parcels used for rural activities. Much of the land immediately to the south and south-west of the Holmes Block is designated by the Council for uses associated with the activities of the Pines Resource Recovery Park (RRP) and the Pines Waste Water Treatment Plant (WWTP). These facilities are recognised as strategic infrastructure to the Council. The Canterbury Regional Policy Statement (CRPS) also identifies that the WWTP is strategic infrastructure/regionally significant infrastructure.

The site itself features land used for cropping and pastoral grazing. There are no notable clusters of buildings on the site, however two centre pivot irrigators are installed on both blocks.

The site was rezoned in 2012 from Rural (Outer Plains) to Living 3 by way of Plan Changes 8 and 9. The provisions of the operative District Plan permit the establishment of rural residential lots ranging in size from 0.4 – 4.0 hectares, with no more than 97 lots being created on the Holmes Block and no more than 51 lots being created on the Skellerup Block. A range of other provisions are included in the operative District Plan that seek to manage the development of the site to ensure as much rural character is maintained as possible, including outline development plans and specific controls on fencing style, landscaping, roading and the keeping of animals.

The PC 73 request seeks to rezone the site from Living 3 to Living Z, with small areas of Business 1 zoning on each block. The Living Z zone provides for a variety of lot sizes, including Low Density (average lot size of 650m^2 and a minimum individual lot size of 550m^2), Medium Density (Small-lot) with a maximum average lot size of 500m^2 and a minimum lot size of 400m^2, and Medium Density (Comprehensive) with a maximum average lot size of 350m^2, with no minimum lot size.

PC 73 would largely adopt the provisions in the operative District Plan applicable to the Living Z and Business 1 Zones, while also incorporating an Outline Development Plan (ODP) for each block. The ODPs graphically indicate the areas of the Living Z and Business 1 zoning, the areas requiring planting/bunding/fencing or subject to setback restrictions to address potential reverse sensitivity effects; the main road connections and other shared links; and proposed reserve areas. These plans are accompanied by text that further elaborates on the desired land uses, access and transport connections and open space, recreation, and community facilities.

The zoning proposed by the request is designed to achieve an overall minimum net density of 12 households per hectare, noting that the Living Z zoning provides for the provision of higher density (15hh/Ha) residential areas adjacent to key open spaces and green corridors. Based on these densities and the developable areas within the site, the proposed plan change is envisaged to provide for the establishment of up to 2,100 new households (1150 on the Holmes Block and 950 on the Skellerup Block).

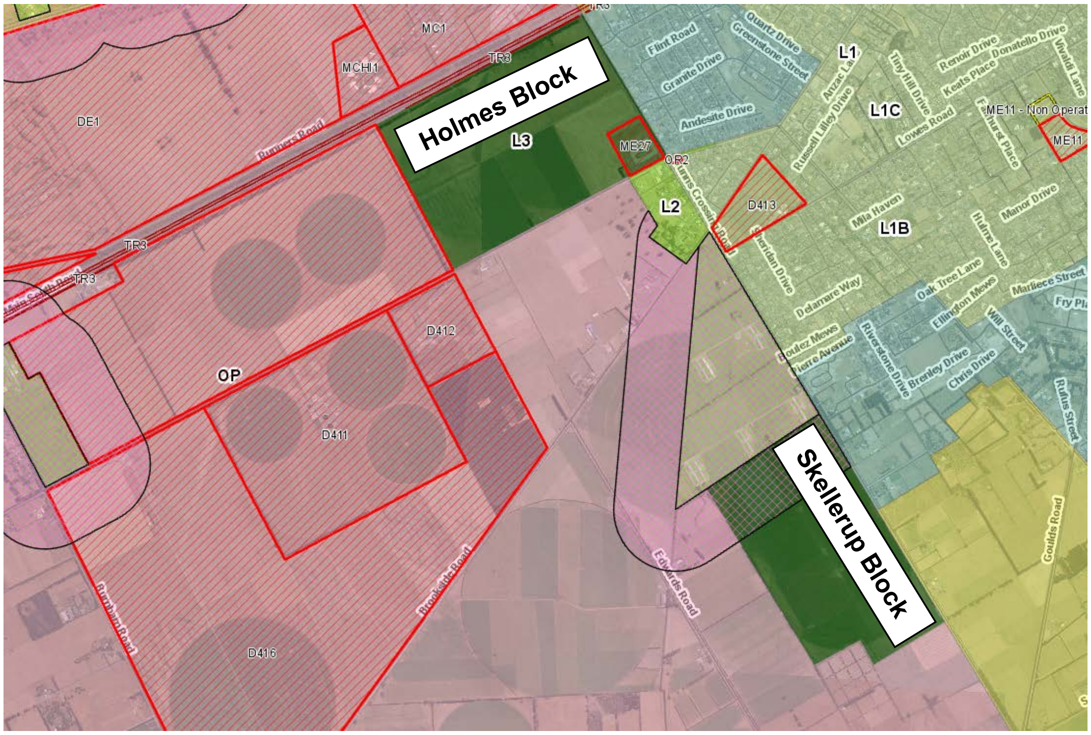


Figure 1 Aerial photograph indicating location of site (areas in green), current zoning and existing designations (Source: Selwyn District Council Maps)

The site is not currently identified within the Canterbury Regional Policy Statement (CRPS) as a priority greenfield area, nor within an area identified as a Future Development Area in Proposed Change 1 to Chapter 6 of the CRPS. The site is also not identified within the Rolleston Projected Infrastructure Boundary.

However, the National Policy Statement on Urban Development (NPS-UD), which came into force on 20 August 2020, provides a policy framework to allow developments providing 'significant capacity' to be accepted even when that development conflicts with the existing CRPS direction. It is on the basis of the direction of the NPS-UD that the proponents have applied for the rezoning. The direction of the NPS-UD is discussed further below in Section 5.

Since lodgement, PC 73 has been reviewed in terms of the adequacy of the information provided. A Request for Further Information (RFI) was issued on 22 December 2020, with the applicant's response received on 4 February 2021. The PC 73 request, along with the response to the RFI, has been peer reviewed by the relevant internal Council staff, including asset managers for water services, solid waste, transportation and open space and strategy and external consultants to check the adequacy of information provided. The outcome of this initial review has resulted in minor amendments to the request.

Attachment 1 contains the proposed ODP for PC 73. Access to the full request has been forwarded to Councillors and made available to members of the public on Council's website.

4. PROPOSAL

Any person may request a change to a District Plan and Council must consider that request. Under Clause 25 of the First Schedule to the RMA, Council must either reject, accept or adopt the request, or process it as a resource consent. An assessment of each of these options is considered in the following section of this report.

5. OPTIONS

Option 1 – Reject the request

Under Clause 25(4), the grounds for rejecting PC 73 outright are that:

a. That the request is frivolous or vexatious;

b. The substance of the request has been considered by the Council or the Environment Court in the last two years;

c. The request does not accord with sound resource management practice;

d. The request would make the District Plan inconsistent with Part 5 of the RMA; or

e. The District Plan has been operative for less than two years.

Section 18 of the Greater Christchurch Regeneration Act 2016 (the GCRA) provides an additional ground for rejecting a request for a plan change. Council may reject the request in whole or in part on the ground that, within the last two years, the substance of the request or part of the request has been considered and given effect to, or rejected, under the Canterbury Earthquake Recovery Act 2011.

In terms of (b) and (e) and s18 of the CGRA, the substance of the request has not been considered by the Council or the Environment Court in the last two years and the District Plan was made fully operative in May 2016, meaning that it has been operative for more than two years.

In terms of (c) and (d), the proposal is considered to be generally consistent with Part 5 of the RMA, which relates to standards, policy statements and plans. However, s75(3)(c) requires the district plan to give effect to any regional policy statement. On initial assessment, PC 73 would generally give effect to the intent of the CRPS yet, as acknowledged in the request, it would be inconsistent with the direction in the CRPS to provide for new urban development only in identified greenfield priority areas, as the site is not included in Map A of Chapter 6 of the CRPS.

Generally, a change that would be contrary to the CRPS would not be considered to accord with sound resource management practice as it would result in the District Plan being inconsistent with one of the provisions in Part 5 of the RMA. However, with the introduction of the NPS-UD, this consideration is not so straightforward, as Policy 8 of the NPS-UD provides for consideration of 'unanticipated' or 'out-of-sequence' development, where a plan change would add significantly to development capacity; if that development capacity would also contribute to a well-functioning urban environment. This is considered to provide an avenue for plan change requests to be considered for processing even where there is a conflict with the CRPS.

While not specific to this plan change request, the Council has received legal advice on the conflict between the NPS-UD, the existing CRPS and the provisions for rejection of a plan change request under clause 25(4). The advice outlined that Council need not rely on the CRPS to reject a plan change under Clause 25 simply because the site of the plan change is outside of the 'greenfield' development areas identified on Map A of the CRPS.

In terms of (c) alone, it is considered that there is a very high legal threshold to be met for a decision to be made to reject a plan change on the basis that it does not accord with sound resource management practice. Provided with the request is substantial documentation that, in the view of the proponent, supports an assertion that the request does accord with sound resource management practice. It is appropriate therefore that the substantive nature of this material be tested through the appropriate process.

For the reasons set out in Option 3 below, it is considered at this time that the plan change request is not inconsistent with the NPS-UD in terms of providing for significant development capacity, and the RMA process would test the extent to which it would contribute to a well-functioning urban environment.

The plan change request is not considered to be frivolous or vexatious, and so it is considered that there are no sound reasons to reject PC 73 under the current set of circumstances.

Option 2: Adopt the Plan Change request

Under Clause 25(2)(a), Council may adopt the request, in whole or in part, as its own. Adopting the request means that the Council effectively takes over the plan change request so that it becomes a council-initiated plan change rather than a private plan change.

Council should only consider adoption if the change has a strategic benefit, a substantial community benefit, a cost element which might require negotiations to occur between the council and the applicant or involves a complex issue or a number of landowners that would benefit from Council coordinating the plan change process.

PC 73 will have some economic benefit to the wider community, through providing construction and employment opportunities and flow-on benefits of additional development occurring within the district.

The plan change may involve a cost to Council where services (roading, water, sewer and stormwater) are vested in Council. This is likely to occur, in line with similar plan changes, and Council would be responsible for the operation and ongoing maintenance of the systems. Overall, the cost to Council from any infrastructure vested would be minimal and in line with similar private plan change proposals.

It is considered that, in respect of the Holmes Block, rather than a strategic benefit, the request may constrain the on-going and future development of Council's strategic infrastructure, and this aspect makes the request more complex than that of other private plan changes previously or currently presented to Council.

The proposed change of zoning of the Holmes Block provides for the significant intensification of residential activity in close proximity to the Pines WWTP and the Pines RRP, both of which are identified as significant infrastructure for the Council. While these both operate under existing consents, Council's long-term planning is to expand these facilities, to support the population growth in the district. In peer reviewing the request, Council's Asset staff have expressed concern regarding the potential reverse sensitivity effects arising from more intensive residential development in proximity to these Council facilities, and the implications that this may have on the continued operation, and the further development, of this infrastructure.

As discussed above, the substantive merits of the request have not been considered at this time, merely the adequacy of the information provided to enable continued processing. As such, limited consideration has been given to the question of whether Council supports the plan change request or not, however adopting the plan change request, in whole or in part, as currently presented or modified, would imply that Council generally supports the request.

The advantage of adopting the plan change as its own would mean that Council would have more control of the process, and it would be able to modify the request to address the concerns raised by Assets in regard to impact of the plan change on the strategic infrastructure. Any modifications would not require the consent of the proponent. Such modifications could include reducing the area proposed to be rezoned to Living Z or incorporating provisions to manage the interface between the various activities.

However it is considered that there are a number of significant disadvantages of adopting the plan change. The first is that Council would have to fund the remainder of the process, relinquishing the ability to recover costs from the applicant. Therefore, if modifications were proposed to the plan change request, these would have to be funded by Council, along with the cost of any technical evidence to support these modifications, as well as all on-going processing costs, and any costs associated with an appeal against the decision.

The second disadvantage is that, pursuant to Clause 25(2)(a)(iii), the request would have legal effect from the date of *notification*, rather than the date of *decision*. Assuming modifications are only proposed to address the perceived reverse sensitivity concerns, and that that balance of the request remained unchanged, the effect of adopting the request would mean that, from the date of notification, the provisions of the Living Z zone would have effect. Should a resource consent for development be received by Council, it would have to be considered against the provisions of the proposed zone, without the broader consideration of the merits of this zone in this location, or the opportunity for community involvement. This is equally relevant for the Skellerup Block as it is for the Holmes Block.

Finally, as mentioned above, if the Council adopted the Plan Change it would create a perception that the Council generally supported and was making its own a proposal that was outside of the Council's infrastructure boundary and was in a locality that was in conflict with its own vital strategic infrastructure (the Pines facilities). For these reasons it is not recommended that the Council adopt the request as it is considered that there are many merit-based matters that it is appropriate to consider at the substantive hearing stage, with the potential that other matters may be raised by interested parties through the submissions process.

Option 3: Accept the Plan Change

Accepting PC 73, under Clause 25(2)(b), would enable the plan change request to be publicly notified and for the request to be subject to the substantive assessment and public participatory processes provided under the RMA. This, in turn, would provide Council with a more informed understanding of the community's view on this specific request.

Accepting the plan change would mean that the costs associated with the continued processing of the request would be the responsibility of the proponent and no direct costs would be incurred by the Council or rate payers, although the preparation of any Council submission could not be on-charged.

As mentioned, in Option 1 above, PC 73 is located outside of the 'greenfield' development areas identified on Map A of the CRPS, but the NPS-UD provides for consideration of 'unanticipated' or 'out-of-sequence' development, where a plan change would add significantly to development capacity; if that development capacity would also contribute to a well-functioning urban environment.

The NPS-UD directs that the CRPS include criteria for determining what plan changes will be considered as adding significantly to development capacity. However, the CRPS does not yet contain such criteria. Criteria is being developed by the Greater Christchurch Partnership local authorities, but this is currently in the very early stages. In the absence of this criteria, plan change proponents can apply and rely on the NPS-UD policy direction to have plan changes accepted, even where they do not comply with Chapter 6 of the CRPS.

In the absence of any criteria, the plan change request states that it provides significant development capacity in that it will enable development of up to 2,100 additional households. This is the equivalent of 27% of the current housing stock in Rolleston, and 8% of the existing dwellings in the district. In 2030, the proposed capacity enabled would represent around 21% of projected dwelling in Rolleston and 7% of the dwellings within the district[1].

Taking the above into account, it is agreed that that request would provide a significant increase in development capacity.

The NPS-UD direction does not mean that every development providing capacity is appropriate. A plan change proponent must also demonstrate that the plan change would contribute to a well-functioning urban environment; and while the Council must have "particular regard" to the development capacity provided, the Council may still determine that the proposal is not the most appropriate course of action, and any plan change still needs to be considered on its merits overall. This includes that PC 73 must still meet RMA section 32 and Part 2 tests and be subject to a substantive assessment of these through the Schedule 1 process

It is considered that the merits of the plan change proposal overall, including the weight and consideration that should be given to the development capacity provided by the proposal, are best tested through the submission and hearing process.

[1] RFI Response p.2-3

It is noted that Council retains the right to lodge submissions or further submissions to ensure there is sufficient scope to support amendments that may address any concerns with PC 73.

Accepting the plan change request is the recommended option under the current set of circumstances.

Option 4: Convert to a Resource Consent Application

The final option open to the Council is to process PC 73 as a resource consent.

The request seeks to enable the type of residential development facilitated by a Living Z zoning and a small area of business development under a Business 1 zoning, across a large landholding. It also seeks to amend existing provisions within the operative District Plan and to insert new provisions to guide the future development of the site, rather than a specific development proposal. It is considered that these are matters best addressed through a comprehensive plan change process rather than reliance on resource consent applications which may not provide the outcomes anticipated by the District Plan.

Processing the request as a resource consent is not therefore considered appropriate.

Recommended Option:

Option 3, to accept PC 73 for further consideration, is recommended.

There are not considered to be sufficient grounds to reject the plan change request when assessed against the statutory powers available to Council under the RMA. And while Council could adopt the plan change as its own, for the reasons set out above, this is not recommended.

The consideration of the request at this stage has been limited to a coarse scale assessment of the contents of PC 73 to ensure that the content and implications of the proposal can be generally understood and that the request is not in direct conflict with other planning processes and statutory instruments.

The RMA process will enable the request to be publicly notified, submissions and further submissions received and for the substantive merits of the proposal to be considered at a public hearing.

Accepting the private plan change request for notification does not signal that Council supports the proposal. The opportunity remains for Council to recommend that the request be supported, amended or opposed at a later stage. The benefit in accepting the request is that public input can be received to inform the overall assessment of the merits of the proposal.

6. VIEWS OF THOSE AFFECTED / CONSULTATION

(a) Views of those affected

If the recommendation to accept the request for notification is adopted, then the content of PC 73 will be subject to the statutory consultative provisions of the RMA where the opportunity for public involvement is mandatory. Council will be required to publicly notify PC 73 and serve notice on all directly affected parties and organisations who then can participate in the process.

(b) Consultation

The proponents did not consult with Selwyn District Council while preparing PC 73. As addressed above, the request has been peer reviewed by the relevant internal Council staff to consider the adequacy of information provided and amendments have been made

As outlined above, the plan change request has been …

The recommendation to accept PC 73 will advance the request to the point where members of the public and interested parties can participate in the process through submissions, further submissions, and the hearing.

(c) Māori implications

Mahaanui Kurataiao Limited who represent Tangata Whenua interests have reviewed the request and provided preliminary comments following engagement by the proponents. This assessment was provided as part of the response to the request for further information, and a number of their recommendations have been incorporated in the plan change request and/or would be imposed at the time of subdivision consent under the existing matters of control within the District Plan. This includes the management of waterways within the plan change area, appropriate stormwater management, landscaping provision that includes indigenous planting, and the adoption of an Accidental Discovery Protocol and sediment control measures at the time of site development

In addition, the submission process allows for a submission to be made by runanga.

(d) Climate Change considerations

The request includes an assessment of the resilience of the proposal to the effects of climate change. The adequacy of this assessment will be tested through the submission and hearings processes.

7. FUNDING IMPLICATIONS

If PC 73 is accepted for processing then the applicant is responsible for the costs associated with processing a private plan change request, with Council costs being recoverable. Council would be responsible for the cost of defending its decision should it be appealed to the Environment Court.

8. INPUT FROM OTHER DEPARTMENTS

As discussed above, the contents of the request, including relevant technical reports, were circulated to Council's Asset Managers for review. Queries received from the Asset Managers were included in the RFI and the response received has been provided back to the relevant staff for their consideration.

Jocelyn Lewes
STRATEGY AND POLICY PLANNER

Robert Love
TEAM LEADER STRATEGY AND POLICY

Endorsed For Agenda

Tim Harris
GROUP MANAGER ENVIRONMENTAL AND REGULATORY SERVICES

Attachment 1 – Outline Development Plans for PC 73

OUTLINE DEVELOPMENT PLAN 39 - HOLMES BLOCK

LEGEND

- Outline Development Plan Area
- Living Z Zone
- Business 1 Zone
- Indicative Road
- Indicative Cycle/Pedestrian Route
- Reserve Location (size to be determined at time of subdivision)
- Setback
- Boundary Treatment
- Noise Control Boundary

OUTLINE DEVELOPMENT PLAN 39 (HOLMES BLOCK)

This area comprises approximately 87.5 hectares and is situated on the southwest corner of Main South Road (State Highway 1) and Dunns Crossing Road.

Land Use

The development area shall achieve a minimum net density of 12 household per hectare, averaged over the area. The zoning framework supports a variety of site sizes to achieve this minimum density requirement. Should this area be developed in stages, confirmation at the time of subdivision of each stage, and an assessment as to how the minimum net density of 12 household per hectare for the overall area can be achieved, will be required.

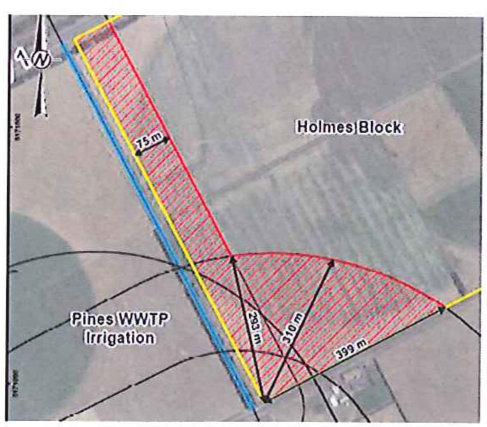
Medium density areas within the development area are able to be supported by adjacent amenities that include key open spaces and green corridors, a small commercial centre and the West Rolleston Primary School.

The small local commercial centre is proposed adjacent to the intersection of Dunns Crossing Road, the proposed Primary Road and West Rolleston Primary School to provide good accessibility and to meet some of the convenience needs of residents in the immediate area.

No more than 1150 sites shall be provided across the whole of the development area. However, no more than 97 occupied dwellings shall be established across the area prior to the completion of the upgrade to the SH1 / Dunns Crossing Road intersection and signals upgrade to the Burnham School Road / Dunns Crossing Road intersection. A consent notice or similar mechanism shall be imposed at the time of any subdivision consent to ensure this outcome.

Any sensitive activities in the development area adjoining the State Highway 1 boundary, western boundary (with the adjacent rural zoned land) and southwest corner of the area, or Burnham School Road boundary are subject to specific setback or boundary treatment requirements, supported by an appropriate, enduring legal mechanism (such as a covenant, consent notice, etc) imposed at the time of subdivision, as follows:

- For the full length of the State Highway 1 boundary a 3m high acoustic bund and/or fence and 40m building setback shall be provided;
- Except for gaps required for roads or cycle/pedestrian/green links, for the Burnham School Road boundary a 2m high acoustic bund and/or fence shall be provided within a 5m wide landscape strip.
- A building setback shall apply within that area defined the figure below:



Access and Transport

The ODP employs a roading hierarchy that delivers a range of integrated transport options, including active transport connections at the boundary of the development area to adjacent neighbourhoods that facilitate the use of existing and future public transport routes. Roading connections shall be designed to achieve permeability, whilst minimising the number of new intersections and maintaining appropriate intersection spacing. The ODP features a primary route that provides an east-to-west route through that part of the ODP area to the west of Dunns Crossing Road and provides a connection to Burnham School Road to the south. The proposed roading hierarchy will deliver an accessible and coherent neighbourhood that provides safe and efficient access to the new development.

The intersection of State Highway 1, Dunns Crossing Road and Walkers Road is planned to be upgraded with a roundabout by Waka Kotahi NZTA. In addition, the Dunns Crossing Road / Burnham School Road intersection will require the installation of traffic signals to accommodate predicted traffic volumes. These works will require completion prior to the establishment of more than 97 homes on the ODP block.

An integrated network of roads will facilitate the safe and efficient distribution of internal traffic, provide access to properties, assist in connecting the open space reserves network both within and beyond the site and provide links to adjoining neighbourhoods. Property access directly to Burnham School Road is precluded, noting the arterial status of this road and the cycle and pedestrian path extending along this length of the development area.

The transport network for the area shall integrate into the pedestrian and cycle network established in adjoining neighbourhoods and the wider township. Cycling and walking will be contained within the road reserve and incorporated into the roading design of the overall road network where applicable. Adequate space must be provided to accommodate cyclists and to facilitate safe and convenient pedestrian movements.

Open Space, Recreation, and Community Facilities

A recreation reserve and pocket park are to be established within the area. The location of these reserves has been determined based on the number of reserves established in the wider area and to ensure people living within the development block have access to open space reserve is within a 500m walking radius of their homes. These neighbourhood parks will provide passive recreation opportunities, with nearby Foster Park providing access to active recreation opportunities.

There is an opportunity to integrate the collection, treatment, and disposal of stormwater with open space reserves where appropriate. Pedestrian and cycle paths are required to integrate into the green network to ensure a high level of connectivity is achieved, and to maximise the utility of the public space. Council's open space requirements cited in the Long Term Plan and Activity Management Plans should be adhered to during subdivision design.

An existing water race runs through the area. Whilst this may need to be realigned, it will remain open and fish and kākahi salvage works will be conducted in accordance with ECAN fish salvage guidelines prior to any works occurring within the water races.

As noted above in regards land use, buffer areas are to be provided along the north, west and southern boundaries of the area. This will ensure reverse sensitivity effects arising from conflicting land uses are avoided. Unless otherwise specified by Council, buffers will remain in private ownership and methods to protect these treatments in the long term such as private covenants, consent notices or LIM notes, shall be established. Treatments could include appropriate bunding, fencing, landscaping, and/or building setbacks.

Servicing

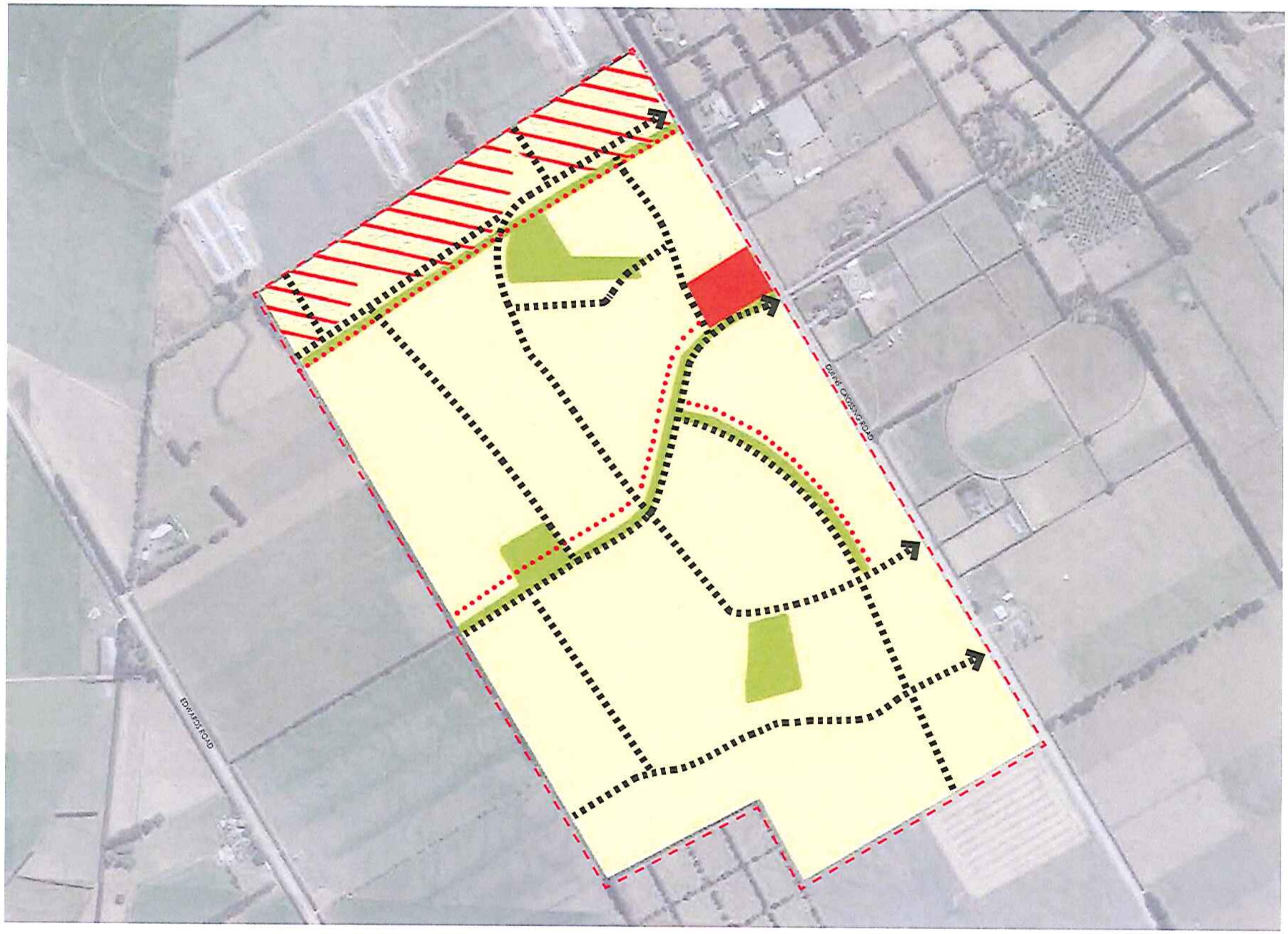
The underlying soils are relatively free-draining and generally support the discharge of stormwater disposal via infiltration to ground. There are a range of options available for the collection, treatment, and disposal of stormwater. Detailed stormwater solutions are to be determined by the developer in collaboration with Council at subdivision stage and in accordance with Environment Canterbury requirements. Systems will be designed to integrate into both the transport and reserve networks where practicable.

The provision of infrastructure to service the area shall align with the Council's indicative infrastructure staging plan, unless an alternative arrangement is made by the landowner/developer and approved by Council.

OUTLINE DEVELOPMENT PLAN 40 - SKELLERUP BLOCK

LEGEND

- Outline Development Plan Area
- Living Zone Z
- Business 1 zone
- Indicative Road
- Indicative Cycle/Pedestrian Route
- Reserve Location (size to be determined at time of subdivision)
- Setback



OUTLINE DEVELOPMENT PLAN 40 (SKELLERUP BLOCK)

This area comprises approximately 72.7 hectares and is situated on the west side of Dunns Crossing Road, approximately midway between Selwyn Road and Brookside Road.

Land Use

The development area shall achieve a minimum net density of 12 household per hectare, averaged over the area. The zoning framework supports a variety of site sizes to achieve this minimum density requirement. Should this area be developed in stages, confirmation at the time of subdivision of each stage, and an assessment as to how the minimum net density of 12 household per hectare for the overall area can be achieved, will be required.

Medium density areas within the development area are able to be supported by adjacent amenities that include key open spaces and green corridors and a small commercial centre.

The small local commercial centre is proposed adjacent to the intersection of Dunns Crossing Road and the proposed central Primary Road to provide good accessibility and to meet some of the convenience needs of residents in the immediate area.

No more than 950 sites shall be provided across the whole of the development area.

Any sensitive activities in the development area adjoining the area's northern boundary (with the adjacent rural zoned land) are subject to a 150m setback from the poultry sheds existing as at 1 January 2021 located on the property at 243 Dunns Crossing Road (which is legally described as Lots 3-4 DP 20007 BLKS III VII LEESTON SD), supported by an appropriate, enduring legal mechanism (such as a covenant, consent notice, etc) imposed at the time of subdivision.

Access and Transport

The ODP employs a roading hierarchy that delivers a range of integrated transport options, including active transport connections at the boundary of the development area to adjacent neighbourhoods that facilitate the use of existing and future public transport routes. Roading connections shall be designed to achieve permeability, whilst minimising the number of new intersections and maintaining appropriate intersection spacing. The ODP features a primary route that provides three connection points to Dunns Crossing Road and land further to the east. The proposed roading hierarchy will deliver an accessible and coherent neighbourhood that provides safe and efficient access to the new development.

An integrated network of roads will facilitate the safe and efficient distribution of internal traffic, provide access to properties, assist in connecting the open space reserves network both within and beyond the site and provide links to adjoining neighbourhoods.

The transport network for the area shall integrate into the pedestrian and cycle network established in adjoining neighbourhoods and the wider township. Cycling and walking will be contained within the road reserve and incorporated into the roading design of the overall road network where applicable. Adequate space must be provided to accommodate cyclists and to facilitate safe and convenient pedestrian movements.

Open Space, Recreation, and Community Facilities

Two recreation reserves and a pocket park are to be established within the area. The location of these reserves has been determined based on the number of reserves established in the wider area and to ensure people living within the development block have access to open space reserve is within a 500m walking radius of their homes.

These neighbourhood parks will provide passive recreation opportunities, with nearby Foster Park providing access to active recreation opportunities.

There is an opportunity to integrate the collection, treatment, and disposal of stormwater with open space reserves where appropriate. Pedestrian and cycle paths are required to integrate into the green network to ensure a high level of connectivity is achieved, and to maximise the utility of the public space. Council's open space requirements cited in the Long Term Plan and Activity Management Plans should be adhered to during subdivision design.

As noted above in regards land use, buffer areas are to be provided along the north boundary of the area. This will ensure reverse sensitivity effects arising from conflicting land uses are avoided. Unless otherwise specified by Council, buffers will remain in private ownership and methods to protect these treatments in the long term such as private covenants, consent notices or LIM notes, shall be established.

Servicing

The underlying soils are relatively free-draining and generally support the discharge of stormwater disposal via infiltration to ground. There are a range of options available for the collection, treatment, and disposal of stormwater. Detailed stormwater solutions are to be determined by the developer in collaboration with Council at subdivision stage and in accordance with Environment Canterbury requirements. Systems will be designed to integrate into both the transport and reserve networks where practicable.

The provision of infrastructure to service the area shall align with the Council's indicative infrastructure staging plan, unless an alternative arrangement is made by the landowner/developer and approved by Council.

REPORT

TO: Chief Executive

FOR: Council Meeting – 10 March 2021

FROM: Asset Manager Water Services
Water Services Asset Planner

DATE: 3 March 2021

SUBJECT: **Ellesmere Wastewater Treatment Plant: Issues and Options Update**

RECOMMENDATION

That the Council receives this report "Ellesmere Wastewater Treatment Plant: Issues and Options" for information.

1. PURPOSE

The purpose of this report is to provide Council with a summary of the issues and options for Ellesmere Wastewater Treatment Plant.

2. SIGNIFICANCE ASSESSMENT/COMPLIANCE STATEMENT

This matter has been assessed against the Significance and Engagement Policy:

Consideration has been given to criteria set out in the policy, including:

- the magnitude of the net costs of the proposal or decision to the Council and / or to affected communities or groups;
- the level of community interest in the proposal, decision or issue; and
- the values and interests of Ngāi Tahu whānau, hapū and rūnanga, as manawhenua for the region.

On this basis the matter is considered to be of **high significance**.

Consultation is planned to be undertaken as part of the 2021-2031 Long Term Plan.

3. ISSUES FOR ELLESMERE WASTEWATER TREATMENT PLANT

Overview of the WWTP

The Ellesmere Wastewater Treatment Plant (WWTP) serves the communities of Leeston, Southbridge and Doyleston. These communities are forecast to experience moderate growth, with an additional 516 people expected in the catchment by 2031 (total population of 4,401 people in 2031).

The plant consists of two partially aerated lagoons followed by six maturation cells in series, with treated effluent irrigated to land. Rapid infiltration basis are also used for effluent discharge.

The WWTP is now beyond its design capacity for the population served

The treatment process was sized for a population of approximately 3,600 residents at the time of construction. The latest SDC population statistics indicate there are approximately 3,900 residents, which suggests the plant is at, or over capacity. The regularly high nitrogen in the treated wastewater and hydraulic load through the plant confirms this (Beca, September 2020; Appendix A).

This is not a new issue, but a matter identified and budgeted for in the 2018-28 LTP.

If SDC decide to keep the wastewater treatment plant, upgrades would be required to meet consent conditions now and in future. More detail on these upgrades is provided below.

The WWTP has a current, disputed, technical non-compliance with one of its discharge conditions.

Environment Canterbury has recently provided an alternative interpretation to Condition 7 of consent CRC204099, which states:

> *"The rate at which treated wastewater is applied shall not exceed 200 kg of nitrogen per hectare per year onto grazed pasture, or an equivalent application and land management system, that matches the annual nitrogen application with the annual plant uptake"*

Lowe Environmental Impact (LEI) have carried out a study to assess the soils and pasture at the site and optimise the land application system for effluent (Appendix B). LEI also modelled different management options for the WWTP, to see whether a 'net zero' nitrogen balance could be theoretically achieved, as has been requested by ECan.

Based on LEI's modelling, it is not possible to meet condition 7 of the consent as it is being interpreted by ECan (i.e. achieving a net zero nitrogen balance) without making changes to the wastewater treatment, storage and land application system.

The loss of nitrogen from the system is unavoidable due to:

- High flows and high total nitrogen load applied
- Too much nitrogen applied during winter (when plant demand is low), resulting in a loss of nitrogen to groundwater
- Not enough nitrogen applied in summer (when plant demand is high), resulting in less than optimal pasture growth

The last two points highlight that, for optimal pasture growth and nitrogen removal, wastewater applications need to be timed in relation to plant growth. To achieve this, the WWTP would need the facility to store wastewater.

LEI have recommended the following actions to improve the land application system:

- Build enough storage for 3 months of winter inflow, to eliminate or significantly reduce irrigation applications during the winter (when nitrogen loss is highest).
- Add more irrigation area
- Reduce the maximum daily irrigation rate
- Match nitrogen applications to periods of active plant growth
- Consider plant species that have more active growth in winter, and under-sow the existing areas with clover (which fixes nitrogen)
- Monitor and correct pasture micro-nutrient deficiencies and pH

LEI's findings also have implications for condition 7 of consent CRC204099. LEI's modelling demonstrated that applying 200 kg N/ha and grazing the pasture would still result in nitrogen loss of 79 kg N/ha/year. Thus the interpretation of the condition by ECan (net zero nitrogen loss) is not achievable with this system, and the consent wording should be changed if the consent is to be retained.

The WWTP is constrained by poor drainage (as a result of high ground water table) in winter and surface flooding (in extreme rainfall events), which may worsen with time

As noted above, the irrigation fields, at times, struggle to cope with the hydraulic loading of wastewater being applied (LEI, 2020). Hydraulic loading is often more of a constraint than nitrogen loading. This means that storage would be required to avoid discharging effluent during wet winter conditions.

The site is subject to periodic flooding (Figures 1 & 2), disrupting the ability to discharge wastewater to land at times.

The treatment plant is likely to become less resilient with time due to growth.

Aqualinc (2020; Appendix C) found that the Ellesmere WWTP is expected to not be able to discharge to land because of high groundwater, roughly every year, usually for 4 – 5 days at a time but up to 12 days/year at times. This reinforces the need for extended storage at Ellesmere WWTP.

Figure 1 – Flooding at Ellesmere WWTP in 2013

Figure 2 – Flooding at Ellesmere WWTP in 2013

4. OPTIONS FOR THE FUTURE OF ELLESMERE WWTP

Two alternative options have been considered for the future of the Ellesmere WWTP:

1. Pump partially-treated wastewater to Pines WWTP; or
2. Upgrade Ellesmere WWTP, addressing the key issues

More detail of the options is given below. The financial implications of each option are presented in section 9.

The preferred option is to pipe wastewater to Pines WWTP

This option is preferred because it has lower capital and operational costs, and is considered to be lower-risk in terms of climate change and consentability. However, there are ESSS development contributions applicable which push up the overall upfront capital costs. This is discussed in section 9 (Funding Implications).

Partially treated wastewater would be pumped from the Ellesmere WWTP to the Pines WWTP. The preferred pipeline route is 21km long and crosses the Selwyn River at the bridge on Leeston Road (Figure 3). The pipe route follows the existing roadway and does not cross privately owned land.

The new pipeline would allow Selwyn Huts and the campgrounds at Chamberlains Ford and Coes Ford to potentially connect to the Selwyn Sewerage Scheme as well.

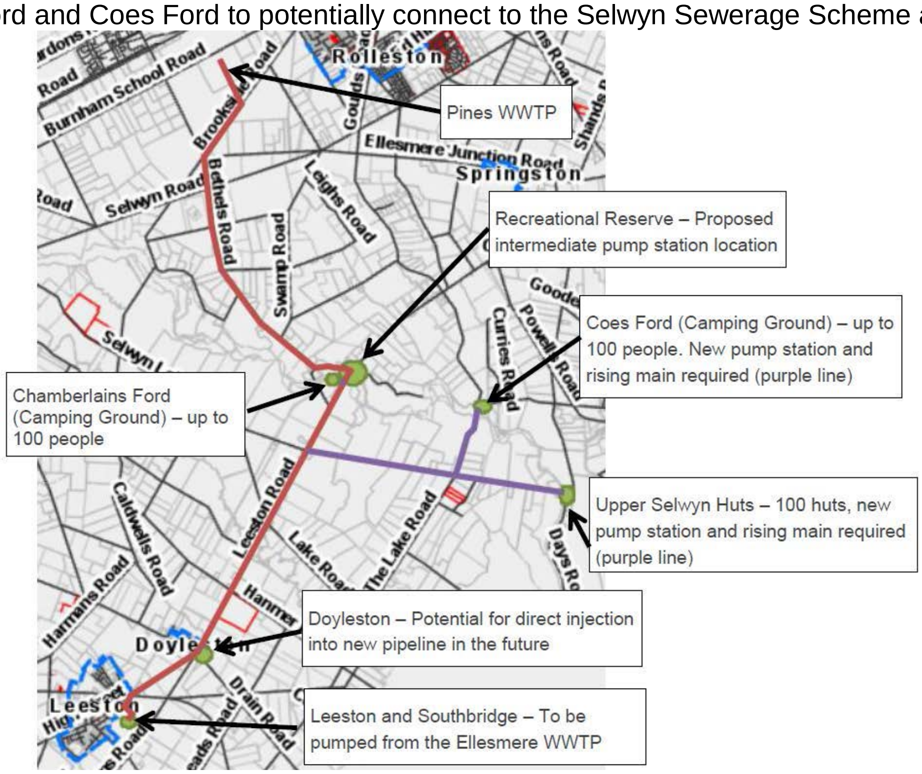


Figure 3 – proposed Ellesmere to Pines pipeline

The consultants considered the options of conveying raw wastewater or treated effluent. The problems presented by conveying treated wastewater to Pines WWTP would have less negative effect compared to raw wastewater, as well as a lower capital cost. For this reason it is assumed treated effluent is pumped to the Pines WWTP. 'Treatment' is simply through the existing waste stabilisation ponds.

The alternative option is to upgrade Ellesmere WWTP

Beca completed a concept design for an upgrade to Ellesmere WWTP. The following changes would be required:

- Convert the treatment plant to an activated sludge process, to reduce the nitrogen content in the treated wastewater
- Procure an additional 22ha of irrigation area
- Provide winter buffer storage of around 3 months inflow

If Ellesmere WWTP is upgraded to an activated sludge process, with a reactor constructed in Pond 1, the remaining pond volume (with the exception of the area recovered for construction of the Clarifier and ancillary equipment) could be used for winter storage. For the purposes of developing a feasibility estimate it has been assumed that ponds 2B, and 3 – 8 would be repurposed as a treated wastewater buffer storage pond with approximate volume of 50,000 m³ (Figure 4). Due to the high groundwater on site the outer bunds of the existing pond area would be built up to create the required storage volume.

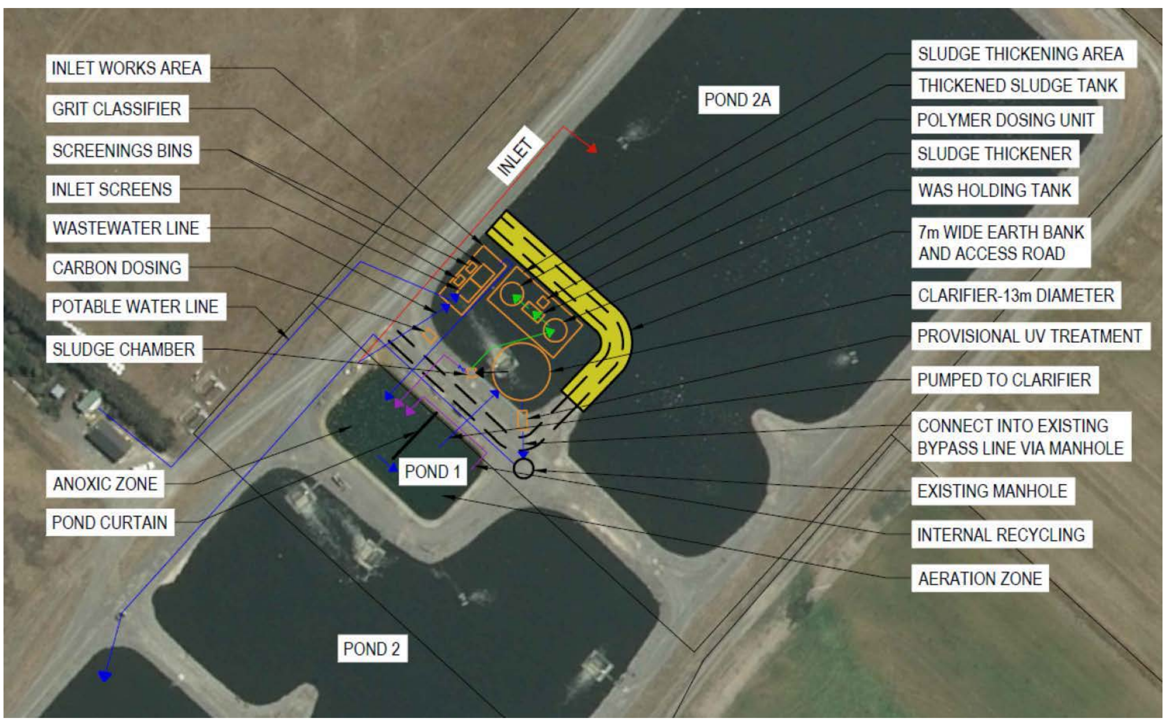


Figure 4 - Potential site layout plan for Ellesmere WWTP upgrade

5. CONSENT AND DESIGNATION REVIEW

Beca completed a review of resource consents held for Ellesmere WWTP, and the designations held for the plant (Appendix D). There are currently 8 active consents for the plant relating to discharge to land, air, groundwater and surface water. Consent CRC204099 was obtained in 2020 and amalgamates all of the requirements of the other consents (Table 1). CRC204099 is the only consent which needs to be retained; all others can be surrendered.

Table 1: Summary of consents at Ellesmere WWTP

Consent number	Consent purpose	Action
CRC204099	To discharge contaminants to land, air, and groundwater and surface water.	Keep this consent
CRC011680.1	To discharge contaminants into land and groundwater from the operation of additional wastewater treatment and disposal.	Surrender consent
CRC930165.1	To discharge contaminants to land.	Surrender consent
CRC011681.2	To discharge up to 120 litres per second of extracted groundwater into Tramway Reserve Drain.	Surrender consent
CRC011679.1	To discharge contaminants into air from construction and operation of additional wastewater treatment and disposal facilities.	Surrender consent
CRC941475.1	To discharge contaminants to air.	Surrender consent
CRC941476	To discharge contaminants into Land	Surrender consent
CRC950253	To discharge oxidation pond effluent onto land via border dyke irrigation	Surrender consent

As noted previously, if Ellesmere WWTP is retained, SDC should seek an amendment to condition 7 of CRC204099.

Beca have also applied for an amended designation for the WWTP through the District Plan review process (application attached in Appendix D).

6. PROPOSAL

That staff progress the detail design and consenting of the Ellesmere to Pines pipeline.

7. OPTIONS

The options open to Council are to either accept the recommendation, amend the recommendation or to reject the recommendation.

8. VIEWS OF THOSE AFFECTED / CONSULTATION

(a) Consultation

No public consultation has been completed to date. This matter will be publicly consulted on as part of the 2021-31 LTP.

(b) Māori implications

Staff recommend that SDC consult with the Rūnanga regarding the two options. We anticipate that pumping wastewater to Pines WWTP would be preferred by the Rūnanga, as it improve the quality of the effluent (if subjected to further treatment at Pines WWTP), reduces the leaching of nitrogen to groundwater and provides an opportunity for three small communities to connect and to cease discharging to land via septic tank or package plant systems.

(c) Climate Change considerations

Based on the Aqualinc assessment, the option of pumping wastewater to Pines WWTP would provide greater long-term resilience against climate change.

9. FUNDING IMPLICATIONS

PricewaterhouseCoopers (PwC) was engaged to develop a financial model for a variety of wastewater options that SDC are considering (Figure 5). The model apportions the capital cost of the enhancements (and other associated works and upgrades), over time amongst the beneficiaries of those enhancements. This modelling considered both Option 1 (pipe to Pines) and Option 2 (upgrade Ellesmere WWTP).

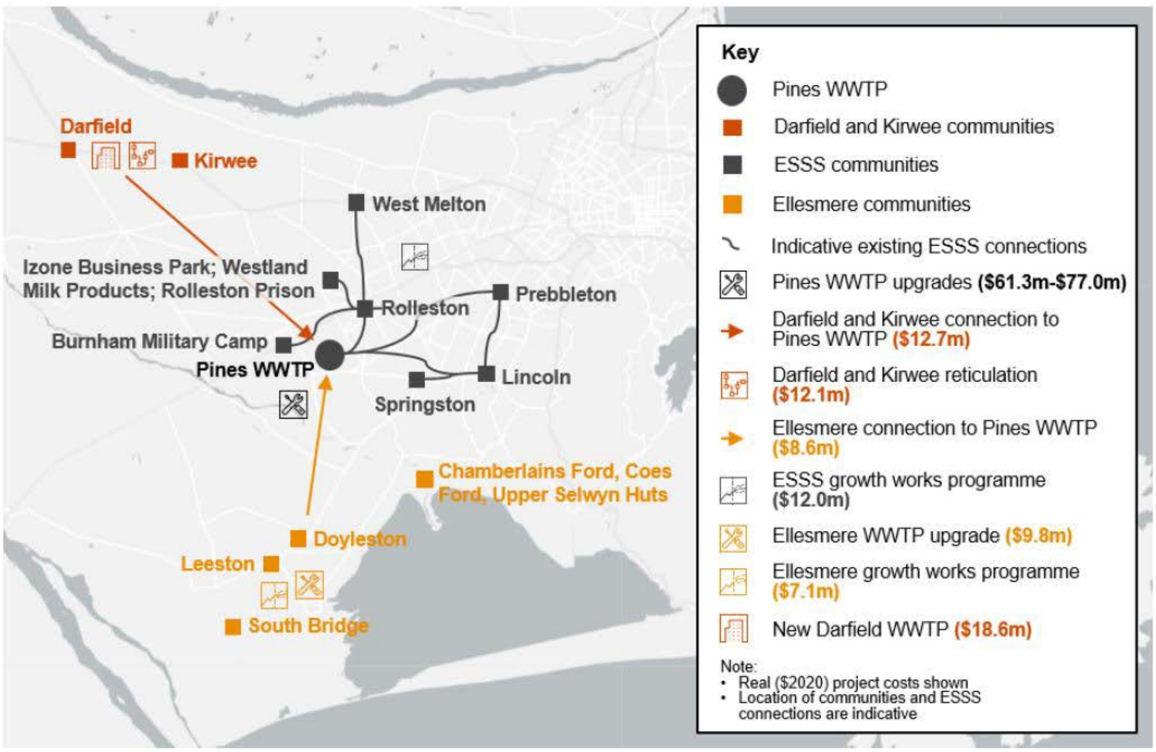


Figure 5 – Communities and projects included in the financial model

Following on from this work and in consideration of the earlier work from BECA, Council staff have summarised the cost implication of the two options (Table 2). Please note that in this calculation, no inflation and discounting has been applied e.g. we have assumed that both factors are the same.

Table 2: Financial implications of the Ellesmere WWTP options

	Option 1			Option 2		
	Pipe to Pines			Upgrade		
	Rates ($000)	**DC ($000)**	**Total ($000)**	**Rates ($000)**	**DC ($000)**	**Total ($000)**
Capex	13,600	9,600	23,200	3,900	12,500	16,400
Opex	9,000		9,000	23,700		23,700
Total	22,600	9,600	**32,200**	27,600	12,500	**40,100**

The table above shows the funding required from both rates and Development Contributions (DC).

Over the 30 year period, the cost of option 1 is less than option 2.

The preferred option will be consulted on as part of the 2021 LTP.

Murray England
ASSET MANAGER WATER SERVICES

Alex Ross
WATER SERVICES ASSET PLANNER

Endorsed For Agenda

Murray Washington
GROUP MANAGER INFRASTRUCTURE

Appendix A – Concept design report for Ellesmere upgrade (Beca)
Appendix B – Soil and pasture evaluation (Lowe Environmental Impact)
Appendix C – Climate change report (Aqualinc)
Appendix D – Consents review (Beca)

Appendix A – Concept design report for Ellesmere upgrade (Beca)

ANZ Centre, 267 High Street,
PO Box 13960, Christchurch,
8141, New Zealand
T: +64 3 366 3521 // **F:** +64 3 366 3188
E: info@beca.com // www.beca.com

Selwyn District Council
PO Box 90
Rolleston 7643
New Zealand

6 November 2020

Attention: Murray England

Dear Murray

Ellesmere WWTP Overall Scheme Concept Assessment

Selwyn District Council (SDC) has been looking at ways to upgrade the Ellesmere Wastewater Treatment Plant (WWTP) to meet the future disposal needs for the Ellesmere area. This letter summarises the work that has been undertaken and a concept for a robust scheme.

1 WWTP Concept Design

Beca completed a concept design for an upgrade to the Leeston WWTP based on understanding that the nitrogen content in the treated wastewater needed to be reduced to allow ongoing compliance with the existing discharge consent. The work was summarised in the draft report *Concept Design Report, Ellesmere Wastewater Treatment Plant Upgrade*, 22 September 2020, Beca Ltd. The report concluded that the treatment process is currently operating beyond its intended design capacity. A concept and cost estimate for upgrades to the site to reduce nitrogen level in the treated wastewater to a design horizon of 2050 was developed and reported on.

Two options for the Activated Sludge Process (ASP) concept design were considered, based on achieving different Total Nitrogen (TN) concentrations in the treated wastewater. This was due to the uncertainty around how Condition 7 of the existing discharge consent may be modified or interpreted in future by ECan. The design target concentrations for each option are:

Option 1 – 17 mg/L. This option is based on continuing to irrigate to pasture and complete cut and carry operations as per the existing understanding of Condition 7

Option 2 – 7 mg/L. This option is based on irrigating to pasture at an estimated rate that matches the amount of nitrogen that can be taken up by pasture. Cut and carry operation will not be required.

Capital cost estimates were prepared to ±50% for the treatment plant upgrade options and estimates of operating cost were also made. Option 1 is estimated to cost $5.5M and have an annual operation cost of $630,000. Option 2 is estimated to cost $5.6M and have an annual operating cost of $750,000.

2 Irrigation Assessment by LEI

In parallel with the concept design of the WWTP, SDC engaged Lowe Environmental Impact Ltd (LEI) to complete a nitrogen balance on the irrigation aspect of the scheme. This was to inform the amount of nitrogen that could be taken up by plants and/or removed by cut and carry to determine resultant levels of nitrogen leaching for different treated wastewater quality. The draft report produced by LEI (*Assessment of Soils Receiving Wastewater Leeston WWTP, October 2020, LEI)* concluded that nitrogen loss for the scheme is dominated by winter drainage and that the irrigation fields sometime struggle to cope with the volume of wastewater being applied. The use of additional irrigation area and winter buffer storage of around 3 months was recommended as it was identified that reducing the level of nitrogen in the effluent would not resolve potential consent compliance issues in the future due to growth in the area.

Upon discussing the findings with LEI it was noted that the draft report had considered only current flows of 1,247 m³/day, LEI were subsequently provided with future population and flow estimates (2,098 m³/day). Analysis using these new numbers increased the hydraulic constraints of the scheme. LEI modelled a number of different scenarios combining different amounts of irrigable area and storage to keep the level of nitrogen applied around 400 kg.N/ha/year as shown in Table 1.

Table 1 – Summary of Proposed Future Irrigation Scenarios

	Current (2019 – based on data)	**Current (Theoretical with changes to irrigation)**	**Proposed Future – limiting irrigation rate**	**Proposed Future – buffer storage and catchup irrigation**	**Proposed Future – no treatment plant upgrade**
		2- 7 mm/day equal application acr oss the 30.2 ha – no storage	4.1 mm/day maximum application Seasonal buffering of the flow 100,000m^3 storage	2 to 7 mm/day irrigation. 50,000m3 storage – catchup irrigation	2.4 mm/day average application 150,000 m3 storage
Annual average volume irrigated (m^3/day)	1,247	1,247	2,098	2,098	2,098
Irrigation area (ha)	30.2	30.2	52	52	86
Irrigation Nitrogen concentration (g/m^3)	23	23	27	27	45 (estimated from influent less 30%)
Nitrogen Applied (kg N/ha/yr)	346	346	401	401	401
Nitrogen Removed (kg N/ha/yr)	278	281	330	330	330
Nitrogen leached (kg N/ha/yr)	87	77	88	Not modelled in Overseer[1] - estimated to be 77 to 85	Not modelled in Overseer- estimated to be 65
RIB N (kg N/yr)	0	0	0	0	0
Total N loss (kg/yr)	2,618	2348	4,566	4,004 – 4,420	5,590

[1] At the time of this letter LEI are completing further work to confirm the information presented in Table 1.

The scheme that uses catchup irrigation is modelled on limiting irrigation when there has been 5 mm or more rainfall, then allowing up to 7 mm wastewater irrigation per day after the rainfall once ground conditions are suitable again. This enables the irrigation scheme to dispose of the volume that has been stored during the rain events. The current pivot spray irrigation system is applying peak irrigation depth of 7.5 mm/application with a return period of 1 day. The annual average application is between 2.3 and 4.9 mm/day.

For the purposes of a feasibility assessment the scenario of increased irrigable area to 52 ha (addition of 22 ha of irrigable area), buffer storage of 50,000 m³ for peak events and catchup irrigation rates after rain events has been chosen (highlighted blue in Table 1). This is because this scheme offers a realistic compromise between the scenario of full winter storage where 100,000 m³ of storage would be required on site, and the scenario of no plant upgrades where an additional 50 ha of irrigable land would be needed in addition to storage.

It is considered that it would be potentially difficult and expensive to build and consent very large storage volumes at the existing WWTP site. Similarly it is likely that it will be difficult and time consuming for SDC to acquire an additional 50ha of land in close proximity to the existing irrigable area. These assumptions need to be reviewed by SDC to confirm that the scenario selected is the preferred option.

3 Treated Wastewater Buffer Storage

If the treatment plant at Leeston is upgraded to an activated sludge process, with a reactor constructed in Pond 1, the remaining pond volume (with the exception of the area recovered for construction of the Clarifier and ancillary equipment) could be used for winter storage. A summary of the current pond volumes in shown in Table 2 – these have been calculated from reported pond areas, and depth of pond determined from proposed operating level to pond invert. It is noted that pond depth typically varies over time and there will be some volume lost to sludge.

Table 2 Ellesmere WWTP Existing Ponds

Pond	Depth (m)	Area (hectares)	Volume (m^3)
2A	1.8	1.3	23,400
2B	1.6	0.5	8,000
3	1.3	0.3	3,900
4	1.3	0.2	2,600
5	1.1	0.9	9,900
6	1.1		
7	1.1		
8	1.1		
TOTALS		**3.2**	**47,800**

For the purposes of developing a feasibility estimate it has been assumed that ponds 2B, and 3 – 8 will be repurposed as a treated wastewater buffer storage pond with approximate volume of 50,000 m³. Due to the high groundwater on site the outer bunds of the existing pond area will be built up using a combination of imported material, and material recovered from the existing pond intermediary bunds, which will be demolished as part of the repurposing.

SDC has advised that it is likely that if the existing ponds are modified for use as winter buffer storage, they will need to be relined to meet future consent conditions around wastewater lost to ground so allowance has been made for lining the new pond.

4 Ground Conditions at Ellesmere WWTP

SDC commissioned an update of a study to assess the potential impact of climate change on their 3 waters assets. The report *Impact of Climate Cycles and Trends on Selwyn District Water Assets: 2020 Update, October 2020, Aqualinc* details this study. The findings with regard to the Ellesmere WWTP include the following:

- *"At Leeston, the wastewater treatment plant groundwater levels have exceeded the 900mm below land surface threshold approximately once each year, altering the normal discharge to land procedure. On the basis of this work it appears that the predicted minor changes in groundwater levels over the next 30 years should not significantly increase exceedances to this threshold, though it is recommended that more detailed, site specific, modelling is carried out to ensure that this conclusion is correct"*
- *"On the basis of available data, Leeston WWTP would be expected to not be able to discharge to land because of high groundwater, approximately once a year, for short durations."*

These findings support anecdotal evidence provided by SDC that the Ellesmere WWTP irrigation areas can sometimes suffer from flooding and surface water ponding, resulting in both the inability to irrigate and difficulties associated with maintaining the cut and carry operation. The LEI report also notes that ponding is occurring over parts of the irrigation areas. A scheme that introduces both additional irrigable area, and wet weather buffer storage will assist with long term management of soil moisture, drainage and leaching.

5 Cost Estimate

5.1 Ellesmere WWTP Upgrade

A cost estimate has been prepared for the scheme concept selected in Section 2 using the following inputs:

- Cost for treatment plant upgrade Option 2 as described in Section 1. While the scheme selected in Section 2 is based on continued cut and carry operation, given the minimal difference between capital costs for Option 1 and Option 2 treatment, Option 2 treatment will further minimise potential nitrogen leaching and is conducive to a more sustainable scheme.
- Cost for additional irrigable area of approximately 22 ha. SDC has provided an indicated rateable value for a property adjacent to the WWTP site of approximately this size. This rateable value has been used as the basis for estimating the cost to the scheme of purchasing additional irrigable area.
- Cost for developing the additional irrigable area based on pivot irrigation. These costs include allowances for additional power supply, a booster pump station, fencing and the irrigators based on a square metre rate.
- Cost for treated wastewater buffer storage of 50,000 m³. Costs based on converting ponds 2B, 3, 4, 5, 6, 7, 8 into a new, lined treated wastewater storage pond as described in Section 3.

Please refer to Attachment A for a summary of the cost estimate, and the key assumptions and exclusions.

5.2 Comparison to Alternative Option of Pumping to Pines

In addition to the WWTP upgrade options, Beca investigated the possibility of meeting future wastewater disposal needs by conveying partly treated wastewater from Ellesmere WWTP to the Pines WWTP. The pipeline concept design, including cost estimate, was provided to SDC in the report “Pipeline from Ellesmere WWTP to Pines WWTP”, Beca, 19th June 2020. A cost comparison of the WWTP upgrade option to the option of pumping to the Pines WWTP is shown in Table 3. The costs in Table 3 are rough order cost estimates only, for planning and comparison purposes. Once SDC review and confirm the assumptions that have been made around the preferred WWTP upgrade scheme, further design will be necessary to confirm the associated costs

Table 3 – Comparison of Future Wastewater Disposal Options

Estimate	WWTP Upgrade Feasible Scheme(Option 2)	Pumping to Pines
Most Likely Capital Cost (+50%/-30%)	$9.8M	$8M
Annual Operating Cost Estimate	$790,000	$200,000
30 year NPV Estimate	$22,780,000	$10,920,000

Please note the following when comparing the WWTP capital cost estimates with the pumping and pipeline capital cost estimates,

- The WWTP estimates include allowances for Professional Fees, Client Costs, consenting and investigations, while the pumping and pipeline estimate does not. This will skew the figures in favour of the Pipeline
- The pumping and pipeline operating cost estimates do not include any allowance for operational changes that may be required at the Pines, such as carbon dosing.
- Operational costs for the WWTP upgrade do not include an allowance for revenue that may be generated from a cut and carry operation.

We hope this information proves helpful and we look forward to confirming the way forward with you for the Ellesmere WWTP upgrade project.

Yours sincerely

Rae Stewart
Technical Director - Project Management

on behalf of

Beca Limited

Phone Number: +64 3 363 3465
Email: Rae.Stewart@beca.com

Attachments

Attachment A – Cost Estimate for WWTP Upgrade Scheme

Attachment A – WWTP Upgrade Scheme Cost Estimate

Sensitivity: General

Ellesmere Wastewater Treatment Plant

Concept Cost Estimates

SUMMARY

Ref	Option	Concept Cost Estimate - P50	Annual Operating Cost Estimate	30 yr Net Present Value Estimate
1	Upgrade Ellesmere WWTP - Option 2 Rev 1	$9,820,000	$790,000	$22,780,000

Assumptions and clarifications:

0.1 The Ellesmere WWTP capital cost estimate values are taken from the separate concept cost estimates prepared and issued in this report.

0.2 Power costs allowed at $0.30/kWh and are to be confirmed by SDC.

0.3 NPV discount rate is allowed at 5% and is to be confirmed by SDC.

0.4 NPV study period is based on 30yrs.

0.5 These estimates exclude all operation, maintenance, and renewals costs associated with the existing WWTP.

0.6 The Opex and NPV estimates do not include for irrigation site cut-and-carry operational costs.

0.7 Additional assumptions, exclusions, and clarifications can be found in the respective estimates that these summary values are taken from.

Sensitivity: General

Project:	**Ellesmere Wastewater Treatment Plant (WWTP)**
Phase:	Concept Design
Report:	Rough Order of Cost (ROC) estimates
Prepared By:	R. Verbeek 6/11/2020
Reviewed By:	J. Pimlott 6/11/2020

Comparative Cost Estimate Summary

Ref	Description		Option 2 - Rev 1	
1.0	Civil and Siteworks		$	1,609,140
2.0	Inlet Works		$	263,000
3.0	Secondary Treatment		$	1,492,000
4.0	TertiaryTreatment		$	380,000
5.0	Electrical, Instrumentation, and Control		$	293,000
6.0	Disposal Site		$	824,800
	Subtotal - Net Construction Estimate		**$**	**4,861,940**
7.0	Main Contractor Overhead Costs		$	1,034,378
	Subtotal - Gross Construction Estimate		**$**	**5,896,318**
8.0	Professional Fees & Client Costs		$	1,156,337
9.0	Property Costs		$	1,000,000
10.0	Allowances for Risk Register Items and Residual Uncertainty		$	1,767,156
	Rounding		$	189
	Most Likely - P50 Estimate		**$**	**9,820,000**
	P95 Estimate		**$**	**10,750,000**

Sensitivity: General

Assumptions

0.01 The basis of the revised estimate is the Beca concept design information received 05/11/2020.

0.02 All quantities and dimensions are approximate and are subject to design development.
0.03 Elements of cost included within this estimate are based on costs from similar projects and other Beca cost benchmarks.
0.04 We assume that all of the work will be undertaken by a single 'Main Contractor' through a single contract for the project.
0.05 We assume that a competitive tendering process will be followed as part of the agreed procurement process.
0.06 We assume that all works are carried out during normal daytime working hours.
0.07 We assume that the Contractor will have unobstructed access to the whole site throughout the construction phase.
0.08 All base prices are current to November 2020. No allowance for general cost escalation has been included in the estimate.
0.09 The allowances for Professional Fees and Client-owned project-related internal costs are high-level indicative allowances only and have not been based on a detailed work breakdown structure.

0.10 We assume that the clarifier will sit on a stiffened raft of compacted gravels. No additional ground improvement is allowed for. This is subject to further geotechnical investigation and design.

Expected Estimate Range:

0.11 Estimate range is an indication of the degree to which the final cost outcome for a given project will vary from the estimated cost – it is not an additional Contingency. Range is expressed as a +/- percentage range around the point of estimate after the application of contingency, with a stated level of confidence that the actual cost outcome would fall within this range. As the level of project definition increases and the tender date draws nearer, the expected range of the estimate tends to improve, as indicated by a tighter +/- range.

0.12 The estimates are based on high-level design information that is under development. These estimates are deemed to be Class 5 estimates in terms of the AACE Cost Estimate Classification System guidelines. The expected accuracy range of the estimate is -30% to +50%.

General Estimate Exclusions

0.13 Goods and services Tax (GST).
0.14 Incurred costs to date.
0.15 Fast track or accelerated programme.
0.16 Work outside normal working hours.
0.17 Professional fees other than those listed.
0.18 Client independent legal and accounting fees
0.19 Costs associated with staging of the works.

Project Specific Exclusions

Sensitivity: General

0.20 Ground improvements and piling beneath structures. The estimate only allows to build up the reclaimed area with compacted gravels and geogrid.
0.21 Relocating existing services. Subject to further investigations.
0.22 No allowance to remove existing redundant screen and associated equipment.
0.23 Phosphorus reduction and alkalinity dosing.
0.24 Landscaping.
0.25 Costs of impacts associated with extraordinary global events (such as the current COVID-19 outbreak).

Risks

Risks with a potential cost effect include:
0.26 Design development.
0.27 Foreign exchange rates (an allowance for this risk has been included in the estimate).
0.28 General cost escalation.
0.29 Cost associated with staging of the works.
0.30 Ground conditions and ground water levels.
0.31 Working around existing services.
0.32 Costs of impacts associated with extraordinary global events (such as the current COVID-19 outbreak).
0.33 Where quantitative risk analysis processes have been undertaken, the estimate does not allow for the risk of a public health shut-down where social distancing measures are adopted, nor does it allow for the risk of indefinite suspension of projects due to unavailability of materials and/or labour due to restrictions in response to COVID-19.

General Considerations and Limitations.

0.34 These estimates are solely for our Client's use for the purpose for which they were intended in accordance with the agreed scope of work. They may not be disclosed to any person other than the Client and any use or reliance by any person contrary to the above, to which Beca has not given its prior written consent, is at that person's own risk.

0.35 The high-level cost estimates presented in this section have been developed solely for the purpose of comparing and evaluating competing options. They are sufficiently accurate to serve this purpose. They should not be used for budget-setting purposes as common elements between options may have been omitted and/or the works not fully scoped. A functional design should be undertaken if a budget estimate is required.

Sensitivity: General

Project:	**Ellesmere Wastewater Treatment Plant**	
Phase:	Concept Design	
Report:	Operating Cost Estimates	
Prepared By:	R. Verbeek	6/11/2020
Reviewed By:	J. Pimlott	6/11/2020

Annual Operating Costs		**Option 2 Rev 1**
Power Costs - WWTP		$ 223,302
Power Costs - Irrigation		$ 10,000
Polymer		$ 6,300
Acetic acid		$ 133,590
Grit disposal		$ 25,896
Screenings disposal		$ 24,648
Sludge disposal		$ 91,000
WWTP Operations labour		$ 60,000
Irrigation system labour		$ 6,780
Sampling and lab testing		$ 25,000
Maintenance		$ 52,370
Subtotal		**$ 658,886**
Allow 20% contingency		$ 132,000
Rounding		-$ 886
Total Annual Operating Costs - $/yr		**$ 790,000**

Sensitivity: General

Project:	**Ellesmere Wastewater Treatment Plant**
Phase:	Concept Design
Report:	Net Present Value Cost Estimates
Option:	**Upgrade Ellesmere WWTP - Option 2 Rev 1**

Study Period	30 year	assumed. TBC by SDC.
Discount Factor	5.0%	assumed. TBC by SDC.
General cost inflation - % p.a.	2.0%	allowance.
Electricity cost inflation - % p.a.	2.0%	allowance.
Electricity cost ($/kWh)	$0.30	assumed. TBC by SDC.

Summary	**Upgrade Ellesmere WWTP - Option 2 Rev 1**
Total CAPEX NPV	$ 9,400,000
Total OPEX NPV	$ 13,380,000
Total NPV Estimate	**$ 22,780,000**

Year			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051
Years from base			0	1	2	3	4	5	6	7	8	9	10	20	30
CAPEX costs															
Capital Cost Estimate - P50															
Allow 60/30/10	$/yr	$ 9,820,000		$ 6,009,840	$ 3,065,018	$ 1,042,106									
	$/yr	**$ 9,820,000**	$ -	$ 6,009,840	$ 3,065,018	$ 1,042,106	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Discounted Cost			$ -	$ 5,723,657	$ 2,780,062	$ 900,211	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cumulative Discounted Cost			$ -	$ 5,723,657	$ 8,503,719	$ 9,403,930	$ 9,403,930	$ 9,403,930	$ 9,403,930	$ 9,403,930	$ 9,403,930	$ 9,403,930	$ 9,403,930	$ 9,403,930	$ 9,403,930

Total NPV Cost	**CAPEX**	**$ 9,400,000**

Check: $ 9,403,930 $ 3,930 rounding

OPEX costs															
Cost values below include 20% contingency		20%													
Power Costs - WWTP	$/yr	$ 267,963					$ 290,052	$ 295,853	$ 301,770	$ 307,805	$ 313,961	$ 320,240	$ 326,645	$ 398,179	$ 485,377
Power Costs - Irrigation	$/yr	$ 12,000					$ 12,989	$ 13,249	$ 13,514	$ 13,784	$ 14,060	$ 14,341	$ 14,628	$ 17,831	$ 21,736
Polymer	$/yr	$ 7,560					$ 8,183	$ 8,347	$ 8,514	$ 8,684	$ 8,858	$ 9,035	$ 9,216	$ 11,234	$ 13,694
Acetic acid	$/yr	$ 160,308					$ 173,523	$ 176,993	$ 180,533	$ 184,144	$ 187,826	$ 191,583	$ 195,415	$ 238,209	$ 290,376
Grit disposal	$/yr	$ 31,075					$ 33,637	$ 34,310	$ 34,996	$ 35,696	$ 36,410	$ 37,138	$ 37,880	$ 46,176	$ 56,288
Screenings disposal	$/yr	$ 29,578					$ 32,016	$ 32,656	$ 33,309	$ 33,975	$ 34,655	$ 35,348	$ 36,055	$ 43,951	$ 53,576
Sludge disposal	$/yr	$ 109,200					$ 118,202	$ 120,566	$ 122,977	$ 125,436	$ 127,945	$ 130,504	$ 133,114	$ 162,265	$ 197,801
WWTP Operations labour	$/yr	$ 72,000					$ 77,935	$ 79,494	$ 81,084	$ 82,705	$ 84,359	$ 86,047	$ 87,768	$ 106,988	$ 130,418
Irrigation system labour	$/yr	$ 8,136					$ 8,807	$ 8,983	$ 9,162	$ 9,346	$ 9,533	$ 9,723	$ 9,918	$ 12,090	$ 14,737
Sampling and lab testing	$/yr	$ 30,000					$ 32,473	$ 33,122	$ 33,785	$ 34,461	$ 35,150	$ 35,853	$ 36,570	$ 44,578	$ 54,341
Maintenance	$/yr	$ 62,844					$ 68,024	$ 69,385	$ 70,773	$ 72,188	$ 73,632	$ 75,104	$ 76,606	$ 93,383	$ 113,833
Total Costs		$ 790,664	$ -	$ -	$ -	$ -	$ 855,840	$ 872,956	$ 890,416	$ 908,224	$ 926,388	$ 944,916	$ 963,814	$ 1,174,884	$ 1,432,178
Discounted Cost			$ -	$ -	$ -	$ -	$ 704,101	$ 683,984	$ 664,442	$ 645,458	$ 627,016	$ 609,101	$ 591,698	$ 442,802	$ 331,374
Cumulative Discounted Cost			$ -	$ -	$ -	$ -	$ 704,101	$ 1,388,086	$ 2,052,527	$ 2,697,985	$ 3,325,001	$ 3,934,103	$ 4,525,801	$ 9,588,295	$ 13,376,847

Total NPV Cost	**OPEX**	**$ 13,380,000**

Sensitivity: General

Concept Design Report

Ellesmere Wastewater Treatment Plant Upgrade

Prepared for Selwyn District Council

Prepared by Beca Limited

22/09/2020

Creative people together transforming our world

Revision History

Revision Nº	Prepared By	Description	Date
1	Jolanta Liutkute, Jon Tweed	Draft for client review	22/9/2020

Document Acceptance

Action	Name	Signed	Date
Prepared by	Jolanta Liutkute		22/9/2020
Reviewed by	Rae Stewart		22/9/2020
Approved by	Paul Reed		22/9/2020
on behalf of	Beca Limited		

Contents

Appendices

Sensitivity: General

Appendix B – Updated Basis of Design

Appendix C – Drawings

Appendix D – Cost Estimate

Appendix E – Ellesmere to Pines Pump Option

Executive Summary

Beca Ltd (Beca) has been engaged by Selwyn District Council (SDC) to undertake a Concept Design of the Ellesmere Wastewater Treatment Plant (WWTP) upgrade as part of the Masterplan to meet the future wastewater disposal needs for the Ellesmere area. This work is a continuation from the previous work SDC undertook on the Ellesmere WWTP upgrade optioneering in 2016 and 2017.

Population statistics suggest that the treatment process is currently operating beyond its intended design capacity. The regularly high nitrogen in the treated wastewater and hydraulic load through the plant confirms this.

This report contains the concept-level study and cost estimate for upgrades to the site to add more treatment capacity to reduce the nitrogen level in the treated wastewater to a design horizon of 2050 based on current estimates of future population growth in the area.

An activated sludge type process (ASP) was selected in the Basis of Design as the preferred option to treat incoming wastewater and achieve the estimated target Nitrogen levels in the treated wastewater. Works to the site that would be needed to convert the existing treatment process to a 100% “in line” activated sludge plant (ASP) include converting the existing Pond 1 into a reactor by adding concrete bund walls to the pond to increase volume, adding mixing and establishing anoxic and aerobic zones, and the installation of a new headworks, a conventional clarifier and onsite solids thickening.

Two options for the ASP concept design were considered, based on achieving different Total Nitrogen (TN) concentrations in the treated wastewater due to the uncertainty around how Condition 7 of the existing discharge consent may be modified or interpreted in future by ECan. The design target concentrations for each option are:

Option 1 – 17 mg/L. This option is based on continuing to irrigate to pasture and complete cut and carry operations as per the existing understanding of Condition 7

Option 2 – 7 mg/L. This option is based on irrigating to pasture at an estimated rate that matches the amount of nitrogen that can be taken up by pasture. Cut and carry operation will not be required.

A Nitrogen balance is being undertaken for SDC by Lowe Environmental Limited (LEI). Once this is complete the assumption around the amount of nitrogen able to be taken up by plants in the irrigation area can be confirmed and Option 2 refined to suit.

Capital cost estimates were prepared to ±50% for the treatment plant upgrade options and estimates of operating cost were also made. Option 1 is estimated to cost $5.5M and have an annual operation cost of $630,000. Option 2 is estimated to cost $5.6M and have an annual operating cost of $750,000.

The two treatment plant upgrade options were then compared to the option of pumping partially treated wastewater (using the existing treatment facilities at Ellesmere) to the Pines WWTP. This option had previously been investigated by Beca for SDC with a cost estimate of $8M to install a 21km pipeline and two pump stations for the preferred route. The estimated annual operating cost for the pumping of wastewater to the Pines WWTP is $200,000.

A high-level multi-criteria analysis was completed. This showed that while the pipeline has the highest capital cost, it offers the benefit of being able to connect other small schemes. Option 1 treatment is a similar overall capital cost to Option 2 but has risks associated with consentability and the does not address existing issues around the ability to undertake cut and carry operations. Options 2 treatment has slightly higher capital and operational costs than Option 1 but has the advantage of being able to graze the existing land.

The proposed next steps for this project are as follows:

- Obtain feedback from LEI on Nitrogen balance
- Meet with ECan to discuss wording and/or changes to Condition 7
- Update options comparison based on Condition 7 requirements and any necessary changes to Option 2 treatment
- Estimate the impact of each option on the Pines WWTP, and associated costs
- Select a preferred option to progress to preliminary design

1 Introduction

1.1 Background

The Selwyn District has one of the fastest population growth rates in New Zealand. Growth along with changes in environment, regulatory and cultural drivers means that parts of the wastewater infrastructure servicing the Ellesmere area (Doyleston, Leeston and Southbridge) may not fully meet the future demands.

The Ellesmere Wastewater Treatment Plant (WWTP) is no longer relying on increasing irrigation disposal areas to meet its nitrogen loading obligations under the existing Recourse Consent as there is no farmland available to extend disposal areas beyond the boundaries of the existing SDC owned land. Therefore, the plant relies on either optimising the existing irrigation system to utilise "dead zones" or upgrading the process to reduce nitrogen concentrations in the treated wastewater. The current catchment zoning has already been extended beyond the plant's capacity and therefore long-term planning needs to come into place to upgrade the plant to meet the future demand.

Currently the Ellesmere WWTP is facing challenges with meeting rates for Nitrogen application to the land under Consent Condition 7. The consent condition wording is being reviewed. To cater for increasing flows and loads, as well as irrigation application rate clarification, Selwyn District Council (SDC) commissioned Beca to develop the concept design for two options to upgrade the Ellesmere WWTP:

- Option 1 – upgrades required to target total nitrogen concentration of 20 mg/L in the treated wastewater
- Option 2 – upgrades required to target total nitrogen concentration of 8.8 mg/L in the treated wastewater

1.2 Purpose of this Report

This report describes the concept of two options and informs SDC of the required upgrades to the Ellesmere WWTP for each option and capital cost to implement the upgrades.

1.3 Scope

As described in *Design and Masterplanning Scope proposal*, the scope of this package of work is:

- Update the Basis of Design document for the two design conditions
- Size the WWTP using the following Total Nitrogen (TN) design targets:
  - Option 1 - TN in the treated wastewater is 17 mg/L
  - Option 2 - TN in the treated wastewater is 7 mg/L

  (Note: These are the design targets which are lower than the upgrade targets to allow for a design buffer.)
- Consider options for reactor size and form – e.g. digging a deeper pond or building up sides of the pond, consideration of a concrete reactor instead of pond modification.
- Recommend suitable upgrade(s) to accommodate WWTP flows and loads for the growth up until 2050
- Prepare Rough Order of Cost (ROC) estimates (Class 5 +/- 50%) for capital and operational costs for both options
- Prepare layout drawings
- Major equipment selection
- Assessment of EI&C requirements
- Utilities assessment
- Overall evaluation of options (high level MCA type analysis)

2 Ellesmere WWTP

2.1 General Information

The Ellesmere WWTP is located at 40 Station Street, South-East of Leeston township. The WWTP is adjacent to farmland and located in close proximity to a commercial zone with the closest neighbour located approximately 200 m away, see Figure 2-1.

Figure 2-1 Aerial photo of Ellesmere WWTP and surrounds (Google)

2.2 Process Overview

The WWTP receives municipal wastewater from the Doyleston, Leeston and Southbridge townships. The site design currently consists of two partially aerated lagoons followed by six maturation cells in series (refer to Figure 2-2) and finally an irrigated land application area. The treatment process was sized for a population of approximately 3,600 residents at the time of construction. The latest SDC population statistics indicate there are approximately 3,900 residents, which suggests the plant is at, or over capacity.

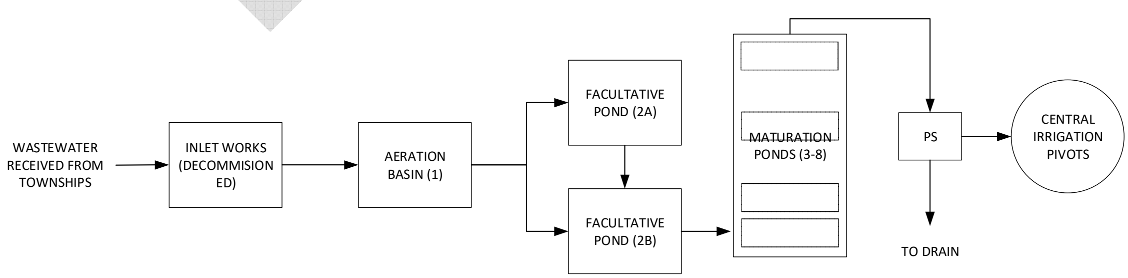


Figure 2-2. Current Treatment Schematic

The treated wastewater is currently either irrigated to the land on site via three centre pivot irrigators or, during high ground water periods, applied to rapid infiltration basins (RIBs) and subsequently delivered to the Tramway Reserve Drain (via. pump abstraction). However, only 3.5% of the total treated wastewater volume can be discharged to the infiltration basins due to the restricted consent allowance.

The WWTP is located in an area lower than the surrounding land, with peat soils and so soakage is poor. Groundwater levels vary from 1.5 m below ground level (bgl) in summer to 0.3 m bgl in winter. This has meant that SDC are often unable to achieve their cut and carry targets due to restricted access when the ground is saturated during winter.

The Ellesmere WWTP is currently relying on increasing irrigation disposal areas to meet its nitrogen loading obligations under its existing Resource Consent. There is a limit to the amount of additional area that can be irrigated. In addition to this, the current catchment zoning has been extended beyond the plant's throughput capacity and long-term planning needs. Therefore, an upgrade to the plant's treatment system will be required to meet the future demand.

2.3 Existing Geotechnical Information

A geotechnical site investigation has been completed by Beca which was presented in *Ellesmere WWTP – Geotechnical Desktop Study* issued 20th April 2020 (Beca Ref: 3364542). This was the second Technical Memorandum (TM) from a series of TMs that have been issued for the project. A summary of the key recommendations are:

- The proposed design and development of the clarifier to be informed by a site-specific geotechnical investigation. Ideally, this investigation would be conducted within the footprint of the proposed clarifier, however as the clarifier will be located within one of the existing wastewater ponds, this may not be practical. Therefore, we propose to drill as close as practical to the location of the new clarifier. Further assessment of the bottom of the pond is also recommended once the pond has been drained, including a visual assessment of the embankments, particularly the intermediate embankments in between pond cells.
- That ground investigations be used to evaluate the insitu soil materials and strengths, which will be used to determine the most appropriate foundation solution. We further recommend that environmental sampling be performed in parallel with the geotechnical investigation to identify potentially contaminated and/or hazardous substances which may be present on site.
- We recommend the following scope of geotechnical investigations:
  - 1x machine borehole with SPT testing at 1.5 m intervals to a depth of 20 m bgl
  - 1x piezometer constructed within the borehole to monitor long-term groundwater levels
  - 2-3x test pits to inform foundation for ancillary infrastructure

The complete report is attached in Appendix A.

2.4 Existing Electrical Supply

At present, power to the site is supplied via a 100kVA transformer. This will need to be upgraded for the future load – refer Section 4.4.2.

3 Basis of Design

3.1 Design Horizon

The plant upgrades are to be sized for the design horizon of 2050. This is a new design horizon from the prior revision (Rev B) of the Basis of Design owing to updated population data being provided by SDC on 14th July 2020. The updated Basis of Design is attached in Appendix B.

3.2 Flows

Beca has undertaken to model future contributions to the wastewater network based on a **revised per capita flow of 250 l/person/day.** This does not include the additional flow from groundwater derived infiltration (GDI). However, for the WWTP process design purpose GDI should be included. Therefore, Average Dry Weather Flow (ADWF) is made up of GDI and wastewater contributed by the township. ADWF was calculated using the equation below:

ADWF = (Per Capita Flow * Population) + GDI

Using the per capita flow rate of 250 l/person/d, the contribution to the plant in 2018 was 931 m^3/day (for the population of 3,723, recorded in 2018). However, flow data collected at the plant inlet indicates that the actual ADWF received from the sewer network was approximately 1,161 m^3/day (or 311 l/p/day) in 2018. As ADWF does not include flow derived from rainfall, it is likely that the additional margin (230 m^3/day) comes from ground water. GDI is assumed constant at 230m^3/day over the project design horizon unless significant improvement is made towards reducing infiltration in the system. We assume that GDI of 230 m^3/day will remain the same in the future.

Recent (2018-2019) flows entering the plant are summarised in Table 3-1. Flow data was recorded on FM599466 prior to entering Ponds 2A and/or 2B approximately every 15 minutes between the 2018 and 2019 period. This recording represents the instantaneous flow rate at that point in time. Future flows have also been estimated.

Table 3-1. Current and Future Estimate Influent Flow Rates

Parameter	Current (18-19)	Future (2050)
Total Per Capita Flow* (m^3/day)	931	1522
Groundwater Derived Infiltration (GDI) (m^3/day)	230	230
Average Dry Weather Flow (ADWF) (m^3/d)	1161	1751
Average Daily Flow (ADF) (m^3/d)	1478	2098
Peak Dry Weather Flow (PDWF) (m^3/d)	2014	3038
Peak Wet Weather Flow (PWWF) (m^3/d)	3105	4683
Peak Instantaneous Flow (PIF) (L/s)	105	158

*Flows only based on population contribution to wastewater network at 250l/p/day

The flow figures in Table 3-1 above have been sourced from the following:

- Current flow data – was recorded on FM599466 prior to entering Ponds 2A and/or 2B approximately every 15 minutes between 2018 and 2019 period.
- Future flow data is based on the following assumptions:
  - Per capita flow rate is 250 L/p/d
  - GDI at 230 m^3/d
  - Ratios determined from current flow data (see Table 3-2. below)

Table 3-2. Flow Ratios (2018-2019)

Ratio	Value
PDWF / ADWF	1.73
AWWF / ADWF	1.27
PWWF / ADWF	2.67
ADF/ADWF	1.20
PIF / PDWF	0.09

The future ADWF was calculated by adding GDI (constant over the design horizon at 230 m³/day unless future works to improve infiltration are anticipated) to the 2050 per capita contribution to the wastewater network. We do not recommend that GDI be removed from the ADWF calculation. The future ADWF was estimated by multiplying the per capita flow (250 l/p/d) by the 2050 population (6086). All other flow parameters were estimated by multiplying respective flow ratios by the future ADWF. Average daily flow of 2,098 m³/d is used for the load calculation.

Figure 3-1 shows the estimated change in influent flow through the plant over a 30-year design horizon.

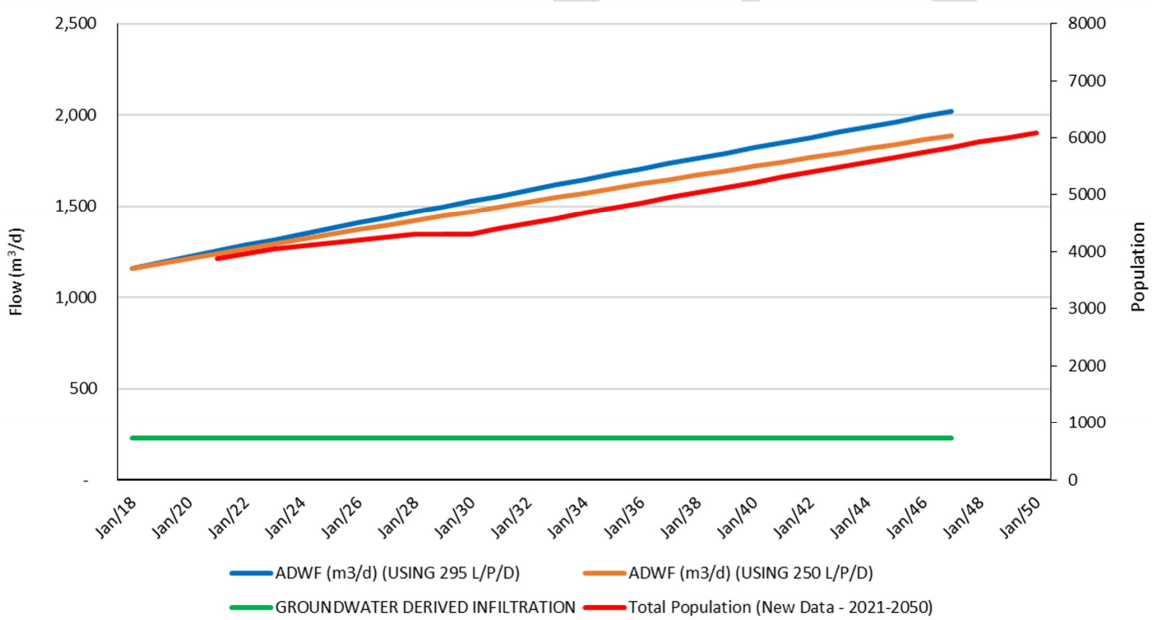


Figure 3-1. Total Flow and Population Estimate (based on ADF)

Furthermore, the normalised diurnal dry weather flow over the 2018-2019 period is provided in Figure 3-2. This was derived from influent plant data recorded every ~15 minutes for periods of no rainfall in the prior 7 days over the same period.

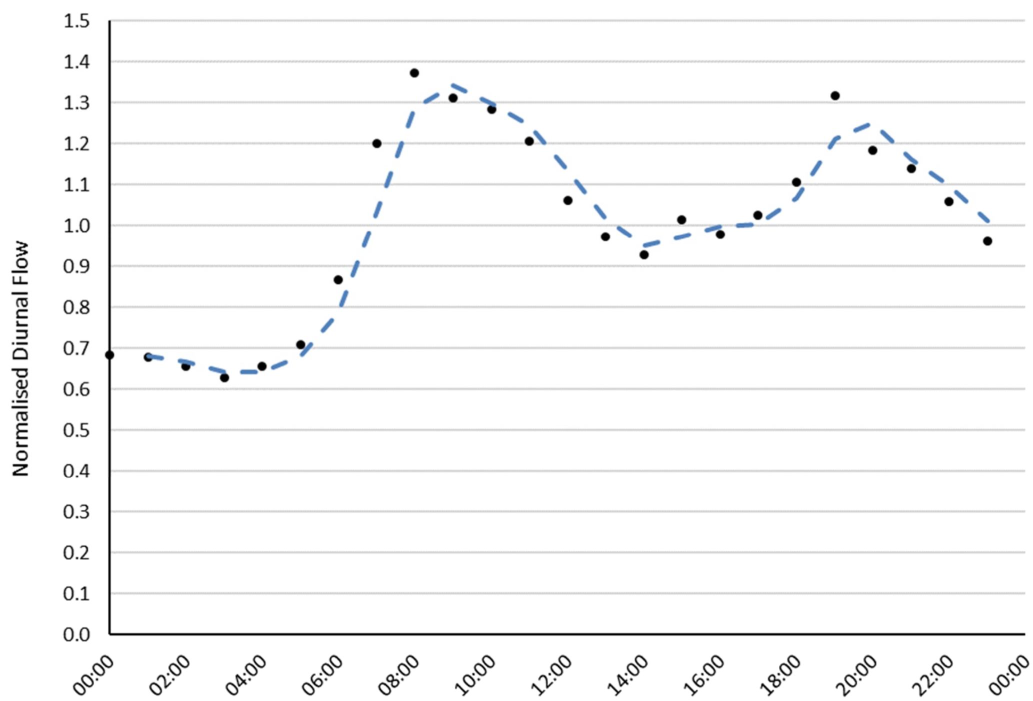


Figure 3-2. Normalised Diurnal dry weather flow for the 2018-2019 period

The diurnal peaking factor for the 2018 – 2019 period is 1.37. This value is proposed for the basis of design.

3.3 Loads

Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), Total Nitrogen (TN), TKN and Total Phosphorus (TP) are the minimum influent characteristics needed to define the future load on the plant. These, as well as additional wastewater characteristics, have been defined in Table 3-3. as the design basis for the WWTP upgrade. The loads are based on the ADFs of 1,478 m³/d and 2,098 m³/d at average concentrations for current and future incoming loads respectively. In *Technical Memorandum 1* we suggested that the future load to the plant could be determined using a typical load per capita, as the sampling data at the time wasn't comparing well with typical wastewater characteristics. However, with the new sampling data we are more confident, that the loads estimated with the new data are adequate to use for the plant design. Therefore, we recommend that the future average load values, as shown in Table 3-3. below, should be used for the upgrade of the Ellesmere WWTP.

Table 3-3. Influent Loads Summary Table

Parameter	Average Concentration (mg/L)	Current Average Load (kg/d)	Future Average Load (kg/d)
ADF		1,487 (m^3/d)	**2,098** (m^3/d)
COD	472	656	**990**
sCOD	127	177	**266**
$cBOD_5$	211	294	**443**
TSS	199	276	**416**
VSS	183	255	**384**
TN	65	90	**136**

Parameter	Average Concentration (mg/L)	Current Average Load (kg/d)	Future Average Load (kg/d)
TKN	65	90	**136**
NH_3-N	46	65	**97**
TP	7.9	11	**17**

It is essential to understand the wastewater characteristics, as the activated sludge treatment plant performance depends on a various type of bacteria. To establish a healthy balance of bacteria for effective nitrogen removal, a ratio of Biochemical Oxygen Demand (BOD), Nitrogen (N) and Phosphorus (P) (i.e. ratio of BOD:N:P) should be balanced. For the optimum conditions in the plant treating municipal wastewater, the ratio is approximately 100:5:1.

From the new sampling data, a BOD:N:P ratio of 100:30:4 was found, indicating there is a significant excess of nitrogen (or alternatively a lack of carbon) and phosphorus in the incoming wastewater. A nitrogen to BOD ratio of 1:4 is commonly used to estimate how much BOD will be required for denitrification[1]. Based on the above ratio it is expected that approx. 192 mg/L to 234 mg/L of additional carbon will be required for nitrogen removal, depending on desired TN concentration in the treated wastewater. From Table 3-3. above, available carbon in the influent on average is 211 mg/L, which is a strong indication that supplementary carbon will be required to achieve higher nitrogen removal. Phosphorus can be removed by using a chemical precipitant.

3.4 Treated Wastewater Quality Required

Treated wastewater target parameters are defined by the discharge consents to land and drain. Currently it is uncertain how and if Discharge Consent Condition 7 will be reworded. The total nitrogen limits are based on 200kg/ha/d of nitrogen leaching to the ground and:

- Option 1 – cut and carry operation removing at least 250 kg/ha/d given total nitrogen application rate of 450 kg/ha/yr.
- Option 2 – total nitrogen application rate 200kg/ha/yr.

Therefore, in preparation for a potential condition change, the target limits for the two options for treated wastewater requirements are summarised in Table 3-4.

Table 3-4 Treated Wastewater limits

Parameter	Units	Average	
		Option 1	**Option 2**
NH_4-N	mg/L	<2	<2
cBOD5	mg/L	20	10
Total Suspended Solids (TSS)	mg/L	20	20
Total Nitrogen (TN)	mg/L	20	8.8
Total Phosphorus (TP)	mg/L	5	5
E-coli	cfu/100/mL	<1000	<1000

[1] Based on data retrieved from ATV-DVWK-A 131E. *Dimensioning of Single Stage Activated Sludge Plants,* assuming:
- X Org. N in WAS = 0.05g/g_{BODrem}
- Effluent of:
  - Sol. Org. N = 2mg/l
  - NO_3-N = 5mg/l

4 Conceptual Design

4.1 Process Selection

An activated sludge type process (ASP) was recommended by Beca in *Ellesmere WWTP – Basis of Design (Technical Memorandum 3)* (refer Appendix B) and adopted by SDC as the preferred option to treat incoming wastewater and achieve the likely necessary target Nitrogen levels in the treated wastewater.

A 100% "in line" activated sludge plant (ASP) option was selected for the upgrades required to meet Nitrogen limits. This option would involve converting the existing Pond 1 into an ASP by establishing anoxic and aerobic zones and including the installation of a headworks, a conventional clarifier and onsite solids thickening.

All incoming flows will be treated in the ASP, therefore Ponds 2A and 2B will not be required as part of the main treatment train after the upgrades. No allowance is made to bypass the ASP under normal operation and allowance has been made in a conventional clarifier to accommodate wet weather flows. The bypass of wet weather flows requires keeping at least one facultative pond in operation. As no flows will be going to the facultative pond during dry periods, it will be impossible to maintain a minimum food/mass ratio and therefore to keep sludge in a healthy condition. A decision not to by-pass wet weather flows was made to prevent a secondary nitrogen contamination from the facultative pond as the nitrogen concentration in the treated wastewater is critical to meet the discharge consent condition.

The ASP concept design includes two options, each of which is aiming to achieve a different Total Nitrogen (TN) concentration in the treated wastewater. The design target concentrations for each option are:

- Option 1 – 17 mg/L
- Option 2 – 7 mg/L

In addition to the nitrogen removal, the ASP also provides a high removal of Total Suspended Solids (TSS) and Biological Oxygen Demand (BOD), which will meet the current consent conditions. At least 20 mg/L of TSS and 20 mg/L of BOD will be achieved in the treated wastewater, however reducing TN to 7 mg/L of TN in the treated wastewater, these treated wastewater parameters will actually be much lower than stated above.

4.2 Process Description

The proposed design includes a new inlet screen and grit removal to treat all incoming flows to protect downstream mixers and avoid grit build-up in the reactor. The indicative location of all elements around the ASP, including inlet works, is at the corner of Pond 2A near Pond 1 and the driveway (see Figure 4-2 below). An existing inlet pump station was designed to lift the flow to the above ground screens (currently decommissioned) inlet works. The indicative location of the new inlet works will be significantly lower than the previous inlet works, therefore it is unlikely that the inlet pumps require an upgrade.

After grit removal, the wastewater will gravitate to the ASP (converted Pond 1) where biological treatment will take place. A PE liner and PE dividing curtains are required to convert Pond 1 into the ASP and establish anoxic and aerobic zones. The proposed conversion follows the need to utilise the existing assets and reduce building costs. For Option 2, embankments are required around the reactor to provide freeboard as almost all the existing Pond 1 freeboard volume is required for the process volume. We propose to use concrete walls to preserve space, but earth embankments could be considered in the next stage of design.

Solids separation is required to remove solids from the treated wastewater. A conventional clarifier is proposed to separate solids after the ASP. A lift pump station is required either for the mixed liquor or clarified treated wastewater depending on whether the clarifier is built above or below the ground. Separated treated wastewater from the clarifier will then be gravitated or pumped into Maturation Pond 3 and will then gravitate through the rest of the Ponds until it is discharged from Pond 8 to the irrigation pump station.

Natural disinfection will occur in Maturation Ponds 3-8, which on average could achieve 10,000 cfu/100 mL E-Coli in the treated wastewater. The discharge consent has an E-coli limit of 30 cfu/100 mL in the Tramway Reserve Drain. Only 3.5% of the flow can be discharged to the Rapid Infiltration Beds (RIBs) and then into the Tramway Reserve Drain, therefore only a very small portion of the total treated wastewater flow needs to achieve a higher degree of disinfection. No disinfection would be required if discharge to the RIBs is discontinued in the future. However, we recommend including a UV unit as a provisional item for 100% of the flow for the following reasons:

- As a mitigation measure if treated wastewater discharge via the RIBs continues
- To mitigate any health and safety risks for central pivot operators
- To mitigate any health and safety risks for members of the public as the irrigation areas are not fenced.

Solids separated in the secondary clarifier will be returned back to the activated sludge reactor anoxic zone to maintain the required mixed liquor suspended solids (MLSS) concentration in the reactor, this is called returned activated sludge (RAS). To maintain the required MLSS a portion of separated solids needs to be removed. This is achieved by wasting activated sludge (WAS) from the secondary clarifier. The proposed sludge management is to take the WAS offsite to the Pines. A sludge thickener is required to reduce the WAS volume and therefore transportation costs.

4.2.1 Proposed Flow Diagram

Figure 4-1 below indicates the proposed upgrades for the Ellesmere WWTP. This introduces an activated sludge reactor in Pond 1 that will treat all incoming flow from Leeston, Doyleston and Southbridge areas up to 2,098 m^3/d. No flow will be bypassed, therefore Ponds 2A and 2B will become redundant once the ASP is established.

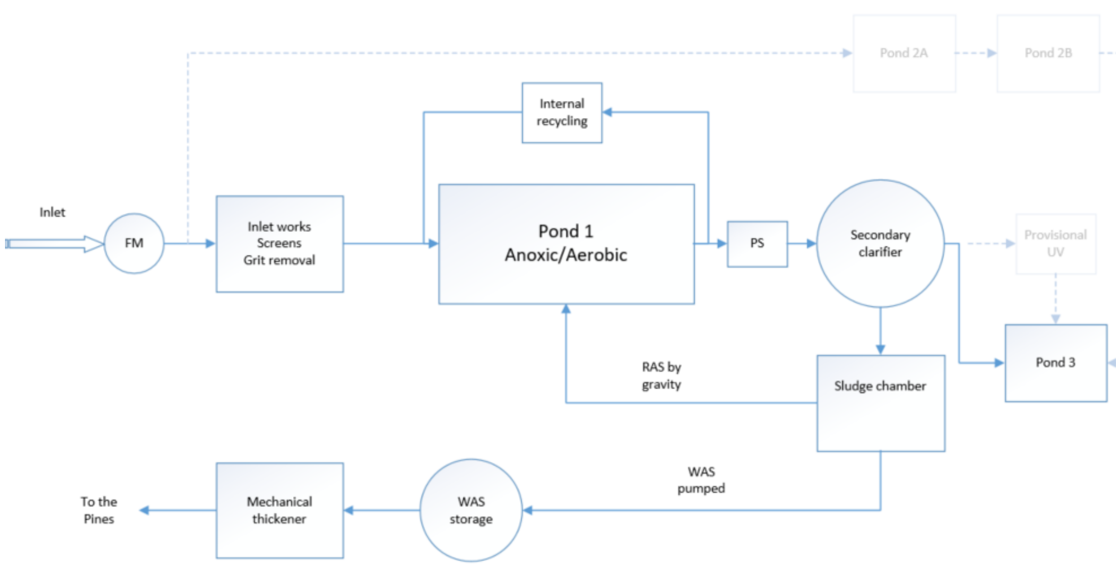


Figure 4-1 Proposed process flow diagram

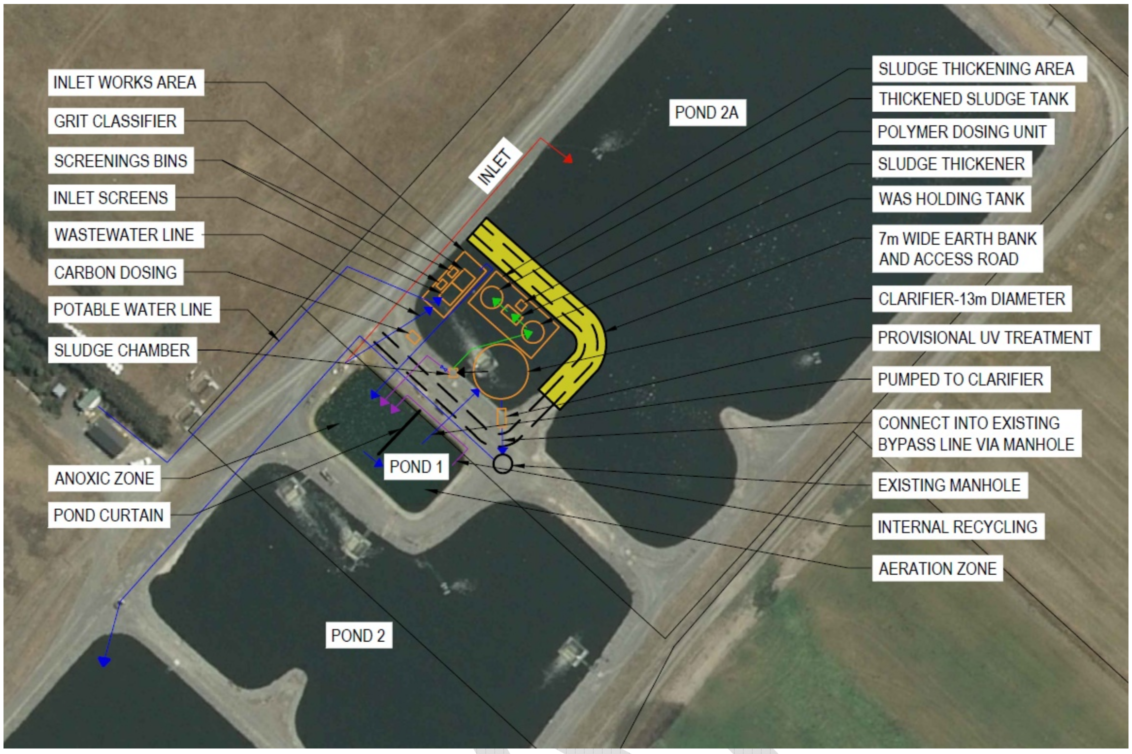


Figure 4-2 Proposed site layout plan

4.3 Key Elements

4.3.1 Inlet Works, Screens and Grit Removal

The proposed inlet works, screen and grit removal sizing is consistent for both treatment options.

Currently the site has decommissioned screens on the northwest bank of aeration Pond 1 in close proximity to the pond slope. See Figure 4-3 below. There is no intention to reconnect these as the screens were failing and causing operational issues. Wastewater currently bypasses the screens and enters the facultative ponds.

Figure 4-3 Decommissioned screens

The proposed design includes a new inlet screen to treat all flows (up to the design PIF of 158 L/s) and provide grit removal. It is proposed to use a combined unit (screens and grit chamber as one unit) which will be installed above ground, allowing wastewater to gravitate to the reactor without the need for a pump. An assessment of the hydraulic profile through the plant is required to determine inlet and outlet levels. A tie-in from the existing inlet point to the new screen is required. A sand separator is required after the grit chamber to avoid sand build up in the reactor. Furthermore, the sand will be part of the RAS and WAS which will cause wear and tear on process equipment in further stages of treatment. A concept example of the structure is provided in Figure 4-4. The channel structure can be constructed from concrete or steel.

Figure 4-4 An example of an above ground combined inlet works installation

4.3.2 Activated Sludge Plant

For both options the ASP will be fed with screened raw domestic wastewater from the grit chamber by gravity. The ASP will consist of a system to take up to 2,098 m^3/d incoming flows (plus associated recycle flows) including aeration system, chemical supply and control system, except a secondary clarifier, which is sized to take peak wet weather flow up to 4,608 m^3/d.

Ancillary requirements, such as a connection point, connecting pipework, waste sludge pumping and storage are also required.

The ASP is sized for the flows and loads described in Section 3.3 assuming that Pond 1 is converted into a reactor. The reactor includes anoxic and aeration zones, RAS flow and internal recycling flow. It is proposed that Pond 1 is lined with a PE liner and divided into zones using a PE curtain (see Figure 4-5 below).

The following Pond 1 dimensions were used for reactor sizing:

- Length – 39 m (top)
- Width – 24m (top)
- Slopes 2:1
- Total depth – 2.93 m
- Max water depth – 2.5 m. Free board – 0.43 m.
- Min water depth – 2.25 m. Free board – 0.68 m.
- Volume – 1,540 m^3 and 1,400 m^3 for Max and Min water level respectively

Reactor Volume Size

Process modelling was undertaken for Option 1 and Option 2 to determine the reactor volume required to achieve a TN target in the treated wastewater at 2050. The required volume for each option is summarised in Table 4-1. The reactor volume is determined on the basis that MLSS concentration will start at approximately 2,300 mg/L and gradually build up to an MLSS of 3,500 mg/L by 2050 and reach design capacity. Reactor volume and dimensions are summarised in Table 4-1.

Table 4-1 Required Reactor volume

	Anoxic volume, m^3	Aerobic volume, m^3	Total Reactor Volume m^3 2050	Pond Water level, m	Available volume, m^3
Option 1	795	795	1,600	2.60	1,594
Option 2	985	987	2,000	2.93*	1,788

*Including free board

Reactor configuration

a. Option 1

For Option 1, to provide the required volume, the existing freeboard will be reduced from 0.43 m to 0.33 m. This would increase the risk of splashing wastewater due to surface aeration and overspills due to wind driven energy. A small earth embankment of 0.2 m could be added on top of the existing embankments to compensate for the lost freeboard height.

b. Option 2

For Option 2, an increase in Pond 1 volume is required to provide the necessary volume for the future reactor. This is proposed to be achieved by building a reinforced concrete wall around the pond on top of the existing embankments to provide an additional 150 m^3. A 0.7 m high reinforced concrete wall around the pond is required for additional volume, this includes 0.5 m freeboard.

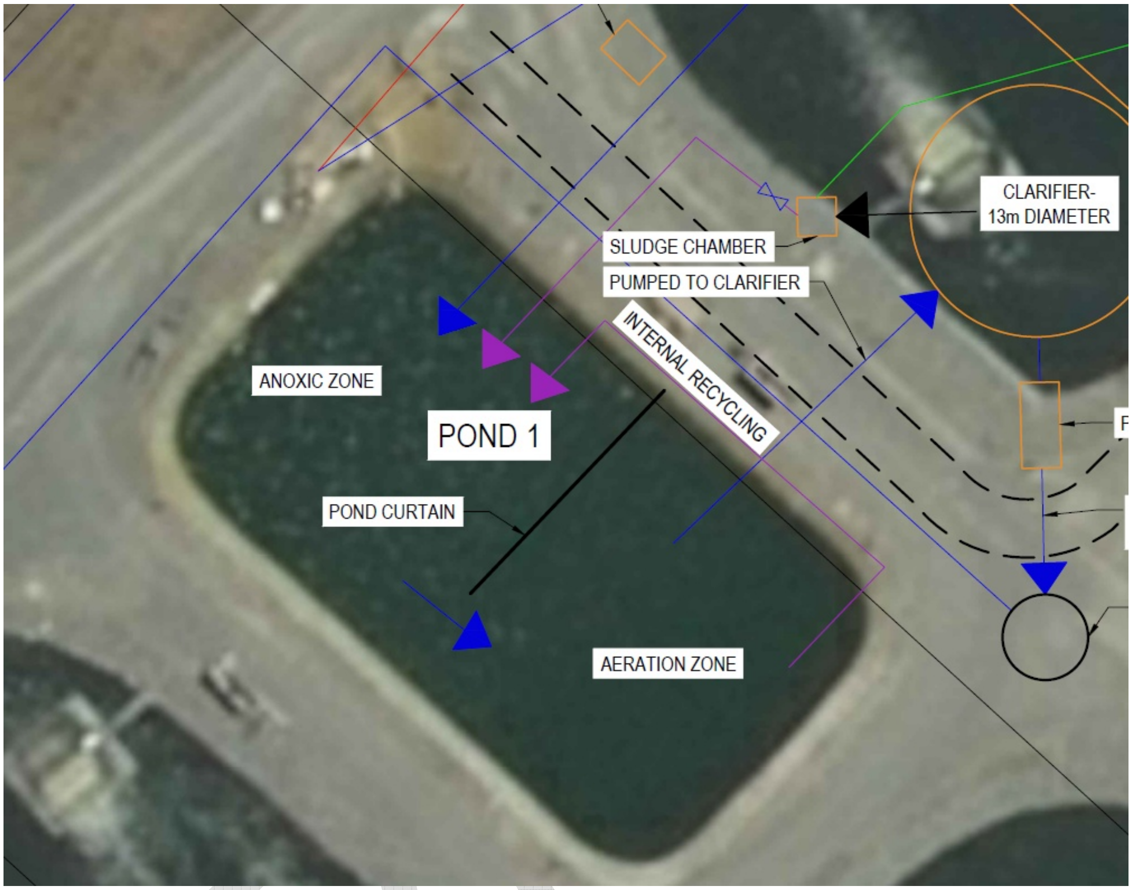


Figure 4-5 Reactor in Pond 1

Pond 1 can be converted into the ASP and achieve the target treated wastewater quality for both options. However, due to the trapezoidal shape of Pond 1, a more detailed mixing design will be required at the preliminary design stage to avoid/minimize “dead” zones in the reactor and minimise the risk of insufficient volume due to these zones.

This report allows for the reactor to be established in Pond 1 to best utilise current assets and for economic reasons. However, a standalone vertical wall reactor could be built, which would eliminate the mixing risk. A “donut” type reactor/clarifier (see Figure 4-6 below) would be an economical way to build an ASP, but still more expensive than modifications required for conversion of Pond 1. This donut type reactor is used at the Te Puke, Oxford, Manukau and Gore Industrial WWTPs. The reactor is essentially “wrapped” around the secondary clarifier, which reduces building costs by eliminating one wall if compared to the rectangular independent reactor and secondary clarifier. For comparison purposes only the approximate sizing of the reactor diameter (wrapped around a 13 m diameter secondary clarifier and assuming reactor depth is 4.5m) for each option would be:

- Option 1 – 26 m
- Option 2 – 28 m

Besides the advantage of efficient mixing this type of reactor would simplify RAS and recirculation flows. Bottom mounted aeration could be installed which can be lifted out for maintenance.

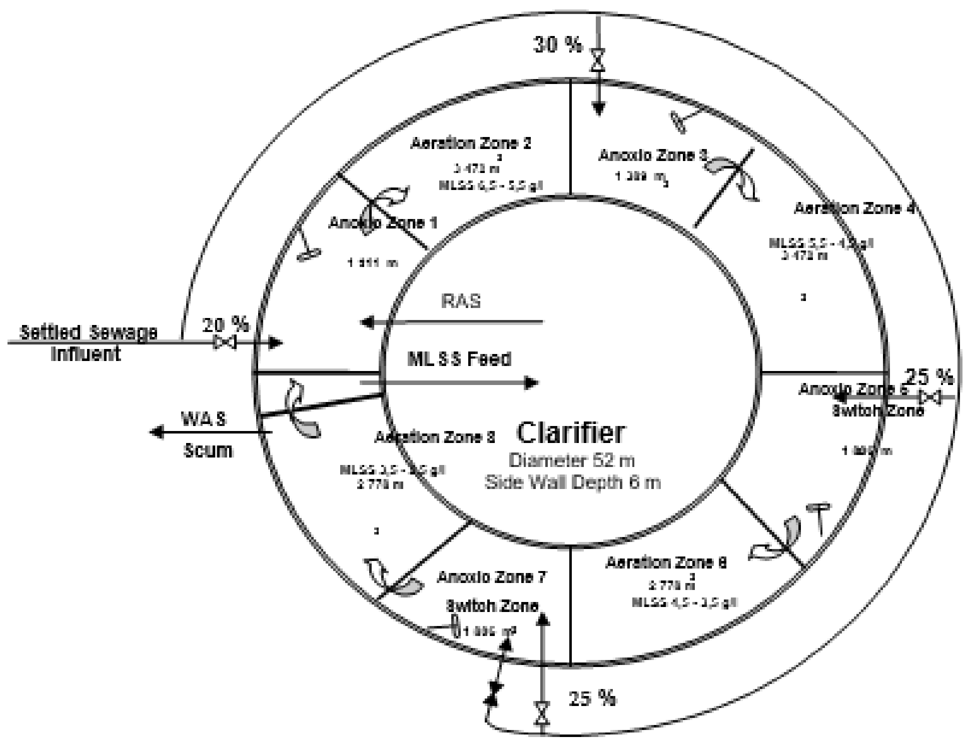


Figure 4-6 Mangere WWTP reactor/clarifier configuration

Mixing and Aeration

A minimum of 5 W/m³ of energy is required to keep MLSS in suspension. The following mixing is required for each option:

- Option 1 – anoxic zone mixer and aeration zone approx. 4.8 kW each – 9.6 kW in total required
- Option 2 – anoxic zone mixer and aeration zone approx. 5.0 kW each – 10.0 kW in total required

Required aeration demand for each option:

- Option 1 - 63 kW
- Option 2 – 61 kW. This option requires lower oxygen demand than Option 1 due to oxygen recovery during denitrification.

Float mounted surface aerators are proposed for ease of installation and maintenance. Aerators can provide the mixing required to keep MLSS in suspension, therefore the mixing energy required in the aeration zones for both options (above) can be compensated by aeration. For aeration purposes the design allows for 3 x 22 kW aerators to improve peak air demand, however for mixing proposes 5 x 15 kW aerators might be required. This is to be confirmed with the supplier during the preliminary design stage. An example of a float mounted surface aerator is provided in Figure 4-7.

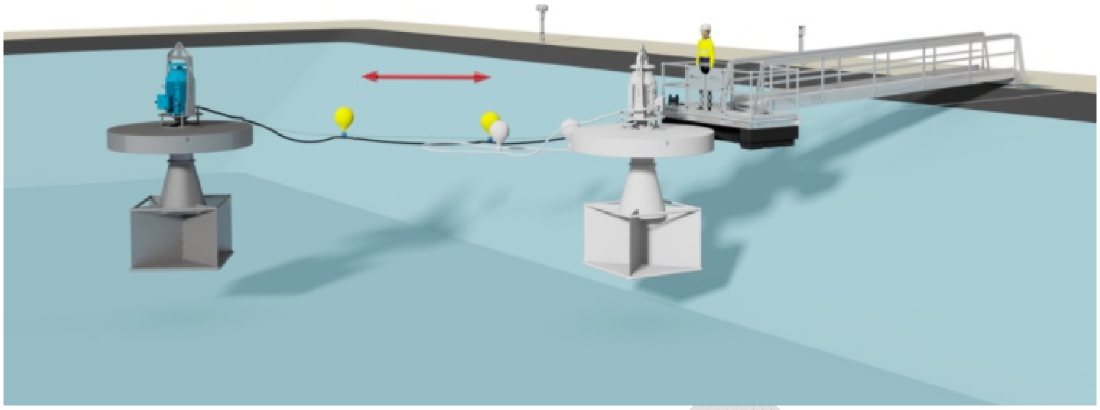


Figure 4-7 Proposed surface aerator type (Aeris Global Ltd picture)

4.3.3 Recycle Flows

Two recycle flows are required for each reactor train in this plant:

- **Internal recycle**

  This recycle is from the aerobic zone to the anoxic zone to recycle sufficient nitrate (NO_3), which is generated in the aerobic zone, for nitrogen removal by denitrification. The following concept design for the internal recycle flow and power is estimated for each option:

  – Option 1 – 2.5 times of the average daily flow or 389 m^3/h, approximately 1.8 kW required.

  – Option 2 – 9.7 times of the average daily flow or 1,545 m^3/h approximately 7 kW required.

Figure 4-8 Possible Internal recycle Station Concept

- **Return Activated Sludge (RAS)**

  This recycle provides sufficient microorganisms (otherwise known as MLSS) to treat wastewater. It also acts to prevent the build-up of solids in the clarifier. The concept design RAS flow is 0.75 times the average daily flow or 118 m^3/h.

4.3.4 Waste Activated Sludge (WAS)

To control MLSS concentration in the reactor and avoid solids build-up in the secondary clarifier, excess activated sludge is removed from the system (also known as wasting). WAS Pumps are proposed to be mounted on a concrete slab as it was done in Te Awamutu WWTP (see Figure 4-9). The estimated power demand of the WAS pumps is 1.1 kW. The predicted future average WAS flow for each option is as follows:

- Option 1 – 35 m^3/d at 0.8% Dry Solids
- Option 2 – 44 m^3/d at 0.8% Dry Solids

Figure 4-9 WAS Pump Station at Te Awamutu

4.3.5 Chemicals

Supplementary Carbon for Denitrification

Based on the currently available influent characterisation and treated wastewater requirements supplementary carbon dosing is required to provide the required levels of treatment. Acetic Acid (90%) is considered as a source of external carbon. A dosing system consists of an IBC and a dosing pump and is proposed to be located next to the inlet works and installed under cover in a bunded area. The following volumes of dosed Acetic Acid are predicted for each option:

- Option 1 – 106 l/d
- Option 2 – 244 l/d

Aluminium Salt for Phosphorus Reduction

The concept design has not allowed for Phosphorus removal; however, this may be necessary for the amended consent conditions. If Phosphorus removal is found to be needed this can be allowed for during the preliminary design stage.

Supplementary Alkalinity for Stable Nitrification

The concept design has not allowed for alkalinity dosing equipment as limited data suggests there is enough alkalinity for stable nitrification. However, alkalinity sampling results should be reviewed during the preliminary design stage and a dosing system added if required.

Polymer for Sludge thickening

Based on the currently estimated WAS and the assumption that powder polymer at 5kg/tonne of DS will be used, the following approximate volumes of polymer are predicted for each option:

- Option 1 – 526 kg/yr
- Option 2 – 630 kg/yr

4.3.6 Clarifier Sizing

A secondary clarifier is required to separate solids from the treated wastewater. The same size clarifier is estimated for both options. A conventional clarifier is proposed which is circular in shape and includes a sludge scraper with rotating bridge and scum removal (see Figure 4-10 below). The estimated clarifier size is 13 m in diameter and 4.5 m deep. The clarifier design parameters are provided in the Table 4-2.

Table 4-2 Clarifier Concept Design Parameters Capacity

Parameter at 2050	Units	Operating	Typical Design
Hydraulic load at ADF	m/h	1.2	0.6 to 1.7
Hydraulic load at peak flow	m/h	1.4	1.7 to 2.3
Solids load at ADF	kg/m^2/h	4	4 to 6
Solids load at peak flow	kg/m^2/h	8	8

It is proposed that the clarifier is installed above the existing pond invert level. There is an option to build it further into the ground so treated wastewater from the reactor can gravitate to the clarifier. However, ground water pumping would likely be required for construction as groundwater levels are high. Treated wastewater from the reactor will require lifting to the clarifier, therefore an above ground pump station (similar to WAS) is proposed at this stage. Should the clarifier be built further below ground, the lifting pump station will be used to lift treated wastewater from the clarifier to Pond 3.

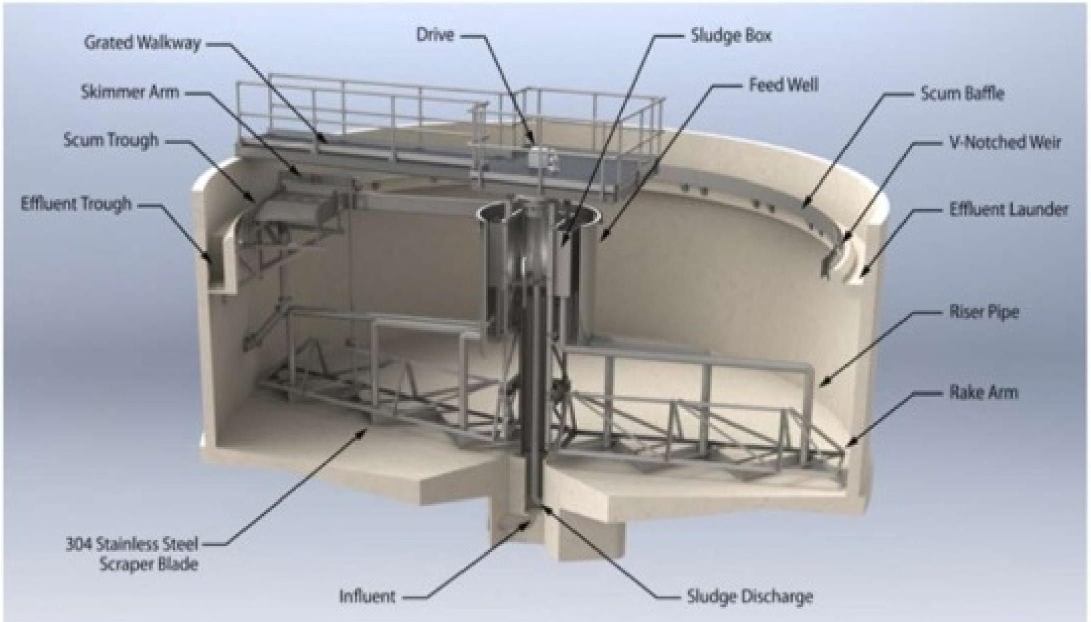


Figure 4-10 Proposed secondary clarifier

The lifting pump station to lift treated wastewater to the clarifier is sized for PWWF 4,683 m^3/d and has an estimated power requirement of 4.4 kW.

An above ground sludge chamber is required from which RAS will gravitate to the anoxic zone and WAS will be pumped out to the WAS holding tank. A manhole riser of 2m Ø and 2 m high with a control valve on the outlet is required which will provide a retention time of 3 minutes.

Treated wastewater from the clarifier will gravitate to maturation Pond 3 through Ponds 4-8 and from there it will go to irrigation as per the current treatment arrangement. The treated wastewater chamber is required to reduce air in the discharge line and provide opportunity to use treated wastewater for site washing. It is proposed to install a 2 m diameter and 2-meter high chamber with hydraulic break. Elevation levels to be determined. A pipe connection will be installed in the chamber to allow treated wastewater reuse for cleaning purposes. The treated wastewater discharge line will tie-in into the existing bypass line via manhole located the bottom of Pond 2A and Pond 1 (see Figure 4-11). A new manhole on the existing bypass line is required.

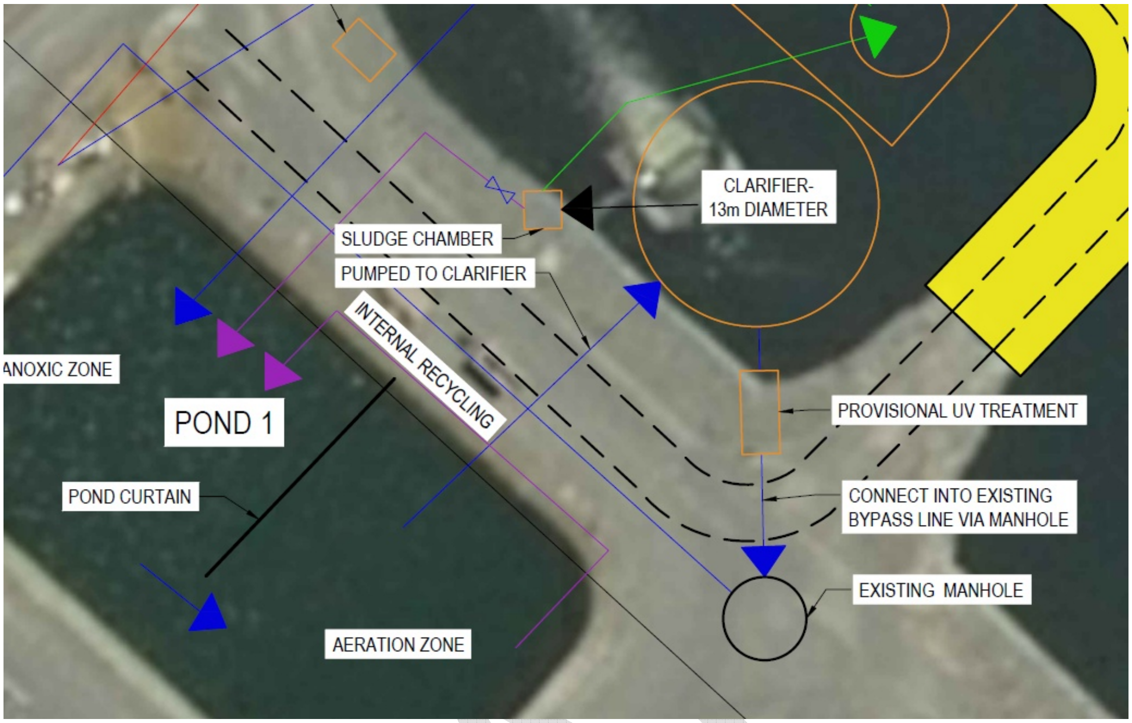


Figure 4-11 Treated wastewater discharge via manhole on existing by-pass line

4.3.7 Solids Management

The proposed sludge management strategy is to thicken the sludge on site and then take it to the Pines WWTP for dewatering and solar drying.

WAS will be pumped from the sludge chamber to a holding tank, from there it will go to a mechanical drum thickener before being trucked to the Pines WWTP. The holding tank size for sludge will depend on the thickener feed requirement, but at this stage a minimum of three days sludge storage should be provided (135 m^3 required with current values). A coarse bubble aeration system is proposed in the holding tank to provide mixing and air to keep the sludge well mixed and prevent odour. The estimated mixing energy required for this duty is 0.5 kW based on a minimum of 5W/m^3 mixing energy.

The sludge is required to be thickened to 5% DS. The thickener and holding tanks will be installed outside on a concrete slab adjacent to the clarifier. A polymer dosing system is required for the mechanical thickener which will be installed adjacent to the thickener.

A further thickened sludge holding tank is proposed to be installed on site to accommodate two days of thickened sludge volume (approx. 45 m^3) so there is a buffer between tanker loads.

4.3.8 Disinfection

It is proposed that provision is made for Ultraviolet (UV) disinfection of the treated wastewater. A channel UV unit can be installed either after the secondary clarifier, before discharging treated wastewater to Maturation Pond 3 or at the irrigation pump station.

We recommend installing the UV unit after the secondary clarifier as this would achieve greater levels of disinfection compared to installation at the irrigation pump station site. This is because the secondary clarifier will produce lower TSS wastewater with higher ultraviolet transmittance (UVT) compared to Pond 8 wastewater, where some algae growth will occur.

Therefore, a higher level of E-coli removal can be achieved by using UV after the secondary clarifier. E-coli is not expected to increase significantly in Ponds 3-8. UVT testing in Pond 8 will be required if the UV unit is located at the irrigation PS to determine what level of treatment can be achieved without removing algae. It is expected that the lower level of disinfection can be achieved for Pond 8 discharge (compared to the recommendation above) without additional improvements to reduce TSS and increase UVT.

4.3.9 Odour

The screens and WAS tanks are potential sources of odour. The screening bins will be covered. Any splashing of the raw wastewater will generate localised odour. Currently there are no odour issues with the raw wastewater going into the facultative Pond 2A via the inverted pipe. The WAS tank is provided with an air source for odour management. There are no houses close to the WWTP site and the closest industrial building is 220 m away from the site. No specific odour treatment is proposed at this time.

4.4 Utilities/ Constraints

4.4.1 Electrical

A preliminary load list has been created for the purpose of determining what power upgrades may be required. The load list is preliminary and based on assumptions that will need to be revisited during preliminary design. The proposed design assumes the following equipment estimates for Option 2, as this option will have the higher power requirements:

- Combined screen - grit removal unit (1.84 kW total)
- Mixers x 4 (9 kW total)
- Aerators x 5 (15 kW each)
- Clarifier x 1 (0.25 kW)
- Internal recycling Pumps duty/stand by x 2 (8 kW total)
- WAS Pumps duty/stand by x 2 (1.1 kW total)
- General light and power (2 kW)
- Sludge thickening and dewatering (0.75 kW)
- Sludge Holding tank (0.5 kW)
- Recycled Treated wastewater for cleaning etc, (2 kW) provisional
- Lifting PS (4.4 kW)
- Total installed capacity approximately ~140kVA
- Contingency capacity 25% minimum

4.4.2 Recommended MCC and Transformer Capacity

Nairn Electrical were consulted to provide information about the existing electrical equipment onsite. At present, power to the site is supplied via a 100kVA transformer. This will need to be upgraded to meet the proposed future load. Beca has made an allowance for future expansion onsite which will require a 150-200kVa transformer be installed. The electrical supplier will be required to produce finalised costing for this upgrade.

Assuming the infiltration pumps and irrigation pumps are not operated concurrently and with diversity across the site, the existing 400A switchboard and cables will be sufficient for the proposed demand. The existing 250kVA genset can be retained, although load shedding may be required during power cuts to keep the total current within the genset's rated capacity of 320A.

The switchboard design drawings also show there is a spare group starter feeder, this will need to be confirmed during later stages of design.

A new Group Starter Cubicle (GSC3) will be required to house the motor starters for the new equipment above.

4.4.3 Potable Water

A potable water connection can be provided from the existing control room. The nominal diameter of the watermain to the site is 50 mm. This assumes a 200 kPa network pressure (SDC Code of Engineering Practice 2012) at which 4L/s can be delivered.

The combined inlet works proposed at the screens will require periodic backwashing to remain functional. The screens require wash water at 2.1 L/s at 500 kPa. This will therefore require a booster pump connection to transfer water from the control room to the inlet works (approximately 80 m away).

Figure 4-12 Potable water line to the inlet works

To service the screens with wash water, the following infrastructure is required:

- 80 m buried connection
- Booster pump to provide water supply at 2.1 L/s at 500 kPa
- Tie-ins to existing infrastructure at the control room

Other requirements for the potable water supply will be developed by the contractor, based on the requirements for the emergency shower, CIP needs, and other ancillary equipment. Treated wastewater may be used for some of these applications to reduce the requirement for potable water. However, UV disinfection will be required for treated wastewater reuse and tertiary filtration may also be needed.

4.5 Instrumentation and Controls

4.5.1 Instrumentation

The following instruments are proposed for the process:

- Anoxic zone:
  - Combined and pH meter
  - Temperature

- Aerobic zone
  - Two DO analysers
  - Nitrate testing kit for onsite lab
  - pH meter
  - Level sensors, ultrasonic and float.
  - Suspended Solids analyser
- Clarifier
  - Level switches as above in the clarifier and sludge chamber
  - Sludge blanket analyser
  - Sludge outlet chamber motorised valve on the RAS line
- WAS holding tank:
  - Level sensors, ultrasonic and float.
  - Flow meter on incoming line
  - Temperature and pressure switches on blower
- Sludge thickener
  - TBC supplier's scope

4.5.2 Control

- Cabinet mounted IO and wiring to accommodate the new EIC equipment, an estimate of the Input/Output requirements is as follows (based upon CONSTRUCTION RECORD drawings)
  - Analogue Inputs – 15 ~ (3 x 8 channel cards)
  - Analogue Outputs – Nil
  - Digital Inputs – 86 (4x 32 channel cards including approximately 25% spare IO)
  - Digital Outputs - 15 (2x 16 channel cards including approximately 25% spare IO)
- RTU Upgrade – To be confirmed
- Software changes to support the new equipment
  - RTU/PLC
  - Local HMI (on-site)
  - Telemetry
  - Remote SCADA

4.6 Civil Requirements

4.6.1 Works associated with Pond 2A

A 7m wide water retaining earth bank will be required in Pond 2A to allow dewatering, geotechnical investigations for foundation design and reclamation of the area proposed for the works. A 3m wide gravel road will be constructed on the top of the earth bank to create a "ring road" to provide vehicle access to the inlet screening bins, thickened sludge tank and polymer dosing unit.

After the geotechnical investigations are completed, approximately 3,000m^3 of compacted pit run will be required to fill the annexed area of Pond 2A up to the existing top of bund level. Pit run is an inexpensive fill material and is readily available from local quarries. The Contractor will be required to construct a temporary ramp down to the pond floor to complete this work and to maintain safe vehicle access during construction.

Reinforced concrete foundation slabs for the Inlet Works Area and Sludge Thickening Area will be constructed on top of the compacted fill. A reinforced concrete foundation slab for the new Clarifier will be constructed in situ at the base of the pond. The proposed Clarifier will be 4.5m deep and is expected to extend approximately 2.5m above ground level. This would be a circular reinforced concrete tank with pre-cast post tensioned walls.

In addition, the following pipework will be required:

- Extension of the existing pipeline to the new Inlet Screen
- New gravity pipe from Inlet Screen to Pond 1
- New rising main from Pond 1 to new ASR plant and Clarifier
- New gravity pipe from new Clarifier to existing manhole
- New rising main from new RAS pump station to WAS Holding Tank
- New actuated valve with controller for RAS to Pond 1, located in precast concrete chamber with lid.
- A temporary connection from the existing inlet to Pond 2A during construction (inlet line relocation – refer to the red line in drawing 3364542-SK-202)
- Scum transfer pipeline
- Alum dosing pipeline
- Ethanol dosing pipeline.

4.6.2 Works relating to preparation of the Pond 1 site

If the option to increase the capacity of Pond 1 is selected (refer 4.3.2b above), a 700mm high reinforced concrete embankment is proposed to be installed around the perimeter of Pond 1.

The existing decommissioned inlet screens will be removed to make room to connect the new inlet screen pipeline.

4.7 Site Layout

Site layout concept schematics are provided on drawings 3364542-SK-202 and 3364542-SK-203 in Appendix C.

5 Cost Estimate

5.1 Estimating Process and Assumptions

An estimate of the likely cost of the two treatment upgrade options has been developed based on the concepts presented in this report and on the investigations (particularly geotechnical) that have been undertaken to date. The estimate is a Class 5 estimate in terms of the AACE Estimating guidelines.

Major plant and process items (e.g. clarifier mechanism and aeration system) have been estimated based on historical data for similar systems with inflation adjustment applied.

Commodity works such as earthworks, concrete and pipework have been estimated by a Beca Quantity Surveyor, based on a basic quantity take off from the concept drawings and contemporary unit rates.

The following contingencies have been included in the estimate:

- Construction contingency of 10%
- Design development allowance of 10% contingency
- FOREX risk of supply cost of process plant and equipment 7% contingency
- No allowance for scope change

No allowance has currently been made within the base estimate for the impacts of extraordinary global events such as the current COVID-19 outbreak. It is not possible at this time to predict or quantify what effect this might have on the overall project cost.

In addition to the 18% contingency and risk allowances included in the base estimate, the 95th percentile estimate provides for approximately an additional 8% contingency, making allowances for uncertainties in the quantities and rates used in the main body of the base estimate.

A full breakdown of the estimate, inclusions and assumptions is included in Appendix D.

5.2 Capital Cost Estimate

The estimated capital costs are shown in Table 5-1:

Table 5-1: Class 5 – Capital Cost Estimate

	Option 1 WWTP	Option 2 WWTP	Pumping to Pines
Most Likely	$5.47M	$5.56M	$8M
'95th%ile'	$5.93M	$6.03M	

5.3 Operational

Operational expenditure (OPEX) estimates have been developed. The OPEX is based upon operational data to date, current and future projected flows and allowances for renewals based on typical life spans for civil, structural, mechanical, electrical and automation elements of the plant make up.

Table 5-2: Operational Cost Estimates

	Option 1 WWTP	Option 2 WWTP	Pumping to Pines
Estimated Annual Operating Cost	$630,000	$750,000	$200,000

6 Risk Considerations

6.1 Project Risk

Key project risks and suggested mitigations are shown in Table 6-1.

Table 6-1 Project Risks

Risk	Consequence	Proposed Mitigation
Consent condition 7 changes are different/harsher than expected	Required treated wastewater quality is not achieved	The WWTP upgrades for Option 2 treated wastewater quality reflect the largest amount of nitrogen reduction that can be achieved without a change in technology
Industry growth in the area higher than anticipated	Activated Sludge Plant is no longer sufficient to achieve treated wastewater quality	SDC can impose limits on the amount and strength of industrial wastewater able to be received at the WWTP
Domestic growth lower than predicted	Activated Sludge Plant is too big – design horizon is extended	Reactor volume is sized based on latest population information with allowance for the future
Domestic growth higher than predicted	Activated Sludge Plant is too small and design horizon is not met	Upgrades will be required before 2050
Failure of existing WWTP assets before upgrade	Compliance failures	Routine maintenance of assets early planning for upgrades
Estimated project budget exceeds available funding	Project delay	Changes in effluent disposal utilization. Alternative disposal options.
WWTP upgrade delay	Treated wastewater unable to meet required limits – ongoing compliance failures	Divert part of the flow to the Pines
Concept phase cost estimate is found to be too low due to unknowns identified later	Project delay	Risks and contingencies to be allowed for in estimate. SDC to add own margins to estimate if appropriate.
Opportunity	**Outcome**	**Means to Exploit**
Use pipeline to the Pines to capture wastewater from other small communities		Size pipeline to the Pines and make allowance for future connections

6.2 Safety in Design

A safety in design workshop is planned for review of the draft concept design of the WWTP upgrades. Safety in design considerations that have been included to date are:

- Allowance for adequate vehicle access
- Recommending provision be made for UV disinfection of the treated wastewater – to reduce potential H&S risks to centre pivot operators and members of the public who may stray into the irrigation area

- Consideration of high groundwater construction risks when determining the depth of the new clarifier

6.2.1 Site Health and Safety

In order to better facilitate safe operation onsite, the following will be considered in the next stages of design:

- External peripheral walkway with handrails for the reactor and Clarifier structures
- Stairs and handrails for the reactor and Clarifier structures
- Traffic management features such as bollards and designated truck loading areas for emptying the screenings bin, removal of grit, removal of thickened sludge and delivery of chemicals
- Fences.

7 Comparison of Options

7.1 Upgrade to Ellesmere WWTP

Two options for the upgrades required at Ellesmere WWTP to meet discharge consent conditions for current and future population have been developed. The decision on which upgrade option is selected is driven by the discharge consent conditions around total nitrogen in the treated wastewater.

Currently there are investigations being undertaken to establish a nitrogen balance for the scheme. The findings of this work will have an impact on the level of treatment that is needed. Therefore, the decision on which option to adopt should be made after receiving the re-worded discharge consent and nitrogen balance. The upgrade options can then be refined if required, before the decision is made as to which option will be taken forward to preliminary design.

7.2 Pumping Wastewater to the Pines WWTP

In addition to the WWTP upgrade options, Beca investigated the possibility of meeting future wastewater disposal needs by conveying partly treated wastewater from Ellesmere WWTP to the Pines WWTP. The pipeline concept design, including cost estimate, was provided to SDC in the report "Pipeline from Ellesmere WWTP to Pines WWTP", Beca, 19th June 2020 (refer Appendix E). The following is a summary of this report:

- Ellesmere WWTP discharges treated wastewater to the land surrounding the plant. Disposal can be problematic due to the high nitrogen concentrations and the high groundwater table in winter.
- A pipeline is to be considered to connect the Ellesmere WWTP to Pines WWTP to meet the future wastewater disposal needs for the Ellesmere area by conveying the wastewater to Pines WWTP where there is sufficient area for the disposal.
- A pump flow rate of 45 l/s was estimated to be used to convey treated effluent. This is based on ADWF plus an allowance for conveying wet weather flow. This relies on at least 150 mm of pond height for buffering the inflows to the plant.
- A 21 km, DNOD280 SDR 17 PE100 pipeline is proposed to be installed in the roadway and cross the Selwyn River at the existing bridge on Selwyn Leeston Rd, to convey the wastewater.
- An alternative 18 km pipe route is possible however this would require crossing private land.
- Two mainline pump stations are proposed:
- A dry mounted pump set at Ellesmere WWTP adjacent to the ponds with a new suction line into the ponds. Pumps to be duty, standby located in a new shed with VSD, and controls and SCADA.
- A new wet well and submersible pumps located in the reserve on Leeston Road adjacent to the Selwyn River, near Chamberlain's Ford. Pumps to be duty, standby with VSD, controls and SCADA.
- A preliminary cost estimate to install the pipeline and pumps is $8,000,000 + GST. (including a 25% contingency).
- No estimate has been made for what additional costs may be required at the Pines WWTP.

7.3 Options Comparison

Table 7 1 compares the options of Ellesmere WWTP upgrades with conveying partially treated wastewater to the Pines.

Table 7-1 Options comparison

Item	Option 1 WWTP Upgrade	Option 2 WWTP Upgrade	Pipeline to the Pines WWTP
WWTP Upgrades	New inlet works, Pond 1 lining and dividing curtain, lifting PS to the secondary clarifier, Sludge thickener, potable water booster pump, external carbon dosing equipment provisional UV unit.		None
Key differences	0.2 m earth bund around Pond 1 to provide sufficient free board. Smaller internal recycle pumps. Less external carbon required. Lower solids production.	0.7 m concrete wall around Pond 1 to provide sufficient volume and free board. Bigger internal recycle pumps. More external carbon required. Higher solids production.	Treated wastewater quality improvement will be achieved in the Pines WWTP
Advantages	Improved treated wastewater quality for TSS and TN	Improved treated wastewater quality for TSS and TN No cut and carry operation required Year-round treated wastewater disposal, (providing hydraulic loading allows).	No upgrades required to Ellesmere WWTP Solids management from further treated wastewater improvement at the Pines WWTP.
Disadvantages	Solids management Chemical handing Year-round disposal might not be an option, depending on Nitrogen balance. Cut and carry operation to be continued providing Condition 7 allows	Solids management Chemical handling	Treatment required at the Pines WWTP Operational costs at both Ellesmere WWTP and Pines WWTP, plus addition of pumping costs
TN in the treated wastewater	20 mg/l	8.8 mg/l	Current
Constructability	Have to keep existing plant running throughout construction– site H&S risks with operational plant and working around water	Have to keep existing plant running throughout construction– site H&S risks with operational plant and working around water	21 km line proposed along Council controlled roads. Some high groundwater and silts along alignment. Largely BAU design and construction.
Operability	More complex operation compared to existing system	More complex operation compared to existing and Option 1 system, experienced operator required.	Simple

Risks	Dead zones in the reactor, therefore reduced active volume Odour Not relevant due Condition 7 changes Geotechnical investigations may indicate need for major ground improvements	Risk of reversing Nitrates to Ammonia in the treated wastewater before it gets to the Pines WWTP, which will require more treatment.

The considerations outlined in detail in Table 7-1 have been converted into a high level multi criteria analysis as shown in Table 7-2.

Table 7-2 MCA Comparison

Category	Criteria	Option 1 WWTP (20 mg/L Nitrogen)	Option 2 WWTP (8 mg/L Nitrogen)	Pumping to Pines
Capital Cost (most likely)		$5,470,000	$5,560,000	$8,000,000
Opex Cost	Operating cost	Higher operational cost at Leeston	Higher operational cost at Leeston	Pumping costs but less opex at Leeston
Consentability	Difficulty associated with obtaining consent for proposed scheme	ECan may not agree to this	Likely to be easier to consent based on 200kg/ha/yr current rate for grazed land (no C&C required)	Pines already has consent for increased flow
Programme	Ability to implement to SDC preferred timeline	Likely to take longer than PSs and pipeline. Time needed to agree consent first.	Likely to take longer than PS and pipeline. Time needed to agree consent first	Pump station and pipeline are BAU type projects that could be started quickly
Resilience/ future proofing	Process stability and ability to expand in future	Need to build above ground reactor if more capacity is needed. No more land available for irrigation	Need to build above ground reactor if more capacity is needed	PE pipeline robust. Could add in extra flow connections as area develops. Add additional PSs for extra flow.
Environmental impact		Higher chance of nitrogen leaching to ground – depending on cut and carry operation	Could graze land, low Nitrogen to ground	Emissions associated with pump operation; energy intense. Further cost to process at Pines
Ease of Operation	Degree of operator involvement required and similarity to other SDC infrastructure	More complex than existing	Complex – need specialist operator	Simple to operate
Benefits to wider community	Ability to connect in smaller rural schemes	Unlikely to add further schemes as constrained by discharge consent	Some capacity for further load to be added	Can pick up small schemes along the pipeline

7.4 Conclusions and Recommendations

A high-level review of the different options indicates that the options with the most benefits are upgrading the Ellesmere WWTP to achieve treated wastewater low in nitrogen or pumping partially treated wastewater to the Pines.

The proposed next steps for this project are as follows:

- Obtain feedback from LEI on Nitrogen balance
- Meet with ECan to discuss wording and/or changes to Condition 7
- Update options comparison based on Condition 7 requirements and any necessary changes to Option 2 treatment
- Estimate the impact of each option on the Pines WWTP, and associated costs
- Select a preferred option to progress to preliminary design

A

Appendix A – Geotechnical Investigation Report

Memorandum

To:	Paul Reed	**Date:**	20 April 2020
From:	David Dobson	**Our Ref:**	3364542
Copy:	Jim Dabkowski		
Subject:	Ellesmere WWTP - Geotechnical Desktop Study		

1 Introduction

1.1 Background

Beca Limited (Beca) has been commissioned by Selwyn District Council (SDC) to undertake a geotechnical desktop study for the proposed upgrade of the Ellesmere Wastewater Treatment Plant (WWTP) located at 40 Station Street, Leeston. Beca undertook design and construction monitoring of the existing aeration lagoons and maturation cell embankments in 2002 to 2003 (Beca Ref: 6511236).

The Ellesmere WWTP is currently relying on increasing irrigation disposal areas to meet its nitrogen loading obligations under its existing Recourse Consent. In addition, the current catchment zoning has been extended beyond the plant's throughput capacity and long-term planning needs. Therefore, an upgrade(s) the plant's treatment system will be required to meet future demand.

The proposed upgrade includes a 14m diameter, 4m deep clarifier and ancillary infrastructure. The ancillary infrastructure includes a pump station and reactor at location to be confirmed during design. This study is based on siting the clarifier within an existing aeration lagoon as illustrated in Figure 1.

This desktop study presents collated available geotechnical data, discusses anticipated ground conditions, and assesses potential geotechnical hazards. A review of available information pertaining to design and construction of the settlement ponds and embankments has been included in this study and concludes with recommendations for future development and site-specific investigations.

Figure 1: Ellesmere WWTP – proposed clarifier location (*Google Earth, 2020*)

1.2 Site Location and Description

The Ellesmere WWTP is located in the Leeston township and receives municipal wastewater from the Doyleston, Leeston, and Southbridge townships. The wastewater treatment and irrigation areas cover approximately 58 ha as shown on Figure 2.

The site currently consists of two partially aerated lagoons followed by six maturation cells in series. The treated wastewater is currently either irrigated to the land on site via three centre pivot irrigators or, during high ground water periods, applied to rapid infiltration basins and subsequently pump abstracted and delivered to the Tramway Reserve Drain. The WWTP site is lower than the surrounding land and soakage is very poor.

A review of Beca design drawings for the existing aeration lagoons and maturation cell embankments shows base pond construction consisted of a Bentofix X1000 geosynthetic clay liner placed on a compacted native subgrade, topped with compacted rounded silty gravel. The review shows the following construction for the lagoon and maturation cell external bunds:

- Approximate height of 2.5m
- Gradient of 2H:1V (internal) and 3H:1V (external)
- Primary construction material: selected compacted rounded, silty gravel
- Internal berm lining: Bentofix X2000, 75mm AP65, 75mm AP25-75, 150mm Riprap (AP80-150)
- External berm lining: vegetated

For the internal bunds, construction corresponds with the external bunds yet excludes the Bentomax X2000 lining and comprises a consistent gradient of 2H:1V on both slopes. Internal rock filter embankments are approximately 1.7m in height, constructed of AP80-150 at 1.5H:1V gradients with no lining.

The site is bordered by Station Street to the northwest, private pastures to the northeast, Beethams Road to the southeast, and Leeston and Lakes Road to the southwest. The site is relatively flat with a surface elevation of approximately 15m (New Zealand Geodic Datum 2000). The nearest water body to the site (not considering irrigation ditches) is Lake Ellesmere approximately 5km south of the site.

A review of municipal utilities has been conducted and can be referred to within Figure 1. Buried utilities in proximity of the site include water trunk mains (blue), stormwater (green), and wastewater (red) services (Water Services Layer, Canterbury Maps, 2020). Additional buried services may be present on site which have not been identified in this desktop study.

Figure 2: Ellesmere WWTP - site extents (shaded) and municipal services (*Canterbury Maps, 2020*)

1.3 Site Geology

The relevant published Geological Map of the Christchurch Area (Forsyth, Barrell and Jongens, 2008) shows the site to be underlain by the Holocene (< 10,000 years) aged Christchurch Formation. The post-glacial Christchurch Formation is comprised of unweathered, variably sorted fluvial channel sands and gravels with overbank sand and silt sediments deposited by meandering and braided river channels.

The GNS New Zealand Active Faults database (2020) indicates that the nearest mapped active fault is the Greendale Fault, passing west-east, approximately 20km north of the site. Additional unknown or unmapped faults may be present in closer proximity of the site, which have not been identified in this study.

1.4 Previous Investigations

A review of the Beca archives and the New Zealand Geotechnical Database (NZGD, 2020) has identified existing investigative data both on and adjacent to the site. A plan showing existing investigation locations in proximity of the site is presented in Figure 3.

Test pits were conducted on site by Beca (2002) to inform design of the ponds and embankments. Photographs of the test pits have been reviewed and show topsoil to approximately 0.3m bgl, followed by sandy or silty gravel to approximately 1.5m bgl, with average groundwater level encountered between 1.0 to 1.5m bgl.

Publicly available investigation data is limited to shallow data comprising of hand augers and test pits to average depths of maximum depth of 0.8 to 2.0m, respectively. The investigations show, on average, topsoil to 0.3m followed by silt to between 0.6 to 1.2m below ground surface (bgl). This is underlain by sandy gravels to 2.0m, with average groundwater measurements of 1.0 to 1.2m bgl.

A review of well construction records sourced from the Canterbury Maps database (Well Search, 2020) shows well number M36/0424 was constructed to a depth of 12.8m approximately 1.8km northwest of the site. A bore log is available for the well, detailing topsoil and silt to a depth of 0.9m, followed by sandy and/or silty gravel to 12.8m bgl.

Figure 3: Previous investigations. (Image retrieved from the NZGD, 2020)

1.5 Ground Profile

A projected ground profile has been developed from available investigative data and is summarised in Table 1. This profile is projected from available data and may not represent actual site conditions.

Table 1: Ellesmere WWTP - Generalised Ground Profile

Unit No.	Material Description	Depth to Top of Unit (m, bgl)	Thickness (m)
1	SILT and or/ SAND [Topsoil]	0	0.3
2	Sandy fine to coarse GRAVEL	0.3	>10

1.6 Groundwater

A review of groundwater records sourced from the Canterbury Maps database (Well Search, 2020) shows well M36/0424 is located approximately 1.8km northeast of the site. Records indicate the depth to groundwater ranges from May 2019 to March 2020 from 0.0 to 3.0m bgl.

A Climate Variation report was conducted by Aqualink Research Limited for SDC (Aqualink, 2016), in which groundwater modelling was conducted. The report includes regional and localised groundwater monitoring wells, including M36/0424. The report states that ‘shallow groundwater levels and drainage’ occur on the site and surrounding area.

1.7 Historical Land Use / Contaminated Ground

The Listed Land Use Register (LLUR), operated by Environment Canterbury, is a publicly available database of registered sites in which hazardous activities and industries have taken place. An enquiry was submitted for the site which returned the following lot descriptions: Lot 1 DP 29488, Lot 1 DP 69263, and Lot 1 DP 70552. The site is registered on the LLUR under the Hazardous Activities and Industries List (HAIL). The only registration is for its current use, recorded from 1975 to present day, as 'waste recycling or waste or wastewater treatment'.

The earliest accessible historical aerial photographs (sourced from http://retrolens.nz and licensed by LINZ CC-BY 3.0, 2020) show the site was used for agriculture from 1942 to 1975. The existing land use (wastewater treatment) and site boundaries have been in place since 1975 (refer Figure 4), with construction of the first wastewater pond.

The presence of contaminated materials and/or hazardous substances is likely considering the current use of the site. This should be confirmed by soil sampling and laboratory analysis. We recommend that contamination testing be included within the scope of a detailed site investigation prior to further development of the site.

Figure 4: Historical photograph detailing first use for wastewater treatment, 1975 *(Retrolens, 2020)*

2 Geotechnical Hazards Assessment

2.1 Site-Specific Seismic Demand

Seismic loads were computed for the site according to the methodology outlined within the MBIE Earthquake Geotechnical Engineering Practice (MBIE, 2016) for the Canterbury Earthquake Region (CER). This document states recommended values for earthquake peak ground acceleration (PGA) and effective magnitude (Mw) for the CER, to be compared with values calculated according to the methodology outlined in the NZ Transport Agency Bridge Manual (Version 3.3) as recommended by the MBIE Guidance for the Assessment of Liquefaction Hazards (NZGS, 2016). The greater of the resulting PGA/Mw combinations should be adopted for design purposes.

Two earthquake limit state load cases would be considered for the site; the Serviceability Limit State (SLS) and Ultimate Limit State (ULS):

- For a SLS design earthquake: The structure is “intended to be used without the need for repair”.
- For a ULS design earthquake: The structure is required to maintain life safety of the building’s occupants and ensure the structural integrity of the building is not lost following the event

In the absence of importance level and design life, we have assumed an importance level of 3 and a design life of 100 years. The recommended annual probability of exceedance, unscaled PGA, and Mw for the site are summarized in Table 2.

Table 2: Peak Ground Acceleration and Effective Magnitude for the site (as per MBIE EGMP 2016)

Limit State Load	Annual Probability of Exceedance (yr)	Effective Magnitude (Mw)	Peak Ground Acceleration (PGA)	Methodology Comment
SLS	1/25	7.5	0.13	MBIE Module 3 (2016) Resulting worst case scenario to be adopted
SLS	1/25	6.0	0.19	
ULS	1/2500	7.5	0.61	NZS 1170.0 / BM v3.3

2.2 Liquefaction

Liquefaction may occur in loosely consolidated and saturated deposits as earthquake-induced cyclic shearing causes pore-water pressures to increase and exceed the static confining pressures, resulting in significant loss of stiffness and strength. Surface effects of liquefaction typically include surface cracking and permanent ground deformations such as vertical settlements and lateral displacements.

Strain softening may additionally occur in soft and high plasticity silts and clays during earthquakes as earthquake-induced cyclic shearing causes deformation of the deposit and results in a loss of soil strength. Surface effects typically include differential settlements of the ground surface.

A review of the Canterbury Geotechnical Database (Earthquake Commission, 2013) resulted in no information pertaining to earthquake performance of the site during the Canterbury Earthquake Sequence, and the publicly available geotechnical information for the site is insufficient to perform a quantitative liquefaction assessment. The site is anticipated to be underlain by loosely consolidated sedimentary deposits which could be susceptible to liquefaction. For any future development, an assessment of the likelihood of liquefaction is required for deposits identified as being potentially susceptible to liquefaction, as set out in MBIE Guidance for the Assessment of Liquefaction Hazards (NZGS, 2016). A site-specific geotechnical investigation will be required to identify liquefaction-susceptible deposits.

2.3 Lateral Spreading

Lateral spread is the movement and consequential cracking of the ground surface that may be observed following liquefaction which translates towards nearby riverbanks, slopes, or cuttings (i.e. free faces). The assessment of lateral spread is complex, with many phenomena influencing the predicted magnitude of displacement. Variations in ground conditions (as observed across the site), groundwater levels, pore pressure dissipation pathways, and free face heights affect the assessment.

Two aeration lagoons and six maturation cells exist on site with engineered embankments rising approximately 2.6m above the surrounding ground level. The embankments are constructed of compacted rounded, silty gravel with an internal geosynthetic clay liner. We anticipate that lined, well-constructed and maintained embankments showing no signs of leakage are unlikely to be susceptible to lateral spreading. And the flat land surrounding the ponds are also unlikely to be susceptible to lateral spreading. Further site-specific assessment of the embankment condition is recommended during the site investigation.

2.4 Fault Rupture Hazard

No active recorded faults pass through the site, therefore the risk of direct fault rupture affecting the site is considered low.

2.5 Slope Stability

The site is generally flat and not within proximity of slopes, therefore site slope stability is not considered to be a risk. Settlement pond embankments may be susceptible to slope instability during a seismic event, which can be assessed during later stages of design.

2.6 Soft/Weak Ground

The clarifier is proposed to be constructed within one of the existing wastewater treatment ponds. Depending on how the pond was constructed, unsuitable surficial soils may need to be removed and replaced with compacted engineered fill. Alternatively, if gravels are found below the pond, the clarifier could be founded directly on those materials. This will be assessed during the geotechnical investigation and design.

3 Recommendations

We recommend that the proposed design and development of the clarifier be informed by a site-specific geotechnical investigation. Ideally, this investigation would be conducted within the footprint of the proposed clarifier, however as the clarifier will be located within one of the existing wastewater ponds, this may not be practical. Therefore, we propose to drill as close as practical to the location of the new clarifier. Further assessment of the bottom of the pond is also recommend once the pond has been drained. This may also include a visual assessment of the embankments, particularly the intermediate embankments in-between pond cells.

Ground investigations will be used to evaluate the insitu soil materials and strengths, which will be used to determine the most appropriate foundation solution. We further recommend that environmental sampling be performed in parallel with the geotechnical investigation to identify potentially contaminated and/or hazardous substances which may be present on site.

We recommend the following scope of geotechnical investigations:

- 1x machine borehole with SPT testing at 1.5m intervals to a depth of 20m bgl
- 1x piezometer constructed within the borehole to monitor long-term groundwater levels
- 2-3x test pits to inform foundation for ancillary infrastructure

The final depth of the borehole will be determined on site once the underlying geology is better understood. If competent gravels around found near the surface and to a reasonable depth, it may not be necessary to advance the borehole the full 20m.

David Dobson
Engineering Geologist
Phone Number: +64 3 366 3521
Email: david.dobson@beca.com

4 Applicability Statement

This report has been prepared by Beca on the specific instructions of our Client. It is solely for our Client's use for the purpose for which it is intended in accordance with the agreed scope of work. Any use or reliance by any person contrary to the above, to which Beca has not given its prior written consent, is at that person's own risk.

Should you be in any doubt as to the applicability of this report for the proposed development described herein, it is essential that you carry out independent investigations and analysis to satisfy your needs.

5 References

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B

Appendix B – Updated Basis of Design

Selwyn District Council
PO Box 90
Rolleston 7643
New Zealand

15 September 2020

Attention: Alex Ross

Dear Alex,

Ellesmere WWTP – Basis of Design (Technical Memorandum 3)

1 Introduction

1.1 Background

The Selwyn District has one of the fastest population growth rates in New Zealand. Growth along with changes in environment, regulatory and cultural drivers mean that parts of the wastewater infrastructure servicing the Ellesmere area (Doyleston, Leeston and Southbridge) may not fully meet the future demands.

1.2 Purpose

Beca Ltd (Beca) has been engaged by Selwyn District Council (SDC) to undertake a Preliminary Design of the Ellesmere Wastewater Treatment Plant (WWTP) upgrade as part of the Masterplan to meet the future wastewater disposal needs for the Ellesmere area. This work is a continuation from the previous work SDC undertook on WWTP upgrade optioneering in 2016 and 2017.

This memorandum provides the assumptions and parameters used to form the basis of design for the preliminary design of future upgrades. This is the third document in a series of technical memoranda and will be appended to the Concept Design Report.

1.3 Scope

The preparation of this report includes the following work:

- Design Horizon
- Flows and Loads Assessment[1]
- Discharge (Treated Wastewater) Requirements
- Site Requirements

1.4 Process Description

The Ellesmere WWTP is owned and operated by Selwyn District Council. The site is located at 40 Station Street, Leeston. Ellesmere WWTP receives municipal wastewater from the Doyleston, Leeston and Southbridge townships. A number of changes to the WWTP have been made over prior decades:

[1] Additional data has been received since the last Technical Memorandum issue.

- **1975:** Reticulation and an oxidation pond were installed to replace the "night cart" service for the township and sullage that went to local waterways (Tramway Reserve Drain) from side channels.
- **1993:** Two pump stations were substantially upgraded along with installation of an aeration pond to increase treatment capacity.
- **2003**: Further extension of the treatment system occurs with additional ponds and the upgrading of the wastewater disposal system. The total capacity of the treatment after extension increased to 3,600 people.
- **2014**: Further 13.2 ha Pivot irrigation application added bringing the total irrigation area to 28.6 ha.
- **2016/17**: Further 2.98 ha Pivot irrigation application added bring total irrigation area to 31.6 ha.

The site design currently consists of two partially aerated lagoons followed by 6 maturation cells in series (refer to Figure 1) and finally an irrigated land application area. These were sized for a population of approximately 3,600 residents at the time of construction. The latest SDC population statistics indicate there are approximately 3,900 residents, which suggests the plant is at, or over capacity.

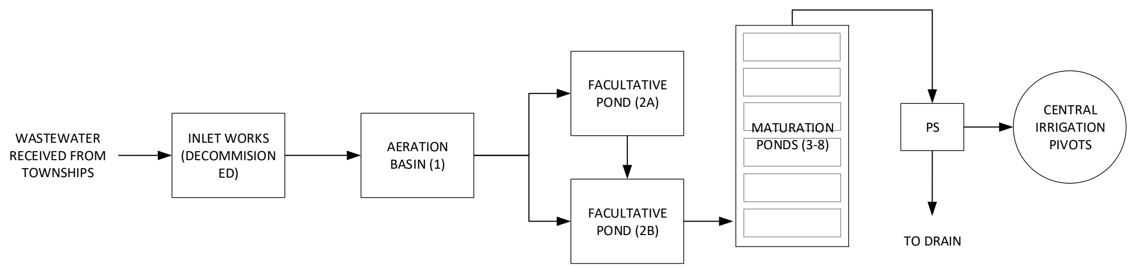

Figure 1. Current Treatment Schematic

The treated wastewater is currently either irrigated to the land on site via 3 centre pivot irrigators or, during high ground water periods, applied to rapid infiltration basins (RIBs) and subsequently delivered to the Tramway Reserve Drain (via. pump abstraction). However, only 3.5% of the volume can be discharged to the infiltration basins due to the consent allowance.

The WWTP is located in an area lower than the surrounding land and soakage is poor. Groundwater levels vary from 1.5m below ground level (bgl) in summer to 0.3 m bgl in winter.

The Ellesmere WWTP is currently relying on increasing irrigation disposal areas to meet its nitrogen loading obligations under its existing Resource Consent. There is a limit to the amount of additional area that can be irrigated. In addition to this, the current catchment zoning has been extended beyond the plant's throughput capacity and long-term planning needs. Therefore, an upgrade(s) to the plant's treatment system will be required to meet the future demand.

1.5 Site Constraints

Ellesmere WWTP is located at 40 Station Street in the Leeston township. The wastewater treatment and irrigation areas cover a total of approximately 57.7 ha (Refer to Figure 2).

Figure 2. Site Boundary for the Ellesmere WWTP

The approximate distribution of the land is provided in Table 1 and Table 2 below. We completed Blue Beam (i.e. pdf measurement) and Google Earth (GE) measure-ups based on drawing 6511236-120-C200 and compared it with the irrigation area described by LEI[2]. The Blue Beam and GE measures give areas that are in close agreement.

[2] LEI is currently undertaking Nitrogen mass balance for available irrigation area.

Table 1 Disposal area available for treated wastewater disposal

Area Description (ha)	Area (ha)	Check	Comments
Land Disposal Area	**44.4**	Blue Beam Measure	
Net Available Area for Pivots	36.4	20.1 12.4 8.6 Total 41.1	CP1 = 13.18ha CP2 = 11.3 ha CP3 = 5.9 ha
Buffers	4.7		
Residual Border Dyke Area	3.3	4.1-0.8	CP/BD Overlap
Pivot Area	30.3		
Net Wetted Area	33.6		If Border used
Rapid Infiltration	2.1	2.1	
Total Area	**46.5**	46.5	

Table 2 Applicable area for treated wastewater disposal

Calculation	Applicable Area		Reasoning
Cut and Carry – High rate	30.3 + 3.3	33.6	Pivot Area + Border Dykes
Cut and Carry – Low rate	4.7+2.1+6.1	12.9	Buffers + RIBs + CP Corners
Area for soil storage and Denitrification		33.6	Wetted area only
Area for effect of leaching on groundwater	33.6+ 12.9	46.5	All area as this is a regional issue, not specifically under the application footprint.

The opportunity to increase the yield in the farmland is limited by the configuration of the irrigation pivots. Therefore, we recommend considering sub-surface irrigation to utilize buffer areas, CP corners and other currently non-irrigated areas to maximise the potential of the site.

Currently SDC has set aside and uses a package of land **41.9 ha gross** (to boundaries), **36.4 ha available** (net available, Table 1) and 30.3 ha wetted (excluding 3.3 ha of residual Border Dyke area which been unused for several years). For the basis of design, we propose that net available area for Pivots is used to estimate nitrogen application rate.

1.6 Resource Consents

There are the following seven currently active consents relating to the operation of the Ellesmere WWTP.

Table 3. Active consents from the Canterbury Regional Council

Consent Number	Consent Type
CRC011680.1	To discharge contaminants into land and groundwater from the operation of additional wastewater treatment and disposal.
CRC930165.1	To discharge contaminants to land.
CRC011681.2	To discharge up to 120 litres per second of extracted groundwater into Tramway Reserve Drain.

CRC011679.1	To discharge contaminants into air from construction and operation of additional wastewater treatment and disposal facilities.
CRC941475.1	To discharge contaminants to air.
CRC941476	To discharge contaminant into Land
CRC950253	To discharge oxidation pond effluent onto land via border dyke irrigation
CRC110148	To discharge contaminants to land, air, and groundwater and surface water.

Beca planners undertook a review of active consents and issued a Report (Resource Consent and Designation Review, 27th March 2020). The recommendation was made that the consents CRC011680.1, CRC930165.1, CRC011681.2, CRC011679.1, CRC941475.1, CRC941476, and CRC950253, which were amalgamated into CRC110148 in 2010, are surrendered to the Canterbury Regional Council (ECan).

Based on the recommendation above and for the simplicity of this memorandum, resource consent CRC110148 (exp. 28/7/29) is considered to be the most relevant. The consent permits the discharge of treated wastewater to land, air, ground and surface water. This section will only focus on the factors relating to discharge to land and drain. Performance factors described in the resource consent are given in **Table 4**.

Table 4. Discharge Consent Parameters for Discharge to Land and Drain

Discharge to	Parameter	Value	Condition(s)
Land	Available for Discharge	41.9 ha	*Maximum loading rates given the following are not breached: a. Within 20 metres of any surface waterway b. Within 50 metres of the site boundary with neighbouring properties c. Within 30 metres of the site boundary with public roads; d. Onto ground with no vegetative cover; e. Onto ground where surface ponding is occurring (Wet Weather limits) **Onto grazed pasture, or an equivalent application and land management system, that matches the annual nitrogen application with the annual plant uptake.
	Hydraulic Loading*	8mm / day	
		20mm / application	
	Nitrogen Loading**	200 kg / ha / year	
Drain	Maximum Discharge Rate	120 L/s	Maximum concentration (grams per cubic metre) in at least 90 percent of samples in any 36 months
	Total Nitrogen (TN)	7 mg/L	
	NH_3-N	0.9 mg/L	
	Total Phosphorus (TP)	0.5 mg/L	
	Faecal Coliforms	30 /100mL	

Condition 7 of CRC110148 regulates the amount of nitrogen which can be applied when the wastewater is discharged, and states as follows:

7.The rate at which treated wastewater is applied shall not exceed 200 kg of nitrogen per hectare per year onto grazed pasture, or an equivalent application and land management system, that matches the annual nitrogen application with the annual plant uptake.

It is understood that the condition was originally intended to allow 200kg of N per ha to be applied to grazed land and in addition allowing other land management systems such as cut and carry, in which the application rate for cut and carry can be increased as long as all the nitrogen above 200 kgTN/ha is removed in hay (or equivalent). This is the basis upon which SDC and ECan interpreted the consent from the time it was issued until 2019.

However, a more recent interpretation by E.Can staff is that there must be "net zero" nitrogen from the land application of wastewater under a non-grazed management regime.

Given the importance of the condition to the design and operation, SDC has engaged Beca to undertake the technical investigation work required to prepare an application to change Consent Condition 7 wording, so that the intent of the condition is fulfilled and so that the condition wording no longer leaves room for interpretations around the permissible nitrogen application rate. To support proposed Condition 7 wording around application rates, scientific evidence of the current and sustainable nitrogen balance will be provided by LEI including plant uptake rates, denitrification in soil and other fate pathways for the applied nitrogen. This is expected to be completed after the Concept Design stage.

For the purposes of this memorandum, we assume that either interpretation can be made for the concept design regarding Nitrogen application rates:

- Originally intended interpretation is in place, allowing the consent holder to undertake cut and carry operation, with Nitrogen to the ground of up to 200 kg/ha/yr in excess of that which is harvested.
- Nitrogen loading rate that matches annual plant uptake rate is 200 kg/ha/yr, until LEI provide scientific evidence of different value.

2 Basis of Design

2.1 General

The Ellesmere WWTP is currently relying on increasing irrigation disposal areas to meet its nitrogen loading obligations under its existing Recourse Consent. The current catchment zoning (area of benefit) has been extended beyond the plant's capacity and therefore long-term planning needs to come in place to upgrade the plant to meet the future demand. From previous studies[3] undertaken, it was likely that some form of activated sludge type treatment would be utilized in the chosen upgrade option, whether this is in the form of aerated lagoons with a clarifier or more intensively managed reactor/s. Based on our data review and gap identification Memorandum (issued 2nd March 2020), we recommended adopting the '100% "in line" activated sludge' plant option.

However, given the current issues with discharge consent and the level of Nitrogen reduction required for one of the options we have reconsidered the previously recommended reactor type. We now recommend building an independent activated sludge reactor as it is likely to achieve a greater level of Nitrification-denitrification. An independent reactor will be built with vertical walls, which would provide greater mixing efficiency compared to an in-pond reactor with a sloped wall. Efficient mixing is essential to achieving greater levels of denitrification. The upgrade option will include backfilling of Pond 1 and a concrete reactor built on top of the filled pond. For solids separation a secondary clarifier will be built above the ground. This memorandum outlines the basis of design for the ponds upgrade to the activated sludge plant.

2.2 Design Horizon

The plant upgrades are to be sized for the design horizon to year 2050. This is a new design horizon from the last revision owing to updated population data being provided by SDC 14th July 2020.

2.3 Design Population

The future population estimates have been revised to reflect the new population data provided by SDC. The relevant values from the two (old and updated) population data sets are provided in Table 5.

[3] Leeston WWTP Options Report Revised Population Options, Opus, 9 August 2017 and Optioneering Report Leeston WWTP Upgrade, Opus 8th August 2016

Table 5. Key value from SDC Population Growth Data

SDC Data Set	Year	Population
Old (2018-2047)[4]	2018	3,723
	2020 (current)	3,932
	2047	6,631
New (2021-2050)[5]	2021	3,885
	2050	6,086

From the revised population growth data, it is estimated that by 2050 there will be 2,291 household connections to the wastewater network; Leeston (1,736 connections), Doyleston (127) and Southbridge (428). This will result in an estimated future population of 6,086[5] contributing to the sewer network. This is a significant reduction from the original projection; therefore, the predicted flows and loads were reviewed to address the new predicted population.

Note, that due to the COVID-19 global pandemic it is considered that the anticipated growth projections might be affected by COVID-19 long term and therefore SDC has advised that the corrected growth projections should be used.

The growth projections for each of the townships are given in **Figure 3**.

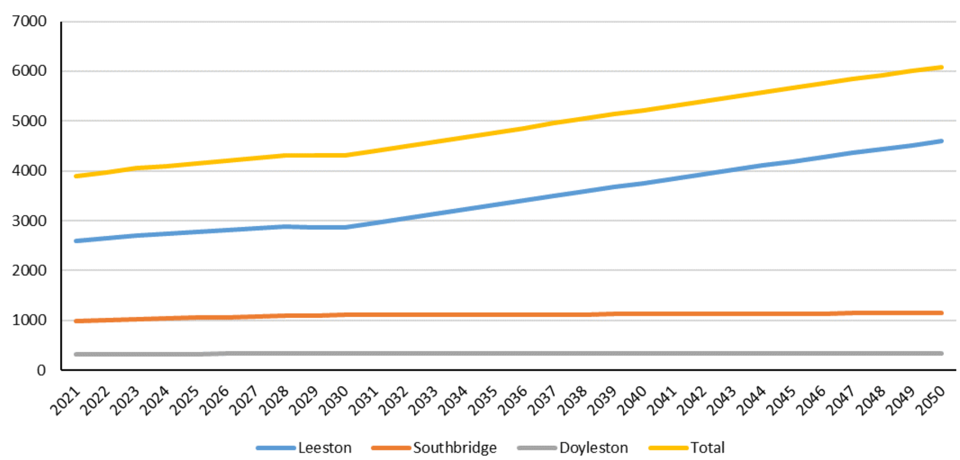

Figure 3. Predicted Population Growth in Contributing Townships (2021-2050 SDC Data)

[4] Population figures obtained from the SDC excel document titled: *"Growth Projections LTP 2018-28 Draft Population Numbers FINAL"*

[5] Population figure obtained from the SDC excel document titled: *'LTP Projections 2021-2050 – updated 7 July 2020.xlsx".*

2.4 Influent Flow

After reviewing the draft issue of *Technical Memorandum 1 – Data Review and Gap Analysis*, SDC has deemed the estimated incoming flows to the plant to be too high. These were found to be ~311 and 295 l/person/day for the 2018 and 2020 population respectively (using flow data recorded at the plant inlet from 2018-2019). For comparison, the per capita flow used in the report *Ellesmere Wastewater Model Build, Calibration and System Performance* (Opus, October 2017) was ~200 l/person/day across the three main townships. Typical flows in New Zealand are approximately 230 – 250 l/person/day.

Beca has agreed to model future contribution to the wastewater network based on a **revised per capita flow of 250l/person/day.** This does not include the additional flow from groundwater derived infiltration (GDI). However, for the WWTP process design purpose GDI should be included. Therefore, Average Dry Weather Flow (ADWF) is made up from GDI and wastewater contributed by the township. ADWF was calculated using the equation below:

ADWF = (Per Capita Flow * Population) + GDI

Using the per capita flow rate of 250 l/person/d, the contribution to the plant in 2018 was 931 m^3/day (for the population of 3,723, recorded in 2018). However, flow data collected at the plant inlet indicates that the actual ADWF received from the sewer network was approximately 1,161 m^3/day (or 311 l/p/day) in 2018. As ADWF does not include flow derived from rainfall, it is likely that the additional margin (230 m^3/day) comes from ground water. GDI is assumed constant at 230m^3/day over the project design horizon unless significant improvement is made towards reducing infiltration in the system.

Recent (2018-19) flows entering the plant are summarised in Table 6. Flow data was recorded on FM599466 prior to entering Ponds 2A and/or 2B approximately every 15 minutes between the 2018 and 2019 period. This recording represents the instantaneous flow rate at that point in time. Future flows have also been estimated.

Table **6**. Current and Future Estimate Influent Flow Rates

Parameter	Current (18-19)	Future (2050)
Total Per Capita Flow* (m^3/day)	931	1522
Groundwater Derived Infiltration (GDI) (m^3/day)	230	230
Average Dry Weather Flow (ADWF) (m^3/d)	1161	1751
Average Daily Flow (ADF) (m^3/d)	1478	2098
Peak Dry Weather Flow (PDWF) (m^3/d)	2014	3038
Peak Wet Weather Flow (PWWF) (m^3/d)	3105	4683
Peak Instantaneous Flow (PIF) (L/s)	105	158

*Flows only based on population contribution to wastewater network at 250l/p/day

The flow figures in Table 6 above have been sourced from the following:

- Current flow data – was recorded on FM599466 prior to entering Ponds 2A and/or 2B approximately every 15 minutes between 2018 and 2019 period.
- Future flow data is based on the following assumptions:
- Per capita flow rate is 250 L/p/d
- GDI at 230 m^3/d
- Ratios determined from current flow data (see Table 7 below)

Table 7. Flow Ratios (2018-2019)

Ratio	Value
PDWF / ADWF	1.73
AWWF / ADWF	1.27
PWWF / ADWF	2.67
ADF/ADWF	1.20
PIF / PDWF	0.09

The future ADWF was calculated by adding GDI (assumed constant over the design horizon at 230 m^3/day unless future works to improve infiltration are anticipated) to the 2050 per capita contribution to the wastewater network. We do not recommend that GDI be removed from the ADWF calculation. The estimated wastewater flow was found by multiplying the per capita flow (250 l/p/d) by the 2050 population (6086). All other flow parameters were estimated by multiplying respective flow ratios by the future ADWF. Average daily flow of 2,098 m^3/d is used for the load calculation.

Figure 4 describes the estimated change in influent flow through the plant over a 30-year design horizon.

Figure 4. Total Flow and Population Estimate (based on ADWF)

Furthermore, the normalised diurnal dry weather flow over the 2018-19 period is provided in Figure 5. This was derived from influent plant data recorded every ~15 minutes for periods of no rainfall in the prior 7 days.

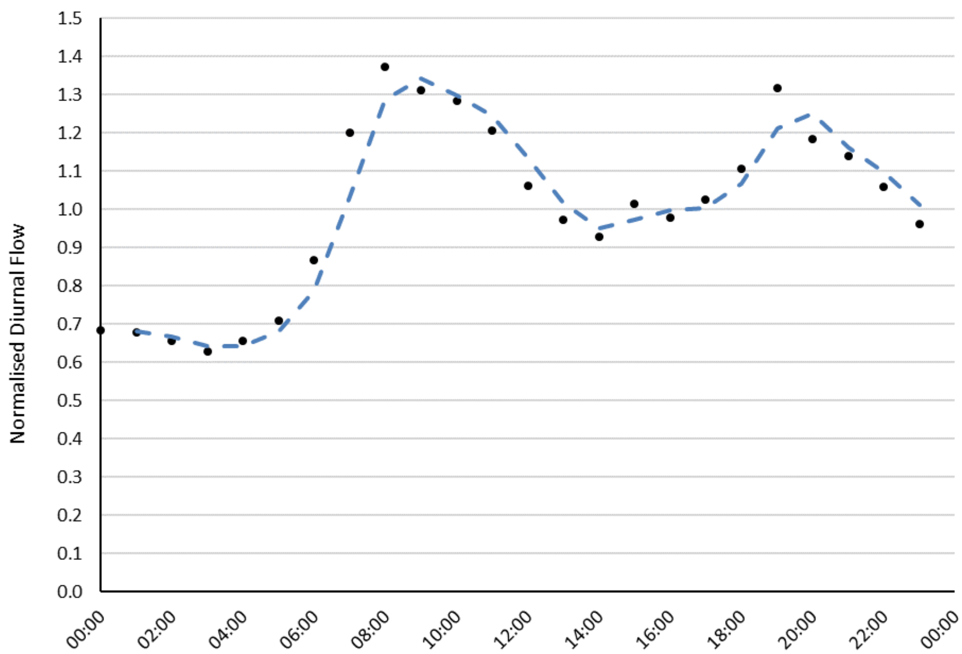

Figure 5. Normalised Diurnal dry weather flow for the 2018-19 period

The diurnal peaking factor for the 2018 – 19 period is 1.37 This value is proposed for the basis of design.

2.5 Influent Wastewater Characteristics

The influent data provided in Table 8 is from the laboratory analysis of four time-weight composite samples collected between 27th February and 5th of March 2020 following the recommendations made in *Technical Memorandum 1* to better characterise the wastewater. Time-weight samples were taken as SDC initially had issues connecting the autosampler.

The recommended sampling program started with six grab samples taken between 24th January and 20th February, followed by four composite samples taken from 20th to 27th February. After that, three more lab results were received for the samples taken 28th February, 10th March and 14th April. The composite samples were analysed for most of the recommended parameters except TN, NOx and COD. Furthermore, the grab sample analysis did not include pH, Alkalinity, VSS, Ammonia-N, dKN (or sTKN) DRP and sCOD. Due to inconsistencies in the sampling parameters taken, there is a limitation on the information that can be derived. The samples were collected in the inlet splitter chamber before Pond 2A and 2B and analysed by Hill Laboratories.

Table 8 summarises the influent wastewater characteristics collected from composite sampling from 20th to 27th February. All parameters but COD and TN were analysed in these samples. It is unknown why these samples were tested for a wide suite of parameters. The number of samples is very low, therefore data presented in Table 8 is not statistically valid and should be interpreted with caution.

Table 8. Influent Wastewater Characteristics for recommended samples (4 total) (20/2/20 – 27/2/20)

Parameter	# of Samples	Average	50th %ile	90th %ile	Max	Typical[6]		
						Weak	Ave	Strong
Total Alkalinity, mg/L (in $CaCO_3$)	4	383	355	-	530	50	100	200
COD, mg/L	4	-	-	-	0	339	508	1016
sCOD, mg/L	4	127	111	-	186	-	-	-
$cBOD_5$, mg/L	4	229	235	-	290	133	200	400
TSS, mg/L	4	207	191	-	270	130	195	389
VSS, mg/L	4	191	190	-	240	95	160	315
TN*, mg/L	4	91	80	-	137	23	35	69
TKN, mg/L	4	91	80	-	137	23	35	69
dKN, mg/L	4	76	67	-	124	-	-	-
NH_3-N, mg/L	4	65	65	-	81	14	20	41
TP, mg/L	4	8.2	8.1	-	9.0	3.7	5.6	11
DRP, mg/L	4	4.9	4.9	-	5.4	-	-	-
pH	4	7.9	7.8	-	8.7	-	-	-

* TN was not measured, however there is no NOx in incoming wastewater, therefore TN=TKN.

Organically bound nitrogen in raw wastewater as a percentage of TKN typically ranges from 23.4 % to 57.1 % with an average value of 26.5 %[7]. The samples suggest that the incoming wastewater has around 28 % organically bound nitrogen on average. Most of organic bound nitrogen can be converted to ammonia and removed from wastewater, however nonbiodegradable particular inert (X_{NI}) and soluble nonbiodegradable inert (S_{NI}) portions will remain in the wastewater.

No further ammonia samples were collected to validate this ratio; therefore, the nitrogen fractionation ratio is considered to be estimated, rather than determined from sampling data. As the organically bound nitrogen percentage of TKN is very close to the average typical value (based on the four samples), we assume typical average percentage values of TKN for X_{NI} and S_{NI} of 8.6% and 3.4% respectively will be used for design.

Table 9 provides a summary of 20 time-weight composite samples accumulated over a six-month period from January to August 2020. For unknown reasons these samples were tested for a reduced suite of parameters. **It is recommended that the recommended sampling program is reinstated as soon as possible to make sure the wastewater can be comprehensively characterised for preliminary design. Flow proportional composite sampling should be undertaken instead of time-weight composite sampling.**

The sampling program is still ongoing, therefore Table 10 remains live during the design process and will be updated with composite sampling analysis as it comes to hand.

[6] Metcalf & Eddy Wastewater Engineering Treatment and Resource Recovery 5th Edition Table 3-18

[7] Analysis and Characterisation of Wastewater Nitrogen Components for using in Wastewater Modelling and Simulation. Volume 3, Issue5, May 2016, PP 28-36, IJARCS.

Table 9. Influent Wastewater Characteristics from Grab and Time-Weight Composite Samples (20 total) (16/1/20 – 30/7/20)

Parameter	# of Samples	Average	50th %ile	90th %ile	Max	Typical[8]		
						Weak	Ave	Strong
Total Alkalinity, mg/L	0	0	0	0	0	50	100	200
COD, mg/L	20	472	470	612	680	339	508	1016
$cBOD_5$, mg/L	20	211	194	301	320	-	-	-
TSS, mg/L	20	199	196	311	320	133	200	400
VSS*, mg/L	20	183	180	287	295	130	195	389
TN, mg/L	20	65	60	100	114	95	160	315
TKN, mg/L	20	65	60	100	114	23	35	69
NH_3-N*, mg/L	20	46	43	72	82	23	35	69
TP, mg/L	20	7.9	8.0	10.8	11.3	-	-	-

* VSS and NH_3-N and are calculated using VSS/TSS ratio of 0.92 and Ammonia/TKN ration of 0.72 accordingly. Both ratios are determined from the Table 8.

Compared to typical municipal influent wastewater characteristics, the Ellesmere WWTP influent absolute numbers compare well with typical average strength wastewater characteristics. Outliers to this trend are the absolute TKN and Ammonia results; these are all currently limited by the low number of data points and have been interpreted with caution.

TKN and NH_3-N, are both approaching a typically strong concentration for municipal wastewater compared to all other parameters. The samples range from 50 – 137 mg/L. In *Technical Memorandum 1* we commented that high values of nitrogen might be associated with the morning rush, however, time-weight composite samples suggest that nitrogen values are high during the whole day. Typical nitrogen values presented in Table 9 are from Metcalf and Eddy. While this is an American publication it is used worldwide as it represents the nature of domestic wastewater quite accurately. However, each country can have their own typical wastewater characteristics. In New Zealand, nitrogen levels are often elevated compare to other countries, therefore it is not surprising that the reported Ellesmere nitrogen concentrations are elevated compared to the typical values given in Table 9.

At the time of updating this document SDC were asked to confirm if there is industrial waste streams contributing to the total load. SDC confirmed that there are known sources of pet food, stock truck effluent (or truck wash) discharges as well as caravan waste in low volumes and home kill in very low volumes. SDC also noted that there are no permitted discharges of portaloo waste. The composition and quantities of industrial wastewater contributing WWTP was not provided. Therefore, we can't comment on the extent of industry contribution. Industrial input will be considered in preliminary design should the information be made available.

Alkalinity (ref. Table 8) appears to be higher than what is expected in typical strong domestic wastewater. However, the reference used is for typical American wastewater characteristics and wastewater characteristics differ from country to country. In New Zealand it is not unusual to see higher Alkalinity values (e.g. mean - 220mg/L, 90%tile – 280mg/L, 95%tile – 300mg/L seen in Queenstown) therefore we consider that the measured alkalinity values can be adopted as realistic values. With the high concentrations of ammonia present, additional alkalinity will be required for nitrification. For every mg/l of converted ammonia,

[8] Metcalf & Eddy Wastewater Engineering Treatment and Resource Recovery 5th Edition Table 3-18

alkalinity decreases by 7.14 mg/l, hence a minimum of 328 mg/l of alkalinity is required to nitrify all of the incoming ammonia on the average basis. An actual measure of influent alkalinity is 383 mg/l, which leaves 55 mg/l after completely nitrifying influent ammonia. Some alkalinity will be recovered during denitrification, which will most likely be around 170 mg/l. Also, around 40 mg/l of critical alkalinity storage is required. Hence, 185 mg/l (383-328-40+170) of alkalinity remains in the influent. It is unlikely that supplementary alkalinity will be required.

Influent COD compares well with average typical wastewater characteristics. The BOD: COD (from grab samples taken in January – April 2020) ratio of 2.1 suggests that the balance of chemical oxygen and biological oxygen demand in the system is correct. A ratio of 2.2 to 2.4[9] is typically observed for municipal wastewater; this is in agreement with the sampling data.

2.6 Influent Loads

BOD, TSS, TN, TKN and TP are the minimum influent characteristics needed to define the future load on the plant. These, as well as additional wastewater characteristics, have been defined in **Table 10** as the design basis for the WWTP upgrade. The loads are based on the ADFs of 1,391 m^3/d and 2,098 m^3/d at average concentrations (Table 9**Error! Reference source not found.**) for current and future incoming loads respectively. In *Technical Memorandum 1* we suggested that the future load to the plant could be determined using a typical load per capita, as the sampling data at the time wasn't comparing well with typical wastewater characteristics. However, with the new sampling data we are more confident that the loads estimated with the new data are adequate to use for the plant design. Therefore, we recommend that the future average load values, as shown in Table 10 below, should be used for the upgrade of the Ellesmere WWTP.

Table 10. Influent Loads Summary Table

Parameter	Average Concentration (mg/L)	Current Average Load (kg/d)	Future Average Load (kg/d)
COD	472	656	**990**
sCOD	127	177	**266**
$cBOD_5$	211	294	**443**
TSS	199	276	**416**
VSS	183	255	**384**
TN	65	90	**136**
TKN	65	90	**136**
NH_3-N	46	65	**97**
TP	7.9	11	**17**

It is essential to understand the wastewater characteristics, as the activated sludge treatment plant performance depends on a variety of bacteria types. To establish the healthy balance of bacteria for effective nitrogen removal, a ratio of Biochemical Oxygen Demand (BOD), nitrogen (N) and phosphorus (P) (i.e. ratio of BOD:N:P) should be balanced. For the optimum conditions in the plant treating municipal wastewater, the ratio is approximately 100:5:1.

[9] Metcalf & Eddy Wastewater Engineering Treatment and Resource Recovery 5th Edition Table 3-14

From the new sampling data, a BOD:N:P ratio of 100:30:4 was found, indicating there is excess nitrogen (or alternatively a lack of carbon) and phosphorus in the incoming wastewater. A nitrogen to BOD ratio of 1:4 is commonly used to estimate how much BOD will be required for denitrification[10]. Based on the above ratio it is expected that approx. 192 mg/L to 234 mg/L of additional carbon will be required for nitrogen removal, depending on the desired TN concentration in the treated wastewater. From Table 10 above, available carbon in the influent on an average is 211 mg/L, which is a strong indication that supplementary carbon will be required to achieve higher nitrogen removal. Phosphorus can be removed by using a chemical precipitant.

2.7 Temperature

Weekly temperature records were provided by SDC for the period of 31 December 2018 to 29 March 2020. The temperature readings were taken from the DO meter installed in Pond 8 between 10.00 am and 1.00 pm every day. The lowest recorded temperature was 4.4^{0} C and the highest was 27.5^{0}C.

The average pond temperatures of the winter (June to August) and summer (December to February) months during the monitoring period were 7.7^{0}C and 20.5^{0}C respectively.

For the process design it is proposed to use 10^{0}C as a minimum temperature and 21^{0}C as a maximum temperature. The temperature correction is added to allow for heating from the mixers and aeration and also because the incoming wastewater tends to be comparatively warm. Unlike the full pond based treatment, the residence time in the reactor is comparatively short and so the water does not have the chance to get down to the lower temperatures that would be experience when treatment takes place through the entire HRT of the full pond system. However, we recommend checking what the minimum temperature is in the Pines WWTP reactor as it can be increased. At Queenstown, while the old maturation pond got to a temperature whereby the surface froze in winter, the new MLE AS process does not drop below 10^{o}C.

3 Discharge Requirements

3.1 Current Nitrogen Loading of Irrigation

The treatment plant wastewater is discharged to three centre pivot irrigators (CP1, CP2 and CP3) over approximately 28 ha of land out of 31.58 ha of land available (and 41.9 ha consented). The 12-month nitrogen rebate during the cut and carry operation is given in Figure 6 below.

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[10] Based on data retrieved from ATV-DVWK-A 131E. *Dimensioning of Single Stage Activated Sludge Plants,* assuming:

- X Org. N in WAS = $0.05g/g_{BODrem}$
- Effluent of:
  - Sol. Org. N = 2mg/l
  - NO_3-N = 5mg/l

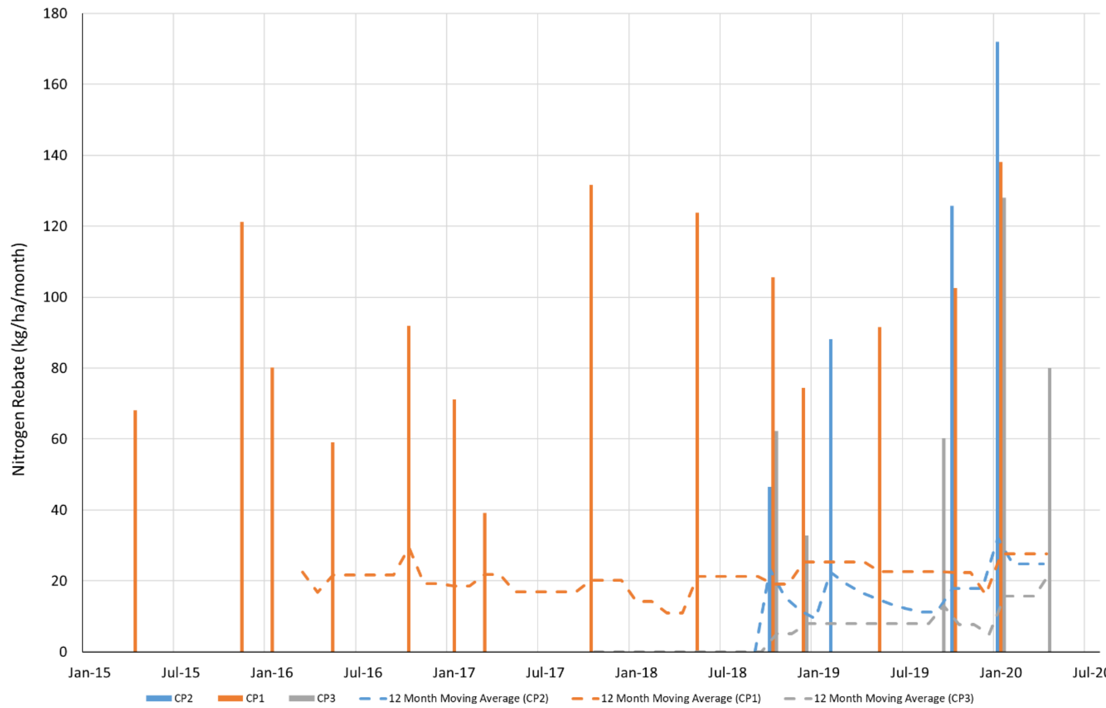

Figure 6. Nitrogen Rebate in CP1 CP2 and CP3

The discharge to land assumes discharge is onto grazed pasture, or an equivalent application and land management system that matches the annual nitrogen application with the annual plant uptake. Cut and carry is assumed the preferred option in the future, which is triggering new nitrogen discharge limits. As discussed in section 1.6 we assume that the allowance of total nitrogen to be applied on the ground is 200 kgN/ha/yr plus the load removed from the site by the cut and carry operation. This is consistent with the historical management of the site.

As outlined in *Technical Memorandum 1*, Council is removing 350 kgN/ha/yr through its cut and carry operation. This would require the treatment plant to achieve 26 mg/l of TN in the final treated wastewater. However, our recommendation was that the TN target in the treated wastewater be 20 mg/l to provide for a safety factor. The recommendation was made providing 35.3 ha is used for irrigation (not the current 31.6 ha). Following *Technical Memorandum 1* Council has decided to lower the expected cut and carry removal rate from 350 kgN/ha/yr down to 320 kgN/ha/yr to provide some factor of safety for variable growing years. Based on this, the application rate would need to be no greater than 520 kgN/ha/yr over the recommended 35.3 ha, allowing 200 kg/N/ha/yr leaching to the ground. We proposed to base the design on an irrigation application rate of 450 kg/N/ha/yr, which is based on future ADF and TN target of 17 mg/l in the treated wastewater.

With a cut and carry removal rate of 320 kgN/ha/yr, only a net 130 kgN/ha/yr will be left to go to ground. If the full consented area of 41.9 ha can be utilised in the future even less nitrogen will 'go to ground' (approx. 58kgN/ha/yr) provided that the cut and carry removal rate can be maintained. Based on this, the application rate would need to be no greater than 450 kgN/ha/yr over 100% of the consented area, which is significantly less than the application rate over the recommended 35.3 ha.

There is currently (Aug 2020) a nitrogen balance including assessment of plant uptake rate being undertaken to improve the level of accuracy of the nitrogen balance for the site. As part of nitrogen balance, investigation of how to achieve a 100% utilization of the consented irrigation area is being undertaken. We recommend that concept design should focus on a lower application rate until investigations are complete. Our recommended application rates are included in the options description below.

Until Condition 7 wording is resolved / amended, SDC consider undertaking concept design for two options:

- Option 1 – will aim to reduce nitrogen to the level, that after cut and carry operation is undertaken would result in no more than 200kgN/ha/yr leaching to the ground. We propose to base the design on a nitrogen application rate of 450 kgN/ha/yr, which is based on the future ADF and TN target of 20 mg/l in the treated wastewater. The concentration of TN **for the design purposes will be assumed as 17 mg/l** as the future load would reach 452 kgN/ha/yr with 20 mg/l of TN in the treated wastewater over the recommended irrigation area of 36.4 ha (refer section 1.5). This would leave no room for flexibility in the cut and carry operation if the irrigation area was not increased.
- Option 2 – will aim to reduce nitrogen to the level that matches plant uptake rate. Currently the plant uptake rate is being investigated, therefore for the purpose of the concept design, SDC advised that nitrogen loading rate should be assumed to be 200 kg/ha/yr. The concentration of TN for the **design purposes will be assumed as 7 mg/l** as the future load would reach 200 kgN/ha/yr with 8.8 mg/l of TN in the treated wastewater over the recommended irrigation area of 36.4 ha. This would leave no room for flexibility in the cut and carry operation if the irrigation area was not increased.

3.2 Current Treated Wastewater Characteristics

Treated wastewater data provided in Table 11 is for samples collected between 27 May 2018 and 6 November 2019. Weekly grab samples were collected in Pond 8 and analysed at Hills Laboratories. These tests were completed as part of internal monitoring at SDC.

Table 11. Current Treated Wastewater Characteristics

Parameter	10^{th}%ile	Ave	50^{th}%ile	90^{th}%ile	Max
Total Suspended Solids (TSS), mg/L	7.8	45.1	43.0	77.6	117
Total Nitrogen (TN), mg/l	16.0	25.7	24.0	39.0	47
Ammoniacal Nitrogen (NH_3-N), mg/l	10.9	19.5	17.4	34.0	44
Nitrite-N, mg/l	0.1	0.5	0.2	1.5	5
Nitrate + Nitrite-N, mg/l	0.4	2.0	1.3	4.5	10
Total Kjeldahl Nitrogen (TKN), mg/l	14.0	23.9	23.0	38.0	46
Total Phosphorus (TP), mg/l	2.8	4.2	4.2	5.8	7.3
Total BOD_5, mg/l	7.0	23.1	23	39.6	63
Faecal Coliforms, CFU/100 ml	252	5,135	3,100	11,600	49,000

The treated wastewater data provided in Table 12 and Table 13 is for laboratory grab and composite samples collected between January and March 2020 following the recommendations made in *Technical Memorandum 1* to better characterise the wastewater. 20 samples in total were collected.

Table 12 Treated Wastewater Characteristics from time-weight Composite Lab Samples (11 samples)

Parameter	10th%ile	Ave	50th%ile	90th%ile	Max
Total Suspended Solids (TSS), mg/L	21	41	37	81	97
Total Nitrogen (TN), mg/l	28	36	36	43	44
Ammoniacal Nitrogen (NH_3-N), mg/l	Not tested				
Nitrate + Nitrite-N, mg/l	3.5	8.2	6.3	21.0	21.0
Total Kjeldahl Nitrogen (TKN), mg/l	9.0	27.6	28.0	39.0	39.0
Total Phosphorus (TP), mg/l	6.4	7.6	7.2	8.8	9.7
$cBOD_5$, mg/l	10	17	13	24	31
COD, mg/l	99	125	116	150	200

Table 13. Treated Wastewater Characteristics from Grab Lab Samples (9 samples)

Parameter	10th%ile	Ave	50th%ile	90th%ile	Max
Total Suspended Solids (TSS), mg/L	30	32	65	45	106
Total Nitrogen (TN), mg/l	16	20	25	26	30
Ammoniacal Nitrogen (NH_3-N), mg/l	Not tested				
Nitrate + Nitrite-N, mg/l	0.1	0.1	5.0	1.2	12.6
Total Kjeldahl Nitrogen (TKN), mg/l	7	8	20	25	29
Total Phosphorus (TP), mg/l	4	4	8	6	15
$cBOD_5$, mg/l	17	19	23	21	31
COD, mg/l	133	135	160	166	182

The following parameters were recommended for the composite sampling program. This was provided to SDC via. email dated 7th February 2020.

- TSS
- TKN
- TP
- BOD5

- sCOD (filtered)
- VSS
- NH3-N
- Soluble TKN
- dRP
- Alkalinity
- pH

Several of these parameters (red) have been excluded from the sampling program. COD was tested instead of recommended sCOD. **It is recommended these additional parameters be integrated into the sampling program as soon as possible to make sure the wastewater can be comprehensively characterised for preliminary design. Flow proportional composite sampling should be undertaken instead of time-weight composite sampling.**

3.3 Hydraulic Considerations

The irrigation operation is currently limited by the hydraulic loading rate in periods of high rainfall and/or low evaporation rates i.e. in winter. This leaves the irrigation pastures sodden and unable to uptake treated wastewater.

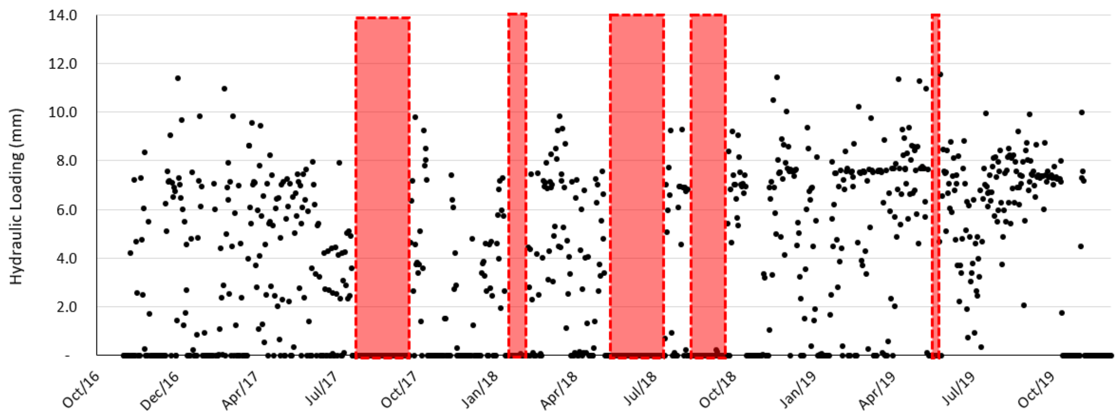

Figure 7. Hydraulic Loading onto Irrigated Farmland (Area 8)

As shown in Figure 7, there have been five instances (red boxes on graph) from 2016 to 2019 in which irrigation to land has been halted for extended periods. Four of these five instances occurred in winter months. (It is likely that treated wastewater is discharged to the RIBs periodically during winter to prevent excess loading to land.) The last instance, during the summer of February 2018, is an outlier and cannot be tied to an extreme weather event (temperature or rainfall). The scope of the upgrade of the Ellesmere WWTP excludes consideration of hydraulic loading because hydraulic loading does not affect the process design of the treatment plant upgrade.

3.4 Target Treated Wastewater Characteristics

Treated wastewater target parameters are defined by the discharge consents to land and drain. Currently it is uncertain how the final agreed discharge Consent Condition 7 will be worded. Therefore, in preparation for the potential condition change SDC decided to undertake concept design for two options targeting different potential TN concentrations in the treated wastewater:

- Option 1 – targeting 20 mg/l of TN in the treated wastewater, should the assessment of Condition 7 be in favour of the current interpretation and current cut and carry operation.
- Option 2 – targeting 9 mg/l of TN in the treated wastewater should the assessment of Condition 7 conclude that that the nitrogen application rate for cut and carry operation should match plant uptake rate. SDC proposed that for the concept design basis 200 kgN/ha/yr should be used as the application rate matching plant uptake rate. This rate will be verified when the Nitrogen balance is completed (by LEI).

The design will be based on 17 mg/l and 7 mg/l of TN in the treated wastewater for Option 1 and Option 2 respectively, which would allow for a safety factor to meet the treated wastewater target. The additional target parameters from a consent perspective are proposed as follows:

- TSS – 20 mg/L
- BOD – 20 mg/L
- Ammonia - <2 mg/L

To reach 7 mg/L of TN in the treated wastewater, the above parameters will be much lower than stated above.

4 Site Investigations

4.1 Controls

The upgrade proposes the installation of the following additional instrumentation and equipment:

- pH and temperature sensors
- Oxygen sensors
- Level sensors
- Motion sensor; and
- Actuated valves.

There is a spare control cabinet in the switchboard with sufficient space available for the additional equipment listed. Additional I/O modules can easily be added to the site controller if required.

4.2 Power

A preliminary load list has been created for the purpose of determining what power upgrades may be required. The load list is preliminary and is based on assumptions that will need to be revisited during detailed design. The proposed design assumes the following equipment est6imated for Option 2, as this option will have higher power requirements:

- Combined screen - grit removal unit (1.84 kW total)
- Mixers x 4 (9 kW total)
- Aerators x 5 (15 kW each)

- Clarifier x 1 (0.25 kW)
- Internal recycling Pumps duty/stand by x 2 (8 kW total)
- WAS Pumps duty/stand by x 2 (1.1 kW total)
- General light and power (2 kW)
- Sludge thickening and dewatering (0.75 kW)
- Sludge Holding tank (0.5 kW)
- Recycled Treated wastewater for cleaning etc, (2 kW) provisional
- Total installed capacity approximately ~140kVA
- Contingency capacity 25% minimum

Nairn Electrical were consulted to provide information about the existing electrical equipment onsite. At present, power to the site is supplied via a 100kVA transformer. This will need to be upgraded to meet the proposed future load. Beca has made an allowance for future expansion onsite which will require a 150-200kVa transformer be installed. The electrical supplier will be required to produce finalised costing for this upgrade.

Assuming the infiltration pumps and irrigation pumps are not operated concurrently and with diversity across the site, the existing 400A switchboard and cables will be sufficient for the proposed demand. The existing 250kVA genset can be retained, although load shedding may be required during power cuts to keep the total current within the genset's rated capacity of 320A. The switchboard design drawings also show there is a spare group starter feeder, this will need to be confirmed during later stages of design.

4.3 Access

No additional access is anticipated to be required for the upgrade. However, given the history of fatal accidents at ponds in New Zealand in the last decade we recommend including restriction of the site access by fencing the area.

4.4 Utilities

The nominal diameter of the water main to the site is 50 mm. Assuming a 200 kPa network pressure (SDC Code of Engineering Practice 2012), 4L/s can be delivered.

For the purpose of the Basis of Design, band screens have been assumed as they have the highest wash water demands from all screens i.e. 2.1L/s at 500kPa. This will require a booster pump set to be installed.

4.5 Geotechnical Engineering

Refer to the attached desktop study.

Yours sincerely

Jolanta Liutkute
Senior Process Engineer

on behalf of
Beca Limited

C

Appendix C – Drawings

Drawing Plotted: 16 Sep 2020 1:15 pm

NOTES:

1. SERVICES SHOWN ARE INDICATIVE ONLY.
2. CONCEPT LAYOUT FOR WATER TREATMENT PLANT UPGRADE.
3. LAND OWNED BY SELWYN DISTRICT COUNCIL.

LEGEND

- MAIN WASTEWATER LINES
- SHARED SLUDGE LINE
- WAS LINE
- RAS LINE
- TEMPORARY LINES
- ACCESS TRACK

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ORIGINAL DRAWING IN COLOUR

FOR REVIEW
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	FOR REVIEW	STC	AMB	JL	10.09.20

Drawing Originator: Beca

Original Scale (A1)	1:1000	Design	J. LIUTKUTE	09.09.20
Reduced Scale (A3)	1:2000	Drawn	S. CROSSON	10.09.20
		Dsg Verifier		
		Dwg Check		

Client: Selwyn District Council

Project: ELLESMERE WWTP

Title: LEESTON AND LAKE RD PS PUMP STATION UPGRADE CONCEPT LAYOUT

Discipline: CIVIL ENGINEERING

Drawing No. 3364542-SK-202 Rev. A

Document No. 3364542-SK-202.DWG

DO NOT SCALE

IF IN DOUBT ASK.


Drawing Plotted: 16 Sep 2020 1:17 pm
NOTES:
1. SERVICES SHOWN ARE INDICATIVE ONLY.
2. CONCEPT LAYOUT FOR WATER TREATMENT PLANT UPGRADE.
3. LAND OWNED BY SELWYN DISTRICT COUNCIL.
LEGEND
MAIN WASTEWATER LINES
SHARED SLUDGE LINE
WAS LINE
RAS LINE
TEMPORARY LINES
ACCESS TRACK
PROPERTY BOUNDARIES
POND 2A
INLET
7m WIDE EARTH BANK AND ACCESS ROAD
INLET WORKS AREA
GRIT CLASSIFIER
SCREENINGS BINS
INLET SCREENS
THICKENED SLUDGE TANK
SLUDGE THICKENING AREA
POLYMER DOSING UNIT
SLUDGE THICKENER
WAS HOLDING TANK
WASTEWATER LINE
CARBON DOSING
POTABLE WATER LINE
CLARIFIER- 13m DIAMETER
SLUDGE CHAMBER
PUMPED TO CLARIFIER
INTERNAL RECYCLING
ANOXIC ZONE
POND 1
PROVISIONAL UV TREATMENT
POND CURTAIN
CONNECT INTO EXISTING BYPASS LINE VIA MANHOLE
EXISTING MANHOLE
AERATION ZONE
POND 2
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A FOR REVIEW STC AMB JL 10.09.20
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Original Scale (A1) 1:1000
Reduced Scale (A3) 1:2000
Design J. LIUTKUTE 09.09.20
Drawn S. CROSSON 10.09.20
Dsg Verifier
Dwg Check
Client: Selwyn DISTRICT COUNCIL
Project: ELLESMERE WWTP
Title: LEESTON AND LAKE RD PS PUMP STATION UPGRADE CONCEPT LAYOUT
Discipline CIVIL ENGINEERING
Drawing No. 3364542-SK-203
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Document No. 3364542-SK-203.DWG
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D

Appendix D – Cost Estimate

Sensitivity: General

Project:	**Ellesmere WWTP**
Phase:	Concept Design
Report:	Rough Order of Cost (ROC) estimates
Prepared By:	R. Verbeek 22/09/2020
Reviewed By:	J. Pimlott 22/09/2020

Comparative Cost Estimate Summary

Ref	Description	Option 1			Option 2		
1.0	Civil and Siteworks	$	626,440		$	678,940	
2.0	Inlet Works	$	263,000		$	263,000	
3.0	Secondary Treatment	$	1,492,000		$	1,492,000	
4.0	TertiaryTreatment	$	380,000		$	380,000	
5.0	Electrical, Instrumentation, and Control	$	293,000		$	293,000	
	Subtotal - Net Construction Estimate	**$**	**3,054,440**		**$**	**3,106,940**	
6.0	Main Contractor Overhead Costs	$	649,832		$	661,001	
	Subtotal - Gross Construction Estimate	**$**	**3,704,272**		**$**	**3,767,941**	
7.0	Professional Fees	$	761,769		$	773,229	
8.0	Allowances for Risk Register Items and Residual Uncertainty	$	1,007,833		$	1,022,859	
	Rounding	-$	3,874		-$	4,030	
	Most Likely - P50 Estimate	**$**	**5,470,000**		**$**	**5,560,000**	
	P95 Estimate	**$**	**5,930,000**		**$**	**6,030,000**	

	Total Annual Operating Costs - $/yr	$	630,000		$	750,000	

Sensitivity: General

Assumptions

0.01 The basis of the estimate is the Beca concept design information received 11/09/2020 and as described in the Beca concept design report.
0.02 All quantities and dimensions are approximate and are subject to design development.
0.03 Elements of cost included within this estimate are based on costs from similar projects and other Beca cost benchmarks.
0.04 We assume that all of the work will be undertaken by a single 'Main Contractor' through a single contract for the project.
0.05 We assume that a competitive tendering process will be followed as part of the agreed procurement process.
0.06 We assume that all works are carried out during normal daytime working hours.
0.07 We assume that the Contractor will have unobstructed access to the whole site throughout the construction phase.
0.08 All base prices are current to September 2020. No allowance for general cost escalation has been included in the estimate.
0.09 The allowances for Professional Fees and Client-owned project-related internal costs are high-level indicative allowances only and have not been based on a detailed work breakdown structure.
0.10 We assume that the clarifier will sit on a stiffened raft of compacted gravels. No additional ground improvement is allowed for. This is subject to further geotechnical investigation and design.

Expected Estimate Range:

0.11 Estimate range is an indication of the degree to which the final cost outcome for a given project will vary from the estimated cost – it is not an additional Contingency. Range is expressed as a +/- percentage range around the point of estimate after the application of contingency, with a stated level of confidence that the actual cost outcome would fall within this range. As the level of project definition increases and the tender date draws nearer, the expected range of the estimate tends to improve, as indicated by a tighter +/- range.
0.12 The estimates are based on high-level design information that is under development. These estimates are deemed to be Class 5 estimates in terms of the AACE Cost Estimate Classification System guidelines. The probable accuracy range of the estimate is likely to be around +/-50%.

General Estimate Exclusions

0.13 Goods and services Tax (GST).
0.14 Incurred costs to date.
0.15 Fast track or accelerated programme.
0.16 Work outside normal working hours.
0.17 Professional fees other than those listed.
0.18 Client independent legal and accounting fees
0.19 Costs associated with staging of the works.

Project Specific Exclusions

0.20 Ground improvements and piling beneath structures. The estimate only allows to buildup the reclaimed area with compacted gravels and geogrid.
0.21 Relocating existing services. Subject to further investigations.
0.22 No allowance to remove existing redundant screen and associated equipment.
0.23 Phosphorus reduction and alkalinity dosing.
0.24 Landscaping.
0.25 Costs of impacts associated with extraordinary global events (such as the current COVID-19 outbreak).

Sensitivity: General

Risks

Risks with a potential cost effect include:

0.26 Design development.
0.27 Foreign exchange rates (an allowance for this risk has been included in the estimate).
0.28 General cost escalation.
0.29 Cost associated with staging of the works.
0.30 Ground conditions and ground water levels.
0.31 Working around existing services.
0.32 Costs of impacts associated with extraordinary global events (such as the current COVID-19 outbreak).
0.33 Where quantitative risk analysis processes have been undertaken, the estimate does not allow for the risk of a public health shut-down where social distancing measures are adopted, nor does it allow for the risk of indefinite suspension of projects due to unavailability of materials and/or labour due to restrictions in response to COVID-19.

General Considerations and Limitations.

0.34 These estimates are solely for our Client's use for the purpose for which they were intended in accordance with the agreed scope of work. They may not be disclosed to any person other than the Client and any use or reliance by any person contrary to the above, to which Beca has not given its prior written consent, is at that person's own risk.

0.35 The high-level cost estimates presented in this section have been developed solely for the purpose of comparing and evaluating competing options. They are sufficiently accurate to serve this purpose. They should not be used for budget-setting purposes as common elements between options may have been omitted and/or the works not fully scoped. A functional design should be undertaken if a budget estimate is required.

Sensitivity: General

Project	**Ellesmere WWTP**	
Option:	**Option 1 - TN is 17 mg/L**	
Beca Project Number:	3364542	
Phase:	Concept Design	
Estimate Class / Design Stage:	Class 5 / Concept	
Estimate prepared by:	R. Verbeek	22/09/2020
Reviewed By:	J. Pimlott	22/09/2020
Version:	1	

Ref	Plant Area	Description	Type	Size or Capacity	Unit	Quantity Min	Quantity ML	Quantity Max	Rate $ Min	Rate $ ML	Rate $ Max	Most Likely $	Estimator Comments
1.00	**Civil and Siteworks**											**$ 626,440**	
	Site Preparation												
1.01	Site clearance	Allowance for general site clearance	C		LS	0	1	1	$ 2,500	$ 5,000	$ 10,000	$ 5,000	
1.02	Site clearance	Remove existing redundant equipment	C	Excluded.	LS	0	0	0				$ -	Excluded
	Ponds												
1.03	Relocate aerator in Pond 2A	Relocate existing aerator in Pond 2A.	M	Assume aerator will be removed, cleaned, and reinstalled in Pond 2A.	LS	1	1	1	$ 5,000	$ 10,000	$ 15,000	$ 10,000	
1.04	Pond 2A land reclamation	Construct new bund to section off reclamation area from Pond 2A.	C	Assume silty gravels or similar to build up the core. Allow 56m long, assume 2.5m high, with 3m wide at crest and 3H:1V slopes. Volume calculated at 20m3/m.	m3	1,010	1,120	1,680	$ 35	$ 40	$ 50	$ 44,800	Assume supply is $23/m3 for AP65 from Yaldhurst quarries. Allow $10/m3 to cart to site and dump. Allow $5/m3 to place and trim.
1.05	Pond 2A land reclamation	Armouring to new bund.	C	Allow riprap on AP65 to inside face of new bund.	m3	310	340	510	$ 90	$ 110	$ 150	$ 37,400	Assume supply is $19/m3 from Yaldhurst quarries. Allow $10/m3 to cart to site and dump. Allow $2.50/m3 to place and trim.
1.06	Pond 2A land reclamation	Empty pond and dry out.	C	Assume standard 6" pump sets.	LS	1	1	1	$ 10,000	$ 15,000	$ 25,000	$ 15,000	Allowance for pumping.
1.07	Pond 2A land reclamation	Construct reclamation area structural fill for WWTP.	C	Assume buildup will AP65 or similar placed in layers; assume over 1120m2 x 2.5m deep.	m3	2,520	2,800	4,200	$ 45	$ 65	$ 85	$ 182,000	Assume supply is $23/m3 for from Yaldhurst quarries. Allow $10/m3 to cart to site and dump. Allow $5/m3 to place and roll.
1.08	Pond 2A land reclamation	Geogrid reinforcement.	C	Extra over the above for geogrid. Quantity assumes 2-5 layers over 1,120m2.	m2	2,240	3,360	5,600	$ 5	$ 7	$ 9	$ 23,520	
1.09	Pond 1 - create new ASP	Empty pond and dry out.	C	Assume standard 6" pump sets.	LS	1	1	1	$ 10,000	$ 15,000	$ 25,000	$ 15,000	Allowance for pumping.
1.10	Pond 1	Pond liner.	C	HDPE pond liner.	m2	1,040	1,190	1,300	$ 15	$ 17	$ 20	$ 20,230	
1.11	Pond 1	Gas and groundwater drainage pipework	C	Gas and water drain pipes beneath base of pond liner - assume on a 5m grid. Assume water is drained to sumps. Assume gas is directed to vents located on the crest of pond embankments.	m2	1,040	1,190	1,300	$ 20	$ 25	$ 30	$ 29,750	Alternatively, a single layer of Flownet drainage system is around $12/m2 supply - say $15-20/m2 installed. Additional for offtakes, drainage sumps, and gas vents.
1.12	Pond 1	Raise bund to perimeter of Pond 1	C	Allow to raise existing embankment by 200mm high with imported gravels.	m	100	105	110	$50	$ 70	$ 80	$ 7,350	
1.13	Pond 1	HDPE baffle curtain to Pond 1	C	Allow 15m long.	m	15	15	20	$ 400	$ 500	$ 750	$ 7,500	Rates based on similar for Te Maunga (2015) and Woodend (2016).
	Pipework												
1.14	Temporary wastewater line to Pond 2A.	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	80	80	100	$ 170	$ 190	$ 240	$ 15,200	
1.15	Inlet Works - inlet pipe	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	30	30	40	$ 170	$ 190	$ 240	$ 5,700	
1.16	Inlet Works - outlet pipe	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	45	45	60	$ 170	$ 190	$ 240	$ 8,550	

Sensitivity: General

Ref	Plant Area	Description	Type	Size or Capacity	Unit	Quantity Min	Quantity ML	Quantity Max	Rate $ Min	Rate $ ML	Rate $ Max	Most Likely $	Estimator Comments
1.17	Clarifier - inlet pipe	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	20	20	30	$ 170	$ 190	$ 240	$ 3,800	
1.18	Clarifier - outlet pipe	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	18	18	30	$ 170	$ 190	$ 240	$ 3,420	
1.19	Discharge to Pond 3	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	145	145	190	$ 170	$ 190	$ 240	$ 27,550	
1.20	Clarifier - sludge discharge pipe	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	13	13	20	$ 170	$ 190	$ 240	$ 2,470	
1.21	WAS pipeline	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	30	30	40	$ 170	$ 190	$ 240	$ 5,700	
1.22	RAS pipeline	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.		55	55	70	$ 170	$ 190	$ 240	$ 10,450	
1.23	Valving	Isolation valves.	C	Allow one valve at each inlet/outlet for tanks and major equipment.	No	12	12	24	$ 1,000	$ 1,500	$ 2,500	$ 18,000	
1.24	Potable watermain	Assume DN50 PE80 PNM12.5	C	Assume trenched <1.5m deep.	m	110	110	140	$ 80	$ 90	$ 110	$ 9,900	
1.25	Water supply connections and valving		C		No	2	2	2	$ 1,500	$ 2,000	$ 2,500	$ 4,000	
1.26	Water supply booster pump		M		LS	1	1	1	$ 1,500	$ 2,000	$ 3,000	$ 2,000	
1.27	Safety shower and eyewash station		M		LS	1	1	1	$ 2,000	$ 2,500	$ 3,000	$ 2,500	
	Pavements and Hardstandings												
1.28	Inlet works slab	Assume 150 thick reinforced concrete	C		m2	50	100	120	$ 150	$ 225	$ 263	$ 22,500	
1.29	Lift pumpstation slab	Assume 150 thick reinforced concrete	C	Allow 4m x 6m.	m3	24	24	30	$ 150	$ 225	$ 263	$ 5,400	
1.30	Sludge Thickening slab	Assume 150 thick reinforced concrete	C		m2	100	200	220	$ 150	$ 225	$ 263	$ 45,000	
1.31	WAS pumpstation slab	Assume 150 thick reinforced concrete	C	Allow 4m x 6m.	m2	24	24	30	$ 150	$ 225	$ 263	$ 5,400	
1.32	Carbon dosing slab	Assume 150 thick reinforced concrete	C	Allow 2m x 3m.	m2	6	6	12	$ 150	$ 225	$ 263	$ 1,350	
1.33	Chemical storage bund	Carbon dosing bunded area.	S	Assume 3m x 3m bunded area formed with blockwork and protective lining, with a lightweight roof on steel roof framing supported by steel posts.	LS	1	1	1	$ 15,000	$ 20,000	$ 25,000	$ 20,000	
1.34	Drainage around site	Sumps and drains from hardstanding and slabs	C		LS	1	1	1	$ 10,000	$ 10,000	$ 15,000	$ 10,000	
2.00	**Inlet Works**											**$ 263,000**	
2.01	Inlet Screens and Grit Classifier	Combined unit including inlet screen, grit removal, and grit seperator.	M	Assume Aqseptence Noggerath Combined PTP/TOP unit or similar.	LS	1	1	1	$ 220,000	$ 240,000	$ 300,000	$ 240,000	Budget pricing from Brickhouse 11/09/2020.

Ref	Plant Area	Description	Type	Size or Capacity	Unit	Quantity			Rate $			Most Likely $	Estimator Comments
						Min	ML	Max	Min	ML	Max		
2.02	Grit and screening bins		M		No	2	2	2	$ 1,000	$ 1,500	$ 2,500	$ 3,000	nominal allowance for new 1-2m3 waste collection bins.
2.03	Carbon dosing		M	IBC and dosing pump, located in a under cover in a bunded area (measured in Civil Works above.	LS	1	1	1	$ 15,000	$ 20,000	$ 30,000	$ 20,000	
3.00	**Secondary Treatment**											**$ 1,492,000**	
3.01	Activated Sludge Plant (ASP)	Aeration	M	Install 3 x 22kW aerators.	Each	3	3	3	$ 90,000	$ 100,000	$ 120,000	$ 300,000	Allowance is scaled based on costs from other projects.
3.02	Clarifier - Structure	Circular reinforced concrete tank with insitu base & pre-cast post-tensioned walls.	S	Assume 13m ID x 4.5m deep.	LS	1	1	1	$ 350,000	$ 400,000	$ 500,000	$ 400,000	Allowance is scaled based on costs from other projects.
3.03	Clarifier - Vendor supplied package		M	Including support column, stainless steel launder and v-notch weir, travelling bridge scraper, scum baffle and trough, etc.	LS	1	1	1	$ 350,000	$ 400,000	$ 450,000	$ 400,000	Allowance is scaled based on costs from other projects.
3.04	Clarifier	External peripheral walkway and support frame, excluding bridge and stairs	S	Webforge open grating 4kPa, all MSG	m2	40	40	60	$ 1,000	$ 1,100	$ 1,500	$ 44,000	
3.05	Clarifier	Handrails	S	Mono wills, 2m c-c, 2 Rail + Kicker MSG	m	80	80	110	$ 300	$ 350	$ 500	$ 28,000	
3.06	Clarifier	Stairs	S	4.5m, rise, 1.5m wide. MSG Stairs and support frame + Monowills Rails.	m rise	4.5	4.5	4.5	$ 3,500	$ 4,000	$ 4,500	$ 18,000	
3.07	Treated wastewater lift pump station	Assume dry mounted pumps and valving arrangement on a small concrete slab with isolation and non-return valving.	M	Allowance. Concrete slab measured in Civil Works above.	LS	1	1	1	$ 20,000	$ 25,000	$ 30,000	$ 25,000	
3.08		Allowance for valving and flow meters.	M		LS	1	1	1	$ 10,000	$ 15,000	$ 20,000	$ 15,000	
3.09		Lift pipeline.	M	Measured in Civil Works above.	m								
3.10	Sludge chamber	Sludge chamber.	C	Allowance. Design and dimensions TBC.	LS	1	1	1	$ 5,000	$ 10,000	$ 15,000	$ 10,000	
3.11	Treated wastewater chamber	Treated wastewater chamber.	C	Assume precast concrete chamber 2m diameter x 2m high.	LS	1	1	1	$ 10,000	$ 12,000	$ 15,000	$ 12,000	
	Internal Recycle												
3.12	Recycle pump station	Assume dry mounted pumps and valving arrangement on a small concrete slab with isolation and non-return valving.	M	Allowance. Concrete slab measured in Civil Works above.	LS	1	1	1	$ 10,000	$ 15,000	$ 20,000	$ 15,000	
3.13		Allowance for valving and flow meters.	M		LS	1	1	1	$ 10,000	$ 15,000	$ 20,000	$ 15,000	
3.14		Recycle pipeline	M	Measured in Civil Works above.	m								
	WAS											$ -	
3.15	WAS pump station	Assume dry mounted pumps and valving arrangement on a small concrete slab with isolation and non-return valving.	M	Allowance. Concrete slab measured in Civil Works above.	LS	1	1	1	$ 20,000	$ 25,000	$ 30,000	$ 25,000	
3.16		Allowance for valving and flow meters.	M		LS	1	1	1	$ 10,000	$ 15,000	$ 20,000	$ 15,000	
3.17		WAS pipeline to WAS tank	M	Measured in Civil Works above.	m								
3.18	WAS Tank	WAS tank	M	Allow 135m3 minimum. Dimensions and material TBC.	LS	1	1	1	$ 100,000	$ 150,000	$ 170,000	$ 150,000	
3.19	WAS Tank	Coarse bubble aeration system to tank.	M	0.5kW.	LS	1	1	1	$ 15,000	$ 20,000	$ 25,000	$ 20,000	

Sensitivity: General

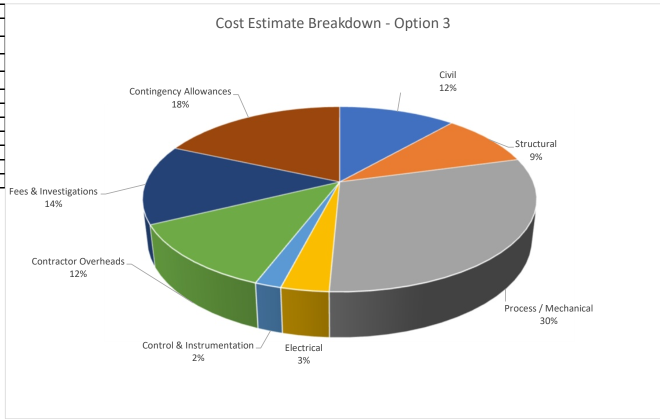
Ref	Plant Area	Description	Type	Size or Capacity	Unit	Quantity			Rate $			Most Likely $	Estimator Comments
						Min	ML	Max	Min	ML	Max		
3.20		Concrete foundation for WAS tank	C	Measured in Civil Works above.	m3								
4.00	**TertiaryTreatment**											**$ 380,000**	
4.01	Dewatering	Polymer dosing system	M		LS	1	1	1	$ 15,000	$ 20,000	$ 25,000	$ 20,000	Allowance is scaled based on costs from other projects.
4.02	Dewatering	Sludge thickening system	M	Drum thickener.	LS	1	1	1	$ 100,000	$ 150,000	$ 170,000	$ 150,000	Allowance is scaled based on costs from other projects.
4.03	Thickened Sludge tank	Sludge tank.	M	Allow 45m3 minimum. Dimensions and material TBC.	LS	1	1	1	$ 50,000	$ 60,000	$ 75,000	$ 60,000	
4.04	Thickened Sludge tank	Coarse bubble aeration system to tank.	M	0.5kW.	LS	1	1	1	$ 15,000	$ 20,000	$ 25,000	$ 20,000	
4.05	Disinfection	UV disinfection.	M	Provisional Allowance only.	LS	0	1	1	$ 100,000	$ 130,000	$ 150,000	$ 130,000	Allowance is scaled based on costs from other projects.
5.00	**Electrical, Instrumentation, and Control**											**$ 293,000**	
5.01	Power Supply	New incomer power cable	E	Allow for a new power supply cable from the existing transformer to the WWTP site.	m	0	150	200	$ 150	$ 250	$ 300	$ 37,500	Allowance only. Subject to further investigation and design.
5.02	Transformer upgrade	Upgrade transformer from 100kVa to 200kVa.	E		LS	1	1	1	$ 50,000	$ 100,000	$ 150,000	$ 100,000	
5.03	MCC	New group starter cabinet to existing MCC for new equipment.	E		LS	1	1	1	$ 5,000	$ 10,000	$ 15,000	$ 10,000	
5.04	Cabling	Power and controls cabling around site to serve new equipment	E	Power and controls cabling for relocated aerators	m	100	200	300	$ 25	$ 30	$ 50	$ 6,000	
5.05	Ducting	Ducting for new cabling	C		m	100	200	300	$ 50	$ 60	$ 70	$ 12,000	
5.06	Instrumentation	Allowance for instrumentation.	I		LS	1	1	1	$ 75,000	$ 80,000	$ 100,000	$ 80,000	
5.07	Controls integration	Allow to integrate new equipment into the existing system.	I		LS	1	1	1	$ 10,000	$ 20,000	$ 50,000	$ 20,000	
5.08	Miscellaneous	Miscellaneous labour and materials for electrical works	E		LS	1	1	1	$ 10,000	$ 20,000	$ 30,000	$ 20,000	
5.09	General site lighting		E		LS	1	1	1	$ 5,000	$ 7,500	$ 10,000	$ 7,500	
	Subtotal - Net Construction Estimate	**Physical Works**								check:	$ 3,054,440	**$ 3,054,440**	
6.00	**Main Contractor Overhead Costs**										**21%**	**$ 649,832**	
6.01	Contractor Overheads	Main Contractor Onsite Overheads / P&G	O		%	$ 3,054,440	$ 3,054,440	$ 3,054,440	10%	15%	20%	$ 458,166	
6.02		Traffic Management	O		%	$ 3,054,440	$ 3,054,440	$ 3,054,440				excluded	assume very minimal - all works on the WWTP site
6.03		Environmental Management	O		%	$ 3,054,440	$ 3,054,440	$ 3,054,440	0.5%	0.5%	1.0%	$ 15,272	
6.04		Main Contractor Offsite Overheads and Profit Margin	O		%	$ 3,527,878	$ 3,527,878	$ 3,527,878	3.0%	5.0%	7.0%	$ 176,394	
	Subtotal - Gross Construction Estima	**Construction Budget**										**$ 3,704,272**	
7.00	**Professional Fees**										**21%**	**$ 761,769**	
7.01	Design and Project Management	Concept design	F		%	$ 3,704,272	$ 3,704,272	$ 3,704,272	2.0%	3.0%	4.0%	$ 111,128	
7.02		Preliminary & detailed design	F		%	$ 3,704,272	$ 3,704,272	$ 3,704,272	5.0%	6.0%	8.0%	$ 222,256	
7.03		Procurement	F		%	$ 3,704,272	$ 3,704,272	$ 3,704,272	1.0%	2.0%	3.0%	$ 74,085	
7.04		Construction supervision	F		%	$ 3,704,272	$ 3,704,272	$ 3,704,272	3.0%	4.0%	6.0%	$ 148,171	
	Subtotal - Professional Fees								**11.0%**	**15.0%**	**21.0%**		
7.05	Consents & Investigations	Allowance for general consenting	F		LS	1	1	1	$ 20,000	$ 30,000	$ 45,000	$ 30,000	
7.06		Geotechnical Investigations & Interpretation	F		LS	0	1	1	$ 10,000	$ 15,000	$ 20,000	$ 15,000	
7.07		Geotech Investigation Contractor	F		LS	0	1	1	$ 50,000	$ 50,000	$ 50,000	$ 50,000	
7.08	Client-managed project costs	Client internal costs, staffing, legal etc.	F		%	$ 3,704,272	$ 3,704,272	$ 3,704,272	2.0%	3.0%	4.0%	$ 111,128	
	Subtotal											**$ 4,466,041**	

Sensitivity: General

Ref	Plant Area	Description	Type	Size or Capacity	Unit	Quantity Min	Quantity ML	Quantity Max	Rate $ Min	Rate $ ML	Rate $ Max	Most Likely $	Estimator Comments
8.00	**Allowances for Risk Register Items and Residual Uncertainty**										**23%**	**$1,007,833.22**	
8.01	Design Development Contingency		G		%	$ 4,466,041	$ 4,466,041	$ 4,466,041	5.0%	10.0%	15.0%	$446,604.11	
8.02	Construction Phase Risk Contingency		G		%	$ 4,466,041	$ 4,466,041	$ 4,466,041	5.0%	10.0%	15.0%	$446,604.11	
8.03	FOREX risk on supply costs of process plant & equipment		G		%	$ 1,637,500	$ 1,637,500	$ 1,637,500	5.0%	7.0%	10.0%	$114,625.00	
8.04	General cost escalation		G		%							excluded	
	Rounding		G		LS	1	1	1		-$3,874		-$3,874.31	
	Total Expected Estimate	**Most Likely**										**$ 5,470,000**	
											check:	$ 5,470,000	
											difference:	$0.00	

Asset Type Totals - Most Likely	Code			Respread	Total
Civil	C	$ 625,940	20.5%	$ 495,016	$ 1,120,956
Structural	S	$ 510,000	16.7%	$ 403,326	$ 913,326
Process / Mechanical	M	$ 1,637,500	53.6%	$ 1,294,993	$ 2,932,493
Electrical	E	$ 181,000	5.9%	$ 143,141	$ 324,141
Control & Instrumentation	I	$ 100,000	3.3%	$ 79,084	$ 179,084
Contractor Overheads	O	$ 649,832			
Fees & Investigations	F	$ 761,769			
Contingency Allowances	G	$ 1,003,959			
Direct Works Subtotal		**$ 3,054,440**			
Indirect Costs Subtotal		**$ 2,415,560**			
Total		**$ 5,470,000**		**$ 2,415,560**	**$ 5,470,000**

			% of Base
Base Estimate		**$ 5,150,000**	
Most Likely - P50 Estimate		**$ 5,470,000**	**106%**
P95 Estimate		**$ 5,930,000**	**115%**
Maximum		**$ 7,610,000**	**148%**



Sensitivity: General

Project	**Ellesmere WWTP**	
Option:	**Option 2 - TN is 7 mg/L**	
Beca Project Number:	3364542	
Phase:	Concept Design	
Estimate Class / Design Stage:	Class 5 / Concept	
Estimate prepared by:	R. Verbeek	22/09/2020
Reviewed By:	J. Pimlott	22/09/2020
Version:	1	

Ref	Plant Area	Description	Type	Size or Capacity	Unit	Quantity Min	Quantity ML	Quantity Max	Rate $ Min	Rate $ ML	Rate $ Max	Most Likely $	Estimator Comments
1.00	**Civil and Siteworks**											**$ 678,940**	
	Site Preparation												
1.01	Site clearance	Allowance for general site clearance	C		LS	0	1	1	$2,500	$ 5,000	$ 10,000	$ 5,000	
1.02	Site clearance	Remove existing redundant equipment	C	Excluded.	LS	0	0	0				$ -	Excluded
	Ponds												
1.03	Relocate aerator in Pond 2A	Relocate existing aerator in Pond 2A.	M	Assume aerator will be removed, cleaned, and reinstalled in Pond 2A.	LS	1	1	1	$5,000	$ 10,000	$ 15,000	$ 10,000	
1.04	Pond 2A land reclamation	Construct new bund to section off reclamation area from Pond 2A.	C	Assume silty gravels or similar to build up the core. Allow 56m long, assume 2.5m high, with 3m wide at crest and 3H:1V slopes. Volume calculated at 20m3/m.	m3	1,010	1,120	1,680	$35	$ 40	$ 50	$ 44,800	Assume supply is $23/m3 for AP65 from Yaldhurst quarries. Allow $10/m3 to cart to site and dump. Allow $5/m3 to place and trim.
1.05	Pond 2A land reclamation	Armouring to new bund.	C	Allow riprap on AP65 to inside face of new bund.	m3	310	340	510	$90	$ 110	$ 150	$ 37,400	Assume supply is $19/m3 from Yaldhurst quarries. Allow $10/m3 to cart to site and dump. Allow $2.50/m3 to place and trim.
1.06	Pond 2A land reclamation	Empty pond and dry out.	C	Assume standard 6" pump sets.	LS	1	1	1	$10,000	$ 15,000	$ 25,000	$ 15,000	Allowance for pumping.
1.07	Pond 2A land reclamation	Construct reclamation area structural fill for WWTP.	C	Assume buildup will AP65 or similar placed in layers; assume over 1120m2 x 2.5m deep.	m3	2,520	2,800	4,200	$45	$ 65	$ 85	$ 182,000	Assume supply is $23/m3 for from Yaldhurst quarries. Allow $10/m3 to cart to site and dump. Allow $5/m3 to place and roll.
1.08	Pond 2A land reclamation	Geogrid reinforcement.	C	Extra over the above for geogrid. Quantity assumes 2-5 layers over 1,120m2.	m2	2,240	3,360	5,600	$5	$ 7	$ 9	$ 23,520	
1.09	Pond 1 - create new ASP	Empty pond and dry out.	C	Assume standard 6" pump sets.	LS	1	1	1	$10,000	$ 15,000	$ 25,000	$ 15,000	Allowance for pumping.
1.10	Pond 1	Pond liner.	C	HDPE pond liner.	m2	1,040	1,190	1,300	$15	$ 17	$ 20	$ 20,230	
1.11	Pond 1	Gas and groundwater drainage pipework	C	Gas and water drain pipes beneath base of pond liner - assume on a 5m grid. Assume water is drained to sumps. Assume gas is directed to vents located on the crest of pond embankments.	m2	1,040	1,190	1,300	$20	$ 25	$ 30	$ 29,750	Alternatively, a single layer of Flownet drainage system is around $12/m2 supply - say $15-20/m2 installed. Additional for offtakes, drainage sumps, and gas vents.
1.12	Pond 1	Concrete wall to perimeter of Pond 1	C	700mm high reinforced concrete wall to perimeter. PE liner fixed to new wall.	m	100	105	110	$470	$ 570	$ 680	$ 59,850	
1.13	Pond 1	HDPE baffle curtain to Pond 1	C	Allow 15m long.	m	15	15	20	$400	$ 500	$ 750	$ 7,500	Rates based on similar for Te Maunga (2015) and Woodend (2016).

Sensitivity: General

Ref	Plant Area	Description	Type	Size or Capacity	Unit	Quantity Min	Quantity ML	Quantity Max	Rate $ Min	Rate $ ML	Rate $ Max	Most Likely $	Estimator Comments
	Pipework												
1.14	Temporary wastewater line to Pond 2A.	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	80	80	100	$170	$ 190	$ 240	$ 15,200	
1.15	Inlet Works - inlet pipe	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	30	30	40	$170	$ 190	$ 240	$ 5,700	
1.16	Inlet Works - outlet pipe	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	45	45	60	$170	$ 190	$ 240	$ 8,550	
1.17	Clarifier - inlet pipe	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	20	20	30	$170	$ 190	$ 240	$ 3,800	
1.18	Clarifier - outlet pipe	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	18	18	30	$170	$ 190	$ 240	$ 3,420	
1.19	Discharge to Pond 3	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	145	145	190	$170	$ 190	$ 240	$ 27,550	
1.20	Clarifier - sludge discharge pipe	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	13	13	20	$170	$ 190	$ 240	$ 2,470	
1.21	WAS pipeline	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.	m	30	30	40	$170	$ 190	$ 240	$ 5,700	
1.22	RAS pipeline	Assume HDPE upto DN225.	C	Assume trenched <1.5m deep.		55	55	70	$170	$ 190	$ 240	$ 10,450	
1.23	Valving	Isolation valves.	C	Allow one valve at each inlet/outlet for tanks and major equipment.	No	12	12	24	$1,000	$ 1,500	$ 2,500	$ 18,000	
1.24	Potable watermain	Assume DN50 PE80 PNM12.5	C	Assume trenched <1.5m deep.	m	110	110	140	$80	$ 90	$ 110	$ 9,900	
1.25	Water supply connections and valving		C		No	2	2	2	$1,500	$ 2,000	$ 2,500	$ 4,000	
1.26	Water supply booster pump		M		LS	1	1	1	$1,500	$ 2,000	$ 3,000	$ 2,000	
1.27	Safety shower and eyewash station		M		LS	1	1	1	$2,000	$ 2,500	$ 3,000	$ 2,500	
	Pavements and Hardstandings												
1.28	Inlet works slab	Assume 150 thick reinforced concrete	C		m2	50	100	120	$150	$ 225	$ 263	$ 22,500	
1.29	Lift pumpstation slab	Assume 150 thick reinforced concrete	C	Allow 4m x 6m.	m3	24	24	30	$150	$ 225	$ 263	$ 5,400	
1.30	Sludge Thickening slab	Assume 150 thick reinforced concrete	C		m2	100	200	220	$150	$ 225	$ 263	$ 45,000	
1.31	WAS pumpstation slab	Assume 150 thick reinforced concrete	C	Allow 4m x 6m.	m2	24	24	30	$150	$ 225	$ 263	$ 5,400	

Ref	Plant Area	Description	Type	Size or Capacity	Unit	Quantity Min	Quantity ML	Quantity Max	Rate $ Min	Rate $ ML	Rate $ Max	Most Likely $	Estimator Comments
1.32	Carbon dosing slab	Assume 150 thick reinforced concrete	C	Allow 2m x 3m.	m2	6	6	12	$150	$ 225	$ 263	$ 1,350	
1.33	Chemical storage bund	Carbon dosing bunded area.	S	Assume 3m x 3m bunded area formed with blockwork and protective lining, with a lightweight roof on steel roof framing supported by steel posts.	LS	1	1	1	$15,000	$ 20,000	$ 25,000	$ 20,000	
1.34	Drainage around site	Sumps and drains from hardstanding and slabs	C		LS	1	1	1	$10,000	$ 10,000	$ 15,000	$ 10,000	
2.00	**Inlet Works**											**$ 263,000**	
2.01	Inlet Screens and Grit Classifier	Combined unit including inlet screen, grit removal, and grit seperator.	M	Assume Aqseptence Noggerath Combined PTP/TOP unit or similar.	LS	1	1	1	$220,000	$ 240,000	$ 300,000	$ 240,000	Budget pricing from Brickhouse 11/09/2020.
2.02	Grit and screening bins		M		No	2	2	2	$1,000	$ 1,500	$ 2,500	$ 3,000	nominal allowance for new 1-2m3 waste collection bins.
2.03	Carbon dosing		M	IBC and dosing pump, located in a under cover in a bunded area (measured in Civil Works above.	LS	1	1	1	$15,000	$ 20,000	$ 30,000	$ 20,000	
3.00	**Secondary Treatment**											**$ 1,492,000**	
3.01	Activated Sludge Plant (ASP)	Aeration	M	Install 3 x 22kW aerators.	Each	3	3	3	$90,000	$ 100,000	$ 120,000	$ 300,000	Allowance is scaled based on costs from other projects.
3.02	Clarifier - Structure	Circular reinforced concrete tank with insitu base & pre-cast post-tensioned walls.	S	Assume 13m ID x 4.5m deep.	LS	1	1	1	$350,000	$ 400,000	$ 500,000	$ 400,000	Allowance is scaled based on costs from other projects.
3.03	Clarifier - Vendor supplied package		M	Including support column, stainless steel launder and v-notch weir, travelling bridge scraper, scum baffle and trough, etc.	LS	1	1	1	$350,000	$ 400,000	$ 450,000	$ 400,000	Allowance is scaled based on costs from other projects.
3.04	Clarifier	External peripheral walkway and support frame, excluding bridge and stairs	S	Webforge open grating 4kPa, all MSG	m2	40	40	60	$1,000	$ 1,100	$ 1,500	$ 44,000	
3.05	Clarifier	Handrails	S	Mono wills, 2m c-c, 2 Rail + Kicker MSG	m	80	80	110	$300	$ 350	$ 500	$ 28,000	
3.06	Clarifier	Stairs	S	4.5m, rise, 1.5m wide. MSG Stairs and support frame + Monowills Rails.	m rise	4.5	4.5	4.5	$3,500	$ 4,000	$ 4,500	$ 18,000	
3.07	Treated wastewater lift pump station	Assume dry mounted pumps and valving arrangement on a small concrete slab with isolation and non-return valving.	M	Allowance. Concrete slab measured in Civil Works above.	LS	1	1	1	$20,000	$ 25,000	$ 30,000	$ 25,000	
3.08		Allowance for valving and flow meters.	M		LS	1	1	1	$10,000	$ 15,000	$ 20,000	$ 15,000	
3.09		Lift pipeline.	M	Measured in Civil Works above.	m								
3.10	Sludge chamber	Sludge chamber.	C	Allowance. Design and dimensions TBC.	LS	1	1	1	$5,000	$ 10,000	$ 15,000	$ 10,000	
3.11	Treated wastewater chamber	Treated wastewater chamber.	C	Assume precast concrete chamber 2m diameter x 2m high.	LS	1	1	1	$10,000	$ 12,000	$ 15,000	$ 12,000	
	Internal Recycle												
3.12	Recycle pump station	Assume dry mounted pumps and valving arrangement on a small concrete slab with isolation and non-return valving.	M	Allowance. Concrete slab measured in Civil Works above.	LS	1	1	1	$10,000	$ 15,000	$ 20,000	$ 15,000	
3.13		Allowance for valving and flow meters.	M		LS	1	1	1	$10,000	$ 15,000	$ 20,000	$ 15,000	

Sensitivity: General

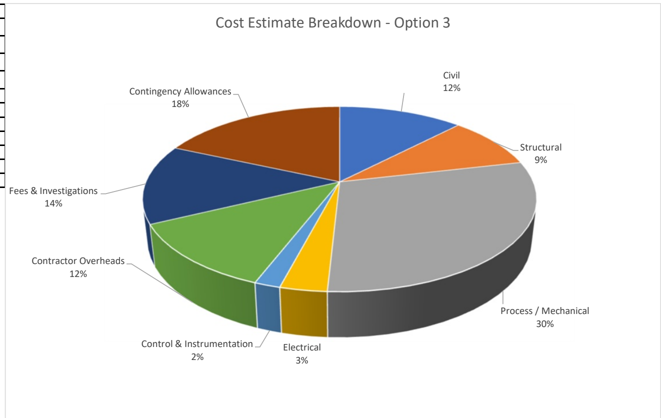
Ref	Plant Area	Description	Type	Size or Capacity	Unit	Quantity			Rate $			Most Likely $	Estimator Comments
						Min	ML	Max	Min	ML	Max		
3.14		Recycle pipeline	M	Measured in Civil Works above.	m								
	WAS											$ -	
3.15	WAS pump station	Assume dry mounted pumps and valving arrangement on a small concrete slab with isolation and non-return valving.	M	Allowance. Concrete slab measured in Civil Works above.	LS	1	1	1	$20,000	$ 25,000	$ 30,000	$ 25,000	
3.16		Allowance for valving and flow meters.	M		LS	1	1	1	$10,000	$ 15,000	$ 20,000	$ 15,000	
3.17		WAS pipeline to WAS tank	M	Measured in Civil Works above.	m								
3.18	WAS Tank	WAS tank	M	Allow 135m3 minimum. Dimensions and material TBC.	LS	1	1	1	$100,000	$ 150,000	$ 170,000	$ 150,000	
3.19	WAS Tank	Coarse bubble aeration system to tank.	M	0.5kW.	LS	1	1	1	$15,000	$ 20,000	$ 25,000	$ 20,000	
3.20		Concrete foundation for WAS tank	C	Measured in Civil Works above.	m3								
4.00	**TertiaryTreatment**											**$ 380,000**	
4.01	Dewatering	Polymer dosing system	M		LS	1	1	1	$15,000	$ 20,000	$ 25,000	$ 20,000	Allowance is scaled based on costs from other projects.
4.02	Dewatering	Sludge thickening system	M	Drum thickener.	LS	1	1	1	$100,000	$ 150,000	$ 170,000	$ 150,000	Allowance is scaled based on costs from other projects.
4.03	Thickened Sludge tank	Sludge tank.	M	Allow 45m3 minimum. Dimensions and material TBC.	LS	1	1	1	$50,000	$ 60,000	$ 75,000	$ 60,000	
4.04	Thickened Sludge tank	Coarse bubble aeration system to tank.	M	0.5kW.	LS	1	1	1	$15,000	$ 20,000	$ 25,000	$ 20,000	
4.05	Disinfection	UV disinfection.	M	Provisional Allowance only.	LS	0	1	1	$100,000	$ 130,000	$ 150,000	$ 130,000	Allowance is scaled based on costs from other projects.
5.00	**Electrical, Instrumentation, and Control**											**$ 293,000**	
5.01	Power Supply	New incomer power cable	E	Allow for a new power supply cable from the existing transformer to the WWTP site.	m	0	150	200	$150	$ 250	$ 300	$ 37,500	Allowance only. Subject to further investigation and design.
5.02	Transformer upgrade	Upgrade transformer from 100kVa to 200kVa.	E		LS	1	1	1	$ 50,000	$ 100,000	$ 150,000	$ 100,000	
5.03	MCC	New group starter cabinet to existing MCC for new equipment.	E		LS	1	1	1	$ 5,000	$ 10,000	$ 15,000	$ 10,000	
5.04	Cabling	Power and controls cabling around site to serve new equipment	E	Power and controls cabling for relocated aerators	m	100	200	300	$ 25	$ 30	$ 50	$ 6,000	
5.05	Ducting	Ducting for new cabling	C		m	100	200	300	$ 50	$ 60	$ 70	$ 12,000	
5.06	Instrumentation	Allowance for instrumentation.	I		LS	1	1	1	$ 75,000	$ 80,000	$ 100,000	$ 80,000	
5.07	Controls integration	Allow to integrate new equipment into the existing system.	I		LS	1	1	1	$ 10,000	$ 20,000	$ 50,000	$ 20,000	
5.08	Miscellaneous	Miscellaneous labour and materials for electrical works	E		LS	1	1	1	$ 10,000	$ 20,000	$ 30,000	$ 20,000	
5.09	General site lighting		E		LS	1	1	1	$ 5,000	$ 7,500	$ 10,000	$ 7,500	
	Subtotal - Net Construction Estimate	**Physical Works**								check:	$ 3,106,940	**$ 3,106,940**	
6.00	**Main Contractor Overhead Costs**										**21%**	**$661,001**	
6.01	Contractor Overheads	Main Contractor Onsite Overheads / P&G	O		%	$ 3,106,940	$ 3,106,940	$ 3,106,940	10%	15%	20%	$466,041	
6.02		Traffic Management	O		%	$ 3,106,940	$ 3,106,940	$ 3,106,940				excluded	assume very minimal - all works on the WWTP site
6.03		Environmental Management	O		%	$ 3,106,940	$ 3,106,940	$ 3,106,940	0.5%	0.5%	1.0%	$15,535	
6.04		Main Contractor Offsite Overheads and Profit Margin	O		%	$ 3,588,516	$ 3,588,516	$ 3,588,516	3.0%	5.0%	7.0%	$179,426	
	Subtotal - Gross Construction Estima	**Construction Budget**										**$ 3,767,941**	

Sensitivity: General

Ref	Plant Area	Description	Type	Size or Capacity	Unit	Quantity			Rate $			Most Likely $	Estimator Comments
						Min	ML	Max	Min	ML	Max		
7.00	**Professional Fees**										**21%**	**$ 773,229**	
7.01	Design and Project Management	Concept design	F		%	$ 3,767,941	$ 3,767,941	$ 3,767,941	2.0%	3.0%	4.0%	$ 113,038	
7.02		Preliminary & detailed design	F		%	$ 3,767,941	$ 3,767,941	$ 3,767,941	5.0%	6.0%	8.0%	$ 226,076	
7.03		Procurement	F		%	$ 3,767,941	$ 3,767,941	$ 3,767,941	1.0%	2.0%	3.0%	$ 75,359	
7.04		Construction supervision	F		%	$ 3,767,941	$ 3,767,941	$ 3,767,941	3.0%	4.0%	6.0%	$ 150,718	
	Subtotal - Professional Fees								**11.0%**	**15.0%**	**21.0%**		
7.05	Consents & Investigations	Allowance for general consenting	F		LS	1	1	1	$ 20,000	$ 30,000	$ 45,000	$ 30,000	
7.06		Geotechnical Investigations & Interpretation	F		LS	0	1	1	$ 10,000	$ 15,000	$ 20,000	$ 15,000	
7.07		Geotech Investigation Contractor	F		LS	0	1	1	$ 50,000	$ 50,000	$ 50,000	$ 50,000	
7.08	Client-managed project costs	Client internal costs, staffing, legal etc.	F		%	$ 3,767,941	$ 3,767,941	$ 3,767,941	2.0%	3.0%	4.0%	$ 113,038	
	Subtotal											**$ 4,541,171**	
8.00	**Allowances for Risk Register Items and Residual Uncertainty**										**23%**	**$ 1,022,859**	
8.01	Design Development Contingency		G		%	$ 4,541,171	$ 4,541,171	$ 4,541,171	5.0%	10.0%	15.0%	$ 454,117	
8.02	Construction Phase Risk Contingency		G		%	$ 4,541,171	$ 4,541,171	$ 4,541,171	5.0%	10.0%	15.0%	$ 454,117	
8.03	FOREX risk on supply costs of process plant & equipment		G		%	$ 1,637,500	$ 1,637,500	$ 1,637,500	5.0%	7.0%	10.0%	$ 114,625	
8.04	General cost escalation		G		%							excluded	
	Rounding		G		LS	1	1	1		-$4,030		-$ 4,030	
	Total Expected Estimate	**Most Likely**										**$ 5,560,000**	
											check:	$ 5,560,000	
											difference:	$ -	

Asset Type Totals - Most Likely	Code			Respread	Total
Civil	C	$ 678,440	21.8%	$ 535,657	$ 1,214,097
Structural	S	$ 510,000	16.4%	$ 402,666	$ 912,666
Process / Mechanical	M	$ 1,637,500	52.7%	$ 1,292,875	$ 2,930,375
Electrical	E	$ 181,000	5.8%	$ 142,907	$ 323,907
Control & Instrumentation	I	$ 100,000	3.2%	$ 78,954	$ 178,954
Contractor Overheads	O	$ 661,001			
Fees & Investigations	F	$ 773,229			
Contingency Allowances	G	$ 1,018,829			
Direct Works Subtotal		**$ 3,106,940**			
Indirect Costs Subtotal		**$ 2,453,060**			
Total		**$ 5,560,000**		**$ 2,453,060**	**$ 5,560,000**

			% of Base
Base Estimate		**$ 5,240,000**	
Most Likely - P50 Estimate		**$ 5,560,000**	**106%**
P95 Estimate		**$ 6,030,000**	**115%**
Maximum		**$ 7,730,000**	**148%**



22/09/2020
3255220 // Option 2
Ellesmere WWTP Concept Cost Estimate.xlsx

Sensitivity: General

Project:	**Ellesmere WWTP**	
Phase:	Concept Design	
Report:	Operating Cost Estimates	
Prepared By:	R. Verbeek	22/09/2020
Reviewed By:	J. Pimlott	22/09/2020

Annual Operating Costs		**Option 1**		**Option 2**
Power Costs	$	217,045	$	223,302
Polymer	$	5,260	$	6,300
Acetic acid	$	58,035	$	133,590
Grit disposal	$	25,896	$	25,896
Screenings disposal	$	24,648	$	24,648
Sludge disposal	$	72,800	$	91,000
Operations labour	$	60,000	$	60,000
Sampling and lab testing	$	25,000	$	25,000
Maintenance	$	38,370	$	38,370
Subtotal	**$**	**527,054**	**$**	**628,106**
Allow 20% contingency	$	105,000	$	126,000
Rounding	-$	2,054	-$	4,106
Total Annual Operating Costs - $/yr	**$**	**630,000**	**$**	**750,000**

Inputs:		**Option 1**		**Option 2**		
Electricity cost - $/kWh	$	0.30	$	0.30	kWh	allowance. Rate TBC by SDC.
Polymer dosing		526		630	kg/p.a.	from design team.
Polymer $/kg	$	10	$	10	kg	typical supply pricing.
Acetic acid dosing		106		244	l/day	from design team.
Acetic acid (90%) $/l	$	1.50	$	1.50	l	allowance - supply pricing to be confirmed by supplier.
Grit production - 480kg/week		480		480	kg/wk	from design team.
Screenings production - 240kg/week		240		240	kg/wk	from design team.
Screenings cartage	$	150	$	150	hr	allowance. Assume 3hr return trip to the Kate Valley.
Dumping fees	$	100	$	100	tonne	typical allowance.
Sludge production - thickened sludge at 5% DS		14.0		17.6	m3/day	from design team.
Sludge cartage	$	200	$	250	hr	allowance. Assume 1hr return trip to the Pines WWTP = +/- 23km.
Operator cost	$	120,000	$	120,000	p.a.	assume 50% FTE required.
Sampling and lab testing	$	25,000	$	25,000	p.a.	allowance.
MEIC maintenance		2%		2%	p.a.	typical allowance.
Mechanical and Electrical CAPEX		$1,918,500		$1,918,500		from capex cost estimates.

Power Costs						
Daily power consumption kWh		1,982		2,039	kWh/day	
Yearly power consumption kWh/year		723,484		744,341	kWh/yr	from design team.
Power cost	$	0.30	$	0.30	$/kWh	
Yearly power cost	**$**	**217,045**	**$**	**223,302**	$/yr	

Chemical Costs					
Polymer dosing					
Weekly polymer consumption		10.1		12.1	kg/wk
Yearly polymer consumption		526		630	kg/y
Polymer cost	$	10	$	10	$/kg
Yearly polymer cost	**$**	**5,260**	**$**	**6,300**	$/yr

Acetic acid dosing						
Daily consumption		106		244	l/day	
Yearly consumption		38,690		89,060	liters	
Acetic acid cost	$	1.50	$	1.50	$/l	rate is allowance only - need to verify with supplier.
Yearly acetic acid cost	**$**	**58,035**	**$**	**133,590**	$/yr	

Grit and Screenings Disposal

Assume collected in 2 X 1100 L bins. Both bins emptied to offsite disposal weekly. (Assume to Kate Valley).

Grit production per week.		480		480	kg/wk
Allow to dispose weekly. 3hr round trip @$150/hr plus $100/tonne dumping fees.	$	498	$	498	$/wk
Annual disposal costs.	**$**	**25,896**	**$**	**25,896**	$/yr
Screenings production per week.		240		240	kg/wk
Allow to dispose weekly. 3hr round trip @$150/hr plus $100/tonne dumping fees.	$	474	$	474	$/wk
Annual disposal costs.	**$**	**24,648**	**$**	**24,648**	$/yr

Sensitivity: General

Project:	**Ellesmere WWTP**		
Phase:	Concept Design		
Report:	Operating Cost Estimates		
Prepared By:	R. Verbeek	22/09/2020	
Reviewed By:	J. Pimlott	22/09/2020	

Sludge Disposal

Assume daily disposal.

Volume for Option 2 means likely to require either a larger truck or truck and trailer unit, or 2 trips per day.

Sludge production per week.	98	123	kg/wk
Allow to dispose daily. 1hr round trip @$150/hr.	$ 1,400	$ 1,750	$/wk
Annual disposal costs.	**$ 72,800**	**$ 91,000**	$/yr
Operations labour			
Allow $120k p.a., assume 50% FTE required.	$ 60,000	$ 60,000	$/yr
Sampling and lab testing			
Allowance	$ 25,000	$ 25,000	$/yr
Maintenance			
Allow 2% for maintenance and renewals	2%	2%	
Mechanical and Electrical CAPEX	$ 1,918,500	$ 1,918,500	
Annual maintenance allowance	**$ 38,370**	**$ 38,370**	$/yr

E

Appendix E – Ellesmere to Pines Pump Option

Ellesmere WWTP to Pines WWTP Pipeline

Concept Design

Prepared for Selwyn District Council

Prepared by Beca Limited

15 June 2020

Creative people together transforming our world

Contents

Appendices

Revision History

Revision Nº	Prepared By	Description	Date
A	David Carshalton	For Client Review	19 June 2020

Document Acceptance

Action	Name	Signed	Date
Prepared by	David Carshalton	DCarshalton	19 June 2020
Reviewed by	Paul Reed	Paul Reed	19 June 2020
Approved by	Paul Reed		19 June 2020
on behalf of	Beca Limited		

Executive Summary

Ellesmere WWTP needs to be upgraded to cater for future growth and to meet its consent conditions. An option being considered by Selwyn District Council (SDC) is to convey the wastewater to Pines WWTP to minimise the need for the upgrade at the Ellesmere WWTP. This report summarises the design of a new pipeline between the Ellesmere WWTP and the Pines WWTP.

The catchment area proposed by SDC for the pipeline includes the current Ellesmere WWTP catchment and three other areas: Selwyn Huts, Coes Ford and a campground at Chamberlains Ford.

The design flow rates in the proposed pipeline are estimated below for both raw and treated wastewater.

- Raw effluent conveyed at peak wet weather flow (PWWF): 192 l/s.
- Raw effluent conveyed at average wet weather flow (AWWF): 77 l/s. This would require some buffer storage for the wet weather flow in excess of the AWWF. The existing ponds could be retained to serve this function.
- Treated effluent flow using the ponds fr buffering: 25 l/s. This is based on the WWTP influent flow from December 2017 to January 2020.

There are issues with pumping both treated and raw wastewater. The treated effluent will be low in carbon and rich in nitrogen, giving a C:N ratio imbalance and therefore making the nitrogen difficult to remove at the Pines WWTP. On the other hand the raw wastewater is likely to be septic by the time it arrives at the Pines WWTP causing odour issues. The pipe would need to be larger due to the higher raw wastewater flow and also more expensive.

Of the two options, to convey raw wastewater or treated effluent, the problems presented by conveying treated wastewater to Pines WWTP would have less negative effect compared to raw wastewater, as well as a lower capital cost. For this reason it is assumed treated effluent is pumped to the Pines WWTP.

The proposed pipeline route would follow local roads and the river crossing would be at the existing Leeston Road bridge.

Two pump stations have been proposed on the main line: at the Leeston WWTP outlet and at the recreational reserve on Leeston Road. Commercial sized pressure sewer type pump stations are proposed for Selwyn Huts and Coes Ford to discharge to the pump station at the Leeston Rd recreational reserve. Upgrades will be required at the Pines WWTP to treat the Ellesmere wastewater. These include a new clarifier and a method of adding carbon to the process (to remove the nitrogen).

Further design work is required, including bridge investigations, detailing the Pines WWTP treatment upgrades and a Safety in Design workshop.

The total cost estimate for this project is $8,000,000 + GST (including a 25% contingency).

1 Introduction

Ellesmere WWTP needs to be upgraded to cater for future growth and to meet its consent conditions. An option being considered by Selwyn District Council (SDC) is to convey the wastewater to Pines WWTP to minimise the upgrade required at the Ellesmere WWTP.

Beca Ltd (Beca) has been engaged by Selwyn District Council (SDC) to undertake a Concept Design of a pipeline from the Ellesmere WWTP to the Pines WWTP.

The purpose of this report is to present a Concept Design and Cost Estimate of a pipeline between the Ellesmere WWTP and the Pines WWTP, including the required scope of investigations to allow the project to be developed into the detailed design stage.

2 Design Inputs

2.1 Catchment

The wastewater catchments for the proposed pipeline, and the method for connecting them, are outlined below.

- Southbridge, Leeston and Doyleston – Wastewater from all of these townshops currently gets pumped to the Ellesmere WWTP. The proposed pipeline will go through Doyleston and so it may be possible to pump directly into the proposed pipeline.
- Upper Selwyn Huts, near Dayes Rd (100huts). A new pump station and rising main would be required for this catchment.
- Coes Ford Campground - assumed 100 people. A new pump station and rising main would be required at the camp ground.
- Chamberlains Ford Campground – assumed 100 people. A new pump station and rising main would be required at the camp ground to pump through to the proposed intermediate pump station. It is unlikely that it will be suitable to install the intermediate pump station at the camp ground, however this may also be an option.

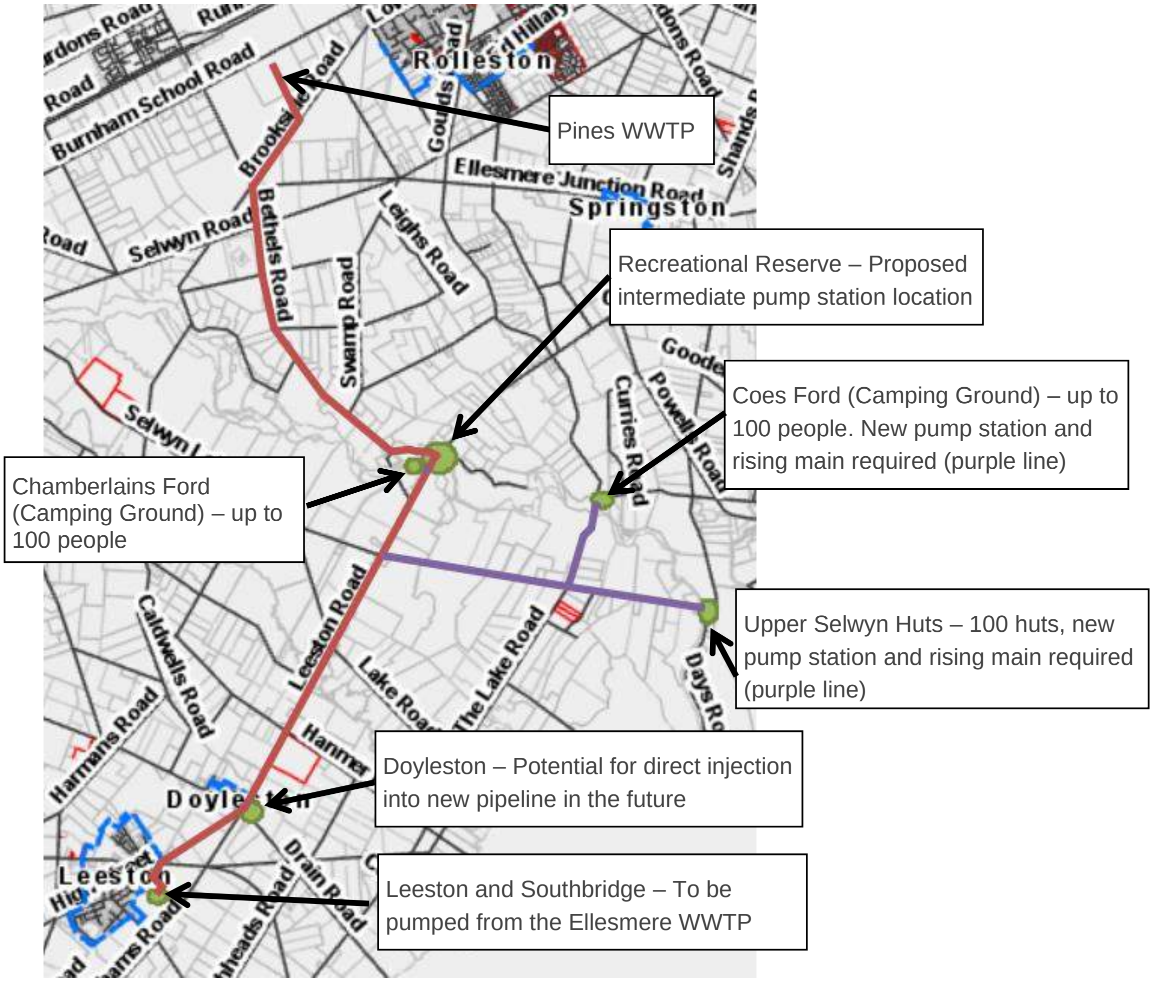


Figure 1 - Locations of the catchments (green dots) relative to the new pipeline (red line)

2.2 Flows

The fluid to be conveyed will either be:

1) Raw sewage – This will require the pipeline and pump stations to be sized to convey the peak wet weather flow, or the average wet weather flow if some buffer storage is included (e.g. in the existing ponds). Or,

2) Treated effluent – This will require the pipeline and pump stations to be sized to convey a smaller flow than the peak wet weather flow, since the existing ponds will act as a buffer.

The raw sewage flow information for Leeston, Southbridge and Doyleston has come from Appendix B of the report *'Ellesmere Wastewater Masterplan' prepared for SDC by Stantec in 2017*. The flows include Stantec's estimations of discharges from "proposed full development" based on the development of the town to the maximum allowed by zoning, rather than by population figures. Stantec's' report states *"The projected population has been calculated with reference to the recent LURP, Selwyn District Plan changes, and of population growths agreed with SDC."*

The raw sewage design flows are shown in Table 1. Peak wet weather flow (PWWF), and average wet weather flow (AWWF) are useful for the sizing of the pipeline to convey raw wastewater. Both flow options could be used.

Table 1 – Sewage Design Flows

Catchment	PWWF (l/s)	AWWF (l/s)	ADWF (l/s)
Leeston	108.2	43.3	21.6
Southbridge	67.1	26.8	13.4
Doyleston	6.4	2.56	1.28
Upper Selwyn Huts	3.6*	1.4	0.7
Coes Ford Campsite	3.6*	1.4	0.7
Chamberlains Ford Campsite	3.6*	1.4	0.7
Total	**192**	**77**	**38**

* Wet weather flows from small catchments can be effectively attenuated because the volumes to be stored are small, therefore this is conservative.

The treated effluent flow to be used for the pipeline sizing is assumed to be the average dry weather flow (ADWF) plus an allowance of 7 l/s (approx. 20%) for wet weather flow. To use the ADWF in this way will require the Ellesmere ponds to be used to buffer flows, therefore a larger flow (ie an extra 7 l/s) is required to account for rainfall on the ponds and to convey wet weather flows after wet weather events.

To use the ponds as buffer storage will require approximately 150 mm of free board over normal operating levels. Rainfall and evaporation have not been included in the study of the flow rate; an additional allowance of freeboard will be required to accommodate these effects.

3 Pipeline Design

3.1 Initial Pipe Sizing

Table 2 shows the pipe diameters for each flow conveyance option, the flow velocity, pumping head, power requirements and the retention time (based on current ADWF flow).

Table 2: Initial Pipe and Pump Sizing for Various Flows

Parameter	Raw Sewage PWWF (192 l/s)		Raw Sewage AWWF (77 l/s)		Treated Effluent Pond attenuated flow (45 l/s)	
Pipe internal diameter (mm)	500	400	310	260	240	200
Flow velocity (m/s)	1.0	1.5	1.0	1.5	1.0	1.5
Required pumping head for full pipe length (m)	67	129	95	176	130	280
Required Pump kW (estimated from flow and head)	212	409	122	226	80	180
Average retention time (hrs)	28.8	18.4	11.1	7.8	5.4	4.07

3.2 Effluent Type Consideration

The final pipeline can be designed to convey either raw wastewater or treated wastewater as described below:

1) Raw wastewater - This would allow the Ellesmere WWTP Ponds to be decommissioned although some buffer storage would be required for the raw wastewater if the AWWF only is pumped. Decommissioning the plant would lead to lower operational costs as it would be more efficient to treat the effluent at the Pines WWTP. However, a larger pipe would be required to convey the peak flows. This will result in a much larger residence time in the pipeline, and septic sewage arriving at Pines WWTP greatly increasing the risk of odour. Residence time would increase up to 29 hours in the initial operating period. Retention times above 8 hours are considered the potential to increase the risk of septic sewage. Dosing of the effluent could be used to overcome this risk.

2) Treated wastewater - This would allow for a substantially smaller pipeline. This would result in the ponds buffering wet weather flows, the treated effluent being less likely to turn septic in the pipeline and reduced residence time. However, this will lead to a carbon deficit at the Pines WWTP during the nitrogen removal treatment process. Carbon could be added to the system to overcome this. This will require upgrades at the Ellesmere WWTP and/or additional carbon being added at the Pines WWTP.

Of these two options, Beca considers that the problems presented by conveying treated wastewater to Pines WWTP are substantially easier to overcome than treating septic sewage. Furthermore, conveying treated wastewater will be a substantially lower capital cost as it requires smaller pipes.

Therefore, a DN280 SDR17 PE pipe delivering 45L/s is recommended to be used to convey the flow.

3.3 Horizontal Alignment

Two pipe routes from Leeston WWTP to Pines WWTP were considered – a direct route (shortest length) and a route following local roads. These proposed routes are shown in Figure 3, where the longer route is green and the shorter route is red.

The preferred route is the longer route (green). It is 21 km long and crosses the Selwyn River at the bridge on Leeston Road. The pipe route follows the existing roadway and does not cross privately owned land.

A more direct route can be selected, reducing the pipe length to 18 km. However, this requires directional drilling beneath the Selwyn River and crosses privately owned land to reduce the length of the pipeline. All other routes that remain in the roadway are approximately 21 km long regardless of where the Selwyn River is crossed.

Appendix A shows the proposed detailed pipe route in greater detail, including the extent of the pipeline that is in sealed roads. This selection avoids surface features such as overhead power lines and deep drains and was based on a site visit in late May 2020. The pipeline distance is currently taken from the inlet of the Ellesmere WWTP. An additional length may be required if it is agreed to pump treated effluent.

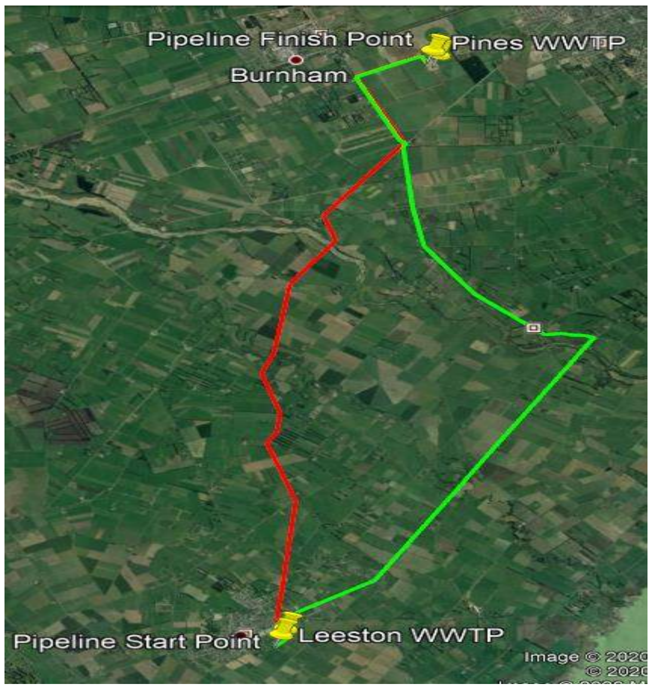


Figure 1: Pipe Route Options. Green route is preferred.

3.4 Bridge Crossing

The rising main is proposed to cross the existing bridge at Leeston Road. This requires:

- Consultation with the appropriate bridge engineer to consider the additional load and supports proposed.
- PE or metallic pipe bolted onto the underside or side of the bridge (refer to photographs below of the top and bottom of the bridge). A metallic pipe is preferred as a PE pipe can expand and contract significantly in different temperatures putting pressure on end connections.
- A transition at either end for material (if using metallic pipe)
- An air release valve due to it being a high point
- An isolation valve at either end.

Figure 2: Selwyn River Bridge at Leeston Road

Figure 3: Selwyn River Bridge at Leeston Road - Underside

3.5 Vertical Profile

The vertical profile proposed is shown in Appendix A. This includes the following features:

- A general rising trend from Ellesmere WWTP to Pines WWTP
- Local high points expected at about CH500 and at the Selwyn River Bridge
- Pipe cover assumed to be 900 mm throughout
- The pipeline rises from 14.72 mRL to 49.32 mRL (an increase of 34.6 m)

3.6 Construction Method

The pipe is assumed to be trenched for the full length, but with trenchless road crossings. Alternatives could be considered during the next stage of design including:

- Drilling beneath the Selwyn River
- Mole ploughing or chain trenching

3.7 Air Management and Scour Points

The pipeline will have a generally rising trend with the flow direction. Therefore, the pipe will remain full when not operating. Air valves will be required at local high points with a 1 km spacing to allow for pipe filling and draining.

In addition, scour valves and line valves are likely to be required along the pipe. The scour valves may double as pigging ports to allow for the future cleaning of the pipeline. The line valves allow manageable lengths (e.g. 1 km) of the pipeline to be isolated for maintenance and repairs.

3.8 Transients

The pipeline is likely to experience full vacuum pressure during a pump trip, as such, it will need to be appropriately bedded and have enough inherent strength to withstand full vacuum pressure. No check on water hammer has been undertaken as part of this study.

3.9 Pipe Material

PE100 pipe has been selected for this concept design because it is robust, easy to lay in long lengths and removes the need for thrust blocks. Other pipes materials (e.g. PVC) shall be considered and can progress to the next stage of design for comparison. A PN10 PE100 pipe should be sufficient for the majority of the pipeline. It is suggested a fatigue analysis is undertaken as part of the next stage of design to check for any derting that might be required. The pipeline immediately after the intermediate pump station may need to be increased to PN12.5 for a relatively short length.

4 Pump Station Design

4.1 Pump Station Locations

The two proposed mainline pump stations are as follows:

1) At the Leeston WWTP outlet, consisting of:

    a. New suction DN200 pipe through the lagoon wall with a course screen.

    b. 2 x 25kW pumps (duty/standby) end suction dry mounted on a concrete slab outside of the pond

    c. Galvanised shed to provide protection

    d. New electrical connection to provide power to the pump station

    e. Controls and telemetry to be incorporated into the SDC SCADA network

    Note: It may be possible to use the existing suction pipework from the irrigation pump station for the new treated effluent pump station. This should be considered in the next stage of design.

2) At the recreational reserve on Leeston Road consisting of:

    a. New 2 m diameter, 3 m deep GRP wet well.

    b. 2 x 55kW pumps (duty/standby) submersible Flygt pumps. Higher solids passing ability is required to allow for raw sewage from Selwyn Huts, Coes Ford and Chamberlains Ford as well as potentially Doyleston in the future

    c. New electrical connection to provide power to the pump station

    d. Controls and telemetry to be incorporated into the SDC SCADA network.

Additional to the mainline pump stations, new commercial-sized pressure sewer type pump stations will be required at Selwyn Huts and Coes Ford. (Most likely at Chamberlains Ford also but this will depend on the location of the main pump station.) These small pressure sewer pump stations will discharge to the new pump station at the recreation reserve on Leeston Road. These pump stations and the pipelines from them have not been included in the pricing as they are assumed to be provided by the campgrounds.

5 Pines WWTP Upgrades Required

5.1 Discharge Design

The pipeline is proposed to connect into the Pines WWTP at the inlet works. There is assumed to be enough space to connect this pipe into the system.

5.2 Additional Works at Pines WWTP

The Pines WTP masterplan indicates that the additional 45L/s flow will require treatment upgrades at the Pines WWTP including:

- A new clarifier
- Additional carbon to support the removal of nitrogen to be added into the process.

These costs have not been included in the cost estimate.

6 Further Design Work (Preliminary Design Scope)

Once the project business case has been approved, the following works are required:

- Survey of proposed pipe route
- Geotechnical investigation – expected to be straightforward given the area is known to be predominantly gravel
- Bridge crossing design and bridge assessment – to confirm the details of the pipe crossing over the existing bridge
- Assessment of Pines WWTP upgrades required – to date the design work has only been based on discussions with SDC on the Pines WWTP Master Plan. In particular, the nitrogen removal, and details around the additional carbon are required to be investigated further.

7 Risks and Opportunities

7.1 Safety in Design

Safety in design of the construction and operation of the proposed works has been evaluated by Beca. The following are considered the safety issues that warrant attending in the next stage of design:

- Open Trenching – maintain trench depths less than 1.5 m. This is expected to be achievable given the route has very few services
- Road crossings – it is assumed that open trenches will be used to install the pipe across roads. This needs to be confirmed with SDC in the next stage of the design.
- River crossing – this may require working at heights to access the underside of the bridge and may require working in the riverbed. In the next stage of design, an assessment is required to assess if this task can be carried out from above. There are power cables in close proximity to the bridge on the western side also. Consent scoping will be required due to the proximity of the river.
- Works within existing WWTP – the pipe routes have been proposed to skirt around the existing WWTP's where possible. The next stage of design will require an assessment of the connections and plans of the intake and discharge.

In the next stage of the design a Safety in Design workshop, with operators present, will be required to formally assess the full extent of the project.

7.2 Project Risk and Opportunities

Various risks and opportunities are outlined in Table 3.

Table 3: Project Risks and Opportunities

Item	Description	Value (bracketed values imply a saving)
O1	Route – if the pipe could be installed through private land the cost of installation would be lower due to reduced traffic management and higher productivity	($250,000)
O2	Design and build procurement – the design required for the pump station and pipeline for the project are straightforward. Once SDC has confirmed the project requirements and defined the design in key areas (intake, discharge, and river crossing) the remainder of the design could be delivered in a design-build environment.	($50,000)
O3	Westland Milk has a processing plant in the Rolleston Business unit. This type of process is known for generating waste with high percentages of carbon. It might be possible to adjust their wastewater treatment process to suit the treatment of Ellesmere WWTP effluent at Pines WWTP to remove additional nitrogen.	Not priced
O4	Early Contractor Involvement – There may be benefits in using innovative trenching and laying techniques. In some cases reducing the need for imported dedding or backfill material.	Not priced
O5	Reuse of the existing irrigation pump station shed and pipework at the Ellesmere WWTP	Not priced
O6	Selling of the irrigated farm land around the Ellesmere WWTP	($300,000)
R1	River crossing – it may not be possible to utilise the existing bridge over the Selwyn River. This would require a trenchless crossing of the river or upgrades to the bridge to accommodate the new pipe.	$150,000
R2	Treatment upgrades at Pines WWTP – this depends on the requirements of the resource consent. Further process investigation is required, although this may be defined by the master planning of the Pines WWTP.	Not Priced

8 Cost Estimates

A Cost Estimate for the new pipeline was completed and is based on a high level concept design estimation. The total estimated cost is $8,000,000 + GST for the preferred route. This cost assumes:

- No allowance for land that could be sold around the WWTP (i.e. that is no longer required for irrigation)
- Connection points at Pines WWTP and Leeston WWTP are directly into existing pipework
- The pipeline is laid in the grassed/unsealed berm with trenchless road crossings
- The pipe crossing at the Selwyn River bridge can be attached to the existing structure
- A 25% cost contingency is included
- Further exclusions from the cost estimate include:
  - Goods and Services Tax (GST)
  - Pump stations at Selwyn Huts, Coes Ford, and Chamberlains Ford and pipelines connecting these pump stations to the main pipeline
  - Staged or phased handover or commissioning
  - Fast track / accelerated programme
  - Working outside normal daytime working hours
  - Incurred costs to date
  - Cost escalation including foreign exchange rate fluctuations
  - Professional fees
  - Client-owned costs
  - Consenting costs
  - Land purchase and land access costs (e.g. easements)

9 Summary

- Ellesmere WWTP discharges treated wastewater to the land surrounding the plant. Disposal can be problematic due to the high nitrogen concentrations and the high groundwater table in winter.
- A pipeline is to be considered to connect the Ellesmere WWTP to Pines WWTP to meet the future wastewater disposal needs for the Ellesmere area by conveying the wastewater to Pines WWTP where there is sufficient area for the disposal.
- A pump flow rate of 45 l/s was estimated to be used to convey treated effluent. This is based on ADWF plus an allowance for conveying wet weather flow. This relies on at least 150 mm of pond height for buffering the inflows to the plant.
- A 21 km, DN280 SDR 17 PE100 pipeline is proposed to be installed in the roadway and cross the Selwyn River at the existing bridge on Leeston Rd, to convey the wastewater.
- An alternative 18 km pipe route is possible however this would require crossing private land.
- Two mainline pump stations are proposed:
  - A dry mounted pump set at Ellesmere WWTP adjacent to the ponds with a new suction line into the ponds. Pumps to be duty, standby located in a new shed with VSD, controls and SCADA.
  - A new wet well and submersible pumps located in the reserve on Leeston Road adjacent to the Selwyn River. Pumps to be duty, standby with VSD, controls and SCADA.
- A preliminary cost estimate to install the pipeline and pumps is $8,000,000 + GST (including a 25% contingency).
- A pump and pipe system to convey wastewater from the Ellesmere WWTP to the Pines WWTP is feasible and it would be prudent to consider this option further. It is suggested that this option be compared against the treatment upgrade option, including an assessment of operational costs.

A

Appendix A – Concept Drawings

Drawing Plotted: 19 Jun 2020 12:23 PM

NOTES

1. PIPE DESIGN IS FOR CONCEPT ONLY, AND SHOULD BE READ IN CONJUNCTION WITH THE CONCEPT DESIGN REPORT.
2. FOR PIPE SIZE AND MATERIAL REFER TO RECOMMENDATIONS IN THE CONCEPT DESIGN REPORT.
3. PIPE ROUTE SELECTION BASED ON SURFACE FEATURE ONLY.
4. PIPE TO BE LOCATED 2M FROM THE BOUNDARY WHEREVER POSSIBLE TO ALLOW IN SITU FILL TO BE REDUCED FOR BACKFILL.
5. PIPE TO BE BEDDED IN IMPORTED BEDDING.

CH START	CH END	ROAD	PIPE LOCATION
0	430	ELLESMERE WWTP ACCESS RD	UNSEALED ACCESS RD
430	700	STATION ST	RHS BERM
700	701	CROSSING OF OPEN WATERCOURSE	
701	2600	LEESTON RD	RHS BERM
2600	2950	LEESTON RD (THRU DOYLESTON)	RHS SHOULDER (SEALED)
2950	10120	LEESTON RD	RHS BERM

CONCEPT DESIGN
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No.	Revision	By	Chk	Appd	Date
A	CONCEPT DESIGN	TW	DC	PR	19.06.20

Drawing Originator: Beca

Original Scale (A1) 1:10,000
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Design	T. WAGER	28.04.20
Drawn	T. WAGER	28.04.20
Dsg Verifier	D.CARSHALTON	06.05.20
Dwg Check	A. BOAKES	06.05.20

* Refer to Revision 1 for Original Signature

Approved For Construction*

Date

Client: Selwyn District Council

Project: ELLESMERE WWTP - PINES WWTP WASTEWATER RISING MAIN

Title: PLAN VIEW SHEET 1 OF 3

Discipline: CIVIL

Drawing No. 3364542-CA-011

Rev. +

Document No. 3364542-CA-011.DWG

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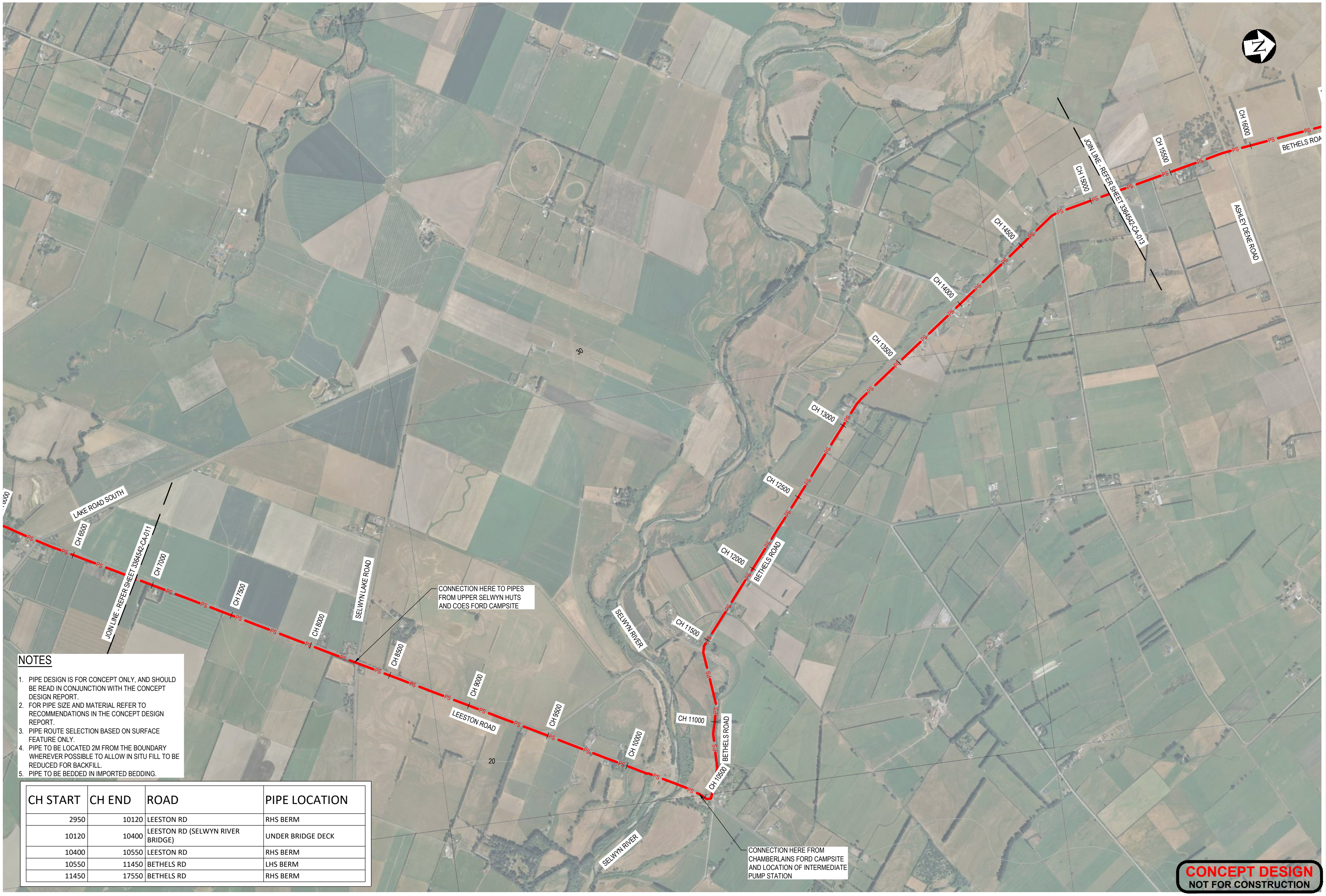
Drawing Plotted: 19 Jun 2020 12:24 PM



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5. PIPE TO BE BEDDED IN IMPORTED BEDDING.

CH START	CH END	ROAD	PIPE LOCATION
2950	10120	LEESTON RD	RHS BERM
10120	10400	LEESTON RD (SELWYN RIVER BRIDGE)	UNDER BRIDGE DECK
10400	10550	LEESTON RD	RHS BERM
10550	11450	BETHELS RD	LHS BERM
11450	17550	BETHELS RD	RHS BERM

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Dwg Check	A. BOAKES	06.05.20	Date

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Client: Selwyn District Council

Project: ELLESMERE WWTP - PINES WWTP WASTEWATER RISING MAIN

Title: PLAN VIEW SHEET 2 OF 3

Discipline: CIVIL

Drawing No.: 3364542-CA-012 Rev.: +

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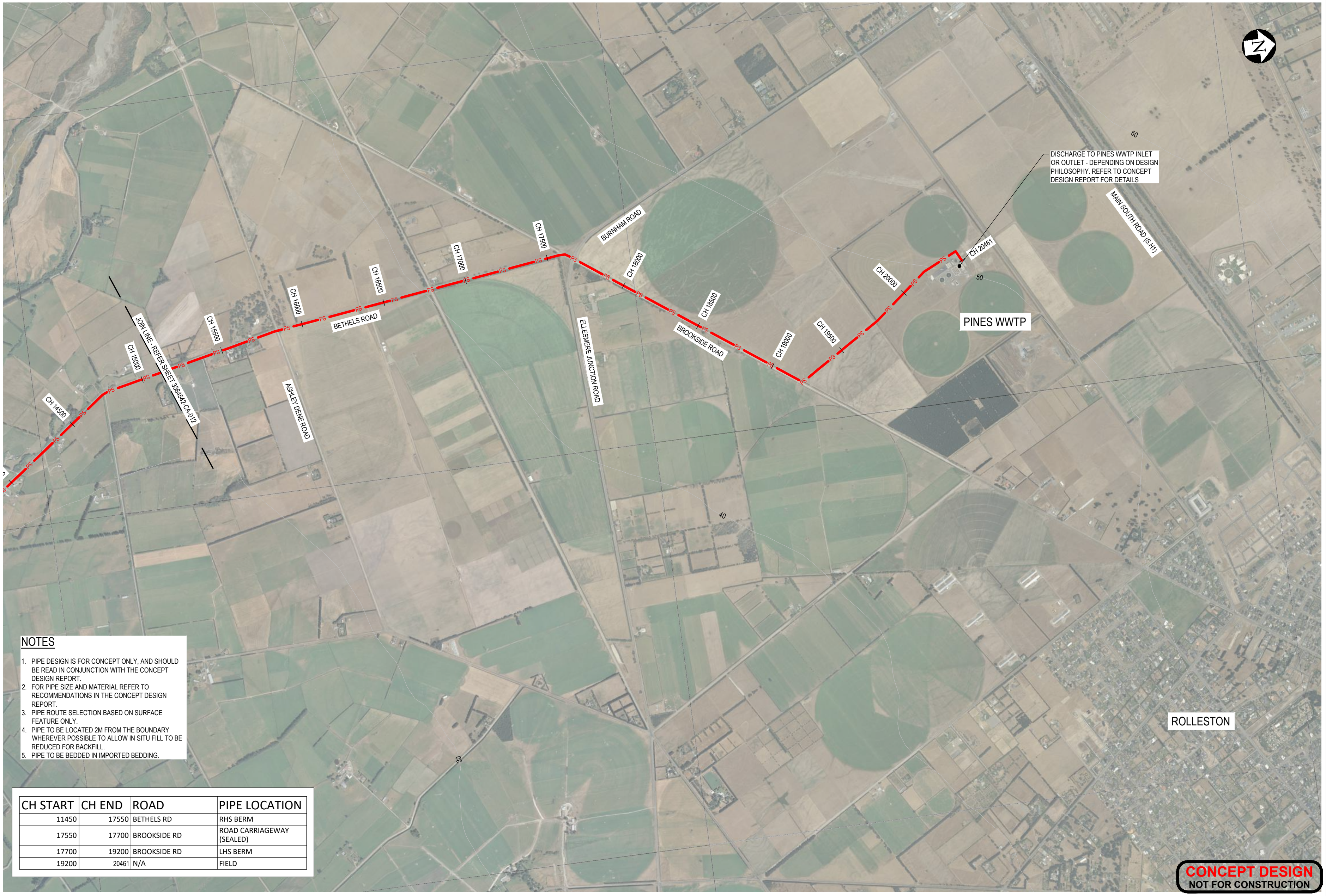

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CH START	CH END	ROAD	PIPE LOCATION
11450	17550	BETHELS RD	RHS BERM
17550	17700	BROOKSIDE RD	ROAD CARRIAGEWAY (SEALED)
17700	19200	BROOKSIDE RD	LHS BERM
19200	20461	N/A	FIELD

CONCEPT DESIGN
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No.	Revision	By	Chk	Appd	Date
A	CONCEPT DESIGN	TW	DC	PR	19.06.20

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Client: Selwyn District Council

Project: ELLESMERE WWTP - PINES WWTP WASTEWATER RISING MAIN

Title: PLAN VIEW SHEET 3 OF 3

Discipline: CIVIL

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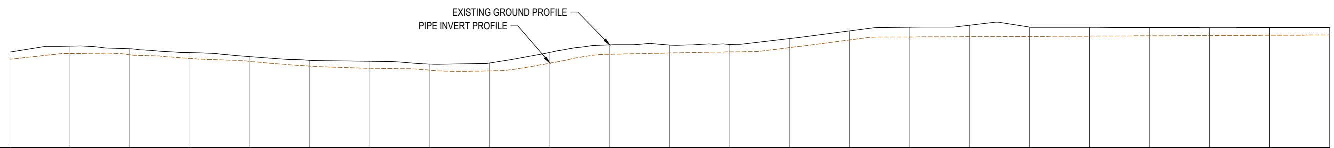
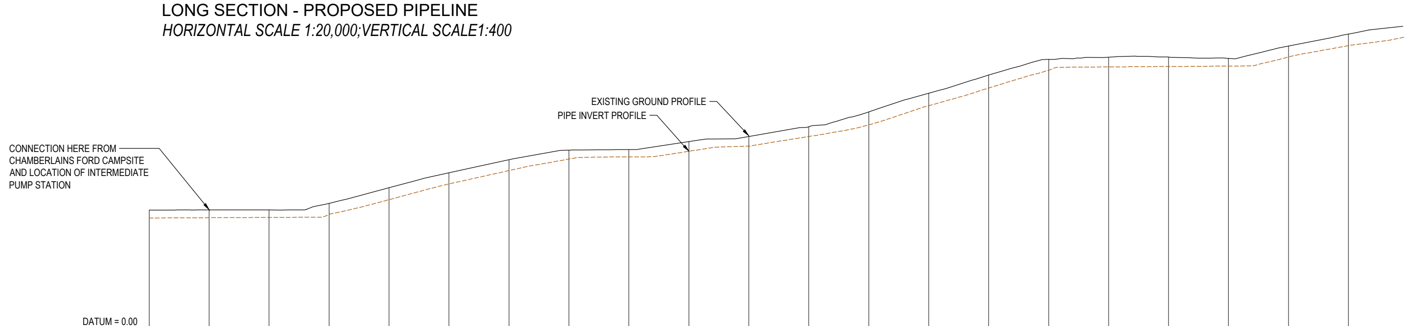


FINISHED SURFACE LEVEL		16.91	16.47	15.82	15.15	14.54	14.37	13.91 13.88	14.10	15.84	17.10
DEPTH TO INVERT	1.20	1.23	1.01	0.98	0.80	0.97	1.16	1.03	1.33	1.78	1.55
PIPE INVERT LEVEL	14.72	15.67	15.46	14.84	14.34	13.56	13.21	12.89 12.68	12.77	14.06	15.55
CHAINAGE	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000

FINISHED SURFACE LEVEL	17.06	17.17	18.16	19.45	20.05	20.38	20.06	20.03	20.01	19.99	20.01	20.00
DEPTH TO INVERT	1.30	1.24	1.50	1.51	1.62	1.90	1.53	1.46	1.39	1.32	1.30	1.24
PIPE INVERT LEVEL	15.75	15.94	16.66	17.94	18.43	18.48	18.52	18.57	18.62	18.66	18.71	18.76
CHAINAGE	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	10500	11000

LONG SECTION - PROPOSED PIPELINE
HORIZONTAL SCALE 1:20,000;VERTICAL SCALE1:400



FINISHED SURFACE LEVEL	19.99	20.01	20.00	21.11	23.71	26.19	28.39	29.97	30.06	31.40	32.23
DEPTH TO INVERT	1.32	1.30	1.24	1.87	1.99	1.84	1.82	1.48	1.21	1.62	1.58
PIPE INVERT LEVEL	18.66	18.71	18.76	19.24	21.72	24.35	26.57	28.50	28.86	29.78	30.65
CHAINAGE	10000	10500	11000	11500	12000	12500	13000	13500	14000	14500	15000

FINISHED SURFACE LEVEL	33.88	36.36	39.47	42.49	45.10	45.47	45.49	45.27	47.33	49.32 50.00	
DEPTH TO INVERT	1.64	2.17	2.10	2.16	1.79	1.62	1.57	1.28	1.83	1.92	
PIPE INVERT LEVEL	32.24	34.19	37.37	40.33	43.30	43.85	43.92	43.99	45.50	47.40	48.80
CHAINAGE	15500	16000	16500	17000	17500	18000	18500	19000	19500	20000	20500

LONG SECTION - PROPOSED PIPELINE
HORIZONTAL SCALE 1:20,000;VERTICAL SCALE1:400

CH START	CH END	ROAD	PIPE LOCATION
0	430	ELLESMERE WWTP ACCESS RD	UNSEALED ACCESS RD
430	700	STATION ST	RHS BERM
700	701	CROSSING OF OPEN WATERCOURSE	
701	2600	LEESTON RD	RHS BERM
2600	2950	LEESTON RD (THRU DOYLESTON)	RHS SHOULDER (SEALED)
2950	10120	LEESTON RD	RHS BERM
10120	10400	LEESTON RD (SELWYN RIVER BRIDGE)	UNDER BRIDGE DECK
10400	10550	LEESTON RD	RHS BERM
10550	11450	BETHELS RD	LHS BERM
11450	17550	BETHELS RD	RHS BERM
17550	17700	BETHELS RD	ROAD CARRIAGEWAY (SEALED)
17700	19200	BROOKSIDE RD	LHS BERM
19200	20310	N/A	FIELD

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No.	Revision	By	Chk	Appd	Date
A	CONCEPT DESIGN	TW	DC	PR	19.06.20

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Reduced Scale (A3) 1:20,000	Dsg Verifier	D.CARSHALTON	06.05.20
	Dwg Check	A. BOAKES	06.05.20

Approved For Construction* Date

* Refer to Revision 1 for Original Signature

Client: Selwyn District Council

Project: ELLESMERE WWTP - PINES WWTP WASTEWATER RISING MAIN

Title: LONG SECTIONS SHEET 1 OF 1

Discipline: CIVIL

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B

Appendix B – Cost Estimate

SECTION: 336 - SOUTHERN WATER
REPORT: Leeston to Pines Pipeline Cost Estimate

Code	Description	Quantity	Unit	Rate	Total
	Works at Leeston WWTP & Pines WWTP				
	Decommission existing irrigation pump station at Leeston WWTP.	1			Excluded
	New pump station at Ellesmere WWTP - 2x 25kW single stage 2p pumps mounted on concrete slab with shed, new suction line into pond, SCADA, VSD.	1	EA	$ 400,000	$ 400,000
	New submersible pump station adjacent Selwyn River Bridge. Including 2x 55kW submersible pumps in new chamber with SCADA and VSD	1	EA	$ 600,000	$ 600,000
	Pipeline and Civil				
	Install pipeline along local roads - assume pipeline is laid in the grassed/unsealed berm.	21000	m	$ 160	$ 3,360,000
	Reinstate berm/edge of seal.	21000	m	$ 10	$ 210,000
	Air valve in chamber including external isolation valve installation, odour filter and connecting pipe.	20	EA	$ 15,000	$ 300,000
	Scour valve and chamber.	6	EA	$ 12,000	$ 72,000
	Flowmeter in Chamber.	2	EA	$ 20,000	$ 40,000
	DN200 gate valves in box.	20	EA	$ 6,000	$ 120,000
	Allowance for additional valves and fittings.	1	LS	$ 40,000	$ 40,000
	Bridge Crossing - Selwyn River. Provisional allowance assuming the PE pipe can be hung off the existing bridge structure. No allowance for change in material.	1	PS	$ 125,000	$ 125,000
	Trenchless crossing of road intersections.	8	EA	$ 35,000	$ 280,000
	Net Construction Estimate				$ 5,547,000
	Main Contractor Overheads	15	%	$ 5,547,000	$ 832,050
	Gross Construction Estimate				$ 6,379,050
	Contingency	25	%	$ 6,379,050	$ 1,594,763
	Total Construction Budget				**$ 7,973,813**
	Professional Fees				Excluded
	Client Fees				Excluded
	Consenting				Excluded
	Cost Escalation				Excluded
	Land purchase and access				Excluded
	Rounding	1	LS	$ 26,188	$ 26,188
	Total Expected Estimate				**$ 8,000,000**

SECTION: 336 - SOUTHERN WATER
REPORT: Leeston to Pines Pipeline Cost Estimate

Code	Description	Quantity	Unit	Rate	Total
	Assumptions: The estimate is based upon high-level concept design information. All quantities and measures are approximate and subject to design development. The estimate assumes that the project will be procured on a competitve basis with at least 3 tenderers. Estimate rates and allowances are based on cost information from similar projects and Beca's experience. **Exclusions:** Goods and Services Tax (GST). Staged or phased handover or commissioning. Fast track / accelerated programme. Working outside normal daytime working hours. Incurred costs to date. Cost escalation including foreign exchange rate Professional Fees. Client-owned costs. Consenting costs. Land purchase and land access costs (e.g. easements). **Cost Estimate Risks:** Design development. Ground conditions and ground water levels. Underground services and obstructions. Contaminated ground and hazardous materials. Cost escalation and foreign exchange rates. **Limitations:** This estimate is solely for our Client's use for the purpose for which it was intended in accordance with the agreed scope of work. It may not be disclosed to any person other than the Client and any use or reliance by any person contrary to the above, to which Beca has not given its prior written consent, is at that person's own risk. This concept stage cost estimate has been developed to provide in early indication of the expected cost. It is sufficiently accurate to serve this purpose. A functional design should be undertaken if a more accurate estimate is required. This estimate should be considered as a high-level concept design estimate. The probable accuracy range of the estimate is likely to be +/-50%.				

Appendix B – Soil and pasture evaluation (Lowe Environmental Impact)

Assessment of Soils Receiving Wastewater

Leeston WWTP

Prepared for

Selwyn District Council

Prepared by

Lowe Environmental Impact

November 2020

Assessment of Soils Receiving Wastewater, Leeston WWTP

Selwyn District Council

This report has been prepared for the Selwyn District Council by Lowe Environmental Impact (LEI). No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other parties.

Quality Assurance Statement		
Task	Responsibility	Signature
Project Manager:	Rob Potts	
Prepared by:	Brittany Paton; Brian Ellwood	
Reviewed by:	Rob Potts	
Approved for Issue by:	Rob Potts	
Status:	Final	

Prepared by:

Lowe Environmental Impact
P O Box 29288
Christchurch 8540

| T | [+64] 3 359 3059
| E | office@lei.co.nz
| W| www.lei.co.nz

Ref: RE-10662-Leeston-Soil_Eval-200907-BP-Draft

Job No.: 10662

Date: 23rd November 2020

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

Selwyn District Council (SDC) are responsible for operating the Ellesmere wastewater system that collects wastewater from Leeston, Doyleston, Southbridge and Dunsandel (with a long term combined population of 3,600 person equivalent), treats it at the wastewater treatment plant (WWTP) in Leeston and discharges it to land via spry irrigation or rapid infiltration. The current discharge consent is constraining the use of the land application system and resulting in less than optimal pasture production and periods of non-compliance. SDC is interested in varying resource consent conditions (primarily Condition 7) to allow the land treatment area to be optimised. The current consent expires in 2029.

Lowe Environment Impact (LEI) has been asked to provide technical assistance to help with the variation of consent conditions. As part of this LEI was asked to carry out a site investigation at the WWTP to analyse the soils and pasture to optimise the land treatment system. LEI was also asked to review the current land application system, model nitrogen loss and provide recommendations to optimise the land applications.

Site investigations of the soils were conducted by LEI Staff on 19 - 20 August 2020. Sites' 1 – 3 are within irrigated areas and Sites' 4 and 5 in dryland (control) areas. The key outcomes from the investigations are:

- Soil types were similar across all test pit sites. Site 3 varied slightly due to having had fresh topsoil from off-site added to the top 0 – 10 cm. The main differences between sites was due to the amount of water infiltration causing weathering to a greater depth of the subsoils under the irrigated sites, versus the dryland sites.

- S-Maps assess the soils as being Leeston Argillic Orthic Gley Soils, and the site investigation confirms this. These soils are generally suited to receiving wastewater applications. The clay content of the soil prevents excessive drainage, however there is risk of ponding if irrigation applications are not optimised.

- Groundwater was detected at 1.4 m below soil surface at one site (Site 5).

- Soils across the sites are largely in adequate physical health. This is determined through both bulk density and macroporosity. Site 2 has low macro porosity, while all other sites are in the adequate range (8 - 30% macropores) (Sparling *et al.,* 2008). Bulk density values are predominantly between or around the adequate values of 0.9 - 1.3 for a recent soil (Sparling *et al.,* 2008).

- The soils' field capacity values vary between 36% and 50% moisture content between sites, indicating that trigger levels to commence irrigation could be customised to each site. Topsoil available water holding capacity (AWC) across the sites ranged from 16 to 29% v/v.

- The base soil fertility of the soil is low. Wastewater applications on some sites have caused elevated nutrients such as phosphorus and potassium. Fertiliser addition of macro-nutrients and adjustment to soil pH should be considered.

- Plants are nitrogen deficient in summer, which is causing lower than expected pasture yields. Currently, there is limited biological fixing of nitrogen; this makes it difficult to export the full application depth of nitrogen as during winter the majority of applied nitrogen is lost to groundwater.

- Natural variation between sites was evident, with Site 1 having a patch of consolidated area within the test pit. This was not consistent throughout the soils and appeared to only be in one area. Site 3 has had the topsoil replaced with fresh topsoil from off-site.

- Soil hydraulic conductivity was measured (3 replicates per site). Soils showed variation in both saturated hydraulic conductivity (K_{sat}) and soil unsaturated hydraulic conductivity (K_{-40mm}) values.

The nitrogen modelling assessment found:

- N loss has increased from the 2017 period, depending on the use of the rapid infiltration basins (RIB) to discharge during high groundwater level times. The increase in area and conversion to spray irrigation is not offsetting the higher flow and total nitrogen applied. The nitrogen loss is dominated by winter drainage and the winter drainage of nitrogen is unavoidable with this system. This loss then contributes to pasture deficit in the summer which cannot be met from a ryegrass pasture only system. The lack of nitrogen available during the active growing period suppresses summer pasture growth.

- In reality, the system cannot export more nitrogen than is applied as required by the consent conditions due to winter leaching of nitrogen.

- Proposed future scenarios have been modelled in Overseer with even application of wastewater at either 5 mm over 42 ha or 4 mm over 52 ha, with a future volume of 2,098 m^3/day. The even application using buffer storage of 5 mm results in a modelled leaching of 98 kg N/ha/yr and a total nitrogen loss of 4,136 kg N/yr, while the 4 mm results in leaching of 88 kg N/ha/yr and a total N loss of 4,566 kg N/yr.

The outputs of the nitrogen modelling, the site investigation and the review of current and proposed activities have resulted in the following recommendations for land application optimisation. It was found that:

- The maximum daily irrigation rate recommended is the lower of 10% of K_{sat} or 30% of K_{-40mm}. This has been used to determine the maximum daily irrigation rate recommendations. The daily irrigation rate at 7.7 mm/day is greater than 30% of K_{-40mm} rate of 5 mm/d for Sites' 1 and 3.

- A generally accepted depth of application for efficient summer irrigation is less than 50% of the soil's AWC. The current application depth is typically 7.5 mm/event (75 m^3/ha) is similar to or less than 30% of most soil's profile available water. This is, therefore considered an acceptable depth of application.

- If there are concerns over plant nutrient uptake then K_{-40} values should be considered instead of 10% of K_{sat}, as these values would maximise the chance for plant nutrient uptake.

- The pivot irrigation systems' application intensity currently have an application rate of 5 to 8.8 mm/hr. All sites could accept this rate through absorption and infiltration. However, the application rate is greater than the K_{-40mm} rate, therefore some surface redistribution and subsequent macropore bypass flow will occur in some soils with localised short-term ponding in depressions.

- A water balance shows that the total area (30 ha plus a potential additional 8 ha) is more than that required to apply all wastewater on an average daily basis. Other constraints may impact on this conclusion that need further discussion. To achieve this, lesser application depth over the winter would be required and thus it would be necessary to add winter water storage to the treatment system to buffer flows.

- Historical irrigation (2016 – present) is not evenly spread over all areas, e.g. in 2019 CP1 received 1,788 mm while CP3 had 868 mm applied.

- Increased water storage for winter inflow buffering will significantly reduce nitrogen leaching losses. Indicatively adding 3 months of winter inflow storage capacity to eliminate or significantly reduce irrigation applications during the winter will improve the WWTP system operability, reduce leaching and increase pasture production as more nitrogen will be plant available during the growing season. The storage would increase the flexibility of pasture harvest and irrigation management during times of high rainfall.

- The development of storage on the RIB site, coupled with managing pond levels is estimated to be able to provide 100,000 m^3. It is recommended that a detailed water balance is developed to optimise storage size vs drainage rates.

- A change to the consent nitrogen balance is needed to account for the winter leaching component that cannot be exported in pasture.

- It is noted that Leeston discharge will leach nutrients during the winter without storage, as drainage below the rootzone is unavoidable due to rainfall.

- Overall it is concluded that an upgraded Leeston WWTP site has the hydraulic and nutrient uptake capacity to treat the future wastewater loads within or less than historical nitrogen baseline rates.

2. INTRODUCTION

2.1. Background

Selwyn District Council (SDC) are responsible for operating the Ellesmere wastewater system that collects wastewater from Leeston, Doyleston, Southbridge and Dunsandel. The long term combined population is 3,600 persons equivalent.

Wastewater is treated at the WWTP in Leeston and discharged to land via spray irrigation or rapid infiltration. The current discharge consent is constraining the use of the land application system and resulting in less than optimal pasture production and periods of non-compliance.

SDC is interested in varying resource consent conditions (primarily Condition 7) to allow the land treatment area to be optimised. The current consent expires in 2029. Condition 7 is in respect to nitrogen loading and pasture removal, as follows:

> The rate at which treated wastewater is applied shall not exceed 200 kg of nitrogen per hectare per year onto grazed pasture, or an equivalent application and land management system, that matches the annual nitrogen application with the annual plant uptake.

Lowe Environment Impact (LEI) has been asked to provide technical assistance to help with the variation of consent conditions. As part of this LEI was asked to carry out a site investigation at the WWTP to analyse the soils and pasture to optimise the land treatment system.

This technical assessment also involves modelling of nitrogen losses from the land application system. Using the information from the site soil investigation, the nitrogen modelling and a review of the current management practices, LEI has been asked to provide recommendations to optimise the land application of wastewater.

2.2. Scope

This report describes the site investigations, outcomes from the site investigations conducted and nutrient modelling of historic and current practices at the Leeston WWTP. The report gives details of:

- Section 4 summarises the investigations undertaken;
- Section 5 characterises the investigation site;
- Section 6 summarises the soil physical condition of the sites;
- Section 7 summarises the soil chemical status;
- Section 8 summarises the pasture chemical status;
- Section 9 outlines the nitrogen modelling results;
- Section 10 examines the implications of site investigations for long term irrigation; and the future land management considerations.
- Section 11 summaries the findings from the above sections.

3. SITE BACKGROUND

The wastewater treatment plant (WWTP) located in Leeston, Canterbury (known as Ellesmere WTTP) is owned by Selwyn District Council. Selwyn District Council hold consent CRC110148 which allows for the application of wastewater to land.

The WWTP was designed to accommodate wastewater from Leeston, Doyleston, Southbridge and Dunsandel, with a long-term combined population of 3,600 persons equivalent. It was determined that Dunsandel will continue its existing on-site disposal freeing up the additional capacity for Leeston, Doyleston and Southbridge.

The wastewater plant involves multistage maturation ponds and is currently using 30.4 ha of centre pivots to apply the wastewater to land. Historically up to 15.7 ha of border dyke was used to apply the wastewater to land.

The existing consented land application system has some key constraints:

- The resource consent allows either grazed pasture with a 200 kg N/ha/yr loading limit or a cut and carry system with the same amount of N applied having to be removed;
- The site is currently run as a cut and carry system and the amount of nitrogen being applied to un-grazed pasture is in excess of that removed through the cut and carry system, due to pasture yields;
- The consent stipulates that 41.9 ha must be used for wastewater application. Currently, approximately only 30.38 ha is utilised for application;
- The treated wastewater is to be applied as far as practicable at a uniform depth over the land application area;
- The monthly average application depth must not exceed 8 mm and be no more than 20 mm for any one application;
- No ponding of wastewater is allowed;
- There is an infiltration basin that wastewater can be discharged to. This is permitted when groundwater is within 900 mm of the ground surface and/or when adverse ground conditions prevent a discharge to the irrigation areas; and
- The design capacity of the plant is 3,600 pp and current population is now above this. The Leeston WWTP contributing population is forecast to increase to nearly double from 3,722 (2018) to 6,631 (2048).

4. INVESTIGATIONS DESCRIPTION

4.1. General

The Leeston WWTP currently irrigates wastewater onto approximately 30.4 ha under 3 separate pivots. There is an additional 9 to 18 ha of dryland that could potentially be used for the irrigation of wastewater if buffers to the boundary are set at current distances or reduced to 5 m and subsurface drip irrigation was uses as the irrigation system in these areas.

Understanding the soils is key to determining the capability of a site to accept wastewater irrigation over the long-term. The following field programme was conducted at the sites on the 19th and 20th of August 2020.

In total, five sites across the WWTP were tested. Two sites were dryland (Site 4 and Site 5) and 3 sites were under existing pivot irrigation areas. Figure 4.1 below outlines the location of the test sites.

Figure 4-1: Location of Sites and Test Pits

4.2. Soil Physical and Chemical Testing

At each of the five test sites:

- A test pit was dug using an excavator to determine subsoil depths and physical properties. The pit size was approximately 2 m L x 1 m W x 1 - 2 m D. Soil logs to describe the soil profile were created.

- A GPS location of each test pit was taken, and the soil profile and surrounding landscape photographed.

Saturated and Unsaturated hydraulic conductivity testing was carried out at each site on the top 1 – 10 cm. Soil K_{sat} measurements were performed using double ring infiltrometers (K_{sat}) and unsaturated using the plate permeameter (K_{-40mm}) method of Perroux and White (1998). Three or four replicate tests were carried out for each K measurement at each site (e.g. 4 x K_{sat} & 3 x K_{-40mm} tests).

Composite soil samples were taken near each test pit site at 0 - 75 mm. The samples comprised around twenty 75(L) mm x 25(dia) mm cores. Samples taken were analysed for soil fertility, including nitrogen (N) species. Laboratory analyses were conducted by Hill Laboratories.

In addition, separate soil cores were taken at each test pit and sent to Landcare Soil Physics laboratory for measurements of soil physical properties. The process involved taking 100 mm diameter x 100 mm depth soil cores from the surface soil and these were analysed for bulk density, available water capacity (AWC), total porosity and macroporosity. These soil cores were also tested in the laboratory for saturated and unsaturated hydraulic conductivity to confirm in-field parameters.

A sample of the pasture at all five sites was also taken for pasture chemistry analysis.

5. SITE SOIL DESCRIPTIONS

5.1. Mapping of the Investigation Area

As noted above, 5 soil test pits were dug using an excavator and soil descriptions were carried out. The soil types identified and profile description across the Investigation Area are described below.

Weather was fine with slight breeze during the investigations. Test pits were 1.5 – 2 m deep. The soils at the three sites (Sites' 1 – 3 that are receiving wastewater were saturated.

5.2. Site 1

Table 5-1 shows the soil characteristics log and Figure 5-1 shows the profile for Site 1.

Table 5-1: Site 1 Soil Log

Horizon	Depth (cm)	Description
1	0 - 20	Dark brown clay loam; presence of fine and medium sized roots; polyhedral nut and crumb structure; presence of stones/gravels (10 - 20%); slightly sticky; friable; wet; no mottles; smooth indistinct boundary
2	20 - 70	Orange sandy clay loam; presence of gravels/stones (60%); crumbly structure; some fine roots; wet; mottled (30%); Smooth indistinct boundary; Areas of consolidation/compacted soil
3	70 – 100	Grey sands and gravels (60% stones/gravels); mottled (30%); no structure; no roots present; dry; smooth indistinct boundary
4	100 +	Grey sands and gravels (40% stones/gravels); dry; structureless

Figure 5-1: Site 1 Soil Profile

5.3. Site 2

Table 5-2 shows the soil characteristics log and Figure 5-2 shows the profile for Site 2

Table 5-2: Site 2 Soil Log

Horizon	Depth (cm)	Description
1	0 - 15	Brown clay loam topsoil; slightly sticky; slightly plastic; polyhedral nut and crumb structure; common fine roots; indistinct, moist; few dark orange mottles. Smooth indistinct boundary
2	15 - 65	Orange brown clay loam with gravels/rocks (50%); slightly sticky; moist; loose crumbly structure; some fine roots; indistinct smooth boundary; moist; common mottles present (50%)
3	65	Grey sands and gravels (60% gravels and stones); loose structureless; dry

Figure 5-2: Site 2 Soil Profile

5.4. Site 3

Comments:

- Areas of ponding present;
- Topsoil had been added to this soil. The new soil has components of charcoal and terracotta present. This layer is variable in depth and this variation maybe causing the ponding seen.

Table 5-3 shows the soil characteristics log and Figure 5-3 shows the profile for Site 3

Table 5-3: Site 3 Soil Log

Horizon	Depth (cm)	Description
1	0 - 15	Brown clay loam topsoil; wet; presence of stones (10%); presence of charcoal and terracotta; slightly sticky; polyhedral nut and crumb structure; common fine roots; indistinct smooth boundary;
2	15 - 20	Brown clay loam; stones and gravels (50%); mottled (20%) moist; friable; some fine roots; compact structure; smooth indistinct boundary
3	20 - 60	Orange clay loam; gravels and stones (50%); moist; friable; weak structure; slightly sticky; smooth indistinct boundary; slightly moist; common mottles present
4	60+	Grey sands and gravels (gravel/stones >50%); structureless; moist

Site 5-3: Site 3 Soil Profile

5.5. Site 4 Dryland

Table 5-4 shows the soil characteristics log and Figure 5-4 shows the profile for Site 4

Table 5-4: Site 4 Soil Log

Horizon	Depth (cm)	Description
1	0 - 20	Brown clay loam; presence of small gravels (10 – 20%); dry; polyhedral nut and crumb structure; presence of medium and fine roots; indistinct smooth boundary
2	20 – 30	Orange clay loam; presence of small to medium gravels (30%); common presence of mottles (30 – 50%); moist; moderately plastic; compact; indistinct smooth boundary
3	30 – 55	Orange grey clay loam with sands and gravels (70% gravels/stones – small and medium in size); compact; friable; smooth indistinct boundary
4	55+	Grey sands and gravels (50% stones/gravels); structureless; damp

Figure 5-4: Site 4 Soil Profile

5.6. Site 5 Dryland

Comments:
- Dryland block currently grazed by sheep
- Water table was present at a depth of 1.4 m

Table 5-5 shows the soil characteristics log and Figure 5-5 shows the profile for Site 5

Table 5-5: Site 5 Soil Log

Horizon	Depth (cm)	Description
1	0 - 7	Brown clay loam; presence of medium-fine roots; wet; slightly sticky; damp; polyhedral nut and crumb structure; smooth indistinct boundary
2	7 - 55	Light brown; sandy clay loam; gravels and stones-medium (50%); approx. 35% clay and 15% sand; presence of fine roots; distinct boundary with some mottling at boundary edge
3	55 - 85	Gray silts and sands; small to medium stones and gravels (60%); mottles; structureless; wet
4	85 - 90 cm	Orange grey silty clay loam; gravels present (60%); mottles; wet; Is perched water table line
5	90 – 140	Grey gravels and sands (65% gravels/stones); wet; structureless Test pit stopped at 1.4m due to presence of water table

Figure 5-5: Site 5 Soil Profile

5.7. Summary

To note:

- Site 1 has a patch of consolidated area within the test pit. This was not consistent throughout the soil and appeared to only be in one area. This may cause variation in soil infiltration rates.
- Site 3 has had the topsoil replaced with fresh topsoil from off-site. Charcoal and Terracotta were present and this layer was variable in depth.
- Groundwater was present at Site 5 at 1.4 m depth.

6. SOIL PHYSICAL HEALTH

6.1. Soil Density, Porosity and Available Water Capacity

Soil physical properties determined from intact cores described in Section 5 are given in Table 6-1 below.

Table 6-1: Soil Physical Properties

Sample name	Depth (cm)	Particle density (g/cm^3)	Dry bulk density (g/cm^3)	Porosity (%)	Macro-porosity (-5 kPa) (%)	Field capacity (%)	AWC (%)
Site 1 (irrigated)	1-10	2.57	1.05	59	12	45	26
Site 2 (irrigated)	1-10	2.54	1.07	58	6	50	29
Site 3 (irrigated)	1-10	2.51	1.19	53	14	37	18
Site 4 (dryland)	1-10	2.57	1.23	52	15	36	16
Site 5 (dryland)	1-10	2.54	1.12	56	17	36	20

6.2. Porosity and Macroporosity

In general, the bulk density measured across the sites is adequate (Sparling et al., 2008). Macroporosity is low at Site 2 and adequate for all other sites (Sparling et al., 2008).

6.3. Field Capacity and Available Water Capacity

Field capacity for the sites vary between 36% moisture content and 50% moisture content. These are relatively high values compared to the porosity, meaning that the soils have good capacity for holding water before drainage occurs. AWC varies between 16 and 29%. Site 3 has a lower capacity for retaining applied water (18 mm in 100 mm of topsoil) and if developed for irrigation, Site 4 will be similar.

6.4. Soil Hydraulic Conductivity

The soils' ability to retain or drain applied water is governed by the infiltration rate and permeability of the soil. Soil hydraulic conductivity (K) is a measurement of infiltration and permeability. An understanding of the soil's hydraulic conductivity is needed to enable the development of application rates suitable for the long-term sustainability of an irrigation regime.

6.5. Soil Hydraulic Conductivity Testing

Testing *in-situ* soil hydraulic properties occurs at either the soil surface, being the area that receives wastewater, or at the most restricting soil layer. During the soil mapping exercise, it was noted that there did not appear to be any restricting layer at depth in the soils of the sites.

The use of irrigation across the sites and the relative uniformity of the sub-soil environment led to the testing being conducted in the near surface.

Soil saturated hydraulic conductivity (K_{sat}) was measured using *in-situ* double ring infiltration test (ASTM D3385-09). Unsaturated K was measured *in-situ* using the disc permeameter method of Perroux and White (1988). Unsaturated K at a soil matrix potential of -40 mm pressure (K_{-40mm}) is considered to represent soil water movement through pores excluding the macropores and is the focus of results presented in this report.

6.6. Soil Hydraulic Conductivity Results

Results of the K_{sat} and K_{-40mm} testing infield are given in Table 6-2. Laboratory testing results are given in Table 6.3.

There are differences between the in-field and laboratory soil hydraulic conductivity results. This is due to the natural variation in the soil and differences in the test method. The laboratory results are completed on a much smaller soil core. The in-field results are lower and in-terms of having conservative values to ensure a sustainable design, the in-field values shown in Figure 6.2 are recommended to be used to establish irrigation rates.

To establish an irrigation rate that can be received by the soil over the long-term without causing soil damage, a conversion needs to be made to allow for the application of "enriched" water, which has elevated levels of other constituents (cations, anions, complex organic molecules). A value of either 30% of K_{-40mm} or 10% of the K_{sat} is usually adopted in-line with the recommendations of Crites and Tchobanoglous (1998) to provide a recommended irrigation rate that can be applied daily; 30% of K_{-40mm} has been adopted here. It should be noted that this rate considers both the long-term protection of soil health, as well as ensuring full soil matrix flow. As a result, the actual discharge rate may need to be based on nutrient loading as well as hydraulic loading to the soil.

Table 6-2: In-field Soil Hydraulic Conductivity Results

Testing Location	K_{sat} (mm/h)	$K_{-40\ mm}$ (mm/h)	Maximum irrigation rate, wastewater 10% Ksat (mm/d)	Maximum irrigation rate, wastewater 30% K-40 (mm/d)
Site 1	15.3 ± 14.9	0.79 ± 0.16	36.7	5.8
Site 2	106.0 ± 7.1	2.13 ± 0.88	254.4	15.3
Site 3	34.5 ± 48.79	0.69 ± 0.4	82.8	5.0
Site 4	269 ± 7.07	1.21 ± 0.22	645.6	8.7
Site 5	102.5 ± 14.85	1.62 ± 0.30	246	11.7

Table 6.3: Laboratory Soil Hydraulic Conductivity Results

Site	K_{sat} (mm/h)	K_{-40} (mm/h)	Maximum irrigation rate, wastewater 10% Ksat (mm/d)	Maximum irrigation rate, wastewater 30% K-40 (mm/d)
Site 1	300	19	720	136.8
Site 2	173	1	415	7.2
Site 3	231	4	554	28.8
Site 4	647	50	1,552	360
Site 5	335	83	804	597.6

6.7. Summary of Soil Physical Parameters Impacted Discharge Regime Design

Soil physical condition of the sites is generally adequate. As identified in Section 5.5, depth to groundwater is shallow at one of the sites (1.4 m deep).

- Soils across the respective sites are largely in adequate health, determined through both bulk density and macroporosity. Site 2 has low macroporosity, while all other sites have adequate macroporosity (10 - 30% macropores) (Sparling *et al.,* 2008). There is only a slight indication on Site 2 that wastewater irrigation has impacted the ability for air and water to enter and drain through the soil. Bulk density values are around the adequate values of 0.9 – 1.3 for a recent soil (Sparling *et al.,* 2008).

- The soils' field capacity values vary between 36% and 50% moisture content between sites, indicating that trigger levels to commence irrigation could be customised depending on the soils present, i.e. if there was storage, Site 3 irrigation application would cease before the other two irrigated sites. Topsoil AWC ranged from 16 to 29% v/v, with Site 3 having low AWC.

- Soil hydraulic conductivity was measured at 5 locations (3 replicates per site). Soil saturated hydraulic conductivity (K_{sat}) values and soil unsaturated hydraulic conductivity (K_{-40mm}) values were variable between in-field and laboratory results. The lower of 10% of the in-field K-sat values or 30% of the K_{-40mm} were used for maximum irrigation design rates to avoid ponding, however, this may not result in optimised nutrient uptake. All sites K_{-40mm} rates are less than the application rate, with Sites' 1 and 3 particularly low. This will result in surface redistribution, localised ponding and macropore flow.

7. SOIL CHEMISTRY

7.1. Soil Chemistry Sampling

Soil retrieval for chemical analysis was conducted using a 0 - 75 mm foot corer.

Using the foot corer, 20 samples were collected per site within a zip lock bag within the vicinity of the test pit and sealed, stored within a chiller and sent away for lab analysis.

Between retrieving soil samples, equipment was cleaned to avoid any risk of cross contamination of soil.

7.2. Soil Chemistry Results

Soil pH

Table 7.1 below displays the soil pH results from the 5 test sites.

Table 7.1: Soil pH

Test Name:	Test Unit:	Site 1	Site 2	Site 3	Site 4	Site 5
pH	pH Units	6.4	6.3	6.8	5.9	6.1

The optimum soil pH for pasture growth is between 5.8 – 6.2. The pH on the sites that have had wastewater applications are slightly higher than optimum. If soils are too acidic, aluminium and manganese become toxic to the plant. If pH levels rise above 7.0, then deficiencies in iron, manganese, zinc, copper and cobalt may occur. Soil pH monitoring should be carried out every year and pH corrected back to the optimum range.

Soil Nitrogen and Phosphorus

Table 7.2 below displays the soil nitrogen and phosphorus results from the soil at the 5 test sites.

Table 7.2: Soil Nitrogen and Phosphorus Results

Test Name:	Test Unit:	Site 1	Site 2	Site 3	Site 4	Site 5
Total Nitrogen	%	0.34	0.42	0.36	0.42	0.4
Olsen Phosphorus	mg/L	19	45	38	19	24

Total Nitrogen levels are all within the typical medium range of 0.30 - 0.60%. Site 2 and Site 3 have high soil phosphorus levels, with the optimum Olsen P level being 20 - 30. High producing dairy farms operate at levels higher than this. Site 2 is in the high range, and caution is recommended to avoid P loss via leaching.

Cation Status and Cation Exchange Capacity

Table 7.3 below displays the cation status and Table 7.4 displays the cation exchange capacity and base saturation results from the soil at the 5 test sites.

Table 7.3 Cation Status

Test Name:	Test Unit:	Site 1	Site 2	Site 3	Site 4	Site 5
Potassium	MAF units	5	6	9	8	22
	me/100 g	0.27	0.35	0.5	0.47	1.23
	%BS	1.3	1.7	2.7	2.5	6.6
Calcium	MAF units	13	11	13	10	10
	me/100 g	11.7	10.3	11.7	9.2	9.1
	%BS	56	51	62	49	49
Magnesium	MAF units	49	56	44	39	57
	me/100 g	2.49	2.9	2.3	2.04	2.87
	%BS	12	14.4	12.2	10.8	15.4
Sodium	MAF units	30	28	23	8	6
	me/100 g	0.75	0.71	0.58	0.2	0.16
	%BS	3.6	3.5	3.1	1.1	0.8

The optimal soil potassium range is 7 - 10 (MAF units) or 0.4 – 0.6 me/100 g. Sites' 1 and 2 are low, and Site 5 is very high. Potassium fertiliser is recommended for Sites 1 and 2. The pasture potassium concentrations displayed in the next section indicate high potassium in the plants. At each harvest, large amount of potassium will be removed and fertiliser with potassium may be required long-term across each of the sites, if the levels in the wastewater are not applying appropriate amounts for maintenance.

For calcium, the typical medium range values seen in pasture is 4 – 10 me/100 g. The current calcium levels are adequate for plant growth. The wastewater sites are slightly above the typical range seen.

For magnesium, the optimum range for pasture growth is 8 – 10 (MAF) and the typical medium range is 1 – 1.6 me/100 g. Magnesium levels in the soil are high at all sites.

For sodium, the typical medium range is 0.2 – 0.5 me/100 g. Sodium soil levels are high under the wastewater irrigated sites and low on the dryland blocks. Sodium is not critical for pasture growth however, can impact on soil structural stability if high due to dispersion. Levels are well below levels of concern and the bulk density of the soils did not indicate issues.

Table 7.4 Cation Exchange Capacity and Base Saturation

Test Name:	Test Unit:	Site 1	Site 2	Site 3	Site 4	Site 5
Anion Storage Capacity	%	28	22	31	29	21
Soluble Salts (Field)	%	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EC (in 1:5 Extract)	mS/cm	0.06	0.04	0.03	< 0.01	0.02
CEC	me/100g	21	20	19	19	19
Total Base Saturation	%	73	70	80	63	71
Volume Weight	g/mL	0.87	0.86	0.86	0.84	0.88

The cation exchange capacity (CEC) for all the sites is within typical medium range values of 12 – 25. The volume weights are relatively consistent across all sites and within the typical medium range of 0.60 - 1.00 g/mL.

Metals

Table 7.5 below displays the metal concentrations from the soil at the 5 test sites.

Table 7.5 Soil Metal Concentrations

Test Name:	Test Unit:	Medium Range	Site 1	Site 2	Site 3	Site 4	Site 5
Boron	mg/kg	1 – 2	1.2	1.8	1.7	1	1.1
Manganese	mg/kg	50 - 400	179	64	123	170	148
Zinc	mg/kg	2 - 12	2.6	4	20.2	2.8	5.8
Copper	mg/kg	1 - 7	1.8	2.1	2.8	2.1	2.3
Cobalt	mg/kg	2 – 4	1.5	0.9	1.5	1.3	1.8
'Total' Chromium	mg/kg		23	21	31	21	17.7
'Total' Arsenic	mg/kg		13.3	11.3	16.9	10	9.5
'Total' Lead	mg/kg		22	22	21	23	20
'Total' Nickel	mg/kg		11.7	10.5	14.8	11.2	10
'Total' Mercury	mg/kg		< 0.12	< 0.12	< 0.12	< 0.12	< 0.12
'Total' Cadmium	mg/kg		0.19	0.12	0.17	0.15	0.12
Iron	mg/kg		715	836	945	1,141	654
Aluminum ($CaCl_2$ Extractable)	mg/kg		< 0.2	< 0.2	< 0.2	0.9	0.2

The soil concentration of boron and manganese for all sites is within the typical medium range of 1 – 2 mg/kg for boron and 50 - 400 for manganese.

Cobalt is below the typical medium range of 2 – 4 for all sites.

Copper is within the typical values of 1 – 7 mg/kg for all sites but is on the low side and fertiliser is recommended.

Zinc is high at Site 2 at 20.2, being above the typical range of 2 – 12 mg/kg. All other sites are within the typical range.

The soil is has high iron levels, with normal levels 100 – 500 mg/kg. High levels can cause toxicity in acidic soils but the soils at this site are in the normal pH range.

7.3. Summary of Soil Chemistry

- The variation in soil fertility is largely due to differences between the dryland and irrigated blocks and also the amount of wastewater that has been applied to each of the irrigated sites.
- Soil pH on the sites that have received wastewater applications are slightly elevated.
- Soil pH monitoring should be carried out every year and pH corrected back to the optimum range.
- Total Nitrogen and Olsen P levels are at appropriate levels. Site 2 is in the high range for Olsen P and caution is recommended to avoid P loss.

- Potassium fertiliser is recommended for Sites 1 and 2. Fertiliser of potassium may be required long-term across each of the sites, if the levels in the wastewater are not appropriate for maintenance.
- Magnesium levels are high at all sites.

8. PASTURE CHEMISTRY

Table 8.1 displays the pasture chemistry results. The results are compared to typical medium range values for samples received by Hills Laboratory. These results are compared to the critical level for deficiency values (Dairy NZ, 2012).

Table 8.1: Pasture Chemistry Results

	Medium Range	Site 1		Site 2		Site 3		Site 4		Site 5	
Nitrogen (%)	4 – 5 %	3.9	Low	3.7	Low	3	Low	2.5	Low	2	Low
Phosphorus (%)	0.38 – 0.45 %	0.48	High	0.47	High	0.49	High	0.3	Low	0.2	Low
Potassium (%)	2.5 – 3 %	3	Med - High	3.4	High	3.9	High	2.5	Medium	1.1	Low
Sulphur (%)	0.3 – 0.4 %	0.4	Med-High	0.35	Medium	0.45	High	0.29	Low	0.19	Low
Calcium (%)	0.6 – 1 %	0.33	Low	0.53	Low	0.42	Low	0.59	Low	0.42	Low
Magnesium (%)	0.2 – 0.3 %	0.2	Medium	0.23	Medium	0.23	Medium	0.2	Low	0.15	Low
Sodium (%)	0.15 – 0.30 %	0.251	Medium	0.45	High	0.257	Medium	0.12	Low	0.081	Low
Iron (mg/kg)	100 – 250	205	Medium	249	Med-High	104	Medium	233	Medium	280	High
Manganese (mg/kg)	60 – 150	82	Medium	81	Medium	61	Medium	111	Medium	188	High
Zinc (mg/kg)	30 – 50	27	Low	25	Low	29	Low	25	Low	26	Low
Copper (mg/kg)	10 – 12	8	Low	7	Low	8	Low	7	Low	5	Low
Boron (mg/kg)	-	4	-	6	-	5	-	9		5	

The amount of nitrogen present in the plant dry matter is on the low side at all sites, with medium range being 4 – 5% largely due to the dilute effluent being applied and the pasture being ryegrass dominated. The critical level for deficiency is <4%. It is likely that the plants are not receiving enough nitrogen year-round for full growth. The timing of wastewater applications in relation to plant growth is an important consideration.

Phosphorus is high in the pasture at all the wastewater sites and low at the two dryland sites. This follows the soil Olsen P results which identified the dryland soils as having a lower Olsen P and is expected due to the amount of phosphorus that is being applied to the land receiving wastewater. The critical level for deficiency in plants is <0.3%, so the dryland sites may be starting to be limited by phosphorus.

The critical range for potassium deficiency is <0.2%. Potassium is also elevated at all of the sites that have wastewater applied. The soil results indicated that potassium in the soil was low, due to it high leaching potential, however, the plant nutrient results indicate that the plants have been able to take up adequate amounts of potassium. Large amounts of potassium will be removed during every harvest, so fertiliser of potassium is recommended long-term across each the sites, if the levels in the wastewater are not appropriate for maintenance.

The critical level for deficiency of sulphur in pasture is seen at <0.25%. The two dryland sites have low concentrations of sulphur in the pasture. Site 4 is just above the critical point and Site

5 is below. Applications of sulphur are recommended for the dryland sites if they do not receive wastewater.

The pasture calcium concentrations are in the low range of typical values at all sites. However, the critical level for deficiencies is <0.25% and all sites are above this.

The pasture magnesium levels are slightly higher at the wastewater applied sites than dryland. The sites with wastewater applied are in the medium range of typical level seen in pasture, but still on the low side of the medium range. The dryland sites are low in comparison to typical values. The critical point for deficiencies is <0.15%. Site 5 is at this level and all other sites are close to this at 0.22% or less.

Sodium is elevated in the wastewater applied sites and above typical ranges seen, but it is not a critical nutrient for plant growth.

Iron levels are varying across all sites are high (>65). Pasture levels above 250 mg/kg indicate possible soil contamination. Concentration of iron in the pasture at Site 2 and Site 5 are at or above these criteria. The critical point for deficiencies is <45 ppm and all sites are well above this. High Iron at Site 5 could indicate that the natural iron content of the soil is high.

The manganese concentrations of the pasture of the irrigated blocks are within the typical range seen, with two dryland sites having the highest manganese levels. These dryland soils have lower pH and at a lower pH manganese becomes more plant available. The critical level for deficiency is <20 ppm and all sites are well above this. Manganese concentrations are in the high range for pasture requirements.

Zinc concentrations in the pasture are all on the low sides of typical values. The critical point for deficiency is 12 ppm and all sites are above this. The soil concentrations were not directly reflected in the pasture concentrations, as Site 2 soil concentrations were much higher, but the pasture concentration was similar to the other sites.

Copper pasture concentrations are also on the low side of typical values. The critical point for copper deficiency is < 5 ppm. All sites are just above this, with Site 5 sitting at 5 ppm. The optimum is 6 – 7. Copper fertiliser should be considered on Site 5 to improve pasture yields.

The critical deficiency point for boron is less than <10 ppm. All sites are likely to be deficient in boron and fertiliser applications of boron are recommended.

8.1. Summary

- Differences in the fertility status of the pasture was evident between the dryland and wastewater sites.
- Pasture nitrogen deficiencies were identified. It is likely that the plants are not receiving enough nitrogen year-round for full growth. The timing of wastewater applications in relation to plant growth is an important consideration. This is constrained by wastewater storage.
- High removal of potassium from the wastewater sites will be occurring with each harvest. It is recommended that the monitoring of potassium soil levels long term is carried out to ensure adequate potassium remains in soil to cover the potassium removed.
- Site 5 is deficient in Boron and fertiliser of Boron is recommended
- If the two dryland sites are not to be irrigated with wastewater they would benefit from additional nutrients, such as phosphorus, sulphur and copper.

9. NITROGEN LOSS MODELLING

Overseer modelling of the nitrogen and phosphorus loss was completed for:

1. The system in 2017 when there was borderdyke and one pivot (28.5 ha total irrigated);
2. The current system (2019) with 3 pivots (30.2 ha total irrigated). Current wastewater application as reported (not applied evenly between all 3 pivots);
3. A theoretical system (2019 flows), which models the actual monthly discharge of wastewater applied evenly across the 30.2 ha, rather than unevenly to the three pivot blocks;
4. A theoretical system using current 2019 volumes, but applications are applied evenly throughout the year – no seasonal variation (30.2 ha irrigated);
5. A theoretical system using current volumes, but with additional storage so that there is no wastewater application in June and July;
6. A comparison scenario, using current volumes but with reduced N concentrations to give an N loading of 200 kg N/ha/yr with a grazing management, rather than cut and carry;
7. A proposed system using increased volumes with a 5 mm irrigation depth limit (42 ha); and
8. A proposed system using increased volumes with a 4 mm irrigation depth limit (52 ha).

9.1. Scenario 1 – Historical – 2017/2018

Historical- 2017/2018 Irrigation

Overseer modelling was used to model the nitrogen and phosphorus loss from the wastewater applications that were applied via border dyke or via pivot irrigation. The outputs are shown in Table 9.1 and Figure 9.2. In this season there was an additional 13.2 ha irrigated by a centre pivot, meaning a total of 28.5 ha received wastewater applications. In this year wastewater was also sent to the rapid infiltration basins. Nitrogen mass balance calculations have been completed for this year. The predicted N loss from the rapid infiltration basins is calculated using a mass balance in the section below.

Table 9.1: Overseer Outputs – 2017/2018

Nitrogen (kg N/ha/yr)	51
Total Nitrogen loss (kg/yr)	1,442

Historical- 2017/2018 Rapid Infiltration Basin (RIB)

A mass balance for RIBs was completed for the 2017 and 2018 data, as shown in Table 9.2. In 2017 the RIB's were used in July and August and in 2018 between May and September.

Table 9.2: RIB Nitrogen Mass Balance

Year	Volume discharged (m^3/yr)	Concentration TN (g/m^3)	Total Nitrogen Mass discharged (kg N/yr)
2017	112,573	26.3	2,964
2018	179,922	28.25	5,083

Note that the total N load to the catchment is a sum of the RIB and irrigation leaching, so 2017/18 season was 1,442 plus 2,964 kg N/yr, a total of 4,406 kg N/yr.

9.2. Scenario 2 – Current Activities 2019– Centre Pivots

The N loss from current activities (2019 season) was modelled in OverseerFM (Table 9.3). Two additional pivots had been added to the system and the border dyke system had been retired. The total area currently irrigated by pivots that received wastewater applications was 30.2 ha. The pivots were modelled as separate blocks as each pivot block received different amounts of wastewater throughout the year.

Table 9.3: Overseer Outputs – Current

Nitrogen (kg N/ha/yr)	87
Total Nitrogen loss (kg/yr)	2,618

The rapid infiltration basins have not been used in 2019 or 2020.

9.1. Scenario 3 – Theoretical 2019 Seasonal Profile across 30.2 ha

Three theoretical scenarios using current data were created. The first scenario models the actual seasonal profile of wastewater applications if this was applied evenly across the 30.2 ha, rather than unevenly to the three pivot blocks. The output from this scenario is shown in Table 9.4

Table 9.4: Overseer Outputs – Seasonal Profile across 30.2ha

Nitrogen (kg N/ha/yr)	77
Total Nitrogen loss (kg/yr)	2,348

9.2. Scenario 4 – Theoretical Even 2019 Applications all year around

The second theoretical scenario was created which assumes an even application of wastewater all year around – no seasonal variation – across the existing 30.2 ha. The outputs from this scenario are shown in Table 9.5

Table 9.5: Overseer Outputs – Current

Nitrogen (kg N/ha/yr)	82
Total Nitrogen loss (kg/yr)	2,493

9.3. Scenario 5 – Theoretical 2019 flows with No June and July applications

The third theoretical scenario was created which assumes that there is adequate storage that allows for no wastewater applications in June and July. The outputs from this scenario are shown in Table 9.6

Table 9.6: Overseer Outputs – Current

Nitrogen (kg N/ha/yr)	65
Total Nitrogen loss (kg/yr)	2,009

9.4. Scenario 6 – 2019 Flows Grazed and 200 kg N

One of the consent conditions for the existing system allows a system where 200 kg N/ha/yr is applied from wastewater and the land is grazed rather than managed as a cut and carry system. To apply only 200 kg N/ha the current concentrations of wastewater would need to be reduced to 13 mg/L. This scenario was modelled using the 2019 seasonal distribution of wastewater applications across the year, with sheep being grazed across the year. The outputs are shown in Table 9.7 below.

Table 9.7: Overseer Outputs – Theoretical Scenario

Nitrogen (kg N/ha/yr)	79
Total Nitrogen loss (kg/yr)	2,406

9.5. Future Proposed Scenarios 7 & 8

Two future proposed scenarios were modelled:

- A proposed system using increased volumes with a 5 mm irrigation depth limit (42 ha)
- A proposed system using increased volumes with a 4 mm irrigation depth limit (52 ha)

Scenario 7 was modelled with an irrigation average depth limit of 5 mm. This meant that the irrigation area is increased to 42 ha. The scenario was modelled treating a daily average volume of 2,098 m^3/day (5,300 PE). The overseer outputs are shown in Table 9.8. The total nitrogen applied is 401 kg N/ha and 12,000 kg DM of pasture is removed. Again assuming no discharge to RIBs.

Table 9.8: Overseer Outputs – Proposed 5 mm

Nitrogen (kg N/ha/yr)	98
Total Nitrogen loss (kg/yr)	4,136

Scenario 8 was modelled, with an average application depth of 4 mm. This meant that an irrigation area of 52 ha was required. The same daily average volume, nitrogen and drymatter was removed as in the Scenario 7 above. No discharge to RIBs. The overseer outputs are shown in Table 9.9.

Table 9.9: Overseer Outputs – Proposed 4 mm

Nitrogen (kg N/ha/yr)	88
Total Nitrogen loss (kg/yr)	4,566

9.6. Model Summary

Table 9.10 summarises the Overseer N outputs from the above scenarios.

Table 9.10: Overseer Outputs

Scenario	1	2	3	4	5	6	7	8
Year	2017	Current (2019)	Current (2019) Theoretical – Seasonal Variation	Current Theoretical – Even applications	Current-Theoretical No June-July	Grazed with 200 kg N/ha	Future – 5 mm	Future – 4 mm
Annual average volume irrigated (m^3/day)	640	1,247	1,247	1,247	1,247	1,247	2,098	2,098
Irrigation area (ha)	28.3	30.2	30.2	30.2	30.2	30.2	42	52
Irrigation Nitrogen concentration (g/m^3)	35	23	23	23	23	13.1	22	27
Nitrogen Applied (kg N/ha/yr)	301	345	346	345	338	195	401	401
Nitrogen leached (kg N/ha/yr)	51	87	77	82	66	79	98	88
RIB N (kg N/yr)	2,964	0	0	0	0	0	0	0
Total N loss (kg/yr)	4,406	2,618	2,348	2,493	2,009	2,406	4,136	4,556

9.7. N Modelling Implications

The modelled leaching is higher in the current 2019 system than in 2017 on a per ha basis due to the diversion of flow to the RIB's. However, when the total nitrogen leached is combined with the loss to groundwater via the RIB, the total leaching in 2017 is greater by 1,788 kg N. The 2017 system had border dyke irrigation in place, and this has been updated with more efficient pivot systems since.

There are three pivots in the current system and wastewater applications in 2019 were reported to have not been applied evenly between each of the pivots. The outputs from the current theoretical – seasonal variation model (Scenario 2) shows that by improving the management of the pivots (Scenario 3) so that applications are even between all 3 pivots then the N loss reduces from 87 kg N/ha to 77 kg N/ha.

If storage to buffer flows was added to the system so that applications can be applied evenly each month without any seasonal variation the N loss goes reduces from 87 kg N/ha currently (Scenario 2) to 82 kg N/ha (Scenario 4). The reason that even applications of wastewater all year around does not reduce N loss as much as the 77 kg N/ha Scenario 3, is due to the timing of wastewater application. The 2019 year has a peak loading of wastewater to land in November, resulting in 60 kg N of 346 kg N/ha being applied in just that month. With an even distribution of wastewater applications throughout the year, the N load in winter ends up being slightly higher than the 2019 winter loading, due to the uneven seasonal distribution that is currently being applied.

If additional storage is added so that wastewater applications avoid the critical N loss months such as June-July (Scenario 5) and more is added in spring and summer when plant demand is higher, then N loss can be significantly reduced. This is seen in Scenario 5 which models no applications of wastewater in June and July. The model reports an N loss of 66 kg N/ha which is significantly less than the current scenario at 87 kg N/ha.

A comparison scenario, Scenario 6 was created which models the second type of management system allowed by the current consent conditions. This scenario requires a reduction in N load so that only 200 kg N/ha is being applied and the pasture is grazed, rather than being required to be removed off-farm. The N loss from this scenario is 79 kg N/ha/yr, which is more than could be achieved with current system (Scenario 3) at 77 kg N/ha if this was managed appropriately and applications were even across all pivots with existing seasonal flows.

The grazed scenario is a realistic representation of the N loss that would be occurring if N application were limited to 200 kg N/ha and grazed by sheep. Figure 9.1 shows for Scenario 6 the monthly changes in nitrogen within the grazed system from wastewater applications (as N in fertiliser), plant uptake, the breakdown of plant residues, volatilisation, denitrification, mineralisation and N lost from the root zone from leaching. Figure 9.2 shows the Scenario 2 monthly N changes for the current cut and carry system with improved management (even application, with existing seasonal variation).

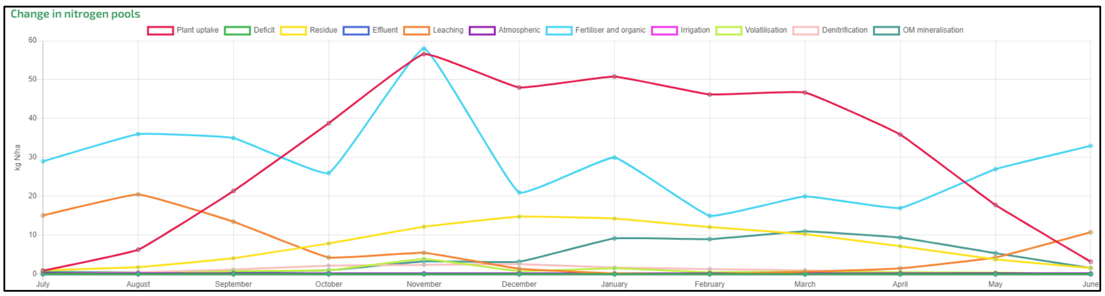

Figure 9.1: Monthly N Changes - Grazed with 200 kg N/ha Appled

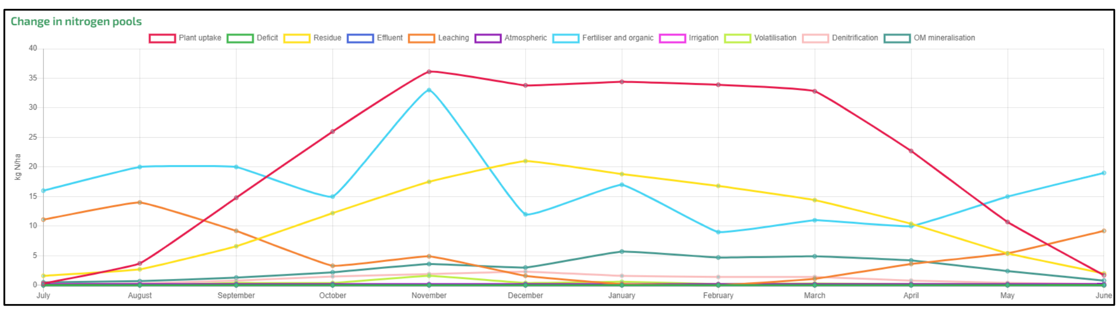

Figure 9.2: Monthly N Changes - Current System with Improved Mangement

The overseer model analysis above supports that current N loss with improved irrigation distribution is similar to the permitted scenario of 200 kg N application without having a 100% nitrogen applied removed in the harvest. On this basis the downstream effects of the current system are broadly equivalent for 200 kg grazing system. These models account for the fact winter drainage causes N loss irrespective of the mass of nitrogen harvested.

In addition, two future models (Scenarios' 7 and 8) were prepared within increased annual volumes to represent the wastewater that may be received by the wastewater treatment plant in the future. The annual average daily volume irrigated was increased from 1,247 m^3/day currently to 2,098 m^3/day. These scenarios limit the N loss to 400 kg N/ha and either 5 mm or 4 mm max application per day. This meant that the irrigation area needed to be increased from 42 ha for 5 mm applications and to 52 ha for 4 mm applications.

The N loss from the 5 mm Scenario 7 is 98 kg N/ha, namely due to the increased N loading overall. When the monthly hydraulic application depth is reduced to 4 mm the N loss decreases to 88 kg N/ha as there is less drainage occurring. The future Scenario 8 a 4 mm even application depth limit, is comparable, with the existing system (Scenario 2) N loss per ha, which is 87 kg N/ha. Again, the timing of when N is applied is important.

With an increased future total N load modelled at 400 kg N/ha but with an even distribution of wastewater applications throughout the year achieved with around 100,000 m^3 of storage, the N load in winter ends up being slightly higher than the current 2019 winter loading, due to the uneven seasonal distribution being applied currently.

On the basis above, the ideal situation would be a system that limits hydraulic application depth so that drainage throughout the year is minimised and allows for limiting N applications during critical N loss time periods.

10. FUTURE LAND MANAGEMENT CONSIDERATIONS

10.1. Soil Hydraulics and Loading Rates

The soil hydraulic analysis indicates the current sites are suitable for the application of wastewater at low rates. The instantaneous application rates of the pivots are greater than the mesoporosity of all soils, so some surface redistribution and ponding will occur.

The soil hydraulic characteristics outlined in Section 6 show the topsoil can receive relatively high loading, ranging from 37 – 645 mm/d based on 10% of K_{sat} and 5 – 15 mm/d based on 30% of $K_{-40\ mm}$.

The current pivot spray irrigation system is applying peak irrigation depth of 7.5 mm/application with a return period of 1 day. The annual average application is between 2.3 and 4.9 mm/day.

The test pits from the irrigated area show topsoil of 15 – 20 cm depth. AWC of the irrigated areas is 18 – 29% of the soil depth, or 36 – 52 mm. Irrigation practice is to limit applications depth to less than 50% of the AWC, or 18 – 26 mm for the sites. The application at 7.5 mm/application is meeting this criterion.

The difference between field capacity and porosity is the ability of the soil to absorb irrigation/rainfall without ponding, with the soil draining back down to field capacity following application. This ranges from 8% to 16%, with the 8% occurring at Site 2 on the shallow soil. This equates to just 12 mm for Site 2, i.e. the soil can only accept 12 mm application and rainfall when the soil is at FC (winter or following rainfall) without ponding occurring, unless the application rate is less than the soil's infiltration rate.

As the current irrigation practices are causing ponding at times, active monitoring and an even application depth between the pivots is recommended.

10.2. Other Loading Constraints

The irrigation rate of 7.5 mm is a relatively low application depth and should not result in observed ponding, unless the underlying soils are already saturated. Note that the surface redistribution and localised ponding due to low K_{-40mm} may not be visible as the water will quickly drain via macropores. The irrigation fields are at times struggling to cope with the volume of wastewater being applied; this is partially due to the uneven application of water and consequently ground conditions are becoming adverse. Historically this has resulted in a discharge to the infiltration basins.

The Leeston WWTP population is forecast to increase to nearly double from 3,722 (2018) to 6,631 (2048), which will result in an exceedance of current consent conditions.

10.3. Irrigation Methods

Consent conditions require that the treated wastewater is to be applied as far as practicable at a uniform depth over the land application area; the treated wastewater application system is to be managed to ensure the return period between applications to any part of the of the land application area is maximised. However, historically wastewater hasn't been applied evenly across all sites. There are stand down periods required between the last application of wastewater and harvest that complicate the operation.

10.4. Additional Irrigation Area

The consent condition stipulates that 41.9 ha of land should be used at all times for wastewater applications. Currently, 30.4 ha of land is used for wastewater application. However, as stated in a recent compliance report, the majority of the application areas noted on the Drawing 6511266-120-C200 (attached to the consent application) are available for application. It is likely that the original consent application miss-calculated the available land and loading rates were based on 41.9 ha being available.

Additional irrigation is possible at the site with the installation of solid set irrigation sprinklers or subsurface drip irrigation infilling between the pivots and setback buffers. However, this additional land still does not make up 41.9 ha with the current buffers. A new greenfield area would be required to increase the area beyond 39 ha.

The use of solid set sprinklers could also reduce the need for end guns to be used on the pivots. End guns have higher instantaneous application rates. Figure 10.1 presents the additional area available in addition to the 2 ha of RIB area that could be converted to spray irrigation at the current site.

Using surface irrigation, it is assessed that a maximum of 9.9 ha of additional land is available, as shown in Figure 10.1. If sub-surface irrigation was installed the buffers to neighbouring properties could be reduced to 5 m, which adds an additional 18 ha that could be irrigated. This would need a good filtration system.

Figure 10.1: Potential Additional Irrigation Land

10.5. Crop/Pasture Management

Improving irrigation management: Current uneven loading practice, with high volumes of water, could be causing soil temperatures to remain low or be flushing out nutrients from the soil under those pivots. This leaching of the nutrients means that there is insufficient nitrogen for the required pasture growth.

Pasture nitrogen deficiencies were identified. It is likely that the plants are not receiving enough nitrogen year-round for full growth. The timing of wastewater applications in relation to plant growth is an important consideration. Nitrogen added to the pasture in excess of that taken up in the plants and soil or lost to the atmosphere is leached into the underlying shallow aquifer. The amount of nitrogen currently being applied to un-grazed pasture is in excess of that removed through the cut and carry system. It was concluded that there is unlikely to be enough nitrogen in the system during summer for appropriate pasture growth and there is an excess of nitrogen in winter resulting in leaching to the shallow groundwater.

Other pasture nutrient deficiencies were also identified. High removal of potassium from the wastewater sites will be occurring with each harvest. It is recommended that the monitoring of potassium soil levels long term is carried out to ensure adequate potassium remains in soil to cover the potassium removed. Soil pH is outside the optimum range for plant nutrient availability and should be corrected.

Plant species that have more active growth in winter to be able to take up the winter nitrogen surplus could be considered. Also species such as clover that can fix nitrogen into the system could be considered. The introduction of clover will slightly increase the leaching but will in practice contribute to filling the nitrogen deficit in the summer months. Ryegrass alone doesn't have the ability to fix nitrogen, and the nitrogen in the plants is less than that required to balance nitrogen applied and exported. What the consent conditions require for the cut and carry system is not feasible to achieve without limiting winter leaching and the addition of biologically fixed nitrogen for summer pasture growth. When clover is added into the proposed overseer model, an additional 50 kilos of N is added to the system and the N deficit decreases.

10.6. Additional storage

While the soil testing and nutrient modelling has shown that system has capacity to receive wastewater all year round, saturated soil conditions and nutrient leaching associated with winter drainage cannot be avoided with the current system.

The hydraulic loading rates relative to the soil water holding capacity dictates the amount of nutrient loss. Limiting soil moisture drainage by using storage to hold and delay irrigation during winter and high rainfall days will reduce the nitrogen loss from the site. Storage to buffer or retain all of the flows water during June and July is recommended. While a detailed water balance has not been undertaken as part of this scope of work, it is expected that storage could be developed on the RIB site and area and coupled with the existing treatment pond level management 80,000 to 100,00m^3 of storage could be achieved without reducing the current irrigation area.

To store all of the flows during June and July, it is estimated that a storage volume of 167,000 m^3 would be required.

Reducing with network infiltration and inflows (I&I) will also reduce winter application depths from those currently seen.

In the future, if flows were transferred to the Pines site, any storage provided at Leeston would allow buffering of flows and the ability to reduce winter irrigation requirements at the Pines if required.

10.7. Summary of Land Management Considerations

- Soil is appropriate to receive wastewater applications, but care needs to be taken to ensure that instantaneous application rates are not excessive and that wastewater is evenly applied across the full area;
- Increase the buffer storage is recommended, initially within existing WWTP pond system;
- Recommend the addition of three months of winter storage to avoid application during high soil moisture times;
- Additional irrigation area is recommended;
- Match nitrogen applications to plant growth to increase N uptake by plants – nitrogen uptake increases during periods of active plant growth;
- Consider under sowing the existing areas with clover;
- Consider planting winter specific active rye grass plant species; and
- Carry out regular soil testing to monitor soil fertility status and possible application of micro-nutrients to balance and promote pasture growth.

11. REFERENCE LIST

Sparling, G., Lilburne, L., & Vojvodic-Vukovic, M. (2008). *Provisional Targets for Soil Quality Indicators in New Zealand.* Landcare Research Science Series No. 34

Appendix C – Climate change report (Aqualinc)

17 WASTEWATER

The key conclusions for this section are:

- Climate change will probably have only a minor impact on most aspects of SDC wastewater assets over the next 30 years;
- Higher alpine rainfall and flood flows may result in an increase in stormwater inflows for the Arthurs Pass, Castle Hill and Lake Coleridge wastewater systems; and
- An increase in sea level rise of up to 0.28 m may have an impact on Upper Selwyn Huts, Rakaia Huts and Lakeside wastewater systems.
- At Leeston, the wastewater treatment plant groundwater levels have exceeded the 900 mm below land surface threshold approximately once each year, altering the normal discharge to land procedure. On the basis of this work, it appears that the predicted minor changes in groundwater levels over the next 30 years should not significantly increase exceedances to this threshold, though it is recommended that more detailed, site specific, modelling is carried out to ensure that this conclusion is correct.

SDC manages 16 reticulated wastewater systems that service 55% of properties within the district. A map of the schemes is shown in Figure 34 and Figure 35. Predicted climate change impacts are summarised in Table 13.

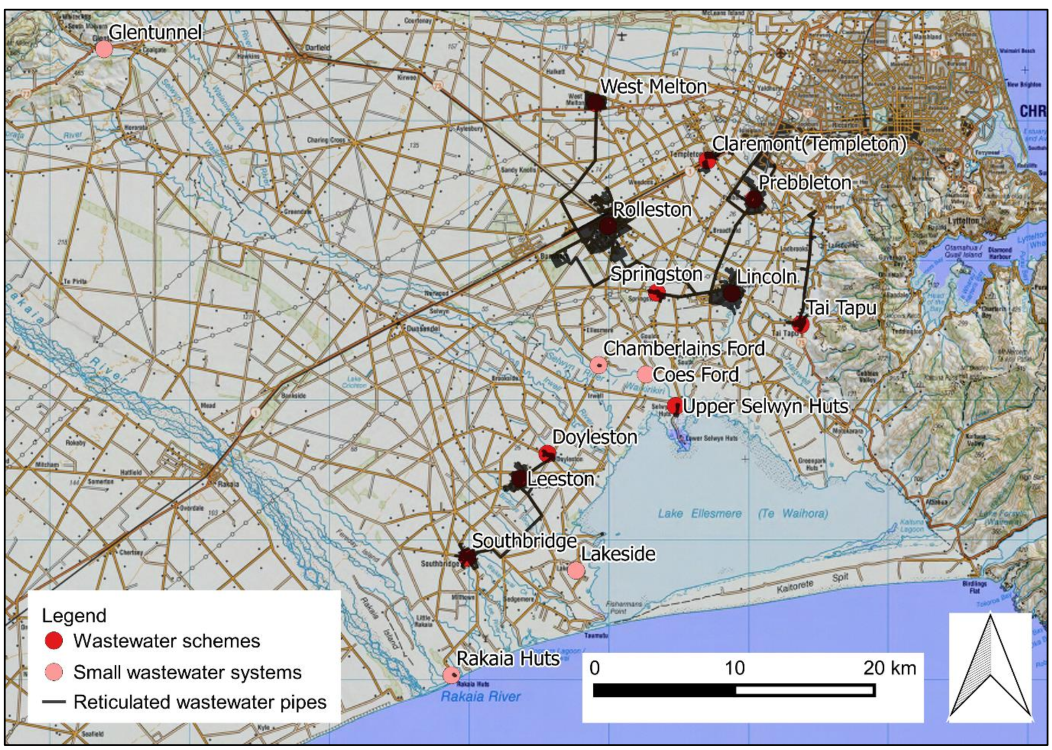

Figure 34: SDC wastewater schemes – Canterbury Plains

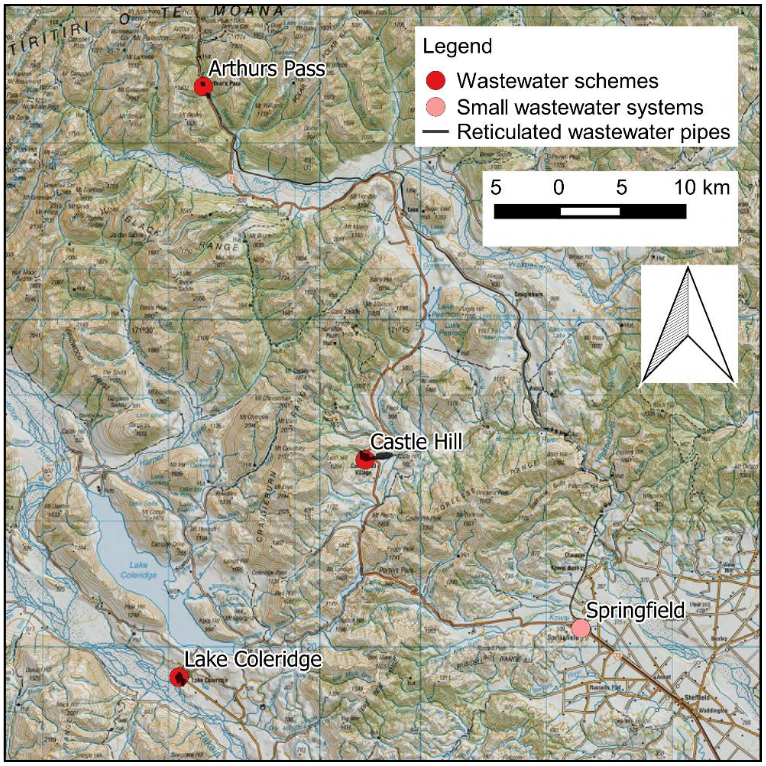

Figure 35: SDC wastewater schemes – Alpine and foothill

Table 13: Impact of climate change on SDC wastewater systems

Environmental factor	Asset vulnerability	Issues	Projected climate change	Asset impact	Climate change /Historic range[1]
Ground water levels (upper plains)	Minor		Minor	Minor	1% lower
Ground water levels (lower plains)	High	GW infiltration into sewer system	Minor	Minor	7% higher
Annual rainfall	Minor		Minor	Minor	Small
Extreme rainfall events (Plains)	High	Inflow and infiltration	4-12% increase	Minor	2-7% higher
Extreme rainfall events (foothills and alpine)	High	Inflow	4-12% increase	Minor	Small
Alpine river flows	Minor		3% increase	Minor	5% higher
Foothill and lowland river flows	Minor		Minor	Minor	Small
Evapotranspiration (ET)	Minor		6% increase	Minor	10% higher
Sea level rise <0.23 m	Low	Upper Selwyn Huts	0.09-0.28 m increase	Low negative	+50% to 150%
Snow and ice (excl. alpine river flows impacts)	Minor		Minor	Minor	20% less (Castle Hill snow)
Temperature (excl. ET impacts)	Minor		1.1 °C increase	Minor	56% higher
Wind (excluding ET impacts)	Moderate	Wind damage to assets in a storm	Low	Low negative	Small

(1) Refer Table 12 for details.

Climate change will probably have only a minor impact on most aspects of SDC wastewater assets over the next 30 years. This is because on the Canterbury Plains where SDC have most of their assets, climate change is projected to only have a minor impact on environmental factors that affect asset vulnerability.

The main environmental factor that is projected to change on the plains is sea level rise. This has the potential to impact on the Upper Selwyn Huts borderdyke wastewater disposal system (Chapter 13) and to a lesser extent the risk of flooding at Rakaia Huts (Chapter 14). Sea level rise also has the potential to impact on the Lakeside wastewater system; we are not familiar with the details of the Lakeside system and have not assessed the impacts.

In alpine areas, climate change is projected to have a more significant impact. The main projected change that impacts on SDC assets is the increase in both mean annual rainfall and flood flows which may have some impact on Arthurs Pass, Castle Hill, Lake Coleridge and Springfield wastewater systems. The exact impact will depend on the individual vulnerability of these assets to floods and high rainfall events.

MFE (2016) predict a 5% increase in wind speed on 'windy days' (Chapter 8). This may result in a very small increase in the frequency of wind damage during storms.

The Leeston waste water treatment plant (WWTP) has a current consent (expires July 2029) for treated wastewater to be discharged if the groundwater level in the monitoring bore on Beethams Rd (M36/4083), is higher than 900 mm below the land surface. During these periods wastewater is discharged into specialised infiltration basins. While using the infiltration basins for discharge, groundwater is pumped from below the basins to ensure groundwater level stays below 900 mm in four monitoring bores surrounding the infiltration basins. Six groundwater pumps below the basins are used to extract the groundwater which is then discharged as surface water into Tramway Reserve drain that drains into Te Waihora.

Figure 36 shows that between April 2017 and April 2020, there were only two occasions where groundwater level in the WWTP monitoring bore M36/4083 was higher than 900 mm bgl, in July and August 2017. Groundwater levels were close to the 900 mm threshold (between 1000 and 900 mm), in the winter of 2018 and 2019, for several days.

To understand local ground water levels over a longer time frame than the last 3 years, data from the WWTP monitoring bore was compared to a Doyleston bore (M36/0424), which has several decades of data and is 2.3 km from the WWTP monitoring bore. Our analysis shows the Doyleston bore data minus 500 mm approximates the WWTP monitoring bore reasonably well over the last 3 years (Figure 37), so can be used as a surrogate to approximate groundwater levels over the last several decades. Based on the “surrogate Doyleston bore – 500 mm” data set, there are likely to be exceedances of the 900 mm threshold, roughly every year, with each having a duration of approximately 4 or 5 days/year, but up to a maximum of 12 days/year (based on the last 20 years (Figure 31)). Regional groundwater levels in 2015/16 were unusually low, so this period should not be considered representative of normal groundwater levels in the SDC monitoring bore.

Although the “Doyleston – 500 mm surrogate” does look to be a reasonable representative for the WWTP bore, it may under-represent high groundwater levels, at least for the 2017 high ground water level period. For this reason, it should be used with caution as it may under-represent earlier high ground water levels as well. On the basis of the available data, Leeston WWTP would be expected to not be able to discharge to land because of high groundwater, approximately once a year, for short durations.

Since the Leeston WWTP is 4 km from the lake and 15.9 m amsl, lake management will likely have more impact in the medium term, than sea level rise, on ground water levels. Even so, the sea level rise expected in the next 30 years would likely only impact ground water levels up to 1 km inland (Chapter 15), and it is reasonable to assume that changing lake levels would have a similar effect.

The effects of CPW have been incorporated within the eigen modelling, which suggests that they are minimal. Backwater effects from the lake were also assessed as they may influence drainage of pumped surface water to Te Waihora. In this case, this influence is expected to be minor because even in large storm events, reduced land drainage would be expected to occur at up to approximately 3.8 m amsl (Chapter 13). The Leeston WWTP is 15.9 m amsl, so even in extreme events the Tramway drain is unlikely to be affected to the extent that it poses an issue to the WWTP. We have not considered the discharge flow rate into Tramway drain, and the effects this may have.

In summary, based on this data, groundwater levels are expected to exceed the 900 mm below land surface threshold, approximately once each year, restricting discharge to land for a short duration of a few days at a time. Groundwater levels are expected to decrease slightly as a result of climate change, however a minor increase is expected from CPW effects, resulting in relatively stable ground water levels over the next 30 years. However, it should be noted that the eigen modelling is a relatively simple approach, with attendant uncertainties and limitations. If the future of operations at the WWTP are to be assessed with more confidence, we would recommend further, more specific modelling of the site, including the impacts of CPW.

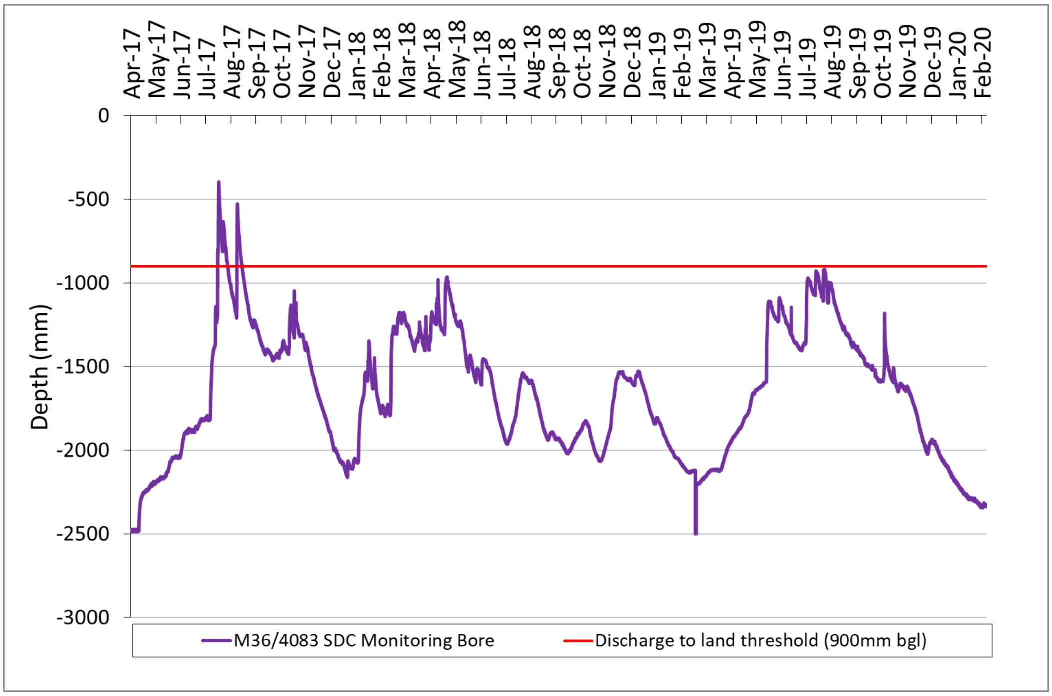

Figure 36: Ground water level of monitoring bore M36/4083 at Leeston waste water treatment plant

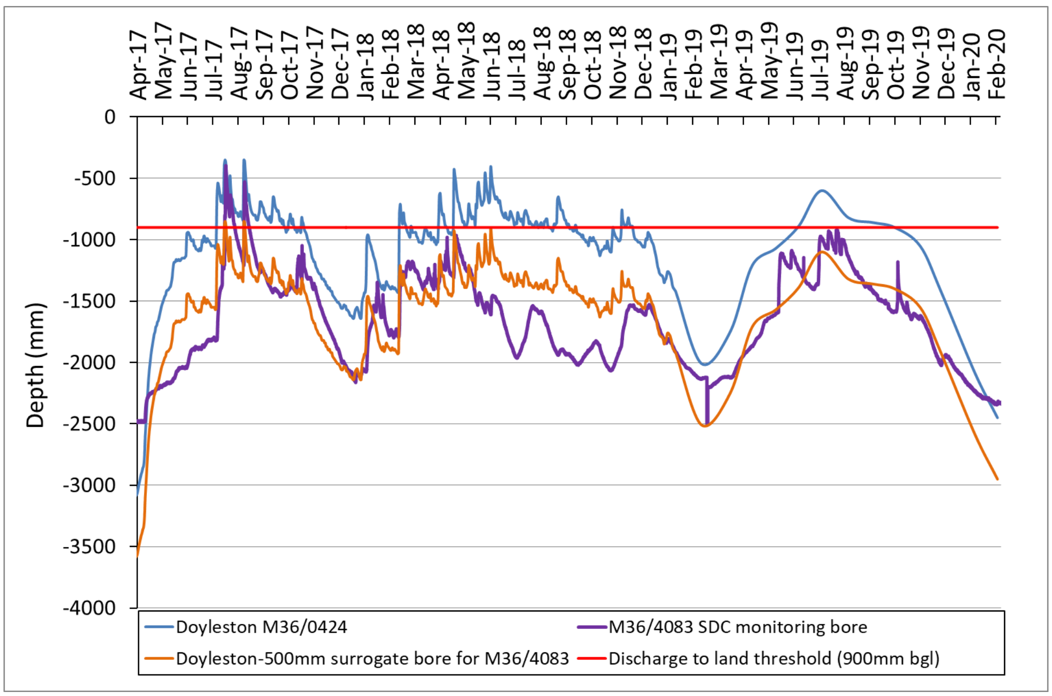

Figure 37: Ground water level over the last 3 years from the Doyleston bore M36/0424, the SDC monitoring bore M36/4083, and an adjusted data set that approximates water levels in the M36/4083.

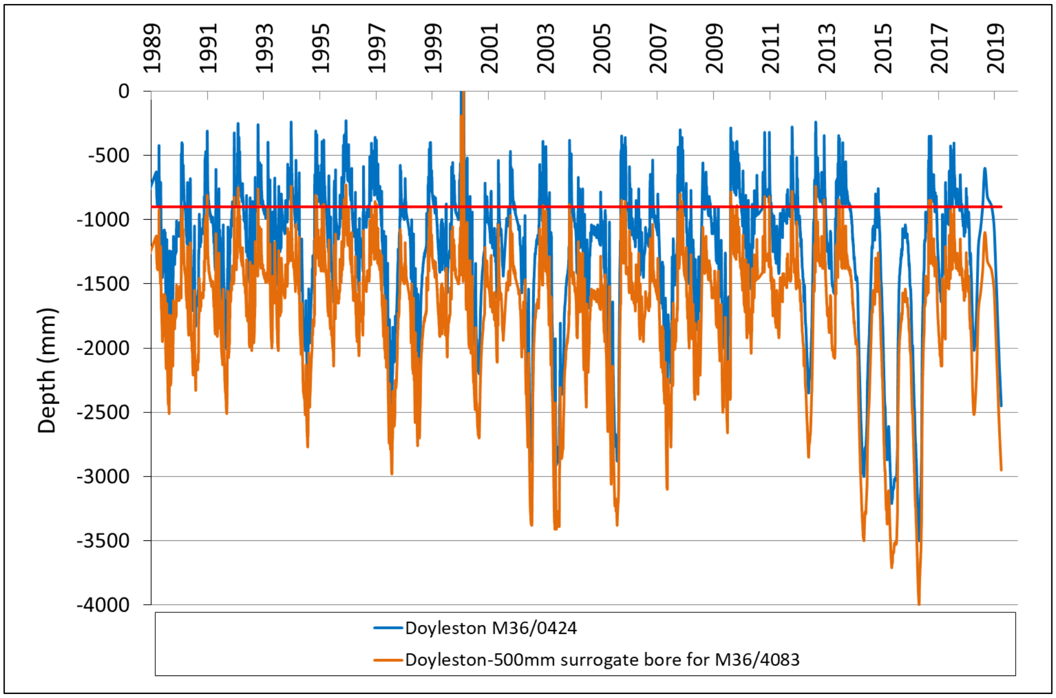

Figure 38: Ground water level data since 1989 for the Doyleston bore M36/0424, and the altered dataset 'Doyleston-500mm', which approximates water level in the SDC monitoring bore.

Appendix D – Consents and designations review (Beca)

Sensitivity: General

Ellesmere Wastewater Treatment Plant

Resource Consents and Designation Review

Prepared for Selwyn District Council

Prepared by Beca Limited

27 March 2020

Creative people together transforming our world

Contents

Appendices

Sensitivity: General

Revision History

Revision Nº	Prepared By	Description	Date
A	Hugh Loughnan	Draft for client review	27/03/2020

Document Acceptance

Action	Name	Signed	Date
Prepared by	Hugh Loughnan		27/03/2020
Reviewed by	Paul Whyte Graeme Jenner		27/03/2020
Approved by	Paul Reed		27/03/2020
on behalf of	Beca Limited		

Ellesmere Wastewater Treatment Plant - Resource Consents and Designation Review

1 Introduction

Beca Limited (Beca) has been commissioned to review and recommend on the rationalisation of the resource consents associated with the discharge of treated wastewater from the Ellesmere Wastewater Treatment Plant (EWTP); and review and recommend on the designation of the EWTP.

Comment is also provided on the interpretation of a condition relating to nitrogen loading in CRC110148.

These findings and recommendations are outlined below.

2 Resource Consents

2.1 Active Resource consents

The following consents from the Canterbury Regional Council (CRC) are currently active at the site:

Consent Number	Consent Type
CRC011680.1	To discharge contaminants into land and groundwater from the operation of additional wastewater treatment and disposal.
CRC930165.1	To discharge contaminants to land.
CRC011681.2	To discharge up to 120 litres per second of extracted groundwater into Tramway Reserve Drain.
CRC011679.1	To discharge contaminants into air from construction and operation of additional wastewater treatment and disposal facilities.
CRC941475.1	To discharge contaminants to air.
CRC941476	To discharge contaminant into Land
CRC950253	To discharge oxidation pond effluent onto land via border dyke irrigation
CRC110148	To discharge contaminants to land, air, and groundwater and surface water.

The following two consents are also applicable to the site.

Consent Number	Consent Type
CRC011678	To take groundwater
CRC136795	To discharge contaminants to land.

CRC011678 is a water permit and therefore did not need to be reviewed or rationalised while CRC136795 was found to be associated with discharge to land at Coes Ford and therefore is not relevant to the EWTP.

2.2 Consents Review

During the consents review it became apparent that Beca, on behalf of SDC, had undertaken a similar review of the resource consents in 2010. This review amalgamated the consents (CRC011680.1, CRC930165.1, CRC011681.2, CRC011679.1, CRC941475.1, CRC941476, and CRC950253 above) into one consent (CRC110148 above), including expanding the applicable treatment disposal area (shown in Appendix 1). The 2010 review recommended surrendering the amalgamated consents referred to but, for unknown reasons, this did not occur.

However, in order to ensure that the resource consents could be surrendered a review and comparison of the conditions of the relevant consents was undertaken as follows. Firstly, consent conditions were grouped according to the consent type and then to where and to what they applied (Appendix 2), then the wording of each condition was compared for any similarities/differences (see Appendix 3). There were a small number of differences identified but these are not considered critical and overall, do not affect CRC110148.

Overall, CRC110148 covers all the requirements of the consents to be surrendered and amalgamates them in one consent. It also allows for disposal of treated wastewater over 41.9 hectares. This is greater than the areas permitted under the other consents and is greater than is currently used by SDC (28.6ha). This area also allows for the use of the 35.3ha land area, recommended by Opus in 2017, so that SDC can continue to meet the nitrogen loading limit for the EWTP in the short term. The 41.9ha consented area also allows for the use of an extra 5.6ha of land disposal area, if this is required before the 2029 expiry date.

In summary, CRC110148 covers the matters of the other reviewed consents and accordingly these can be surrendered to CRC in order to avoid confusion, as well as potential costs/duplication in compliance monitoring and reporting.

2.3 Condition Relating to Nitrogen Loading

Condition 7 of CRC110148 regulates the amount of nitrogen which can be applied when the wastewater is discharged and states as follows:

7.The rate at which treated wastewater is applied shall not exceed 200 kg of nitrogen per hectare per year onto grazed pasture, or an equivalent application and land management system, that matches the annual nitrogen application with the annual plant uptake.

It is understood that the condition has traditionally been interpreted as allowing 200kg of N per ha to be applied to grazed land and in addition allowing other land management systems such as cut and carry, in which the application rate for cut and carry can be increased as long as all the nitrogen above 200 kgTN/ha is removed in hay.

However, a more recent interpretation is that there must be “net zero” nitrogen from the land application of wastewater.

Given the importance of the condition to the operation of the EWTP it is essential this matter is resolved as soon as possible with SDC/CRC.

2.4 Recommendation

It is recommended that the consents CRC011680.1, CRC930165.1, CRC011681.2, CRC011679.1, CRC941475.1, CRC941476, and CRC950253, which were amalgamated into CRC110148 in 2010, are surrendered to the Canterbury Regional Council. CRC110148 should be retained as the primary consent for the EWTP along with CRC011678 which is a groundwater take permit and cannot be succeeded by CRC110148.

While it is recommended that CRC110148 and CRC011678 are retained and the remaining consents surrendered, it is recommended that SDC first check internally to see if there is any reason for not surrendering the consents as recommended in 2010.

3 Designation

3.1 EWTP Designation

The EWTP is designated in the Selwyn District Plan as 'SDC 129 - Sewage Treatment and Disposal Area" as shown in Figure 1 below.

Figure 1 : Land owned by SDC for the EWTP (in orange), the area currently designated under the district plan (in blue) and the remaining area that should be designated (in light purple).

The designation only covers 6.1ha of the 60ha site and to authorise the land use aspect of the discharge over the whole site it will be necessary to extend the area of the designation (notwithstanding the existing CRC consents which authorise the discharge from a regional perspective).

The method to undertake the increase in designated area requires discussion with SDC planning officers. Alternatives include an alteration to the designation under section 181 of the RMA or a new Notice of Requirement for designation under section 168A of RMA, or by incorporation into the upcoming review of the District Plan in accordance with the First Schedule to the RMA. The alteration of the designation under section 181 is likely to provide the most straightforward option.

3.2 Recommendation

To begin this next scope of work, it is recommended that discussions are held with SDC planning officers to establish the most appropriate method for incorporating the increased designated area into the Selwyn District Plan.

4 Next Steps

The recommended next steps are;

- Discussions held between Beca and SDC wastewater staff to confirm the recommendations of this report.

- Beca to contact CRC officers to confirm the scope of CRC110148 and to discuss the formal surrender of the identified consents to CRC.

- Beca to contact SDC Planning officers regarding the most appropriate method for incorporating the increased designated area into the Selwyn District Plan.

- Beca to discuss with SDC the interpretation of Condition 7 of CRC110148 regarding nitrogen loading.

Appendices

Appendix 1: Map of land disposal area CRC110148

Appendix 2: Where each consent applies

Consent Number Parameter	CRC011680.1 Discharge Contaminant into Land to Water, etc	CRC930165.1 To discharge contaminants to land.	CRC110148 (Land)	CRC110148 (Air)	CRC110148 (Drain)	CRC011681.2 (Discharge Water into Water)	CRC011679.1 (Air)	CRC941475.1 (Air)	CRC941476 (Discharge Contaminant into Land to Water)	CRC950253 (Discharge oxidation pond effluent onto land via border dyke irrigation)	Final Parameter under CRC110148
Infiltration Basins	2ha (6)		2ha (6) (Drawing 6511236-120-C200)	2ha (6) (Drawing 6511236-120-C200)	2ha	2ha	2ha (6)				2ha
Maturation Pond	1 ha (2B, 3,4)		0.5ha (3,4)	0.5ha (3,4)	1ha	1ha	1 ha (2B, 3,4)				1ha
Wetland	0.9 ha (5,6,7,8)		0.9ha (5,6,7,8)	0.9ha (5,6,7,8)	0.9ha	0.9ha	0.9 ha (5,6,7,8) (plan 3812936/C001)				0.9ha
Aeration Pond			1000m2 (pond 1)	1000m2 (pond 1)				1000m2	1000m2		1000m2
Oxidation Pond			Approx. 1.8ha (2A, 2B)	Approx. 1.8ha (2A, 2B)				12,000m2	12,000m2 (Lots 1 and 2 on DP 29488, part of RS 5787 in Blocks XIV)		1.8ha
Land Treatment and Disposal Areas		11.5ha	41.9ha (Drawing 6511236-120-C200)	41.9ha				18ha (Plan CRC941475.1)		4ha	41.9ha
Discharge (wetland)	5 L/d/m2 of base area		5 L/d/m2 of base area (5,6,7,8)								5L L/d/m2

	(5,6,7,8)										
Discharger (Mat Pond)	5 L/d/m2 of base area (2B,3,4)		5 L/d/m2 of base area (3,4)								5L L/d/m2
Discharge (aeration pond)			10L/d/m2 of pond 1 area						10L/d/m2 of pond area		10L L/d/m2
Discharge (oxidation pond)			5 L/d/m2 of base area (2A, 2B)						5L/d/m2 of pond area		5L L/d/m2
Spray Irrigation- (monthly average hydraulic loading rate)		Not exceed 8mm/d (No single app of oxidation pond effluent shall exceed 20mm)	Not exceed 8mm/d (No single app of treated wastewater shall exceed 20mm)								8mm/d
Effluent		200kg N/ha/yr	200kg N/ha/yr							200kg N/ha/yr	200kg N/ha/yr
Discharge of Extracted Groundwater					120 L/s	120 L/s					120L/s
Dissolved O2 concentration				2g/cm3 and positive daylight hours			2g/cm3				2g/cm3 and positive daylight hours

Appendix 3: Comparison of Conditions

Consent conditions were grouped according to the consent type, and then to where and to what they applied.

Green highlights show wording differences.

CRC110148		CRC011680.1		CRC930165.1		CRC941476		CRC950253	Difference between CRC110148 and other consents
Discharge to Land									
The discharge shall only be treated wastewater from the Leeston Wastewater Treatment Plant.				1. The discharge shall only be treated sewage effluent	Effluent shall only be discharged to land via border dyke and spray irrigation systems, at or about map reference NZMS 260 M36:543-155.				Difference in wording-Treated wastewater v treated sewerage effluent -CRC110148 is sufficient
The seepage discharge from the base of the treatment units shall only be from:	1. an aeration pond (Pond 1), with a surface area not greater than 1,000 square metres, and 2. two primary oxidation ponds (Ponds 2A and 2B), with a total surface area of approximately 1.8 hectares, and 3. two maturation ponds (Ponds 3 and 4), with a total surface area of	The discharge shall only be from:	1. six rapid infiltration basins having a total area of approximately two hectares; 2. maturation ponds 2B, 3 and 4 having a total area of approximately one hectare; and 3. wetland cells 5, 6, 7 and 8 having a total area of approximately 0.9 hectare; as described in the consent			The discharge shall only be from: (i) the aeration pond, with surface area not greater than 1000 square metres, and(ii) the oxidation pond, with surface area not greater than 12,000 square metres, located on land being Lots 1 and 2 on DP 29488, part of RS 5787 in Blocks XIV of the Leeston and			Slight differences in the parameters of features but all are covered -CRC110148 is sufficient

	approximately 0.5 hectares, and 4. four wetland cells (Ponds 5 – 8), with a total surface area of approximately 0.9 hectares 5. six rapid infiltration basins having a total area of approximately 2 hectares, as shown on Drawing 6511236-120-C200 which forms part of this consent.		application and shown on plan 3812936/C001 submitted with the application.			II of the Southbridge Survey Districts, as located on Selwyn District Council DWG No.S/03 Sheet 1 of 1.			
The treated wastewater shall be applied as far as practicable at a uniform depth over the land disposal area. The treated wastewater application system shall be managed to ensure the return period between applications to any part of the of the land disposal area is maximised.				The oxidation pond effluent shall be applied as far as practicable at a uniformed depth over the land disposal area. The effluent application system shall be managed to ensure the return period between applications to any part of the land disposal area is maximised.				The oxidation pond effluent shall be applied as far as practicable at a uniform depth over the land disposal area. The effluent application system shall be managed to ensure the return period between applications to any part of the land disposal area is maximised.	Difference in wording-Treated wastewater v oxidation pond effluent -CRC110148 is sufficient

Oxidation ponds 2A and 2B, maturation ponds 3 and 4 and wetland cells 5, 6, 7 and 8, shall be lined with low-permeability material forming a layer at least 300 millimetres thick such that the rate of discharge from the base of any single pond or wetland does not exceed 5 litres per day per square metre of base area.		Maturation ponds 2B, 3 and 4 and wetland cells 5, 6, 7 and 8, as described in the application, shall be lined with low-permeability material forming a layer at least 300 millimetres thick such that the rate of discharge from the base of any single pond or wetland does not exceed 5 litres per day per square metre of base area.							Difference between what is covered but both Oxidation and Maturation ponds are considered -CRC110148 is sufficient
The treated wastewater application system shall be managed in such a way that ponding of the treated wastewater does not occur. Where spray irrigation is utilised, treated wastewater shall not be applied:	1. Onto land within 20 metres of any surface waterway; 2. Onto land within 50 metres of the site boundary with neighbouring properties and sensitive developments (i.e. housing, gardens, intakes to drinking water supplies and crops for human consumption);			The oxidation pond effluent application system shall be managed in such a way that ponding of effluent does not occur.				The oxidation pond effluent application system shall be managed in such a way that ponding of effluent does not occur.	Difference in wording-Treated wastewater v oxidation pond effluent + extra conditions are included -CRC110148 is sufficient

	3. Onto land within 30 metres of the site boundary with public roads; 4. Onto ground with no vegetative cover; 5. Onto ground where surface ponding is occurring; 6. If the local wind speed in the direction of neighbouring properties exceeds 15 kilometres per hour (as an average over 15 minutes), as measured by an anemometer suitably installed and maintained at the Control Room of the wastewater treatment plant.								
If, for any reason, any of the maturation ponds 2B, 3 and 4 and the wetland cells 5, 6, 7 and 8, as described in the application, are emptied of their		4-If, for any reason, any of the maturation ponds 2B, 3 and 4 and wetland cells 5, 6, 7 and 8, as described in the application, are emptied of their	3-The rate of water discharge via the base of each of the maturation ponds 2B, 3 and 4 and wetland cells 5, 6, 7 and 8, as described in the application, shall			4.If, for any reason, the oxidation pond is emptied of its liquid contents, the rate of discharge through the lining shall be determined prior to	3.The consent holder shall determine the rate of discharge through the lining of the aeration pond prior to it receiving any sewage. The		Difference in wording- Maturation pond v Oxidation pond Re-commissioning v refilling and usage

liquid contents, the rate of water discharge via the base of each pond or cell shall be determined before that unit is refilled with wastewater. The results of these measurements shall be provided to the Canterbury Regional Council before re-commissioning of that pond or cell for wastewater treatment purposes.		liquid contents, the rate of water discharge via the base of each pond or cell shall be determined before that unit is refilled with wastewater. The results of these measurements shall be provided to the Canterbury Regional Council before re-commissioning of that pond or cell for effluent treatment purposes.	be determined before each pond or cell is filled with wastewater. The results of these measurements shall be provided to the Canterbury Regional Council before usage of these facilities for effluent treatment commences			the oxidation pond being refilled. The results of this determination shall be forwarded to the Canterbury Regional Council, prior to the re-commissioning of the oxidation pond	results of this determination shall be forwarded to the Canterbury Regional Council, prior to the commissioning of the aeration pond for sewage treatment purposes.		Two conditions relate to determining rate of discharge before the facility first used so no longer apply -CRC110148 is sufficient
Treated wastewater shall be intermittently dosed to each infiltration basin such that the return period between applications of wastewater to any one basin is maximised. The return period between applications to any		Effluent shall be intermittently dosed to each infiltration basin such that the return period between applications of effluent to any one basin is maximised. The return period between applications to any								Difference in wording- Treated wastewater v effluent -CRC110148 is sufficient

one basin shall be at least three days.		one basin shall be at least three days.							
Treated wastewater shall be applied to the infiltration basins such that, as far as practicable, a uniform depth of wastewater is achieved across the basin area.		Effluent shall be applied to the infiltration basins such that, as far as practicable, a uniform depth of effluent is achieved across the basin area.							Difference in wording -Treated wastewater v effluent -CRC110148 is sufficient
Where treated wastewater is being applied to land via a spray irrigation system, the monthly average hydraulic loading rate shall not exceed eight millimetres per day. No single application of treated wastewater shall exceed 20 millimetres.				Where oxidation pond effluent is being applied to land via a spray irrigation system, the monthly average hydraulic loading rate of effluent shall not exceed eight millimetres per day. No single application of oxidation pond effluent shall exceed 20 millimetres.					Difference in wording -Treated wastewater v oxidation pond effluent -CRC110148 is sufficient
The treated wastewater shall not be discharged in any place or in such a manner that wastewater is likely to discharge	Treated wastewater shall not be discharged onto land in a manner that results in surface runoff of	Effluent shall not be discharged onto land in a manner that results in surface runoff of effluent to any surface water		The oxidation pond effluent shall not be discharged in any place or in such a manner that effluent is likely to discharge				The oxidation pond effluent shall not be discharged in any place or in such a manner that effluent is likely to discharge	Difference in wording-Effectively saying the same thing but different wording.

or percolate into surface water or onto neighbouring property.	wastewater to any surface water body or neighbouring property.	body or neighbouring property.		or percolate into surface water or onto neighbouring property.				or percolate into surface water or onto neighbouring property.	- CRC110148 is sufficient and wording is a more appropriate terminology
The rate at which treated wastewater is applied shall not exceed 200 kg of nitrogen per hectare per year onto grazed pasture, or an equivalent application and land management system, that matches the annual nitrogen application with the annual plant uptake.				The rate at which oxidation pond effluent is applied shall not exceed 200 kilograms of nitrogen per hectare per year onto grazed pasture, or an equivalent application and land management system that matches the annual nitrogen application with the annual plant uptake.				The rate at which oxidation pond effluent is applied shall not exceed 200 kg of nitrogen per hectare per year onto grazed pasture, or an equivalent application and land management system, that matches the annual nitrogen application with the annual plant uptake.	Difference in wording-Treated wastewater v oxidation pond effluent -CRC110148 is sufficient
The treated wastewater shall not be applied to the land disposal area when the level of groundwater is higher than 900 mm below the land surface, as measured in monitoring well	Treated wastewater shall only be discharged to the infiltration basins when the level of groundwater is within 900 millimetres of the land surface, as measured in existing monitoring	Effluent shall only be discharged to the infiltration basins when the level of groundwater is within 900 millimetres of the land surface, as measured in existing monitoring well M36/4803		The oxidation pond effluent shall not be applied to the land disposal area when the level of groundwater is higher than 900 millimetres below the land surface, as measured in monitoring well				The oxidation pond effluent shall not be applied to the land disposal area when the level of groundwater is higher than 900 mm below the land surface, as measured in monitoring well	Difference in wording-Treated wastewater v effluent/oxidation pond effluent Border-dyke or spray irrigation v border-dyke irrigation -CRC110148 is sufficient

M36/4803 installed adjacent to the land disposal area, on Beethams Road, at or about map reference NZMS 260 M36:546-156.	well M36/4803 installed adjacent to the land treatment area near Beethams Road, or when adverse ground conditions prevent discharge of wastewater to the existing border-dyke or spray irrigation areas.	installed adjacent to the land treatment area near Beethams Road, or when adverse ground conditions prevent discharge of effluent to the existing border-dyke irrigation areas.		M36/4803 installed adjacent to the land disposal area, on Beethams Road at or about map reference NZMS 260 M36:546-156.				M36/4803 installed adjacent to the land disposal area, on Beethams Road, at or about map reference NZMS 260 M36:546-156.	
At all times when treated wastewater is discharged to the infiltration basins, groundwater beneath the basins shall be taken from bores M36/6961, M36/6962, M36/6963, M36/6964, M36/6965 and M36/6966, at or about map reference NZMS 260 M36:5405-1583, M36:5408-1579, M36:5401-1579, M36:5405-1575, M36:5396-1575, and M36:5401-1571, to		At all times when effluent is discharged to the infiltration basins, groundwater beneath the basins shall be taken from bores M36/6961, M36/6962, M36/6963, M36/6964, M36/6965 and M36/6966, at or about map reference NZMS 260 M36:5405-1583, M36:5408-1579, M36:5401-1579, M36:5405-1575, M36:5396-1575, and M36:5401-1571, as described in the							Difference in wording-Treated wastewater v effluent + extra conditions are included -CRC110148 is sufficient

ensure the local groundwater level is at least 900 millimetres below the land surface as measured in the four piezometric tubes labelled as MB2, MB3, MB4 and MB5 on the attached Drawing 6511236-120-C200.		application, to ensure the local groundwater level is at least 900 millimetres below the land surface.							
The consent holder shall provide a water supply which meets the Ministry of Health Drinking Water Standards to those users of drinking water supplied from well M36/0672 (Ellesmere Gun Club) and M36/4566 (Aymes) and to those users of drinking water taken at a depth of less than 20 meters below the ground surface from any wells within 200 metres		The consent holder shall provide a water supply which meets the Ministry of Health New Zealand Drinking Water Standards to those users of drinking water supplied from well M36/0672 (Ellesmere Gun Club) and M36/4566 (Amyes) and to those users of drinking water taken at a depth of less than 20 metres below the ground surface from any wells		The consent holder shall provide a water supply which meets the numeric standards specified in the Ministry of Health Drinking Water Standards to those users of water supplies presently supplied from well M36/672 (Ellesmere Gun Club) and M36/4566 (Amyes).					Extra conditions included + specification of users of drinking water v users of water -CRC110148 is sufficient and more appropriate and requires stronger consideration of others drinking water

down-gradient of any part of the treatment plant where the discharge of effluent to land occurs. For the purposes of this condition down-gradient is defined as any direction between east (90 degrees) and south (180 degrees) from the point of discharge.		installed within 200 metres down-gradient of any part of the treatment plant where the discharge of effluent to land occurs. For the purposes of this condition down-gradient is defined as any direction between east (90 degrees) and south (180 degrees) from the point of discharge.							
CRC110148		**CRC011681.2**							
Discharge to Drain									
The discharge into Tramway Reserve Drain shall only occur when the level of groundwater is within 900 millimetres of the land surface, as measured in existing monitoring well M36/4803 installed adjacent to the land treatment area near Beethams	The date, time and duration of all discharges to Tramway Reserve Drain shall be recorded and provided to the Canterbury Regional Council on request	The discharge into Tramway Reserve Drain shall only occur when the level of groundwater is within 900 millimetres of the land surface, as measured in existing monitoring well M36/4803 installed adjacent to the land treatment area near Beethams							Difference in wording-Treated wastewater v effluent and border-dyke or spray irrigation v border-dyke irrigation -CRC110148 is sufficient

Road, or when adverse ground conditions prevent the discharge of treated wastewater to the existing border-dyke or spray irrigation areas.		Road, or when adverse ground conditions prevent the discharge of effluent to the existing border-dyke irrigation areas. The date, time and duration of all discharges to the drain shall be recorded and provided to the Canterbury Regional Council on request.							
The discharge shall be into a culvert under Beethams Road designed to ensure that contaminants are dispersed rapidly, as far as practicable, at a uniform depth throughout the available flow in the drain.		The discharge shall be into a culvert under Beethams Road designed to ensure that contaminants are dispersed rapidly, as far as practicable, at a uniform depth throughout the available flow in the drain.							Same condition -CRC110148 is sufficient
The discharge shall only be groundwater containing dilute wastewater that	1. Maturation ponds having a total area of approximately one hectare;	The discharge shall only be groundwater containing dilute effluent that has	1. Maturation ponds having a total area of approximately one hectare;						Difference in wording- Wastewater v effluent

has been treated by passage through:	2. Wetland cells having a total area of approximately 0.9 hectare; and 3. Rapid infiltration basins having a total area of approximately two hectares;	been treated by passage through:	2. Wetland cells having a total area of approximately 0.9 hectare; and 3. Rapid infiltration basins having a total area of approximately two hectares; as described in the consent application.						-CRC110148 is sufficient
At all times, whilst this resource consent is being exercised, the control gate on Leeston Stream at the Tramway Reserve Drain – Leeston Stream diversion shall be fully closed to ensure maximum availability of water in the drain for dilution of extracted groundwater containing treated wastewater		At all times, whilst this resource consent is being exercised, the control gate on Leeston Stream at the Tramway Reserve Drain - Leeston Stream diversion shall be fully closed to ensure maximum availability of water in the drain for the dilution of effluent.							Difference in wording-Extracted groundwater containing treated wastewater v effluent -CRC110148 is sufficient and more appropriate
The rate of discharge shall not		The rate of discharge shall not							Same condition

exceed 120 litres per second.		exceed 120 litres per second.							-CRC110148 is sufficient
Beyond a distance of 10 metres downstream, of the extracted groundwater outfall structure, the discharge shall not give rise to all or any of the following effects on the drain:	1. The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; 2. Any conspicuous change in the colour or visual clarity; 3. Any emission of objectionable odour; 4. The rendering of fresh water unsuitable for consumption by farm animals; 5. Any significant adverse effects on aquatic life, habitats or ecology.	Beyond a distance of 10 metres downstream of the effluent outfall structure, the discharge shall not give rise to all or any of the following effects in the drain:	1. The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; 2. Any conspicuous change in the colour or visual clarity; 3. Any emission of objectionable odour; 4. The rendering of fresh water unsuitable for consumption by farm animals; 5. Any significant adverse effects on aquatic life, habitats or ecology.						Difference in wording-Extracted groundwater v effluent -CRC110148 is sufficient
The concentration of the following parameters measured in extracted groundwater before discharge		The concentration of the following parameters measured in extracted groundwater before discharge							Same condition-the parameters are in the consents and are the same -CRC110148 is sufficient

to the drain, shall not exceed the following values in at least 90 percent of all samples collected within any period of 36 consecutive months:		to the drain, shall not exceed the following values in at least 90 percent of all samples collected within any period of 36 consecutive months:							
CRC110148		**CRC011679.1**		**CRC941475.1**					
Discharge to Air									
There shall be no removal of accumulated organic matter, sediment or sludge material from the base of the maturation ponds.		There shall be no removal of accumulated organic matter, sediment or sludge material from the base of the maturation ponds.							Same condition -CRC110148 is sufficient
Section B of this consent authorises the discharge of odour and aerosols to the air, subject to the following conditions, from:	1. one aeration pond (Pond 1) with a surface area of approximately 1,000 square metres, and 2. two primary oxidation ponds (Ponds 2A and 2B), with a total surface area of approximately 1.8 hectares, and 3. two maturation ponds (Ponds 3 and 4), with a total	The discharge shall only be from:	1. six rapid infiltration basins having a total area of approximately two hectares; 2. maturation ponds 2B, 3 and 4 having a total area of approximately one hectare; and 3. wetland cells 5, 6, 7 and 8 having a total area of approximately 0.9 hectare; as described in the	This consent authorises the discharge of contaminants to the air, subject to the following conditions, from:	1. an aeration pond, with surface area not greater than 1,000 square metres; and 2. an oxidation pond, with surface area not greater than 12,000 square metres; and 3. the land treatment and disposal areas not greater than 18 hectares, as				Slight differences in the parameters of features but all are covered + Difference in wording- Odour and aerosols v contaminants -CRC110148 is sufficient

	surface area of approximately 0.5 hectares, and 4. four wetland cells (Ponds 5 – 8), with a total surface area of approximately 0.9 hectares, 5. the land treatment and disposal areas of approximately 41.9 hectares, and 6. six rapid infiltration basins having a total area of approximately two hectares, as shown on Drawing 6511236-120-C200 which forms part of this consent.		consent application and shown on plan 3812936/C001 submitted with the application.		located on attached Plan CRC941475.1, which forms part of this consent.				
The discharge shall not cause any spray drift and odour which is offensive or objectionable beyond the boundary of the property on which the consent is exercised.		The discharge shall not cause an odour which is offensive or objectionable beyond the boundary of the property on which this consent is exercised.		The sewage treatment and disposal facilities shall be operated to ensure that there is no objectionable odour discernable by an enforcement officer of the Canterbury Regional Council					Differences in what the discharge shall not cause and how it is considered objectionable -CRC110148 is sufficient and is more appropriate and stronger

				at the boundary of any adjoining private property that is attributable by that officer to the sewage treatment and its disposal.					
A record of any complaints related to odour from the wastewater treatment and disposal facilities shall be maintained, and shall include:	1.location where the odour was detected by the complainant; 2.date and time when the odour was detected; 3.a description of the wind speed and direction when the odour was detected by the complainant; 4.the most likely cause of the odour detected; and 5.any corrective action taken by the consent holder to avoid, remedy, or mitigate the odour detected by the complainant. This record shall be provided to the Canterbury Regional Council before the last working day of November each year, and otherwise on request	A record of any complaints related to odour from the effluent treatment and disposal facilities shall be maintained, and shall include:	1. Location where the odour was detected by the complainant; 2. Date and time when the odour was detected; 3. A description of the wind speed and wind direction when the odour was detected by the complainant; 4. The most likely cause of the odour detected; and 5. Any corrective action undertaken by the consent holder to avoid, remedy, or mitigate the odour detected by the complainant. This record shall be provided to the Canterbury Regional Council	The consent holder shall maintain records of all odour complaints, in which the complainant considers the odours result from the sewage treatment and disposal operations at this site. These records shall include:	1. Location of complainant when odour detected. 2. Date and time of odour detection. 3. Wind speed and direction when odour detected. 4. Any possible cause of odour complained of; and(e) Any corrective action taken. These records shall be made available to the Canterbury Regional Council, upon request.				Difference in wording- Wastewater v effluent/sewage and disposal facilities v disposal operations -CRC110148 is sufficient

			before the last working day of November each year, and otherwise on request.						
The concentration of dissolved oxygen measured in wastewater in the maturation ponds and wetlands shall be positive during daylight hours and at least two grams per cubic metre.		The concentration of dissolved oxygen measured in effluent in the maturation ponds and wetlands shall be at least two grams per cubic metre.							Extra condition included -CRC110148 is sufficient
CRC110148		**CRC011680.1**		**CRC930165.1**	**CRC941476**	**CRC950253**	**CRC011681.2**	**CRC011679.1**	
Monitoring and Recording									
The consent holder may, on any of the last five working days of November each year, apply for a change of the monitoring requirements of Conditions (36), (37), (38) (41), (42) and (43).		The consent holder may, on any of the last five working days of November each year, apply for a change to the monitoring requirements of Conditions (12), (13) and (16).					The consent holder may, on any of the last five working days of November each year, apply for a change to the monitoring requirements of Conditions (7), (8) and (9).		The conditions in CRC110148 match those in the other consents -CRC110148 is sufficient
36-At least once a month, the concentration of 5-day Biochemical		12-At least once every month, the concentration of 5-day Biochemical							Same condition -CRC110148 is sufficient

Oxygen Demand (BOD5), Suspended Solids, Total Nitrogen, Ammonia Nitrogen, Nitrate Nitrogen, Total Phosphorus and Faecal Coliform Bacteria shall be measured in the final wetland cell. The results of these analyses shall be provided to the Canterbury Regional Council on request.		Oxygen Demand (BOD5), Suspended Solids, Total Nitrogen, Ammonia Nitrogen, Nitrate Nitrogen, Total Phosphorus and Faecal Coliform Bacteria shall be measured in the final wetland cell. The results of these analyses shall be provided to the Canterbury Regional Council on request.							
37-On at least three occasions each year, twice during the period June to October and once during the period March to May, conductivity, pH, and the concentration of faecal coliform bacteria, nitrate nitrogen and ammonia nitrogen shall be monitored	1. one bore within 100 metres up-gradient (in terms of direction of groundwater flow) of the infiltration basins; 2. two bores immediately down-gradient of the maturation ponds and wetlands, but up-gradient of the border-dyke/spray irrigation areas; and	13-On at least three occasions every year, twice during the period June to October and once during the period March to May, conductivity, pH, and the concentration of faecal coliform bacteria, nitrate nitrogen and ammonia nitrogen shall be monitored	1. one bore within 100 metres up-gradient (in terms of the direction of groundwater flow) of the infiltration basins; 2. two bores immediately down-gradient of the maturation ponds and wetlands, but up-gradient of the border-dyke irrigation areas; and						Border dyke/spray irrigation v border-dyke -CRC110148 is sufficient

in the groundwater taken from the following bores:	3. two bores located at the down-gradient border of the border-dyke/spray irrigation areas, adjacent to Beethams Road The five monitoring bores shall sample shallow groundwater from the first aquifer, taken at a depth of less than 16 metres below the ground surface. The results of these analyses shall be provided to the Canterbury Regional Council on request	in groundwater taken from the following bores:	3. two bores located at the down-gradient border of the border-dyke irrigation areas, adjacent to Beethams Road. The five monitoring bores shall sample shallow groundwater from the first aquifer, taken at a depth of less than 16 metres below the ground surface. The results of these analyses shall be provided to the Canterbury Regional Council on request.						
38-The consent holder shall submit a written report to the Canterbury Regional Council before the last working day of November each year. This report shall summarise the results of all		16-The consent holder shall submit a written report to the Canterbury Regional Council before the last working day of November each year. This report shall summarise the results of all monitoring							The conditions in CRC110148 match those in the other consents Condition 3 is no longer necessary to be included -CRC110148 is sufficient

monitoring undertaken during the previous 12 months in accordance with Conditions (16), (35), (36) and (37) of this consent. Any non-compliances with consent conditions shall be clearly identified in the report, and a proposed action plan to ensure future compliance shall be specified.		undertaken during the previous 12 months in accordance with Conditions (3), (4), (10), (12) and (13) of this consent. Any non-compliance with consent conditions shall be clearly identified in the report, and a proposed action plan to ensure future compliance shall be specified.							
35-A record shall be kept of the volume (in cubic metres) of treated wastewater applied to the infiltration basins each day; the date, time and duration (in hours) of wastewater application; and the location and total area of land (in square metres) where the wastewater is		10-A record shall be kept of the volume (in cubic metres) of effluent applied to the infiltration basins each day; the date, time and duration (in hours) of effluent application; and the location and total area of land (in square metres) where effluent is applied to the basins. The							Difference in wording- Treated wastewater v effluent -CRC110148 is sufficient

applied to the basins. The volume of treated wastewater discharged to the basins shall be measured to within an accuracy of 10 percent. This record shall be held and provided to the Canterbury Regional Council on request.		volume of effluent discharged to the basins shall be measured to within an accuracy of 10 percent. This record shall be held and provided to the Canterbury Regional Council on request.							
44-Before the last working day of November each year, the consent holder shall submit a written report to the Canterbury Regional Council, Department of Conservation, North Canterbury Fish and Game Council, Te Taumutu Runanga, Te Runanga o Ngai Tahu, and either the Selwyn District Council Sewage Project team of							11-Before the last working day of November each year, the consent holder shall submit a written report to the Canterbury Regional Council, Department of Conservation, North Canterbury Fish and Game Council, Te Taumutu Runanga, Te Runanga o Ngai Tahu and either the Selwyn District Council Sewage Project Team or the Leeston Town Committee. This report shall		The conditions in CRC110148 match those in the other consents -CRC110148 is sufficient

the Leeston Town committee. This report shall summarise the results of all monitoring undertaken during the previous 12 months in accordance with Conditions (41), (42) and (43) of this consent. Any non-compliance with consent conditions shall be clearly identified in the report, and a proposed action plan to ensure future compliance shall be specified							summarise the results of all monitoring undertaken during the previous 12 months in accordance with Conditions (7), (8) and (9) of this consent. Any non-compliance with consent conditions shall be clearly identified in the report, and a proposed action plan to ensure future compliance shall be specified.		
41-At least once a month when discharge to Tramway Reserve Drain occurs, the concentration of the parameters specified in Condition (28) shall be measured in the extracted groundwater before discharge to the drain. The							7-At least once every month when discharge to the drain occurs, the concentration of the parameters specified in Condition (6) shall be measured in the extracted groundwater before discharge to the drain. The results of these analyses shall		The conditions in CRC110148 match those in the other consents -CRC110148 is sufficient

results of these analyses shall be provided to the Canterbury Regional Council on request							be provided to the Canterbury Regional Council on request.		
42-1.The Canterbury Regional Council, Attention: RMA Compliance Monitoring and Enforcement shall be notified of the intention to discharge to Tramway Reserve Drain as it is practicable beforehand. 2. When discharge to the drain occurs, the concentration of 5-day Biochemical Oxygen Demand (BOD5) Suspended Solids and the parameters listed in Condition (28) shall be measured in the water in Tramway Reserve Drain at a location 10 metres							8- The Canterbury Regional Council, Attention: RMA Compliance Monitoring and Enforcement shall be notified of the intention to discharge to Tramway Reserve Drain as soon as it is practicable beforehand. 2. When discharge to the drain occurs, the concentration of biochemical oxygen demand, suspended solids and the parameters listed in Condition (6) shall be measured in water in Tramway Reserve Drain at a location ten metres upstream and ten metres downstream of the effluent outfall structure. 3. Sampling in		Difference in wording- Extracted groundwater v effluent 5-day Biochemical Oxygen Demand v biochemical oxygen demand -CRC110148 is sufficient

upstream and 10 metres downstream of the extracted groundwater outfall structure. 3. Sampling in accordance with clause (b) of this Condition shall occur within 72 hours of commencement of the discharge of extracted groundwater, each time a discharge occurs. 4. The results of these analyses shall be provided to the Canterbury Regional Council on request.							accordance with clause (b) of this condition shall occur within 72 hours of commencement of the discharge of extracted groundwater, each time a discharge occurs. 4. The results of these analyses shall be provided to the Canterbury Regional Council on request.		
43-An observational ecological assessment shall be undertaken by suitably qualified persons during the months of July to October in the years 2008 and 2018. The survey shall be compared							9-An ecological survey of Tramway Reserve Drain, including a survey of benthic macro-invertebrate fauna, shall be undertaken by suitably qualified persons at two locations, one 10 metres upstream of the effluent outfall		Similar conditions but 9 applied when the EWTP first started operation -CRC110148 is sufficient

to the ecological survey initially carried out as part of the consent conditions for CRC011681.2 and shall be used determine if any substantive change has occurred to flora and fauna in the drain and adjacent to the discharge. The results shall be provided to the Canterbury Regional Council within one month of completion of that survey							and one 10 metres downstream of the effluent outfall. The survey shall be undertaken once every year for two years after the commencement of discharge, during the months of July to October. An observational ecological assessment shall be undertaken by suitable qualified persons during the months of July to October in the seventh and seventeenth years after the commencement of discharge in order to determine if any substantive change has occurred to flora and fauna in the drain and adjacent to the discharge. The results shall be provided to the Canterbury Regional Council within one month of		

							completion of that survey		
The collection and preservation of samples required under this consent shall be in accordance with "Standard Methods for the Examination of Water and Wastewater" (published by the American Public Health Association or an equivalent nationally recognised methodology for the collection and preservation of water samples. The laboratory carrying out the analyses required under this consent shall be accredited to ISO/IEC Guide 25: (1980) or an equivalent defined by an accreditation body recognised as		The collection and preservation of samples required under this consent shall be in accordance with "Standard Methods for the Examination of Water and Wastewater" (published by the American Public Health Association) or an equivalent nationally recognised methodology for the collection and preservation of water samples. The laboratory carrying out analyses required under this consent shall be accredited to ISO/IEC Guide 25: (1990) or an equivalent defined by an accreditation body recognised as					The collection and preservation of samples required under this consent shall be in accordance with "Standard Methods for the Examination of Water and Wastewater" (published by the American Public Health Association) or an equivalent nationally recognised methodology for the collection and preservation of water samples. The laboratory carrying out analyses required under this consent shall be accredited to ISO/IEC Guide 25: (1990) or an equivalent defined by an accreditation body recognised as operating to ISO/IEC Guide 58.		Difference in wording- 1980 v 1990 years of standards Have searched both years and only have found results for 1990. Assuming that 1980 is a typo. -CRC110148 made need updating to 1990- will discuss with CRC

operating to ISO/IEC Guide 58.		operating to ISO/IEC Guide 58.							
The consent holder shall record the date, duration, and section of the land disposal area used, of each application of treated wastewater. These records shall be forwarded to the Canterbury Regional Council by the last working day of each month or upon request.				The consent holder shall record; the date, duration, and the section of the land disposal area used, of each application of oxidation pond effluent. These records shall be forwarded to the Canterbury Regional Council by the last working day of each month or upon request		The consent holder shall record the date, duration, and the section of the land disposal area used, of each application of oxidation pond effluent. These records shall be forwarded to the Canterbury Regional Council by the last working date of each month or upon request.			Difference in wording- Treated wastewater v oxidation pond effluent -CRC110148 is sufficient
The consent holder shall produce a written report on the means undertaken and intended to ensure compliance with Condition (7). The report shall cover those actions taken in the previous year and those intended for the year ahead. A copy of this report				The consent holder shall produce a written report on the means undertaken and intended to ensure compliance with Condition 5. This report shall cover those actions taken in the previous year and those intended for the year ahead. A copy of this report		The consent holder shall produce a written report on the means undertaken and intended to ensure compliance with Condition 5. This report shall cover those actions taken in the previous year and those intended for the year ahead. A copy of this report			Condition 5 of CRC93016 is different to 7 and 5 of the other consents and is to do with the management of effluent so ponding does not occur. It is not considered necessary to produce a report on the compliance of this management of effluent if it is not required under CRC110148. Therefore,

shall be made available to the Canterbury Regional Council by the last working day in November.				shall be made available to the Canterbury Regional Council by the last working day in November.		shall be made available to the Canterbury Regional Council by the last working day in November.			-CRC110148 is sufficient
The volume and rate at which raw wastewater is pumped to the wastewater treatment plant shall be measured, to within an accuracy of 15%, and recorded daily in a log kept for that purpose. A copy of the log shall be forwarded to the Canterbury Regional Council by the last working day of each month or upon request.				The volume and rate at which effluent is pumped to the sewage treatment facilities shall be measured, to within an accuracy of 15 percent, and recorded daily in a log kept for that purpose. A copy of the log shall be forwarded to the Canterbury Regional Council by the last working day of each month or upon request.		The volume and rate at which effluent is pumped to the sewage treatment facilities shall be measured, to within an accuracy of 15%, and recorded daily in a log kept for that purpose. A copy of the log shall be forwarded to the Canterbury Regional Council by the last working day of each month or upon request.			Difference in wording Raw wastewater v effluent Wastewater treatment plant v sewerage treatment facilities -CRC110148 is sufficient
The concentration of dissolved oxygen in wastewater shall be measured between 11:00 and 14:00 hours at least once								The concentration of dissolved oxygen in effluent shall be measured between 11:00 and 14:00 hours	Same condition- except for the drawing/plan forming part of each consent -CRC110148 is sufficient

every month at the outlet of cells 2A, 2B, 4 and 8, and shown on Drawing 6511236-120-C200 which forms part of this consent. Results of this monitoring shall be provided to the Canterbury Regional Council before the last working day of November each year, and otherwise on request.								at least once every month at the outlet of cells 2A, 2B, 4 and 8, as described in the consent application and shown on Plan 3812936/C001 submitted with the application. Results of this monitoring shall be provided to the Canterbury Regional Council before the last working day of November each year, and otherwise on request.	
The Canterbury Regional Council may annually, on any of the last five working days of November each year, serve notice of its intention to review the conditions of this consent for the purpose of:	3. complying with the requirements of a regional plan; or 4. amending the monitoring requirements of Conditions (36), (37), (38) (41), (42) and (43).	The Canterbury Regional Council may, on any of the last five working days of November each year, serve notice of its intention to review the conditions of this consent for the purposes of:	amending the monitoring requirements of Conditions (12), (13) and (16).	The Canterbury Regional Council may annually, on the last working day of July each year, serve notice of its intention to review the conditions of this consent for the purposes of: complying with the requirements of a regional plan.	The Canterbury Regional Council may annually, on the last working day of August each year, serve notice of its intention to review the conditions of this consent for the purposes of: complying	The Canterbury Regional Council may annually, on the last working day of July each year, serve notice of its intention to review the conditions of this consent for the purposes of: complying with the requirements of a regional plan.	The Canterbury Regional Council may, on any of the last five working days of November each year, serve notice of its intention to review the conditions of this consent for the purposes of: Amending the monitoring requirements of	The Canterbury Regional Council may, on any of the last five working days of November each year, serve notice of its intention to review the conditions of this consent for the purposes of:	Difference in wording- Dates that CRC may serve notice of its intention to review the conditions -CRC110148 is sufficient

					with the requirements of a regional plan.		Conditions (7), (8) and (9).		
CRC941475.1 The Canterbury Regional Council may annually, on the last working day of August each year, serve notice of its intention to review the conditions of this consent for the purposes of: complying with the requirements of a regional plan.									
CRC941475.1 Charges, set in accordance with section 36(2) of the Resource Management Act 1991, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and for the carrying out of its				Charges, set in accordance with section 36(2) of the Resource Management Act 1991, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and for the carrying out of its functions under	Charges, set in accordance with section 36(2) of the Resource Management Act 1991, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and	Charges, set in accordance with section 36(2) of the Resource Management Act 1991, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and for the carrying out of its functions under			CRC110148 does not include a condition relating to the Charges set in accordance with section 36(2) of the RMA. This is not considered necessary. -CRC110148 is sufficient

functions under section 35 of the Act.				section 35 of the Act.	for the carrying out of its functions under section 35 of the Act.	section 35 of the Act			

REPORT

TO: Chief Executive

FOR: Council Meeting - 10 March 2021

FROM: Murray Washington, Group Manager Infrastructure

DATE: 1 March 2021

SUBJECT: **SELECTING THE APPROPRIATE LEVEL OF ASSET MANAGEMENT: POLICY REVIEW AND UPDATE**

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1. RECOMMENDATION

"That the Council approves:

- *The recommendation to leave the Appropriate Levels of Asset Management previously adopted as:*

Transportation	*Intermediate*
Five Waters	*Intermediate*
Community Facilities	*Core*
Solid Waste	*Core*

- *The Asset Management Policy (2021) for inclusion in the Policy Manual".*

2. PURPOSE

This report provides an update on the Asset Management Policy which was first adopted in 2008. Adoption is sought to incorporate minor changes. The information and key issues assessment have been updated to reflect the 2021 context.

3. SIGNIFICANCE ASSESSMENT/COMPLIANCE STATEMENT

This has been assessed against the Significance Policy and the matter is not regarded as significant or likely to have financial implications on the Council's resources that would be substantial as it doesn't change the status quo.

4. HISTORY/BACKGROUND

In 2008 Selwyn District Council determined and adopted the following levels of asset management practice as being appropriate for the infrastructure activities. The policy adopted recommended review of the policy every three years.

In 2011 the appropriate practice AM level for Community Facilities was amended to ‘Core’ (resolution of Council 12 April 2011).

In 2013 the policy was reviewed, and the terminology updated from ‘Core Plus’ to ‘Intermediate,’ reflecting the 2011 International Infrastructure Management Manual.

A review resulting in minor modifications was undertaken in 2017.

Activity & Final Appropriate AM Level				
Policy Version	**Land Transport**	**Utilities (Five Waters)**	**Community Facilities**	**Solid Waste**
2008	Core Plus	Core Plus	Core Plus	Core
2011			Amended to Core	
2013	‘Core Plus terminology change to ‘Intermediate’	‘Core Plus terminology change to ‘Intermediate’	Core	Core
2017	Remains at ‘Intermediate’	Remains at ‘Intermediate’	Remains at ’Core’	Remains at ’Core’

While there is general agreement that the levels continue to be suitable for asset management practice, a review was fitting to ensure Asset Management work to support the 2021 - 2031 LTP reflects accepted practice.

This report also comments on the concept of Asset Management Maturity; which is the extent the maturity of the organisation’s asset management practices are able to meet the current and future needs of the organisation, and is a lead Indicator of future performance.

The document structure has also been revised to reflect the new Policy format.

5. PROPOSAL

A structured review of the methodology for selecting appropriate practice was undertaken to identify any changes that would be required to the report, activity statements and earlier resolutions.

The results are shown below:

Activity, Appropriate AM Level & AM Maturity Assessment				
	Transportation	**Five Waters**	**Community Facilities**	**Solid Waste**
Final AM Level	**Intermediate**	**Intermediate**	**Core**	**Core**
	Analysis of factors suggests that asset management practice should be more sophisticated and transition nearer to 'Advanced'.	Analysis of factors suggests that asset management practice should be more sophisticated and transition nearer to 'Advanced'.	Analysis of factors suggests that asset management practice at a 'Core' level is sufficient. In some aspects of Community facility Asset Management, Council is operating at higher than Core. As Council regains management of Community Assets, then this may be enhanced.	Analysis of factors suggests that asset management practice should be 'Core' given there are few hard assets and the contracted services offer scope to manage risks adequately.

Activity, Appropriate AM Level & AM Maturity Assessment				
	Transportation	**Five Waters**	**Community Facilities**	**Solid Waste**
AM Maturity Assessment	**Advanced**	**Intermediate**	**Core**	**Core**
	The maturity targeted should be 'Advanced' Practice including Asset Register, Asset Condition, Demand Forecasting, Risk Management and Service Delivery drivers. Emphasis in the 'Understanding the Requirements' area.	The maturity targeted should be 'Intermediate' Practice leaning towards 'Advanced'. This includes the Asset Register, Asset Condition, Demand Forecasting, Risk Management, Capital Works Planning and Service Delivery drivers. Emphasis in the 'Understanding the Requirements' area.	The maturity targeted should be 'Core' Practice with emphasis in the 'Understanding the Requirements' area.	The maturity targeted should be 'Core' Practice with Service Delivery driver.

For the Transportation activity the level of asset management determined is at the high end of 'Intermediate', while the asset management maturity level is at the low end of 'Advanced'.

This is a reflection of Waka Kotahi/NZTA and Road Efficiency Group (REG) initiatives and leadership. For Five Waters, Community Facilities and Solid Waste the Appropriate level of Asset Management and the AM Maturity level are aligned.

These results will be reviewed with staff responsible to determine any changes to processes that would be beneficial.

Updating AMPs has commenced as part of the development of the 2021-31 Long Term Plan, and 2021-2051 Infrastructure Strategy. These AMPs are structured in line with the levels of AM defined.

In adopting an appropriate level of asset management, a policy setting for each activity is established. The policy statements for each activity area which are appended to this report discuss this in further detail.

6. OPTIONS

In terms of the asset management level there are two possible options. These are:

1. Do nothing – retain the current ‘core’ and ‘intermediate’ levels
2. Revisit the levels assessed in detail and assign an alternative asset management level such as ‘advanced’.
3. Adopt the levels and methodology presented

An assessment of implications for each option is shown in the table below:

Option	Implications
1. Do nothing – retain the current ‘core’ and ‘intermediate’ levels.	• The target level of AM practice will remain the same, but will not be based on a current methodology • The policy will be five years old when the new Long Term Plan is adopted.
2. Revisit the levels assessed in detail and assign an alternative asset management level such as ‘advanced’.	• Would require a review of the target level of AM practice based on the independent assessment • Would require more staff resources ($) to implement
3. Adopt the levels and methodology presented	• Current practice being followed • Provides a sound basis for decision making • Greater likelihood of good asset management outcomes.

Option 3 is the preferred option as this will attribute an appropriate level of asset management sophistication to this activity that reflects the current management model and does not necessitate any further amendment to the policy or drive changes to the current suite of AMPs.

7. VIEWS OF THOSE AFFECTED/CONSULTATION

a) Views of those affected, Consultation and Maori implications

The Appropriate Level of Asset Management Policy is an internal Guidance Document. It will be considered by AMP writers, and reviewers/auditors of those plans. As the current policy was determined through an independent assessment process and the need for change undertaken by the same independent consultancy, no further consultation is regarded as necessary.

Three Waters reform is acknowledged. Council has determined it remains responsible for long term planning and delivery of Water Services irrespective of Governance, Management or Service Delivery changes pending.

b) Climate Changes considerations

Climate change considerations will form part of all Activity Management Plan preparation.

8. RELEVANT POLICY/PLANS

The Level of Appropriate Asset Management Policy affects the development of Asset Management Plans and the Long Term Plan.

To ensure regular review, attached is a draft Asset Management Policy for inclusion in the Policy Manual.

9. COMMUNITY OUTCOMES

Asset Management Plans and Asset Management Practice are prepared in alignment with the community outcomes applicable to those activities. Ensuring an appropriate level of Asset Management is targeted, will assist in the achievement of community outcomes.

10. NEGATIVE IMPACTS

There are no negative impacts identified.

11. LEGAL IMPLICATIONS

This report does not have any legal implications.

Changes to legislation that have occurred has been considered in this review. It is acknowledged that proposed changes to the Resource Management Act 1991, including integration with the Local Government Act 2002, the Land Transport Management Act 2003 and the Climate Change Response Act 2002 will impact Asset Management and this Policy in future.

Legislation enacting the Waters Reform is expected to pass during the 2021-2024 period which will also impact management and planning frameworks.

12. FUNDING IMPLICATIONS

There are no funding implications beyond the budgets approved in the Long Term Plan. It is noted that Infrastructure Strategy expenditure is based on what is known at the time of preparation.

Council and Co-funders decisions will affect this throughout the life of the Strategy, annually and through long term plans.

13. HAS THE INPUT/IMPACT FROM/ON OTHER DEPARTMENTS BEEN CONSIDERED?

This proposal has been discussed with Corporate and Finance Staff.

Murray Washington
GROUP MANAGER INFRASTRUCTURE

Appendix A – Asset Management Policy

X### - Asset Management Policy

Category	Infrastructure	Type	Policy
Policy Owner	Group Manager Infrastructure	Approved by	Council
Last Approved Revision	March 2021	Review Date	March 2023

ORGANISATIONAL SCOPE

This policy relates to all of Council infrastructure services and associated physical assets.

THE POLICY

1. General Policy Statements

The Selwyn District Council Asset Management Policy Statement relating to all its infrastructure activities is outlined below. It is intended that this Policy Statement be added to the introduction of the Asset Management Plans, to set the direction of the overall Asset Management process.

1.1 Objective of the Asset Management Policy

The objective of the Selwyn District Council's Asset Management Policy is to ensure that Council's service delivery is optimised to deliver the purpose of local government (as defined in the Local Government Act 2002), agreed community outcomes and levels of service, manage related risks, and optimise expenditure over the entire life cycle of the service delivery, using appropriate assets and non-asset solutions as required.

The Asset Management Policy requires that the management of assets be in a systematic process to guide planning, acquisition, operation and maintenance, renewal and disposal of the required assets.

Delivery of service is required to be sustainable in the long term and deliver on the purpose of local government and Council's economic, environmental, social, and cultural objectives.

1.2 Asset Management Policy Principles

Our approach to Asset Management supports transparency and accountability in decision making. Under our AM objectives, we will:

- Place users of the services we provide at the heart of everything we do.
- Build positive, collaborative relationships with our stakeholders.
- Incorporate Māori perspectives in key strategic decision making.
- Engage effectively with our communities and other utility service providers.
- Take account of the rural identity, culture and heritage of the Selwyn District in decision making.
- Take account of changes in our operating environment including changes in demand, climate change and changes in required standards.
- Integrate sustainability into all aspects of Asset Management. Sustainable management will be focused on providing for present needs whilst sustaining resources for future generations.
- Provide assets that are safe, and support the health and wellbeing of the community.
- Identify and manage risks in accordance with Council's agreed risk management frameworks and risk tolerance levels.
- Seek to balance and make appropriate trade-offs between risk, service and lifecycle costs, in particular when funding levels are constrained.
- Work to minimise adverse impacts of our activities on the environment.
- Consider whole-of-life costs before initiating any major works, significant renewals of assets and

the introduction of new activities.

- Use appropriate decision making tools and criteria on a whole of network or individual project basis including as appropriate the use of lifecycle benefit cost analysis, risks to assets, business case development, optimised decision making and multi-criteria analysis.
- Comply with statutory obligations and responsibilities and with relevant industry standards.
- Identify and collect the data and information required to support key Asset Management processes, fact-based decision making and accurate reporting.
- Work to continually improve how we manage the services we provide to Selwyn District.
- Develop a high level of staff capability in Asset Management.

1.3 Coverage and Appropriate Level of Asset Management Practice

The Local Government Act sets out as a minimum the groupings that must be separately reported, those affecting Selwyn DC are:

- Transportation
- Water Supply
- Wastewater
- Stormwater

These along with the groups listed below are all to be covered by Asset Management Plans and this Policy

- Solid Waste
- Community Facilities – Parks & Property

The target levels of asset management sophistication targeted are shown in table 1.

Table 1: Appropriate Level of Asset Management Practice

Activity	Appropriate Level of Asset Management Practice
Transportation Activity	Intermediate
5 Waters Activity	Intermediate
Solid Waste Activity	Core
Community Facilities Activity	Core

1.4 Policy Linkages to Other Plans

This Asset Management Policy links to:

- Council's LTP
- the individual asset management plans for Council's infrastructural assets
- the Canterbury Regional Transport Strategy and Public Transport Plans
- Council's Transportation Strategies (Walking, Cycling, Parking, District Transport, and Maintenance Intervention Strategies)
- the Water and Sanitary Services assessment
- the Waste Minimisation and Management Plan
- the Council's Reserve Management Plans
- the Financial Strategy and funding Policies
- the Infrastructure Strategy
- the District Plan

Waka Kotahi/New Zealand Transportation Agency asset management requirements form this Policy's minimum asset management practice requirements for Transportation assets.

1.5 Implementation and Review of Policy

This Asset Management Policy will be implemented in conjunction with the 2021 Asset Management Plans and 2021 - 2031 LTP.

The next full review of this Asset Management Policy shall be completed in March 2023 prior to completing activity plan updates to support the 2024 LTP.

It is anticipated this review will reflect Water Reform and changes to the Resource Management Act 1991. Greater clarity around engagement with Māori, Iwi and Rūnanga along with Climate Change initiatives should also be included.

1.6 Asset Management Implementation Strategy

Council staff have completed a detailed analysis of appropriate activity management maturity and practice within the guidance offered by this Policy. This analysis has examined asset description, levels of service, managing growth, risk management, asset lifecycle decision making, financial forecasts, planning assumptions and confidence levels, improvement programmes, use of qualified persons and Council commitment to asset management planning.

From this detailed analysis Council's level of achievement and any gaps in appropriate asset management practice were identified.

Asset management practice gaps that were noted have been transferred to the Asset Management Improvement Programme for action.

The achievement and effectiveness of the improvement items is included in annual work plans and monitored by the Assets Group.

1.7 Definitions

For the purposes of these policies, three levels of asset management practice are defined as follows:

'Core' Asset Management

Asset management which relies primarily on the use of an asset register, maintenance management systems, top-down condition assessment, simple risk assessment and defined levels of service, in order to establish a long-term cashflow projection.

'Intermediate' Asset Management

'Intermediate' asset management practice is undertaken at a level between 'Core' and 'Advanced' practice. The focus is to build on the basic technical asset management planning of 'Core' practice by introducing improved maintenance management and more advanced asset management techniques (as appropriate). Further use is made of risk management, asset lifecycle management, and service standard optimisation techniques.

'Advanced' Asset Management

Asset management which employs predictive modelling, risk management and optimised decision-making techniques to establish asset lifecycle treatment options and related long term cashflow predictions.

1.8 Purpose of the Detailed Factor Assessment Tables for Asset Management Practice

The tables that follow have been prepared for provide a template for Councils Asset Management Policy, or to be inserted (in part) into the introduction of an Asset Management Plan. The Tables provide assessment of an appropriate level of asset management practice for each asset group. The initial population and district wide risk screens suggest 'Core - Intermediate' asset management practice for Selwyn District Council asset groups.

The tables assess factors and determine for the factors being assessed whether asset management practice should be **higher** (i.e. tending towards 'Advanced' practice), **same** (as the initial screening assessment), or **lower** (i.e. tending toward 'Core' practice).

Indications from the Office of the Auditor General (OAG) are that Core is the minimum acceptable level for Infrastructure Asset Management of public services in New Zealand.

The initial risk screen and factor assessments are summarised in a **Final Asset Management Level** assessment that then provides a broad target for asset management practice development in the asset group being considered.

1.9 AM Maturity

The Appropriate Level of Asset Management is defined by district and organisational factors, while AM maturity is based around an assessment of the sophistication of the asset management process required for each activity.

Section 1.4.2 in the IIMM introduces the Asset Management Maturity Index. The AM Maturity index is a tool that organisations can use to determine the sophistication of asset management requirements, lifecycle planning and asset management enablers, rather than asset management overall.

As part of the NZ Treasury Investment Confidence Rating, the NZ Treasury developed an Asset Management Maturity methodology to help agencies and their professional advisors identify current and appropriate (or target) levels of asset management practice.

Asset management maturity is the extent the maturity of the organisation's asset management practices are able to meet the current and future needs of the organisation and is a lead indicator of future performance.
(NZ Treasury)

Merging the IIMM AM Maturity index and expectations with the Treasury AM Maturity methodology provides a useful tool to assess current and target AM Maturity levels. The target results of the AM Maturity assessment have been included with the Appropriate Asset Management Level.

Assessment of the organisations achievement against the AM Maturity index targets is a detailed process undertaken separately

2. Policy Statement - Transportation

The Selwyn District Council Asset Management Policy Statement for the Transportation Activity is outlined below. It is intended that this Policy Statement be added to the introduction of the Asset Management Plan, to set the direction of the Transportation Activity Management process.

This Asset Management Policy sets the appropriate level of asset management practice for Council's Transportation Activity as 'Intermediate' practice.

> ***Definition:*** *'Intermediate' asset management practice is undertaken at a level between 'Core' and 'Advanced' practice. The focus is to build on the basic technical asset management planning of 'Core' practice by introducing improved maintenance management and more advanced asset management techniques (as appropriate). Further use is made of risk management, asset lifecycle management, and service standard optimisation techniques.*

2.1 Policy Linkages to Other Plans

This Asset Management Policy links to, Council's LTP, Regional Land Transport Plan Greater Christchurch Partnership, and Transportation Asset Management Plan. Waka Kotahi/New Zealand Transportation Agency asset management requirements form this Policy's minimum asset management practice requirements.

2.2 Structured Assessment of Asset Management Practice

Council has undertaken a structured assessment of the appropriate level of asset management practice for the Transportation assets. This structured assessment follows the guidance provided in Section 2.1 of the International Infrastructure Management Manual (2011) and Table 2.1.2. International Infrastructure Management Manual (2015).

The results of this assessment are shown in Table 2: Transportation Activity Factor Assessment Results below.

Table 2: Transportation Activity Factor Assessment Results

Criteria	Assessment	Commentary
Population	Core	The initial population risk screen for urban areas, all township population, and total district population showed that asset management practice should be Core
District Wide Risks	Intermediate	Based on the identified district wide risk factors, the suggested level of appropriate asset management practice for Selwyn District Council is 'Intermediate'
Costs and Benefits	18% of budget more risk	The Transportation budget was historically the largest in Council and still is significant. There are considerable risks to comprehensive programmes if there is not adequate funding or programme management. The impacts of urbanisation and responsibilities as a regional partner are consistent with a city or regional approach with some large capital projects underway. The Waka Kotahi/New Zealand Transport Agency requires three-year programmes to be submitted
Legislative Requirements	Meet minimum	Selwyn District Council policy is to meet minimum legislative requirements, or exceed requirements where deemed appropriate and cost effective
Size, Condition, Complexity of Assets	Normal + Increasing	With the rapid growth within the district, specifically the Eastern area of Selwyn District faces a similar complexity to that of neighbouring Christchurch city as the Land Transport and 5 Waters networks are linked. The rapid growth drives the need for comprehensive forecasting of demand and the funding and implementation of projects on a just-in-time basis. For Land Transport assets this means that the size and complexity of assets is, in some areas, higher than might normally be expected, and this in turn is a driver for a higher level of asset management practice
Risks Associated with Failures	Average	The risk of failure of funding or project implementation within the Land Transport activity requires a pro-active management approach integrating with neighbouring authorities and other agencies. Any reduction in the Financial assistance rate from the Waka Kotahi/New Zealand Transport Agency poses an economic risk Overall risks associated with asset failure have been assessed to be average
Organisational Skills and Resources	Normal + Increasing	Selwyn District Council is a medium sized local authority. Council uses a mix of its own staff and external resources (where appropriate) to deliver levels of service and achieve associated planning and programmes. Council's approach is to ramp up to meet the changing demands of the district. This approach places Selwyn District in the 'Intermediate' range of asset management practice

Criteria	Assessment	Commentary
Customer Expectations	Medium to High (varied across the district)	Council has developed and maintained assets to a good standard and the impacts of new residents bringing 'city values' to townships and rural residential areas is evident. The District has a range of community assets that are of a high standard and the community is justifiably proud of them, and has high expectations of the development and maintenance Overall customer expectations are judged to be medium to high. This suggests a requirement for well-developed asset management practice to consistently meet community expectations in the long term. Waka Kotahi/NZTA requirements include of the One Network Road Classification System integration and Business Case Development
Sustainability	Compliance currently, Corporate Policy to be developed	Selwyn District Council is following the sustainability regimes of the Land Transport Management Act 2003, the Government Policy Statement on Land Transport Funding and Regional Land Transport Plan requirements (including subsequent amendments and revisions) for Land Transport and has adopted sustainability for the purposes of asset planning
Climate Change	Normal + Increasing	Climate Change is an increasing factor for Council to consider in its long term planning. Initiatives should reflect Council's Policy on Climate Change (December 2020), and include community leadership, mitigation and adaptation
Final AM Level	**Intermediate**	**Analysis of factors suggests that asset management practice should be more sophisticated and nearer to Advanced**
AM Maturity Assessment	**Advanced**	**The maturity targeted should be Advanced Practice including Asset Register, Asset Condition, Demand Forecasting, Risk Management and Service Delivery drivers. Emphasis in the 'Understanding the Requirements' area**

(The level of asset management determined is at the high end of 'Intermediate', while the asset management maturity level is at the low end of 'Advanced'.)

3. Policy Statement – 5 Waters

This Asset Management Policy sets the appropriate level of asset management practice for Council's 5 Waters Activity as 'Intermediate' practice:

> ***Definition:*** *'Intermediate' asset management practice is undertaken at a level between 'Core' and 'Advanced' practice. The focus is to build on the basic technical asset management planning of 'Core' practice by introducing improved maintenance management and more advanced asset management techniques (as appropriate). Further use is made of risk management, asset lifecycle management, and service standard optimisation techniques.*

3.1 Policy Linkages to Other Plans

This Asset Management Policy links to, Council's LTP, 5 Waters Asset Management Plans, Water and Sanitary Services Assessment and Water Safety Plans. An approach where planning is based around communities of interest is favoured, as this aims to promote an integrated management regime and encourage efficiencies across the district's 5 Waters schemes.

3.2 Structured Assessment of Asset Management Practice

Council has undertaken a structured assessment of the appropriate level of asset management practice for the 5 Waters assets. This structured assessment follows the guidance provided in Section 2.1 of the International Infrastructure Management Manual (2011) and Table 2.1.2 International Infrastructure Management Manual (2015). The results of this assessment are shown in Table 3: 5 Waters Factor Assessment Results below:

Table 3: 5 Waters Factor Assessment Results

Criteria	Assessment	Commentary
Population	Core	The initial population risk screen for urban areas, all township populations, and total district population showed that asset management practice should be Core
District Wide Risks	Intermediate	Based on the identified district wide risk factors, the suggested level of appropriate asset management practice for Selwyn District Council is 'Intermediate'
Costs and Benefits	19% of budget More risk	The 5 Waters budget is the second largest in Council and represents higher risks if AM practice is not at an appropriate level. These budgets also allow more scope to develop asset management practice as appropriate. The impacts of urbanisation and responsibilities as a Greater Christchurch Partnership member are consistent with a city or regional approach with some large capital projects underway
Legislative Requirements	Meet minimum requirements	Selwyn District Council policy is to meet minimum legislative requirements, or exceed requirements where deemed appropriate and cost effective
Size, Condition, Complexity of Assets	Normal +	With the rapid growth within the district, specifically the Eastern area of Selwyn District faces a similar complexity to that of neighbouring Christchurch city as the Land Transport and 5 Waters networks are linked. The rapid growth drives the need for comprehensive forecasting of demand and the funding and implementation of projects on a just-in-time basis. For 5 Waters assets this means that the size and complexity of assets is, in some areas, higher than might normally be expected, and this in turn is a driver for a higher level of asset management practice

Criteria	Assessment	Commentary
Risks Associated with Failures	Higher	Failure of water systems would lead to a range of issues, and wastewater system failure has public health and environmental damage consequences. This suggests a higher level of risk management practice for 5 Waters. Public Health risk management is already legislatively mandated
Organisational Skills and Resources	Normal + Increasing	Selwyn District Council is a medium sized local authority. Council uses a mix of its own staff and external resources (where appropriate) to deliver levels of service and achieve associated planning and programmes. Council's approach is to ramp up to meet the changing demands of the district. This approach places Selwyn District in the 'Intermediate' range of asset management practice
Customer Expectations	Medium to High (varied across the district)	Council has developed and maintained assets to a good standard and the impacts of new residents bringing 'city values' to townships and rural residential areas is evident. The District has a range of community assets that are of a high standard and the community is justifiably proud of them, and has high expectations of the development and maintenance. Overall customer expectations are judged to be medium to high. This suggests a requirement for well-developed asset management practice to consistently meet community expectations in the long term
Sustainability	Principles in place for 5 Waters Planning Corporate Policy to be developed	Selwyn District Council has adopted sustainability for the purposes of 5 Waters planning, otherwise Council is still in the process of developing its corporate sustainability policies. This will include incorporating legislative changes and the any national or regional policies or plans. Any impact of these on asset management practice will be incorporated into the next review of Asset Management Policies
Climate Change	Normal + Increasing	Climate Change is an increasing factor for Council to consider in its long term planning. Initiatives should reflect Council's Policy on Climate Change (December 2020), and include community leadership, mitigation and adaptation
Final AM Level	**Intermediate**	**Analysis of factors suggests that asset management practice should be more sophisticated and nearer to Advanced**
AM Maturity Assessment	**Intermediate**	**The maturity targeted should be Intermediate Practice leaning towards Advanced. This includes the Asset Register, Asset Condition, Demand Forecasting, Risk Management, Capital Works Planning and Service Delivery drivers. Emphasis in the 'Understanding the Requirements' area**

4. Policy Statement - Solid Waste

This Asset Management Policy sets the appropriate level of asset management practice for Council's Solid Waste Activity as 'Core' practice:

> ***Definition:*** *''Core' asset management practice is basic technical asset management planning undertaken at a level designed to meet minimum legislative and organisational requirements for financial planning and reporting. 'Core' practice provides technical management outputs for current levels of service, demand management, asset lifecycles, asset forward replacement programmes, new capital expenditure and associated cash flow projections.*

4.1 Policy Linkages to Other Plans

This Asset Management Policy links to Council's LTP, Solid Waste Asset Management Plan, and Waste Minimisation & Management Plan.

4.2 Structured Assessment of Asset Management Practice

Council has undertaken a structured assessment of the appropriate level of asset management practice for the Stormwater assets. This structured assessment follows the guidance provided in Section 2.1 of the International Infrastructure Management Manual (2011) and Table 2.1.2 International Infrastructure Management Manual (2015). The results of this assessment are shown in Table 4: Solid Waste Factor Assessment Results below.

Table 4: Solid Waste Factor Assessment Results

Criteria	Assessment	Commentary
Population	Core	The initial population risk screen using urban areas, all township populations, and total district population showed that asset management practice should be Core
District Wide Risks	Intermediate	Based on the identified district wide risk factors, the suggested level of appropriate asset management practice for Selwyn District Council is 'Intermediate'
Costs and Benefits	8% of budget	Much of the operating budget is associated with collection and disposal costs which are contracted services. These can be ramped up as demand dictates and the cost risks is regarded as low
Legislative Requirements	Meet minimum	Selwyn District Council policy is to meet minimum legislative requirements, or exceed requirements where deemed appropriate and cost effective.
Size, Condition, Complexity of Assets	Low	Size, condition and complexity of assets are low with only the Pines Resource Recovery Park in hard assets
Risks Associated with Failures	Low	Much of the operating budget is associated with collection and disposal costs which are contracted services. These can be ramped up as demand dictates and the cost risks is regarded as low
Organisational Skills and Resources	Normal + Increasing	Selwyn District Council is a medium sized local authority. Council uses a mix of its own staff and external resources (where appropriate) to deliver levels of service and achieve associated planning and programmes. Councils approach is to ramp up to meet the changing demands of the district. This approach places Selwyn District in the 'Intermediate' range of asset management practice

Criteria	Assessment	Commentary
Customer Expectations	Medium to High (varied across the district)	Council has developed and maintained assets to a good standard and the impacts of new residents bringing 'city values' to townships and rural residential areas is evident. The District has a range of community assets that are of a high standard and the community is justifiably proud of them, and has high expectations of the development and maintenance Overall customer expectations are judged to be medium to high. This suggests a requirement for well-developed asset management practice to consistently meet community expectations in the long term
Sustainability	Medium	This is discussed in the Waste Management & Minimisation Plan. Selwyn District Council is following Canterbury wide initiatives, otherwise Council is still in the process of developing its corporate sustainability policies. This will include incorporating legislative changes and the any national or regional policies or plans. Any impact of these on asset management practice will be incorporated into the next review of Asset Management Policies
Climate Change	Normal + Increasing	Climate Change is an increasing factor for Council to consider in its long term planning. Initiatives should reflect Council's Policy on Climate Change (December 2020), and include community leadership, mitigation and adaptation
Final AM Level	**Core**	**Analysis of factors suggests that asset management practice should be Core given there are few hard assets and the contracted services offer scope to manage risks adequately**
AM Maturity Assessment	**Core**	**The maturity targeted should be Core Practice with Service Delivery driver**

5. Policy Statement - Community Facilities

This Asset Management Policy sets the appropriate level of asset management practice for Council's Community Buildings & Facilities Activity as 'Core'

> ***Definition:*** *''Core' asset management practice is basic technical asset management planning undertaken at a level designed to meet minimum legislative and organisational requirements for financial planning and reporting. 'Core' practice provides technical management outputs for current levels of service, demand management, asset lifecycles, asset forward replacement programmes, new capital expenditure and associated cash flow projections.*

5.1 Policy Linkages to Other Plans

This Asset Management Policy links to Council's LTP and the Community Buildings & Facilities Asset Management Plan.

5.2 Structured Assessment of Asset Management Practice

Council has undertaken a structured assessment of the appropriate level of asset management practice for the Community Buildings & Facilities assets. This structured assessment follows the guidance provided in Section 2.1 of the International Infrastructure Management Manual (2011) and Table 2.1.2 International Infrastructure Management Manual (2015). The results of this assessment are shown below in Table 5: Community Facilities Factor Assessment Results:

Table 5: Community Facilities Factor Assessment Results

Criteria	Assessment	Commentary
Population	Core	The initial population risk screen using urban areas, all township populations, and total district population showed that asset management practice should be Core
District Wide Risks	Intermediate	Based on the identified district wide risk factors, the suggested level of appropriate asset management practice for Selwyn District Council is 'Intermediate'
Costs and Benefits	55% of budget	The Community Facility budgets for operations and capital have grown over time to become the largest areas of expenditure for Council Securing funding along with the scoping and timing of projects represent areas of higher risk for Council. Operations are more straight forward are moderate in terms of Council expenditure and funds for small facilities are often limited. This contrasts with the large capital projects being implemented elsewhere in the district
Legislative Requirements	Meet minimum	Selwyn District Council policy is to meet minimum legislative requirements, especially for playgrounds and pools
Size, Condition, Complexity of Assets	Normal +	A varied approach is required given the range of assets involved, the portfolio of assets is becoming for sophisticated over time. The complexity of the management approach for Community Services means AM needs to be robust and convincing to ensure committees understand and effect appropriate lifecycle management
Risks Associated with Failures	Lower	Overall risks associated with asset failure have been assessed to be low with the exception of playgrounds, pools and public toilets which have higher associated risks

Criteria	Assessment	Commentary
Organisational Skills and Resources	Normal + Increasing	Selwyn District Council is a medium sized local authority. Council uses a mix of its own staff and external resources (where appropriate) to deliver levels of service and achieve associated planning and programmes. Council's approach is to ramp up to meet the changing demands of the district. This approach places Selwyn District in the 'Intermediate' range of asset management practice
Customer Expectations	Medium to High (varied across the district)	Council has developed and maintained assets to a good standard and the impacts of new residents bringing 'city values' to townships and rural residential areas is evident. The District has a range of community assets that are of a high standard and the community is justifiably proud of them, and has high expectations of the development and maintenance. Overall customer expectations are judged to be medium to high. This suggests a requirement for well-developed asset management practice to consistently meet community expectations in the long term
Sustainability	Corporate Policy to be developed	Council is still in the process of developing its corporate sustainability policies. This will include incorporating legislative changes and the any national or regional policies or plans. Any impact of these on asset management practice will be incorporated into the next review of Asset Management Policies
Climate Change	Normal + Increasing	Climate Change is an increasing factor for Council to consider in its long term planning. Initiatives should reflect Council's Policy on Climate Change (December 2020), and include community leadership, mitigation and adaptation
Final AM Level	**Core**	**Analysis of factors suggests that asset management practice at a Core level is sufficient.** **In some aspects of Community Facility Asset Management, Council is operating at higher than core. As Council regains management of Community assets, then this may be enhanced.**
AM Maturity Assessment	**Core**	**The maturity targeted should be Core Practice with emphasis in the 'Understanding the Requirements' area**

REPORT

TO: Chief Executive

FOR: Council Meeting – 10 March 2021

FROM: Asset Manager Water Services, and
Water Service Delivery Manager

DATE: 1 March 2021

SUBJECT: **WATER SERVICES MONTHLY UPDATE**

RECOMMENDATION

'That the Council receives the report "Water Services Monthly Update" for information'

1. PURPOSE

The purpose of this report is to inform Council on matters of interest in the context of the 5 Waters activity.

2. SIGNIFICANCE ASSESSMENT/COMPLIANCE STATEMENT

As this report is for information only it is not considered to be significant in the context of Council's Significance Policy.

3. HISTORY/BACKGROUND

Selwyn District Council's goal for the 5 Waters activities is:

> *'To provide water services that meet all relevant standards with a level of service the public can afford and have confidence in, both now and moving forward into the future'.*

We discuss key considerations for each of the 5 Waters activities (Water, Wastewater Stormwater, Land Drainage and Water Races).

3.1. Wastewater

Ellesmere WWTP Options

The Ellesmere Wastewater Treatment Plant (WWTP) serves the communities of Leeston, Southbridge and Doyleston. These communities are forecast to experience moderate growth over the next 30 years. This combined with a number of site constraints has lead Council to consider a number of upgrade options. This matter is subject to a separate report to Council.

3.2. Potable Water

Water Services Bill

The Water Services Bill was introduced in Parliament on 27 July 2020 and had its first reading on 8 December 2020. Submissions on the Bill opened 14 December 2020 and closed 2 March 2021.

Selwyn District Council submitted on the bill, this submission was presented to Council at its 24 February 2021 meeting. The next stage will be the hearing of submissions by the Health Select Committee. Council is to be represented by our Mayor and Staff.

Drinking Water Compliance

The updated Hororātā Water Safety Plan (WSP) was approved by the DHB on the 16th of February 2021. This is only the third WSP in New Zealand to be approved under the current framework. The lessons learnt from this plan can now be applied to all SDC submissions going forward.

The Annual Chemical Sampling Programme is currently in progress, this includes testing for nitrates and lead in our drinking water supply, along with the full suite of chemicals as per our WSP and as agreed with the DHB.

3.3. Land Drainage

The annual land drainage activities are due to occur over the next two months. The Water Services Team are working with the Land Drainage Committees and their Contractors who undertake the works.

Best practice methodology and documentation is being created to provide guidance for performing typical maintenance works. This will give confidence to external stakeholders best practices are occurring during drain cleaning works.

3.4. Stormwater

Leeston Stormwater Flood Bypass – Consents have been lodged for Stage 4 of the Leeston Bypass, we are still awaiting confirmation from ECan and SDC. The contractor has priced the work with the aim to commence onsite this autumn. Land negotiations are currently ongoing with one remaining land owner, any further delay may prevent construction work progressing prior to winter, while ground conditions still allow.

Hororātā – We continue to work through the Hororātā Flood Works plan, a number of items have been completed and we continue to work through trying to resolve the issues preventing works on the remaining items.

Work has started with ECan and their contractor on the willow clearing in the Hororātā River and Cordy's Stream, with works to be completed by the end of March 2021.

All approvals and authorisation to allow work clearing material from Happy Jack's Stream has been obtained, physical works are due to commence mid-March and be completed by the end of the month.

3.5. Water Races

Upper Ellesmere Water Race Closure

Council proposed in the 2018 Long Term Plan to *'work towards the closure of the Upper Ellesmere Water Race network'*. Significant effort has been made towards this goal but due to agreements required by a third party, this has not been progressed to completion.

Staff have been working on an alternative process to enable the closure of the Upper Ellesmere Water race. At the 10th of February 2021 meeting Council appointed Cr Lemon and Cr Epiha to assist with this process. The proposal is well underway with the aim of presenting this at the 14 April 2021 Council meeting.

3.6. Three Waters Grant and Delivery Plan

DIA Review

Central government is driving the proposal for reform of three waters service delivery nationwide.

Selwyn District Council have signed a Memorandum of Understanding with central government (administered through DIA) to participate in the first stage of the reform process. We are actively engaged in providing information at both a regional and national level.

While the reform creates significant uncertainty for Council, in the interim Selwyn District Council (and all TAs) have been advised to continue delivering services as per business as usual and to prepare our LTP 2021-31 on a continuation basis. Our voluntary involvement in the detailed RFI process will put us in the best possible position to prepare for the reforms.

On February 1st, Selwyn District Council submitted our detailed RFI workbook to the Department of Internal Affairs (DIA). We have responded to review questions in the subsequent weeks.

Canterbury Review

In addition to the Governments reform process, Canterbury Councils are undertaking an independent review of water services and reform opportunities. The Canterbury Regional steering group has appointed a Project Manager Rob Kerr, to lead the development of an evidence-led internal review on the best delivery option(s). PricewaterhouseCoopers have been appointed as the consultants to lead the Canterbury region reform review.

In February, we submitted information for the Canterbury reform review. The consultants have responded with a package of information describing the financial and operational performance of all Canterbury councils. We have reviewed this information and provided review comments.

Waters Stimulus Project Update – Darfield and Kirwee to Pines WWTP Pipeline

The Project Team has now been appointed and assembled as per Council approval 9 December 2020:

- Project Manager – Gareth Taylor, Collaborations
- Designer – Beca
- ECI & Contractor – SICON

The Project Control Group have established a weekly and monthly progress schedule to ensure the project remains on track.

A project walk-over was undertaken on the 12th of January 2021 and attended by SDC and the key project team. Key points of current progress include:

- Material and pipe supply enquiries are underway
- Survey of the route and sites is underway
- A 'Safety in Design" and "Hazard in operations" workshop was undertaken on the 26 of January 2021
- Discussions are underway with the Property team with regards to land availability and purchase for the availability for pump station sites
- Draft construction contract (NZS 3910) in progress allow for early contractor involvement (ECI)
- SICON pricing for service location and investigation works
- SICON developing Global Traffic Management Plan (TMP) for the route and project

The first DIA progress report was submitted on the 12th of February 2021.

The actual programme of construction is still to be finalised to ensure we meet the completion date of March 2022.

4. Future points for discussion

During previous Council meetings, the following topics in addition to those covered above were requested to be presented at a meeting on a future date:

- Outline of nitrate levels and trends in ground water impacting Council supplies, and
- Ground water levels

5. PROPOSAL

Staff seek that the Council consider and implement the recommendation set out above.

6. OPTIONS

The options available to Council are to:

(a) To approve the recommendation of this report, or
(b) To decline the recommendation of this report

Staff would appreciate feedback on the subject matter and level of information provided in this report.

7. VIEWS OF THOSE AFFECTED / CONSULTATION

Not applicable

8. FUNDING IMPLICATIONS

No funding implications have been identified in relation to the recommendation of this report.

Murray England
ASSET MANAGER WATER SERVICES

Elaine McLaren
WATER SERVICES DELIVERY MANAGER

Endorsed For Agenda

Murray Washington
GROUP MANAGER INFRASTRUCTURE

REPORT

TO: Council

FOR: Council Meeting – 10 March 2021

FROM: Bernadette Ryan

DATE: 24 February 2021

SUBJECT: **REGISTER OF DOCUMENTS SIGNED AND SEALED**

RECOMMENDATION

'That the following transactions and the fixing of the Common Seal under authorised signatures have been approved.'

1. PURPOSE

To advise Council of legal documents approved for signing and sealing.

REGISTER OF DOCUMENTS SIGNED AND SEALED

1	Name of other party	Central Plains Water Ltd
	Transaction type	Agreement to Grant an Easement
	Transaction description	Rights to convey water, electricity and telecommunications – Stage 2 Reserves 1460 and 1556

2	Name of other party	Selwyn Dog Training Club Incorporated
	Transaction type	Deed of Renewal and Variation of Lease
	Transaction description	Rural section 40441 Rolleston Dog Park

3	Name of other party	Rolleston Land Developments Limited
	Transaction type	Deed of Indemnity
	Transaction description	Dedication of road on subdivision - East Maddisons Road, Rolleston

4	Name of other party	Transpower NZ Ltd
	Transaction type	Licence to Occupy Road Reserve
	Transaction description	Unformed legal road off Davies Road, Glenroy

5	Name of other party	Isaac Construction Ltd
	Transaction type	Deed of Licence
	Transaction description	Part Reserve 263, Shands Road, Prebbleton Intersection Upgrades Stage 1

6	Name of other party	The Ferngrove Trust
	Transaction type	Licence to Occupy Unformed Legal Road
	Transaction description	Bealey Road – Unformed Legal Road and Part Road Reserve

7	Name of other party	McCarthy Contracting Ltd
	Transaction type	Deed of Renewal of Lease
	Transaction description	Lot 2 DP 365486 - 27 Hamptons Road, Prebbleton

8	Name of other party	Tony Richard Matthews
	Transaction type	Deed of Licence to occupy to 31 March 2021
	Transaction description	Transfer of Deed of Licence from Jane Caitlin Ayres to Tony Richard Matthews following sale of Hut 77 Upper Selwyn Huts

Bernadette Ryan
PERSONAL ASSISTANT TO MAYOR

Endorsed For Agenda

David Ward
CHIEF EXECUTIVE

RESOLUTION TO EXCLUDE THE PUBLIC

Recommended:

'That the public be excluded from the following proceedings of this meeting. The general subject matter to be considered while the public is excluded, the reason of passing this resolution in relation to the matter, and the specific grounds under Section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution are as follows:

General subject of each matter to be considered		**Reasons for passing this resolution in relation to each matter**	**Ground(s) under Section 48(1) for the passing of this resolution**	**Date information can be released**
1.	Public Excluded Minutes	*Good reason to withhold exists under Section 7*	*Section 48(1)(a)*	
2.	Three Waters Stimulus Grant Delivery Progress			

This resolution is made in reliance on Section 48(1)(a) of the Local Government Official Information and Meetings Act 1987 and the particular interest or interests protected by Section 6 or Section 7 of that Act or Section 6 or Section 7 or Section 9 of the Official Information Act 1982, as the case may require, which would be prejudiced by the holding of the whole or the relevant part of the proceedings of the meeting in public are as follows:

1	Enable the local authority holding the information to carry out, without prejudice or disadvantage, commercial activities; or	Section 7(2)(h)
1, 2	Enable the local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations); or	Section 7(2)(i)

2 that appropriate officers remain to provide advice to the Committee.'

**PUBLIC EXCLUDED MINUTES OF AN ORDINARY MEETING
OF THE SELWYN DISTRICT COUNCIL
HELD IN THE COUNCIL CHAMBERS
ON WEDNESDAY 24 FEBRUARY 2021 COMMENCING AT 3.00PM**

COMMITTEE

Mayor (S T Broughton), Councillors, M A Alexander, J B Bland, S N O H Epiha, J A Gallagher, D Hasson, M P Lemon, M B Lyall, S McInnes, G S F Miller, R H Mugford and N C Reid

IN ATTENDANCE

Messrs. D Ward (Chief Executive), K Mason (Group Manager Organisational Performance), S Hill (Group Manager Communication and Customers), M Washington (Group Manager Infrastructure), D Marshall (Group Manager Property), R Raymond (Communications Advisor), R Love (Team Leader Strategy and Policy), Mesdames D Kidd (Group Manager Community Services and Facilities), and N Smith (Executive Assistant) and Ms T Davel (Governance Coordinator) and Miss T Bain (Tuia Representative)

APOLOGIES

None

CONFLICTS OF INTEREST

None

IDENTIFICATION OF ANY EXTRAORDINARY BUSINESS

None.

CURRENT MATTERS REQUIRING ATTENTION

None currently.

CONFIRMATION OF MINUTES

1. Public excluded minutes of an Ordinary meeting of the Selwyn District Council held in the Council Chambers on Wednesday 10 February 2021.

Moved – Councillor Gallagher / **Seconded** – Councillor Miller

'That Council confirms the unconfirmed public excluded minutes of an Ordinary Meeting of the Selwyn District Council held on Wednesday 10 February 2021.'

CARRIED

REPORTS

1. Group Manager Property
Property Transaction Update – 31 January 2021

The Group Manager Property provided an update on recent SAC work and in particular issues with the ceiling. He reported that staff had known there would have to be work done on the roof in future and he said it could possibly have been dealt with earlier.

Staff advised that this was the second issue with the architect / builder but before they consider taking legal advice they needed to get all of the facts and put those to the parties. The Audit and Risk Subcommittee Chair, Councillor Lemon, noted a review into the issues has been added to the Subcommittee's matter under investigation. It will be reported to Council in due course.

Other projects were briefly mentioned noting that these were mostly progressing well.

The Mayor asked Council to consider putting Izone forward for a national award such as being planned by Local Government New Zealand. He added that this had been a successful enterprise and returned money to Council in a short period of time and he thought they were worthy of an award.

Related to the Moore Street extension from Ministry of Education (MoE), Councillor Miller pointed out that it had been previously agreed that whenever Council needed the land that it would be a simple process of being handed back. He said it seems this had been conveniently forgotten somehow. Councillor Miller also asked staff whether the Memorandum of Understanding with MoE could include that were the school ever to be moved, Council could have first option to purchase the land.

In terms of Leeston and Lake Road it was noted that staff would bring a business case back to Council in June. Councillor Miller said there was a Council investment strategy and Council needed to drive it. He said there was currently no future strategy or delivery mechanism in place, to which the Chief Executive said it was one of his work programmes at the moment.

Moved – Councillor Gallagher / **Seconded** – Councillor Epiha

'That Council receives the Property transactions update, public excluded report, as at 31 January 2021, for information.

CARRIED

RESOLUTION TO MOVE FROM PUBLIC EXCLUDED

Moved – Councillor Alexander / **Seconded** – Councillor Hasson

'That the meeting move out of public excluded business at 3.58pm and resume in open meeting.'

CARRIED

The meeting closed at 3.58pm

DATED this day of 2021

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MAYOR

PUBLIC EXCLUDED REPORT

TO:	Chief Executive
FOR:	Council Meeting – 10 March 2021
FROM:	Gareth Morgan, Service Delivery Manager Infrastructure
DATE:	1 March 2021
SUBJECT:	**THREE-WATERS STIMULUS GRANT DELIVERY PROGRESS - WASTEWATER CONVEYANCE PIPELINE, DARFIELD AND KIRWEE TO THE PINES WWTP IN ROLLESTON**

RECOMMENDATION

"That Council;

(a) Receives the Report "Procurement for the Three-Waters Stimulus Grant Delivery Progress"

(b) Approves the commitment to a forward order of 26,000M of Pipe to the estimated value of $1.7M

(c) Approves that the Acquisitions Disposals and Leasing Manager begin negotiations with the Lessee to surrender land required for the Darfield Pumpstation

(d) Approves to the forward advancement of the Construction Programme of up to three (3) months to Apr-21 and ahead of the LTP"

1. PUBLIC EXCLUDED REASONING

To enable the local authority holding the information to carry out, without prejudice or disadvantage, commercial activities	*Local Government Official Information and Meetings Act 1987* ***Section 7 (2)(i)***

2. SIGNIFICANCE ASSESSMENT/COMPLIANCE STATEMENT

This matter has been assessed against the Council's Policy on Significance and is regarded as "high" significance in consideration of the following:

This report deals with a highly important commitment by Council to expend the DIA Three-Waters Stimulus Grant funding of $10.66M in accordance with the Funding Agreement and stringent timelines therein.

The anticipated $-value arising from the Project is estimated be of the order of circa $12M+ in total.

That $10.66M of the cost to service this Project has already been secured from the DIA and agreed in the Three-Waters Stimulus Funding Agreement.

3. PURPOSE

The purpose of this report is to gain approval from Council to enter into forward financial commitments for pipe purchase, to begin the process of negotiating with Council leaseholders for the surrender of land at Darfield and to advance the physical work commencement date.

4. BACKGROUND

4.1. Three-Waters Stimulus Grant

To meet the DIA 30th September 2020 deadline for funding Grant submissions, Council at its meeting on 23rd September 2020 received a report from staff, who had undertaken a comprehensive review of projects which could be delivered within the stimulus funding package offered.

Of the four options presented to Council, Council's preferred project option approved being the installation of a 26KM Wastewater conveyance pipeline and Pumpstations from the townships of Darfield and Kirwee through to the Pines WwTP in Rolleston.

Council received approval to proceed as presented from the DIA on 19th November 2020.

4.2. Procurement Plan

At its meeting of Wednesday 9th December 2020, Council received a Report, 'Procurement for the Three-Waters Stimulus Grant Delivery Plan' which outlined and documented the appointments required.

Following approval of this report, BECA have been appointed as the Designers and Dr Gareth Taylor of Collaborations as the Project Manager.

Sicon have also been engaged with on an Early Contractor Involvement (ECI) basis as the Main Delivery Contractor and are yet to Price and Tender for the whole works, as final designs are incomplete but have been integral to the design process and early material availability.

5. PROJECT PROGRESS UPDATES

5.1. Design, Project Manager and Contractor ECI Appointments.

With these appointments made, good progress has been maintained and timeline improvements gained. To such extent, that physical work could potentially commence as early as April-21, some three (3) months ahead of the initially planned July-21 commencement.

Commencing earlier than planned has merit and is sought.

It reduces completion risk significantly. A Three (3) month gain in a Nine (9) month construction programme is significant but the ability to implement this opportunity places install commencement works ahead of Council's LTP decisions.

5.2. DIA Agreed Timeline

Three-Waters Stimulus Grant Delivery Plan submitted to DIA by Council on 27th October 2020 and approved on 19th November 2020 included the timeline of,

(i) Nov 2020 – Apr 2021: Completion of the two design packages (Ww Pipeline & renewals) and peer review.
(ii) Apr 2021 – May 2021: Tendering of the construction works. The intention is to include the two alternative projects (Darfield pipeline or accelerated renewals) as provisional separable portions of one tender. Tender award will be conditional on the outcome of the LTP consultation. Council will consider a negotiated tender to the 100% Council-owned contractor, SICON, as per SDC procurement policy.
(iii) Apr - Jun 2021: LTP consultation.
(iv) Jun 2021: Council decision on LTP. Tender award for either Darfield pipeline or accelerated renewals.
(v) Jul 2021 – Mar 2022: construction of the pipeline or accelerated renewals.

This is the current timeline being adopted.

5.3. Design Work Progress to-date

The design work to-date has focussed wholly on the Wastewater conveyance pipeline and pumpstations for Darfield and Kirwee to the Pines WwTP, as Council's preferred option.

Although, not discounted as an option, no Renewals design work has commenced, as the Wastewater conveyance pipeline is Council's preferred option and this option has reached a point in the project which will require a significant forward financial commitment from Council for the pre-order of pipe.

5.4. Project Challenges

It should be noted the project has encountered a number of previously uncommunicated challenges, which is not unexpected in a project of this size or quickly evolving scope.

Nor, are any these insurmountable, they have a requirement of process, time and possibly cost and are already in progress.

Council in its deliberations of choosing this preferred option did so on the basis of installing a pipeline from points A and B, to connect to C within accessible road reserve.

The realities of achieving this outcome has presented a number of challenges not considered at that time, being,

(i) Lizards – At a number of locations along the proposed route, there are habitats of Lizard's. A Wildlife Permit is required to work within these areas and are expected to take time to obtain.
(ii) Contaminated land – There a few locations where previous activities have included the fill of contaminated material, namely asbestos and hydrocarbons.
(iii) Heritage – The whole area surrounding Burnham Military Camp is a designated Heritage site and whilst being road reserve, this has to be worked through.
(iv) Kiwirail crossings – There are two along the proposed route. One at SH1 Burnham and one at SH73 Kirwee. Kiwirail crossings are notoriously difficult and time consuming processes to gain approval.
(v) Leased Land – The proposed location of the pumpstation at Darfield is currently under lease from Council. The lessees are very accommodating and co-operative but the formal surrender of some land from this lease is required. This is a process which will be managed by Council's Property Team through the Acquisitions Disposals and Leasing Manager.
(vi) Resource consents – earthworks consents are not unexpected by volume but a process which also involves Haz sites such as the Pines WwTP. Operational consents are also required but can only progress as design is completed.

5.5. Opportunities

Recently, Council has requested three opportunities for adding additional benefit when installing the pipeline be considered, assessed and costed.

Those being,

(i) The placement of an additional pipe for water supply into the trench
(ii) Laying of fibre optic cable adjacent to (or in) the trench
(iii) Cycle track with loose metal finish on top of the pipe trench.

Work has begun on these options and expected to be reported back to Council in a few weeks.

It should be noted however, that whilst any opportunity option may be achievable, there are significant risk, time, disruption and cost as factors to consider.

5.6. Pipe Order

Supplying 26,000m (26KM) of pipe and associated junctions is not an 'off the shelf' order.

Sicon as the ECI, has explored various supply options through two NZ manufactures and suppliers, confirming that pipe is available locally and able to be supplied progressively at the lay-rate required to meet the construction install programme.

However, a supply order of this magnitude requires pre-order and a forward commitment from Council in the order of $1.7M, (including Sicon's margins).

6. OPTIONS

Council has two options,

6.1. Receives and approves the recommendations.

Or,

6.2. Council could reject one or more of the recommendations sought.

Recommendation (b) is sought for good reason, as outlined above, as are recommendations (c) and (d).

Although, recommendation (d) does signal choice before an LTP process is concluded.

7. VIEWS OF THOSE AFFECTED / CONSULTATION

(a) Views of those affected
This report is supported by Council's Chief Executive, Infrastructure Manager and Infrastructure Staff.

(b) Consultation
No additional consultation has taken place beyond the Project Team as this is a Confidential Process which cannot be communicated wider.

(c) Māori implications
No Maori implications have been identified at this stage of the Project but will be considered further as the Project advances.

(a) Climate Change considerations
None identified.

8. FUNDING IMPLICATIONS

This project is subsidised by $10.66M of DIA Stimulus Grant Funding.

The recommendation(s) fit within Council's existing budget allocations.

9. RELEVANT POLICY/PLANS

This proposal of engagements contained herein is consistent with Council's Procurement Policy & Strategy.

10. COMMUNITY OUTCOMES

Community Outcomes as they relate to Wastewater are included Activity Management Plan and the installation of this conveyance pipeline will be consulted upon in the LTP.

11. NEGATIVE IMPACTS

None anticipated

12. LEGAL IMPLICATIONS

Aspects of this report does deal with the advancement of work ahead of an LTP process.

Council is entitled to make procurement and property decisions about the services referred to in this report.

13. HAS THE INPUT/IMPACT FROM/ON OTHER DEPARTMENTS BEEN CONSIDERED?

No, there is considered to be little impact on other departments.

Gareth Morgan
SERVICE DELIVERY MANAGER (INFRASTRUCTURE)

Endorsed For Agenda

Murray Washington
GROUP MANAGER INFRASTRUCTURE