CH2M Beca

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Report

Akaroa Wastewater Scheme Upgrading - Resource Consents Application and Assessment of Effects on the Environment

Prepared for Christchurch City Council

Prepared by CH2M Beca Ltd

30 June 2014

Revision History

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1	**Graeme Jenner and Letitcia Jarrett**	Draft for Client review	18/6/14
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3	**Graeme Jenner and Letitcia Jarrett**	Final	30/6/14

Document Acceptance

Action	Name	Signed	Date
Prepared by	**Graeme Jenner**		30/6/14
Reviewed by	**Paul Whyte and Bridget O'Brien**		30/6/14
Approved by	**Garry Macdonald**		30/6/14
on behalf of	CH2M Beca Ltd		

Consent Applications

Form 9

Application for Resource Consent under section 88 of the Resource Management Act 1991

To: **Canterbury Regional Council**

From: **Christchurch City Council**

1. **I, Christchurch City Council, apply for the following type of resource consents:**

   The resource consents sought are described in the attached AEE and relate to the upgrading of the Akaroa Wastewater Scheme. In summary, they are for:

   Construction Resource Consents

- Water Permit (take of water from contaminated land for dewatering at Terminal Pump Station) (Section 14 of RMA)
- Coastal Permit and Discharge Permit (Outfall pipeline - placement and disturbance of seabed and foreshore and discharge of contaminants) (Sections 12 and 15 of RMA)

   Operational Resource Consents

- Coastal Permit (Outfall pipeline - occupation of seabed and foreshore) (Section 12 of RMA).
- Discharge Permit (Outfall pipeline - discharge of treated wastewater) (Section 15 of RMA).
- Discharge Permit (Terminal Pump Station discharge of contaminants to air) (Section 15 of RMA).
- Discharge Permit (Wastewater Treatment Plant (WWTP) discharge of contaminants to air) (Section 15 of RMA).
- Land Use Consent (WWTP storage of wastewater) (Section 9(2) of RMA).

2. **The names and addresses of the owners and occupiers of the land to which the application relates are as follows:**

- The Crown - Akaroa Harbour Foreshore and Seabed
- Christchurch City Council, PO Box 237, Christchurch

3. **The locations of the proposed activities are as follows:**

- Akaroa Harbour Foreshore and Seabed from Childrens Bay to a point, 2.5km (approximately) in Akaroa Harbour.
- WWTP-Old Coach Road, Akaroa legally described as Lot 3 DP 459704 (Identifier 604498)
- Terminal Pump Station, Jubilee Park, Akaroa legally described as Lot 1 DP 79110 (CT45A/1127)

4. **The following additional land use resource consents are needed for the proposed activity and have been applied for to the Christchurch City Council:**

- The construction operation, operation and maintenance of a Terminal Pump Station (Section 9(3)).
- The construction operation, operation and maintenance of a Wastewater Treatment Plant (WWTP) (Section 9(3)).
- Disturbance of contaminated land under National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Regulations 2011 (NES) in respect of the Terminal Pump Station site and associated pipeline (Section 9(1)).

5. **I attach, in accordance with the Fourth Schedule of the Resource Management Act 1991, an assessment of environmental effects in detail that corresponds with the scale and significance of the effects that the proposed activities may have on the environment.**

   See attached Report: *Akaroa Wastewater Scheme Upgrading-Resource Consents Application and Assessment of Effects on the Environment*

6. **I attach, any information required to be included in this application by the district plan, the regional plan, the New Zealand Coastal Policy Statement 1994, the Resource Management Act 1991, or any regulations made under that Act.**

   See attached Report: *Akaroa Wastewater Scheme Upgrading-Resource Consents Application and Assessment of Effects on the Environment*

……..

Signature of applicant or person authorised to sign on behalf of applicant

……..

Date

Address for service of applicant:

CH2M Beca Ltd
PO Box 13960
Christchurch 8141

Telephone No: 03 374 3156

Attention: Graeme Jenner

Form 9

Application for Resource Consent under section 88 of the Resource Management Act 1991

To: **Christchurch City Council**

From: **Christchurch City Council**

7. **I, Christchurch City Council, apply for the following type of resource consents:**

Land use resource consents sought are described in the attached AEE and relate to the upgrading of the Akaroa wastewater Scheme. In summary, they are for:

- The construction operation, operation and maintenance of a Terminal Pump Station (Section 9(3) of RMA).
- The construction operation, operation and maintenance of a Wastewater Treatment Plant (WWTP) (Section 9(3) of RMA).
- Disturbance of contaminated land under National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Regulations 2011 (NES) in respect of the Terminal Pump Station site and associated pipeline (Section 9(1) of RMA).

8. **The names and addresses of the owners and occupiers of the land to which the application relates are as follows:**

Christchurch City Council, PO Box 237, Christchurch

9. **The locations of the proposed activities are as follows:**

WWTP-Old Coach Road, Akaroa legally described as Lot 3 DP 459704 (Identifier 604498)

Terminal Pump Station, Jubilee Park, Akaroa legally described as Lot 1 DP 79110 (CT45A/1127)

10. **The following additional regional resource consents are needed for the proposed activity and have been applied for to Environment Canterbury:**

Construction Resource Consents

- Water Permit (take of water from contaminated land for dewatering)
- Coastal Permit and Discharge Permit (Outfall pipeline - placement and disturbance of seabed and foreshore and discharge of contaminants)

Operational Resource Consents

- Coastal Permit (Outfall pipeline - occupation of seabed and foreshore)
- Discharge Permit (Outfall pipeline - discharge of treated wastewater)
- Discharge Permit (Terminal Pump Station - discharge of contaminants to air)
- Discharge Permit (Wastewater Treatment Plant (WWTP) - discharge of contaminants to air)
- Land Use Consent (WWTP storage of wastewater)

11. **I attach, in accordance with the Fourth Schedule of the Resource Management Act 1991, an assessment of environmental effects in detail that corresponds with the scale and significance of the effects that the proposed activities may have on the environment.**

See attached Report: *Akaroa Wastewater Scheme Upgrading-Resource Consents Application and Assessment of Effects on the Environment*

12. **I attach, any information required to be included in this application by the district plan, the regional plan, the New Zealand Coastal Policy Statement 1994, the Resource Management Act 1991, or any regulations made under that Act.**

See attached Report: *Akaroa Wastewater Scheme Upgrading-Resource Consents Application and Assessment of Effects on the Environment*

……..

Signature of applicant or person authorised to sign on behalf of applicant

……..

Date

Address for service of applicant:

CH2M Beca Ltd
PO Box 13960
Christchurch

Telephone No: 03 374 3156

Attention: Graeme Jenner

Assessment of Environmental Effects

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1 Introduction

1.1 Background

Christchurch City Council (CCC) is making application for resource consents for the construction and operation of the upgraded Akaroa Wastewater Scheme. This new scheme will largely replace the existing system which provides for the conveyance of raw wastewater from north to south through the township of Akaroa via three pump stations to the existing Wastewater Treatment Plant (WWTP) site at the end of Beach Road and result in an improved wastewater quality. The existing WWTP provides screening, primary, secondary and tertiary treatment of wastewater with discharge via a short outfall into Redhouse Bay, Akaroa Harbour.

The existing WWTP is located at Takapuneke Reserve. Consultation with the local community through the Akaroa Wastewater Working Party, as well as Ōnuku Rūnanga, has identified significant historical and cultural values associated with the Takapuneke Reserve site. The Akaroa Wastewater Working Party was established to consider the status of the existing treatment plant and options for a new plant including discharge options. As a result of this consultation, CCC is proposing to relocate the WWTP and discharge point to alternative sites.

Several studies were carried out in conjunction with Working Party. The reports prepared following these studies included:

- *Akaroa Wastewater Treatment & Disposal* (February 2010) by Harrison Grierson, EcoEng & Golder Associates
- *Akaroa WWTP – Location Options Study* (October 2011) by Harrison Grierson
- *Akaroa WWTP – Concept Design Report* (May 2012) by Harrison Grierson.

The project to upgrade the Akaroa WWTP was approved for implementation by Christchurch City Council at a meeting on 8 December 2011.

At that meeting CCC resolved that:

(a) The Akaroa Wastewater Working Party be thanked for its valuable work over the last three years.

(b) A replacement wastewater treatment plant for Akaroa be located away from Takapuneke Reserve, and that staff discuss siting options with the Ōnuku Rūnanga and community, and report back to the Council within six months on suitable potential sites.

(c) The outfall for the treatment plant be re-located to the middle of the Akaroa Harbour and that consideration be given to measures to address cultural concerns, in consultation with Ngāi Tahu.

(d) The new treatment plant be designed to produce wastewater that achieves the best quality wastewater available at the time, and that the design of the plant enable the potential future beneficial re-use of treated wastewater for domestic, commercial or agricultural purposes.

(e) Should suitable land become available, a land irrigation trial be costed and presented to the Council for consideration.

(f) Environment Canterbury be advised of the working party outcomes adopted by the Christchurch City Council.

Following the Council resolution, CCC commissioned a concept design report on the proposed new wastewater scheme. That report (Harrison Grierson, 2012), considered two WWTP sites: one near the coast, approximately 5km south of Akaroa and one to the north of Akaroa located adjacent to the intersection of Long Bay Road/Old Coach Road at approximately 110m elevation.

From the outcome of the site studies and subsequent public consultation, CCC selected the North Akaroa site as the location for the new WWTP. This site is zoned Rural in the Banks Peninsula District Plan and the proposed WWTP is subject to rules relating to “utilities”. The report also determined a new outfall discharge point.

CCC have since subdivided and purchased the new WWTP site. A new 250m^3 treated water reservoir serving Takamatua is also proposed to be constructed at this site under the separate Akaroa Water Project, prior to construction of the WWTP.

The location of the existing WWTP and associated outfall, trunk main and pump stations and the new WWTP and associated outfall, trunk main and pump stations is shown in Figure 1-1.

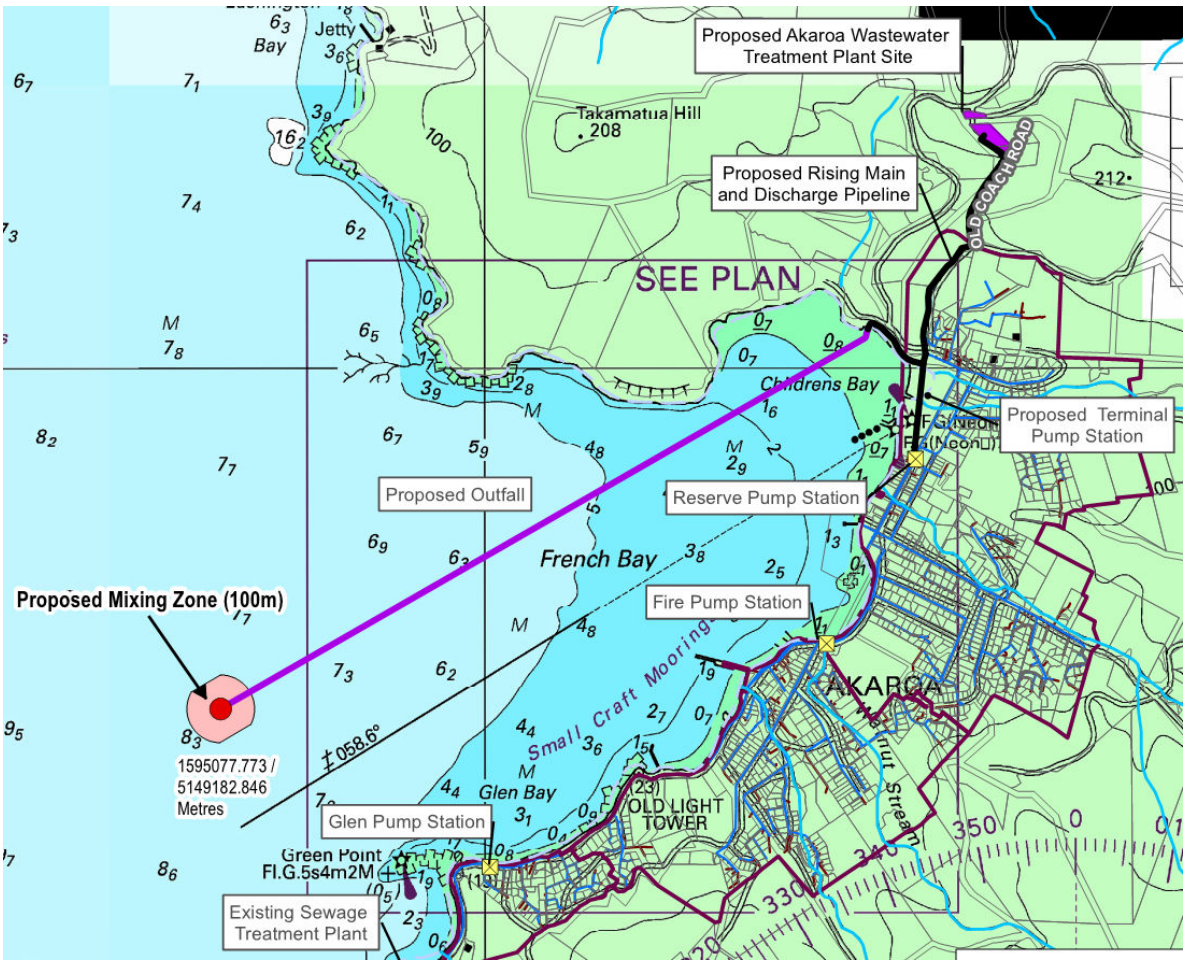

Figure 1-1 Location Plan

1.2 Key Project Objectives

The key objectives of the Akaroa Wastewater Scheme Upgrade are:

- To treat wastewater to a high standard, commensurate with the ecological, social, cultural, recreational and commercial importance of Akaroa Harbour, and which allows the potential for some future discharge to land
- To obtain resource consents for the scheme that are realistic and able to be complied with
- To deliver a wastewater scheme at the lowest whole-of-life cost, which is compliant with its consents, is reliable and easy to operate.

1.3 Purpose of AEE Report

The purpose of this report is to provide an Assessment of Effects on the Environment (AEE) to accompany resource consent applications for the proposed activities, in accordance with section 88 and Schedule 4 of the Resource Management Act 1991 (the RMA).

1.4 Structure of AEE Report

Volume One of this report describes the nature of the existing and proposed activities, the environment within which the proposed activities will occur, the alternatives investigated, consultation undertaken, and the assessment of effects process, mitigation and outcomes. The proposed activities are then assessed against the relevant planning and statutory requirements and consent conditions are proposed to monitor the activities and minimise any adverse environmental effects. Appropriate references are provided, together with a list of abbreviations and a glossary of terms.

Several key technical reports have been prepared as inputs to the AEE including:

- *Akaroa Wastewater Preliminary Design Report* (CH2M Beca Ltd, 2014)
- *Akaroa Harbour Modelling Report* (NIWA Ltd, 2014)
- *Water-Related Health Risks Analysis for the proposed Akaroa Wastewater Scheme* (NIWA Ltd, 2014)
- *Baseline Ecological Survey for Proposed Akaroa Wastewater Outfall* (Cawthron Institute, 2014)
- *Preliminary Site Investigation (Contamination), Akaroa Wastewater Terminal Pump Station* (CH2M Beca, 2014)
- *Akaroa Wastewater Treatment Plant and Reticulation System - Odour Effects Assessment* (CH2M Beca, 2014).

These and other technical reports have been referenced in the preparation of this AEE and, where appropriate, these have been appended in Volume Two (Appendices).

1.5 Existing Consents

CCC has consent to continue to discharge effluent from the existing WWTP until June 2020. However, the target programme is for completion of the Akaroa Wastewater Scheme Upgrade project in mid-2019 which aligns with CCC's Long Term Plan. A copy of the existing consent (CRC133179) is attached in Appendix A.

1.6 Summary of Proposed Upgrading

The proposed upgrading work will consist of the following:

- Redevelopment of the Akaroa wastewater network, including replacement of the existing pipeline network, upgrading of the existing pump stations, and construction of a new Terminal Pump Station to pump flows north through the Township to the new treatment plant.
- The Terminal Pump Station will be located in the Akaroa boat/trailer park, and will incorporate fine screens and grit removal, to protect the progressive cavity pumps and to provide primary treatment.
- A new biological nitrogen removal (BNR) membrane wastewater treatment plant located at the site on Old Coach Road, providing a higher quality treated wastewater. The treatment process will likely be the Modified Ludsak-Ettinger (MLE) process, although other alternatives proposed by tenderers will be considered. Solids separation and disinfection will be provided by membrane filtration. High flows will bypass the main treatment process, and will receive UV disinfection before being discharged into the outfall pipe.
- Treated wastewater from the new treatment plant will flow by gravity in a new polyethylene discharge pipeline along Old Coach Road to the terminus of a new harbour outfall at Childrens Bay.
- A new 2.5km long polyethylene harbour outfall will extend from Childrens Bay, with a diffuser located at 9.5m depth to Mean Sea Level (MSL). The outfall will be pressurised (i.e. not vented to atmosphere at the terminus) and will be fitted with a de-aeration chamber to minimise air lock risks.

1.7 Main Benefits from Upgrade

The main benefits from the upgrading works will be:

- Removal of the existing WWTP from the culturally sensitive Takapuneke Reserve site
- A reduction in the frequency, duration and volume of overflows from the wastewater network
- A reduction in the public health risks from human contact with treated wastewater
- An improvement in harbour water quality and the marine environment
- An increase in the capacity of the wastewater system
- Provision for the future growth of Akaroa Township.

1.8 Consents Sought

CCC is applying for a number of consents which are summarised below in Table 1-1 and Table 1-2.

Table 1-1 Section 9 RMA and NES Activities - Christchurch City Council

Activity	RMA Classification	Zoning	District Plan Rules	Location	Classification
1.Pipeline					
HAIL Site – Earthworks in the vicinity of Terminal Pump Station	S9	Recreational Reserve	NES Reg 7 and 9	Sheet 8 Chain 3160	Discretionary
2.Terminal Pump Station and Pumping Stations					
Terminal Pump Station	S9	Recreational Reserve-Utilities	Chapter 36 Rule 4	Sheet 8 Chain 3160	Restricted Discretionary
HAIL Site -Terminal Pump Station	S9	Recreational Reserve	NES Reg 7 and 9	Sheet 8 Chain 3160	Discretionary
3. WWTP					
WWTP	S9	Rural-Utilities	Chapter 36 Rule 4	WWTP Concept Layout Plan; drawing reference 6151786-GE-040	Restricted discretionary
4.Temporary Construction Management Areas					
Use of land for TCMA's TBC	s9(3)	Mixed	Various	To be confirmed	To be confirmed

Table 1-2 Sections 9 and 12-15 of RMA Activities - Environment Canterbury

Activity	RMA classification	NRRP	pLWRP	RCEP	Location	Classification
1.Pipeline in CMA						
Excavating, drilling, or tunnelling in the foreshore and or seabed Construction activity	s12	NA	NA	Rule 8.2	Outfall Pipeline Sheet 9	Discretionary
Discharge during construction Construction activity	S15	NA	NA	Rule 7.2	Outfall Pipeline Sheet 9	Discretionary
Placement of pipeline in, on, under, or over any foreshore	S12	NA	NA	Rule 8.3	Outfall Pipeline Sheet 9	Discretionary
Destruction, damage or disturbance Construction activity	S12	NA	NA	Rule 8.7	Outfall Pipeline Sheet 9	Discretionary
Occupation of the Coastal Marine Area Operation activity	S12	NA	NA	Rule 8.23	Outfall Pipeline Sheet 9	Discretionary
Discharge of treated wastewater Operation activity	S15	NA	NA	Rule 7.3	Outfall Pipeline Sheet 9	Discretionary
2. Terminal Pump Station						
Groundwater take dewatering from contaminated site (includes pipeline in proximity to Terminal Pump Station) Construction activity	S14	Rule WQN4	Rule 5.119 and 5.120	NA	Terminal Pump Station Sheet 8 Chain Length 3160	Restricted Discretionary
Discharge to air from Terminal Pump Station	S15	Rule AQL69	NA	NA	Terminal Pump Station Sheet 5 and 8 Chain length:1780 and 3120-3140	Discretionary

Activity	RMA classification	NRRP	pLWRP	RCEP	Location	Classification
3.WWTP						
Use of land for storing wastewater Operational activity	s9	Rule WQL26	Rule 5.84	NA	WWTP-Old Coach Road	Discretionary
Discharge to Air from WWTP	S15	Rule AQL69	NA	NA	WWTP-Old Coach Road	Discretionary
4.Temporay Construction Management Areas						
Discharges from TCMA's	S15	Various	Various	Various	To be confirmed	To be confirmed

2 Description of Existing Wastewater Scheme

2.1 History of Scheme

The existing Akaroa WWTP is located at Redhouse Bay, approximately 2km south of the Akaroa Township. A WWTP has been located on the site since the 1960s and a discharge to the harbour has been authorised by a successive number of permits under both the Water and Soil Conservation Act (1967) and the Resource Management Act (1991).

Coastal permit CRC920822 was granted to Banks Peninsula District Council in August 1994 and contained conditions setting wastewater discharge standards. An ultraviolet light (UV) disinfection system was installed in 1996, which reduced the concentration of microorganisms by 1-2 log. However, its efficiency was observed to reduce during the summer peak loading period (MWH, 2012).

Coastal permit CRC971242 was granted in 1998 for a period of 10 years. This consent expired in June 2007 and the CCC (post-merger with Banks Peninsula District Council) applied for new consents. A short-term consent (5 years duration) was subsequently granted to enable CCC to undertake investigations into the long term options for wastewater management at Akaroa. The consent expired in July 2013 and CCC successfully applied for a new consent CRC133179 with a term of seven years (expires 2020) (see Appendix A for a copy). This consent was granted on the basis that a new WWTP and outfall would be consented, designed, built and commissioned by the end of that period.

2.2 Wastewater Conveyance

The existing Akaroa wastewater scheme is made up of three catchments, with the wastewater from each flowing by gravity to a pump station. The pump stations are in a “daisy chain” arrangement, connected by a pressure pipeline which runs along Rue Jolie and Beach Road, with the Reserve Pump Station pumping to the Fire Station Pump Station, which pumps to the Glen Pump Station, which pumps to the Akaroa WWTP. The existing pump stations are generally underground and occupy a footprint of approximately 1.8m x 3m.

A schematic of the existing wastewater scheme is shown in Figure 2-1.

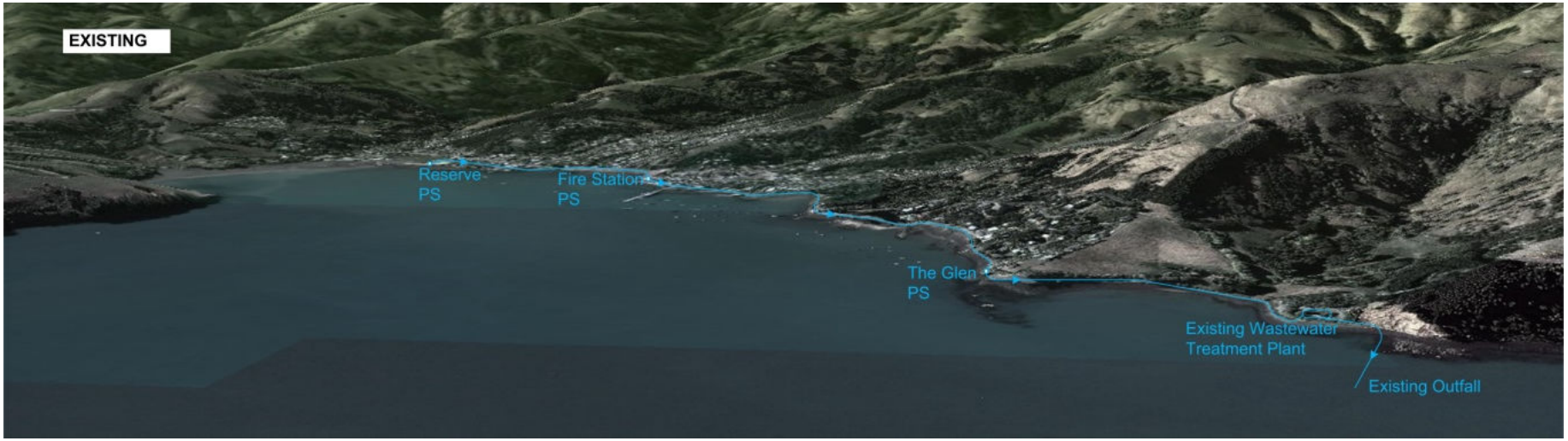

Figure 2-1 Schematic of the Existing Wastewater Scheme

2.3 Wastewater Treatment

The existing Akaroa WWTP provides for primary, secondary and tertiary (disinfection) treatment, and consists of the following consecutive stages:

- **Inlet Screen**: Wastewater from Akaroa is pumped from the Glen Pump Station to a 3mm aperture spiral screen.
- **Imhoff Tanks**: The flow of screened effluent is evenly split to the two Imhoff Tanks in the flow balancing/splitting tank. Suspended solids settle out of the effluent and are stored and anaerobically digested in the bottom of the Imhoff Tanks.
- **Trickling Filter:** Effluent from the Imhoff Tanks flows to the trickling filter inlet chamber, where it combines with recycled trickling filter effluent. The combined flow gravitates to the trickling filter and the effluent is treated by biological processes within the filter rock media.
- **Clarifier:** Effluent which is not recycled back to the Trickling Filter flows to a secondary clarifier where biological solids from the trickling filter are allowed to settle out.
- **UV Disinfection:** Clarified effluent flows from the clarifier to the UV disinfection system which reduces the concentration of potentially harmful micro-organisms in the wastewater using UV irradiation.

2.4 WWTP Design Parameters

The raw wastewater treated by the existing Akaroa WWTP is from predominantly domestic and a few commercial sources (e.g. hotels, pubs, restaurants, petrol station etc.). There is likely to be some trade waste discharges from these facilities reaching the WWTP. Other than the petrol station, the waste from these commercial facilities is unlikely to contain any significant contaminants of concern, hazardous substances or persistent organic pollutants.

WWTP design parameters are shown in Table 2-1.

Table 2-1 Akaroa Wastewater Treatment Plant Design Parameters

Parameter	Design Capacity
Population served (PE)	3,820
Average daily BOD_5 load (summer) (kg/day)	270
Average daily dry weather flow (m^3/day)	955
Maximum daily flow (m^3/day)	2,376
Consented maximum daily flow (m^3/day)	3,000

2.5 Treated Wastewater Disposal

The treated wastewater is discharged by gravity into the Akaroa Harbour via an open-ended, 160mm diameter, single port outfall pipeline that extends approximately 100m into Redhouse Bay. During periods of high flow and/or high harbour water level, a booster pump located in a wet well downstream of the UV system is automatically activated to pump wastewater through to the outfall. Should an overflow occur from the pump stations or WWTP, raw wastewater can overflow directly into the nearby streams and/or coastal marine area.

2.6 Compliance with Existing Consent

2.6.1 Discharge Volumes

Hydraulic flow through the WWTP varies with the inflow to the plant, which exhibits a seasonal pattern, reflecting the influx of holidaymakers over the summer period, and peaking around 1 January. While no overflows have been recorded from the WWTP since 2006, there have been some minor overflows from the reticulation which have been reported to Environment Canterbury (ECan) when they occurred.

The discharge limit on the existing consent is 750 cubic metres per day except during rainfall events of 50 millimetres or more over three consecutive days where flow may not exceed 3,000 cubic metres (m^3) per day. There were two minor exceedences of the 3,000 cubic metres consent guideline (3,019 and 3,018m^3 in August 2012) as a result of significant rainfall of close to 200mm in one day. On a number of other occasions, flow has exceeded 750m^3 but when compared against rainfall levels for these periods, these exceedances have corresponded with periods of greater than 50mm of rainfall.

2.6.2 WWTP Performance

The performance of the WWTP was summarised by MWH (2012) and shows that it is seasonally variable due to the significant population increases over the Christmas holiday period and to a lesser degree other key holiday periods. The faecal coliforms, total suspended solids (TSS) and biological oxygen demand (BOD) concentrations in the treated wastewater peak over these periods in response to higher flows and loads. However monitoring shows that these key concentrations generally remain within the limits set by the previous and current consent conditions.

Nutrient and heavy metal concentrations in the treated wastewater discharge are within expected levels for domestic treated wastewater discharges and are not required to meet any limits. In general, treated wastewater discharged from Akaroa WWTP complies with the consent limits.

2.7 Effects on Environment

The presence of the existing WWTP at the Takapuneke Reserve and discharge of treated wastewater from the WWTP to Akaroa Harbour is recognised as having adverse impacts on the cultural values of Ōnuku Rūnanga. However, long term water quality monitoring around the outfall and in the wider harbour indicates that there are no significant adverse environmental effects as a result of the discharge (MWH, 2012). The intertidal and benthic environment around the outfall does not show any signs of adverse effects which can be attributed to the discharge. MWH considers that based on the results of historical monitoring data, the risks to public health from swimming at the Akaroa Main Beach, as a result of the discharge, are low.

The existing WWTP provides significant social and economic benefits to the community that rely on an efficient and effective wastewater scheme to protect public health, business and tourism.

3 Description of Receiving Environment

3.1 Overview

Akaroa Township is located on a wide bay on the eastern side of the Akaroa Harbour. The permanent population is approximately 600 people but this number grows significantly over summer to approximately 3000 people. The proposed components of the scheme are generally located within the existing township boundaries, except for the start of the pipeline at Beach Road, the WWTP located at Old Coach Road and the outfall pipeline in Akaroa Harbour. Akaroa is Maori for long harbour and the harbour can be described as a tidal inlet which is almost 17km long with an area of 44km^2.

3.2 Climate

Overview

The climate of Akaroa is temperate and varies slightly to that of nearby Christchurch, where the closest NZ Meteorological Service station is located. Mean annual rainfall between 1969 and 1998 was 635mm (Taylor, 2003 cited in MWH, October 2006).

Winds

NIWA (2014) investigated wind direction and speed as part of the development of the harbour hydrodynamic model. The Akaroa Environmental Weather Stations (EWS) wind dataset spans almost 5 years, having been established in November 2008. However, the outputs from the NIWA 12km resolution EcoConnect climate model of Banks Peninsula (1 year of data for 2013) and the new 1.5km high-resolution EcoConnect model outputs show that winds within Akaroa Harbour basin are strongly influenced by local topography of the surrounding hills and valleys. Winds measured during the 1-month acoustic Doppler profiler (ADP) current-meter deployment are shown in windroses (see Figures 2.2-2.4 of the Akaroa Harbour Modelling Report (NIWA, 2014a) in Appendix B).

The wind-frequency rose from the elevated CCC weather station at the proposed WWTP site (which approximately matches with the finer 1.5km EcoConnect grid output for that location) suggests that winds offshore in the Harbour mainly exhibit an approximate northeast - south-southwest direction, approximately down the axis of the Harbour. This was also the pattern found by Heuff et al. (2005) from a wind station temporarily deployed in 1998 at the southern end of Wainui Bay.

Winds from the east or west quarters are diminished by the sheltering effect of the surrounding terrain, but also include local effects from air drainage down adjacent valley systems. Most of the stronger storms have been associated with southerlies and tend to be more frequent in winter.

The observed flows suggest that drainage flows and land breezes have a significant influence on air flows during low wind speed conditions, such as those observed at the Akaroa EWS. The highest proportion of low wind speeds have been recorded during north easterly winds.

Winds at WWTP site

Winds in the vicinity of the WWTP are expected to be influenced by the channelling effect of the surrounding hills. During cool evenings and low speed conditions, the meteorological monitoring data shows that during these conditions wind flows follow the direction of the gully to the south of the WWTP site and flow down towards Childrens Bay.

Meteorological monitoring has been conducted at the Akaroa EWS monitoring station which has been operated since November 2008. The station is located approximately 1.9km to the south of the WWTP site close to French Bay at an elevation of 45m above sea level. A summary of the distribution of hourly average wind speed and wind direction measured at the station for the five year period between January 2009 and December 2013 is shown in Figure 3-1. This shows a high proportion (approximately 48%) of speeds measured at the station are less than 1.5m/s. The highest proportion of these low wind speeds have been recorded during easterly winds. The predominant wind directions when wind speeds are above 1.5m/s occur from the south west and also from the north east. During these hours, wind flows are approximately parallel to the coast line.

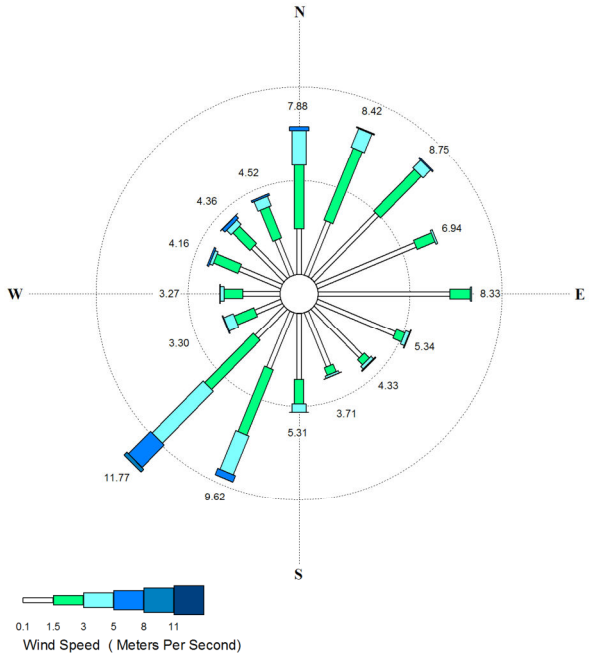

Figure 3-1 Wind speed (m/s) and wind direction distribution measured at the Akaroa WWA meteorological station January 2009 – December 2013

Figure 2-5 in the appended Akaroa Wastewater Treatment Plant and Reticulation System - Odour Effects Assessment (CH2M Beca, 2014) shows day time (8am to 6pm) and night-time (6pm to 8am) winds for the same time period. The figure clearly shows the influence of sea breezes during the day. The wind roses indicate that the surrounding terrain and the monitoring station's location in relation to the coast have a significant effect on local wind flows.

CCC established a short term meteorological monitoring station at the WWTP site and the results between 13 November and 18 December 2013 are shown in Figure 3-2. The meteorological monitoring data shows a high proportion of low winds occur from the north. The observed flows similarly suggest that drainage flows and land breezes have a significant influence on air flows during low wind speed conditions, such as those observed at the Akaroa EWS. It is expected that the average wind speed at the proposed WWTP site will be higher than the average wind speed measured at the Akaroa climate station, due to its more elevated and exposed location.

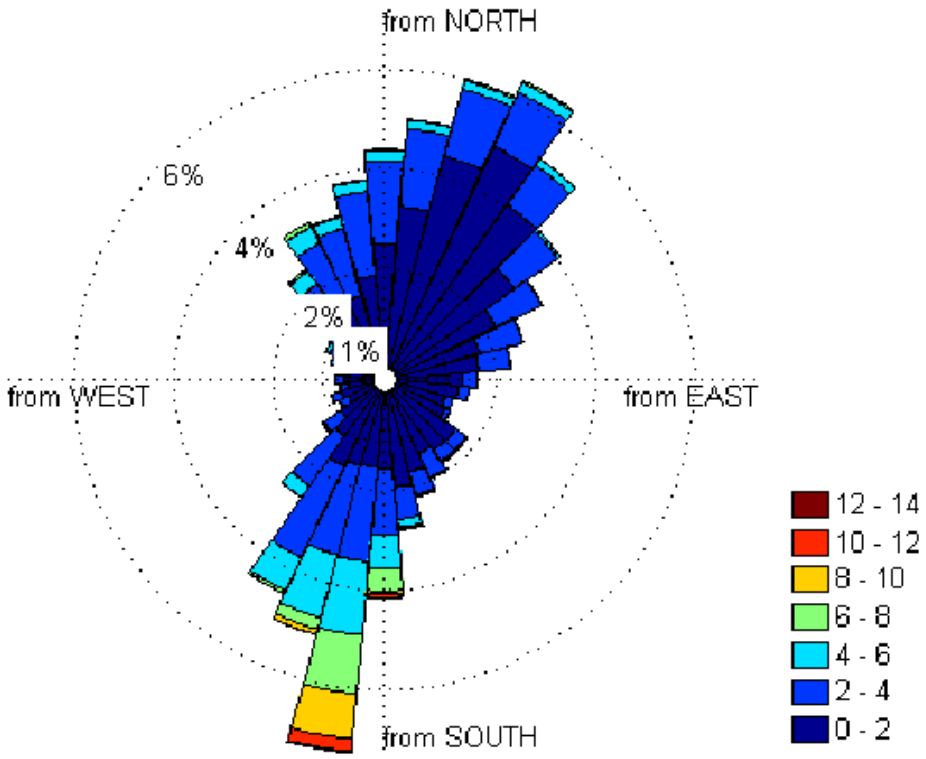

Figure 3-2 Christchurch City Council Weather Station 13 November - 18 December 2013 (from NIWA, 2014).

Worst case dispersion conditions for discharges from the WWTP are expected to occur during cool night time and early daytime conditions when winds speeds are low and the atmosphere is highly stable. The meteorological monitoring data suggests that during these conditions wind flows are likely to follow the direction of the gully to the south of the WWTP site and flow down towards Childrens Bay.

3.3 Pipeline Route

Drawings 6517986-CE-001 to CE-010 in Appendix C shows the pipeline route. The section of pipeline from its start to the Reserve Pump station largely follows the existing pipeline route and will be installed by “slip lining” or “pipe bursting” the existing pipeline (refer Section 4 of AEE). The first section of pipeline route is along Beach Road which adjoins the harbour. The coastline adjoining the road makes up the inner shores of the Akaroa Harbour and generally consists of alternating sandy/muddy bays interspersed between rocky headlands. From the existing WWTP to Stanley Place vicinity, the road traverses alongside the harbour through rural grazing land. From Stanley Place to the commercial area of Akaroa residences generally adjoin the road on the south side. The pipeline crosses over Alymers Stream by burial in the road over the Alymers Stream Bridge. The bridge is identified in Appendix IV of the BPDP as a Protected Building/Object.

The pipeline continues along Beach Road through the commercial centre and past residences before turning north to Rue Jolie in the vicinity of the War Memorial and Rue Balguerie. The pipeline crosses over the Balguerie Stream Bridge to the Reserve Pump Station at Jubilee Park. It then proceeds across the park over the Grehan Stream (south branch) Bridge to the proposed Terminal Pump Station which will be located in the boat/trailer park. Jubilee Park is used for a variety of sporting activities and includes a mini golf course, a recreation ground, tennis courts, croquet green,

skate park and vehicle, boat and trailer storage areas and launching ramp. From the Terminal Pump Station the pipeline will cross over the Graham Stream (north branch) Bridge and up Old Coach Road to the proposed WWTP. Land in the vicinity of Old Coach Road is generally rural grazing with some dwellings. The outfall pipeline from the WWTP proceeds down Old Coach Road to Childrens Bay and then to the harbour outfall (refer to Section 4.6 of the AEE).

As indicated above the proposed pipeline route crosses four streams which drain the hillsides above Akaroa Harbour. These streams are mostly short (less than 4km in length from headwaters to the ocean), with steep catchments consisting of a mixture of native forest, pasture and residential areas. In the lower reaches of each stream, water quality is affected by runoff from roads and urban activities. Waterways on Banks Peninsula are typically rain-fed, are subject to rapid flow recession, and some may be seasonally dry. Banks Peninsula waterways also typically have long periods of low flow, low base flows and infrequent large floods of short duration, with higher flows occurring in winter when precipitation is higher. The affected streams exit to the beaches of Glen Bay, French Bay and Childrens Bay.

The widths of streams where crossed by the bridges are generally 2-4 m in width with stony/sandy beds and some riparian vegetation. There will not be any work in the beds of the streams as the pipeline will be buried in the seal of the existing roads that cross the bridges.

While Akaroa has a significant history of Maori and European settlement there are no recorded sites of heritage or archaeological importance directly affecting the route according to the New Zealand Historic Places Trust 'Register of Historic Places, Historic Areas, Wahi Tapu and Wahi Tapu Areas', the BPDP, and ECan Canterbury Maps GIS viewer except the Beach Road Bridge referred to above. The pipeline will be buried in the seal of the road that crosses this bridge. Small sections of the pipeline are located in Silent File Areas 27 and 28 of the BPDP.

Schedule 101 of the Ngāi Tahu Settlement Act 1998 does identify a Statutory Acknowledgement for Te Tai O Mahaanui (Selwyn – Banks Peninsula Coastal Marine Area). It includes the coastline of Akaroa Harbour which some of the pipeline will be located in. The Statutory Acknowledgement refers to the association of Ngai Tahu with the coastline. A Statutory Acknowledgement is an instrument created as part of the Deed of Settlement signed by the Crown and Ngāi Tahu on 21 November 1997 to achieve a final settlement of Ngāi Tahu's historical claims against the Crown under the Ngāi Tahu Claims Settlement Act 1998. A consent authority must have regard to a statutory area in forming an opinion in as to whether Te Rūnanga o Ngāi Tahu is a person who may be adversely affected by the granting of a resource consent for activities affecting the statutory area.

A consent authority must have regard to the statutory acknowledgement relating to a statutory area in forming an opinion in as to whether Te Rūnanga o Ngāi Tahu is a person who may be adversely affected by the granting of a resource consent for activities within, adjacent to, or impacting directly on, the statutory area.

Utilities in roads such as underground pipes are generally permitted in the BPDP (See Section 5 of the AEE).

Geotechnical investigations have not been carried out along the proposed pipeline routes. Based on published geological information, ground conditions are expected to comprise engineered and/or un-engineered fill overlying colluvium and/or loess. Locally, the Akaroa Volcanic Group bedrock may be encountered relatively close to, or at, ground level. The Akaroa Volcanic Group is likely to be variable in terms of strength and weathering, varying between competent basalt to highly

weathered breccia and pyroclastic material. Groundwater is likely to be shallow (in the order of up to 2m below ground level).

3.4 Terminal Pump Station Site

3.4.1 Overview

The proposed Terminal Pump Station is sited within the Akaroa boat/trailer park at Jubilee Park and will pump wastewater to the proposed WWTP at Old Coach Road. CCC considered a number of sites at the north end of Akaroa, before selecting the proposed site.

Figure 3-3 View of Proposed Terminal Pump Station Site

The boat/trailer park is located near the boat launching ramp located to the south west. The site of the Terminal Pump Station is located in the southeast corner of the boat/trailer park adjoining a mini golf course to the east. Figure 3-3 shows the proposed site immediately to the right of the parked boat in centre view.

Currently the site is occupied by approximately 15 marked car/ boat spaces. Currently there are approximately two or three trailers and boats in the spaces. The immediately adjoining area between the branches of the Grehan Stream contains a boat storage area for approximately 40 boats adjacent to the harbour which appears to be approximately 50% occupied; 8 marked spaces for vehicles and trailers; and a further approximately 12 marked vehicle spaces, giving a total of 60 car/boat parks. This area is used for long term storage as well as daily storage of trailers, particularly during summer.

There is further parking area on the south side of Grehan Stream (south branch) adjacent to the launching ramp. Twelve marked spaces are located outside the Community Pavilion and a further informal parking area adjacent to the harbour. The general area is therefore used for boat storage, trailer parking and vehicle parking and also provides easy access to the harbour for informal amenity visits.

There are two existing access points to the site off State Highway 75 and Rue Brittan. The existing bridges over the north and south branches of Grehan Street are weight-restricted bridges but both bridges are to be replaced as part of a separate project.

The site is located on reclaimed land, which partly consists of a former landfill, used for the dumping of general household waste from Akaroa from pre 1890s to the 1978. The site accordingly has been identified as a HAIL (Hazardous Activities and Industries List) site given the potential contamination from the landfill. The Preliminary Site Investigation (Contamination), Akaroa Terminal Pump Station report (CH2M Beca, 2014, attached as Appendix D) states that results of soil testing have not identified any contaminants above the adopted human health criteria for recreational landuse.

3.4.2 Legal Description

The site is contained in a fee simple title owned by the CCC. The site is legally described as Lot 1 DP 79110 and comprises part of the title contained in CB45A/1127 (attached as Appendix E) whose purpose is described as "Reclamation and Public Recreation". It is apparent that not all of Lot 1 has been reclaimed, with part of the title and legal road reserve still occupied by Akaroa Harbour.

3.4.3 Zoning of Site

The zoning of the subject site is identified in the BPDP as Recreational Reserve (RV) as shown in Figure 3-2. The site is also overlaid by the "Akaroa Historic Area" but the relevant provisions of the Area (Chapter 14-Rule 5) do not apply to the proposal as the length of the building is less than 20m and does not face a road boundary.

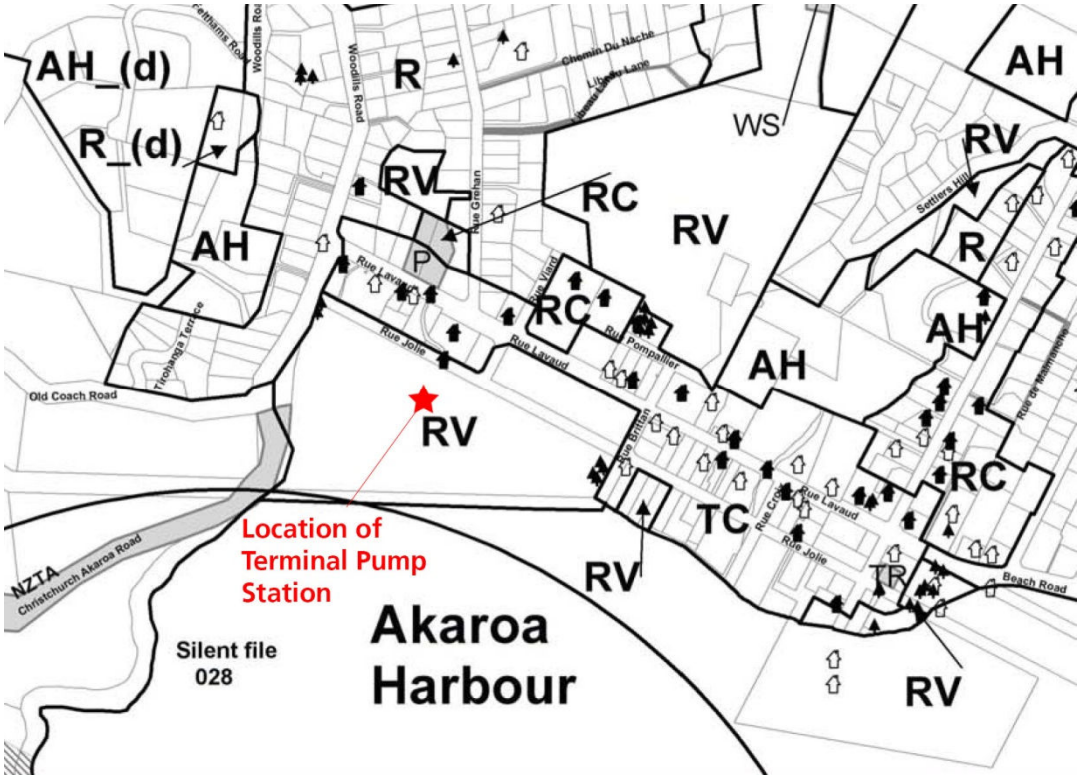

Figure 3-4 Zoning of Terminal Pump Station

3.4.4 Surrounding Land Use

As indicated above the site is located in vicinity to Jubilee Park which is used for a variety of sporting and community activities. These include a mini golf course and croquet lawn and tennis courts adjoining the site to the east and a skate park, community pavilion and recreation area to the south on the opposite side of Grehan Stream (south branch).

3.4.5 Cultural and Heritage Values

The subject site is located within the rohe of the Ōnuku Rūnanga.

As indicated above the Terminal Pump Station is located in the Statutory Acknowledgement for Te Tai O Mahaanui (Selwyn – Banks Peninsula Coastal Marine Area).

While Akaroa has a significant history of Maori and European settlement there are no recorded sites of heritage or archaeological importance (of either a Maori or Colonial nature) affecting the site according to the New Zealand Historic Places Trust 'Register of Historic Places, Historic Areas, Wahi Tapu and Wahi Tapu Areas', the BPDP, and ECan Canterbury Maps GIS viewer.

3.4.6 Surface Water

Grehan Stream (south branch) is located approximately 10m to the south of the site and Grehan Stream (north branch) approximately 70m to the north. Akaroa Harbour lies approximately 50m to the west.

3.4.7 Ecological Values

The BPDP and ECan Canterbury Maps GIS viewer does not identify any natural values within the site or surrounding area, which as indicated above is largely modified and reclaimed land.

Consequently, the ecological values of the environment are relatively low, given the degree of modification of the environment over time.

3.5 Wastewater Treatment Plant Site

3.5.1 Overview

The WWTP site is in a rural area and currently used for grazing of stock. It is located adjacent to Old Coach Road on a sloping site at 110m above sea level. Figure 3-5 shows the location of the WWTP site and surrounding environment.

The site lies beneath a steeply contoured slope with a south westerly aspect. To the north of the site lies a ridgeline which has been identified within the BPDP as a "Main Ridgeline".

The site is mostly in pasture, although there are existing patches of indigenous vegetation comprising kanuka and ngaio in the vicinity of the site. The ECan Canterbury Maps GIS viewer identifies the soil type as silt loam.

SH75 carries the majority of traffic into and out of Akaroa. Old Coach Road is generally used by local residents familiar with the route and visitors to holiday accommodation further along Old Coach Road (see Figure 3-5), and carries an average daily vehicle volume of 500-600 vehicles (obtained from 2007 CCC records).

3.5.2 Legal Description

The site is legally described as Lot 3 Deposited Plan 459704 and comprises 6,929m². The Certificate of Title is attached as Appendix E. The CCC subdivided the site in 2013 from a larger parent title with a view to utilising the site for Council utilities. The Certificate of Title identifies the purpose as a "wastewater treatment plant". CCC was granted resource consent in June 2014 to erect a water reservoir on the same site immediately to the south of the proposed WWTP (RMA92025138).

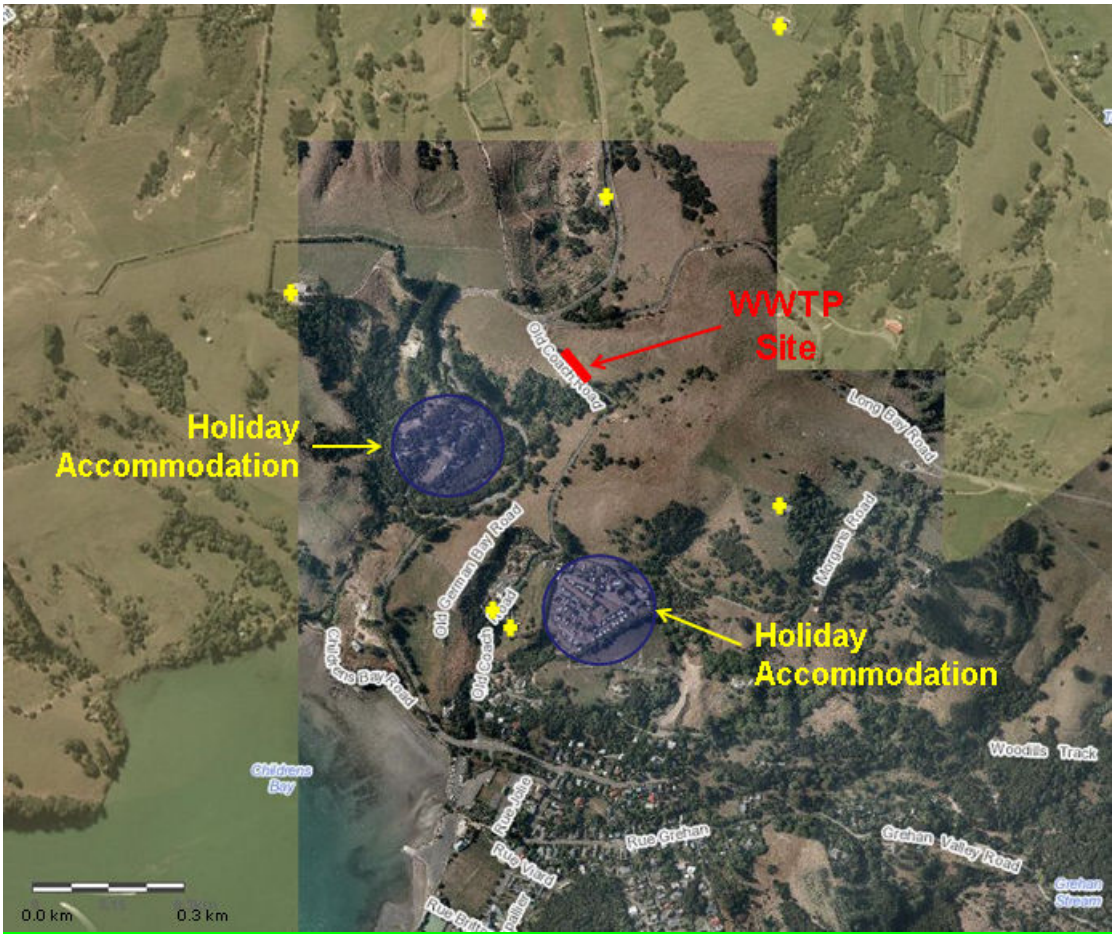

Figure 3-5 Location of the proposed WWTP and surrounding environment

3.5.3 Zoning of Site

The zoning of the subject site is identified in the BPDP as Rural. The site is shown on Planning Map R9 (refer Figure 4 below). As indicated on Planning Map R9 the site is located in a Silent File 27 area and the proximity of the “Main Ridgeline” is also identified.

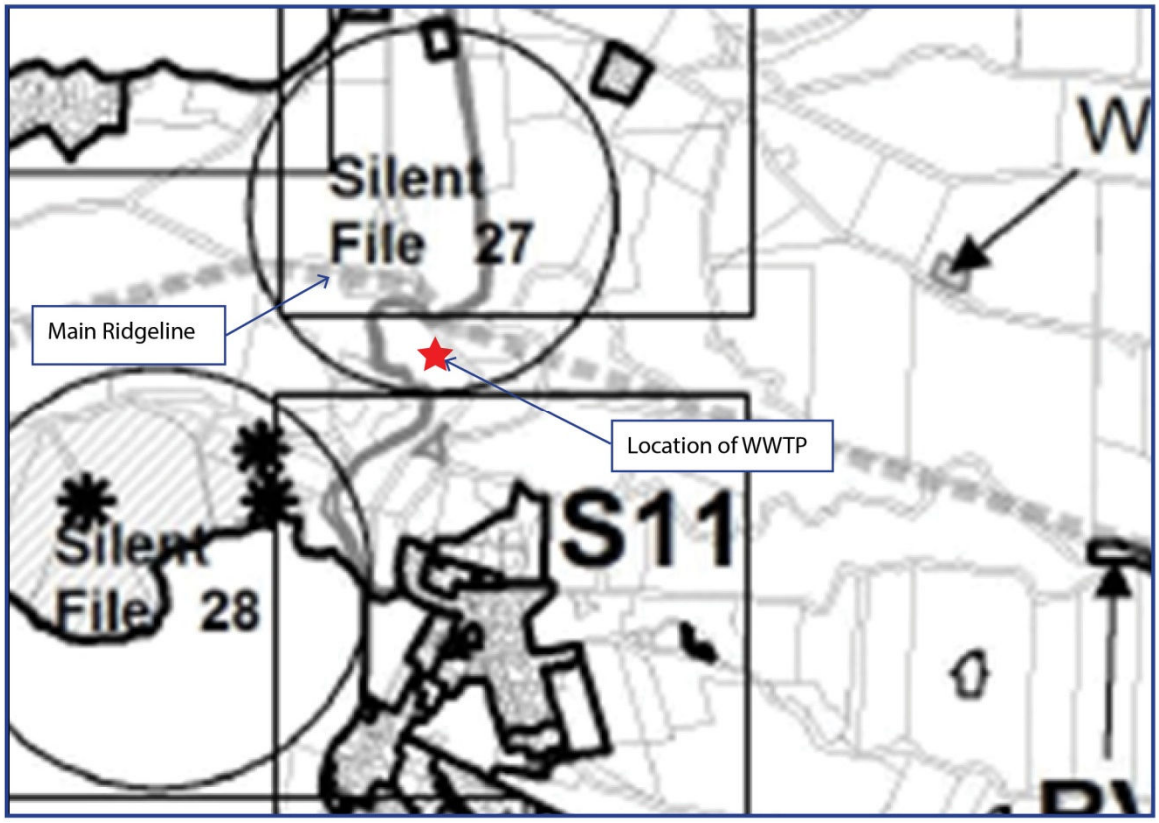

Figure 3-6 Zoning of WWTP Site

3.5.4 Surrounding Land Use

The surrounding area is predominantly in pasture used for grazing, although there are isolated stands of indigenous vegetation. The topography is generally steep.

There are a small number of residential dwellings located further down Old Coach Road with the closest residential property approximately 430m from the reservoir site. A Top 10 Holiday Park (camping ground) is situated approximately 400m to the south east of the site along Old Coach Road.

The Akaroa Township is located approximately 1.2km to the south of the site. The smaller settlement of Takamatua is located approximately 1.1km to the north of the site along SH75.

3.5.5 Cultural and Heritage Values

The subject site is located within the rohe of the Ōnuku Rūnanga.

As indicated above, the subject site is located within Silent File 27. Ōnuku Rūnanga have provided written correspondence that there are no issues with the use of the site for a WWTP. Ōnuku Rūnanga have requested cultural monitoring to take place during earthworks to ensure the protection of any wahi tapu values.

There are no other recorded sites of heritage or archaeological importance (of either a Maori or Colonial nature) in the area according to the New Zealand Historic Places Trust 'Register of Historic Places, Historic Areas, Wahi Tapu and Wahi Tapu Areas', the BPDP, and ECan Canterbury Maps GIS viewer.

3.5.6 Surface Water

The closest surface water body appears to be a tributary of the Takamatua Stream and is situated approximately 430m to the northeast of the site.

There are no other surface water bodies, water races, streams, or ponds in close proximity of the site.

3.5.7 Ecological Values

The BPDP and ECan Canterbury Maps GIS viewer does not identify any natural values within the site or surrounding area, which as indicated above is largely modified and in pasture.

Consequently, the ecological values of the environment are relatively low, given the degree of modification of the environment over time.

Figure 3-7 shows the existing site looking east from Old Coach Road. Figure 3-8 shows a view towards Akaroa from the proposed site.

Figure 3-7 View of proposed Akaroa WWTP site on Old Coach Road

Figure 3-8 View towards Akaroa from Proposed WWTP Site

3.5.8 Geology and Groundwater

The results of site geotechnical investigations have identified up to 8.3m of loess overlying completely to highly weathered basalt, breccia and tuff of the Akaroa Volcanic Group. Non-engineered fill up to 1.1m thick was identified along the Old Coach Road verge, predominantly comprising silt with variable gravel, sand, clay and organic content. Groundwater monitoring standpipes installed during the investigation identified groundwater between 8.0 and 9.8m below ground level. However, it is possible that groundwater levels may temporarily rise during or immediately after high rainfall events and would be expected to vary on a seasonal and annual basis.

3.6 Harbour Outfall

3.6.1 General Setting

MWH (2012) reports that Akaroa Harbour was formed by the collapse of the seaward margin of the southernmost crater that makes up the Banks Peninsula volcanic complex. The long narrow harbour is a tidal inlet almost 17km long (Heuff et al, 2005), with a maximum area of 44km^2 of which 2km^2 is exposed at low tide.. The axis of the harbour extends directly south, it has a maximum depth of 25m (at the entrance), and it is between 1.6km wide (at the entrance) and 4.7km wide (at the head).

The total catchment area around the harbour is almost 200km^2. This catchment comprises, pasture, dairy farms, small townships (Akaroa, Duvauchelle, Barrys Bay) and holiday subdivisions (Wainui, Takamatua, Robinsons Bay). The coastline making up the inner shores of the Akaroa Harbour consists of alternating sandy/muddy bays interspersed between rocky headlands, many of which have shore platforms. Water depths range from 30m just beyond the heads to 15m at the curve and then steadily shallower to the intertidal mudflats in the inner embayment.

Flow through the harbour is dominated by tide rather than fresh runoff from streams. In fact, the estimated volume of water flushed into and out of the harbour with each tidal cycle (81,000,000m³) exceeds estimated average daily freshwater runoff (170,000m³) by a factor of 850:1 (Hicks & Marra, 1988).

The coastal marine area, which extends from the mean high water spring (MHWS) to the seabed, has high natural and cultural values. The harbour is ranked as nationally important (Department of Conservation, 1990) on the grounds that it:

- Is an important habitat for Hector's dolphin
- Is an important habitat for the yellow-eyed penguin
- Has high recreational use
- Is a tourist attraction.

It is also internationally important because it is part of the Banks Peninsula Marine Mammal Sanctuary, which extends from the mouth of the Rakaia River to the mouth of the Waipara River and out to sea 12 nautical miles from the coast.

3.6.2 Background Hydrographic Characteristics

The tide range in the harbour varies from 1.2 to 2.3m on average neap and spring tides respectively (LINZ, 2013). The present-day mean sea level (MSL) is around 1.5m above Chart Datum, based on the 2008 hydrographic survey (LINZ, 2009; LINZ, 2013). Another estimate of MSL of 1.58m was obtained by Goring (2008) for a different period – but both gauge deployments were for relatively short periods of a few months.

Heath (1976) presented some of the key hydrographic characteristics of Akaroa Harbour:

- Surface area of the Harbour at high tide = 44km^2
- Surface area of mud flats exposed at low tide as 2km^2 (~4% total area)
- Harbour volume at low water spring as 500,000,000m^3
- Tidal prism (tidal volume in and out) each neap tide = 65,000,000m^3 (13% of low water spring-tide volume)
- Tidal prism (tidal volume in and out) each spring tide = 81,000,000m^3 (16% of low water spring-tide volume)
- Basin catchment area = 200km^2 (including the Harbour)
- Average annual freshwater run-off of only 2m^3/s, most of which occurs in winter (July run-off is 6m^3/s)
- Residence time of water for the Harbour lies somewhere in the range 3.7 days (based on complete export offshore of the tidal prism for each tide cycle)

Bathymetry

The bathymetry of the upper harbour relative to mean sea level was reported by the University of Canterbury (Hart et al., 2009) and is shown in Figure 3-9.

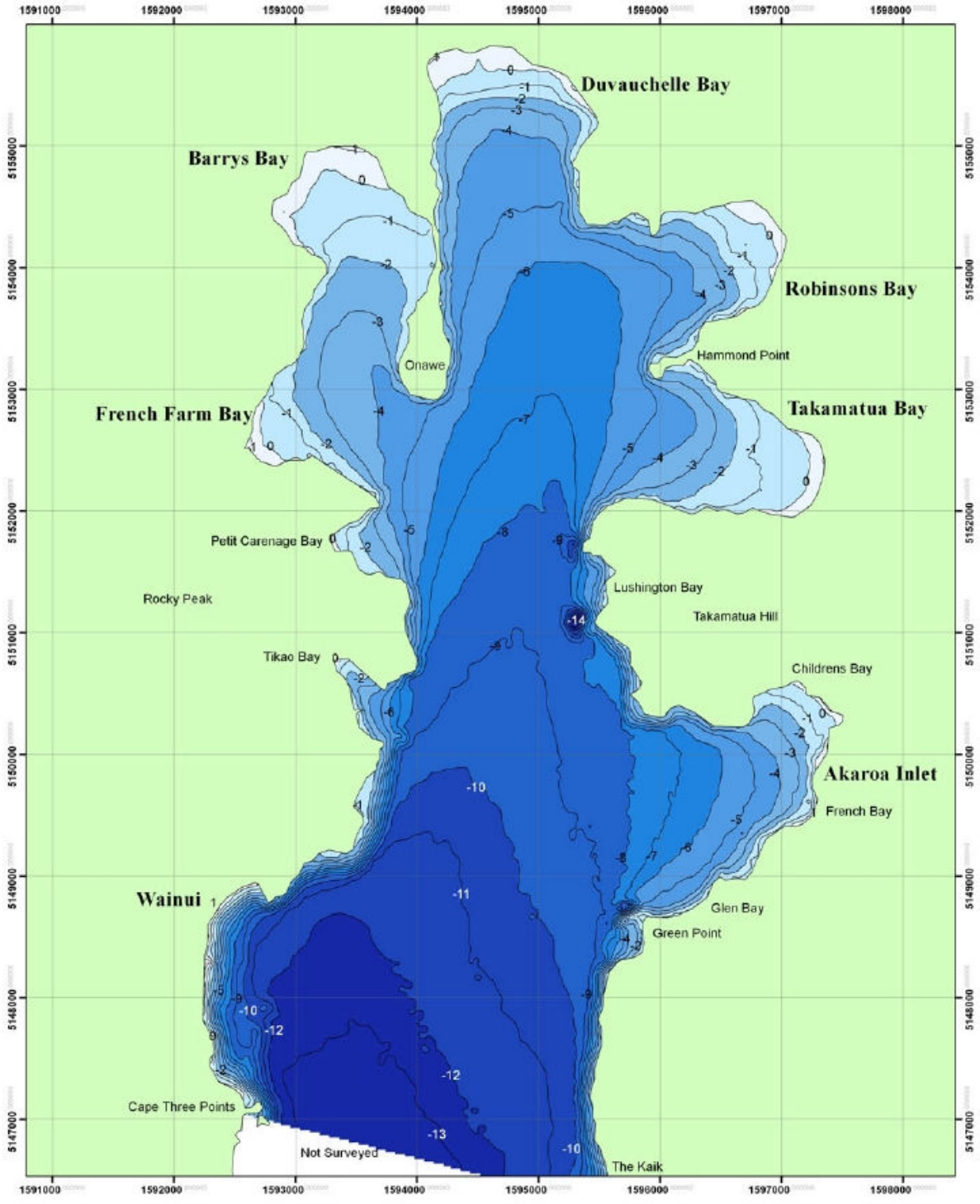

Figure 3-9 Bathymetry of upper Akaroa Harbour relative to mean sea level

Harbour Currents

Hicks & Marra (1988) measured peak flood-tide and ebb-tide current speeds off Green Point (reef just north of the present outfall) of 0.18 and 0.20m/s respectively. Elsewhere in the middle harbour and French Bay, their measured current speeds were generally less than 0.1m/s. Velocities towards the Harbour entrance are higher – up to 0.45m/s from the 1998 ADP deployment (Heuff et al, 2005).

A 500kHz SonTek Acoustic Doppler Profiler current meter (ADP) was deployed by NIWA for over a period of 1 month (13 November to 18 December 2014) for the purpose of calibrating the hydrodynamic model of the Harbour at 43.807° N and 172.9368° E (see site location in Figure 2-1 of the NIWA (2014a) report in Appendix B), which is in just over 8.0m depth below Chart Datum.

From this information, NIWA concluded that predicted current speeds are modest at the outfall diffuser site (up to 0.15m/s with a median of 0.06m/s). Figure 4-7 of the appended NIWA report shows depth-averaged current speeds at the proposed outfall site. The ADP current meter showed that currents in the area can be higher than these values predicted by the model, but in terms of initial dilution, slower currents are more conservative in terms of the dilution they can achieve (with the lowest dilutions in still-water). The main driver is tidal forcing, primarily due to the monthly perigean/apogee cycle, with wind effects being secondary.

Harbour Circulation Patterns

Simulated currents for Akaroa Harbour are dominated by tidal currents, with wind effects secondary. Figure 3-10 shows the current vector maps for the harbour for the peak ebb and flood tides. The characteristic pattern is one of south-north tidal flow up and down the harbour with influx or drainage on the flood and ebb tides respectively for the side arms or embayment's.

There is a stronger ebb-tide flow around Green Point where the existing short outfall is located south of the township. This is confirmed by the previous measurements of Hicks & Marra (1988).

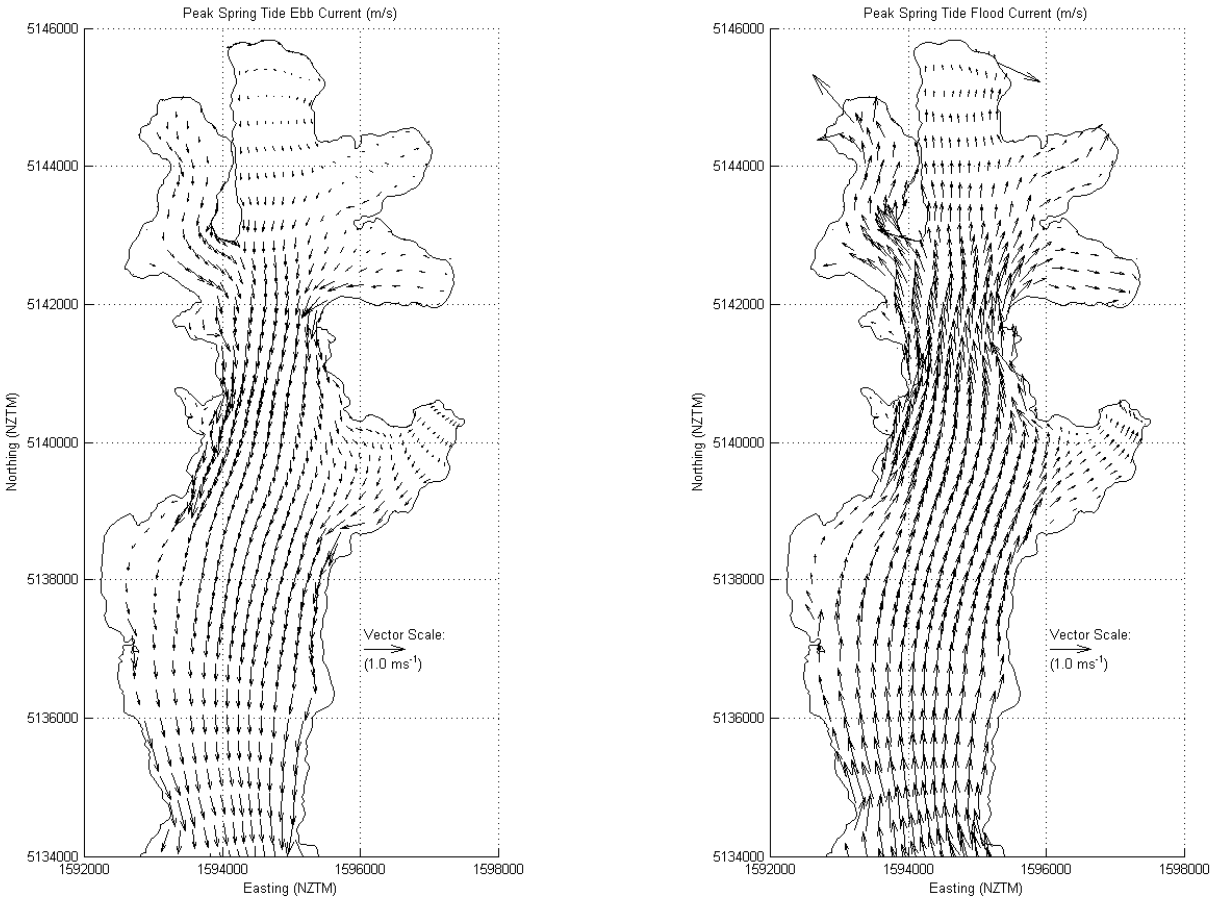

Figure 3-10 Peak and Ebb Tide Current Patterns for a Spring Tide

3.6.3 Solar Radiation

Microbial species found in wastewater, such as bacteria and viruses are, following discharge to the marine environment, eventually rendered inactive by solar radiation (particularly the short wavelength part of the light spectrum) and to a lesser extent by changes in temperature and salinity and predation by micro-fauna (NIWA, 2014).

Solar radiation is routinely monitored by the NIWA at their automatic weather station at Akaroa EWS (Agent #36593). Solar radiation is the energy from the sun that is received on the Earth's surface per square metre and accumulated over each hour, measured in MJ/m^2. Figure 2-5 in the appended NIWA modelling report shows the seasonal and diurnal variability in hourly solar radiation from the Akaroa EWS station for the model simulation period 1 January 2013 to 1 January 2014. As expected, peak solar radiation occurs over summer and is lowest in winter. This data can be used to determine the reduction in concentration of viruses due to solar inactivation over and above physical dilution processes (see Appendix 1 of appended NIWA report).

3.6.4 Water Clarity

Water clarity in the region of a wastewater discharge also determines how far solar radiation is transmitted down into the water column, particularly the short ultra-violet (UV) and short visible wavelengths which can be attenuated relatively quickly below the water surface.

No data was available on UV and short-visible wavelength transmission in Akaroa Harbour waters but NIWA has adapted measurements of attenuation at various UV and short-visible wavelengths 2m below the surface from two sites in the waters of Lyall Bay.

In Akaroa Harbour, the waters are not likely to be as clear as Lyall Bay waters, but given it is a deeper sound-like water body, optical type 1 Coastal waters are likely to be relevant. On this premise, the attenuation coefficient for Akaroa Harbour was selected to be ~$0.10m^{-1}$, or a L_{90} of 2.3m for 340nm wavelength. In any case, the inactivation rate is less sensitive to this attenuation parameter than the day-to-day variability in solar radiation. Figure 2-6 of the appended NIWA report shows attenuation of UV and solar radiation in ocean and coastal waters which forms the basis for NIWA's health risk assessment at Akaroa.

3.6.5 Water Quality

Overview

Water within Akaroa Harbour consists of both tidal exchange water from the Canterbury Bight beyond the harbour entrances, and freshwater discharged into the harbour from the surrounding catchments. The harbour receives contaminants from a variety of point-source and non-point source discharges throughout the harbour basin. These include:

- Urban stormwater
- Discharges from commercial and pleasure craft, including large cruise ships which have increased since the Christchurch earthquakes
- Commercial fish farming enterprises
- Rivers and creeks receiving agricultural and horticultural runoff
- Seepage from septic tank systems
- Treated wastewater from several communities (Akaroa, Duvauchelle, and Wainui) marine farms

The RCEP classifies most of Akaroa Harbour including the receiving environment of the discharge as “Shellfish Gathering” (SEG), refer Appendix F.

Microbiological Contaminants

Environment Canterbury monitors water quality during the summer months at swimming beaches around Akaroa Harbour as part of their Swimming Water Quality Monitoring Program in order to grade the sites for ‘Suitability for Recreation’ in accordance with the Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (MfE/MoH, 2003). There are five ‘Suitability for Recreation Grades’ (SFRG), ranging from “very good” through to “very poor”, with an increasing risk of becoming sick as a result of contact recreation.

Of the six beaches monitored to establish an SFRG within the whole of Akaroa Harbour (Wainui Beach, Tikao Beach French Farm, Duvauchelle, Takamatua, and Akaroa Main Beach shown in Figure 3-11), four (including Akaroa Main Beach) are graded as ‘good’, while Tikao Beach and Takamatua are graded as ‘fair’ (Bolton-Ritchie, 2009). The closest of the monitored sites to the WWTP outfall is in Akaroa Main Beach, approximately 2km north-east of the outfall.

The results of monitoring enterococci concentrations at Akaroa Main Beach for the last two summers show an increase in enterococci concentrations with the trigger level exceeded three times in the summer of 2010/2011 and once in the summer of 2011/2012 (Environment Canterbury 2012). However, there does not appear to be any time correlation between high enterococci concentrations around the existing WWTP outfall and high concentrations being recorded at Akaroa Main Beach.

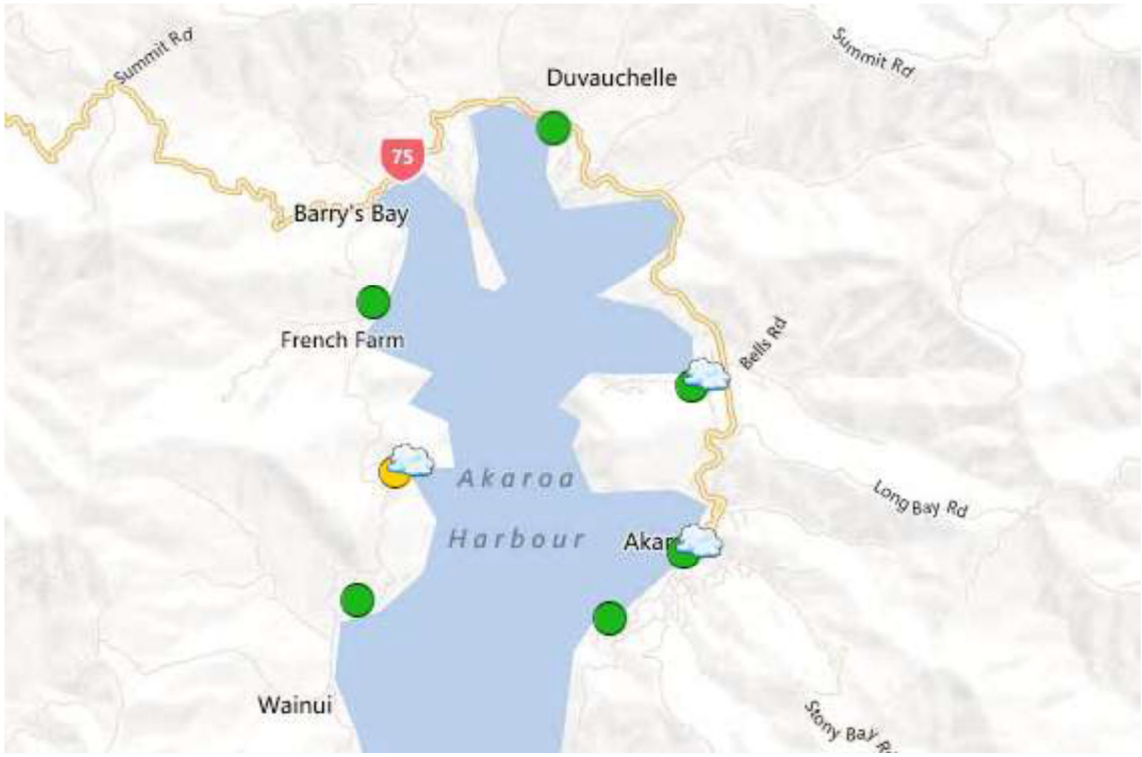

Figure 3-11 Location of ECan swimming water quality monitoring sites in Akaroa Harbour (from ECan website, 2012)

The sampling undertaken by ECan indicates that water quality at the Akaroa Main Beach may be influenced by stormwater outlets with potential wastewater contamination, incidence and density of birdlife and run-off from agricultural/rural/urban activities..

An assessment was also performed by Bolton Richie (2009) of whether the Microbiological Assessment Criteria (MAC) and hence the SFRG would be impacted by rain. This would indicate that the primary source of contamination was stormwater. The MAC is based on the 95th percentile of the data for the preceding five years. Whilst the removal of rain-affected data resulted in a reduction in the 95th percentile of the enterococci results, the MAC for Akaroa Main Beach remained at B so the SFRG was also retained as Good, and the site was not noted as being particularly affected by rainfall.

Nutrients

ECan has been monitoring nutrients in the harbour waters at six sites over six periods since 1989 (Bolton-Ritchie, 2005a). The results of monitoring at these sites between 1989 and 2009 were collated and analysed to provide an assessment of the nutrient status of the harbour. Results of this assessment are set out in the Environment Canterbury Reports No. U05/11 (Bolton Ritchie, 2005a) and No. R12/90 prepared by Bolton Ritchie (2013).

MWH (2012) summarised the key conclusions of these ECan reports as follows:

- There are a number of sources of nutrients in the Akaroa harbour, including the wastewater discharges (Akaroa WWTP discharge has been occurring for the last 50 years), potential discharges from unsewered areas which are close to the coastline, runoff from farm land, stormwater discharges and salmon farming.
- The general pattern of differences in nutrient concentrations between sites consisted of higher concentrations of total nitrogen (TN), dissolved reactive phosphorus (DRP) and total phosphorus (TP) at inner harbour sites (Robinsons Bay, French Farm, Takamatua Bay and Children's Bay) than at mid (between The Kaik and Cape Three Points) and outer (between the Heads) harbour sites.
- Some seasonality in nutrient concentrations has been observed with nitrate and nitrite lower in summer, DRP and TP lower in spring/summer and TN concentrations highest in winter. Generally for all parameters, winter concentrations were highest. This is not consistent with the WWTP being the primary contributing source as highest loads occur during the peak summer season.
- Given the N:P ratio observed, nitrogen is the limiting nutrient in Akaroa Harbour.
- Evaluation of dissolved inorganic nitrogen (DIN) concentrations indicates there is a greater likelihood of enhanced phytoplankton growth at the Heads than at other sites in the harbour. However, optimal nutrient conditions for phytoplankton i.e. an N:P ratio of 16:1, did not occur in the samples collected between 1989 and 2009.
- Anecdotal evidence suggests that there has been no notable excessive growth of algae within the harbour, although over the summer sea lettuce (*Ulva lactuca*) can occur in some of the inner harbour bays. However, this sea lettuce growth has to date not been considered excessive or as being a problem. Areas of sea grass are highly productive and support a diversity of species, and the current nutrient concentrations in the harbour could well contribute to the maintenance of these sea grass beds (Bolton-Ritchie, 2005).
- According to anecdotal sources, some localised algal blooms can occur in the harbour from time to time, particularly in autumn when the thermocline breaks down and there is a release of nutrients.
- A comparison of estimated nutrient loads discharged from the three WWTPs in the harbour with loads discharged from a number of streams indicated that:

  - The WWTPs typically discharge slightly greater loads of ammonia nitrogen than the streams
  - The streams typically contribute greater loads of TN than the WWTPs on an annual basis, however the loads from the WWTPs are greater in summer due to low stream flows
  - The range of total phosphorus loads from the WWTPs is similar to the loads discharged from the streams
  - None of the streams monitored by Environment Canterbury meet the current consent trigger values for TN, nitrate and nitrite, DRP and TP.
- Overall, the volume of nutrient inputs from streams and wastewater discharges is small and localised when compared to the volume of the harbour and the volume of seawater that is flushed in and out of the harbour with the tide.
- Over time, there has been no overall trend of a decrease or increase in the concentrations of TN, total organic nitrogen (TON), DRP and TP. The results indicate that over the 1989-2009 period, any increase in nutrient inputs to the harbour via streams, wastewater and stormwater has not resulted in an increase in the concentrations of these nutrients.
- The nutrient concentrations in the water of Akaroa Harbour are, to date, not a cause for concern.

Harbour ammonia nitrogen concentrations were well below toxic concentrations for marine life and the dissolved oxygen percent saturation results indicate there is sufficient oxygen in the water to maintain the ecological health of the harbour.

Bolton-Ritchie (2013) noted that water classified and managed for contact recreation, meets the criteria for this class. Water classified and managed for shellfish gathering encompasses most of the harbour. Due to faecal contamination, the water in Wainui Bay and South Barrys Bay does not meet the criteria for shellfish gathering.

Water Quality Monitoring at Proposed Outfall Site

While sampling for water quality is of limited efficacy unless encompassing a significant level of replication and covering appropriate time periods, the field survey was seen as an opportunity to collect a ‘snap-shot’ of a number of water quality parameters and to record any stratification occurring within the water column.

A summary of the proposed outfall site water quality data is listed in Table 9 of the Cawthron report (see Appendix G). Surface samples taken for turbidity measurements averaged 2.7NTU over the five sites, ranging 2.0-2.91 NTU. This is well within the range reported by Bolton-Ritchie (2013a) for measurements made over 2003/4 and 2008/9 for a number of sites within Akaroa Harbour.

The main feature of the profiles (supported by diver observation) was a distinct change in temperature near the seabed indicating a benthic layer some 1.7℃ colder than surface waters. Towards the southern end of the transect, this layer extended further up through the water column but was less well-defined. The depth of the thermocline varied from 1.5-1.8m from the seabed in the north to nearly 6m at station 1000S.

Examination of the salinity profiles leads to a conclusion that the temperature effect was the sole cause of variation and that there was in fact negligible change through the water column. pH was also consistent throughout the water column and between sites, averaging 8.14.

Dissolved oxygen concentration was recorded as lower in the benthic cold water layer, decreasing from an average of 8.3mg/L (above 100% saturation) for the upper water column to 7.4mg/L (90-94% saturation) near the seabed.

3.6.6 Benthic Sediment Quality and Ecology

Overview

The broader benthic sediments and biota of the harbour have been previously characterised by Fenwick (2004). This study noted the following:

- Species occurrences were similar across the harbour
- Mean faunal densities increase steadily seaward
- Several common benthic species tended to be less abundant inshore
- The distribution of benthic fauna or community pattern was most strongly correlated with depth (most), sediment organic and zinc content
- Total faunal diversity in the harbour were similar to that reported at other Banks Peninsula locations
- Benthos densities in the harbour varied widely but were largely consistent with densities from other Banks Peninsula locations
- Akaroa and Lyttelton Harbours share many common aquatic species
- Inner harbour areas are similar to each other but dissimilar to outer harbour locations

Sediment and Benthic Survey of Proposed Outfall Site

Cawthron (2014) carried out a survey of soft sediment benthic fauna in the vicinity of the proposed outfall site as part of the current study (see report in Appendix G). Further investigation of hard substrate, intertidal areas of the harbour was not considered to be relevant to a mid-harbour outfall site. Cawthron concluded that here will be no measureable effects from the proposed discharge on intertidal areas because of the high quality wastewater, distance of the outfall offshore (2.5km) and predicted dilutions.

One of the principal survey objectives was to provide an effective baseline characterisation of the seabed along a sampling transect aligned with the expected plume dispersion axis (see Figure 3-12). In this way, the results serve as a benchmark of pre-existing conditions against which future (post-commissioning) monitoring data can be effectively compared.

The 2km transect was considered to provide coverage appropriate for the determination of spatial gradients along the principal axis of dispersion. Cawthron noted that such designs are widely used for coastal outfalls and utilise far-field stations to serve as effective control or reference points (NZWERF, 2002).

Details of the 10 benthic sampling stations are shown in Figure 3-12 and Table 1 of the appended Cawthron Report.

Sediment Physico-chemical Characteristics

Grain size profiles for sediments from the ten benthic stations are shown graphically in Figure 3-13 and the full data are tabulated in Appendix 2 of the Cawthron Report. From Figure 3-13, it can be seen that the samples were dominated by the silt/clay fraction (<63µm) which ranged 63% - 80% and averaged 74% over all stations with no clear spatial trends along the sampling transect. Small amounts of very fine, fine and medium sand classes were also consistently present in the composite samples, averaging 7%, 7% and 9%, respectively.

In a NIWA investigation undertaken in 2003, Fenwick (2004) reported benthic sediments in the vicinity of the proposed diffuser site to be finer than was found in the current investigation, with approximately 98% finer than 63µm. The NIWA ‘Station 3’ was approximately 250m west of station

500N in the current study and the methodology for analysis of grain size distribution was not specified.

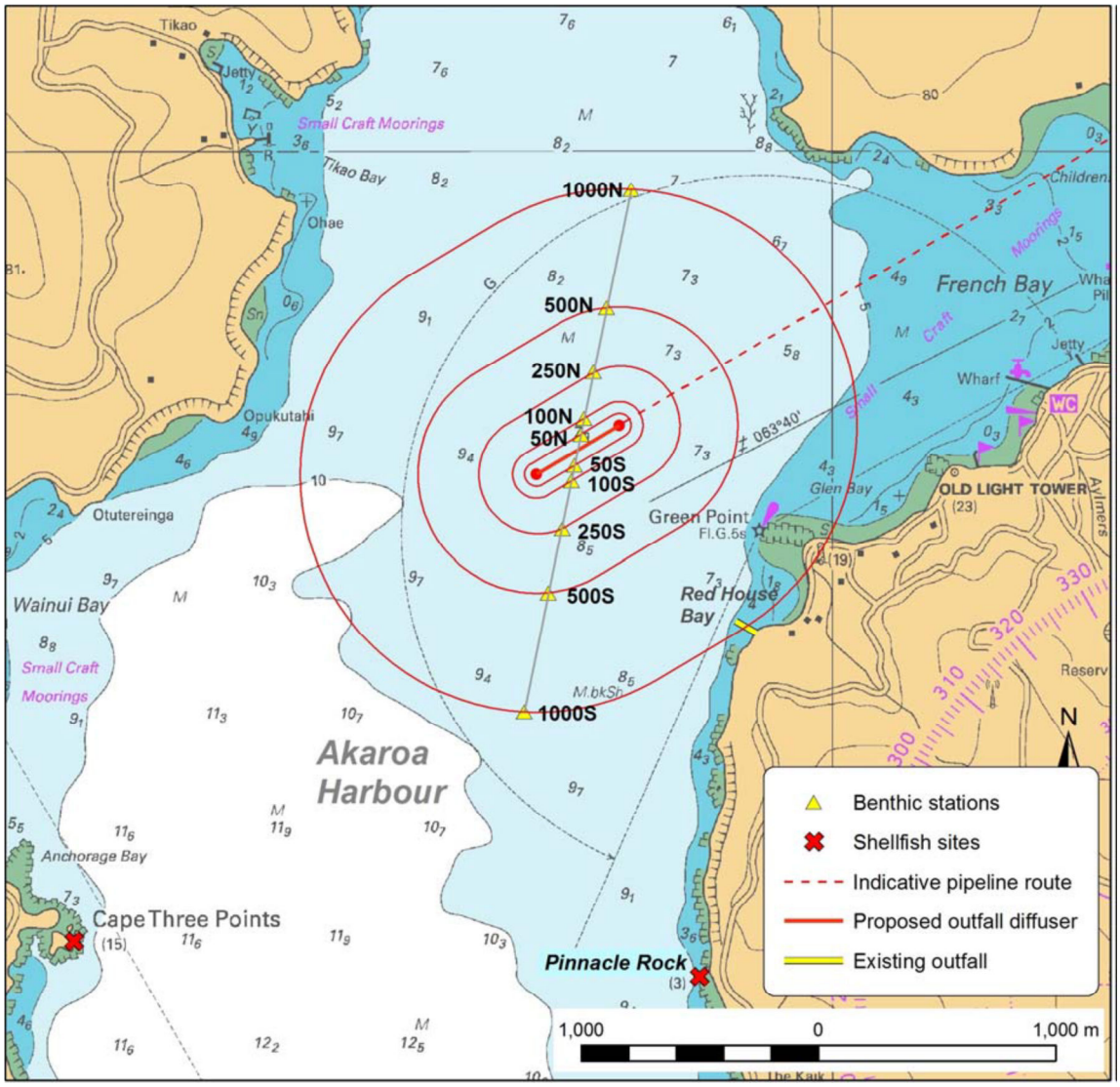

Figure 3-12 Benthic Sampling Stations for 2014 Cawthron Survey

Hart et al. (2009) mapped sub-tidal sediment trends in upper Akaroa Harbour (north of Cape Three Points) based on 89 separate samples. Analyses undertaken utilized wet sieving, dry sieving and pipette analysis. At a point on the mid-harbour axis corresponding to the current study area, sediments of 5% sand, 50% silt and 45% clay were reported, a result which was in general agreement with the Fenwick (2004) data. It was suggested that the central upper harbour operates as a sink for fine sediments carried into the harbour and for suspended fines swept northward along the central harbour axis.

While the wet sieve grain-size methodology employed in the current study is a standard approach in ecological assessments, the very fine nature of the Akaroa sediments (where the bulk of the material is finer than 63µm) means that it may not be the best method for monitoring changes which occur within the fine fraction.

All of the relevant data concerning areas adjacent to the current sampling transect support findings of fine soft mud substrate and a high level of spatial uniformity in sediment texture.

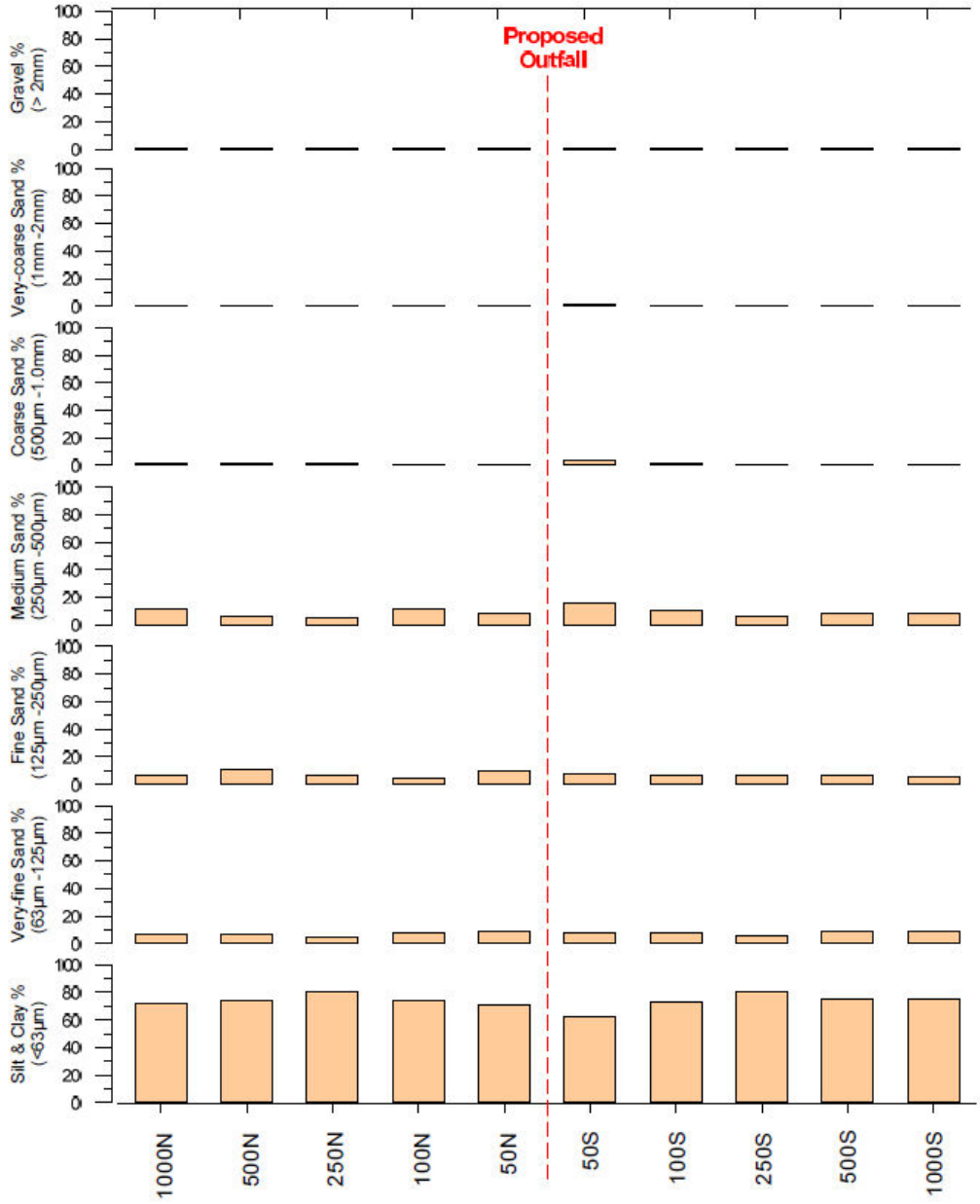

Figure 3-13 Grain size distribution for composite sediment samples across the ten benthic stations

Sediment Nutrients and Organic Enrichment

The analytical results for sediment nutrients and organic carbon are shown graphically in Figure 3-14 and are listed in Appendix 2 of the appended Cawthron report. Very little variation in these parameters was apparent along the 2km sampling transect.

At 860-950mg/kg, total recoverable phosphorus was in the upper part of the range typical for coastal sediments. While this probably reflects mineralogy, higher levels may also be expected for very fine sediments which present a high surface area to analytical digestion processes. Fenwick

(2004) reported a harbour range for total phosphorus of 590-740mg/kg and 590mg/kg for a station adjacent to the current sampling transect. Bolton-Ritchie (2005) reported a range for ten sites in upper Akaroa Harbour (across Barrys, Duvauchelle, Robinsons and Takamatua Bays) of 390-830mg/kg.

Total nitrogen ranged 0.10-0.13g/100g, in general agreement with values observed by Fenwick (2004) (0.06-0.13g/100g) and Bolton-Ritchie (2005) (0.08-0.26g/100g).

The organic content of the sediments was at levels fairly typical of fine harbour sediments. Fenwick (2004) reported sediment organic content as weight loss on ignition (LOI or ash-free dry weight), giving a range for the harbour of 2.5-5% and 4% for the station closest to the current sample transect. Although direct conversion between these parameters is generally unreliable, the results indicate consistent ranges in organic enrichment across the two studies.

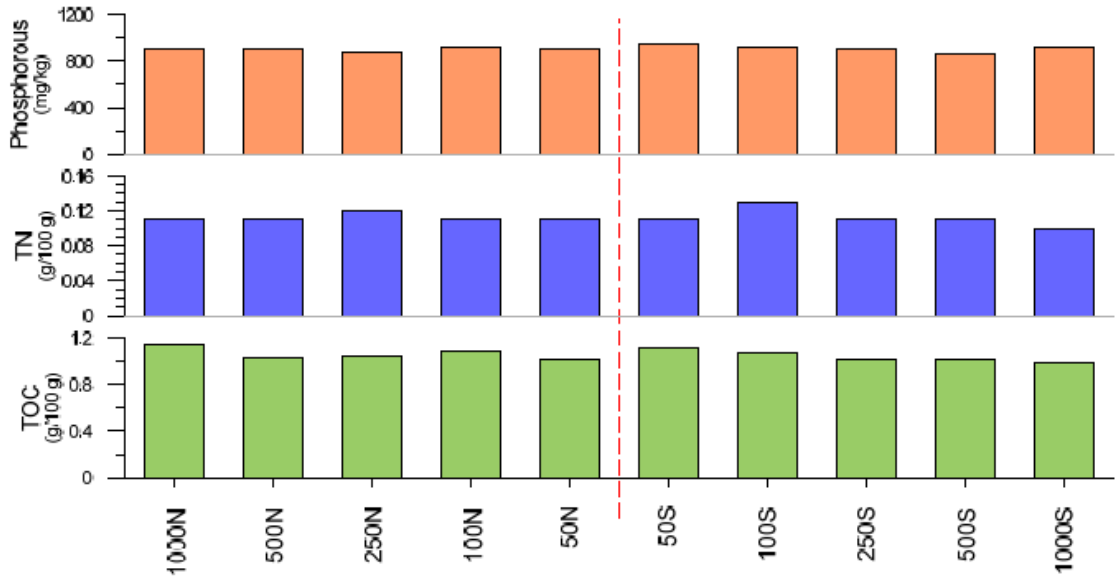

Figure 3-14 Sediment concentrations of nutrients (total recoverable phosphorus and total nitrogen)

Analytical results for sediment trace metals are presented graphically in Figure 3-15.Similar to results for other sediment physicochemical parameters, concentrations exhibited generally flat spatial profiles along the 2km sampling transect

Concentrations for all metal analytes were well below the corresponding ANZECC (2000) ISQG-Low trigger levels for possible ecological effects. As for nutrients and TOC, the data shows almost no effective spatial variation. The slight variability observable for cadmium and mercury can be attributed mainly to overall levels being proportionately much closer to the analytical detection limit (ADL) for these metals.

Fenwick (2004) reported sediment trace metal concentrations for Akaroa Harbour which were in general agreement with those in Figure 3-15 and found little variation throughout the Harbour. However, a spatial trend was noted for lead (22-38mg/kg) and zinc (60-76mg/kg) gradually decreasing towards the harbour entrance.

The generally low concentrations and even spatial distribution of trace metal contaminants in the vicinity of the proposed outfall site suggests that these levels are likely to be representative of the

natural background for the harbour. It is concluded that subsequent monitoring surveys using a similar transect approach will be able to detect and quantify any future changes which may be attributable to the discharge.

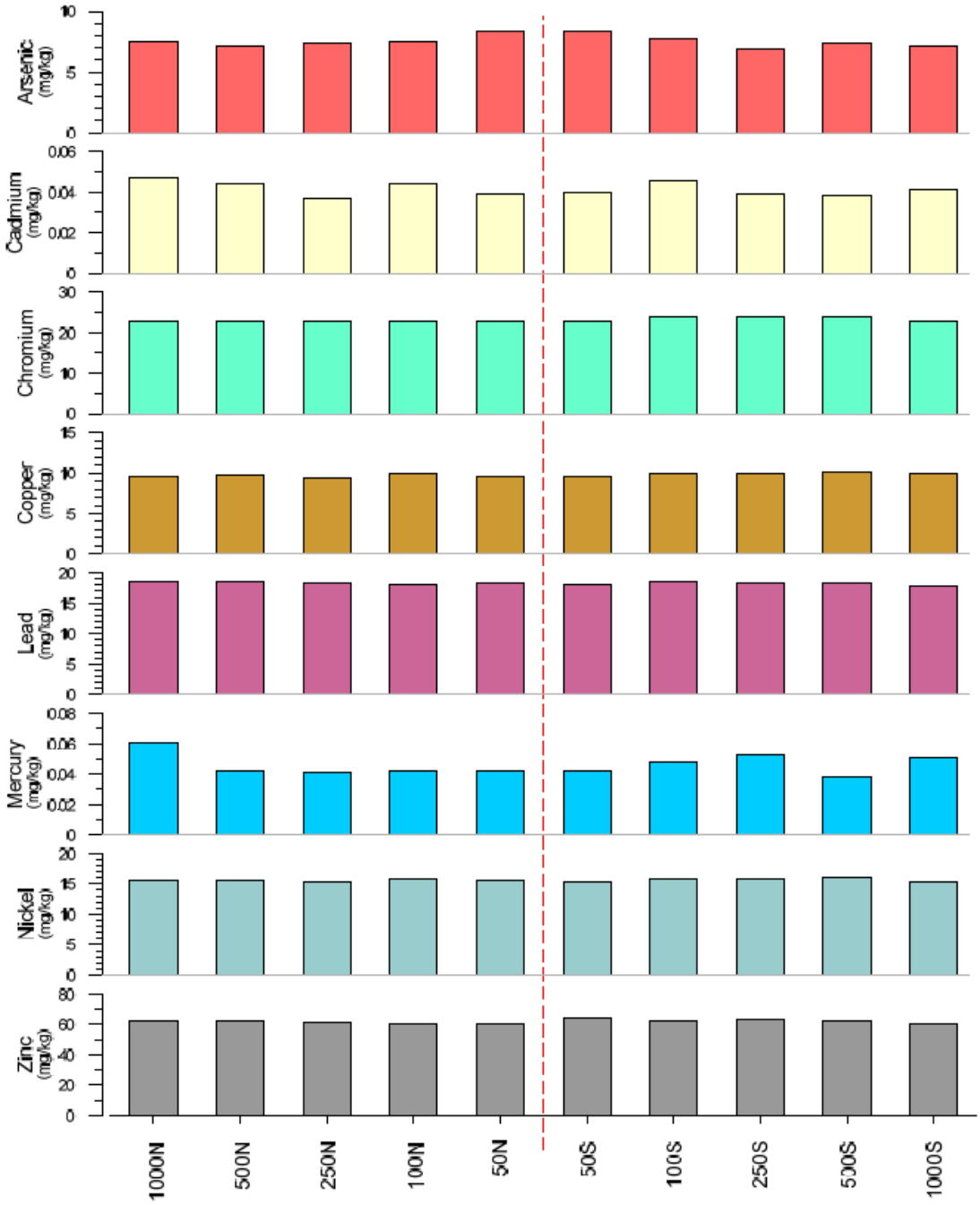

Figure 3-15 Trace metals (mg/kg) in sediments from the ten Akaroa benthic stations. ANZECC (2000) ISQG-Low triggers for sediments as follows (mg/kg): As, 20; Cd, 1.5; Cr, 80; Cu, 65; Pb, 50; Hg, 0.15; Ni, 21; Zn, 200

Macrofaunal Communities

The macroinvertebrate count data for the 30 infauna samples (three replicates from each of ten stations) collected along the sampling transect is presented in Appendix 3 of the appended Cawthron report.

The ten most abundant taxa identified across all stations are listed in Table 5 of the appended report. The samples were characterised by a range of macrofaunal taxa considered fairly typical of fine sediment environments in protected coastal areas. Also typical of such habitats, detrital deposit feeders and epifaunal scavengers were well represented within the benthic community.

The principal macroinvertebrate community indices for each station are plotted in Figure 6 of the appended Cawthron report and are listed in Appendix 4 of that report. Abundance within the samples was highly variable between stations, but much less so between replicates from a single station, suggesting a degree of patchiness in communities despite the observed uniformity in sediment physicochemical conditions.

Species richness (S) was relatively less variable. Across all sites, 53 individual taxa were recorded, although for individual replicate samples, S varied between 7 and 24 (average 16).

Shannon-Weiner diversity (H') and Pielou's evenness (J) were generally consistent across all sampling stations, exhibiting no apparent spatial trends, although stations 100N and 500S exhibited consistently slightly lower values of both indices. H' ranged from approximately 1.3-2.7, indicating a medium level of complexity in species composition. Values for J were moderate to high, ranging from approximately 0.47-0.97 and indicating a fairly uniform distribution of species composition at most stations.

The primary reason for the lower values at stations 50N and 500S was that communities were dominated by high densities of nematode worms (see Figure 7 of appended Cawthron report). Although nematodes were the most abundant taxa overall (average 27 per sample, see Table 5 of Cawthron report), they were significantly more dominant in communities at these two stations, yielding mean abundances of 94 and 83 per sample at 50N and 500S, respectively.

Of other dominant taxa, abundances of the small gastropod *Zeacolpus symmetricus* and paraonid polychaetes also tended to be variable, but less so between stations relative to overall variability between replicates.

With no clear spatial gradients in sediment physicochemical parameters along the 2km transect and only a small change in water depth, the absence of overall trends in benthic community distribution is not surprising. The data-set therefore represents a suitable baseline against which any future changes in the benthos may be effectively compared.

3.6.7 Shellfish

The Akaroa Harbour contains areas of reef, rocky shore, and kelp environments diverse in flora and fauna and supporting a range of foodchain and kaimataitai species, including algaes, mobile invertebrate communities and nests of adult and juvenile shellfish (e.g. mussels).

Cawthron (2014) collected triplicate mussel samples (*Perna canaliculus*) from Cape Three Points and Pinnacle Rock from water depths down to 3 m at neap high water. At neither site was *P. canaliculus* plentiful, only occurring in small clusters within crevices and overhangs.

Shell length observed varied up to 150mm although the collected samples were in the approximate range 60-100mm. It is important to note that, although drawn from samples which were temporally and spatially coincident, a separate set of replicate sub-samples was submitted for the analysis of tissue trace metals and bacteriological quality.

Results returned generally low values for trace metals and no apparent influence from relative proximity to the current WWTP outfall was identified. Tissue trace metal concentrations were below

relevant food standards and consistent with available data for this species and the blue mussel *Mytilus edulis.* Although the limitations of sampling at a single point in time are acknowledged, analyses for indicator bacteria similarly suggested no exposure to significant anthropogenic bacterial sources.

All bacterial counts were below 100MPN/100g and generally at the lower end of the ranges reported by Bolton-Ritchie (2013a) for shellfish collected at other points in the Harbour. Cawthron noted that the presence of indicator bacteria at these low levels is to be expected from a sheltered coastal inlet receiving inputs from streams and run-off from land supporting a range of feral and domestic animals. As for the metals results, and notwithstanding the 'snap-shot' nature of the samples, there is no suggestion (based on proximity) of an influence from the current outfall.

3.6.8 Fish Species

Fish species in the harbour include wrasse, butterfish, red and blue cod, blue moki, triplefin, leather jacket, carpet shark and whitebait (AHMPS cited in MWH, 2012). Other oceanic fish will enter the harbour on occasion. Flounder and sole are common in the shallow mudflats of the upper harbour.

3.6.9 Natural Character and Values

Despite considerable modification in some parts of the harbour catchment, many areas retain their natural character and amenity, and this is a significant factor in the popularity of the harbour for recreational activities, and in the overall landscape of Banks Peninsula (MWH, 2012). The Department of Conservation has ranked Akaroa Harbour as nationally important due to its importance for Hector's dolphin and yellow-eyed penguin, its high recreational use, and its popularity as a tourist destination, and as internationally important due to being part of the Marine Mammal Sanctuary (Environment Canterbury, 2005).

There are no identified "Areas of Significant Natural Value" set out in Schedule 1 of the Regional Coastal Environment Plan (RCEP). Schedule 2 of the RCEP lists "Identified Areas of High Natural, Physical, Heritage or Cultural Value". Sites include The Kaik (approximately 1.6km south of the existing WWTP), listed for its cultural value and natural value associated with marine mammals and birds, ecosystems and flora and fauna habitat, and Red House Bay to Red Point, listed for its historical value.

The harbour provides a large range of habitats supporting many wildlife species, including Hector's Dolphin, seals, and penguins.

3.6.10 Banks Peninsula Marine Mammal Sanctuary

Banks Peninsula is home to some of New Zealand's threatened marine species, including the Hector's Dolphin. The Hector's Dolphin is found only in New Zealand waters and is the smallest marine dolphin in the world. The Banks Peninsula Marine Mammal Sanctuary was created in 1988 to protect Hector's Dolphin from by catch in set nets, and was the first marine mammal sanctuary established in New Zealand. It extends from the Waipara River to the Rakaia River (including Akaroa Harbour), and out to a distance of 12 nautical miles off the coast. As well as protecting the Hector's Dolphin, the sanctuary also helps protect other marine species, including the endangered hoiho/yellow-eyed penguin, korora/white flippered penguin, and kekeno/NZ fur seal (www.doc.govt.nz).

3.6.11 Akaroa Harbour Marine Reserve

An application for a marine reserve in the south eastern part of Akaroa Harbour in the vicinity of Dan Rogers Bluff was notified in 1996; however consideration of the application was suspended until 2006, while the Akaroa Harbour Taiapure was established. The taiapure came into effect in 2006, and so the marine reserve application was able to be considered by the Minister of Conservation. The area that was proposed as a marine reserve was from Manukatahi Stream (beyond Ōnuku) to Haylocks Bay (just beyond the heads) covering about half the width of the harbour in this area. The reserve was proposed in order to protect a representative area of the marine environment of Banks Peninsula, and allow populations of species such as paua to rehabilitate to a more natural state.

The Akaroa Marine Reserve was declined by the Minister of Conservation in 2010 due to the effect on recreational fishing and the loss of customary fishing and mana to local tangata whenua. In May 2012, the High Court overturned the Conservation Minister's decision to decline the proposed Akaroa Marine reserve, finding that she had made an error in law by excluding the wider benefits of the reserve when determining whether it would affect existing use for recreational purposes. The marine reserve was finally gazetted in May 2014 and officially opened by the Ministers of Environment and Conservation on 8 June 2014.

3.6.12 Recreational and Commercial Values

MWH (2012) notes that Akaroa Harbour is a popular recreational area, and is used for a range of water-based recreational activities, including fishing, diving, swimming, recreational boating, water skiing, kayaking, and windsurfing. The scenic values of the harbour and its coastline, its numerous reserves, and areas of natural value for marine mammals, birds, and other flora and fauna, also provide considerable land based attractions.

Akaroa's proximity to Christchurch make it a popular location for holiday homes for Christchurch residents, and its mixed history of Maori, English and French settlement, arts and crafts, and recreational opportunities make it a popular tourist destination. Tourism is an important industry within the harbour, and water-based tourism activities include harbour cruises, chartered fishing trips, sea kayaking, diving, nature viewing (penguins, seals, dolphins), and swimming with dolphins.

There are several marine farms in the Akaroa Harbour, located on the western side of the harbour, between Wainui and the heads. These enterprises include the farming of salmon, paua, culture pearls, and research sponge farming. Some limited commercial fishing of crayfish and flat fish also occurs in the harbour.

Schedule 4 of the RCEP identifies the areas of coastal waters in Canterbury to be managed in accordance with coastal water classifications (Map 1.8 from the RCEP is attached in Appendix F).

Schedule 4 classifies the location of the outfall into Akaroa Harbour as "Class Coastal SG", which is to be managed for shellfish gathering, contact recreation and the maintenance of aquatic ecosystems.

3.6.13 Tangata Whenua Values

Overview

Akaroa Harbour and the coastal margins affected by the project fall within the takiwā (territory) of Ōnuku Rūnanga. It is also understood that Wairewa Rūnanga share kaitiakitanga (guardianship) responsibilities for Akaroa Harbour.

The following is an extract from a statement made by a representative of the Onuku Rūnanga highlighting the importance of the wider harbour area (cited in MWH, 2102):

"*The Patipu Runanga is Te Runanga o Ōnuku. Akaroa Harbour is significant to the runanga in respect of wahi tapu and waahi taonga and the collection of mahinga kai and kai moana.*

Akaroa Harbour is of greater significance as a mahinga kai – its waters traditionally provided primary sustenance for the people of Ōnuku. The rim of hills and peaks that look down upon Akaroa's waters evoke many histories. Directly across the harbour from Ōnuku Marae stands the distinctive Tuiraki (Mt Bossu). This peak is said to have been formed when the Ngāi Tahu explorer Rakaihautu thrust his ko (digging stick) into Horomaka after using all the principal lakes of Te Wai Pounamu including nearby Te Roto o Wairewa and Te Waihora".

Akaroa Harbour Taiapure

A taiapure has been established over the whole of the Akaroa Harbour (except those areas covered by existing marine farms and the area covered by the Akaroa Marine Reserve), reflecting the significance of the harbour to local Maori. Taiapure can cover areas that have customarily been of special significance to any iwi or hapu, either as a source of food, or for spiritual or cultural reasons.

Evidence presented in support of the taiapure application illustrated that the whole harbour is of special significance to Ngāi Tahu, both as a mahinga kai and as the locus of the spiritual life of local hapu. There are particular sites of special significance around the harbour; however, it was to the mana and mauri of the harbour as a single entity that the hapu primarily related (Taiapure Tribunal, 2005).

The harbour has traditionally been a source of food for the people living in its vicinity, and for those who came from further afield. Although the harbour fishery has become depleted in more recent times, it formerly produced a range of edible species upon which Ngāi Tahu people relied for sustenance (Taiapure Tribunal, 2005).

The cultural significance of the harbour is reflected in the extent to which it features in the stories of identity and occupation that define the local runanga. In addition, the Treaty of Waitangi was signed at Akaroa (Ōnuku), and two significant kainga (settlement) are located on the shores of the harbour (Ōnuku and Opukutahi). Reserves were established at these sites when the land was bought by the Crown in 1856, indicating recognition of the significance of these settlements (Taiapure Tribunal, 2005). There are also a number of urupa (burial grounds), pa kakari (battle grounds) and turaka tipuna (ancestral areas) around the harbour (Taiapure Tribunal, 2005).

The spiritual significance of the harbour waters stems from the guardian taniwha believed to live there to protect the people and resources of the harbour (Taiapure Tribunal, 2005). Also, the harbour is recognised by Ngāi Tahu as the dwelling place of the sacred white whale, who is closely linked with the mauri of Tangaroa (the god of the sea). The white whale is a kaitiaki (guardian) who is a tohu (omen or special sign) for Ngāi Tahu people. If for no other reason than to ensure the on-going wellbeing of this kaitiaki, the harbour's ecology is of central concern to Ngāi Tahu (Taiapure Tribunal, 2005).

Identified Areas

As indicated above Schedule 101 of the Ngāi Tahu Settlement Act 1998 identifies the Statutory Acknowledgement for Te Tai O Mahaanui (Selwyn – Banks Peninsula Coastal Marine Area) which includes the coastline of Akaroa Harbour. The Statutory Acknowledgement refers to the association of Ngai Tahu with the coastline.

A number of “Identified Areas of Value to Tangata Whenua” and “Identified Areas of High Natural, Physical, Heritage or Cultural Value” are set out in Schedule 3 and Schedule 2 of the RCEP respectively. These include a number of sites within Akaroa Harbour, including French Bay (Schedule 3) to the north of the existing WWTP, Red House Bay to Red Point (Schedule 2 – historic values), and The Kaik (Onuku) (Schedule 2 – cultural values, natural values). None of tehse directly affect the outfall pipeline or discharge.

4 Description of Proposed Upgrade

4.1 Overview

The overall scheme concept for the Akaroa Wastewater Project is based upon the previous work of consultants, Harrison Grierson. The preliminary design as further developed by CH2M Beca is shown in Drawing GIS-6517986-05 in Appendix C and in Figure 4-1. The key features of the scheme are:

- Reversal of the wastewater flow along Beach Road, with the Glen Pump Station pumping to the Fire Station Pump Station, which will pump to a new Terminal Pump Station. The Reserve Pump Station will also pump to the Terminal Pump Station, which will pump wastewater up to the new Akaroa treatment plant on Old Coach Road. This will involve replacing pumps in the Glen and Fire Station Pump Station, and new pressure pipelines.
- The Terminal Pump Station will be located in the Akaroa Boat Park, and will include fine screens and grit removal, to protect the progressive cavity pumps. Flow from the Terminal Pump Station will be pumped up Old Coach Road in a new pipeline.
- A new biological nitrogen removal (BNR) membrane treatment plant on the corner of Old Coach Road near the intersection of Long Bay Road, which will provide secondary and tertiary treatment, producing a significantly better effluent quality than the current treatment plant. The treatment process will likely be the Modified Ludsak-Ettinger (MLE) process, although other alternatives proposed by tenderers would be considered. The MLE process includes an anoxic zone followed by an aerobic zone. Solids separation and disinfection will be provided by membrane filtration. A flow buffer tank will also be installed to smooth peak flows to the treatment process.
- Treated wastewater flows will discharge mid-Akaroa Harbour via a new outfall pipeline approximately 2.5km long starting from Childrens Bay. The outfall will be connected to the treatment plant via a new gravity main installed on Old Coach Road.
- Peak wet weather wastewater flows in Akaroa above 14L/s, and once the capacity of the balance tank has been exceeded, will bypass the biological treatment process. The bypass flows will be screened and UV disinfected before being combined with the fully treated wastewater and discharged via the harbour outfall.

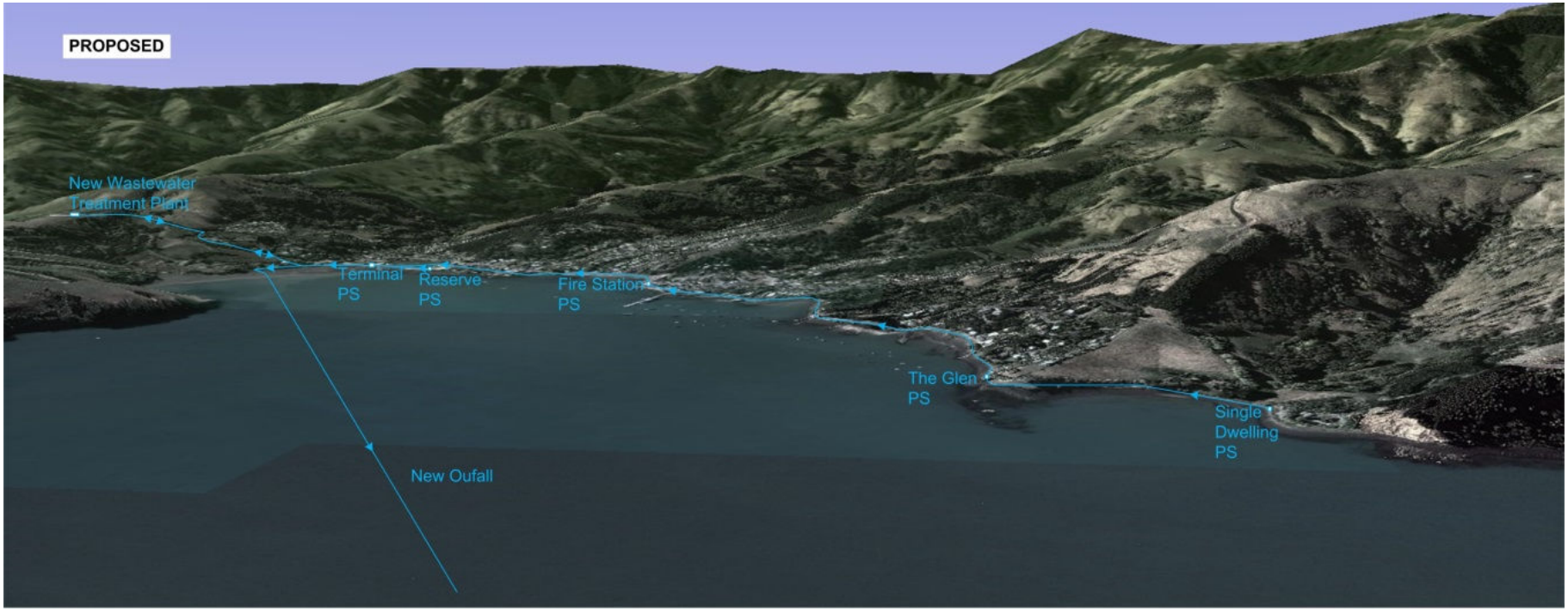

Figure 4-1 Proposed Wastewater Schematic

4.2 Design Population

The upgraded wastewater system is to be designed for year 2041 projected flows.

Updated population predictions from the recent 2013 census are not yet available. Previous population predictions taken from the technical memo *Akaroa Wastewater Concept Design – Basis of Design* (Harrison Grierson, 10 May 2012) are given in Table 4-1.

Table 4-1 Akaroa Current and Design Population Prediction

Season	2011	Design (2041)
Winter	591	783
Peak Summer	2,919	3,542

4.3 Wastewater Collection and Reticulation

4.3.1 Existing Drainage Network

As discussed in Section 2, the existing wastewater drainage network consists of three gravity catchments serviced by three pump stations connected in series - Reserve Pump Station, Fire Station Pump Station and Glen Pump Station. The Glen Pump Station then pumps all Akaroa's wastewater flows to the existing treatment plant south of the town.

There are five existing emergency overflows in the Akaroa network which discharge wastewater to the environment occasionally due to high wet weather flows, pump failure or blockages. Records of the overflows were reviewed but they do not typically report flows or volume of overflow. CCC has an on-going programme of pipeline renewals will help to reduce the frequency of overflows.

4.3.2 Proposed Drainage Network

The site for the new WWTP is at Old Coach Road, which requires reversal of flow through the existing reticulation network. The existing pump stations at the Glen, the Fire Station and the Reserve will therefore pump in the opposite direction to a new Terminal Pump Station near the Reserve in Akaroa which will then pump to the WWTP. Once treated, the wastewater will discharge, via gravity, from the WWTP, along Old Coach Road through a new pipe to connect to the harbour outfall pipe.

An overview of the new scheme is shown in Figure 4-1. The reversal of the reticulation network is illustrated on Drawings 6517986-CE-001 to 6517986-CE-010, which are included in Appendix C.

As shown on Drawings 6517986-CE010 the new pipeline from its inception at the south end to the Reserve Pump Station will be "slip lined" or "pipe burst" through the existing pipeline. The pipeline will be inserted into the existing pipeline by directionally drilling which will minimise earthworks. The pipeline from the Reserve Pump Station to the Terminal Pump Station and along Old Coach Road to the WWTP is new and will be inserted by directional drilling or conventional pipeline trenching where the topography limits the use of machinery. Trenching may require dewatering in certain locations and these works will be undertaken in accordance with appropriate Erosion and Sediment Control Guidelines to minimise adverse effects arising from the discharge of sediments and contaminants.

The Glen and the Fire Station Pump Stations will be upgraded with new pumps installed. A new (larger) biofilter will be constructed to treat the air extracted from the Fire Station Pump Station.

4.4 Terminal Pump Station Design

4.4.1 Overview

The new Terminal Pump Station will pump all the wastewater from Akaroa up to the treatment plant through a single pressure main along Old Coach Road.

The pump station will be a building containing screens and grit traps, a wet well, three progressive cavity pumps and electrical equipment. An external containerised generator will be provided outside the building so the pump station can operate when normal power supply is interrupted. A biofilter will be provided for odour management.

Drawings 6517986-ME-20 and 6517986-ME-21 in Appendix C show the proposed location and general arrangement for the Terminal Pump Station.

4.4.2 General Site Issues

According to the report Effects of Sea Level Rise for Christchurch City (Tonkin & Taylor, 2013) the pump station site is within an area that may be affected by sea level rise. The report predicts the 1% annual exceedance probability (AEP) tide will reach RL3.3m Lyttelton Datum, which is RL12.34m CCC Datum. The level of pump station site is approximately RL 11.5-12m.

The pump station is to be located on level ground adjacent to a stream (approximately 6.0m distance) and the Akaroa Harbour shore (approximately 50m distance). The site is understood to have previously been occupied by a stream channel, then used as an uncontrolled landfill, upon which hardfill has been placed to create the level platform for the existing boat park.

The available factual information indicates a groundwater level of 1.8m below ground level. The water level in the adjacent stream is understood to be tidally influenced, so some hydraulic connectivity between the groundwater level and tide levels may be expected. Some dewatering may be necessary if excavation is required for foundations.

The proposal will result in the loss of existing car/boat spaces and a necessity to change the parking space layout as shown in Figure 4-2.

4.4.3 Pump Station Building

The pump station building will be approximately 13m x 17.5m x 7m high, and positioned approximately 800mm above the existing ground level, to take into account future sea level rise. The building walls will be made from precast concrete panels attached to steel frames. A standby generator will be located in a separate building which measures 3m x 5m x 2m high. An artist's impression of how the Terminal Pump Station may look is shown in Figure 4-2. The architectural and landscaping design is to be confirmed following consultation with key stakeholders.

The height of the main building will accommodate an overhead gantry crane for removing pumps from the wetwell. Other features include roller shutter doors for Hiab/truck access and an enclosed electrical switchroom.

When operational the facility is likely to require one visit a week in autumn to spring and 2 visits a week in summer from maintenance staff. Vehicles will use the existing carpark or the entrance when these visits occur.

The underground structures will include a wet well, grit trap and valve chamber.

Figure 4-2 Terminal Pump Station - Artist's Impression

Stormwater from the roof will discharge to Council's existing reticulation system who have given permission for this connection.

The architectural components of pump station will be designed with consideration of the SCIRT Pump Station Design Guide, which has been adopted by CCC.

Due to the harbour front location adjacent to public reserve and recreation areas, the building components should be considered as appropriate for the most sensitive context i.e. a residential context in accordance with the Draft Akaroa Public Realm Design Guidelines and Banks Peninsula District Plan requirements. This determines that a greater level of architectural treatment should be applied and that landscaping should be incorporated.

Any other structures required such as the generator, will be treated with screening or appropriate material finishes so as to mitigate the visual impact in this area. Landscape planting will be designed to "soften" the impact of the structures, provide screening where appropriate and contribute to the amenity of the site. Plant species will be selected to be appropriate to the context of the area as well as low maintenance.

The layout of the Terminal Pump Station is shown in Figure 4-3.

Figure 4-3 Layout of Terminal Pump Station

4.4.4 Emergency Overflow Pipe

The pump station is expected to operate reliably, incorporating three pumps (duty/assist/standby) and an emergency backup generator. Wastewater is only delivered to the Terminal Pump Station by pumping from the upstream Pump Stations. These factors mean that multiple failures would need to occur before an overflow occurred. However, an emergency screened, overflow pipe will be provided to allow wastewater to discharge to the adjacent stream, before the wet well overflows into the building, in the event of an unexpected emergency failure. A non-return valve will be provided on the outlet of the overflow to prevent escape of odour, or water flowing back into the pump station.

4.4.5 Odour Management

Odour will be contained at source in the pump station with covers over odour-generating equipment such as screens, grit handling equipment and the wet well. Odorous air will be extracted from this equipment and transferred to a bark biofilter using a single duty blower. The proposed location is adjacent to the pump station as shown on Figure 4-3 and appended Drawing 6517986-ME-020.

Capturing odour from individual pieces of equipment will require more complex ducting than the lower capital cost alternative of extracting air from the building as a whole. However, this approach is recommended as it will minimise the release of odour during operator visits and during maintenance activities when the building doors may need to remain open and it will also reduce the size of the biofilter as a smaller air volume will need to be treated.

4.4.6 Noise Management

The pump station building will be designed to meet the noise limits of the BPDP.

4.4.7 Power and Standby Generation

Power for the pump station will be provided from the Orion network.

A standby generator set (preliminary sizing of 160kVA) will be provided to operate the pumps, screening and grit removal equipment at full design flows. The generator will be located outside the pump station building, housed in an acoustic cabinet designed for emergency use only. It is not proposed to use the generator for regular load shedding or power export as this would require a higher level of acoustic treatment. Fuel storage for 72 hours operation at full load will be provided on site.

4.4.8 Operations and Maintenance

Material collected by the screens and grit removal facilities will be stored in wheeled bins to allow transport to the door for removal from site.

Hinged access hatches will be provided over the wet well to contain odours while allowing access for cleaning and maintenance. Handrails provided around wet well for safety when the hatches are open.

An overhead travelling crane will be provided in the building to allow disassembly of pumps and removal of grit and screening equipment.

4.5 Wastewater Treatment Plant

4.5.1 Site and Layout Philosophy

The treatment plant site concept site layout is shown in Figure 4-4 and Drawings 6517986-GE-040 and GE-041 in Appendix C. The layout has been developed with the following concepts in mind:

- The plant has is of a narrow configuration located on the flatter land adjacent to Old Coach Road to avoid the steeper hillside (and higher construction cost and risks associated with increased earthworks volumes and retaining walls).
- The height of the buildings has been arranged so that the higher structures are located to the south east end of the site to maintain maximum vertical separation from the ridgeline at the rear of the site.
- Site access is via a one way access lane from the north, as the available width of the site constrains vehicle turning. This means that it is likely heavy vehicles leaving the site will need to travel down Old Coach Road to Akaroa. The access lane is partly located on road reserve but well clear of the existing carriageway and will also provide a parking area. When operational the facility is likely to require 3 visits a week in autumn to spring and 6 visits a week in summer from maintenance staff.
- All the buildings are located within the boundaries of the site outside the of the Old Coach Road reserve.
- The majority of the equipment is indoors, to reduce noise and visual effects, and to maximise serviceability.
- The north east walls of the buildings and tanks are used as retaining walls.
- Stormwater from roofs and hardstanding areas will be collected, treated by a proprietary sump system and discharged to the Old Coach Road drainage system. Council propose to upgrade

the drainage system on Old Coach Road and have confirmed in principle that the stormwater from the WWTP can discharge to this system.

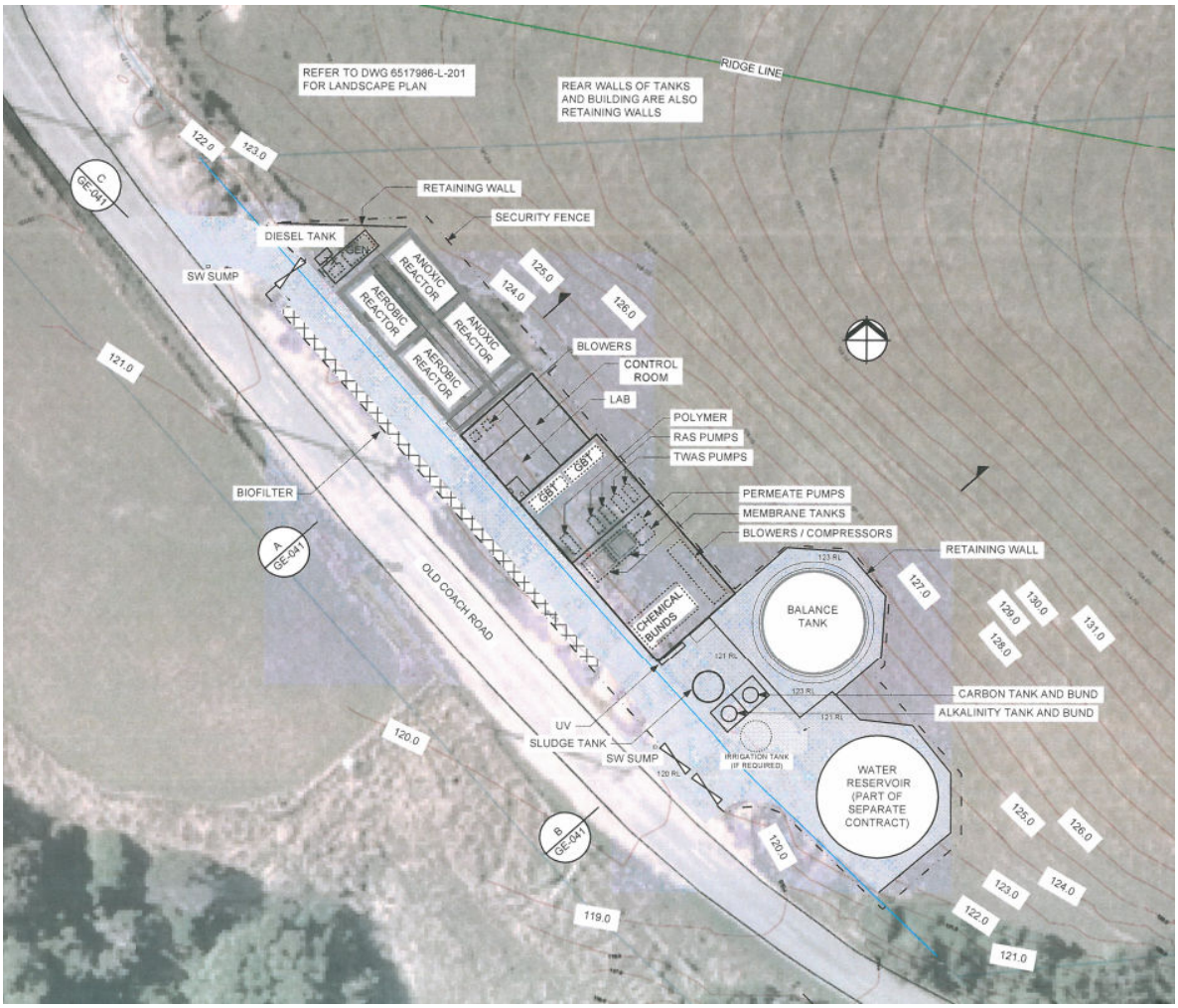

Figure 4-4 Treatment Plant Concept Layout

4.5.2 Design Flows

Design flows were estimated for each of the pump stations using theoretical per capita flow estimation (in accordance with the methods set out in CCC's Infrastructure Design Standards), and back analysis of the existing treatment plant flow meter readings, pump tests and run hours.

Design influent flows to the WWTP (see Table 4-2) were taken from the concept design report (Harrison Grierson (2012), and compared with more recent flow monitoring data.

Table 4-2 - Design Influent Flows

Flow		Current	Design (2041)
Winter ADWF	m^3/d	200	290
Annual Average	m^3/d	246	357
Summer Average	m^3/d	386	561
Peak Summer Day	m^3/d	696	1,011
Peak Instantaneous	L/s		65

The calculated peak design flows for the system are shown in Figure 4-5.

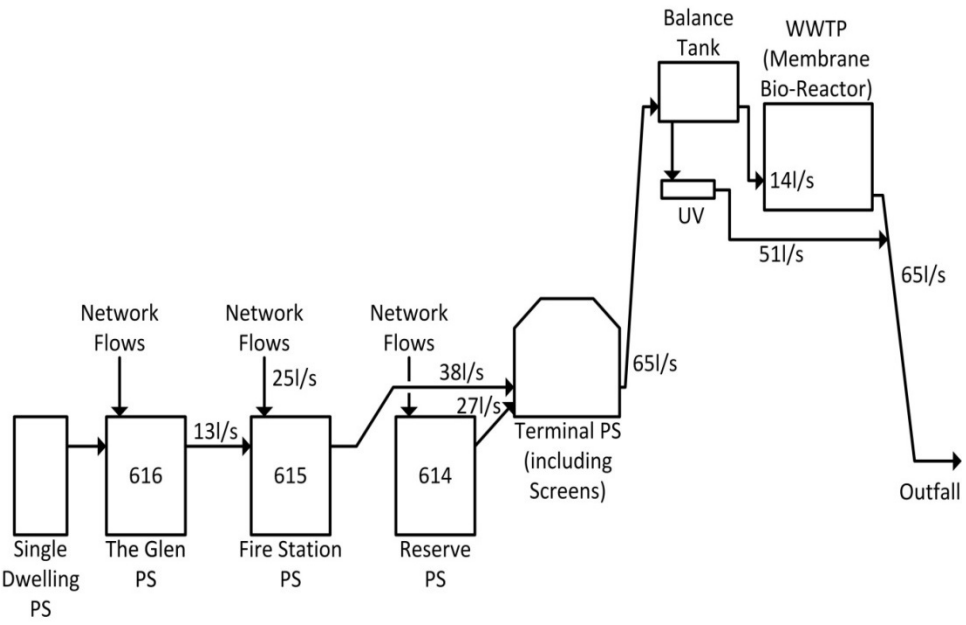

Figure 4-5 Peak Design Flows

4.5.3 Design Influent Quality

Influent wastewater monitoring was carried out three times per week from 11 December 2013 to 7 February 2014. Based on this data, the design influent concentrations which will be used in the treatment plant specification are given in Table 4-3.

Table 4-3 Design Influent Quality

Parameter		Median	Peak Summer Day
TSS	mg/L	130	210
VSS	mg/L	120	180
COD	mg/L	355	500
Soluble COD	mg/L	180	300
BOD_5	mg/L	135	200
Soluble BOD_5	mg/L	75	120
Ammonia-N	mg/L	36	54
Nitrate-N	mg/L	0.06	0.22
Nitrite-N	mg/L	0.01	0.02
Soluble TKN	mg/L	40	60
TKN and TN	mg/L	46	64
TP	mg/L	6.6	8.4
Alkalinity	mg$CaCO_3$/L	225	270
Faecal Coliforms	cfu/100mL	5,000,000	7,500,000
Enterococci	cfu/100mL	500,000	1,000,000

4.5.4 Design Treated Wastewater Quality

CCC has confirmed that the new treatment plant will include a year-round biological nitrogen reduction (BNR), with membrane filtration, based on its resolution of the 8 December 2011 to provide a "*best quality wastewater available"* standard. The proposed treated wastewater consent limits given in Table 4-4 reflect this decision.

Table 4-4 Wastewater Consent Limits

Parameter		Proposed Consent Limit	Measure	Discharge Quality required to meet Standards
TSS	mg/L	20	annual median	No standard
		50	annual 95 percentile	
$CBOD_5$	mg/L	20	annual median	No standard
		50	annual 95 percentile	
Amm-N	mg/L	10	annual median	69.2 [1]
		20	annual 95 percentile	
TN	mg/L	15	annual median	No standard
		30	annual 95 percentile	
Faecal Coliforms	cfu/100mL	500	annual median	1064 [2]
		1,000	annual 95 percentile	
Enterococci	cfu/100mL	500	annual median	10640 [3]
		1,000	annual 95 percentile	

Notes:
1. Based on ammonia limit of 0.910g/m³ x worst case modelled dilution of 76 times
2. Based on Faecal coliform limit of 14 MPN/100mL x worst case dilution of 76 times
3. Based on Enterococci limit of 43 MPN/100mL x worst case dilution of 76 times.

4.5.5 Proposed Treatment Process Description

A preliminary design Process Flow Diagram (PFD) with treatment and hydraulic capacity is shown in Figure 4-6 and a 3D schematic showing flow paths through the treatment plant is shown in Figure 4-7.

Screening and grit removal will be provided at the Terminal Pump Station and no further primary treatment is proposed at the treatment plant.

All flow to the treatment plant will be received in a 250m³ flow balance tank. The purpose of the balance tank is to:

- Optimise the required size of the reactor tanks
- Smooth diurnal flow patterns
- Capture the peak inflows for a specified wet weather event.

Normal flows (up to 14L/s) will receive full treatment using the BNR process with membrane filtration. Once the capacity of the balance tank is reached, additional flows above 14L/s will bypass the main treatment process, receiving UV disinfection, before combining with the treated wastewater from the main process.

One option is to use Modified Ludzak-Ettinger (MLE) reactors, which is a conventional process for BNR, but other options producing the same treated wastewater quality will also be considered. The MLE process is an anoxic followed by aerobic system with a high level of recycle from the aerobic zone to the anoxic zone to provide sufficient nitrate and nitrite for nitrogen removal by denitrification. This recycle is combined with Return Activated Sludge (RAS) from the membranes to provide sufficient microorganisms (otherwise known as Mixed Liquor Suspended Solids (MLSS)) to treat the wastewater. To avoid biological inhibition, both carbon (acetic acid) and alkalinity (bicarbonate) will be added to the wastewater as it enters the MLE reactors.

Wastewater from the MLE reactors will then be treated using membrane filtration, to remove suspended solids and pathogens. The membranes are most likely to be low pressure hollow fibre membranes located in a separate membrane building.

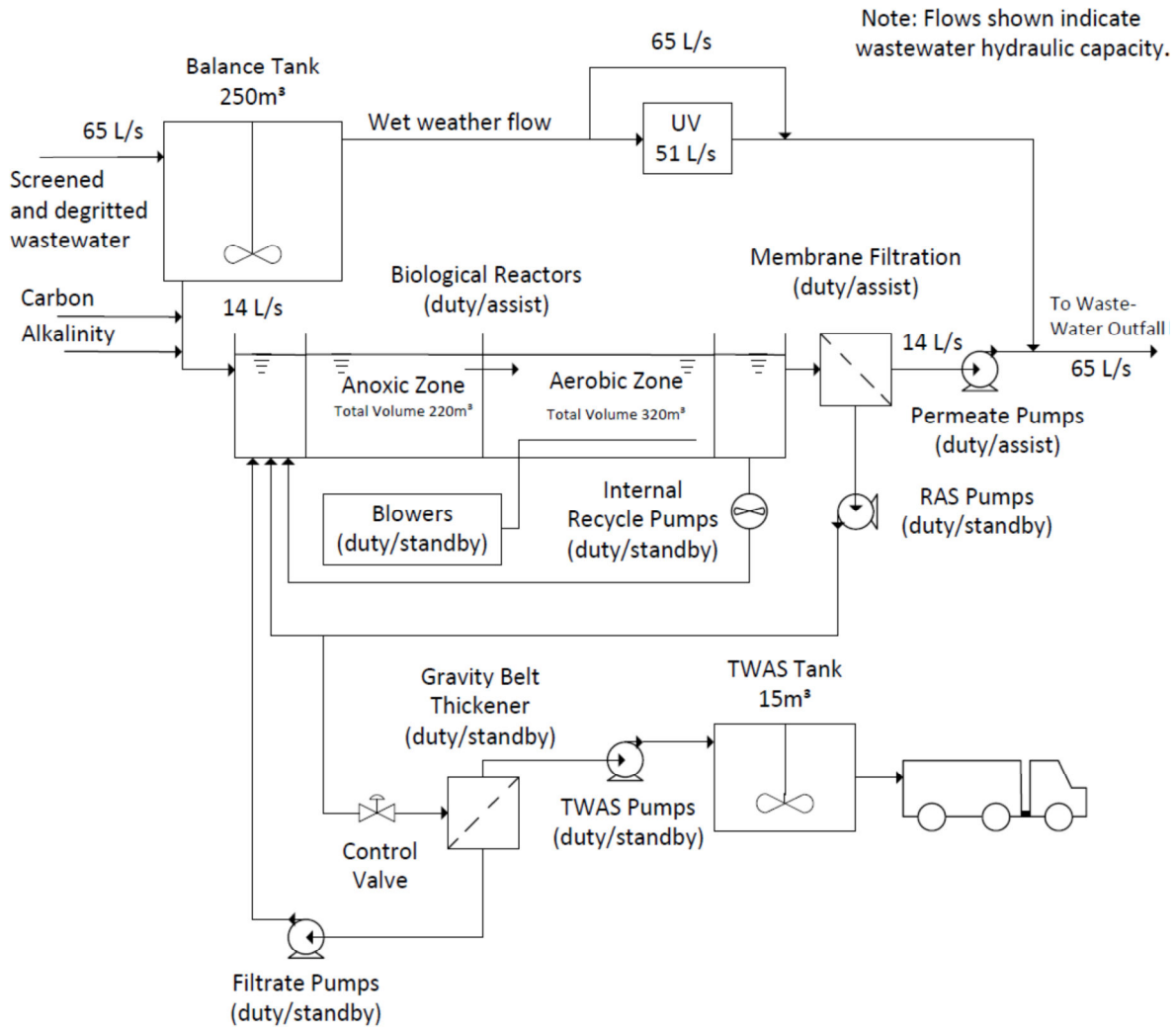

Figure 4-6 Process Flow Diagram (PFD) with Treatment and Hydraulic Capacity

Waste Activated Sludge (WAS) will be periodically removed from the membrane tanks and thickened using a gravity belt thickener, and stored in an enclosed tank. It is expected that sludge from the tank would be removed weekly and tankered to the Christchurch Wastewater Treatment Plant for processing into biosolids.

Mechanical equipment (blowers and most pumps) will be sized for duty/standby operation. This means the process can continue following the failure of individual items of mechanical equipment. The gravity belt thickener and thickened WAS pumping will be specified duty only, as they are only required 1 to 2 hours per day, and the process could continue for several days without these units in operation.

4.5.6 Treatment Process Options

It is proposed that the following BNR processes should remain as viable treatment alternatives for the design build contractor:

- Modified Ludzak-Ettinger Reactors (MLE)
- Sequence Batch Reactors (SBR)
- Oxidation Ditch

- Mixed Bed Biofilm Reactor (MBBR)
- Integrated Fixed Film Activated Sludge (IFAS)

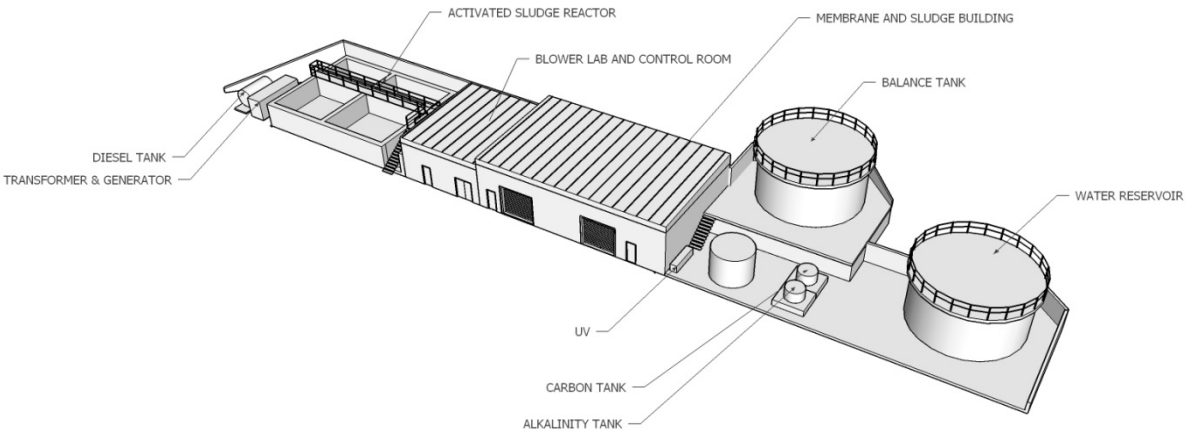

Figure 4-7 3D Schematic Showing Flow Paths through the Treatment Plant

4.5.7 Wastewater Disinfection

Advantages and disadvantages of membrane filtration are compared to clarifiers with UV disinfection in Table 4-5.

Table 4-5 Comparison of Membranes with Clarifiers and UV

Parameter	Membrane Filtration	Clarification with UV Disinfection
Typical treatment quality ▪ TSS (mg/L) ▪ Faecal Coliforms (cfu/100mL)	 2 10	 15 100
Treatment reliability	Good – Significant breakthrough of solids or coliform is unlikely.	Fair – If sludge blanket rises, solids will break though and Disinfection will be ineffective.
Operational reliability	Good	Better
Footprint	Lower – although requires a tall building to allow membranes to be lifted out and cleaned	Higher – although can be largely in ground structures. Would be difficult to fit on site.
Cost	Higher	Lower
Best available technology	Yes	No

In summary, membrane filtration has been adopted as a required treatment process, i.e. the option of clarifier with UV disinfection will be precluded in the design/build procurement process.

4.5.8 Residuals Management

Waste Activated Sludge (WAS) will need to be thickened and stored, before being tankered to the Christchurch Wastewater Treatment Plant for processing into biosolids. Thickening will reduce the number of tanker movements, and so reduce transport costs.

4.5.9 Bypass Treatment

Once the balance tank is full, wastewater will overflow to a UV disinfection system. The 0.5mm gap sizing of the fine screen at the Terminal Pump Station is sufficient to allow UV disinfection without further pre-treatment.

To minimise the discharge of odours from the WWTP, the major odour-generating equipment will be enclosed including the balance tank, sludge processing equipment and sludge tanks. The odorous air from this equipment will be extracted and transferred to a bark biofilter for treatment. Forced ventilation will also be provided in the blower, laboratory and control room building. The ventilation air from these items will be discharged directly to atmosphere via vents which will discharge horizontally from the rear side of the building.

4.5.10 Operations and Maintenance

The main treatment process (activated sludge reactors and membrane filters) units have been sized for duty/assist operation. For the majority of the time, only the duty reactors will be required, with the assist reactor started up prior to the peak load during Christmas/New Year holiday period. The assist membranes may be left in service during the off season, to maximise the treatment of wet weather flows, but would be serviced during this period.

Mechanical equipment (blowers and most pumps) will be sized for duty/standby operation. This means the process can continue following the failure of individual items of mechanical equipment. The gravity belt thickener and thickened WAS pumping will be specified duty only, as they are only required 1 to 2 hours per day, and the process could continue for several days without these units in operation.

4.5.11 Appearance of Buildings and Site

The architectural components of treatment plant will be designed with consideration of the SCIRT Pump Station Design Guide, which has been adopted by CCC. This will be a requirement of the design and build contract.

Although there are no immediate adjacent properties containing dwellings, it is considered that the treatment plant should be laid out and treated in a sensitive manner.

Due to the size of the proposed treatment plant in terms of the number of structures, it is important that the overall layout is considered. It is proposed that the higher structures are sited further down the hill so as to reduce their visual impact. In addition, smaller elements such as tanks, will be clustered together where possible, set back from the main frontages and screened. The design of the buildings proposed will follow the functional requirements including use of pre-cast concrete panels to meet the Importance Level and Design Life requirements. The concrete will be patterned or stained, and a secondary material (such as timber or corten steel) will be added to introduce design feature elements and reduce the industrial appearance and reflectivity of the concrete finish. The detailing on the concrete panels is intended to respond to the context as well as to help deter graffiti. The elevations will also be treated with anti-graffiti products.

Landscape planting will be designed to “soften” the impact of the structures and provide screening where appropriate. Plant species will be selected to be appropriate to the context of the area as well as being low maintenance.

4.5.12 Power Supply

Power for the treatment plant will be provided from the Orion network. A standby generator set will be provided at the treatment plant. This generator will be included as part of the design and

construct package for the treatment plant and will be required to be sized to operate the treatment facilities at full flows/load. Preliminary sizing for the generator is 160kVA.

The containerised generator will be specified with fuel storage for 72 hours operation at full load provided on site.

4.6 Wastewater Disposal

4.6.1 Overview

In normal operation, the outfall pipeline will carry treated wastewater from the treatment plant to the harbour discharge point. In periods of sustained wet weather, when the wastewater inflow exceeds the capacity of the treatment plant and balance tank, the outfall pipe will carry screened (primary treated) and UV-disinfected diluted wastewater to the discharge location. Provision will be made at detailed design to enable irrigation to land or other reuse options.

The total length of the pipeline between the treatment plant and the discharge location is 3,725m.

4.6.2 Outfall Alignment

The proposed outfall alignment and discharge location is shown on Drawing GIS-6517986-05 in Appendix C.

The land pipeline runs from the WWTP down Old Coach Road, across State Highway 75 and along Childrens Bay Road to the north end of Childrens Bay (refer Figure 4-7). This is the preferred location for the pipeline to leave the shoreline, as it reduces construction phase disruption to beach and boat users, avoids the well-established vegetation and boardwalks in Childrens Bay and avoids the rock headland further north.

The outfall pipeline is proposed to run from Childrens Bay to a mid-harbour outfall location shown in Figure 4-9. To determine the final discharge location two possible mid-harbour discharge options were assessed, based on avoiding designated cruise ship anchorages, and reaching water deep enough to provide satisfactory dilution and dispersion of the discharge. The two options (2.5km and 2.9km long measured from the shoreline) were assessed by modelling the dilutions that occur in the ambient harbour environment. The assessment (contained in Appendix B) indicated similar (and satisfactory) dilutions at both assessed locations, and therefore the shorter of the two outfall options was adopted.

The pipeline has been designed with 1m cover to the pipe beneath the seabed to reduce the risk of it being snagged by anchors and to provide protection from tsunami conditions. The pipeline depth at the inshore end increases to 2.6m so that the proposed de-aeration structure is always submerged even at low tide.

Even though the design has considered boat anchorage, the completed outfall and diffuser location will require restricted anchorage designations, and diffuser components will be designed with a degree of protection from errant anchor placement and drag.

Figure 4-8 Alignment of Outfall Pipeline in Childrens Bay

Figure 4-9 Akaroa Harbour and location of existing treatment plant (x-WWTP) and short 100m outfall (yellow) and proposed treatment plant (n-WWTP) and 2.5km outfall (white) Akaroa Harbour

4.6.3 Diffuser Arrangement and Performance

Dispersion modelling was conducted by NIWA (2014) to establish the dispersion, dilution and virus inactivation effects in the receiving environment for the proposed wastewater discharge. The modelling was based on CORMIX for near-field dilution and dispersion effects and DELFT2 for far field dispersion and dilution and virus inactivation.

Two outfall lengths (2.5km and 2.9km) were initially chosen based on the CCC objective of discharging at a mid-harbour location. Both of these lengths provide a minimum water depth of 9m from the outfall diffuser to Mean Sea Level. Modelling of plume dispersion based on tidal and wind effects was conducted at 1 hour intervals over a 1 year period to take into account seasonal changes in wind and tidal and solar radiation effects. The modelling also looked at plume impingement on 13 specific receptors on the coastline as well as a mid-harbour receptor. Receiving environment receptors were chosen that included swimming sites and potential shellfish gathering areas. These receptor sites were agreed with CCC and are shown in Table 4-6 and Figure 4-10. The results of the dilution and inactivation modelling are presented in Figure 4-11.

Figure 4-10 Map of receptor sites for which total dilution plus viral inactivation and concentration-reduction factors were determined

North point is upward (see Table 4-6 for site names and codes). All sites except No. 14 are near the coastline; Site 14 is 150m north of the diffuser. Sites 7–10 have also been used to assess health risks from harvested shellfish, eaten raw.

Sites 7–10 have also been used to assess health risks from harvested shellfish, eaten raw.

Table 4-6 List of Receptor Sites for NIWA Model

Number	Site	Code
1	Lushington Bay	LuB
2	Childrens Bay	ChB
3	Offshore Childrens Bay	OCB
4	French Bay – CBD	FBC
5	French Bay – Wharf	FBW
6	Glen Bay	GnB
7	Existing outfall/WWTP	ExW
8	The Kaik	ThK
9	Ohinepaka Bay	OhB

Number	Site	Code
10	Wainui	Wai
11	Petit Carenage Bay	PCG
12	French Farm Bay	FFB
13	Takamatua Bay	TaB
14	Mid Harbour, 150m north of diffuser	MHb

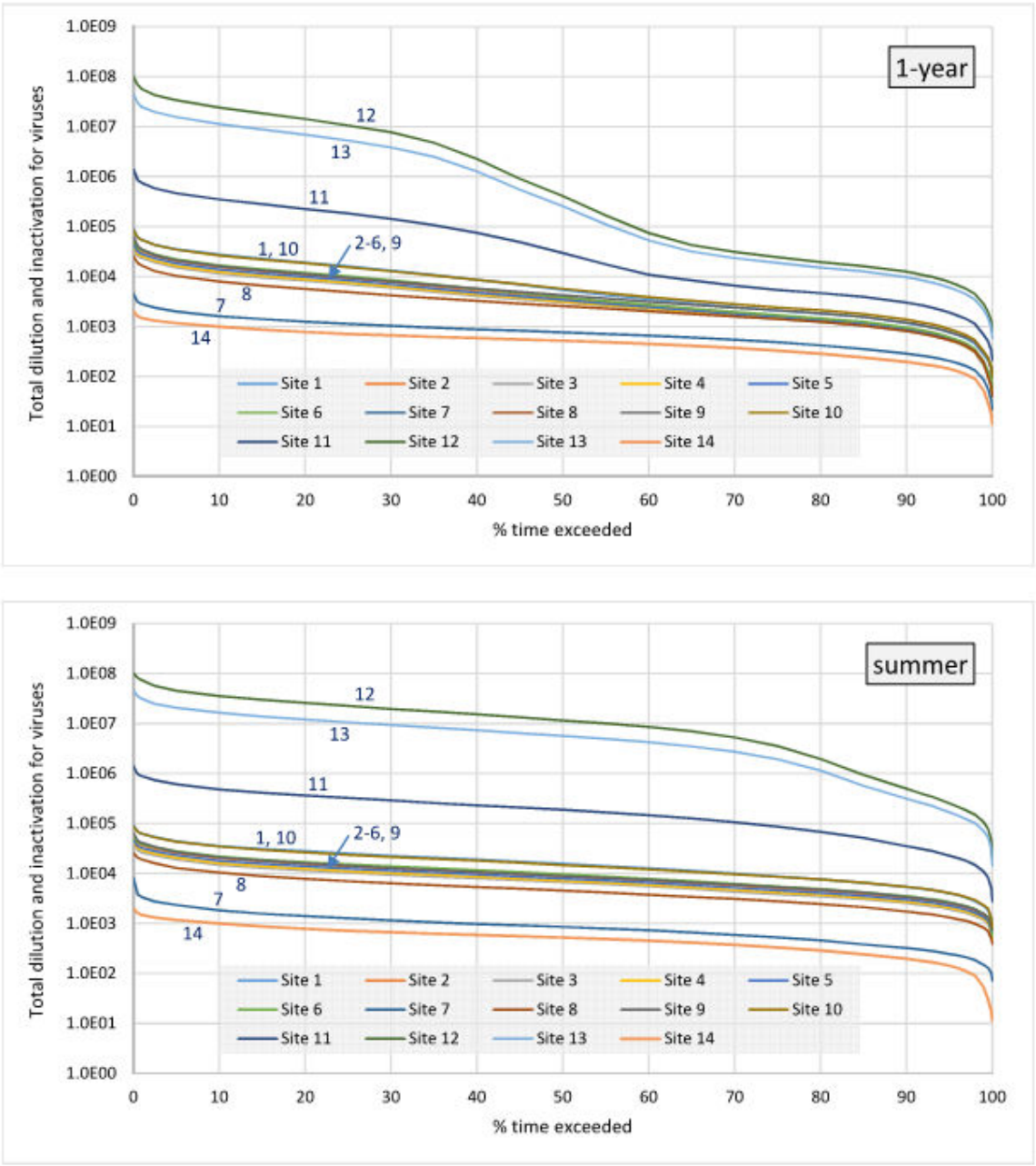

Figure 4-11 Cumulative distribution of total dilution plus inactivation for viruses at each of the receptor sites

4.6.4 Hydraulic Design

The proposed hydraulic design for the treatment plant outfall is summarised below.

- The outfall pipeline which will operate under gravity using the head available from the treatment plant
- The maximum design flow is 65L/s and the minimum flow is 0.5L/s
- The land line will have partial flows conditions over its upper reach and be under pressure over its lower reach
- To avoid air "gulping", the initial 50m of pipe downstream of the WWTP should be PE100 DN315 PN10 laid at a minimum gradient of 1.5% between 2 manholes.
- As the harbour outfall will be laid relatively flat and air may accumulate at local high points, a buried de-aeration chamber will be included at the shoreline, to remove entrained air from the pipeline before discharging into the marine line.
- The maximum steady state pressure in the land line will be 75m and for transient conditions would be similar.
- The maximum steady state pressure in the marine line will be 65m and for transient conditions would be similar.
- No resonance is expected in the pipeline due to swell or long period waves in the harbour.

4.6.5 Seabed Conditions along outfall pipeline

Geotechnical investigations along the pipeline route including jetting the seabed, in situ shear vane testing, and material sampling and testing. At the same time, a bathymetric survey was undertaken to confirm the seabed contours shown on the marine chart for the pipeline route, and basic side scan run of the alignment carried out to check for any isolated seabed obstructions.

The results of the seabed geotechnical investigation as well as the proposed pipeline location are presented in OCEL Drawing DR-130604-001 in Appendix C. The seabed away from the shoreline was the characteristic loess-derived silt typically found in the Akaroa Harbour. The sediment is consistent with a typical un-drained shear strength of 15kPa away from the shore. Higher shear strengths were found closer to the shore due to the presence of shells, increasing amounts of sand and the proximity to the underlying rock. There is a rock outcrop where the outfall reaches the shore.

The echo sounder side scan function was in operation during a transit along the line of the outfall. The seabed appeared to be featureless with no apparent seabed obstructions.

The implication of the survey results for the design of the outfall and the diffuser are that the outfall can be readily buried in the seabed along its alignment – close to shore using an excavator and away from shore either using an excavator on a barge or by water jetting using a purpose built unit designed to fit over and run along the pipe with its attached ballast weights. The alignment at the shoreline will seek to avoid the rock outcrop.

4.6.6 Diffuser design

The proposed diffuser design comprises three risers at 5m centres, each discharging to two horizontally opposed ports 300-500mm above the seabed. The diffuser will be buried with riser units to bring the flow up from the pipe ports to a tee head discharge above the seabed. The risers and discharge heads will be contained within protective structures designed to deflect/protect the risers and heads from entanglement with anchor cables and fishing lines and to withstand propeller wash from cruise ships.

The soft nature of the seabed means that either screw or friction piles can be used to support the diffuser and protection structures.

Figure 4-12 shows a schematic of an outfall diffuser with risers.

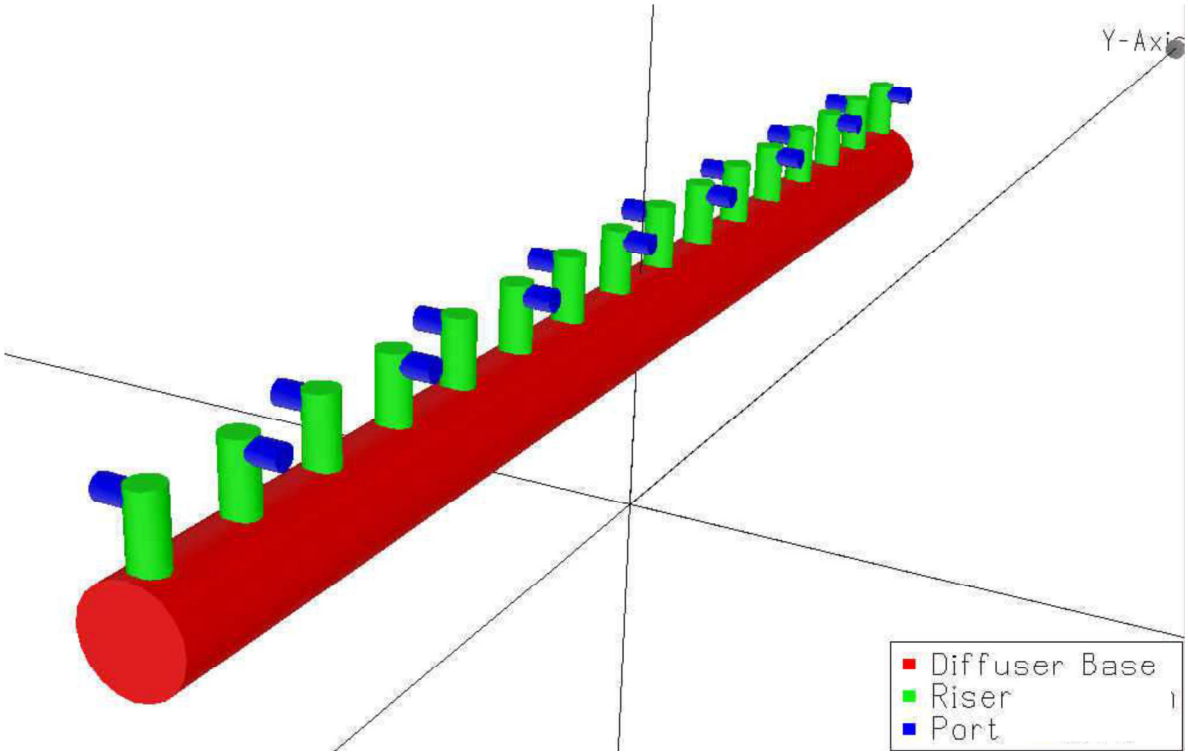

Figure 4-12 Schematic of an outfall diffuser with risers. Ports can be alternate on each riser or for the specimen design for Akaroa, alternate ports would be positioned on each of 3 risers to make 6 ports in total. [*Source*: CORMIX web site: http://www.cormix.info/methodology.php]

4.6.7 Outfall Pipeline Materials

It is proposed to construct the outfall using welded polyethylene (PE) pipe. PE is a commonly available material that is used to manufacture pipes in a wide range of sizes. It can be welded into continuous lengths and is relatively light and flexible as well as being inert with regard to corrosion on exposure to seawater and effluent. It is a remarkably tough and robust material, and with correct and quality controlled welding procedures can be made into continuous lengths. In situ jointing during construction needs to be carefully addressed for durability against corrosion.

Ballasting of PE pipe can be achieved by the addition of concrete weights to the pipe. They can be cast on, clamped (bolted) to the pipe with fibreglass bolts (for corrosion resistance), or added as a saddle weight. Smaller pipes of up to 450mm have been installed with cast on weights, and the buoyancy provided by the pipe itself when full of air allows pipe strings to be towed into position while floating. This also provides the option of storing assembled pipe strings on the seabed so they can be recovered as required for installation.

4.6.8 Construction Issues and Methodology

Overview

There are several factors of the Akaroa outfall site and alignment that influence its design and potential construction methods. The shallow and busy nature of the harbour requires that the

pipeline is buried to protect it from damage by vessels and anchors, and so that it is not visible in the near shore zone. The onshore topography on the outfall alignment is not suited to establishing a temporary pipe assembly and launching area as it rises steeply from the beach and does not provide suitable space. The outfall location benefits from the protected nature of the harbour which should allow a high proportion of productive time, and easy access for working vessels. It is also noted that during summer months the bay is a popular area for recreational boating.

These issues require that the outfall components be assembled away from the alignment of the outfall, and that an adequate means of pipe burial to provide protective over to the installed pipeline is required.

While the detail of the construction method will be a matter for the Contractor, it is prudent to check that practical and feasible options are available. In this case, the length of the outfall requires that an appropriate onshore assembly area is available to provide material storage, pipe string assembly and welding, ballasting, and launching of complete pipe strings to be floated to the installation site. Areas exist between the main road access to Akaroa Township and the main boat ramp which would provide for pipe strings of up to 130 m to be prepared. Strings of this length could be assembled, launched and stored on the harbour bed to reduce the amount of onshore site required. Another option is to find a suitable location elsewhere in Akaroa Harbour where traffic and population is less likely to be disrupted. The location of construction assembly areas will be agreed between CCC and the Contractor. Any consents required, in regard to the temporary use of these areas, will be the responsibility of the Contractor.

Two construction methods have been considered for installing the outfall pipeline. Horizontal Direct Drilling (HDD) was investigated on the grounds that it offered the potential to minimise ground surface disturbance, and thus potentially disturbance of seabed sediment during construction. This is a specialist procedure. The second option of conventional pipe lay into an excavated trench was considered. The options are discussed as follows.

4.6.9 Horizontal Directional Drilling

This method involves the drilling of a pilot hole along the pipeline alignment from the onshore end, the reaming of the hole to enlarge it, and the pulling of a PE liner from the harbour end. The success is sensitive to soil conditions and particularly the presence of buried obstructions such as logs. The resulting PE pipeline, while installed under undisturbed soils remains susceptible to flotation under liquefaction conditions due to its density.

The length of the proposed Akaroa outfall at 2.5km is significantly longer than has been achieved in New Zealand and this method is not considered feasible for this project.

4.6.10 Conventional Pipeline Trench and Installation

The use of continuous lengths of pipe provides the opportunity to open up long lengths of trench and install equivalent pipe sections. Underwater flanged or surface electrofusion jointing of pipes between strings allows options for installation lengths to be selected, and it is proposed that selection of length be left to the contractor as a trade-off between risk and cost saving.

At the shoreline, the de-aeration structure governs the starting invert level of the outfall pipeline, and requires an excavation of 2.6m to invert of the pipeline. To maintain the trench required for pipe installation and connection to the de-aeration structure in the intertidal zone temporary sheet piling is expected to be required, and will also be needed to install the de-aeration structure. The long section of the outfall is shown on Drawing DR-130604-002 in Appendix C.

A section of trestle or temporary bund adjacent to the pipe alignment is envisaged for this nearshore section. This will provide access for excavation and sheet piling plant. Again, it is proposed that it should be the contractor's decision to select pipe lengths for installation and the configuration of access and sheet piling requirements, as well as excavation further offshore. This will be based on an assessment of the length of trench that can be practically maintained, and the number of in situ joints that will be required.

Beyond low water, excavation would be carried out from a barge, with the trench prepared and the spoil placed to one side. This assessment assumes prefabricated pipe strings will be installed into the excavated trench, although other options such as installing the pipeline on the seabed and then lifting across into a trench excavated adjacent, or jetting the pipe down to grade are available. Jetting is less likely to be acceptable because of the resulting turbidity.

The first section of pipeline to be installed is expected to be the inshore end and connection to the de-aeration structure. The length of preassembled floating pipeline will be towed into the sheet piled trench at high tide, the pipe flooded and sunk into the sheet piled trench and the connection made. Trenching would then proceed offshore from that point over the length of the pipe strings to be installed. The pre-welded strings fitted with ballast blocks will be sequentially installed into the trench and roughly backfilled using the accessible spoil. Completion of backfilling will occur naturally, the ballast on the pipeline providing stability in the process.

The diffuser incorporates three PE riser pipes spaced 5m apart at the seaward end of the pipeline which will each discharge through two horizontally opposed duckbill valves. It is proposed that the diffuser section is installed as a separate component once the rest of the pipeline is installed. Connection of the diffuser will be by flanged joint so that the risers are installed plumb. Risers will be protected by 1m OD thick wall PE installed over each riser and screw anchored in place prior to backfilling of the sleeve both internally and externally. It is proposed that each riser component is gravel filled after installation, and backfilled to seabed level. The preliminary diffuser design is shown on DR-130604-003 in Appendix C. This will provide protection to the exposed diffuser ports from thruster scour from larger vessels, and anchor drag.

4.7 Construction Programme

It is anticipated that construction work will commence in April 2017 and will be carried out in a number of phases over a 2 year period. The Wastewater Treatment Plant, Terminal Pump Station and Outfall Pipeline can all be constructed simultaneously. They must be completed, alongside supporting infrastructural elements, prior to the upgrade of the reticulation network. Figure 4-13 shows a schematic of the construction works. The overall project programme is included in Table 4-1 of the draft Construction and Environmental Management Plan (see Appendix H for a copy).

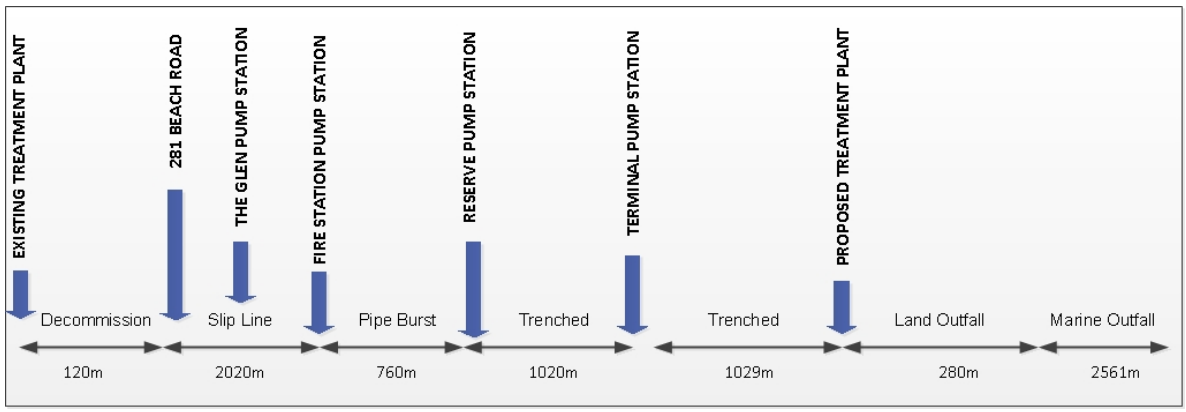

Figure 4-13 Schematic of construction works

5 Summary of Activity Status

5.1 Overview

This section sets out the activity status of the different activities of the proposal in terms of the Resource Management Act (RMA) and the relevant district and regional plans and the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Regulatory 2011 (NES).

Tables 5-1 and 5-2 summarise the activity status of the various activities associated with the proposal. The type of resource consent under the RMA is also stated – Section 9 (land use), Section 12 (coastal permit), Section 13 (land use – beds or lakes and rivers) and Section 15 (discharges).

Table 5-1 addresses activities administered by the Christchurch City Council in terms of the Banks Peninsula District Plan and the NES.

Table 5-2 addresses activities administered by the Environment Canterbury in terms of the Natural Regional Resources Plan (NRRP) and in particular Chapter 3-Air Quality, Chapter 4 Water Quality, Chapter 5 Water Quantity, Chapter 6 Beds of Lakes and Rivers, the proposed Land and Water Regional Plan (pLWRP) and the Regional Coastal Environment Plan for the Canterbury Region (RCEP).

Table 5-1 Section 9 FRMA and NES Activities - Christchurch City Council

Activity	RMA Classification	Zoning	District Plan Rules	Location	Classification
1. Pipeline					
Earthworks	S9	Various	Chapter 36 Rule 1a	Entire site unless specified	Permitted
Pipe crossing heritage bridge by burying the pipe in the seal of the bridge – Beach Road Bridge	s9	Residential Conservation	Chapter 36 Rule 5a)	Beach Road Sheet 5 Chain 1780	Permitted
HAIL Site – Earthworks in the vicinity of Terminal Pump Station	S9	Recreational Reserve	NES Reg 7 and 9	Sheet 8 Chain 3160	Discretionary
2. Terminal Pump Station and Pumping Stations					
Terminal Pump Station	S9	Recreational Reserve-Utilities	Chapter 36 Rule 4	Sheet 8 Chain 3160	Restricted Discretionary
Upgrading of pump stations	S9	Various	Chapter 36 Utilities	Various	Permitted
Biofilters at Terminal Pump Station and Fire Station Pump Station	S9	Road Reserve	Chapter 36 Utilities	Sheet 8	Permitted
HAIL Site -Terminal Pump Station	S9	Recreational Reserve	NES Reg 7 and 9	Sheet 8 Chain 3160	Discretionary
3. WWTP					
WWTP	S9	Rural-Utilities	Chapter 36 Rule 4	WWTP Concept Layout Plan; drawing reference 6151786-GE-040	Restricted discretionary
4.Temporary Construction Management Areas (TMCAs)					
Use of land for TCMAs to be confirmed	s9(3)	Mixed	Various	To be confirmed	To be confirmed

Table 5-2 Sections 9 and 12-15 of RMA Activities - Environment Canterbury

Activity	RMA classification	NRRP	pLWRP	RCEP	Location	Classification
1. Pipeline on Land						
Pipeline over streams on existing bridge structures ■ Construction activity and operation activity	S13	Rule BRL4	Rule 5.135	NA	Sheet 5 and 8 Chain length:1780 and 3120-3140	Permitted
Groundwater take dewatering (excludes pipeline in proximity to Terminal Pump Station) ■ Construction activity	S14	Rule WQN12	Rule 5.119 and 5.120	NA	Pipeline	Permitted
Groundwater discharge from dewatering (excludes pipeline in proximity to Terminal Pump Station) ■ Construction activity	S15	WQL2	5.119 and 5.120	NA	Pipeline	Permitted as Council has given permission to discharge to reticulated systems
2. Pipeline in CMA						
Excavating, drilling, or tunnelling in the foreshore and or seabed ■ Construction activity	s12	NA	NA	Rule 8.2	Outfall pipeline Sheet 9	Discretionary
Discharge during construction ■ Construction activity	S15	NA	NA	Rule 7.2	Outfall pipeline Sheet 9	Discretionary
Placement of pipeline in, on, under, or over any foreshore	S12	NA	NA	Rule 8.3	Outfall Pipeline Sheet 9	Discretionary
Destruction, damage or disturbance ■ Construction activity	S12	NA	NA	Rule 8.7	Outfall Pipeline Sheet 9	Discretionary
Construction Noise in CMA ■ Construction activity	S12	NA	NA	Rule 8.21	Outfall Pipeline Sheet 9	Permitted
Occupation of the Coastal Marine Area ■ Operation activity	S12	NA	NA	Rule 8.23	Outfall Pipeline Sheet 9	Discretionary

Activity	RMA classification	NRRP	pLWRP	RCEP	Location	Classification
Discharge of treated wastewater ■ Operation activity	S15	NA	NA	Rule 7.3	Outfall Pipeline Sheet 9	Discretionary
3. Terminal Pump Station and Existing Pump Stations						
Groundwater take dewatering from contaminated site (includes pipeline in proximity to Terminal Pump Station) ■ Construction activity	S14	Rule WQN4	Rule 5.119 and 5.120	NA	Terminal Pump Station Sheet 8 Chain Length 3160	Restricted Discretionary
Groundwater discharge from dewatering (includes pipeline in proximity to Terminal Pump Station) ■ Construction activity	S15	WQL2	5.119 and 5.120	NA	Pipeline, Terminal Pump Station, WWTP	Permitted as Council has given permission to discharge to reticulated sewerage system
Discharge of stormwater to water/land during construction ■ Construction activity	S15	Rule WQL6 and WQL7	5.95 PA standards 5.97 or 5.100 Discretionary Activity	NA	Terminal Pump Station Sheet 5 and 8 Chain length:1780 and 3120-3140	Permitted as Council has given permission to discharge to reticulated systems
Discharge of stormwater from roof ■ Operation activity	S15	Rule WQL6 and WQL7	5.95 PA standards 5.97 or 5.100 Discretionary Activity	NA	Terminal Pump Station Sheet 5 and 8 Chain length:1780 and 3120-3140	Permitted as Council has given permission to discharge to reticulated systems
Discharge to air from Terminal Pump Station	S15	Rule AQL69	NA	NA	Terminal Pump Station Sheet 5 and 8 Chain length:1780 and 3120-3140	Discretionary
Discharge to air from Fire Station Pump Station biofilter	S15	Rule AQL 63	NA	NA	Fire Station Pump Station Sheet 6 Chain legnth2140	Permitted
Discharge to air from Terminal Pump Station generator	S15	Rule AQL25	NA	NA	Terminal Pump Station Sheet 5 and 8 Chain length:1780 and	Permitted

Activity	RMA classification	NRRP	pLWRP	RCEP	Location	Classification
					3120-3140	
4. WWTP						
Use of land for storing wastewater ▪ Operational activity	s9	Rule WQL26	Rule 5.84	NA	WWTP-Old Coach Road	Discretionary
Discharge of stormwater to water/land during construction ▪ Construction activity	S15	Rule WQL6	5.95 PA standards 5.97 or Discretionary Activity	NA	WWTP-Old Coach Road	Permitted as Council has given permission to discharge to stormwater reticulated system
Discharge of stormwater to water/land from buildings and hardstanding surfaces ▪ Operational activity	S15	Rule WQL7	5.95 PA standards 5.97 Discretionary Activity	NA	WWTP-Old Coach Road	Permitted as Council has given permission to discharge to stormwater reticulated system
Discharge to Air from WWTP	S15	Rule AQL69	NA	NA	WWTP-Old Coach Road	Discretionary
Discharge to Air from WWTP generator	S15	Rule AQL25	NA	NA	WWTP-Old Coach Road	Permitted
5. Temporary Construction Management Areas (TCMAs)						
Discharges from TCMAs	S15	Various	Various	Various	To be confirmed	To be confirmed

5.2 Discussion of Activities and Rules

5.2.1 Pipeline on Land

5.2.1.1 Banks Peninsula District Plan

In terms of the BPDP the proposed pipeline is considered to be a "utility" under the BPDP given "utilities" are defined on page 358E as:

> *Any structure, network or facility established or operated by, or activity undertaken by a network utility operator as defined at section 166 of the Act.*

In Chapter 36 Utilities of the BPDP the following is stated under Rules:

> *These rules on utilities replace any zone rules which may otherwise apply to utilities in zones through which utilities pass, or within which they are sited unless specifically stated to the contrary in this chapter.*

The BPDP indicates that the pipeline is a permitted activity in terms of Rule 1(a) of Chapter 36, Utilities provided that the conditions for permitted activities are met and the application is not specified as a controlled, restricted discretionary or discretionary activity in Chapter 36.

Most sections of the pipeline meet the conditions for permitted activities assuming that the trenches will be backfilled in accordance with Rule 2.1 (c). As indicated in Section 4.3 the majority of the pipeline will be installed by directionally drilling to minimise disturbance. Small sections will require conventional pipeline trenching where the topography limits the use of the drilling machinery but will be backfilled within the specified time limit of seven days (assuming it is "large scale trenching" referred to in Rule 2.1(c)).

The pipeline will be buried in Beach Road as it crosses the Alymers Stream Bridge. While the bridge is identified as a Protected Building and Object (Appendix IV) the pipe will not be 'above ground' and as such is permitted in terms of Rule 36.5.

Overall the installation of the pipeline is permitted.

5.2.1.2 NES Contaminated Land

Installation of a section of the pipeline will occur on a HAIL site in the vicinity of the Terminal Pump Station. The site is identified as a previous landfill site. This requires resource consent as a discretionary activity under the NES Contaminated Land (Regulation 9(3) from the CCC given the disturbance of land that will occur during construction exceeds the minimum earthworks volume.

5.2.1.3 Canterbury Regional Plans

The take of groundwater as part of the dewatering during construction is permitted in terms of Rule WQN12 and Rule 5-119 (this assumes there is no contaminated land involved – the pipeline in proximity to the Terminal Pump Station is dealt with in 5.4.3 below). The discharge of stormwater during construction is proposed to be disposed of to Council's reticulated system and accordingly resource consent is not required. CCC has given permission for discharge to the reticulated system.

Where the pipeline crosses over watercourses this complies with the Conditions of Rules BLR 4 of the NRRP and 5.135 of the pLWRP and accordingly are permitted activities. In particular, the

pipelines will be buried in the road that crosses the bridges and will not reduce the hydraulic capacity of the bridge. There will not be disturbance of the beds of the streams.

5.2.2 Pipeline in CMA

5.2.2.1 Regional Coastal Environmental Plan

The placement of the pipeline in the foreshore and seabed as describe requires resource consent under Rule 8.3 as the pipeline is solid, is sited perpendicular to the MHWS and is more than 100m in length. The occupation of the seabed by the pipeline requires resource consent under Rule 8.23.

The construction of the pipeline of the pipeline by burial in the foreshore and seabed as described in Section 4.6 will result in excavation, disturbance, drilling and discharge of contaminants during construction and accordingly requires resource consent under Rules 7.2 and 8.7.

It is anticipated that construction noise will comply with the requirements of Rule 8.21.

The discharge of human wastewater from the pipeline into water in the Coastal Marine Area is a discretionary activity under Rule 7.3. While the wastewater has not passed through soil or a wetland outside the Coastal Marine Area the discharge will comply with the standards and terms set out in the rule as described in Section 7 of this report.

5.2.3 Terminal Pump Station and Pump Stations

5.2.3.1 Banks Peninsula District Plan

In terms of the BPDP the proposed Terminal Pump Station is considered to be a “utility” under the BPDP given “utilities” are defined on page 358E as:

Any structure, network or facility established or operated by, or activity undertaken by a network utility operator as defined at section 166 of the Act.

In Chapter 36 Utilities of the BPDP the following is stated under Rules:

These rules on utilities replace any zone rules which may otherwise apply to utilities in zones through which utilities pass, or within which they are sited unless specifically stated to the contrary in this chapter.

The site is zoned Recreational Reserve in the BPDP but the zone provisions do not apply in accordance with the above.

Rule 1 of Chapter 36 states:

Permitted Activities

a) All utilities are permitted activities in all areas of the District where they meet the conditions for permitted activities except in Rule 2, unless otherwise specified as a Controlled, Restricted Discretionary, or Discretionary Activity in this chapter.

This rule is difficult to interpret but appears to say that utilities are permitted provided they meet the conditions for permitted activities in Rule 2 and are not listed as a controlled, restricted discretionary or discretionary activity in the chapter. This interpretation is confirmed by Rule 4 below in particular.

In terms of Rule 2 the following is relevant:

Rule 2.1 Earthworks (a) states the earthworks conditions in Rule 3.6 in the Recreational Zone apply. This rule states earthworks undertaken in any continuous period of five years shall not exceed the following dimensions:

- $20m^3$ (volume) or $100m^2$ (area) per site where a site is 1 hectare or less in area or
- $20m^3$ (volume) or $100m^2$ (area) per hectare where a site is greater than 1 hectare in area, and
- shall not have a face height greater than 1.2m.

This rule is unlikely to be met given the overall site area is $750m^2$ and the volume of earthworks is likely to be at least $365m^2$ given the presence of contaminated soils.

Rule 2.2 Height and Size of Buildings and Structures (a) states the height conditions (Rule 3.1 and 3.2) in the Recreational Zone apply. The maximum height of buildings and structures in the Recreational Reserve Zone is 6m and the height of the Terminal Pump Station is 7m and accordingly resource consent is required. The building height to boundary (Rule 3.2) is complied with.

Rule 2.3 Yards (a) states the yard conditions (Rule 3.3) in the Recreational Zone apply where an above ground utility is over 3m in height or $10m^2$ in area. Accordingly the rule applies.Rule 3.3 states that all buildings or part of a building are to be setback the following minimum distances from boundaries:

- Front boundary - **7.5m**
- Side/Rear boundary - **3m**
- Yards fronting a State Highway - **20m**

The Terminal Pump Station is located 65m back from the Rue Jolie boundary, 190m from the Rue Brittan boundary, 110m from the Christchurch-Akaroa (SH75), and 50m from MHWS. Accordingly the proposal complies with Rule 3.3.

Rule 2.4 and 2.5 relating to trees are not applicable to the site.

Rule 2.6 Overhead Lines refers to the location of overhead lines in specified areas which is not applicable to this application, given that power will be supplied underground and the site is not in the specified areas.

Rule 2.7 Hazardous Substances states all utilities shall meet the standards for hazardous substance for the Rural Zone.

The following hazardous substances will be stored on site-diesel. It is anticipated to meet the rules in Chapter 37 and the specified thresholds in Appendix XV.

Rule 2.8 Screening refers to screening of utilities in the Residential Conservation and Town Centre Zones and does not apply to this site.

Accordingly the proposal does not comply with the earthworks and height requirement conditions.

Rule 3 Controlled Activities applies to controlled activities and is not applicable as it refers to telecommunication and radio communication facilities.

Rule 4 Restricted Discretionary Activities states that any application which does not comply with the conditions in Rule 2 is a restricted discretionary activity. As indicated above the proposal does not comply with earthworks and height conditions.

Assessment of Applications (p316) for **restricted discretionary activities** states the following:

Assessment of applications for controlled or restricted discretionary activities will be limited to that condition or conditions for permitted activities with which the proposal fails to comply. Applications will be assessed against the relevant objectives and policies for Utilities and the relevant Zone.

In addition while zone rules are not applicable to utilities it appears the general provisions are and in this respect the following are of relevance:

Site Access, Parking and Loading

The provisions contained in Chapter 35 Access, Parking and Loading are applicable and the Terminal Pump Station complies with these provisions. The existing hard standing parking area or entrance will be utilised for parking and access during maintenance visits.

Noise

The provisions contained in Chapter 33 relate to Noise in which Rule 1.5 states the following noise limits shall not be exceeded at any point outside the site boundary:

- At night time 40dBA (L10)
  70dBA (LMax)
- At all other times 50dBA (L10)

These provisions will be complied with. It is also noted that the site boundaries are located a significant distance from the Terminal Pump Station given the area contained in CB 45A/1127.

Activity Status

Overall, this proposal will require resource consent for a restricted discretionary activity in respect of earthworks, and height provisions.

The upgrading of the existing pump stations are considered to be a permitted activity in terms of Rule 1(a) of Chapter 36. Similarly, the placement of the biofilter for the Fire Station Pump Station are considered to be permitted under this rule.

Noise

The provisions contained in Chapter 33 relate to Noise in which Rule 1.5 states the following noise limits shall not be exceeded at any point outside the site boundary:

- At night time 40dBA (L10)
  70dBA (LMax)
- At all other times 50dBA (L10)

These provisions will be complied with. It is also noted that the site boundaries are located a significant distance from the Terminal Pump Station given the area contained in CB 45A/1127.

5.2.3.2 NES Contaminated Land

The construction of the Terminal Pump Station will occur on a HAIL site (previous landfill site). This requires resource consent as a discreationary activity under the NES Contaminated Land (Regulation 9(3) from the CCC given the disturbance of land that will occur during construction exceeds the minimum earthworks volume and a DSI does not exist (refer Appendix D).

5.2.3.3 Canterbury Regional Plans

The take of groundwater as part of the dewatering during construction requires resource consent under Rule 5.119 and 5.120 of the pLWRP because the site is contaminated (this also applies to the relevant section of pipeline). The take is permitted in terms of Rule WQN12. The discharge of the contaminated dewatering water is is proposed to be disposed of to Councils reticulated sewerage system and accordingly resource consent is not required. CCC has given permission for discharge to its reticulated system.

The discharge of stormwater to water/land during construction is proposed to be disposed of to Councils reticulated system and accordingly resource consent is not required. CCC has given permission for discharge to their reticulated system.

The discharge of stormwater to water/land from the roof area of the Terminal Pump Station is proposed to be disposed of to Council's reticulated stormwater system and accordingly resource consent is not required. Council has given permission for this discharge to their system.

In terms of air discharges, Rule AQL63 permits the discharges to air from waste management processes established prior to June 2002 providing the discharge does not involve hazardous substances, there is no increase in the scale, intensity, frequency or duration of the effects, and there are no noxious dangerous objectionable or offensive effect beyond the boundary of the property where the discharge originates.

This rule applies to the Reserve Pump Station, Fire Station Pump Station and the Glen Pump Station as they were lawfully established prior to June 2002 and there will not be any increase in the scale, intensity, frequency or duration of the effects of the air discharges resulting from this proposal. They are therefore classified as **permitted activities.**

Rule AQL69 classifies the discharges to air from waste management processes that do not comply with Rules AQL63 to AQL67 as permitted activities. The proposed WWTP and Terminal Pump Station will be covered by this rule. Consequently, the WWTP and Terminal Pump Station will require consent and are **discretionary activities**. As noted in Section 1.2 of the odour effects report (see Appendix I), the discharges to air from the outfall pipeline deaeration chamber and the single dwelling pump station at 281 Beach Road are considered to be de minimis.

Rule AQL25 classifies the discharges to air from the diesel generators proposed for standby duties at the WWTP and Terminal Pump Station as a permitted activity subject to a number of conditions which will be met by the generators. The generators will not be located on production land and will meet the chimney height requirements and size and duty restrictions. Consequently, the discharges to air from the two standby generators are **permitted activities.**

5.2.4 WWTP

5.2.4.1 Banks Peninsula District Plan

In terms of the BPDP the proposed WWTP is considered to be a "utility" under the BPDP given "utilities" are defined on page 358E as:

> *Any structure, network or facility established or operated by, or activity undertaken by a network utility operator as defined at section 166 of the Act.*

In Chapter 36 Utilities of the BPDP the following is stated under Rules:

> *These rules on utilities replace any zone rules which may otherwise apply to utilities in zones through which utilities pass, or within which they are sited unless specifically stated to the contrary in this chapter.*

Rule 1 of Chapter 36 states:

> *Permitted Activities*
>
> *a) All utilities are permitted activities in all areas of the District where they meet the conditions for permitted activities except in Rule 2, unless otherwise specified as a Controlled, Restricted Discretionary, or Discretionary Activity in this chapter.*

This rule is difficult to interpret but appears to say that utilities are permitted provided they meet the conditions for permitted activities in Rule 2 and are not listed as a controlled, restricted discretionary or discretionary activity in the chapter. This interpretation is confirmed by Rule 4 below in particular.

In terms of Rule 2 the following is relevant:

Rule 2.1 Earthworks (a) states the earthworks conditions (Rule 3.5) in the Rural Zone apply. These are set out below in Table 5-3 and the WWTP is assessed against these.

Table 5-3 Earthwork Rules

Standards for Permitted Activity	Assessment/Compliance
The maximum uphill cut depth is 2m.	The estimated cut depth is 3.5m therefore the proposal will not comply with the permitted activity standard.
The maximum downhill vertical spill of side castings is to be 2.4m.	While this rule is not clear how it relates to the proposal. It is anticipated that the proposal will comply with the permitted activity standard.
The maximum volume of earth moved shall not exceed 100m^3 per site within any one consecutive 12 month period except that for farm access tracks.	The estimated volume of earthworks is approximately 550m^3 therefore the proposal will not comply with the permitted activity standard.
The maximum width of any vehicle track is to be 5m.	Access to the site will be via an asphalted access way approximately 5m in width and will comply.
There shall be no disturbance of a known wahi tapu site.	Ōnuku Rūnanga have requested cultural monitoring to take place during earthworks to ensure the protection of any wahi tapu values.

Rule 2.2 Height and Size of Buildings and Structures (a) states the height conditions (Rule 3.1) in the Rural Zone apply. The maximum height of buildings and structures in the Rural Zone is 7.5m.

The highest building on the site is the balance tank which is 8m and accordingly resource consent is required for this protrusion. All of the other buildings on site comply with the height requirement.

Rule 2.3 Yards (a) states the yard conditions (Rule 3.2) in the Rural Zone apply where an above ground utility is over 3m in height or 10m² in area. Accordingly the rule applies.

Rule 3.2 states that all buildings or part of a building are to be setback the following minimum distances from boundaries:

Front boundary - **7.5m**
Side/Rear boundary - **7.5m**

The WWTP buildings are located 1m back from the Old Coach Road boundary and accordingly do not provide the required minimum front yard. The buildings will be set back approximately 10m from the northern side boundary and approximately 35m from the rear boundary of the site at their closest point, and therefore, comply with side/rear boundary requirements.

Rule 2.5 Tree Clearance states there shall not be any clearance of indigenous trees in the Rural Zone.

There will not be any clearance of indigenous trees.

Rule 2.6 Overhead Lines refers to the location of overhead lines in specified areas which is not applicable to this application as power will be supplied underground and the site is not in the specified areas.

Rule 2.7 Hazardous Substances states all utilities shall meet the standards for hazardous substance for the Rural Zone.

The following hazardous substances will be stored on site - diesel, acetic acid and bicarbonate. All are anticipated to meet the rules in Chapter 37 and the specified thresholds in Appendix XV.

Rule 2.8 Screening refers to screening of utilities in the Residential Conservation and Town Centre Zones and does not apply to this site.

Accordingly the proposal does not comply with earthworks (uphill cut depth and volumes), height and yard conditions.

Rule 3 Controlled Activities applies to controlled activities and is not applicable as it refers to telecommunication and radio communication facilities.

Rule 4 Restricted Discretionary Activities states that any application which does not comply with the conditions in Rule 2 is a restricted discretionary activity. As indicated above the proposal does not comply with earthworks (uphill cut depth and volumes) and height and yard conditions.

Rule 5 Discretionary Activities states any utilities “within Main Ridgelines as identified within the Rural Amenity Landscape” are discretionary activities.

Planning Maps R9 and S12 identify a Main Ridgeline by way of a dashed line in proximity to the site. The reservoir is not “within” the marked dashed line.

Ridgeline is defined in the BPDP (page 357) as:

> *Means the longitudinal crest of raised ground separating two watercourses and which is defined by contour lines on an NZMS topographical map.*

There is some uncertainty in the definition as to the extent of the "crest".

If it is deemed the WWTP is "within" the ridgeline the proposal is a discretionary activity. However given the uncertainty of the ridge provisions as to the extent of the ridgeline which is not defined by the rules, it appears that a literal definition should be applied. As the reservoir is not "within" the marked Main Ridgeline on the planning maps it is considered the proposal should be dealt with as a **restricted discretionary activity**.

Assessment of Applications (p316) for **restricted discretionary activities** states the following:

> *Assessment of applications for controlled or restricted discretionary activities will be limited to that condition or conditions for permitted activities with which the proposal fails to comply. Applications will be assessed against the relevant objectives and policies for Utilities and the relevant Zone.*

However the Council in their decision on RMA92025135 in respect of the reservoir on the adjoining site considered the application as a discretionary activity in respect of the ridgeline.

The Assessment of Applications (p316) for **discretionary activities** states the following:

Applications for discretionary activities will be assessed against the following:

The relevant objectives and policies of the Utilities Chapter.
Any other objectives and policies of the Plan which are relevant to consideration of the application.
Any relevant criteria set out in Chapter 30 (Resource Consent Procedures).

In addition while zone rules are not applicable to utilities it appears the general provisions are and in this respect the following are of relevance

Silent File – Chapter 14 Heritage

As indicated above the site is located within Silent File 27 as identified on the Planning Maps. Therefore Chapter 14 Cultural Heritage is applicable. Rule 2 states that any activity within a Silent File area which involves earthworks or the establishment of any building or structure is a **restricted discretionary activity** (with the exclusion of certain activities undertaken by Rūnanga), and therefore, resource consent under this rule is required.

Site Access, Parking and Loading

The provisions contained in Chapter 35 Access, Parking and Loading are applicable.

Old Coach Road is defined as a District Road in the BPDP (all roads other than State Highways are deemed to be District Roads).

Old Coach Road has a legal speed limit of 100km/h.

Rule 2.1 applies given that a new access is proposed. The rule states the minimum sight distance for accesses in 100km/h zones is 250m and for intersections 150m-250m.

The sight distance to the south along Old Coach Road is estimated to be approximately 60m and to the north along Old Coach Road to the Long Bay/SH 75 intersection is approximately 110m.

Generally the other provisions of Chapter 35 are met given that there is sufficient room on site to park a vehicle and vehicles are not required to reverse on and off the site. The standard of the crossing will also comply with the relevant standards.

Noise

The provisions contained in Chapter 33 relate to noise in which Rule 1.4 states that the following noise limits are not exceeded at any point within the notional boundary of any dwellings, other than a dwelling on the same site:

- At night time 40dBA (L10)
  70dBA (Lmax)
- At all other times 50dBA (L10)

These provisions will be complied with given that all machinery will be contained inside buildings and designed to comply with the specified limits. It is also noted the closest dwelling is approximately 430m from the site.

Activity Status

Overall, this proposal will require resource consent for a restricted discretionary activity in respect of earthworks, front yard, height, silent file and sight line provisions.

As indicated above the BPDP states that the assessment of restricted discretionary applications will be limited to that condition or conditions for permitted activities with which the proposal fails to comply. Applications will be assessed against the relevant objectives and policies for utilities and the relevant Zone.

This indicates the assessment should be in terms of the matters identified above. However a broader assessment has been undertaken in accordance with a **discretionary activity** status if the application is determined to be a discretionary activity in accordance with RMA92023135.

5.2.4.2 Canterbury Regional Plans

Rule WQL26 of NRRP and Rule 5.84 of pLWRP requires that the use of land for storing wastewater to be assessed as a discretionary activity

The discharge of stormwater during construction is proposed to be disposed of to Councils reticulated system in Old Coach Road and accordingly resource consent is not required. Council has given permission for the discharge to the reticulated system.

The discharge of stormwater to water/land from the roof and hard standing areas of the WWTP is proposed to be disposed to Council's reticulated system in Old Coach Road, and accordingly resource consent is not required. As indicated previously Council proposes to upgrade the stormwater reticulation at Old coach Road.

Rule AQL69 classifies the discharge to air from waste management processes that do not comply with Rules AQL63 to AQL67 as discretionary activities. As a consequence the discharge to air from the WWTP requires resource consent.

Rule AQL25 classifies the discharges to air from the diesel generators proposed for standby duties at the Terminal Pump Station as a permitted activity subject to a number of conditions which will be met by the generators. The generator will not be located on production land and will meet the

chimney height requirements and size and duty restrictions. Consequently, the discharge to air from the standby generator is a **permitted activity.**

5.2.5 Temporary Construction Management Areas

A number of temporary construction management areas will be required to facilitate the construction of the various components of the upgrade. Their exact location will be dependent on discussions between Council and the contractor. Any necessary resource consents for their operation will be submitted when their location is determined.

5.3 Other Approvals

5.3.1 Archaeological Authority

Section 42 of the Heritage New Zealand Pouhere Taonga Act 2014 states that unless an Archaeological Authority is granted from Heritage New Zealand no person may modify or destroy an archaeological site. An "archaeological site" is defined as "*a place that was associated with human activity that occurred before 1900".* Potentially the earthworks associated with the project could result in a requirement to apply for an Archaeological Authority and is considered likely given that the Akaroa Water Supply upgrade has required the submission of an Archaeological Authority.

Consultation with Iwi has not raised any major issues in respect of this matter although they have requested cultural monitoring to take place during earthworks at the WWTP and Terminal Pump Station to ensure the protection of any wahi tapu values.

The applicant will apply for any necessary Archaeological Authority prior to construction commencing.

5.3.2 Jubilee Park

The Terminal Pump Station and a section of the pipeline will be located in Jubilee Park. While the park area is held in a fee simple title (CB45A/1127) and does not refer to the Reserves Act 1977, a legal opinion obtained by CCC, suggests that because of historical circumstances relating to the creation of the park, the site is subject to the Reserves Act. Accordingly it is likely a separate process under the Reserves Act will be required to authorise use of the site for the Terminal Pump Station.

5.4 Proposed Conditions of Consents

Consideration of the activities has been undertaken and based on the anticipated potential effects and consideration of consents granted for similar activities in the district, region and throughout the country suggested conditions have been proposed. There suggested conditions are discussed in section 10 of this report.

5.5 Overall Activity Status

A number of activities comprise the overall proposal and these activities relate to different sites and different plans (district and regional and NES). Generally the activities that require resource consent are either restricted discretionary or discretionary status. The regional consents are generally discretionary except for the water take at the Terminal Pump Station. In terms of the district consents in respect of the Banks Peninsula District Plan, the Terminal Pump Station and WWTP applications are restricted discretionary although Council in their decision on RMA92025135 in respect of the reservoir and its proximity to the ridgeline dealt with the application as a discretionary

activity. The NES application at the Terminal Pump Station in respect of contaminated land is discretionary

Salmon-Resource Management (page 1-670) indicates that the classification of an activity has to be the most stringent status applying to any part of the activity (Aley v North Shore CC [1999] 1 NZLR 365). Where there is a 'bundle of uses' and the uses are closely related, an overall assessment of those uses may be appropriate. However when the different users are not closely related and where one is carried out in a separate part of the total area from the others, a joint single separation would not represent the reality of the situation (K8 Furniture Ltd v Tauranga DC [1993] 1 NZLR 197).

This latter situation tends to apply to this proposal and accordingly the components can be considered separately. However in reality, nearly all of the regional consents are discretionary and this status can be applied to these consents. In terms of the district consents as it relates to the BPDP, it is considered restricted activity status should apply to the Terminal Pump Station and WWTP (notwithstanding Council's decision on RMA92025135.) In terms of the NES, given that the activity in respect of contaminated land is different from the use of the site, discretionary activity status can apply to this activity.

Accordingly Sections 104,104B (discretionary activities) and 104C (restricted discretionary activities,) of the RMA apply. Section 104 (1) sates that in considering applications the consent authority shall have regard to:

- any actual and potential effects on the environment of allowing the activity; and
- any relevant provisions of—
  - a national environmental standard:
  - other regulations:
  - a national policy statement:
  - a New Zealand coastal policy statement:
  - a regional policy statement or proposed regional policy statement:
  - a plan or proposed plan; and
- any other matter the consent authority considers relevant and reasonably necessary to determine the application.

Section 105 of the RMA also states if an application is for a discharge permit or coastal permit the consent authority must, in addition to the matters in section 104(1), have regard to—

- The nature of the discharge and the sensitivity of the receiving environment to adverse effects; and
- The applicant's reasons for the proposed choice; and
- Any possible alternative methods of discharge, including discharge into any other receiving environment.

Section 107(1) of the Act states (except for as provided in subsection 2) a consent authority shall not grant a discharge permit if, after reasonable mixing, the contaminant or water discharged (either by itself or in combination with the same, similar, or other contaminants or water), is likely to give rise to all or any of the following effects in the receiving waters:

- The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials
- Any conspicuous change in the colour or visual clarity
- Any emission of objectionable odour
- The rendering of fresh water unsuitable for consumption by farm animals
- Any significant adverse effects on aquatic life.

These matters are addressed in the subsequent sections of the AEE.

6 Consultation

6.1 Overview

The future of the Akaroa WWTP has been debated at length within the community over the last couple of decades, with a number of parties feeling very strongly that the current treatment and disposal scheme needs to be discontinued and a better alternative found.

6.2 History of Akaroa Working Party Involvement

The continued short-term operation of the existing wastewater treatment plant at Redhouse Bay, Akaroa was authorised by CRC071865 on 1 July 2008 for a period of 5 years. The consent included a requirement that the Council establish a community working party to explore alternative long term options for managing Akaroa's wastewater, and to advise the CCC on its preferred options. All parties which were required by the consent to be invited to participate were invited to participate in the Working Party. Members of the public were also invited to participate.

Working Party members included: Bob Ayrey (resident), Tom Bates (Taiapure Management Group), Jeff Hamilton (resident), Kevin Simcock (resident), Harold Surtees (Akaroa Harbour Marine Protection Society), Ōnuku Rūnanga, Wairewa Rūnanga, Councillor Claudia Reid, Jane Chetwynd (Akaroa Wairewa Community Board), Fiona Nicol (ECan), Derek Cox (DoC) and CCC staff.

The Working Party was tasked with considering the range of disposal options available in Akaroa Harbour in order to come up with recommendations to CCC regarding the long term wastewater management for Akaroa.

The Working Party spent three years on the formulation and evaluation of a number of different options. In summary, the options for future wastewater management considered by the Working Party included:

- Whether or not the wastewater treatment plan should remain at the existing site (Takapuneke Reserve) which is an historic and culturally sensitive site
- The desired level of treatment of the wastewater
- The application of treated wastewater to land instead of discharging into the harbour
- Beneficial reuse options e.g. third pipe reticulation for Akaroa
- The viability of an ocean outfall outside the Akaroa Heads.

The Working Party met fifteen times between October 2008 and July 2011. Specialist technical reports were made available at the start of the process, and additional technical reports were commissioned at the request of the working party.

6.3 Consultation with Iwi

Ōnuku Rūnanga, Wairewa Rūnanga and Mahaanui Kurataiao Ltd elected to engage in separate parallel discussions, as well as participating in some working party meetings. The Rūnanga's strongly held views opposing any discharge of treated wastewater into the harbour, and supporting land irrigation was noted right at the start of proceedings.

Three hui also took place in 2012, one at Rehua Marae and two at Ōnuku Marae, which facilitated valuable exchanges of views between the Rūnanga, working party members, and Council representatives. Throughout the whole working party process, Council elected members and staff

stayed in regular informal contact with Mahaanui Kurataiao Ltd, and such contact continued after the working party concluded its work, right up to the present.

6.4 Field Trip to New Turangi WWTP

On 17 June 2011 a working party delegation including representative of Ōnuku and Wairewa Rūnanga travelled to the new Turangi wastewater treatment plant near Taupo, where the delegation was briefed by Taupo District Council staff on their modern new plant which produces very high quality treated wastewater, a quality so high that a member of the working party delegation volunteered to drink a glass full. The delegation also met and interacted with representatives of the local Rūnanga which had been involved in the process that lead to the establishment of the new plant.

6.5 Public Information Pamphlet

As part of its progress towards a preferred long term option for Akaroa's wastewater, the Working Party produced a public information pamphlet on work done to date, followed by two public information meetings, one on 19 June 2010 in Akaroa and another 23 June 2010 in Christchurch, where views were exchanged with interested parties

The Working Party concluded it work on 20 July 2011 and made the flowing recommendations to the Akaroa/Wairewa Community Board:

1. *A new plant be located away from Takapuneke Reserve, on the paper road south of the present plant together with a small portion of adjacent private land if this can be obtained. This would allow Ōnuku Marae to be linked to the treatment plant at some time in the future. (Further discussions with the Rūnanga are recommended in light of their concerns noted below).*

2. The plant is to be designed to produce wastewater that achieves the best quality wastewater at the time. The membrane plant at Turangi is the minimum performance level to be achieved.

3. The outfall is to be located in the mid harbour. The exact location is to be decided at a future meeting in consultation with Council staff. The location is to be chosen to ensure effective mixing of the wastewater.

4. The outfall design should allow for extension to a location outside the harbour if required in the future.

5. Future wastewater management options, including the design of the plant, must allow for the beneficial re-use of treated wastewater.

6. Land irrigation of Banks Peninsula soils and topography is to be trialled to determine the parameters that will enable better decision making in the future about reuse of wastewater for irrigation.

7. The wastewater is to pass over or through land before it is discharged into the harbour. This is to be done in a way that respects the cultural concerns of Ngāi Tahu.

Important note:

The Working Party notes that Ōnuku and Wairewa Rūnanga and the Taiāpure Management Committee do not support the recommendations for a harbour discharge, nor for a treatment plant on a southern site"

6.6 CCC Resolution

On 8 December 2011 the Council considered the Board's recommendations and unanimously resolved that:

"(a*) The Akaroa Wastewater Working Party be thanked for its valuable work over the last three years.*

(b) A replacement wastewater treatment plant for Akaroa be located away from Takapuneke Reserve, and that staff discuss siting options with the Ōnuku Rūnanga and community, and report back to the Council within six months on suitable potential sites.

(c) The outfall for the treatment plant be re-located to the middle of the Akaroa Harbour and that consideration be given to measures to address cultural concerns, in consultation with Ngāi Tahu.

(d) The new treatment plant be designed to produce wastewater that achieves the best quality wastewater available at the time, and that the design of the plant enable the potential future beneficial re-use of treated wastewater for domestic, commercial or agricultural purposes.

(e) Should suitable land become available, a land irrigation trial be costed and presented to the Council for consideration.

(f) Environment Canterbury be advised of the working party outcomes adopted by the Christchurch City Council.

6.7 Adoption of New WWTP Site

A lengthy process to find and purchase a site for a new wastewater treatment plant to the north of Akaroa ensued and in May 2013, the Council acquired ownership of the proposed site on Old Coach Road.

Prior to hosting public information meetings on the location of the new site, Council staff endeavoured to contact by phone all the registered landowners in a 500m radius around the site.

The public were then invited via notices in the Akaroa Mail to a meeting on 20 May 2013 at the Akaroa Recreation Centre to learn more about the proposed site for the future Akaroa wastewater treatment plant. On 12 June 2013, a second public information meeting was held, this time in Christchurch.

6.8 Consultation for Current Consent Application

6.8.1 Consultation with Iwi

A hui was held on 13 March 2014 with representatives from Ōnuku Rūnanga (Liz Robinson) and Wairewa Rūnanga (Iaean Cranwell). The proposal was described and issues and concerns were canvassed. Particular concerns were raised about:

- The inability of the current system to cope with peak flows and whether there would be an improvement with the upgraded system
- Whether more intense rainfall resulting from climate change had been taken into account in the design
- Desire to see land disposal of treated wastewater
- Odour at the Fire Station Pump Station is an issue
- Whether all overflows could be contained

- Not always receiving notifications of overflows

It was agreed that CH2M Beca would prepare a draft cultural effects assessment for Ōnuku Rūnanga to review (see Appendix K for a copy).

6.8.2 Consultation with ECan

Three pre-lodgement meetings were held with ECan staff. The first meeting was on 2 December 2013 with the Harbourmaster (Jim Dilley) to discuss the outfall location and agree the need for the permanent relocation of Anchorage Number 4 to avoid a clash with the outfall, and the temporary closure of Anchorage Numbers 5 and 6 during construction. The second meeting was with 12 December 2013 Consents Planner, Deepani Seneviratna and Kathryn Challies (Team Leader for Consents/Industrial team), to discuss the proposal and the consenting process. A third meeting was held on 8 May 2014 with Deepani Seneviratna and Jocelyn Douglas (Principal Consents Planner) to discuss the proposed consent conditions for the outfall wastewater discharge and structure.

6.8.3 Consultation with Signatories to Side Agreement

A meeting was held with the signatories to the side agreement to the consent for the discharge from the existing WWTP on 1 May 2014. The proposal was described, with technical experts presenting their findings. Issues and concerns were canvassed. Particular concerns were raised about:

- Desire to see land disposal of treated wastewater
- Input into the architectural treatment of the Terminal Pump Station
- Overflow reduction of the wastewater network into the harbour
- Shellfish quality
- Landscaping to the treatment plant and adjacent land
- Not being involved in the site selection process for the Terminal Pump Station site.

7 Consideration of Alternatives

7.1 Overview

Section 105(1) of the RMA states that for a consent application for an activity that would contravene section 15, a consent authority must have regard to several matters in addition to those outlined in section 104(1), including *"any possible alternative methods of discharge, including discharge into any other receiving environment".*

The previous resource consent for the existing WWTP required that the CCC identify a preferred option for the long term management of wastewater at Akaroa. In addition, Iwi have for a long time expressed concerns over the existing treatment plant site, which has significant historical and cultural importance.

An Akaroa Wastewater Working Party (WP), involving key stakeholder groups within the harbour area, was established to recommend to the CCC a preferred option for long term wastewater disposal at Akaroa.

Previous investigations (MWH, 2008) examined a number of treatment plant relocation options and shortlisted three sites, 1) the existing site, 2) an Akaroa North site and 3) an Akaroa South site. This report was a follow-on study examining the issues, risks and costs.

This section discusses the investigations by Harrison Grierson, in conjunction with Golder Associates and ecoEng Ltd, of alternative methods for treated wastewater disposal as well as options considered by CCC during the WWTP site and treatment process selection.

7.2 Treated Wastewater Disposal

The following wastewater disposal options were investigated:

- Harbour outfall
- Land irrigation
- Hybrid discharge consisting of dry weather land application and wet weather harbour outfall.

7.2.1 Harbour Outfall

Two outfall options of were studied by Golder Associates (2009): (i) Near-shore outfall (similar to existing) and (ii) Mid-harbour outfall. A long ocean outfall was not considered in this report, which has been studied previously (MWH, 2008), but it was too costly to consider further.

Existing WWTP Site

Two outfall options were considered for the existing site:

- Near-Shore Outfall – a new outfall approximately 600m long from the shoreline in 8m of water. The outfall would extend approximately 400m past the headlands of Red House Bay and as a consequence, it will be exposed to the diurnal tidal currents.
- Mid-Harbour Outfall – a new outfall located between Red House Bay and Wainui Bay. This outfall would be in approximately 9.8m of water, and would extend approximately 1.6km from the Red House Bay shoreline.

Akaroa North

If the treatment plant was relocated to the Akaroa North site, an outfall pipe would originate from the western shore of Childrens' Bay, and follow the headland into the Akaroa Harbour. Two outfall options were considered:

- Near-Shore Outfall – Due to the proximity of the water skiing lanes in Childrens Bay and the proximity of French Bay (Akaroa) a 1.5km outfall was anticipated for this option. The outfall will be approximately 200 - 300m from the shoreline and in 8.8m of water.
- Mid-Harbour Outfall - The mid-harbour outfall was assumed to be located between French Bay and Tikao Bay. The outfall would be in approximately 8.2m of water, and in the middle of the Akaroa Harbour. Similar to the near-shore outfall, the outfall will most likely originate from Childrens Bay. A 2.5km outfall would be required.

Akaroa South

Similarly, two outfall options were considered for the South Akaroa Site:

- Near-Shore Outfall – A near shore outfall, approximately 600m in length would be required. In the vicinity of The Kaik the water is relatively deep. The proposed near shore outfall, whilst only 600m from the shoreline, resides in approximately 9.4m of water (at Chart Datum).
- Mid-Harbour Outfall - The mid-harbour outfall would be located 1.5km west of Te Ahiteraiti (south of The Kaik). The outfall would be in approximately 12.8m of water, and in the middle of the Akaroa Harbour. Similar to the near shore outfall, the outfall would most likely originate from north of the Kaik and Onuku Marae. A 1.9km outfall would be required.

Results of Study

The following broad risk factors were considered in the risk assessment (NZWERF, 2002):

- Human health and safety
- Ecology
- Community value
- Cultural
- Economic utility
- Aesthetics.

The Leopold Matrix was employed by Golder to qualitatively assess the environmental and social issues, impacts and risks associated with various harbour outfall discharge options. From the assessment above, Golder (2009) concluded that a mid-harbour outfall, offshore from the Red House Bay and discharging during outgoing tide would cause the least environmental, social and cultural effects. However, the benefit of an outgoing tidal discharge is barely distinguishable from a conventional (continuous) discharge or the hybrid discharge option and the additional benefit associated with it is unlikely to warrant the additional costs.

7.2.2 Discharge to Land

Overview

An assessment of the options for land application of treated wastewater in Akaroa was undertaken by ecoEng Ltd (2010) and the results presented in the Akaroa Wastewater Treatment and Disposal – Wastewater Options and Risk Analysis Report (Harrison Grierson, 2010), for consideration by the Akaroa Wastewater Working Party.

While irrigating treated wastewater to land has been carried for many years in New Zealand with examples including Rotorua, Taupo and Otautau, there are a number of technical, cultural, consenting and economic factors to be taken into consideration for establishing an effluent irrigation scheme in Akaroa.

Treated domestic wastewater irrigation provides two resources, water and nutrients. Reclaiming treated wastewater as a water resource for irrigation is an alternative to developing new water supply source, especially for areas such as Akaroa where the limitation of the water supply restricts development. Nutrients in wastewater such as nitrogen and phosphorus are essential components for plant growth and would improve yield and decrease fertiliser usage if the application systems are managed and operated properly.

Treated wastewater irrigation in New Zealand is currently used in exotic forests, pastures and in larger recreational areas such as parks and golf courses.

There are a range of irrigation methods including: flood irrigation, large centre pivot sprinklers mini, micro and pop-up sprinklers and subsurface and surface dripper irrigation. Sprinkler irrigation and dripper irrigation were selected by ecoEng for assessing potential treated wastewater irrigation in Akaroa.

Results of Investigation

The irrigation assessment by ecoEng considered the issues, effects and risks associated with wastewater irrigation at the two new sites, Akaroa North and Akaroa South. Two irrigation options were considered, “All Dry Weather Flow (DWF) to Irrigation” and “Hybrid Disposal”. “All Dry Weather Flow to Irrigation” is based on the irrigation of treated dry weather flow to land while treated wet weather flow is stored and may bypass to a harbour discharge when the storage lagoon becomes full. “Hybrid Disposal” is based on irrigation of dry weather flow to land during the summer months (October to March) only and discharge to the harbour during the winter months and wet weather events.

The scenario of “All Flow to Irrigation” was also considered but was found to be neither feasible nor practical because of the very large irrigation area required.

The conclusion of the ecoEng irrigation assessment is that Akaroa South has sufficient irrigable area for All Dry Weather Flow irrigation and for Hybrid Disposal if areas of steeper slope and higher elevation are also used.

Akaroa North was considered to be not feasible due to lack of available and suitable areas that met the slope constraints.

Therefore, a total of six wastewater options were further evaluated:

- Upgrade treatment plant at existing site with mid-harbour outfall wastewater disposal

- Upgrade treatment plant at existing site with year round wastewater irrigation at South Akaroa (dry weather flow only)
- Upgrade treatment plant at existing site with hybrid wastewater irrigation at South Akaroa
- Relocate treatment plant to Akaroa South with mid-harbour outfall wastewater disposal
- Relocate the treatment Plant and establish year round irrigation at Akaroa South (dry weather flow only)
- Relocate the treatment plant to Akaroa South with hybrid disposal (Irrigation in summer and mid-harbour disposal in winter and wet weather).

The upgrade requirements, issues and risks of conveyance, wastewater treatment plant and effluent discharge/irrigation for the above options were assessed.

Conclusions from Irrigation Study

As a result of the irrigation study, Harrison Grierson (2010) concluded the following:

- Upgrading the existing treatment plant with new mid-harbour outfall was considered as the "Baseline option" as it represented the option with the minimum upgrade requirement. This option had the lowest capital and operating costs, but was likely to be a subject of serious cultural and social concerns due to the site location and the community's perception of the existing harbour discharge.
- Relocating the treatment plant to another site to the north or south of Akaroa was likely to be more culturally acceptable, but would incur an estimated additional cost of between $12 and $20M.
- Both the "All Dry Weather Flow to irrigation" and hybrid disposal options were feasible in Akaroa South but with a higher cost as more new infrastructure would be required.
- The availability of a suitable wastewater irrigation area would be subject to successful negotiation between CCC and the respective landowners.

An assessment of the risks and issues associated with the options was carried out and the results were presented to the Akaroa Wastewater Working Party for further consideration.

7.3 Location of WWTP

7.3.1 Overview

One of the main recommendations of the Wastewater Working Party arising from the previous studies was that suitable sites for a new WWTP be identified. As a result, Harrison Grierson (2011) was commissioned to further investigate potential sites for a new WWTP at North and South Akaroa including provision for wet weather storages. A two-step methodology was followed in evaluating the site options. Firstly, sites were identified based on aerial and contour maps taking into account proximity issues, elevation and general topographical features. After this initial identification, a site visit was undertaken by Harrison Grierson and CCC to identify specific issues related to each site.

Each site was then evaluated, scored and ranked based on technical and nontechnical criteria.

In order to demarcate a site for the new plant, a configuration based on a membrane bioreactor process was used as a benchmark as suggested by the Akaroa Wastewater Working Party. This included provision for wet weather storage and discharge via a mid-harbour ocean outfall.

7.3.2 WWTP Site Selection Criteria

CCC requested that the following selection criteria be used:

- Potential sites not to be higher than 150m above mean sea level.
- Treatment plant and storage sites to be either north of Akaroa towards the top of the Takamatua Hill or south of Akaroa towards Ōnuku (closer to Township the better).
- Suitable sites above Township (i.e. east of Akaroa towards the hills) to be ignored
- Storage to accommodate for wet weather peak flows to be considered. Storage site to have provision for fine screens and grit removal before storage and secondary treatment. Wet weather storage to assume that major inflow and infiltration reduction will be achieved over time.
- Sites must have simple access to an outfall location and overflows.
- Sites must have access to public road and power supply.
- Sites to be as far away as possible from Ōnuku Marae, residences and public areas.

South Akaroa Sites

As identified in the previous studies and discussions with the Akaroa Wastewater Working Party, the southern sites are to be off Onuku Road south of the Township. Based on the contour maps and aerial photos supplied by CCC, four potential sites south of Akaroa were identified (Harrison Grierson, 2011).

There are reasonably flat land portions at lower elevation (40m to 50m) further south off Onuku Road, which could be beneficial in terms of construction and access. However, this area was not considered further as it falls under Maori Reserve and is closer to Ōnuku Marae.

North Akaroa Sites

The northern sites were to be near Children's Bay on south-eastern slopes of Takamatua Hill. Six potential sites were identified. Any potential sites north or west of those identified were considered to be impractical. Further north would incur very high capital and pumping costs due to the distance from Akaroa and high elevations. The western side is susceptible to landslides as determined by previous studies. The six sites were identified based on reasonably flat topography and good access from existing roads or paper roads.

The selected sites were evaluated based on agreed criteria and the results of this desktop investigation were presented to the Akaroa Wastewater Working Party.

Consequently a site near the intersection of SH75 and Long Bay Road was chosen as the preferred site. However, this site was not available for purchase, so a nearby site on Old Coach Road was purchased by CCC instead.

7.4 Treatment Methods

7.4.1 Overview

The following treatment processes were considered by Harrison Grierson (2011) for the scenario of relocating the treatment plant to a new site:

- Modified Ludzack Ettinger (MLE) Activated Sludge Process
- Sequencing Batch Reactor Process
- Membrane Bioreactor Process.

7.4.2 Modified Ludzack-Ettinger Activated Sludge Process

The wastewater would be pumped to the inlet works at the new site, which consists of an automatic step screen followed by grit removal unit. The preliminary treatment prevents accumulation of large and heavy solids in the downstream reactor basins.

The screened wastewater would be equally split between two activated sludge basins. The basins would be configured based on a MLE process, which consists of anoxic tanks followed by aerobic tanks. The nitrate-rich mixed liquor in aerobic tanks is returned to the anoxic tanks for denitrification. Liquid alum would be dosed in the aerobic cells to remove phosphorus by precipitation.

Two secondary clarifiers would be built for secondary clarification. Clarified effluent would pass through the cloth media disc filters prior to UV disinfection.

Since the wastewater flow is expected to increase over 3 fold during peak summer, the biomass inventory could be built up through restricted wasting and incremental increase in loads.

The excess sludge from the biological process would be stored in waste activated sludge tanks before being thickened to 4 - 5% dry solids concentration. The thickened sludge would be transported to Christchurch WWTP for further processing and disposal.

7.4.3 Sequencing Batch Reactor (SBR) Process

The wastewater would be pumped to the inlet works at the new site, which would consist of an automatic step screen followed by a grit removal unit. The preliminary treatment would prevent accumulation of large and heavy solids in the downstream reactor basins.

The screened wastewater will be equally split between two SBR basins. The basins would consist of pre-anoxic zones followed by main reactor zones. Decanters would be installed in the SBR basin to decant the clarified effluent. A new decant tank would be built to buffer the decant flow.

The SBR effluent would then be pumped to the cloth media filters for tertiary solids removal and would be disinfected by an UV unit.

Liquid alum would be dosed in the aerobic cells to form phosphorus precipitates.

Since the wastewater flow is expected to increase over 3 fold during peak summer, the biomass inventory could be built up through no wasting and incremental increase in loads.

The excess sludge from the biological process would be stored in waste activated sludge tanks before thickening to 4 - 5% dry solids concentration.

The thickened sludge would be transported to Christchurch WWTP for further processing and disposal.

7.4.4 Membrane Bioreactor

The wastewater would be pumped to the inlet works at the new site, which would consist of an automatic step screen followed by a grit removal unit. The preliminary treatment would prevent accumulation of large and heavy solids in the downstream reactor basins.

The screened wastewater would be equally distributed between two bioreactor trains. The bioreactor tanks in the MBR processes are usually smaller because it operates at a higher mixed liquor suspended solids (8 to 10g/L) which could be detrimental to sludge settling in the secondary

clarifiers for other activated sludge processes. Each reactor tank would consist of an anoxic cell followed by an aerobic cell, like an MLE configuration. Recycle pumps would be installed to return the nitrate-rich mixed liquor from the aerobic cells to the pre-anoxic cells. The mixed liquor would be separated by the membrane filtration modules. As the membrane modules act as physical barrier for solids and pathogens, additional tertiary solids removal process and UV disinfection would not be required.

Liquid alum would dosed in the aerobic cells to remove phosphorus by precipitation.

Since the wastewater flow is expected to increase over 3 fold during peak summer, the biomass inventory could be built up through no wasting and incremental increase in loads.

The excess sludge from the biological process would be stored in would be stored in waste activated sludge tanks before thickening to 4 - 5% dry solids concentration.

The thickened sludge would be transported to Christchurch WWTP for further processing and disposal.

7.4.5 Comparison of Treatment Options

All three treatment options considered would deliver similar treated effluent quality, with lower suspended solids from the MBR process. However, the MBR option would require the membrane system to be over-sized to treat the wastewater flow during summer peaks and wet weather periods. In addition, the MBR option has slightly higher operating costs attributed to the scouring aeration, cleaning chemicals and membrane replacement.

SBR process is commonly used in places where there are significant variations in flow as the cycle length in the SBR basins can be adjusted to suit the incoming wastewater flow. However, the range of hydraulic throughput and the tight nitrogen removal requirement would require a storage basin for untreated diluted wastewater, which could be an odour source. Therefore, this option is less preferred.

The activated sludge process with clarifiers is the preferred option as the capital and operating costs are expected to be slightly lower than the other two options.

7.5 Concept Design Report for Two Wastewater Sites

7.5.1 Overview

Concept design and cost estimates for wastewater conveyance, wastewater treatment plant and mid-harbour outfalls in North Akaroa and South Akaroa were developed in the Akaroa Wastewater Treatment Plant -Concept Design Report (Harrison Grierson, 2012).

The preferred sites identified in the October 2011 study were unavailable due to landowner issues. Hence, alternative sites were considered in the 2012 study.

7.5.2 North Akaroa Wastewater Treatment Plant Option

Under this option, the treatment plant would be located off Old Coach Road near the intersection of Long Bay Road, North Akaroa. The direction of wastewater flow in the existing wastewater trunk wastewater network would have to be reversed as the existing wastewater treatment plant is located south of the Township. A new Terminal Pump Station would be constructed at the northern end of the Township, from where the wastewater would be pumped to the new site via Old Coach Road.

The slope of the proposed site is steep and it would require a significant cut to form a platform area. Retaining walls would be required to minimise soil erosion.

The wastewater treatment plant would consist of two parallel process trains based on a Membrane Bioreactor (MBR) process. It is expected that only one process train would be operated during winter months. Excess flow beyond the hydraulic capacity of the treatment plant would be temporarily stored in a balance tank. During emergency events/situations, overflow from the balance tank would pass through a dedicated peak flow UV unit for disinfection before combining with the treated wastewater for discharge to the mid-harbour outfall.

Treated wastewater would be discharged via a mid-harbour outfall pipe. The outfall pipe would run along the same trench as the incoming rising main on Old Coach Road. The treated wastewater would be discharged approximately 2.5km from the shore, near the middle of the harbour.

7.5.3 South Akaroa Wastewater Treatment Plant Option

A new South Akaroa site was identified approximately 1.2km south of the Ōnuku Marae. The proposed site is currently accessed via an unformed track from the main road near the Marae.

As the site is approximately 5km from the Township, the existing Glen Pump Station would need to be significantly modified and a new 4.6km rising main constructed. The rising main would run along the Ōnuku Road and the new site access road.

A new 1.2km long road would have to be constructed to allow construction and operation traffic to access the site. There is no detailed topographical survey available for the site therefore some assumptions were made for the civil design of the new treatment plant. It was assumed that the treatment plant site would be built based on two platform levels which would allow a cut to fill balance.

The treatment plant configuration would be similar to the North Akaroa Option, except the balance tank would likely to be a timber tank structure.

Treated wastewater would be discharged via a mid-harbour outfall pipe, approximately 1.1km from the shore.

7.5.4 Wastewater Reuse

The new treatment plant would produce a high quality wastewater suitable for land application or other potential reuse options in future. However, the rolling and steep landscape surrounding Akaroa makes land irrigation extremely difficult. In addition, there is no available land identified which is suitable for wastewater irrigation.

However, as recommended by the Working Party and endorsed by CCC, a land irrigation trial will be undertaken, after the treatment plant has been successfully constructed.

7.5.5 Conclusions from the Concept Design Report (Harrison Grierson, 2012)

A number of issues were identified in this study:

- Land irrigation is likely to be very difficult around Akaroa due to naturally steep landscape. The combination of high quality treated wastewater and mid-harbour outfall will address the concerns relating to any potential effects on the Akaroa Harbour.
- Retaining structures would be required for the proposed North Akaroa site as the site contour is very steep and would require a significant cut area to form the plant platform. This would require geotechnical fieldwork to be undertaken.

- Planting and careful design considerations would be required to reduce any visual, odour and noise impact for the proposed North Akaroa site.
- Installation and construction of infrastructure relating to reversing the existing rising mains in the network for the proposed North Akaroa option is expected to be more complex.
- There is no topographical survey and geotechnical data for the proposed South Akaroa site. It was assumed that the site could achieve a cut to fill balance, however, additional topographical survey and geotechnical field investigation would need to be undertaken if this option was carried forward.
- The proposed South Akaroa site is more difficult to access, and it would require construction of a new access road.
- Long retention time in the conveyance pipeline to the proposed South Akaroa site may cause odour and septicity issues.
- The existing Glen Pump Station is very close to nearby residential house and significant modification to construct a larger pump station may be objectionable to the community and neighbours.
- In addition, sludge trucks and chemical deliveries would have to travel through the Akaroa Township periodically if the treatment plant is relocated to South Akaroa, which may be objectionable to the community.

7.6 Selection of Preferred Treatment Upgrade Option

The preferred wastewater treatment option is an MLE process or other process that achieves an equally high level of treated wastewater quality, including nitrogen removal, followed by membrane filtration for disinfection and solids removal. The treatment plant will be designed to treat the peak summer day flow and load in 2041, with higher flows receiving primary treatment (screening and grit removal) and UV disinfection. A more detailed description of the proposed treatment plant is included in Section 4.5.

7.7 Conclusion

Clearly, alternatives for the treatment plant sites, outfall sites and treatment process upgrades have been fully considered by Council during the development of the proposal.

8 Assessment of Environmental Effects

8.1 Overview

In accordance with section 104 of the RMA when considering an application for a resource consent, the Consent Authority must, subject to Part 2, have regard to any actual and potential effects on the environment of allowing the activity.

In the RMA, unless the context otherwise requires, the term effect includes—

(a) any positive or adverse effect; and

(b) any temporary or permanent effect; and

(c) any past, present, or future effect; and

(d) any cumulative effect which arises over time or in combination with other effects—

regardless of the scale, intensity, duration, or frequency of the effect, and also includes—

(e) any potential effect of high probability; and

(f) any potential effect of low probability which has a high potential impact.

8.2 Framework for Assessment

The following assessment of effects associated with the construction and operation of the new Akaroa Wastewater Scheme has been prepared on the basis of the matters set out in the Fourth Schedule to the RMA that should be considered when preparing an assessment of effects on the environment (AEE).

8.3 Positive Effects

The proposed new Akaroa Wastewater Scheme will result in a number of positive effects including:

- Removal of the existing WWTP from the culturally sensitive Takapuneke Reserve site
- A reduction in the frequency, duration and volume of overflows from the Akaroa wastewater network
- A further reduction in the public health risks associated with the discharge of treated wastewater to the Harbour
- An improvement in harbour water quality and the marine environment
- An increase in the capacity of the Akaroa wastewater system
- Provision for the future growth of Akaroa Township
- Facilitating, where possible, future land application of treated wastewater.

8.4 Construction Effects

8.4.1 Overview

Apart from the overall positive effects to the Akaroa community of the proposal, given the scale, nature, intensity, and more importantly duration of the proposed construction activities, the potential adverse effects will have a high probability of occurring but will be temporary, and are considered unlikely to be cumulative in nature.

The most significant potential effects of the construction activities and how they will be managed are:

- **Disruption to road users, particularly during peak seasonal use periods**

The Contractor's construction methodology and programme will determine how these potential effects are mitigated. The construction contract documents will restrict Contractor activities in certain parts of the project during critical periods. Traffic management plans will be prepared by the Contractor(s).

- **Noise, vibration, dust and discharges from dewatering to waterways**

The Contractor will need to submit an Environmental Management Plan, detailing mitigation measures for the potential temporary effects of noise, vibration, dust, discharges from dewatering and erosion and sediment control.

- **Storage of materials and stockpiling soil and hardfill**

The Contractor will be required to prepare a Site Management Plan, either as a separate plan or as part of the Contractors Environmental Management Plan (CEMP), relating to access, storage of materials and security detailing site-specific mitigation measure for these effects.

Council will provide temporary construction management areas clear of roadways for the Contractor's use.

8.4.2 Construction Environmental Management Plans

Prior to construction, the Contractor will be required to prepare a Contractor's Environmental Management Plan (CEMP) that identifies procedures for mitigating potential construction effects. The preparation of a CEMP is a standard industry practice tool and similar management plans have been used successfully for the recently completed wastewater scheme projects in Blenheim, Picton, Christchurch and Timaru.

The main issues associated with the proposed works include the temporary generation of noise, vibration, dust, discharges from dewatering of excavations, increased traffic and private access disruption, the siting and use of Temporary Construction Management Areas and the handling and storage of hazardous material such as diesel fuel. The Contractor's EMP will include a description of works, construction programme, a Consents/Approval Register, a list of key personnel and communications protocols, a list of potential effects and associated mitigation measures, staff induction and training, a Complaints Register, appropriate monitoring requirements and site audits.

Subordinate plans addressing site-specific issues (e.g. erosion and sediment control) will also be prepared or included in the EMP.

There will be provision for the Contractor's EMP to be submitted to CCC and the Engineer's Representative (CH2M Beca) for approval prior to construction commencing.

For the purposes of this application a draft Construction Environmental Management Plan (CEMP) has been appended (refer Appendix H) which has incorporated the construction methodology options and preliminary design information, as well as the environmental effects and mitigation aspects, that would be expected to be included in a Contractor's EMP. The draft appended CEMP also provides guidance to the Contractor on the options for their plan structures and content.

The mitigation of construction projects in public areas is well understood by the applicant and the civil works contractors who are likely to be selected to carry out the project. Recent experience with similar wastewater projects in Christchurch shows that these projects can be managed with minimal effects on the neighbours, the public and the environment. CCC will facilitate a pre-registration process for contractors who have the experience and resources to undertake the work in an environmentally sustainable manner.

8.4.3 Hours of Work

The works will be generally limited to the following hours:

- Monday to Saturday (inclusive) 6:30am to 8:00pm
- Sundays and Public Holidays - no work.

Some work outside of these hours is likely to be reasonably necessary, being:

- When necessary to avoid significant disruption to traffic; or
- For contractor and public health and safety reasons (e.g. for sewer connections when flow is typically lower (at night) to limit risk of overflows, or in areas where excavations cannot be left open and is not practicable to temporarily fill in; or
- Environmental reasons (e.g. to enable critical construction works in relation to stream and groundwater levels due to the tide and a forecast of severe weather).

Neighbours to the works will be advised in writing in advance and noise and vibration will be minimised as far as practicable.

8.4.4 Communication with Affected Parties

During construction, the Contractor will be required to regularly notify the public in areas of impending construction activities and communicate with residents about the project. The exact requirements for notification and communication will be included in the contract documents, and may include:

- Letters to affected residents prior to construction commencing
- A phone number and/or website to receive public comments, complaints and concerns throughout the project
- A regular community newsletter, possibly quarterly, detailing the upcoming work, likely disruption and mitigation and overall work progress.

8.4.5 Traffic

The construction of the pipeline, new Terminal Pump Station and WWTP will require the movement of quantities of material, vehicles and equipment to and from the TCMAs and the construction sites. The Contractor will be required to submit Traffic Management Plans (TMP) for NZTA and CCC approval that will likely cover all project works not just those sections that require resource consent. These plans will be followed to minimise the temporary disruption to road users as far as practicable. The plans will, amongst other things, show how the works will be carried out to minimise local traffic and private access issues. Of particular note will be the programming of works along key roads to Akaroa and the WWTP to meet seasonal (i.e. holiday) demands.

During construction, the Contractor will be required to regularly update and notify the public of areas of impending construction activities and communicate with residents about the project.

It is considered that any traffic effects associated with the project are able to be adequately mitigated.

8.4.6 Noise and Vibration

The Terminal Pump Station, WWTP and the outfall through the beach will likely require sheet piling to protect the works and surrounding ground. Driving sheet piles will create vibration and noise. Piles may be required to provide strong foundations to meet the design standards necessary for these critical assets. There may be some temporary vibration while ground improvements are made to the soils. Noise arising from the use of heavy machinery can cause nuisance to neighbours.

The draft CMP requires that the Contractor use best practice to manage noise and vibration effects which will include:

- Neighbours to the works will be advised in writing in advance
- Adequate muffling of all machinery used on site
- Locating the machinery warm-up areas and site facilities away from dwellings where practicable
- Managing associated noise in accordance with the requirements of NZS 6803:1999 Acoustic Construction Noise
- Managing associated vibration in accordance with DIN 4150-3:1999 Structural vibration – Part 3 Effects of vibration on structures
- Maintaining an appropriate complaints procedure.

While, there is potential for noise to be created by the use of heavy machinery, it is considered that this will be intermittent, temporary and localised and can be effectively managed by an experienced Contractor.

8.4.7 Dust

The pipeline, Terminal Pump Station and WWTP construction involves earthworks which have the potential to generate small quantities of dust and adversely affect neighbours. Dust can be generated, particularly during dry windy conditions when underlying soils are exposed. The relatively narrow trench required for constructing parts of the pipeline means that the area of exposed land surface will be small. The excavated area for the installation of the Terminal Pump Station and WWTP are larger.

Dust can also be generated during dry windy conditions from stockpiles of dry soil. It is considered that the potential effect of dust can be effectively managed on this site by:

- Removing excess soil material from the site as soon as practicable after it is excavated
- Keeping exposed areas to a practicable minimum
- Wetting or stabilising any temporary stockpiles of soil
- Minimising vehicle speeds where appropriate
- Locating any temporary stockpiles as far as practicable from neighbours
- Programming of works to avoid times of high winds.

The appended draft CMP addresses dust management.

With the proper mitigation measures in place, the effects of dust nuisance on neighbours can be managed so as to be no more than minor.

8.4.8 Land Disturbance and Vegetation Clearance

Pipeline

The construction of the pipeline to the Terminal Pump Station will be mainly by pipe thrusting which will result in minimal land disturbance. From the Terminal Pump Station, the pipeline will be thrust

under SH75 before being trenched up Old Coach Road to the WWTP. The outfall pipeline from the WWTP to the foreshore will be constructed in the same trench.

The construction of the influent pipeline up Old Coach Road from the Terminal Pump Station and the treated wastewater pipeline down this road will be completed as part of separate water reticulation works carried out by CCC.

A separate duct carrying odorous air from the Terminal Pump Station to the treatment biofilter will be constructed.

Terminal Pump Station Site

The construction of the Terminal Pump Station will require the excavation of material. Some of this material may be contaminated (see Section 8.4.7) and will need to be stored onsite until it can be removed.

WWTP site

The construction of the WWTP will require the excavation of material which will need to be stored onsite until it can be removed.

8.4.9 Contaminated Land

A review of all current and historical information has identified that the formation of the land which makes up the area via a combination of traditional reclamation using unknown but potentially benign materials, and areas of landfill may have resulted in soil contamination. The historical use of the property has been for landfill from the pre 1890s to the 1978 and the reclamation of adjoining areas of the property with unidentified fill in the late 1800s. 'Waste disposal to land' is an activity listed on the Ministry for the Environment's Hazardous Activities and Industries List (HAIL).

The results of soil testing from the area around the proposed pump station location have not identified any contaminants above the adopted human health criteria for Recreational landuse. However, concentrations of arsenic and zinc in two samples exceeded environmental criteria. Hydrocarbons were also detected within samples. Heavy metal concentrations above background concentrations were also identified.

These results confirm that the property on which the proposed works are to occur is a 'piece of land' under the NES. As a Detailed Site Investigation (DSI) has not been completed for this piece of land, a resource consent for a **Discretionary Activity** is required under Regulation 11 of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES) and the proposed works will be undertaken in accordance with the Contaminated Soils Management Plan – Akaroa Wastewater Terminal Pump Station (CH2M Beca, 2014) (see Appendix J for a copy).

8.4.10 Dewatering and Sediment Runoff

Groundwater dewatering is the removal or drainage of water from a construction site (e.g. a pump station) or pipeline trench. Different techniques are used to dewater depending on the permeability of the soil and depth to the water table.

Well point dewatering involves the use of multiple spears that are jetted into the ground using high pressure water, or installed within an auger hole, and backfilled with sand. Water is pumped out of the spears using a surface-mounted centrifugal pump. The spears are steel pipes with a fine screen at the base. The dewatering system would be installed ahead of construction so that the ground is effectively stabilised before excavation begins. Dewatering may also need to be carried out behind

trench excavations, during pipe laying applications, to prevent water flowing into the construction area.

Another technique is to drill bores around the excavation in which submersible pumps are directly installed or surface-mounted pumps used if the water level is less than 6m below ground. If groundwater infiltrates the excavation at a slow rate, it may be practicable to dewater by pumping from within deepened sections of the trench or pump station excavation. This method requires geofabric material between the excavation and the abstraction points to control sediment, unless there is an effective physical barrier such as closely interlocked sheet piling.

The dewatering of the Terminal Pump Station site and associated pipeline is not anticipated to have any significant effect on local groundwater levels given the relatively small volumes to be dewatered and the localised nature of the take.

8.4.11 Erosion and Sediment Control

During construction, the pipeline trenches, Terminal Pump Station and WWTP sites will be excavated and excess material removed and stockpiled. If not appropriately managed, there is potential for sediment run-off from the site during wet weather to have an adverse effect on the environment. Soils along the pipeline route could be mobilised if exposed to heavy rainfall. Some parts of the route are close to waterways or the CMA which could exacerbate run-off effects.

The following guidance and procedures apply to erosion and sediment control planning:

- Erosion and sediment control drawings will be prepared by the Contractor in accordance with the Environment Canterbury Erosion and Sediment Control Guideline (2007), or equivalent guideline acceptable to Environment Canterbury
- The Contractor shall include a description in its Management Plans how erosion, and sediment management controls will be designed, maintained and monitored in accordance with established best practice
- The Contractor shall install erosion and sediment controls before the site is stripped or exposed.

It is considered that run-off can be managed by:

- Excluding stormwater runoff from outside the work area from entering the work or storage site wherever possible using clean water diversions, such as bunds or cut off drains so water is diverted around the work site. This will reduce the volume of dirty water to be managed.
- Keeping disturbance and exposed areas to a practical minimum and stabilising and/or sealing these areas as soon as practicable.
- Minimising stockpiles where practical and where required, locating these on flat areas as far as practicable from waterways.
- Using appropriate sediment control strategies e.g. silt fences and diversions around stockpiles.

It is also important that no clean water diversions, or discharges cause downstream erosion, alter the natural course of its receiving waterbody or cause flooding on private land.

While some dewatering may be required during construction of the incoming trunk sewer and Terminal Pump Station (depending on construction techniques), Council has confirmed that any dewatered flows can be directed to the Akaroa sewerage system. As a consequence, no direct discharges from the construction activity will occur to land or water.

8.4.12 Pipeline Stream Crossings

The construction of the new pipeline to the Terminal Pump Station will require the crossing of local streams via existing bridge structures. These streams are modified water courses in an urban environment and are not classified as having any significant environmental values. The water quality of the streams is typical of similar streams in rural/urban catchments.

The bridges already carry other piped and ducted services.

The crossings will be made by burying the pipeline in the road seal crossing the existing bridge structures. There will therefore be no obstruction to stream flows or floating debris. The construction will not involve any disturbance of the stream bed, but will temporarily impede road traffic using the bridge.

As the pipeline will be buried, it will not visible be from vehicles, or to pedestrians, passing by.

8.4.13 Temporary Construction Management Areas

Temporary Construction Management Areas (TCMAs) will be required for office site, storage of materials and equipment during construction of Terminal Pump Station and WWTP and fabrication including PE pipe welding.

Hazardous substance storage and the general site management at the TCMAs will be dealt with by the Contractor's Health and Safety Plan and either an EMP or Site Management Plan (refer Draft CMP).

The Contractor will be required to ensure security of the TCMAs against ingress by the public, and for the protection of their personnel and others within the area to the adjacent land uses at the sites.

The Contractor will have a register of hazardous substances that will be kept on site and available to all personnel. The Material Safety Data Sheets will also be made available to Contractors' personnel. The storage of dangerous or hazardous substances will be required to comply with the Dangerous Goods Regulations (HSNO Act, 1996) and any other relevant legislation. This includes obtaining the relevant licences. Hazardous goods will be locked away the end of each working day.

8.4.14 Outfall Pipeline

Overview

The shallow and busy nature of the harbour requires that the pipeline is buried to protect it from damage by vessels and anchors, and so that it is not visible in the near shore zone. The onshore topography on the outfall alignment is not suited to establishing a temporary pipe assembly and launching area as it rises steeply from the beach and does not provide suitable space. The outfall location benefits from the protected nature of the harbour which should allow a high proportion of productive time, and easy access for working vessels. It is also noted that during summer months the bay is a popular area for recreational boating.

These issues require that the outfall components be assembled away from the alignment of the outfall, and that an adequate means of pipe burial to provide protective over to the installed pipeline is required.

Construction Assembly Area and Method

While the detail of the construction method will be a matter for the Contractor, the length of the outfall requires that an appropriate onshore assembly area is available to provide material storage, pipe string assembly and welding, ballasting, and launching of complete pipe strings to be floated to the installation site. Areas exist between the main road access to Akaroa Township and the main

boat ramp which would provide for pipe strings of up to 130m to be prepared. Strings of this length could be assembled, launched and stored on the harbour bed to reduce the amount of onshore site required. Another option is to find a suitable location elsewhere in Akaroa Harbour where traffic and population is less likely to be disrupted. This option has not been investigated to date.

Two construction methods have been considered for installing the outfall pipeline. Horizontal Direct Drilling (HDD) was investigated on the grounds that it offered the potential to minimise ground surface disturbance, and thus potentially disturbance of seabed sediment during construction. However, the length of the proposed outfall at 2,500m is significantly longer than has been achieved in New Zealand and this method is not considered feasible for this project.

The second option of conventional pipe lay into an excavated trench is the preferred option.

Temporary Works

To maintain the trench required for pipe installation and connection to the de-aeration structure in the intertidal zone, temporary sheet piling is expected to be required, and will also be needed to install the de-aeration structure. This will provide access for excavation and sheet piling plant. Again, it is proposed that it should be the Contractor's decision to select pipe lengths for installation and the configuration of access and sheet piling requirements, as well as excavation further offshore. This will be based on an assessment of the length of trench that can be practically maintained, and the number of in situ joints that will be required.

Temporary works associated with the construction process are not expected to have any significant effects on coastal processes-although some temporary localised scouring could occur.

Construction Below Low Water

Beyond low water, excavation would be carried out from a barge, with the trench prepared and the spoil placed to one side. This assessment assumes prefabricated pipe strings will be installed into the excavated trench, although other options such as installing the pipeline on the seabed and then lifting across into a trench excavated adjacent, or jetting the pipe down to grade are available. Jetting is not likely to be acceptable because of the greater potential to exacerbate water turbidity close to the route.

The first section of pipeline to be installed is expected to be the inshore end and connection to the de-aeration structure. The length of preassembled floating pipeline will be towed into the sheet piled trench at high tide, the pipe flooded and sunk into the sheet piled trench and the connection made. Trenching would then proceed offshore from that point over the length of the pipe strings to be installed. The pre-welded strings fitted with ballast blocks will be sequentially installed into the trench and roughly backfilled using the accessible spoil. Completion of backfilling will occur naturally, the ballast on the pipeline providing stability in the process.

The construction of the pipeline will occur over a period of about five months. The process will require that there are temporary restrictions, for safety reasons, on public access to parts of intertidal area at the launching site. The excavation of 2.5km of the seabed trench by barge will also place some temporary restrictions on recreational boating in the area.

Temporary Seabed Disturbance

Seabed trenching will cause some direct seabed disturbance as well as water turbidity in the proximity of the trench. The benthic environment at the outfall site and along the pipeline route is relatively similar and without any taxa or assemblages of special scientific or conservation interest. The benthos was assessed by NIWA as being typical of shallow protected coastal environments in the region. The total width of direct disturbance is estimated as 12m for the trench, batters and spoil

batters with an estimated additional 50m each side of the trench for the indirect effects of fine material from trenching. The total area of direct disturbance is estimated at 30,000m² (Ian Goss, OCEL, pers. comm.).

NIWA has concluded that predicted current speeds are modest along the pipeline route and at the outfall diffuser site (up to 0.15m/s with a median of 0.06m/s). While seabed material along the route is mainly fine loess-derived silt, the low current velocities means that the bed material is not generally mobile in the harbour. These low current velocities and the north-south tidal movement will minimise sediment plume movement towards the shoreline during construction of a large portion of the outfall. As such, increases in water turbidity and deposition of fine material over the surrounding seabed will be confined to an area relatively close to the construction area. There will be some temporary increase in turbidity within Childrens Bay which is likely to be visible from land depending on the background clarity of harbour waters. This is unlikely to be significant in the relatively turbid context of the shallow bay. The temporary works will be minimised in the intertidal area by the temporary sheet piling.

The disturbance of the seabed along the pipeline route will be temporary and the benthic environment is expected to return to a pre-construction state within a relatively short period after construction is completed.

8.4.15 Hazardous Substances

The storage of any dangerous or hazardous substances during construction will be required to comply with the Dangerous Goods Regulations (HSNO Act, 1996) and any other relevant legislation. This includes obtaining the relevant licences. Material Safety Data Sheets (MSDS) will be held on site for all hazardous goods on site. All hazardous goods will be locked away the end of each working day.

Best practice measures are identified in the appended draft CMP including:

- Limiting bulk fuel storage (i.e. petrol, diesel, oil), if required on site, to one location at least 20m from the shoreline or waterway, providing the fuel/oil storage area with an impervious bund with a volume of 120% of the largest container and requiring all dispensing units to have drip trays and drip containers in place at all times.
- Development of a Spill Management Procedure and an Emergency Response Plan as part of the Contractor's CEMP.
- Making a general spill containment kit available at all times when machinery is present and to service each operating unit.
- Requiring any plant operating over water to have its own spill kit. The kit would have sufficient booms and other spill containment devices for 120% of the maximum fuel storage on board the machinery and for the wave environment.
- Requiring any onsite refuelling to occur more than 20m from the shoreline or waterway and the tanker to carry an emergency spill kit with the auto switch-off is fully operational. Specific re-fuelling procedures would be required to be included in the CEMP.
- Requiring sealed waste bins to be provided for the collection of oil rags, oil filters, etc. Waste drums would be transported offsite to an appropriate receiving facility.
- Requiring the storage of hazardous substances to comply with the requirements of the Hazardous Substances and New Organisms Act (HSNO Act, 1996) and the requirements of the relevant regional and district plans.
- Requiring covered rubbish and recycling bins to be provided for general refuse. These bins would be regularly emptied and moved offsite to an approved facility. No burning of waste materials would be permitted.

- Requiring portable toilet facilities to be located away from traffic areas and further than 20m the shoreline.

With the above measures in place, the effects of using or storing any hazardous substances on site during construction will be no more than minor.

8.4.16 Construction Wastes

Construction wastes will be generated at the construction sites. Where practicable, waste will be separated for recycling purposes. Any disposal of waste will be undertaken according to the following requirements, as identified in the appended draft CMP. Target Sustainability, a CCC waste reduction initiative, will be providing guidelines regarding minimising waste and resources.

Solid Waste

Covered rubbish bins will be provided and the refuse regularly disposed off-site to an approved facility. Waste bins for the collection of non-construction related wastes will be covered to minimise wind-blown debris. If necessary, bins will have locking catches to prevent lids lifting during high winds. No burning of any such waste will be permitted.

Human Waste

Regularly serviced portable toilet facilities will be required. Portable units will not be located within 20m of a watercourse or external site boundaries. Portable toilets will be staked to the ground to avoid toppling in high winds.

Cleanfill

Any cleanfill removed during excavation that cannot be reused on site, will be required to be removed to an approved cleanfill site.

Contaminated Soil

The Terminal Pump Station site has been identified potentially containing material from a disused landfill.

Waste management methods and strategies will be required to be implemented in accordance with industry standard practices. With the appropriate measures in place, the effects from any wastes generated on site will be no more than minor.

8.4.17 Public Access

Terminal Pump Station

Public access to the site in the southwest corner of the boat park on the foreshore will need to be restricted during the construction of the Terminal Pump Station. A part of the site will be required as a temporary construction management area for the storage of materials and equipment. Construction of the pump station requires removal of approximately fifteen boat park spaces. The land is owned by CCC.

Both access points to the site cross weight-restricted bridges however, both bridges are being replaced as part of a separate project.

WWTP site

Public access to the WWTP site at the top of Old Coach Road will be restricted during construction and subsequent operation. The site is owned by CCC. Road access past the site will be generally unimpeded during construction although there may be times when heavy machinery and trucks will temporarily slow or halt traffic on Old Coach Road (see also Section 8.4.5 Traffic).

8.4.18 Archaeology and Cultural Values

It is considered that the minor, temporary nature of the dewatering discharges will not have any impact on iwi cultural values.

While the potential for unknown archaeological sites to be uncovered is considered low, an Archaeological Discovery Protocol (ADP) condition providing for accidental discovery of artefacts or taonga is proposed to be included in the land use consents (see Section 10).

The fundamentals of an ADP are:

- Works will cease immediately
- Advice of the discovery shall be given as soon as possible to Ōnuku Rūnanga and CCC (as appropriate)
- No work shall commence until the approval of the Ōnuku Rūnanga and the Historic Places Trust is obtained
- All staff involved in earthmoving should be aware of the requirements of the ADP.

In addition an Archaeology Authority under the Heritage New Zealand Pouhere Taonga Act is likely to be applied for.

8.4.19 Visual and Aesthetics

The visual and amenity effects of the proposed construction works will only be temporary. Reinstatement of these sites by the Contractor will be required.

The temporary use of the TCMAs may result in some disruption to other users. Following completion of work, these areas will be reinstated and public access restored.

Fine suspended sediment that may not be able to be removed by treatment of dewatering flows may enter the receiving environment. This can temporarily affect the natural character of the area by changing the visual amenity of the receiving water. Potential effects of fine suspended sediments discharged may include reduced clarity or a change in colour of the water. Maintaining visual clarity is also important to maintain aesthetic quality and contact recreation safety.

The streams close to the Terminal Pump Station site do not have high amenity values due to their highly modified form and low recreational use.

However the Akaroa Foreshore has higher amenity values. The dewatering at the Terminal Pump Station site may require the use of more sophisticated and larger scale tank settling systems, such as multiple baffling to aid settling with the tanks. This may also need to be combined with the use of flocculants.

The Contractor's methodology for the dewatering to sensitive environments will be subject to approval by CH2M Beca's Engineer's Representative to check procedures will be in place to minimise sediment entering waterways and the impacts to visual clarity and colour are reduced as far as practicable so the short term impacts will be mitigated to an acceptable level.

8.5 Effects of WWTP Wastewater Discharge on Harbour Water Quality

8.5.1 Overview

This assessment of the effects of the treated wastewater discharge on harbour water quality has been undertaken by compliance with applicable water quality standards and guidelines. These include the conditions in section 107 of the RMA, the minimum standards defined for class shellfish

gathering waters in Schedule 4 of the Regional Coastal Environment Plan (RCEP) and relevant guidelines e.g. ANZECC (2000) and MfE (2003).

In relation to wastewater discharges, section 107 places restrictions on granting of consent if, after reasonable mixing, the discharge is likely to give rise to all or any of the following effects in the receiving waters:

- *The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;*
- *Any conspicuous change in the colour or visual clarity;*
- *Any emission of objectionable odour;*
- *The rendering of fresh water unsuitable for consumption by farm animals;*
- *Any significant adverse effects on aquatic life.*

Schedule 4 of the RCEP provides the minimum standards required for class shellfish gathering waters into which the outfall will discharge. Map 1.8 from the RCEP showing water quality areas for Akaroa Harbour and is attached in Appendix F.

The following assessment has been based on the predicted dilution and dispersion of the discharge in the receiving environment, water quality standards in the relevant plans and guidelines and consideration of a reasonable mixing zone. The information used to compare against the standards is the quality of the treated wastewater from the proposed new biological nitrogen removal (BNR) membrane wastewater treatment plant.

8.5.2 Dilution and Dispersion of Treated Wastewater Discharge

Overview

NIWA (2014a) carried out an assessment of both initial dilution and subsequent dispersion of the wastewater plume from the proposed outfall diffuser.

Initial dilution will occur in the immediate vicinity of the outfall diffuser (within approximately 50m of the diffuser in the Akaroa situation) due to buoyancy and shear forces on the jets emanating from each diffuser port as the lighter freshwater-based treated wastewater rises towards the surface and mixes with the adjacent marine waters. These near-field processes were modelled by NIWA using CORMIX, which is described in Section 3.2 of the NIWA report (see Appendix B). The initial dilution process is illustrated in Figure 8-1.

Subsequent dispersion and harbour mixing includes physical mixing processes that contribute to the further dilution of the plume after the initial-dilution phase until it reaches a site of interest. In a harbour, it also includes harbour residence or flushing times, particularly if the wastewater contaminant exhibits conservative (non-decaying) or slow-decay behaviour in the receiving waters. This dispersion phase was modelled by NIWA using Delft2d.

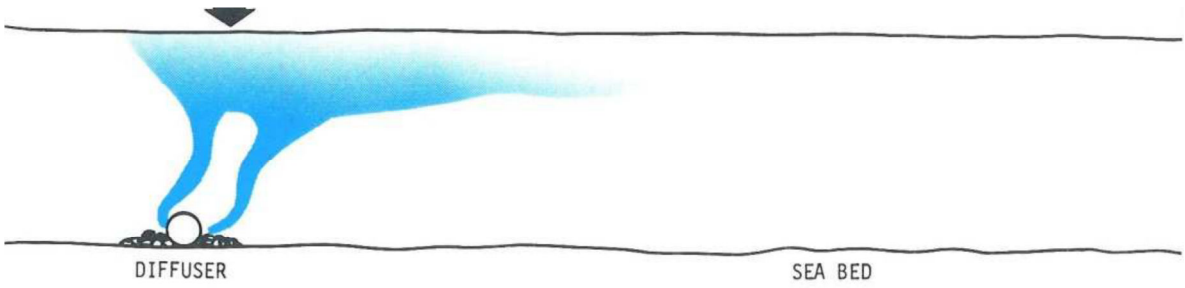

Figure 8-1 Schematic side view of buoyant plumes from seabed outfall diffuser

Nearfield Dilution

Figure 8-2 shows the cumulative distribution of initial dilutions that would be achieved by the specimen diffuser design situated at the end of the 2.5km proposed outfall alignment. Figure 8-2 shows that distribution climbs steeply at the top end, with initial dilutions reaching above 3000-fold, which mainly relate to low night-time discharges of 1.7L/s. The lowest initial dilutions occur for higher discharges during slack-tide or slow-moving conditions at the diffuser.

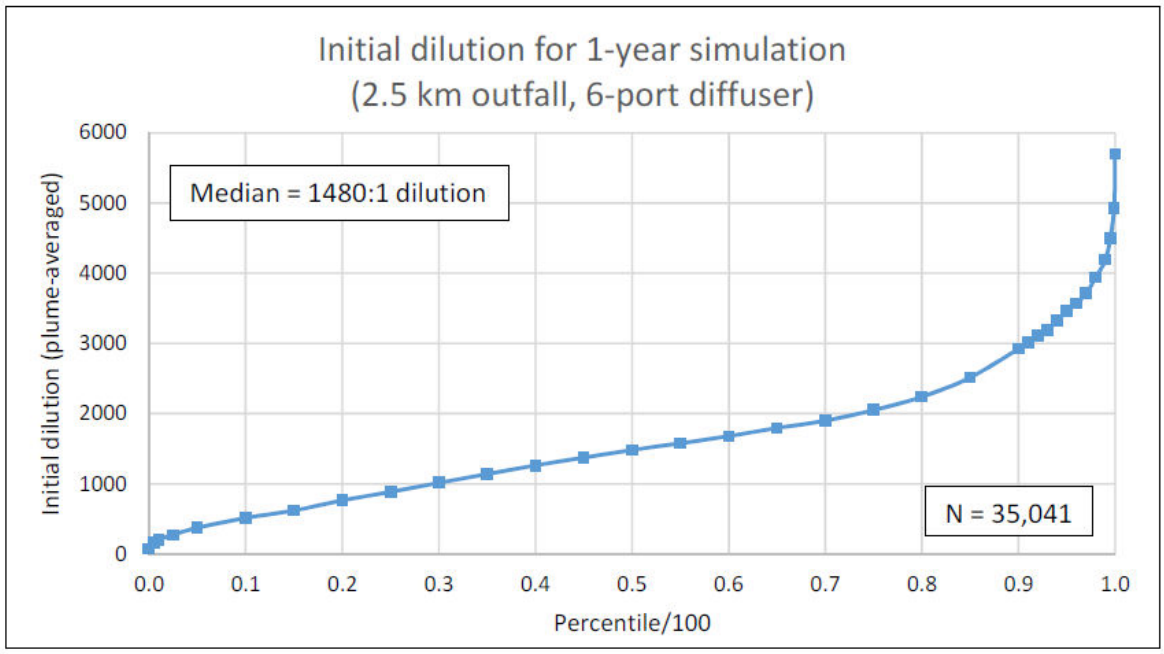

Figure 8-2 Cumulative distribution of initial dilutions computed over the 1-year simulation for the proposed outfall diffuser site (WSW1) (based on dilutions at 15-minute intervals)

Table 8-1 provides a statistical summary of the distributions of expected initial dilutions based on the 1-year simulation encompassing a variety of environmental conditions. The median initial dilution is around 1480-fold, but decreases as the wastewater discharge increases or the current velocity drops. Plume mixing with the receiving waters is much more efficient for lower discharges into faster current speeds.

In most cases, the top surface of the diluted plume reached the sea surface within a few tens of metres of the diffuser. Further initial mixing continued at the lower inter-facial surface of the plume, achieving most of the initial mixing within 50m of the diffuser, with some further residual initial dilution achieved in the next 50m. This length scale is similar to that of the model cell in Delft2d the contained the discharge location.

Table 8-1 Summary statistics for the distribution of expected initial dilutions for 2041 wastewater discharge rates

Percentile	Initial Dilution
Maximum	5,690:1
90th percentile	2,925:1
Mean	1,590:1
Median	1,480:1

10th percentile	516:1
1st percentile	207:1
Minimum	76:1

Far-field Dilution

NIWA's modelling shows that the far-field physical dilution factor is small at around 2–3 fold dilution, as it also includes the moderating effect of the harbour-wide flushing characteristics for the semi-enclosed harbour (where a dynamic equilibrium is reached between the effluent discharge load (when modelled as a conservative tracer) and the volume exchanged each tide with the Canterbury Bight waters).

8.5.3 Reasonable Mixing

The RMA and RCEP both require that water quality standards be met after *reasonable mixing*. This implies the existence of a non-compliance zone where water quality standards may not be met. The need for a mixing zone is recognised by regulation, as no outfall structure can be designed to achieve complete instantaneous mixing of discharged process water with surrounding seawater. Its size depends on the discharge and receiving water characteristics, as well as regulatory constraints.

According to a Ministry for the Environment discussion paper (Rutherford, Zuur et al,1994), reasonable mixing can be said to have occurred when the management objectives of the receiving water are not compromised by the mixing zone. Generally, this means that:

- The mixing zone size should be minimised
- Any significant adverse effects should be confined to this zone
- Any adverse effects within the mixing zone should be no more than minor.

The factors noted in Rutherford et al. (1994) to consider when deciding what constitutes a reasonable mixing zone are:

- The wastewater flow rate and concentration
- Design of the outfall
- Depth, velocity and rate of turbulent mixing of the receiving water
- Ambient concentrations in the receiving water
- Purpose and objectives for which the receiving water is being managed
- The relative size of the receiving environment
- Whether the water quality within the non-compliance zone would case an adverse effect outside the zone.

The extent of this zone can be determined using estimates for the concentration of a particular contaminant in the discharge and in the receiving water, an estimate of the dilution rate and plume movement, and a known standard or guideline limit concentration.

There are rarely any prescribed mixing zone criteria in regional policy documents for ocean outfalls. Such plans appear to accept that there are many factors existing in nearshore coastal waters and tend to default to narrative standards such as "*avoidance of significant adverse effects on biota*".

A mixing zone has been proposed for the new outfall based on the predicted wastewater quality and the results of the dilution and dispersion study. The proposed mixing zone is confined to a radius of 100m in all directions from the 10m long diffuser section (see Figure 8-3 and Drawing GIS-6517986-05 in Appendix C). The proposed 100m mixing zone represents a reduction from the

existing WWTP outfall mixing zone of 250m and reflects CCC's project commitment of *"treating wastewater to a high standard, commensurate with the ecological, social, cultural, recreational and commercial importance of Akaroa Harbour…."*

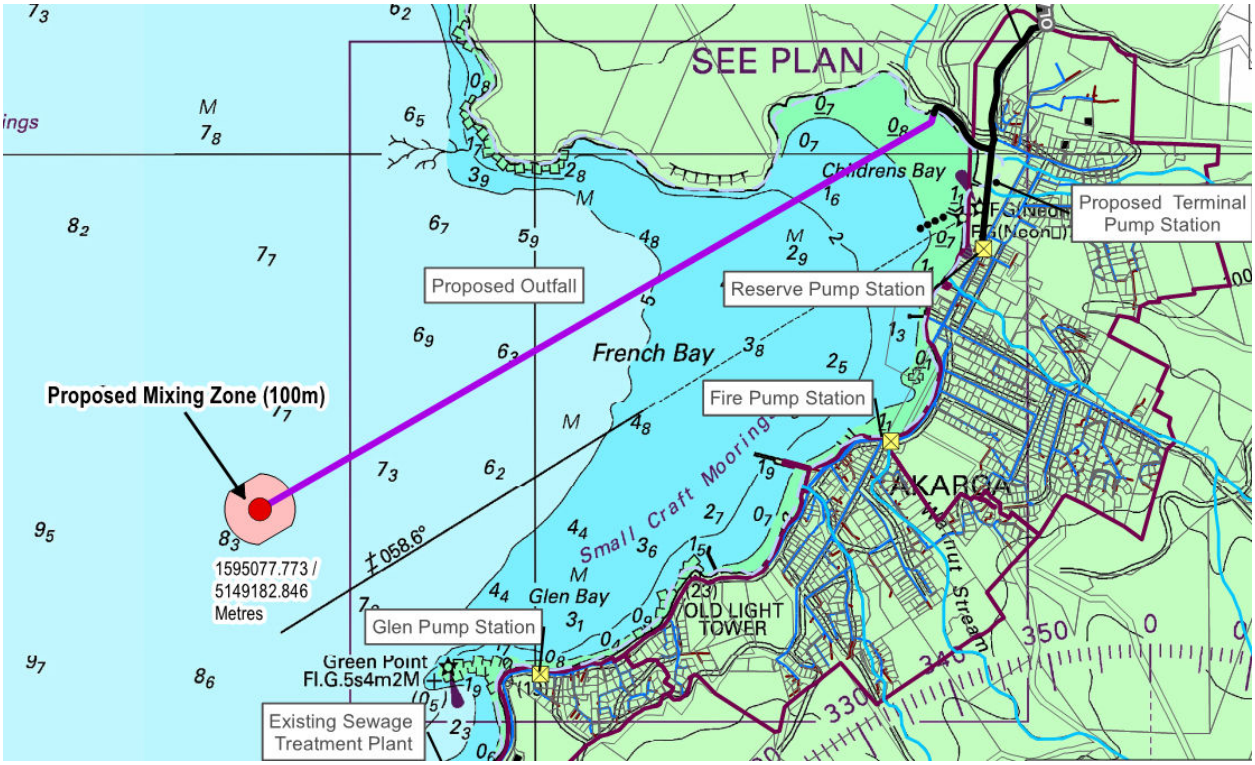

Figure 8-3 Proposed Mixing Zone for Outfall

8.5.4 RCEP Water Quality Standards

The proposed outfall discharge will occur in water classified for Coastal Shellfish Gathering (SG) Water. The water quality standards in the RCEP apply after "reasonable mixing" with receiving waters. This "mixing zone" therefore, can be defined as the area of water that does not need to comply with the water quality standards. The following assessment determines the expected degree of compliance with the Water Quality Standards in the RCEP and the extent of mixing that will be required to ensure compliance where necessary.

Standard 1 – Microbiological (Class SG Water)

The median faecal coliform concentration of not less than five samples taken within any consecutive 30 day period, shall not exceed 14 colony-forming units per 100 ml, and no more than 10% of samples taken within any consecutive 30 day period shall exceed 43 colony-forming units per 100 ml as a result of any discharge of a contaminant or water. Samples shall not be taken on the same or consecutive days.

Pathogenic microorganisms in human wastewater can cause significant public health risk through contact recreation and consumption of shellfish in contaminated waters. The proposed design wastewater microbiological limits are summarised in Table 8-2.

Table 8-2 Proposed Design Treated Wastewater Microbiological Limits

Parameter		Winter Dry Weather	Peak Summer
Faecal Coliforms	cfu/100mL	10	100
Enterococci	cfu/100mL	10	100

On this basis, the faecal coliform concentration in the treated wastewater under winter and dry weather conditions will be less than the lower value (i.e. 14 colony-forming units per 100mL) required by Standard 1 before reasonable mixing. During summer peak conditions, it will require a dilution of 8 fold to meet the lower faecal coliform value.

Modelling of initial dilution from the outfall indicates that the lowest dilution expected for a 2041 discharge flow is 76:1.

On this basis, the proposed wastewater discharge will comply with the requirements of Standard 1 for Class SG water.

The RCEP also sets standards for water used for contact recreation (CR) as follows:

Between 1 November in any year and 31 March in the following year, all running medians of concentrations of enterococci from any series of five consecutive samples collected at intervals of between five and nine days shall not exceed 35 colony-forming units per 100 millilitres of water as a result of any discharge of a contaminant or water, with no single sample exceeding 277 colony-forming units per 100 millilitres of water.

The nearest area of the harbour identified as Class CR Water is located approximately 2km to the north east of the outfall in Childrens Bay, well beyond the mixing zone identified in this application, so it is expected that significant mixing would have occurred in that distance. The design wastewater enterococci standard is the same as for faecal coliforms.

On this basis, the proposed wastewater discharge will comply with the requirements of Standard 1 for Class CR water.

Standard 2 – Dissolved Oxygen

The concentration of dissolved oxygen shall not be reduced to less than 80% of saturation concentration as a result of any discharge of a contaminant or water.

The discharge of organic matter into poorly flushed water bodies can cause oxygen depletion in the water column and sediments. An adequate supply of oxygen is required for the metabolic functioning of aquatic biota.

Dissolved oxygen concentration recorded by Cawthron (2014), during field studies at the outfall site, was lower in the benthic cold water layer, decreasing from an average of 8.3mg/L (above 100% saturation) for the upper water column to 7.4mg/L (90-94% saturation) near the seabed.

No data on dissolved oxygen (DO) levels within the existing treated wastewater is available. However, the design wastewater TSS and cBOD values are shown in Table 8-3.

Table 8-3 Proposed Design Treated Wastewater BOD and Total Suspended Solids Limits

Parameter		Winter Dry Weather	Peak Summer
TSS	mg/L	2	4
CBOD5	mg/L	5	10

The BOD_5 standard for Class SG water requires that the BOD_5 of the receiving water measured after filtration through a GF/C filter shall not exceed $2g/m^3$ as a result of any discharge to water. This will be easily achieved with the high quality wastewater coupled with the modelled initial dilution (minimum of 76:1 under 2041 flows). Well-oxygenated conditions will be maintained well within the proposed mixing zone after discharge from the proposed outfall.

On this basis, the proposed wastewater discharge will comply with the requirements of Standard 2 for Class SG water.

Standard 3 – Bacterial or Fungal Slime Growths

Bacterial or fungal slime growth shall not be visible to the naked eye as plumose growths or mats as a result of any discharge of a contaminant or water.

The discharge of organic matter into poorly flushed water bodies can cause oxygen depletion in the water column and sediments and the proliferation of attached heterotrophic growths.

Most work on the growth of attached bacterial or fungal growths has been carried out in rivers and is likely to have little relevance to an exposed coastal environment such as the middle of Akaroa Harbour. The high quality wastewater, buoyant plume and significant available dilution (minimum of 76:1) will all mitigate against the growth of attached heterotrophic organisms.

The existing WWTP wastewater quality is poorer than is proposed for the new WWTP. However, CCC is not aware of any records of bacterial or fungal slime growths reported within the proximity of the short outfall (100m long) discharge by the public or by WWTP staff. Comments after a dive inspection of the outfall do not suggest evidence of slime growths on the substrate in the immediate vicinity of the outfall.

On this basis, the proposed wastewater discharge will comply with the requirements of Standard 3 for Class SG water.

Standard 4 – Temperature

The natural temperature of the water shall not be changed by more than 3°C *and shall not exceed* 25°C *at any time, as a result of any discharge of a contaminant or water.*

Excessive changes in water temperature can have an adverse effect on aquatic biota.

MWH (2012) noted that the average temperature of the treated wastewater from the existing WWTP (from September 2010 to April 2012) was 17.5°C. The temperature of the proposed wastewater discharge will be similar.

Anecdotal evidence suggests that the sea water temperature in Akaroa Harbour varies from 11°C in winter to 17°C in summer (Kingett Mitchell Ltd, 2006). Given the extent of the harbour receiving waters relative to the discharge volumes, and the depth of those waters in the middle of the harbour, it can be concluded that the discharge would not result in receiving water temperatures exceeding 25°C, or changing by more than 3°C.

On this basis, the proposed wastewater discharge will comply with the requirements of Standard 4 for Class SG water.

Standard 5 – BOD_5

The BOD_5 of the receiving water measured after filtration through a GF/C filter shall not exceed 2g per cubic metre as a result of any discharge of a contaminant or water.

The discharge of organic matter into poorly flushed water bodies can cause oxygen depletion in the water column and sediments and the proliferation of attached heterotrophic growths.

As noted in the discussion under Standard 2 above, the 2g/m^3receiving water standard will be easily achieved with the high quality wastewater coupled with the modelled initial dilution (minimum of 76:1 for 2041 flows).

On this basis, the proposed wastewater discharge will comply with the requirements of Standard 5 for Class SG water.

Standard 6 – Heavy Metals

Concentrations of the dissolved fractions of the following metals, measured after filtering a sample through an acid-washed 0.45 micron filter, shall not exceed the concentrations set out below as the result of any discharge of a contaminant or water:

Arsenic 50 mg per cubic metre

Cadmium 2 mg per cubic metre

Chromium 50 mg per cubic metre

Copper 5 mg per cubic metre

Lead 5 mg per cubic metre

Nickel 15 mg per cubic metre

Zinc 50 mg per cubic metre.

Concentrations of these heavy metals have been recorded in the existing WWTP treated wastewater discharge since 2004 and are set out in Table 8-4. These concentrations are recorded from the treated wastewater prior to discharge and mixing in the receiving waters. The concentrations of heavy metals in the predominantly domestic-sourced Akaroa raw wastewater have remained consistent over the monitoring period (see Table 8-4).

Table 8-4 Metals Concentrations in WWTP Treated Wastewater 2004-2012

	Lead (g/m³)	Copper (g/m³)	Chromium (g/m³)	Zinc (g/m³)	Cadmium (g/m³)
14-Oct-2004	0.114	0.005	0.005	0.09	0.0002
3-Nov-2005	0.0013	0.02	0.001	0.058	0.0002
4-Oct-2006	0.0023	0.0098	0.0023	-	-
6-Nov-2007	0.004	0.0159	0.004	0.0063	0.0002
8-Jan-2008	0.004	0.0185	0.004	-	-
5-Jan-2009	0.003	0.016	0.0015	0.049	0.0002
5-Jan-2010	0.0017	0.018	0.0005	0.039	0.0001
5-Jan-2011	0.001	0.022	0.001	0.046	0.0007
4-Jan-2012	0.0015	0.03	0.001	0.064	0.0002
Median	**0.0035**	**0.019**	**0.0019**	**0.049**	**0.0002**
Maximum	**0.004**	**0.03**	**0.005**	**0.09**	**0.0007**

Cawthron (2014) noted that the sediment concentrations around the outfall site, for all metal analytes, were well below the corresponding ANZECC (2000) ISQG-Low trigger levels[3] for possible ecological effects.

MWH (2012) noted that Akaroa wastewater chromium complies with Standard 6 even before mixing and dilution within the harbour waters and the following dilutions would be required for the other metals:

- 1:1.5 for zinc
- 1:45 for cadmium
- 1:5 for copper
- 1:10 for lead.

The above dilutions will be easily achieved at the proposed outfall which has a modelled minimum dilution of 76:1.

On this basis, the proposed wastewater discharge will comply with the requirements of Standard 6 for Class SG water.

8.5.5 Section 107 of the RMA

There are a number of issues that are required to be addressed by section 107 of the RMA which are not specifically addressed by the standards in the RCEP. These include:

- Conspicuous films, scums, foams, or floatable or suspended materials
- Conspicuous changes in the colour or visual clarity of the receiving waters
- Emission of objectionable odour
- Significant adverse ecological effects.

Conspicuous films, scums, foams, or floatable or suspended materials

The proposed upgrading will provide a high quality treated wastewater. Treatment will include screening and grit removal at the Terminal Pump Station. Normal flows (up to 14L/s) will receive full treatment using the BNR process (Modified Ludzak-Ettinger process) with membrane filtration. Wastewater from the MLE reactors will then be treated using membrane filtration, to remove

suspended solids and pathogens. Flows in excess of 14l/s will receive primary treatment (0.5mm gap size screening and grit removal) and UV disinfection. As a result, no conspicuous films, scums, foams, or floatable or suspended materials will be discharged to the outfall.

The discharge will not cause conspicuous films, scums, foams, or floatable or suspended materials.

Conspicuous changes in the colour or visual clarity of the receiving waters

Wastewater plumes are generally visible because they contain a higher TSS concentration than the surrounding water or they are pigmented (e.g. with blood or industrial dyes). They can also be discernible as a layer of freshwater which appears different to the surrounding salt water.

Akaroa wastewater is from mainly domestic sources and will not contain any dyes etc. from industrial sources. The proposed WWTP will produce a be relatively clear wastewater with low TSS concentrations of between 2-4g/m^3. The predicted initial minimum dilution after discharge is 76:1 under 2041 flows. As a result, there will be no discernible wastewater plume.

The discharge will not cause any conspicuous changes in the colour or visual clarity of the receiving waters.

Emission of objectionable odour

The subsurface discharge wastewater would not be expected to result in any discernible odour due to the high degree of treatment and the dilution available.

No incidents of odour from the existing WWTP discharge (which is of less quality and closer to the shore) have been received or recorded by CCC.

The discharge will not cause the emission of objectionable odour.

Significant adverse ecological effects

This issue is addressed in Section 8.6.

8.6 Effects on Marine Ecosystems

The discharge of contaminants to water can have potential adverse effects on marine ecosystems as a result of increases in toxicity, nutrient enrichment and the discharge of suspended solids.

8.6.1 Toxicity

Toxicity is the inherent capacity of a contaminant to cause adverse effects on a living organism. Toxicity can occur from the accumulation of contaminants in organisms from the water or sediment either directly or through consumption of food containing the toxicants (bioaccumulation).

Given that the wastewater treated by the Akaroa WWTP is from predominantly domestic and a few commercial sources, the primary toxicants that should be considered are change in pH, ammonia and heavy metals. Other toxicants, such as persistent organic pollutants, would not be expected to be present in significant quantities.

Change in pH

Extremes of pH can affect the metabolic function of organisms. Cleaning and other chemicals in industrial wastewater (such as caustic acid, solvents, and phenols) can alter wastewater pH. The predominantly domestic/commercial nature of raw wastewater entering the WWTP means that little variation in wastewater pH is expected. The typical range of influent pH is 7-7.5.

The ANZECC (1992) guideline indicates that the pH should not be permitted to vary by more than 0.2 units from the normal values. While ANZECC (2000) does not include a New Zealand value, the South-eastern Australian Guidelines state that pH should not be permitted to vary outside the range 8-8.4.

The pH of seawater is generally in the range 8-8.3 (the pH remains relatively constant because of inherent buffering or resistance to change). The pH of treated effluent from the WWTP is not expected to cause any significant adverse effects on aquatic biota as the predicted worst case initial dilution at the new outfall will be 76:1 under 2041 flows and the receiving water is well-buffered.

Ammonia

Ammonia nitrogen (NH_3-N) is a gaseous nitrogen and hydrogen compound present in wastewater as a result of the biological degradation of organic matter containing nitrogen. The compound exists as a chemical equilibrium between unionised ammonia (NH_3) and ammonium (NH_4+) and hydroxide ions (OH^-). Ammonia can have both acute and chronic effects on aquatic organisms. NH_3 is the principal toxic form and is highly dependent on pH, temperature and salinity. The concentration of NH_3 increases with increasing temperature and pH and decreases with increasing salinity.

The design ammonia nitrogen concentrations in the proposed WWTP wastewater are 1g/m^3 (winter/dry weather) and 5g/m^3 (summer peak). Therefore, the winter/dry weather discharge will almost meet the receiving water guideline of 0.910g/m^3 without any additional dilution. A dilution of about 8:1 is required to meet the ANZECC (2000) 95th percentile trigger level of 0.910 g/m^3 for the summer peak ammonia concentration. This will be easily achievable as the predicted worst case initial dilution at the new outfall will be 76:1 under 2041 flows.

The high wastewater quality, available dilution and the buoyant effluent plume, will mean that there will be no significant increase in ammonia nitrogen concentrations in sediments or the water column and no potential for toxic effects on aquatic biota.

Heavy Metals

In sufficient concentrations, trace metals can have both acute and chronic effects on marine biota. Generally, mobile biota such as fish and mammals avoid water that is acutely toxic. However, immobile (or sessile) organisms (e.g. mussels) can be adversely affected in this manner by continuous exposure to these metals. Of more importance are chronic effects, where bioaccumulation (or build-up) of toxic substances can occur. Sub-lethal (e.g. growth inhibition and interference with reproduction and maturation) as well as lethal effects can then result. Persistent chemicals can also be passed through the food chain (which can include to humans).

Roof and road runoff in urban areas are an acknowledged source of trace metals such as zinc that can enter the wastewater system for short periods during high rainfall. Copper can leach into domestic water from hot water systems and then be discharged to the sewer. Lead is no longer added to petrol and lead plumbing pipes are increasingly rare. While wastewater from heavy industry can be a source of trace metals, there is no significant industry discharging to the Akaroa wastewater system.

Measured heavy metal concentrations in Akaroa wastewater are consistently low (see Section 8.5). Modelling has shown that the new outfall is predicted to achieve a worst case initial dilution of 76:1 under 2041 flows and, as noted in Section 8.5.2, very little dilution will be required to meet the RCEP metal toxicity standards.

Heavy metals are of concern for bioaccumulation as they are not broken down in the aquatic environment. As noted above, the concentrations of metals in the treated wastewater is very low.

The ANZECC 2000 Guidelines identify that cadmium and mercury are of potential concern with respect to bioaccumulation, but do not provide concentrations at which bioaccumulation may occur. Concentrations of these metals within the existing treated wastewater are monitored and are well within the toxicity trigger value (MWH, 2012).

Therefore, the risk resulting from bioaccumulation of metals sourced from the proposed WWTP to both humans and higher order animals is considered to be very low.

8.6.2 Nutrient Enrichment

If the addition of nutrients exceeds the capacity of the ecosystem to assimilate them, a water body may become eutrophic, which is defined as the level above which unacceptable ecological change occurs. This may be exhibited as excessive growth of aquatic plants, and/or algal blooms, both of which can have both ecological effects, and effects on recreation values.

It is noted that there a number of factors which determine whether a water body will become eutrophic, which whilst including the nutrient concentrations, also include temperature, turbidity, and physical dynamics of the receiving water body. Therefore, a water body with elevated nutrient concentration will not always become eutrophic, and experience nuisance growth of algae or plants. The limiting nutrient in marine water is typically nitrogen, rather than phosphorus and this is confirmed to be the case for the Akaroa Harbour by the monitoring undertaken by ECan (Bolton-Ritchie, 2005 and 2012).

As the impact of nutrients is a cumulative impact, consideration of the treated wastewater concentrations and the expected relative loading of nitrogen from this source is considered most appropriate for the proposed WWTP discharge.

Within the wider harbour, the following two sites which are closest to both the existing and proposed WWTP outfalls have been monitored for TN and DRP concentrations (Bolton-Ritchie, 2005):

Children's Bay:

- TN mean = 0.165 g/m^3, TN max = 0.650 g/m^3
- DRP mean = 0.013 g/m^3, DRP max = 0.027 g/m^3

Between The Kaik and Cape Three Points:

- TN mean = 0.160 g/m^3, TN max = 0.650 g/m^3
- DRP mean = 0.010 g/m^3, DRP max = 0.031 g/m^3

As summarised in reports from Bolton-Ritchie (2005 and 2012), harbour water quality results from 2008-09 indicate very similar results to those from 1989-2004, but slightly higher for TN and slightly lower for DRP. These results indicate that there has been no significant change over the monitoring period in wider harbour TN and DRP concentrations, as a result of the existing WWTP discharge, and more recent samples also indicate that there are no obvious spikes in either of those determinands that would suggest an overall adverse impact from the outfall. This is to be expected as the overall contribution of nutrients from the existing WWTP is very low in the context of the total nutrient loading to the harbour from other sources.

The proposed WWTP has design wastewater TN concentrations as shown in Table 8-5.

Table 8-5 Proposed Design Treated Wastewater Total Nitrogen Limits

Parameter	Winter/ Dry Weather	Peak Summer
Total Nitrogen	10 g/m³	15 g/m³

These design values represent a significant improvement on the existing WWTP wastewater mean TN concentration of 29.4g/m^3 measured over the period July 2008 and August 2012 (MWH, 2012). The mean TN load from the existing WWTP was 7.37kg/d over the same monitoring period. It is noted that the current WWTP is not designed for nutrient removal, although some nutrients are removed through the biological trickling filter process.

The predicted 2041 TN load from the proposed WWTP is calculated as shown in Table 8-6.

Table 8-6 Predicted Treated Wastewater Total Nitrogen Load

Parameter	Winter/ Dry Weather	Peak Summer
Total Flow	290m³/d	561m³/d
Total Nitrogen concentration	5g/m³	15g/m³
Total Nitrogen load	1.5kg/d	8.4kg/d

From the above table, it can be seen that the winter/dry weather TN load from the WWTP is predicted to be 1.5kg/d in 2041. This daily load will occur from most of the year. During peak summer, the daily TN load in 2041 is predicted to be 8.4kg.

It is noted that approximately 90% of the wastewater TN in winter/dry weather conditions will be in the potentially bioavailable dissolved inorganic form (i.e. ammonia nitrogen and nitrate-nitrite nitrogen). The percentage will reduce to approximately 70% during summer peak period. Currently there are no nationally acceptable levels for DIN, however, the higher the concentration, the greater the likelihood that excessive growth of phytoplankton may occur.

The ANZECC (2000) guidelines specify trigger values for nutrients and other water quality parameters in Australian estuarine waters. However, there are no New Zealand-specific ANZECC (2000) guideline trigger values for dissolved inorganic nitrogen in New Zealand marine and estuarine waters. The guidelines suggest that New Zealand uses the south-east Australia trigger values but these are for low-nutrient waters and have been found to be unsuitable for the concentrations of nutrients in the estuarine and coastal waters of Canterbury and elsewhere in New Zealand. Hence the nutrient results from this study have not been compared to ANZECC (2000) trigger values (CCC, 2011).

The discharge of nutrients from the new WWTP will not have a measureable effect on the harbour water quality because:

- The concentration of TN (and DIN) in the wastewater will be significantly reduced from the current WWTP discharge TN concentration
- The relative mass load of TN (and DIN) will be insignificant compared with nitrogen loads from other harbour sources
- The proposed outfall will provide significant dilutions under all future discharge scenarios (see Table 8-1)
- There have been no recorded algal blooms in the harbour attributable to the existing WWTP short outfall discharge, and the typical time of year for blooms in autumn does not coincide with the peak summer wastewater discharges from the WWTP
- The overall water quality of the harbour is being maintained and is not degrading.

8.6.3 Marine Mammals

Marine mammals, particularly Hector's dolphins (*Cephalorhynchus hectori hectori*) which is the world's smallest - and possibly rarest dolphin, are present in the Akaroa Harbour on a regular basis. Overall, the Hector's dolphin species is estimated to number fewer than 8,000, down from close to 30,000 in the early 1970s.

The resident species generally feed on smaller fish species that could be exposed to the outfall discharge. Potential exposure of other transient and migratory mammal species to affected fish is less likely.

Of increasing interest in recent years is the potential effect of so-called endocrine disrupting compounds (EDCs*)* on marine mammals. The endocrine system produces hormones that trigger specific bodily functions (e.g. reproduction, metabolism, growth). EDCs can mimic natural hormones which can adversely affect these natural functions. Insecticides such as DDT, heptachlor and lindane, as well as oral contraceptive pills (containing synthetic oestrogens), and Phthalates (plasticisers) are examples of chemical compounds that have been identified as having the potential for endocrine disruption.

The lipophilic (fat-soluble) and persistent nature of these chemicals make marine mammals particularly vulnerable to bioaccumulation within their thick blubber layers, as well as biomagnification due to their generally higher level in the food chain (Woodley et al, 1991). Trace metals can also accumulate in organs such as the liver and muscle of mammals, which can then be passed to offspring during pregnancy and lactation.

A comprehensive review of pollutant concentrations in Southern Hemisphere mammals found lower levels in all New Zealand samples relative to South Africa, Australian or South American samples. Recent studies (e.g. Stockin et al, 2007) found that total PCB concentrations in common and Hectors dolphins were well below toxic effects thresholds established by Kannan et al (2000). However, high concentrations of organochlorine pesticides (e.g. DDT) were found in New Zealand species relative to Northern Hemisphere samples.

Despite Hector's dolphin populations having the highest risk among local marine species to contaminants in the outfall discharge, the overall risk is expected to be low. Even resident populations potentially forage around Banks Peninsula. Thus, exposure of these mammals to the outfall discharge is expected to be infrequent.

More importantly, the Akaroa wastewater is from domestic and commercial sources and the treated wastewater will be of a very high quality with low concentrations of toxic contaminants such as heavy metals. This coupled with the high dilution expected after discharge from the new outfall, means that the risk of exposure of marine mammals to toxic contaminants (either directly or indirectly) is very low. The discharge of treated wastewater from the proposed outfall will therefore have a less than minor effect on marine mammals.

8.6.4 Fish and Benthic Organisms

A variety of fish species inhabit Akaroa Harbour and recreational fishing is a common activity due to the proximity of boat ramps and the township. There is some shellfish gathering but stocks are limited by due to historical overfishing and access to suitable habitat.

There are several marine farms in the Akaroa Harbour, located on the western side of the harbour, between Wainui and the heads. These enterprises include the farming of salmon, paua, culture pearls, and research sponge farming. Some limited commercial fishing of crayfish and flat fish also occurs in the harbour.

The Cawthron (2014) report indicates that 53 benthic macroinvertebrate taxa were identified in the area around the proposed outfall during fieldwork for the current study. The assemblage is generally consistent with data from previous studies of Akaroa Harbour. No taxa or assemblages of special scientific or conservation interest were identified and the benthos was assessed as being typical of shallow protected coastal environments in the region.

The comments made in respect of marine mammals also apply to fish species within the harbour. The Akaroa wastewater is from domestic and commercial sources and the treated wastewater will be of a very high quality with low concentrations of ammonia and heavy metals. This coupled with the predicted high dilution after discharge from the new outfall, means that the risk of exposure of local fish species to toxic contaminants (either directly or indirectly) is very low. The discharge of treated wastewater from the proposed outfall will have a less than minor effect on fish.

8.6.5 Birds

Akaroa Harbour is home to a wide variety of permanently based and migratory bird species. Most species use the area for feeding and roosting. This includes the white flippered little blue penguins (korora), as well as comorants (shags), black backed gulls (Karoro), red-billed gulls (Tarapunga), the northern giant petrel, (kuaka), Australasian gannet (Takapu) and the mollyhawk or albatross (Toroa).

The comments made in respect of marine mammals and fish also apply to bird species within the harbour. The Akaroa wastewater is from domestic and commercial sources and the treated wastewater will be of very high quality. This coupled with the high dilution expected after discharge from the new outfall, means that the risk of exposure of local bird species to toxic contaminants, either directly by sitting on, or diving into the harbour, or indirectly by consuming fish species, is very low. The discharge of treated wastewater from the proposed outfall will have a less than minor effect on birds.

8.7 Public Health

8.7.1 Overview

The implementation of a safe, reticulated wastewater system is necessary to protect the public health of the Akaroa community. Therefore, a key benefit of the proposed Akaroa Wastewater Scheme is to further reduce the risk to human health resulting from pathogens in human waste.

8.7.2 Pathogens and Faecal Indicator Microorganisms

There are a wide variety of potentially pathogenic organisms in human wastewater (including viruses, bacteria and protozoan parasites). Pathogens can cause mainly gastro-intestinal illnesses such as gastroenteritis, dysentery and giardiasis. Although rare, respiratory and skin diseases can also result from exposure to water-borne pathogens. Worm parasites are not a significant threat in New Zealand.

The actual presence of these organisms in raw wastewater is dependent on the prevalence and incidence of disease in the local population. The Akaroa community health profile can be considered typical of many smaller communities in New Zealand. However, the area is a favoured tourist destination, which may have a seasonal impact on the outbreaks of infectious enteric diseases.

Pathogens (e.g. Norovirus) are not typically measured in the wastewater as they are not always present, and are difficult and expensive to detect and enumerate. The common practice is to test for the presence of faecal contamination, by measuring the concentrations of “indicator organisms” that

are always present in wastewater at high concentrations. CCC routinely monitors the concentrations of both faecal coliforms and enterococci in the existing WWTP treated wastewater.

Pathogens discharged into a marine environment are transmitted to humans most frequently by consumption of contaminated seafood. Other potential infection routes are accidental inhalation or ingestion of contaminated sea water or direct exposure through ears, nose, eyes and broken skin (Thompson, 2005). The potential for contracting an illness after exposure to a pathogen depends on several factors including susceptibility of the human host, the degree of exposure to a viable pathogen population (concentration and duration) and the virulence of the pathogenic agent. Pathogens can also be transmitted in aerosols by wave activity, but this is most unlikely to occur in the relatively calm Akaroa harbour environment.

8.7.3 Quantitative Microbial Risk Assessment

NIWA (2014b) (see report in Appendix L) carried out a Quantitative Microbial Risk Assessment (QMRA) for the proposed wastewater discharge based on the risk of Norovirus illness, using the infection dose-response findings reported by Teunis et al. (2008) and its associated conditional probability of illness (given that infection has occurred), as employed by Schoen and Ashbolt (2010) and Soller et al. (2010). It should be noted that QMRA differs from the approach that has often been adopted that uses a relationship established between faecal indicator bacteria (e.g. faecal coliforms or enterococci) and water-contact-related human health risk (e.g., as reported by Bolton-Ritchie, 2013). That is because the epidemiological studies, upon which that relationship is based, were conducted on waters much further removed from point sources than is the case for the Akaroa discharge.

For such near-proximity cases, the current New Zealand water quality microbiological guidelines for recreational areas (MfE/MoH, 2003) encourage a direct assessment of issues associated with illness-causing pathogens and health effects. Current understanding of the pathogens associated with a receiving water containing some amount of treated wastewater indicates that Norovirus generally poses the greatest health risk (Sinclair et al., 2009, Soller et al., 2010).

8.7.4 QMRA and the Monte Carlo Technique

Overview

The QMRA is informed by recently-developed information on Norovirus. It is also informed by data obtained from the contaminant model, which predicts Norovirus concentrations at each of 14 contact recreation sites in the Harbour (see Figure 4- and Table 4-6), for a constant wastewater Norovirus concentration of 1,000 genome copies per cubic metre (= 1 virion per litre). Those results (NIWA, 2014a) are then scaled in the QMRA by the predicted virus concentrations in the effluent discharged from the outfall.

The QMRA uses a “Monte Carlo” quantitative statistical iterative modelling approach to handle variability and uncertainty in its components. Therefore, many of the input variables are assigned statistical distributions of their likely values, from which random samples are drawn in a 10,000-fold iterative process. On each of these 10,000 “exposure days”, and for each site, one hundred healthy people (swimmers, surfers, etc.) are exposed to the water and another 100 consume raw shellfish.

Each of these exposures may contain some viruses and so, on each iteration and for each individual, the probability of illness is computed. The end results of this iterative statistical sampling are “risk profiles”, averaged over the 10,000 days. That wealth of information is summarised for each site by computing the “Individual’s Illness Risk” (“IIR”), calculated as the number of cases of illness (over all 100 people on each of the 10,000 days) divided by the total number of occasions when exposure to the virus may occur (that is, 1,000,000 exposures).

All calculations have been conducted using the @RISK software (Palisade Corp. 2013) embedded in MS Excel 2010®.

The generic calculation sequence is shown on Figure 2-1 of the NIWA (2014b) report (see Appendix L).

Input variables

The input variables refer to conditions expected to prevail at Akaroa up to the year 2041 and include the duration of an individual's swimming events, their water ingestion rates, the influent Norovirus concentration and virus removal efficacy throughout the treatment train. Those concentrations are transformed to empirical concentration distributions at each exposure site using the results of computational hydrodynamic modelling prepared by NIWA (2014a). These calculations have included the viricidal effects of sunlight-UV which varies with time-of-day, season, cloudiness and plume turbidity.

Why use Norovirus?

Noroviruses are a principal cause of viral gastroenteritis. They all are single-stranded RNA viruses that have been classified into five genogroups (GI to GV). Strains I, II and IV can infect humans (particularly strain II, see Matthews et al., 2012), while GIII infects bovine species and GV has recently been identified in mice. The GI viruses are highly infectious for a proportion of the population (Teunis et al., 2008) and spread easily by direct person or person-to-person or person-surface-person contact. By analogy, the GII genogroup exhibits the same behaviour. They also can be associated with waterborne gastroenteritis (Parshionikar et al., 2003) or shellfish-associated gastroenteritis (Lees et al., 1995; Thebault et al., 2013) and are therefore a hazard to recreational water users (Gray et al., 1997). They have been detected in both raw and treated wastewaters (Nordgren et al., 2009), with strains of GI and GII predominating in human wastewater that are typically very similar to human strains circulating in the population (van den Berg et al., 2005). Therefore, the public may be at appreciable risk whenever there is exposure to human wastes (animal viruses are generally thought to be not infectious to humans. For the purposes of the QMRA, Noroviruses therefore represent the primary potential risk of infection from human wastewaters via ingestion for primary contact users, such as swimmers.

Influent Norovirus Concentrations

Influent Norovirus concentrations were measured at the existing WWTP in December 2013 and January 2014 (see Table 2-1 in the appended NIWA report. Results show median influent Norovirus (Genogroup II) concentrations of about 10^4 genome copies per litre. Maximum concentrations were a little over 10^4 per litre. Accordingly, NIWA has used minimum, mode and maximum Akaroa influent values of 10^4, 10^4 and 10^7 genome copies per litre, as has also been done for a recent QMRA study for New Plymouth (McBride, 2012) and Hawera (Palliser et al., 2013).

NIWA note that if concentrations as high as 10^9 per litre occur (as reported for France by da Silva et al., 2007), this would reflect a substantial disease outbreak in the community which should cause public advisories against swimming or shellfish harvesting to be posted.

Norovirus Removal During Treatment

The efficacy of the treatment system to remove pathogens is an important input. After consideration of the proposed WWTP treatment process, a uniform distribution of the "Log_{10}" virus reduction factor, ranging from 3 to 4, was assumed (i.e. three and four orders-of-magnitude reduction in the influent concentration of viruses). For the possible (but rare) bypass events, these reduction factors have been halved (because a sizeable part of that flow will receive full treatment while the rest, up to about half the total flow, will receive screening and UV disinfection only). But account is also

taken of the increased dilution of influent concentrations during wet weather. By simple flow calculations, the "bypass dilution factor" has been taken as 7.

8.7.5 Scenarios Modelled

Five water contact scenarios have been modelled as shown in Table 8-7. For shellfish consumption, risks for sites 7 – 10 are calculated for summer conditions, for normal "winter" conditions and for bypass "winter" conditions. Bypass conditions do not arise for summer conditions because storms generally occur in winter and ground conditions mean that summer storms have little impact on flows (pers. comm. Reuben Bouman, CH2M Beca, 7 April 2014). The nature of the exposure data for shellfish consumption does not allow us to separation between children and adults.

Table 8-7 Scenarios modelled for recreational water contact

Scenario	Group Exposed	Season [a]	WWTP Operation
1	Children	Summer	Normal
2	Children	“Winter”	Normal
3	Adults	Summer	Normal
4	Adults	“Winter”	Normal
5	Children	“Winter”	Partial bypass

Note: a) “Winter” denotes all months outside the bathing season (April – October inclusive)

8.7.6 Results of QMRA- Recreational Water Contact

Summary of Results

The calculated risk profiles and associated IIR values for all sites and for each of the five scenarios are given in Tables 3-1 to 3-5 of the appended NIWA report. These detailed results can be summarised using a single number, defined as the proportion of all potential exposures that gave rise to cases of illness (see Table 3-6 of appended report).

The results for recreational water-contact (summarised in appended Table 3-6) indicate that swimmers' risks attributable to the proposed outfall are low in all cases. They are higher for children than for adults (compare scenarios 1 and 3; scenarios 2 and 4) and for all shoreline sites are highest at site 7 (of the thirteen nearshore sites its lag time is the shortest). As expected, the risks at site 14, in mid-Harbour close by the proposed diffuser, are the highest. That is because that site's short lag time minimises the time for natural in-harbour virus inactivation processes (e.g., solar irradiation, predation) to occur. Bypass events (scenario 5) do cause some elevation of the risk, but even at the mid-harbour site 14 these are less than 0.5% - reaping the benefits of WWTP disinfection processes and large initial dilution of the wastewater discharged from a diffuser near the sea-bed, mixing with ambient harbour water as the plume rises to the water surface, under buoyancy.

These risks are generally low when compared to “tolerable” risks inherent in the New Zealand water quality guidelines for recreational areas (MfE/MoH, 2003), as discussed below. As noted in part above, that is a consequence of the predicted efficacy of the treatment and disinfection processes and the degree of dilution and inactivation of viruses in the harbour waters. The main water flow is along the axis of the Harbour, and so it exhibits rather long lag times before reaching exposure sites, during which time there is opportunity for removal of viruses from Harbour water. That removal is effected by the joint actions of natural UV irradiation and grazing by higher-order microbes.

Note that the summary risks (see "IIR" results in Table 3-6 of the appended NIWA report) are averaged over substantial periods of time. As noted in Section 2.1, in computing these averages the QMRA model first calculates risk profiles (reported in appended Tables 3-1 to 3-5) and the

averaging process, by its very nature, smoothes out the peak risks predicted. For example, consider site 7 (ExW, existing outfall/WWTP) for scenario 1 (children, summer conditions, see appended Table 3-1). For over 97% of the time, the risk to recreational water-users attributable to the outfall is absent, principally because the plume from the outfall is either absent or very low in concentration. However, for the time that it is present there is a small risk. This is a similar outcome to that predicted for other coastal outfalls of disinfected wastewater (e.g., Napier, McBride, 2011).

Tolerable Risks for Recreational Water Contact

New Zealand microbiological water quality guidelines (MfE/MoH 2003) follow recommendations from the World Health Organisation (WHO 2003). In particular, subject to the results of sanitary surveys of the catchment draining into a recreational area, they set contact-recreation-associated illness bathing-season risk thresholds for beaches maintaining a “very good” Suitability for Recreation Grade (SFRG) as posing <1% risk of gastrointestinal illness (and <0.3%–1.9% risk for Acute Febrile Respiratory Illness); "good" grading as posing 1%–5% risk of gastrointestinal illness (and 0.3%–1.9% risk for Acute Febrile Respiratory Illness). For beaches in a “fair” or “poor” state, these risks are 5%–10% and 1.9%–3.9%, respectively.

Respiratory agents such as Adenoviruses are less important in the rather quiescent Akaroa Harbour waters compared with an open coast and so it is expected that respiratory effects will be less important than gastrointestinal.

Even though the NIWA study’s average predicted gastrointestinal risks attributable to the outfall are less than 1% (even for bypass events), the beach SFRG results derived by the Regional Council (Bolton-Ritchie, 2013) do not explicitly reflect that. This is entirely appropriate because: (i) other local sources (stormwater, leakage, wastewater inflow) can contribute to microbial contamination, and (ii) sanitary survey information used by the guidelines can obviate the possibility of reaching a higher grade.

However, it is evident from Environment Canterbury's monitoring (Bolton-Ritchie, 2013, Figure 5-3 and Appendix 13) that there have been ongoing improvements in the microbial condition of some harbour water sites. This is in terms of the lower surveillance limit given on page D6 of New Zealand Guidelines (MfE/MoH, 2003), i.e., 40 enterococci per 100 mL and, more particularly in terms of the assigned SFRG. For example, Akaroa main beach (site 4) has improved from "Poor" (2002–2003 to "Fair" (2003–2006) and "Good" (2006–2010). The improvements being made to Akaroa’s wastewater system in this project will continue this progress.

8.7.7 Consumption of Raw Shellfish

Summary of Results

Risk profiles and associated IIR (%) values have also been calculated for consumption of raw shellfish harvested from sites 7 – 10. These results are given in Table 3-7 of the appended NIWA report for summer or winter. They apply to any person (child or adult).

The IIR results for shellfish consumption for sites 7 – 10 (existing outfall/WWTP, The Kaik, Ohinepaka Bay and Wainui) (Table 3-7 of the appended NIWA report) indicate risks higher than those faced by swimmers at these sites, in keeping with findings of other studies such as New Plymouth (McBride, 2012). In normal operation of the treatment plant, these IIR values can be as high as 1.5% (for "Winter" conditions at the existing outfall/WWTP (site 7)). They are more elevated during bypass conditions, reflecting the lower efficacy of artificial UV disinfection for bypass flows.

Note that, because shellfish retain microbes for some time, the risk profiles (from which IIR values are calculated) are more gently-rising than those found for contact recreation, meaning that risks are more often present.

Tolerable risks for raw shellfish consumption

Existing specifications for bivalve molluscan shellfish harvesting do not present explicit tolerable risk levels. Their requirement for water samples is based on faecal coliforms (median not to exceed 14MPN/100mL and no more than 10% of the samples to exceed 43MPN/100mL). These were derived from calculations by advisers to the US Public Health Service after a shellfish-related typhoid outbreak in the early parts of last century. In particular, it was believed that typhoid could be avoided if not more than 50% of the 1mL portions examined were positive for total coliforms. This was used to calculate a limit of 70 total coliforms per 100mL which was later adjusted (by a factor of five) to derive a limit of 14 faecal coliforms per 100mL (McBride, 1990).

Nevertheless, if it is assumed that " good" conditions prevail if the predicted shellfish-associated illness risk is between 1% and 5% (as for the SFRG, as discussed above), then the results shown in Table 3-7 of the appended NIWA report indicate that Ohinepaka Bay and Wainui (sites 9 and 10 respectively) would be better than “good”, as would The Kaik (site 8) in summer (and would be almost-so in winter). The existing outfall/WWTP’s (site 7) risks are a little higher than the 1% threshold and so would only qualify as “good”. For bypass flows, risks can reach nearly 5% and the erection of temporary signage warning against shellfish-gathering may be appropriate.

8.7.8 Conclusions

NIWA conclude from the QMRA that Illness risks to swimmers attributable to the proposed wastewater treatment and disposal upgrades, up to 2041, can be expected to be below 1% over any bathing season (summer or "winter". This holds true even for occasional bypass treatment events in winter (because the bypass flow will receive some disinfection before discharge to the Harbour). For a small proportion of winter there may be higher risks, which would particularly occur when and if there is an outbreak of Norovirus illness in the contributing population.

Risks from consumption of raw shellfish harvested from harbour sites are low but somewhat higher than for contact recreation. Again, these arise when the sewered community is contributing unusually large concentrations of Norovirus.

Overall, the scheme can be expected to contribute to an ongoing improvement in harbour water quality and a significant reduction in human health risk.

8.8 Cumulative Effects

The proposed WWTP outfall will discharge highly treated wastewater into Akaroa Harbour. The design of the new WWTP means that the daily contaminants loads in the wastewater will be lower during winter and dry weather conditions than those loads discharged by the current WWTP. During the summer peak period, daily nitrogen contaminant loads will be similar to that discharged from the existing WWTP. Contaminant loads of key parameters such as nitrogen and potentially pathogenic microorganisms will be very low compared with others sources entering the harbour, and lower than the existing discharge.

8.9 Air Discharges

8.9.1 Assessment Method

The Good Practice Guide for Assessing and Managing Odour in New Zealand (GPG Odour, MfE, 2003) provides guidance on methods for assessing the effects of odour discharges. For existing sources of odour, the GPG Odour recommends that operator experience with the site, community feedback and information on the process control and management systems are the primary sources of information that should be used to assess the effects of the activity. Where modifications are planned, information on the known performance of control technology and experience with other sites can be used to assess the impacts of the proposed changes. Dispersion modelling can also be useful for undertaking a comparative assessment of the significance of the changes. For a new activity, the GPG recommends using dispersion modelling where reliable odour emissions data are available. Where reliable data is not available, the GPG recommends that past experience with the same type of activity in other locations is the best method of assessment.

For this current assessment, experience with similar activities in other locations, evaluation of the proposed emission control systems, the sensitivity of the receiving environment and consideration of separation distances have been used to assess the potential effects of the discharges.

8.9.2 Sensitivities of the Receiving Environments

The effects of any odour depend on a number of features of the odour exposure which are collectively known as the “FIDOL” factors:

- **F**requency — How often an individual is exposed to odour
- **I**ntensity — The strength of the odour
- **D**uration — The length of a particular odour event
- **O**ffensiveness/character — The character relates to the “hedonic tone” of the odour, which may be pleasant, neutral or unpleasant
- **L**ocation — The type of land use and nature of human activities in the vicinity of an odour source.

As part of the “location” factor, the sensitivity of the receiving environment must be taken into account.

Different combinations of these factors are significant when assessing adverse effects. Depending on the severity of an odour event, one single occurrence may be significantly adverse and this is known as an “acute” odour effect. However, in other situations, where there is a higher frequency of odorous events the threshold odour level would be lower. This longer term impact is known as a “chronic” odour effect.

Different locations have different sensitivities to odour and can be classified as having high, moderate or low sensitivity. The degree of sensitivity in any particular location to odour is based on characteristics of the land use, including the time of day and the reason people are at the particular location (e.g. for work, home living or recreation). In a residential area an acceptable odour frequency is likely to be much lower than would be expected in a rural area.

Rural Environments

People living in rural areas generally have a high tolerance for rural-type odours, which are acceptable to most rural people and fit the description of a rural odour in a rural area. However, some types of odour are quite different to the normally expected rural odours (due either to the strength, character and unpleasantness of the odour, or to the frequency and duration of the odour), and are much less acceptable.

Residential Environments

People living in residential-zoned areas typically have a high sensitivity to both rural and non-rural odours, because of the following factors:

- People of high sensitivity to odours can be exposed
- People can be present at all times of day and night, both indoors and outdoors
- People tend to carry out activities at residences which are highly sensitive to non-rural odours, such as dining, entertaining, outdoor living, sleeping
- Visitors to the area who are unfamiliar with an odour are more likely to be sensitive to odours they are not used to, and may raise awareness of a problem
- People usually expect a high level of air quality including the absence of odours, and have a low tolerance of even typical rural odours.

Amenity conflicts between residential and rural zones, in terms of incompatible neighbouring land uses and odour presence, are recognised as an issue in many district and regional plans in New Zealand.

Industrial Areas

People in these areas are more likely to tolerate some odour without finding it offensive or objectionable. In comparison to residential areas, industrial land use tends to be classified as low sensitivity.

8.9.3 Recommended Separation Distances

A number of New Zealand and Australian expert sources provide recommendations on separation distances between industrial land uses and sensitive locations in order to prevent land use conflicts occurring. Separation distances are not intended to replace the need for good pollution control but acknowledge that there may be unintended emissions at times which should be allowed for. Separation distances are intended to minimise the effects of these unintended emissions. Table 8-8 summarises the recommended separation distances between sensitive land uses and WWTPs.

Table 8-8 Recommended Buffer Distances for WWTP and Pump Stations

Agency	Recommended Buffer Distance	Comments
Clean Air Society for Australia and New Zealand (2008)	200 – 300m	WWTP
South Australia EPA (2007)	200 – 300m	WWTP
Victoria EPA (2013)	32m	WWTP
West Australia (2005)	20 m	Terminal Pump Station

8.9.4 Effects of WWTP

The proposed WWTP location is rural and is considered to be moderately sensitive to odours. The closest sensitive receptors are some holiday cottages located approximately 250m to the southwest and downhill of the plant (refer to Figure 2-2 of the Akaroa Wastewater Treatment Plant and Reticulation System - Odour Effects Assessment report in Appendix I). Northeasterly quarter winds occur for approximately 25% of the time. When winds are light, drainage flows may carry odours generated at the plant down towards the holiday cottages. However, given the small size of the proposed plant and the enclosure and ventilation of the majority of the equipment, any odours produced are unlikely to be noticeable within approximately 20m of the plant during normal operation.

Consequently, the nearest receptors are expected to be unaffected by odours from the plant during normal operation and any adverse effects on the environment due to odours are expected to be less than minor.

If the plant malfunctions or power is lost, there is a potential for objectionable odours to be produced which may travel further than normally expected. CCC will prepare an Operations and Maintenance Manual for the plant which will include contingency plans that will describe the procedures to be taken in the event of a plant failure. A diesel generator will be provided to supply back up power to the plant.

The WWTP is located 250m from the nearest sensitive development which meets the recommended separation distances noted in Table 8-8 from sensitive locations. It is therefore expected that, even if a plant malfunction occurred during worst case meteorological conditions (i.e. light southeasterly winds), the effects on this nearest sensitive receptors are unlikely to be more than minor.

8.9.5 Effects of Terminal Pump Station and Biofilter

The primary source of odour is expected to be the inlet works at the Terminal Pump Station where the untreated wastewater is received and receives primary treatment (fine screening and grit removal) prior to being pumped to the WWTP. To minimise the discharge of odours from the Terminal Pump Station, all of the individual odour-generating equipment will be covered, including the wet well, screens and grit handling equipment. The odorous air will be extracted from the equipment and transferred to a biofilter for treatment. The Terminal Pump Station building itself will not be ventilated, as all of the potential odour sources will be fully enclosed. The collected screenings and grit will be washed and stored in enclosed containers which will be removed from site on approximately a weekly basis.

The receiving environments surrounding the Terminal Pump Station and the associated biofilter are relatively sensitive, due to the proximity of recreational, residential and commercial areas. The biofilter, which will be source of potential odour if not operated and maintained appropriately, will be located adjacent to the pump station.

During normal operation, there is not expected to be any distinguishable odour within approximately 10m of the pump station as a result of the proposed enclosure and ventilation of the odour sources.

The pump station building will be located adjacent to the coast and Jubilee Park, which is a recreational area. The pump station will be approximately 100m from the commercial area located between Rue Jolie and Rue Lavaud.

During daytime hours, when people are most likely to be present in the recreational and commercial areas in the vicinity of the pump station, winds blow predominantly towards the land and will have the potential to blow any odours produced towards the nearby sensitive receptors. However during the day, winds tend to be stronger resulting in better dispersion and dilution of any odour plumes. At night, winds are often light and blow predominantly towards the coast and away from sensitive areas. Southwesterly quarter winds, which occur for approximately 25% of the time, can be strong and will blow odours towards the residential area located to the north of Jubilee Park. However, the residential area is approximately 180m from the proposed Terminal Pump Station site and any odours produced at the plant are likely to be well-dispersed and diluted prior to the plume reaching the residences.

The diesel generator will provide standby electricity supply during power failures. In the unlikely event of a malfunction at the plant that results in the extraction system failing, due to reasons other

than power failure, odours should be largely contained within the building. However, such a situation could result in odours being noticeable in the adjacent recreational and commercial areas, which may be offensive if they are prolonged and occur when people are present. In order to mitigate this situation, CCC will include a contingency plan as part of the operations and maintenance (O&M) manual. The contingency plan will describe the procedures to be taken in the event of a plant failure to minimise the potential for objectionable odour effects.

Odours from well-designed and maintained biofilters are not offensive (usually slightly musty in character) and are usually only able to be noticed within approximately 5m of the filter. The only people passing within 5m of the biofilter will be people travelling past in cars or walking on the footpath on the side of the road, hence any exposure to these musty odours is likely to be transitory.

If the biofilter is overloaded or malfunctioning the intensity of odours produced may increase. The highest predominance of light winds (which are the worst case wind conditions for dispersions of odours) are from the easterly quarter, which will blow odours discharged from the biofilter away from the nearby sensitive locations and towards the coast. Winds from the southwest, which will blow odours towards the nearest residentially-zoned area, tend to be strong and are likely to rapidly disperse and dilute odours prior to the plume reaching sensitive locations. Consequently, the impact of odour from the biofilter on the residences located to the northeast of the biofilter is likely to be less than minor.

Winds from the southeast, which will blow odours towards the closest residence located to the northwest of the biofilter occur for approximately 14% of the time and are frequently light. However, the nearest residence is located on elevated terrain above the proposed biofilter site on a bushclad hillside. It is expected that during light wind conditions, the air flow will be diverted around the edge of the hill rather than up the hill and consequently, odours are unlikely to have any substantial impact on this residence.

In summary, it is expected that any odours discharged from the Terminal Pump Station building and biofilter will be adequately avoided, remedied and mitigated and will have effects that are less than minor on the surrounding environment providing the Terminal Pump Station ventilation system and the biofilter are properly maintained and operated.

8.9.6 Fire Station Pump Station

The Fire Station Pump Station is located on road reserve in a commercial area in relatively close proximity to residential and recreational areas and is considered to a have a high potential sensitivity to odours. CCC reports that there have been issues regarding odours from the pump station in the past.

The expected flow of wastewater through the Fire Station Pump Station will be less than at present due to reversal of flows through the reticulation network. This should reduce the odours generated at the site to some extent. To further reduce odours, CCC proposes to increase the size of the biofilter. The larger volume of biofilter media will increase the residence time of the odorous air in the filter and consequently reduce the concentration of odour in the discharge. Providing the biofilter is properly designed, maintained and operated, the biofilter should effectively remove any offensive odours generated by the pump station. The discharges from the biofilter may have a slightly musty character but this is not offensive and should only be noticeable to people in very close proximity to the surface of the filter. As the biofilter and pump station are located on the side of the road only people walking past are likely to be exposed and only for a very short time. It is therefore considered that with the proposed extension of the biofilter and the reduced wastewater flow at the pump station the effects of odours discharged from the Fire Station Pump Station should be de minimus.

8.10 Effects on the Akaroa Community

The proposed WWTP will provide an important service to the Akaroa community by collecting, treating and disposing wastewater to a substantially higher level than before. A community system such as this plays an important part in protecting the quality of the environment and public health, and is preferable to individual on-site systems which the community would need to maintain, and which will be less effective than the existing WWTP in avoiding adverse environmental and public health effects.

The proposed WWTP and wastewater discharge will not result in significant adverse effects on the community and provides significant benefits to community in terms of public health, business and tourism that all rely on an efficient and effective wastewater scheme. The effect on the Akaroa community of the proposed WWTP and discharge will therefore be less than minor.

8.11 Effects on Cultural Values

8.11.1 Overview

This assessment of the actual and potential cultural effects is based upon an assessment of the provisions of the Mahaanui Iwi Management Plan 2013 (Mahaanui IMP, 2013) and has been recognised throughout by the Akaroa Wastewater Working Party. This assessment is not a Cultural Impact Assessment, but a high level assessment of the proposal using the provisions of the Mahaanui IMP 2013. A copy of the assessment is contained in Appendix K.

The assessment was submitted to Ōnuku Rūnanga for review on 31 March 2014 following a meeting with iwi representatives Liz Robinson and Iaean Cranwell. On 19 June 2014, Debbie Tikao advised that Ōnuku Rūnanga felt that the assessment of the effects of the proposal against the policies and objectives of the IMP seemed fair.

8.11.2 Importance of Harbour to Ōnuku Rūnanga

Akaroa Harbour and the coastal margins affected by the project fall within the takiwā (territory) of Ōnuku Rūnanga. It is also understood that Wairewa Rūnanga share kaitiakitanga (guardianship) responsibilities for Akaroa Harbour.

The importance of Akaroa Harbour to tangata whenua for mahinga kai purposes is clearly identified in the Mahaanui IMP. The Objectives relating to Akaroa Harbour (see Section 6.8 of IMP) clearly identify that the elimination of discharges to the Harbour is a priority. The discharge of wastewater in to the harbour is considered to be culturally offensive and incompatible with the mahinga kai values of the harbour (Issue A1).

8.11.3 Council Resolution

This issue is understood by the Council in preparing the applications to renew the discharges to the Harbour. In recognition of the cultural significance of the discharges, the Council will work collaboratively with Ōnuku Rūnanga so that tangata whenua values are afforded the appropriate priority throughout the project.

It is accepted that the practice of treating and discharging waste to Akaroa Harbour is inconsistent with the provisions of the Mahaanui IMP 2013, and unacceptable culturally to tangata whenua. Akaroa Harbour is recognised as a mahinga kai, and is identified as a Taiapure (customary fishing area), and the policies of the Plan confirm the fundamental importance of this position. Furthermore, the IMP explains the significance of Akaroa Harbour in Ngai Tahu history.

Notwithstanding that, it is considered that the policies in the IMP offer a practical approach, and guide a thorough assessment of the effects. While discharges to land are preferred, and encouraged, the IMP also recognises that it will take time to eliminate discharges to the harbour and to facilitate land based disposal. To that end, Policy A1.8 supports a short term (5 years) consent for the renewal of the current discharge of wastewater to the harbour in order to provide time to investigate, evaluate and develop land based disposal options.

8.11.4 Policies of Mahaanui IMP 2012

The effects of the proposal on cultural values are considered in the context of the Policies A1.1 to A1.8 of the Mahaanui IMP 2012 (see Appendix K - Cultural Impacts Report).

8.11.5 Conclusions

It is accepted that the discharge of wastewater to Akaroa Harbour is inappropriate in terms of Ngai Tahu tikanga. However, the Council is faced with the situation where there are no realistic or viable land-based options for addressing this issue.

This project will reduce overall the volume of stormwater and groundwater infiltrating the system which in tandem with the system's increased capacity and treatment capability will result in a greater quality of treated wastewater being discharged to the harbour. This, in turn, will further reduce the risks to public health through contact recreation and shellfish gathering.

In addition, the decommissioning of the existing wastewater treatment plant at Takapuneke will bring a cultural benefit to Ōnuku Rūnanga.

8.12 Visual Effects

8.12.1 Wastewater Treatment Plant Site

The WWTP site consists of open rural land that slopes down to Old Coach Road and is located high on the hills that provide the backdrop to the Akaroa Basin and in close proximity to the 'important' Takamatua Ridgeline. Please refer to the Landscape and Visual Assessment in Appendix M for drawings relating to this assessment, including proposed landscape mitigation measures.

The effects of the WWTP on rural character of the site itself has been assessed as significant given that the development represents a fundamental shift in character from rural to utilitarian. The effects of the development on the character of the local and wider landscape will be of a low degree owing to expanse and complexity of the existing viewing catchment and the small scale of the WWTP when considered in that context. The proposal will maintain the existing pattern of small scale and low density of built development in this wider context and in accordance with Policy 1A and 3C of the District Plan Rural Zone or Policy 1F of the Utilities Chapter.

The primary visual effects associated with the WWTP development relate to vehicles travelling past the site on Old Coach Road, which are of a 'high' degree over the short term and decreasing to a moderate – low degree over subsequent years once the proposed landscape has had an opportunity to establish and mature. Visual effects on the wider viewing audience will be low due to distance and the expanse and complexity of the scene. The WWTP is not located on the important/prominent Takamatua Ridgeline and nor will it project above the skyline of the ridge when viewed from the wider landscape and is not contrary to Policy 1A and 3D of the District Plan Rural Zone or Policies 1A and 1E of the Utilities Chapter.

8.12.2 Terminal Pump Station

The character of the Terminal Pump Station site is best described as 'utilitarian' with aspects of peri-urban, coastal and recreational character combining to form a moderate to low degree of amenity. It is a car-dominated environment enclosed by utilitarian fencing and cluttered with vehicle signage and boat trailers. The site and its surrounds consist of simple buildings, scattered vegetation, signage, furniture, fencing and dominance of asphalt.

Even though the Terminal Pump Station will introduce a new built element into the local setting, the resulting adverse effects on utilitarian character will be low as a result of the relatively low (landscape) quality of the site and immediate surrounds and resulting low sensitivity to change and subsequently high capacity to absorb the proposed Terminal Pump Station. Effects on coastal natural character values have been assessed as negligible. For these reasons, the proposed Terminal Pump Station is consistent with Policies 1A, 1B, 2A and 2B of the District Plan Recreational Zone and Policies 1A and 1E of the Utilities Chapter.

It is anticipated that visual effects from areas surrounding the Terminal Pump Station site will be of a moderate – low degree in the short term and whilst the proposed mitigation planting becomes established and the majority of the lower half of the Terminal Pump Station building becomes screened and the Terminal Pump Station is bedded down in the view. In the medium to long term the proposed planting will mature to heights up to 7-10m and will screen significant portions of the Terminal Pump Station from those key viewing locations described above and as a result visual effects will be of a low degree. It is likely that glimpses of the upper most parts of the Terminal Pump Station will be visible to some degree throughout the life of the Terminal Pump Station although resulting visual effects will not be significant.

In addition to effects on visual amenity it is possible that the Terminal Pump Station could cast some shadow onto the mini golf course located to the east of the site, particularly in the winter when the afternoon sun is low in the sky. The extent of these shadows will be limited to the western end of the mini golf course and is unlikely to adversely affect the existing experiential quality of the site to any great degree. For the reasons above the proposed Terminal Pump Station is consistent with Policies 3A and 3B of the District Plan Recreational Zone.

8.12.3 Summary

The proposed WWTP and Terminal Pump Station will result in short term adverse effects on rural character and visual amenity ranging from high to low in degree. In general, the respective sites, adjacent land and wider landscape have the capacity to absorb the proposed developments and overtime the overall effect profile of both developments will reduce once the proposed mitigation measures have been implemented and landscaping becomes established and matures over time. For these reasons, the development of the proposed WWTP and Terminal Pump Station facilities are considered appropriate in landscape and visual terms.

8.13 Effects on Recreational and Commercial Values

The land pipeline runs from the WWTP down Old Coach Road, across State Highway 75 and along Childrens Bay Road to the north end of Childrens Bay. This is the preferred location for the pipeline to leave the shoreline, as it reduces construction phase disruption to beach and boat users, avoids the well-established vegetation and boardwalks in Childrens Bay and the rock headland further north.

The proposed 2.5km long outfall will be located in an area of the harbour which is relatively remote from popular swimming beaches or fishing areas. However, the wider harbour is used by recreational boat users including yachts and motorised craft. The outfall pipeline will be buried

under the beach and is likely to be trenched in the submarine section. Only the diffuser risers will project above the seabed.

The diffuser section will be constructed in approximately 8m of water and will be clearly marked on marine charts. The wastewater discharge will be of high quality which will be significantly further-diluted before the plume reaches the surface. The public health risk assessment has determined that the risk of infection risk at key contact recreation and shellfish gathering sites is very low and often absent.

The outfall will be located outside the Tourist Ship mooring areas.

The highly treated wastewater will have no adverse effects on commercial tourist ventures or enterprises (e.g. aquaculture). However, as noted in Section 8.2, there will be a number of positive effects for the Akaroa community arising from the new WWTP.

The location of Terminal Pump Station and associated landscaping will result in the loss of approximately 15 parking spaces but it is considered there is sufficient capacity in the existing waterfront parking/launching area to accommodate this loss given its extensive area. The immediate area in the vicinity of the Terminal Pump Station will be re-marked to retain the same number of trailer parks and to ensure that there will not be any interference with manoeuvring areas associated with the parks.

8.14 Natural Processes, Hazards and Risks

8.14.1 Terminal Pump Station

The Terminal Pump Station, located in the southwest corner of the boat park, will be a building containing screens and grit traps, a wet well, three progressive cavity pumps and electrical equipment. An external containerised generator will be provided outside the building so the pump station can operate when normal power supply is interrupted. A biofilter will also be located adjacent to the pump station.

Sea level Rise

According to the report Effects of Sea Level Rise for Christchurch City (Tonkin & Taylor, 2013) the pump station site is within an area that may be affected by sea level rise. The report predicts the 1% AEP tide will reach RL3.3m Lyttelton Datum, which is RL12.34m CCC Datum. The level of pump station site is approximately RL 11.5-12m.

To mitigate this risk, the pump station floor level will be raised above RL12.34m, by localized filling of approximately 350-800mm.

Geotechnical Hazards

A preliminary assessment has been undertaken of the geotechnical hazards at the site to determine the main geotechnical risks to the proposed pump station.

To address geotechnical risks, the design will consider and address the following potential failure mechanisms:

- Non-engineered fill / landfill: potential for differential settlement, rotation of structures, and damage to connecting pipe infrastructure.
- Lateral Displacement: potential for >SLS and <ULS earthquake-induced lateral displacement causing differential settlement of the structure and associated rotation. This also to reduce

damage to connecting infrastructure and reduce the cost of the post-earthquake repair or replacement.

- Landfill: Mitigate excavation of potentially contaminated landfill to reduce potential environmental risks and costs.

The pump station will be constructed on piles with a suspended floor slab based on practicality, performance and cost considerations.

Wind, Snow and Earthquakes

The structural design will adopt the following design criteria to mitigate risks from wind, snow and earthquake risks. The basic design loading requirements are given in Table 8-9 along with the annual probability of exceedance (APE), which has been determined in accordance with clause 3.3 of AS/NZS 1170 Structural Design Actions – Part 0: General Principles.

Table 8-9 Terminal Pump Station structural design loading requirements

Description	Criteria
Design working life of building	100 years
Importance category	3
Annual probability of exceedance – ULS	1/2500 (wind and earthquake), 1/500 (snow)
Annual probability of exceedance – SLS	1/25 (wind and snow), 1/50 (earthquake)

The emphasis on this structure will be on 'resilient design', i.e. easily repairable.

Power Supply Failure

Power for the pump station will be provided from the Orion network. A 160kVA standby generator set will be provided to operate the pumps, screening and grit removal equipment at full design flows. The generator will be located outside the pump station building, housed in an acoustic cabinet designed for emergency use only. It is not proposed to use the generator for regular load shedding or power export as this would require a higher level of acoustic treatment. Fuel storage for 72 hours operation at full load will be provided on site.

8.14.2 Wastewater Treatment Plant

The WWTP situated at the top of Old Coach Road will consist of a series of covered tanks, buildings and open reactors (see Schematic in Figure 4-1).

Geotechnical Risks

The main risks associated with the WWTP site are geotechnical hazards which include:

- Presence of moisture sensitive and highly erodible loess soils
- Slope instability
- Presence of non-engineered fill along Old Coach Road
- Variable thickness of Loess and strength of the Akaroa Volcanic Group across the site.

A qualitative assessment suggests that shallow foundations may be suitable for structures if appropriate water control is applied, subject to review and development of the detailed design.

Retaining walls will be required to support the slope and provide a level platform for the development. Potential retaining wall options include timber cantilever walls and gravity walls, including mechanically stabilised earth (MSE) walls. The non-engineered fill along Old Coach Road will need to be removed or treated prior to the placement of pavements.

Due to the sensitivity to moisture and highly erodible nature of the loess soil, together with the evidence of historic slope instability, it is proposed that there is no discharge of water to ground. Instead stormwater and any subsoil drains (if needed) will discharge to the roadside drain.

Sea level Rise and Flooding

The WWTP site at 120m elevation is not susceptible to sea level rise. There are no significant watercourses near the site.

Power Supply

Power for the treatment plant will be provided from the Orion network. A 160kVA standby generator set will be provided at the treatment plant. This generator included as part of the design and construct package for the treatment plant and will be required to be sized to operate the treatment facilities at full flows/load.

The generator controls will be specified to allow synchronous operation with the network supply to allow testing under full load during normal conditions when wastewater flows are too low to permit operation at full load. The generator acoustic treatment will be designed for emergency use only. It is not proposed to use the generator for regular load shedding or power export as this would require a higher level of acoustic treatment.

The containerised generator will be specified with fuel storage for 72 hours operation at full load provided on site.

Redundancy

The main treatment process (activated sludge reactors and membrane filters) units have been sized for duty/assist operation. For the majority of the time, only the duty reactors will be required, with the assist reactor started up prior to the peak load during Christmas/New Year holiday period. The assist membranes may be left in service during the off season, to maximise the treatment of wet weather flows, but would be serviced during this period.

Mechanical equipment (blowers and most pumps) will be sized for duty/standby operation. This means the process can continue following the failure of individual items of mechanical equipment. The gravity belt thickener and thickened WAS pumping will be specified duty only, as they are only required 1 to 2 hours per day, and the process could continue for several days without these units in operation.

Toxic Material Entering the Wastewater System

Biological in-tank treatment systems (such as activated sludge processes) are susceptible to upset and, in extreme situations, collapse caused by a slug of toxic material entering the treatment plant system via the reticulation system. Such an effect has the potential to measurably reduce the quality of the final effluent leaving a plant and in some cases cause increased odour potential.

The primary method of control is by preventing the materials from entering the wastewater system. CCC has an effective (liquid) trade waste control and management system, including by-laws, to limit and control at source potentially toxic and corrosive discharges into the wastewater collection system is required. However, true emergencies cannot be entirely anticipated and may still occur.

Mitigation and risk management procedures to avoid and minimise the potential adverse effects of against toxic slugs on the proposed WWTP process include:

- Treatment plant selection and operation, including robustness of the biological treatment operations

- Material and equipment selection
- Liquid trade waste management systems, including on-going risk assessment
- Appropriate monitoring and alarm systems.

8.14.3 Outfall Pipeline

The outfall pipeline will be buried below the seabed for a length of approximately 2.5km into Akaroa Harbour.

Pipeline and Diffuser Cover

The outfall pipeline has been designed with 1m cover to the pipe beneath the seabed to reduce the risk of it being snagged by anchors and to provide protection from tsunami conditions. The pipeline depth at the inshore end increases to 2.6m so that the proposed de-aeration structure is always submerged even at low tide.

Even though the design has considered boat anchorage, the completed outfall and diffuser location will require restricted anchorage designations, and diffuser components will be designed with a degree of protection from anchor placement and drag.

Pipeline Materials

A range of pipeline materials was considered based upon seismic performance, durability, availability and ease of construction. Pipeline materials with continuous tensile capacity to perform well in seismic conditions are limited to steel and polyethylene (PE). Both can be welded into continuous lengths, and also connected in situ with bolted joints.

Steel, especially in the marine environment, suffers from corrosion effects both from wastewater and external exposure requiring concrete mortar lining and a good quality of external corrosion protection coating. It is structurally stiff, and in comparison with PE, difficult to handle and float if required for installation. PE is the preferred pipeline material as it can be welded into continuous lengths and is relatively light and flexible as well as being inert with regard to corrosion on exposure to seawater and wastewater.

There will be no other effects on physical processes arising from the operation of the new outfall.

Regular inspections of the outfall pipeline and diffuser are proposed as part of consent conditions.

8.15 Traffic Effects

The new Terminal Pump Station and WWTP will generate vehicle movements once they are operational.

In relation to the Terminal Pump Station it is anticipated that when operational the facility is likely to require approximately one visit a week in autumn to spring and approximately 2 visits a week in summer from maintenance staff. Vehicles will use the existing carpark or the entrance when these infrequent visits occur. Good access is available to the site from either SH75 or Rue Brittan. These accesses do cross existing one way bridges which will be upgraded as part of a separate project.

In respect of the WWTP it is anticipated that when operational the facility is likely to require approximately 3 visits a week in autumn to spring and approximately 6 visits a week in summer from maintenance staff. As indicated above a one way access lane is proposed to be provided on site and which also provides for parking.

The sight lines in the BPDP for the site are unable to be met but this effect is not considered adversely significant because:

- The low number of vehicles accessing the site
- The relatively low traffic volumes on Old Coach Road
- Vehicles are not required to reverse off and onto the site
- Vehicles travelling up Old Coach Road will generally not be at high speed because of the steep and winding nature of the road
- Reasonable site distances are able to be achieved and in particular 110m is available to the Long Bay Road/SH75 intersection.

Overall, it is considered that any traffic impacts will be no more than minor.

9 Assessment of Part 2 and Planning Documents

9.1 Overview

Section 104(1) (b) of the RMA states that subject to Part 2 regard must be had to the provisions of a number of planning documents including:

- The New Zealand Coastal Policy Statement
- Canterbury Regional Policy Statement (CRPS)
- Environment Canterbury Natural Resources Regional Plan
- Environment Canterbury Proposed Land and Water Regional Plan
- Environment Canterbury Regional Coastal Plan
- The Banks Peninsula District Plan (BPDP).

In addition the Maahaanui Iwi Management Plan is also had regard to in terms of Section 104(1) (c). The objectives and policies of the relevant plans (excluding the BPDP provisions which are contained in the actual document) are attached in Appendix N. These matters are discussed below.

9.2 Part 2 of RMA (Sections 5-8)

The purpose of the RMA, set out in Section 5, is to *"promote the sustainable management of natural and physical resources"*, which includes enabling "*people and communities to provide for their health and safety social, economic, and cultural wellbeing".* This must be achieved in the context of Section 5(2) by:

(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment

Section 5 is met in that the proposal will enable the Akaroa community to provide for their health and well-being by the provision of a wastewater scheme that is more efficient with positive health benefits. The scheme will meet the matters in (a) –(c) by resulting in a significant improvement of the water quality in Akaroa Harbour.

In terms of Section 6 of the Act, which refers to matters of national importance, the proposal will assist to preserve the natural character of the coastal environment and protect habitats of significance by improving the water quality of Akaroa Harbour (Sections 6(a) and (c)). While the scheme is not the preferred option for Iwi, they nevertheless have supported the proposal, particularly as it results in the removal of the WWTP from a sensitive site (Section 6(e)). While the Terminal Pump Station will be located in a coastal location the visual assessment establishes the existing environment can absorb the building without affecting natural character.

In respect of Section 7 of the Act, that refers to Other Matters, the scheme will be an efficient use of resources having regard to the alternatives considered (Section 7(b)), while amenity values and ecosystems will generally be enhanced and not adversely affected (Section 7(c) and (d)).

In respect of Section 8 and the Treaty of Waitangi extensive consultation has been undertaken with Iwi in order to derive a satisfactory outcome in terms of wastewater disposal.

9.3 New Zealand Coastal Policy Statement

The New Zealand Coastal Policy Statement (NZCPS) is a framework of objectives and policies set out to achieve the purpose of the RMA in relation to New Zealand's coastal environment.

As indicated above regard must be had to the NZCPS rather than giving "effect to" it as required for plan changes (Section 75 of RMA) and discussed in the case Environmental Defence Society v NZ Salmon Company Ltd and others [2014] NZSC 41.

There are a number of objectives and policies that are relevant to the proposal. In general it is considered the proposal is consistent with the NZPS including the following objectives and policies:

Objective 1 is to safeguard the coastal environment by among other matters maintaining and where appropriate enhance water quality. Objective 3 refers to the need to take into account the principles of the Treaty of Waitangi. Objective 6 is to enable people to provide for their health and safety (among other matters) by recognising that some activities are not precluded at locating in the coastal environment within appropriate limits. Policy 1 recognises that the coastal environment includes built facilities, including infrastructure that has modified the coastal environment. Policy 2 emphasises consultation and collaboration with Iwi. Policy 6 recognises that the provision of infrastructure is important to communities and that there may be a functional need for activities to locate in the coastal marine area. Policy 18 recognises the importance of open space adjacent to the coastal marine area. Policy 21 refers to enhancing water quality where it is having an adverse effect. Policy 23 refers to the requirement to treat human sewage prior to discharge to the coastal environment; and to consider alternatives and which should be informed by an understanding of tangata whenua values.

In particular the proposal will enhance the water quality of Akaroa Harbour by a significant improvement in the treatment of waste water discharged to the harbour. The proposed option has been arrived at after considerable discussion with Iwi and will result in the removal of the treatment plant from a sensitive site located in the coastal environment. The discharge to the harbour is the only realistic and viable alternative. While the Terminal Pump Station and associated infrastructure is located in the coastal environment the existing environment is modified to a significant degree and the proposal will not interfere with existing public open space or access.

9.4 Canterbury Regional Policy Statement

The Canterbury Regional Policy Statement (RPS) is the principal planning instrument for the region that sets out the overall resource management policy framework for the Canterbury Region. All other regional and district plans in Canterbury must be consistent with the RPS.

The matters relevant to the consideration of this application are primarily contained in the following chapters:

- Chapter 6 – Provision for the Relationship of Tangata Whenua with Resources
- Chapter 9 – Water
- Chapter 11 – The Coastal Environment
- Chapter 12 – Settlement and the Built Environment.

Each chapter identifies issues and sets out how those issues are to be addressed by defining a framework of objectives and policies. The relevant objectives and policies are discussed under Section 10.4 of this report.

9.4.1 Chapter 6 - Provision for the Relationship of Tangata Whenua with Resources

Chapter 6 provides for the relationship of Tangata Whenua with resources, and sets out processes to provide for the exercise of rangatiratanga and kaitiakitanga in the management of natural and physical resources. Issues addressed in this chapter include the importance of taking into account the principles of the Treaty of Waitangi which include partnership and active protection of Maori in the use of land and water.

Consultation has provided the Iwi the opportunity to input into matters which affect their relationship with resources and uphold wahi tapu, taonga, and kai moana values and traditions. While the proposal is not consistent with the Iwi preference of discharging wastewater to land, it nevertheless is an option which is accepted by Iwi, particularly given the other benefist that derive from the proposal.

9.4.2 Chapter 9 – Water

Chapter 9 identifies issues arising from the demand for, and the use of water in Canterbury and from the use of land that can affect water. It establishes a framework for managing the quality and quantity of the region's water resources.

Issue 3 acknowledges the affect land use and discharge activities can have on the quality of water bodies, including coastal waters. It is addressed by Objective 3 which aims to safeguard the quality of Canterbury's water bodies. The principal issue stemming from the activity is the effect on coastal water quality from the discharge, and its impact on ecological and intrinsic values, and the safety of harvesting kai moana. This objective is supported by policy which directs that resource consent conditions be applied to approvals to protect water and environmental quality and avoid, remedy or mitigate the adverse effects of point source discharges.

The proposed upgrade will result in an improvement in water quality and as such consistent with these provisions.

9.4.3 Chapter 11 - The Coastal Environment

Chapter 11 identifies issues related to the quality of coastal environments in Canterbury. The importance of protecting the life-supporting capacity of coastal ecosystems is reflected in Objective 1 which seeks to "*provide for the appropriate use and development of the coastal environment while protecting and where appropriate enhancing: (a) life-supporting capacity of coastal eco-systems.*" Objective 1 is supported by Policy 1, directing that activities avoid, remedy or mitigate effects on the life-supporting capacity of coastal ecosystems, amenity and recreational values, people's health, and areas of Tangata Whenua significance.

The discharge is consistent with the provisions of Chapter 11 as the improvements will improve the current quality of the discharge which will improve the life-supporting capacity of the coastal environment and will maintain the quality of the coastal environment.

9.4.4 Chapter 12 - Settlement and the Built Environment

Chapter 12 identifies issues around the strategic importance of maintaining network utilities to enable people to provide for their social, economic, and cultural wellbeing, and their health and safety. This is to be achieved while minimising the adverse environmental effects of network utilities.

Objective 1 seeks to enable urban development and expansion through network utilities while avoiding, remedying or mitigating adverse effects on several aspects. This objective is supported by Policy 2 which states that such urban development and expansion should be discouraged if the

network utility would adversely affect the natural character of the coastal environment or ancestral land, water and sites of cultural value.

The proposed upgrade will enable existing (and future) urban development to be serviced by infrastructure of an appropriate standard that will not adversely affect the matters identified in Policy 2.

9.5 Regional Plans

9.5.1 Canterbury Regional Coastal Environment Plan

The Regional Coastal Environment Plan 2005 (RCEP) became operative in November 2005. It identifies issues, and contains a framework of objectives, policies and rules to guide the appropriate use of coastal resources in the region. It is the dominant regional statutory plan applicable to activities in and the management of the coastal environment, and particularly below MHWS.

The relevant objectives and policies of the RCEP are contained in Chapter 3 – Resource Overview; Chapter 4 – Tangata Whenua; and Chapter 7 - Coastal Water Quality. The relevant objectives and policies are considered under Section 9.4.2 of this report

Chapter 3 – Resource Overview
Chapter 3 describes the Banks Peninsula environment and discusses some of the issues that need to be considered when undertaking activities that may affect the environment. These issues include:

- Low water quality in some bays and harbours
- Adverse effects on water quality and habitats from the discharge of human wastewater and other contaminants
- Discharge of human wastewater damaging the wairua (spirit) of water bodies.

The assessment of effects in demonstrates that the discharge from the Akaroa WWTP does not result in significant adverse effects in respect of water quality and aquatic habitats and will impose water quality in Akaroa Harbour. The cultural effect, of the discharge is generally acceptable taking into account the overall proposal and conditions.

Chapter 4 – Tangata Whenua and the Coastal Environment
This chapter explains Ngāi Tahu's role under the Treaty of Waitangi, the Resource Management Act 1991 and Te Runanga o Ngāi Tahu Act 1996. It describes the partnership the Runanga has with the Crown and regional authorities.

This application acknowledges there are genuine concerns in respect of discharging wastewater to coastal waters which are addressed in the application by proposing conditions specifying discharge quality and monitoring.

Chapter 7 – Coastal Water Quality
Chapter 7 addresses coastal water quality in which the main issue is the adverse effects contaminants from point and non point sources can have on the ecological, recreational and cultural values of coastal water.

In particular Objective 7.1 is to enable present and future generations to gain cultural, social, recreational, economic, health and other benefits from the quality of the water in the Coastal Marine Area, while protecting and preserving a number of items including water quality, natural character, ecosystems and values of the tangata whenua.

Policy 7.2(b)(vi) is to establish water quality classes, set water quality standards and control the discharge of contaminants and water within certain parts of parts of the Coastal Marine Area defined in Schedule 5 that contain areas of degraded water quality or which need classifications to reflect existing or potential uses of the areas:

As indicated in Sections 3 and 8 of the AEE the receiving waters at the point of discharge of the treated waste water is Coastal Shellfish Gathering (SG).

Policy 7.5 states that generally a resource consent to discharge human sewage in the Coastal Marine Area, without it passing through land or a specially constructed wetland outside the Coastal Marine Area, should only be granted where the discharge better meets the purpose of the Act than disposal through land or a wetland outside the Coastal Marine Area; and there has been consultation by the applicant with Tangata Whenua and there has been consultation by the applicant with the community generally; and the discharge is not within an Area of Significant Natural Value (ASNV).The treated waste water will not pass through land or wetland but the conditions specified in the policy have been met. In particular there has been extensive consultation with Iwi and the community. The discharge point is not identified as an ASNV and given the circumstances, particularly relating to an improvement in water quality and the removal of the existing WWTP, the purpose of the Act is better met by this proposal.

Policy 7.6 states that In setting conditions on a resource consent to discharge a contaminant or water into water, or onto or into land in the Coastal Marine Area, a reasonable mixing zone should be determined by considering a variety of matter including volumes, contaminant loading, and contaminant concentrations involved with the discharge, sea conditions, and set water quality standards.

As indicated in Section s 8 and 10 of the AEE all of these types of matters are considered in terms of an appropriate mixing zone.

Policy 7.7 is to ensure that discharges of water or contaminants into water, or onto or into land in the Coastal Marine Area avoid significant adverse effects on cultural or spiritual values associated with sites of special significance to the Tangata Whenua.

As indicated CCC have undertaken considerable consultation with iwi and which will result in the cessation of the existing WWTP and an improvement in harbour water quality.

Policy 7.8 states the discharge of contaminants should not give rise to significant adverse effects on existing habitats of indigenous fauna and acquatic ecosytems or have acute toxic effects on fish or aquatic ecosytems.

As indicated in Section 8 of the AEE the effects in respect of these matters will be less than minor.

Chapter 8 Activities and Occupation in the Coastal Marine Area

Chapter 8 addresses the adverse effects arising from the disturbance and occupation of the foreshore and seabed.

Objective 8.1 is to enable people to use the Coastal Marine Area and its resources while avoiding, remedying or mitigating the adverse effects of that use on the environment and to enable the efficient and effective operation of network utilities while avoiding, remedying or mitigating adverse effects on the environment.

Policy 8.3 states that in considering applications for resource consents to undertake activities in the Coastal Marine Area, Environment Canterbury will have regard to a number of matters including the

existing level of use and development in the area; the need to protect characteristics of the coastal environment of special value to Tangata Whenua; the effects on the public use and enjoyment of the coast, including public access to and along the Coastal Marine Area.

The matters in Policy 8.3 have been had regard to. In particular, other than some minor disruption during construction, the proposed pipeline will not affect use and enjoyment of Akaroa Harbour and its margins or public access. Iwi have been consulted in respect of their values in relation to the proposal.

Policy 8. 5 states that in considering applications for resource consents to occupy the Coastal Marine Area, Environment Canterbury should among other matters give priority to maintaining safe anchorages for vessels; avoid impeding navigational channels and access to wharves, slipways and jetties; avoid displacing existing public recreational use of the area ;have regard to any adverse effects on the values relating to the natural character of the coastal environment, both within and outside the immediate location; have regard to any adverse effects on the cultural, historic, scenic, amenity, Tangata Whenua, and natural values of the area; and have regard to available alternative sites.

All of these matters have been had regard to. The occupation of the seabed and foreshore will not result in any permanent adverse effects given that it will largely be buried and not interfere with commercial or recreational activities.

Natural Resources Regional Plan (NRRP)

The NRRP is the current Operative Plan particular regard has been given to Chapters 3, 4 5 and 6.

- Chapter 3 Regional Air Quality includes objectives, policies and rules which are relevant to this application. Chapter 3 of the NRRP was made operative on 11 June 2011.
- Chapter 4 Water Quality, has been considered in relation to any construction activity effects near the River that runs through Jubilee Park and adjoins the proposed site of the Terminal Pump Station.
- Chapter 5 Regional Water Quantity
- Chapter 6 Beds of Lands and Rivers.

The relevant objectives and policies are commented on as follows:

Chapter 3 Regional Air Quality

Objective AQL1 Objective for localised air quality seeks to ensure that localised air discharges do not cause significant adverse effects.

The assessment of effects demonstrates that there should be no adverse effects on localised air quality that are more than minor.

Policy AQL5 Odour Nuisance This policy seeks to prevent discharges of odour from new activities causing offensive or objectionable effects. Where a new activity is unable to do this the policy requires the activity to be located as far away as possible from sensitive areas and activities. The policy requires existing activities to adopt the best practicable option to avoid remedy or mitigate offensive or objectionable effects of odour beyond the boundary of any site from which they originate.

Odours from the WWTP and the Terminal Pump Station are not expected to cause offensive or objectionable effects. They are not located in close proximity to sensitive activities and the best practicable option for control is proposed.

Chapter 4 Water Quality

Generally any discharges, which essentially relate to construction discharges and stormwater runoff from roofs and hardstanding areas, will comply with such Policies as WQL1 and WQL3 given the mitigation measures proposed to be undertaken. These include erosion and sediment control plans and treatment sumps and the nature of contaminants to be discharged.

Policy WQL12 relates to the management of contaminated land and this will be complied with given an appropriate management plan will be prepared for the Terminal Pump Station. The contaminated water will be discharged to the CCC sewerage system.

Chapter 5 Regional Water Quantity

Policy WQN12 relates to the effects of de-watering. This policy will be given effect to given that the rate and duration of pumping from groundwater will be regulated to prevent localised land subsidence.

Chapter 6 Beds of Lakes and Rivers

The objectives and policies of this plan will be met in respect of the crossing of streams by the pipeline given that the pipeline will be contained in the road thereby minimising effects in terms of flood flow, natural character and ecosystems.

9.5.2 Proposed Land and Water Regional Plan (pLWRP)

The pLWRP is intended to replace the NRRP in respect of Chapters 4-6. The document is not yet operative as it is subject to appeal following the release of decisions in January 2014. Generally the intent of the objectives and policies in the pLWRP in respect of the activities that form part of this application are similar to the NRRP. Particularly relevant objectives and policies include Objectives 3.17 and 3.19 and Policies 4.13, 4.15, and 4.17. Given the relatively minor nature of the discharges it is considered the objectives and policies of the PLWRP are met.

9.6 Banks Peninsula District Plan

9.6.1 Objectives and Policies

There are a number of objectives and policies in the BPDP which are considered to be of relevance. These are set out below and generally relate to the Terminal Pump Station and the Waste Water Treatment Plant given that these items require Resource Consent.

9.6.2 Policies and Objectives relating to Utilities

Table 9-1 assesses the proposal against the objectives and policies of the Utilities Chapter.

Table 9-1 Banks Peninsula District Plan - Utilities Objectives and Policies

Objective / Policy	Comment
Objective 1 *To protect the environment from the actual and potential adverse effects of utilities.*	Overall, any actual or potential effects on the environment associated with the WWTP and the Terminal Pump Station are not considered to be significant.
Policy 1A *Above-ground utility buildings and structures should not be located on ridgelines or in Conservation Reserves, or on Heritage Items, unless there is no technically feasible alternative.*	While the WWTP is located in proximity to a ridgeline it is located below the ridgeline and as such is not considered “on” the ridgeline.

Objective / Policy	Comment
	Visual impacts are minimised by the WWTP's location and mitigation measures.
Policy 1B *Where above-ground utility buildings and structures are located within the Coastal Protection Areas or Outstanding Natural Features and Landscape Protection Areas they should be sited in such a way and be of a size, height and position, or be screened by planting, so that they do not detract from the intrinsic qualities of those areas.*	The selected sites are not within any of these areas.
Policy 1C *Utilities should be located underground or within existing buildings or structures where this is feasible.*	Given technical constraints and costs it is not feasible for the WWTP or TPS to be located underground or within an existing structure.
Policy 1D *The co-siting and sharing of compatible facilities should be encouraged where technically and operationally feasible.*	The site has been purchased by the CCC for the purpose of accommodating the WWTP and reservoir. Accordingly co-siting will occur.
Policy 1E *Utilities should not require the removal of indigenous vegetation.*	No indigenous vegetation is to be removed as part of this proposal.
Policy 1F*Earthworks associated with any utility should not detract from any significant landforms.*	The proposed earthworks will not detract from the adjacent ridgeline given the WWTP's location below the ridgeline and the proposed mitigation measures.
Policy 1G*Earthworks associated with any utility should not create or exacerbate any soil erosion or slope instability.*	A retaining wall will be constructed into the sloping ground to minimise erosion and instability on the WWTP site. The contractor will also be required to develop an EMP for the project construction including erosion and sediment control measures in accordance with Environment Canterbury's Erosion and Sediment Control Guidelines.
Policy 1H *Screening by landscaping and other appropriate means should be used to avoid, remedy or mitigate the adverse visual effects of utilities.*	Landscaping on the sites and on the downhill side of Old Coach Road will provide screening of the Terminal Pump Station and the WWTP. The structures are also proposed to be finished in a recessive colour.

9.6.3 Policies and Objectives relating to Cultural Heritage

Given the WWTP is located within an identified Silent File the policies and objectives contained within Chapter 14 Cultural Heritage are considered to be relevant to the proposal. Table 9-2 assesses the proposal against these provisions.

Table 9-2 Banks Peninsula District Plan - Cultural Heritage Objectives and Policies

Objective / Policy	Comment
Objective 2*To protect from inappropriate use and development, the 'silent file' areas which have been identified as having significant cultural value for local runanga.*	Consultation has been undertaken with Iwi authorities who not indicated any issues but have expressed a desire for cultural monitoring to occur during earthworks which is considered to be appropriate.
Policy 2A *Consultation with the relevant runanga shall be required where activities are to be undertaken in locations identified within a 'silent file' area.*	As indicated above consultation has been undertaken.

9.6.4 Policies and Objectives relating to the Rural Zone

Given the WWTP site is located the Rural Zone the policies and objectives contained within Chapter 19 Rural are considered to be relevant to the proposal. Table 9-3assesses the proposal against these provisions.

Table 9-3 Banks Peninsula District Plan - Rural Zone Objectives and Policies

Objective / Policy	Comment
Objective 1 *To maintain the landscape values, natural character and amenity values of each of the Landscape Categories identified within the Rural Zone.* **Policy 1A** *The following qualities or elements contribute to the landscape character and amenity values of the rural environment and are to be maintained and enhanced:* ■ *A generally small scale low density of buildings and residential development in those areas of the District where landscape character and amenity values are vulnerable to degradation.* ■ *Absence of highly visible structures and development on prominent ridges and skylines. (See also Chapters 12, 13 and 31.)* ■ *Prominent rocky outcrops.* ■ *Areas of indigenous vegetation and habitat.* ■ *The quality and clarity of water in rivers and streams.* ■ *Indigenous streamside (riparian) and coastal vegetation.* ■ *The ability to sustainably provide for the evolving nature of land based activities.*	The visual and landscape assessment has confirmed that any impacts on the landscape values, natural character and amenity values, particularly in respect of the Main Ridgeline will be no more than minor. No indigenous vegetation will be impacted by the proposal.
Objective 2 *To identify, protect and enhance significant indigenous vegetation and significant habitats of indigenous fauna, wetlands and ecosystems; and encourage the retention and enhancement of indigenous vegetation and habitats of indigenous fauna.*	All indigenous vegetation on the site is to be retained. Therefore, no indigenous vegetation will be impacted by the proposal.
Policy 2A *Areas of significant indigenous vegetation and significant habitats of indigenous fauna referred to in Method 1, Chapter 19 are to be protected and adverse effects on such areas are to be avoided.*	All indigenous vegetation is to be retained. No adverse effects are anticipated.
Policy 2C *Plantings of exotic forestry are to avoid adverse effects on areas of significant indigenous vegetation and significant habitats of indigenous fauna.*	All mitigation planting will comprise indigenous varieties and match the existing vegetation.
Policy 2E *The Council, in the consideration of any resource consent application is to be able to take into account whether or not the community benefits by the applicant taking effective and appropriate steps to preserve indigenous vegetation and habitats of indigenous fauna closely related to the application site.*	The planting will reflect the mosaic planting patterns of the surrounding area. All existing indigenous vegetation is to be retained.
Policy 2G *The planting of indigenous tree species is to be encouraged.*	Native kanuka and ngaio are to be planted on the site and on the downhill side of Old Coach Road to provide mitigation.

Objective / Policy	Comment
Policy 2H *To encourage the retention and enhancement of remaining areas of indigenous vegetation and habitats of indigenous fauna.*	All indigenous trees are to be retained.
Objective 3 *To maintain and enhance the amenity values and conditions required for health and safety within the Rural Zone.*	The proposal will result in an improved waste water treatment system benefiting the health of residents. The location and scale of the WWTP will not significantly impact on amenity values.
Policy 3A *Activities must not generate continuous or persistent nuisance, sufficient to have more than minor adverse effects on the amenity values and the health and safety of adjoining land users.*	The WWTP will not generate any nuisance effects in terms of such matters as odour or noise.
Policy 3C *Any adverse effects on amenity values, health and safety from increased density of development, vehicle movements or changes to the level of intensity or character of road usage on district roads, are to be avoided remedied or mitigated.*	Measures have been proposed to make sure impacts of amenity values are mitigated as it relates to visual impact. Vehicles can safely access the site and are not required to reverse on or off the road.
Policy 3D *Adverse effects from any activity affecting the rural outlook and privacy of adjoining properties are to be avoided, remedied or mitigated.*	The WWTP will be set into the adjoining slope and is not of significant height. Given this and the proposed mitigation measures any adverse effects on the rural outlook is expected to be no more than minor. There are no dwellings in close proximity to the site (the closest residence is some 430m from the site).

9.6.5 Policies and Objectives relating to Chapter 18 – Recreational Reserve

Given the Terminal Pump Station site is located the Recreational Zone the objectives and policies contained within Chapter 18 Recreational Reserve are considered to be relevant to the proposal. Table 9-4 assesses the proposal against these provisions.

Table 9-4 Banks Peninsula District Plan - Recreational Reserve Objectives and Policies

Objective / Policy	Comment
Objective 1 *To ensure that activities and development on reserves do not compromise the contribution which land in the Recreational Reserve Zone makes to the health and welfare of residents and visitors.*	The Terminal Pump Station will result in the loss of some park spaces but the number is not considered significant. The building is location in a “corner” of the reserve and does not compromise the overall use of the area including the other sports activities within the wider area.
Policy 1A *Activities in the zone should not unduly compromise the existing use, enjoyment and amenity of reserves.*	The Terminal Pump Station will result in the loss of some park spaces but the number is not considered significant. The building is location in a “corner” of the reserve and does not compromise the overall use of the area including the other sports activities within the wider area.

Objective / Policy	Comment
Policy 1B *Development on recreational reserve land such as buildings, facilities and car parking areas should not be located or be or be of a design, size or intensity which detracts from any recognised use or amenity of the land.*	The building is not of a significant scale and will be screened.
Policy 2A *Activities within the Recreational Reserves Zone should not adversely affect land of recognised natural amenity and valye*	See above
Policy 2B *Development such as buildings, facilities and car parking area should only be undertaken where they do not adversely affect land with recognised natural amenity and value within the Recreational Reserves Zone.*	The existing landscape quality of the site is described as "low". However the visual appearance and location of the building has as far as practicable be blending into the surrounding environment, with landscape planting, and the exterior of the building will be finished in recessive colours.
Objective 3 *To ensure that the effects of development and activities on recreational reserve land are not detrimental to land and activities in other areas*	The Terminal Pump Station may be visible from the surrounding area but the nature of the building, the noise and activity generated on site as a result of the building will be minimal.
Policy 3A *The design, appearance, location, size and intensity of activities and development including buildings, facilities and car parking areas should not have an adverse effect on the amenity of surrounding land nor other activities.*	As discussed under Policy 1B consideration to the scale, character and intensity of the building has been given and mitigation measures to soften the impact of the building proposed.
Policy 3B *The generated effects of activities such as noise and traffic and of development such as shadowing, and visual domination by buildings should not adversely affect the amenity of surrounding land or other activities.*	The scale of the building is not significant and largely complies with relevant bulk and location requirements. Traffic movement will be very low and the proposal will comply with more requirements.

9.6.6 Policies and Objectives relating to Access, Parking and Loading

The objectives and policies contained within the Access, Parking and Loading Chapter of the BPDP have been evaluated. Table 9-5 assesses the proposal against these provisions.

Table 9-5 Banks Peninsula District Plan - Access, Parking and Loading Objectives and Policies

Objective / Policy	Comment
Objective 1 *To provide a safe and efficient transport network within the District while avoiding, remedying or mitigating the adverse effects on the environment.* **Objective 2** *To ensure that the transport network, including vehicle access, and vehicle parking and loading areas, is designed and located to an acceptable standard for public safety and allows for the efficient movement of traffic.*	In respect of the WWTP given: ■ the low number of vehicle trips expected to be generated by the site ■ the relatively low traffic volumes on Old Coach Road ■ that vehicles are not required to reverse off and onto the site ■ that vehicles travelling up Old Coach Road will generally not be at high speed ■ reasonable sight distances are able to be achieved; the proposal is considered to be consistent with these objectives. In terms of the Terminal Pump Station the low number of vehicle trips expected to be generated by the site, the low speed environment and adequate visibility and access will ensure the objectives are met.
Policy 2B *Ensure that the number, location, design and gradient of vehicle accesses and vehicle crossings are compatible with road capacity and function, including the State Highways, in order to promote both vehicle and pedestrian safety.*	See above.

9.6.7 Summary

Overall it is considered that the proposal is consistent with the relevant objectives and policies of the BPDP.

9.7 Mahaanui Iwi Management Plan 2013

As assessment of cultural effects of the wastewater outfall in respect of the Mahaanui Iwi Management Plan (MIMP) is set out in Appendix K. While it is concluded the discharge to the harbour is inconsistent with the MIMP other benefits will accrue including a better quality of wastewater and the decommissioning of the existing WWTP at Takapuneke.

10 Proposed Consent Conditions and Duration of Consents

10.1 Overview

The following resource consents are required as identified from Tables 5.1 and 5.2 in Section 5 of the AEE.

Table 10-1 Section 9 RMA and NES Activities - Christchurch City Council

Activity	RMA Classification	Zoning	District Plan Rules	Location	Classification
1.Pipeline					
HAIL Site – Earthworks in the vicinity of Terminal Pump Station	S9	Recreational Reserve	NES Reg 7 and 9	Sheet 8 Chain 3160	Discretionary
2.Terminal Pump Station and Pumping Stations					
Terminal Pump Station	S9	Recreational Reserve-Utilities	Chapter 36 Rule 4	Sheet 8 Chain 3160	Restricted Discretionary
HAIL Site -Terminal Pump Station	S9	Recreational Reserve	NES Reg 7 and 9	Sheet 8 Chain 3160	Discretionary
3. WWTP					
WWTP	S9	Rural-Utilities	Chapter 36 Rule 4	WWTP Concept Layout Plan; drawing reference 6151786-GE-040	Restricted discretionary
4.Temporary Construction Management Areas					
Use of land for TCMA's TBC	s9(3)	Mixed	Various	To be confirmed	To Be confirmed

Table 10-2 Sections 9 and 12-15 of RMA Activities - Environment Canterbury

Activity	RMA classification	NRRP	pLWRP	RCEP	Location	Classification
1.Pipeline in CMA						
Excavating, drilling, or tunnelling in the foreshore and or seabed Construction activity	s12	NA	NA	Rule 8.2	Outfall pipeline Sheet 9	Discretionary
Discharge during construction Construction activity	S15	NA	NA	Rule 7.2	Outfall pipeline Sheet 9	Discretionary
Placement of pipeline in, on, under, or over any foreshore	S12	NA	NA	Rule 8.3	Outfall Pipeline Sheet 9	Discretionary
Destruction, damage or disturbance Construction activity	S12	NA	NA	Rule 8.7	Outfall Pipeline Sheet 9	Discretionary
Occupation of the Coastal Marine Area Operation activity	S12	NA	NA	Rule 8.23	Outfall Pipeline Sheet 9	Discretionary
Discharge of treated wastewater Operation activity	S15	NA	NA	Rule 7.3	Outfall Pipeline Sheet 9	Discretionary
2. Terminal Pump Station and Existing Pump Stations						
Groundwater take dewatering from contaminated site (includes pipeline in proximity to Terminal Pump Station) Construction activity	S14	Rule WQN4	Rule 5.119 and 5.120	NA	Terminal Pump Station Sheet 8 Chain Length 3160	Restricted Discretionary
Discharge to air from Terminal Pump Station	S15	Rule AQL69	NA	NA	Terminal Pump Station Sheet 5 and 8 Chain length:1780 and	Discretionary

Activity	RMA classification	NRRP	pLWRP	RCEP	Location	Classification
					3120-3140	
3.WWTP						
Use of land for storing wastewater Operational activity	s9	Rule WQL26	Rule 5.84	NA	WWTP-Old Coach Road	Discretionary
Discharge to Air from WWTP	S15	Rule AQL69	NA	NA	WWTP-Old Coach Road	Discretionary
4.Temporary Construction Management Areas (TCMAs)						
Discharges from TCMA's	S15	Various	Various	Various	To be confirmed	To be confirmed

10.2 Proposed Conditions

The conditions for the various resource consents are set out below on the following basis:

10.3. Christchurch City Council Resource Consents

10.3.1 Terminal Pump Station

10.3.2 WWTP

10.3.3 NES Contaminated Land-Terminal Pump Station

10.4 Environment Canterbury Construction Resource Consents

10.4.1 Water Permit (Terminal Pump Station take of water from contaminated land for dewatering)

10.4.2 Coastal Permit and Discharge Permit (Outfall pipeline - placement and disturbance of seabed and foreshore and discharge of contaminants)

10.5 Environment Canterbury Operational Resource Consents

10.5.1 General Conditions

10.5.2 Coastal Permit (Outfall pipeline - occupation of seabed and foreshore)

10.5.3 Discharge Permit (Outfall pipeline - discharge of treated wastewater)

10.5.4 Discharge Permit (Terminal Pump Station - discharge of contaminants to air)

10.5.5 Discharge Permit (WWTP- discharge of contaminants to air)

10.5.6 Land Use Consent (WWTP - storage of wastewater)

10.3 Christchurch City Council Resource Consents

10.3.1 Terminal Pump Station

1. The works will occur in accordance with the plans and information attached to and forming part of the application xxx and dated 30/6/2014.

2. At least two weeks prior to works commencing the consent holder shall submit a site –specific Environmental Management Plan (EMP) to CCC. The purpose of the EMP is to minimise any adverse effects occurring as a result of erosion and sedimentation arising from the construction works. This plan must be prepared in accordance with Environmental Canterbury Erosion and Sediment Control Guidelines (ESCG). The EMP is to be certified by the Resource Consents Manager at the Christchurch City Council as complying with the requirements of these conditions and is to be adhered to in the implementation of this consent.

3. Construction related activity shall comply with the requirements of NZS 6803 “Acoustics – Construction Noise”.

4. The site must be adequately rehabilitated within three months of completion of works. Surplus or unsuitable material is to be disposed of away from the site to a Council approved destination and bare surfaces shall be adequately top-soiled and re-vegetated.

5. All planting shall be maintained and any dead, diseased or damaged plants shall be replaced with plants of a similar species.

6. All structures on the site shall be finished in visually recessive colours.

7. That local Runanga be contacted 2 weeks prior to earthworks beginning on the site to ensure they have time to arrange cultural monitoring of earthworks on site if necessary.

8. If archaeological material such as koiwi (human skeletal remains), taonga or artefacts are discovered during the construction of the Terminal Pump Station all work that may affect the archaeological material shall cease immediately. The New Zealand Historic Places Trust shall be contacted in the event of the discovery as well as Te Runanga o Onuku and or their representatives and no work within 50 metres of the archaeological material discovered shall be undertaken until the appropriate approvals have been obtained by the New Zealand Historic Places Trust, and / or any other necessary authorisations have been issued.

9. The operation of the facility shall comply with the specified noise limits of the Banks Peninsula District Plan.

10.3.2 Wastewater Treatment Plant

1. The development shall proceed in accordance with the information and plans (including landscaping plans) submitted with the application.

2. At least two weeks prior to works commencing the consent holder shall submit a site –specific Environmental Management Plan (EMP) to CCC. The purpose of the EMP is to minimise any adverse effects occurring as a result of erosion and sedimentation arising from the construction works. This plan must be prepared in accordance with Environmental Canterbury Erosion and Sediment Control Guidelines (ESCG). The EMP is to be certified by the Resource Consents Manager at the Christchurch City Council as complying with the requirements of these conditions and is to be adhered to in the implementation of this consent.

3. Construction related activity shall comply with the requirements of NZS 6803 “Acoustics – Construction Noise”.

4. The site must be adequately rehabilitated within three months of completion of works. Surplus or unsuitable material is to be disposed of away from the site to a Council approved destination and bare surfaces shall be adequately top-soiled and re-vegetated.

5. All planting shall be maintained and any dead, diseased or damaged plants shall be replaced with plants of a similar species.

6. All structures on the site shall be finished in visually recessive colours.

7. That local Runanga be contacted 2 weeks prior to earthworks beginning on the site to ensure they have time to arrange cultural monitoring of earthworks on site if necessary.

8. If archaeological material such as koiwi (human skeletal remains), taonga or artefacts are discovered during the construction of the Terminal Pump Station all work that may affect the archaeological material shall cease immediately. The New Zealand Historic Places Trust shall be contacted in the event of the discovery as well as Te Runanga o Onuku and or their representatives and no work within 50 metres of the archaeological material discovered shall be undertaken until the appropriate approvals have been obtained by the New Zealand Historic Places Trust, and / or any other necessary authorisations have been issued.

9. The operation of the facility shall comply with the specified noise limits of the Banks Peninsula District Plan.

10.3.3 NES Contaminated Land

1. During excavation of potentially contaminated soils within the site management procedures shall be undertaken in accordance with the submitted CH2M Beca Report titled “Contaminated Solids Management Plan – Akaroa Wastewater Terminal Pump Station dated 30 June.

2. The earthworks on the site must be overseen by a suitably qualified and experienced person who meets the specifications outlined in the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.

3. If contaminated soil is removed from the site the consent holder must:

a) Provide evidence to the Manager Compliance, Christchurch City Council , that the material has been deposited at an approved disposal facility and must provide copies of the approval to accept the material and receipts from that facility; and/or

b) Provide evidence to the Manager Compliance, Christchurch City Council, of where the material is taken, a plan of where it is placed and the quantity involved.

4. Any stockpiled contaminated soil on the site must:

a) Be located as far as practicable from adjoining property boundaries;

b) Be kept in order and must not exceed 4.0 metres in height;

c) If the stockpile is odorous, be covered with an impermeable material or other form of odour suppression.

10.4 Environment Canterbury Construction Resource Consents

10.4.1 Water Permit (Terminal Pump Station - Take of Water from Contaminated Land for Dewatering)

1. The take of water shall be discharged to the Council reticulated wastewater system and the water shall not be discharged to any other receiving environment.

2. The Consent Holder’s Contractor shall provide the Compliance Manager, Canterbury Regional Council with a Contractor’s Construction Management Plan (including an Environmental Management Plan, a Site Access Plan, and a Traffic Management Plan), at least ten working days prior to the intended date of commencement of works authorised by this consent.

3. The submitted Contractor’s Construction Management Plan shall define the actions to be taken to ensure compliance with all conditions of these consents, or in response to any incident that may impact adversely on the environment. The Plan and any revisions shall include the best practicable options for achieving compliance with the conditions of this consent.

4. All work shall be carried out in accordance with the Contractor’s Construction Management Plan, except that the Contractor may, at any time during the period of this consent, submit to the Manager, Regulatory Department, Canterbury Regional Council, amendments to the Plan for approval, provided these amendments improve the efficiency and/or quality of the construction works, or avoid, remedy or mitigate an adverse effect.

5. Copies of this consent and the Contractor’s Construction Management Plan shall be kept in the Contractor’s office on site at all times during each stage of works, and is to be made readily available. All workers and contractors on the sites.

10.4.2 Coastal Permit and Discharge Permit (Outfall Pipeline - Placement and Disturbance of Seabed and Foreshore and Discharge of Contaminants)

1. The outfall and diffuser structures authorised by this consent shall be constructed in general accordance with Drawing GIS-6517986-05 in Attachment A of these conditions, with the mid-point of the diffuser located at or about Map Reference 1595077.773/5149182.846.

2. At least one month prior to commencement of construction of the new outfall pipeline and diffuser, the Consent Holder shall submit to the Manager, Regulatory Department of Canterbury Regional Council, the construction drawings relating to the outfall and diffuser structure for approval. No work shall commence until written approval from the Manager, Regulatory Department of Canterbury Regional Council is received.

3. The Consent Holder shall at least one month prior to the commencement of works, the subject of this consent, submit to the Manager, Regulatory Department of Canterbury Regional Council, a draft Construction Management Plan (CMP) outlining the construction processes, practices and procedures to be adopted in undertaking the works. The CMP shall address at a minimum, the matters set out in the draft CMP attached as Attachment B of these conditions. No works shall commence until the CMP has been approved in writing by the Manager, Regulatory Department of Canterbury Regional Council.

4. All work shall be carried out in accordance with the approved CMP, except that the Consent Holder may, at any time, submit to the Manager, Regulatory Department of Canterbury Regional Council, amendments to the CMP for approval, provided those amendments are for the purpose of improving efficiency and/or quality of the construction works, or to avoid, remedy or mitigate an adverse effect.

5. The Consent Holder shall notify the Manager, Regulatory Department of Canterbury Regional Council, in writing of the proposed date of commencement of the construction works, at least 1 week prior to the start date of the works.

6. The Director of Maritime Safety, as defined in the Maritime Transport Act and Land Information New Zealand (LINZ), as the National Hydrographic Authority for New Zealand and the Canterbury Regional Council Harbour Master, shall be notified of the location of the outfall diffuser, together with appropriate map references, at least six months before construction of the outfall starts.

7. A certificate signed by a suitably qualified professional engineer responsible for the outfall and diffuser design shall be submitted to the Manager, Regulatory Department of Canterbury Regional Council within three months of commissioning of the outfall and diffuser to certify that the structure has been constructed in accordance with the construction drawings submitted in accordance with Condition 3.

10.5 Environment Canterbury Operational Resource Consents

10.5.1 General Conditions Applying to 10.5.2-10.5.6

1. The consents/permits are to be exercised in a manner which is consistent with the proposal and the methodologies described in the documents, information and analyses provided by the Application in support of its application for resource consents and held on Council File xxx.

2. The Applicant shall provide to the Consent Authority on or before 31 August of each year of the term of the consent, an Annual Monitoring Report (AMR) which must contain the following information:

a) An analysis of the extent to which the Applicant has complied with consent conditions, in each case with a summary of the environmental effects arising from the operation of the outfall pipeline and diffuser, during the preceding 12 month period from 1 July to 30 June inclusive (the reporting period).

b) An identification and discussion of any operational difficulties, changes or improvements made to the Akaroa Wastewater Treatment Plant and other operating processes, which may cause any material difference in environmental outcomes from the previous reporting period.

c) An identification of any maintenance works needed, proposed or undertaken to achieve compliance with these Conditions of Consent.

d) An identification of any improvements or changes required to achieve compliance and the proposed timetable for implementation.

e) Treated wastewater discharge quality

f) A summary of all the treated wastewater monitoring data collected as a requirement of Condition 7 of Consent xxxx during the reporting period.

g) A summary of all receiving environment monitoring data collected as a requirement of the Condition 13 of Consent xxxx during the reporting period.

h) An analysis of the data summarised under Condition e and f in terms of consent compliance and environmental effects during the reporting period.

i) A comparison of results with those of previous years and a discussion of any trends during the reporting period.

j) Any complaints received in regard to the discharge of treated wastewater from the outfall.

3. The Consent Authority may review these conditions of consent by serving notice on the Consent Holder, in September or October, for any of the following purposes:

- To deal with any adverse effect on the environment which may arise from the exercise of these consents
- To require the Consent Holder to adopt the best practicable option to remove or reduce any adverse effect on the environment
- To address any matters raised in the AMR required by General Condition 2
- To comply with the relevant requirements of a regional plan.

4. The Consent Holder shall be responsible for all costs associated with the monitoring required by these consent conditions as required by section 26 of the Resource Management Act 1991 according to the Canterbury Regional Council's Schedule of Fees.

5. The Consent Holder shall be responsible for all costs incurred by the Consent Authority associated with the review of requested changes to any management plan, which forms part of this consent.

10.5.2 Coastal Permit (Outfall Pipeline - Occupation of Seabed and Foreshore)

1. The outfall and diffuser structures authorised by this consent shall be constructed in general accordance with Drawing GIS-6517986-05 in Attachment A of these conditions, with the mid-point of the diffuser located at or about Map Reference 1595077.773/5149182.846.

2. The outfall pipeline, diffuser and associated facilities shall be maintained in efficient working order in accordance with generally accepted best engineering practice.

3. The Consent Holder shall undertake a visual inspection of the outfall diffuser within 12 months of the commissioning of the outfall and thereafter at yearly intervals for the duration of the consent. A report shall be submitted to the Regulatory Manager: Canterbury Regional Council within 20 working days of receipt of the inspection report. The report will include but not be limited to the following:

a) The date and time of the inspection.

b) The condition of the outfall diffuser structure.

c) A description of any maintenance work and if required, a programme for completion of this work.

4. Should the report required by Condition 3 identify the requirement for maintenance, confirmation of the completion of the works shall be forwarded to the Manager, Regulatory Department, Canterbury Regional Council, within 20 working days of the completion of the works.

10.5.3 Discharge Permit (Discharge of Treated Wastewater)

1. The discharge shall only be treated wastewater from the Akaroa Wastewater Treatment Plant, located at Old Coach Road, Akaroa.

2. Treated wastewater from the Akaroa Wastewater Treatment Plant shall be discharged into Akaroa Harbour via submerged outfall approximately 2.5km long with the mid-point of the diffuser located at or about Map Reference 1595077.773/5149182.846 as shown in Drawing GIS 6517986-05 in Attachment A of these conditions.

3. The volume of treated wastewater discharged from the Akaroa Wastewater Treatment Plant shall be recorded continuously in litres per second using a flow meter.

4. The proposed mixing zone for the discharge to Akaroa Harbour from the outfall shall be 100 metres radius measured in all directions from the outfall diffuser as shown in Drawing GIS 6517986-05 (see Attachment A of these Conditions).

5. The discharge of treated wastewater through the outfall shall not cause any of the following effects outside the mixing zone described in Condition 4:

    - A change in the natural temperature of the receiving water of more than 3 degrees Celsius
    - Any conspicuous change in colour or clarity of the receiving water such that visual clarity is reduced by more than 33 percent as per the Water Quality Guidelines No. 2 (Ministry for the Environment,1994)
    - Any significant adverse effects on aquatic life as assessed by the benthic surveys required by Condition 13 of this consent.
    - A concentration of dissolved oxygen in the receiving water of below 80 percent of the saturation concentration.

6. Any undesirable heterotrophic bacterial or fungus growths as observed during outfall inspections required by Condition 3 of Consent xxx.

7. The Consent Holder shall carry out treated wastewater monitoring at the outlet of the Akaroa Wastewater Treatment Plant using the sampling method and frequency shown below.

Parameter	Units	Frequency	Sampling Method
Carbonaceous Biochemical Oxygen Demand	g/m³	Samples collected weekly between December and February, and monthly between March and November	24 Hour Composite
Total Suspended Solids	g/m³		24 Hour Composite
pH	pH units		Grab
Ammoniacal Nitrogen	g/m³		Grab
Total Nitrogen	g/m³		Grab
Faecal Coliforms	Number/100mL		Grab
Enterococci	Number/100mL		Grab

8. All treated wastewater sampling required by Condition 7 shall be undertaken by a suitably qualified and experienced person who has completed appropriate training (for example, NZQA Unit Standard 17878 or a Certificate in Wastewater Treatment).

9. Treated wastewater samples shall be collected, stored, preserved and analysed in accordance with Standard Methods for the Examination of Water and Wastewater (American Waterworks Association and the Water Environment Federation) or any other generally accepted methodology.

10. All samples taken shall be analysed by a laboratory that is accredited for that analysis to NZS/ISO/IEC 17025 or equivalent or to any other comparable standard approved by the consent authority.

11. The treated wastewater discharged from the Akaroa Wastewater Treatment Plant shall meet the following limits:

Parameter	Reported as	Statistical Basis[1]	Consent limit
Carbonaceous Biochemical Oxygen Demand	g/m^3	Median	20
		95th percentile	50
Total Suspended Solids	g/m^3	Median	20
		95th percentile	50
pH	pH units	Range	6.0-8.5
Ammoniacal Nitrogen	g/m^3	Median	10
		95th percentile	20
Total Nitrogen	g/m^3	Median	15
		95th percentile	30
Faecal Coliforms	Number /100mL	Median	500
		95th percentile	1,000
Enterococci	Number /100mL	Median	500
		95th percentile	1,000

Note: 1. The median and 95th percentile shall be calculated on a rolling basis from 10 consecutive samples.

12. The Consent Holder shall carry out a one-off study within 12 months of the commissioning of the outfall to validate the predicted initial dilution of the diffuser. Validation of dilution will be achieved using a quantitative dye injection and discharge, with receiving water monitoring via vessel-mounted fluorometer. The study would be carried out under reasonable worst-case conditions (ie over low tide slack-water neap in calm conditions).

13. The Consent Holder shall carry out a survey of benthic ecology, sediments and water quality in the vicinity of the diffuser prior to the commissioning of the outfall, followed by a survey 2 years after commissioning and thereafter at 5 yearly intervals for the duration of the consent. Monitoring will be carried out in accordance with the following:

a) Samples shall be collected from a minimum of eight locations which will align with the baseline benthic sampling stations established by Cawthron (2014) along a transect running through the centre of the outfall diffuser section. Four sampling stations shall be selected from each side of the diffuser at 50, 100, 250 and 500 metre intervals from the diffuser.

b) Three replicate samples shall be collected at each sampling location from cores driven approximately 100 mm into the sediment.

Benthic Infauna

- All samples shall be sieved to 0.5 mm for identification and enumeration of benthic infaunal taxa (including mean density, species richness (j), and Shannon Weiner diversity (H) indices calculated for each location).
- Infaunal community changes at each location between surveys shall be assessed.

Sediment Chemistry

- Prior to chemical analysis, all core samples shall be examined to determine texture, colour and odour. Photographs shall be taken of each core to document the relative degree of enrichment.
- All samples shall be analysed for Total Nitrogen, particle grain size, organic content and trace metals (mercury, chromium, copper, lead and zinc).
- Sediment chemistry changes at each location between surveys shall be assessed.

Reporting

The objective of the benthic, sediments and water quality monitoring programme is to provide a scientifically rigorous description and evaluation of effects (if any) of the treated wastewater discharge on the receiving environment. Reporting shall at a minimum:

- Summarise the data collected as required under this Condition (including graphical presentation and statistical summations of data) and analyse the information in regard to meeting the ecological provisions of section 107(1)(g) of the RMA. Specifically, whether or not the discharge is causing significant adverse effects on aquatic life.
- Highlight and discuss environmental trends in the results.
- Compare results obtained during the survey with results obtained during previous surveys and provide an interpretation of any significant differences, changes or trends.

Attachments

A: Plan GIS-6517986-05 showing location of outfall pipeline and mixing zone

B: Draft Construction Environmental Management Plan

10.5.4 Discharge Permit (Discharge of Contaminants to Air - Terminal Pump Station)

1. The discharge of contaminants to air shall only be odours associated with the operation of the Terminal Pump Station for the Akaroa Wastewater Treatment Plant and associated infrastructure at or near map reference NZTM 597435E, 150265N as shown on Plan CRCxxxx, which forms part of this consent.

2. There shall be no discharge of odours as a result of the exercise of this consent that is offensive or objectionable to the extent that it causes an adverse effect beyond the boundary of the site on which the discharge occurs.

3. The consent holder shall prepare and implement an Odour Management Plan (OMP) for the Terminal Pump Station which shall be incorporated into the Akaroa Wastewater Treatment Plant Operation and Management Plan.

a) The OMP shall be prepared and provided to the Canterbury Regional Council at least twenty working days prior to the exercise of this consent.

b) The OMP shall be reviewed at least annually by the Consent Holder.

c) The OMP and any revisions shall include all measures necessary to achieve compliance with the conditions of this consent.

d) The OMP shall include but not be limited to:

i. A description of the odour sources on site

ii. A description of the housekeeping procedures to be used at the site

iii. The methods used for controlling odour at each source

iv. A description of the inspection and maintenance procedures for all odour containment and ventilation systems including the biofilter

v. Contingency methods for plant malfunctions

vi. Testing and maintenance procedures for the standby generator

vii. A description of the odour monitoring requirements

viii. A system of training for employees and contractors to make them aware of the requirements of the OMP

ix. Identification of staff responsible for implementing and reviewing the OMP

x. A method for recording and responding to complaints from the public

4. The Consent Holder shall keep a record of any complaints relating to odours from the Terminal Pump Station, and shall include (when provided that information):

a) The location where the odour was detected by the complainant

b) The date and time the odour was detected

c) A description of the wind speed and wind direction when the odour was detected by the complainant

d) The most likely cause of the odour detected, and

e) 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 on request.

5. The following equipment shall be fully enclosed and all waste gases shall be extracted via a fan and ventilation system to a biofilter;

a) Wet well

b) Screens

c) Grit trap

6. The biofilter required by condition 5 shall be designed, operated and maintained to ensure compliance with condition 2 at all times. This shall include but not be limited to;

a) Ensuring the waste gases are well dispersed throughout the filter bed

b) Maintaining the biofilter bed in a friable condition with a pressure drop of no greater than 200 millimetres water gauge.

c) Installing a manometer or other means of pressure measurement to provide a permanent indication of pressure drop across the biofilter bed.

d) Maintaining the moisture content of the biofilter bed between 40% and 60% by weight

e) Measuring and recording the moisture content of the biofilter bed material on a monthly basis

f) Maintaining the pH of the biofilter bed to within 6 and 8 at all times

g) Measuring and recording the pH of the biofilter bed at least once every 3 months

7. The lapsing date for the purposes of section 125 shall be xxxx.

8. The Canterbury Regional Council may annually, on the last working day of May or September, serve notice of its intention to review the conditions of this consent for the purposes of:

a) Dealing with any adverse effect on the environment which may arise from the exercise of this consent and which is appropriate to deal with at a later stage; or

b) Requiring the adoption of the best practicable option to remove or reduce any adverse effect on the environment; or

c) Requiring the Consent Holder to carry out monitoring and reporting instead of, or in addition to, that required by the consent, or

d) Complying with a relevant rule in an operative regional plan; or

e) Taking into account any Act of Parliament, Regulation, National Policy Statement, Regional Policy Statement or relevant regional plan which relates to limiting, recording or mitigating the discharges to air authorised by this consent.

10.5.5 Discharge Permit (Discharge of Contaminants to Air – WWTP)

1. The discharge of contaminants to air shall only be odours associated with the operation of the Akaroa Wastewater Treatment Plant and associated infrastructure at or near map reference NZTM 597662E 5151143N as shown on Plan CRCxxxx, which forms part of this consent.

2. There shall be no discharge of odours as a result of the exercise of this consent that is offensive or objectionable to the extent that it causes an adverse effect beyond the boundary of the site on which the discharge occurs.

3. The consent holder shall prepare and implement an Odour Management Plan (OMP) for the wastewater treatment plant which shall be incorporated into the Akaroa Wastewater Treatment Plant Operation and Management Plan.

a) The OMP shall be prepared and provided to the Canterbury Regional Council at least twenty working days prior to the exercise of this consent.

b) The OMP shall be reviewed at least annually by the Consent Holder

c) The OMP and any revisions shall include all measures necessary to achieve compliance with the conditions of this consent.

d) The OMP shall include but not be limited to:

i. A description of the odour sources on site

ii. A description of the housekeeping procedures to be used at the plant

iii. The methods used for controlling odour at each source

iv. A description of the inspection and maintenance procedures for all odour containment and ventilation systems

v. Contingency methods for plant malfunctions

vi. Testing and maintenance procedures for the standby generator

vii. A description of the odour monitoring requirements

viii. A system of training for employees and contractors to make them aware of the requirements of the OMP

ix. Identification of staff responsible for implementing and reviewing the OMP

x. A method for recording and responding to complaints from the public

4. The Consent Holder shall keep a record of any complaints relating to odours from the wastewater treatment plant, and shall include (when provided that information):

a) The location where the odour was detected by the complainant

b) The date and time the odour was detected

c) A description of the wind speed and wind direction when the odour was detected by the complainant

d) The most likely cause of the odour detected, and

e) Any corrective action undertaken by the Consent Holder to avoid, remedy or mitigate the odour detected by the complainant.

5. This record shall be provided to the Canterbury Regional Council on request.

6. The following equipment shall be fully enclosed and all waste gases shall be extracted via a fan and ventilation system to atmosphere:

a) Balance tank

b) Blower, laboratory and control room building

c) Sludge and membrane building

d) Gravity belt thickener

e) Sludge storage tank.

7. The fan as required by Condition 5 shall be sized and operated to ensure that a negative pressure in maintained in the ventilation system at all times.

8. The lapsing date for the purposes of section 125 shall be 10 years.

9. The Canterbury Regional Council may annually, on the last working day of May or September, serve notice of its intention to review the conditions of this consent for the purposes of:

a) Dealing with any adverse effect on the environment which may arise from the exercise of this consent and which is appropriate to deal with at a later stage; or

b) Requiring the adoption of the best practicable option to remove or reduce any adverse effect on the environment; or

c) Requiring the Consent Holder to carry out monitoring and reporting instead of, or in addition to, that required by the consent, or

d) Complying with a relevant rule in an operative regional plan; or

e) Taking into account any Act of Parliament, Regulation, National Policy Statement, Regional Policy Statement or relevant regional plan which relates to limiting, recording or mitigating the discharges to air authorised by this consent.

10.5.6 Land Use Consent (Storage of Wastewater – WWTP)

1. The development shall proceed in accordance with the information and plans (including landscaping plans) submitted with the application.

10.6 Consent Durations

A consent duration of 35 years is sought for the following resource consent:

10.5.1 General Conditions

10.5.2 Coastal Permit (outfall pipeline – occupation)

10.5.3 Discharge Permit (discharge of treated wastewater)

10.5.4 Discharge Permit (Terminal Pump Station - discharge of contaminants to Air)

10.5.5 Discharge Permit (WWTP - discharge of contaminants to Air)

This duration is considered appropriate given the absence of significant adverse effects, the standard technology used for the treatment and disposal of the wastewater and the proposed monitoring and review conditions.

A consent duration of 5 years is sought for:

10.4.1 Water Permit (Terminal Pump Station take of water from contaminated land for dewatering)

10.4.2 Coastal Permit and Discharge Permit (Outfall Pipeline – placement and disturbance of seabed and foreshore and discharge of contaminants)

This duration is considered appropriate to enable construction of the components of the upgrade.

11 Conclusion

Overall, the proposal will result in a significantly improved wastewater treatment and disposal system for Akaroa. The upgraded system will largely fulfil the expectations of the Akaroa community, which has been consulted extensively over the last five years or so.

The proposed Akaroa WWTP will produce a high quality treated wastewater which will have very low concentrations of the wastewater parameters that are generally responsible for adverse environmental and public health effects. The results of computer modelling and the subsequent public health risk (QMRA) assessment show that under normal viral loads in the community, the infection risk from either contact recreation or shellfish gathering within Akaroa Harbour is very low.

Potential adverse effects to marine mammals and other aquatic biota as a result of exposure to contaminants in the WWTP wastewater are negligible. Recreationalists and other users of Akaroa Harbour will not be adversely affected and their experience enhanced with an improvement in water quality.

The assessment of outfall location options indicates that a properly designed and constructed outfall at the proposed site will meet the environmental and social requirements of the majority of the local community. While it is acknowledged land-based wastewater disposal is the preference of Iwi, studies indicate that given the physical constraints of Akaroa and its environs this option is not likely to be environmentally or economically sustainable. It would still require the construction of a large storage or alternative disposal system (e.g. outfall) for use during winter and wet weather.

The proposed upgrading of the wastewater network and the proposed treatment of wet weather flows through the new outfall will have a positive effect on the water quality of the harbour and reduce public health risks.

The removal of the existing WWTP from a particularly sensitive site will have significant cultural benefits. The major replacement structures associated with the proposal, the Terminal Pump Station and the WWTP can be accommodated on their respective sites without significant adverse effect (including cultural effects) on the environment given the scale, proposed mitigation measures and surrounding environment. Utilities such as these are anticipated in the District Plan given the vital servicing function they perform.

It is also considered that the temporary effects of the construction activities (noise, dust, traffic, access and discharges from site dewatering), on the receiving environment will be no more than minor and the effects on persons will be less than minor. To facilitate this, the Contractor will be required to prepare and submit a Construction Environmental Management Plan (or appropriate EMP content contained in an overarching Construction Management Plan) to Environment Canterbury that will demonstrate compliance with consent conditions and provide the basis and method for mitigating any potential environmental effects. An appropriate level of communication throughout the project with potentially affected persons (particularly neighbours) will be a key mitigation measure.

The proposal is considered to be generally consistent with the objectives and policies of the relevant planning documents including the NZCPS, the RPS, various regional plans and the BPDP.

In terms of Part 2 of the Act, the proposal will enable the Akaroa community and future generations to provide for social wellbeing and health without affecting the natural and physical resources of the environment in any significant manner.

Accordingly, it is considered the various resource consents for the proposed can be granted having regard to Sections 104, 104B,104C, 105 and 107 of the RMA, subject to specified conditions.

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13 Abbreviations and Glossary

Abbreviation	Full Name
ARI	Average Recurrence Interval, which is the average period in years when the magnitude of rainfall or flow event, is likely to be exceeded.
ADP	Archaeological Discovery Protocol
ADWF	Average Dry Weather Flow
AEE	Assessment Environmental Effects
Analyte	Chemical constituent
ANZECC	Australia and New Zealand Environment and Conservation Council
Bacteria	Large group of unicellular micro-organisms
Bathymetry	Underwater topography (ie of seabed)
Benthic	Refers to organisms living in or on sediments of aquatic habitats
Biota	Flora and fauna of an area
Biosolids	Treated sewage sludge
BNR	Biological Nitrogen Removal
BOD_5	Five day biochemical oxygen demand; a measure of the organic content of water or wastewater by the quantity of oxygen consumed in five days
BPDP	Banks Peninsula District Plan
CEMP	Contractors Environmental Management Plan
Cfu	Colony forming units – measure of viable bacteria numbers
CMP	Construction Management Plan
COD	Chemical Oxygen Demand
Concentration	Measure of how much of a given substance there is when mixed with another substance
Consent Authority	The Minister of Conservation, a Regional Council, or a Territorial Authority, where permission is required to carry out an activity for which a resource consent is required under the RMA
Consultation	The communication of a genuine invitation to give advice and a genuine

Abbreviation	Full Name
	consideration of that advice
CRPS	Canterbury Regional Policy Statement
CSMP	Contaminated Soils Management Plan
Dilution	Ratio of the concentration of a conservative contaminant in a wastewater plume at the discharge point, to the local concentration in the diluted plume
DIN	Dissolved Inorganic Nitrogen
Disinfection	A process designed to reduce micro-organism numbers in wastewater
DO	Dissolved Oxygen
DoC	Department of Conservation
DRP	Dissolved Reactive Phosphorus
DWF	Dry Weather Flow
EDC	Endocrine Disrupting Compounds
Effluent	Final liquid from a wastewater treatment process
Enterococci-also E Coli	A genus of bacteria abundant in the gut of warm blooded animals and used as an indicator of the presence of faecal contamination in swimming water
Environment	Includes ecosystems and their constituent parts (including people and communities), all natural and physical resources and amenity values, as well as social, economic and cultural conditions that affect or are affected by the other matters noted (as defined in the RMA)
EWS	Environmental Weather Stations
Faecal coliforms	A group of bacteria abundant in the gut of warm blooded animals and used as an indicator of faecal contamination in shellfish gathering water
g/m^3	Grams per cubic metre (same as mg/l)
Genotype	Genetic make-up of a cell or organism
Guideline	Non mandatory values established for guidance (e.g. as a trigger, intervention or maximum level of a contaminant)
HAIL	Hazardous Activities and Industries List
Hapu	Sub tribe

Abbreviation	Full Name
HDD	Horizontal Direct Drilling
Heterotroph	An organism that cannot synthesise its own food e.g. bacteria or fungi
Heavy metal	Denser metal (e.g. lead) that can be toxic at high concentrations, includes the following: As (Arsenic), Cd (Cadmium), Cr (Chromium), Cu (copper), Ni (nickel), Pb (lead), Zn (zinc), Hg (mercury)
IFAS	Integrated Fixed Film Activated Sludge
IMP	Iwi Management Plan
ISQG	ANZECC Interim Sediment Quality Guideline
Iwi	Tribe
km	Kilometre
Kaitiakitanga	Guardianship
LINZ	Land Information New Zealand
LOI	Loss on Ignition
Log scale	Scale of measurement showing value using intervals based on order of magnitude e.g. 1, 10, 100, 1000 instead of 0, 1, 2, 3
m	Metre
m^3	Cubic metre (1000 litres)
MAC	Microbiological Assessment Criteria
Mahinga Kai	Maori interests in traditional food and places where this is obtained
MBBR	Mixed Bed Biofilm Reactor
Mean	Single value that typifies the average of set of values (e.g. arithmetic or geometric mean)
Median	Single value in a data set that has equal number of greater and lesser magnitude (i.e., 50^{th} percentile)
MfE	Ministry for the Environment
MHWS	Mean high water springs (average line of spring high tide)
MJ/m^2	milliJoule per square metre-unit of solar radiation

Abbreviation	Full Name
MoH	Ministry of Health
Mixing zone	Zone of non-compliance
Micron	One millionth of a metre
MLE	Modified Ludsak-Ettinger
MLSS	Mixed Liquor Suspended Solids
mg/L	Milligrams per litre (same as g/m^3)
MSL	Mean Sea Level
MSDS	Material Safety Data Sheets
MPN	Most Probable Number -a laboratory measure of the number of bacteria (such as faecal coliforms or enterococci)
NIWA	National Institute of Water and Atmosphere
NZCPS	The New Zealand Coastal Policy Statement
NZTA	New Zealand Transport Agency
Nutrient	Chemical that an organism or plant requires for metabolic function and growth
N	Nitrogen
NES	National Environmental Standard
NRRP	Natural Resource Regional Plan
NTU	Nephelometric Turbidity Units-a measure of turbidity or cloudiness of a fluid
Organic	Containing or combined with carbon
Outfall	A pipe on or under the sea bed through which wastewater is pumped for discharge to sea
P	Phosphorus
Pathogen	An organism which is capable of eliciting disease symptoms in another organism
PE	Polyethylene Pipe
pH	Unit giving measure of acidity or alkalinity on a logarithmic scale of 0 to 14 where less than 7 is acidic and greater than 7 is alkaline
Phytoplankton	Algae that take energy from the sun and form part of the oceanic plankton

Abbreviation	Full Name
	community
Percentile	One of 99 values of a variable e.g. 90th percentile
QMRA	Quantitative Microbial Risk Assessment
RAS	Return Activated Sludge
RCEP	Regional Coastal Environmental Plan
RL	Reduced level-ie to a common datum such as sea level
RMA	Resource Management Act, 1991
Rohe	Territory or boundary of tribal group
Runanga	Governing Council of hapu or iwi
SBR	Sequence Batch Reactors
Sewage	Toilet and other waterborne waste derived from domestic dwellings and non-industrial sources (e.g. office buildings)
Sewerage	Network of pipes, pumps and other facilities that convey and treat sewage
Sludge	Untreated sewage solids
SFRG	Suitability for Recreation Grades
Standard	Statutory requirement
Taiapure	Area of special significance to an iwi or hapu as source of food or for spiritual/cultural reasons
Takiwa	Territory
TCMA	Temporary Construction Management Area
TMP	Traffic Management Plan
TSS	Total suspended solids
TKN	Total Kjeldahl Nitrogen (sum of organic nitrogen, ammonia (NH_3) and ammonium (NH_4))
TN	Total Nitrogen (sum of TKN plus Nitrate (No_3) and Nitrite (No_2) nitrogen)
TOC	Total Organic Carbon

Abbreviation	Full Name
TON	Total Organic Nitrogen
Toxicity	The inherent potential or capacity of material (e.g. heavy metal) to cause adverse effects in a living organism
TP	Total Phosphorus
Trade Waste	Liquid waste discharged by industry
Treatment	The processing of wastewater to help remove constituents that may have a harmful effect on public health or the environment at the point of discharge
Turbidity	Cloudiness of a fluid caused by suspended solids
UV Transmittance (UVT)	Percentage measurement of the amount of UV light able to pass through a solution
UV (ultra violet)	Short wave length light (254nm) used to destroy the nucleic acids of microorganisms
Virus	Microscopic infectious agent that can only reproduce inside a host cell
WAS	Waste Activated Sludge
Wastewater	The mixture of sewage and trade wastes (also called sewage)
Water Quality	An indication of the extent to which the condition of water is considered suitable, or meets the expectations that people may have of it, for any particular use
WHO	World Health Organisation
WP	Working Party
WWF	Wet Weather Flow
WWTP	Wastewater Treatment Plant
Wahi tapu	Places sacred to Maori in the traditional, spiritual, religious, ritual or mythological sense

Appendix A

Existing Consent

Appendix B

Akaroa Harbour Modelling Report (NIWA, 2014a)

Appendix C

Drawings

Appendix D

Preliminary Site Investigation (Contamination) Akaroa Wastewater Terminal Pump Station (CH2M Beca, 2014)

Appendix E

Certificates of Title

Appendix F

RCEP – Water Quality Classification

Appendix G

Baseline Benthic Ecological Survey for a Proposed Wastewater Treatment Plant Outfall in Akaroa (Cawthron, 2014)

Appendix H

Draft Construction Environmental Management Plan

Appendix I

Akaroa Wastewater Treatment Plant and Reticulation System – Odour Effects Assessment (CH2M Beca, 2014)

Appendix J

Contaminated Soils Management Plan – Akaroa Wastewater Terminal Pump Station

Appendix K

Cultural Effects Assessment

Appendix L

Water-Related Health Risks Analysis for the Proposed Akaroa Wastewater Scheme (NIWA, 2014b)

Appendix M

Landscape and Visual Assessment

Appendix N

Objectives and Policies

New Zealand Coastal Policy Objectives and Policies

Objective 1

To safeguard the integrity, form, functioning and resilience of the coastal environment and sustain its ecosystems, including marine and intertidal areas, estuaries, dunes and land, by:

- maintaining or enhancing natural biological and physical processes in the coastal environment and recognising their dynamic, complex and interdependent nature;
- protecting representative or significant natural ecosystems and sites of biological importance and maintaining the diversity of New Zealand's indigenous coastal flora and fauna; and
- maintaining coastal water quality, and enhancing it where it has deteriorated from what would otherwise be its natural condition, with significant adverse effects on ecology and habitat, because of discharges associated with human activity.

Policy 1: Extent and characteristics of the coastal environment

1. Recognise that the extent and characteristics of the coastal environment vary from region to region and locality to locality; and the issues that arise may have different effects in different localities.

2. Recognise that the coastal environment includes:

    a. the coastal marine area;

    b. islands within the coastal marine area;

    c. areas where coastal processes, influences or qualities are significant, including coastal lakes, lagoons, tidal estuaries, saltmarshes, coastal wetlands, and the margins of these;

    d. areas at risk from coastal hazards;

    e. coastal vegetation and the habitat of indigenous coastal species including migratory birds;

    f. elements and features that contribute to the natural character, landscape, visual qualities or amenity values;

    g. items of cultural and historic heritage in the coastal marine area or on the coast;

    h. inter-related coastal marine and terrestrial systems, including the intertidal zone; and

    i. physical resources and built facilities, including infrastructure, that have modified the coastal environment.

Policy 2: The Treaty of Waitangi, Tangata Whenua and Māori

In taking account of the principles of the Treaty of Waitangi (Te Tiriti o Waitangi), and kaitiakitanga, in relation to the coastal environment:

a. recognise that tangata whenua have traditional and continuing cultural relationships with areas of the coastal environment, including places where they have lived and fished for generations;

b. involve iwi authorities or hapū on behalf of tangata whenua in the preparation of regional policy statements, and plans, by undertaking effective consultation with tangata whenua; with such consultation to be early, meaningful, and as far as practicable in accordance with tikanga Māori;

c. with the consent of tangata whenua and as far as practicable in accordance with tikanga Māori, incorporate mātauranga Māori1 in regional policy statements, in plans, and in the consideration of applications for resource consents, notices of requirement for designation and private plan changes;

d. provide opportunities in appropriate circumstances for Māori involvement in decision making, for example when a consent application or notice of requirement is dealing with cultural localities or issues of cultural significance, and Māori experts, including pūkenga2, may have knowledge not otherwise available;

e. take into account any relevant iwi resource management plan and any other relevant planning document recognised by the appropriate iwi authority or hapū and lodged with the council, to the extent that its content has a bearing on resource management issues in the region or district; and

   i. where appropriate incorporate references to, or material from, iwi resource management plans in regional policy statements and in plans; and

   ii. consider providing practical assistance to iwi or hapū who have indicated a wish to develop iwi resource management plans;

f. provide for opportunities for tangata whenua to exercise kaitiakitanga over waters, forests, lands, and fisheries in the coastal environment through such measures as:

   i. bringing cultural understanding to monitoring of natural resources;

   ii. providing appropriate methods for the management, maintenance and protection of the taonga of tangata whenua;

   iii. having regard to regulations, rules or bylaws relating to ensuring sustainability of fisheries resources such as taiāpure, mahinga mātaitai or other non commercial Māori customary fishing;

g. in consultation and collaboration with tangata whenua, working as far as practicable in accordance with tikanga Māori, and recognising that tangata whenua have the right to choose not to identify places or values of historic, cultural or spiritual significance or special value:

   i. recognise the importance of Māori cultural and heritage values through such methods as historic heritage, landscape and cultural impact assessments; and

   ii. provide for the identification, assessment, protection and management of areas or sites of significance or special value to Māori, including by historic analysis and archaeological survey and the development of methods such as alert layers and predictive methodologies for identifying areas of high potential for undiscovered Māori heritage, for example coastal pā or fishing villages

Policy 6: Activities in the Coastal Environment

1. In relation to the coastal environment:

   a. recognise that the provision of infrastructure, the supply and transport of energy including the generation and transmission of electricity, and the extraction of minerals are activities important to the social, economic and cultural well-being of people and communities;

b. consider the rate at which built development and the associated public infrastructure should be enabled to provide for the reasonably foreseeable needs of population growth without compromising the other values of the coastal environment;

c. encourage the consolidation of existing coastal settlements and urban areas where this will contribute to the avoidance or mitigation of sprawling or sporadic patterns of settlement and urban growth;

d. recognise tangata whenua needs for papakāinga3, marae and associated developments and make appropriate provision for them;

e. consider where and how built development on land should be controlled so that it does not compromise activities of national or regional importance that have a functional need to locate and operate in the coastal marine area;

f. consider where development that maintains the character of the existing built environment should be encouraged, and where development resulting in a change in character would be acceptable;

g. take into account the potential of renewable resources in the coastal environment, such as energy from wind, waves, currents and tides, to meet the reasonably foreseeable needs of future generations;

h. consider how adverse visual impacts of development can be avoided in areas sensitive to such effects, such as headlands and prominent ridgelines, and as far as practicable and reasonable apply controls or conditions to avoid those effects;

i. set back development from the coastal marine area and other water bodies, where practicable and reasonable, to protect the natural character, open space, public access and amenity values of the coastal environment; and

j. where appropriate, buffer areas and sites of significant indigenous biological diversity, or historic heritage value.

2. Additionally, in relation to the coastal marine area:

a. recognise potential contributions to the social, economic and cultural wellbeing of people and communities from use and development of the coastal marine area, including the potential for renewable marine energy to contribute to meeting the energy needs of future generations;

b. recognise the need to maintain and enhance the public open space and recreation qualities and values of the coastal marine area;

c. recognise that there are activities that have a functional need to be located in the coastal marine area, and provide for those activities in appropriate places;

d. recognise that activities that do not have a functional need for location in the coastal marine area generally should not be located there; and

e. promote the efficient use of occupied space, including by:

i. requiring that structures be made available for public or multiple use wherever reasonable and practicable;

ii. requiring the removal of any abandoned or redundant structure that has no heritage, amenity or reuse value; and

iii. considering whether consent conditions should be applied to ensure that space occupied for an activity is used for that purpose effectively and without unreasonable delay.

Policy 18: Public Open Space

Recognise the need for public open space within and adjacent to the coastal marine area, for public use and appreciation including active and passive recreation, and provide for such public open space, including by:

a. ensuring that the location and treatment of public open space is compatible with the natural character, natural features and landscapes, and amenity values of the coastal environment;

b. taking account of future need for public open space within and adjacent to the coastal marine area, including in and close to cities, towns and other settlements;

c. maintaining and enhancing walking access linkages between public open space areas in the coastal environment;

d. considering the likely impact of coastal processes and climate change so as not to compromise the ability of future generations to have access to public open space; and

e. recognising the important role that esplanade reserves and strips can have in contributing to meeting public open space needs.

Policy 21: Enhancement of Water Quality

Where the quality of water in the coastal environment has deteriorated so that it is having a significant adverse effect on ecosystems, natural habitats, or water-based recreational activities, or is restricting existing uses, such as aquaculture, shellfish gathering, and cultural activities, give priority to improving that quality by:

a. identifying such areas of coastal water and water bodies and including them in plans;

b. including provisions in plans to address improving water quality in the areas identified above;

c. where practicable, restoring water quality to at least a state that can support such activities and ecosystems and natural habitats;

d. requiring that stock are excluded from the coastal marine area, adjoining intertidal areas and other water bodies and riparian margins in the coastal environment, within a prescribed time frame; and

e. engaging with tangata whenua to identify areas of coastal waters where they have particular interest, for example in cultural sites, wāhi tapu, other taonga, and values such as mauri, and remedying, or, where remediation is not practicable, mitigating adverse effects on these areas and values.

Policy 23: Discharge of Contaminants

1. In managing discharges to water in the coastal environment, have particular regard to:

a. the sensitivity of the receiving environment;

b. the nature of the contaminants to be discharged, the particular concentration of contaminants needed to achieve the required water quality in the receiving environment, and the risks if that concentration of contaminants is exceeded; and

c. the capacity of the receiving environment to assimilate the contaminants; and:

d. avoid significant adverse effects on ecosystems and habitats after reasonable mixing;

e. use the smallest mixing zone necessary to achieve the required water quality in the receiving environment; and

f. minimise adverse effects on the life-supporting capacity of water within a mixing zone.

2. In managing discharge of human sewage, do not allow:

a. discharge of human sewage directly to water in the coastal environment without treatment; and

b. the discharge of treated human sewage to water in the coastal environment, unless:

i. there has been adequate consideration of alternative methods, sites and routes for undertaking the discharge; and

ii. informed by an understanding of tangata whenua values and the effects on them.

3. Objectives, policies and rules in plans which provide for the discharge of treated human sewage into waters of the coastal environment must have been subject to early and meaningful consultation with tangata whenua.

4. In managing discharges of stormwater take steps to avoid adverse effects of stormwater discharge to water in the coastal environment, on a catchment by catchment basis, by:

a. avoiding where practicable and otherwise remedying cross contamination of sewage and stormwater systems;

b. reducing contaminant and sediment loadings in stormwater at source, through contaminant treatment and by controls on land use activities;

c. promoting integrated management of catchments and stormwater networks; and

d. promoting design options that reduce flows to stormwater reticulation systems at source.

5. In managing discharges from ports and other marine facilities:

a. require operators of ports and other marine facilities to take all practicable steps to avoid contamination of coastal waters, substrate, ecosystems and habitats that is more than minor;

b. require that the disturbance or relocation of contaminated seabed material, other than by the movement of vessels, and the dumping or storage of dredged material does not result in significant adverse effects on water quality or the seabed, substrate, ecosystems or habitats;

c. require operators of ports, marinas and other relevant marine facilities to provide for the collection of sewage and waste from vessels, and for residues from vessel maintenance to be safely contained and disposed of; and

d. consider the need for facilities for the collection of sewage and other wastes for recreational and commercial boating.

Canterbury Regional Environment Plan Coastal

Objective 7.1 *Enable present and future generations to gain cultural, social, recreational, economic, health and other benefits from the quality of the water in the Coastal Marine Area, while:*

(a) maintaining the overall existing high natural water quality of coastal waters;.

(b) safeguarding the life-supporting capacity of the water, including its associated: aquatic ecosystems, significant habitats of indigenous fauna and areas of significant indigenous vegetation;

(c) safeguarding, and where appropriate, enhancing its value for providing mahinga kai for Tangata Whenua;

(d) protecting wahi tapu and wahi taonga of value to Tangata Whenua;

(e) preserving natural character and protecting outstanding natural features and landscapes, where water quality is an aspect of their value, from reductions in water quality;

(f) maintaining, and where appropriate enhancing, amenity values; and

(g) recognising the intrinsic values of ecosystems and any finite characteristics of the coastal environment.

Policy 7.2(b)(vi) *Establish water quality classes, set water quality standards and control the*

discharge of contaminants and water within the parts of the Coastal Marine Area

defined in Schedule 5 that contain areas of degraded water quality or which need

classifications to reflect existing or potential uses of the areas:...

(b) The water quality in the following areas will be classified as water managed for contact recreation and for the maintenance of aquatic ecosystems, and the water quality maintained and where necessary improved for these purposes:…

(vi) Childrens Bay, Takamatua Bay, Robinsons Bay, Duvauchelle Bay,

Barrys Bay and French Farm Bay in Akaroa Harbour;

Policy 7.4 *Before being granted a resource consent for a point source discharge of a contaminant or water into water, or onto or into land in the Coastal Marine Area in*

circumstances where the discharge, after reasonable mixing, would not achieve the water classification purposes for which the water quality standards set in this

plan, the applicant must satisfy Environment Canterbury:

(a) that exceptional circumstances justify the granting of the consent; or

(b) that the discharge is of a temporary nature; or

(c) that the discharge is associated with necessary maintenance work; or

(d) that practicable alternatives to avoid such a discharge are not available.

Policy 7.5 *Only grant a resource consent to discharge human wastewater into water, or onto or into land in the Coastal Marine Area, without it passing through land or a specially constructed wetland outside the Coastal Marine Area, where:*

(a) the discharge better meets the purpose of the Act than disposal through land or a wetland outside the Coastal Marine Area; and

(b) there has been consultation by the applicant with Tangata Whenua in accordance with Tikanga Maori and due weight has been given to sections 6, 7 and 8 of the Act; and

(c) there has been consultation by the applicant with the community generally; and

(d) the discharge is not within an Area of Significant Natural Value, unless the applicant satisfies Environment Canterbury that exceptional circumstances justify the discharge in such an area.

Policy 7.6 *In setting conditions on a resource consent to discharge a contaminant or water into water, or onto or into land in the Coastal Marine Area, a reasonable mixing*

zone should be determined by considering, amongst other matters, the following:

(a) the volumes, contaminant loading and contaminant concentrations involved with the discharge;

(b) factors such as sea conditions, tides, wave action, water depths, water velocity, and flushing characteristics that will normally affect the assimilative capacity of the receiving water and the dispersion of the contaminants or the discharge water;

(c) the presence of an Area of Significant Natural Value at the site or in close proximity;

(d) the existing use of the immediate area, including the presence of other discharges;

(e) if in any area within which a water quality standard is set, the size of the area in relation to the mixing zone; and

(f) the proximity of adjacent areas where water quality standards have been set; and

(g) the natural values of the receiving environment.

Policy 7.7 *Ensure that discharges of water or contaminants into water, or onto or into land in the Coastal Marine Area avoid significant adverse effects on cultural or spiritual values associated with sites, (e.g. areas covered by controls such as taiapure or mahinga mataitai), of special significance to the Tangata Whenua.*

Objective 8.1

(1) To enable people to use the Coastal Marine Area and its resources while avoiding, remedying or mitigating the adverse effects of that use on the environment, including avoiding, remedying or mitigating the adverse effects:

(a) of conflicts between these uses and people's well-being, health, safety and amenity; and

(b) on natural character, and other (natural, ecological, amenity, Tangata Whenua, historic and cultural) values of the coastal environment.

(2) To enable the efficient and effective operation and development of the Ports of Lyttelton and Timaru and network utilities while avoiding, remedying or

mitigating adverse effects on the environment consistent with the normal requirements of commercial ports and network utilities.

Policy 8.2

Environment Canterbury will regulate activities in the Coastal Marine Area that may have adverse effects on the environment.

These activities include:..

(a) the placement of swing moorings;

(b) the introduction or planting of exotic plants;

(c) the emission of noise;

(d) reclamations;

(e) the transfer of petroleum products between vessels;

(f) the use of vessels or buildings for habitation;

(g) activities involving: structures, foreshore and sea bed disturbance,

deposition of material, occupation, or taking of water or heat or energy

from water; where those activities are not authorised as a Permitted

Activities; and

(h) production and storage of hazardous substances.

Policy 8.3

In considering applications for resource consents to undertake activities in the Coastal Marine Area, Environment Canterbury will have regard to:

(a) the existing level of use and development in the area and the national priority in the New Zealand Coastal Policy Statement to preserve the natural character of the coastal environment; and

(b) the need to protect characteristics of the coastal environment of special value to Tangata Whenua; and

(c) effects on the public use and enjoyment of the coast, including public access to and along the Coastal Marine Area, and the contribution of open space to the amenity value of the coast; and

(d) cumulative effects of such activities on the coastal environment both within and outside the immediate location; and

(e) existing agricultural and other use and development of the adjacent land area, and any adverse effects on that activity; and

(f) the status of any lands or areas administered by the Department of Conservation that are affected; and

(g) the publicly notified purpose of any proposal for protected status, if the application affects an area proposed for protection under a statute administered by the Department of Conservation; and(h) the possibility of natural features migrating inland as the result of dynamic coastal processes, including sea level rise, and the ability of natural features to protect subdivision, use and development from erosion and inundation; and

(i) the need to protect existing network utility infrastructure where such infrastructure is located adjacent to or within the Coastal Marine Area.

Policy 8.5
In considering applications for resource consents to occupy the Coastal Marine Area, Environment Canterbury should:

(a) give priority to maintaining safe anchorages for vessels; and

(b) avoid impeding navigational channels and access to wharves, slipways and jetties; and

(c) avoid displacing existing public recreational use of the area where there are no safe adjacent alternative areas available; and

(d) have regard to existing commercial use of the area and any adverse effects on that activity, including recognition of the designated Port Operational Areas; and

(e) have regard to any adverse effects on the values relating to the natural character of the coastal environment, both within and outside the immediate location; and

(f) have regard to any adverse effects on the cultural, historic, scenic, amenity, Tangata Whenua, and natural values of the area; and

(g) have regard to available alternative sites and the reasons for the applicant's choice of site; and

(h) have regard to existing use and development of the area and the extent to which the natural character of the area has already been compromised; and

(i) only provide for the period or periods of occupation that are reasonably necessary to meet the purposes for which occupation is sought.

Policy 8.7
Activities in the Coastal Marine Area should not take place where they have, or have the potential to have, a significant or irreversible adverse effect on the natural or cultural values of an Area of Significant Natural Value, or on the natural or cultural values of areas of the coastal environment adjacent to an Area of Significant Natural Value; unless:

(a) there are special or extraordinary and unique reasons why the activity should be sited in the area; and

(b) any adverse effects on areas of significant indigenous vegetation or significant habitats of indigenous fauna, are avoided, remedied or mitigated.

Chapter 3 NRRP

Objective AQL1 Objective for localised air quality. This objective aims to ensure that localised air discharges do not cause significant adverse effects.

Policy AQL5 Odour Nuisance

Water Quality – Chapter 4 NRRP

Policy WQL9 Prevent the entry of hazardous contaminants to groundwater

(1) Avoid the discharge of contaminants into groundwater from new solid or hazardous waste landfills by:

(a) not locating new landfills, except for cleanfills, over unconfined or semiconfined aquifers; and

(b) prohibiting new landfills, except for cleanfills, in the Coastal Confined Gravel Aquifer System and in Community Drinking Water Supply Protection Zones.

(2) Prevent, as far as practicable, the discharge of contaminants onto or into land where they may enter groundwater, or directly into groundwater from; a hazardous facility, waste storage facility, or a pipeline used to transport contaminants, by:

(a) not locating new facilities or pipelines in areas where there is a significant risk that the contaminants could enter an aquifer as a result of:

(i) permanent ground deformation caused by movement on an active fault line;

(ii) inundation by flood waters; or

(iii) subsidence or slippage of land.

(b) requiring the implementation of best practices in the design, construction and use of hazardous or waste storage facilities and associated pipelines

transporting contaminants, including appropriate containment and emergency response measures, to minimise the risk of contaminants being discharged and

entering an aquifer as a result of:

(i) a system failure, including leakage or accidental discharge; or

(ii) seismic activity that is likely to result in structural damage from ground motion or liquefaction.

(3) Prohibit the discharge of the following contaminants into groundwater via a bore, excavation, storage tank or other means:

(a) hazardous substances and hazardous wastes, except where the discharge occurs during the remediation of contaminated land or it is required as part of a groundwater investigation, provided the discharge does not result in any significant adverse effects on groundwater quality;

(b) wastes from industrial or trade processes, excluding heated water or cleanfill material;

(c) human sewage effluent; or

(d) animal effluent from a collection system.

Water Quality – Chapter 5 NRRP

Policy WQN12 Effects of de-watering

Control the de-watering of construction sites or de-watering for other activities, by limiting the rate and duration of pumping from groundwater, and/or requiring other mitigation measures, to prevent localised land subsidence and significant adverse effects on flow, level and allocation regimes.