Hill Laboratories
TRIED, TESTED AND TRUSTED

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Certificate of Analysis

Client:	AquaTech (Environmental Data Collection) Limited	**Lab No:**	2154037	SPv1
Contact:	Dianne Elliotte	**Date Received:**	03-Apr-2019	
	C/- AquaTech (Environmental Data Collection) Limit	**Date Reported:**	10-Apr-2019	
	17 Fowler Road	**Quote No:**	98283	
	RD 4	**Order No:**		
	Invercargill 9874	**Client Reference:**	Pypers Wastewater	
		Submitted By:	Dianne Elliotte	

Sample Type: Aqueous

Sample Name:		Pond 1 Surface 02-Apr-2019 9:09 am	Pond 1 Bottom 02-Apr-2019 9:13 am	Pond 2 Surface 02-Apr-2019 8:36 am	Pond 2 Bottom 02-Apr-2019 8:47 am	
Lab Number:		2154037.1	2154037.2	2154037.3	2154037.4	
Total Nitrogen	g/m³	8.9	9.7	6.1	6.3	-
Total Ammoniacal-N	g/m³	1.32	1.29	0.50	0.48	-
Nitrate-N + Nitrite-N	g/m³	0.010	0.010	0.008	0.010	-
Total Kjeldahl Nitrogen (TKN)	g/m³	8.9	9.7	6.1	6.3	-
Dissolved Reactive Phosphorus	g/m³	0.006	0.006	0.006	0.004	-

Analyst's Comments

The customer has indicated that the sampling time was recorded as NZ Standard Time (NZST). The sampling time has been reported as supplied in NZST. It should be noted any other times reported by Hill Laboratories will have been corrected for New Zealand Daylight Saving Time (NZDT), where applicable.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter. Performed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch.	-	1-4
Total Nitrogen	Calculation: TKN + Nitrate-N + Nitrite-N. Please note: The Default Detection Limit of 0.05 g/m³ is only attainable when the TKN has been determined using a trace method utilising duplicate analyses. In cases where the Detection Limit for TKN is 0.10 g/m³, the Default Detection Limit for Total Nitrogen will be 0.11 g/m³.	0.05 g/m³	1-4
Total Ammoniacal-N	Filtered Sample from Christchurch. Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 23rd ed. 2017.	0.010 g/m³	1-4
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) 23rd ed. 2017.	0.002 g/m³	1-4
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D (modified) 4500 NH_3 F (modified) 23rd ed. 2017.	0.10 g/m³	1-4
Dissolved Reactive Phosphorus	Filtered sample from Christchurch. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) 23rd ed. 2017.	0.004 g/m³	1-4

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

	Date	Time (NZST)	Easting	Northing	Depth (m)	Water Temperature (degC)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Oxidation Reduction Potential (mV)
Pond 1	4/2/2019	9:09	1238610	4863455	5.5	13.38	0	0	-116.16
Pond 1 (bottom)	4/2/2019	9:13	1238610	4863455		13.37	0	0	-126.4
Pond 2	4/2/2019	8:36	1238556	4863454	4.5	13.39	1.48	14.15	91.25
Pond 2 (bottom)	4/2/2019	8:47	1238556	4863454		13.33	1.48	14.08	94.99

Comments

In pond 2 (first pond) the lack of oxygen and the negative ORP readings indicate that there may be reducing conditions occuring (denitrification)

pH	Conductivity (microsiemens)	Visual Clarity (200mm disc) Metres visibility	Field Comments
6.97	538.34	0.075	Sample very cloudy. Odour of rotting potatoes. Light to moderate wind.
6.96	537.91		
7.4	496.46	0.15	Sample discoloured (green) no odour. Light to moderate wind
7.33	493.41		

Pond 1

Pond 2.

Safety Data Sheet

HANCROFT
NEW ZEALAND LTD

Section 1: Identification of the Substance and the Supplier.

Product Name:	**HC Protect 800C**
Recommended use:	Sodium Hypochlorite Sanitiser
Company details:	Hancroft New Zealand Ltd.
Address:	PO Box 27009, Shirley Christchurch, New Zealand
Telephone number:	+64 3 386 1853 **Facsimile:** +64 3 386 1856
Email:	customerservice@hancroft.co.nz
Emergency Phone No:	0800 243 622 (*0800 CHEMCALL*) for out of hours advice

Section 2: Hazards identification

HSNO classifications:

8.2 C Causes severe skin burns and eye damage
8.3 A Causes serious eye damage
9.1 C Harmful to aquatic life

Section 3: Information on Ingredients

Components	CAS Number	Proportion
Sodium Hypochlorite	7681-52-9	10-30 % w/v
Water	-	Balance to 100%

Section 4: First Aid Measures

First Aid: Call a Doctor or National Poisons Centre 0800 POISON (0800 764 766) following first aid treatment.

Skin Contact: Rinse skin with plenty of water. Remove contaminated clothing and wash before re-use.

Eye Contact: Rinse with water for several minutes, remove contact lenses if present and easy to do, continue rinsing.
IMMEDIATELY seek medical attention.

Ingestion: Rinse mouth, do **NOT** induce vomiting.
IMMEDIATELY call a POISONS CENTRE or doctor.

Inhalation: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing.

Medical attention and special treatment:
Treat symptomatically. Capable of causing corneal burns

Section 5: Fire Fighting Measures

Hazards from combustion products: Toxic chlorine gas evolves upon heat.
Precautions for fire fighters and special protective equipment: Wear self-contained breathing apparatus and protective clothing when in confined spaces.
Suitable extinguishing media: If fire is in presence of product, use a fine water spray, foam or dry agent.
Hazchem: 2R

Section 6: Accidental Release Methods

Method and materials for containment and clean up: Contain spill with sand or other absorbent material and transfer to plastic drums for approved disposal. Wash away very small spills with water, avoid contamination of waterways.

Section 7: Handling and Storage

Precautions for safe handling: Avoid inhaling any vapours/mists.
Conditions for safe storage: Store separate from foodstuffs and acids. Allow container to vent if required.

Section 8: Exposure controls/Personal protection

Workplace Exposure guidelines:	No exposure standard set. A Decomposition product, Chlorine gas, has: 8hr TWA of 0.5 ppm (1.5 mg/m^3) 15min STEL of 1 ppm (2.9 mg/m^3)
Ventilation specification:	Ensure adequate ventilation. Consider use of respirator if working in confined or unventilated spaces and mists/vapours are generated.
Personal Protective equipment:	Wear protective gloves and eye protection.

Section 9: Physical and Chemical Properties

Physical state:	Liquid
Colour:	Clear Lemon/Pale Yellow
Odour:	Chlorine
Solubility in water:	100%
Specific gravity:	1.2 – 1.3
Flash point (°C):	Not Determined
pH:	1% Solution 12-13

Section 10: Stability and Reactivity

Chemical Stability: Strong Oxidiser. Decomposes on exposure to air. May decompose if exposed to heat or direct sunlight which will cause a loss of available chlorine.

Conditions to avoid: Heat, Acids

Material to avoid: Acids and Reducing agents

Hazardous reactions: Liberation of toxic chlorine gas when exposed to acidic conditions.

Section 11: Toxicological Information

Ingestion: SPECIES: Mouse
ENDPOINT: LD50
VALUE: 5800 mg/kg

Eye contact: Not Determined

Skin contact: Not Determined

Inhalation: INHALATION FORM: Vapours/Mists/Aerosols
REMARK: Inhalation of aerosol may cause lung oedema. The effects may be delayed. Medical observation is indicated. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation is therefore essential.

Long term effects: Not Determined

Section 12: Ecological information

Ecotoxicity: SPECIES: Clupea pallasi Pacific herring
TYPE OF EXPOSURE: Flow through
DURATION: 96 hr
ENDPOINT: LC50
VALUE: 65, 33 - 97 ug/l (= 0.065 mg/l)
REFERENCE SOURCE: Ref No: 5842. Thatcher, T.O. (1978) The Relative Sensitivity of Pacific Northwest Fishes and Invertebrates to Chlorinated Sea Water. In: R.L.Jolley, H.Gorchev, and D.H.Hamilton,Jr.(Eds.), Proc.Second Conf.Water Chlorination, Environ.Impact and Health Effects, Vol.2, Oct.31 to Nov.4, 1977, Gatlinburg, TN :341-350 [ECOTOX]

Bioccumulative: No

Rapidly Degradable: Yes

Section 13: Disposal considerations

Disposal methods: Dispose of the product and packaging at an approved landfill or other approved facility. Avoid contamination of waterways. Do not use container for any other purpose.

Section 14: Transport information

Road and Rail Transport: Classified as a Dangerous Good under NZS 5433:2007 (Transport of Dangerous Goods on Land)

Marine, Air Transport: Similar listing as for Road and Rail Transport apply

UN No.: 1791 **Proper Shipping Name:** Sodium Hypochlorite solution >5%

DG Class(es): 8 **Packing Group:** III **Hazchem:** 2R

Section 15: Regulatory Information

ERMA NZ Approval: HSR 004692 Sodium Hypochlorite >5-25% in a non hazardous diluent

NZFSA Approved (all animal products except dairy) C43

Passed AsureQuality assessment for food/beverage including dairy factory food contact surfaces. **(H2381)**

Section 16: Other information

Disclaimer: This SDS summarises our best knowledge at the date of issue, the chemical health and safety limits of the material and general guidance on how to safely handle the material in the workplace. Since Hancroft New Zealand Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material. If clarification or further information is needed, the user should contact Hancroft New Zealand Ltd

HC Protect 800C

Chlorine Based Disinfectant/Sanitiser

HANCROFT

Product Description and Applications

HC Protect 800C is widely used for sanitising and disinfection of all surfaces in the food, beverage, dairy and meat processing plants. It contains 13% sodium hypochlorite proven to be cost effective in most applications such as spray or CIP sanitising, water treatment, fogging and misting.

Directions for Use

Dilute HC Protect 800C with clean warm/cold water only. Do not mix with other chemicals to preserve germicidal activity. Apply HC Protect 800C solution by clean cloth, spray or soak method. Leave for 1-5 minutes, or longer then if necessary drain and rinse off with potable water.

Food Preparatory Areas:

1. Surfaces must first be cleaned of all soils, then rinse off with water all areas to be sanitised.
2. Dilute 1 part HC Protect 800C with 100-200 parts water or 1-2 ml/litre water (gives 100-200 ppm chlorine). Apply and leave for 1-5 minute contact time
3. Rinse off with clean potable water.

Safety

WARNING: Contains 135g/L **Sodium Hypochlorite. Causes severe skin burns and eye damage.** Harmful if inhaled. Harmful to aquatic life with long lasting effects.
PRECAUTIONS: Read label before use. Keep out of reach of children. Do not breathe mist vapours or spray. Wash hands thoroughly after handling. Avoid release to the environment. Wear protective gloves and eye protection. Store locked up.

FIRST AID – If medical advice is needed have product container or label at hand.
Skin: Flush immediately with large quantities of cold water. remove any contaminated clothing. Wash before reuse.
Ingested: Rinse mouth. **DO NOT** induce vomiting. **Seek medical attention immediately.** Call a doctor or the **National Poisons Centre.**
Inhaled: Remove patient to fresh air and make comfortable. Call National Poisons Centre 0800 764 766 or a doctor/physician if you feel unwell.
Eyes: Rinse cautiously with water for several minutes. Remove contacts if present and easy to do. Continue rinsing then seek medical attention immediately.

National Poisons Centre 0800 764 766 (0800 POISON)

EMERGENCY RESPONSE PROCEDURE
IN CASE OF FIRE: Non-combustible but toxic fumes given off with heating. Use water to cool.
IN CASE OF SPILL: Clean up spill wearing protective equipment. Absorb with sand, soil. Do not return spill to original container or into rubbish bin. Flush spill area with water do not allow water to enter waterways.
DISPOSAL: Dispose of unused material using a waste disposal contractor. Rinse empty containers with water before disposal. Run water into sewer drain only.

Registrations

NZFSA Approved C43 (All animal product except dairy)
Passed AsureQuality assessment for food/beverage including dairy factory food contact surfaces. (H2381)

Hancroft New Zealand Ltd
10 Maurice Stanton Place, Shirley
Christchurch Ph (03)386-1853
24 Hour Emergency Response: Ph 0800 CHEMCALL (0800 243 622)

NEW ZEALAND FOOD SAFETY AUTHORITY

6 April 2009

Hancroft New Zealand Limited
10 Maurice Stanton Place
Shirley
Christchurch

Trade Name: HC Protect 800C
Description: Sanitiser
Code: C 43

Approvals:
This compound is approved for use in premises processing all animal product except dairy, operating under the Animal products Act regime.

This approval is under the following regulations and notices, subject to the conditions stated in this approval:

1. Regulation 11(4)(b) of the Animal Products Regulations 2000 and Regulation 18(4)(b) of the Animal Products (Regulated Control Scheme - Limited Processing Fishing Vessels) Regulations 2001

2. Clause 4(1) of the Animal Products (Specifications for Limited Processing Fishing Vessels) Notice 2005, Clause 3(1) of the Animal Products (Specifications for Products Intended for Human Consumption) Notice 2004, clause 4(1) of the Animal Products (Specifications for Products Intended for Animal Consumption) Notice 2006

Conditions:
1. This may be used as a no-rinse sanitiser on clean hard surfaces in licensed premises which are restricted only to the processing of fish.
2. Before use, all edible product and packaging material must be removed from the room or carefully protected.
3. After use, a rinse with potable water is not required but food contact surfaces must be thoroughly drained to minimise residues.
4. When used as a sanitiser in other licensed premises, surfaces must be thoroughly rinsed with potable water before production starts.
5. This product must always be used at the dilutions recommended by the manufacturer.
This approval may be withdrawn at any time due to unapproved directions for use, or unsatisfactory performance, or any change in product formulation or manufacturer.

The product must be used in accordance with the manufacturer's instructions and specifications. The label may include a statement to the effect that the product is approved for use in premises registered under the Animal Products Act regime. Any statements made, however, must include the approval code and must be limited to the following unless otherwise specified:

NZFSA Approved C 43(All animal product except dairy)

AsureQuality

49 Mahana Road, Te Rapa
Hamilton
PO Box 10222 Te Rapa
Hamilton

Business Group: Proficiency- Programmes
Phone: 64-(0) 7 849 9990
Fax: 64-(0) 7 849 4215
Email:< hutchinsonb@asurequality.com >
http://assessedproducts.asurequality.com/ or google AsureQuality Assessed Products

25/08/09 (replaces n/a new), reference h2381 (cross-ref -), non-regulated, review 25/08/2014 & at any change.

Hancroft New Zealand Ltd,
10 Maurice Stanton Place, Shirley, Christchurch.
Ph 03 386 1853, Fax 03 386 1853. cliff@hancroft.co.nz
Attention Adam Kellerhals or Murray Rowden, Chemist,
cc Tony Rumney, N.Z.F.S.A, PO Box 2835 Wellington (only if requested & regulated farm detergent or sanitiser).

To whom it may concern,
Hancroft NZ Ltd HC PROTECT 800C,

- Which is: sanitiser Chlorine,
- For: food contact surfaces,
- And status: passed assessment (new),

"Passed AsureQuality assessment for food/beverage inc dairy, factory, food contact surface use, with conditions". (This excludes other animal products but may be a recommendation for NZFSA recognition - or for RMP holders).
Conditions:

- General conditions: Used per instructions, & food contact surfaces drained, & (pre)rinsed. Uses as permitted & not prohibited see references.
- **Special conditions: nil.**
- Approval conditions: Subject to notification of change, review within 5 years, inclusion of the approval statement level of contact, and activation by (counter)-signing.

Administration detail:

- " Asurequality assessment is a non-regulated, voluntary, and evidential certification by the supplier, independently confirmed, without prejudice or guarantee, against checklist standards for food safety as shown in the report attached for your verification. It can be used in food/beverage program purchasing. "It excludes NZFSA meat/fish/game specifically regulated approvals & is a recommendation for their specifically legislated farm dairy detergent/sanitiser approval.
- "The purpose of this work is to ensure that when used according to instructions products perform without compromising food safety, protect it when this is part of their function, and they should not have other apparent adverse effects for production.
- Compliance vs HACCP risk standards is via coded identities linked to confidential appendices protected by legislation with a partial list of standards compliant, or used, listed - Animal Prods Act, RMP/PSPs. Quality Manual, Approval System Procedures. Has AQIS cleaner cat 1 General cleaner type A for export meat processing.
- Raw materials listings.
- Chlorine 13% from raw 1 USAFDA21CFR 178.1010 food contact surface sanitiser to 200 mg/kg not necessarily rinsed/dairy USAFDAPMO down to 50 mg/kg. ANZFA 1.3.3.11 potable bottled/process water to 10 mg/kg available. 1.3.3.12 bleaching washing peeling to 1mg/kg in food. NZDWS Chlorine MAC 5mg/kg. EU sanitiser survey list. BS5350, IDF 9101& Bull 288. reference "Block" with biocidal effect of free available Chlorine on various microorganisms

AsureQuality NZ Ltd: .....R B J Hutchinson..... Date: 25/08/09
Signed on original & file

Supplier: ..... Date:.....

Risk Rating (failure/accident)

	Chemical	Microbiological NB efficacy complete.
Incidence	Low	Low (because of effective use of cleaner etc)
Susceptibility	Low	Low –moderate (low prior to pasteurization)
Severity	Low	Low
Total	Low	Low-moderate (because of effectiveness of cleaning) & moderate after pasteurisation

Contents

Evaluation: Note that Standards bolded are vs. submission-responses & yield compliance status in each of the sections belo

Version 1.2 September 2017

Vegetable Washwater
Discharge Code of Practice

1) The requirements for achieving Good Practice

The following checklist, decision tree, and reference values is a self-audit to assist you in determining if your discharge of vegetable washwater meets Good Practice.

The primary contaminants in vegetable washwater is sediment, phosphorus and nitrogen. Disposal of washwater through the soil profile using an infiltration bed is a very effective way of removing suspended sediment and phosphorus. As nitrogen is not well filtered by the soil, levels need to be reduced to less than the receiving environment prior to application though a soil-aquifer treatment system (SAT). If nitrogen levels cannot be lowered enough, then land application to unsaturated soil through an irrigation system may be more appropriate. When applying washwater to land through an irrigation system the required application area is generally determined by the volume of water, not the nitrogen level as is the case for most other agricultural discharges.

Good Practice is to discharge the washwater through an infiltration bed where nutrient levels are low enough or apply the washwater to land through an efficient irrigation system where nutrients can be taken up by the plants. With an irrigated system, winter storage is one of the major considerations.

To meet Good Practice, you need to achieve the conditions in the following checklist.

Further information on vegetable washwater systems can be found in Vegetable Washwater – Literature and Council Policy Review (Barber, Wharfe and Hodgson, 2017), available from HortNZ.

Always aim to improve the environment through Good Practice, rather than just achieving council compliance.

Contact:
Horticulture New Zealand
04 472 3795

This CoP was developed with funding from the Vegetable Research & Innovation Board.

2) Good practice standards and methods

Good Practice – All systems		
Standard	**How achieved**	✓ ✗
Reduce discharge volumes		
Use best practicable methods to reduce the volume of water being discharged.	This includes minimising soil on the harvested produce, monitoring and tracking water use, leak detection, and nozzles attached to end of hoses rather than the tap end. Where possible reuse in a continuous recycling system using filtered and disinfected water.	
Use of sanitisers		
Any sanitisers used in the washing process must have HSNO approval.	Follow the label recommendations, and meet NZS 8409:2004 Management of Agrichemicals.	
Application to land (infiltration or irrigation)		
Remove organic matter from the discharge water.	Reject crop disposal practices, filter.	
Pre-treat discharge water with a sediment trap.	Ensure sediment trap is operating to minimise sediment load and clogging.	
No discharges into surface water from runoff can occur.	The land application system must be setup to ensure that discharged washwater is applied in a way that does not result in runoff to waterways or artificial water courses.	
There is no application within 20m of the landholding boundary, lake, river, modified watercourse, artificial watercourse, ephemeral waterway, the coastal marine area, or natural wetland.	Ensure adequate buffer areas are established.	
There is no application within 20m of residential dwellings.	Ensure adequate buffer areas are established.	
There is no application within 250m of a drinking water supply site.	Ensure adequate buffer areas are established.	
There is adequate storage volume (m^3) for improving water quality or delayed irrigation.	See the storage calculations at the end of this COP.	

Good Practice – Soil-Aquifer Treatment system (SAT) - infiltration bed		
Standard	**How achieved**	✓ ✗
Soil-Aquifer Treatment system (SAT) - Infiltration bed		
Levels of nitrogen concentrations in the final discharge water are less than the receiving environment[1].	Undertake methods to reduce the nitrogen concentrations. See the following Discharge Decision Tree. Test to ensure that the nitrogen levels at the outlet are less than the receiving environment.	
Recordkeeping for evidence of Good Practice		
Record and monitor the discharge system including volumes and concentrations; retain records.	Put in place a monitoring and recording system to track that there are no negative impacts on the receiving environment.	

1. Sediment and phosphorus concentrations are not normally a constraint as there is > 98% removal in the top 1m of soil.

Good Practice – Irrigated land application		
Standard	**How achieved**	✓ ✗
Irrigated land application - Infrastructure and maintenance		
All vegetable washwater discharge is fully contained within the system (pipe work, sumps, and ponds) prior to land application.	Ensure that there are no leaks in the system.	
There are no leaks or discharges to water or land from the storage structure.	This means all storage ponds must be adequately lined.	
The storage system for discharged washwater must have sufficient capacity to store water when soil conditions are unsuitable for application (saturated).	The volume of storage required will vary depending on the volumes discharged in winter, and the soil type. See the storage calculations at the end of this COP.	
Application - Getting the right amount of discharged washwater on the soil at the right time and in the right place		
Application does not occur when soils are saturated and do not have the capacity to fully absorb the discharged washwater.	The guidance is that soils must have greater than a 10mm soil moisture deficit in the top 300mm of soil.	
The application area is large enough to prevent the soils from becoming saturated or exceeding a nitrogen application rate of 150 kgN/ha/year (note water not nitrogen is normally the area determining factor).	See the following Discharge Decision Tree for an example of the required application area.	

Good Practice – Irrigated land application		
Standard	**How achieved**	✓ ✗
Recordkeeping for evidence of Good Practice		
Have a property map.	A property map with the size and unique code of each paddock used for applying washwater.	
Record the soil moisture level.	Soil moisture probes (see possible examples below), physical soil checks and rainfall records can be used to show that irrigation occurred when the soil had adequate capacity for the volume of washwater applied.	
Record irrigation practices.	The date, soil moisture level, field code, area irrigated, and total volume of washwater applied is recorded.	

Topography, rainfall, soil moisture, soil type and drainage all influence the risk of runoff and ponding. Therefore, the soil moisture at the time of irrigation must be checked to ensure there is adequate capacity in the soil to accept the discharged washwater. Good practice is to walk over the irrigation area prior to each application event to check soil moisture conditions. Soil moisture can be checked using soil moisture probes or records of evapotranspiration, rainfall and irrigation events. As a general guide between May and August do not apply irrigation unless there has been 10 days without rain (<2mm).

Five key elements of successful land application systems	✓ ✗
Have sufficient winter storage.	
Know the soil moisture to determine when and how much to irrigate.	
Know and track water volumes and nitrogen application rates.	
Ensure even irrigation.	
Keep a record of your activities and prevailing conditions.	

Possible soil moisture probes:	
	
Quick Draw Tensiometers Approximately $975	**Hand-held time-domain reflectometer (TDR)** Approximately $1,300 - $1,900

3) Vegetable Washwater Discharge Decision Tree

Calculate the volume and key characteristics of the pre-treated discharge.

NEXT

Investigate influent cleaning options:

- Filter organic matter
- Storage (detention time, volatilisation)
- Denitrification / filter beds (carbon source)
- Wetland

Reference values	Influent	After more than 1-month storage
Discharged water (m^3/t)	1.0 – 2.5	-
Sediment (g/m^3)	2,000	70
Nitrogen (g/m^3, ppm)	25	8
E. coli (cfu/100ml)	0.6	-

Can nitrogen concentrations be reduced to less than the receiving environment?

YES → Consider a soil-aquifer treatment system (SAT) using an infiltration bed or application to land without ponding and runoff.

NO

Is irrigating to unsaturated land an option?

NO → Other options include:

- More intensive water treatment (e.g. membrane reactor) followed by SAT
- Collect and supply to a neighbouring landowner with land for irrigation
- Truck it away
- Connect to a sewer – consent may be required
- Obtain a consent to discharge to water

YES

Calculate the irrigation area needed.

NEXT

Calculate the storage volume needed.

NEXT

Processing 2,500 tonnes per year (5,000 m^3)	Disposal area (ha)
Water limit @ 200mm/year	2.5
Nitrogen limit @ 150kgN/ha/year	0.3

Sufficient storage is crucial. You may need 3 months or more storage, at winter discharge rates. Irrigation triggered at 5mm soil moisture deficit.
See the Permitted Activity Rules and Storage document for your regional requirements.

Processing over winter – 600 tonnes (20 m^3/day = 1,200 m^3)	Winter storage 3 months (m^3)
Covered storage	< 1,200
Uncovered storage	2,000

NEXT

How will you manage the land application?

→ Refer to Irrigation NZ guidelines

NEXT

Do you meet the permitted activity conditions in the Regional Plan?

NO → Apply for a resource consent.

YES

Apply discharged washwater to land using good management practices, including keeping records to show how conditions are being met.

→ See the document:
Vegetable Washwater COP – Regional Requirements