



WASTEWATER MANAGEMENT REPORT

**QUEEN CHARLOTTE HOLDINGS LTD
EAST BAY, QUEEN CHARLOTTE SOUND**

**Our Ref: 25972
Date: August 2018**

Our Ref: 25972

30 August 2018

WASTEWATER MANAGEMENT REPORT

QUEEN CHARLOTTE HOLDINGS LTD EAST BAY, QUEEN CHARLOTTE SOUND

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1 **INTRODUCTION**

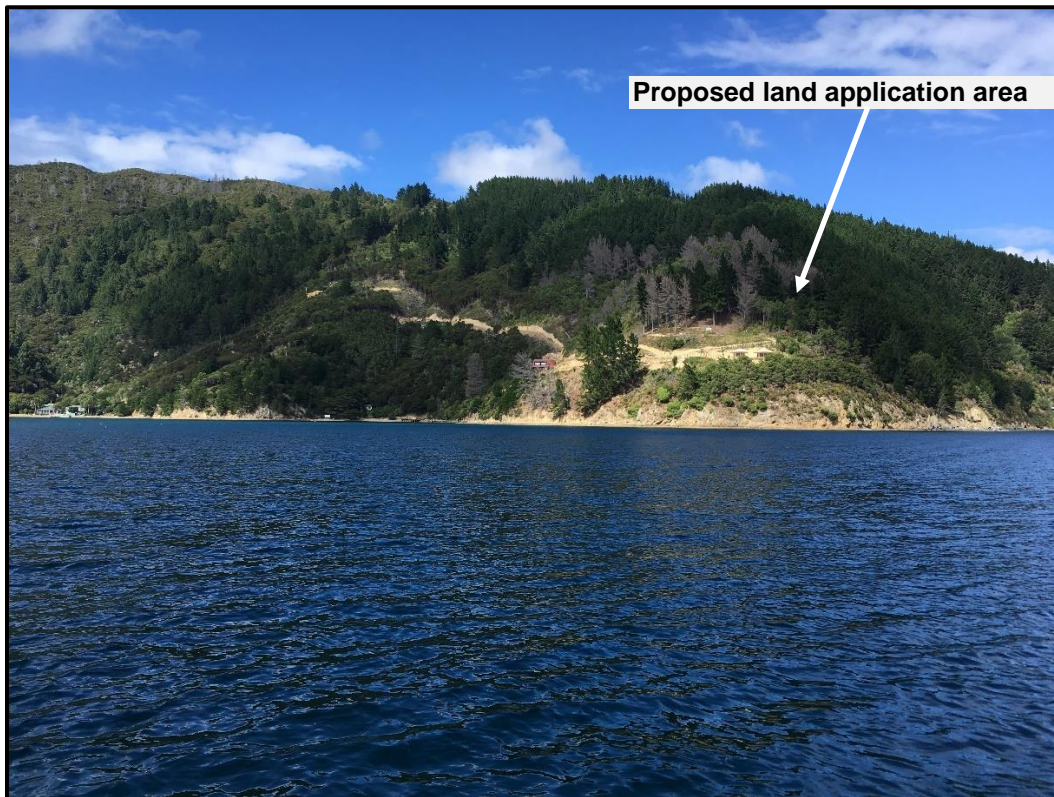
Queen Charlotte Holdings Ltd require a new on-site wastewater management system to serve two permanent two man tents and an existing house.

We have been engaged to assess the site and confirm appropriate wastewater system details for the sustainable discharge of treated domestic wastewater. Our investigation included;

- a general visual inspection
- excavation of test pits to evaluate the soil properties
- an assessment of the potential environmental effects
- a review of previous investigations carried out in this area, and
- site survey work.

2 **SITE DESCRIPTION**

The property is located on a prominent ridge between East and Kahikatea Bays in the Queen Charlotte Sound. The individual lots which are subject to this investigation and development total about 170 Ha in area and comprise of a long well defined ridge running north-south through the central part of the site, dropping off either side to moderate to steep slopes and gullies. The slopes are covered in regenerating native bush.



View from the north east

3 **DESIGN SUMMARY**

• Soil description	Fine Sandy CLAY - Light CLAY
• Ribbon length	40 - 50 and 60 - 70 mm
• Soil category	4 - 5
• Water supply	Spring/creek
• Number of people	6-house (3 bedrooms) 4-tents (2 x 2 person tents)
• Wastewater flow allowance	6 x 150 litres/person/day (house) 4 x 100 litres/person/day (tents)
• Daily load	1,300 litres
• Land application details	
- Method	Drip
- Reduction for slope	20%
- Design Irrigation Rate (DIR)	2.64 mm/day
- Area (min)	500 m ²
• Treatment type	Secondary

4 **INVESTIGATION**

An investigation was carried out in accordance with AS/NZS 1547:2012 'On-Site Domestic Wastewater Management' and the Marlborough District Council 'Guidelines for New On-Site Wastewater Management Systems'. Refer to the site notes in the Appendix.

The moderate, north facing slope, west of the tent sites, is clear of surface water and suitable for a wastewater land application system. The exposure to the sun and wind is excellent, providing good evapotranspiration assistance.

Three test pits were excavated by spade and logged. Refer to the site notes and logs in the Appendix.

The soil profile consisted of 200 mm of topsoil overlying a light brown, dry, stiff, light CLAY at test pit 1, and a fine sandy CLAY at test pits 2 and 3.

The soil had ribbon lengths that varied from 60 - 70 mm at TP 1, and 40 - 50 mm at TP's 2 & 3. The ribbon lengths indicate that the soil is a Category 4 - 5, but tending towards 4.

A 100% reserve area is available.

5 **DESIGN**

5.1 **General**

Any land application system should be kept shallow to make maximum benefit of evapotranspiration and biological activity in the upper soil. The system should also be kept as simple as is practically possible to keep costs and maintenance to a minimum.

5.2 **Loading**

The maximum number of people has been estimated as follows:

- Tents
 - Two tents at 2 people each = 4

The wastewater allowance has been estimated as follows (no laundry facilities):

- A campground type use, no showers (ex AS/NZS 1547, Table H4, roof water) 50
- Showers (limited to 5 minutes at 10 litres/min) 50
100 litres/person/day
- Load = 4 x 100 l/p/day = 400 litres/day
- House
 - 150 litres/person/day based on flow recordings from existing appliances using a spring source.
 - Three bedrooms are equivalent to 6 persons.
 - Load = 6 x 150 l/p/day = 900 litres/day

The daily flow allowance is therefore:

- Tents 400
- House 900
1,300 litres/day

5.3 Land Application System

5.3.1 Assessment of Land Application Options

The following options were reviewed:

a) Primary Treatment to Trenches

This is the most basic system and uses the pipe work and aggregate in the trench to evenly distribute effluent onto the surface of the underlying soil which then provides further treatment before being completely assimilated.

However, we consider that the length of trenches required will be excessive and construction on the steep slopes available will be inappropriate.

b) Primary or Secondary Treatment to Bed

This system has the advantage of reducing the area requirements. However, the slope again precludes the practical construction of this system.

c) Primary Treatment to Low Pressure Effluent Distribution (LPED)

The principle of the LPED is to discharge primary effluent through a small diameter pipe nestled within a larger pipe to evenly distribute into the topsoil for evapotranspiration uptake by the vegetation covering the area.

An LPED system was considered using a DIR of 2.32 mm/day (close to a Cat 4 soil, less 20%). An area of 1,640 m² or a line length of 1,093 m is required at 1.5 m centres. This option has the advantage of using simple, low maintenance primary treatment, but the materials for over 1 km of line and the subsector reticulation and valves required could make it less economic than other methods. This option could be pursued but it is not the preferred one.

f) Secondary Treatment to Drip Irrigation

The principle of the drip irrigation system is irrigation into the topsoil at a low application rate for evapotranspiration uptake by the vegetation covering the area. Use of drip irrigation will require secondary treatment.

A drip irrigation system will require 500 m² or 500 m of drip line, based on a DIR of 2.64 mm/day (3.3 mm/day less 20%) and is considered to be the Best Practicable Option.

All systems will require distribution by pump dose to ensure even loading throughout the whole field.

5.4 Treatment

5.4.1 Assessment of Treatment Options

Secondary treatment systems include aeration, media / textile filters, wetlands, composting or vermiculture.

a) Aeration Wastewater Treatment Systems (AWTS)

Aeration systems perform well with intermittent loading if they are maintained correctly and regularly and are an option for this site.

b) Media/Textile Systems

Media or textile systems require a septic tank and a good ongoing maintenance programme and provide high quality treatment under varying conditions. Although acceptable, they are not the preferred option.

c) Wetlands

Wetlands are an attractive passive environmental treatment system. However, flat area is required and therefore is not suited to this site.

d) Composting Toilet Systems

Composting toilet systems have traditionally only treated the black water and require diligent attendance by the owner. They do not treat the grey water.

e) Vermiculture

A treatment system using worms and humus, has infrequent maintenance requirements (usually annually by the manufacturer), has practically no odours and is compact. It requires a pre-settling chamber to capture the grease and fats.

Despite the increased maintenance demand, the AWTS is cost effective and considered to be the Best Practicable Option in this particular case.

6 INSTALLATION, OPERATION AND MAINTENANCE

Appropriate operation and maintenance of the overall wastewater system is paramount to its performance and a service contract must be in place at the time of commissioning and remain so with the approved service agent. Records of maintenance work should be made available for Council inspection and records.

Davidson Group Ltd has carried out a site investigation and design in accordance with current codes and modern practice. However, the treatment and land application systems are biological (living) processes, and modifications may have to be undertaken to the treatment and/or land application system in some circumstances, such as when there is;

- (a) an increase in design load
- (b) disposal of inappropriate substances to the treatment system
- (c) poor maintenance
- (d) poor workmanship or departure from construction drawings.

We strongly recommend that the homeowner and installer read and note the information included in the Appendix and shown on the drawings to ensure ongoing good practice and maintenance.

7 RISK ASSESSMENT

The following risk assessment follows the guidelines and recommendations in AS/NZS 1547:2012.

- Risk Reduction Measures (Table A1)

Hydraulic Failure

The risk of hydraulic failure will be reduced by good hydraulic design, the use of water conservation fixtures and the use of secondary treatment.

The risk of hydraulic failure will be reduced by the use of pressure dosing within the irrigation field to create an even distribution.

Power Failure

Power is required for distribution.

The proposed system will have a 24-hour reserve storage capacity at full design flow.

Bacteria Washout

The risk of bacteria washout will be mitigated by the low application rate and pressurised (even) distribution.

Dispersive Soils

The soils are not dispersive.

Marginal Soil Conditions

The soils are clays but their low drainage properties are compensated by the good topsoil depth over, excellent exposure to the sun and wind and the drip irrigation type system proposed.

Site Constraints

There are no site constraints.

Rainfall

The annual rainfall is greater than 1,400 mm and there are high rainfall events on occasion. However, there is a good topsoil depth to assimilate stormwater and the slopes will ensure rapid runoff.

Salinisation

No bare ground, salt crystals or salt tolerant plants were found to indicate evidence of salinity.

Highly permeable Soils

The soils are not free draining and there is no permanent water table.

No specific measures are therefore required to reduce the risk of water table contamination.

- Slope (Table M2)

Table M2 recommends a reduction in the DIR for slopes greater than 10% (6°).

A reduction of 20% is considered reasonable.

- Setback Distances (Table R2)

The setback distances have been assessed by way of a weighting analysis (see Appendix) and can be summarised as follows:

Feature	Setback		Comment
	Assessed	Proposed	
Property boundary	21.7 m	50 m	No risk
Building/House	3.7 m	30 m min	No risk
Surface water	58 m	60 m (sea)	No risk
Bore/Well	24 m	N/A	No risk
Recreational areas	8 m	50 m to SFR	No risk
In-ground water tank	8.6 m	No in ground tank	No risk
Retaining wall cut within 3 m or 45°	-	None within 3m or 45°	No risk
Ground water	900 mm	No ground water	No risk
Hardpan/Bedrock	800 mm	>1500 mm	No risk

8 REFERENCES

Crites, R and Tchobanoglous, A (1998). 'Small and Decentralized Wastewater Management Systems'.

ARC Environment, Technical Paper No. 58, Third Edition 'On-Site Wastewater Disposal from Households and Institutions'.

AS/NZS 1546.1:2008 'On-Site Domestic Wastewater Treatment Units, Part 1: Septic Tanks.

AS/NZS 1547:2012 'On-Site Domestic Wastewater Management'.

MDC (11 July 2005) 'Guidelines for New On-Site Wastewater Management Systems'.

Marlborough Sounds Resource Management Plan.

Marlborough Environment Plan.

Centre for Environment Training 'On-Site Wastewater Management Training Course', Christchurch 2001.

Davidson Group Ltd, 10 May 2017, 'Engineering Report for Queen Charlotte Holdings Ltd'.

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W L McGlynn

WLM: LW

APPENDIX

- A1.** Field Assessment Report
- A2.** Setback Risk Assessment Analysis
- A3.** Owner & Installer Guidelines
- A4.** Drawings 25972 sheets;
 - R1 Locality and Site Plans



FIELD ASSESSMENT REPORT
Queen Charlotte Holdings Ltd
East Bay

Job No
Name
Date

25972
 WLM
 30-May-16

REFS : 1 MDC, 11.07.05 "Guidelines for new on-site wastewater management systems"
 2 AS/NZS 1547:2012 "On Site Domestic Wastewater Management"

1 Soil log (depth from surface in mm)

Test Pit No.					
1		2		3	
200	Topsoil	200	Topsoil	200	Topsoil
	Light brown, dry, stiff, friable, light CLAY		Light brown, dry, stiff, friable, fine sandyCLAY		Light brown, dry, stiff, friable, fine sandyCLAY
400		400		400	
none		none		none	
60-70		40		45-50	
high		high		high	
5		4		4	
high					
high					
sea					
35 m					
no					
no					
no					
no					
no water table					
pines and regenerating natives					
young regenerating natives					
no					
septic/trench					
1 km					
unknown					
yes					
roof					
yes					
will suit irrigation LAA. Secondary treatment best. So secondary to drip probably best					

2 Coarse Fragments (size / abundance)

3 Ribbon Length (mm)

4 Soil Structure (Pedal Content)

5 Soil Category (1 - 6)

6 Site Exposure to
 - sun
 - wind

7 Nearby Water Bodies ?
 - Separation Distance ?

8 Nearby Wells ?
 - Separation Distance ?

9 Runoff To Be Controlled ?

10 Ground Water To Be Controlled ?

11 Any Stability Considerations ?

12 Depth to Water Table

13 Vegetation Cover Existing ?
 - Proposed ?

14 Gravity Head to Proposed Disposal Field


15 Existing Systems Nearby
 - type
 - proximity
 - perform'ce

16 Reserve Area Available ?

17 Intended Water Supply

18 Power Available?

19 Other Comments ?

			SETBACK RISK ASSESSMENT re : AS/NZS 1547:2012, TABLE R1 (Weighted Assessment)				Job No	25972	
				Queen Charlotte Holdings Ltd East Bat, Queen Charlotte Sound				Name	LM
								Date	18.08.16
SITE FEATURE	SETBACK(m)		SITE CONSTRT ITEM	SCORE (0 - 4) low-best high-worst	WEIGHTED SETBACK (m)	COMMENTS		TP 58	
	min	max							
Property	1.5	50.0	A	1	21.7	The effluent is secondary treated	1.5 m		
Boundary			D	3		> 30% , mod risk of off site export but no gw and mod environmental value			
			J	1		sub surface application method			
			TOTAL	5					
Building/ houses	2.0	6.0	A	1	3.7	The effluent is secondary treated	1.5-3.0 m		
			D	3		> 30% , mod risk of off site export but no gw and mod environmental value			
			J	1		sub surface application method			
			TOTAL	5					
Surface water	15.0	100.0	A	1	57.9	The effluent is secondary treated	5-20 m		
			B	3		Cat 4-5 soil. The nearest surface water is 30 m away, downgradient			
			D	3		> 30% , mod risk of off site export but no gw and mod environmental value			
			E	3		Up gradient from sea and recreational area			
			F	1		Cat 4-5 soil, no groundwater, low pollution haz			
			G	0		No flooding risk			
			J	1		sub surface application method			
			TOTAL	12					
Bore, well	15.0	50.0	A	1	23.8	The effluent is secondary treated	10-20 m		
			C	1		Cat 4-5 soil and no groundwater			
			H	1		Cat 4-5 soil, no groundwater pollution risk			
			J	1		sub surface application method			
			TOTAL	4					
Recreatnl areas	3	15	A	1	8.0	The effluent is secondary treated			
			E	3		Up gradient from sea and recreational area			
			J	1		sub surface application method			
			TOTAL	5					
In-ground water tank	4	15	A	1	8.6	The effluent is secondary treated			
			E	3		Up gradient from sea and recreational area			
			J	1		sub surface application method			
			TOTAL	5					
Ret. wall, embankm, escarpmt, cuttings	3 or > 45°		D			> 30% , mod risk of off site export but no gw and mod environmental value	3 m		
			G			No flooding risk			
			H			Cat 4-5 soil, no groundwater pollution risk			
						nothing within 3 m			
Ground water	0.6	1.5	A	1	0.9	The effluent is secondary treated	0.6-1.5 m		
			C	1		Cat 4-5 soil and no groundwater			
			F	1		Cat 4-5 soil, no groundwater, low pollution haz			
			H	1		Cat 4-5 soil, no groundwater pollution risk			
			I	2		Even but steep slope, no concentration of surface waters			
			J	1		sub surface application method			
			TOTAL	7					
Hardpan, bedrock	0.5	1.5	A	1	0.8	The effluent is secondary treated			
			C	1		Cat 4-5 soil and no groundwater			
			J	1		sub surface application method			
			TOTAL	3					

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GUIDELINES FOR INSTALLERS OF ON-SITE DOMESTIC WASTEWATER MANAGEMENT SYSTEMS

References

AS/NZS 1546.1:2008 'On-Site Domestic Wastewater Treatment Units, Part 1: Septic Tanks'
AS/NZS 1547:2000 'On-Site Wastewater Management'

1. GENERAL

- (a) All products and construction shall be in accordance with the relevant standards and in general the best trade practices shall prevail. If there are any questions about any aspect of the work, please contact Council in the first instance.
- (b) The Contractor shall act to protect the health and safety of staff and private persons at all times.
- (c) The Contractor must be aware of the inspection requirements of Council and/or the Engineer and the need to provide As-Built locations of the treatment and land application systems to Council and the Owner.
- (d) The Contractor should also educate the Owner about the functioning of their system, especially the maintenance requirements, and where appropriate put in place a maintenance contract for systems which rely on mechanical action in order to function properly.

2. LOCATION OF TREATMENT AND DISTRIBUTION SYSTEMS AND LAND APPLICATION AREAS

- (a) All tanks and the land application area shall be located clear of structures to avoid the undermining of foundations. In general, a minimum clearance of 3.0 metres should be adequate but if in doubt check with Council or an Engineer.
- (b) The Contractor must be aware of the required separation distances of tanks and/or the land application area to surface water (ponds, water courses and drainage paths), wells and/or boundaries.
- (c) Treatment systems should be sited with consideration for access by desludging trucks.

3. GOOD CONSTRUCTION TECHNIQUE

(a) Treatment and Distribution Systems

- (i) When working with existing systems or carrying out maintenance tasks, measures shall be in place to ensure staff are adequately protected from contact with wastewater.
- (ii) All tanks located in areas where high seasonal groundwater levels are known to occur shall be weighted down or provided with anchorage in accordance with clause 3.2.2 of AS/NZS 1546.1:2008.

- (iii) The Contractor shall allow to carry out any treated effluent testing required by Council. Samples should be taken once the system has been in operation for approximately three months. In a holiday home situation, testing should be done in January.
- (iv) All pump chambers shall be vented. The commissioning of pumped distribution systems shall consist of at least the following:
 - A check of pump out and emergency storage volumes (reserve capacity equivalent to the peak daily flow should be provided).
 - Three drawdown tests.
 - Testing of the operation of controls and alarms.
 - Checking of uniform flow throughout any pressurised distribution network prior to covering over.

(b) Land Application Area

The following excavation techniques shall be observed so as to minimise the risk of damage to the soil.

- (i) Plan to excavate only when the weather is fine. Pudding, where washed clay settles on the base of the trench to form a relatively impermeable layer, must be avoided.
- (ii) Avoid excavation when the soil has a moisture content above the plastic limit. This can be tested by seeing if the soil forms a “wire” when rolled between the palms.
- (iii) During wet seasons or when construction cannot be delayed until the weather becomes fine, smeared soil (smooth) surfaces should be raked to reinstate a more natural soil surface taking care to use fine tines and only at the surface.
- (iv) When excavating by machine, fit the bucket with “raker teeth” if possible, and excavate in small “bites” to minimise compaction.
- (v) Avoid compaction by keeping people off the finished trench or bed floor.

In particular for trenches and beds:

- (vi) If rain is forecast, cover any open trenches to protect them from rain damage.
- (vii) Excavate perpendicular to the line of fall or parallel to the contour levels.
- (viii) Ensure that the inverts are horizontal or sloped at not more than 1 in 200.

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HOW TO GET THE BEST FROM YOUR ON-SITE WASTEWATER MANAGEMENT SYSTEM

Helpful Information for Homeowners/Occupiers

1. GOOD HOUSEHOLD PRACTICES

- (a) Reduce solids disposal to treatment tanks as much as possible including food scraps, fats, grease etc. Scrape all dishes before washing and do not install a waste disposal unit unless the wastewater system has been specifically designed to carry the extra load.
- (b) Do not put any of the following down sinks, drains or the toilet.
 - (i) Oil/grease from e.g. a deep fryer;
 - (ii) Stormwater and any drainage other than wastewater generated in the house;
 - (iii) Petrol, oil and other flammable/explosive substances;
 - (iv) Household, garden, garage and workshop chemicals (e.g. pesticides, paint cleaners, photographic chemicals, motor oil and trade waste);
 - (v) Disposable nappies and sanitary napkins.
- (c) In order to keep the bacteria working in the tank and in the land application area:
 - (i) Use biodegradable soaps;
 - (ii) Use a low-phosphorus detergent;
 - (iii) Use a low-sodium detergent in the dispersive soil areas;
 - (iv) Use detergents in the recommended quantities;
 - (v) Do not use powerful bleaches, whiteners, nappy soakers, spot removers and disinfectants including cold water washing products.
 - (vi) Do not put chemicals or paint down the drain.
- (d) Conserve water. Less water means a lower load on the treatment system and land application area, with ensuing improved and more reliable performance. Conservation measures include:
 - (i) Installation of water-conservation fittings such as low water use toilets, spray taps and water saving automatic washing machines;
 - (ii) Taking showers instead of baths;
 - (iii) Only putting the dishwasher or washing machine on when there is a full load.
- (e) Space washing machine and dishwasher use out to avoid overloading the wastewater system. Try not to do a large amount of washing in any one day and avoid running the washing machine and dishwasher at the same time.

- (f) For the physical protection of treatment and land application systems:
 - (i) The treatment unit must be protected from vehicles;
 - (ii) Pedestrian traffic routes should not cross effluent field areas;
 - (iii) No vehicles or heavy stock should be allowed on effluent fields;
 - (iv) Deep rooting trees or shrubs should not be grown over absorption trenches or beds.

2. **MAINTENANCE**

(a) **General**

The appropriate maintenance of your treatment and land application systems will be the key to their effective and reliable performance. Please contact a drainlayer or Council if you are unsure about anything or require further advice.

(b) **Septic Tanks**

Any septic tank (primary wastewater treatment unit) will need to:

- (i) Be cleaned out regularly i.e. every three to five years or when scum and sludge occupy two thirds of the volume of the tank (or first stage of a two-stage system). All scum, sludge and septage material must be disposed of in an approved manner. Pump chambers should be cleaned out at the same time if necessary;
- (ii) Have grease traps cleaned out regularly (typically three monthly or as required);
- (iii) Keep the access cover of the septic tank exposed;
- (iv) Have any outlet filter inspected and cleaned, normally at the same time as septic tank cleaning. Remove the cartridge and rinse off with a garden hose, being careful to rinse all septage material back into the tank. It is not necessary that the cartridge be cleaned "spotless". The biomass growing on the filter aids in the pre-treatment process and should be left on the cartridge.

(c) **Secondary Treatment Systems**

Improved treatment systems, such as aerated plants or media systems, require specialist maintenance and must be looked after under a maintenance contract. Owners should ensure that they are aware of the manufacturers/suppliers recommended maintenance intervals and that a contract is in place for routine checks of mechanical components.

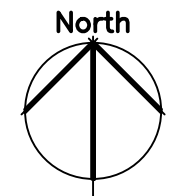
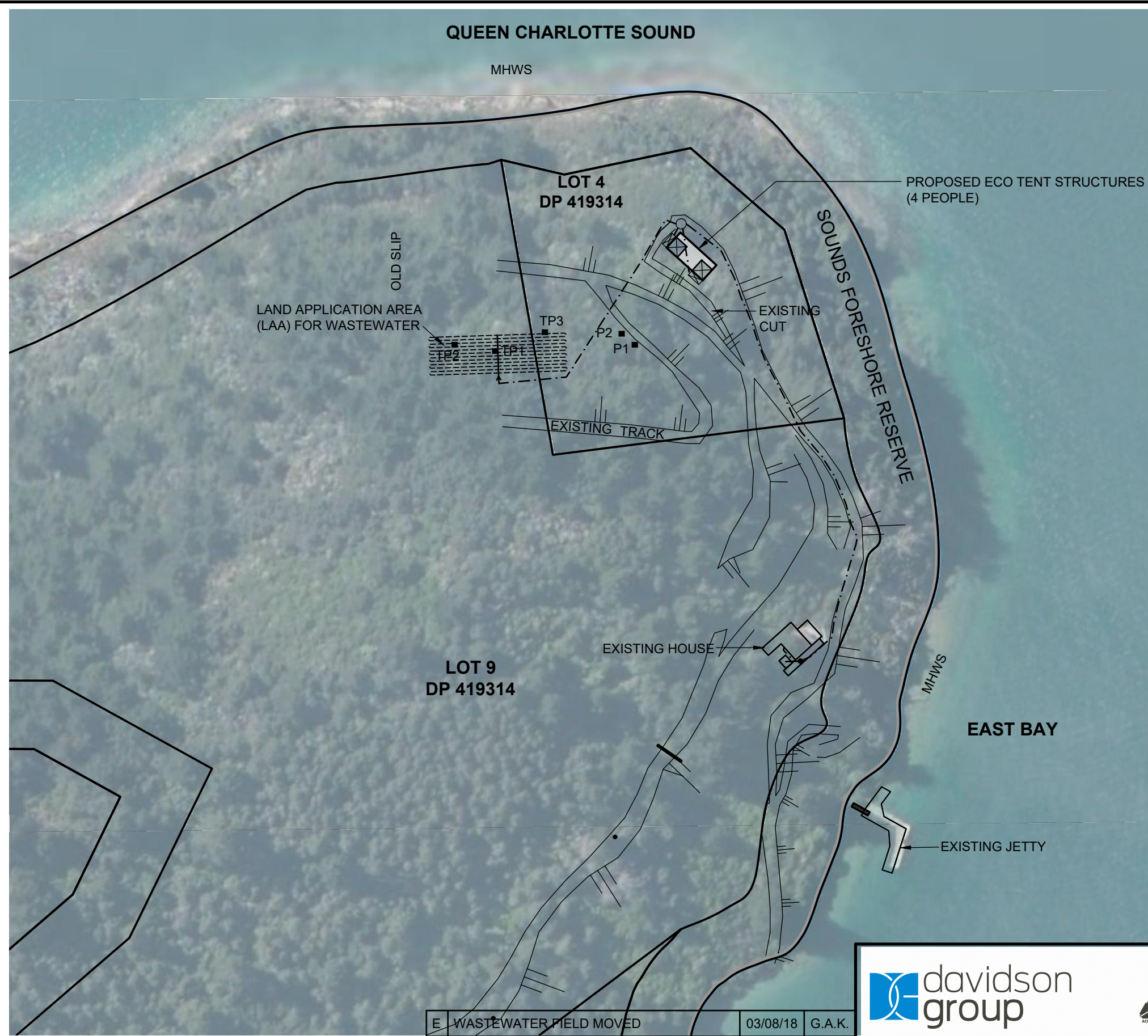
These systems will typically have a primary treatment stage which should be treated as in (b) above.

(d) **Effluent Field**

Reliable performance from your effluent field (including shallow trenches or beds, drip or LPED irrigation fields) will be aided by regular attention including one or more of the following depending on the type of system:

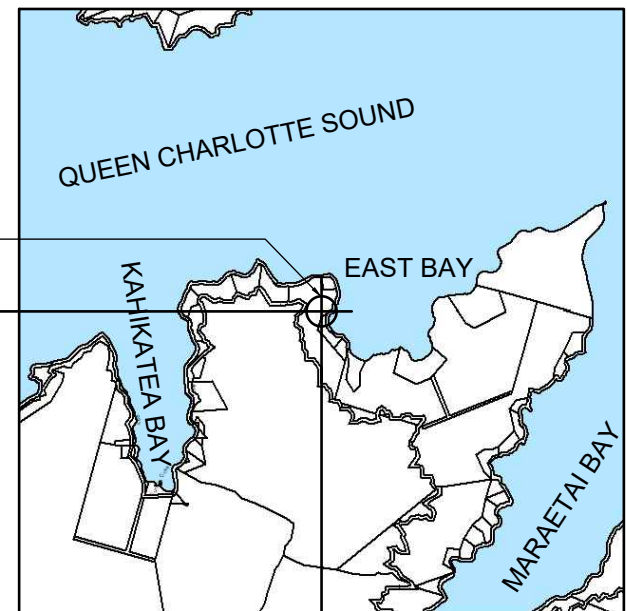
- (i) Keep any surface water diversion drains upslope of and around the land application area clear to reduce absorption of rainwater into trenches or beds;
- (ii) Evapotranspiration and irrigation areas should have their vegetation maintained to ensure that these areas take up nutrients with maximum efficiency;
- (iii) Ensure pumps, alarms and sequencing valves are operating correctly;
- (iv) Clean disc filters or filter screens on irrigation-dosing equipment periodically by rinsing back into the primary wastewater treatment unit;

- (v) Irrigation systems which discharge wastewater that has only been treated by a septic tank and filter (i.e. LPED systems), must be flushed through with clean water before and after any significant period of non-use.
- (vi) Regular maintenance of the treatment system (as per manufacturers recommendations), especially for aerated and media-type systems.



THE SITE

5434113mN



LOCALITY PLAN (NZTM)
1:50000

LEGEND	
	INACTIVE SCARP
	TOP OF SLOPE
	TP1 TEST PIT
	P2 PENITROMETER TEST

SITE PLAN
1:1250 (A3)

E	WASTEWATER FIELD MOVED	03/08/18	G.A.K.
D	REVISION TO SMALLER SCALE	12/02/18	G.A.K.
C	CHALET SITE AREA	13/12/16	R.B.M.
B	ADDITIONAL CHALET SITES	01/12/16	R.B.M.
	REVISION	DATE	BY



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QUEEN CHARLOTTE HOLDINGS LTD,
EAST BAY, QUEEN CHARLOTTE SOUND
ENGINEERING ASSESSMENT FOR BUILDING SITES

site and location plans

DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
07/16	A3	25972	R1	E
DES L.M	DRN DS RM	CK	REF	

0mm

100mm

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