# 1861 ONGAROTO ROAD
# WHAKAMARU

## Preliminary On-Site Wastewater Land Disposal Assessment and Treatment Recommendations for a Proposed Rural-Residential Development

For Jonathan Quigley

30 August 2022
Our Ref. 4721

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4721

# PRELIMINARY
# ON-SITE WASTEWATER LAND DISPOSAL ASSESSMENT & TREATMENT RECOMMENDATIONS FOR A PROPOSED RURAL RESIDENTIAL DEVELOPMENT AT 1861 ONGAROTO ROAD, WHAKAMARU.

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# TABLE OF CONTENTS

## 1. Executive Summary

This report describes a preliminary on-site wastewater treatment and land disposal assessment for a proposed rural-residential development (circa 55 lots) at 1861 Ongaroto Road, Whakamaru.

Soil conditions across the site indicate the presence of a minimum of category 3 soils (AS/NZS1547:2012), and these are favourable to support on-site wastewater land disposal, by either primary treatment (septic tanks) and conventional trench or bed disposal systems, or by secondary treatment (aerated systems) and pressure compensating dripper irrigation.

Where any proposed primary and reserve disposal areas are located on sloping land greater than 8.5°, secondary treatment and dripper irrigation disposal will be required.

Design peak daily septic wastewater production for the potential future residential lots is assessed to be up to 1,080 litres per day based on a 4 bedroom dwelling per lot having a 6 person occupancy, and roof water collection and tank supply. Specific design will be required when specific development plans are available.

Due to the variability in soil conditions and slope angles across the site, along with the potential changes in soil conditions due to stump removal and earthworks, specific design will be required at the time of building consent application.

Primary treatment systems:

a) Treatment: We recommend a minimum septic tank volume of 4,500 litres with each tank to be fitted with an effluent outlet filter.
b) Land Disposal: We recommend conventional beds or trenches are loaded at a maximum basal loading rate of 15 mm/day.

Secondary treatment systems:

a. Treatment: Where secondary treatment is required we recommend on-site wastewater treatment comprise one of the following systems capable of producing at least secondary standard treated effluent suitable for land disposal: AdvanTex AX20 Recirculating Textile Filter or Hynds Lifestyle Advanced aerated treatment system or Biolytix BioPod BF6 wastewater treatment system.

b. Land Disposal: We recommend irrigation of treated effluent onto or into the ground within the proposed primary land disposal area by pressure-compensating irrigation lines dose loaded at an areal loading rate of up to 4.0 litres/$m^2$/day (4.0mm/day).

Based on the above, we have calculated that for primary treatment systems an area of at least 456$m^2$ (Primary and reserve disposal area) is required per lot while for secondary treatment systems the total area required per lot is 540$m^2$. Area must also be set aside for the tanks and treatment system and setback requirements from boundaries and buildings. All disposal areas must meet the required setback distances from property boundaries and dwellings.

We have determined that as long as the lot sizes remain above 2,500$m^2$ the proposed subdivision will create lots where discharge of treated effluent is considered a Permitted Activity under either rule 3.5.7.5 (primary treatment/septic tanks) or rule 3.5.7.6 (secondary treatment) of the Waikato Regional Plan.

The establishment of a rural-residential development on a property which to date has been utilised as production forest and farmland raises the issue of the cumulative effects of the on-site wastewater discharges. In this instance the cumulative effects are not considered to be of significant concern, due to the baseline set by the relevant permitted activities of the Waikato Regional Plan. As long as lot sizes remain greater than 2,500$m^2$ the proposal effectively remains within the level of effects which would be permitted, similarly to remaining within a benchmark. The conversion of production forestry to residential land represents a potential reduction in nitrogen discharge of over 50%.

Overall, given the soil conditions encountered, and the proposed lot sizes, the private plan change and further rural-residential development of the site is expected to be well supported by individual on-site wastewater treatment and land disposal systems.

## 2. Introduction

As requested, we have undertaken a preliminary on-site wastewater treatment and land disposal assessment for a proposed rural-residential development at 1861 Ongaroto Road, Whakamaru. This report does not contain specific design information on wastewater system design to support any resource consent or building consent application.

Our brief and objectives, were to provide the following:

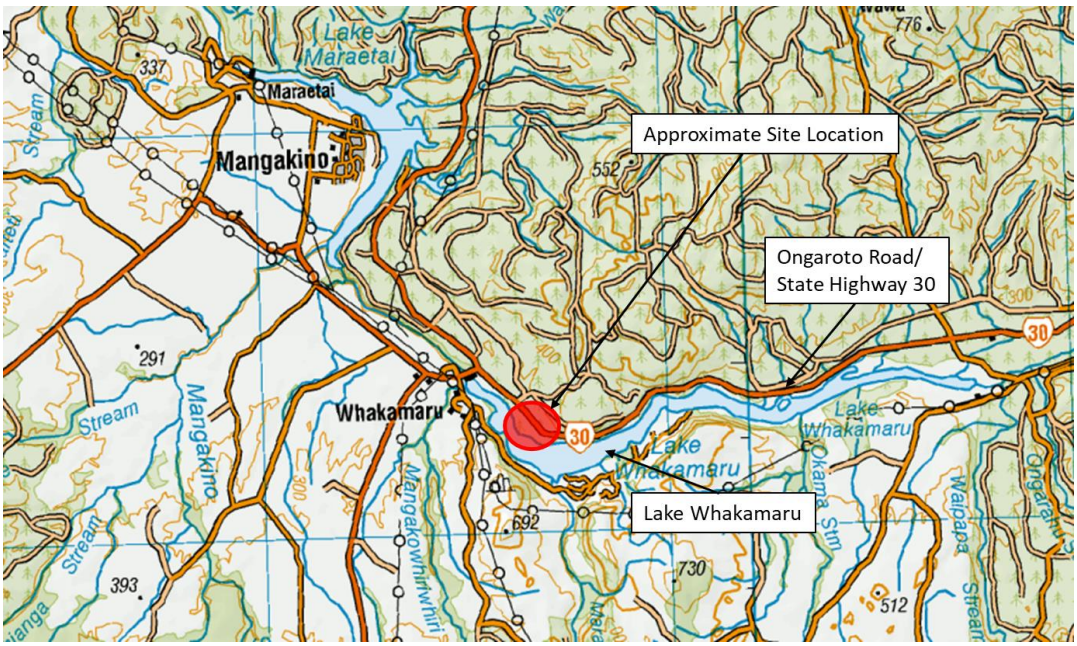
1. Assess design peak daily wastewater production, both per lot and in total, for the proposed development based on the potential development plan provided.
2. Review wastewater treatment options and provide recommendations, both for individual on-site systems (if conditions allow) and a decentralised system.
3. Assess the treated effluent standard required for land discharge based on the irrigation method and environmental and public health risks.
4. Assess land disposal area requirements for irrigation of treated effluent and confirm most appropriate irrigation method.
5. Determine land area requirements for primary and & reserve land disposal areas.
6. Provide a preliminary assessment of effects on the environment.
7. Provide general policy advice with respect to on-site wastewater.

## 3. Proposed Development

This report is to support a private plan change application, to change the zone of the site from Rural, to Rural-Residential. Following a successful plan change process, the proposal is to subdivide the property at 1861 Ongaroto Road, Whakamaru into approximately 55 rural-residential lots of at least 2,500m$^2$ each. Other land may be vested as reserve in SWDC.. The site is not serviced with any three waters infrastructure.

## 4. Site Description

The property is located at Ongaroto Road (State Highway 30), Whakamaru, and is legally described as Lot 9 Deposited Plan 425239 and Part Lot 1 Deposited Plan 24479, with an approximate total area of 31.6749ha (316,749m$^2$). The property is roughly rectangular in shape and is located on the south-western side of Ongaroto Road and on the northern shore of Lake Whakamaru. The approximate location of the property is shown on the **Location Map** below.




**Location Map**
**Ongaroto Road**

The property was previously established as a pine tree plantation, and has been logged. The site has not yet been cleared of tree stumps, apart from at the south-eastern end, and as a result comprises hummocky terrain. The site is accessed by a gravel-surfaced narrow road at the north-western end of the site, which also currently provides access to the Lake Whakamaru reserve on the foreshore (Figure 1).

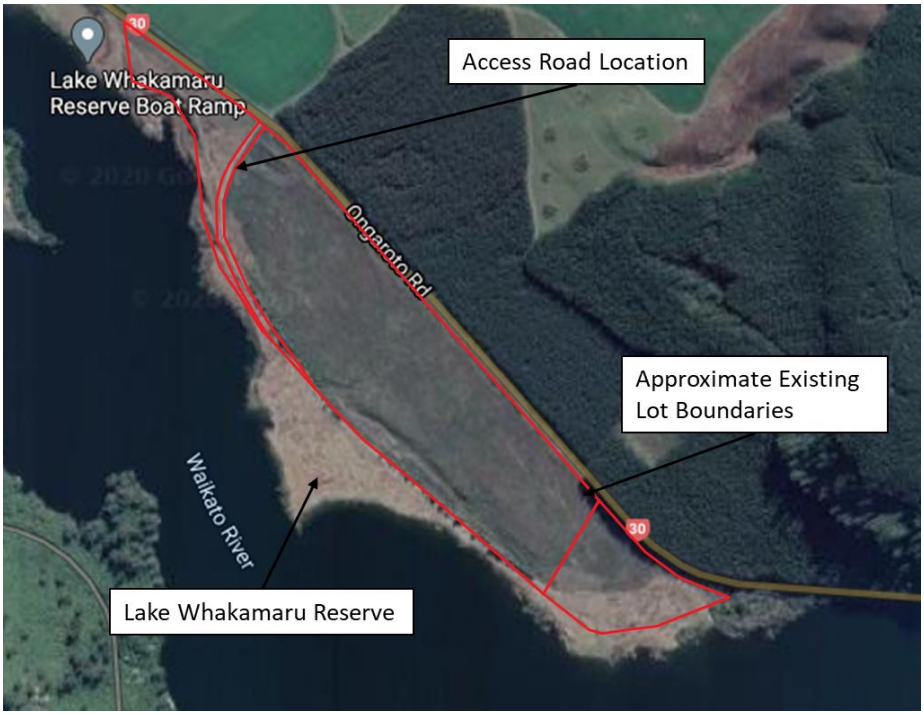



**Figure 1**
**Aerial View of Ongaroto Road and Approximate Lot Boundaries**

In general, slopes descend gently to moderately at approximately 7° to 10° through the property from Ongaroto Road to the southwest, for approximately 150-200 metres (see Figure 2). Slopes then steepen to 14° to 20° with localised areas of up to 30° degrees representing a previous river terrace bank (Figures 3 and 4). At the base of the steep slopes the ground surface flattens out and extends to the Lake shore, which is approximately 35 metres lower in elevation than the highest elevation within the site. In the southern part of the site slopes turn to the south and south-east.

**Figure 2: General view to the south west over the upper slopes**

**Figure 3: View to the north showing the slope break and access road.**

**Figure 4: View of steep slopes at the slope break**

The approximate location of site features is shown on the attached Site Plan, Drawing No. 4721-1-2022. This drawing is based on a plan prepared and provided by CKL Ltd. and we have adopted this plan for our use.

## 5. Geology

Reference to GNS Science web maps indicates the property is which indicates that the site is underlain by Hinuera Formation comprising cross-bedded pumice sand, silt and gravel alluvium with interbedded peat belonging to the Tauranga Group of Holocene age.

Materials observed in our boreholes are interpreted to comprise a surficial veneer of residually weathered remnants of the Tauranga Group overlying tephra deposits of the Ongaroto Group.

## 6. Site Investigation

Soils investigations were carried out on the 26th November 2020 under late spring conditions. Investigations comprised a comprehensive walkover assessment of the site and the drilling of representative 50mm diameter hand auger boreholes across the site.

A total of 10 boreholes (EF1 to EF10) were drilled to a maximum depth of 2.2 metres in order to assess soil texture, depth to limiting horizons and shallow groundwater table, if present, within the site, to provide representative information regarding wastewater land disposal. The approximate locations of the boreholes are shown on the appended Site Plan Drawing No. 4721-1. Borehole intersections are summarised in Table 1 below and detailed in the following hand auger borehole soil logs.

The soils assessment has been undertaken with reference to the Australian/New Zealand Standard 1547:2012 On-site domestic wastewater management.

**Table 1**
**BOREHOLE SOIL HORIZON INTERSECTION SUMMARY**

| Borehole Number | Total Depth (metres) | Depth of Topsoil (metres) | Groundwater Depth (metres from surface) |
|---|---|---|---|
| **EF 1** | 1.20 | 0.00 | Dry |
| **EF 2** | 1.20 | 0.00 | Dry |
| **EF 3** | 1.90 | 0.05 | Dry |
| **EF 4** | 2.20 | 0.05 | Dry |
| **EF 5** | 1.20 | 0.05 | Dry |
| **EF 6** | 1.20 | 0.00 | Dry |
| **EF 7** | 1.20 | 0.10 | Dry |
| **EF 8** | 1.20 | 0.45 | Dry |
| **EF 9** | 1.20 | 0.05 | Dry |
| **EF 10** | 1.20 | 0.40 | Dry |
| **Boreholes drilled on the 26th November 2020** | | | |

### 6.1 Soil Descriptions

All soils were assessed by an Engineering Geologist and categorised according to the methodology set out in AS/NZS 1547:2012. Borehole intersections within the proposed wastewater land disposal areas are summarised as follows.

**EF1**

| DEPTH (mm) | SOIL TYPE | SOIL CATEGORY |
|---|---|---|
| **0 – 400** | **SILT**, trace sand, non-plastic, loose, light orange-brown, dry-moist. @300mm black fragments. | **3-4** |
| **400 - 550** | **Gravelly and sandy SILT**, non- plastic, dry-moist, pumice fragments and gravels up to 10mm diameter, light brown. | **2-3** |
| **550 – 1,200** | **SILT,** non- plastic, moist, dark orange-brown. | **3** |
| | **TOTAL DEPTH 1,200mm** | **Groundwater Dry** |

**EF2**

| DEPTH (mm) | SOIL TYPE | SOIL CATEGORY |
|---|---|---|
| **0 – 1,200** | **Gravelly and sandy SILT**, non- plastic, dry-moist, pumice and rock fragments and gravels up to 5mm diameter, light orange-brown, becoming grey brown from 600mm | **2-3** |
| | **TOTAL DEPTH 1,200mm** | **Groundwater Dry** |

**EF 3**

| DEPTH (mm) | SOIL TYPE | SOIL CATEGORY |
|---|---|---|
| **0 – 50** | **TOPSOIL –Organic Silt**, moist, non-plastic, brown. | **4** |
| **50– 350** | **SILT,** non- plastic, moist, light orange-brown. | **3** |
| **350 – 600** | **Gravelly and sandy SILT**, non- plastic, dry-moist, pumice fragments and gravels up to 13mm diameter, light yellow and grey brown. | **2-3** |
| **600 – 1,900** | **SILT,** non- plastic, dry-moist, dark red-brown, @700,, becomes light orange brown, moisture increasing with depth, unable to drill beyond 1,900mm. | **3** |
| | **TOTAL DEPTH 1,900mm** | **Groundwater Dry** |

**EF4**

| DEPTH (mm) | SOIL TYPE | SOIL CATEGORY |
|---|---|---|
| **0 – 50** | **TOPSOIL –Organic Silt**, moist, non-plastic, brown. | **4** |
| **50 - 620** | **Gravelly and sandy SILT**, non- plastic, dry-moist, pumice fragments and gravels up to 10mm diameter, light brown. | **2-3** |
| **620 – 2,200** | **SILT,** non- plastic, moist, dark orange-brown. | **3** |
| | **TOTAL DEPTH 2,200mm** | **Groundwater Dry** |

**EF5**

| DEPTH (mm) | SOIL TYPE | SOIL CATEGORY |
|---|---|---|
| **0 – 50** | **TOPSOIL –Organic Silt**, moist, non-plastic, brown. | **4** |
| **50 – 1,200** | **SILT,** non- plastic, moist, dark orange-brown. | **3** |
| | **TOTAL DEPTH 1,200mm** | **Groundwater Dry** |

**EF6**

| DEPTH (mm) | SOIL TYPE | SOIL CATEGORY |
|---|---|---|
| 0 – 1,200 | **Gravelly and sandy SILT**, non- plastic, dry-moist, pumice and rock fragments and gravels up to 5mm diameter, light orange-brown, becoming grey brown from 600mm | 2-3 |
| | **TOTAL DEPTH 1,200mm** | **Groundwater Dry** |

**EF7**

| DEPTH (mm) | SOIL TYPE | SOIL CATEGORY |
|---|---|---|
| 0 – 100 | **TOPSOIL –Organic Silt**, moist, non-plastic, brown. | 4 |
| 100 – 1,200 | **SILT,** non- plastic, moist, dark orange-brown. | 3 |
| | **TOTAL DEPTH 1,200mm** | **Groundwater Dry** |

**EF8**

| DEPTH (mm) | SOIL TYPE | SOIL CATEGORY |
|---|---|---|
| 0 – 450 | **TOPSOIL –Organic Silt**, moist, non-plastic, brown. | 4 |
| 450 - 550 | **Gravelly and sandy SILT**, non- plastic, dry-moist, pumice fragments and gravels up to 10mm diameter, light brown. | 2-3 |
| 550 – 750 | **SILT,** non- plastic, moist, dark orange-brown. | 3 |
| 750 – 1,000 | **Gravelly and sandy SILT**, non- plastic, dry-moist, pumice fragments and gravels up to 10mm diameter, light brown. | 2-3 |
| 1,000 – 1,200 | **SILT,** non- plastic, moist, dark orange-brown. | 3 |
| | **TOTAL DEPTH 1,200mm** | **Groundwater Dry** |

**EF9**

| DEPTH (mm) | SOIL TYPE | SOIL CATEGORY |
|---|---|---|
| 0 – 50 | **TOPSOIL –Organic Silt**, moist, non-plastic, brown. | 4 |
| 50 - 400 | **Gravelly and sandy SILT**, non- plastic, dry-moist, pumice fragments and gravels up to 10mm diameter, light brown. | 2-3 |
| 400 – 700 | **SILT,** non- plastic, moist, dark orange-brown. | 3 |
| 700 – 1,000 | **Gravelly and sandy SILT**, non- plastic, dry-moist, pumice fragments and gravels up to 10mm diameter, light brown. | 2-3 |
| 1,000 – 1,200 | **SILT,** non- plastic, moist, dark orange-brown. | 3 |
| | **TOTAL DEPTH 1,200mm** | **Groundwater Dry** |

**EF10**

| DEPTH (mm) | SOIL TYPE | SOIL CATEGORY |
|---|---|---|
| 0 – 400 | **TOPSOIL –Organic Silt**, moist, non-plastic, brown. | 4 |
| 400 - 500 | **Organic PEAT,** moist, brownish black, organic fragments. | 4 |
| 500 - 700 | **Gravelly and sandy SILT**, non- plastic, dry-moist, pumice fragments and gravels up to 10mm diameter, light brown. | 2-3 |
| 700 – 1,200 | **SILT,** non- plastic, moist, dark orange-brown. | 3 |
| | **TOTAL DEPTH 1,200mm** | **Groundwater Dry** |

## 6.2 Soil Categories

The boreholes intersected Hinuera Formation gravelly and sandy silts (category 2-3), along with orange-brown silts (category 3) which are interpreted to be weathered tephra (volcanic ash) units (AS/NZS1547, Table E1).

The units vary in depth and stratigraphic position across the site, however generally the tephra layer underlies the Hinuera Formation at depth (aside from EF2, EF6 and EF10 which comprise only Hinuera Formation deposits).

Topsoil presence in the soil profile and depth where present also varies across the site, to a maximum of 450mm depth.

We note that the removal of the tree stumps prior to further development of the subdivision will disturb the shallow soil profile, to a significant degree. We have taken this into account in our recommendations, which propose specific design for each lot to ensure the soil conditions at the time of building are utilised.

Our design irrigation rate has been based on soil category 3, as this is the most restrictive soil capacity encountered within the soil profile, in accordance with AS/NZS 1547:2012 C.5.2.3.1.

Boreholes EF1 to EF10 did not intersect groundwater at the time of drilling which is indicative of the elevated location of the proposed subdivision. The design irrigation rate for the treated effluent land disposal systems has been assessed on soil texture and consequently no soakage testing has been undertaken.

# 7. On-site Wastewater Production

We have assumed a 4 bedroom 6 person dwelling will be constructed on each lot, for the purposes of this assessment in support of the Private Plan Change.

## 7.1 Wastewater Production Assessment – Individual Lots

The wastewater system preliminary design is based on roof water collection and supply and a per capita wastewater flow allowance of **180 litres per person per day** (AS/NZS1547:2012 Table H3) for households with standard fixtures as detailed below (Table 2 below).

| **Table 2: Individual On-Site Systems Daily Wastewater Production** | |
|---|---|
| No. of Bedrooms | 4 bedrooms |
| No. of Occupants | 6 people |
| Design Per Capita Wastewater Flow Allowance | 180 l/p/d |
| Total Design Daily Wastewater Flow Per Lot | **1,080 litres per day** |

### 7.1.1 Water Conservation Devices

Water conservation devices could be incorporated into the proposed dwellings to minimise water use and wastewater production, consequently some or all of the following devices could be fitted. Installation of these devices can provide a savings in the order of 20%. Our calculations **exclude** these savings.

Examples of water conservation devices include:

- Restricted flush or dual flush (6/3 litre) toilet cisterns.
- Bathroom aerated tap faucets.
- Low Flow Shower Roses 9 litres/minute.
- Low water use clothes washing machine.

# 8. Potential On-Site Wastewater Treatment

## 8.1 Wastewater Treatment Options

We provide four options for on-site wastewater treatment, three of which are capable of treating effluent to a standard suitable for discharge to pressure compensating dripper irrigation land disposal systems and an option for primary treatment via a septic tank and discharge to conventional beds or trenches.

In accordance with AS/NZS 1547:2012, and the Waikato Regional Plan, primary treatment is an acceptable treatment solution for discharge into category 3 soils, such as those present on the subject site. However, conventional disposal systems must be laid level, and on slopes of less than 8.5° (AS/NZS1547:2012 Table K1). Primary treatment is not suitable for dripper irrigation disposal systems. Where insufficient area is available on any lot due to the ground slope, or site layout, secondary treatment will be required.

## 8.2 Primary Treatment

We recommend a minimum 4,500 litre capacity septic tank which complies with New Zealand Standard 1547.1:2012 On-site domestic wastewater treatment units – Septic Tanks, fitted with an outlet filter which complies with New Zealand Standard 1546.1:2008 On-site domestic wastewater treatment units Part 1:Septic tanks section 3.4.2.

## 8.3 Secondary Treatment

We provide three options for secondary treatment plants, in no particular order.

### 8.3.1 The 'AdvanTex' AX20 Wastewater Treatment System

The 'AdvanTex' textile filter wastewater treatment system is supplied by Innoflow Technologies Ltd. (ph. 09 426 1027). The wastewater treatment system is a fibreglass package treatment system that comprises a dual compartment tank and pump basin divided into the following:

- 4,000 litre Septic Chamber with outlet filter
- 2,000 litre Recirculation Chamber
- Recirculating engineered textile filter (rtPBR) 2m$^2$ (1 x AX20 pod)
- 1,200 litre Treated Wastewater Tank (pump basin)
- High Water Level Alarm
- Disc Filter (120 Micron)

The system has a total capacity of 7,200 litres. Information supplied by Innoflow Technologies Ltd. indicates that the standard 'AdvanTex' AX20 Treatment System can treat up to a maximum of 2,000 litres per day and includes emergency storage in excess of 2,000 litres and has a very low power requirement.

### 8.3.2 The Lifestyle 'Advanced' Wastewater Treatment System

The Hynds **Lifestyle Advanced System** is an aeration treatment system produced by Hynds Environmental Ltd. (ph 09 571 0090). The treatment plant is a single, circular concrete multi-chambered tank which includes the following:

- 2,750 litre Septic Chamber with outlet filter
- Two Aeration Chambers (1 x 1,440 litres and 1 x 1,660 litres)
- 660 litre Disposal Pump Chamber
- High Water Level Alarm
- Disc Filter (120 Micron)

The system has a total capacity of 8,800 litres and includes emergency storage of 2,300 litres. Information supplied by Hynds Environmental Ltd. indicates that the standard Lifestyle 'Advanced' Treatment System can treat up to a maximum of 2,000 litres per day.

### 8.3.3 The Biolytix BioPod (BF6) Wastewater Treatment System

The **Biolytix BioPod (BF6) System** is an aerated biological trickling filter with vermicomposter wastewater treatment system produced by Biolytix Ltd. (ph 0800 700 818). The treatment plant is a single, 3,000 litre circular polypropylene tank which includes the following:

- Six layers of drainage elements and peat/drainage elements containing plastic trickling filter media in open-mesh bags. The layers are separated by coarse HDPE mesh fabric.
- On commissioning, the filter is inoculated with a kilogram of tiger worms (Eisenia Fetida). These worms propagate and burrow through the filter bed, thereby keeping its structure open and porous. A Schego M2K3 air pump is used to provide additional air to the bed at the rate of 350 L per hour.
- A geotextile filter layer with a nominal pore size of 80 micron separates the filter bed from the effluent storage sump. It drains into the central pump well, from

where the effluent is pumped using a submersible pump to a land dispersal system.

The manufacturer's rated design capacity is 1,600 litres/day. Total liquid volume is 1,351 litres within a 3,000 litre tank: (aerobic treatment 893 litres; pump chamber 458 litres). Emergency storage is 1,649 litres.

### 8.3.4 Secondary Wastewater Treatment Quality

The three recommended secondary wastewater treatment systems have met the required secondary treatment standard of 20 $g/m^3$ Biochemical Oxygen Demand and 30 $g/m^3$ Total Suspended Solids at the On-site Effluent Treatment National Testing Programme (OSET NTP) in Rotorua. Trial results are summarised below:

**Table 3: Secondary treatment quality – OSET-NTP test results**

| Performance Criteria | Advantex AX20 Median Concentration (mg/L) | Hynds Lifestyle Advanced Median Concentration (mg/L) | Biolytix BioPod Median Concentration (mg/L) |
|---|---|---|---|
| $cBOD_5$ | 3 | 4.9 | 5.5 |
| Suspended Solids | 8.4 | 9.85 | 10 |

## 9. Treated Effluent On-Site Land Disposal

As noted the soil investigation boreholes indicate that the site is underlain by minimal topsoil, gravelly and sandy silt Hinuera Formation deposits (category 2-3) and weathered tephra/volcanic ash deposits (category 3).

Given the variability of soil distribution encountered, and expected soil disturbance due the to removal of stumps and any other earthworks, specific investigation will be required at the building consent stage to ensure the soils within the land disposal areas are appropriately classified.

The use of land disposal areas on slopes steeper than gentle slopes (<8.5°) will require secondary treatment as outlined below.

### 9.1 Primary Effluent Land Disposal Systems

Any conventional trench disposal system should be evenly loaded via slotted uPVC lines inserted within slotted drain coil to achieve a maximum basal loading rate of **15 litres/m$^2$/day (AS/NZS1547:2012 Table L1 – Category 3 soils).**

| **TABLE 4**<br>**Conventional Trench Basal Area Requirement** | |
|---|---|
| **Projected Daily Discharge Flow** | **1,080 Litres** |
| **Soil Basal Loading Rate** | **15mm/day (15 litres/square metre/day)** |
| | **1,080 Litres/Day**<br>**15 Litres/m$^2$/day** |
| **Total Basal Surface Area Required** | **72m$^2$** |

| **TABLE 5**<br>**Conventional Trench Length Requirement** | |
|---|---|
| **Basal Area Required** | **72m$^2$** |
| **Trench Width** | **0.5m** |
| | **72 m$^2$**<br>**0.5 m** |
| **Total Trench Length Required** | **114m** |

Given the recommended maximum length for a conventional trench is in the order of 20m, a system comprising 8 x 18m long trenches would suffice. Alternatively, 1m wide beds may be used, hence requiring 4 x 18m long beds to reach the required basal area. Trenches should be laid with 1m spacing between each trench, requiring an enclosing area of 228m$^2$.

### 9.2 Secondary Effluent Land Disposal Systems

Where a secondary treatment system has been selected, we recommend irrigating treated effluent onto the ground via Netafim **UniBioline** or **UniRam AS** pressure compensating dripper irrigation lines (PCDI). Irrigation lines are to be either pinned to the ground surface and the area intensively planted or buried to 100mm – 150mm depth within the proposed primary land disposal area with a line spacing of 1.0 metre and emitter spacing of 0.6 metres.

We recommend that any PCDI network is **loaded at a maximum areal loading rate of *4.0 litres/m$^2$/day (4mm/day), based on Soil Category 3 (AS/NZS 1547:2012 Table M1 – Category 3 soils).***

This method utilises both soakage into the ground and evapotranspiration by vegetation cover. The low loading rate and pulse dose loading over an extended period minimises the potential for saturation of the ground.

Advantages of PCDI are:

1. Low loading rate minimises potential for ground saturation and wetting.
2. Maximises use of available land disposal areas.
3. PCDI lines can run generally along the contour.
4. Spreading treated effluent over an extensive area allows for better assimilation by the environment and provides for optimum reduction of remaining bacteria and nutrients.
5. Irrigation lines can be surface laid and snaked between existing plants.

### 9.2.1 PCDI Disposal Network Design

The disposal network system has been designed with the following parameters (Table 6 below).

| TABLE 6<br>PCDI LAND DISPOSAL AREA CALCULATION | |
|---|---|
| **Projected Daily Discharge Flow** | **1,080 Litres** |
| **Soil Areal Loading Rate** | **4mm/day (4 litres/square metre/day)** |
| **So total disposal network required is** | **1,080 Litres/Day**<br>**4 Litres/m²/day** |
| **Total Primary Network Area Required** | **270m²** |

Based on an areal loading rate of ***4 litres/m²/day***, and an **irrigation line separation of 1.0m** with irrigation line emitters at 0.6m intervals, a total linear length of **270m** of PCDI disposal network is required over an area of **270m²**.

### 9.3 Reserve Disposal Area

Area on each lot must be set aside for both a primary disposal area and a reserve disposal area of at least 100% of the primary area. A reserve disposal area is required in the event of additional disposal area requirements in the future.

### 9.4 Total Primary and Reserve Disposal Area Requirements – Per Lot

The total primary and reserve area requirements are summarised in Table 7 below.

| TABLE 7<br>Overall Site Area Required for On-Site Wastewater | | | |
|---|---|---|---|
| | **Disposal Area** | **Reserve Area** | **Total Area** |
| **Primary Treatment:**<br>**Septic Tank and Trenches/Beds** | **228 m²** | **228 m²** | **456 m²** |
| **Secondary Treatment:**<br>**AX20 or Hynds or Biolytix and PCDI** | **270 m²** | **270 m²** | **540m²** |

This indicates that the proposed lot sizes - generally above 2,500m² - will likely be sufficient to allow for on-site wastewater disposal, along with the additional development of each site for the dwelling and outbuildings, driveways and curtilage. It should be noted however that to install a septic tank as a permitted activity the minimum lot size required is 2,500m² – this is further addressed in section 12.

## 10. Assessment of Effects on the Environment

A summary of the separation distances required for various limiting factors for on-site wastewater treatment and disposal is detailed in **Table 8** below and outlined in the following sections.

**TABLE 8**
**SUMMARY OF REQUIRED SEPARATION DISTANCES**

| Limiting Factors | Primary On-site System | Secondary On-Site System |
|---|---|---|
| **Property Boundaries** | >1.5m | >1.5m |
| **Surface water/Watercourses** | >20m | >15m |
| **Groundwater** | > 0.6m | > 0.3m |
| **Wells, water bores** | > 30m | > 30m |
| **Embankments/retaining walls** | > 3.0m | > 3.0m |
| **Buildings** | >3.0m | > 3.0m |
| **Floodplains (1 in 100 & 1 in 20)** | Outside 1 in 20 | Outside 1 in 20 |

***Note: The above separation distances are based on WRC Permitted Activity Rules and AS/NZS 1547:2012***
***NA = not applicable***

A specific assessment of potential effects cannot be fully completed at this stage due to the unknowns in terms of level and type of development, however general comments are outlined in the following sections.

### 10.1 Impact on Surface Water

Treated effluent discharges can cause water quality problems in aquatic environments when:

- Plant and weed growth accelerate in response to wastewater sourced nutrients,
- Aquatic organisms are adversely affected by oxygen levels being reduced by the BOD (organic) load from the wastewater,
- Aquatic organisms are adversely affected by the toxic effects of ammonia from wastewater,
- The presence of microbiological contaminants (bacteria and viruses) in wastewater can cause a risk to human and animal health.

Such outcomes are not necessarily attributed to any single on-site wastewater discharge, rather through the cumulative effects of discharges within a catchment.

The risk of adverse effects can be minimised as much as possible with the discharge of high quality secondary treated effluent. The subdivision property boundary is located over 50m from the Waikato River/Lake Whakamaru and it is considered that given the soil type overland flow is unlikely.

### 10.2 Impact on Groundwater

The release of nitrates directly to groundwater can raise concentrations to levels with a potential to exceed drinking water standards. Ammonia, which is highly soluble and easily leached into groundwater, is toxic to aquatic life. Both nitrates and phosphates in soil or groundwater can reach water bodies such as streams, ponds and lakes. These nutrients can stimulate increased plant and algae growth and when present in natural water are significant factors in eutrophication. The die-off of additional vegetation or algal growth in the water; a result of the increased nutrient load, is then decomposed by bacteria that absorb oxygen in the water. This in turn has a significant impact on the degradation of water quality and alters sensitive aquatic ecosystems.

To reduce cumulative adverse effects, wherever practicable and especially where nutrients may impact on natural ground or surface waters, nutrients and in particular nitrogen components should be reduced in wastewater via the treatment process. In addition, the wastewater land distribution and application system methodologies should be designed to optimise further reduction in the soils prior to contact with water.

The proposed land disposal systems will distribute highly treated effluent over an area at a loading rate appropriate for the soil types, site conditions and constraints. As previously described, our investigations across the site did not intersect groundwater at depth of up to 2.2m below the existing ground surface.

Therefore, the separation distance exceeds the benchmark requirement of the WRP Rule 3.5.7.6 which requires 0.6m clearance for the discharge of primary treated effluent.

In terms of groundwater quality protection for potable water supplies, the nearest mapped water bore, 72_6511 is located a minimum distance of 1.3km from the site's property

boundary. This conforms to WRC requirement of 30 metres separation to a water supply bore.

Based on the above information, the impact on groundwater at the site is concluded to be negligible.

### 10.3 Soils

Wastewater from domestic sources does not generally contain heavy metals and environmentally harmful compounds in concentrations likely to lead to soil contamination or problems that would render the soil unusable. It is considered that chemicals are generally diluted and removed in the treatment system or renovated by the microbial action in the soil itself.

### 10.4 Amenity Values

**Public Health**

Wastewater discharges may contain very high concentrations of pathogens which may have human health-related effects if people are exposed to the effluent. Contact with effluent could occur if it were to run across the ground surface, or when partially treated effluent enters surface or groundwater. The potential for these types of effects typically arises when a system provides only limited treatment, when the system is not properly designed, installed, or maintained, or a combination of these factors. It is considered in this case that public health effects will be limited by appropriate system design and good soakage ability of the underlying soil.

**Odour**

Offensive odours can emanate from processes which occur within the treatment and disposal of wastewater. There is not expected to be any nuisance odour, however any treatment system vents can be fitted with carbon filters to scrub any odour.

### 10.5 Cumulative Effects

The establishment of approximately up to 55 dwellings on a property which to date has been utilised as production forest and farmland raises the issue of the cumulative effects of the on-site wastewater discharges. In this instance the cumulative effects are not considered to be of significant concern, due to the baseline set by the relevant permitted activities of the Waikato Regional Plan.

In terms of nitrogen discharges, the operation of the site as a production forest is permitted, through Table 3.4, to utilise up to 150 kgN/hectare/year. Over the 31.6749 hectare property, this equates to 4,751 kgN/ha/year. Should the subdivision be developed with 55 septic tank systems serving 4 bedroom houses, this equates to 2,168 kgN/ha/year (based on 100g/$m^3$N, 1.08$m^3$ volume and 365 days). Therefore, in terms of nitrogen, and assuming no stock input on the subdivision, the proposal presents a potential betterment in terms of nitrogen of over 50%. This is also a conservative estimate, as some of the lots will be served by secondary treatment systems with lower nitrogen concentrations.

As long as the lot sizes remain above 2,500$m^2$, the permitted activity for on-site wastewater will be met, and therefore the effects of the activities are accounted for in the Waikato Regional Plan.

# 11. Status of Activities under the Waikato Regional Plan

Section 15 of the Resource Management Act, 1991 states that no person may discharge any contaminant to water or into or onto land in circumstances which may result in that contaminant entering water unless the discharge of the contaminant is expressly allowed by a rule in a regional plan (and in any relevant proposed regional plan) or by a resource consent. The Waikato Regional Plan (WRP) became operative on 28 September 2007 therefore no other plans apply.

## 11.1 Assessment – Individual Lots

Two Permitted Activity rules are available for individual lot discharges, rule 3.5.7.5 for new septic tank discharges, and Rule 3.5.7.6 for new discharges from an improved system. Permitted activity assessments are included in the tables below, although each lot will require a specific assessment.

**Table 9: Assessment of Activity Against Waikato Regional Plan Rule 3.5.7.5**

| WRP 3.5.7.5 Condition | Assessment |
|---|---|
| a. The volume of effluent to be discharged from any one system shall not exceed 1.3 cubic metres per day averaged over any one month period. | a. Complies.<br>Daily discharge volume is 1.08 cubic metres per day. |
| b. The minimum total septic tank size shall be no less than 3,000 litres. | b. Complies<br>Recommended minimum tank size is 4,500 litres |
| c. There shall be no direct discharge of effluent into water. | c. Complies<br>The system design proposes discharge to land. |
| d. During times of normal wet winter groundwater level, there shall be at least 600 millimetres separation distance between the groundwater level and the bottom of the disposal trench. | d. Complies<br>Groundwater was not intercepted on site to depths of 2.2m |
| e. The discharge shall not result in any objectionable odour beyond the boundary of the subject property. | e. Complies<br>The required property boundary clearances are met and the high quality treatment process are not expected to produce objectionable odour beyond the boundary. |
| f. The effective disposal area* for any one treatment and disposal system discharge shall be not less than 2,500 square metres. The discharge shall no longer comply with this Rule where the effective disposal area* is subsequently reduced to less than 2,500 square metres. | f. Complies<br>The minimum lot size will be significantly greater than 2,500m$^2$ |
| g. The sewage disposal system shall not be sited within 20 metres of a Natural State Water Body or Fisheries Class Water Body as specified in the Water Management Class Maps, and 10 metres from any | g. Complies<br>The site boundary is located approximately 50m from the Waikato River |

| WRP 3.5.7.5 Condition | Assessment |
|---|---|
| other surface water body. | |
| h. The sewage disposal system shall not be sited within 30 metres of any potable water supply well unless the well is drawing from a separate, confined aquifer. | h. Complies.<br>The nearest water supply bore is over 1.3km from the site boundary |
| i. The discharge shall not occur within 20 metres of a Significant Geothermal Feature. | i. Complies |
| j. The septic tank shall be fitted with an effluent outlet filter. | j. Complies.<br>Recommended design includes an outlet filter |
| k. The wastewater system shall be designed and installed such that there will be no adverse change in groundwater quality as a result of the discharge, or in combination with other discharges. | k. Complies.<br>Given the soil types and conservative disposal area loading rate, along with groundwater clearance, such effects are considered unlikely. |

**Table 10: Assessment of Activity Against Waikato Regional Plan Rule 3.5.7.6**

| WRP 3.5.7.6 Condition | Assessment |
|---|---|
| a. The volume of effluent to be discharged shall not exceed three cubic metres per day averaged over any one month period. | a. Complies.<br>Daily discharge volume is 1,080 litres per day. |
| b. The design, construction, operation and maintenance of the system shall meet the following standards: | b. Complies |
| i. pre-treatment of effluent to a standard not to exceed concentrations of 20g/m$^3$ of Biological Oxygen Demand and 30g/m$^3$ of suspended solids | i. The three recommended treatment plants have all been proven to meet the required standards at the WaterNZ OSET trial, see https://www.waternz.org.nz/OSETresults for details. |
| ii. during times of normal wet winter groundwater level, there shall be at least 600 millimetres separation distance between the groundwater level and the bottom of the disposal trench or 300 millimetres between the groundwater level and dripper irrigation lines, where dripper irrigation lines are used and the design loading rate for effluent disposal is less than five millimetres/day. | ii. No groundwater was intersected to 2.2m depth on site which provides the required separation distance. |
| iii. there shall be no adverse change in groundwater quality as a result of the discharge, or in combination with other discharges | iii. Given the proposed high quality treatment and conservative disposal area loading rate, along with groundwater clearance, such effects are considered unlikely. |
| iv. there shall be no adverse change in surface water quality as a result of the discharge, or in combination with other discharges | iv. Given the proposed high quality treatment and conservative disposal area loading rate, along with surface water clearance, such effects are considered unlikely. |
| v. there shall be no direct discharge of effluent into groundwater or surface water. | v. The system design proposes discharge to land. |
| c. The discharge shall not result in any objectionable | c. Complies |

| WRP 3.5.7.6 Condition | Assessment |
|---|---|
| effects from odour beyond the boundary of the subject property. | The required property boundary clearances can met and the high quality treatment process are not expected to produce objectionable odour beyond the boundary. |
| d. The sewage disposal system shall not be sited within 30 metres of a Natural State Water Body or Fisheries Class Water Body as specified in the Water Management Class Maps, and 10 metres from any other surface water body. | d. Complies<br>The site boundary is located over 50m from the Waikato River. |
| e. Written proof of compliance with this Rule shall be provided to the Waikato Regional Council on require in the form of either:<br>i. certification by a person who is qualified and experienced in the field of onsite sewage treatment and disposal that the system will consistently satisfy the above standards taking into account the relevant site constraints, or<br>ii. documentation which demonstrates achievement of the standards | e. Complies |
| f. The discharge shall not occur within 20 metres of a Significant Geothermal Feature. | f. Complies |

# 12. Policy Assessment

## 12.1 National Policy Statements, Plans and Other Legislation

Section 104(1)(b) of the Act sets out that when considering an application for resource consent, the Council shall have regard to any relevant provisions of national environmental standards and policy statements, regional policy statements, and plans or proposed plans. Having regard to this, the relevant statutory documents in this case, are addressed below.

### 12.1.1 National Environmental Standards and Policy Statements.

Currently there are nine NESs that have come into effect - the National Environmental Standards for Air Quality (where various standards have been in effect since October 2004); Sources of Human Drinking Water, Electricity Transmission Activities, Telecommunication Facilities, Assessing and managing contaminants in soil to protect human health, Plantation Forestry, Freshwater, Marine Aquaculture and Storing Tyres Outdoors.

The Freshwater NES is relevant to works and activities in and adjacent to "natural wetlands"; structures (culverts, weirs, flap-gates, dams and fords) in rivers; and various farming activities (including specified land use changes, intensive winter grazing, use of stockholding areas). There are no wetlands within 100m of the site. This NES is not relevant to this application.

The National Policy Statement for Freshwater Management 2020 (NPSFW) came into force on 3 September 2020. It supersedes earlier versions of the NPSFW.

The NPSFW includes Te Mana o te Wai – a concept that "refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It protects the mauri of the wai. Te Mana o te Wai is about restoring and preserving the balance between the water, the wider environment, and the community."

As the discharges are considered to be permitted, and minor activities, it is my opinion that the application is not contrary to the Freshwater NPS.

### 12.2 Waikato Regional Policy Statement

The RPS is a high-level broad-based document containing objectives and policies the purpose of which is to provide an overview of the resource management issues of the region and to achieve integrated management of the natural and physical resources of the Region. The Waikato Regional Council's new RPS was made operative on 20 May 2016.

Key issues in the RPS relating to this proposal are the state of resources (Issue 1.1), managing the built environment (Issue 1.4), and the relationship of tangata whenua with the environment (te taiao) (Issue 1.5). There are a number of overlapping objectives under each of these relevant to this proposal. These are listed as follows:

- Integrated management of natural and physical resources (Objective 3.1);
- Decision making (Objective 3.2);
- Ecosystem services (Objective 3.7);
- Relationship of tangata whenua with the environment (Objective 3.8);
- Efficient use of resources (Objective 3.9);
- Mauri and values of fresh water bodies (Objective 3.13);
- Amenity (Objective 3.20);
- Values of soil (Objective 3.24).

Relevant policies include integrated management (Policy 4), air (Policy 5), built environment (Policy 6), fresh water bodies (Policy 8), landscape natural character and amenity (Policy 12), and soils (Policy 14).

These objectives and policies have been considered and measures have been recommended and undertaken to avoid, remedy or mitigate adverse environmental effects. We consider that the proposal is not inconsistent with the RPS.

### 12.3 Waikato Regional Plan and Proposed Plan

#### 12.3.1 Proposed Waikato Regional Plan Change 1 – Healthy Rivers

The proposed plan change Decisions Version was notified on 22 April 2020. The plan change relates to the catchment of the Waikato and Waipa Rivers and gives effect to the National Policy Statement for Freshwater (2014) and Te Ture Whaimana o Te Awa o Waikato (The Vision and Strategy for the Waikato and Waipa rivers) which was adopted by Government as part of Treaty Settlement legislation. The regional council has a legal requirement to give effect to both of these.

The proposed plan seeks to manage and require reductions in diffuse discharges of nitrogen, phosphorus, sediment and microbial pathogens. The plan change sets water quality targets for each sub-catchment to be reached over an 80-year time period. The plan change makes reference to point source discharges, which include on-site wastewater discharges. Policy 12 requires point source discharges to adopt the best practicable option to avoid or mitigate the adverse effects of the discharge.

In terms of the proposed on-site wastewater discharges, the proposed wastewater treatment systems will provide good to high quality wastewater and the separation between the discharge and both groundwater and surface water has been maximised.

As noted above in section 11.5, as long as lot sizes remain greater than 2,500m$^2$ the proposal effectively remains within the level of effects which would be permitted, similarly to remaining within a benchmark. The conversion of production forestry to residential land represents a potential reduction in nitrogen discharge of over 50%.

### 12.3.2 Operative Waikato Regional Plan

The Waikato Regional Plan ("WRP") is operative. The purpose of regional plans is to help the Council carry out its functions under s30 of the RMA.

The focus of the Regional Plan in respect of on-site wastewater discharges is with regard to managing water resources in the first instance. It is considered that the following policies of the discharge section of the Water Module are pertinent to this proposal. **Policy 3 (Alternative of discharging to water)** and **Policy 4 (Discharges to land)** acknowledge that discharging contaminants into land is an appropriate alternative to direct discharges to water where soil conditions and topography allow, and where the adverse effects would be less. It is also recognised that by applying wastes to land the available nutrients and water can be reused. **Policy 5 (Groundwater)** recognises that groundwater quality can be adversely affected by inappropriate use of soils to treat waste discharges. Correct design and operation of on-site wastewater treatment and disposal systems is required to avoid adverse effects on groundwater resources.

The nearest mapped water body is the Waikato River. This watercourse is classified under the WRP as a Contact Recreation, Trout Fishery and Indigenous Fishery water body.

Given that the discharge is to land and the proposed high level of wastewater treatment we consider the proposal is not contrary to the water class standard.

Section 5.2.2 of the Regional Plan also has objectives that on-site discharges a) do not contaminate soil to levels that present significant risks to human health or the wider environment, and e) avoid significant adverse effects on the relationship that tangata whenua as Kaitiaki have with their taonga such as ancestral lands, water and waahi tapu.

Overall, we consider that this application is consistent with the policies and objectives of the WRP.

### 12.4 Other Matters

#### 12.4.1 Ngati Tuwharetoa, Raukawa, and Te Arawa River Iwi Waikato River Act 2010

We have had particular regard to the Vision and Strategy (Schedule 2 of the Settlement Claims Act) as the embodiment of the settlement act, seeking to restore and protect the health and wellbeing of the Waikato River for future generations.

We understand that applications must now demonstrate some positive benefit contributing to the restoration of the Waikato River, proportionate to the activity in question.

In the case of the proposal, we consider that proportionally the effects of the discharge are small, given the expected permitted activity status of the discharges. We consider that betterment is achieved by the retirement of the property from the previous use of production forestry, with its inherent higher levels of nutrient discharge. We consider that the Vision and Strategy is not compromised by the proposal.

#### 12.4.2 Te Rautaki Taiao A Raukawa (Raukawa Environmental Management Plan 2015)

The Raukawa Environmental Management Plan is a significant document that:

- Represents the views and perspectives of Raukawa with regards to environmental resource management,
- Incorporates the Ngati Tuwharetoa, Raukawa and Te Awara Iwi Waikato River Act 2010, (including the Vision and Strategy for the Waikato River),

- Regards sections 5, 6, 7, and 8, sections 61, 66, 74 and 104 of the Resource Management Act 1991.
- Incorporates the Raukawa Fisheries Plan.

We have reviewed the plan, and consider that as the application includes discharge of treated wastewater to the ground that the aspirations of Raukawa in regard to fresh water are not negatively impacted by the proposal and that the activity does not compromise the aims and objectives of the REMP.

### 12.5 Relevant Part 2 Considerations

All resource consent applications must be considered subject to Part 2 of the Resource Management Act 1991. Part 2 details the matters that must be considered for the sustainable management of natural and physical resources including matters of national importance, other matters, and the Treaty of Waitangi. The proposed activity has been considered in the context of the matters outlined in Part 2 of the Resource Management Act 1991, in particular sections 5 to 8. In our opinion, the activity does not compromise any of these issues and, therefore, the overall purpose of the Act.

# 13. Alternative Methods

## 13.1 Municipal Sewerage Reticulation

Whakamaru township is served by a municipal sewer network, primary level wastewater treatment plant (WWTP) and discharge to soakage beds adjacent to the Lake. Connection to the network is problematic due the fact that Whakamaru township lies within Taupo District, while the subject site lies within South Waikato District. Raw sewage would need to be piped alongside Ongaroto Road and pumped across the Whakamaru Dam to the municipal treatment plant, at a distance of approximately 2.2 kilometres. Due to elevation differences between the site and the WWTP, at least one pump station would also be required to pump the sewage.

Complicating factors which limit the feasibility of such a connection include:

- The cost of the network and pump station would be significant.
- The existing capacity of the WWTP and disposal system, which is sized for Whakamaru township only.
- Connection of a new subdivision would likely require expansion of the WWTP and disposal system and hence a new Regional Council consent.
- How the cost recovery of such expansion and reconsenting, and ongoing management costs (i.e., rates) would be recovered given two different territorial authorities are involved.
- There are also cultural concerns with the movement of sewage from one location to another. In particular moving sewage across the Waikato River raises the risk of possible pipe breaches and significant contamination of the river from raw sewage.
- The current Whakamaru WWTP provides a primary level of treatment and hence discharges from the proposed individual subdivision lots will be either the equivalent level of treatment where septic tanks are used or an improvement on lots with secondary treatment plants. Therefore, directing sewage to the municipal WWTP does not represent an improvement and is not considered the Best Practicable Option in this case.

As noted in this report, individual on-site systems are feasible at this location with less than minor effects on the environment and remain the preferred option.

### 13.2 Decentralised Wastewater Treatment System

The collection of wastewater from each lot within the future subdivision and treatment of effluent at a central treatment system and centralised disposal is an alternative to individual on-site systems in this location. Such a system would require a Discretionary Activity consent for the discharge of the combined treated wastewater under rule 3.5.7.7 of the Waikato Regional Plan.

A decentralised system requires significant upfront investment, as the treatment plant and disposal system must be established prior to any dwellings being constructed. Development of a subdivision in this location could take up to 20 years, hence the cost of the decentralised system could make the development unviable. The management and maintenance of the wastewater system would need to be addressed through a residents association or body corporate, and there are legal complications regarding these types of bodies holding discharge consents. Alternatively South Waikato District Council may, in the long term, inherit a wastewater system which they do not necessarily want to manage or have the technical expertise to manage. The treatment and disposal system, due to its scale, would require regular (at least quarterly) maintenance visits and telemetered remote monitoring, the cost of which would need to be borne by the developer and then the residents association.

A decentralised system would provide a suitable level of wastewater treatment, which would be regularly monitored by Regional Council, however our previous affects assessment allows for permitted activity individual systems and this remains our recommendation.

## 14. Conclusions and Recommendations

We provide the following conclusions, opinions and recommendations based on the information obtained from the site investigation, discussions with the applicant and our site observations.

1. Our investigation into the feasibility of on-site wastewater treatment and disposal at the site supports a private plan change and future rural residential development.
2. Soil conditions across the site indicate the presence of a minimum of category 3 soils, and these are favourable to support on-site wastewater disposal, by either primary treatment (septic tanks) and conventional trench or bed disposal systems, or by secondary treatment (aerated systems) and pressure compensating dripper irrigation.
3. Where any proposed primary and reserve disposal areas are located on sloping land greater than 8.5°, secondary treatment and dripper irrigation disposal will be required.
4. Design peak daily septic wastewater production for the proposed lots is calculated to be up to 1,080 litres per day based on a 4 bedroom dwelling per lot having a 6 person occupancy, and roof water collection and tank supply.
5. Due to the variability in soil conditions and slope angles across the site, along with the potential changes in soil conditions due to stump removal and earthworks, specific design will be required at the time of building consent application.
6. Primary systems:
    a. Treatment: We recommend a minimum septic tank volume of 4,500 litres with each tank to be fitted with an effluent outlet filter.
    b. Disposal: We recommend conventional beds or trenches are loaded at a maximum basal loading rate of 15 mm/day.
7. Secondary systems:
    a. Treatment: Where secondary treatment is required we recommend on-site wastewater treatment comprise one of the following systems capable of producing at least secondary standard treated effluent suitable for land disposal: AdvanTex AX 20 Recirculating Textile Filter or Hynds Lifestyle Advanced aerated treatment system or Biolytix BioPod BF6 wastewater treatment system.
    b. Disposal: We recommend irrigation of treated effluent onto or into the ground within the proposed primary land disposal area by pressure-

compensating irrigation lines dose loaded at an areal loading rate of up to 4.0 litres/$m^2$/day (4.0mm/day).

8. Based on the above, we have calculated that for primary treatment systems an area of at least 456$m^2$ (Primary and reserve disposal area) is required per lot while for secondary treatment systems the total area required per lot is 540$m^2$. Area must also be set aside for the tanks and treatment system.
9. We have determined that as long as the lot sizes remain above 2,500$m^2$ the proposed subdivision will create lots where discharge of treated wastewater is considered a Permitted Activity under either rule 3.5.7.5 (primary treatment/septic tanks) or rule 3.5.7.6 (secondary treatment) of the Waikato Regional Plan.

## 15. Limitation

This report has been prepared for the sole benefit of **Jonathan Quigley** as our client with respect to the brief for the presently proposed development and to be used in design by their appointed Consultants and support a private plan change application. It is not to be relied upon or used out of context by any other person without reference to Ormiston Associates Ltd.

The reliance by other parties on the information or opinions contained in the report shall, without prior review and agreement in writing, be at such parties sole risk.

**ORMISTON ASSOCIATES LTD.**

Trisha Simonson
**Senior Engineering Geologist**

A W Ormiston
**Director**

# Innoflow Advantex 'AX20' Recirculating Textile Filter Secondary Wastewater Treatment System

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# AX20

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# AdvanTex® – Treatment Systems

## A Sustainable Technology

In the patented* AdvanTex Treatment System, household sewage flows into the processing tank, where it separates into scum, sludge, and liquid effluent. Filtered effluent is dosed to the AdvanTex filter pod, where it trickles through sheets of a synthetic textile. There, naturally occurring microorganisms remove impurities from the effluent. After recirculating between the tank and the AdvanTex filter, the effluent is discharged to the soil via irrigation or a drainfield.

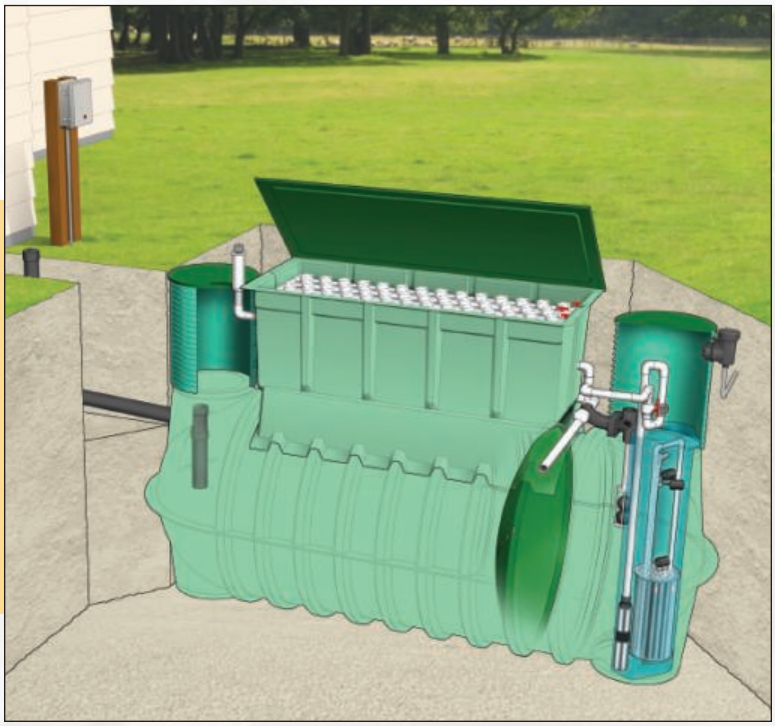
The system's pump runs only a few minutes an hour, using just a few cents worth of electricity a day. Because solids decompose in the tank, the tank requires pumping only every 8–12 years, under normal use. Using little energy, generating a minimum of sludge, and purifying wastewater for beneficial reuse, AdvanTex Systems are one of the most environmentally sustainable technologies for home wastewater treatment.

More than 30,000 of Orenco's textile filters have been installed at homes, businesses, and community treatment systems throughout the United States, Canada, Europe, and Australasia. Third-party testing shows that AdvanTex Treatment Systems do a better job of treating wastewater than most municipal sewers. And field testing shows that AdvanTex Treatment Systems work under real-world conditions.

textile filters

*"The effluent from the filter units typically was clear with no odor . . . the increased loading rate allows for a decrease in the footprint required by filter units (compared to sand and gravel filters) . . . in an onsite treatment scenario, textile filter effluent could be utilized for landscape irrigation . . ."*

Leverenz, Darby, and Tchobanoglous, "Evaluation of Textile Filters for the Treatment of Septic Tank Effluent," University of California at Davis, October 2000.



*Typical backyard configuration of an AdvanTex® Treatment System.*

*The system has five main functional parts:*

1. *VeriComm® Web-based monitoring system†*
2. *Processing tank*
3. *Biotube® pumping package*
4. *AdvanTex filter*
5. *Recirculating splitter valve*

† MVP digital programmable panels available as an option in some markets.

*Other configurations and models available.*

NOTE: * Covered by U.S. patent numbers 6,372,137; 5,980,748; 5,531,894; 5,480,561; 5,360,556; 5,492,635; 4,439,323; D461,870; and D445,476. Additional patents pending.

# AdvanTex® – Treatment Systems

## Finally! Residential Wastewater Treatment — That Works!

Orenco's AdvanTex® Treatment Systems are the ideal solution for environmentally sustainable treatment of residential wastewater flows.


*AX20 shown here.*
*In addition to being compact, AdvanTex® Treatment Systems are easier to operate and maintain than other wastewater technologies. No odors. No power-hungry, noisy blowers. No activated sludge to manage or pump. No discharge of untreated sewage during peak flows or emergencies.*

### Outstanding Wastewater Treatment

Unlike other onsite wastewater treatment technologies, AdvanTex provides consistent, reliable treatment under real-world conditions. Other systems work OK in a controlled testing environment, but don't hold up to normal household use. AdvanTex does. AdvanTex Treatment Systems process and discharge small amounts of treated wastewater throughout the day. Water so clean it can be reused for drip or subsurface irrigation, or discharged to shallow, inconspicuous trenches.

### Fits Small Yards

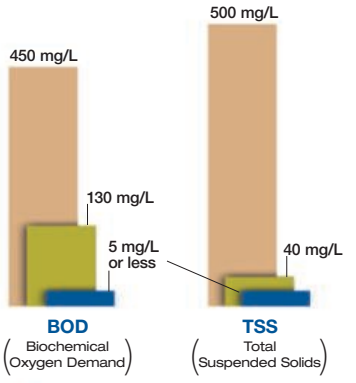
AdvanTex Treatment Systems require very little space. The filter unit is 7.5 ft × 3 ft × 2.5 ft (2286 mm × 914 mm × 762 mm), small enough to fit under a deck or on top of the processing tank. And some jurisdictions allow a reduction in drainfield area with AdvanTex. So AdvanTex is ideal for small sites, or for homeowners who simply want more use of their yard.

### Low Lifetime Cost

AdvanTex Treatment Systems may cost a little more up front than other systems, but, thanks to low maintenance requirements, they cost much, much less over time. Power costs, pumping costs, and equipment replacement costs are a fraction of those for other technologies. Plus, AdvanTex filters protect your drainfield.

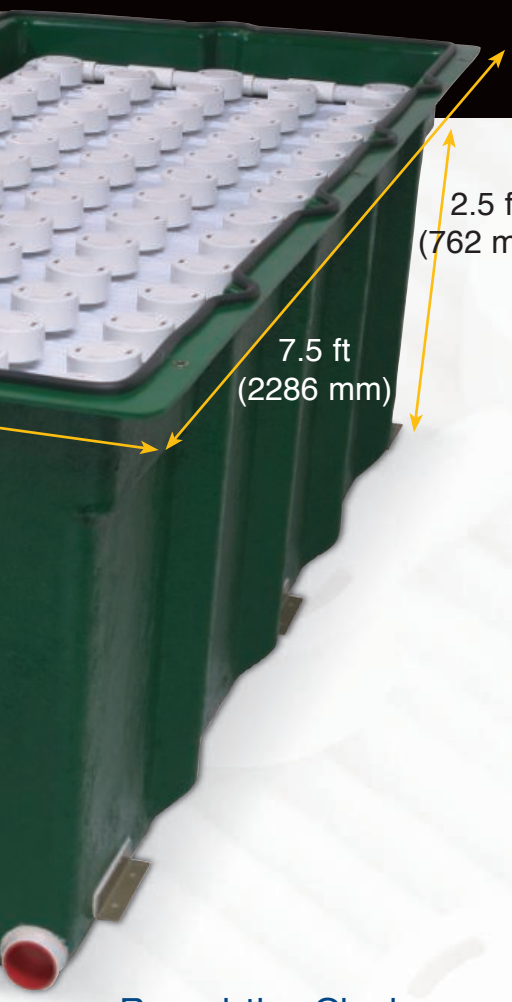
*AdvanTex turns household wastewater into clear, odorless effluent you can reuse for subsurface irrigation.*

**AdvanTex®** Treatment Systems make raw wastewater up to 98% cleaner ... consistently producing effluent in the 5/5 mg/L range




1 Source: Derived from *Small and Decentralized Wastewater Management Systems*, Crites & Tchobanoglous, McGraw-Hill, 1998, p. 183.

2 Actual performance results, based on a six-month accumulative average from NSF (National Sanitation Foundation) testing on the AX20N at 500 gpd (1900 L/d), using composite sampling.




# AdvanTex®
# Gives You Peace of Mind

Orenco's AdvanTex Treatment Systems are not just a product. They are part of a comprehensive program, for homeowners' peace of mind.

## Authorized Dealers and Trained Installers

AdvanTex Treatment Systems are sold by authorized Dealers, who provide ongoing support and warranty service. Dealers ensure that AdvanTex Treatment Systems are set in place by trained installers, following Orenco's instructions.

## Trained Service Providers

Like any onsite technology, your AdvanTex Treatment System benefits from regular maintenance by a trained service provider, following Orenco's instructions. Field maintenance report forms are digitally archived for future reference.

## Complete, Carefully Engineered Package

Your AdvanTex Treatment System comes as a totally pre-manufactured package, including AdvanTex textile filter, Biotube® pumping package, and "smart" control panel. AdvanTex can be installed on most lots in less than a day.

## Low Routine Maintenance Costs

AdvanTex Treatment Systems are easy to service, easy to clean, and generate no troublesome activated sludge. Since maintenance is minimal, so are the long-term costs. Each system comes with a Homeowner's Manual, with tips for preventive maintenance.

## Low Power Costs

AdvanTex uses very little power… an average of $1.75–$2.00 per month (based on a national average of ten cents per kilowatt-hour). Compare that to the average power cost of $30.00–$60.00 per month (depending on your area) for many "activated sludge" aerobic treatment units!

## Safe in Emergencies

AdvanTex Treatment Systems that are equipped with VeriComm® Control Panels automatically notify service providers of irregular conditions. And all systems are sized to allow for a minimum of 24 hours of wastewater storage, at average daily flows. So operators can provide "emergency" service during normal working hours, keeping service costs down.

## Child-Proof

The lid of the AdvanTex filter is affixed with recessed bolts, making it very tamper-resistant.

## Warrantied

Orenco Systems®, Inc. provides a limited, multi-year warranty on all materials and workmanship. Length of warranty varies by region but is at least three years.

## Round-the-Clock Monitoring

Your AdvanTex Treatment System may include a control panel with a remote telemetry unit and a round-the-clock, Web-based monitoring system, supervised by your service provider. You'll have even more peace of mind, knowing that the VeriComm® Monitoring System is continually and automatically verifying the operation of your system. For more information, go to **www.vericomm.net** and click on the icon for VeriComm's "On-Line Demo." (Non-telemetry control panels also available.)

# For Every Residential Site

There's a standard AdvanTex Treatment System model for every site condition, design flow, and regulatory requirement.

AdvanTex Treatment Systems are particularly well suited for . . .

- small sites
- failing systems
- poor soils
- nitrogen reduction
- environmentally sensitive sites
- stringent treatment standards
- pretreatment of moderately high-strength waste

## Alberta, Canada

*"We've installed about 500 AdvanTex Treatment Systems for all sizes of homes, and, typically, the treated wastewater looks just like water. Our winter temperatures can be as low as –38˚ F (–39˚ C). In the middle of December, we started up an AdvanTex Treatment System on a 13,000 ft² (1200 m²) home that averages 1200 gpd (4500 L/d). Two weeks after start-up, the owners entertained 30 family members and guests for a full week. It worked great!"*

Bruce Silvester, Onsite Specialties, Inc.

**"It worked great!"**

## Deschutes County, Oregon

*"I specified an AdvanTex Treatment System for a cluster of 12 luxury homes in the Metolius River Resort, along a premier trout stream in eastern Oregon. AdvanTex worked well because the site has an extremely small footprint and the system was easy to install. Also, the treatment unit is right in front of the Resort's office, so it was super important that there be absolutely no smell, and there isn't. Plus, we didn't have to search for the right treatment media, since it's all included. I would use AdvanTex any place you'd use a conventional recirculating filter."*

Steve Wert, CPSS, WWS
Wert & Associates, Bend, Oregon

## Tucson, Arizona

*"Nearly 1,000 AdvanTex Treatment Systems have been installed in Arizona, primarily due to poor soils, seasonal high water tables and/or nitrogen in the groundwater. In Tucson, homeowners and their treatment system designers have also had to deal with limiting site constraints, shallow rock shelves, and small building envelopes. The AdvanTex system, followed by a subsurface drip system, was the answer. Plus, the installed systems go almost unnoticed in yards and landscaping."*

Todd Christianson,
Premier Environmental
Products, LLC

## Newport, Rhode Island

*"I spent six years looking for the right wastewater system for my second home, which is on a small island. Even with seasonal flows, our AdvanTex Treatment System is working great . . . so great, I decided to become a dealer! We entertain often, so we use a lot of water, but we've never had a problem. And the system was easy to transport and install."*

Peter Kent, Atlantic Solutions, Ltd.

# AdvanTex® – Treatment Systems

*Orenco Systems is owned and managed by engineers who develop wastewater systems that work — systems based on sound science.*

*Clockwise from left:*
*Eric Ball, P.E., Jeff Ball, P.E., Hal Ball, P.E., (front) Terry Bounds, P.E.*

*AdvanTex® Treatment System AXN Models meet the requirements of NSF-ANSI Standard 40 for Class I Systems.*

Certified Product
Australian Standard

c UL us LISTED

Powered by
Franklin Electric

## Carefully Engineered by Orenco

*Your health is our priority. At Orenco Systems, we are committed to "Changing the Way the World Does Wastewater®."*

Orenco Systems has been researching, designing, manufacturing, and selling leading-edge products for small-scale wastewater treatment systems since 1981. The company has grown to become an industry leader, with about 300 employees and with more than 300 points of distribution in North America, Australasia, Europe, Africa, and Southwest Asia. Our products and technologies have been installed in more than 70 countries around the world.


Orenco maintains an environmental lab and employs dozens of scientists and engineers who collectively have more than 500 years of wastewater experience. Orenco's systems are based on sound scientific principles of chemistry, biology, mechanical structure, and hydraulics. As a result, our research appears in numerous publications, and our engineers are regularly asked to give workshops and offer trainings.

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**ABR-ATX-1**
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# Hynds 'Lifestyle Advanced' Secondary Wastewater Treatment System

ORMISTON ASSOCIATES LTD

CONSULTANTS IN GEOTECHNICAL ENGINEERING, GEOLOGY & ENGINEERING GEOLOGY

Scan for more information

# Lifestyle Domestic Wastewater Systems

Technical Guide WW 4

Hynds Lifestyle Systems are a high performing range of aerated wastewater treatment systems for domestic applications that offer environmentally sensitive alternatives to the septic tank.




### Applications

Residential properties

Irrigation for landscaping

### Product Attributes

High quality wastewater treatment

Genuine 24-hour emergency capacity

Simple IP rated control and alarm system

Quiet and economic operation

### Approvals/Standards

Tested (OSET–NTP)

### Quality

Manufactured to ISO 9001 Quality Standards

***We are the supply partner of choice for New Zealand's civil construction industry, specialising in water and infrastructure based solutions.***

HYNDS WASTEWATER

# Hynds Lifestyle Systems - The next generation of aerated wastewater treatment.

Hynds Lifestyle Systems are high performing modular wastewater treatment systems, which can be designed for all domestic applications. The systems are designed to easily blend into the landscaped environment. They offer high quality treatment performance, low running cost, and can be maintained by Hynds approved local service agents.

## Hynds Wastewater Treatment Systems. Proven Submerged Aerated Filtration (SAF) Technology.

This tested and proven secondary treatment process produces a clear, odourless liquid suitable for irrigation of water to landscaped gardens, bushes or trees.

### Installation

The installation of a Hynds Lifestyle System will be completed by an approved Hynds Installer. Installation of the treatment system and irrigation field is typically completed within one day.

### Design

Hynds wastewater treatment systems cater for all site conditions and household requirements. Each system's design includes an assessment of the local Council regulations, or consent conditions.

Your local Hynds approved Installer will provide a free site visit to determine the most appropriate location of the treatment system, landscaping, and drainage requirements, and on request can provide approval for council consent and a quotation for the appropriate Hynds wastewater system.

### Performance

The unique design of Hynds Lifestyle System offers a level of performance unrivalled by traditional disposal methods. All Hynds Lifestyle Systems are designed to exceed New Zealand Standards for disposal of wastewater and are guaranteed to meet the following criteria:

- $BOD_5$ <20
- Suspended Solids <30mg/L
- Ammonia <5mg/L
- >99% faecal coliform removal <10,000mg/L
- Total Nitrogen <15-25mg/L

### Servicing

Your local Hynds approved service provider can offer a service contract to ensure ongoing optimum system performance. Two visits per annum are recommended to ensure compliance with council rules. The service provider offers back-up support with each service contract.

**TABLE 1**

| System | Number of Tanks | Volume (L/day) | Dia. (mm) | Height (mm) | Inlet from underside of tank (mm) | Elite Primary Length (mm) | Elite Primary Width (mm) | Elite Primary Height (mm) | Weight (tonne) |
|---|---|---|---|---|---|---|---|---|---|
| Lifestyle - Pokeno | 1 | 1800 | 2500 | 2500 | 1912 | | | | 7.1 |
| Lifestyle - Advanced PN - CHCH | 1 | 1800 | 2500 | 2500 | 1915 | | | | 6.75 |
| Lifestyle - Ultimate | 1 | 1800 | 2500 | 2500 | 1915 | | | | 6.75 |
| Lifestyle - Elite | 2 | 3000 | 2500 | 2500 | 1915 | 3300 | 1240 | 1970 | 12 |

**TABLE 2 North Island**

| Code | Description |
|---|---|
| CLE8500.B42A-IR | Lifestyle System (internal sludge) |
| CLE8500.B42A-IR | Advanced Lifestyle System (internal sludge) |
| CLE8500A.D42-ER | Elite Lifestyle System (to go with 4500 primary - External sludge ) |
| CLE4500EP.TANK | Elite Primary Tank 4500lt (Use this tank with Elite Lifestyle) c/w T100 Filter |
| CLE8500.ULT | ULTIMATE Lifestyle System (Low nitrogen system) |

**TABLE 3 South Island**

| Code | Description |
|---|---|
| CLE8500.D-IR-SK | Advanced Lifestyle System ( internal sludge) |
| CLE8500.D-ER-SK | Elite Lifestyle System (to go with 4500 primary - External sludge ) |
| CLE4500EP.TANK | Elite Primary Tank 4500lt (Use this tank with Elite Lifestyle) c/w T100 Filter |
| CLE8500.ULT | ULTIMATE Lifestyle System (Low nitrogen system) |

# Which is the right Hynds system for your site?

## Hynds Lifestyle Advanced

The Hynds Lifestyle System is designed for an individual house. The treatment process is incorporated in a single precast concrete tank.

- Maximum daily flow of up to 1800L/day
- High quality treatment performance
- Maximum 1 house
- Number of tanks: 1
- Total tank capacity: 8500 litres
- OSET and BOP Catchment Approved

**FIG. 1** Hynds Lifestyle Advanced

## Hynds Lifestyle Ultimate

The Hynds Lifestyle 'Ultimate' System is designed for an individual house and offers excellent surge control for high occupancy with advanced performance. A large biological surge protection filter is installed on the outlet of the primary chamber.

- Maximum daily flow of up to 1800L/day
- Offers good surge protection
- Maximum 1 house
- Number of tanks: 1
- Total tank capacity: 8500 litres
- OSET and BOP Catchment Approved

**FIG. 2** Hynds Lifestyle Ultimate

## Hynds Lifestyle Elite

The Hynds Lifestyle 'Elite' System is designed to cater for the larger home, or two connected dwellings. This system offers an additional large capacity primary chamber which provides protection againt surge flows that can adversely affect a systems performance.

- Maximum daily flow of up to 3000L/day
- Maximum 2 houses
- Number of tanks: 2
- Total tank capacity: 13000 litres

**FIG. 3** Hynds Lifestyle Elite

### *Tank and Blower Box Riser*

**TABLE 4 Tank and Blower Box Riser and Filter access Riser**

| Code | Description |
|---|---|
| R1050300 | 1050 x 300 Concrete Lid Riser |
| LIFECBR | 450w x 300h Poly Blower Box Riser (Advanced) |
| ICO4500300 | 450w x 300 Concrete Riser (Lifestyle) |
| ICO4500450 | 450 x 450 Concrete Riser (Lifestyle) |
| LIFECONTBR300 | Blower Box Riser 300mm (Lifestyle) |

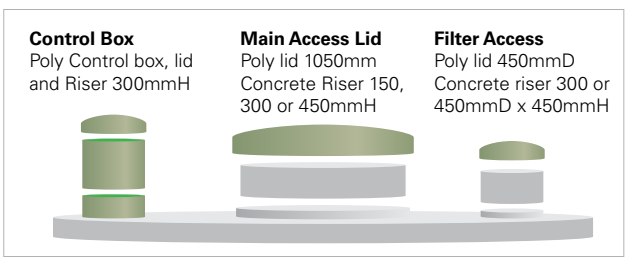



**FIG. 4** Hynds Lifestyle Lid, Blower Box and Riser

## Irrigation

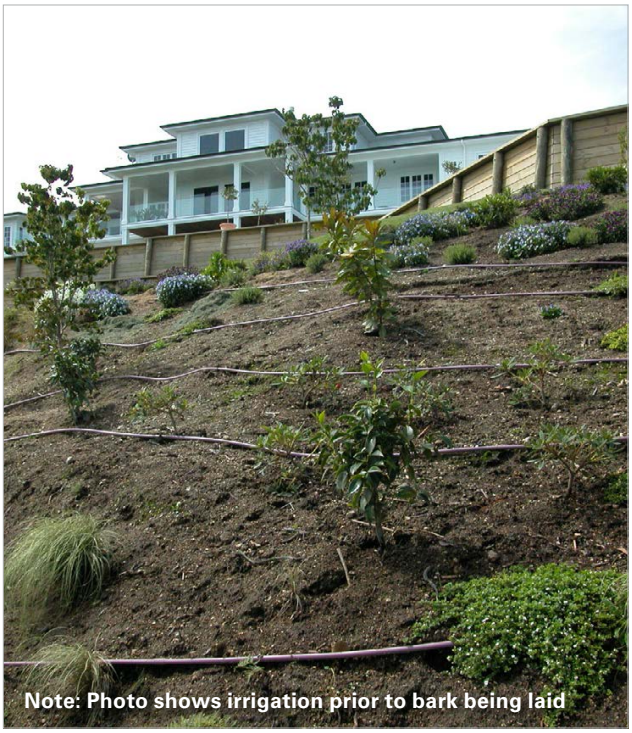



**FIG. 5** Disposal of the treated effluent from the tank is through small (16mm dia.) controlled drip emission system to evenly distribute treated effluent onto your landscaped garden, trees or bush. Various irrigation layout designs can be considered to suit your property.

**FIG. 6** Irrigation filter
IRRA25TFC130 (body)
IRRA25TFCL130 (disk)

## Lifting and Handling

All Lifestyle Domestic Wastewater Systems incorporate Swiftlift lifting anchors for safe lifting and must be used with the correct lifting clutch.

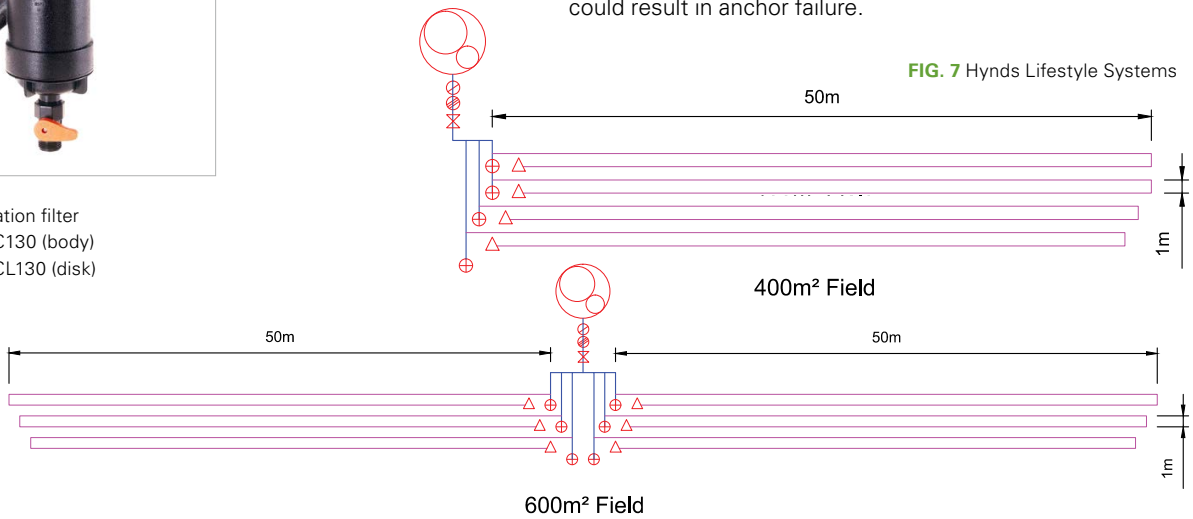
Hynds Pipe Systems has designed and manufactured Lifestyle Domestic Wastewater Systems with a minimum dynamic factor of 1.2. This dynamic factor requires that all the following conditions are observed when lifting, moving or placing the units:

1. Lifting with mobile plant *(such as an excavator or similar)* where equipment is specifically exempt from the requirements of the PECPR Regulations 1999, subject to the conditions outlined in the New Zealand Gazette, No. 104, September 2015 and
2. Lifting, travelling and placing over rough or uneven ground where anchor failure is not anticipated to cause harm or injury, by adopting procedures such as:
   a. Transporting the element as close as practical to ground level (300mm recommended)
   b. Establishing and maintaining exclusion zones
   c. Transporting only precast concrete elements that are unlikely to topple if they were to hit the ground
   d. Inspecting lifting anchors both after transportation and before final lifting into place

Refer to "Safe work with precast concrete - Handling, transportation and erection of precast concrete elements" published by Worksafe New Zealand (October 2018)

Shock loads resulting from travelling with suspended Lifestyle Domestic Wastewater Systems over rough terrain and uneven ground may exceed design, dynamic and safety factors of the lifting systems. It is essential that care is taken during lifting and transporting as additional stresses could result in anchor failure.

**FIG. 7** Hynds Lifestyle Systems



# Biolytix 'BioPod' (BF6) Secondary Wastewater Treatment System

ORMISTON ASSOCIATES LTD
CONSULTANTS IN GEOTECHNICAL ENGINEERING, GEOLOGY & ENGINEERING GEOLOGY

# Biolytix BioPod (BF6) Wastewater Treatment System

## Specifications

The Biolytix BioPod (BF6) is an onsite treatment system designed to treat wastewater from domestic sources. It uses a single tank configuration based on an enhanced trickling filter process which mimics a natural soil habitat. The BF6 is certified to comply with AS/NZS 1546.3:2008 and must be operated in accordance with this standard.

### Effluent Quality

The BF6 wastewater treatment system generates secondary treated effluent of the following quality:

- 5-day Biochemical Oxygen Demand ($BOD_5$) <20 mg/L
- Suspended solids <30 mg/L

The effluent must be disposed of as stipulated by the local Territorial Authority. AS/NZS 1547:2012 describes discharge options for secondary-treated effluent. However, the Territorial Authority regulations applying to a specific site may be different and more stringent and should be consulted before making a decision.

### Maximum Loading

- Flow rate: 1600 L per day
- Organic loading as $BOD_5$: 700 g per day
- Suspended solids loading: 700 g per day

Important: The actual maximum loading of an installed BF6 is limited by the capacity of the dispersal system it discharges to. For example, if the BF6 is connected to a land dispersal system with a capacity of 800 L/day, then the BF6 must not be loaded at more than 800 L/day.

### Operation

- Emergency storage capacity: 1650 L
- Temperature and humidity: Operates under normal temperature and humidity conditions experienced in New Zealand and the Pacific Islands.
- Noise < 40 dB $L_{Aeq}$ at a distance of 1 m
- Electricity consumption (per year): Treatment process 44 kWh; effluent pump typically 165 kWh (per year). Effluent pump power use can vary significantly depending on the size and location of the dispersal system and the actual household water usage.
- Maintenance: Requires at least an annual service (Note: Some Regional Authorities require at least two services per year regardless of the type of on-site wastewater system)
- Minimum serviceable life: 15 years

## Treatment Process

The BF6 filter bed (Figure 1) is contained in an injection moulded high grade polypropylene tank and consists of six layers of drainage elements and peat/drainage elements. All layers contain plastic trickling filter media contained in open-mesh bags. In the filter bed there is in excess of $2m^3$ of plastic filter media with a high porosity and a high specific surface area. The peat layers additionally contain coco peat, the fibrous structure of which significantly increases the available treatment surface area and the ability to retain moisture. The layers are separated by coarse HDPE mesh fabric.

The resulting filter bed mimics a natural soil habitat, containing a diverse ecosystem of micro and macro-organisms. These organisms aerobically treat the wastewater as it percolates through the bed, prevent the accumulation of sludge, and keep the filter aerated. On commissioning, the filter is inoculated with a kilogram of tiger worms *(Eisenia Fetida)*. These worms propagate and burrow through the filter bed, thereby keeping its structure open and porous. A Schego M2K3 air pump is used to provide additional air to the bed at the rate of 350 L per hour.

A geotextile filter layer with a nominal pore size of 80 micron separates the filter bed from the effluent storage sump. Its purpose is to remove fine solids from the treated effluent. To support the bed, the sump is filled to a depth of 400 mm with a matrix of plastic media. It drains into the central pump well, from where the effluent is pumped using a submersible pump to a land dispersal system (e.g. subsurface drip irrigation). The pump is controlled by a factory set float switch. The total bed depth including sump is 1050 mm.

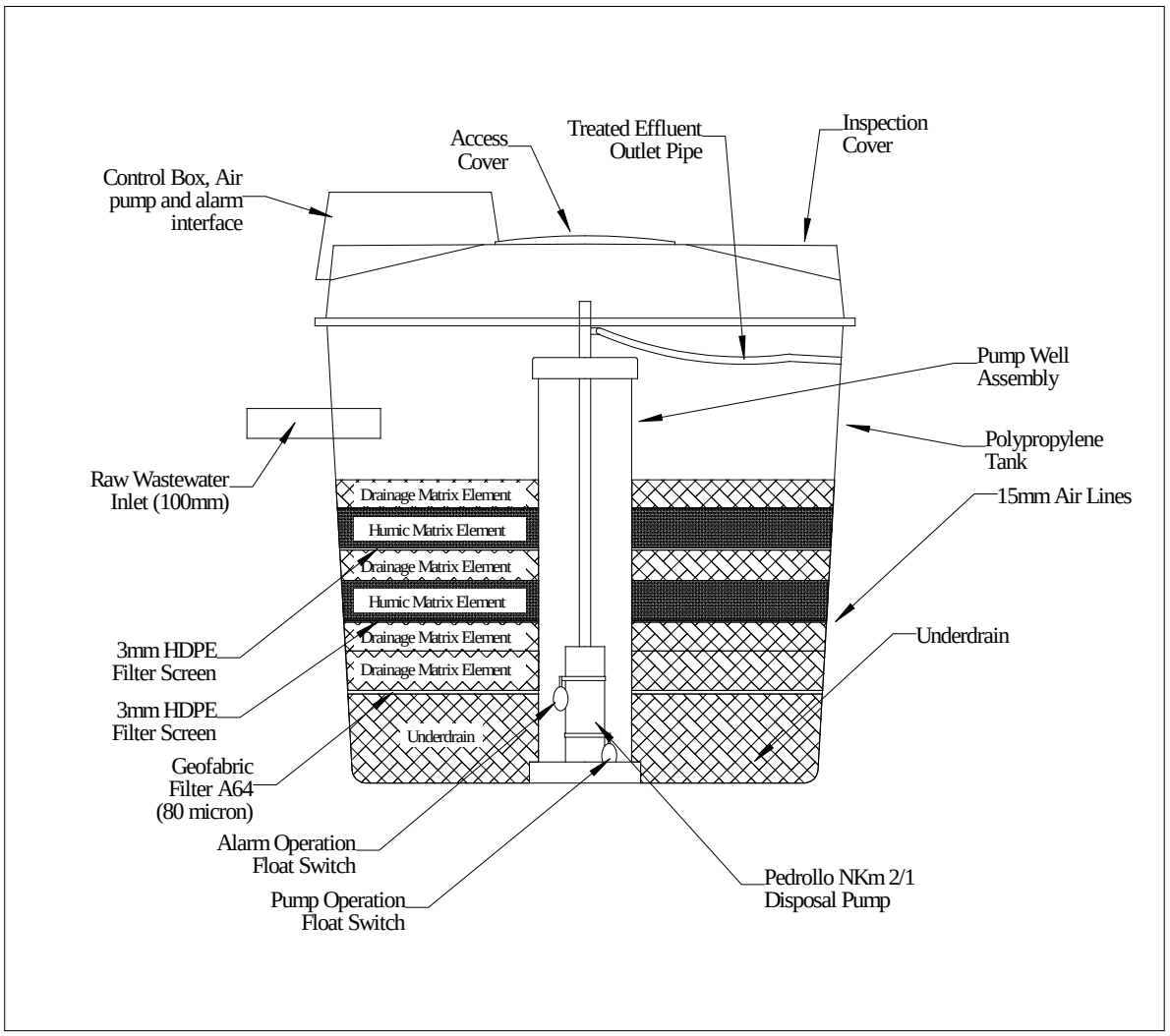



**Figure 1** Biolytix BF6 wastewater treatment system

## Configuration Options

The BF6 can be installed in-ground or above ground. Local Council restrictions may apply to above-ground installations (Land Use/Building Consent conditions etc). Available tank sizes are 3000 L and 4000 L. Both tanks have the same bed configuration and provide the same treatment capacity and performance, but use different inlet invert depths as follows:

- BF6-3000 tank: 650 mm
- BF6-4000 tank: 1100 mm

The BF6 effluent is either gravity drained or pumped to a dispersal system. The pumpout (dose) volume is 220 L per cycle. The standard pump is a high-quality Pedrollo NKm 2/1 submersible pump, the characteristics of which are shown in Figure 2 below. Other Pedrollo pumps may be used instead to suit specific sites. Contact Biolytix to discuss your requirements and for information on the types of pumps available.

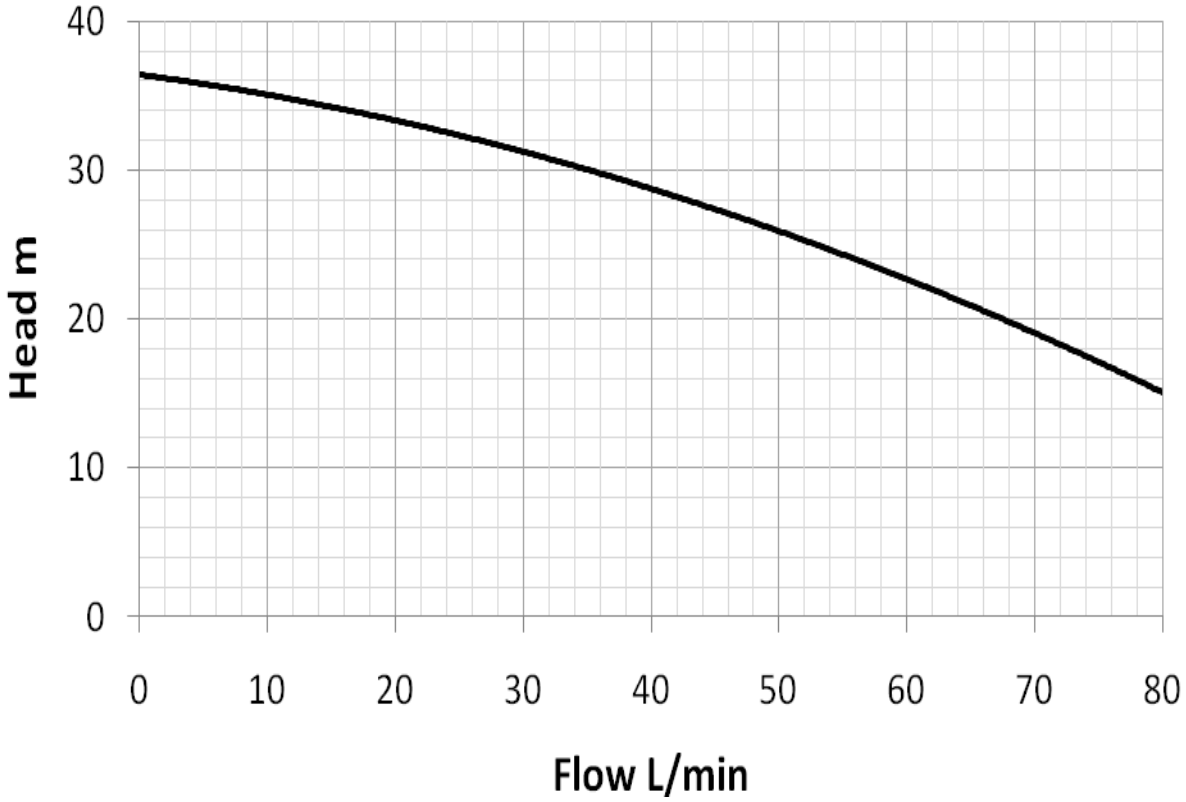


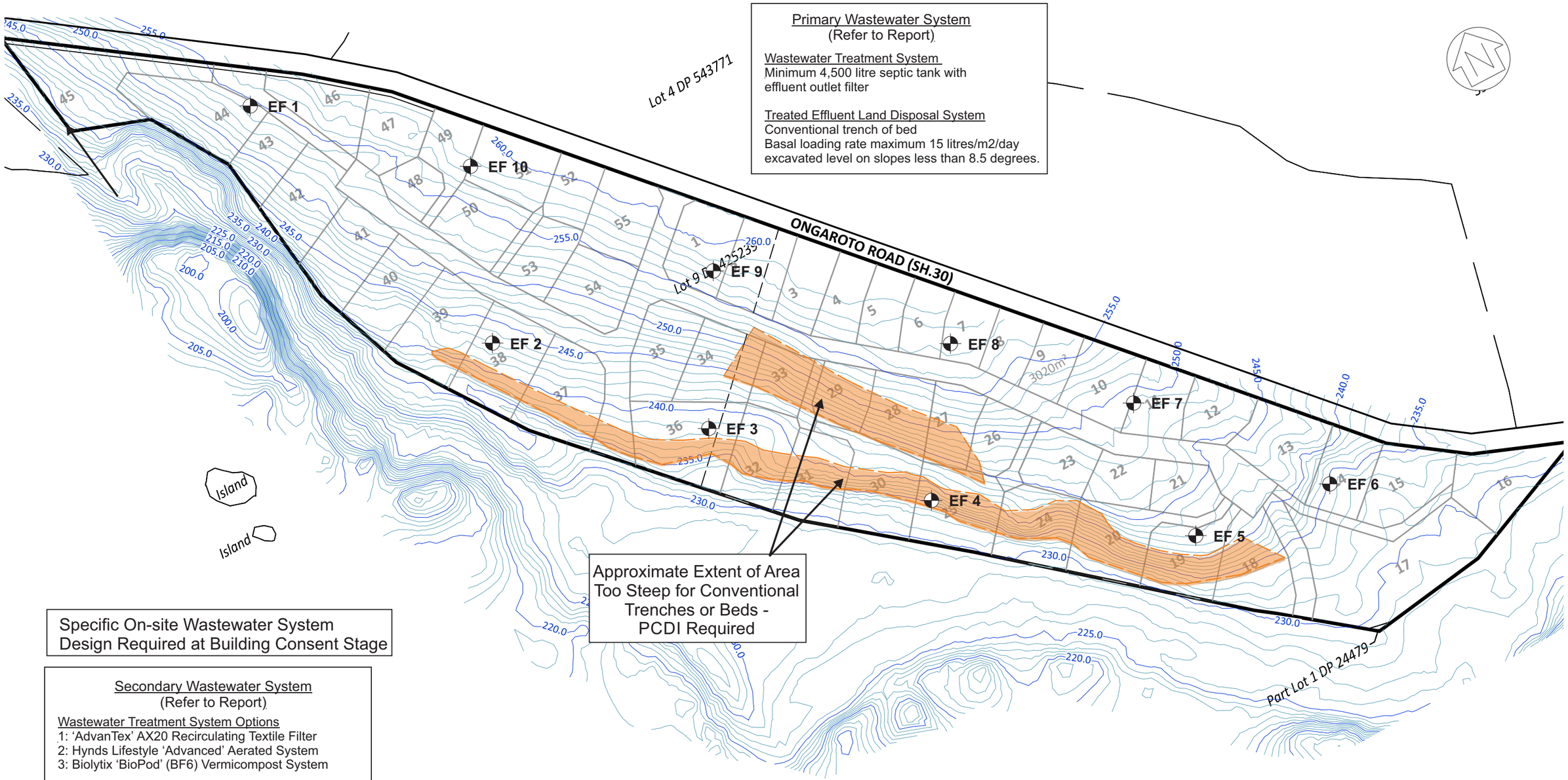

**Figure 2** Pedrollo NKm 2/1 characteristic curve (power 0.45 kW)

### Alarm System

The BF6 is equipped with an AS/NZS 1546.3 compliant audible and visual alarm with a mutable audible alarm signal and an alarm light. The alarm must be mounted in a location that is readily visible from within the dwelling.

Alarms are triggered by either a high-level float switch in the pump well or an air pressure switch on the air supply line.

# Site Plan




Specific On-site Wastewater System Design Required at Building Consent Stage

Secondary Wastewater System
(Refer to Report)

Wastewater Treatment System Options
1: 'AdvanTex' AX20 Recirculating Textile Filter
2: Hynds Lifestyle 'Advanced' Aerated System
3: Biolytix 'BioPod' (BF6) Vermicompost System

Selected system to have disc filter and a minimum 24 hours emergency storage.

Treated Effluent Land Disposal System
Pressure Compensating Dripper Irrigation (PCDI)
Areal loading rate maximum 4 litres/m2/day laid at 1m centres and either buried or pinned to the surface and intensively planted

Subdivision Layout July 2022 CONCEPT
All Layout Subject to Change

Scale 1:4,000

0m 100m 200m 300m

**LEGEND**

EF 1 Approximate Location of Effluent Borehole

NOTE: Plan based on drawing prepared and provided by CKL Ltd.

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CLIENT: Jonathan Quigley
LOCATION: Ongaroto Road, Whakamaru
TITLE: Preliminary Wastewater Management Plan

SCALE: 1:4,000 @ A3
DRAWN: TLS
DATE: August 2022
CHECKED: AWO

DRAWING NO
4721-1-2022
SHEET 1 OF 1