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Irrigation Water Take Consent

Resource Consent Application & Assessment of Environmental Effects

BRYAN ESTATE

WWA0092| Rev. 2

10 April 2019

Irrigation Water Take Application

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Contents

1. Introduction

This document and attachments comprise a Resource Consent Application and an Assessment of Environmental Effects associated with a water take permit for irrigation of a horticultural development with Total Orchard Area of 60 hectares at Far North Road in the Pukenui area. The development comprises two properties, one of 43 hectares (Property 1) and the second of 67 hectares (Property 2). The legal description for Property 1 is Section 81, Block XV Houhora and for Property 2 is Lot 1, DP 195379 Block XV Houhora.

The background details of this application using Northland Regional Council's (NRC) "Application for Resource Consent" form is provided in **Appendix A**. Further details of various items where marked on the form are provided in the **Section 2**.

1.1 Report Structure

The report comprises:

- **Section 2** – a description of the proposed activity and suggested consent conditions;
- **Section 3** – background details of the application;
- **Section 4** – an assessment of environmental effects;
- **Section 5** – an assessment of cultural effects;
- **Section 6** – an assessment of statutory considerations;
- **Section 7** – a discussion of the notification process;
- **Section 8** – a discussion on consideration of consultation; and
- **Section 9** – summary and conclusions.

2. Description of Proposed Activity

2.1 Location

Figure 1 provides a map of the project area. As mentioned, there are two properties which are located on Far North Road in Pukenui which will both have individual bores located on the properties (see **Appendix A**).

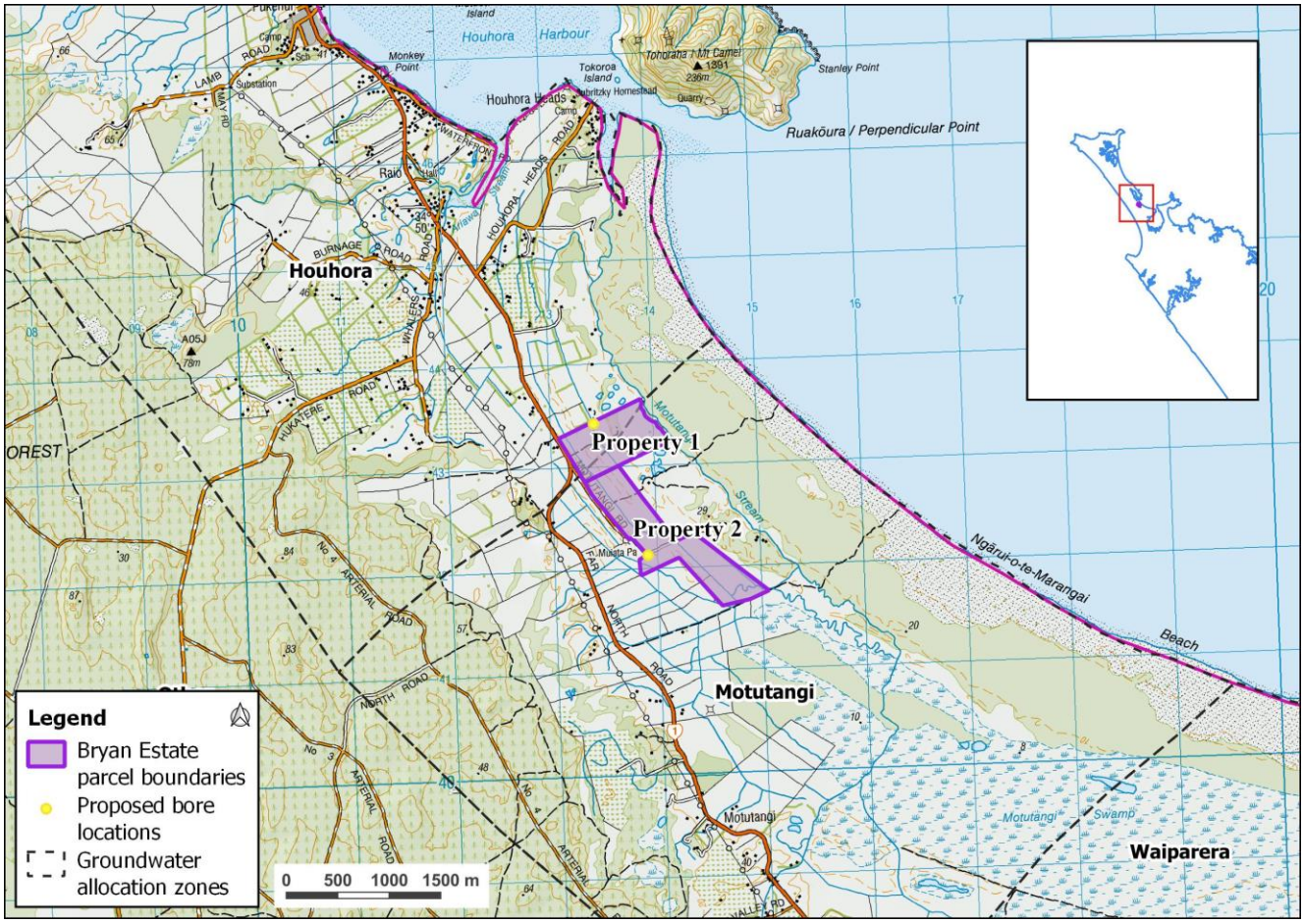


Figure 1. Project location and NRC groundwater allocation zones.

2.1 Description of Proposed Activity

The resource consent application for Bryan Estate seeks to take and use groundwater from two bores to develop and irrigate two new avocado orchards. The properties total 110 ha with plans for the development of a 60 ha canopy orchard (20 ha in Property 1 and 40 ha in Property 2).

The Total Orchard Area (TOA) of the development has been estimated at 75 ha assuming canopy is 80% of orchard area, which is well within the total area of the property available. The TOA for Property 1 and 2 are 25 ha and 50 ha, respectively.

Each property will have its own bore and these will be located in different groundwater allocation zones. The Property 1 bore is currently existing and is within the Aupouri-Houhora allocation zone while the Property 2 bore will be constructed within the Aupouri-Motutangi allocation zone as shown in **Figure 1**.

The groundwater take will be exercised from October to April, in accordance with the following volumes:

- Property 1 (Aupouri-Houhora allocation zone)
    - Maximum daily volume of 500 m^3/day; and
    - Maximum annual volume of 80,000 m^3/yr.
- Property 2 (Aupouri-Motuntangi allocation zone)
    - Maximum daily volume of 1,000 m^3/day; and
    - Maximum annual volume of 160,000 m^3/yr.

Typically, the maximum daily volume would be calculated at 25 m^3/ha/day over the TOA, in accordance with the decision made in the Motutangi-Waiharara Water User Group (MWWUG) hearing[1]. However, in this application the landowner specifically requests a lesser amount of 20 m^3/ha/day over the TOA for this development.

The maximum annual volume has been calculated from the canopy area of 20 ha and 40 ha for Property 1 and 2, respectively. The maximum annual volume has been calculated on the basis of 400 mm/annum (or 4,000 m^3/ha/annum canopy area), which is consistent with the Council Officers' recommendation in the MWWUG Hearing. This irrigation requirement is adequate to meet up to a 1 in 10 years drought requirement (**3.1.4**).

2.1.1 Consent Duration, Lapse and Review

A consent duration of 30 years is sought subject to a lapse period of 5 years from commencement of consent, and review conditions have been proposed for the purposes laid out in **Section 2.2**.

2.2 Proposed Consent Conditions

This section contains the proposed conditions for the water permit sought by the Applicant.

Water Extraction Volumes

1. The rate of take shall not exceed the limits set out as follows:
    (a) Property 1
        a. Maximum daily volume of 500 m^3/day (being any 24 consecutive hours); and
        b. Maximum annual volume of 80,000 m^3/yr (being 1 July to 30 June)
    (b) Property 2
        a. Maximum daily volume of 1,000 m^3/day (being any 24 consecutive hours); and
        b. Maximum annual volume of 160,000 m^3/yr (being 1 July to 30 June).

Notification of Irrigation

2. The Consent Holder shall advise the Council's assigned Monitoring Officer in writing when irrigation is to commence for the first time each season, at least five days beforehand.

Metering and Abstraction Reporting

3. The Consent Holder shall install a meter to measure the volume of water taken, in cubic metres, from each production bore. Each meter shall:

[1] The maximum daily volume can also be calculated on the basis of 41.6 m^3/day per canopy hectare (4.16 mm irrigation system capacity) on the basis of a peak daily soil requirement of 3.74 mm/day per canopy hectare and allowing for 10% system losses in delivery and application.

(a) Be able to provide data in a form suitable for electronic storage;

(b) Be sealed and as tamper-proof as practicable;

(c) Be installed at the location from which the water is taken; and

(d) Have an accuracy of +/-5%.

The Consent Holder shall, at all times, provide safe and easy access to each meter installed for the purposes of undertaking visual inspections and water take measurements.

4. The Consent Holder shall verify that the meter required by Condition 3 is accurate. This verification shall be undertaken prior to 30 June:

   (a) Following the first taking of water from each production bore; and

   (b) At least once in every five years thereafter.

   Each verification shall be undertaken by a person, who in the opinion of the Council's Compliance Manager, is suitably qualified. Written verification of the accuracy shall be provided to the Council's assigned Monitoring Officer by 31 July following the date of each verification.

5. The Consent Holder shall, using the meter required by Condition 3, keep a record of the daily volume of water taken from each production bore in cubic metres, including all nil abstractions.

6. If the instantaneous rate of taking is equal to or greater than 10 litres per second, then the water meter required by Condition 3 shall have an electronic datalogger for automatic logging of meter data. A copy of the electronic data records shall be forwarded to Council's assigned Monitoring Officer by the 7th of the following month, and immediately on written request from the assigned monitoring officer.

7. The Consent Holder shall measure, and keep a record of, the static water level in each production bore at least once each month. This measurement shall be taken at least eight hours after cessation of pumping. The Consent Holder shall also monitor electrical conductivity at least once a month during any irrigation season when the bore is in use.

8. A copy of the records required to be kept by Conditions 5, 6 and 7 for the period 1 July to 30 June (inclusive) shall be forwarded each year to the Council's assigned Monitoring Officer by the following 31 July. In addition, a copy of these records shall be forwarded immediately to the Council's Compliance Manager on written request. The records shall be in an electronic format that has been agreed to by the Council.

   Advice Note: If no water is taken during the period 1 July to 30 June (inclusive) then the Consent Holder is still required to notify the Council's Monitoring Manager in writing of the nil abstraction. Water use record sheets in an electronic format are available from the Council's website at www.nrc.govt.nz/wur.

9. Easy access for a water level probe shall be provided and maintained at the production bore wellhead to enable the measurement of static water levels in the bore.

Water Use Efficiency

10. The Consent Holder shall prepare an Irrigation Scheduling Plan (ISP) that outlines how irrigation decisions will be made. The ISP shall be prepared by a suitably qualified and experienced person and submitted to the Council's Compliance Manager for written approval. The ISP shall, as a minimum, address:

    - Water balance and crop water requirements;
    - Subsurface drainage; and
    - Overall irrigation strategy.

    For each irrigation area, the ISP should include:

    (a) A description of how water requirement for each irrigation cycle is calculated;

    (b) Method(s) for assessing current soil moisture levels;

    (c) Method(s) for assessing potential evapotranspiration (PET) and rainfall to date;

(d) Assessment of other inputs such as effluent irrigation and effect on irrigation requirement;

(e) Soil moisture target to be maintained in each zone by irrigation;

(f) How measured data will be used to assess irrigation requirements over the next irrigation cycle; and

(g) A description of proposed method(s) for remaining within consent limits at each borehole or group of boreholes.

Advice Note: The ISP seeks to ensure that an irrigation efficiency of a minimum 80% is achieved.

11. The Consent Holder shall not exercise this consent until the ISP required by Condition 10 has been certified by the Council's Compliance Manager.

12. The ISP certified in accordance with Condition 11 shall be implemented prior to the first irrigation season, unless a later date has been approved in writing by the Council's Compliance Manager.

13. The Consent Holder shall, within six months of the first exercise of this consent, undertake an audit of the irrigation system and the ISP described in Condition 10 using a suitably qualified and experienced person. The irrigation system audit shall be prepared in accordance with Irrigation New Zealand's "Irrigation Evaluation Code of Practice" (dated 12 April 2010), including recommendations on any improvements that should be made to the system to increase water efficiencies. The results of the audit and its recommendations shall be submitted in writing to the Council's assigned Monitoring Officer within one month of the audit being undertaken. A follow-up audit shall occur at five yearly intervals throughout the term of this consent, with a focus on the efficiency of water use.

14. The Consent Holder shall, within three months of notification in writing by the Council's Compliance Manager, implement any recommendations of the audit referred to in Condition 13.

15. The reticulation system and components shall be maintained in good working order to minimise leakage and wastage of water.

16. There shall be no significant ponding of irrigated water within any irrigated area, or significant runoff from either surface or subsurface drainage to a water body, as a result of the exercise of this consent.

Review Condition

17. The Council may, in accordance with Section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions annually during the month of June for any one or more of the following purposes:

    (a) To deal with any adverse effects on the environment that may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; or

    (b) To review the allocation of the resource.

    The Consent Holder shall meet all reasonable costs of any such review.

Lapsing Condition

18. This consent shall lapse on the **30 June 2024**, unless before this date the consent has been given effect to.

Advice Note: An application can be made to the Council in accordance with Section 125 of the Act to extend the date after which the consent lapses. Such an application must be made before the consent lapses.

EXPIRY DATE: 30 June 2049

3. Background Information

3.1 Site Conditions

3.1.1 Soils

There is no Landcare Research S-map soil data available for this site, however there is Fundamental Soil Layer information, pre-dating S-Map, which describes the soil around the property as having strongly weathered grey ultic soils[2], brown soils[3] which occur in places where summer drought is uncommon, and Mesic organic soils[4] which is moderately decomposed peat. These soils display the following properties:

- ***Physical properties*** – Ultic soils have slow permeability due to the clayey sub soil. Sandy recent soils occur on young land surfaces generally having deep rooting and high plant available water capacity. Mesic organic soils occur in areas of wetlands or under forests which produce acidic litter, with low bulk density, bearing strength and thermal conductivity but high total available water capacity.
- ***Chemical properties*** – Ultic soils are strongly acidic with low nutrient reserves and sandy recent soils have high natural saturation with high base saturation. Part of Mesic organic soils have mineral material but is dominated by organic matter.
- ***Biological properties*** –Ultic soils have a large and active population of organisms in the top soil. Sandy recent soils have a continuous cover of vascular plants. Organic soils have restricted biological activity of organisms due to the anaerobic conditions, leading to a slow decomposition rate.

3.1.2 Geology

Bryan Estate bore is underlain by the Aupouri Aquifer, comprising an extensive sequence of fine-grained sands, interspersed with sporadic iron pan, peat, and silt near the surface and shellbed in the deep layer. This consists of Pleistocene and Holocene unconsolidated sedimentary materials deposited in beach and dune (abandoned shorelines and marine terraces) and associated alluvial, intertidal estuarine, shallow marine, lakebed and wetland environments.

With distance inland from the coast, the sand deposits become progressively older and have a higher degree of compaction and weathering compared to the younger foredune sands located at the coast.

With increasing depth, the occurrence of shellbed layers increases. The shellbeds comprise layers that typically range in composition from 30-90% medium to coarse shell and 10-70% fine sand. The shellbed aquifer typically resides from approximately 70 to 120 mBGL. Underlying the shellbed aquifer are basement rocks of the Mount Camel Terrain, which typically comprise hard grey to dark green / black igneous rocks described in Isaac (1996) as intercalated basalt and basaltic andesite lava, pillow lava, rhyolitic tuff, tuff-breccia, conglomerate, sandstone and mudstone.

3.1.3 Hydrogeological Interpretation

The sands deposited on the east and west coast are generally younger and more permeable than the weathered sand in the central area. The shell content in the sand increases with depth, and the shell-rich sand layer is the most prolific water yielding aquifer in the region and hence the target for irrigation bores.

The aquifer system is unconfined at the surface but behaves in a manner that suggests a progressive degree of confinement with depth (leaky confinement). There is no well-defined regionally extensive confining layer but there are numerous low-permeability layers (e.g. iron pan, brown (organic) sand, silt, peat) that vary in depth and thickness, which over multiple occurrences collectively provide a degree of confinement that leads to the development of vertical pressure gradients.

[2] https://soils.landcareresearch.co.nz/describing-soils/nzsc/soil-order/ultic-soils/
[3] https://soils.landcareresearch.co.nz/describing-soils/nzsc/soil-order/brown-soils/
[4] https://soils.landcareresearch.co.nz/describing-soils/nzsc/soil-order/organic-soils/

All the basement rocks in the area are known to be low permeability.

3.1.4 Irrigation Requirements

The peak water requirement in this area is typically 40.0 m^3/day per canopy hectare, which is equivalent to 4.0 mm per day. The irrigation requirement was simulated on a daily basis with the Soil Moisture Water Balance Model (SMWBM) using historical rainfall and evaporation data from 1960 to 2018. The simulation results are portrayed statistically on a monthly basis in **Figure 2**, which is a box and whisker plot showing the monthly median, lower quartile (25th percentile), upper quartile (75th percentile) and minimum and maximum recorded monthly values. The graph shows the seasonal irrigation profile and likelihood of water requirements each month.

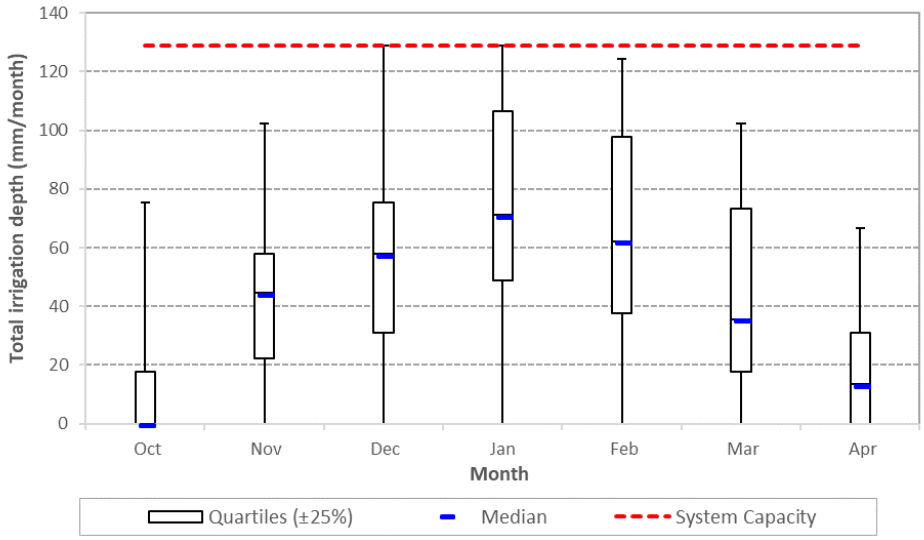


Figure 2. Simulated monthly statistical irrigation profile.

During the irrigation season, the rate of application will remain the same, but the number of days between irrigation events will increase during the shoulders of the season (i.e. typically in spring and autumn), which is exemplified in the monthly statistics shown in **Figure 2**.

Table 2 provides information on the frequency of monthly irrigation requirements and the number of days irrigation is likely required. The 1-year recurrence interval represents the typical monthly requirements and indicates that on average irrigation will not be required in October and April, and between November and March will vary from 18 mm to 47 mm per month.

In a 10-year drought year, the irrigation requirement for the season is likely to be approximately 400 mm, with peak monthly totals up to approximately 120 mm, hence the amount of water being applied for is adequate to fully meet the requirements up to the 10-year drought.

Table 1. Frequency of monthly and annual irrigation requirements (mm) and days of irrigation [days].

Average Recurrence Interval	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Annual
1 yr	0 [0]	23 [6]	31 [7]	47 [11]	40 [10]	18 [4]	0 [0]	250 [60]
2 yr	0 [0]	44 [11]	58 [14]	69 [17]	62 [15]	36 [9]	16 [4]	307 [74]
4 yr	18 [4]	58 [14]	76 [18]	107 [26]	98 [24]	74 [18]	31 [7]	369 [89]
5 yr	18 [4]	62 [15]	76 [18]	107 [26]	98 [24]	80 [19]	40 [10]	382 [92]
10 yr	31 [7]	76 [18]	104 [25]	117 [28]	116 [28]	84 [20]	50 [12]	401 [96]
100 yr	53 [13]	102 [25]	124 [30]	129 [31]	124 [30]	100 [24]	64 [15]	545 [131]

Table 2 provides the orchard water balance under dryland and irrigated conditions and

Figure 6 shows the mean monthly seasonal breakdown of this data. The data represents the mean annual water balance components from the 59-year simulation. It is evident that under the irrigated orchard profile, soil moisture content typically resides at a higher status (which is the intention) during summer, and surface runoff, sub-soil drainage, soil evaporation and canopy interception all increase.

However, avoidable losses due to surface runoff have not changed appreciably, and the additional runoff that has occurred is due to rainfall excess rather than too much irrigation, demonstrating that the irrigation applications of 3 mm/day are efficient.

Table 2. Summary of average annual water balance components under irrigated and unirrigated profiles (mm/yr unless specified otherwise).

Annual Average	Dryland	Irrigated
Average Soil Moisture Content (mm)	92	104
Sub-Soil Drainage	452	522
Surface Runoff	93	105
Soil ET	467	547
Canopy Interception	179	284
TOTAL	1,191	1,458

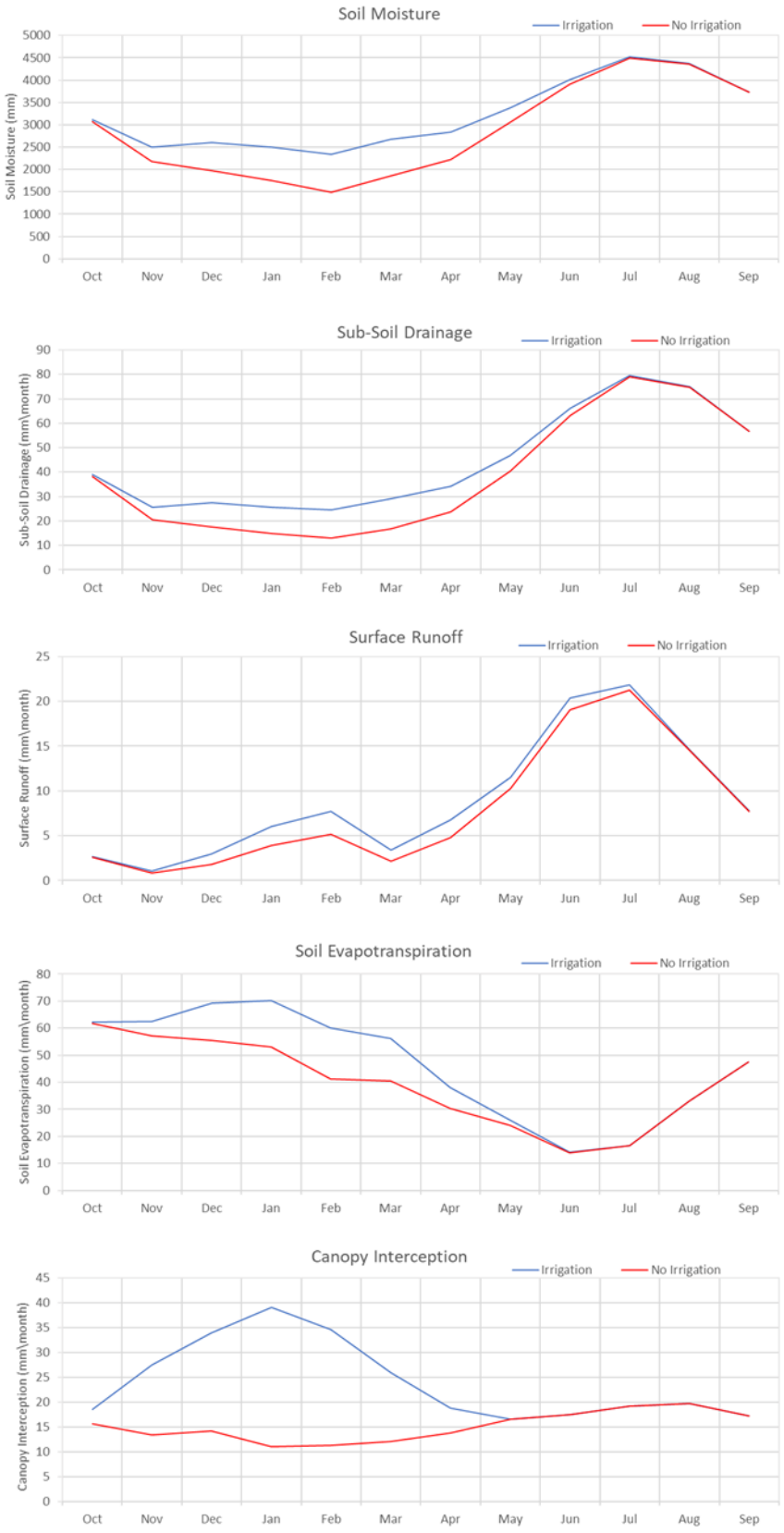


Figure 3. Comparison of water balance components.

3.2 Neighbouring Bore Information

There are 51 bores registered within the NRC database within a 2 km radius of the Bryan Estate properties (**Figure 4**). Statistics on the 51 bores are as follows:

- 42 are active, four are inactive, and five are pending;
- Bore depth is provided for 47 bores and ranges from 11 m to 117 m with an average of 79 m.
- 39 bores have information attached in terms of the purpose of the bores; among these bores:
    - Eleven are for domestic purposes;
    - Four are for stock;
    - Six are for domestic and stock use;
    - Three are for domestic use and irrigation;
    - Fourteen are for irrigation;
    - One is listed as commercial water supply

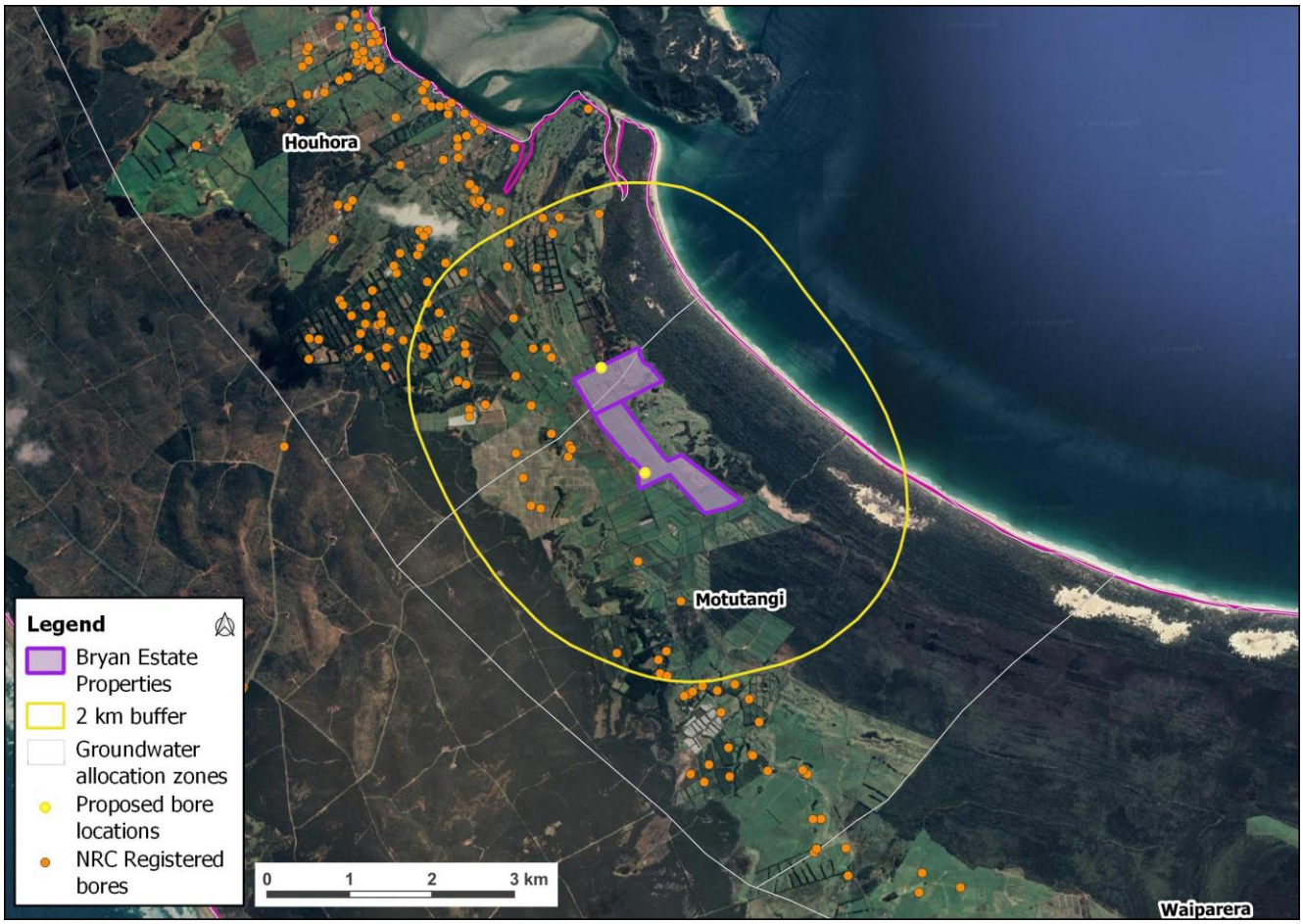


Figure 4. Neighbouring bores within 2 km radius of Bryan Estate properties. Groundwater allocation zones are labelled.

3.3 Relevant Statutory Documents

3.3.1 Activity Status

The activity status of the proposed activity under both the Regional Water and Soil Plan (RWSPN) and Proposed Regional Plan for Northland (pRPN) is considered a discretionary activity – details of this conclusion are summarised in **Table 3.**

Table 3. Summary of activity status against Regional Plan Provisions.

Plan	Relevant Rules	Comment
RWSPN	Rule 25.03.01 of the plan states that "The taking, use or diversion of groundwater from an aquifer, and any associated discharge of groundwater onto or into land or into water, which does not meet the requirements of the permitted, controlled or non-complying activity rules is a discretionary activity." In essence, the discretionary activity rule is for takes that are not for domestic or stock watering purposes (Rule 25(A)) and exceed the permitted activity thresholds (Rule 25.01.01) of a daily volume of 10 m^3/d and instantaneous rate of 5 L/s per bore.	Under this plan and until such time as the equivalent provisions within the pRPN are no longer contested, the proposed activity would be considered Discretionary Activity.
pRPN	Rule C.5.1.10 states that the taking and use of fresh water is a discretionary activity unless it is one of the following: 1) a permitted activity under C.5.1.1 'Minor takes – permitted activity', or 2) a permitted activity under C.5.1.2 'Temporary take for road construction or maintenance – permitted activity', or 3) a permitted activity under C.5.1.3 'Water take from an off-stream dam – permitted activity', or 4) a permitted activity under C.5.1.4 'Water take from an artificial watercourse – permitted activity', or 5) a permitted activity underC.5.1.5 'Water take associated with bore development, bore testing or dewatering – permitted activity', or 6) a controlled activity under C.5.1.6 'Replacement water permits for registered drinking water supplies - controlled activity', or 7) a controlled activity under C.5.1.7 'Takes existing at the notification date of the plan - controlled activity', or 8) a restricted discretionary activity under C.5.1.8 'Supplementary allocation – restricted discretionary activity', or 9) a discretionary activity under C.5.1.9 'Takes existing at the notification date of this plan – discretionary activity', or 10) a non-complying activity under C.5.1.11 'Water take below a minimum flow or water level-non-complying activity', or 11) a non-complying activity under C.5.1.12 'Water take that will exceed an allocation limit - non-complying activity', or 12) a prohibited activity under C.5.1.13 'Water takes that will exceed an allocation limit - prohibited activity'.	The proposed groundwater take does not conform to any of the activities listed in 1) to 10) in the lefthand column of the table, and as indicated in the following **Section 3.3.2** does not exceed an allocation limit, therefore the proposed activity constitutes a Discretionary Activity under the pRPN.

3.3.2 Allocation Zones

The Aupouri Peninsula Aquifer is divided into different allocation zones for management purposes. The Bryan Estate Property 1 is situated upon the boundary of the Aupouri-Houhora and Aupouri-Motutangi allocation zones, however the proposed bore for Property 1 is in the Aupouri-Houhora zone. Property 2 is located within the Aupouri-Motutangi allocation zone. The allocation limit, current level of allocation and the level of allocation should this consent (along with other pending consents) be granted, is shown for both zones in **Table 4.**

The allocation limit is calculated as 15% of mean annual recharge, on the basis of:

- the recommendation by the Northland Regional Council in paragraphs 111 to 118 of the Section 42 Hearing Report (Tait, 2018); and
- that this was uncontested by submitters on the Plan Change.

There are seven pending groundwater takes in the Aupouri-Houhora zone where the proposed groundwater take for Property 1 is located. They are S. & L. Blucher (96,000 m^3/yr), Te Raite Station (875,000 m^3/yr), J. Evans (160,000 m^3/yr), D. Wedding & Doody (304,000 m^3/yr), A. Matthews (12,000 m^3/yr), M. Evans (36,400 m^3/yr), M Evans Temp Consent (9,100 m^3/yr).

There are two pending groundwater takes in the Aupouri-Motutangi Zone where the proposed groundwater take for Property 2 is located. They are KSL Limited (3,600 m^3/yr) and Tuscany (36,000 m^3/yr).

Table 4 shows that the Aupouri-Hohoura zone is currently 46% allocated and granting the proposed Bryan Estate Property 1 groundwater take (80,000 m^3/yr) will account for an additional 2.6% of the allocation limit. If the other current proposals are granted, then the total allocation status for the Aupouri-Houhora zone will increase to 98.5%.

Table 5 shows that the Aupouri-Motutangi zone is currently 59% allocated and granting the proposed Bryan Estate Property 2 groundwater take (160,000 m^3/yr) will account for an additional 10% of the allocation limit. If the other current proposals are granted the total allocation status for the Aupouri-Motutangi zone will increase to 71%.

Table 4. Aupouri-Houhora Aquifer Limits[5] and Allocation Status.

Sub-aquifer	Allocation Limit [A.]		Allocation Status (Current)[B.]		Allocation Status Including Proposed Groundwater Takes: Byran Estate Property 1 (80,000), S. & L. Blucher (96,000), Te Raite Station (875,000), J. Evans (160,000), D. Wedding & Doody (304,000), A. Matthews (12,000), M. Evans (36,400), M Evans Temp Consent (9,100).	
	m^3/year	% mean annual recharge	m^3/year	%	m^3/year	% mean annual recharge
Aupouri - Houhora	2,999,201	15	1,374,864	46.0%	2,947,364	98.5%

Notes:

A. Recalculated from Lincoln AgriTech (2015).

B. Current allocation includes the recently granted (June 2018) MWWUG consents, which equated to 329,370 m^3/year in the Houhora zone

[5] According to NRC's allocation maps at http://gis.nrc.govt.nz/LocalMaps-Viewer/?map=895e0785f7054d47b10a72edc38022dc

Table 5. Aupouri-Motutangi Aquifer Limits[6] and Allocation Status.

Sub-aquifer	Allocation Limit [A.]		Allocation Status (Current)[B.]		Allocation Status Including Proposed Groundwater Takes: Byran Estate Property 2 (160,000), KSL (3,600), Tuscany (36,000)	
	m^3/year	% mean annual recharge	m^3/year	%	m^3/year	% mean annual recharge
Aupouri - Motutangi	1,604,487	15	941,457	58.7%	1,141,057	71.1%

Notes:

A. Recalculated from Lincoln AgriTech (2015).

B. Current allocation includes the recently granted (June 2018) MWWUG consents, which equated to 566,960 m^3/year in the Motutangi zone.

3.3.3 Section 104(1)(b) of the RMA

Schedule 4 of the RMA requires that when applying for a resource consent for any activity an assessment of activities against the matters in any relevant provisions of a statutory document referred to in s104(1)(b) of the RMA must be provided. These matters are described below and **Section 6** provides an assessment against the relevant documents.

The documents referred to in Section 104(1)(b) of the RMA are:

- a national environmental standard;
- other regulations;
- a national policy statement;
- a New Zealand coastal policy statement;
- a regional policy statement or proposed regional policy statement;
- a plan or proposed plan;

The following section provides details of the relevant Regional Planning provisions, while assessment of which documents listed above are relevant, is provided in **Table 6.**

Table 6. Summary of relevance of Section 104 statutes.

Statute	Relevance	Requirement of Statue
National Environmental Standards	There are no national environmental standards that are applicable to the proposed activity.	None
Resource Management (Measurement and Reporting of Water Takes) Regulations 2010	This regulation applies to a water permit that allows fresh water to be taken at a rate of 5 litres/second or more and is consumptive. Therefore, this regulation is relevant for this water take consent.	In summary, the regulations require permit holders to keep records that provide continuous measurement of the water taken under a water permit, including water taken in excess of what the permit allows. These records are to comprise measurements of the volume of water taken each day (in cubic metres) or each week (if approved by the Regional Council), and must be in

[6] According to NRC's allocation maps at http://gis.nrc.govt.nz/LocalMaps-Viewer/?map=895e0785f7054d47b10a72edc38022dc

Statute	Relevance	Requirement of Statue
		an appropriate format for auditing, and in a form suitable for electronic storage. The regulations also specify the required accuracy of any metering device (to within ±5% of the actual volume taken if from a full pipe (e.g. bore)).
National Policy Statement for Freshwater Management 2014	The following objectives and policies of the NPS are relevant to this proposal: *Water Quality* • Objectives A1, A2, and A4. • Policies A2, A3, and A7. *Water Quantity* • Objective B2, B3 and B5. • Policies B2 to B6. *Integrated Management* • Objective C1. • Policies C1 and C2.	*Water Quality* • Objective A1 seeks to safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems of fresh water, in sustainably managing the use and development of land, and of discharges of contaminants. • Objective A2 required that the overall quality of fresh water within a region is maintained or improved while improving the quantity of fresh water in water bodies that have been degraded by human activities to the point of being over-allocated. • Objective A4 seeks to enable communities to provide for their economic well-being, including productive economic opportunities. • Policies A2, A3, and A7 are considered relevant to this application and give effect to Objectives A1, A2, A4. *Water Quantity* • Objective B2 seeks to avoid any further over-allocation of fresh water and phase out existing over-allocation. • Objective B3 seeks to improve and maximise the efficient allocation and efficient use of water. • Objective B5 seeks to provide for communities' economic wellbeing within freshwater quantity limits. • Policies B2 to B6 are considered relevant to this proposal. *Integrated Management* • Objective C1 seeks to improve integrated management of fresh water and the use and development of land in whole catchments, including the interactions between fresh water, land, associated ecosystems and the coastal environment. • Policies C1 and C2 are relevant to this application and give effect to Objective C1.
Regional Policy Statement for Northland	The Regional Policy Statement (RPS) was made operative on 9 May 2016. The RPS provides a broad direction and framework for managing Northland's natural and physical resources. These include land, water, air, soil, minerals, plants, animals and all built structures.	• Objective 3.2 seeks to maintain and improve water quality for human use and ecological health. • Objective 3.3 seeks to safeguard the flows and flow variability required to maintain water's life-supporting capacity, for ecological processes, and to support indigenous species. • Objective 3.5 requires that the region's resources are sustainably managed in a way that is attractive

Statute	Relevance	Requirement of Statue
	The following Objectives are considered relevant to this proposal: • Objective 3.2, 3.3, 3.5, and 3.10. The following Policies give effect to the above Objectives, and therefore are considered relevant to this application: • Policy 4.3.2, 4.3.3.	for business and investment that will improve the economic wellbeing of the region and its communities. • Objective 3.10 requires efficient use and allocation of common natural resources with a particular focus on maximising the security and reliability of supply for users. • Policy 4.3.2 requires regulatory methods to avoid over-allocation of region-wide ecological flows and water levels. • Policy 4.3.3 requires the allocation and use of water efficiently within allocation limits.
Regional Plans	The Proposed Regional Plan for Northland (pRPN) sets out policies and rules for how Northland's water, soil, air and coast are used and was publicly notified on 6 September 2017 and closed for submissions on 26 March 2018. The pRPN will replace the Regional Water and Soil Plan for Northland (RWSPN), which has been operative since 28 August 2004. At present, the rules in both these plans have legal effect, with weight given to whichever plan has the more restrictive rule for the same activity if there is a conflict between the two plans, or the later plan if no submissions were received on certain aspects. Both plans address groundwater abstractions that have the potential to adversely affect the environment. However, there are no specific aquifer allocation limits set in the RWSPN. The following objectives and policies of the pRPN are considered relevant to this proposal: • Objective F.0.1. • Policy D.2.2. • Policy D.2.5. • Policy D.4.5. • Policy D.4.13. • Policy D.4.17. • Policy D.4.18. • Policy D.4.20. • Policy D.4.23.	From the pRPN: • Objective F.0.1 seeks to manage the use, development, and protection of Northland's natural and physical resources which enables people and communities to provide for their social, economic and cultural well-being while 1. sustaining the natural resources to meet the reasonable, foreseeable needs of future generations, 2. safeguarding life-supporting capacities of water, and 3. avoiding, remedying, or mitigating adverse effects on the environment. • Policy D.2.2 requires that regard is had to the social, cultural, and economic benefits of the proposed activity when considering resource consents. • Policy D.2.5 requires an authority to have regard to community and tangata whenua values • Policy D.4.5 seeks to maintain overall water quality. • Policy D.4.13 seeks to achieving freshwater quantity related outcomes and in particular manage the taking, use, damming, and diversion of fresh water so that (with relevance to this application) saline intrusion in, and land subsidence above, aquifers is avoided (amongst other things). • Policy D.4.17 considers allocation limits for aquifers and requires rules and applications to meet allocation limits • Policy D.4.18 concerns conjunctive surface water and groundwater management. • Policy D.4.20 requires the reasonable and efficient use of water for irrigation and sets requirements for a resource consent application to take water for irrigation purposes. • Policy D.4.23

Statute	Relevance	Requirement of Statue
	The following objectives and policies of the RWSPN are considered relevant to this proposal: • Objective 7.4. • Objective 10.4.1. • Policy 10.5.1. • Policy 10.5.2. • Policy 10.5.4. • Policy 10.5.7. • Policy 10.5.9	From the RWSPN: • Objective 7.4 requires the maintenance or enhancement of water quality of natural water bodies. • Objective 10.4.1 maintains the sustainable use and development of the region's groundwater resources while avoiding, remedying, or mitigating actual and potential adverse effects on groundwater quantity and quality. • Policy 10.5.1 seeks to ensure the sustainable use of resources by avoiding takes that exceed recharge. Saltwater intrusion, reduced groundwater quality, significant drawdown, and adverse effects on surface water resources can arise where takes exceed recharge. • Policy 10.5.2 recognises that aquifers are at risk in certain circumstances and that adverse effects on water quality should be avoided. • Policy 10.5.4 seeks that groundwater allocations take into account reduction in recharge that may occur in time. • Policy 10.5.7 requires the Northland Regional Council to consider effects of a groundwater take and use on surface water bodies. • Policy 10.5.9 seeks to avoid, remedy or mitigate any ground subsidence as a result of groundwater takes, use or diversion, where this is likely to cause adverse flooding, drainage problems, or building damage.

4. Assessment of Environmental Effects

The proposed groundwater takes for the Bryan Estate properties, totalling 240,000 m^3/year, were evaluated using the Aupouri Aquifer Groundwater Model (AAGWM), which is a numerical model covering the Aupouri shellbed aquifer from Ahipara to Ngataki. The model applied the MODFLOW Unstructured Grid (MODFLOW-USG) developed by the United States Geological Survey (USGS) within the GMS10.3 modelling platform to simulate regional groundwater flow.

The model comprises six layers that are used to represent the varying geology of the region with the shellbed aquifer, the primary source of groundwater, represented by the fourth and sixth model layers.

Table 7 provides a brief description of the geological units assigned to the layers in the model.

The development and calibration of the AAGWM is detailed in a standalone report on model development and calibration (WWA, 2019A). The model domain and locations of consented and proposed groundwater takes are shown in **Figure 5.**

Table 7. Geological units in the model conceptualisation.

Model Layer	Strat. Layer	Name	Description	Locality
1-3	1	Coastal sand	Loose coast sand, highly permeable	Western and eastern coastal strips.
	1	Weathered sand	Weathered dune sand, moderately compacted	Inland hilly or rolling country areas.
	1	Plain zone	Peaty and clayey sediments, low permeability	Inland low-lying plain areas.
4	2	Shellbed	Sand presented with shells, highly permeable	Throughout model, albeit thickness varies.
5	3	Fine sand	Old sand deposits, fine sand, moderately permeable	
6	4	Shellbed	Sand presented with more shells, highly permeable	

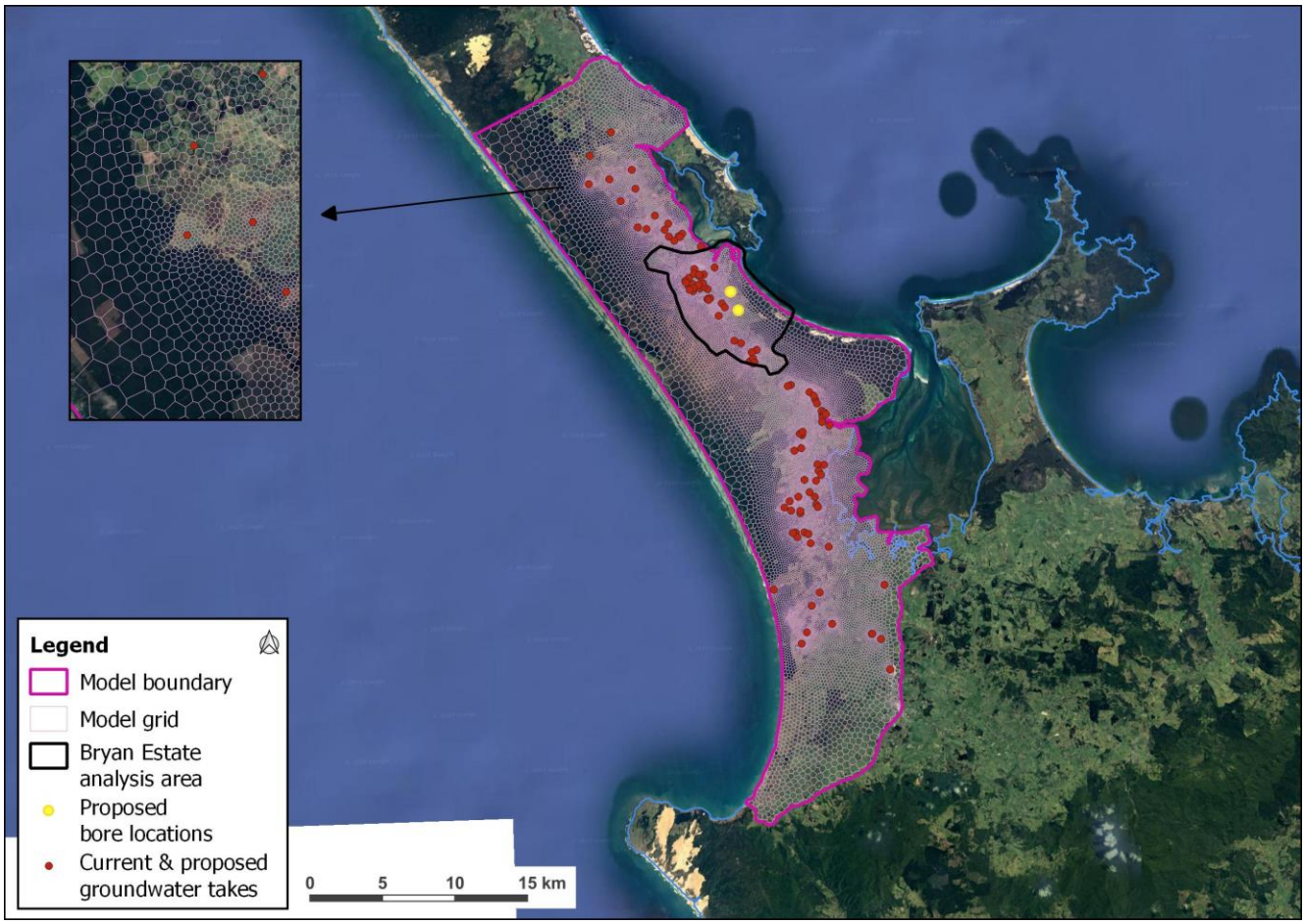


Figure 5. Aupouri Aquifer Groundwater Model domain

The Motutangi-Waiharara Groundwater Model (MWGWM), detailed in WWA (2017) is a previous numerical model that includes the area occupied by the proposed groundwater take.

The Base Case Scenario (Scenario 1) for evaluating the proposed groundwater takes for Bryan Estate applied the AAGWM with all currently consented groundwater takes and pending applications included. The Proposed Extraction Scenario (Scenario 2) was then developed by adding the proposed Bryan Estate groundwater takes to the Base Case Scenario. The results of the two scenarios were compared to assess the cumulative effect of the proposed groundwater takes with regard to the AEE criteria. Simulation results were evaluated for the drainages within and around the Bryan Estate properties in order to assess potential effects from proposed pumping in the area most likely to be impacted. This area is referred to in this report as the Bryan Estate Analysis Area and is shown in **Figure 5**.

This assessment also included a sensitivity analysis (Scenario 3) using the methods described in WWA (2017). In the sensitivity analysis connectivity between the surface conditions and the deep aquifer was significantly reduced while boundary and source/sink conditions remained the same as in the baseline model. The model was not calibrated to the conditions applied in Scenario 3, therefore Scenario 3 results are only referenced to illustrate relative (rather than absolute) changes in simulated groundwater levels.

The sensitivity analysis was undertaken because the calibrated groundwater model errs on the side of over simulation of vertical leakage. This was deliberately built into the model in the absence of a single well-defined low permeability horizon in the field, but rather a series of multi-layered and discontinuous iron pans and other low permeability horizons within the sedimentary sequence that in combination act as a flow barrier between the deeper groundwater system and the surface drains and wetlands. As a result, the model exaggerates the

effects of the proposed abstraction on the groundwater levels in the shallow aquifer and at the surface. Conversely, the model under-predicts the local-scale drawdown in the deeper aquifer.

The numerical simulation was run for a 58-year time period using historic climate records and groundwater pumping data. In effect, the climatic conditions of the last 58-years have been utilised to simulate conditions that may occur in the next 58-years.

The three predictive model scenarios can be summarised as follows:

- ***Scenario 1: Base Case*** – the calibration model which includes all currently consented groundwater takes at a total peak annual abstraction rate of 12,421,851 m^3/year.
- ***Scenario 2: Proposed Extraction*** – includes current and proposed groundwater extraction totalling a combined peak annual rate of 12,661,851 m^3/year.
- ***Scenario 3: Low Permeability-Proposed Extraction*** – Groundwater extraction is the same as in Scenario 2 with horizontal hydraulic conductivity of Layer 2 decreased to $1x10^{-7}$ m/s in both the coastal sands and weathered sand regions to simulate a hard pan extending over the model area.

From an assessment of effects perspective, it is important to focus on annual volumes. However, simulated pumping in the model is premised on peak daily rates (consented or proposed) pumped until the annual volume is reached (cap). However, due to variable stress period length ranging from a minimum of 13 days to a maximum of 185 days, the average pumping rate reported from the model is always less than the peak rate due to days within the stress period where pumping was not required. Historical dates where the maximum annual volume (consented or proposed) was simulated included 1964, 1974, 1983, 1991, and 2010.

4.1 Surface Water Effects

An analysis of the impact on flows including discharge to both farm drains and wetlands was undertaken for low-flow situations. Scenario 2 was selected for this assessment because it represents a greater potential impact on surface drains compared to Scenario 3. The annual minima in daily flow was determined from the global flow budget for all combined drain cells within the potential area of impact (**Figure 6**). Annual minima flows were used to calculate annual recurrence intervals for each scenario, and the resulting data is presented in **Table 8** and **Figure 7.**

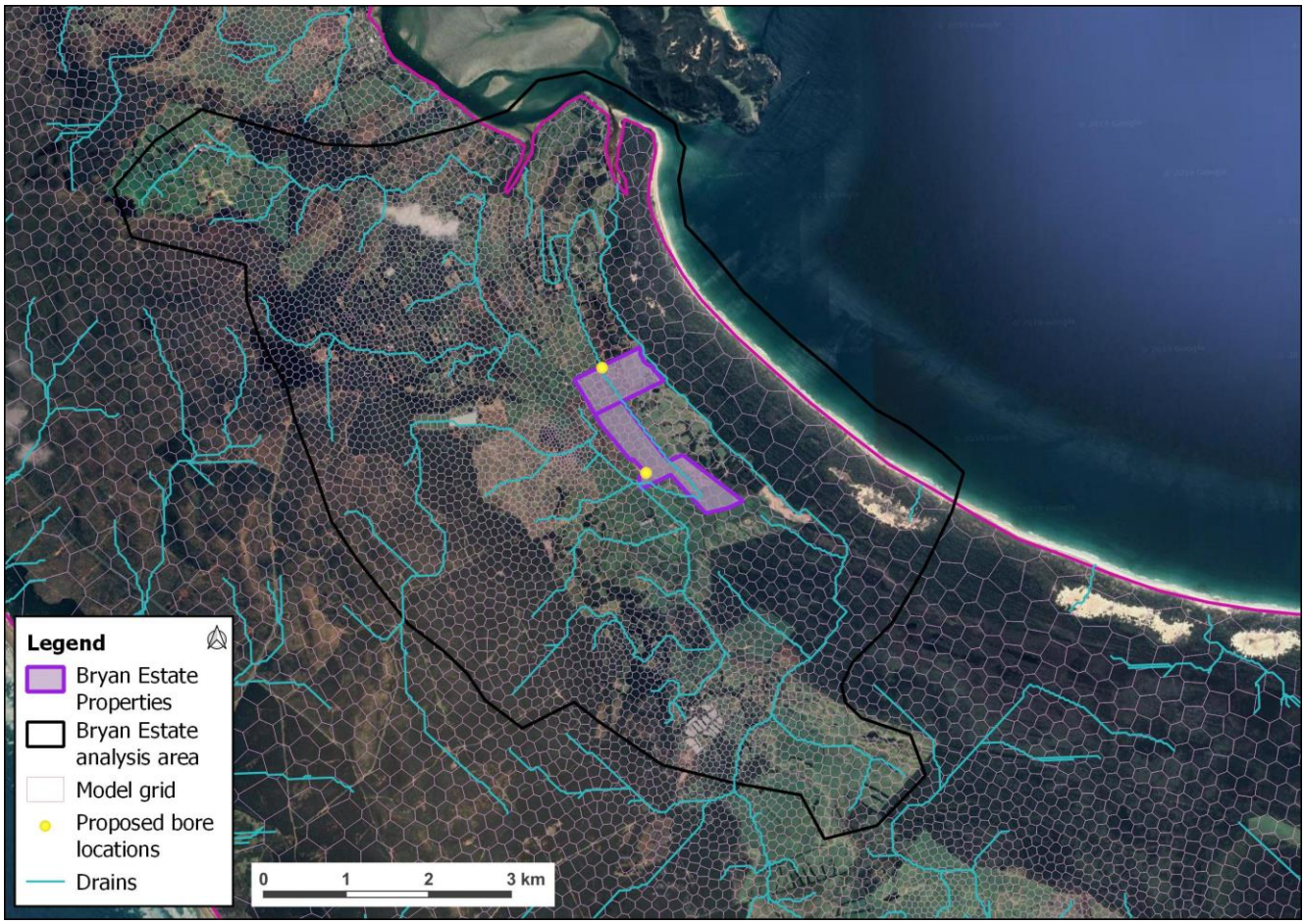


Figure 6. Drain locations in AAGWM within Bryan Estate area.

A comparison of the proposed groundwater extraction (Scenario 2) against the Base Case scenario indicates that the reduction in mean annual (1-year) low flow as a result of the combined groundwater extraction at the proposed bores is likely to be approximately 1%. However, as stated in WWA (2017) the model errs on the side of exaggerating groundwater level reduction in the shallow aquifer and at the surface because of the lack of hard pans in the model. In this regard, this can be considered a conservative estimate.

Results also indicate that the variation in annual minimum discharge from groundwater to surface water over a range of drought severities (i.e. annual to 100-year recurrence interval) is likely to be, at most, a 3.4% reduction with the proposed groundwater extraction. The greatest relative flow reduction, is predicted to occur with a 10-year low flow. More infrequent events (e.g. the 25, 50, and 100-year events) are also predicted to have a decline of approximately 3% relative to the Base Case Scenario.

The drain that flows through the Bryan Estate experiences the majority of the small flow reduction predicted, with lesser reductions in baseflow predicted for the other drains in the Bryan Estate Analysis Area.

Given the consideration that most of the surface flow reduction occurs on the property where the extraction will occur and that the model likely exaggerates groundwater level reduction in the shallow aquifer the broader impact of farm drains is unlikely to be significant. In summary, the effect of the proposed pumping on surface flows will be less than minor based on this analysis.

Table 8. Reduction in low-flow for surface drains in the Bryan Estate Analysis Area.

Recurrence Interval	Scenario 1: Base Case	Scenario 2: Proposed GW Extraction	Relative Difference
(years)	(L/s)	(L/s)	(%)
1	215	212	-1.1%
2	139	136	-2.4%
5	111	108	-2.5%
10	99	95	-3.4%
25	97	94	-3.0%
50	96	94	-3.0%
100	88	86	-3.1%

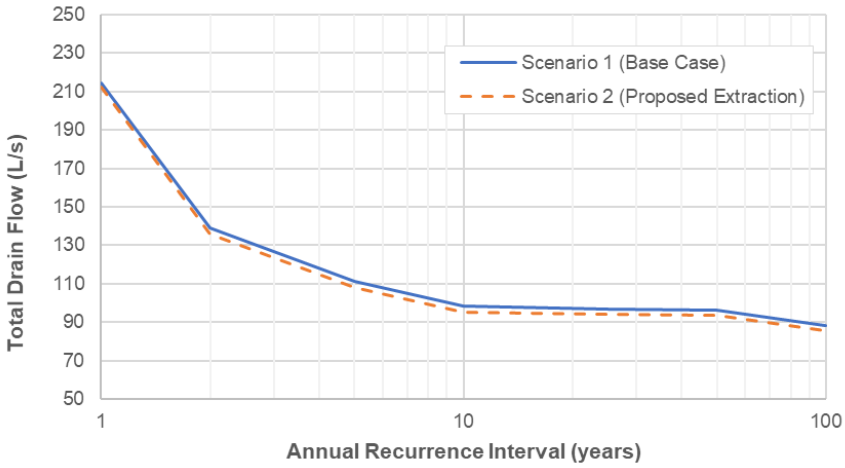


Figure 7. Surface drainage low flow analysis for model predictive scenarios.

4.2 Pumping Interference Effects

The end of the 2010 irrigation season (30 April 2010) was selected for impact analysis as this date represents the end time of the driest period within the historical record, and the greatest simulated seasonal irrigation pumping requirement. Simulation results were evaluated within and around the Bryan Estate properties in order to assess potential effects from proposed pumping in the area most likely to be impacted.

Drawdown Effects

The simulated groundwater level for the end of 2010 irrigation season for Scenarios 2 and 3 were subtracted from the head simulated at the corresponding time from the Baseline Model in the case of Scenario 2, and a revised version of the Baseline Model with low permeability in Layer 2 for Scenario 3, to produce regional drawdown maps (**Figure 8** and **Figure 9**). The resulting drawdown predictions are used to evaluate the magnitude and extent of potential impacts resulting from the proposed pumping on both the shallow and deep aquifers for both scenario conditions.

Deep aquifer

The predicted drawdown in the deep aquifer for Scenario 2 is shown in **Figure 8**. In Scenario 2 the maximum predicted drawdown was 0.74 m at the proposed bore location on Property 2 while a maximum of 0.45 m drawdown was predicted at the proposed bore location on Property 1. The extent of significant drawdown, typically considered to be the 0.6 m contour, was a maximum of 54 m from the proposed bore location and occurred almost entirely within the boundary of Property 2 while Property 1 was not predicted to have significant drawdown under Scenario 2 conditions.

In Scenario 3, the low permeability of model Layer 2 limited leakage from the overlying layers thereby magnifying the impact of pumping on groundwater levels. The maximum drawdown predicted in Scenario 3 was 0.93 m at the Property 2 pumping location (**Figure 10**) with a maximum drawdown of 0.65 m predicted at the Property 1 pumping location. The 0.6 m drawdown contour extended a maximum of 77 m beyond the boundary of Property 2 and was entirely within the property boundary at Property 1.

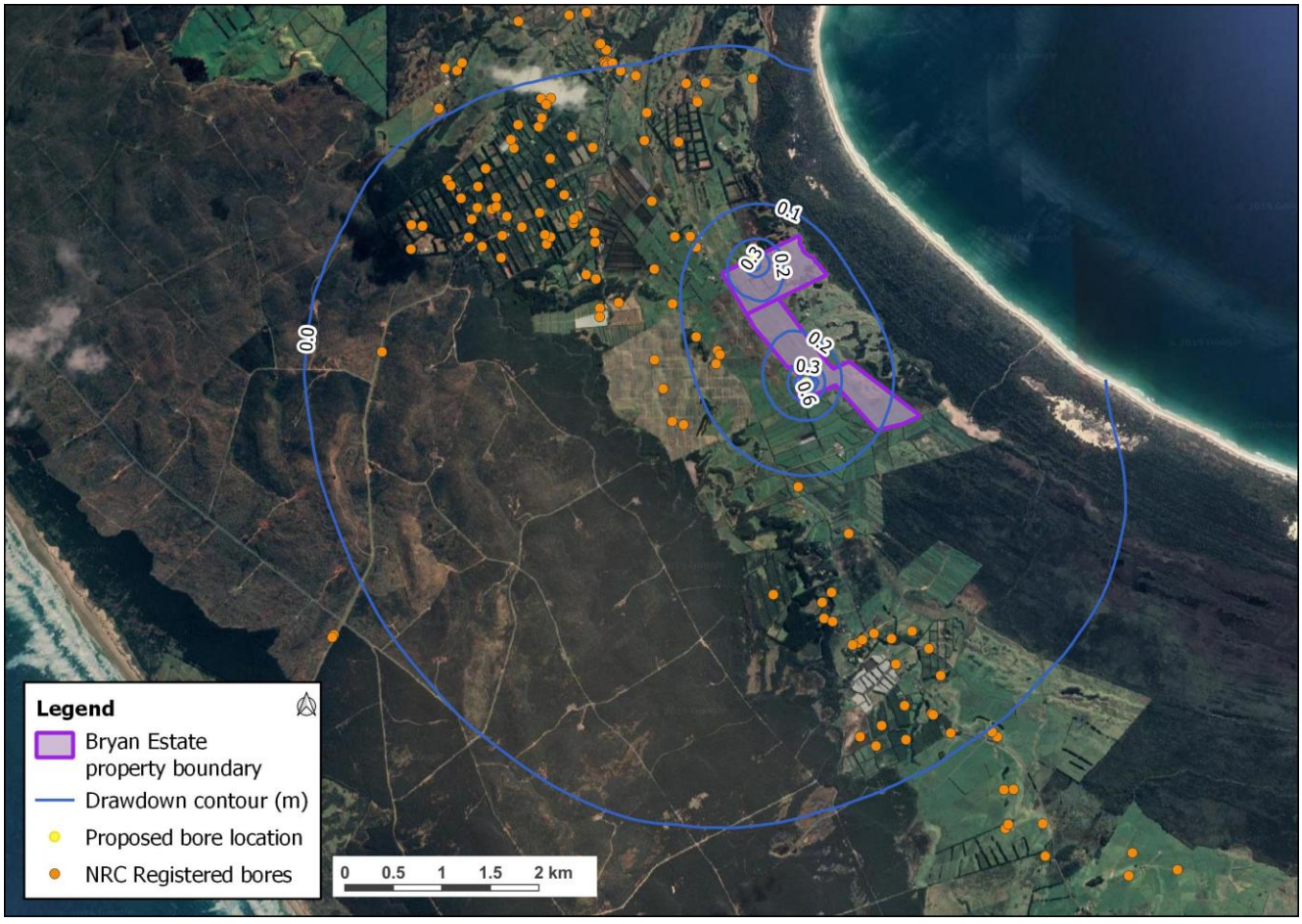


Figure 8. Simulated drawdown of deep aquifer (Scenario 2).

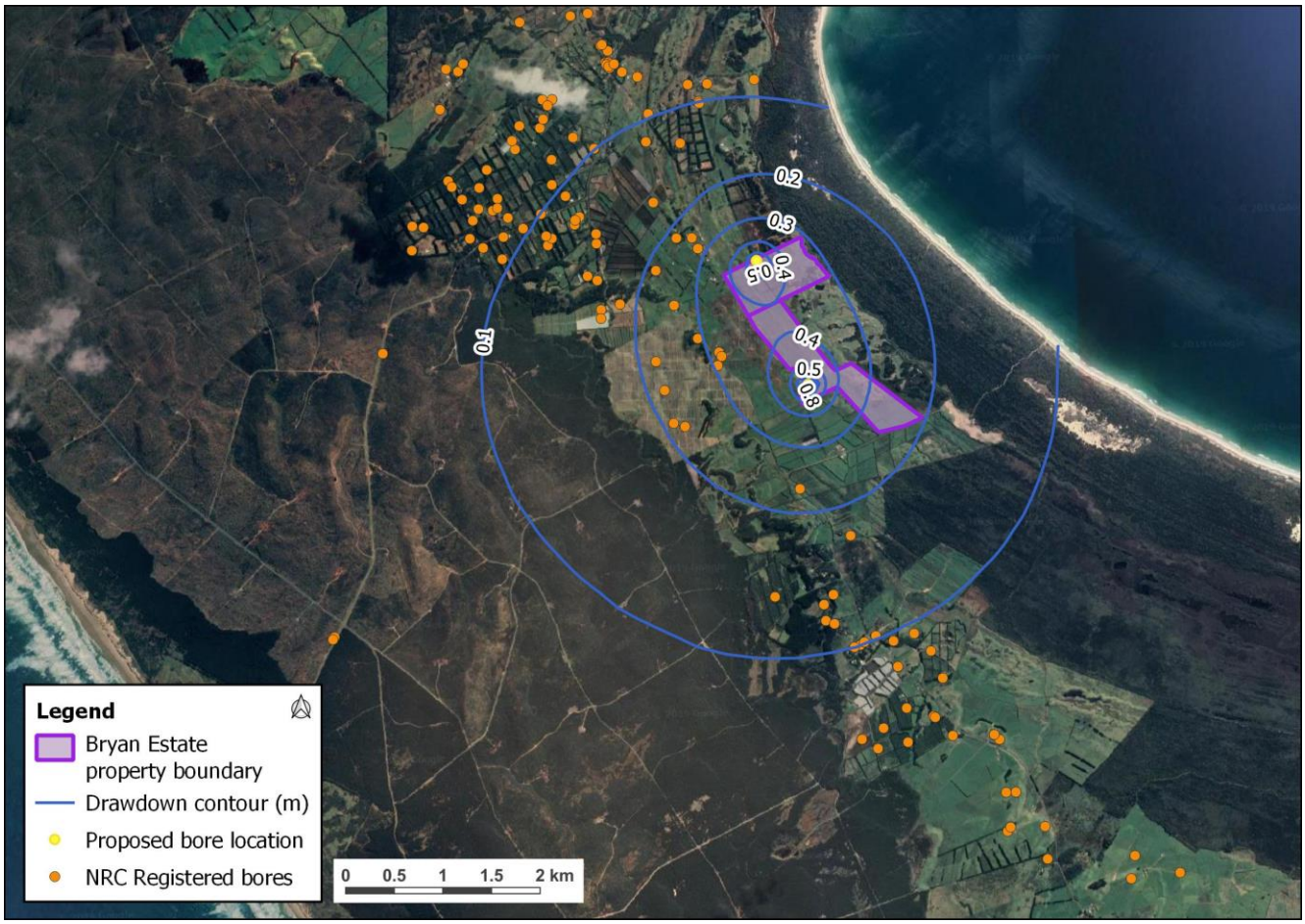


Figure 9. Simulated drawdown of deep aquifer (Scenario 3)

Shallow aquifer

The proposed groundwater take was predicted to cause negligible drawdown (0.06 m) in the shallow aquifer under Scenario 2 conditions (**Figure 10**). In Scenario 3, no shallow aquifer drawdown was predicted due to increased groundwater pumping because of the disconnection of the upper and lower portions of the aquifer.

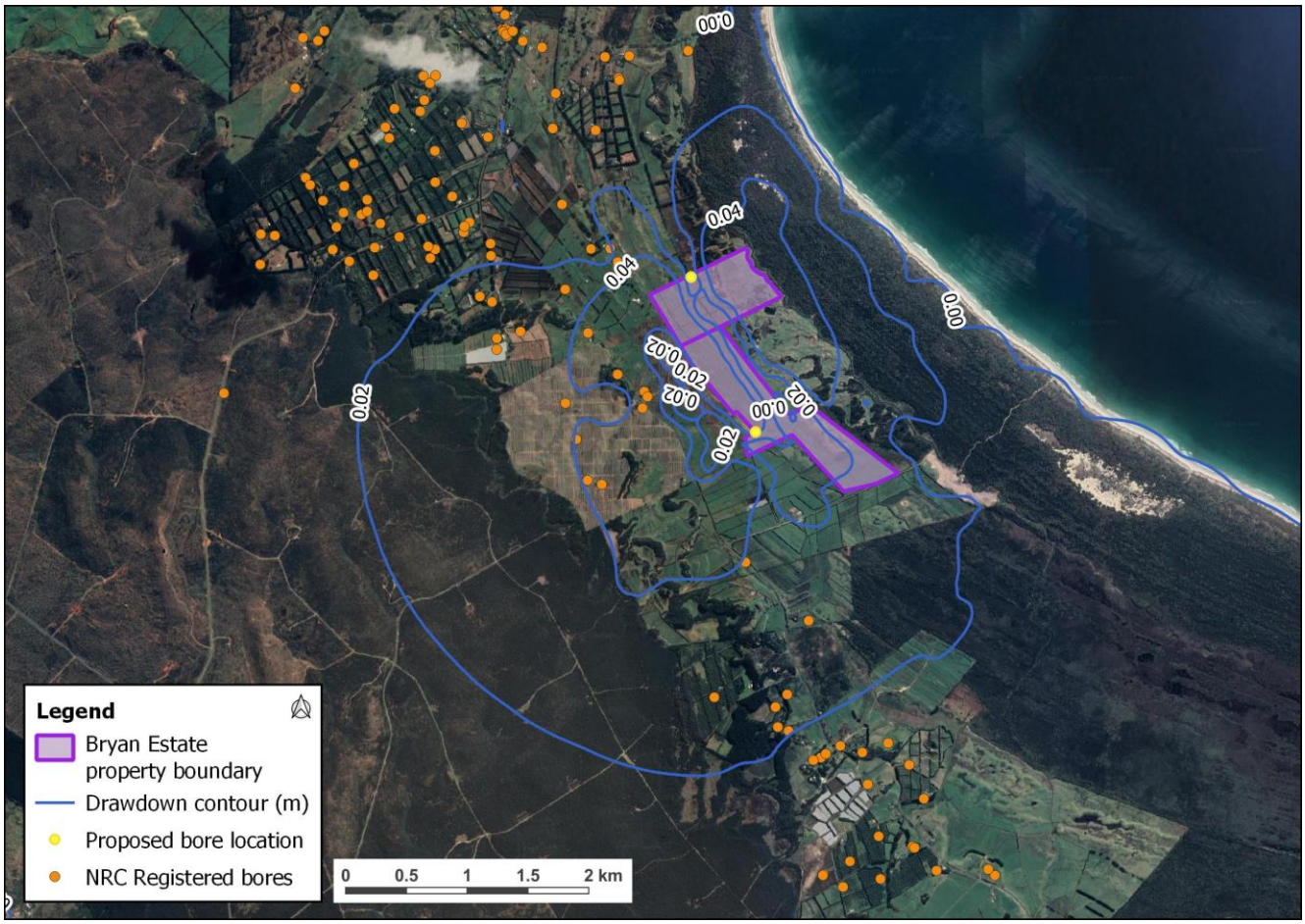


Figure 10. Simulated drawdown of shallow aquifer (Scenario 2).

Neighbouring Bores

The drawdown induced by the groundwater take applied in each scenario was calculated and plotted similarly at 51 existing bores within 2 km of the proposed groundwater takes (**Figure 4**) as a boxplot, with the maximum and minimum drawdown shown in **Figure 11**.

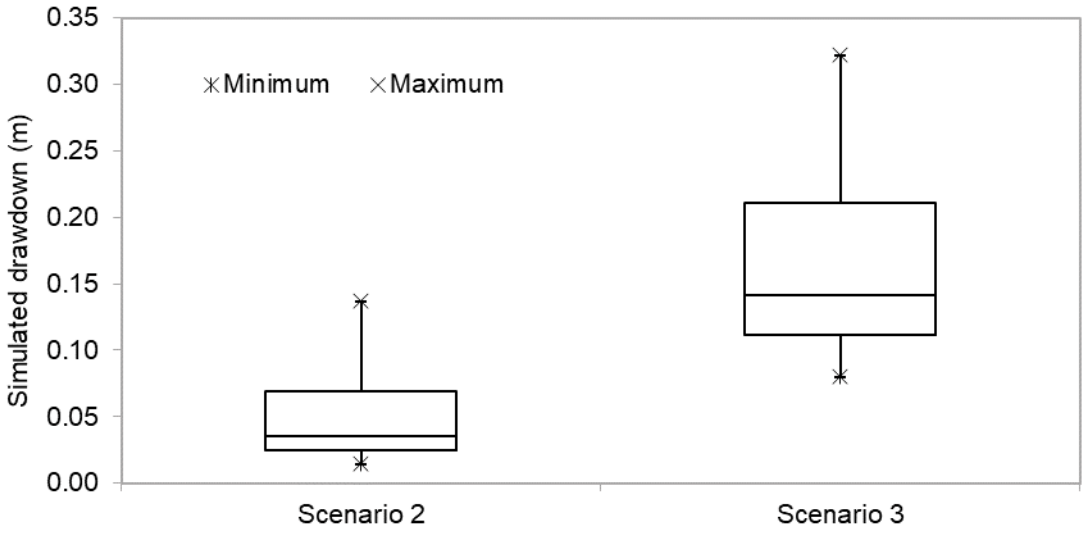


Figure 11. Drawdown observed at existing bores at the observation time step for each scenario.

The predicted drawdown in both scenarios is largely affected by the distance between a given bore and the proposed pumping location. At the time of maximum pumping (30/04/2010), the drawdown in Scenario 2 ranges between a 0.01 m and 0.14 m. In Scenario 3 the range of predicted drawdown increases to 0.08 m to 0.32 m. The maximum drawdown predicted was at the bore registered as LOC.315389, a bore of unspecified depth, approximately 450 m west of Bryan Estate Property 2. Similar drawdown levels were also predicted at an immediately adjacent bore (450 m west) registered as LOC.317160, a consented irrigation bore that is 94 m deep.

Appendix A provides a table specifying predicted drawdown at all NRC registered bores within 2 km of Bryan Estate proposed groundwater takes.

Given the available drawdown in the Aupouri aquifer is typically 70 to 100 m in most shellbed bores and no bore is predicted to see an impact of over 0.32 m under the more conservative scenario conditions, the interference effects on existing groundwater users is considered less than minor.

Cumulative Effects

The cumulative impact of groundwater extraction on the deep aquifer, including the proposed pumping at Bryan Estate, is shown relative to a naturalised condition with no groundwater pumping under Scenario 2 conditions in **Figure 12** and under Scenario 3 conditions in **Figure 13**. The cumulative impact of all groundwater pumping relative to a naturalised condition is shown for the shallow aquifer under Scenario 2 conditions in **Figure 14**, while negligible drawdown is predicted in the shallow aquifer in Scenario 3.

Available drawdown for shellbed aquifer bores is typically 60 to 100 m, while maximum cumulative drawdown in the area where Bryan Estate is located averages 3 m for bores with consented groundwater takes in the more conservative low permeability model scenario (WWA 2019B).

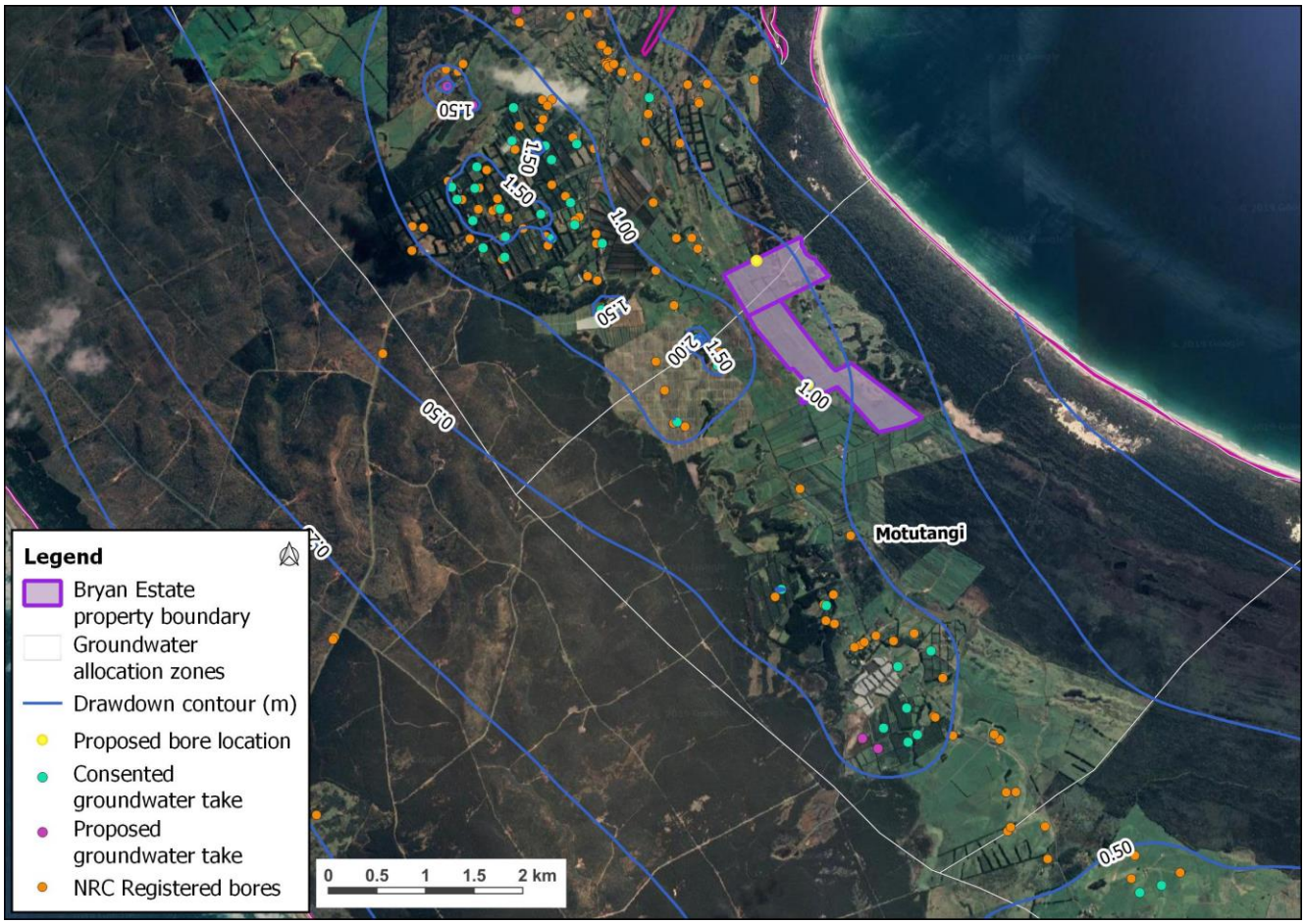


Figure 12. Cumulative drawdown (Scenario 2) in the deep aquifer relative to a naturalised condition for all consented and proposed bores.

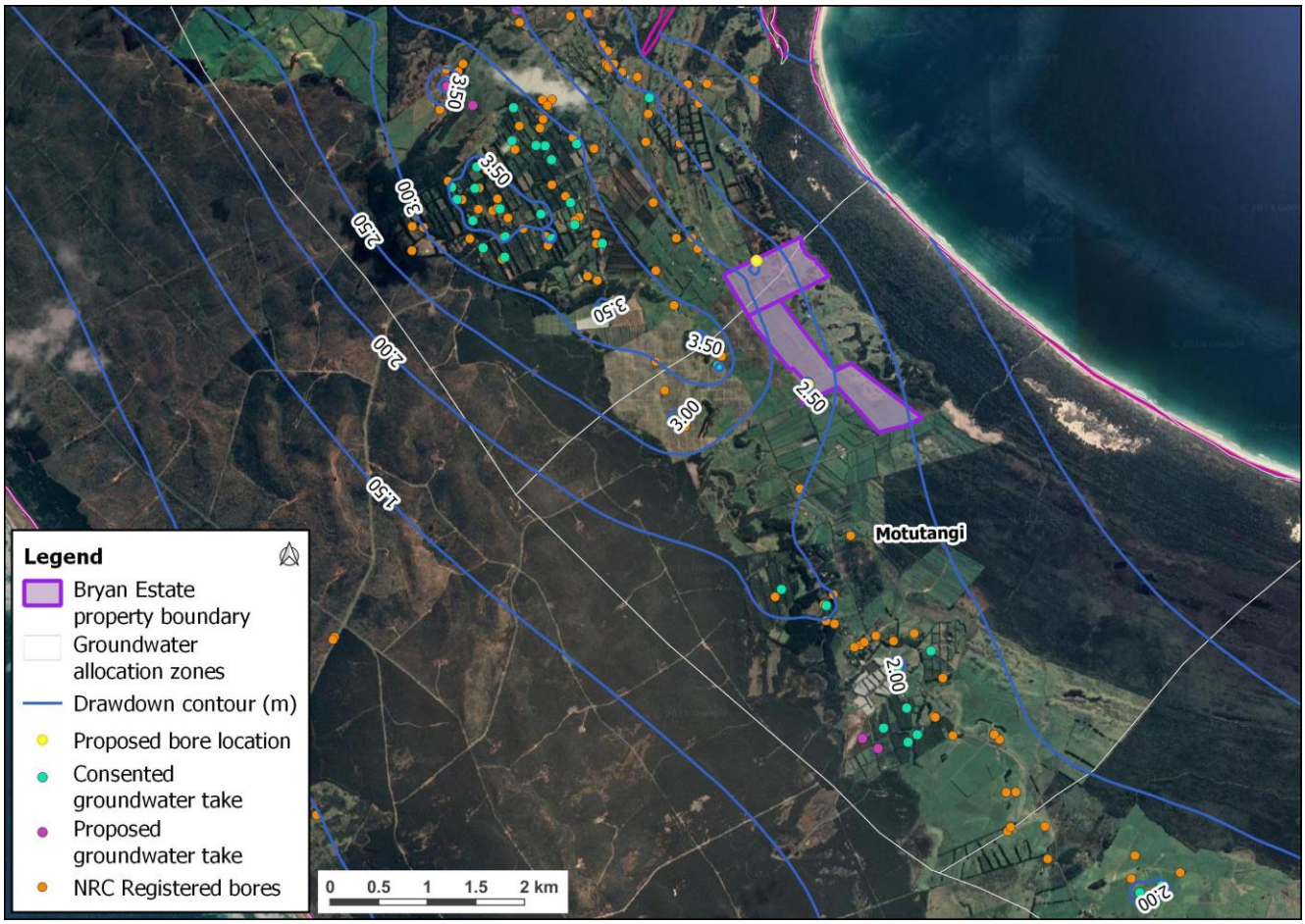


Figure 13. Cumulative drawdown (Scenario 3) in the deep aquifer relative to a naturalised condition for all consented and proposed bores.

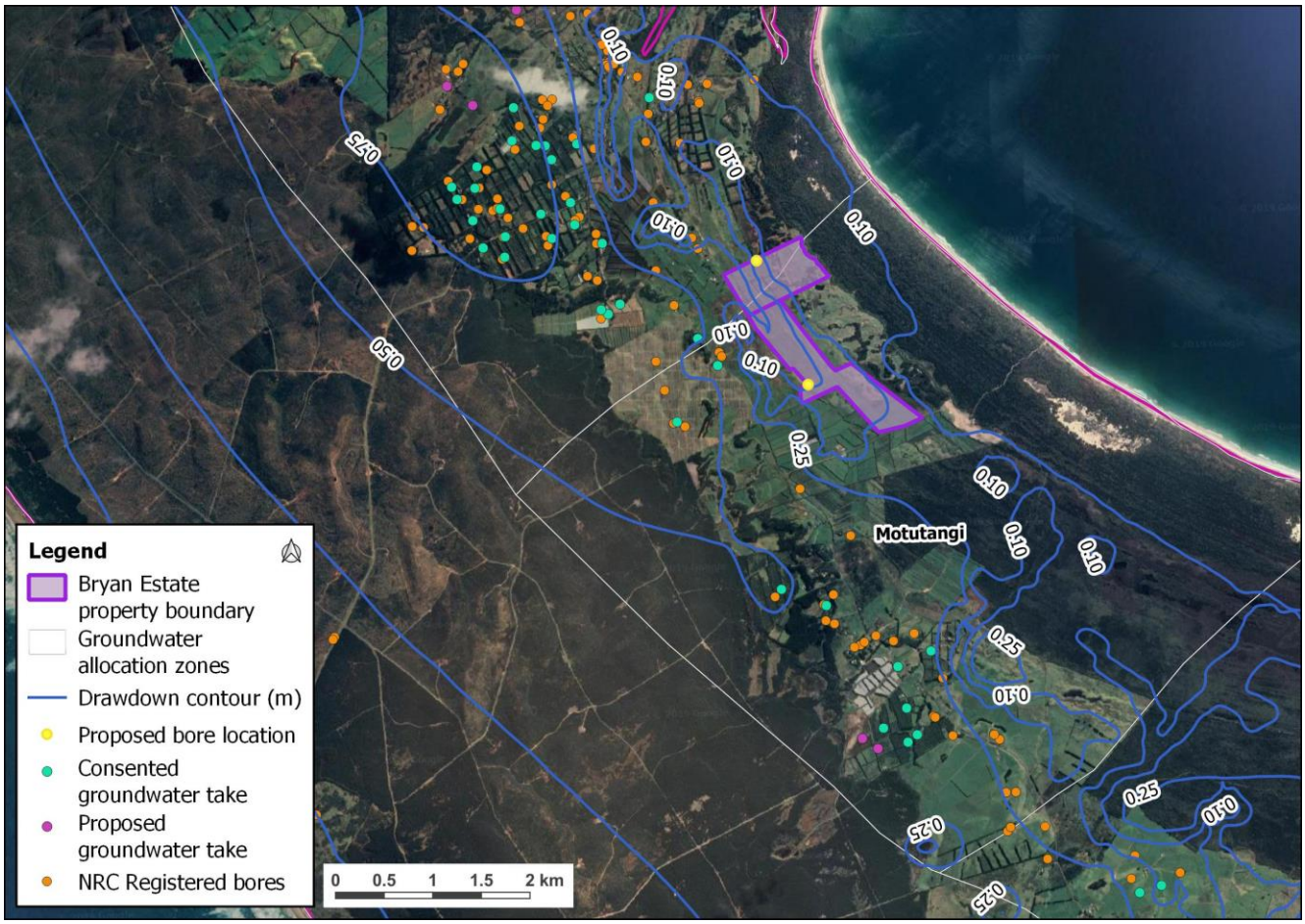


Figure 14. Cumulative drawdown (Scenario 2) in the shallow aquifer relative to a naturalised condition for all consented and proposed bores.

4.3 Saline Intrusion

Saltwater intrusion under the hydrogeological conditions in the Bryan Estate area, and specifically into the shellbed aquifer has been evaluated using the method of *Lateral Migration Analysis*. Lateral migration along the aquifer/bedrock interface considers the material under the aquifer impermeable where inland migration of salinity occurs via the permeable sediments along the lower boundary of the aquifer. This mechanism assumes that the pressure at the coastal margin is relevant to maintaining an offshore position of the saline interface.

The shellbed aquifer in the Bryan Estate Analysis Area is underlain by relatively impermeable basement rock and is well represented by this conceptual approach.

4.3.1 Lateral Migration Analysis

Based on the estimated depth to the basement rock at the coastal margins, the Ghyben-Herzberg relation was used to back-calculate the minimum hydraulic head required to maintain the saline interface below the shellbed aquifer (i.e. the lateral migration "Trigger Level"). This calculation was performed at approximately 500 m intervals along the coastal margin of the eastern model boundary, adjacent to the Bryan Estate Analysis Area where saline intrusion would be most likely to occur due to the proposed groundwater extraction. This analysis accounts for cumulative drawdown from all groundwater pumping in the model. The analysis was not performed for the west coast because it was beyond the extent of predicted drawdown.

The point locations used for lateral migration analysis are shown in **Figure 15**. These points were selected to provide a representative coverage in the area where reduced groundwater levels due to pumping at the Bryan Estate could induce saline intrusion at or near the coast. It was determined that a 500 m spacing extending over the area where drawdown was predicted in Scenario 2 would provide adequate coverage to make this determination. Scenario 2 groundwater levels were used for Lateral Migration Analysis because the scenario is based on the calibrated AAGWM model. Simulated groundwater levels in the deep aquifer from the Base Case and Proposed Extraction scenarios were extracted at the locations shown in **Figure 15**.

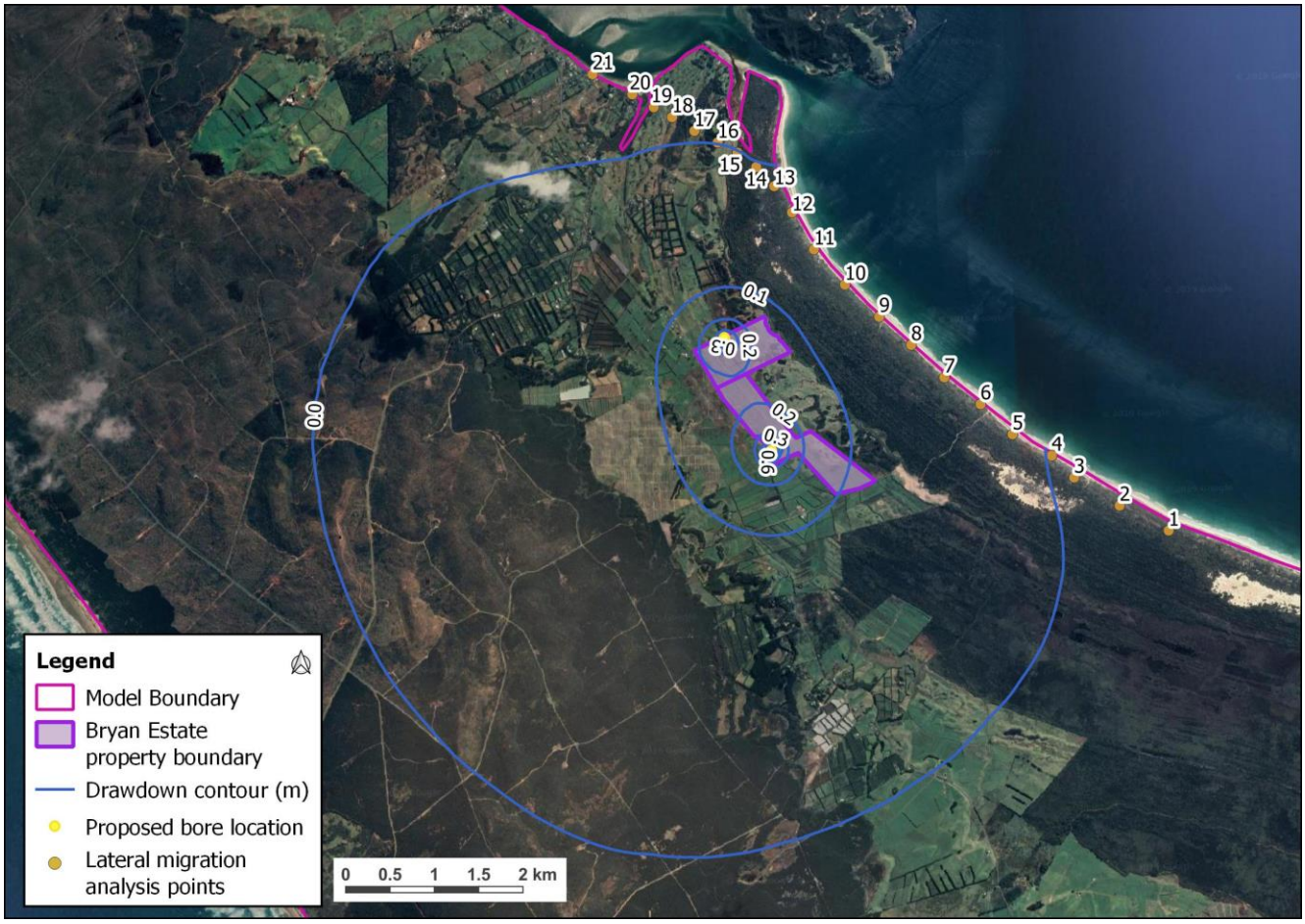


Figure 15. Location of the selected points for lateral migration analysis showing Scenario 2 drawdown contours.

Saltwater intrusion is not an instantaneous response to the lowered water table - it is a gradual process requiring prolonged reduction in groundwater level below a critical level to initiate the landward migration of the saline interface. A 90-day rolling average (RA) was calculated from the simulated groundwater level to reflect this slow process. The simulated groundwater levels were then compared against the Trigger Level at the model time 15/03/1994, which corresponds to the lowest groundwater level over the simulation period.

The hydraulic heads in the deep shellbed at the selected time step (15/03/1994) were, on average, 0.63 and 0.61 m greater than the pressure required to maintain the saline interface below the shellbed aquifer at the selected points in Base case and Proposed Extraction scenarios, respectively.

The greatest difference in groundwater elevation at the coast between the two scenarios, 0.05 m, was predicted to occur at sampling point 10, adjacent to the Bryan Estate Property 1. The predicted groundwater level at this location at the lowest point of the simulation period was 0.87 m above the head required to prevent saline

intrusion under proposed pumping conditions. Based on this result the predicted drawdown resulting from proposed extraction at Bryan Estate is not a risk to induce saline intrusion along the east coast (**Figure 16**). It is notable that though there are areas that appear to be at risk for saline intrusion under present conditions (e.g. point 14) the proposed groundwater extraction has a negligible impact on the level of risk.

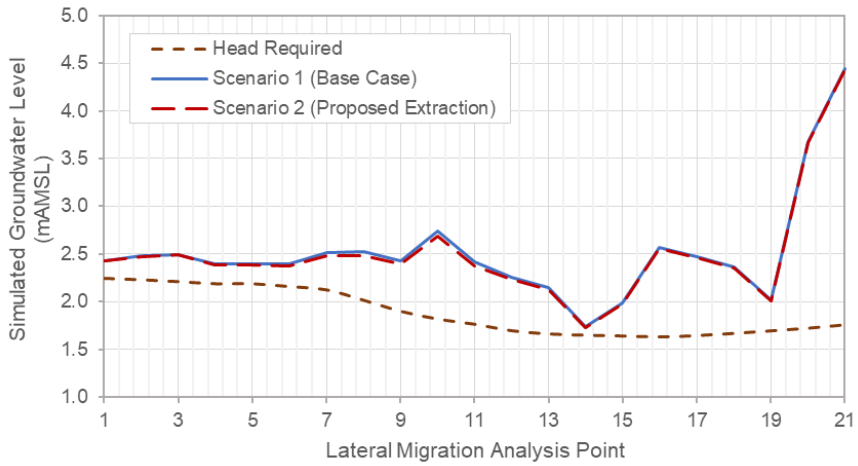


Figure 16. Simulated minimum groundwater level between 1960 and 2018 in Layer 6. Corresponding point locations are shown in Figure 11.

It can be concluded that inland saltwater migration along the basement contact is unlikely to increase in response to the proposed groundwater extraction at Bryan Estate and the predicted impact in terms of saline intrusion is less than minor.

4.4 Ground Settlement

Land subsidence due to groundwater extraction was calculated using the Bouwer (1977) equation:

$$S_u = (P_{i2} - P_{i1})\frac{Z_1}{E}$$

where S_u = vertical subsidence (m)
$P_{i2} - P_{i1}$ = Increase in intergranular pressure due to drop of the water table
Z_1 = layer thickness
E = modulus of elasticity of the soil

The following characteristics were assumed for the aquifer:

- Porosity = 0.30
- Unsaturated water content = 0.08
- Specific weight of aquifer material (consolidated silty sand) = 20 kN/m^3 (Silty sand density ranges between 1,410 kg/m^3 and 2,275 kg/m^3 (http://structx.com/Soil_Properties_002.html), corresponding to specific weight of 14 kN/m^3 and 22 kN/m^3)
- Specific weight of water = 9.81 kN/m^3.

The deep shellbed material is denser and less compressible compared to the mixture of sand, silt and peat overlying above. The subsidence analysis was conducted using two separate layers representing the sand and peat layers in the shallow aquifer and the shellbed aquifer, with applied parameter values based on Bouwer (1977).

The potential maximum ground settlement was estimated at the proposed bores on the Bryan Estate properties based on the maximum simulated drawdown in the Base Case Scenario and low permeability scenarios. Predicted settlement at the Property 1 and Property 2 bore locations was 0.6 cm and 1.1 cm, respectively, under Scenario 2 (Base Case) conditions and 0.8 cm and 1.3 cm, respectively, under Scenario 3 (Low Permeability) conditions. Under existing field conditions these values can be considered negligible for the following reasons:

- there is no sensitive urban infrastructure such as water or wastewater mains or high-rise buildings to rupture or crack; and
- the changes in land surface due to farm machinery (e.g. rotary hoeing) would likely mask impacts of this magnitude (<0.1 m) if materialised.

In summary, the potential settlement effects are considered less than minor.

4.5 Water Quality

The potential risk to water quality from the leaching of fertilisers and pesticides that may be associated with horticulture is not a relevant consideration for a water take application under the current Northland Regional planning framework. With reference to the effects from horticultural sprays the Commissioners for the MWWUG water take applications stated in their Hearing Decision Report (June 2018) that:

"such are not matters that are directly engaged by the present applications for water abstraction. Accordingly, we have no present jurisdiction to consider those putative effects. If resource (or other) consent is subsequently required, then such will need to be applied for and considered at the appropriate time".

Nevertheless, there are a range of factors that make the leaching of fertiliser and pesticides unlikely to impact water quality:

- In practice orchardists in this area tend to apply fertiliser efficiently via fertigation as part of their irrigation water using a small dosage regularly, which is driven by both the soil conditions (i.e. high permeability and lacking in nutrients) and economic considerations.
- Inefficient irrigation practice will lead to root rot, thus because orchardists will actively avoid this, excessive leaching of nutrients is unlikely.
- Both fertiliser and approved pesticides are applied in accordance with permitted activity rules within the pRPN and rules needing to be met to become certified under the AvoGreen Assured program by the Avocado Industry Council Ltd. One of the key aims is "environmental sustainability by only using sprays when required".
- Due to the presence of significant amounts of organic matter within the shallow sand deposits, shallow groundwater is likely to be reducing. Under such conditions, nitrate concentrations are likely to be low in groundwater (consistent with available groundwater quality data) due to denitrification within the aquifer system. The presence of organic matter is also likely to substantially decrease the mobility of any pesticide compounds prone to leaching.

4.6 Consideration of Alternatives

An AEE must include a description of alternative locations or methods for undertaking an activity, if it is likely that the activity will result in any significant adverse effect on the environment.

The effects of the proposed taking and using of groundwater were assessed above as being no more than minor on the environment and less than minor on other groundwater users. As such, no alternatives have been considered for this proposal.

5. Assessment of Cultural Effects

Northland Regional Council have an internal procedure where they circulate all applications to local Iwi and Maori Groups that have registered with the Council as having an interest in the area. Therefore, regardless of whether the local Iwi or Maori Groups are considered to be affected by the effects of the proposed activity, the Group will be notified by the Regional Council and therefore can be considered as part of the consultation process.

The applicant has not undertaken any personal consultation with Iwi or Maori Groups based on the understanding that physical effects of this application are less than minor, therefore any meta-physical (cultural and spiritual) effects would commensurately be less than minor.

Therefore, given the less than minor impact of this proposal, we do not consider Iwi consultation is necessary for this application.

6. Assessment Of Statutory Considerations

Table 9 to **Table 12** provide assessments of the relevant statutory documents as were identified in **Section 3.3**.

Overall, this resource consent application is consistent with the objectives and policies of the National Policy Statement for Freshwater Management 2014, incumbent regional plan (RWSPN) and proposed regional plan (pRPN).

Table 9. Assessment against relevant objectives and policies for the National Policy Statement for Freshwater Management 2014.

No.	Objective / Policy	Assessment
Water Quality		
Objective A1	• Seeks to safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems of fresh water, in sustainably managing the use and development of land, and of discharges of contaminants.	This proposal is consistent with these objectives and policies and either supports them or at the least maintains them.
Objective A2	• Required that the overall quality of fresh water within a region is maintained or improved while improving the quantity of fresh water in water bodies that have been degraded by human activities to the point of being over-allocated.	
Objective A4	• Seeks to enable communities to provide for their economic well-being, including productive economic opportunities.	
Policies A2, A3, and A7	• Give effect to Objectives A1, A2, A4	
Water Quantity		
Objective B2	• Seeks to avoid any further over-allocation of fresh water and phase out existing over-allocation.	This proposal is consistent with these objectives and policies.
Objective B3	• Seeks to improve and maximise the efficient allocation and efficient use of water.	
Objective B5	• Seeks to provide for communities' economic wellbeing within freshwater quantity limits.	
Policies B2 to B6	• Give effect to Objectives B2 to B5.	

No.	Objective / Policy	Assessment
Integrated Management		
Objective C1	• Seeks to improve integrated management of fresh water and the use and development of land in whole catchments, including the interactions between fresh water, land, associated ecosystems and the coastal environment.	This proposal is consistent with these objective and policies.
Policies C1 and C2	• Give effect to Objective C1.	

Table 10. Assessment against relevant objectives and policies for the Regional Policy Statement for Northland.

No.	Objective / Policy	Comment
Objective 3.2	• Seeks to maintain and improve water quality for human use and ecological health.	This proposal is consistent with this objective as it will at the least maintain water quality.
Objective 3.3	• Seeks to safeguard the flows and flow variability required to maintain water's life-supporting capacity, for ecological processes, and to support indigenous species.	The proposal is consistent with this objective as it will have a no more than minor impact on surface water resources.
Objective 3.5	• Requires that the region's resources are sustainably managed in a way that is attractive for business and investment that will improve the economic wellbeing of the region and its communities.	The proposal is consistent with this objective as it will efficiently utilise a natural resource to facilitate development of economic wellbeing.
Objective 3.10	• Requires efficient use and allocation of common natural resources with a particular focus on maximising the security and reliability of supply for users.	The proposal is consistent with this objective.
Policy 4.3.2	• Requires regulatory methods to avoid over-allocation of region-wide ecological flows and water levels.	The proposal does not exceed allocation limits, hence is consistent with this policy.
Policy 4.3.3	• Requires the allocation and use of water efficiently within allocation limits.	The proposal will use water efficiently and will not exceed allocation limits, hence is consistent with this policy.

Table 11. Assessment against relevant objectives and policies for the Proposed Regional Plan for Northland.

No.	Objective / Policy	Comment
Objective F.0.1	• Seeks to manage the use, development, and protection of Northland's natural and physical resources which enables people and communities to provide for their social, economic and cultural well-being while 1. sustaining the natural resources to meet the reasonable, foreseeable needs of future generations, 2. safeguarding life-supporting capacities of water, and 3. avoiding, remedying, or mitigating adverse effects on the environment.	The proposal is consistent with this objective.
Policy D.2.2	• Requires that regard is had to the social, cultural, and economic benefits of the proposed activity when considering resource consents.	The proposal will facilitate the economic and social benefits of both the landowner, their employees and the wider community through flow on effects of purchases made to operate and maintain the orchard.
Policy D.2.5	• Requires an authority to have regard to community and tangata whenua values	The proposal is not inconsistent with either community values, as there has been conversion to market gardening and horticulture in the area that has benefitted the community and tangata whenua through employment opportunities.
Policies D.4.5	• Seeks to maintain overall water quality	This proposal is consistent with this policy as it will not impact water quality.
Policy D.4.13	• Seeks to achieve freshwater quantity related outcomes and in particular manage the taking, use, damming, and diversion of fresh water so that (with relevance to this application) saline intrusion in, and land subsidence above, aquifers is avoided (amongst other things).	This proposal is consistent with this policy as it will avoid the saline intrusion and subsidence impacts, as discussed in **Section 4.3** and **4.4**.
Policy D.4.17	• Considers allocation limits for aquifers and requires rules and applications to meet allocation limits.	This proposal is consistent with this policy as the proposed take will not exceed allocation limits within the Aupouri-Motutangi zone.
Policy D.4.18	• Concerns conjunctive surface water and groundwater management.	This application is not inconsistent with this policy, in that the groundwater take will not adversely impact on surface water through stream depletion.
Policy D.4.20	• Requires the reasonable and efficient use of water for irrigation and sets requirements for a resource consent application to take water for irrigation purposes.	This proposal is consistent with this policy as the daily irrigation rate and annual volume are considered efficient and just meet 10-year drought requirements, but provide reduced reliability for more severe droughts.

No.	Objective / Policy	Comment
Policy D.4.23	• Requires conditions on water permits that 1) clearly define the take amount in instantaneous take rates and total volumes, by including reference to the temporal aspects of the take and use, and 2) require that the water take is metered and information on rates and total volume of the take is provided electronically to the regional council, and 3) for water permits for takes equal to or greater than 10 litres per second, require the water meter to be telemetered to the regional council, and 4) clearly define when any restrictions and cessation of the water take must occur to ensure compliance with freshwater water quantity limits set in this plan, and 5) require the use of a backflow prevention system to prevent the backflow of contaminants to surface water or ground water from irrigation systems used to apply animal effluent, agrichemical or nutrients, and 6) specify when and under what circumstances the permit will be reviewed pursuant to Section 128(1) of the RMA, including by way of a common review date with other water permits in a catchment.	The proposal is only partially consistent with this policy, as the applicants are arguing that so long as pumping data is recorded electronically and available for the council upon request, telemetry is not required. All other provisions will be met.

Table 12. Assessment against relevant objectives and policies for the Regional Water and Soil Plan for Northland.

No.	Objective / Policy	Comment
Objective 7.4	• Requires the maintenance or enhancement of water quality of natural water bodies.	This proposal is consistent with this objective as the effects of the take and use of the water will have no more than minor impacts on the shallow aquifer and other surface water bodies, as discussed in **Section 4.5**
Objective 10.4.1	• Seeks to maintain the sustainable use and development of the region's groundwater resources while avoiding, remedying, or mitigating actual and potential adverse effects on groundwater quantity and quality.	Ditto above.
Policy 10.5.1	• Seeks to ensure the sustainable use of resources by avoiding takes that exceed recharge. Saltwater intrusion, reduced groundwater quality, significant drawdown, and adverse effects on surface water resources can arise where takes exceed recharge.	This proposal is consistent with this policy as the cumulative allocation in this aquifer management zone is only 11% of mean annual recharge, which is a low limit on a national scale.
Policy 10.5.2	• Recognises that aquifers are at risk in certain circumstances and that adverse effects on water quality should be avoided.	This proposal is consistent with this policy in that current water quality will be maintained.

No.	Objective / Policy	Comment
Policy 10.5.4	• Seeks that groundwater allocations take into account reduction in recharge that may occur in time.	This proposal is consistent with this policy in that the analysis assumed no rainfall for the entire 96 days of pumping.
Policy 10.5.7	• Requires the Northland Regional Council to consider effects of a groundwater take and use on surface water bodies.	This proposal is consistent with this policy as the effects of the take and use of the water will have no more than minor impacts on the shallow aquifer and other surface water bodies, as discussed in **Section 4.1**.
Policy 10.5.9	• Seeks to avoid, remedy or mitigate any ground subsidence as a result of groundwater takes, use or diversion, where this is likely to cause adverse flooding, drainage problems, or building damage.	This proposal is consistent with this policy as subsidence effects will be no more than minor in the context of a rural setting, as discussed in **Section 4.4**.

7. Notification

Section 95 sets out the decision-making steps for the determining of public notification and limited notification of applications and the timeframe Councils have for making the notification decision.

A notification assessment has been carried out in accordance with the stepped process as documented in **Table 13**.

Table 13. RMA Section 95A public notification of consent applications assessment.

Step	Question	Assessment
Step 1: mandatory public notification in certain circumstances	a) The applicant has requested that the application be publicly notified	NO
	b) Public notification is required under section 95C	NO
	c) The application is made jointly with an application to exchange recreation reserve land under section 15AA of the Reserves Act 1977	NO
Step 2: if not required by step 1, public notification precluded in certain circumstances	a) The application is for a resource consent for 1 or more activities, and each activity is subject to a rule or national environmental standard that precludes public notification.	NO
	b) The application is for a resource consent for 1 or more of the following, but no other, activities: (i) a controlled activity; (ii) a restricted discretionary or discretionary activity, but only if the activity is a subdivision of land or a residential activity; (iii) a restricted discretionary, discretionary, or non-complying activity, but only if the activity is a boundary activity; (iv) a prescribed activity (see section 360H(1)(a)(i)).	NO
Step 3: if not precluded by step 2, public notification required in certain circumstances	a) The application is for a resource consent for 1 or more activities, and any of those activities is subject to a rule or national environmental standard that requires public notification.	NO
	b) The consent authority decides, in accordance with section 95D, that the activity will have or is likely to have adverse effects on the environment that are more than minor.	NO
Step 4: public notification in special circumstances	Determine whether special circumstances exist in relation to the application that warrant the application being publicly notified.	NO

Therefore, in accordance with s95A(9)(b) RMA, the consent authority should not publicly notify this application but may determine whether to give limited notification under s95B.

8. Consultation

Schedule 4 of the RMA requires that an AEE should identify (amongst other things) the persons affected by the activity, any consultation undertaken, and any response to the views of any person consulted.

Potentially affected parties in relation to this application could include other groundwater users and occupiers of the land within the pumping induced groundwater cone of depression.

However, it should also be noted that while it is considered good practice and “neighbourly” to undertake consultation, under Section 36A of the RMA there is no requirement for an applicant or council to undertake any consultation with any person in regard to an application.

In this case, consultation has not been undertaken with other water users and landowners because the assessment of effects and in particular the bore interference assessment provided in **Section 4.2** concludes that no other groundwater users are considered to be adversely affected by the granting of this application.

9. Summary and Conclusions

Bryan Estate are seeking a groundwater take to facilitate the development of a 40 ha orchard and a 20 ha orchard on two neighbouring properties located at Far North Road in Pukenui area. The groundwater take will be exercised from October to April, in accordance with the following volumes:

The two bores on the properties will have different water take amounts.

The groundwater take will be exercised from October to April, in accordance with the following volumes:

- Property 1
    - Maximum daily volume of 500 m^3/day; and
    - Maximum annual volume of 80,000 m^3/yr.
- Property 2
    - Maximum daily volume of 1000 m^3/day; and
    - Maximum annual volume of 160,000 m^3/yr.

A consent duration of 30 years is sought, subject to a lapse period of 5 years.

If granted, this consent taken with existing and other applications we are aware of, will take the allocation status for the Aupouri-Houhora management zone to approximately 98.5% of full allocation and the Aupouri-Motutangi management zone to approximately 71% of full allocation. The activity status thus remains Discretionary.

The AEE has demonstrated that the potential adverse effects of the proposed water take and use on the environment will be less than minor, and the effects on persons will also be less than minor.

The proposal is also considered to be consistent with the relevant objectives and policies of the NPS, the RPS, the pRPN, the RWSPN, and Part 2 of the RMA. The applicant considers that in light of the less than minor effects of the application and the decision made following the recent hearing for the MWWUG consent applications, the consent should proceed without public notification and be granted on a non-notified basis.

10. References

Bouwer H, 1977. Land Subsidence and Cracking Due to Ground-Water Depletion. Agricultural Research Service-U.S. Department of Agriculture

Lincoln AgriTech, 2015. Aupouri Aquifer Groundwater Model. Consultancy report prepared for Northland Regional Council.

Tait, B., 2018. Allocation and use of water. Recommendations in response to submissions on the Proposed Regional Plan for Northland - Section 42A hearing report. Date: 3/07/2018. Author: Ben Tait. Version: Final.

Williamson Water Advisory, 2017. Motutangi-Waiharara Groundwater Model Factual Technical Report – Modelling. Consultancy report prepared for Motutangi-Waiharara Water Users Group.

Williamson Water Advisory, 2018. Te Raite Station Groundwater Investigations. Letter report addressing RMA s92 requests prepared for WSP-OPUIS Consultants Limited.

Williamson Water and Land Advisory, 2019A. Aupouri Aquifer Groundwater Model-Factual Technical Report. Consultancy report *prepared for interested parties and the public.*

Williamson Water and Land Advisory, 2019B. Addendum to Assessment of Effects Reports Pertaining to Aupouri Aquifer Resource Consent Applications Compiled by WWLA *prepared for the Northland Regional Council*

Appendix A. Form A - Application for Resource Consent

APPLICATION FORM FOR RESOURCE CONSENT

NORTHLAND REGIONAL COUNCIL

Putting Northland first

Whāngārei Office	Phone:	(09) 470 1200
	Fax:	(09) 470 1202
Kaitāia Office	Phone:	(09) 408 6600
Ōpua Office	Phone:	(09) 402 7516
Dargaville Office	Phone:	(09) 439 3300
Free Phone		0800 002 004
E-mail		mailroom@nrc.govt.nz
Website		www.nrc.govt.nz

This application is made under Section 88/127 of the Resource Management Act 1991

To: Consents Department
Northland Regional Council
Private Bag 9021
Whāngārei Mail Centre
Whāngārei 0148

IMPORTANT NOTES TO APPLICANTS

(a) Please read fully the notes below and the Information Brochures and Explanatory Notes available from the Council, before preparing your application and any supporting information.

(b) The Resource Management Act 1991 sets out the information you must provide with your application for a resource consent. If you do not provide adequate information, your application cannot be received nor processed by the Council and will be returned to you. If you are unsure of what information should be included with your application, please contact the Council before submitting the application.

(c) Applications require notification (public advertising calling for submissions) unless the Council is satisfied that the adverse effects on the environment of the activity for which consent is sought will be minor; and written approval has been obtained from every person who the Council is satisfied may be adversely affected by the granting of the consent. The Council also has available a form "Form 8A – Affected Person's Written Approval", to help you record such approvals for applications that may be processed without public notification.

PART A – GENERAL

APPLICANT	Full Names
(1) Full Name of Applicant(s): (in full e.g. Albert William Jones and Mary Anne Jones. For Companies, Trusts and other Organisations, commonly used name)	The Estate of Norman Ashley Bryan
Phone Number – Business:	09 409 8422 Fax:
Home:	Mobile: 021 066 7723
E-mail:	thebryanestate@gmail.com

For applications by a company, private trusts or other entity/organisations, the Directors; Trustees and Officers' full names must be supplied and Section (12) completed and signed.

(2) Postal Address: (in full)	3633 Far North Road RD4 Kaitaia 0484

(3) Residential Address: (if different from postal address)	

Application Form continued on next page

(4) Address for Service of Documents: (if different from postal address e.g. Consultant)	Jon Williamson (jon.williamson@wwa.kiwi) c/o Williamson Water & Land Advisory PO Box 314 Kumeu, 0812 Auckland

(5) Owner/Occupier of Land/ Water Body: (if different from the Applicant)	N/a

(6) Type(s) of Resource Consent sought from the Regional Council:

You will need to fill in a separate Assessment of Environmental Effects Form for each activity.
These forms can be obtained from the Northland Regional Council.

Coastal Permit

☐ Mooring ☐ Marine Farm ☐ Structure ☐ Pipeline/Cable

☐ Other (specify)_____

Land Use Consent

☐ Vegetation Clearance ☐ Quarry ☐ Structure in/over Watercourse

☐ Earthworks ☐ Construct/Alter a Bore ☐ Dam Structure

☐ Other (specify)_____

Water Permit

☐ Stream/Surface Take ☐ Damming ☒ Groundwater Take ☐ Diverting Water

☐ Other (specify)_____

Discharge Permit

☐ Domestic Effluent to Land ☐ General Discharge to Land ☐ Farm Dairy Effluent to Land/Water

☐ Air ☐ Water

☐ Other (specify)_____

(7) Other Resource Consents required from the District Council:

Where other Resource Consents are required for the same activity, they must be applied for at the same time.
Not doing so will delay the processing of this application.

What other Resource Consents are required from the District Council?

☒ None ☐ Land Use Consent ☐ Subdivision Consent

Have the applications been made? ☐ Yes ☐ No

(8) Description of the Activity:

Please briefly describe the activities and duration for which Consent(s) are being sought. It is important you fill this out correctly, as the Council cannot grant Consent for any activity you do not apply for.

The resource consent application for the Bryan Estate is to take and use groundwater from the Aupouri aquifer for irrigation of a 20 canopy hectare orchard. This application is seeking consent for the following groundwater take:

- 80,000 m³/yr or 500 m³/day

This annual volume is based on the NRC guideline of 400 mm/yr per hectare while the daily volume amounts to 20 m³/day per hectare, less than the NRC recommended 25 m³/day per hectare

Application Form continued on next page

(9) Location of Property/Waterbody to which Application relates:

Describe the location in a manner which will allow it to be readily identified, e.g. street address, legal description, harbour, bay, map reference etc. Attach appropriate plans and/or diagrams.

Property Address: 3608 State Hwy 1 (see rate demand) Locality: Houhora, 0484

Legal Description: Section 81 Blk: XV Houhora SD:

Other Location Information:

PART B – ASSESSMENT OF EFFECTS ON THE ENVIRONMENT

You must include an assessment of the effects of your activity on the environment as part of your application.

The Resource Management Act 1991 requires that each application include an assessment of the actual and potential effects of the activity on the environment in accordance with the Fourth Schedule.

To assist you to supply this assessment of effects, the Council has prepared specific forms for various consent activities. For minor activities, all that will be required is for you to complete the specific form. Where the potential effects of the activity are more significant, we recommend you undertake a full assessment of effects, with professional assistance if necessary.

If you are unsure of what information to include with you application and the assessment of effects, please contact the Council before submitting your application. A pre-lodgement meeting with relevant Consent Staff is recommended.

PART C – GENERAL

(10) Renewal of an Existing Resource Consent:

☐ Yes ☒ No ☐ A change in conditions of a current Resource Consent

(11) Fee/Deposit Enclosed with Application(s):

Application to be processed as: ☐ Notified ☐ Limited Notified ☒ Non-notified

☐ Coastal Permit: $ ☐ Land Use Consent: $

☒ Water Permit: $ 896.50 ☐ Discharge Permit: $

☐ Bore Permit: $ ☐ Change Conditions: $

(12) Signature of Applicant(s) or Persons authorised to sign on behalf of Applicant(s):

IMPORTANT NOTES TO APPLICANTS

(a) Your application must be accompanied by the minimum fee (deposit) as determined by the Council. A schedule of the fee/deposits for different consent applications is annexed. Please note that applications by private trusts and other group entities require the personal guarantees of the Trustees and/or Officers for the payment of costs to be submitted with the application.

- For complex applications, the Council may require an additional deposit pursuant to Section 36(3) of the Act, based on the estimated costs for processing such complex applications and may require progressive monthly payments during consent processing.
- The final fee is based on actual and reasonable costs including disbursements and where this fee exceeds the fee/deposit, the additional fee is subject to objection and appeal.

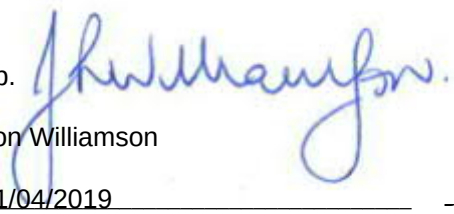
(b) All accounts are payable by the 20th of the month following the date of invoice. Any actual and reasonable costs, including but not limited to legal costs, debt collection fees or disbursements incurred as a result of any default in payment, shall be recoverable from the Applicant and is so notified in compliance with the Credit Contracts and Finance Act 2003. Submitting this Application authorises the Council to, if necessary, provide your personal information to a Credit Reporter in order to employ in its debt collection services in compliance with the Credit Reporting Privacy Code 2004, should payment default occur.

(c) Resource Consents usually attract an annual fee to recover the reasonable costs of the Council's monitoring, supervision and administration of the Consent during its term.

(d) The information you provide is official information. It will be used to process the application and, together with other official information, assist the management of the region's natural and physical resources. Access to information held by the Northland Regional Council is administered in accordance with the Local Government Official Information and Meetings Act 1987 and the Privacy Act 1993.

Application Form continued on next page

I/we declare that, to the best of my/our knowledge and belief, the information given in this Application and attached Assessment of Environmental Effects is true and correct. I/we unconditionally guarantee jointly and severally to pay the actual and reasonable costs of processing this Application as and when charges become due and payable. I/we acknowledge that I/we understand the consequences of sig

Signature: pp.  **ignature:** _____

Full Name (print): Jon Williamson **ull Name** (print): _____

Date: 11/04/2019 **ate:** _____

Continue with Trustees' and Authorised Officers' signatures below, as necessary.

Personal details and signatures of Trustees*, or Officers authorised to sign on behalf of and to bind Trusts, Societies and Unincorporated Entities.
*** Private and Family Trusts only**

Full Name and Status: (Trustee, Officer etc)	Sylvia Bryan
Full Residential Address:	3633 Far North Road R.D. 4 Kaitaia 0484
Signature:	

Full Name and Status: (Trustee, Officer etc)	Katherine Valadares
Full Residential Address:	3547 Far North Road R.D. 4 Kaitaia 0484
Signature:	

Full Name and Status: (Trustee, Officer etc)	Cynthia Mills
Full Residential Address:	133 Port Marsden Highway R.D. 1 Whangarei
Signature:	

Full Name and Status: (Trustee, Officer etc)	Daniel Bryan
Full Residential Address:	161 Tainui Road R.D. 5 Morrinsville
Signature:	

CHECKLIST – Have you remembered to…

- ☐ Complete all details set out in this Application Form
- ☐ Include an Assessment of Effects of the activity on the environment, set out in the attached form
- ☐ Sign and date the Application Form
- ☐ Include a Site Plan
- ☐ Include the appropriate fee as set out in the *"Schedule of Minimum Estimated Initial Fees"*
- ☐ Complete details of Trustees and/or Authorised Officers on this page

Appendix B. Impact on Neighbouring bores

B 1. Predicted drawdown on bores within 2 km of the proposed Bryan Estate bores that are included in the NRC database.

IRISID	X	Y	Purpose	Depth of Bore (m)	Scenario 3 Drawdown: Deep Aquifer (m)
LOC.315389	1612998	6142496	Not specified	Not specified	0.322
LOC.317160	1613023	6142453	Irrigation	94	0.317
LOC.200332	1612979	6142360	Stock	89	0.311
LOC.209586	1612784	6142645	Domestic	92.8	0.294
LOC.209232	1612816	6143569	Domestic and Stock	70.6	0.278
LOC.311385	1612759	6143681	Domestic and stock	72.8	0.261
LOC.313697	1612552	6142994	Not specified	Not specified	0.245
LOC.209708	1613781	6141064	Irrigation	79	0.224
LOC.200231	1612377	6143358	Domestic and Stock	46.5	0.219
LOC.317161	1612622	6141745	Irrigation	108	0.218
LOC.313307	1612425	6142123	Irrigation	109	0.216
LOC.315389	1612346	6142423	Not specified	Not specified	0.214
LOC.209340	1612600	6143684	Domestic	78	0.213
LOC.315389	1612506	6141783	Not specified	Not specified	0.208
LOC.308834	1611928	6143108	Irrigation	108	0.172
LOC.200319	1612375	6144058	Irrigation	88.5	0.168
LOC.308495	1611801	6142975	Not specified	Not specified	0.167
LOC.307989	1611796	6142884	Not specified	Not specified	0.167
LOC.308749	1611801	6142975	Irrigation	104	0.167
LOC.306709	1611801	6142975	Not specified	Not specified	0.167
LOC.200325	1614284	6140565	Domestic and Stock	66	0.165
LOC.317728	1611772	6143277	Domestic	108.4	0.161
LOC.209227	1611673	6143325	Domestic and Irrigation	106	0.149
LOC.200334	1611776	6143656	Irrigation	95.1	0.146
LOC.201480	1611776	6143656	Domestic and Irrigation	11	0.146
LOC.200066	1611776	6143756	Domestic and Irrigation	11	0.141
LOC.200302	1612673	6144658	Irrigation	79.5	0.137
LOC.200292	1613486	6139963	Not specified	117.25	0.129
LOC.200190	1614086	6139965	Stock	76	0.127
LOC.209670	1611559	6143858	Commercial Water Supply	88	0.124
LOC.200321	1613986	6139865	Not specified	117	0.123
LOC.200150	1611610	6143937	Irrigation	67	0.120
LOC.209172	1611566	6143905	Domestic and Stock	87.5	0.120
LOC.318551	1611088	6143280	Domestic	72	0.115
LOC.318549	1611088	6143280	Not specified	Not specified	0.115

IRISID	X	Y	Purpose	Depth of Bore (m)	Scenario 3 Drawdown: Deep Aquifer (m)
LOC.200148	1611277	6143655	Stock	67	0.114
LOC.317202	1612321	6144685	Domestic	68.5	0.113
LOC.200044	1611320	6143725	Not specified	40.65	0.111
LOC.209245	1611262	6143751	Irrigation	92.6	0.111
LOC.200303	1611475	6144155	Irrigation	102	0.108
LOC.307629	1612882	6145063	Domestic	73.7	0.104
LOC.304199	1612877	6145081	Not specified	Not specified	0.104
LOC.200312	1611216	6143980	Irrigation	88.5	0.102
LOC.210404	1611786	6144633	Domestic	79	0.100
LOC.200214	1612355	6144972	Stock	76.2	0.098
LOC.210166	1611339	6144277	Irrigation	68	0.096
LOC.318435	1612822	6145122	Domestic	68.5	0.094
LOC.200310	1612971	6145259	Domestic	38.5	0.088
LOC.200315	1612971	6145259	Domestic and Stock	66	0.088
LOC.200329	1612771	6145258	Domestic	68.5	0.086
LOC.200346	1613456	6145285	Domestic	72.2	0.080