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Irrigation Water Take Consent

Resource Consent Application & Assessment of Environmental Effects

PAUL MCLAUGHLIN

WWLA0130| Rev. Final

27 August 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 26-hectare Total Orchard Area (TOA) horticultural development spanning three properties on Trig Road, Pukenui. The legal descriptions for the properties subject to this application are:

- Section 30 Block X Houhora East SD;
- Section 36 Block X Houhora East SD; and
- Section 77 Block X Houhora East SD.

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. The proposed orchard extends over three properties owned by Paul McLaughlin, located at the western end of Trig Road, west of Far North Road, Waihopo. The legal descriptions for the properties subject to this application are:

- Section 30 Block X Houhora East SD;
- Section 36 Block X Houhora East SD; and
- Section 77 Block X Houhora East SD.

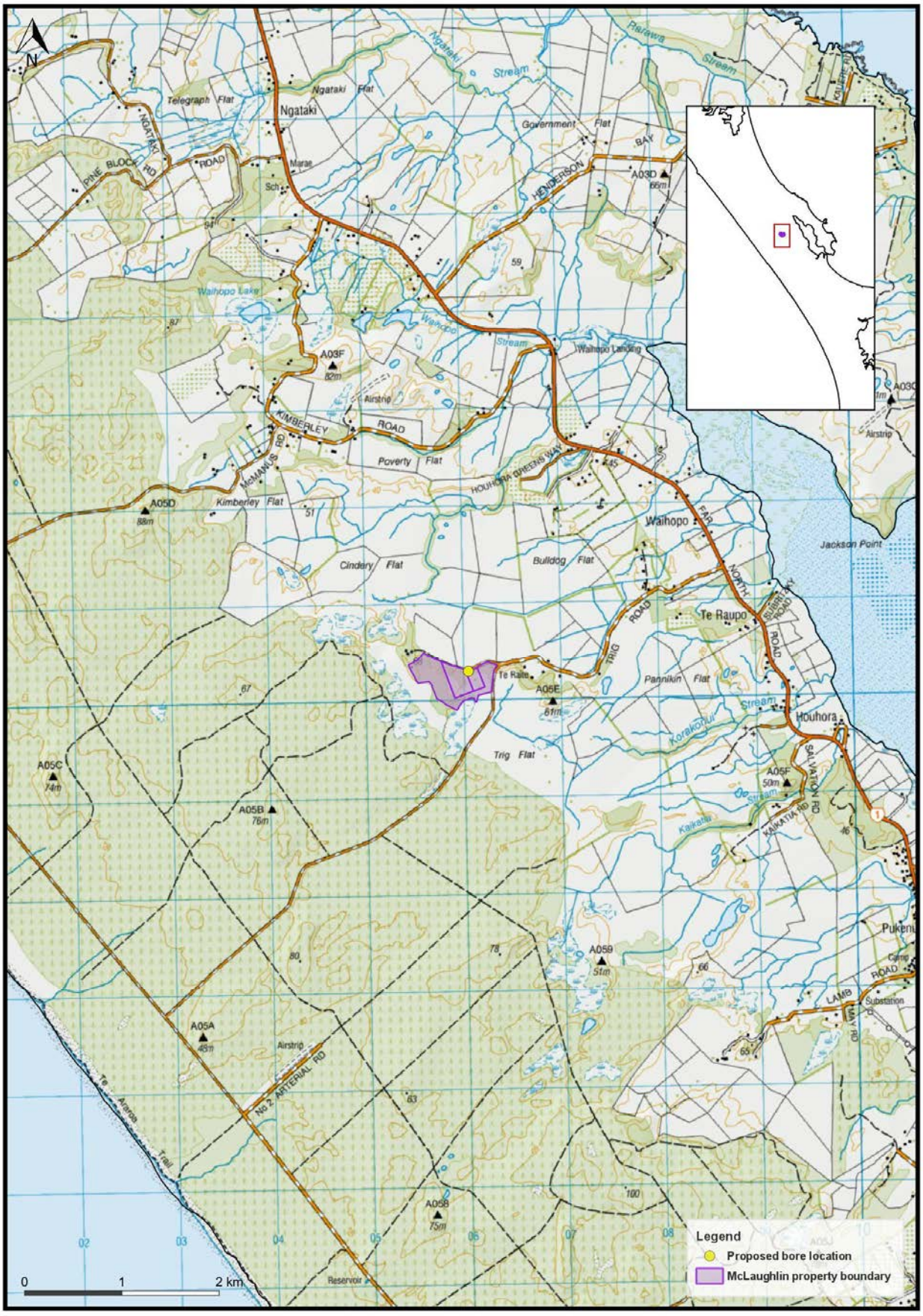


Figure 1. Project location map.

2.2 Description of Proposed Activity

The resource consent application for Paul McLaughlin seeks to take and use groundwater to develop and irrigate a new avocado orchard. The property, shown in **Figure 1**, has a TOA of 28 ha. A new production bore is proposed to be drilled at the location shown in **Figure 1**. This bore will supply irrigation water for the properties described in this application.

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

- Maximum daily volume of 700 m^3/day; and
- Maximum annual volume of 78,400 m^3/year.

The maximum daily volume has been calculated at 25 m^3/ha/day over the TOA, in accordance with the decision made in the Motutangi-Waiharara Water User Group (MWWUG) decision[1].

The maximum annual volume has been calculated from the canopy area, which for this orchard (given the topographic and proposed infrastructure constraints) is 70% of the TOA or 19.6 ha[2]. The maximum annual volume has been calculated on the basis of 400 mm/annum, 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 year drought requirement (**Section 3.1.4**).

2.2.1 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 2.3**.

2.3 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) Maximum daily volume of 700 m^3/day (being any 24 consecutive hours); and
   (b) Maximum annual volume of 78,400 m^3/annum (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.

[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.
[2] The maximum annual volume can also be calculated on the basis of approximately 96 days at full daily volume, which is equivalent to approximately 400 mm/year. In practice the maximum daily rate will only be required on consecutive days during the peak of summer and when this coincides with drought.

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:

(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 slow permeability densipan podzol[3],weakly developed sandy recent soils[4], brown soils[5] which occur in places where summer drought is uncommon, and Mesic organic soils[6] which is moderate decomposed peat. These soils display the following properties:

- ***Physical properties*** – Densipan podzol are commonly cemented or compacted B horizons which relates to the slow permeability of the soil and its limited root depth, there is extreme limitations for arable use. Sandy recent soils occur on young land surfaces generally having deep rooting and high plant – available water capacity. Brown soils are relatively stable topsoils with a well-developed structure. 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*** - Densipan podzol are highly acidic which secondary clays and minerals strongly differentiated with depth. Densipan podzol have generally low natural fertility while sandy recent soils have high natural saturation with high base saturation. Brown soils have low to moderate base saturation. Part of Mesic organic soils have mineral material but is dominated by organic matter.
- ***Biological properties*** – Densipan podzol have generally low biological activity while sandy recent soils have a continuous cover of vascular plants. Brown soils are associated with high biological activity (earthworms are prominent). Organic soils have restricted biological activity of organisms due to the anaerobic conditions, leading to a slow decomposition rate.

3.1.2 Geology

The McLaughlin property 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.

[3] https://soils.landcareresearch.co.nz/describing-soils/nzsc/soil-order/podzol-soils/
[4] https://soils.landcareresearch.co.nz/describing-soils/nzsc/soil-order/recent-soils/
[5] https://soils.landcareresearch.co.nz/describing-soils/nzsc/soil-order/brown-soils/
[6] https://soils.landcareresearch.co.nz/describing-soils/nzsc/soil-order/organic-soils/

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

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

3.1.4 Irrigation Requirements

The peak water requirement is 41.6 m^3/day per canopy hectare, which is equivalent to 4.16 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 1957 to 2016. 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.

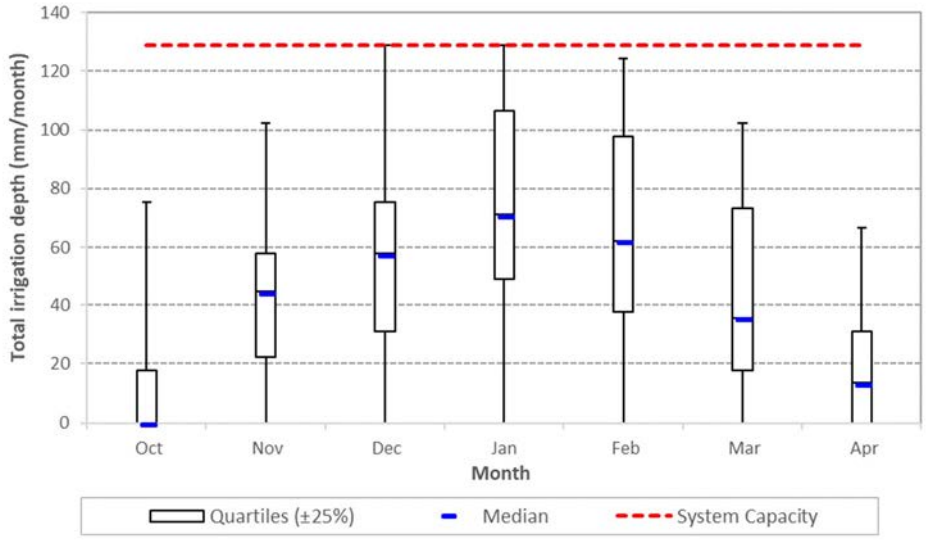


Figure 2. Simulated monthly statistical irrigation profile.

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 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 3** 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, 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 4.16 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

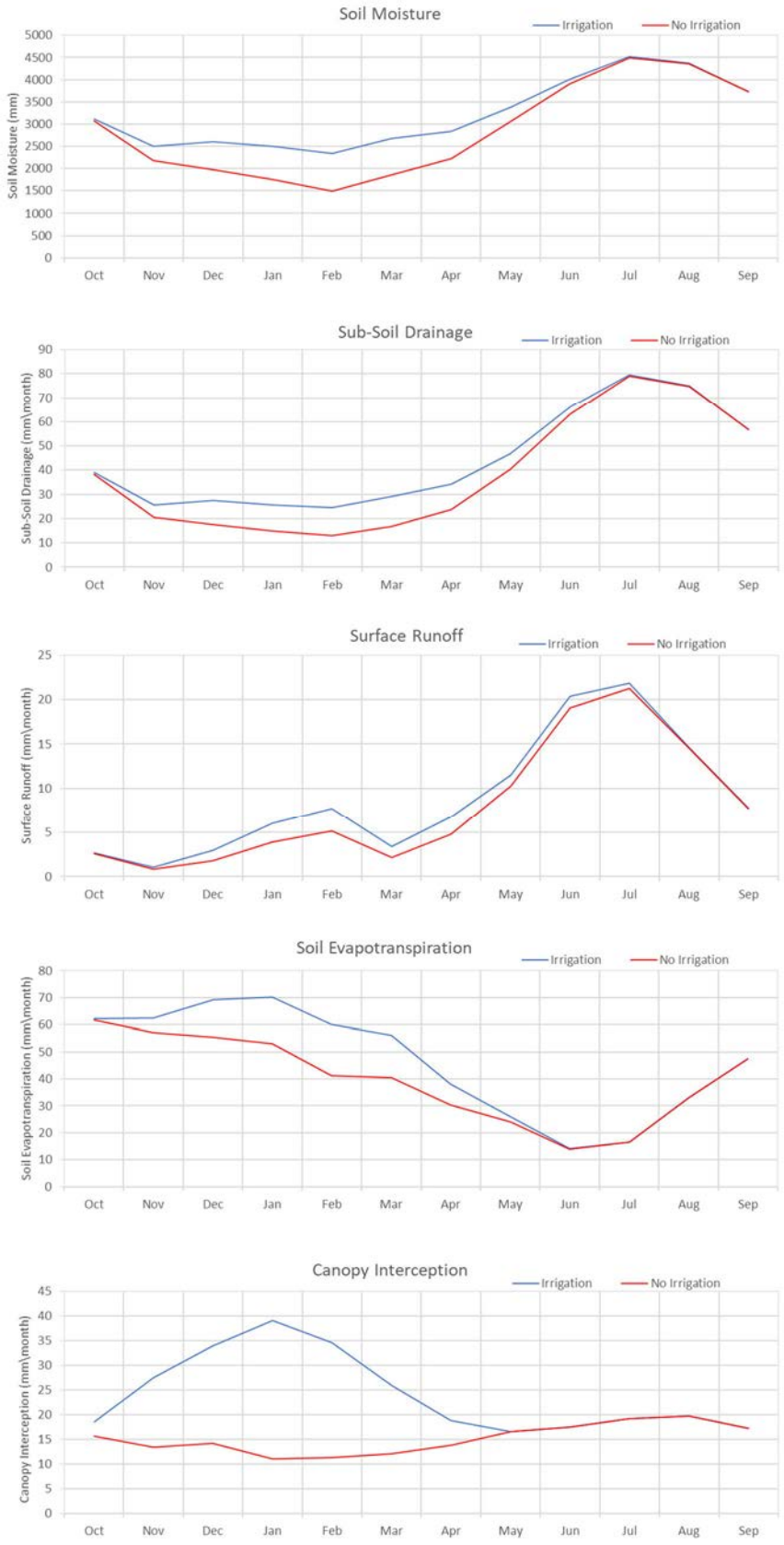


Figure 3. Comparison of water balance components.

3.2 Neighbouring Bore Information

There are two bores registered within the NRC database within a 2 km radius of the McLaughlin bore (**Figure 4**). Statistics on the bores are as follows:

- Both bores are active;
- Bore depth is provided for one of the bores; it is 93 m deep;
- One of the bores is registered as a stock bore while no purpose is provided for the other bore.

Figure 4. Neighbouring bores within 2 km radius.

3.3 Relevant Statutory Documents

3.3.1 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 3**.**

Table 3. 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 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, andA4. • 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 requires that the overall quality of fresh water within a region is maintained or improved while improving the quality of fresh water in water bodies that have been degraded by human activities to the point of being over-allocated.

Statute	Relevance	Requirement of Statue
		• 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. 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.	• 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 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	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

Statute	Relevance	Requirement of Statue
	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 RWSP. 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. 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	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 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.

Statute	Relevance	Requirement of Statue
		• 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.

3.3.2 Activity Status

The activity status of the proposed activity under both the RWSPN and pRPN is considered a discretionary activity – details of this conclusion are summarised in **Table 4.**

Table 4. 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 Proposed Regional Plan for Northland (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	The proposed groundwater take does not conform to any of the activities listed in 1) to 10) in the left column, and as indicated in the following **Section 3.3.3** does not exceed an allocation limit, therefore the proposed activity constitutes a Discretionary Activity under the pRPN.

	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'.	

3.3.3 Allocation Zones

The Aupouri Peninsula Aquifer is divided into different allocation zones for management purposes. The McLaughlin property sits within the Aupouri-Waihopo allocation zone. The allocation limit, current level of allocation and the level of allocation should this consent (along with other pending consents) be granted, are shown in **Table 5**.

Currently there are four pending applications for new groundwater takes in the Waihopo management zone, Te Raite Station (291,170 m^3/year), Waikopu Avocados (83,360 m^3/year), Henderson Bay Avocados (19,000 m^3/year), and Far North Avocados (32,000 m^3/year).

The allocation limit as specified in Table 26 of the Proposed Regional Plan for Northland (decision version dated 4 May 2019; NRC, 2019) equates to 16% of mean annual recharge.

Table 5 shows that the Aupouri-Waihopo zone is currently 13.4% allocated and granting the proposed Paul McLaughlin groundwater take (an increase of 78,400 m^3/year) will account for an additional 6.1% of the allocation limit. If all current proposals are granted, including the one described in this application, the total allocation status for the Aupouri-Waihopo zone will increase to 39.4%.

Table 5. Aupouri Aquifer Limits[7] and Allocation Status.

Sub-aquifer	Allocation Limit [A.]		Allocation Status (Current)		Allocation Status Including Proposed Groundwater Takes: Te Raite Station, Waikopu Avocados, Henderson Bay Avocados, Far North Avocados, and Paul McLaughlin	
	m^3/year	% mean annual recharge	m^3/year	%	m^3/year	%
Aupouri - Houhora	1,278,200	16	171,170	13.4%	503,930	39.4%

Notes:

A. Information obtained from NRC.gov (2019).

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

4. Assessment of Environmental Effects

The proposed 78,400 m^3/year groundwater take for the McLaughlin property was 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) applied 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 6 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 6. 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	

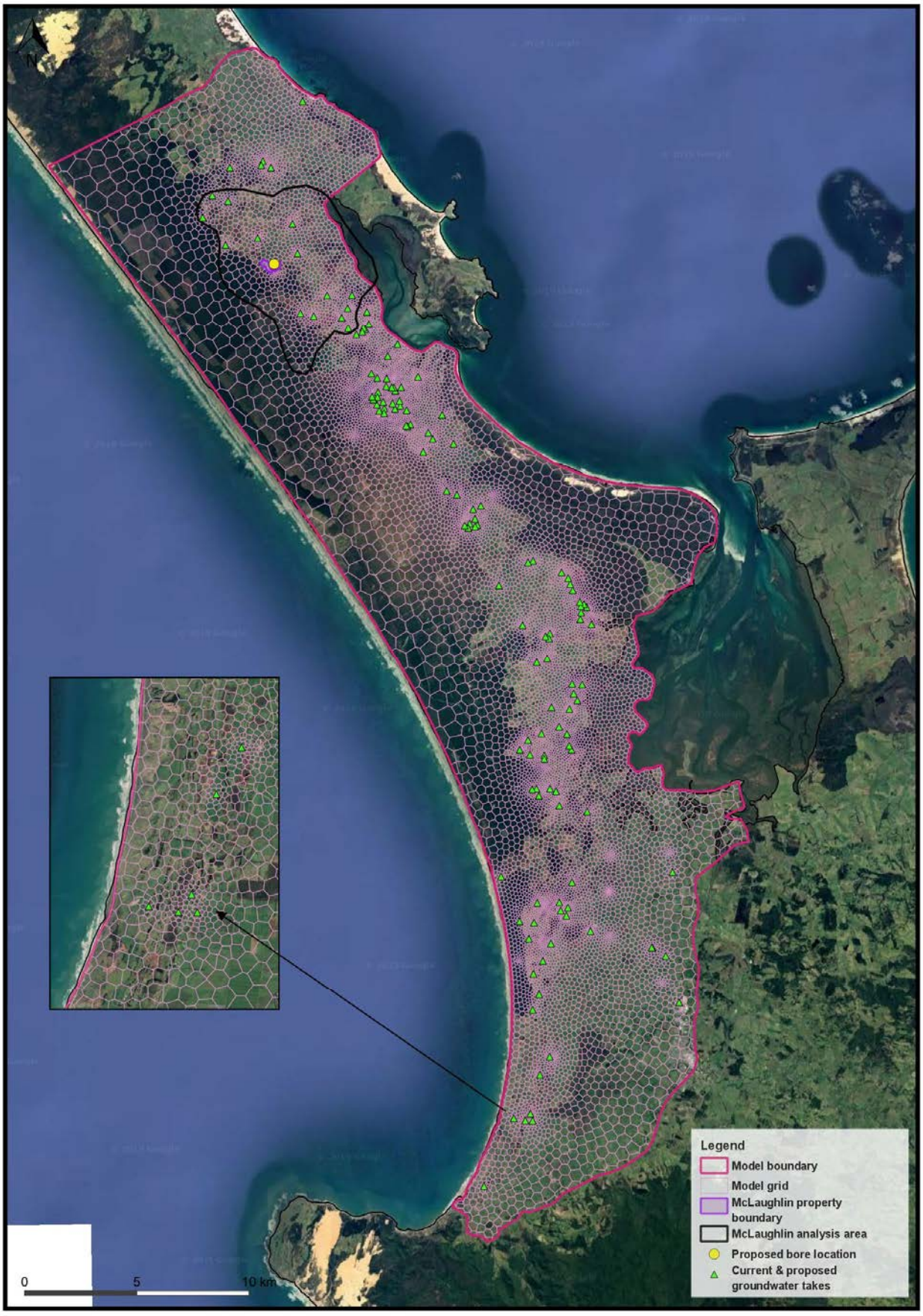


Figure 5. Aupouri Aquifer Groundwater Model domain

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 take at the McLaughlin bore applied the AAGWM under naturalised conditions where no groundwater was extracted. The Base Case Scenario (Scenario 2) was then developed by including all current groundwater takes and those that have been proposed and have applications currently pending including the take for Paul McLaughlin proposed in this application.

Scenario results were compared to assess cumulative effect of the proposed groundwater extraction with regard to the AEE criteria. Simulation results were evaluated for the drainages within and around the McLaughlin property in order to assess potential effects from proposed pumping in the area most likely to be impacted by the groundwater extraction proposed in this resource consent application. This area is referred to in this report as the McLaughlin 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 Scenarios 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: Naturalised*** – the calibration model with no groundwater pumping included in the simulation.
- ***Scenario 2: Proposed Extraction*** – includes all current and proposed groundwater takes including the 78,400 m^3/year proposed for this application.
- ***Scenario 3: Low Permeability-Proposed Extraction*** – Groundwater extraction is the same as in Scenario 2 with horizontal hydraulic conductivity of Model Layer 2 decreased to $1x10^{-7}$ m/s 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). 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 1974, 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 first and foremost it is the only

calibrated model scenario, and of secondary importance, 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. Annual minima flows were assessed to calculate the annually recurring minimum flow for each scenario and the resulting data is presented in **Table 7.**

Table 7. Surface water low-flow reduction analysis.

Recurrence Interval	Scenario 1: Naturalised	Scenario 3: Proposed GW Extraction	Relative Difference
(years)	(L/s)	(L/s)	(%)
1	120.3	112.7	-6.4%

A comparison of the proposed groundwater extraction (Scenario 2) against the Naturalised scenario indicates that the mean annual (1-year) low flow as a result of the combined groundwater extraction from all bores in the McLaughlin analysis area is likely to be 6.4% less than if there was no groundwater pumping. This is well below the NRC threshold for maximum allowable impact on small rivers, specified in Table 23 of the Proposed Regional Plan for Northland which states that minimum flow shall be defined as 80% of the mean annual low flow (NRC 2019). It should also be noted that some of the streams within the McLaughlin analysis area are ephemeral streams and are therefore exempt from minimum flow standards based on the NRC Proposed Regional Plan.

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.

Therefore, the impact on surface water resources due to proposed take will be within the Regional Plan allocation limits and therefore be no more than minor.

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 McLaughlin property in order to assess potential effects from proposed pumping in the area most likely to be impacted.

Drawdown Analysis

The simulated groundwater level for the end of 2010 irrigation season for Scenarios 2 and 3 was subtracted from the simulated head at the corresponding time under naturalised conditions (Scenario 1) in the case of Scenario 2. For Scenario 3, a revised version of Scenario 1 with low permeability in Layer 2 was used for consistency. The results were used to produce regional maps of cumulative drawdown resulting from all currently consented and proposed groundwater extraction (**Figure 6** and **Figure 7**).

Cumulative Effects

The cumulative impact of groundwater extraction on the deep aquifer, including the proposed pumping at the McLaughlin property, is shown relative to a naturalised condition for Scenario 2 conditions in **Figure 6** and for Scenario 3 conditions in **Figure 7**.

The cumulative impact of all groundwater pumping relative to a naturalised condition is shown for the shallow aquifer for Scenario 2 conditions in **Figure 8**.

Available drawdown for shellbed aquifer bores is typically 60 to 100 m, while maximum cumulative drawdown is 2.99 and 2.93 m in the more conservative low permeability model scenario for the 2 bores that are registered in the NRC database and are within 2 km of the McLaughlin bore (WWLA, 2019b). By this measure the cumulative drawdown for all current and proposed groundwater extraction in the area potentially impacted by the proposed groundwater take is a maximum 7% of available drawdown. This estimate assumes the maximum drawdown in the more conservative low-permeability scenario and typical minimum available drawdown for shellbed aquifer bores.

Figure 6. Cumulative drawdown (Scenario 2) in the deep aquifer relative to a naturalised condition for all consented and proposed bores.

Figure 7. Cumulative drawdown (Scenario 3) in the deep aquifer relative to a naturalised condition for all consented and proposed bores.

Figure 8. Cumulative drawdown (Scenario 2) in the shallow aquifer relative to a naturalised condition for all consented and proposed bores.

Drawdown from Proposed Extraction

Deep aquifer

To assess the likely effects of the proposed groundwater extraction at the McLaughlin bore, Scenario 2 and Scenario 3 results were compared to an alternative scenario where the proposed pumping was not applied at the McLaughlin bore but all other consented and proposed groundwater takes were included. The resulting drawdown predictions were used to evaluate the magnitude and extent of potential impacts resulting from the proposed pumping at the McLaughlin bore on both the shallow and deep aquifers relative to the permitted baseline for both scenario conditions.

The predicted drawdown in the deep aquifer for Scenario 2 is shown in **Figure 9**. In Scenario 2 the maximum predicted drawdown was 0.8 m at the proposed bore location. Significant drawdown is typically considered to be the 0.60 m. By this definition the area effected by significant drawdown is limited to the immediate vicinity of the pumping location and does not extend beyond the McLaughlin property boundary.

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 1.14 m at the pumping location (**Figure 10**). In Scenario 3 the area within the 0.6 m drawdown contour extended a maximum of approximately 380 m to the west of the pumping bore and did not extend to any other registered bore.

Figure 9. Simulated drawdown of deep aquifer resulting from proposed pumping at the McLaughlin bore (Scenario 2).

Figure 10. Simulated drawdown of deep aquifer resulting from proposed pumping at the McLaughlin bore (Scenario 3).

Shallow aquifer

The proposed groundwater take was predicted to cause a maximum of 0.24 m of drawdown in the shallow aquifer under Scenario 2 conditions (**Figure 11**). It was apparent in the assessment that the drawdown in the shallow aquifer was also influenced by the locations of agricultural drains. 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.

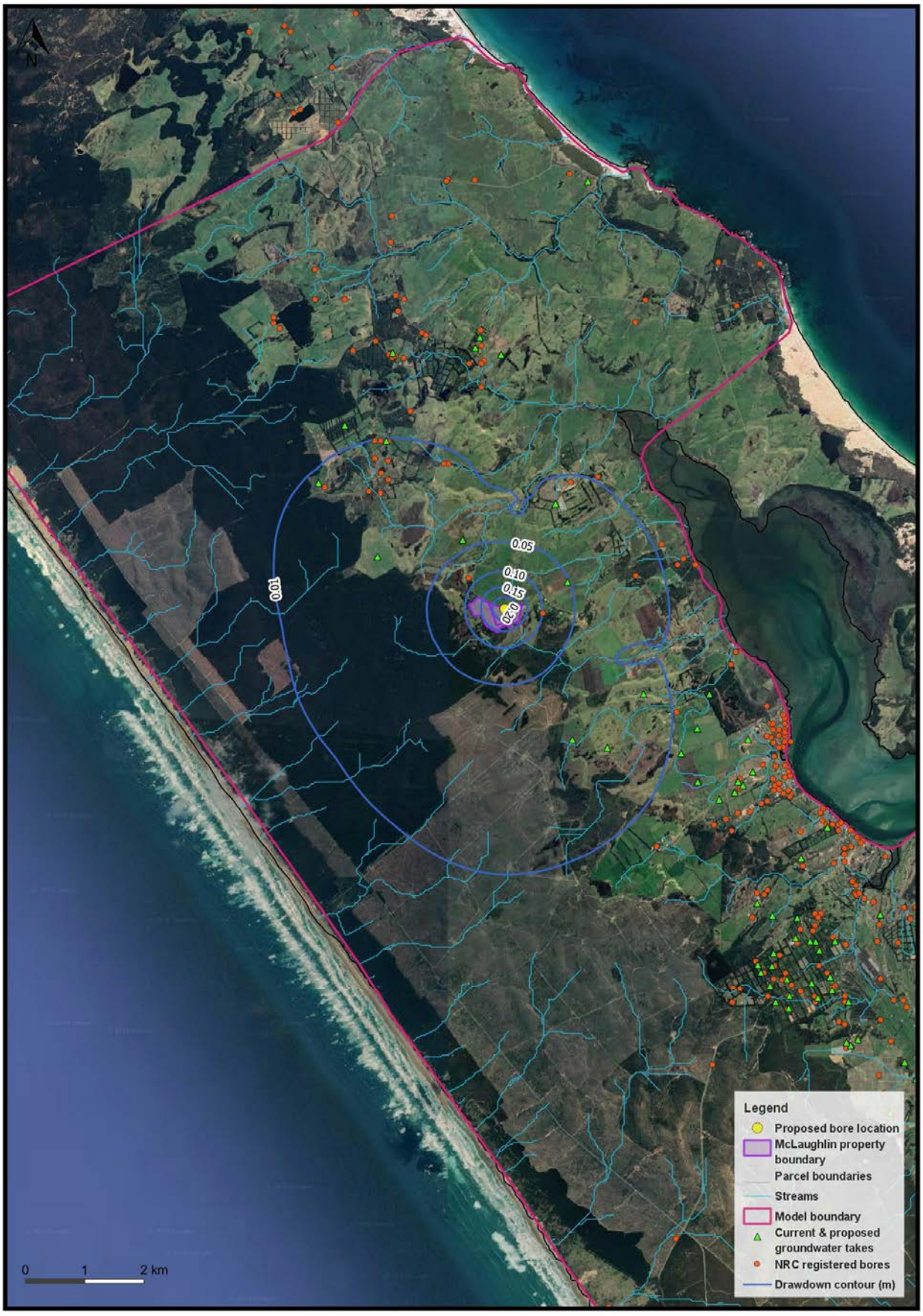


Figure 11. Simulated drawdown of shallow aquifer resulting from proposed pumping at the McLaughlin bore (Scenario 2).

Neighbouring Bores

The drawdown induced by the proposed groundwater take applied with calibrated and low-permeability hydrological conditions was calculated at the 2 registered bores within 2 km of the proposed groundwater take.

Both bores are registered to Landcorp Farming as LOC.210375 and LOC.210159. **Table 8** shows predicted cumulative drawdown in Scenario 2 and Scenario 3 as well as predicted drawdown from the proposed extraction at the McLaughlin bore alone.

Table 8. Predicted drawdown on within 2 km of the McLaughlin bore

IRISID	X	Y	Purpose	Depth of Bore (m)	Scenario 2 Drawdown: Deep Aquifer (m)	Scenario 3 Drawdown: Deep Aquifer (m)
LOC.210375	1606684	6150227	Stock	93	0.12	0.49
LOC.210159	1605435	6150820	Not specified	Not specified	0.08	0.42

In Scenario 2 the maximum predicted drawdown directly resulting from simulated pumping at the McLaughlin bore was 0.12 m at the LOC.210375 bore and 0.08 m at the LOC.210159.

In Scenario 3 the maximum predicted drawdown directly resulting from simulated pumping at the McLaughlin bore was 0.49 m at the LOC.210375 bore and 0.44 m at the LOC.210159.

Given that the available drawdown in the Aupouri aquifer is typically 60 to 100 m in most shellbed bores and no neighbouring bore is predicted to see more than 0.49 m of additional drawdown under the most conservative conditions, the interference effects on existing groundwater users is considered less than minor.

4.3 Saline Intrusion

Saltwater intrusion under the hydrogeological conditions in the area around the McLaughlin property, 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 groundwater assessment area is underlain by relatively impermeable basement rock and is well represented by this conceptual approach. Results from model Scenario 1 (Naturalised conditions) and Scenario 2 (Proposed Extraction) were used for this analysis because these scenarios apply parameters from the calibrated AAGWM. The difference between predicted groundwater pressure at the coast can be attributed to the cumulative impact of groundwater extraction.

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. This pressure is referred to as the lateral migration “Trigger Level” (TL). This calculation was performed at approximately 200 m intervals along the coastal margin of the eastern model boundary, adjacent to the McLaughlin property. The point locations used for lateral migration analysis are shown in

Figure 12. Simulated Layer 6 groundwater levels from the Naturalised and Proposed Extraction scenarios were extracted at these points for analysis.

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 30/04/2010, which corresponds to the lowest groundwater level over the simulation period.

Figure 12. Location of the selected points for lateral migration analysis.

The hydraulic heads in the deep shellbed at the selected time step (30/04/2010) ranged from 2.7 m greater than the trigger level pressure to 0.1 m below the trigger level pressure. In all cases where the simulated head was below the trigger level, this occurred under both Naturalised and Proposed Extraction conditions with negligible difference between the scenarios. Areas with the lowest groundwater head at the coast (analysis points 16 and 17) were not impacted by pumping. This area is known to have a shallow elevation of the basement formation making it potentially susceptible to saline intrusion under natural conditions. The greatest pumping effect was predicted at the southern end of Houhora Harbour (analysis point 1) where simulated groundwater pressure exceeded the trigger level by 2.3 m, even when accounting for the effect of cumulative pumping.

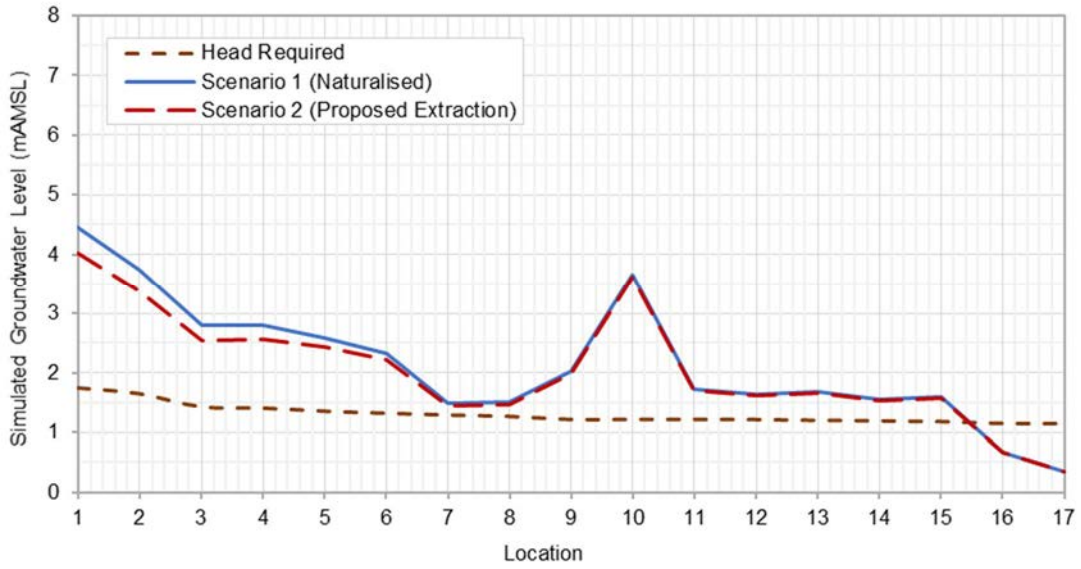


Figure 13. Lateral migration trigger level and simulated minimum Layer 6 groundwater level (1960-2018)[8].

The drawdown contours for the McLaughlin bore considered in isolation, as shown in **Figure 9**, show that the extraction proposed in this application is not predicted to cause any impact on groundwater level along the coast.

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

Cumulative Lateral Migration Analysis for the Aupouri Peninsula

An assessment of potential saline intrusion under naturalised conditions has been undertaken for the entire AAGWM where simulated groundwater levels at selected points along the east and west coasts were compared to calculated TL's. The difference between the groundwater level and TL is the head residual, which is used in the analysis of model results. Saline intrusion due to lateral inland migration was considered to be an issue of concern where the 90-day average of groundwater head was below the TL for 90

[8] Corresponding point locations are shown in Figure 13.

consecutive days. The frequency of these events were evaluated to determine their average recurrence interval (ARI). Locations were flagged as areas of potential concern where it was determined that saline intrusion was likely to occur at least (and/or more frequently than) 1 in every 10 years (10-year ARI).

A 10-year ARI was used to because this has been the standard policy of Councils across NZ including the NRC in the setting of guidelines for efficient use of resources.

Areas indicated by the model as having potential saline intrusion under naturalised conditions are shown in **Figure 14**, the key locations[9] of which include:

- Waihopo Inlet;
- Houhora Heads;
- The south end of East Beach; and
- Mouth of the Awanui River.

A comparison of the frequency of predicted saline intrusion events between naturalised conditions, and Scenario 2 (currently consented and proposed groundwater takes) revealed that only four additional points were identified as exceeding the 10-year ARI under the full groundwater extraction. However, these points are located adjacent to those points that were exceed under naturalised conditions, hence no new locations occurred (**Figure 15**).

No increase in saline intrusion was predicted to occur as a result of the proposed McLaughlin groundwater take.

For additional reference and understanding, groundwater level over the simulation period with and without pumping is plotted for four locations shown in **Figure 16**, to demonstrate water levels relative to TL with various saline intrusion ARIs. These locations include:

1. ***East of McLaughlin property*** – No saline intrusions predicted under naturalised or pumped conditions;
2. ***Houhora Heads*** – 30-year ARI under naturalised conditions, 5-year ARI with pumping;
3. ***East Beach*** – 4-year ARI under naturalised conditions, 3-year ARI with pumping;
4. ***Mouth of Awanui River*** – Water level always below trigger level.

[9] Key saline intrusion locations are considered to reside where there is: i) shellbed present (e.g. the headland between Henderson Bay and Rarawa Beach has rock outcropping hence was not selected), and ii) greater confidence in the interpolated basement (e.g. west coast in the northwest of the model was not selected because of a lack in borehole data).

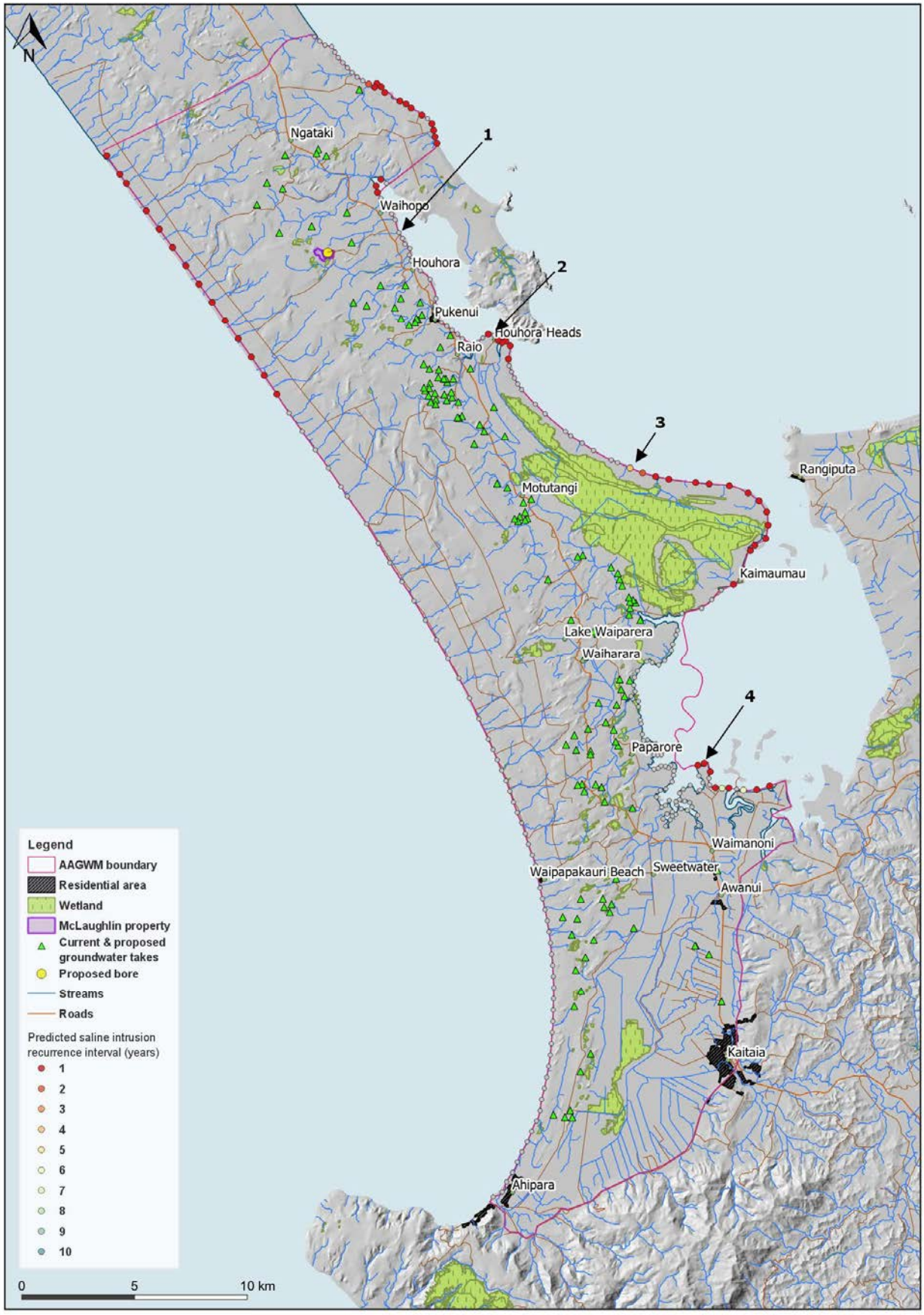


Figure 14. Lateral migration analysis results for Naturalised conditions. (Numbers correspond to locations highlighted in Figure 16).

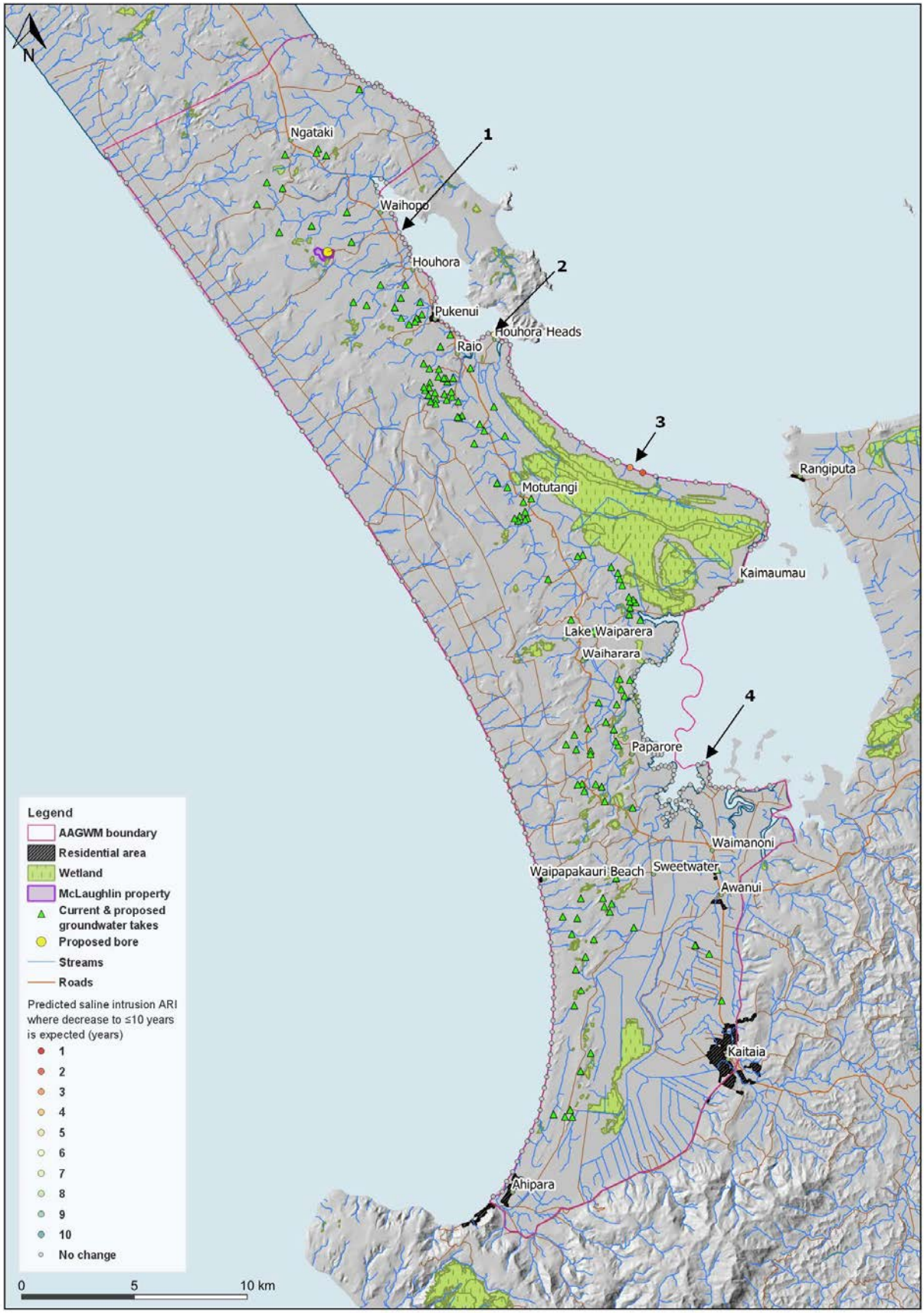


Figure 15. S2 – Locations where saline intrusion potential is increased from naturalised conditions. (Numbers correspond to locations highlighted in Figure 16).

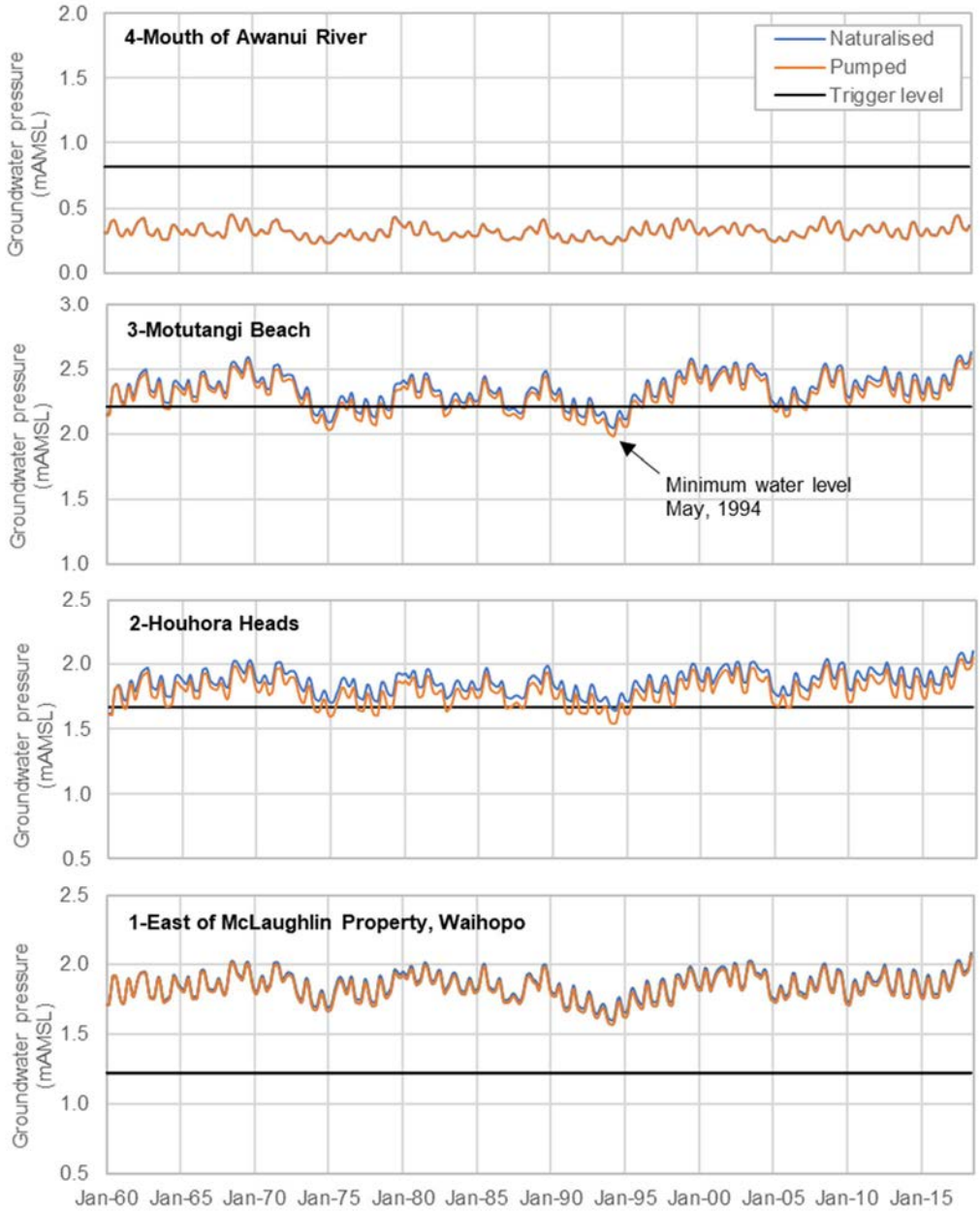


Figure 16. Simulated groundwater level relative to trigger level at select locations.

4.4 Ground Settlement

Land subsidence due to groundwater extraction was calculated using the Bouwer (1977)[10] 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.
- Elasticity: shallow aquifer 8,000 kPa units and shellbed aquifer 100,000 kPa.

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 three separate layers representing the conceptual hydrogeological units of the sub-surface environment, and the parameter values used were based on Bouwer (1977).

The potential maximum ground settlement was estimated at the proposed bore on the McLaughlin property based on the maximum simulated drawdown in Scenario 2 and Scenario 3 relative to a naturalised condition. Predicted settlement at the bore location was 3 cm for Scenario 2 (calibrated parameters) and 5 cm for Scenario 3 (low permeability). It should be noted that the majority of settlement is due to drawdown from the cumulative pumping applied in the scenarios. If the proposed extraction is considered in isolation to quantify the effect of the proposed bore, the predicted settlement is 1.6 cm in Scenario 2 and 1.7 cm in Scenario 3.

In summary, the settlement that can be attributed to the proposed pumping bore would be nearly unmeasurable under field conditions. Therefore, 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 (acknowledging cultural values are complex and effects upon them may manifest in unanticipated ways).

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 quality 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 Quality		
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 **Section 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, including by 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 **Sections 4.1** and **4.2**.
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 minimal, 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) of 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

Paul McLaughlin is seeking a groundwater take to facilitate the development of a 26-ha orchard spanning 3 properties on Trig Road, Pukenui. The legal descriptions for the properties are Section 30 Block X Houhora East SD, Section 36 Block X Houhora East SD, and Section 77 Block X Houhora East SD. The groundwater take will be exercised from October to April, in accordance with the following volumes:

- Maximum daily volume of 700 m^3/day; and
- Maximum annual volume of 78,400 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 another application we are aware of, will take the allocation status for the Aupouri-Waihopo allocation zone to approximately 39% 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 PRP, the RWSPN, and Part 2 of the RMA. The applicant considers that in light of the less than minor effects of the application, 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

Northland Regional Council (NRC), 2019. Proposed Regional Plan Change Decisions Version. https://www.nrc.govt.nz/your-council/about-us/council-projects/new-regional-plan/council-decision/

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

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)	Paul McLaughlin
Phone Number – Business:	Fax:
Home:	Mobile: 027 482 1712
E-mail:	qfoundationsltd@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)	

(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 Advisory PO Box 314 Kumeu, 0812 Auckland

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

(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 Paul McLaughlin is to take and use groundwater for a new orchard of 28 Total Orchard Area (TOA) of which the anticipated Total Canopy Area (TCA) will be 70% of TOA, or 19.6 ha. The additional groundwater take will be exercised from October to April, in accordance with the following volumes:

- Maximum daily volume of 700 m^3/day; and
- Maximum annual volume of 78,400 m^3/yr.

The requested volumes in this application are based on the industry standards of 25 m^3/day for TOA and 400 mm/yr for TCA.

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: (see rate demand) Western end of Trig Road (west of Far North Road) Locality: Waihopo

Legal Description: Section 30, Section 36, & Section 77 Blk: Block X SD: Houhora East 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: $ $3,362.00 ☐ 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.

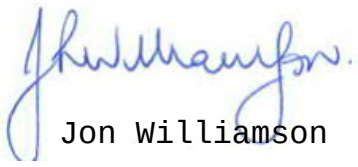
(b) All accounts are payable by the 20th of the month following the date of invoice. Any actual and reasonable costs, including but not limited to legal costs, debt collection fees or disbursements incurred as a result of any default in payment, shall be recoverable from the Applicant and is so notified 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: 

Full Name (print): Jon Williamson

Date: 28/08/2019

Signature: _____

Full Name (print): _____

Date: _____

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)	
Full Residential Address:	
Signature:	
Full Name and Status: (Trustee, Officer etc)	
Full Residential Address:	
Signature:	
Full Name and Status: (Trustee, Officer etc)	
Full Residential Address:	
Signature:	
Full Name and Status: (Trustee, Officer etc)	
Full Residential Address:	
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