



Soil and Resource Report for Warkworth South.

Prepared By: Ian Hanmore

**Prepared For: KA-Waimanawa Limited Partnership and Stepping
Towards Far Limited**

25th October 2022

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1.0 INTRODUCTION

This report has been prepared at the request of the client to assess the soils on a potential rezoning site either side of State Highway 1 south of Warkworth. The purpose of the report is to identify any prime or elite soils located at the proposed site, as defined by the Auckland Council and any highly productive land as defined by the National Policy Statement on highly productive land (NPS-HPL). To achieve this, a site visit was carried out to map the soils and land use classes present and assess them in relation to the Auckland Council soil class definitions and the NPS-HPL. This report presents the description of each of the soil types identified on the proposed site as well as descriptions of each of the Land Use Capability units mapped. This information is then used to determine and quantify any prime or elite soil and any highly productive land present on the proposed site. This information is accompanied by soil, LUC, prime and elite soil and highly productive land classification maps.

2.0 MAPPING METHOD



A site visit was carried out on the 11th of October 2022 to evaluate and describe the soil types and the Land Use Capability (LUC) units present. The site of interest was mapped at a scale of less than 1:5,000. LUC mapping was carried out in accordance with the methods described in the 3rd Edition of the Land Use Capability Survey Handbook (Lynn et al 2009). This process involves making a land resource inventory (LRI) of the property in which soil types, soil parent materials, land slopes, erosion type and severity and land cover are recorded. Whenever any of these land features changes a new unit is made. Specific field work activities include digging and describing soil profiles on each landform with supporting holes dug or profiles observed on bank/drain cuttings to establishing soil boundaries, measuring slopes with a clinometer, and gathering any other data that may be of assistance in assessing the suitability of the land for primary production such as erosion, susceptibility of the land to flooding, winter wetness and/or cold, high temperatures, exposure to salt winds, aspect, and accessibility. This information is then used to determine the specific LUC units, as described in the Land Use Capability Classifications of the Northland Region (Harmsworth, 1996) for the area. At times when mapping at a scale finer than Harmsworth (1996) of 1:50,000, new LUC units are recorded and are noted with an * in the LUC description table.



3.0 SITE DESCRIPTION

The proposed site is located just south of Warkworth township and includes land on the north western and south eastern sides of SH1 covering a total of 134.9ha. It is bordered by lifestyle and residential blocks, farm land and Morrisons Heritage Orchard. The topography of the site to the northwest is dominated by alluvial flats with a lesser area of rolling hills. To the southeast topography climbs from undulating to rolling hills close to the road to steep hills on the southern most boundary. The alluvial flats have poorly drained alluvial clay soils while the hills on both sides of the road have imperfectly drained clay soils. At the time of the site visit the properties were being used for grazing beef cattle and horses.

3.1 Soil Profiles and Descriptions

The soils identified on the proposed site are presented and described in the table below with an accompanying soil map located in section five.

Soil Profile	Soil Profile Description
	<p>Soil Name: Waipuna clay (WU)</p> <p>Soil classification: Strongly leached to weakly podzolised yellow-brown earths from the Whareora suite</p> <p>Parent material: Alluvium mainly from sedimentary rocks.</p> <p>Soil description:</p> <p>0-200mm: Friable, strongly developed, 5-15mm nut, sticky, plastic, dark grey (2.5y 4/1) clay.</p> <p>200-250mm: Friable, strongly developed, 5-15mm nut, sticky, plastic, grey (2.5y 5/1) clay with rusting round plant roots.</p> <p>250-400mm: Friable to firm, strongly developed, predominantly 10-30mm blocky structure, sticky, plastic, grey (5y 6/1) slightly sandy clay with yellowish brown (10yr 5/8) mottles.</p> <p>Overall drainage: Poorly drained</p>
	<p>Soil Name: Albany silt loam (AB)</p> <p>Soil classification: Weakly to moderately podzolised yellow-brown earths from the Whareora suite</p> <p>Parent material: Alluvium mainly from sedimentary rocks.</p> <p>Soil description:</p> <p>This soil varies from the WU profile above in that the topsoil has a less clay and a more silt loam texture, there was a distinct podzolised silica layer forming at approximately 200mm depth and increased mottling in the subsoil.</p> <p>Overall drainage: Poorly drained</p>

	<p>Soil Name: Warkworth clay and sandy clay loam (WA)</p> <p>Soil classification: Strongly leached to weakly podzolized yellow-brown earths from the Puhoi suite</p> <p>Parent material: Banded sandstone</p> <p>Soil description:</p> <p>0-200mm: Friable, strongly developed, 1-5mm nut, sticky, plastic, very dark greyish brown (2.5y 3/2) clay.</p> <p>200-400mm: Soil deforms under pressure, blocky structure, sticky, plastic, olive yellow (2.5y 6/8) clay with strong brown (7.5yr 5/8) mottling.</p> <p>Overall drainage: Moderately well to imperfectly drained.</p>
	<p>Soil Name: Whangaripo clay loam (WR)</p> <p>Soil classification: Moderately to strongly leached yellow-brown earths from the Puhoi suite.</p> <p>Parent material: Banded sandstone.</p> <p>Soil description:</p> <p>0-200mm: Friable, strongly developed, 2-5mm nut, slightly sticky, slightly plastic, dark brown (10yr 3/3) clay loam.</p> <p>200-500mm: Very friable, strongly developed, 2-3mm nut, sticky, plastic, olive (5y 4/3) clay loam with strong brown (7.5yr 5/8) mottles.</p> <p>Overall drainage: Moderately well to imperfectly drained.</p>

3.2 Land Use Capability Descriptions

Land use capability classifications categorizes land into eight classes according to its long-term capability to sustain one or more productive uses. Classes one to four have arable potential with limitations to this land use moving from class one being the most versatile, multi-use land with minimal physical limitations for arable use and increasing to severe limitations under class four land. These classes are also suitable to viticulture, berry production, pastoralism, tree crops and production forestry. Classes five to seven are suitable for pastoral farming and production forestry with class eight land having no productive use and is rather managed for catchment protection and conservation purposes. The table below presents the LUC units mapped on the proposed site with an accompanying LUC map located in section five.

Resource information	Luc unit	Total area (ha)	Parent material	Dominant soil type	Slope (degree)	Land Cover	Erosion degree & severity		Landuse suitability	Stock carrying capacity (su/ha)
							Actual	Potential		Forestry site index (FSI)
3e 3 Gently rolling to rolling slopes on deeply weathered interbedded sandstones and mudstones with occasional massive sandstones and mudstones.		See table in section 4.0 for area information	Interbedded sandstones and mudstones, massive sandstones, and mudstones	Yellow-brown earths on stratified and massive sandstones and mudstones	4-15°	Pasture Viticulture	Nil	Slight sheet, rill, gully. Slight to moderate sheet, rill and gully when cultivating	Root green fodder crops. Horticulture. Intensive grazing. Forestry Now have crop (maize) in rotation	Average: 13 Top: 15 Potential:18 FSI: 29-32 Revised Average: 13 Top: 18 Potential:20
4e 5 Rolling and strong rolling slopes within a subdued rolling to hilly landscape on strongly weathered interbedded and occasionally massive sandstones and mudstones.			Bedded sandstone and mudstone, less extensive areas of massive sandstone and mudstone.	Yellow-brown earths on stratified and massive sandstones and mudstones	8-20°	Pasture Viticulture	Nil	Slight to moderate sheet, soil slip, tunnel gully, earthflow, and rill. Slight to moderate rill and gully and moderate to severe sheet when cultivated.	Grazing Horticulture Cereals Root and green fodder crops	Average: 17 Top: 20 Potential: 24 FSI: 19-29
4e12 Gently rolling to strong rolling slopes within subdued rolling landscape with podzolised soils.			Massive sandstone and mudstone, jointed mudstone, bedded sandstone and mudstone, argillite, crushed argillite, association of rocks, sheared lithologies, lavas and welded ignimbrites.	Podzols on various sedimentary lithologies.	8-20°	Pasture	Nil	Moderate sheet, gully, earthflow, soil slip and tunnel gully. Moderate to severe sheet, rill and gully when cultivated.	Pasture Root and green fodder crops. Forestry	Average: 13 Top: 15 Potential: 18 FSI: 28-32

Resource information	Luc unit	Total area (ha)	Parent material	Dominant soil type	Slope (degree)	Land Cover	Erosion degree & severity		Landuse suitability	Stock carrying capacity (su/ha)
							Actual	Potential		Forestry site index (FSI)
4w 1 Flat to undulating areas on floodplains, valley plains and low terraces with severe continuing wetness or flooding limitation.		See table in section 4.0 for area information	Fine alluvium.	Recent soils on sedimentary and volcanic alluvium.	0-7°	Pasture	Nil	Moderate streambank and deposition.	Intensive grazing Root and green fodder crops. Forestry	Average: 17 Top: 20 Potential:24 FSI: 20-23 Revised Average: 13 Top: 15 Potential:18
4s 4 Flat to undulating slopes within a subdued rolling landscape with podzols and podzolised brown soils.			Fine alluvium or unconsolidated clays and silts and sheared mixed lithologies.	Podzols and podzolised brown soils.	0-15°	Pasture	Nil	Moderate gully and tunnel gully under pasture. Slight to moderate sheet, rill and gully when cultivated.	Pasture Root and green fodder crops Forestry	Average: 13 Top: 15 Potential:18 FSI: 26-30
6e 1 Strongly rolling to moderately steep slopes forming hilly terrain on interbedded sandstone and mudstone.			Interbedded sandstone and mudstone, occasionally massive sandstone	Yellow-Brown earth hill soils on stratified sandstones and mudstones	16-25°	Pasture Trees	Nil	Moderate soil slip, earth slip, sheet, earthflow, and gully.	Pasture Forestry	Average:8 Top :10 Potential:12 FSI:31-34m Revised Average: 11 Top: 13 Potential:15
6e 8 Moderate to steep slopes forming hilly to steep land terrain.			Interbedded sandstone and mudstone	Yellow-Brown earth hill soils on stratified sandstones and mudstones	21-35°	Pasture Trees	Negligible gully	Moderate sheet, soil slip, gully and earthflow. Slight tunnel gully	Pasture Forestry	Average:7 Top farmer:8 Potential:9 FSI:31-34m Revised Average: 11 Top: 13 Potential:15

Land use capability unit descriptions are taken from field work and from Land use capability classification of the Northland region (Harmsworth, 1996).

4.0 PRIME AND ELITE SOIL AND HIGHLY PRODUCTIVE LAND CLASSIFICATIONS

4.1 Prime and Elite Soils

The Auckland Council has classified soils in LUC class 1, Bombay clay loam, Patumahoe clay loam, Patumahoe sandy clay loam, and Whatitiri soils as elite soils. Soils in LUC classes 2 and 3 are classified as prime soils. The regional plan has regulations in place that seek to protect the productivity potential of such soils by regulating non-productive land uses.

4.2 Highly Productive Land

The overall purpose of the proposed NPS-HPL is to improve the way highly productive land is managed under the Resource Management Act 1991 (RMA) to:

- recognise the full range of values and benefits associated with its use for primary production
- maintain its availability for primary production for future generations
- protect it from inappropriate subdivision, use, and development.

The current definition of highly productive land under the NPS-HPL is LUC classes 1-3 (<https://www.mpi.govt.nz/dmsdocument/36621-Valuing-highly-productive-land-a-summary>)

4.3 Warkworth South Soil, LUC and Highly Productive Land Classifications

When completing the field mapping for this report a number of sites were not accessible and as such could only be view from a distance. In some instances not all of the site was visible from neighbouring properties. These sites have been highlighted on the accompanying maps with results based on a visual assessment, aerial imagery, regional scale maps and the authors experience.

The Northland Soil Maps and the New Zealand Resource Inventory (NZLRI) show the alluvial flats on the north-western side of SH1 to be a combination of Whareora clay loam and Kara silt loam soils with the NZLRI giving the area a LUC classification of 3w 1. Detailed mapping of the site found that the soils were not dominated by Whareora clay loam but rather the more strongly leached Waipuna clay soils that are gleyed and have poorer drainage. The site mapping also failed to locate any true podzols (Kara soils) rather the soil profiles were seen to be at an intermediate stage of development between the strongly leached to weakly podzolised Waipuna soils and the podzolised Kara soils. These have been classified as weakly to moderately podzolised Albany silt loam soil. Images of both profiles are presented in the soil section of this report and are included below with the yellow lines indicating the formation of the silica layer in the Albany soil which is characteristic of podzolised soils.



Pictures of the Waipuna clay soil profile on the left and Albany silt loam on the right.

If Whareora and Kara soils had been present at the site as indicated by the regional scale Northland soil and NZLRI maps the correct LUC units would have been either 2w 1 or 3w 1 in the areas of Whareora soils and 4s 4 for the area of Kara soils (Harmsworth 1996). However, as the soils at the site are Waipuna clay with smaller areas of Albany soil the former LUC unit is changed to a 4w 1 (Harmsworth 1996) with 4s 4 remaining for the areas of Albany soil.

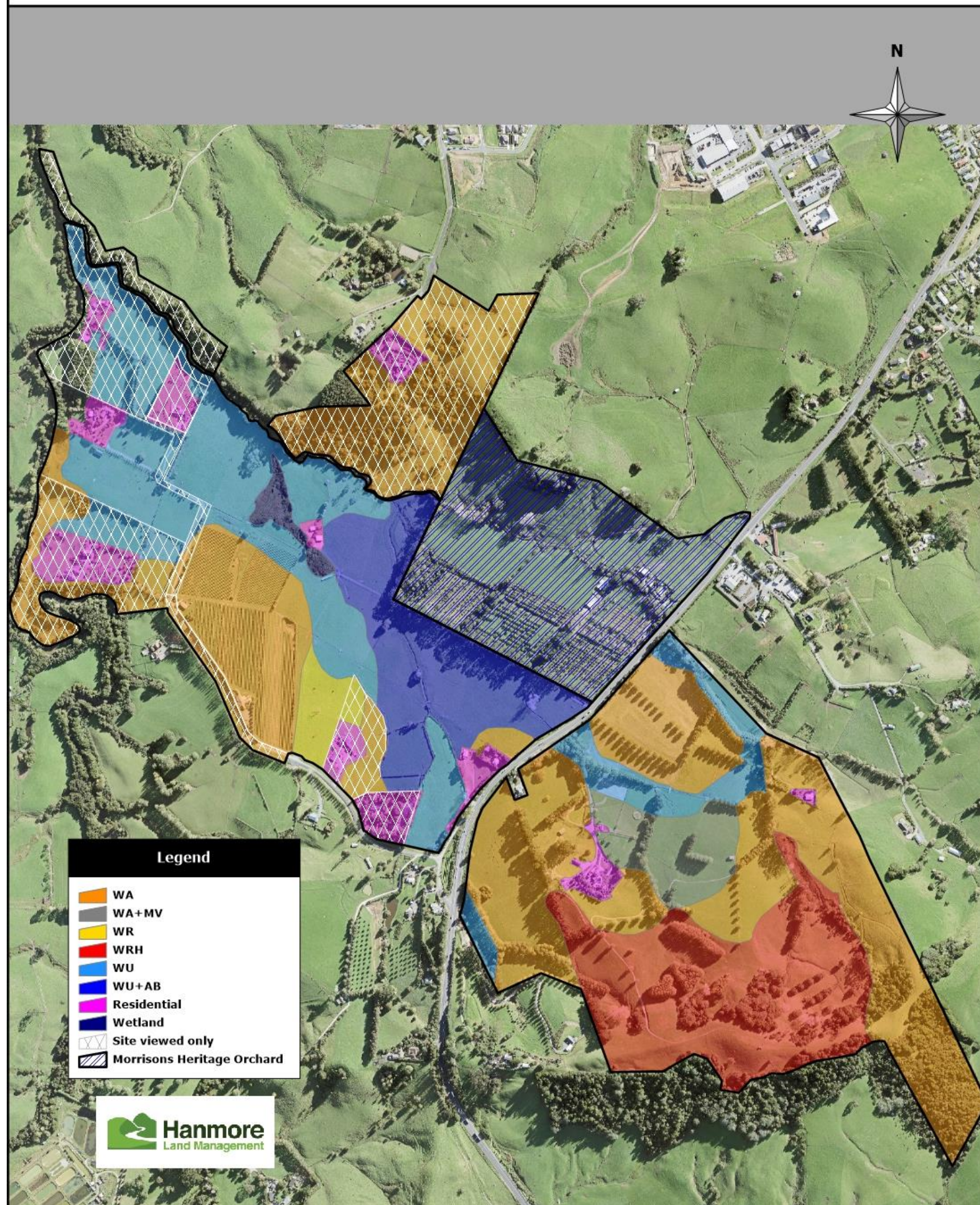
There are five areas on the property that have a combination of LUC units mapped in one polygon. This has been done as the areas are a mix of LUC classes that cannot be separated at the scale of mapping used in this report. The two LUC units are separated by a “+” indicating that the first unit is the dominant unit with smaller areas of the second unit also present. There are two combinations which include both prime soil and highly productive land classifications: 3e 3+4e12 and 4e 5+3e 3. Both of these areas have been given an overall classification of non-prime and non-highly productive land. This has been done as the greater limitations of the class four land determine the potential use of the areas when practically managing them. Further consideration must also be given to the size of the area. The 3e 3+4e12 area is dominated by the class three land but the total area covered is only 0.71ha (0.5%) which is of little productive use on its own. The other areas with combined LUC units are all outside of the prime and elite soils and HPL categories as they are class four and class six land..

The table below shows the area breakdown of LUC units for the proposed site as well as the percentage of prime and elite soils and highly productive land. This information is accompanied by a soil classification and highly productive land classification map in section five.

LUC, prime and elite soils and highly productive land for Warkworth South.

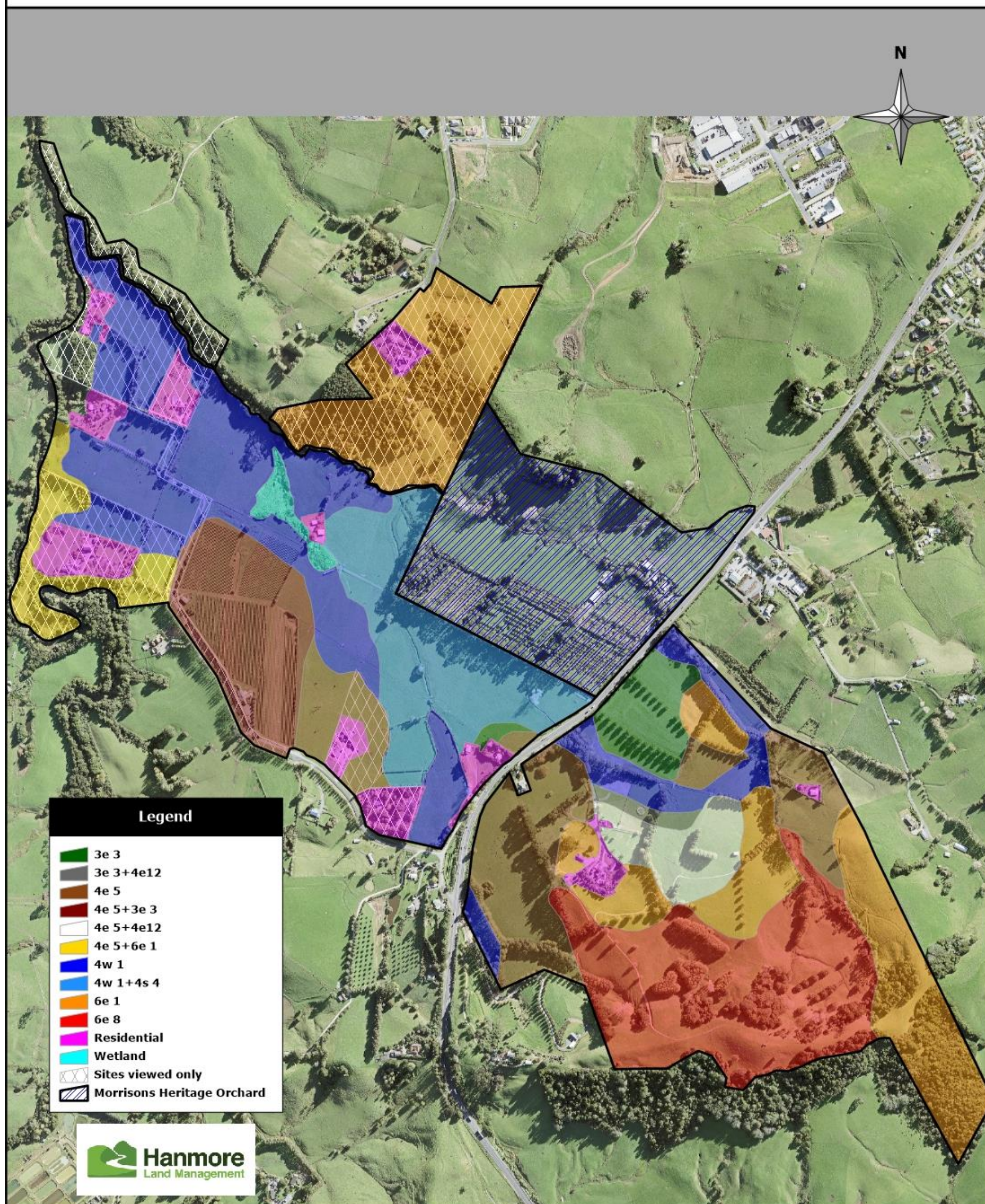
LUC Unit	Area (ha)	Soil Classification	Productivity classification	% of total Area
3e 3	3.92	Prime	HPL	3.0
3e 3+4e12	0.71	Non-prime. Non-elite	Non-highly productive land	0.5
4e 5	15.15	Non-prime. Non-elite	Non-highly productive land	11.6
4e 5+3e 3	9.23	Non-prime. Non-elite	Non-highly productive land	7.0
4e 5+4e12	4.05	Non-prime. Non-elite	Non-highly productive land	3.1
4e 5+6e 1	4.20	Non-prime. Non-elite	Non-highly productive land	3.2
4w 1	26.47	Non-prime. Non-elite	Non-highly productive land	20.2
4w 1+4s 4	12.44	Non-prime. Non-elite	Non-highly productive land	9.5
6e 1	26.20	Non-prime. Non-elite	Non-highly productive land	20.0
6e 8	19.11	Non-prime. Non-elite	Non-highly productive land	14.6
Residential	8.47	Non-prime. Non-elite	Non-highly productive land	6.5
Wetland	1.07	Non-prime. Non-elite	Non-highly productive land	0.8
Total Area	131.02			
	3.92	Prime soil and highly productive land		3.0
	127.10	Non-prime, non-elite soil and non-highly productive land		97.0

Warkworth South Soil Map



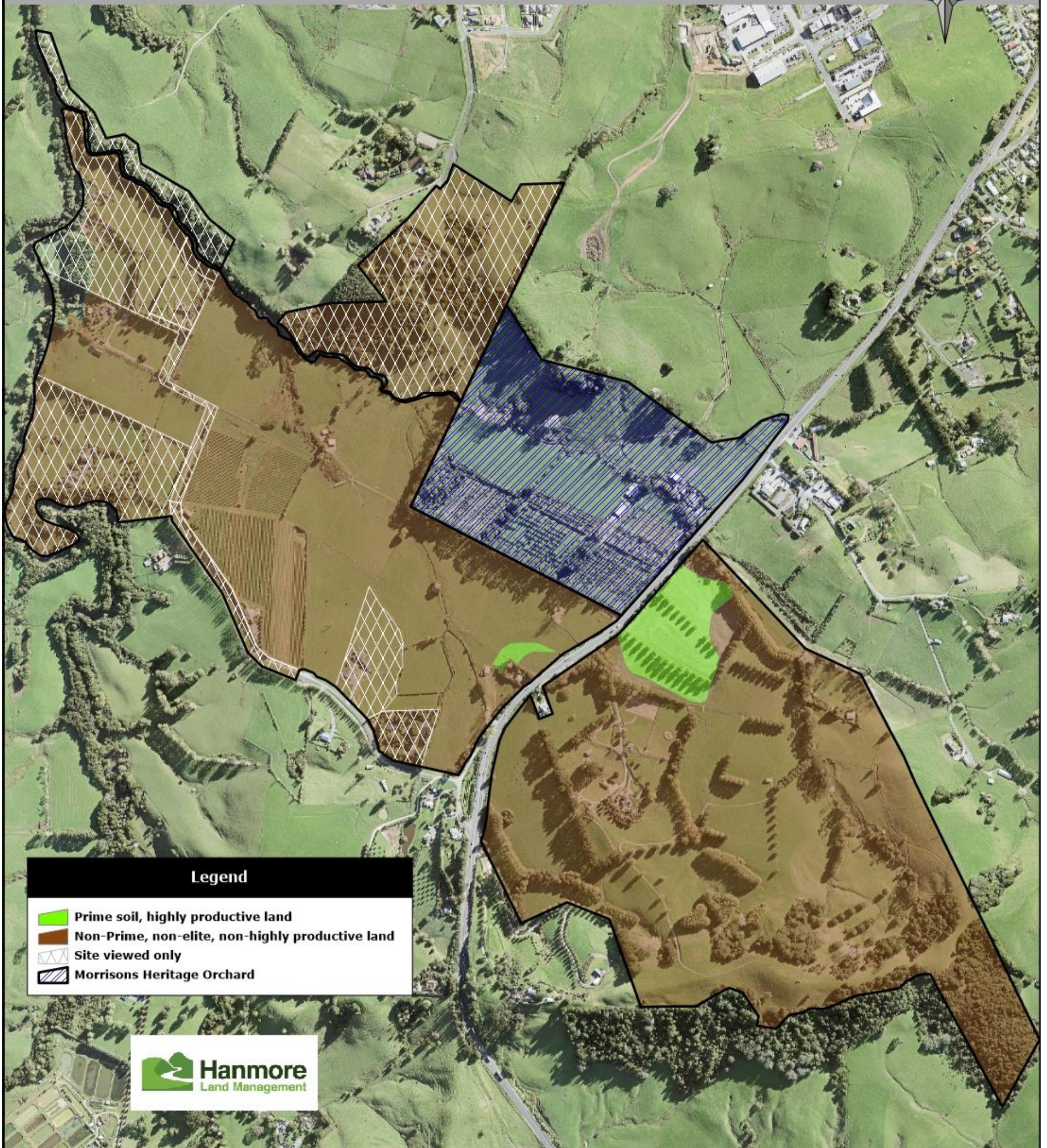
Property Location: SH1, Warkworth, NZ. Date 25th October 2022. Scale 1:7,000. Map Created By: Hanmore Land Management Ltd. Email: ian@hlm.co.nz

Warkworth South Land Use Capability Classifications







Property Location: SH1, Warkworth, NZ. Date 25th October 2022. Scale 1:7,000. Map Created By: Hanmore Land Management Ltd. Email: ian@hlm.co.nz

Warkworth South Soil Classifications



Legend

-  Prime soil, highly productive land
-  Non-Prime, non-elite, non-highly productive land
-  Site viewed only
-  Morrisons Heritage Orchard



6.0 REFERENCES

Harmsworth, G.R. 1996. Land Use Capability classification of the Northland region. A report to accompany the second edition (1:50,000) NZLRI worksheets. Landcare Research Science Series 9. Lincoln, Manaaki Whenua Press.

Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF 2009. NZ Land Use Capability Survey Handbook – a New Zealand handbook for the classification of land 3rd Edition. Hamilton, AgResearch; Lincoln, Landcare Research; Lower Hutt, GNS Science.



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