



Soil and Resource Report for 122 Morven Ferry Road, Arrowtown.

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This report provides an assessment of the Land Use Capability (LUC) and Highly Productive Land (HPL) status of a 107.8-hectare area within a 213-hectare property located at 122 Moven Ferry Road, New Zealand. The assessment focuses on land classified under the New Zealand Land Resource Inventory (NZLRI) as LUC classes 2 and 3, which are potentially recognised as HPL under the National Policy Statement for Highly Productive Land (NPS-HPL). The key findings are outlined as follows:

- A LUC survey was carried out on the area covered by this report at a scale of 1:5,000.
- The site survey found a number of permanent physical limitations to arable use at the site that required additional LUC classes 4 and 6 to be mapped.
- The report found that 41.1ha of the 107.8ha area mapped by the NZLRI as LUC classes 2 and 3 was classified as the Wakatipu Basin Rural Amenity Zone. As such this area is excluded from the HPL classification.
- A total of 66.6ha of the 213ha site is classified as HPL under the NPS-HPL as mapped under the NZLRI.
- The 66.6ha of HPL has permanent physical limitations to arable use such as steep slopes and stony soils which limit the productive potential of the site.
- There is 17.4 ha of the site that can be used in a highly productive capacity, but this area is fragmented and isolated with variable contour and productive potential.
- Based on the permanent physical limitations at the site it meets the exemption criteria under clause 3.10 of the NPS-HPL.

2.0 INTRODUCTION

This report has been prepared at the request of the client to assess the Land Use Capability (LUC) classifications at 122 Morven Ferry Road, Arrowtown. The New Zealand Land Resource Inventory (NZLRI) maps have classified approximately half of the site as LUC classes 2 and 3. As such, it could potentially fall under the National Policy Statement for Highly Productive Land (NPS-HPL).

The purpose of the report is to map the area assessed as LUC classes 2 and 3 (the target area) by the NZLRI and identify any HPL as defined by the NPS-HPL. To achieve this a site visit was carried out to map the soils and land use capability units on the target area and assess them in relation to the NPS-HPL.

This report presents the description of each of the soil types identified on the target area as well as descriptions of each of the LUC units mapped. This information is then used to determine and quantify any highly productive land present. This information is accompanied by LUC, soil and highly productive land maps along with the relevant LUC unit and soil profile descriptions.

3.0 MAPPING METHOD

A site visit was carried out on the 27th and 28th of March 2025 to evaluate and describe the soil types and the LUC units present. The property was mapped at a scale of 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 establish 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 South Island Land Use Capability Extended Legend for the New Zealand Land Resource Inventory (Van Berkel, 1983) for the area. At times when mapping at a scale finer than the NZLRI of 1:50,000, new LUC units are recorded and are noted with an * in the LUC description table.

4.0 SITE DESCRIPTION

This site is located at 122 Morven Ferry Road and covers 213ha. The target area covers 107.8ha and is shown highlighted in blue below. Topography across the target area ranges from flat terraces to steep mountain slopes and includes a significant area of rolling to moderately steep hill country.

Soils are typically deep schist loess on the flats with variable depth stony soils throughout the hill country and shallow steepland soils on the mountain slopes. Soil drainage is generally good across the target area with only a narrow gully and small low-lying areas showing impeded drainage.

At the time of the site visit baleage had recently been cut and very few stock were present. In the past the site has been used to farm deer but current only one small mob of sheep are present.



Figure 1. The total site area at 122 Morven Ferry Road shown outlined in red with the survey target area highlighted in light blue.

4.1 Soil Profiles and Descriptions

The soils identified on the target area are presented and described in the table below. Soil identification has been made using the General Survey of the soils of the South Island, New Zealand (Soil Bureau Bulletin 27) as a reference rather than the more recent S-Map data. This approach has been taken as the former system is used in the South Island Land Use Capability Extended Legend and enables a direct identification of LUC units and therefore HPL.

Of note in the table below is the inclusion of a Shotover soil variant. The description of Shotover soil in the General Survey of the South Island separates it into a standard Shotover soil and a hill soil version. While carrying out the site survey an intermediate type was mapped that has shallow loess cover over glacial till but on a landform not steep enough to be classified as a hill soil. The variation justified its inclusion as a separate soil type and has been labelled as Shotover soil variant.

The soils identified across the target area are presented and described in the table below with their distribution shown on the soil map in Section 6.0 of this report.

Soil Profile	Soil Profile Description
	Soil Name: Shotover soil Soil classification: Yellow-grey earths. Parent material: Deep schist loess overlying schist alluvium (gravels). Soil description: 0-260mm: Friable, moderately developed, 2-5mm crumb, sticky, slightly plastic, dark grey (2.5y 4/1) silt loam. 260-950mm: Firm, moderately developed, 2-8mm nut, very sticky, plastic, olive grey (5y 5/2) silt loam. 950mm-1m: Friable, moderately developed, 2-5mm nut, very sticky, non-plastic, olive (5y 5/3) gritty silt loam. Overall drainage: Well drained.

	Soil Name: Shotover hill soils Soil classification: Yellow-grey earths. Parent material: Schist loess and loess wash over schist rock or glacial till. Soil description: 0-280mm: Very friable, moderately to weakly developed, 2-5mm nut, slightly sticky, non-plastic, dark greyish brown (2.5y 4/2) coarse sandy loam. 280-390mm: Very friable, weakly developed, 4-8mm nut, slightly sticky, non-plastic, olive grey to olive (5y 4/2 to 5y 4/3) sandy to gritty loam. 390mm-1m: Friable, weakly developed, 2-5mm crumb, slightly sticky, slightly plastic, olive (5y 4/4) stony, gritty loam. Overall drainage: Well drained.
	Soil Name: Shotover soils variant Soil classification: Yellow-grey earths. Parent material: Schist loess and loess wash over schist rock or glacial till. Soil description: 0-150mm: Very friable, weakly developed, 2-3mm crumb, slightly sticky, non-plastic, dark greyish brown (2.5y 4/2) gravelly/stony sandy loam. 150-390mm: Very friable, weakly developed, 2-3mm crumb, non-sticky, non-plastic, light olive brown (2.5y 5/3) gravelly, very fine sand. 390mm-1m Very friable, weakly developed, powdery, non-sticky, non-plastic, grey (5y 5/1) very fine sand. Overall drainage: Well drained.



Soil Name: Arrow steepland soil

Soil classification: Yellow-grey earths.

Parent material: Schist and colluvium with a thin cover of loess in places.

Soil description:

0-200mm: Very friable, weakly developed, 2-5mm nut, sticky, non-plastic, dark grey (2.5y 4/1) gravelly sandy loam.

200-340mm: Friable, weakly to moderately developed 2-5mm nut, sticky non-plastic, olive grey (5y 4/2) gravelly fine sandy loam.

340-550mm: Very friable, weakly developed, olive grey (5y 4/2) loamy gravel.

Overall drainage: Well drained.

4.2 Land Use Capability Descriptions

LUC classifications categorize land into eight classes according to its long-term capability to sustain one or more productive uses.

- Classes 1-4 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 5-7 are suitable for pastoral farming and production forestry.
- Class 8 land has no productive use and is rather managed for catchment protection and conservation purposes.

The LUC units mapped on the site are presented in the table below. An LUC map showing the distribution of the mapped units the land resource inventory (LRI) data acquisition points relating to soil identification made during the survey for this report is contained in Section 6.

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) Non-irrigated /irrigated Forestry site index (FSI)
							Actual	Potential		
2e 1 Terraces, fans and floodplains with deep soils in low rainfall districts. Liable to slight wind erosion.		32.0	Loess, Schist and greywacke alluvium and colluvium.	Yellow-grey earths, Recent soils	0-8°	Pasture Cropping	Nil	Slight wind, when cultivated	Intensive cropping, Orchard, Intensive. grazing, Production forestry	Average: 9/12 Top: 12/15 Potential: 16/21 FSI: 19-23
3e13 Undulating to rolling downs with soils of high fertility. Unit has dry summers and cold winters		11.0	Loess on schist and greywacke gravels, mudstone and sandstone	Yellow-grey earths. Brown-grey earths	4-15°	Pasture	Nil	Slight sheet and wind, moderate sheet, wind and rill when cultivated	Cropping, Intensive grazing.	Average: 6/ Top farmer: 11/ Potential: 11/ FSI:<15m
3s 6 Moderately shallow and/or stony soils of medium to high fertility on plains and terraces in dry inland areas with cold winters		4.6	Alluvium from greywacke and schist, loess in patches	Brown-grey earths Yellow-grey earths	0-8°	Pasture	Nil	Slight wind, slight to moderate wind when cultivated	High and low producing pasture, Orchards, Cereal crops	Average: 5/10 Top farmer: 7/14 Potential: 10/20 FSI:<15m

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) Non-irrigated /irrigated Forestry site index (FSI)
							Actual	Potential		
4e19* Rolling to strong rolling slopes in easy hill country with dry summers and cold winters.		11.2	Greywacke, schist, glacial till and alluvial gravels, and loess	Yellow-grey earths, Recent soils	8-20°	Pasture	Nil	Slight to moderate sheet and wind, moderate to severe sheet, rill and wind when cultivated.	Intensive grazing, Occasional cropping. Production forestry	Data not available
4w 5* Narrow, flat gully bottoms that form swales and have prolonged waterlogging.		0.5	Loess, Schist and greywacke alluvium and colluvium.	Yellow-grey earths, Recent soils	0-8°	Pasture	Nil	Slight gully and slight wind when cultivated	Intensive grazing, Occasional cropping	Data not available
4s 9 Terraces and fans with shallow, stony soils in districts with cold winters and dry summers.		6.3	Greywacke and schist alluvium loess in places	Yellow-grey earths. Brown-grey earths Upland and high country yellow-brown earths	0-15°	Pasture	Nil	Slight to moderate wind, moderate wind when cultivated	Intensive grazing, Occasional cropping.	Average: 5/ Top farmer: 5/ Potential: 6/16 FSI:<15m
6e19 Strongly rolling to moderately steep hill country on various rock types in districts with dry summers and a cold winterclimate.		35.3	Greywacke, schist, glacial till and alluvial gravels, loess in places	Yellow-grey earths Upland and high country Yellow-brown earths	9-25°	Pasture	Slight sheet	Slight to moderate sheet and wind	Grazing	Average: 1/ Top farmer: 2/ Potential: 3/ FSI:14-20m
6e22 Moderately steep to steep slopes on harder rocks on lower mountain ranges in districts with dry summers and cold winters.		5.6	Greywacke and schist, colluvium and loess in places	Yellow-grey earths	21-35°	Pasture	Slight scree	Moderate sheet, scree, wind and gully	Grazing	Average: 2/ Top farmer: 4/ Potential: 6/ FSI:<15-20m

Land use capability unit descriptions are taken from the author's field work, and the South Island Land Use Capability Extended Legend for the New Zealand Land Resource Inventory (Van Berkel, 1983).

5.0 SOIL CLASSIFICATIONS

5.1 Highly Productive Land

The NPS-HPL came into effect on 17th October 2022 and was updated in August 2024 with the amendments taking effect from 14th September 2024. This policy seeks to protect highly productive land for use in land-based primary production, both now and for future generations. The policy statement defines highly productive land as land that has been mapped in accordance with clause 3.4 of the NPS-HPL and is included in an operative regional policy statement as required by clause 3.5. There is an interim regime for identifying highly productive land prior to a regional policy statement containing maps of highly productive land in the region is operative. Under clause 3.5(7) of the NPS-HPL, highly productive land in the interim period includes land that is: (i) zoned general rural or rural production; and (ii) LUC 1, 2, or 3 land; but is not: (i) identified for future urban development; or (ii) subject to a Council initiated, or an adopted, notified plan change to rezone it from general rural or rural production to urban or rural lifestyle.

The following definition of LUC 1, 2, or 3 land is taken from section 1.3, page 4 of the NPS-HPL:

LUC 1, 2, or 3 land means land identified as Land Use Capability Class 1, 2, or 3, as mapped by the New Zealand Land Resource Inventory or by any more detailed mapping that uses the Land Use Capability classification.

A recent Environment Court ruling (*Blue Glass Limited v Dunedin City Council*) concluded that during the interim period the mapping by the NZLRI is the means by which LUC classes 1-3 are defined and more detailed mapping carried out since the NPS-HPL came into effect cannot be used to redefine those classifications.

5.2 Site Classifications

The table 1 below shows the LUC area breakdown for the target area as well as the percentage of the total target area.

Mapped LUC Units	Area (ha)	% of total Area
2e 1	32.0	29.7
3e13	11.0	10.2
3s 6	4.6	4.3
4e19*	11.2	10.4
4w 5*	0.5	0.5
4s 9	6.3	5.8
6e19	35.3	32.7
6e22	5.6	5.2
Unproductive	1.3	1.2
Total area	107.8	

Table 1: Area breakdown of the LUC units mapped in the target area.

5.3 NZLRI Mapping

The NZLRI is based on an LUC assessment of the whole of New Zealand and has been carried out at a scale of 1:50,000. It is intended for regional use and planning and is not meant to be used at a farm scale. The 3rd Edition of The Land Use Capability Survey Handbook (Lynn et al 2009) cautions against enlarging LUC data beyond the scale at which it was gathered as it can produce unreliable and misleading results and at time results that are nonsense.

At a scale of 1:50,000, on average one mapping observation is made every 25ha but could be a little as one every 100ha (Hewitt and Lilburne 2003, Grealish 2019). As such, it is likely that very little information has been gathered from the target area. For the purpose of this report, with a site covering 107.8ha the appropriate scale of mapping is between 1:5,000 and 1:10,000 or one to four observations per hectare (Lynn et al 2009).

Using the NZLRI for site specific information is outside of its intended purpose and outside of its parameters of reliability. At best it can only provide an indication of the possible LUC units present. The correct process for mapping soil types and LUC at a site of this size is to carry out a site survey at the correct scale by a suitably qualified person as has been done for this report.

5.4 Reclassified LUC Units

The target area has been mapped by the NZLRI as LUC units 2e 1+3s 6 and 3e13. Based on the farm scale survey carried out for this report, these classifications have been confirmed over part of the target area. A significant proportion of the target area however is not covered by these classifications. This is largely due to the steepness of the slopes and to a lesser extent the soil types present. The additional units mapped over the target area are listed and discussed below.

- 4e19* - This is a new unit mapped and represents areas with rolling to strong rolling slopes and is an intermediate unit between 3e13 and 6e19.
- 4s 9 – This unit covers soils shallower and stonier than unit 3s 6. A number of these were found across the target area and included soil depths of 150-300mm over gravel and sand.
- 4w 5* - This is a new unit that was mapped on a swale that fed into a narrow gully. The loess soils were gleyed and mottled to the soil surface indicating they are waterlogged for a significant part of the year. They were also a passage for ground water and will receive runoff during the winter months and during heavy rain.
- 6e19 – This unit was mapped across the hill country in the target area where slopes were rolling to moderately steep.
- 6e22 – This unit was mapped at the base of a hill slope and on terrace edges with steepland soils dominated by gravels and rock.
- Unproductive – These areas include the residential dwelling and surrounding garden and buildings and a pond. They cannot be used in a productive capacity and therefore cannot be given a LUC classification.

6.0 OVERALL SITE ASSESSMENT

6.1 NZLRI Classifications vs Site mapping

An assessment of the target area has been made based on the definition of HPL under the NPS-HPL. It is acknowledged that for technical purposes based on the Blue Grass ruling referred to in Section 4.1 of this report that the majority of this area is classified as HPL. However, for the reasons outlined in Section 4.3 of this report the findings of this report are relevant to the productive use of the site and its potential use in a highly productive capacity.

As stated above in Section 4.4 the NZLRI has incorrectly mapped a significant part of the target area as LUC classes 2 and 3 which has flat to rolling slopes (0-15°). Below are two examples of these incorrectly mapped areas.



Figure 1. Examples of areas mapped by the NZLRI as LUC classes 2 and 3 and having flat to rolling slopes.

The inaccuracy of the NZLRI data at a farm scale is a common problem as discussed in Section 4.3 of this report. It is clear from the photos in figure 1 that these areas are unsuitable for

arable use due to their steepness and therefore do not fit within the LUC class 2 or 3 classifications made by the NZLRI. As such, though they are technically classified as HPL due to the wording of the NPS-HPL in reality they cannot be utilised in that capacity due to the permanent physical constraints of the site.

6.2 Wakatipu Basin Rural Amenity Zone

For land to be classified as HPL it must be mapped as LUC classes 1-3 by the NZLRI and be zoned general rural or rural production. A significant part of the target area is zoned as Wakatipu Basin Rural Amenity Zone (WBRAZ) and therefore is excluded from the HPL classification. This area is shown below in Figure 2.

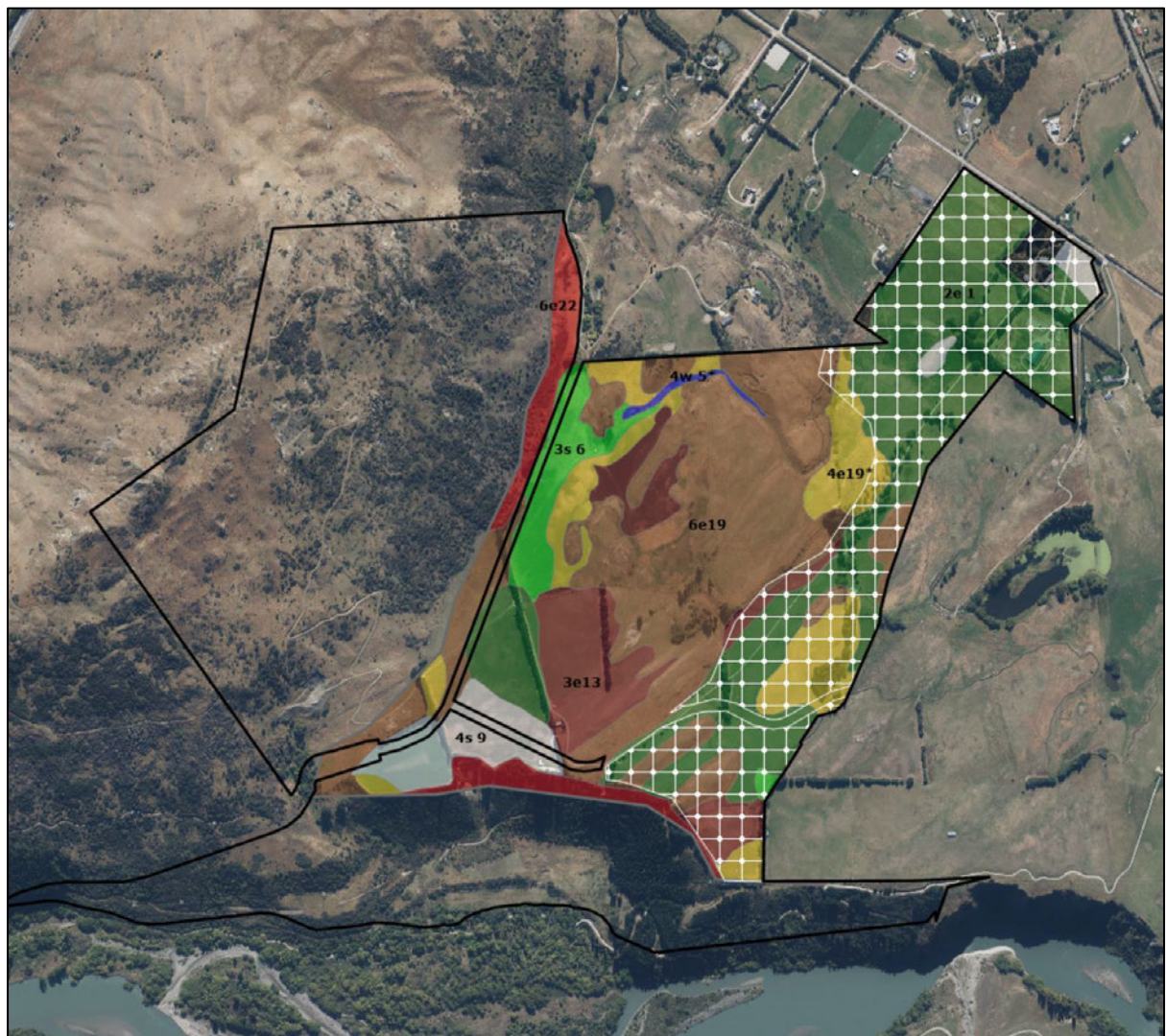


Figure 2. White hatching showing the part of the target area zoned as Wakatipu Basis Rural Amenity.

6.3 HPL Assessment of the Target Area

The WBRAZ covers 41.1ha of the target area. As such the remaining 66.6ha of the target area needs to be assessed in relation to the NPS-HPL. Table 2 below shows a breakdown of the LUC units within this area and their HPL classification.

Mapped LUC Units	Area (ha)	HPL Classification	% of total Area
2e 1	4.5	HPL	4.2
3e13	8.5	HPL	7.9
3s 6	4.3	HPL	4.0
4e19*	6.4	Not HPL	5.9
4w 5*	0.5	Not HPL	0.5
4s 9	5.3	Not HPL	4.9
6e19	31.4	Not HPL	29.2
6e22	5.6	Not HPL	5.2
WBRAZ	41.1	Not HPL	38.2
Total area	107.8		
Area HPL	17.4	Total % HPL	16.1
Total area non-HPL	90.4	Total % non-HPL	83.9

Table 2. Breakdown of LUC units within the area of potential HPL.

Under the NZLRI classifications the whole 66.6ha of the target area zoned general rural or rural production is classified as HPL. When mapped at a farm scale this is corrected to 17.4ha or 16.1% of the target area. As a proportion of the whole 213ha site the HPL covers 8.2%.

6.4 NPS-HPL Clause 3.10 Exemption

Due to the permanent physical constraints to the productive use of the target area and the small, fragmented and isolated nature of its HPL an exemption under clause 3.10 of the NPS-HPL should be considered. As such, points A and B of clause 3.10 of the NPS-HPL are addressed below.

- a) there are permanent or long-term constraints on the land that mean the use of the highly productive land for land-based primary production is not able to be economically viable for at least 30 years; and*

The interim definition of the NPS-HPL does not allow for the reclassification of the NZLRI mapping. It can however, be used to identify permanent physical constraints that prevent its highly productive use and make it economical unviable in that capacity. As such, each of the units mapped at the site and listed in the table above not classified as HPL have a permanent physical constraint to its productive use. These units cover 49.2ha of the 66.6ha mapped as HPL by the NZLRI and are discussed in the points below.

- 4e19* - This unit represents land that has slopes of 8-20°. These slopes create a severe erosion limitation to arable use. Meaning that regular cultivation of these slopes is not

sustainable. It will result in the loss of soil that will degrade the soil profile and reduce its productivity and potentially have negative impacts on any receiving waterbodies.

- 4w 5* - This unit represents an area that receives runoff from the surrounding slopes and acts as a pathway for groundwater movement. The soil in this area experiences prolonged water logging. These factors limit plant growth meaning crops could only be grown here occasionally when conditions are dry enough.
- 4s 9 – This unit identifies areas that have a shallow and stony soil profile. These factors severely limit arable potential due to the limited nutrient and water availability in the profile. Stoniness can also limit cultivation methods and damage equipment.
- 6e19– This unit identifies hill country with rolling to moderately steep slopes (9-25°). The steepness of the slopes on this land precludes any arable use.
- 6e22 - This unit identifies mountain ranges with moderately steep to steep slopes (21-35°). The steepness of the slopes on this land precludes any arable use.

The remaining 17.4ha of HPL covers areas with varying productivity potential and land resources. Topography varies from flat to rolling slopes and soils vary from deep to moderately shallow and stony soil profiles. These areas are fragmented and isolated being surrounded by mountains, steep terraces and hill country. They are also located 1.5-2km from the nearest public road.

b) the subdivision, use or development:

- i. avoids any significant loss (either individually or cumulatively) of productive capacity of highly productive land in the district; and*
- ii. avoids the fragmentation of large and geographically cohesive areas of highly productive land; and*
- iii. avoids if possible, or otherwise mitigates, any potential reverse sensitivity effects on surrounding land-based primary production from the subdivision, use, or development;*

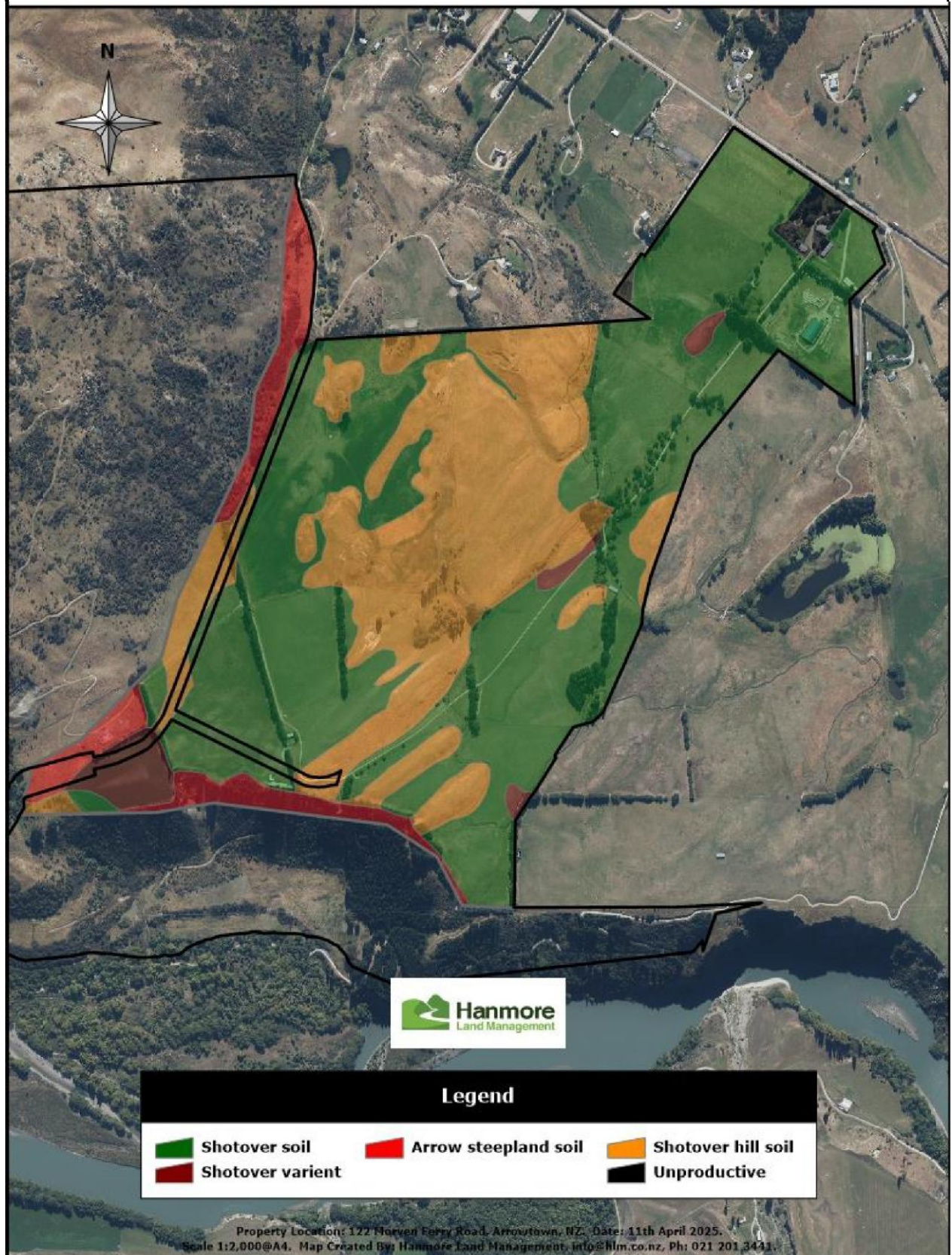
As discussed above there is little in the way of HPL in the target area or over the total site. The loss of this isolated and fragmented area will not be a significant loss to the district, nor will it fragment any large or cohesive area of HPL. Neither will it result in any reverse sensitivity effects as it is surrounded by non-arable land and non-rural zoned land.

7.0 CONCLUSIONS

- Under the interim NPS-HPL all LUC units in LUC classes 1, 2 and 3 as mapped by the NZLRI and within the general rural or rural production zone are classified as HPL. As such, the whole 66.6ha of the target area within this zone is classified as HPL under the interim definition.
- The NZLRI classifications for the site are incorrect due to the coarse scale at which the NZLRI has been mapped and its unsuitability for use at a farm scale.
- Based on the farm scale survey 16.1% of the target area and 8.2% of the whole site are classified as HPL.

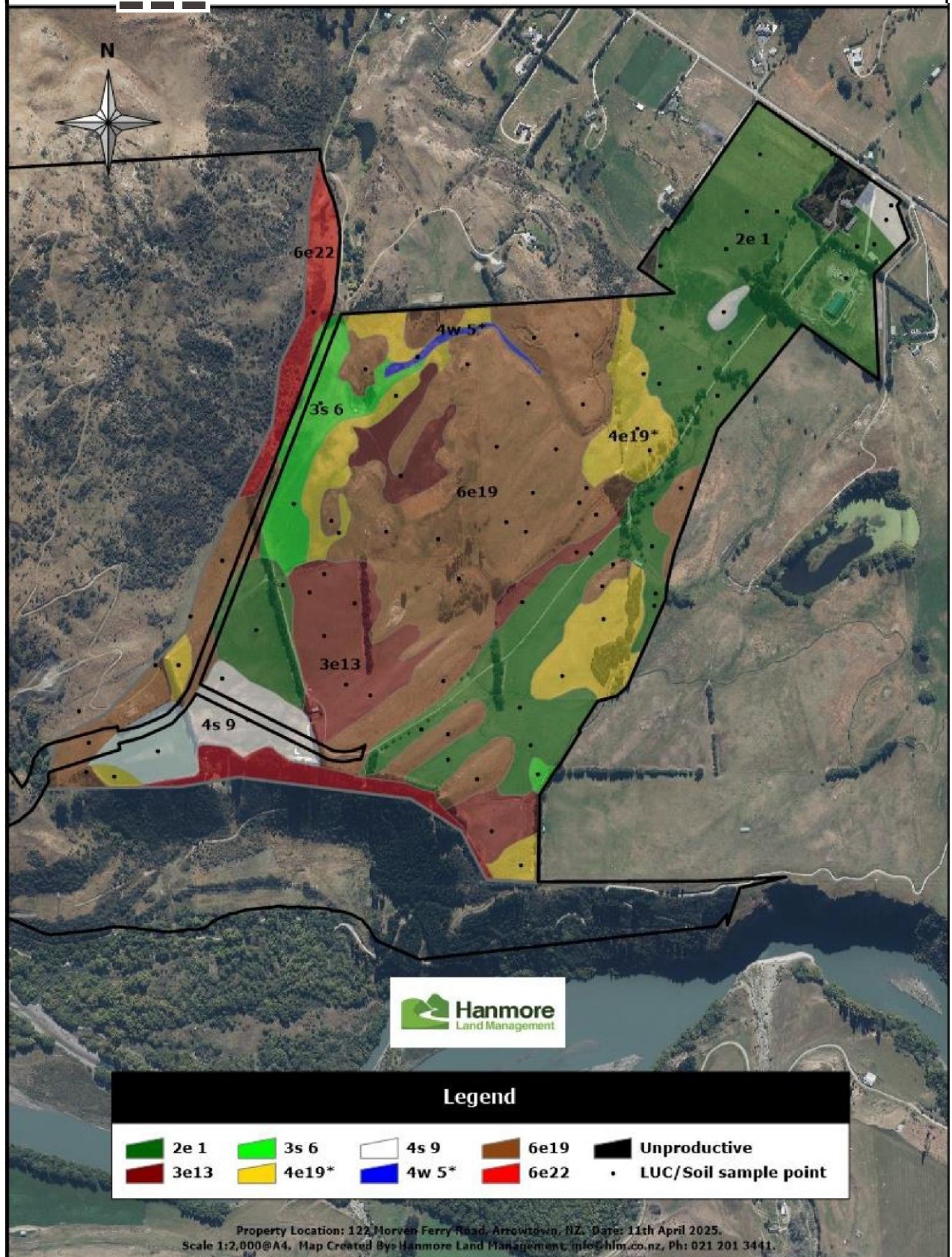
- 49.2ha of the NZLRI HPL area has permanent physical constraints to its highly productive use including steep slopes, erosion, wetness and shallow and stony soils and is mapped as LUC classes 4 and 6 by site scale mapping.
- The remaining area of HPL is isolated and fragmented with variable productive potential.
- The development of the remaining area of HPL will not result in a significant loss of HPL to the district, nor will it fragment any large or cohesive area of HPL nor will it result in any reverse sensitivity effects.
- The HPL at the site meets the conditions for an exemption under clause 3.10 and as such the proposed development can be exempt from the constraints of the NPS-HPL.

122 Morven Ferry Road SoU Map

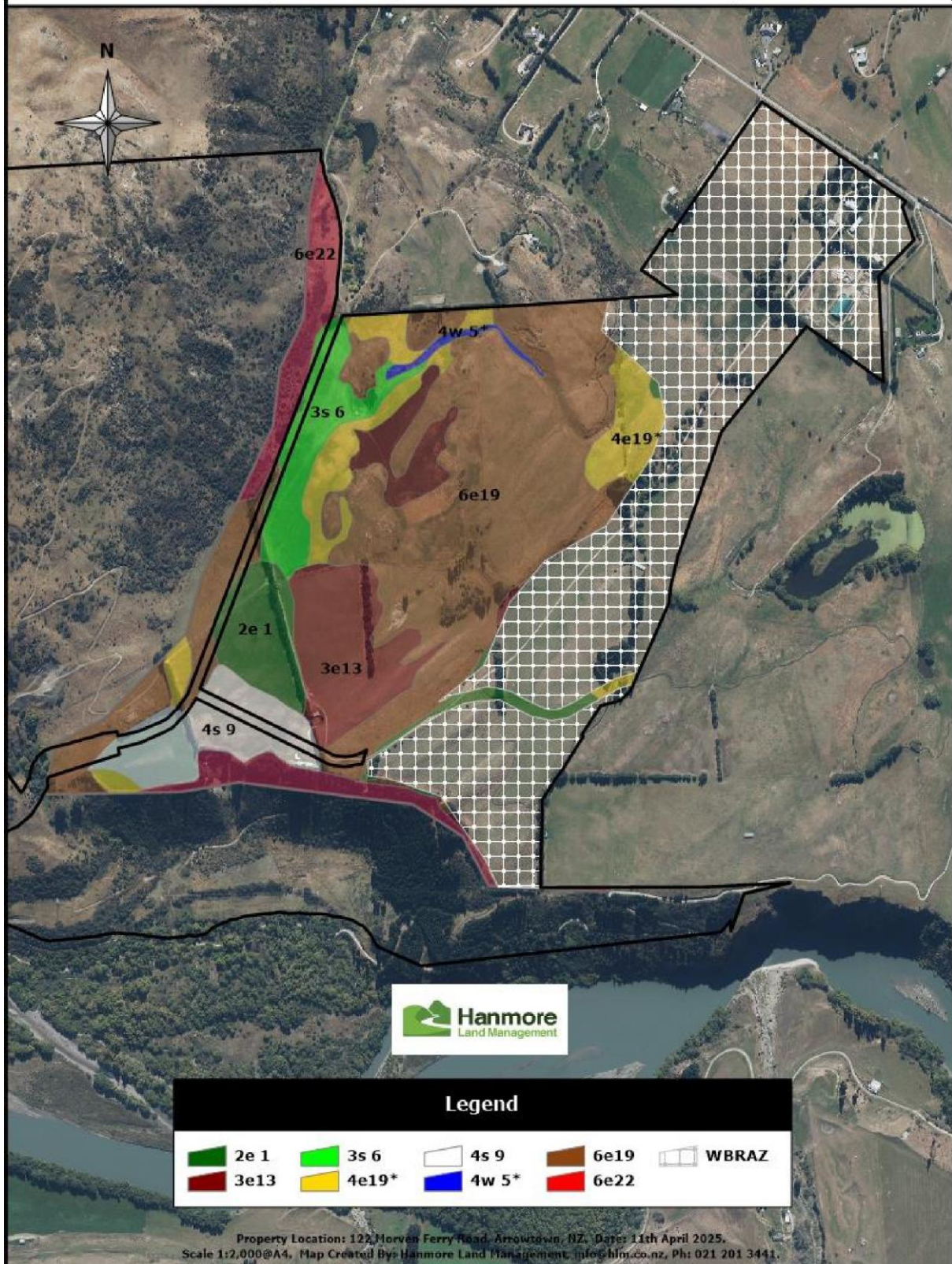


122 Morven Ferry Road

Land Use Capability Classifications

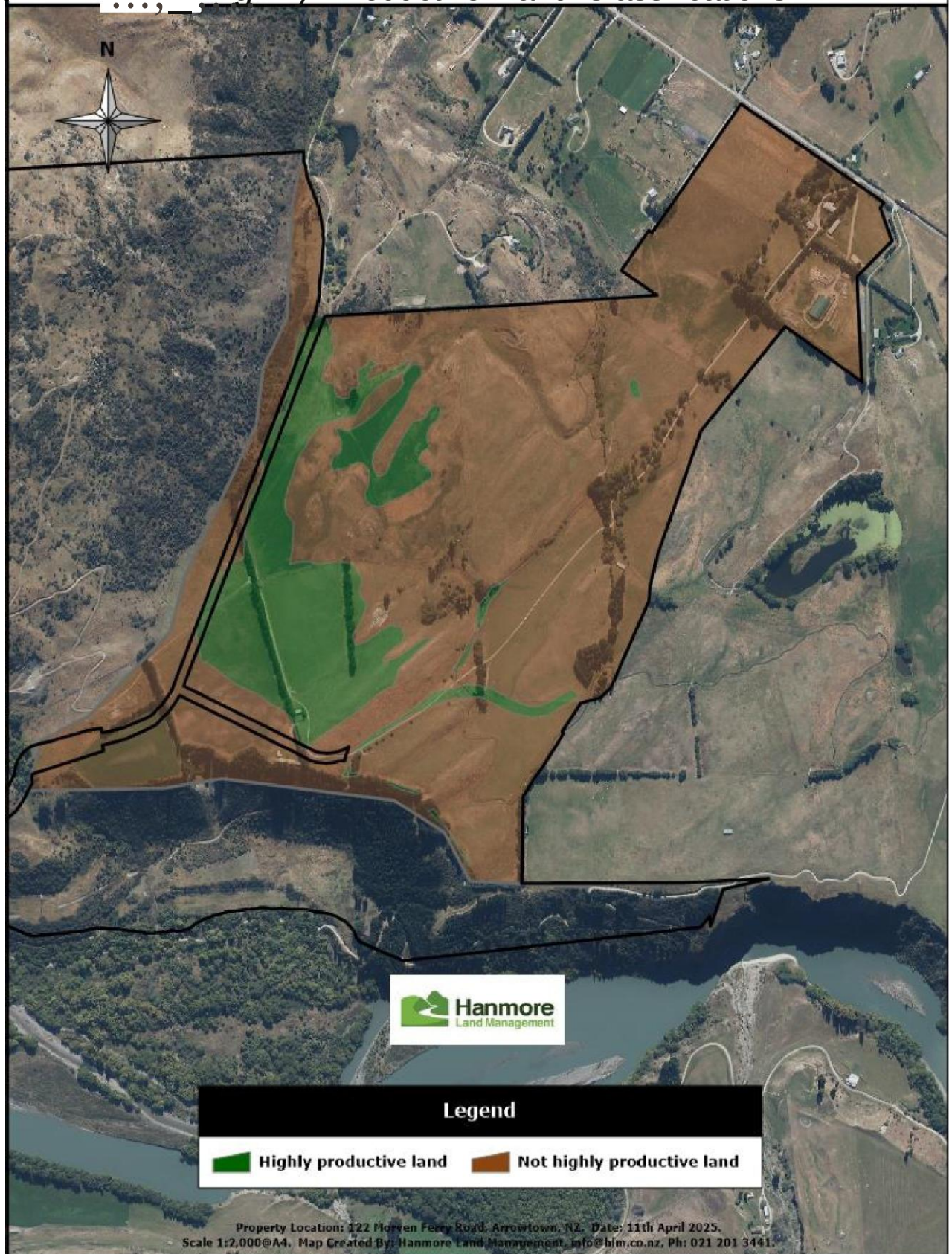


122 Morven Ferry Road Land Use Capability Classifications Including Wakatipu Basin Rural Amenity Zone



122 Morven Ferry Road

...., Highly Productive Land Classifications



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