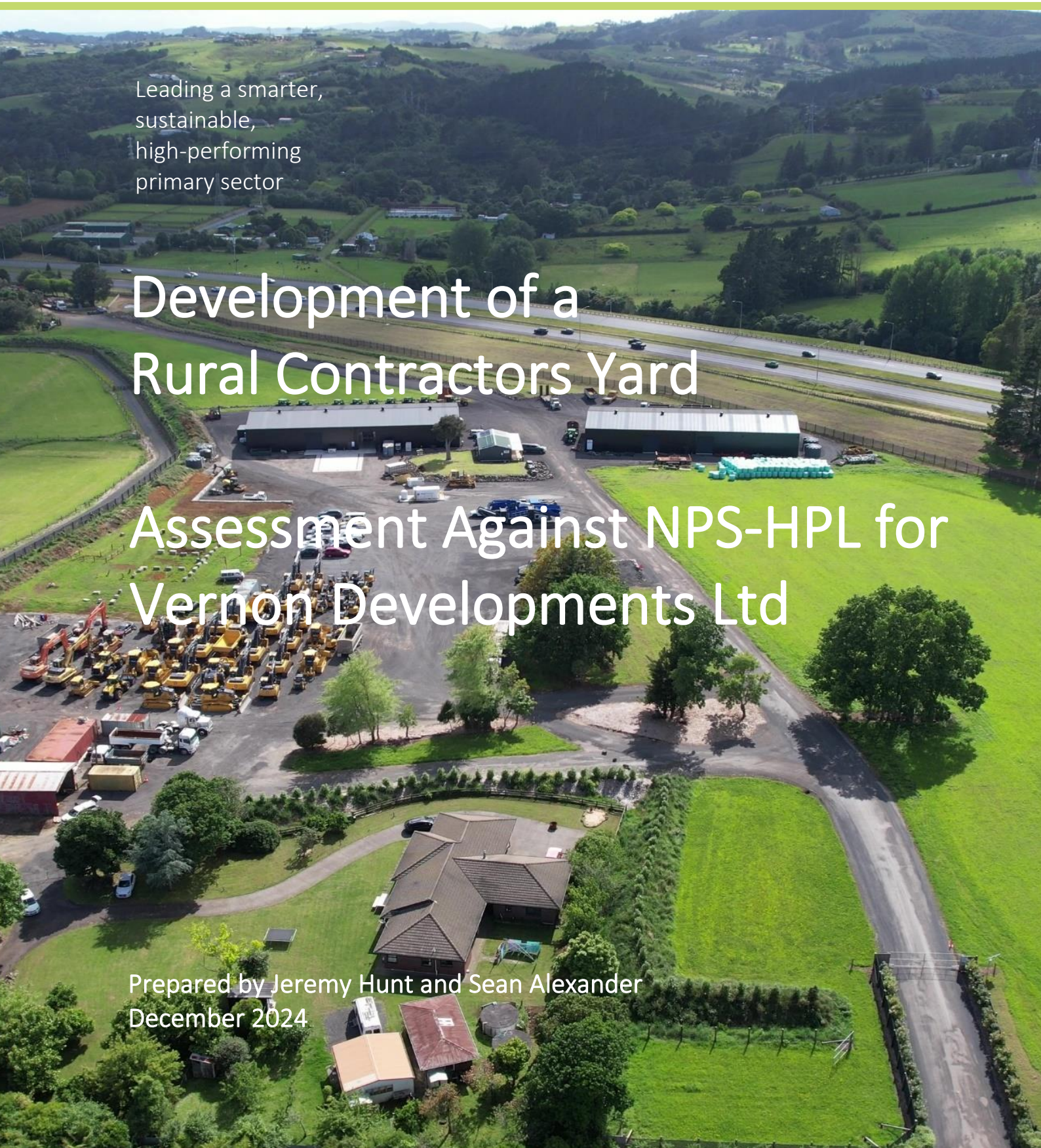
AGFIRST

Leading a smarter, sustainable, high-performing primary sector

Development of a Rural Contractors Yard

Assessment Against NPS-HPL for Vernon Developments Ltd



Prepared by Jeremy Hunt and Sean Alexander
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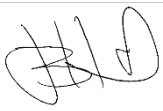
Prepared by:	Sean Alexander B.Ag(Com), MNZIPIM Agribusiness Consultant	
Reviewed by:	Sean Alexander B.Ag(Com), MNZIPIM Agribusiness Consultant	
Approved for release:	Jeremy Hunt B.Sc(Env), MNZIPIM AgFirst Director	
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1.0 BACKGROUND

Vernon Developments Limited (Vernon Developments) is located at 1799a Great South Road, Bombay (Subject Property). The Subject Property and Title is presented in Figure 1.

Vernon Developments is an agricultural contracting and earthmoving company. They use machinery to plant crops, harvest supplementary feed, as well as repair, maintain and develop farmland and infrastructure.

In 2024 Vernon Developments established a rural contractor's yard on the Subject Property and have been operating out of the older existing ancillary farm buildings. The business has recently expanded to meet customer demand. The activity is proposed to utilize two recently constructed farm buildings to store machinery and to undertake maintenance and repair of fleet vehicles. This location is close to Vernon Development's existing rural customer base which has made it easier for the business to access clients instead of trying to get through the traffic and movements of town.

The workshop and surrounding area will occupy approximately 2.5 ha of land, as indicated in Image 2 and is hereon referred to as the 'Development Site'. This includes the proposed workshop, parking areas and turning access for large vehicles and machinery.

The location of the Subject Property suits its rural customers, without the businesses having to drive tractors or large machinery through towns or industrial areas. The proposed activity is clearly a supporting activity, that is reasonably necessary to support land-based primary production. Additionally, the activity is also one that is small scale and will have no impact on the productive capacity of the land.

The Subject Property sits within the Auckland Council (AC). AgFirst has been engaged by Vernon Developments to provide:

- An assessment of the proposed use of the land for Vernon Developments against the provisions of the NPS-HPL.

This assessment forms part of the planning assessment prepared by Chanel Hargrave of The Surveying Company (TSC).

Figure 1: Subject Property and Title

2.0 PROPERTY DESCRIPTION

2.1 Site Description

AgFirst visited the Subject Property on 18 November 2024 to assist with the NPS-HPL assessment. The Subject Property is a large lifestyle block located at 1799a Great South Road, Bombay (Subject Property). The Subject Property consists of a single rural zoned title, being 8.69 ha (8.67 ha surveyed area) as summarised in Table 1. The Subject Property is on the corner of Great South Road (west) and State Highway One (East). The contour is flat to rolling. The Subject Property is zoned rural, as is the immediately surrounding areas to the north, west and south. A strip of land along the east of the Subject Property is a NZTA designation, with the State Highway one beyond this. The location of the Subject Property and surrounding area zoning is presented in Figure 2.

Development on the site includes a metaled access track running through the middle of the site, recently formed areas of hardstand, an older farm building located towards the southwestern corner, and two recently constructed farm sheds towards the centre of the site. For this assessment the site is considered as it existed prior to the construction of the hardstand areas. Therefore, only the existing sheds and access track are considered to form part of the receiving environment. The hardstand areas are assessed in their pre-development state (pasture). This is consistent with the Planning assessment prepared by Chanel Hargrave of TSC.

Table 1: Individual property Titles within the Project

Legal Description	Area (ha)
Lot 6 DP156089	8.69

2.2 Surrounding Land

The subject property is bordered by a drystock farm to the north, lifestyle block settlement to the south and Great South Road and State Highway one to the west and east respectively. The wider area consists of rural zoning and hobby farms/lifestyle blocks and a special purpose school zone to the south (Saint Stephens College). Further to the north beyond the drystock farm is a commercial vegetable production operation on the flatter contour. The surrounding farms rely on Vernon Developments for Agricultural contracting and earthmoving.

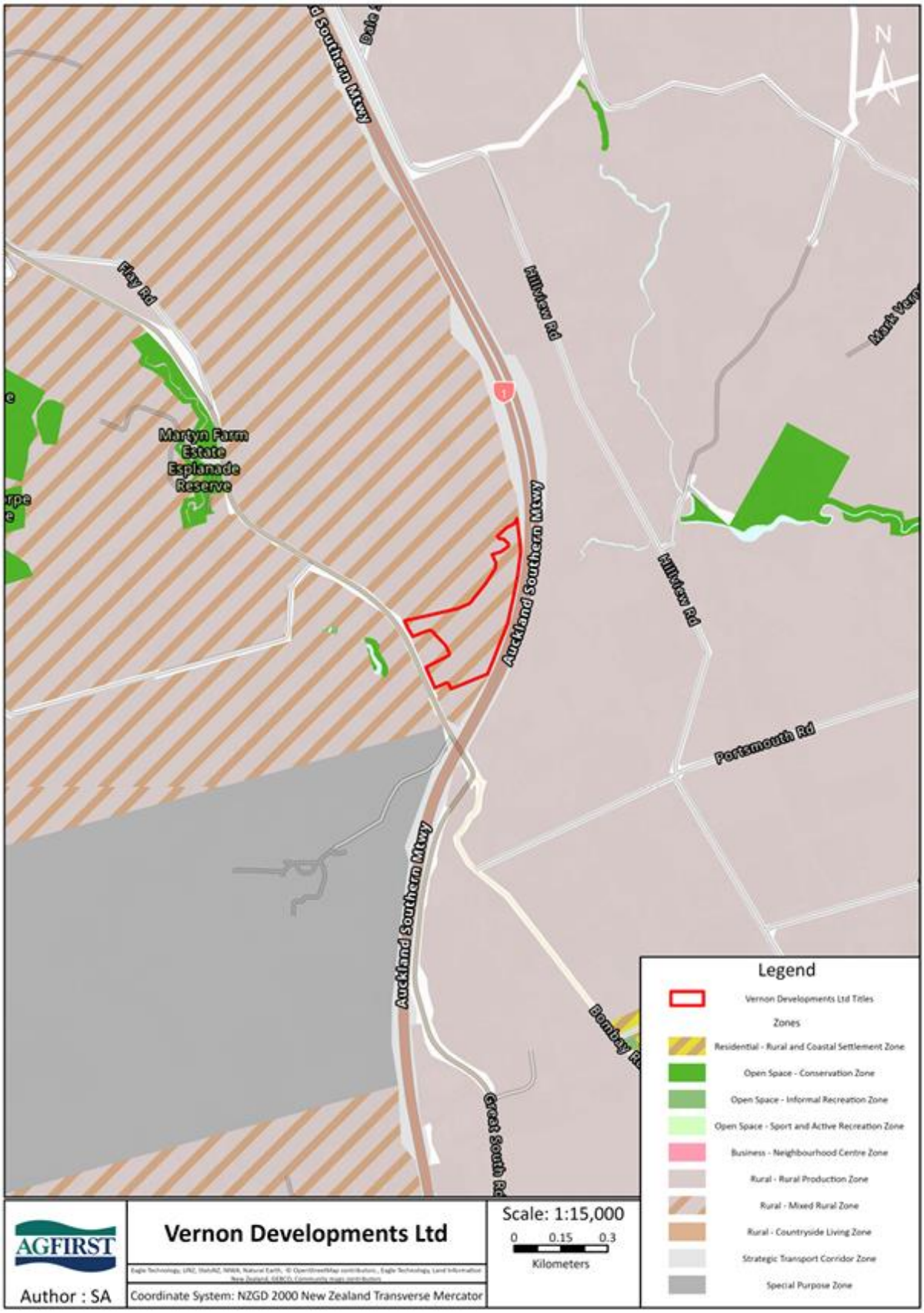

Figure 2: Subject Property Zoning

2.3 Farming Operation

The Subject Property is currently largely developed into the rural contractor's yard. As such there are large buildings, access roads and parking areas. The effective area remaining is approximately 2.2 ha in addition to the NZTA designation area. This land is used as a small scale cut and carry silage block. Currently the block is planted in annual ryegrass, with previous attempts to drill sorghum. The yields are very low, with the landowner reporting that they typically take three cuts over the year. This has previously yielded 11 bales per cut across the effective area. This is likely low due to a combination of issues. The soils across the effective area are a mixture of prime and non-prime soils (further discussed in Section 3). The non-prime areas will have lower than typical growth rates. Another factor is the pasture cultivar selection, being an annual ryegrass. These pastures do not persist throughout the year, with strong growth throughout the winter and spring, but declining through late spring into the summer and typically resown in autumn. Working through the effective area and a typical bale size, this aligns with a block that has constrained pasture production. A summary of the silage yields is presented in Table 2. AgFirst have then used this to extrapolate what the yield would be over the remainder of the block prior to the development. An additional yield estimation has been provided in Table 3, which shows a cut and carry operation under optimal pasture and soil conditions.

Table 2: Current cut and carry silage yields

Current Operation	Effective area	Total Site	Unit
Area	2.20	5.00	ha
Bale size	240	240	kgDM
Pre mow	3,000	3,000	kgDM/ha
Post mow	1,500	1,500	kgDM/ha
Utilisation	85%	85%	%
Harvested	2,805	6,375	kgDM
Yield	11.7	26.6	Silage bales per cut
Cuts	3	3	Per year
Annual Yield	35.1	79.7	Silage bales per year
Pasture growth	4,500	4,500	kgDM/ha/year

Table 3: Typical cut and carry silage yields

Typical	Effective area	Total Site	
Area	2.20	5.00	ha
Bale size	240	240	kgDM
Pre mow	3,600	3,600	kgDM/ha
Post mow	1,200	1,200	kgDM/ha
Utilisation	85%	85%	%
Harvested	4,488	10,200	kgDM
Yield	18.7	42.5	Silage bales per cut
Cuts	4	4	Per year
Annual Yield	74.8	170.0	Silage bales per year
Pasture growth	9,600	9,600	kgDM/ha/year

When working through the costs and returns for these scenarios operating across the total site (the current and optimal operations), they both make a loss and are unviable. A detailed indicative budget for a cut and carry operation is provided in Appendix A.

2.4 Alternative land use options

Due to the soil constraints and size limitations (non-reversable land fragmentation) identified within the Reece Hill soil mapping report (Section 3), either a pastural grazing or cut and carry block would be considered the optimum land use. While the prime soils would suit a range of land-based primary production, the 2.6 ha identified across the Subject Property would not a large enough to consider any of the following: horticulture, commercial vegetable production or arable.

The capital investment required for horticultural development, particularly with increasing climatic challenges requiring irrigation and frost protection, there would be no payback for such a small scale. Kiwifruit licenses are traded in 1 ha units, and the Venture Taranaki report identifies that kiwifruit orchards less than 4 ha are not viable[1].

Whilst the prime soils would be suitable for commercial vegetable production, the other productive areas would not be sought after for a cropping block. Vegetable operations require large scale (typically greater than 20 ha[2]), to ensure there is a rotation of cropping to avoid buildup of pests and diseases. For example, potatoes are susceptible to many different pests and diseases. Crop rotation is one of the most important and effective pest control methods, with crops alternated with at least one other crop for up to 5 years. Best practice is to then rest the field in pasture for 3-5 years before cropping again[3]. This would not be possible for such a small block. Additionally, most of the growers have their own equipment, which differs between crops, requiring scale to invest in the machinery.

While arable operations can be viable on smaller blocks, for continuous repeat cultivation, high quality soils are required. The small area available of prime soils within the Subject Property would not attract any interest for arable land use or a contractor looking for lease land.

Whilst livestock grazing frequently occurs at a small scale (hobby farms and lifestyle blocks), there is currently no infrastructure on the property for this type of operation. For the landowner to progress with this type of grazing operation, they would need to invest in infrastructure, such as: stock fencing (minimum 900 m for the existing productive areas), stock water reticulation and potentially cattle yards. Referencing the Lincoln Farm Budget Manual, an 8-wire fence with battens and a barbed wire on flat land would cost over $40,000 ($4,722/100 m)[4]. At this scale, it would not be a viable investment, with high capital outlays and very low return from a non-commercial drystock operation.

[1] https://www.venture.org.nz/assets/Uploads/Kiwifruit-Blueprint-Final-v2.pdf
[2] The total effective vegetable growing area from a survey based on Pukekohe growers in 2016 ranged from 12 to 170 ha (average 77 ha). This was at the upper end of regional (35 ha) and national (67 ha) average farm sizes for outdoor vegetable growing [customised report from Statistics New Zealand (2013)].
[3] www.tupu.nz
[4] https://aginfo.lincoln.ac.nz/account/book/3123/

Due to the soil and size limitations of the block and lack of infrastructure, the likely continued use for the land would be cut and carry pasture /pasture conservation. Whilst this is land-based primary production, this is not a highly productive use of the land.

2.5 New Proposed Development

Vernon Developments has developed a purpose-built machinery yard, workshop and office on a lifestyle block section that will cater for the needs of the farming community, being an agricultural contracting and earthmoving business. The planning report prepared by TSC confirms the activity meets the definition of a rural industry / rural commercial service under the Auckland Unitary Plan. The primary function of the business is to provide supporting services to rural / land-based primary production activities. Rural support activities undertaken by Vernon Developments include:

- Collection, cartage and distribution of stock feed loose or packaged (maize, silage, haylage, baleage and hay etc).
- Construction, maintenance and repair of farm access tracks, stock races and stand-off pads.
- Construction, maintenance and repair of silt control works for cropping activities.
- Construction, maintenance and repair of farm drains and culverts.
- Paddock recontouring.
- Tractor services for land preparation including power harrowing, rotary hoeing, ripping, discing and seeding.
- Tree work and deadwood removal.
- Storm damage remediation works.
- Earthworks and supply of aggregates for tracks, hardstand areas, feed pads, silage pits, effluent ponds, cattle yards and building platforms (farm sheds, hay sheds and cow sheds).
- Clear out and cartage of manure from goat and pig sheds.
- Burial holes.

The activity will utilise the new sheds, office, parking and implement storage areas, an entry and turning zone for heavy machinery and truck access. The operation is located in the rural zone with a purpose that supports land-based primary production. These operations are often located within the rural setting, to ensure convenience for the farmers and growers they support.

There was already a level of development on the Subject Property, with existing modified soils, sheds and an old cowshed. This is in addition to a permitted baseline of constructing large buildings on a rural site. An indication of a potential Site Plan for the Subject Property is presented in Figure 3. Whilst the Development Site is larger than the permitted baseline, it does not change or impact on the versatility or productive capacity of the Subject Property. They have retained the larger consolidated block of the better prime soils to the southeast of the Site, with the development largely occurring on the LUC 3 soils and on the edge of the LUC 2 soils adjacent to the NZTA designation area. The NZTA designation area is unable to be developed, this would include development and infrastructure for land-based primary production.

Image 1. Development on Subject Site

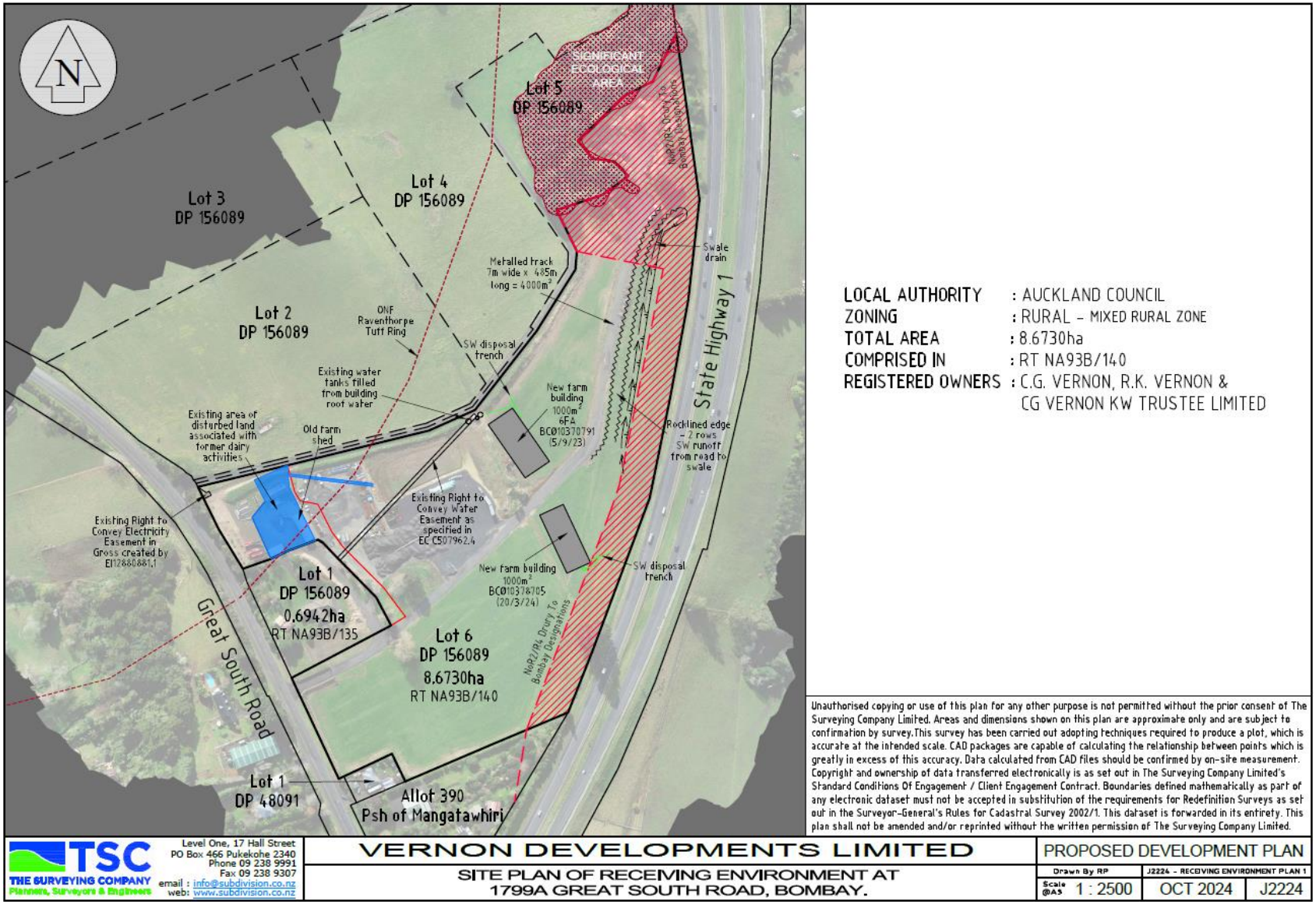

Figure 3: Vernon Developments potential Site plan

3.0 ASSESSMENT OF LAND USE CAPABILITY CLASSES

3.1 Regulatory Framework for Highly Productive Land

The property falls under the jurisdiction of the Auckland Council.

The NPS-HPL came into effect on the 17th of October 2022. The statement sets out a prescriptive approach for councils to identify and protect highly productive land. Until councils have given effect to the NPS-HPL, the interim is provided:

3.5 (7) Until a regional policy statement containing maps of highly productive land in the region is operative, each relevant territorial authority and consent authority must apply this National Policy Statement as if references to highly productive land were references to land that, at the commencement date:

(a) is (i) zoned general rural or rural production; and

(ii) LUC 1, 2, or 3 land;

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

3.2 NZLRI Assessment of Soils LUC

The LUC Classification system is used in New Zealand to help achieve sustainable land development and management on farms. The LUC classification categorises land areas or polygons into classes, subclasses, and units according to the land's capability to sustain productive use. This is summarised in Figure 4 below.

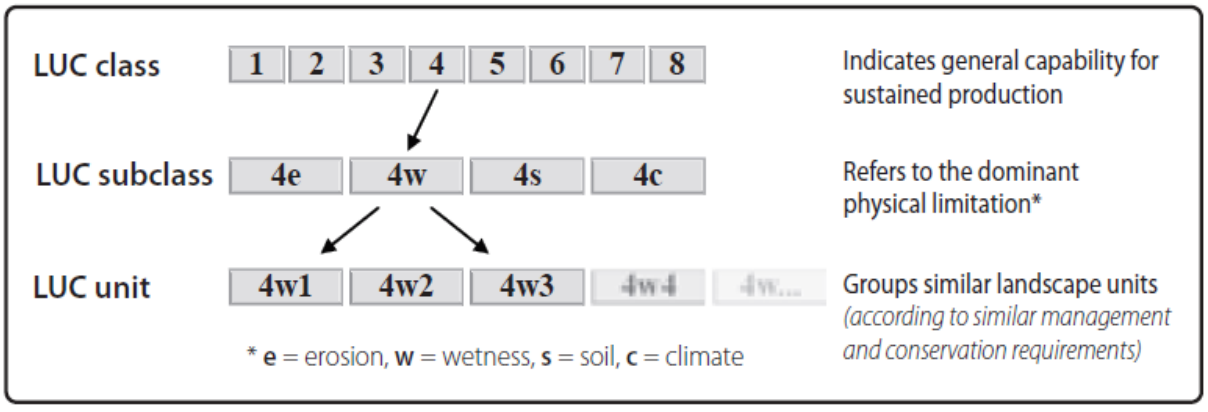

Figure 4: Components of the land use capability classification

AgFirst has reviewed the NZLRI national database of physical land resource information for the Subject Property. This database is based on a regional scale LUC rating of the ability of each polygon to sustain agricultural production.

The soils mapped at the property are classified under the NZLRI as LUC 2e 4. This qualifies as HPL and is subject to the NPS-HPL. The location of the Proposed Development in relation to the LUC classifications is presented in Figure 5.

The NZLRI maps are designed for use at a 1:63,000. The observation guidelines are in reference to one observation site per 1 cm2 of published map, with a minimum acceptable limit of one site per 4 cm2 of published map according to New Zealand soil mapping protocols and guidelines (Grealish 2019). Following the observation guidelines this equates to, at most, one observation per 36.69 ha and at the least one observation per 146.76 ha. Given this Subject Property is 8.69 ha, this scale does not provide an accurate site-specific assessment. Therefore, the NZLRI maps should only be treated as an indicator for LUC at the Subject Property. The NZLRI or S-Map also do not recognise unproductive and modified soils, such as driveways, farm tracks, buildings, curtilage and residential landscaped areas.

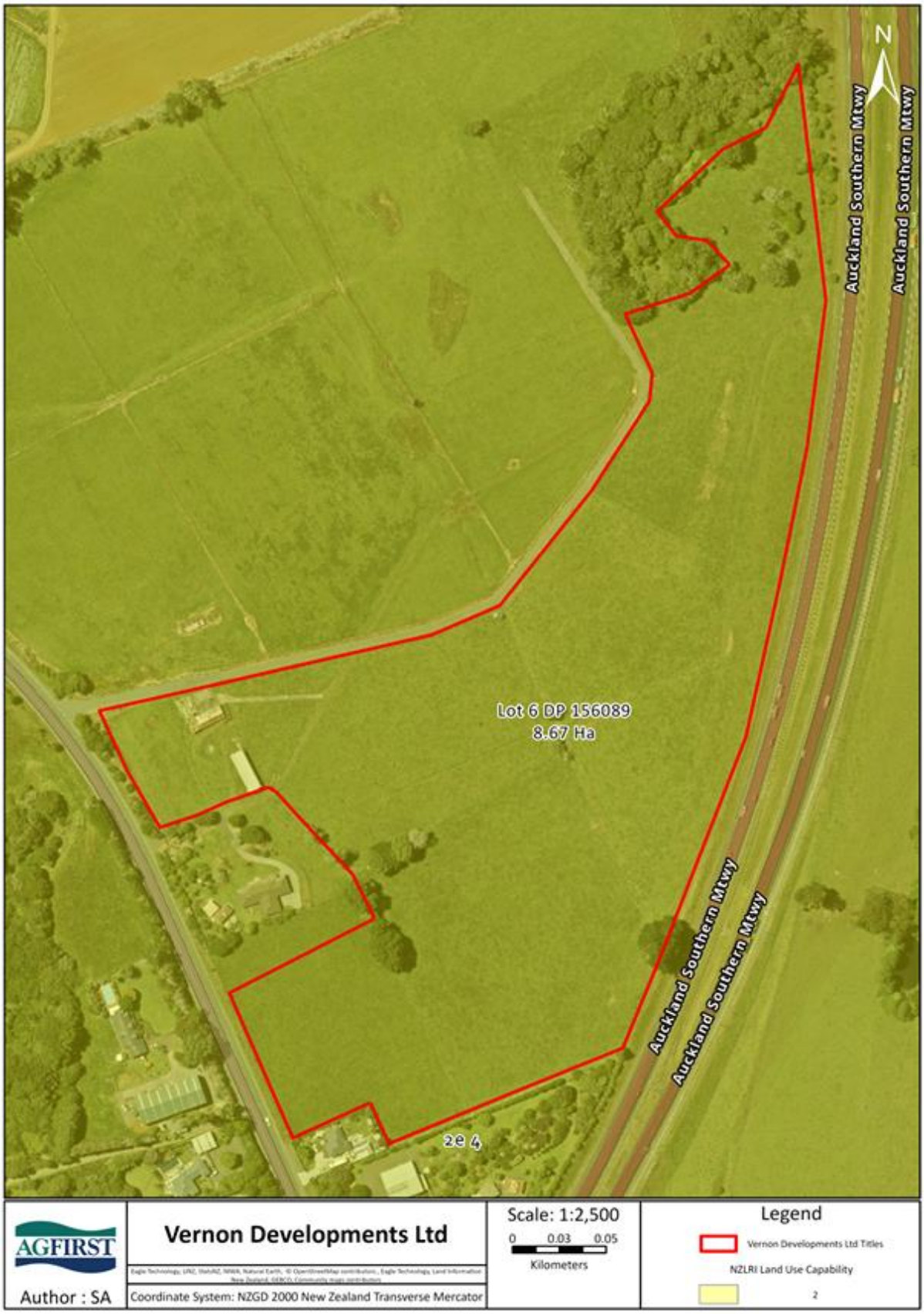

Figure 5: Land use classification for the Subject Property

3.3 Manaaki Whenua – Landcare Research Soils

Soils on the property, as mapped by Manaaki Whenua Landcare Research S-Map online (S-Map) includes imperfectly drained granular soils and well drained granular soils. The S-Map database soil classification and soil drainage maps are provided in Figures 6 and 7.

An overlay of the one-meter LiDAR imagery is presented in Figure 8, which shows the slope profile of the Subject Property. The majority of the Subject Property is flat, except for the NZTA designation area along the eastern boundary. To understand versatility for the Subject Property, AgFirst have also reviewed the neighbour to the north, which is a drystock operation and the only surrounding adjoining property that is used for land-based primary production. The paddocks immediately to the north are rolling to steeply rolling paddocks with unproductive wet seep areas. A photo of the northern property is provided in Image 2 below. Therefore, while there is commercial vegetable production further to the north, the slopes, non-prime soils and fragmentation prevent the Subject Property from being used as any higher and better land use.

Image 2. Neighbouring property to the north

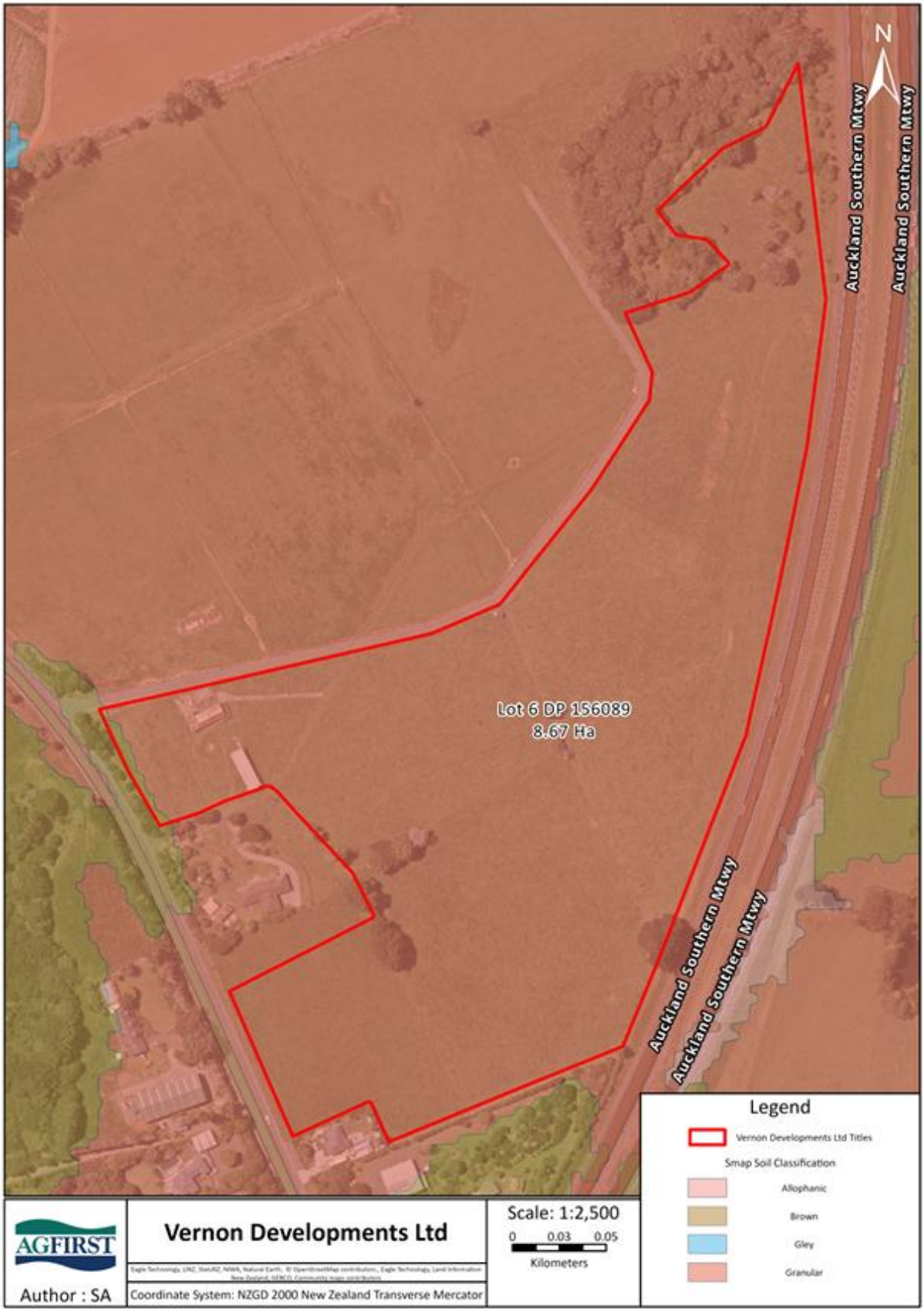

Figure 6: S-Map soil classification for the Subject Property

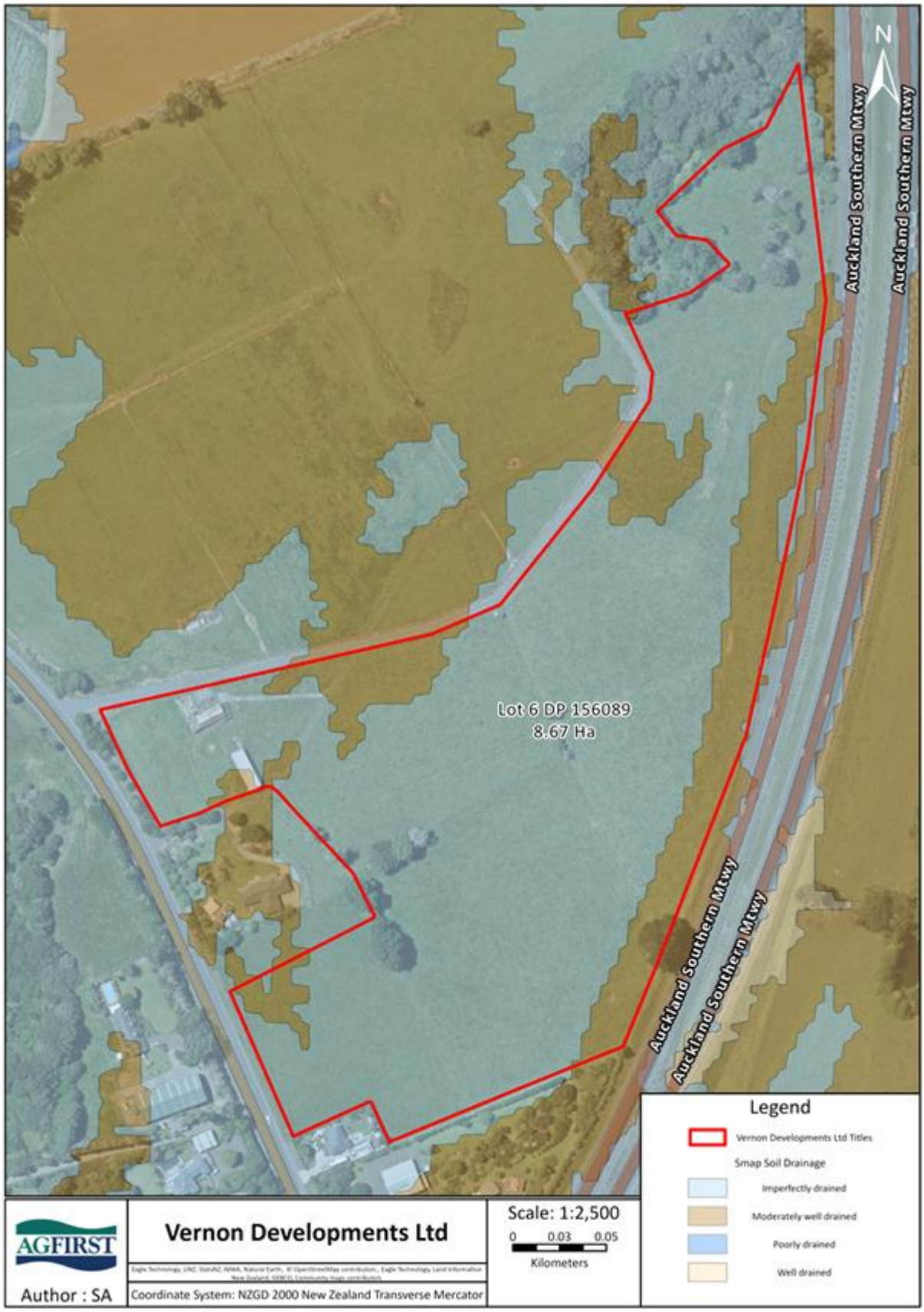

Figure 7: S-Map soil drainage for the Subject Property

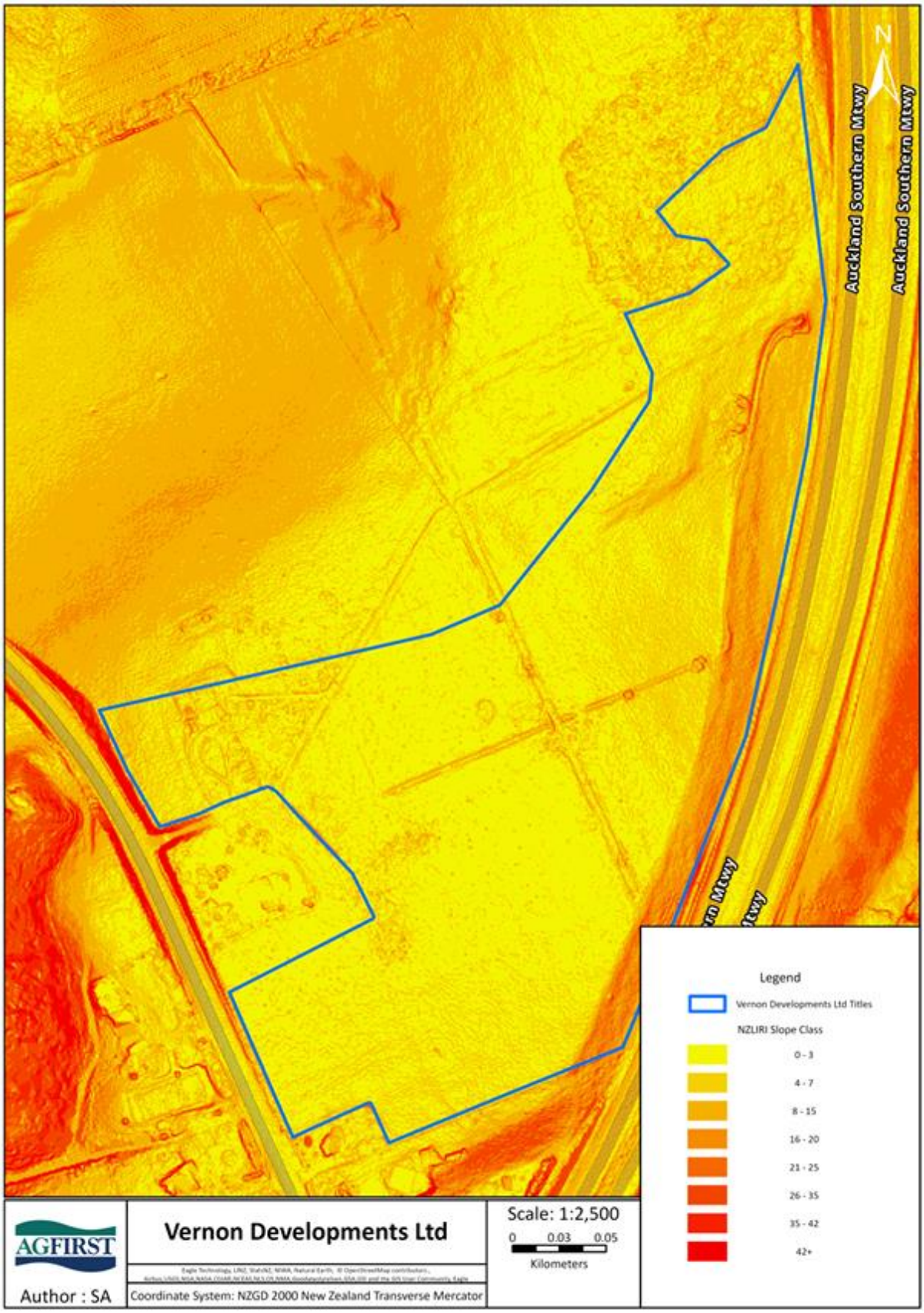

Figure 8: LIDAR overlay showing slope class for the Subject Property

3.4 Site Specific Mapping and LUC Assessment

The NZLRI LUC maps are not intended for farm scale interpretation. Therefore, an expert soil pedologist - Dr Reece Hill (Landsystems) has been engaged to undertake an assessment and review the LUC and soils of the Subject Property. This report is included in Appendix B. This section presents the results and outcomes from the Landsystems report.

Key observations from this report identifies the following:

- The LUC assessment has been undertaken in accordance with accepted guidelines (Milne et al., 1995, and Lynn et al., 2009).
- The detailed on-site assessment identified LUC class 2e 2, 2s 3, 3s 3, and 4s land (Table 4).
- The assessment highlights limitations on the Subject Property with regards to soil, scale, cohesive areas and fragmentation.

Table 4: AUP elite and prime soils identified on the Subject Property

Dominant LUC unit	AUP elite/prime/other productive land	Area ha, (%)*
2e2	Prime	0.5 (6)
2s3	Prime	2.1 (24)
3s3	Other productive land	2.2 (25)
4s	Other productive land	0.2 (3)
NPL^	-	1.6 (19)
NZTA designation area	-	2.0 (23)

based on flow chart Figure *% areas rounded to whole number; ^NPL = Non-productive land/modified soil.

The soils and key features that were identified by Landsystems within the Subject Property are presented in Figure 9, Figure 10 and Figure 11.

Based on the on-site mapping and applying the AUP definition for land containing elite and prime soil, elite soil was not mapped on the site Subject Property. LUC 2e2 and 2s3 land is prime soil. Due to the imperfect drainage characteristics of the LUC 3s3 land on site, and very shallow, stoney nature of the LUC 4s land, the remaining available productive land is classed as other productive land.

This revised soil classification shows that some area of the Subject Property is either non-productive or contains modified soils (anthropic soil). Only the LUC 4s classification is not considered HPL.

The NZTA designation area along the State Highway One road frontage is not considered in the assessment as HPL as it will eventually form part of the State Highway network This would be considered a permanent legal constraint, as the designation sets the land aside for non-productive use, 'specified infrastructure', which would include upgrades to the State Highway One.

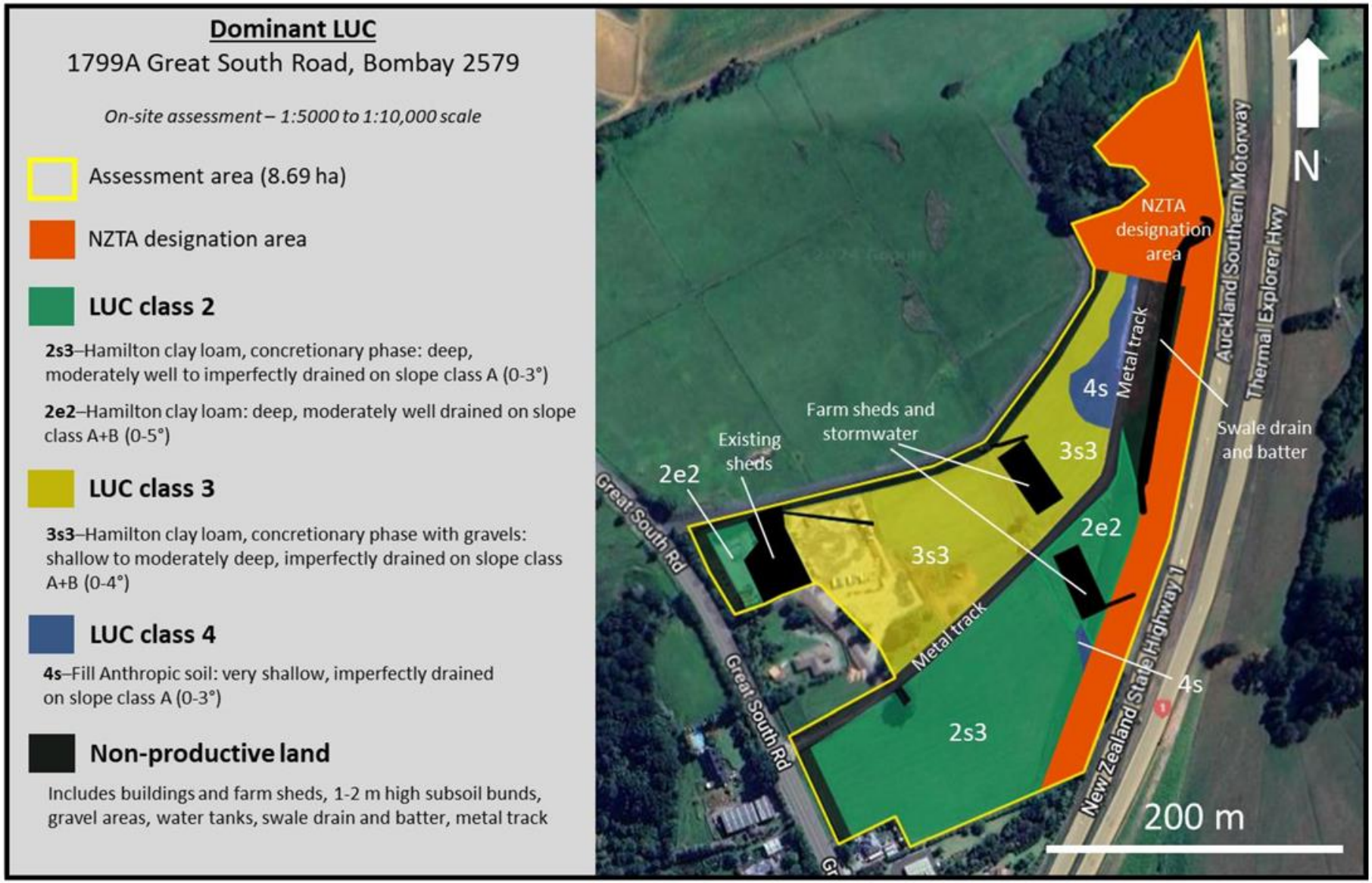

Figure 9. The distribution of LUC units for the Subject Property from Landsystems Report dated 29 November 2024

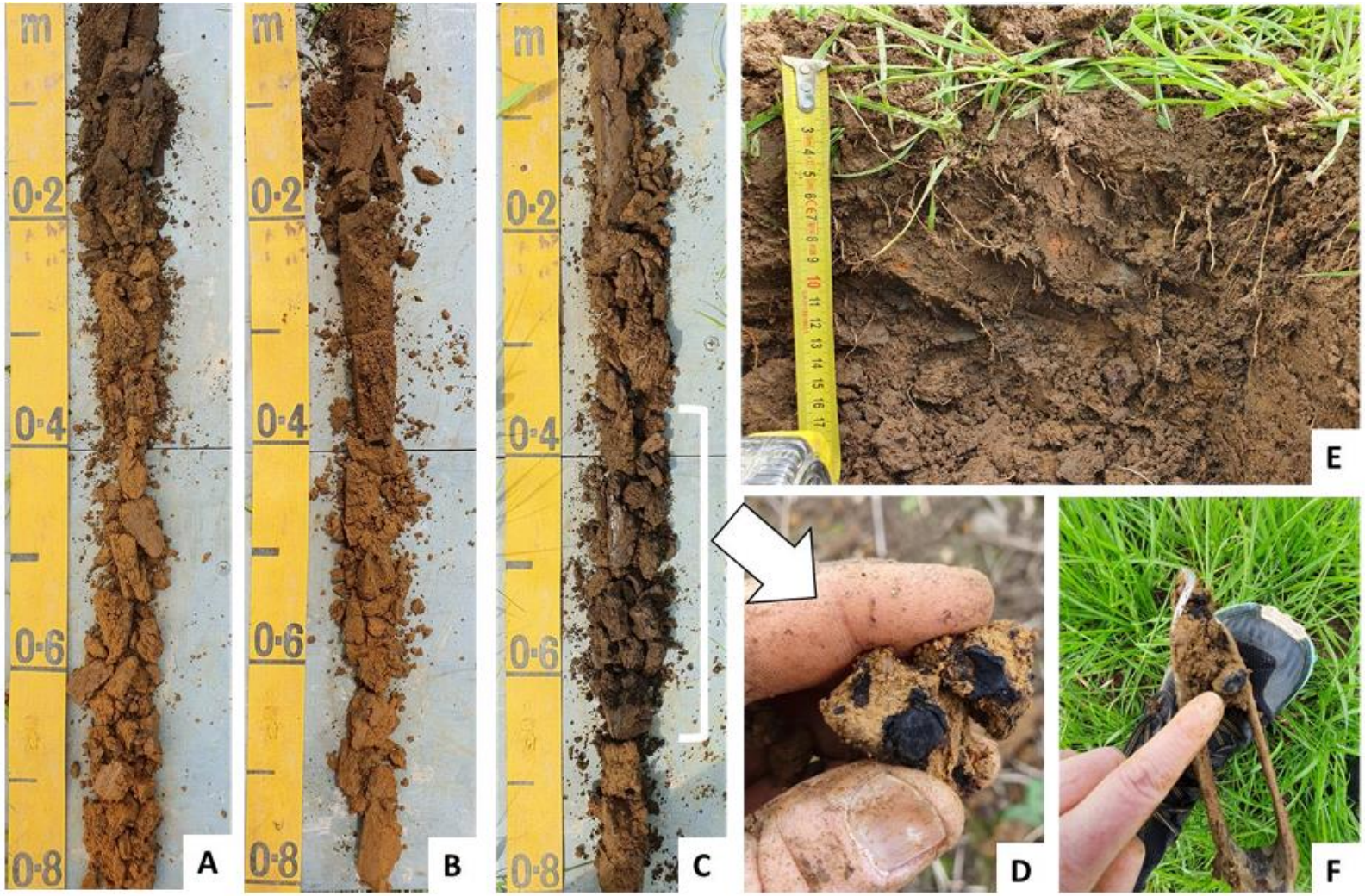

***Figure 9**. Example soil profiles of soils identified in assessment areas. A) Hamilton clay loam, concretionary phase on LUC 2s3 land; B) Hamilton clay loam on LUC 2e2 land; C) Hamilton clay loam, concretionary phase on LUC 3s3 land; D and F) Large 1-2 cm concretions, up to 60% volume at 40 cm depth in LUC 3s3 land; and E) 15-35% gravels within 20 cm of the surface in LUC 3s3 land.*

Figure 10. Page 19 of Landsystems report detailing the Soils and LUC units found on the Subject Property from Landsystems Report dated 29 November 2024

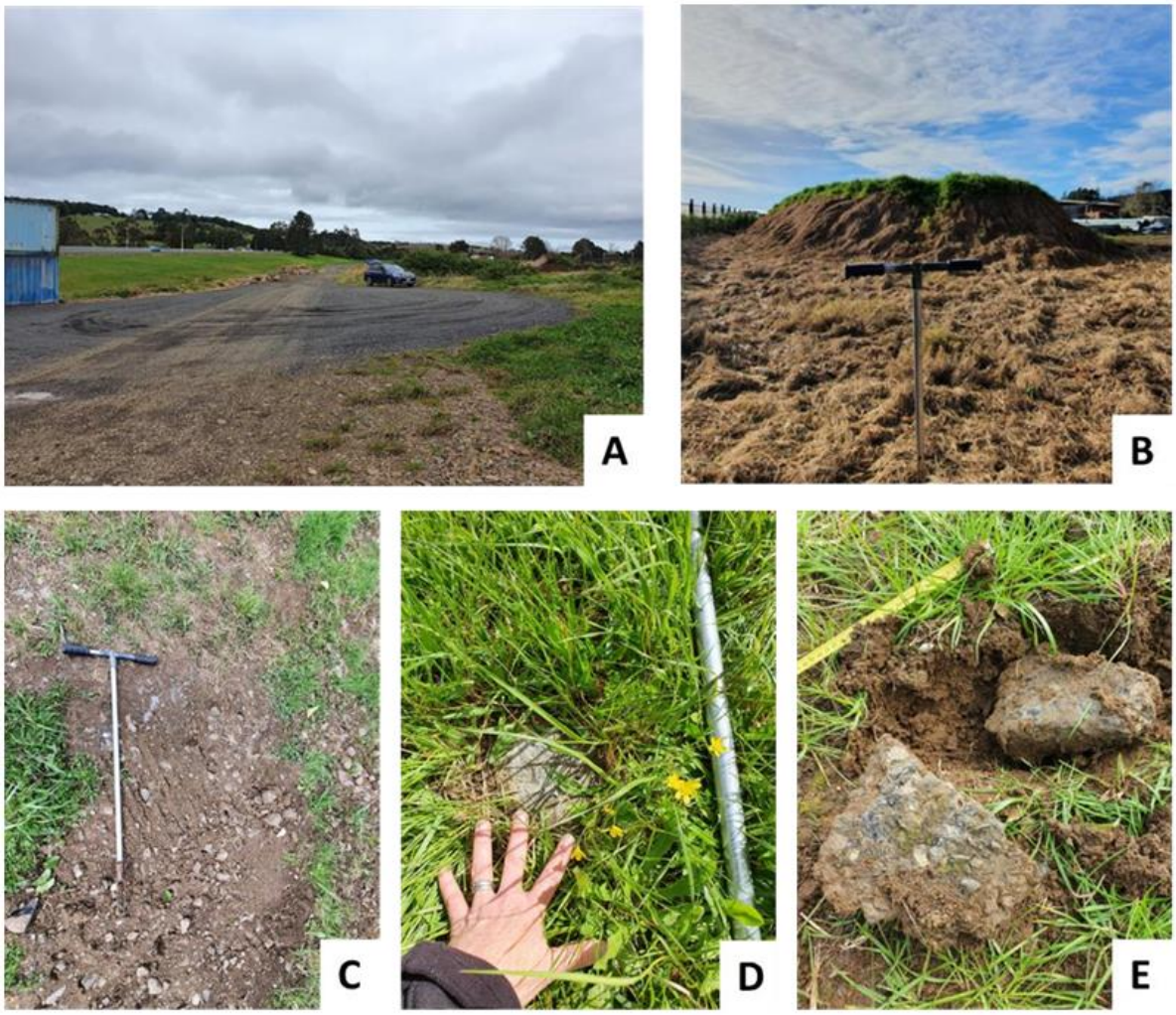

***Figure 10**. Examples of non-productive land and Fill Anthropic Soils identified in LUC 4s areas within the assessment area. A) Metal track and non-productive land near swale drain; B) 1.5-2 m high subsoil bund that surrounds assessment area; C) Fill Anthropic Soil in east; D and E) Concrete embedded into surface in LUC 4s area left of metal track.*

Figure 11. Page 20 of Landsystems report detailing modified soils and non productive areas on the Subject Property from Landsystems Report dated 29 November 2024

4.0 PROTECTION OF HIGHLY PRODUCTIVE LAND

The primary objective of the NPS-HPL is "*Highly productive land is protected for use in land-based primary production, both now and for future generations*". The NPS however does recognise that there are certain situations where the development of HPL is appropriate, as outlined in clause 3.9(2)(a) and 3.9(2)(g).

(2) A use or development of highly productive land is inappropriate except where at least one of the following applies to the use or development, and the measures in subclause (3) are applied:

- ***(a) it provides for supporting activities on the land:***
- *(b) it addresses a high risk to public health and safety:*
- *(c) it is, or is for a purpose associated with, a matter of national importance under section 6 of the Act:*
- *(d) it is on specified Māori land:*
- *(e) it is for the purpose of protecting, maintaining, restoring, or enhancing indigenous biodiversity:*
- *(f) it provides for the retirement of land from land-based primary production for the purpose of improving water quality:*
- *(g) it is a small-scale or temporary land-use activity that has no impact on the productive capacity of the land:*
- *(h) it is for an activity by a requiring authority in relation to a designation or notice of requirement under the Act:*
- *(i) it provides for public access:*
- *(j) it is associated with one of the following, and there is a functional or operational need for the use or development to be on the highly productive land:*
  - *(i) the maintenance, operation, upgrade, or expansion of specified infrastructure:*
  - *(ii) the maintenance, operation, upgrade, or expansion of defence facilities operated by the New Zealand Defence Force to meet its obligations under the Defence Act 1990:*
  - *(iii) mineral extraction that provides significant national public benefit that could not otherwise be achieved using resources within New Zealand:*
  - *(iv) aggregate extraction that provides significant national or regional public benefit that could not otherwise be achieved using resources within New Zealand.*

(3) Territorial authorities must take measures to ensure that any use or development on highly productive land:

- *(a) minimises or mitigates any actual loss or potential cumulative loss of the availability and productive capacity of highly productive land in their district; and*
- *(b) avoids if possible, or otherwise mitigates, any actual or potential reverse sensitivity effects on land-based primary production activities from the use or development.*

(4) Territorial authorities must include objectives, policies, and rules in their district plans to give effect to this clause.

In order to gain a better understand of the intention of this Clause 3.9, AgFirst have referred to the National Policy Statement for Highly Productive Land – Guide to implementation (NPS-HPL G) that was released in March 2023.

> *"The NPS-HPL G states that the starting point is that all land use and development activities that are not land-based primary production are inappropriate on HPL and to be avoided. Clause 3.9(2) provides further a list of activities that may be appropriate on HPL – provided the measures relating to cumulative loss of the availability and productive capacity of HPL and reverse sensitivity effects on Clause 3.9(3) are applied."*

Table 2 within the NPS-HPL G, provides some guidance on the list of activities and some examples of the types of activities anticipated under this clause. The intent is that Clause 3.9(2) applies to the main purpose of the use of development, i.e. core activity being proposed. Which is this case as a rural contractors depot who provides fundamental and necessary supporting activities to rural production businesses. Many of the services provided by Vernon Development (soil preparation, land contouring, silt control) enable and facilitate the utilisation of highly productive land and are a key mechanism in the rural production chain. Other services provide a supporting role including the cartage of stock feed, construction and maintenance of farm infrastructure, dead animal burial and manure removal services. Overall, the business provides a number of services that form a necessary part of rural production and enable the productive capacity of the land to be utilised efficiently.

Clauses 3.9(2)(a) is applicable and considered further below to provide evidence that the Proposed Development is not considered an inappropriate use on HPL.

4.1 Clause 3.9(2)(a) It provides for supporting activities on the land

Supporting activities is defined in the NPS-HPL. **Supporting activities,** in relation to highly productive land, means those activities reasonably necessary to support land-based primary production on that land (such as on-site processing and packing, equipment storage, and animal housing).

As discussed above, the NPS-HPL G provides some additional guidance on the intention and some examples. Relevant to the proposed activity, is the following statement:

> "*The intention of this clause is that activities that support land-based primary production on surrounding HPL or as part of a landholding*[5] *where the production is occurring, have a pathway to occur on HPL. Activities such as residential accommodation for the landowner and/or farm staff, seasonal worker accommodation, sheds for farm machinery, workshops for repairing and maintaining equipment and roadside sales of goods produced on site would all be anticipated under this clause where these support land-based primary production. This clause could also cover on-site processing and manufacturing of goods that were produced on HPL, packing produce, or installing a water reservoir to support the land-based primary production*

[5] Note that "landholding" in this context is intended to have the same meaning as the definition of 'landholding' in the Resource Management (National Environmental Standards for Freshwater) Regulations 2020, which is defined as meaning "one or more parcels of land (whether or not they are contiguous) that are managed as a single operation"

activity. However, the purpose of these activities must be to directly support land-based primary production. For example, a water reservoir would not be appropriate on HPL if it was used to irrigate a golf course. The support provided by these activities must be reasonably necessary in order to be considered appropriate under this clause."

The above statement clearly fits the description of the Proposed Development for Vernon Developments, whereby the activities core purpose is to support surrounding rural landowners that operate on HPL. It is not reasonable for each landholding to purchase, maintain and operate its own machinery to undertake the planting of crops, harvesting supplementary feed, as well as repair, maintain and develop farmland and infrastructure. This would result in both time and cost inefficiencies for these businesses and decrease the economic productivity of agricultural businesses. The Franklin area has a relatively intensive concentration of rural production activities, due to the quality of the soil resources, climate and proximity to transport links and markets. In this regard it has developed a network of growers, farmers and supporting activities that all contribute to the efficiency utilisation of highly productive land. Supporting activities, including those provided by Vernon Developments, are specialist operations, and without them, the use of HPL can be limited.

4.2 Impact on productive capacity of the land

The definition of productive capacity is focused on 'land based primary production over the long term'. Presented below in Table 5 is an assessment on the productive capacity of the land. With the reference to "the land", the intention of this is a landholding[2].

Table 5: Assessment against productive capacity of the land

Physical characteristics	
Soil type/profile and properties	The HPL across the land will not be impacted by the Proposed Development. The scale of the development and Subject Property will ensure that soils in the wider area will not be impacted. Soil types based on assessments undertaken by Landsystems show a highly variable pattern across the Subject Property. There is only a small amount of Prime (LUC 2) soils, and these soils are not contagious with any neighbouring property. Therefore, there are no expansion/amalgamation opportunities to generate any scale suitable for a viable and commercial land-based primary production enterprise.
Soil drainage	Existing drainage will be retained and maintained. The activity will not have any impact of the soil drainage of surrounding sites.
Versatility	The land-based primary production options available (or versatility) is limited due to the current constraints. These constraints include: - Soil limitation – this will have an impact of yields and cropping options. Some of the soil types on the Subject Property would not be targeted by

	horticultural or commercial vegetable production farmers. - Fragmentation – there is non-reversable land fragmentation to the south (road and lifestyle properties), east (NZTA designation and SH1) and south (lifestyle properties). Therefore, very limited opportunity for creating any scale for a viable production type. The Property to the north has slope constraints and is subsequently used as a drystock operation. This type of land use on the Subject Property would not be economically viable, nor is it considered a highly productive use. Land to the west of the site is with an Outstanding Natural Feature Overlay. This is a planning constraint that restricts the grazing types, vegetation, fencing and buildings. This is considered to fragment the land and places limitations and restrictions on potential uses of land to the west. Due to these constraints, the highest and best land use is likely to continue as a cut and carry pastural operation. While the effective areas have been reduced since the development of the site, the versatility has not changed. The Subject Property has always had these constraints.
Legal constraints	The NZTA designation is a legal constraint for land-based primary production, as the land is intended for 'specified infrastructure' and non-productive use. There are no anticipated legal constraints or changes due to the proposal.
Size and shape of land parcels	No change.

4.3 Clause 3.9(3)(a) Minimises or mitigates any actual loss of HPL

Clause 3.9(3)(a) requires authorities to minimise or mitigate any actual or potential loss of HPL. This indicates that some loss of HPL is accepted with the focus to minimise the amount lost. The intension of 3.9 is not an 'avoid if possible' test.

The Proposed Development, while removing an area of HPL, meets this clause as set out below using the criteria from the NPS-HPL G:

4.3.1 Site location

The Subject Property already has non-reversable land fragmentation which isolates it from large and geographically cohesive areas of HPL. This includes State Highway one to the east and the NZTA designation within the Subject Property, lifestyle properties to the south and west and slope and outstanding natural features to the north. Whilst the Site still being central to the rural environment.

Vernon Developments has identified the following as selection requirements for the Development Site:

- Rural locality for ease of access to farming clients.
- Good transport links to key roads for inbound and outbound vehicles.
- Flat land with plenty of space for workshop, parking and vehicle turning.
- Location out of a township to reduce tractor and large vehicle throughput through the town.
- Close enough to Auckland for freight and supplies.
- Large enough area around the development to enable separation for neighbours.
- Activities undertaken by the business are compatible in character and amenity with activities typically occurring in the rural environment.
- Enable the business to co-exist and share resources with the rural production aspects of Cam Vernon's wider business venture.
- Utilise areas unused by the depot for rural production (silage).

While using the NZLRI mapping, the entire Subject Property has complete coverage of HPL. However, when assessing the site at a scale suited for identifying versatility and productive capacity, there are areas that are less productive and are limitations which affect the overall productive capacity of the site. The Development Site has been targeted to these lower productive areas, with an attempt to avoid fragmentation within the site.

4.3.2 Site footprint

The total footprint of the Proposed Development is approximately 2.5 ha. This is the approximate area required for the size and scale of the activity. This does not include a permitted baseline for ancillary buildings and sheds, previously unproductive areas (including an old dairy shed) and the potential for a dwelling that is permitted for this Rural Title. Most of the development is located on LUC 3s3 soils. These soils have constraints such as the concretionary gravels that make them unsuited for arable, commercial vegetable production or horticulture. From a farming and production view, AgFirst considers this to be a small-scale low productive block. The residual effective area of the property will remain under land-based primary production, with no change to the intensification or farming system. Figure 2 shows the layout of the Development in relation to the Subject Property and other ineffective areas.

4.3.3 Co-existing with land based primary production

The Proposed Development is located on a small site that has limited productive capacity but is well suited to service the wider rural community. The wider vicinity is a hub of commercial vegetable production, which has a significant need and requirement for rural contractors. Presented in Figure 12 is a radius of 10 km. This enables efficient deployment of heavy machinery to add value to the primary sector, while minimising the loss of, fragmentation and disruption of highly productive land. The effective areas remaining within the Subject Property will continue to be used in the same way, with the cut and carry operation being able to leverage of the rural contracting business for some of the operational work. AgFirst opinion is the current operation is the highest and best use for this property. The Subject Property is mostly surrounded by non-productive neighbours, with the exception of the neighbour to the north.

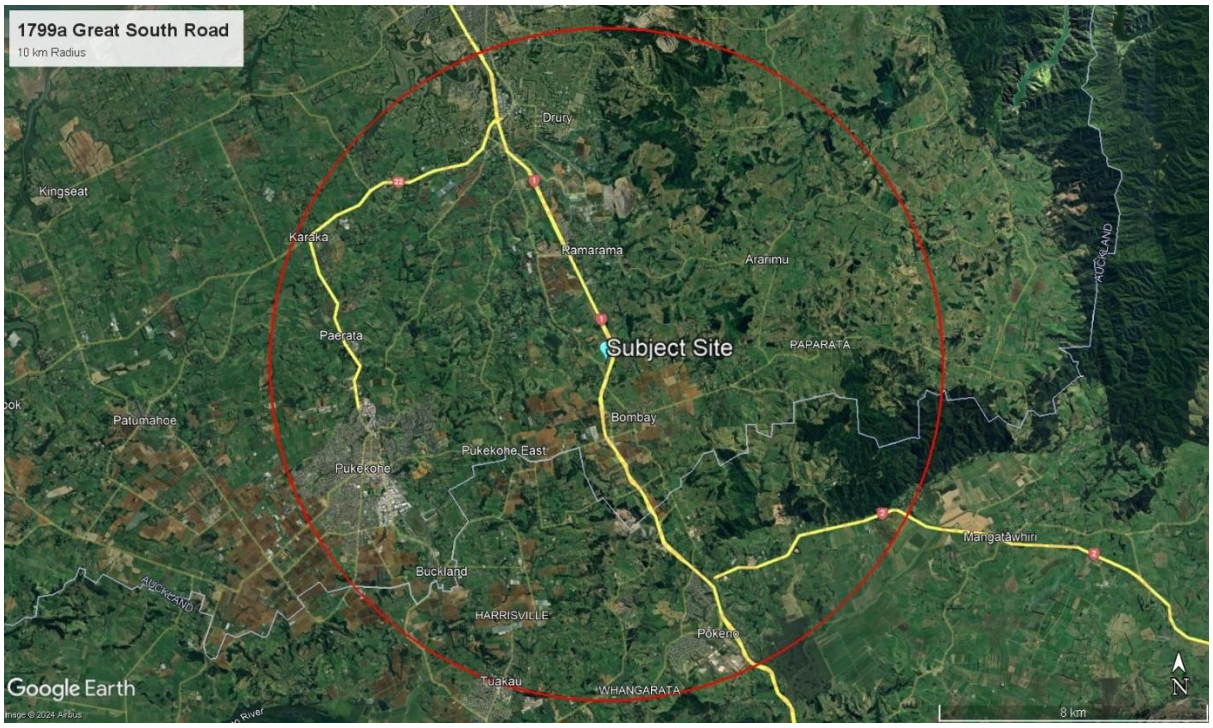

Figure 12: 10 km radius from Subject Property

4.3.4 *Highly Productive Land in the district*

With regards to LUC classes within the district, there is an estimated 124,716 ha of HPL within the Auckland District[6]. The Proposed Development is 0.002% of the total area. The LUC breakdown for the district is presented in Figure 12. As discussed throughout this report, while the Subject Property contains HPL (as mapped by NZLRI and Landsystems), the productivity of the site is limited in versatility and capacity. The majority of HPL within the region is concentrated in the Pukekohe, Bombay, Waiuku and Papakura catchments, which makes any development a challenge where consideration of the NPS-HPL will be required. Therefore, it is important to balance out the demand and need for such activities and selection of appropriate areas that will have less impact and preferably consists of areas with lower productive capacity or constraints for future land-based primary production. AgFirst believes that the Subject Property fits into the lower end of HPL and productive capacity with the soils having lower versatility than other HPL with permanent and long-term constraints limiting the land-based primary production. A LUC representation of the wider district is provided in Figure 13.

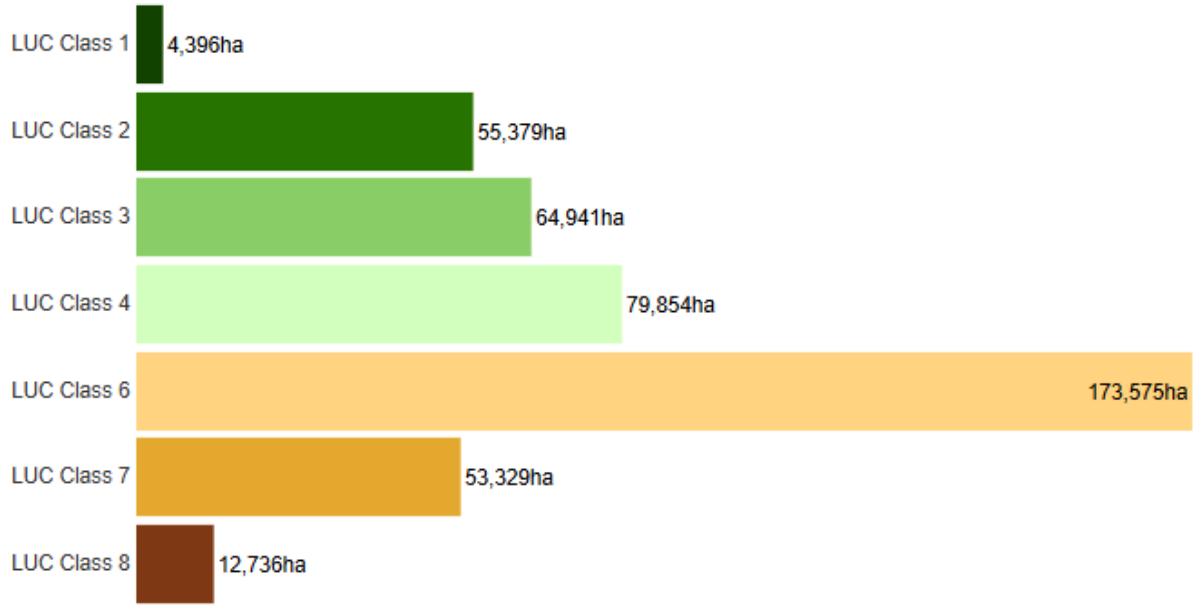

Figure 13: Summary of Land Use Classification within the Auckland District

[6] Manaaki Whenua – Landcare Research. Our Environment, Territorial Authorities, Waikato District LUC map.

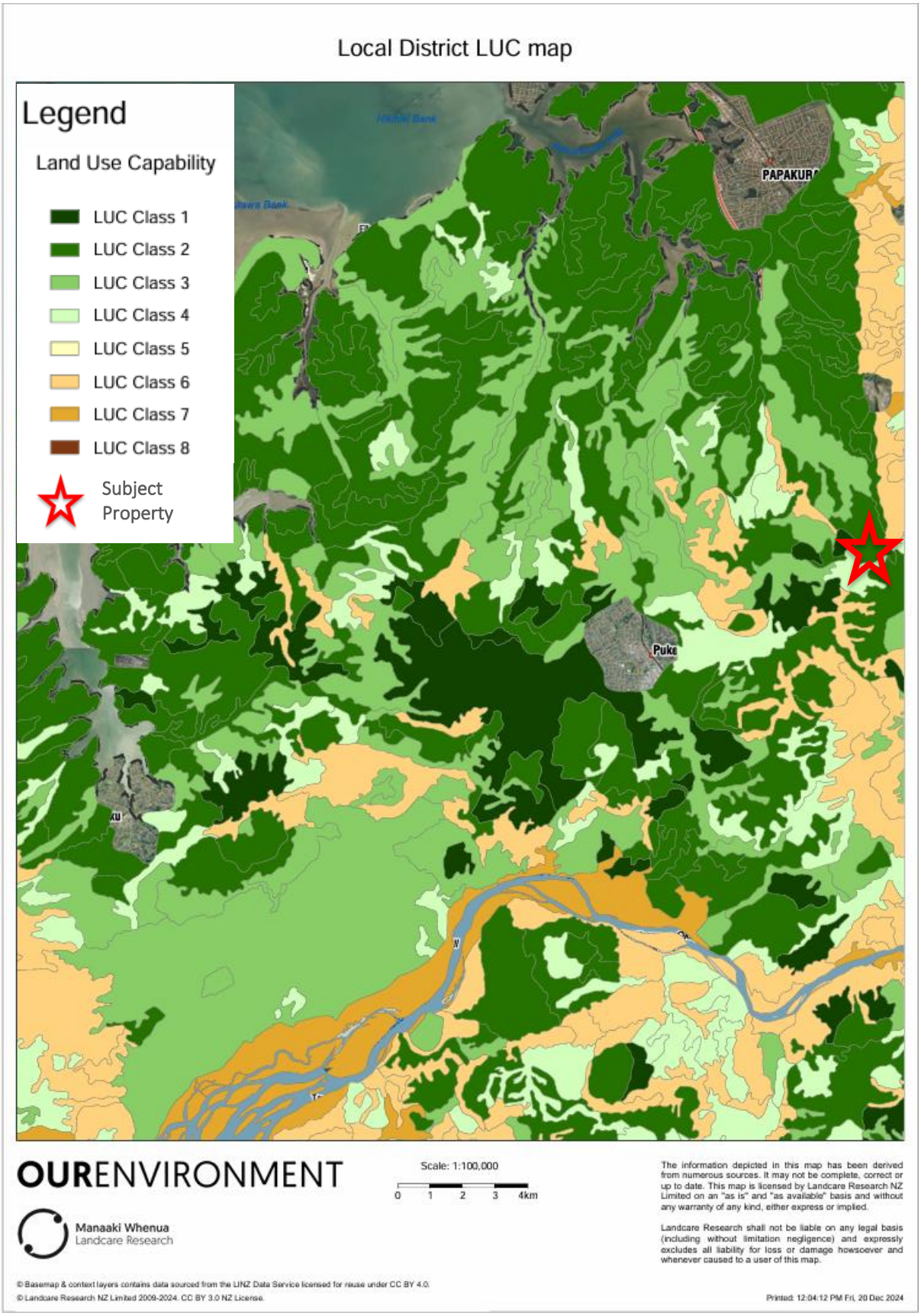

Figure 14: Local District LUC map

4.4 Clause 3.9(3)(b) Reverse sensitivity effects

AgFirst does not see any reverse sensitivity effects as a result of the Project that would not be mitigated or managed. The Subject Property is already operating as an agricultural contracting and earthmoving business and has not identified any of the rural activities that occur on the land as being effect generating activities.

The core purpose of the business is to provide supporting activities to rural production activities that utilise HPL. The activity is not considered to be sensitive to any effects generated by land-based primary production.

5.0 CONCLUSIONS

The soil mapped at the property is classified under the NZLRI is LUC 2e2. This land class qualifies as HPL and is subject to the NPS-HPL.

Vernon Developments currently operate from the site and provide a range of services to farmers and growers on surrounding HPL. Agricultural contracting and earthmoving are an important aspect of rural land and farm management. These activities support agricultural production and make a positive contribution to the utilisation of rural soil resources.

The Proposed Development meets the provisions of Clause 3.9(2)(a) of the NPS-HPL to enable the use of HPL land as a rural contractor facility to provide a service that is an important supporting activity for surrounding HPL. In this regard the activity is not considered to be an inappropriate use of HPL.

The Subject Property provides good access to the roading network and is a suitable location to support local farmers in the area. The activity fulfils a functional need as required under the district plan. A review of soil maps indicates that there is an abundance of HPL in the locality and it would be difficult to find a functional site on an equivalent low productive capacity site. The Subject Property is subject to constraints that limit its versatility and the productive capacity. There are no identified reverse sensitivity effects on the surrounding land use.

APPENDIX A: INDICATIVE BUDGET FOR THE SUBJECT PROPERTY

Total Subject Site - Cut and Carry (Current)		$ Total
Area (ha)		5.00
Revenue	Pasture silage sold	9,961
Total Revenue		9,961
Operating Expenses	Seed	300
	Establishment	125
	Herbicide	146
	Harvesting	5,180
	Fertiliser	5,137
	Labour	400
	Repairs & Maintenance	757
Total Operating Expenses		12,044
Fixed Expenses	Administration	257
	Insurance	0
	Rates	3,533
Total Fixed Expenses		3,790
Depreciation		0
Total Expenses		15,834
Total EBITRm for 5.0 ha		-$ 5,873
EBITRm/ha		-$ 1,175

Total Subject Site - Cut and Carry (Optimised)		$ Total
Area (ha)		5.00
Revenue	Pasture silage sold	21,250
Total Revenue		21,250
Operating Expenses	Seed	300
	Establishment	125
	Herbicide	146
	Harvesting	11,050
	Fertiliser	5,137
	Labour	400
	Repairs & Maintenance	757
Total Operating Expenses		17,914
Fixed Expenses	Administration	257
	Insurance	0
	Rates	3,533
Total Fixed Expenses		3,790
Depreciation		0
Total Expenses		21,705
Total EBITRm for 5.0 ha		-$ 455
EBITRm/ha		-$ 91

Land Use Capability classification assessment

1799A Great South Road, Bombay 2579
(Lot 6 DP 156089)

Date: 29 November 2024

Prepared for: Vernon Developments Limited
Prepared by: Landsystems

Landsystems
22 McNicol Street
Hamilton 3214

M: 022 191 3695
E: reece@landsystems.co.nz

Contents

1. Introduction

Landsystems undertook a Land Use Capability (LUC) classification assessment of an 8.69 ha area (Lot 6 DP 156089) at 1799A Great South Road, Bombay 2579. (**Figure 1**). A simplified map of the assessment area is shown in **Figure 2**. The purpose of the assessment was to confirm the LUC units at property scale and the presence of Auckland Unitary Plan (AUP) land containing elite and prime soil, and highly productive land as defined by the National Policy Statement for Highly Productive Land 2022 (NPS-HPL). The assessment including desktop and on-site assessment components.

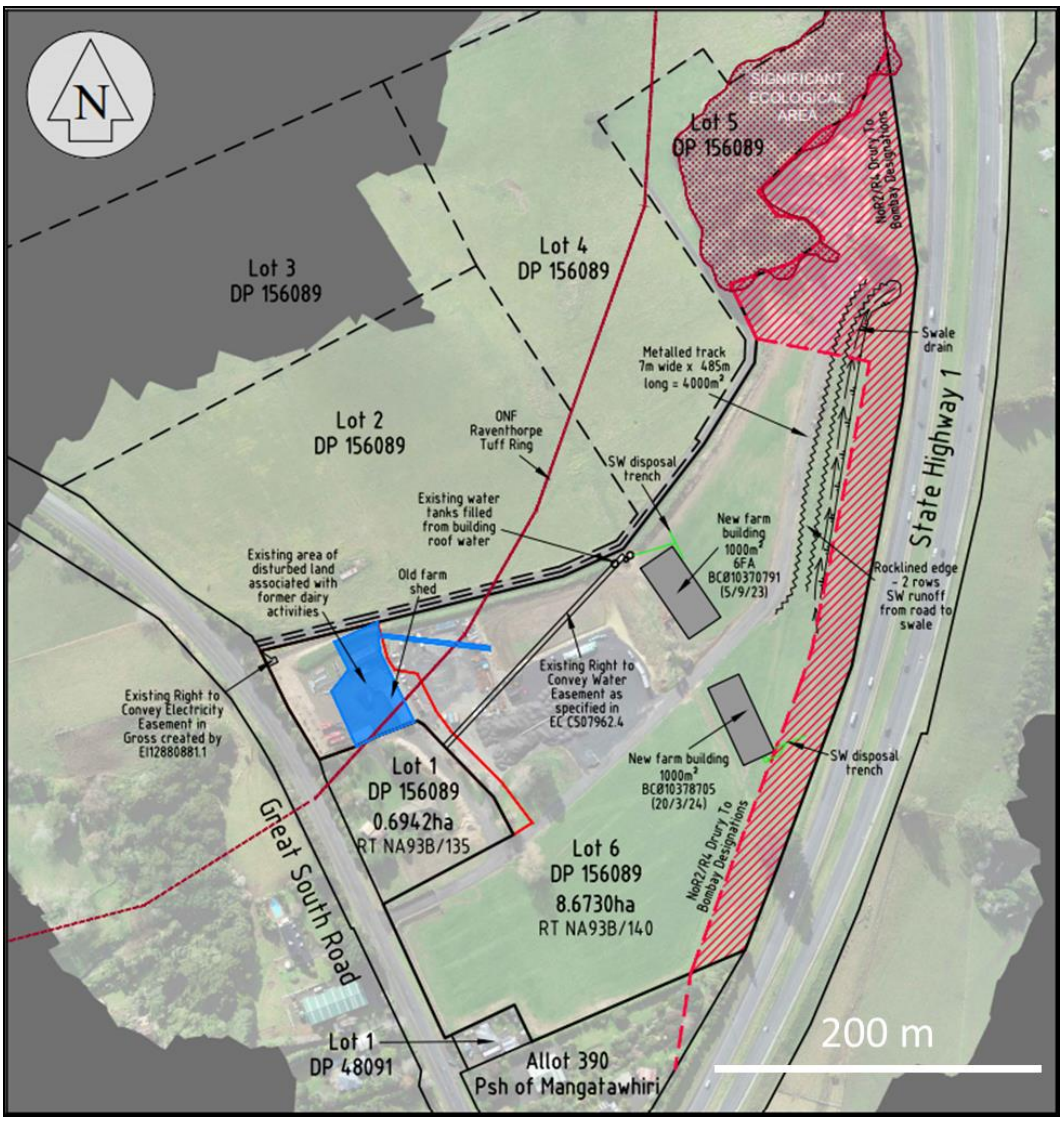

***Figure 1**. Assessment area (Lot 6 DP 156089) and surrounding lots at 1799A Great South Road, Bombay 2579 (from Site Plan of Receiving Environment at 1799A Great South Road, Bombay, TSC).*

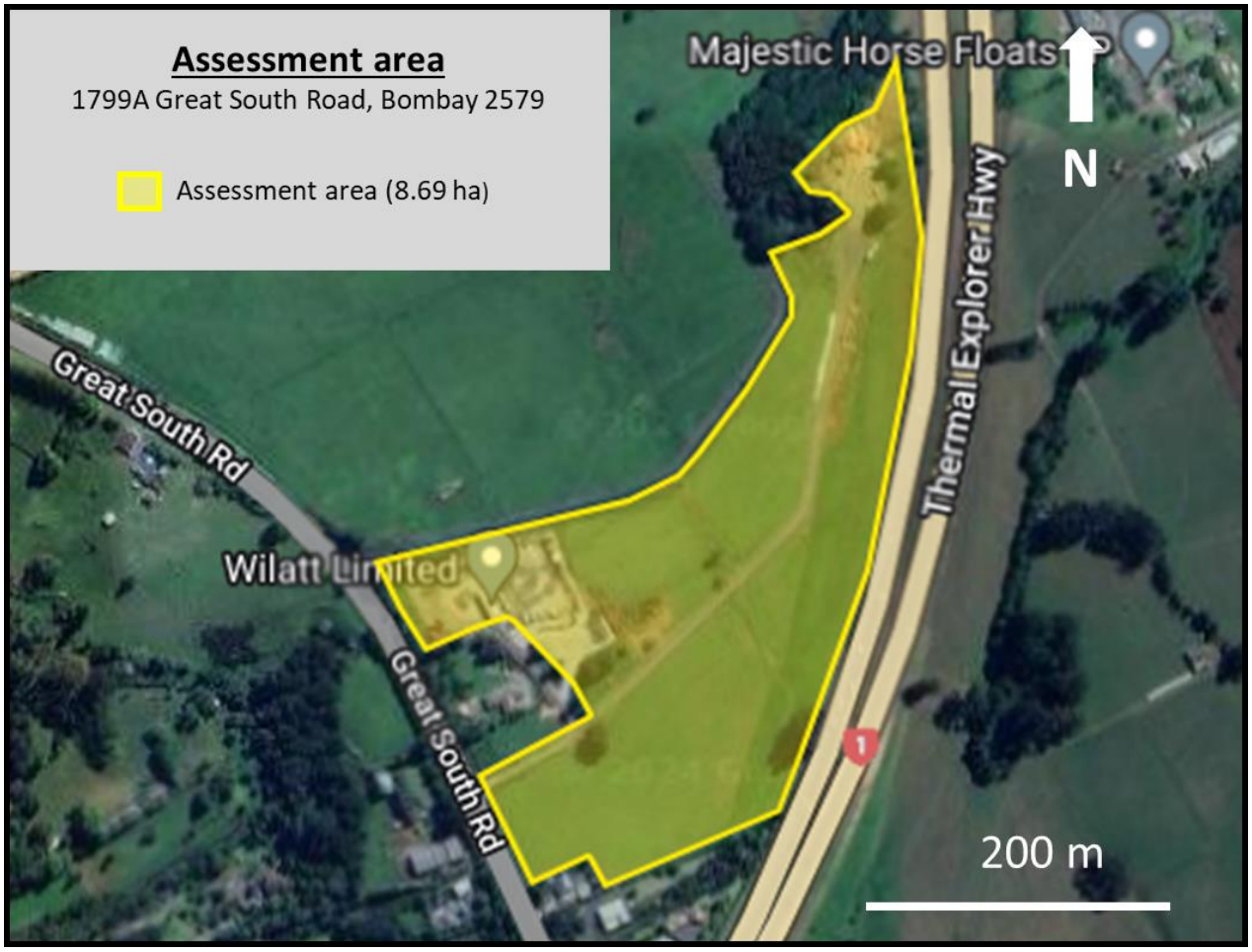

***Figure 2**. Simplified map of assessment area (Lot 6 DP 156089) at 1799A Great South Road, Bombay 2579.*

2. Classification definitions

Land Use Capability classification

Land Use Capability (LUC) assesses an area's capacity for sustained productive use, considering physical limitations, soil type, management requirements and soil conservation needs.

A Land Use Capability assessment is a systematic arrangement of the different types of land according to those properties that affect its capacity for long term and sustained production. It is a system that primarily assesses the land for arable (cropping) use.

The assessment is based on a national land classification system used by soil conservators for farm planning since the 1950s. A detailed description of the LUC classification is provided in the Land Use Capability Survey Handbook, a 3rd edition of which was published in 2009 (Lynn et al., 2009)[1]. The current definitions for Land Use Capability (LUC) classes are provided in the Land Use Capability Handbook (Lynn et al., 2009):

[1] Lynn, IH, Manderson, AK, Harmsworth, GR, Eyles, GO, Douglas, GB, Mackay, AD, Newsome, PJF (2009) Land Use Capability Handbook - a New Zealand handbook for the classification of land 3rd Ed. Hamilton, AgResearch; Lincoln, Landcare Research; Lower Hutt, GNS Science 163pp.

Class 1: the most versatile multiple-use land with minimal physical limitations for arable use.

Class 2: very good land with slight physical limitations to arable use that can be readily overcome by management and soil conservation practices.

Class 3: land with moderate physical limitations to arable use. These limitations restrict the range of crops and the intensity of cultivation, and/or make special soil conservation practices necessary.

Class 4: land with severe physical limitations to arable use. These limitations substantially reduce the range of crops which can be grown, and/or make intensive soil conservation (and management) necessary.

Class 5: land with physical limitations that make it unsuitable for arable cropping, but only negligible to slight limitations or hazards to pastoral, vineyard, tree crop or production forestry use (except where flood-prone).

Class 6: land that is not suitable for arable use and has slight to moderate limitations and hazards under a perennial vegetation cover. Erosion is commonly the dominant limitation, but it is readily controlled by appropriate soil conservation.

Class 7: land that is not suitable for arable use and has severe limitations and hazards under a perennial vegetation cover. Erosion is commonly the dominant limitation, with the land requiring active and intensive soil conservation to be productive.

Class 8: land that is not suitable for arable, pastoral or production forestry use.

AUP land containing elite and prime soil

The Auckland Unitary Plan (Updated 18 April 2024) defines elite land as:

Land containing elite soil:
Land classified as Land Use Capability Class 1 (LUC1). This land is the most highly versatile and productive land in Auckland. It is:

- *well-drained, friable, and has well-structured soils;*
- *flat or gently undulating; and*
- *capable of continuous cultivation.*

Includes:

- *LUC1 land as mapped by the New Zealand Land Resource Inventory (NZLRI);*
- *other lands identified as LUC1 by more detailed site mapping;*
- *land with other unique location or climatic features, such as the frost-free slopes of Bombay Hill;*
- *Bombay clay loam;*
- *Patumahoe clay loam;*
- *Patumahoe sandy clay loam; and*
- *Whatitiri soils.*

Prime land is also very good land but with some minor limitations compared to elite land. The Auckland Unitary Plan defines prime land as:-

Land containing prime soil:
Land identified as Land Use Capability classes two and three (LUC2, LUC3) with slight to moderate physical limitations for arable use. Factors contributing to this classification are:

- *readily available water;*
- *favourable climate;*
- *favourable topography;*
- *good drainage; and*
- *versatile soils easily adapted to a wide range of agricultural uses.*

The definition for land containing elite soil lists features of highly versatile and productive land. The land is described as well-drained, friable, and has well-structured soils. The topography is flat or gently undulating and the soil capable of continuous cultivation. If land is not classified as LUC class 1, all these conditions need to be met for the land to be elite.

The AUP does not itself define "well drained" or "friable", however, the New Zealand Soil Description Handbook[2] defines well drained (on p148) and friable (on p84). Flat or gently undulating slopes are defined in the Land Use Capability Survey Handbook[3] (p21) as slopes that are 0 to 3 degrees.

'Well structured' and 'capable of continuous cultivation' are not defined. However, using LUC class 1 soil characteristics as a guide then a suitable definition for 'well structured' would be soil that is moderately or strongly pedal, or has earthy structure (Soil Description Handbook p58 & 60). The continuous cultivation definition that best suits Class 1 land is the arable use definition in the LUC Survey Handbook (on p153). This is land suitable for cultivation for cropping and able to grow at least one crop or more per season without permanently degrading the soil.

The most versatile soils in New Zealand are Allophanic soils (e.g. Karaka soils). Favourable topography for arable use is commonly regarded as slopes of 0 to 15 degrees. Slopes steeper than 15 degrees have moderate to severe susceptibility to erosion when cultivated and are not ideal for arable use.

Good drainage can be defined as well drained or moderately well drained drainage classes. Under these conditions there is a minimum of 60 to 90 cm to a water table. Having a freely drained soil is required to be able to grow crops sensitive to wet soil (e.g. kiwifruit). Well drained elite soils are ideal for this (water table greater than 90 cm deep), but prime land may also be suitable. Imperfectly and poorly drained soils are too wet for some horticultural crops and the land is not as versatile as prime land.

Land containing prime soil is arable, versatile, has favourable topography and good drainage. There are no serious climate or soil water storage issues. Unfortunately, these characteristics for land containing prime soil are not defined. AUP land containing elite or prime soil, and other productive land was classified using the definition interpretation used by soil scientists in the Auckland region for previous private plan changes[4].

National Policy Statement for Highly Productive Land

The National Policy Statement for Highly Productive Land 2022 (NPS-HPL)[5] came into force on the 17th of October 2022.

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[2] Milne JDG, Clayden B, Singleton P.L, Wilson AD. 1995. Soil Description Handbook. Lincoln, New Zealand, Manaaki Whenua Press. 157p.

[3] Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF. 2009. Land Use Capability survey handbook – a New Zealand handbook for the classification of land. AgResearch Hamilton; Manaaki Whenua Lincoln; GNS Science Lower Hutt, New Zealand.

[4] www.aucklandcouncil.govt.nz/UnitaryPlanDocuments/pc-45-appendix-9.2-soil-assessment-report.pdf; www.aucklandcouncil.govt.nz/UnitaryPlanDocuments/pc-73-appendix-n-land-use-capability-and-soil-assessment.pdf

[5] MfE 2024. National Policy Statement for Highly Productive Land 2022 with amendments. August 2024.

"Highly productive land" is defined as:

> *means land that has been mapped in accordance with clause 3.4 and is included in an operative regional policy statement as required by clause 3.5 (but see clause 3.5(7) for what is treated as highly productive land before the maps are included in an operative regional policy statement and clause 3.5(6) for when land is rezoned and therefore ceases to be highly productive land).*

Our understanding is that NPS-HPL clause 3.5(7) applies because maps produced in accordance with clause 3.4 have not yet been included in an operative regional policy statement as required by clause 3.5. Clause 3.5(7) says:

> *(7) Until a regional policy statement containing maps of highly productive land in the region is operative, each relevant territorial authority and consent authority must apply this National Policy Statement as if references to highly productive land were references to land that, at the commencement date:*
>
> *(a) is*
>
> *(i) zoned general rural or rural production; and*
>
> *(ii) LUC 1, 2, or 3 land; but*
>
> *(b) 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 NPS-HPL includes the following definition of LUC 1, 2, or 3 land:

"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".

For the purpose of defining and mapping highly productive land on the site, a 2024 Environment Court decision (Decision No. [2024] NZEnvC 83)[6] determined that only the NZLRI LUC map information at the time the NPS-HPL 2022 became operative (17th October 2022) can be used.

3. Non-productive land and modified soil areas

For an accurate assessment of LUC classification for a property, the assessment should be based on the current condition of the area (i.e. mapped in current state). This is important because some land management practices (e.g. the placement of tracks, excavation of drains, and general earthworks) result in irreversible changes to the soil (i.e. changes other than those that can be remediated by management practices and return the soil to its intrinsic state). These areas are referred to as non-productive land. Examples of non-productive land include native vegetation, wetlands and riparian areas, tracks, and buildings and curtilage.

Non-productive land can include areas where the soil has been modified by truncation, placement of fill or extensive mixing. Where these areas do not resemble a functioning soil, the areas are not considered to be available for primary production (i.e. they are non-productive land). Where these areas do resemble a

[6] https://www.environmentcourt.govt.nz/assets/Documents/Publications/2024-NZEnvC-083-Blue-Glass-Limited-v-Dunedin-City-Council.pdf

functioning soil (such as the reinstatement of a soil profile following gravel extraction) the land can be assigned a LUC classification.

For this assessment the productive area of the site (to which the LUC classification can be applied) is the site area excluding non-productive land.

4. Regional scale soil and LUC map information (1:50,000 scale)

An initial desktop LUC assessment was undertaken for the entire assessment area. Available map information, soil reports and geospatial data included:

- New Zealand Land Resource Inventory (NZLRI) layers, including the New Zealand Fundamental Soil Layer (NZFSL) and Land Use Capability Layer (providing map units of dominant soil type and LUC unit)[7]
- S-Map Online (providing map units of Soil Siblings)[8]

Of the available map information sources, the S-Map Online soil map information, NZFSL and NZLRI map information are at a regional scale (approximately 1:50,000 scale).

NZLRI (1:50,000 scale) soil and LUC classification

Based on the available NZLRI and NZFSL map information the soils and LUC units in the assessment area are mapped as shown in **Figure 3**.

Based NZLRI map information, 100% of the property[9] is mapped as moderately well drained Hamilton clay loam on undulating slopes (slope class B) with an LUC classification of 2e2.

Table 1 gives the general characteristics of the soils and LUC units as mapped in **Figure 3**.

***Table 1**. Summary of the NZLRI soil and LUC map unit characteristics in the assessment area.*

Soil type (NZSC Soil Order)	Parent material	Soil drainage	Slope class	LUC unit (limitation)
Hamilton clay loam (Granular Soil)	'Hamilton Ash'	Moderately well drained	B	2e2 (erosion)

[7] https://lris.scinfo.org.nz/layer/48134-nzlri-north-island-edition-2-all-attributes/
[8] https://smap.landcareresearch.co.nz/maps-and-tools/app/
[9] https://lris.scinfo.org.nz/layer/48134-nzlri-north-island-edition-2-all-attributes/

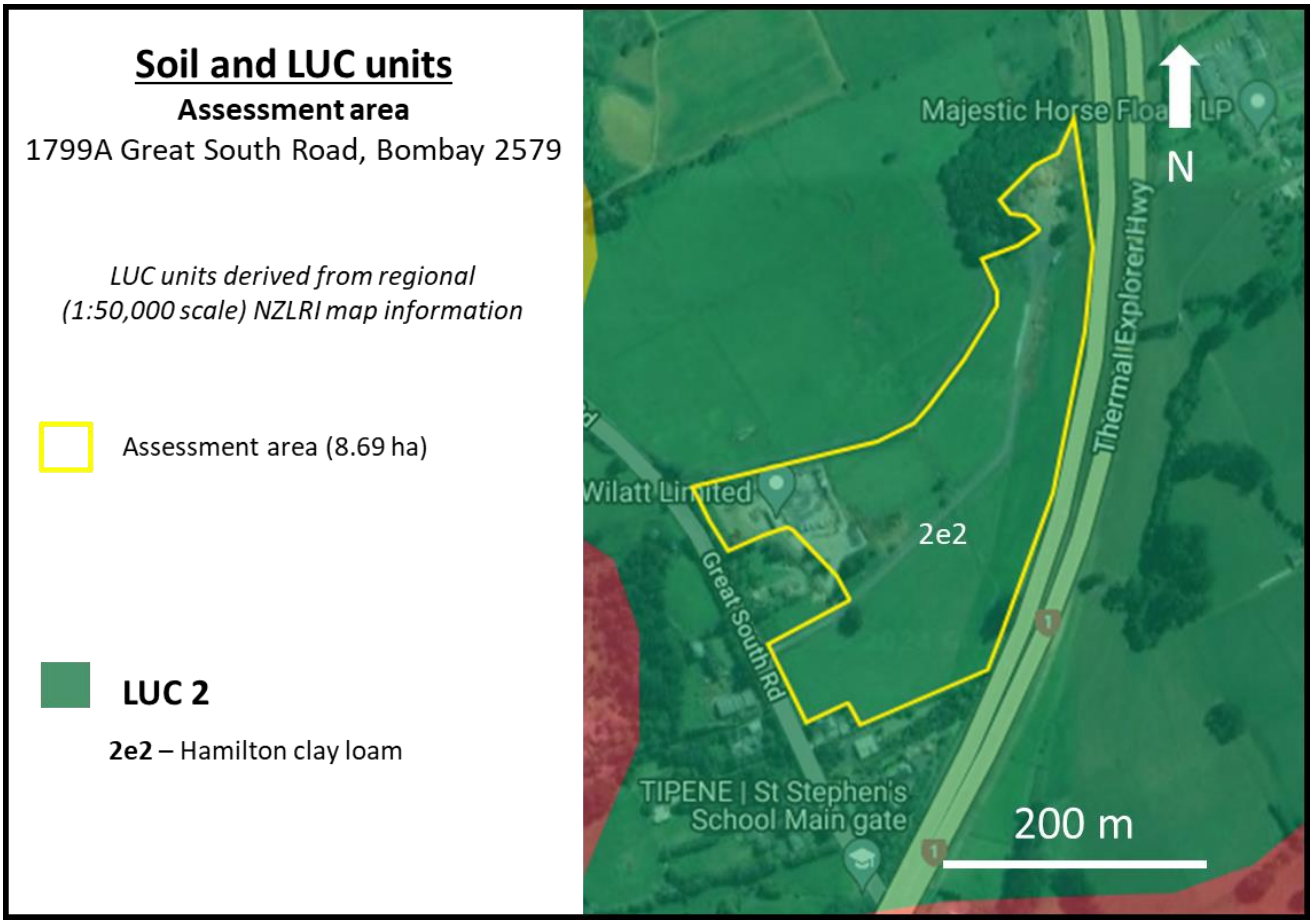


***Figure 3**. LUC units for the assessment area, derived from available regional scale NZLRI map information.*

S-Map Online

The S-Map soil map information is sourced from S-Map Online and is mapped at 1:50,000 scale. S-Map soil polygons are only available on the S-Map Online website. The soil names for each map unit are "soil siblings", with a probability of occurrence (%) and certainty rating provided for each soil sibling in a map unit. S-Map Online identified the soils in the assessment area as 98% Granular Soil and 2% Brown Soil (**Figure 4**).

A simplified S-Map soil sibling map for the assessment area is provided in **Figure 5** with S-Map soil sibling information and the estimated proportion of each soil sibling in the map unit.

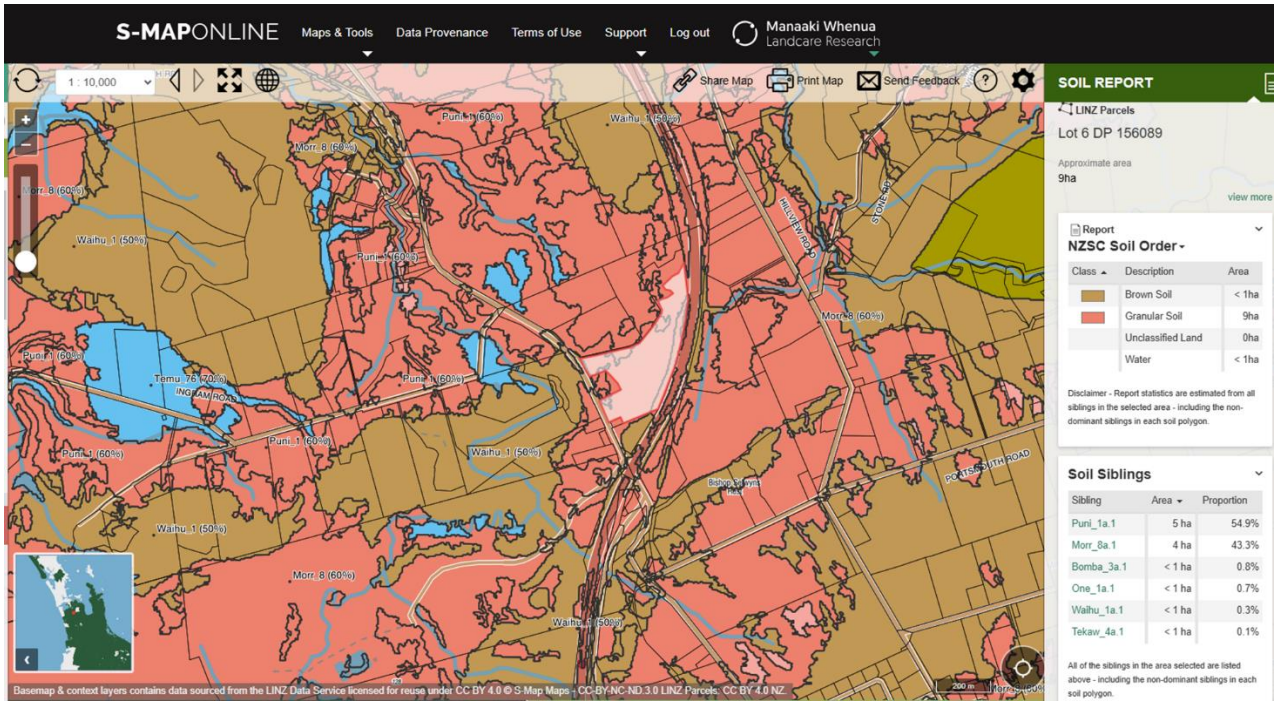


***Figure 4**. S-Map soil (Soil Order and soil sibling) distributions for the assessment area.*

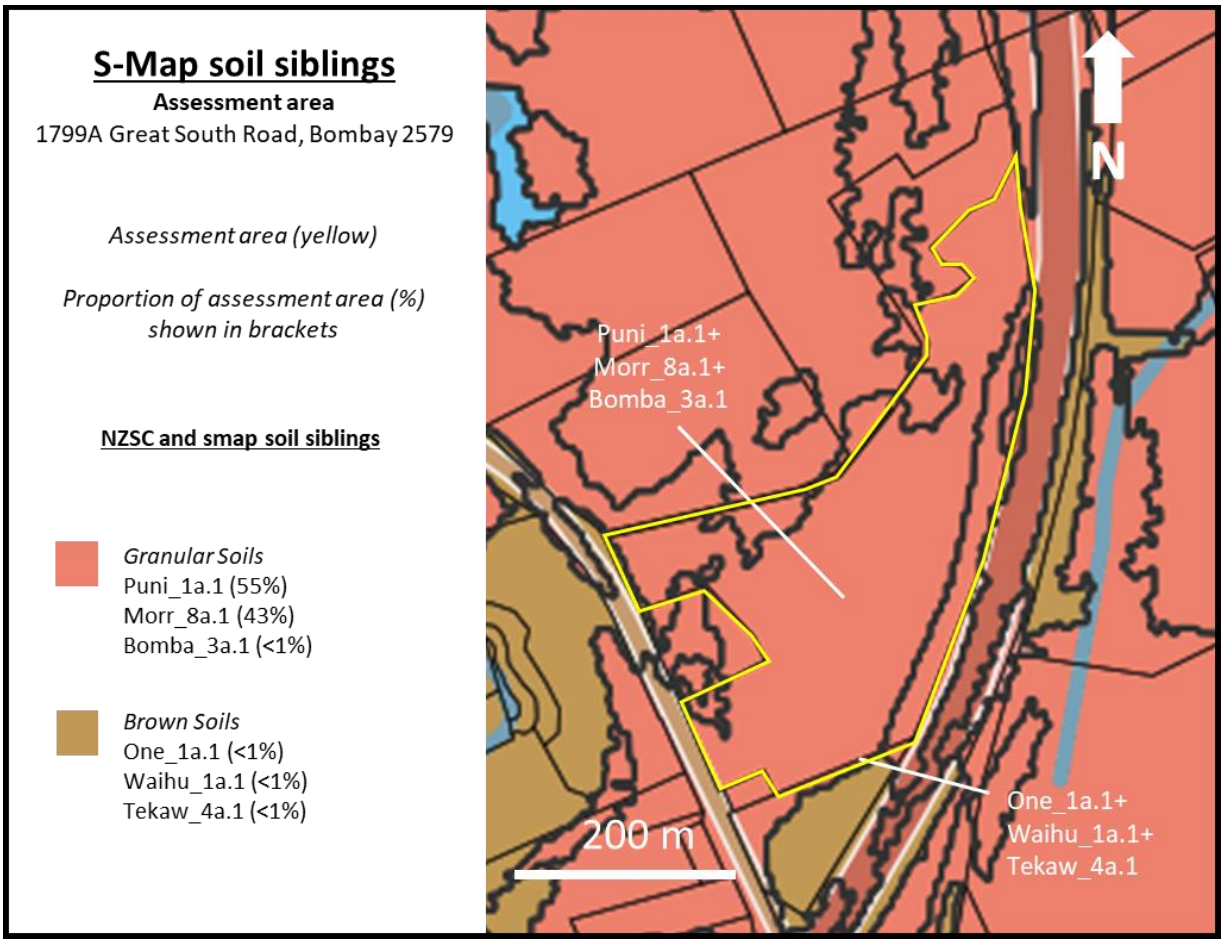


***Figure 5**. Simplified S-Map soil sibling map units the assessment area.*

Table 2 provides a summary of the S-Map soil sibling map unit characteristics, including parent material, soil depth, soil texture and drainage, for the assessment area. This information is derived from S-Map Online factsheets and can be sourced from the S-Map Online website[10].

***Table 2**. S-Map soil sibling map unit characteristics for the assessment area, 1799A Great South Road.*

S-Map soil sibling	Soil Order[11] (Subgroup code)	Soil material	Soil depth	Soil texture	Soil drainage	Correlated soil series name[12]
Puni_1a.1	Granular (NOM)	Rhyolitic rock	Deep (> 1m)	Clay	Imperfectly drained	Not available
Morr_8a.1	Granular (NOT)	Rhyolitic rock	Deep (> 1m)	Clay	Moderately well drained	Patumahoe
Bomba_3a.1	Granular (NOL)	Rhyolitic rock	Deep (> 1m)	Clay	Well drained	Not available
One_1a.1	Brown (BXT)	Rhyolitic and basaltic rock	Deep (> 1m)	Clay	Moderately well drained	Not available
Waihu_1a.1	Brown (BMM)	Basaltic rock	Deep (> 1m)	Loam	Imperfectly drained	Not available
Tekaw_4a.1	Brown (BMT)	Basaltic rock	Deep (> 1m)	Loam	Moderately well drained	Not available

The S-Map soil map information provides a more spatially detailed representation of the soils on the site than the NZLRI 1:50,000 soil map information. However, because of the absence of land characteristics information (e.g. slope) for the soil map units, there is currently no direct correlation with LUC units. Some, but not all, of the S-Map soil map units correlate to the soil series identified by the NZLRI map information. In this report, we have retained the DSIR's soil nomenclature (e.g. soil type and series names) in preference to the S-Map soil sibling nomenclature to allow for direct correlation of the soils with the LUC units provided by the NZLRI map information and associated NZLRI Extended Legends.

5. NPS-HPL assessment based on regional map information

Based on the available 1:50,000 scale NZLRI information and applying the NPS-HPL, LUC 2e2 land is considered highly productive land (**Figure 6**).

[10] https://smap.landcareresearch.co.nz/maps-and-tools/app/
[11] NZSC – New Zealand Soil Classification: Hewitt AE (2010) New Zealand Soil Classification. 3rd ed. Landcare Research Science Series No. 1. Lincoln, Manaaki Whenua Press.
[12] https://smap.landcareresearch.co.nz/maps-and-tools/app/

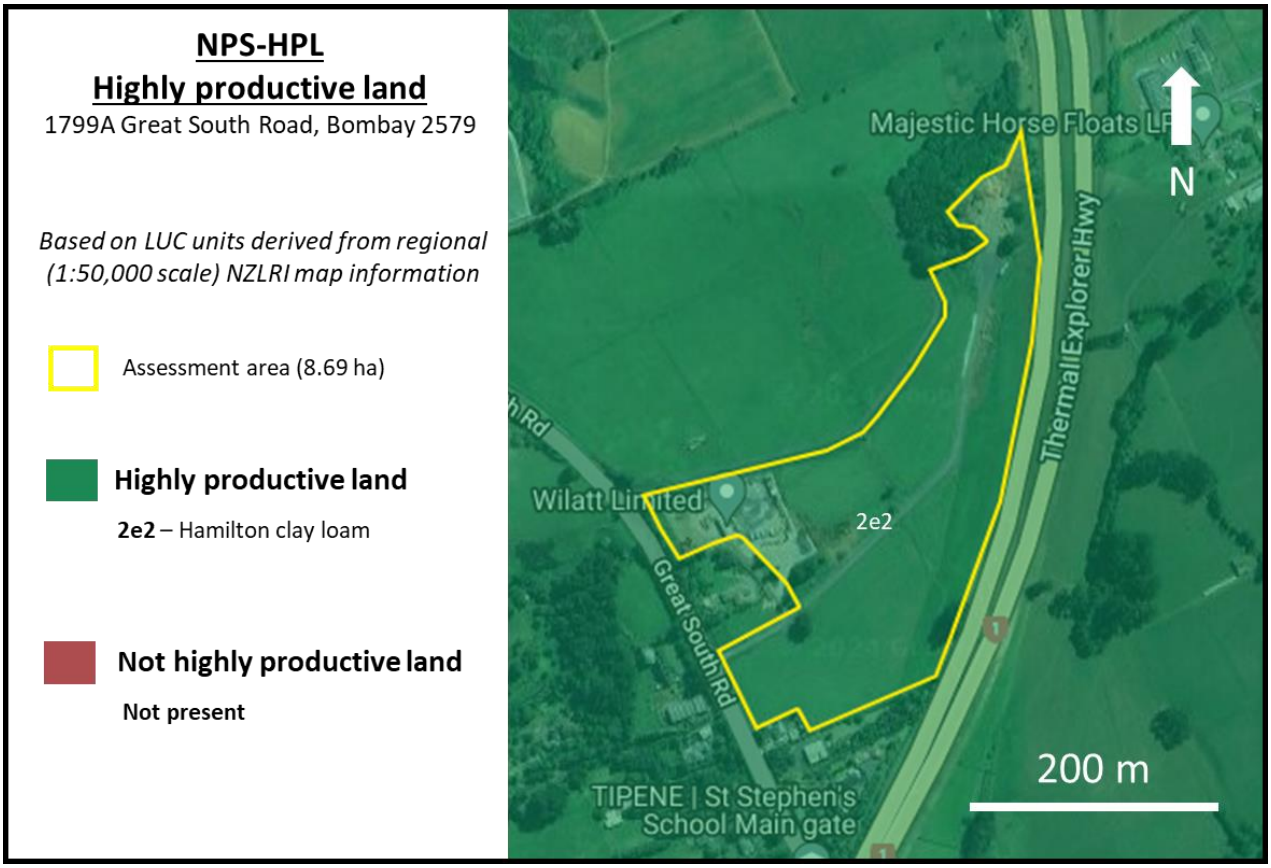


Figure 6. *The distribution of NPS-HPL defined highly productive land within the assessment area, based on the NZLRI (1:50,000 scale) map information.*

6. Regional scale map information limitations

The LUC classification can be applied (mapped) at any scale and regional scale LUC map units can differ from those identified at property scale. Property scale mapping is typically mapped at a scale of 1:10,000, while catchment and regional maps are mapped at 1:15,000 to 1:50,000 scale. The LUC Handbook sets out recommended mapping scales for inventory surveys and LUC mapping (p100).

Mapping LUC at a property scale can identify different LUC units (and map units) than depicted by regional scale LUC mapping. This is because property scale mapping includes more observations compared with regional scale mapping.

Soil and LUC maps are usually drawn at a specific scale depending on the smallest area of interest for a particular use and the density of field observations. For example, a 1:5,000 scale map requires on average four observations/ha while a 1:50,000 scale map requires 0.04 observations/ha (or four observations per 100 ha).

With GIS tools and geospatial databases, it has become easy to manipulate maps, creating the temptation to rescale a map beyond its original scale of collection. Enlarging maps from their original scale will not provide the same accuracy or contain more detail than a coarse scale map. This is because they are not based on sufficient field observations to delineate soil map units at the finer scales portrayed. For the regional scale LUC map information, map unit boundaries may not align with the topography (slope) and other geographic features (such as rivers or terraces). Therefore, to correctly identify and map the LUC units at property scale, on-site assessment using the LUC classification criteria described in Lynn et al. (2009) would be required.

The purpose of this background information is to illustrate and emphasise that the 1:50,000 scale NZLRI information provides excellent physical base data for planners (a planning tool) but is not fit for purpose as a plan (map) unless undertaken at the correct scale. Therefore, the on-site assessment in this report is

considered more appropriate (and accurate) for providing soil and LUC information for the purpose of assessing the presence of elite or prime soil and soil resources as a function of productive capacity and informing land productivity.

7. On-site LUC classification assessment

Method

Landsystems undertook an on-site property scale (1:10,000 scale) LUC assessment of the 8.69 ha assessment area at 1799A Great South Road according to standard methods (Milne et al., 1993[13] and Lynn et al., 2009[14]). The on-site assessment was undertaken on Wednesday 19th of July 2023.

The on-site mapping does not constitute a detailed soil survey rather the focus is on characterisation of soil and land properties to apply the LUC classification, in turn used to determine the extent of elite, prime and NPS-HPL highly productive land on the site. However, recorded soil properties are used to identify limitations that may affect the productivity of the site.

The on-site assessment included soil observations by hand auger across the site using a free survey approach. Ten recorded soil augers observations (excluding additional observations for checking boundaries) were undertaken to determine the LUC units.

Observations of slope angle, topography and soil parent material were made over the relevant area. Soil augering up to 100 cm depth (where possible) was used to assess soil properties such as soil horizons, drainage, plant root depths, texture, structure, and colour.

All soils were assessed in current condition and areas with modified soils and areas considered to be non-productive land were identified and mapped. Soil series and types have been used for this report (as opposed to S-Map soil siblings) to provide clearer correlation with LUC units provided by the regional NZLRI LUC map information. LUC classification was assigned based on the criteria provided in Lynn et al. (2009). LUC units were assigned based on the closest fitting LUC unit provided by the regional NZLRI LUC map information. Where no corresponding LUC unit was available, the unit was coded with LUC class and limitation (e.g. 4s).

Mapping scale

Applying conventional soil mapping protocol, between eight and 32 observations across the 8.69 ha assessment area would be sufficient to support a map scale of between 1:5000 and 1:10,000, which is considered appropriate for property scale decision making[15].

8. On-site point observations

The location and description of 20 auger observations for assessment area are provided in **Figure 7** (a larger image is included at the back of the report). Details of each observation point, including soil order, slope class, drainage, texture profile and depth of the A horizon is given in **Table 3**.

[13] Milne JDG, Clayden B, Singleton P.L, Wilson AD. 1995. Soil Description Handbook. Lincoln, New Zealand, Manaaki Whenua Press. 157p.
[14] Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF. 2009. Land Use Capability survey handbook – a New Zealand handbook for the classification of land. AgResearch Hamilton; Manaaki Whenua Lincoln; GNS Science Lower Hutt, New Zealand.
[15] Grealish G. 2017. New Zealand soil mapping protocols and guidelines. Envirolink Grant: C09X1606. Manaaki Whenua – Landcare Research

***Table 3**. Description of on-site point observations in the assessment area, 1799A Great South Road, Bombay.*

Observation point	NZSC Soil Order	A horizon depth (cm)	Soil profile texture (to 1 m)	Soil drainage
1	Granular	19	Silty clay loam over clay loam with concretions over clay	Moderately well to Imperfectly drained
2	Granular	18	Silty clay loam over clay loam with concretions over clay	Moderately well to Imperfectly drained
3	Granular	20	Silty clay loam over clay loam with concretions over clay	Moderately well to Imperfectly drained
4	Granular	19	Silty clay loam over clay loam with concretions over clay	Moderately well to Imperfectly drained
5	Fill Anthropic Soil	0	Gravel at surface (cannot auger)	Imperfectly drained
6	Fill Anthropic Soil	0	Gravel at surface (cannot auger)	Imperfectly drained
7	Granular	20	Silty clay loam over clay loam over clay	Moderately well drained
8	Fill Anthropic Soil	0	Gravel at surface (cannot auger)	Imperfectly drained
9	Granular	22	Silty clay loam over clay loam over clay	Moderately well drained
10	Fill Anthropic Soil	0	Gravel at surface (cannot auger)	Imperfectly to poorly drained
11	Fill Anthropic Soil	0	Gravel at surface (cannot auger)	Imperfectly drained
12	Granular	10	Clay loam over clay loam with abundant concretions over gravelly clay	Imperfectly drained
13	Fill Anthropic Soil	0	Concrete at surface (cannot auger)	Imperfectly drained
14	Fill Anthropic Soil	0	Gravel at surface (cannot auger)	Imperfectly drained
15	Granular	18	Clay loam over clay loam with abundant concretions over gravelly clay	Imperfectly drained
16	Metal track	0	Permanent gravel over compacted subsoil	-
17	Granular	22	Clay loam over clay loam with abundant concretions over gravelly clay	Imperfectly drained
18	Granular	21	Clay loam over clay loam with abundant concretions over gravelly clay	Imperfectly drained
19	Permanent gravel yard	0	Permanent gravel over compacted subsoil	-
20	Granular	25	Silty clay loam over clay loam over clay	Moderately well drained

Figure 7. *On-site point observations for the assessment area, 1799A Great South Road, Bombay 2579.*

9. On-site soil and LUC classification

A summary of the soil and LUC unit identified in the assessment area is provided in **Table 4**.

The assessment area is located within the Raventhorpe Volcanic Complex, specifically within the Raventhorpe Tuff Ring, a complex of basaltic lava flow and tuff material, commonly formed through the explosive interaction of magma with surface or ground water. **Figure 8** illustrates the approximate location of the assessment area with respect to the volcanic deposits of the Raventhorpe Tuff Ring.

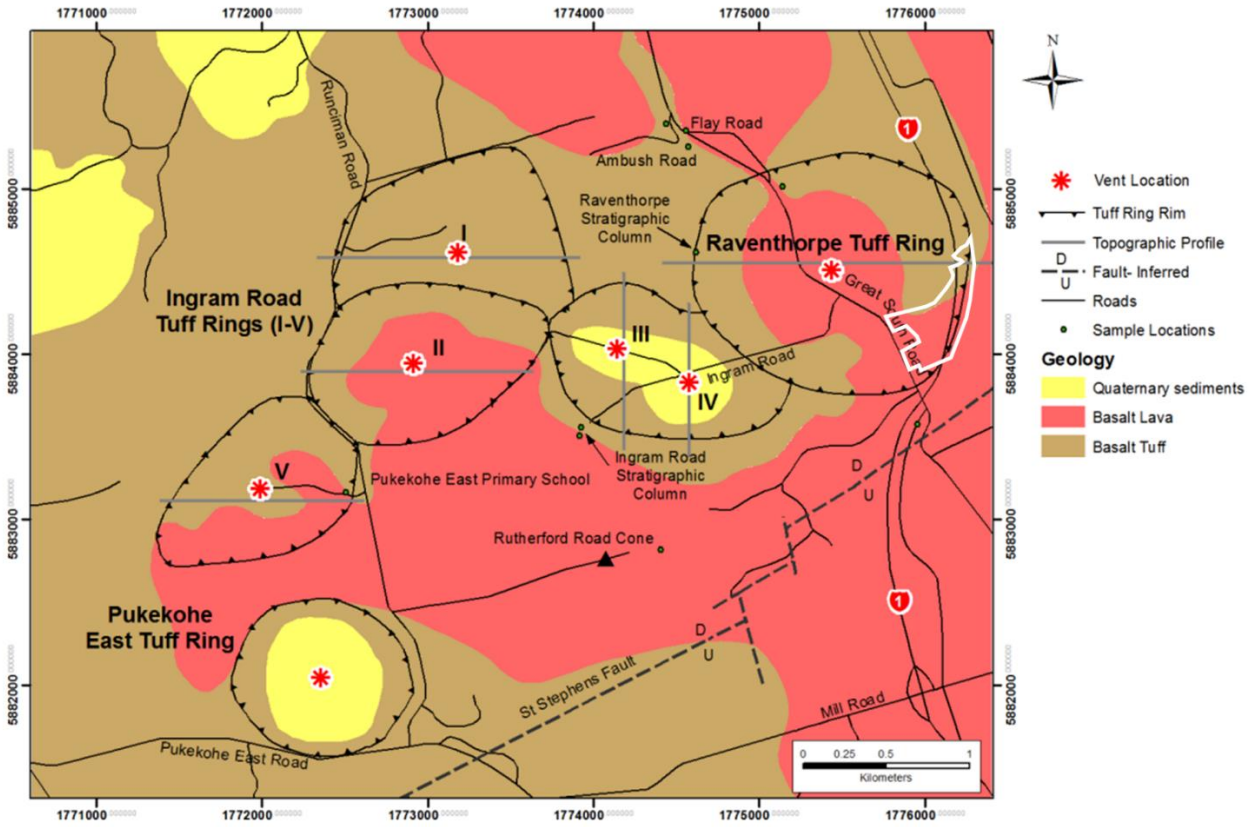


***Figure 8**. Map of the Raventhorpe Volcanic Complex, surrounding lava flows, faults and the approximate location of the assessment area in white (modified from Taylor, 2012)[16].*

The main soils observed and examples of non-productive land within the assessment area is shown in **Figures 9** and **10**. The soil profiles should be considered example soil profiles for each soil as the profile for actual soil observed in the field at any given point may differ slightly from the example shown.

[16]Taylor, S. N. (2012). Volcanology of the Raventhorpe and Pokeno West Volcanic Complexes, South Auckland Volcanic Field (Thesis, Master of Science (MSc)). University of Waikato, Hamilton, New Zealand. Retrieved from https://hdl.handle.net/10289/6516

***Table 4**. Soils and LUC unit identified in the assessment area, 1799A Great South Road, Bombay 2579.*

Soil type (NZSC Soil Order#)	Parent material	Texture profile	Soil drainage	Soil depth	Dominant slope class	Dominant LUC unit (limitation)
Hamilton clay loam (Granular Soil)	'Hamilton Ash'	Silty clay loam on clay loam on clay	Moderately well drained	Deep	A+B (0-5°)	2e2 (erosion)
Hamilton clay loam, concretionary phase (Granular Soil)	'Hamilton Ash'	Silty clay loam on clay loam (concretionary) on clay	Moderately well to Imperfectly drained	Deep	A (0-3°)	2s3 (soil)
Hamilton clay loam, concretionary phase (Granular Soil)	'Hamilton Ash'	Clay loam on clay loam (concretionary) on gravelly clay	Imperfectly drained	Shallow to moderately deep	A+B (0-4°)	3s3 (soil)
Modified Soil (Fill Anthropic Soil)	Deposited fill on soil developed in 'Hamilton Ash'	Gravel at surface or shallow clay loam on gravel	Imperfectly drained	Very shallow (topsoil absent or <10 cm)	A (0-3°)	4s* (soil)
Non-productive land (NPL)	Buildings, sheds, permanent gravel yards, 1-2 m high subsoil bunds, water tanks, swale drain, metal track					NPL

*LUC class and limitation only as no corresponding LUC unit in NZLRI Extended Legend; #as defined by the New Zealand Soil Classification[17]

The detailed on-site assessment identified that dominant soil in the flat to gently undulating southwestern part of the assessment area as the moderately well to imperfectly drained, deep, Hamilton clay loam, concretionary phase (Granular Soil), with a LUC classification of 2s3 (refer observation points 1 to 4 in **Table 3** and **Figure 7**). The Hamilton clay loam, concretionary phase, typically has a silty clay loam topsoil of 20 cm, underlain by a clay loam upper subsoil with few, medium black concretions (up to 0.5 cm in diameter), over a clay subsoil. An example profile of this soil is shown in **Figure 9A**. Concretions are soft and the soil is easily augered.

Ferromanganese (Fe-Mn) nodules and concretions are stone-like accumulations of iron and manganese oxides that form in soils with poor to imperfect internal drainage. Also known as redox concentrations these signify short-term water saturation (and oxygen depletion) interspersed with periods of oxidation[18].

In the northwest of the assessment area on flat to undulating slopes the imperfectly drained, Hamilton clay loam, concretionary phase, with gravelly clay subsoil dominates (refer observation points 12, 15, 17, 18 in **Table 3**, **Figure 7** and **9C**). Depth to gravels is variable and 1-5 cm gravels can be encountered within the top 20 cm of the soil profile (**Figure 9E**), however, comprising less than 35% volume, giving this land an LUC classification of 3s3. The gravels are likely volcanic and associated with the Raventhorpe Tuff Ring. Black, medium to coarse (up to 2 cm in diameter), Fe-Mn concretions, increase with depth from few to abundant, can occur in the topsoil, and comprise up to 60% volume in the subsoil (**Figure 9D** and **9F**). LUC class 3 land

[17] Hewitt AE. 2010. New Zealand Soil Classification. 3rd ed. Landcare Research Science Series No. 1. Lincoln, Manaaki Whenua Press.
[18] Hewitt, A.E., Balks, M. R., and Lowe, D.J., 2021. The Soils of Aotearoa New Zealand. Chapter 5 Gley Soils. Springer International Publishing.

has moderate physical limitations to arable use, and in this case, moderate structural impediments to cultivation, imperfect drainage, and stony soils.

There are two small areas of moderately well drained, deep, Hamilton clay loam (refer observation points 7, 9 and 20 in **Table 3**, and **Figure 7**), that run adjacent to the eastern boundary of the assessment area, an extension of the NZTA designation area (batter and drain), and the northwest of the assessment area between Great South Road and the existing sheds. These soils typically had a 20 to 25 cm A horizon (silty clay loam), over clay loam upper subsoil over clay (**Figure 9B**) and LUC classification of 2e2.

There are small areas of Fill Anthropic Soil (refer observation points 5, 6 and 13, 14 in **Table 3** and **Figure 7**). Land mapped as containing Fill Anthropic Soil has either a very shallow topsoil over gravel, or no topsoil and gravel at the surface (and unable to auger through) (**Figures 10C, 10D** and **10E**). These soils were classified as LUC 4s and have "severe physical limitations for arable use" and these limitations substantially reduce the range of crops which can be grown, and/or make intensive soil conservation and management necessary. In this case, LUC 4s land has severe structure impediments to cultivation (very shallow topsoil lacking natural fertility and/or stony)[19].

The balance of the assessment area includes the NZTA designation area (approximately 2.0 ha) and non-productive land (approximately 1.6 ha), including buildings and farm sheds, permanent gravel yards, 1-2 m high subsoil bunds, water tanks, drain, metalled track (**Figures 10A** and **10B**).

[19] Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF. 2009. Land Use Capability survey handbook – a New Zealand handbook for the classification of land. AgResearch Hamilton; Manaaki Whenua Lincoln; GNS Science Lower Hutt, New Zealand.

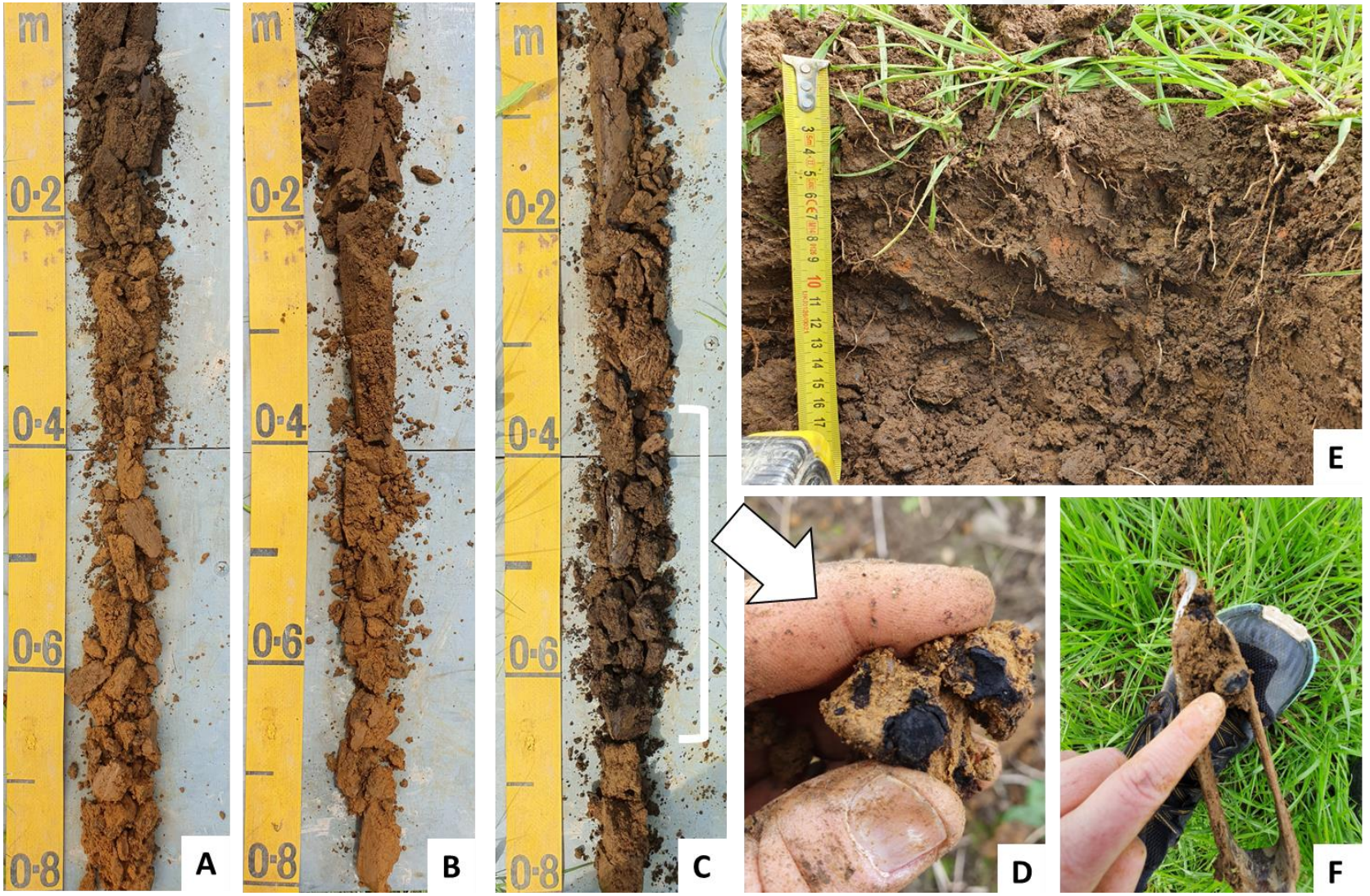


***Figure 9**. Example soil profiles of soils identified in assessment areas. A) Hamilton clay loam, concretionary phase on LUC 2s3 land; B) Hamilton clay loam on LUC 2e2 land; C) Hamilton clay loam, concretionary phase on LUC 3s3 land; D and F) Large 1-2 cm concretions, up to 60% volume at 40 cm depth in LUC 3s3 land; and E) 15-35% gravels within 20 cm of the surface in LUC 3s3 land.*

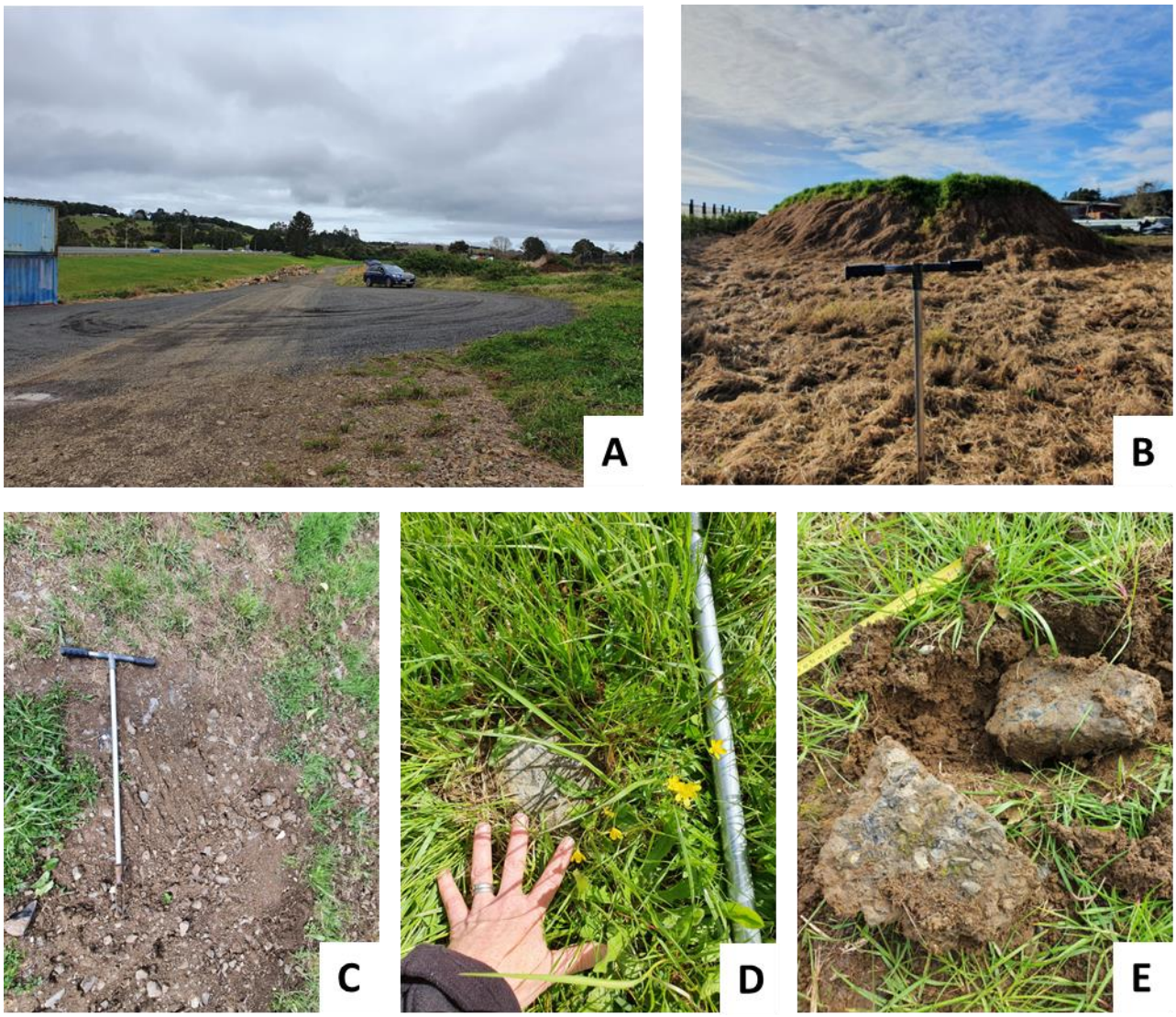


***Figure 10**. Examples of non-productive land and Fill Anthropic Soils identified in LUC 4s areas within the assessment area. A) Metal track and non-productive land near swale drain; B) 1.5-2 m high subsoil bund that surrounds assessment area; C) Fill Anthropic Soil in east; D and E) Concrete embedded into surface in LUC 4s area left of metal track.*

The estimated distribution of LUC units in the assessment area is shown in **Figure 11** (a larger map is provided at the end of the report).

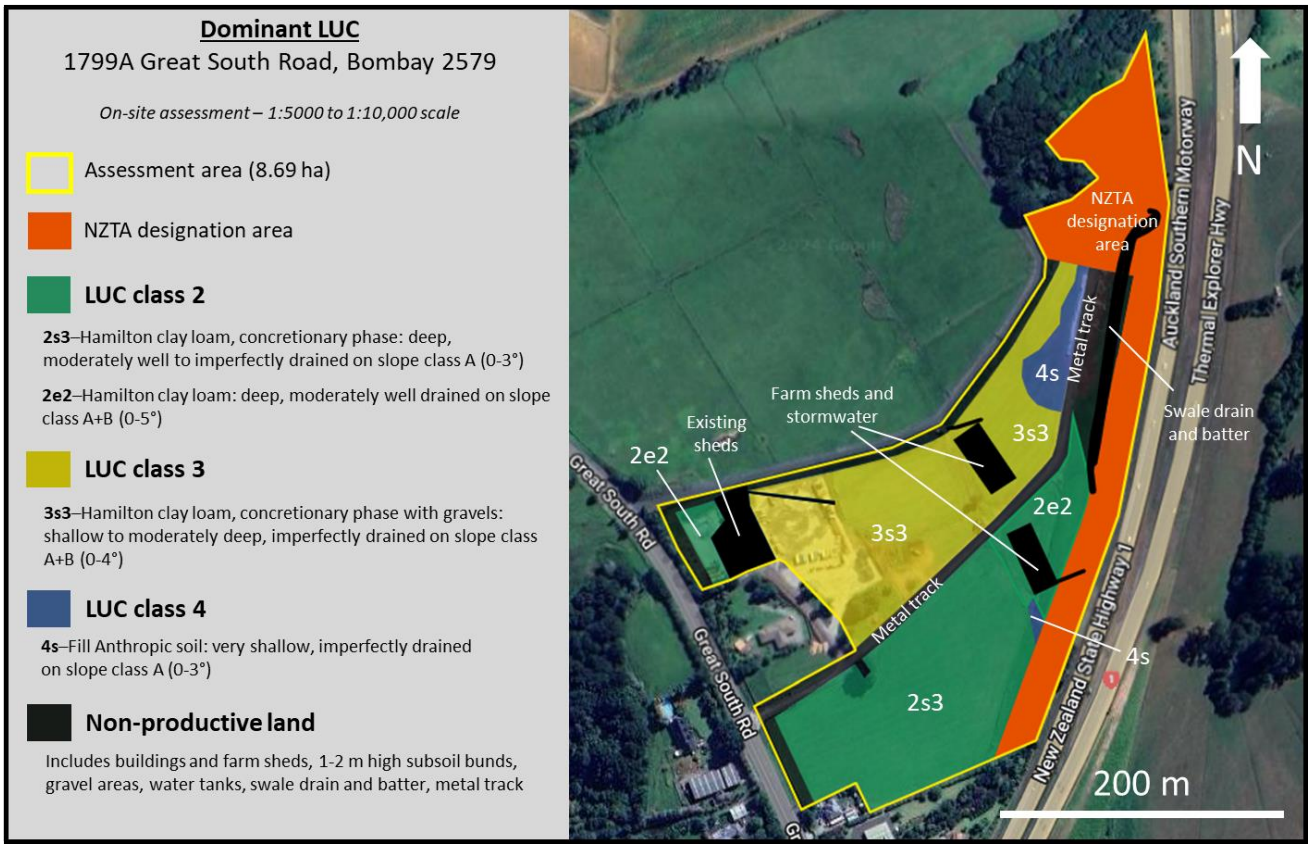


Figure 11. *The distribution of LUC units for the assessment area, 1799A Great South Road, Bombay 2579.*

10. On-site mapped AUP land containing elite and prime soil

The on-site mapped LUC map units for the assessment area were further classified according to the Auckland Unitary Plan (updated 18 April 2024) definition of elite and prime soil and are shown in **Figure 12** (a larger map is provided at the end of the report).

Applying the AUP definition for land containing elite and prime soil, moderately well drained LUC 2e2 and moderately well to imperfectly drained LUC 2s3 is classed as prime soil, and imperfectly drained 3s3 and 4s land is classed as other productive land.

Figure 12. *The distribution of AUP defined elite and prime soil within the assessment area, 1799A Great South Road, Bombay 2579.*

11. Summary

Based on the regional scale NZLRI LUC map information and applying the NPS-HPL, the assessment area is LUC 2e2 and is considered NPS-HPL highly productive land.

The 1799A Great South Road assessment area is 8.69 ha in size. Based on the on-site assessment, the dominant soils include the imperfectly drained, shallow to moderately deep, imperfectly drained Hamilton clay loam, concretionary phase with gravels (LUC 3s3); and moderately well to imperfectly drained, deep, Hamilton clay loam, concretionary phase on flat to gently undulating slopes (LUC 2s3).

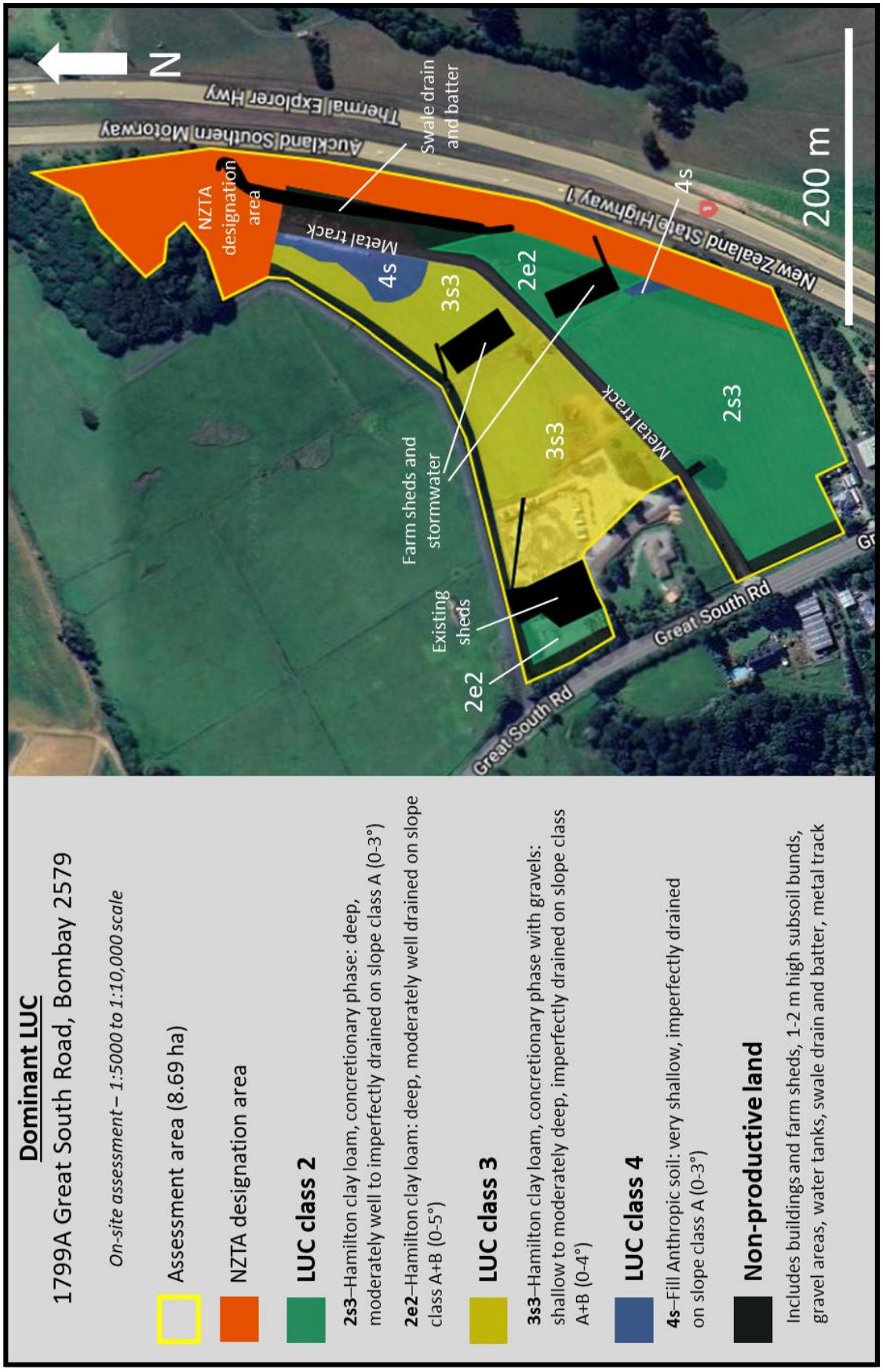
There are two small areas of moderately well drained, deep, Hamilton clay loam, that run adjacent to the eastern boundary and the northwest of the assessment area between Great South Road and the existing sheds (LUC 2e2). There are small areas of Fill Anthropic Soil which is either a very shallow topsoil over gravel, or no topsoil and gravel at the surface (unable to auger through) (LUC 4s). The characteristics of this Fill Anthropic Soil are consistent with the LUC handbook definition of land with “severe physical limitations to arable use”.

The balance of the assessment area includes the NZTA designation area and non-productive land, including buildings and farm sheds, permanent gravel yards, 1-2 m high subsoil bunds, water tanks, drain, and metalled track.

Based on the on-site mapping and applying the AUP definition for land containing elite and prime soil, elite soil was not mapped on the site. LUC 2e2 and 2s3 land is prime soil. Due to the imperfect drainage characteristics of the 3s3 land on site, and very shallow, stoney nature of the LUC 4s land, the remaining available productive land is classed as other productive land.

12. Enlarged map image from Figure 7.

13. Enlarged map image from Figure 11.



14. Enlarged map image from Figure 12.

Contact

Jeremy Hunt

Agribusiness Consultant

027 203 6182
Jeremy. hunt@agfirst.co.nz

AgFirst Waikato (2016) Ltd
26D Liverpool Street
PO Box 9078, Hamilton 3240, New Zealand
07 839 2683
www.agfirst.co.nz