Sunfield Fast-track

Auckland Council Specialist Memo

Annexure 17:

Soil and Land Use Capability

Dr Dani Guinto

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Soil and Land Use Capability Memo

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1. This memorandum addresses the soil and land use capability aspects of the Sunfield proposal.

Qualifications and Relevant Experience

2. I hold the qualifications of PhD in Soil Science from Griffith University, Queensland, Australia obtained in 1998, an MSc in Soil Science from the University of the Philippines Los Baños obtained in 1989, and a BSc in Agriculture (major in Soil Science) also from the University of the Philippines Los Baños obtained in 1983. During my bachelors and master's education, I have completed applied papers in Soil Survey and Classification; Morphology, Genesis and Geography of Soils; and Environment and Land Use. These papers covered soil description, soil mapping, land use capability classification and land suitability evaluation.

3. I have some 41 years of experience practicing as a Soil Scientist and have been in my current role at the Council since April 2021. In this role I oversee and develop monitoring and applied research programmes related to soil quality/health, land use and management. In this role I also review resource consent applications and provide specialist input to inform assessments under relevant provisions of the Auckland Unitary Plan Operative in part (**AUP**) that relate to land containing elite and prime soils and the National Policy Statement for Highly Productive Land 2022 (amended in 2024) (**NPS-HPL**).

4. I am a member of the New Zealand Society of Soil Science, a professional society that encourages the advancement of soil science. I am a life member of the Philippine Society of Soil Science and Technology, Inc., not for profit professional scientific organisation promoting the advancement of soil science and technology in the Philippines.

Preparation in Accordance with the Code of Conduct

5. I confirm that I have read the Environment Court Practice Note 2023 – Code of Conduct for Expert Witnesses (**Code**) and have complied with it in the preparation of this memorandum. I also agree to follow the Code when participating in any subsequent processes, such as expert conferencing, directed by the Panel. I confirm that the opinions I have expressed are within my area of expertise and are my own, except where I have stated that I am relying on the work or evidence of others, which I have specified.

Executive Summary

6. This review assesses the site-specific soil and Land Use Capability (**LUC**) mapping prepared by Landsystems for the proposed Sunfield development at Ardmore. The 188-hectare rural-zoned area is classified as highly productive land (**HPL**) under the NPS-HPL.

7. The site-specific mapping adequately characterises the soil and LUC units in the surveyed areas, identifying predominantly LUC Class 2 and 3 land with wetness limitations. However, 40.7 hectares were assessed only through desktop interpretation rather than field survey, and some areas currently in pastoral use were incorrectly classified as non-productive.

8. Despite wetness limitations, the land demonstrates high productivity potential with estimated pasture dry matter yields of 10-12 tonnes per hectare per year. Wetness limitations can be

managed through proper drainage and soil management practices, as evidenced by successful agricultural operations on similar soils in the area.

9. The presence of peat soils presents significant challenges for residential development, including subsidence risks and greenhouse gas emissions. The soils are best suited to remain in agricultural use under proper water table management.

Background

10. A request was made to review the site-specific soil/LUC mapping and report prepared by Landsystems (Hill, 2024) for a fast-track resource consent application for a proposed residential subdivision development called Sunfield by Winton NZ (FTAA-2502-1039 (BUN60447430)) covering about 244 ha at Old Wairoa Road, Cosgrave Road and Airfield Road, between Takanini and Papakura in south Auckland.

11. The investigation area focused on the rural zoned area covering 188 ha. The area is mapped in the NZLRI as containing HPL. The NPS-HPL aims to protect HPL (LUC classes 1 to 3) from inappropriate development, thus this review. An Auckland Council team site visit was undertaken on a rainy day on 11th July 2025. This report aims to assess the site-specific mapping and make visual observations on the soil conditions at the site.

Approach to assessing the site-specific soil/LUC report

12. A checklist approach was used to facilitate the assessment of the site-specific report as shown in the table below. The checklist consists of questions about the quality of the map and text components of the report answerable by a Yes or No. Relevant comments useful in the assessment are provided in the last column of the table. This is followed by a more detailed explanation to assess the overall quality of the report.

Title: National Policy Statement for Highly Productive Land Assessment of the Sunfield Site, Ardmore	**Report Date:** 11 Nov 2024	**Author:** Reece Hill **Company:** Landsystems **Prepared for:** Sunfield Developments Ltd
RC Application No.: FTAA-2502-1039 (BUN60447430)		
Note: The Hill (2024) report uses the site-specific soil/LUC site mapping completed by Singleton in 2020 for majority of the proposed project area which is included as an appendix to the report. Additional areas of the project site have not been field-surveyed and the LUC mapping was done using aerial photo interpretation according to Hill (2024).		
A. Map component	**Yes/No?**	**Remarks**
Is the map scale shown?	Yes & No	Hill (2024) report: As a bar scale (approx. scale is 1:16,667 on A4 size paper) in Figure 1 (location map, p. 5) and in Figure 3 (map of soils with wetness limitation, p. 9). Singleton (2020) report: No map scale provided in any of the maps shown.
Are locations of pits/auger borings shown?	No	Singleton (2020) mentioned 25 detailed soil borings were made but these locations are not plotted in any of the maps in the report.

Are the soil/LUC map units clearly shown?	Yes	Soil: Soil map units reported at the subgroup level of the NZ Soil Classification system. Shown as Figure 8 (p. 12) of the Singleton (2020) report. The map has no scale. LUC: LUC units are shown in Figure 6 (p. 9) of the Singleton (2020) report. The map has no scale.
Is there a map legend for both soil and LUC maps?	Yes	Both soil and LUC maps have legends shown in the Singleton (2020) report with legend descriptions as above (Figures 8 and 6).
B. Text component		
Are any published or online map(s) mentioned?	Yes	NZLRI LUC map at 1:50,000 scale was referred to and shown as Figure 2a in the Hill (2024) report, p. 8). It shows two LUC units: 2w2 on the western part and 2s4 on the eastern part.
Are there pit/auger boring soil descriptions?	Yes	Shown as Table 2 (p. 13) in the Singleton (2020) report. Described according to soil type, soil order, soil subgroup, drainage class and soil parent material. Additional description is provided in Table 3 (p. 14) showing LUC subclass, soil, slope, erosion risk and drainage.
Are there photographs of pits/auger borings?	Yes	Sample auger boring pictures show six soil classes classified into subgroup level according to the NZ Soil Classification system to a depth of 100 cm depicted in Figure 7 (p. 11) of the Singleton (2020) report. Soil landscape photos are also provided in the Singleton (2020) report showing the different LUC units at different topographic positions (Figures 3-5, pp. 7-8).
Is there a table showing areas (and percentage) of LUC classes?	Yes	Shown in Table 4, p.9 of the Singleton (2020) report consisting of five LUC units (2s4, 3w2, 2w2, 2e5 and 3e4), one LUC subclass (6e), and buildings and accessways.
Are reasons for classifying LUCs described well?	Yes	The LUC units were delineated based on observed slope classes, drainage classes, soil types, etc. in the Singleton (2020) report on pp. 6-9.
Are references to standard methods/protocols of soil description, LUC mapping, etc. mentioned?	Yes	Cited NZ Land Use Capability Survey Handbook, NZ Soil Description Handbook, Soil Survey of Manukau City, Auckland-Waikato LUC Extended Legend and Farm-scale LUC classification for Auckland in the Hill (2004) report and the Singleton (2020) report

Site-specific mapping comments

13. The Singleton (2020) report shows the distribution of soil types in the surveyed area (Figure 1). Area-wise, the majority of the site is mapped as Gley and Organic (peat) soils with poor drainage

followed by imperfectly drained mottled Ultic soil in the southeast and moderately well-drained or well-drained Allophanic soil in parts of the northeast. The resulting LUC classification map by Singleton (2020) shows highly productive LUC classes 2 and 3 with majority of the site having a wetness (w) limitation followed by those with erosion (e) and soil (s) limitations (Figure 2).

14. This map differs from the NZLRI 1:50,000 LUC map in that it identified more LUC units, an outcome which is expected. The NZLRI map identified only two LUC units (2w2 on the western part and 2s4 on the eastern part of the project area). The more detailed LUC map was subsequently used by Hill (2024) to produce a map of soils with a wetness limitation which are LUC units 3w2 and 2w2 (Figure 3). This map also includes the non-surveyed zones covering a combined total area of 40.7 ha in the northeast and southwest of the project area. Hill (2024) stated that he has not visited the site but relied on the existing site-specific soil/LUC report by Singleton (2020), aerial photo interpretation and discussions with Dr Singleton.

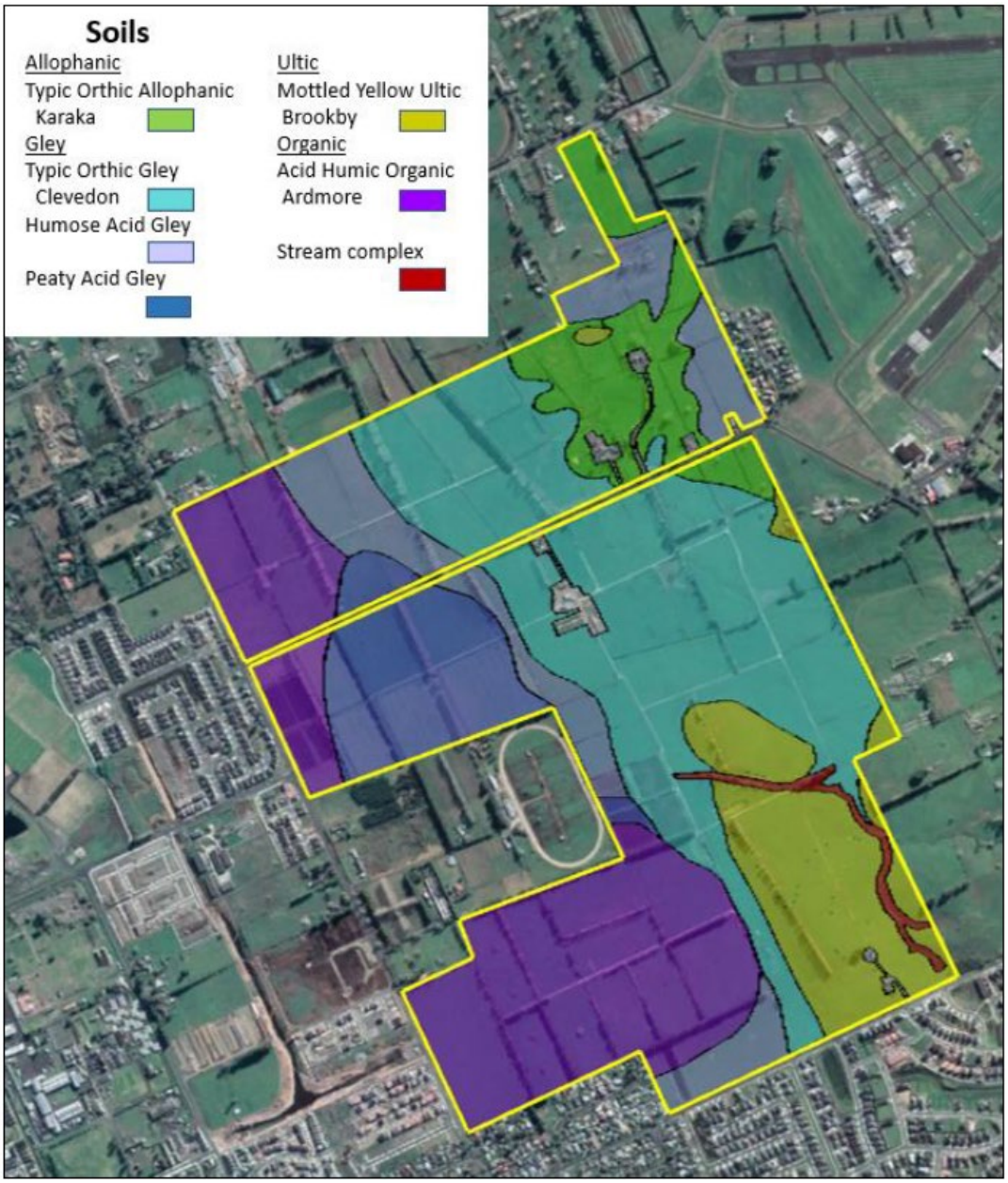

Figure 1. Soil map from the Singleton (2020) report showing the assessed site being dominated by Gley and Organic (peat) soils followed by mottled Ultic soil in the southeast and Allophanic soil in parts of the northeast.

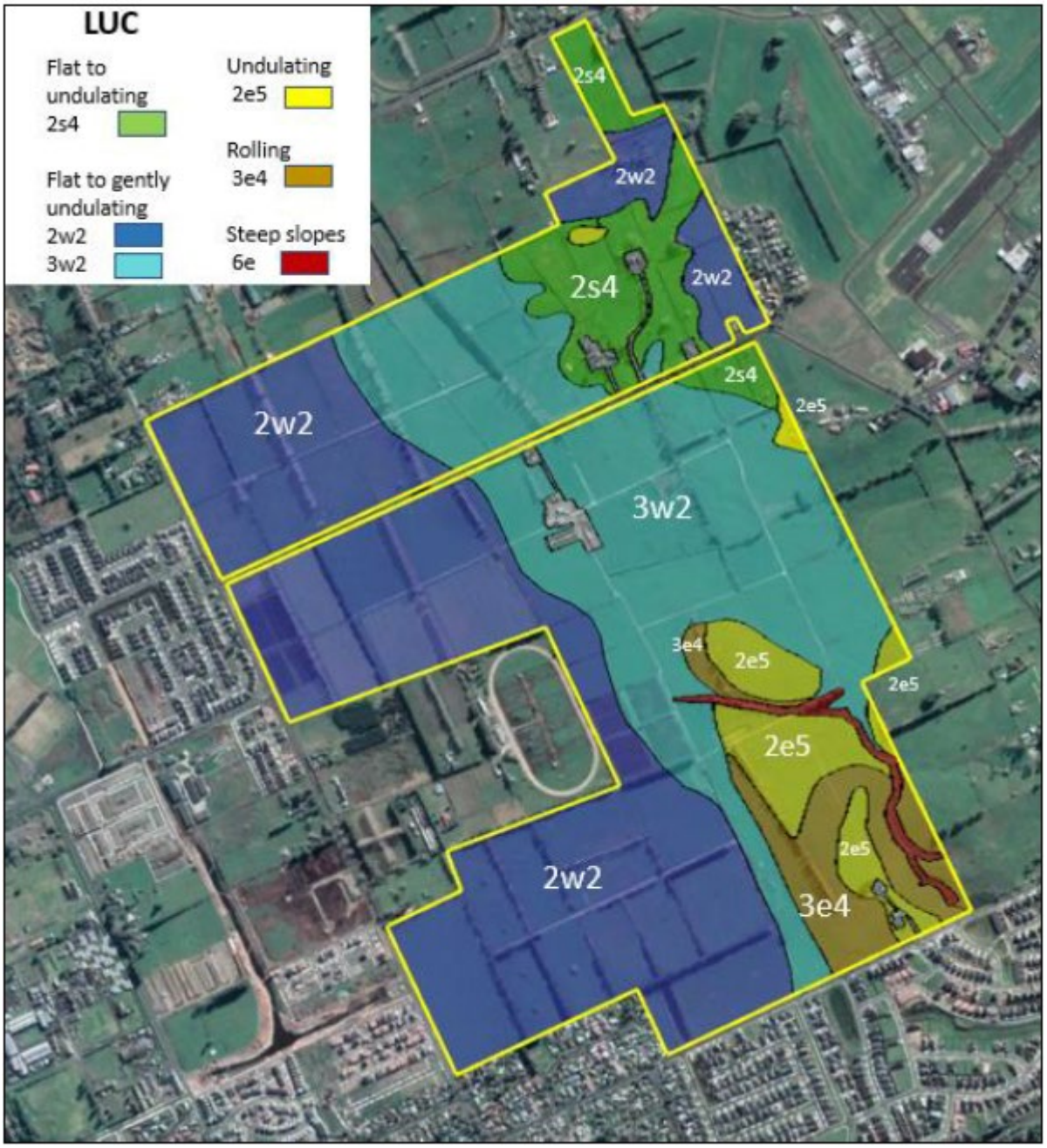

Figure 2. Map of LUC units from the Singleton (2020) report showing highly productive LUC classes 2 and 3 with majority of the site having a wetness (w) limitation.

15. Given that the combined size of the additional areas not included in the Singleton (2020) report is large, there should have been a separate site-specific soil/LUC mapping exercise done for this to capture spatial variation in soil types and/or LUC classes considering this is a large-scale fast-track resource consent application project. Instead, only a desktop assessment was done. It is also noted that the non-surveyed area where the Abernethy Racing Stables is located was classified as a non-productive area (Figure 3) when it is clearly on pasture as seen in Google Maps, a similar observation made by Underwood (2025).

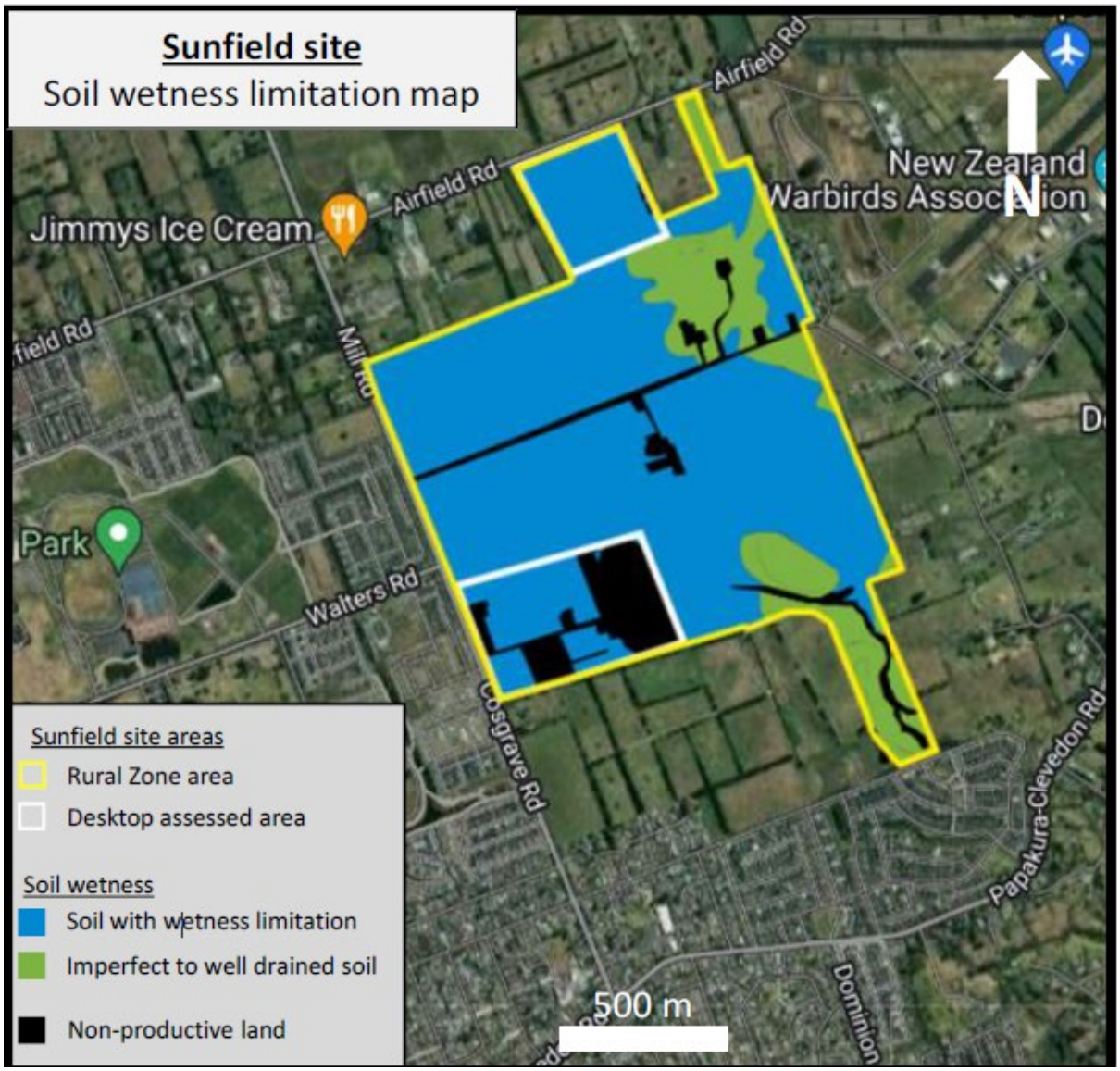

Figure 3. Map showing the distribution of soils with a wetness limitation (blue-coloured polygons, LUC classes 3w2 and 2w2) that include the non-field surveyed areas (enclosed by white polygons) (Hill, 2024).

16. Singleton (2020) concluded that the site was predominantly LUC class 2 land with some LUC class 3 land and that most of the soils had drainage issues and additional limitations such as clay, acid conditions, subsidence or rolling slopes. I agree with the LUC classification mapping of the surveyed area, except as noted in Table 1 above, none of the maps produced has a scale indication given that it is much more detailed than the NZLRI map. Hill (2024) indicated that because of the wetness limitation, these soils cannot support intensive horticultural crops but can only support pastoral land use. However, Dent and Young (1981, p. 137) note that heavy, wet clays can be highly profitable under good pasture management even if they could not to make it to the highest capability classes (LUC 1 and 2).

17. Moreover, wetness limitation or poor drainage is a limitation that is removable through the installation of drains to make farming more favourable to support arable or horticultural cropping. It is only excess wetness even after drainage has been installed that presents a permanent limitation (Lynn and others, 2009, p.86). Photos from the site visit show pastoral land use with horses and cattle grazing in the area. Drains are also present and operational

during the visit (Figure 4). Especially on areas with peat soils, drainage is essential to enable agricultural or horticultural use – the important thing to remember is not to over-drain by maintaining the water table about 0.5 m below the surface on average to minimise oxidation and shrinkage (bearing in mind that it will rise higher during winter and fall lower during summer). Over-drainage would accelerate the oxidation of peat and would result in rapid subsidence.

18. Examples of areas of peat or peaty and poorly drained mineral soils that can be productive when drained include Ardmore Veggies, a 13-ha operational vegetable farm about 5 km east of the site and Ardmore Nurseries, a 14-ha property about 7.5 km east of the site, that grows and supplies many types of plants ranging from grasses, ferns, succulents, trees, etc. to garden centres and plant retailers for 50 years.

Figure 4. Horses and cattle grazing on pasture (top photos) and a drainage ditch in operation during the site visit (lower photo).

Soil productivity estimates

19. It is difficult to provide estimates of vegetable, fruit or crop yield associated with the LUC units on productive soils since these data are privately held by growers and are not widely available, and therefore an estimate of lost productivity on these land uses during land conversion to other uses is not possible. However, estimates of dry matter yields for improved pasture are

available in Auckland Council's Geomaps. This map is based on the work of Hicks and Curran-Cournane (2017) that matched farm production data to LUC classes in the Auckland region.

20. These estimates are based on published and unpublished data from pasture yield trials conducted over many years. Figure 5 shows the map of estimated dry matter yield for improved pasture of the project area. The majority of the site has an estimated pasture dry matter yield of between 10 to 12 t/ha/yr with a smaller area to the east with a higher estimated yield range of 12 to 14 t/ha/yr. Any pasture dry matter yield above 10 t/ha/yr can be considered high so these LUC classes 2 and 3 land are capable of good pasture production despite majority of the area having a wetness limitation. Thus, these highly productive lands should be protected from non-agricultural land uses in accordance with the NPS-HPL.

Figure 5. Map of estimated dry matter yield for improved pasture in the proposed Sunfield residential development area (Source: Auckland Council Geomaps, Scale 1:50,000).

A note on residential development on peat soils

21. The presence of peat soils in the western and central parts of the project site (Figure 1 and Meffan, 2024) presents a challenge to residential development. Although it can be overcome by engineering solutions (Meffan, 2024), it can prove costly on the part of the developer and infrastructure owners. As noted by Beaumont (2021) in residential development in the nearby Takanini area, the main geotechnical issues associated with them are the low undrained shear strength and high settlement potential under fill and building induced loads. Facilities that lack special foundations may settle at different rates. This differential settling causes breakage, high maintenance costs and inconvenience (Muckel, 2004). They are also susceptible to widespread settlement from drawdown of the groundwater table beyond the historic summer low, and groundwater recharge is required.

22. I note that in this instance it is considered by LDE for the Applicant and Mr John Newsome in his review for the Council that there are potential engineering solutions to these issues for the development, subject to a further review of the engineering design as against the most up to date cut and fill plans.

Conclusion

23. The site-specific soil/LUC mapping and report in the surveyed area by Singleton (2020) adequately characterised the soil and LUC units at the site with the exception that none of the maps have a scale indication provided given that it is more detailed than the 1:50,000 NZLRI LUC map. Site-specific mapping of the additional areas mentioned in the Hill (2024) report

should have been conducted given the large area involved (40.7 ha) rather than just doing a desktop interpretation exercise. The area labelled as non-productive should have been given an LUC classification since much of that area is currently under pastoral land use.

24. While wetness or poor soil drainage has been identified as the main land limitation on LUC classes 2 and 3 land, this limitation can be overcome by proper drainage and good soil management using current technology and farming practices. Despite the wetness limitation, dry matter estimates on these LUC classes under improved pasture are quite high (10 to 12 t/ha/yr). Thus, these highly productive lands should be protected from non-agricultural land uses in accordance with the NPS-HPL.

25. The presence of peat soils in the western and central parts of the project site presents a challenge to residential development. However, in this case there are potential engineering solutions which may overcome these challenges.

References

Beaumont, J. L. 2021. Settlement performance of dwellings constructed on Takanini peats. New Zealand Geotechnical Society Symposium 2021. Good Grounds for the Future, 24-26 March 2021, Dunedin, New Zealand. https://www.nzgs.org/libraries/settlement-performance-of-dwellings-constructed-on-takanini-peats/#:~:text=Background,Road%20to%20beyond%20Ranfurly%20Road.

Cleland, E. undated. Navigating the quagmire: The risks of developing on peat soils in the Waikato. Property Council New Zealand https://www.propertynz.co.nz/news/opinion-navigating-the-quagmire-the-risks-of-developing-on-peat-soils-in-the-waikato

Dent, D. and Young. A. 1981. Soil Survey and Land Evaluation. George Allen & Unwin Publishers Ltd., London.

Hicks, D. L. and Curran-Cournane, F. 2017. Matching farm production data to land use capability for Auckland. Auckland Council technical report, TR2017/020 https://knowledgeauckland.org.nz/media/1156/tr2017-020-matching-farm-production.pdf

Hill, R. 2024. National Policy Statement for Highly Productive Land: Assessment of the Sunfield Site, Ardmore. Landsystems, Hamilton.

Lynn, I., Manderson, A., Page, M., Harmsworth, G., Eyles, G., Douglas, G., Mackay, A. & Newsome, P. 2009. Land Use Capability Survey Handbook: A New Zealand Handbook for the Classification of Land. 3rd edition. AgResearch Ltd, Hamilton; Landcare Research New Zealand Ltd, Lincoln; Institute of Geological and Nuclear Sciences Ltd, Lower Hutt, 163 pages.

Meffan, K. 2024. Sunfield Developments Limited Geotechnical Assessment Report. Sunfield Landholding, Ardmore. Land and Development Engineering, Auckland. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0014/3911/24.-Sunfield-Geotechnical-Assessment_part-a.pdf

Muckel, G. 2004. Subsidence of organic soils, pp. 87-89. In Muckel, G. (ed.) Understanding Soil Risks and Hazards: Using Soil Survey to Identify Areas with Risks and Hazards to Human Life and Property. USDA, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, Nebraska

Singleton, P. 2020. Land use capability and soil assessment – Hamlin Road, Ardmore. Natural Knowledge, Hamilton.

Underwood, R. 2025. Specialist input (memo) on highly productive land in proposed Sunfield development. Fruition Horticulture, Tauranga.