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Desktop soil and Land Use Capability classification assessment

55 Brookvale Road, Havelock North 4130

(Lot 2 DP 311724, Lot 1 DP 311724, Lot 1 DP 8274)

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1. Introduction

A desktop soil and Land Use Capability (LUC) classification assessment of 55 Brookvale Road, Havelock North 4130 (the “Brookvale Road site”), (**Figure 1**) was undertaken to comply with the National Policy Statement for Highly Productive Land (NPS-HPL).

The Brookvale Road site is extensively developed, and it is very likely that the soils on the site in their current state are modified to an extent that they are no longer considered available for primary productive use and are best considered non-productive land. The purpose of the desktop assessment was to confirm the presence of any highly productive land on the site, or whether the site was considered non-productive land, and as such the NPS-HPL would not apply.



Figure 1. Soil and LUC assessment area for 55 Brookvale Road, Havelock North 4130.

2. Background

Soils

The soils are represented on a map as map units. These map units may contain one or more soils (this varies depending on the complexity of the soil map and the scale of mapping). Generally, there is one dominant soil in a map unit which will determine the LUC classification for that map unit.

Land Use Capability

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 system is provided in the Land Use Capability Survey Handbook, a 3rd edition of which was published in 2009 (Lynn et al., 2009)¹.

The LUC assessment identifies areas with similar rock type, soil, slope, erosion types and degree and vegetation cover. Where any one of these factors changes significantly a boundary is drawn and a new map unit created. Based on this physical inventory, together with an understanding of climate an assessment is made of each unit's capacity for long term sustained use. Thus, the property is completely covered by mapped units which identify areas having similar physical attributes.

There are eight (8) land use capability classes as recognised in the New Zealand Land Resource Inventory with limitations for use and land use versatility increasing from 1 to 8, with 8 considered unsuitable for productive use and best managed for catchment protection.

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. This is important because some land management practices (e.g. the placement of tracks, excavation for and placement of buildings, excavation of drains, soil remediation for soil contamination, and general earthworks) cause 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 modified soil areas. In essence, these are soil areas classified as Anthropogenic Soils², and can no longer be assessed using the LUC classification or considered high class soil.

Non-productive land includes modified soil areas as well as other areas such as streams, wetlands, native vegetation, and retired and planted areas.

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.

² Hewitt AE (2010) New Zealand Soil Classification. 3rd ed. Landcare Research Science Series No. 1. Lincoln, Manaaki Whenua Press.

3. National Policy Statement for Highly Productive Land

The National Policy Statement for Highly Productive Land (NPS-HPL)³ came into force on the 17th October 2022 (clause 1.2(1)).

“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).

My 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”

My assessment has been carried out using the Land Use Capability classification.

4. Assessment method

Landsystems did not undertake on-site soil observations and LUC mapping of the assessment area. The soil and LUC assessment was undertaken using the following:

- Available NZLRI soil and LUC map information⁴.
- Aerial photographs available on Google Earth.
- Geotechnical drilled bore logs provided by Initia Limited⁵.

The available NZLRI soil and LUC map information was used identify the expected soil on the site. The description(s) were compared with the information provided by the drilled bore logs on the site, to determine whether the original soil was present or whether the soil had

³ National Policy Statement for Highly Productive Land 2022. September 2022.

⁴ <https://iris.scinfo.org.nz/layer/48076-nzlr-land-use-capability-2021/data/110440/>

⁵ Initia Limited. 2021. Brookvale Residential Geotechnical Assessment Report.

been modified, and Anthropogenic Soil was present. If the original soil was present, the soil's corresponding LUC classification could be applied to determine if the site contained highly productive land as defined by the NPS-HPL. If the soil was not present and the soils were Anthropogenic Soil⁶, then the site would be considered non-productive land, and the NPS-HPL would not apply.

5. Soil and LUC assessment

LUC and soil classification from available map sources

The available New Zealand Land Resource Inventory (NZLRI) sources of soil and LUC map information⁷ maps the soils and LUC units in the assessment area as moderately well drained Havelock soils on slope class A (0-3°).

A description of the Havelock soil properties is provided in **Appendix 1**. An example soil profile of the Havelock soil is shown in **Figure 2**.

Based on the NZLRI map information, Havelock soil on slope class A is classified as LUC 3s6.

Applying the NPS-HPL, LUC 3s6 is defined as highly productive land.

Based on the NZLRI map information, the entire assessment area is highly productive land as defined by the NPS-HPL.

⁶ Hewitt AE (2010) New Zealand Soil Classification. 3rd ed. Landcare Research Science Series No. 1. Lincoln, Manaaki Whenua Press.

⁷ <https://iris.scinfo.org.nz/layer/48076-nzlr-land-use-capability-2021/data/110440/>

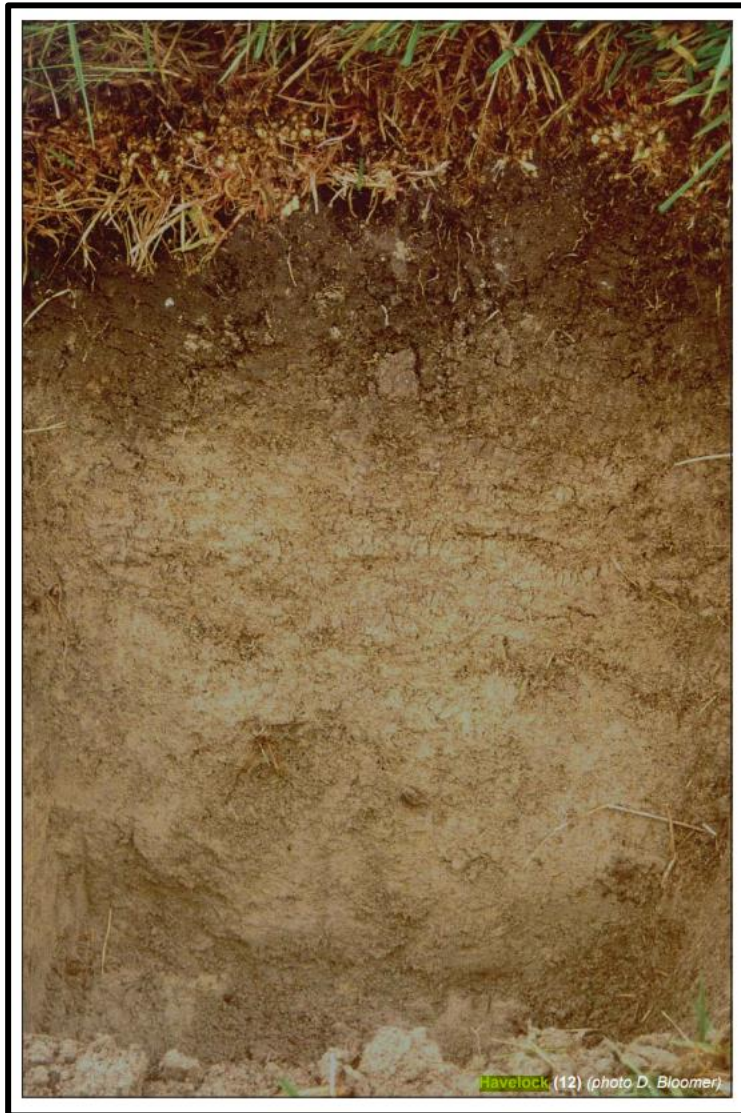


Figure 2. Example soil profile of the Havelock soil (from Griffiths, 1997)⁸.

Aerial photographs

Aerial photography from 2019⁹ indicated that the Brookvale Road site had been extensively modified with nursery buildings, a garden centre, carparks, landscaped areas, recontour areas, and other buildings and dwellings (**Figure 3 (a)**).

Recent aerial photography from 2023¹⁰ indicates that in its current condition many of the buildings on the site have been removed and the site is predominantly cleared, with the exception of some remaining buildings and two dwellings and curtilage (**Figure 3 (b)**).

⁸ Soil map of the Heretaunga Plains [cartographic material] / soil map and legend compiled by E. Griffiths, 1997, from the Soil map of Heretaunga Plains, Hawkes Bay (DSIR 1938) with additional soil surveys by E. Griffiths ... [et al.], 1971-1991, and by E. Griffiths, 1991-1997.

⁹ Google Earth image 20/3/2019.

¹⁰ Google Earth image 4/2023.



Figure 3. Aerial photographs of the Brookvale Road site, (a) 2019, (b) 2023.

Geotechnical borehole log data

Geotechnical bore log data for the Brookvale Road site was provided by Initia Limited. The data consisted of description logs from three drilled boreholes, the locations of which are shown in **Figure 4**.



Figure 4. Drilled borehole locations on the Brookvale Road site.

Log descriptions and photos of the bore log cores for the upper one metre (0-1 m) were used to determine whether the material in the cores resembled similar characteristics (e.g. soil texture and colour) to the Havelock soil profile. Characteristics included the presence of an A horizon (topsoil) overlying a yellowish brown subsoil, with a predominant sandy loam texture throughout.

The upper 2.0 m detailed bore log data and photo the for the three drilled bores (BH1, BH2 and BH3) are provided in **Figures 5-7**.

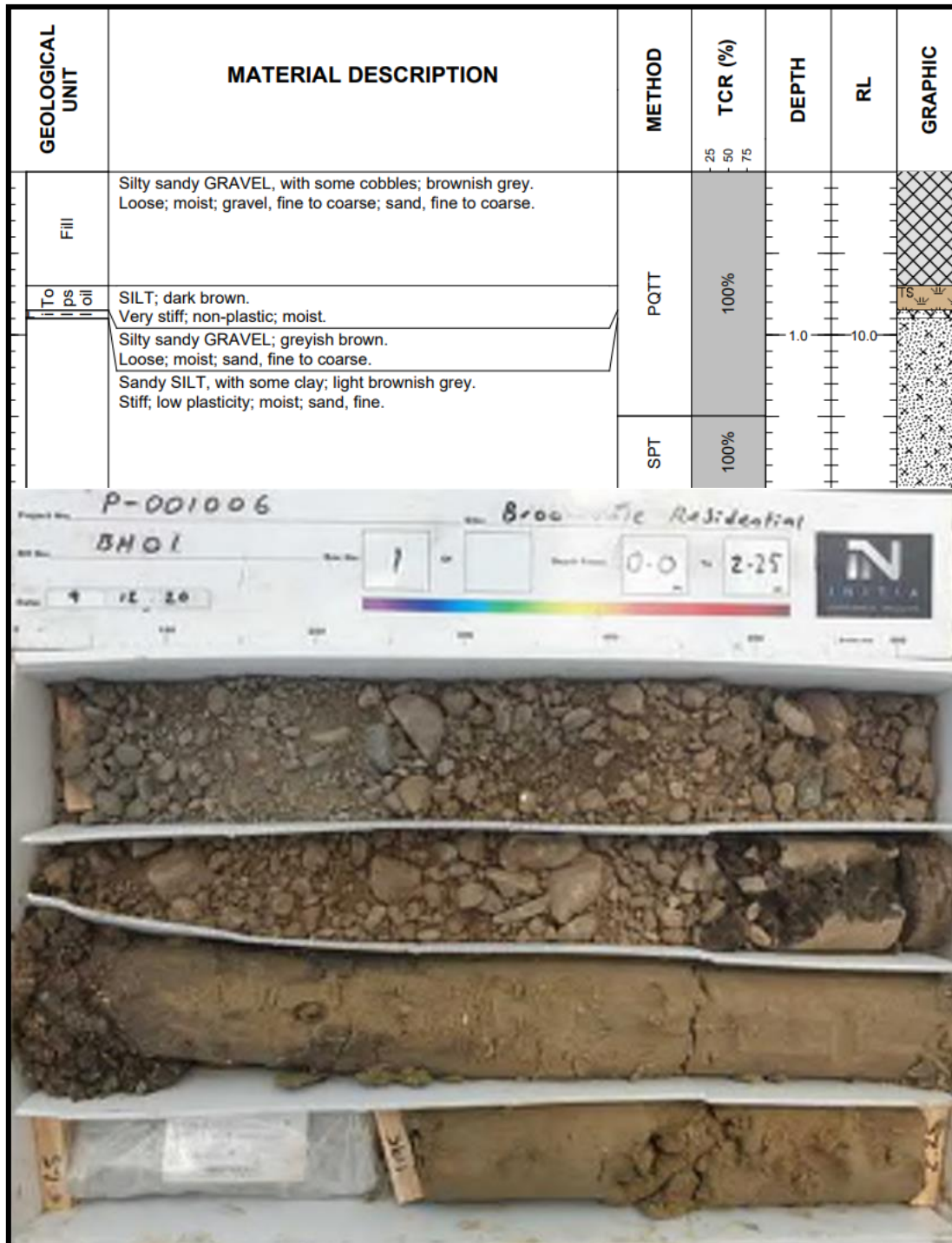


Figure 5. Upper 2.0 m detailed bore log data and photo for the for Bh1.



GEOLOGICAL UNIT	MATERIAL DESCRIPTION	METHOD	TCR (%)	DEPTH	RL	GRAPHIC
Fill 1	Silty SAND; dark grey. Medium dense; moist; sand, fine to medium.	PQTT	100%	1.0	8.0	
	SILT, with trace clay; dark brown grading to greyish brown. Stiff; moist. 0.30m - 0.35m: Silty PEAT (FIBROUS). 1.10m - 1.15m: Clayey silty GRAVEL. Medium dense; moist.					
	Clayey SILT; mottled grey/brownish grey. Stiff; low plasticity; moist.					
	Clayey SILT; greenish grey. Very stiff; high plasticity; moist.	SPT	100%	3.0	7.0	
Silty SAND, with trace shells and gravel; light grey. Loose; dilatant; wet; sand, fine; gravel, medium.						



Figure 6. Upper 2.0 m detailed bore log data and photo for the for Bh2.

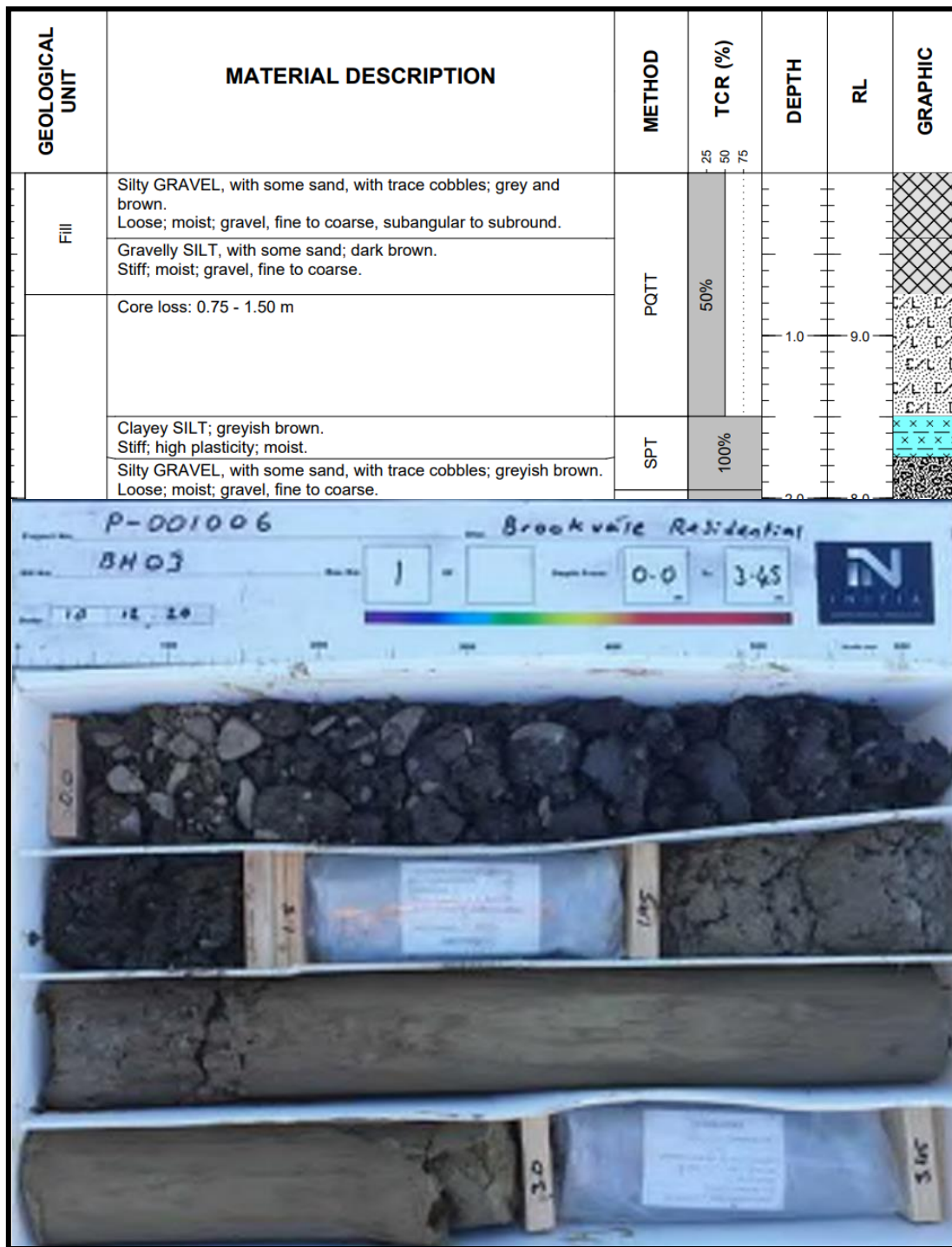


Figure 7. Upper 2.0 m detailed bore log data and photo for the for Bh3.

A summary of my interpretation of the bore log core data, photo observations and estimated LUC and NPS-HPL highly productive land classification is provided in **(Table 1)**.

Table 1. Interpretation of the bore log core data and photo observations and LUC and NPS-HPL highly productive land classification.

Bore log core number	Bore log characteristics (top 1.0 m)	Estimated LUC classification	NPS-HPL highly productive land (HPL)
1	70 cm of gravelly fill over original soil profile, with silty topsoil and greyish brown silty sandy gravel.	Modified soil – classified as non-productive land. Not LUC 3s6.	Not HPL
2	20 cm of dark grey silty sand fill over dark brown to greyish brown silt.	Not LUC 3s6 Underlying poorly drained soil material.	Not HPL
3	75 cm silty gravel fill (core loss underlying).	Modified soil – classified as non-productive land. Not LUC 3s6.	Not HPL

The inferences that can be made from the cores is somewhat limited as they only provide a few points of observation across the site. However, all three LUC cores showed fill overlying soil material. Of the three cores, BH1 possibly had soil material underlying the fill that resembled soil material similar to the Havelock soil. The other two cores did not, and most likely had original soils that were poorly drained.

The presence of fill in the upper 20-75 cm of the cores indicated that the original soil at all three cores had been modified, with placement of fill and possibly some excavation before placement.

6. Revised LUC classification

The bore log core data and photo observations, in combination with the aerial photographs, confirms that the site has undergone modification of the original soil, including excavation of the soil, placement of fill, establishment of buildings and curtilage. The land in its current state cannot be assigned a LUC classification due to the degree of modification and is best considered non-productive land.

In my opinion, the entire site is most appropriately classified as non-productive land.

7. Conclusions

Pre-development the soil on the site were identified by NZLRI regional soil map information as well drained Havelock soils on slope class A (0-3°).

Based on the NZLRI LUC map information, the Havelock soils on the site were classified as LUC 3s6 and would be considered highly productive land as defined by the NPS-HPL.

Based on my interpretation of the geotechnical bore observations it is very unlikely there is any original soil on the site. Considering the extent of development and building across the site as shown by the aerial photography, the site is appropriately classified as non-productive land.

In my opinion, the entire site is not highly productive land as defined by the NPS-HPL, and as such the NPS-HPL does not apply.

8. Appendix 1: Havelock soil properties (from Griffiths, 1997).

12 - Havelock		
Soil Properties		
Parent material	water deposit (alluvium) of hill streams from limestone and greywacke	
Characteristic site and soil features	Narrow terraces on the sides of hill streams from the Havelock and other hills on the southern boundary; soils are alkaline with bits of limestone. The textures varying with the type of limestone - sandy loams from sandy limestone and clay loams from clayey limestone	
Associated soils not shown within map unit at map scale but separated out in more detailed maps. - Sample Location	11, 32	B
Natural drainage and depth to gley and hence to water table after wet periods	12 12h	good - >60cm mperfect - 30-60
Potential rooting depth, texture, and limiting layer	12 12h	>45cm sandy loam from sandy limestone >45cm clay loam from clayey limestone
Available water capacity	12 12h	50-75mm 50-75mm
Infiltration rate	12 12h	moderate if compacted - slow
Permeability rate	12 12h	moderate slow
Susceptibility of topsoil to pugging and compaction	12 12h	moderate very high
Unfavourable soil characteristics	12 12h	pieces of limestone in topsoil high pH (alkaline) heavy topsoil - easily compacted slow infiltration subsoil of slow permeability free lime present - high pH (alkaline)
Soil Management		
Artificial drainage: drain spacing	12 12h	none required 20-40m
Cultivate when moist to avoid: compaction	12h	
Irrigation:-		
recommended method	12h	sprinkler to prevent waterlogging
application rate	12h	slow <4mm/hr
Dripper spacing for continuous wetted Strip		if 4 l/hr drippers used
Amount and frequency	12 12h	40cm 60cm