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# **LAND CAPABILITY FOR URBAN AND RELATED USES IN THE BERWICK-PAKENHAM AREA AND THE SHIRE OF HASTINGS**

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## **SUMMARY**

The Shire of Hastings and an area between Berwick and Pakenham were selected as pilot study areas for land capability assessment within the Westernport Bay Catchment, as shown in the location map, Fig. 1. Different types of land were recognised from stereo-interpretation of 1:25 000 scale aerial photographs and by field inspection and sampling, and were mapped on 1:50 000 topographic base maps and 1:10 000 base maps or orthophotos where these were available. The map units were described in terms of land characteristics considered relevant for land capability assessment.

Land capability rating systems were developed for a range of activities related to urban development, under the general headings, - engineering and waste disposal, earth resources, recreation, and subdivision. These were used to assess the capability of all map units in terms of the kind and degree of limitation to the uses. This information can be used by planners to guide land use to areas best suited to the use and to indicate appropriate management.

# PART I - OUTLINE OF THE STUDY

## 1. Introduction

In Victoria as elsewhere, increasing demands are being made to develop land for a wide range of uses. However, development is often hasty and many factors essential for success are overlooked or misunderstood. An understanding of the limitations to the use caused by the physical properties of the land is a part of the information needed by land use planners. This information can be presented in the form of land capability ratings, which provide an assessment of the ability of the land to support the particular use without deterioration.

This study was undertaken by the Soil Conservation Authority as a field exercise in which procedures for assessing land capability were evaluated and further developed. It is also intended that it provide the Westernport Bay Environmental Study of the Ministry for Conservation with information on land capability for use in planning.

In this study, the assessments of land capability are based on an approach which has been used extensively in the U.S.A. (Olson 1964; Soil Survey Staff 1971; USDA 1973).

The results presented in this report are a guide to the levels of difficulty involved in using the land.

## 2. Land Capability Assessment

Land capability assessment provides a means of analysing and expressing the effect of the natural land characteristics on the ability of the land to sustain use.

Two interrelated operations are involved in assessing land capability. Firstly, the physical characteristics of the land must be known and secondly, the way in which these land features react when land is used must be understood. These two operations are referred to as land resource mapping and land capability assessment.

Areas of land which are relatively uniform with respect to characteristics which affect land use can be identified and delineated on maps. Descriptions of land in the study area are provided in Section 8. Certain key land characteristics have a dominant effect on the success and sustainability of specific uses and this relationship can be expressed in terms of the kind and degree of limitations to the use and also by the amount of deterioration which might occur as a result of the use. In this way, maps showing different land types can be interpreted to show the level and spatial distribution of the capabilities for specified uses.

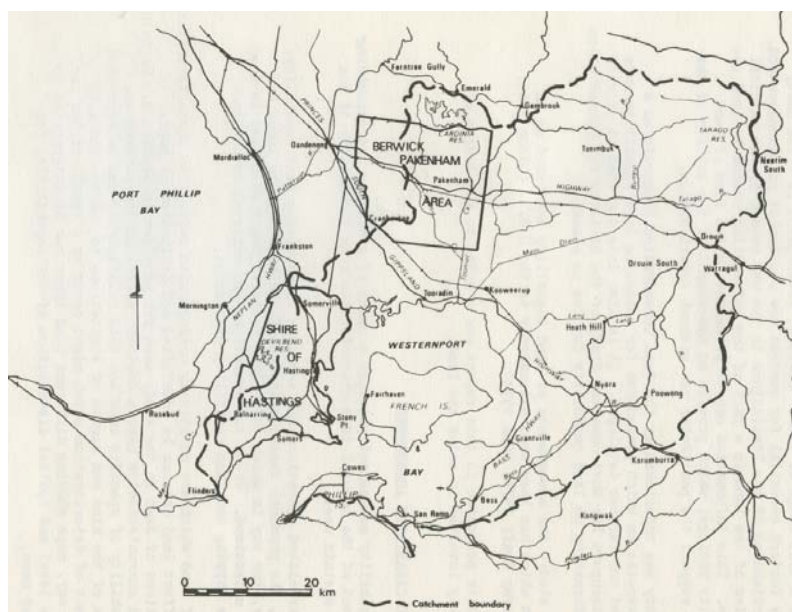


Fig. 1: Location map showing study areas in relation to Westernport Bay Catchment.

Recognition of the need for a means of providing objective, systematic and consistent interpretations of land characteristics has led to the development of land capability rating systems (see Section 7). In this report, rating systems are in the form of tables which show the relationship between levels of the relevant land characteristics and the capability of land for specified uses.

The rating systems identify the kind and degree of limitations to the use and at the same time can be interpreted to indicate the kind and level of management inputs which would be required to achieve the use objectives while minimising deterioration of the physical environment. It is assumed that commonly available technology and management will be applied and that sustained use is an objective.

### **3. The Land Resource Mapping**

The pilot areas were selected to provide a range of land types suitable for the development and testing of rating systems and in which land use pressures were high. The Berwick-Pakenham area and the Shire of Hastings met these requirements. The location of the pilot studies within the Westernport Bay Catchment is shown in Fig. 1. Several kinds of land resource information are available for all or part of the study areas. The major studies are listed in Table 1.

**Table 1 - Existing Resource Surveys of Land in or near the Pilot Study Areas**

<b>Published Surveys</b>	<b>Scale</b>	
Geological Survey: Cranbourne mapsheet (Geological Survey of Vic., 1967)	1:63	360
Geological Survey: Ringwood mapsheet (Geological Survey of Vic., 1970)	1:63	360
Geological Survey: Westernport mapsheet (Geological Survey of Vic., 1963)	1:63	360
Soil Survey, Westernport Bay Catchment (Sargeant, 1975)	1:123	000
Terrain Classification for Engineering Purposes of the Melbourne Area (Grant, 1972)	1:250	000
Soil and Land Utilization Survey of the Country around Berwick. (Holmes et. al., 1940)	1:31	000
Land System Map, County of Mornington. (Soil Conservation Authority, 1975).	1:126	000

These sources of data can be used in their present form for making interpretations related to certain land uses. The geological surveys and soil surveys identify the delineate earth resources within the limits of their scales. This kind of information is useful for broadly assessing capability of land for uses which rely directly upon earth resources and which are carried out at a scale comparable to the map presentation. Examples of these kinds of land use are extractive industries and certain forms of agriculture.

Both the Terrain Classification and Land Systems Map offer broader scope for interpretations in that a wider range of soil and land-form data is included. However, for both, basic map presentation is at a small scale (see Table 1) and although descriptions of the land are detailed, delineations of areas with low variability in physical characteristics are not provided. For the land capability information to be of use in planning the mapping scale must be appropriate for the level of planning.

It was therefore necessary to undertake additional mapping and data collection to provide the information at the scale most appropriate for the level of interpretation intended, i.e. urban and related activities including subdivision. Maps at 1:10 000 were prepared but because of their size, only parts of them are included in the published report to show what is available. The 1:50 000 maps included show the same boundaries but less background detail is available on them.

#### **4. Summary of Land Capability for selected land uses in the Berwick-Pakenham Area and the Shire Of Hastings**

Table 2 presents a summary of the results of the land capability assessment, indicating the level of capability of each map unit for each of land uses considered.

Details of the land capability assessments are presented in charts accompanying each map unit description in Section 6. These indicate the level of capability, and identify the most limiting physical characteristics for each land use. The kind and degree of limitations present indicate the type of management and the level of inputs required for a particular land use if deterioration is to be minimised.

The rating systems used and the general definition of the land capability classes are presented in Section 7.

The explanations of why the various land characteristics affect land capability presented in Section 8, provide further guidance for the development of appropriate management where land of less favourable capability is to be used. Section 9 provides a set of general management practices which can be used to minimise erosion on sites undergoing the development for urban and related uses.

**Table 2 – Summary of land capability for selected land uses in the Berwick-Pakenham area and the Shire of Hastings**

**TABLE 2. SUMMARY OF LAND CAPABILITY FOR SELECTED LAND USES IN THE BERWICK-PAKENHAM AREA AND THE SHIRE OF HASTINGS**

MAP UNIT	ENGINEERING USES AND WASTE DISPOSAL										EARTH RESOURCES				RECREATION						SUBDIVISION	
	Buildings Foundations	Shallow Excavations	Septic Tank Absorption Field	Secondary Roads	Car Parks	Area Type Sanitary Landfill	Sewage Lagoons	Parm Dams	Source of Topsoil	Source of Sand	Source of Gravel	Source of Roadfill	Camp Sites	Raths and Trails	Intensive Use Areas	Playing Fields	Golf Courses	Motor Bike Trails	Rurban	Urban		
Bal	VP	VP	VP	P	P	VP	D	G	F	VP	VP	VP	VP	P	VP	F	F	F	VP	VP		
Bas	P	VP	VP	P	P	P	F	F	VP	VP	VP	P	P	P	P	F	F	F	P	P		
Bel 1. slopes - Dy soils	P	VP	P	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
2. steep slopes - Uc soils	VP	P	P	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
3. minor crests - Gn soils	G	F	G	F	F	F	F	F	VP	VP	VP	G	G	G	G	G	G	G	G	G		
Ber 1. crests - Gn soils	G	F	G	F	F	F	F	F	VP	VP	VP	G	G	G	G	G	G	G	G	G		
2. slopes - Ug soils	F	P	VP	P	P	P	VP	VP	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Brd	P	P	VP	VP	VP	VP	VP	VP	G	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Bin	VP	VP	VP	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Bit	F	F	F	F	F	F	F	F	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Car 1. slopes - Dy soils	F	P	P	P	P	P	P	P	VP	VP	VP	G	G	G	G	G	G	G	G	G		
2. minor crests - Gn soils	G	F	G	F	F	F	F	F	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Chy	F	F	F	F	F	F	F	F	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Cld	G	G	G	G	G	G	G	G	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Coo	VP	VP	VP	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Cra	G	F	VP	G	F	F	VP	P	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Crh	F	P	F	P	P	P	VP	P	P	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Dac	F	P	VP	P	P	P	VP	P	P	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Den	G	F	G	F	F	F	G	F	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Dev	P	P	P	P	VP	VP	VP	VP	P	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Eum	VP	VP	VP	VP	VP	VP	VP	VP	P	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Gem	G	F	VP	F	F	F	F	F	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Hat	VP	VP	VP	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Lys	G	F	G	F	F	F	F	F	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Nar	VP	VP	VP	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Oco	F	F	F	F	F	F	G	F	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Ptl	F	F	F	F	F	F	F	F	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Res	VP	VP	VP	VP	VP	VP	VP	VP	P	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Riv	VP	VP	VP	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Sab	VP	VP	VP	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Scr	P	VP	VP	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Sev	F	F	F	F	F	F	F	F	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Sho	G	VP	VP	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Sil	F	P	P	P	P	P	P	P	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
TN	F	VP	VP	VP	VP	VP	VP	VP	G	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Tyf	P	P	VP	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Tyw	F	F	F	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
War	VP	VP	VP	VP	VP	VP	VP	VP	F	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Wat	G	F	G	G	F	F	F	G	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		
Yag	G	F	G	F	F	F	G	F	VP	VP	VP	P	P	P	VP	F	F	F	VP	VP		



## PART II - DETAILED MAP UNIT DESCRIPTIONS AND CAPABILITY RATINGS

### 5. Land Characteristics used to describe the Mapping Units

Topography and soil type are dominant factors in determining the capability class. For each map unit, data is described in the order given below. The information forms the basis of the land capability assessment for different land uses.

**Map Unit:** The name and mapping symbol are shown for each recognised type of land.

#### General

**Descriptions:** A brief statement is given to indicate the predominant conditions which characterise each map unit.

**Topography:** Shape and steepness are indicated with the average side slope and usual range of slopes given in percentages.

**Sketch:** The schematic representation of a typical cross-section and the usual relationship to adjacent map units is shown.

#### Soils Information:

- (i) **Factual Key:** Information is given to identify the major soil type present in terms of its usual Factual Key (Northcote, 1974), and related Keys where a range occurs.
- (ii) **Profile Description:** Profile information includes depth of major soil horizons and for each horizon, the colour, texture, structure, consistence, inclusions, soil pH and nature of horizon boundary is given.
- (iii) **Unified Classification:** Unified Soil Groups are an engineering soil classification based on soil texture and plasticity. They indicate the likely stability of soil for such activities as construction of foundations, roads and embankments. A **summary** of the classification is given below.

The symbols give the following information:

Coarse textured: G Gravel

W well graded range of coarse particles - few or no fines

S Sand

C well graded with excellent clay binder

M poorly graded coarse particle/clay mixtures

P poorly graded - few or no fines

Fine textured: M Silt

C Clay

H high liquid limit

O Organic

L low liquid limit

Pt Peat

Typical names and group symbols of the unified soil classification system:

Group Symbol	Typical Names
GW	Well graded gravel, gravel and sand mixtures, little or no fines (less than 5%)
GP	Poorly graded gravel, gravel and sand mixtures, little or no fines (less than 5%)
GM	Silty gravel, gravel and sand and silt mixtures
GC*	Clayey gravel, gravel and sand and clay mixtures
SW	Well graded sands, gravelly sands, little or no fines (less than 5%)
SP*	Poorly graded sands, gravelly sands, little or no fines (less than 5%)
SM*	Silty sands, sand and silt mixtures
SC*	Clayey sands, sand and clay mixtures
ML*	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays, low liquid limit
OL*	Organic silts and organic silty clays of low plasticity
MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
CH*	Organic clays of medium to high plasticity, organic silts
Pt	Peat and other highly organic soils

\*Denotes Unified Soil Groups commonly encountered in the Westernport Bay Catchment.

- (iv) **Shrink-swell potential:** Shrink-swell potential or Linear Shrinkage is related to the amount of swelling clays that are present in a soil. Such clays swell on wetting and shrink when drying and can severely damage foundations and earthworks. The risk is largely independent of slope and is related to soil type.

Class limits for shrink-swell potential are:-

Shrink-swell Potential	Linear Shrinkage
Low	Less than 4%
Moderate	4% to 12%
High	12% to 20%
Very high	More than 20%

- (v) **Landslip hazard:** This is related to slope and soil type. Deep permeable soils with low wet strengths are the most susceptible and risk increases with gradient. Evidence of past landslips is the main determinant of the degree of landslip hazard, however, it is difficult to predict an occurrence precisely. More detailed geo-technical investigations are needed to examine specific development proposals in the areas assessed as landslip prone.

The classes of landslip potential are:

Landslip Class	Definition
Nil	No evidence of landslips
Low	Some evidence of slips, most probably old
Moderate	Evidence of slips fairly common
High	Much evidence of slips with signs of recent activity

- (vi) **Permeability class:** This indicates the ability of a soil to absorb and transmit water and is of particular importance for on-site effluent or drainage disposal and for farm dams and sewage lagoons. There are often large variations in permeability within a map unit. The classes quoted are the most commonly recorded values as determined by maintaining a constant head at 15 cm in a 10 cm diameter auger hole 45 cm deep which has been saturated before-hand.

Permeability Class	Approximate percolation rate
Very slow	Less than 2 l/m <sup>2</sup> day
Slow	2 to 5 l/m <sup>2</sup> day
Moderately slow	5 to 15 l/m <sup>2</sup> day
Moderate	15 to 50 l/m <sup>2</sup> day
Moderately rapid	50 to 200 l/m <sup>2</sup> day
Rapid	200 to 500 l/m <sup>2</sup> day
Very rapid	More than 500 l/m <sup>2</sup> day

**Note:** Permeability tests for farm dams and for sewage lagoons are carried out on test holes dug to the expected depth of excavation and rates are generally much slower than for the surface soil where the above rates apply.

- (vii) **Soil drainage class:** This is related to soil type, gradient, rainfall and position in the landscape. Flatter areas and areas which receive runoff are more likely to have high water tables and drainage problems unless the soil is permeable at depth. Drainage problems on crests and areas which shed water will be less severe. Clayey subsoil in a profile may cause a perched water table by restricting downward percolation and waterlogging may occur for a limited period after heavy rain: (see seasonable water table, ix).

Soil Drainage Class	Definition
Well drained	The soil is rarely saturated to a depth of 1 m except during or just after heavy rain.
Moderately well drained	The soil is saturated rarely for longer than a month at a depth below 60 cm.
Imperfectly drained	The soil is saturated up to 4 months shallower than 60 cm but is rarely saturated above 30 cm during growing season

Soil Drainage Class	Definition
Poorly drained	The soil is saturated for at least half the year at less than 60 cm and the upper 30 cm is not saturated for longer than one month after heavy rain.
Very poorly drained	The soil remains saturated at less than 30 cm during much of the growing season.

- (viii) **Flood risk:** Flooding can be a problem on land with very low gradients and within confined drainage ways. Precise data is difficult to obtain on the frequency of flood events and the classes given here were determined by observations of land form, catchment geometry and soil types which reflect recent sediment deposition.

Flooding class	Estimated return period
Nil	More than 100 years
Low	25 to 100 years
Moderate	5 to 25 years
High	1 to 5 years
Very high	Seasonal flooding

- (ix) **Seasonal water table:** This phenomenon can occur in areas low in the landscape and where an impermeable soil layer impedes the downward movement of water. Waterlogging classes were determined by observation of depth to water table in saturated soils and by inferences drawn from profile characteristics in soils which were dry when inspected.

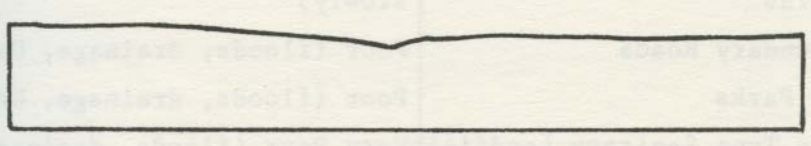
Waterlogging classes	Definition
Nil	Water table drops below 1m within 24 hrs after heavy rain.
Temporarily ponded	Local areas of minor ponding persist for several days after rain - little, if any inhibition of plant growth.
Temporarily waterlogged	Water table perches on an impermeable soil layer causing waterlogging which may persist for a week or so after heavy rain. Plant growth may be inhibited to a limited extent.
Seasonally waterlogged	Water table within pasture root zone for about one month after heavy rain. Surface ponding common. Plant growth may be inhibited to some extent.
Water table seasonally at surface	Water at soil surface for several months during winter. Plant growing season may be inhibited.

- (x) **Erosion and deterioration or erodibility:** This has been determined from observation of soil performance under the wide range of land uses which are being and have been carried out in the study areas. There is at present very little quantitative data on rates of soil erosion information which clearly is essential if the effects of different land uses upon soil loss are to be compared.

## **6. Map Unit Descriptions and Capability Ratings**

The land characteristics used to describe the map units are explained in Section 5. Each map unit description is accompanied by a table detailing capability for selected land uses. The land capability assessments are the result of interpreting the data in the map unit descriptions by means of the land capability rating systems in Section 7.

While most map units describe areas with a relatively low degree of variability, several areas, notably map units Bel, Ber, Car and TN, are complexes containing a mixture of land types which could not be delineated at the selected mapping scale. Further mapping in these areas at a larger scale may be required if the need arises.

<b><u>MAP UNIT</u></b>	Balnarring Flats	Symbol: <b>Bal</b>
<b><u>GENERAL DESCRIPTION:</u></b>	Flat, wide areas of Quaternary alluvial deposits. Soils are darkened at the surface with organic matter and are seasonally wet, with some areas ponding or flooding.	
<b><u>TOPOGRAPHY:</u></b>	Flat to slight undulations, often with a drainage depression or stream. Maximum slope 2%.	
<b><u>SKETCH:</u></b>		
<b><u>SOILS INFORMATION:</u></b>		
(i) Factual Key:	Gn 3.91 (Dy 5.11, Ug 5.16)	
(ii) Profile Description		
0-25 cm	Dark brown (7.5YR3/2) to dark grey (10YR4/1) silty clay; moderate to strong crumb structure; consistence, moist friable, dry slightly hard; pH 6.5. Clear transition to:	
25-55 cm	Greyish brown (10YR5/2) medium to heavy clay with faint medium-sized yellow mottles; coarse angular-blocky structure of moderate strength; consistence, moist firm, dry hard; pH 6.5. Gradual transition to:	
55-100 + cm	Brownish yellow (10YR6/8) heavy clay with faint grey and yellow mottles; coarse angular-blocky structure of moderate strength; consistence, moist firm, dry hard; pH 6.5. Continuing with depth - rock beyond 2 m depth if present.	
(iii) Unified Classification:	CL/CH-CL	
(iv) Shrink-swell Potential:	High	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Slow	
(vii) Profile Drainage Class:	Very poorly drained	
(viii) Flood Risk:	High	
(ix) Seasonal Watertable:	Seasonally waterlogged	
(x) Erosion & Deterioration:	Nil	

**CAPABILITY FOR SELECTED LAND USES****Bal****ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Very Poor (floods, drainage, shrink-swell)
(ii) Shallow Excavations	Very Poor (floods, drainage, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Very Poor (floods, drainage, percolates slowly)
(iv) Secondary Roads	Poor (floods, drainage, Unified Soil Group)
(v) Car Parks	Poor (floods, drainage, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Very Poor (floods, drainage)
(vii) Sewage Lagoons	Poor (floods, Unified Soil Group)
(viii) Farm Dams	Good

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (too clayey, drainage)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group)

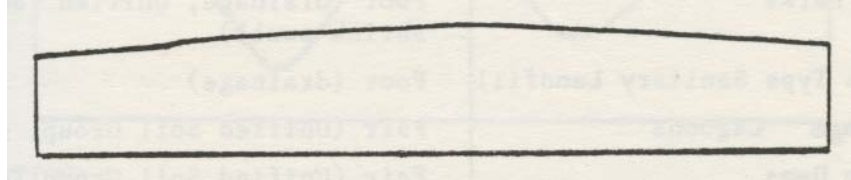
**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Very Poor (drainage, too clayey, percolate slowly)
(ii) Paths and Trails	Poor (drainage, too clayey)
(iii) Intensive Use Areas (Picnic areas, etc.)	Very Poor (drainage)
(iv) Playing Fields	Fair (drainage)
(v) Golf Courses	Fair (drainage)
(vi) Motor Bike Trails	Poor (drainage, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Very Poor	Septic Tanks, buildings, roads, drainage
Urban Subdivision	Very Poor	Buildings, roads, excavation drainage



<b><u>MAP UNIT:</u></b>	Basalt plain	Symbol: <b>Bas</b>
<b><u>GENERAL DESCRIPTION:</u></b>	Gently undulating plain on basalt with brown gradational clay soils and brown and grey uniform clay soils. Some areas of scattered surface basalt stones.	
<b><u>TOPOGRAPHY:</u></b>	Long straight to gently convex slopes averaging about 2%. Relief up to 3 metres.	
<b><u>SKETCH:</u></b>		
<b><u>SOILS INFORMATION:</u></b>		
(i) Factual Key:	Gn 3.93 (Ug 5.22)	
(ii) Profile Description:		
0-20 cm	Very dark greyish brown (10YR3/2) clay loam with 5% fine ironstone gravels and rare sand grains; strong crumb structure; consistence very hard when dry and plastic when wet; pH 6.8 Diffuse transition to:	
20-60 cm	Dark greyish brown (10YR4/2) clay with 57 fine ironstone gravels and rare sand grains; medium angular blocky structure; consistence very hard when dry and plastic when wet; pH 7.0 Diffuse transition to:	
60-120 cm	Dark greyish brown (10YR4/2) heavy clay with pale grey and brown mottles; consistence very hard when dry and firm when moist; pH 7.2. Diffuse transition to:	
120 + cm	Decomposing basalt.	
(iii) Unified soil classification:	CL/CH	
(iv) Shrink-swell potential:	High	
(v) Land slip potential:	Nil	
(vi) Permeability class:	Very slow	
(vii) Soil drainage class:	Poorly drained	
(viii) Flood risk:	Low	
(ix) Seasonal watertable:	Temporarily waterlogged	
(x) Erodibility:	Low	

**CAPABILITY FOR SELECTED LAND USES****Bas****ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Poor (drainage, Unified Soil Group, shrink-swell)
(ii) Shallow Excavations	Poor (drainage, Unified Soil Group)
(iii) Septic Tank Absorption	Very Poor (percolates slowly, drainage)
(iv) Fields	Poor (drainage, Unified Soil Group, shrink-swell)
(v) Secondary Roads	Poor (drainage, Unified Soil Group, shrink-swell)
(vi) Car Parks	Poor (drainage)
(vii) Area Type Sanitary Landfill	Fair (Unified Soil Group, shrink-swell)
(vii) Sewage Lagoons	Fair (Unified Soil Group, shrink-swell)
(viii) Farm Dams	Good

**EARTH RESOURCES:**

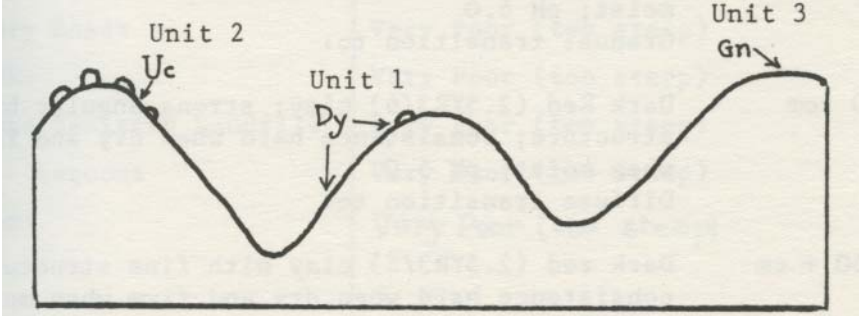
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (thin layer, drainage)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (Unified Soil Group, shrink-swell, drainage)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (drainage, percolates slowly, too clayey)
(ii) Paths and trails	Poor (drainage, too clayey)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (drainage, too clayey)
(iv) Playing Fields	Poor (drainage, too clayey)
(v) Golf Courses	Poor (drainage, too clayey)
(vi) Motor Bike Trails	Poor (drainage, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Poor	Septic tanks, buildings, road
Urban Subdivision	Poor	Buildings, drainage, roads excavation

<p><b>MAP UNIT:</b></p>	<p>Belgrave Heights</p>	<p>Symbol: <b>Bel</b></p>
<p><b>GENERAL DESCRIPTION:</b></p>	<p>Steep hills on granodiorite with yellow-brown duplex soils and minor areas of undifferentiated sandy soils. Rock out-crop is common on crests and upper slopes</p>	
<p><b>TOPOGRAPHY:</b></p>	<p>Steep slopes with average gradient of 20% ranging between 12% and 40%. Relief up to 60 metres.</p>	
<p><b>SKETCH:</b></p>		
<p><b>SOILS INFORMATION:</b></p>		
<p>(i) Factual Key:</p>	<p>Dominant: Dy 3.41, .21, Gn 3.74 on mid and lower slopes</p> <p>Minor: Uc 5.22, Gn 3.94 on steep upper slopes and ridges Gn 3.14 on some gently sloping crests and ridges.</p>	
<p>(ii) Profile Description:</p>	<p><b>Unit 1 Mid and Lower Slopes (Dy 3.41)</b></p>	
<p>0-15 cm</p>	<p>Dark greyish brown (10YR4/2) sandy loam; massive structure; consistence hard when dry and firm when moist; pH 6.0. Clear transition to:</p>	
<p>15-40 cm</p>	<p>Light grey (10YR6/1) clayey sand; massive structure; consistence hard when dry and firm when moist (spewy when wet); pH 6.0. Abrupt transition to:</p>	
<p>40-150 cm</p>	<p>Brownish yellow (10YR6/6) sandy clay with reddish yellow and grey mottles; strong sub-angular blocky structure; consistence very hard when dry and firm when moist; pH 5.5. Continuing to decomposing granodiorite.</p>	
<p></p>	<p><b>Unit 2 Steep slopes and crests (Uc 5.22) Rock outcrop common</b></p>	
<p>0-15 cm</p>	<p>Dark yellowish brown (10YR4/4) loamy sand; weak crumb to apedal single grained structure; consistence dry loose and moist very friable; pH 5.5 to 6.0. Clear transition to:</p>	
<p>15-90 cm</p>	<p>Yellowish brown (10YR5/ ) clayey (often coarse) sand; apedal single-grained structure; consistence hard when dry, firm when moist; pH 6.0. Continuing to decomposing granodiorite:</p>	
<p></p>	<p><b>Unit 3 Broad crests (Gn 3.14) Minor rock outcrop</b></p>	
<p>0-20 cm</p>	<p>Red brown (2.5YR3/2) clay loam; weak crumb structure consistence slightly hard when dry and friable when moist; pH 6.0. Gradual transition to:</p>	

20-50 cm	Dark Red (2.5YR3/6) clay; strong angular blocky fine structure; consistence hard when dry and friable when moist; pH 5.0. Diffuse transition to		
50-150 + cm	Dark red (2.5YR3/6) clay with fine structure; consistence hard when dry and firm when moist; pH 5.0. Continuing to decomposing granodiorite.		
	<b><u>Unit 1</u></b> <b><u>Dy 3.41</u></b>	<b><u>Unit 2</u></b> <b><u>Uc 5.22</u></b>	<b><u>Unit 3</u></b> <b><u>Gn 3.14</u></b>
(iii) Unified Soil Classification:	ML/SC-CL	SP	CL/CH-CL
(iv) Shrink-swell potential:	High	Low	Moderate
(v) Land slip potential:	Low	Moderate	Low
(vi) Permeability class:	Moderate	Moderate	Moderate
(vii) Soil drainage class:	Imperfectly drained	Well drained	Moderately well drained
(viii) Flood risk:	Nil	Nil	Nil
(ix) Seasonal watertable:	Temporarily waterlogged	Nil	Nil
(x) Erodibility	High	Very High	Moderate

### **CAPABILITY FOR SELECTED LAND USES**

#### **ENGINEERING:**

**Be1**  
(Yellow duplex soils on slopes)

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Poor (too steep)
(ii) Shallow Excavations	Very Poor (too steep)
(iii) Septic Tank Absorption Fields	Poor (too steep, percolates slowly)
(iv) Secondary Roads	Very Poor (too steep)
(v) Car Parks	Very Poor (too steep)
(vi) Area Type Sanitary Landfill	Very Poor (too steep)
(vii) Sewage Lagoons	Very Poor (too steep)
(viii) Farm Dams	Very Poor (too steep)

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (too steep, thin layer)
(ii) Source of Sand	Poor (too steep, thin layer)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (too steep)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (too steep)
(ii) Paths and Trails	Poor (too steep)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (too steep)
(iv) Playing Fields	Very Poor (too steep)
(v) Golf Courses	Poor (too steep)
(vi) Motor Bike Trails	Very Poor (too steep, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Poor	Septic Tanks, buildings, roads, dams
Urban Subdivision	Very Poor	Buildings, roads, excavation

**CAPABILITY FOR SELECTED LAND USES****Be12**  
(Sandy soils on steep slopes)**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Very Poor (too steep, rock outcrop)
(ii) Shallow Excavations	Very Poor (too steep, rock outcrop, boulders, depth to rock)
(iii) Septic Tank Absorption Fields	Poor (too steep, rock outcrop, boulders)
(iv) Secondary Roads	Very Poor (too steep, rock outcrop, boulders)
(v) Car Parks	Very Poor (too steep, rock outcrop, boulders)
(vi) Area Type Sanitary Landfill	Very Poor (too steep, rock outcrop, boulders)
(vii) Sewage Lagoons	Very Poor (too steep, rock outcrop, boulders)
(viii) Farm Dams	Very Poor (too steep, rock outcrop, boulders, percolates rapidly)

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Very Poor (too steep, rock outcrop, boulders)
(ii) Source of Sand	Very Poor (too steep, rock outcrop, boulders)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (too steep, rock outcrop, boulders)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Very Poor (too steep, rock outcrop, boulders)
(ii) Paths and Trails	Very Poor (too steep, rock outcrop, boulders)
(iii) Intensive Use Areas (Picnic areas, etc.)	Very Poor (too steep, rock outcrop, boulders)
(iv) Playing Fields	Very Poor (too steep, rock outcrop, boulders)
(v) Golf Courses	Very Poor (too steep, rock outcrop, boulders)
(vi) Motor Bike Trails	Very Poor (too steep, rock outcrop, boulders)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Very Poor	Buildings, dams, roads, septic tanks
Urban Subdivision	Very Poor	Buildings, roads, excavation



**CAPABILITY FOR SELECTED LAND USES****Be13**  
(Red gradational soils on some crests)**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Good
(ii) Shallow Excavations	Fair (Unified Soil Group)
(iii) Septic Tank Absorption Fields	Good
(iv) Secondary Roads	Fair (Unified Soil Group)
(v) Car Parks	Fair (Unified Soil Group)
(vi) Area Type Sanitary Landfill	Fair (percolates rapidly)
(vii) Sewage Lagoons	Poor (too steep, percolates rapidly)
(viii) Farm Dams	Fair (percolates rapidly)

**EARTH RESOURCES:**

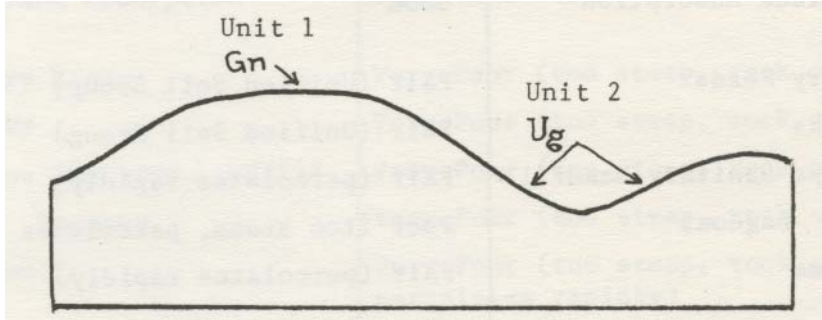
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (thin layer)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Good
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Good
(iv) Playing Fields	Fair (too steep)
(v) Golf Courses	Good
(vi) Motor Bike Trails	Poor (Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	
Urban Subdivision	Fair	Roads, excavation

<p><b>MAP UNIT:</b></p>	<p>Berwick</p>	<p>Symbol: <b>Ber1</b></p>
<p><b>GENERAL DESCRIPTION:</b></p>	<p>Hilly country on basalt with dark grey cracking clay soils on slopes in association with reddish brown friable gradational soils on crests.</p>	
<p><b>TOPOGRAPHY:</b></p>	<p>Convex hilly terrain with average gradient of 14% ranging up to 22%. Relief to 25 metres.</p>	
<p><b>SKETCH:</b></p>		
<p><b>SOILS INFORMATION:</b></p>	<p>Ug 5.14 on side slopes Gn 3.92 on crests</p>	
<p>(i) Factual Key:</p>	<p><b><u>Unit 1: On crests (Gn 3.92) gradient to 10%</u></b></p>	
<p>(ii) Profile Description:</p>	<p>Dark reddish brown (5YR3/4) clay loam; strong crumb structure; consistence slightly hard when dry and friable when moist; pH 6.0. Clear transition to:</p>	
<p>0-30 cm</p>	<p>Dark reddish brown (5YR3/4) light clay; strong fine angular blocky structure; consistence slightly hard when dry and friable when moist; pH 6.0 Diffuse transition to:</p>	
<p>30-60 cm</p>	<p>Weak red (2.5YR4/2) clay with faint grey mottles; strong fine angular-blocky structure; consistence slightly hard when dry and friable when moist; pH 6.5 Diffuse transition to:</p>	
<p>60-140 cm</p>	<p>Decomposing basalt</p>	
<p>140 + cm</p>	<p><b><u>Unit 2: On slopes (Ug 5.14) gradient to 22%</u></b></p>	
<p>0-20 cm</p>	<p>Very dark greyish brown (10YR3/2) light clay; strong crumb structure; consistence dry, very hard; pH 6.8 Diffuse transition to:</p>	
<p>20-55 cm</p>	<p>Very dark greyish brown (10YR3/2) clay; strong, medium angular blocky structure; consistence very hard when dry and firm when moist; pH 7.0 Diffuse transition to:</p>	
<p>55-100 cm</p>	<p>Dark grey (10YR4/1) heavy clay with faint grey mottles; consistence very hard when dry and firm when moist; pH 8.0. Diffuse transition to:</p>	
<p>100 + cm</p>	<p>Decomposing basalt</p>	

	<b><u>Unit 1</u></b> <b><u>Gn 3.92 on crest</u></b>	<b><u>Unit 2</u></b> <b><u>Ug 5.14 on slope</u></b>
(iii) Unified Soil Classification:	CL/CH	OH/CH
(iv) Shrink-swell potential:	Moderate	Very high
(v) Land slip potential:	Low	Low
(vi) Permeability class:	Moderately slow	Very slow
(vii) Soil drainage class:	Moderately well drained	Poorly drained
(viii) Flood risk:	Nil	Nil
(ix) Seasonal watertable:	Nil	Temporarily waterlogged
(x) Erodibility	Low	Low

<b><u>CAPABILITY FOR SELECTED LAND USES</u></b>		<b>Ber1</b> (Reddish-brown gradational on crest)
<b><u>ENGINEERING:</u></b>		
<i>Activity</i>	<i>Rating (limiting factors)</i>	
(i) Building Foundations	Good	
(ii) Shallow Excavations	Fair (Unified Soil Group)	
(iii) Septic Tank Absorption Fields	Good	
(iv) Secondary Roads	Fair (Unified Soil Group)	
(v) Car Parks	Fair (Unified Soil Group)	
(vi) Area Type Sanitary Landfill	Fair (depth to rock)	
(vii) Sewage Lagoons	Fair (depth to rock, Unified Soil Group)	
(viii) Farm Dams	Fair (depth to rock, Unified Soil Group)	

<b><u>EARTH RESOURCES:</u></b>	
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (too clayey)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (Unified Soil Group, depth of overburden)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Good
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Good
(iv) Playing Fields	Fair (too steep)
(v) Golf Courses	Good
(vi) Motor Bike Trails	Poor (Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	
Urban Subdivision	Good	

**CAPABILITY FOR SELECTED LAND USES****Ber2**  
(Grey cracking clays on slopes)**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Fair (too steep, Unified Soil Group, shrink-swell)
(ii) Shallow Excavations	Poor (too steep, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Very Poor (too steep, percolates slowly)
(iv) Secondary Roads	Poor (too steep, Unified Soil Group)
(v) Car Parks	Poor (too steep, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Poor (too steep, drainage)
(vii) Sewage Lagoons	Very Poor (too steep, Unified Soil Group)
(viii) Farm Dams	Poor (too steep, Unified Soil Group)

**EARTH RESOURCES:**

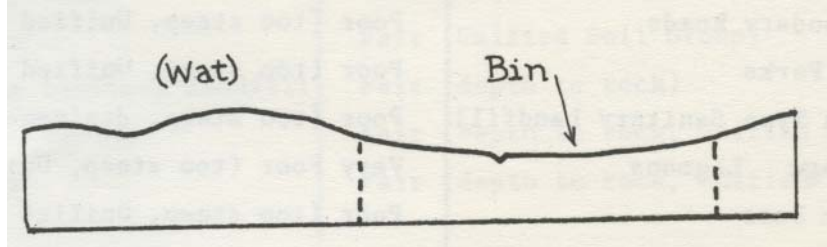
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Very Poor (too clayey)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group, depth of overburden)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (too steep, percolates slowly)
(ii) Paths and Trails	Poor (too steep, too clayey)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (too steep, too clayey)
(iv) Playing Fields	Very Poor (too steep, too clayey)
(v) Golf Courses	Poor (too steep, too clayey)
(vi) Motor Bike Trails	Poor (too steep, Unified Soil Group)

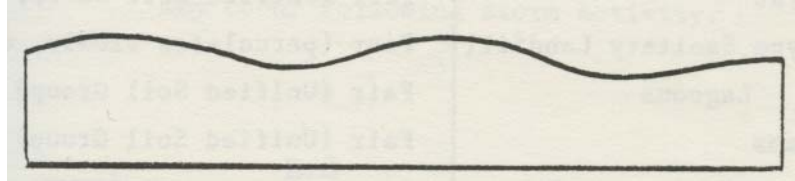
**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Fair	Buildings, septic tanks, roads dams
Urban Subdivision	Poor	Buildings, roads, excavation

<b><u>MAP UNIT:</u></b>	Biningnarring	Symbol: <b>Bin</b>
<b><u>GENERAL DESCRIPTION:</u></b>	Drainage lines flowing from catchments which have a thin covering of sand (Wat unit) overlying Tertiary sediments. Swampy depressions are common.	
<b><u>TOPOGRAPHY:</u></b>	Poorly defined, broadly concave drainage courses with stream grades to 2% in the upper reaches and about 0.5% in the lower sections.	
<b><u>SKETCH:</u></b>		
<b><u>SOILS INFORMATION:</u></b>	<p>(i) Factual Key: Dy 5.6 and Uc 5 soils</p> <p>(ii) Profile Description: Profiles vary from deep sandy soils with an organic A horizon to yellowish duplex soils with a sandy organic A horizon over a mottled clay B horizon.</p> <p>Some areas within the unit remain wet most of the year due to seepage.</p>	

<b><u>CAPABILITY FOR VARIOUS USES:</u></b>
Flooding in this unit results in very poor capability for most uses under consideration.



<b>MAP UNIT:</b>	Bittern	Symbol: <b>Bit</b>
<b>GENERAL DESCRIPTION:</b>	Undulating country usually on Baxter sandstone. Yellow brown duplex soils with sandy loam topsoils predominate. Topsoil strongly influenced by the Quaternary sand sheet.	
<b>TOPOGRAPHY:</b>	Undulating terrain often associated with Cranbourne sand. Average gradient of 2.5%, with a maximum of 5%. Relief of up to 5 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 5.41	
(ii) Profile Description:		
0-15 cm	Greyish-brown (10YR 5/3) fine sandy loam to loamy fine sand; structureless; consistence, friable moist and slightly hard dry; pH 6.5. Clear transition to:	
15-45 cm	Light grey (10YR 7/2) fine sandy loam to loamy fine sand; structureless; consistence, friable moist, loose dry; pH 6.0 Low to moderate quantities of iron oxide concretions in the lower 15 cm. Abrupt transition to:	
45-60 cm	Yellowish brown (10YR 5/6) medium to heavy clay with yellow and grey mottles; moderate strength medium angular-blocky structure; consistence, firm moist, hard dry; pH 6.0. Gradual transition to:	
60-100 + cm	Yellowish grey and red brown mottles; strong angular blocky structure; consistence firm moist, hard dry; pH 6.0. Continuing to rock usually before 2m.	
(iii) Unified Classification:	SP to SM/CH to CL	
(iv) Shrink-Swell Potential:	Moderate	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Moderately well drained	
(viii) Flood Risk:	Nil (Low locally)	
(ix) Seasonal Watertable:	Temporarily waterlogged	
(x) Erosion & Deterioration:	Low erosion risk on bare soil	

**CAPABILITY FOR SELECTED LAND USES:****Bit****ENGINEERING:***Activity**Rating (limiting factors)*

(i) Building Foundations	Fair (Unified Soil Group, drainage)
(ii) Shallow Excavations	Fair (Unified Soil Group, drainage)
(iii) Septic Tank Absorption Fields	Poor (percolates slowly, drainage)
(iv) Secondary Roads	Fair (Unified Soil Group, drainage)
(v) Car Parks	Fair (Unified Soil Group, drainage)
(vi) Area Type Sanitary Landfill	Poor (percolates slowly, drainage)
(vii) Sewage Lagoons	Fair (Unified Soil Group)
(viii) Farm Dams	Fair (Unified Soil Group)

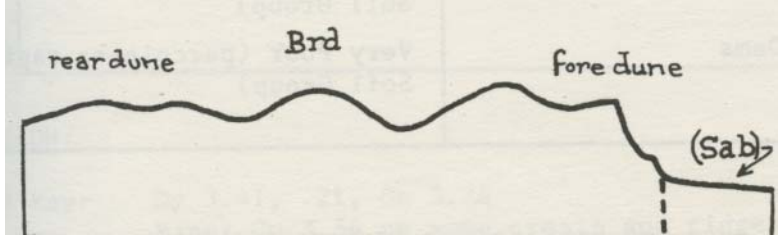
**EARTH RESOURCES:***Rating (limiting factors)*

(i) Source of Topsoil	Fair (thin deposit)
(ii) Source of Sand	Fair (too clayey, thin layer)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group)

**RECREATION:***Activity**Rating (limiting factors)*

(i) Camp Sites	Fair (drainage)
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Fair (drainage)
(iv) Playing Fields	Good
(v) Golf Courses	Good
(vi) Motor Bike Trails	Poor (drainage, Unified Soil Group)

<b><u>SUBDIVISION:</u></b>		
	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	
Urban Subdivision	Good	

<p><b>MAP UNIT:</b></p>	<p>Beach Ridge</p>	<p>Symbol: <b>Brd</b></p>
<p><b>GENERAL DESCRIPTION:</b></p>	<p>Sandy coastal areas which are dynamically active dominated by linear dunes running roughly parallel to the waterline. Swales between the dunes are generally sandy with minor occurrence and tidally inundated marine muds.</p>	
<p><b>TOPOGRAPHY:</b></p>	<p>Linear dunes vary in height up to 4 metres with average side slopes of up to 25%. On exposed coastal aspects, sheer cliff faces to 3 metres may occur following storm activity.</p>	
<p><b>SKETCH:</b></p>		
<p><b>SOILS INFORMATION:</b></p> <p>(i) Factual Key:</p> <p>(ii) Profile Description:</p> <p>0-5 cm</p> <p>50-120 +cm</p> <p>(iii) Unified Classification:</p> <p>(iv) Shrink-Swell Potential:</p> <p>(v) Landslip Potential:</p> <p>(vi) Permeability Class:</p> <p>(vii) Profile Drainage Class:</p> <p>(viii) Flood Risk:</p> <p>(ix) Seasonal Watertable:</p> <p>(x) Erosion &amp; Deterioration:</p>	<p>Uc 1.11 on active coastal fore dunes; Uc 2.21 on more stable rear dunes.</p> <p>Very dark greyish brown (10YR 3/2) sand; structureless; consistence loose; pH 7.5 Clear transition to:</p> <p>Pinkish grey (10YR 6/2) sand; structureless; consistence loose; pH 8.0 Continuing with depth.</p> <p>SP</p> <p>Nil</p> <p>Batters slump</p> <p>Very rapid</p> <p>Very well drained</p> <p>Nil; tidal action and storm damage</p> <p>Nil</p> <p>Wind erosion - very high (especially fore dunes) Salting - high on fore dune.</p>	

**CAPABILITY FOR SELECTED LAND USES:**

Brd

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Poor (too steep, sand drift)
(ii) Shallow Excavations	Poor (Unified Soil Group)
(iii) Septic Tank Absorption Fields	Very Good
(iv) Secondary Roads	Poor (too steep, sand drift)
(v) Car Parks	Poor (too steep, sand drift)
(vi) Area Type Sanitary Landfill	Poor (percolates rapidly)
(vii) Sewage Lagoons	Very Poor (percolates rapidly, Unified Soil Group)
(viii) Farm Dams	Very Poor (percolates rapidly, Unified Soil Group)

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (too sandy)
(ii) Source of Sand	Good
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (sand drift)
(ii) Paths and Trails	Fair (sand drift)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (too sandy, sand drift)
(iv) Playing Fields	Poor (too steep)
(v) Golf Courses	Good
(vi) Motor Bike Trails	Very Poor (sand drift)

**SUBDIVISION:**

Rural Subdivision  
(2 to 10 hectares)

*Rating*

Very Poor on fore dunes  
Fair on rear dunes

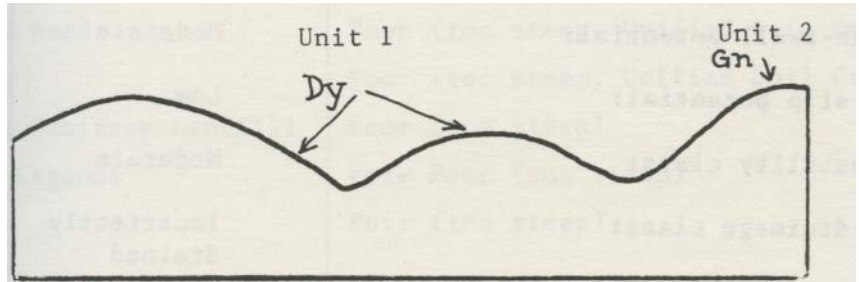
*Limiting Activities*

Buildings, roads, dams

Urban Subdivision

Very Poor on fore dunes  
Fair on rear dunes

Buildings, roads, excavation

<b>MAP UNIT:</b>	Cardinia	Symbol: <b>Car</b>
<b>GENERAL DESCRIPTION:</b>	Hilly terrain on granodiorite with yellow-brown duplex soils, and yellow gradational soils. Minor outcrop on crests.	
<b>TOPOGRAPHY:</b>	Hilly slopes with an average gradient of 12% ranging up to 20%. Relief up to 40 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 3.41, .21, Gn 3.74 Minor Gn 3.54 on some crests and ridges to the north	
(ii) Profile Description:	<b><u>Unit 1: Crests and Slopes (Dy3.41, .21)</u></b>	
0-15 cm	Dark greyish brown (10YR4/2) sandy loam; massive structure; consistence hard when dry and firm when moist; pH 6.0. Clear transition to:	
15-40 cm	Light grey (10YR6/1) clayey sand; massive structure; consistence hard when dry and firm when moist (spewy when wet); pH 6.0. Abrupt transition to:	
40-150 + cm	Brownish yellow (10YR6/6) Sandy clay with reddish-yellow and grey mottles; strong subangular blocky structure; Consistence very hard when dry and firm when moist; pH 5.5. Continuing onto decomposing granodiorite.	
0-20 cm	<b><u>Unit 2: Some Crests (Gn 3.54)</u></b> Red brown (2-5YR3/2) clay loam; weak crumb structure; consistence, slightly hard when dry and friable when moist; pH 6.0. Gradual transition to:	
20-50 cm	Dark red (2-5YR3/6) clay; strong angular blocky fine structure; consistence, hard when dry and firm when moist. pH 5.0. Diffuse transition to:	
50-150 + cm	Dark red (2-5YR3/6) clay with fine yellow mottles; strong angular blocky fine structure; consistence, hard when dry and firm when moist; pH 5.0. Continuing on to decomposing granodiorite.	
	<b><u>Unit 1</u></b> <b><u>Dy 3.41</u></b>	<b><u>Unit2</u></b> <b><u>Gn 3.54</u></b>
(iii) Unified Classification:	ML/CL-SC	CL
(iv) Shrink-Swell Potential:	Moderate	Moderate

(v) Landslip Potential:	Low	Low
(vi) Permeability Class:	Moderate	Moderate
(vii) Profile Drainage Class:	Imperfectly drained	Moderately well drained
(viii) Flood Risk:	Nil	Nil
(ix) Seasonal Watertable:	Temporarily waterlogged	Nil
(x) Erosion & Deterioration:	High	Moderate

**CAPABILITY FOR SELECTED LAND USES**

**Car1**  
(Yellow duplex soils on slopes)

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Fair (too steep, Unified Soil Group)
(ii) Shallow Excavations	Poor (too steep, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Fair (too steep, percolates slowly)
(iv) Secondary Roads	Poor (too steep, Unified Soil Group)
(v) Car Parks	Poor (too steep, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Poor (too steep)
(vii) Sewage Lagoons	Very Poor (too steep)
(viii) Farm Dams	Fair (too steep)

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (too steep, thin layer)
(ii) Source of Sand	Poor (too steep, thin layer, too clayey)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (too steep, Unified Soil Group)



**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Fair (too steep)
(ii) Paths and Trails	Fair (too steep)
(iii) Intensive Use Areas (Picnic areas, etc.)	Fair (too steep, drainage)
(iv) Playing Fields	Very Poor (too steep)
(v) Golf Courses	Poor (too steep)
(vi) Motor Bike Trails	Very Poor (too steep, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Fair	Buildings, roads, septic tanks
Urban Subdivision	Poor	Buildings, roads, excavation

**CAPABILITY FOR SELECTED LAND USES****Car2**

(Red gradational soil on some crests)

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Good
(ii) Shallow Excavations	Fair (Unified Soil Group)
(iii) Septic Tank Absorption Fields	Good
(iv) Secondary Roads	Fair (Unified Soil Group)
(v) Car Parks	Fair (Unified Soil Group)
(vi) Area Type Sanitary Landfill	Fair (percolates rapidly)
(vii) Sewage Lagoons	Poor (too steep, percolates rapidly)
(viii) Farm Dams	Fair (percolates rapidly)

**EARTH RESOURCES:**

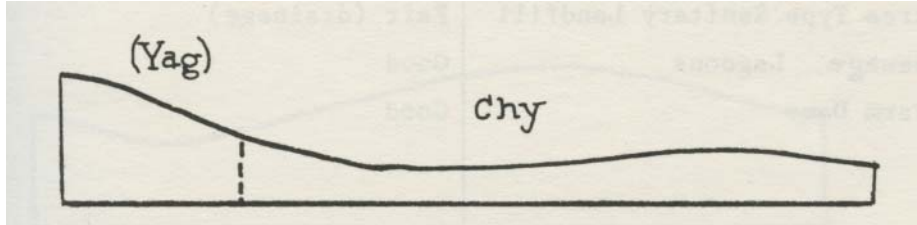
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (thin layer)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Good
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Good
(iv) Playing Fields	Fair (too steep)
(v) Golf Courses	Good
(vi) Motor Bike Trails	Poor (Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	
Urban Subdivision	Fair	Roads, excavation

<p><b>MAP UNIT:</b></p> <p><b>GENERAL DESCRIPTION:</b></p> <p><b>TOPOGRAPHY:</b></p> <p><b>SKETCH:</b></p>	<p>Chateau Yering</p>	<p>Symbol: <b>Chy</b></p> <p>Undulating country on fine to medium textured sedimentary rocks and outwash with yellow brown mottled duplex soils.</p> <p>Lower slopes, usually concave with average gradient of 2%. Relief of up to 4 metres.</p>
<p><b>SOILS INFORMATION:</b></p> <p>(i) Factual Key:</p> <p>(ii) Profile Description:</p> <p>0-20 cm</p> <p>20-50 cm</p> <p>50-150 +cm</p> <p>(iii) Unified Classification:</p> <p>(iv) Shrink-Swell Potential:</p> <p>(v) Landslip Potential:</p> <p>(vi) Permeability Class:</p> <p>(vii) Profile Drainage Class:</p> <p>(viii) Flood Risk:</p> <p>(ix) Seasonal Watertable:</p> <p>(x) Erosion &amp; Deterioration:</p>	<p>Dy 3.21, .31, Gn 3.82</p>	 <p>Very dark greyish brown (10YR 3/2) loam, massive structure; consistence hard when dry and firm when moist; pH 6.0. Gradual transition to:</p> <p>Pale brown (10 YR 6/3) fine sandy loam with 5% ironstone gravels; massive structure; consistence hard when dry and firm when moist, pH 5.5 Abrupt transition to:</p> <p>Yellowish brown (10YR 5/6) medium clay with yellow, grey and brown mottles; consistence very hard when dry and firm when moist; pH 5.5 Continuing with depth.</p> <p>CL to ML/CL to CH</p> <p>Moderate to high (8% to 15%)</p> <p>Nil</p> <p>Slow</p> <p>Imperfectly drained</p> <p>Low, locally high</p> <p>Temporarily waterlogged</p> <p>Moderate erosion hazard on exposed soil</p>

**CAPABILITY FOR SELECTED LAND USES**

Chy

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Fair (drainage, shrink-swell)
(ii) Shallow Excavations	Fair (drainage, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Poor (drainage, percolates slowly)
(iv) Secondary Road	Fair (drainage, Unified Soil Group)
(v) Car Parks	Fair (drainage, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Fair (drainage)
(vii) Sewage. Lagoons	Good
(viii) Farm Dams	Good

**EARTH RESOURCES:**

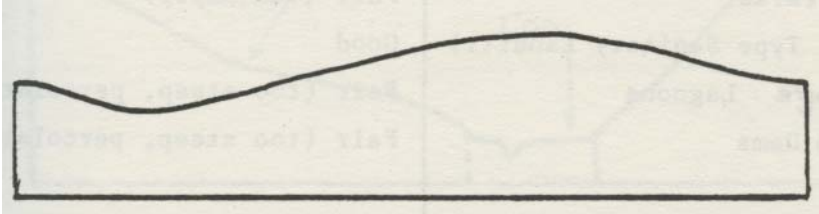
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (thin layer)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (depth of overburden)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Fair (drainage, percolates slowly)
(ii) Paths and Trails	Fair (drainage)
(iii) Intensive Use Areas (Picnic areas, etc.)	Fair (drainage)
(iv) Playing Fields	Fair (drainage)
(v) Golf Courses	Good
(vi) Motor Bike Trails	Poor (drainage, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	Septic tanks, buildings, roads
Urban Subdivision	Fair	Buildings, roads, excavations, drainage

<b>MAP UNIT:</b>	Clyde	Symbol: <b>Cld</b>
<b>GENERAL DESCRIPTION:</b>	Rolling low hills on the Baxter sandstone with yellow duplex soils.	
<b>TOPOGRAPHY:</b>	Low convex hills with average gradient of 7%, ranging between 3% and 10%. Relief of up to 20 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 3.41, .31	
(ii) Profile Description:		
0-25 cm	Dark greyish brown (10 YR 4/2) fine sandy clay loam; weak crumb structure, consistence slightly hard when dry and friable when moist; pH 6.5 Clear transition to:	
25-50 cm	Pale brown (10 YR 6/3) fine sandy loam with yellowish-brown mottling; massive structure; consistence very hard when dry and "spewy" when wet; pH 6.0. Clear transition to:	
50-60 cm	Yellowish-brown (10 YR 5/6) medium to heavy clay with yellow and brown mottling; medium angular blocky structure; consistence very hard when dry and firm when moist; pH 6.5. Gradual transition to:	
60-120 cm	Brownish-yellow (10 YR 6/8) medium to heavy clay with yellow and red mottling; strong angular blocky structure; consistence very hard when dry and firm when moist; pH 6.5. Continuing with depth.	
(iii) Unified Classification:	SM-ML/SC-CH	
(iv) Shrink-Swell Potential:	Low to moderate (5% to 15%)	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Moderately well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Temporarily Ponged	
(x) Erosion & Deterioration:	Moderate erosion hazard on exposed soil	

**CAPABILITY FOR SELECTED LAND USES**

C1d

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Good
(ii) Shallow Excavations	Good
(iii) Septic Tank Absorption Fields	Good
(iv) Secondary Roads	Good
(v) Car Parks	Fair (too steep)
(vi) Area Type Sanitary Landfill	Good
(vii) Sewage Lagoons	Fair (too steep, percolates rapidly)
(viii) Farm Dams	Fair (too steep, percolates rapidly)

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (thin deposit)
(ii) Source of Sand	Poor (thin deposit, too clayey)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Fair (depth of overburden)

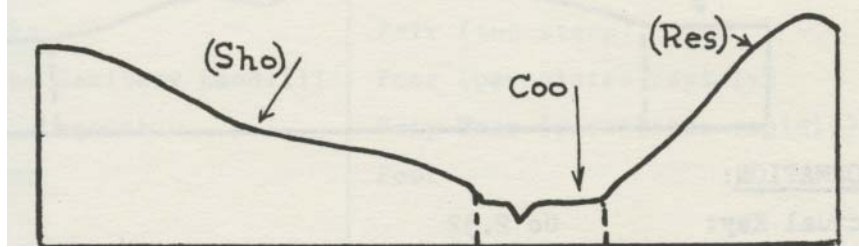
**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Good
(ii) Paths and Trails	Very Good
(iii) Intensive Use Areas (Picnic Areas, etc.)	Good
(iv) Playing Fields	Fair (too steep)
(v) Golf Courses	Very Good
(vi) Motor Bike Trails	Poor (Unified Soil Group)



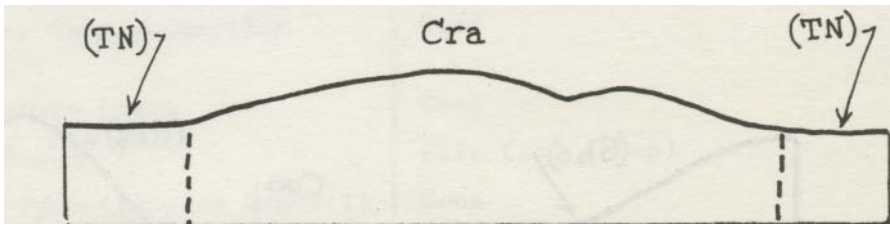
**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Very Good	
Urban Subdivision	Good	

<b>MAP UNIT:</b>	Coolart	Symbol: <b>Coo</b>
<b>GENERAL DESCRIPTION:</b>	Drainage lines flowing from basalt dominated areas. Slopes in the catchment are steep to moderately so and high flows of short duration are likely to occur.	
<b>TOPOGRAPHY:</b>	Narrow, linear drainage courses with incised stream channels. Stream grade averages 4% with some short sections of stream to 6%.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Variable. Gn 3.75, .11, Uf 5.2	
(ii) Profile Description:		
0-15 cm	Dark brown (7.5 YR 4/3) clay loam; medium crumb structure; consistence slightly hard when dry and friable when moist; pH 6.0. Clear transition to:	
15-35 cm	Brown (7.5 YR 4/4) light clay; medium crumb structure consistence hard when dry and very friable when moist; pH 6.5. Clear transition to:	
35-80 cm	Strong brown (7.5 YR 5/8) medium to heavy clay with red mottling hard when dry and friable when moist; pH 7.0. Clear transition to:	
80-120 +cm	Strong brown (7.5 YR 5/6) medium clay with yellow and red mottling; strong angular blocky structure consistence slightly hard when dry and friable when moist; pH 7.0. Continuing with depth.	

**CAPABILITY FOR VARIOUS USES:**

Flooding in this unit results in very poor capability for most uses under consideration. Where flash flooding does not occur, capability for farm dam construction is fair to good.

<b>MAP UNIT:</b>	Cranbourne Sand	Symbol: <b>Cra</b>
<b>GENERAL DESCRIPTION:</b>	Undulating sand sheets. Hard pans of coffee rock commonly occur at about one metre depth.	
<b>TOPOGRAPHY:</b>	Undulating convex slopes up to 8%; average gradient 5%. Relief up to 8m.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Uc 2.32	
(ii) Profile Description:		
0-25 cm	Dark greyish-brown (10YR4/2) loamy sand; single-grained structure; loose dry consistence becoming very friable when moist; pH 6.8. Clear transition to:	
25-70 cm	Light greyish-brown to light grey (10YR7/2 dry) bleached sand; structureless and of loose consistence; pH 6.5. Gradual transition to:	
70-110 cm	Yellowish red (5YR4/8) to <i>grey</i> brown (10YR4/2) structureless sand; very friable when moist and loose when dry; pH 5.5. Abrupt transition to:	
110-130 cm	Yellowish red (5YR4/8) cemented sandy hardpan with dark brown mottles; consistence very hard when moist or dry.	
130 + cm	Mottled, structureless sand.	
(iii) Unified Classification:	SP	
(iv) Shrink-Swell Potential:	Nil	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Very rapid	
(vii) Profile Drainage Class:	Very well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Nil	
(x) Erosion & Deterioration:	High wind erosion risk for bare soil	

**CAPABILITY FOR SELECTED LAND USES**

Cra

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Good
(ii) Shallow Excavations	Fair (Unified Soil Group)
(iii) Septic Tank Absorption Fields	Very Good
(iv) Secondary Roads	Good
(v) Car Parks	Fair (too steep)
(vi) Area Type Sanitary Landfill	Poor (percolates rapidly)
(vii) Sewage Lagoons	Very Poor (percolates rapidly)
(viii) Farm Dams	Poor

**EARTH RESOURCES:**

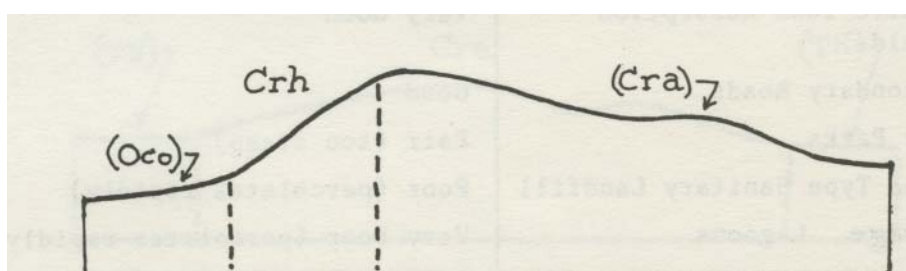
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Good
(ii) Source of Sand	Very Good
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Fair (too sandy)
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Fair (too sandy)
(iv) Playing Fields	Fair (too steep)
(v) Golf Courses	Very Good
(vi) Motor Bike Trails	Good (?)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Very Good	
Urban Subdivision	Good	

<b>MAP UNIT:</b>	Cranbourne Sand-Hilly	Symbol: <b>Crh</b>
<b>GENERAL DESCRIPTION:</b>	Steeper areas of deep sandy deposits usually overlying hard pans of cemented sand (coffee rock).	
<b>TOPOGRAPHY:</b>	Undulating convex slopes up to 15 per cent; average gradient 12 per cent. Average local relief is 8 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Uc 2.32	
(ii) Profile Description:		
0-25 cm	Dark greyish brown (10YR4/2) loamy sand; structure less consistence loose when dry and very friable when moist; pH 6.8. Clear transition to:	
25-70 cm	Slightly greyish brown to light grey (10YR6/2 dry) bleached sand; structureless; loose consistence; pH 7.5. Gradual transition to:	
70-110 cm	Yellowish red (10YR4/8) to grey brown (10YR4/2) sand; structureless; loose consistence; pH 5.5 Abrupt transition to:	
110-130 cm	Yellowish red (5YR4/8) sandy hardpan with <u>dark</u> brown mottles; very hard consistence when moist or dry.	
130 cm +	Mottled structureless sand.	
(iii) Unified Classification:	SP	
(iv) Shrink-Swell Potential:	Nil	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Very rapid	
(vii) Profile Drainage Class:	Very well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Nil	
(x) Erosion & Deterioration:	High wind erosion risk for bare soil.	

**CAPABILITY FOR SELECTED LAND USES**

Crh

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Fair (too steep)
(ii) Shallow Excavations	Poor (too steep, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Fair (too steep)
(iv) Secondary Roads	Poor (too steep, Unified Soil Group)
(v) Car Parks	Poor (too steep, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Poor (too steep, percolates rapidly)
(vii) Sewage Lagoons	Very Poor (too steep, percolates rapidly)
(viii) Farm Dams	Poor (percolates rapidly)

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (too steep)
(ii) Source of Sand	Poor (too steep)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group)

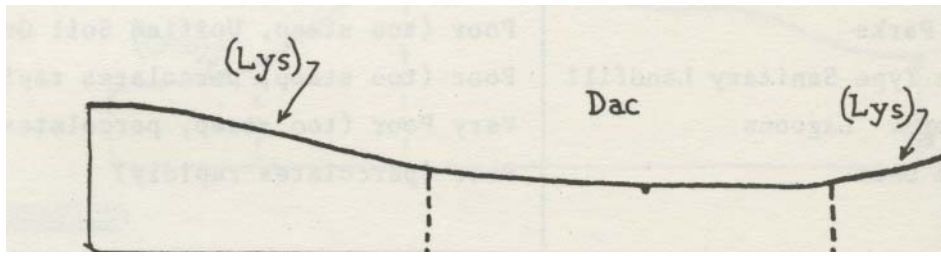
**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Fair (too sandy, too steep)
(ii) Paths and Trails	Fair (too sandy)
(iii) Intensive Use Areas (Picnic areas, etc.)	Fair (too sandy)
(iv) Playing fields	Poor (too steep)
(v) Golf Courses	Fair (too steep)
(vi) Motor Bike Trails	Poor (too steep)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Fair	Buildings, roads, dams
Urban Subdivision	Poor	Buildings, roads, excavation



<b>MAP UNIT:</b>	Dandenong Creek	Symbol: <b>Dac</b>
<b>GENERAL DESCRIPTION:</b>	Valley floors on outwash from granodiorite with yellow-brown mottled duplex soils and minor occurrence of alluvial soils.	
<b>TOPOGRAPHY:</b>	Concave with side slopes less than 2%	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 3.41, .31 and Uc Soils	
(ii) Profile Description:		
0-35 cm	Very dark greyish brown (10YR3/2) fine sandy loam; weak crumb to massive structure; consistence hard when dry and firm when moist; pH 6.0. Clear transition to:	
35-60 cm	Brown (10YR5/3) clayey sand; massive structure; consistence very hard when dry and "spewy" when wet; pH 5.8. Abrupt transition to:	
60-150 + cm	Brownish yellow (10YR6/6) medium clay with brown yellow and grey mottles; strong angular blocky structure; consistence very hard when dry and very firm when moist; pH 6.0. Continuing with depth.	
(iii) Unified Classification:	SM/CH	
(iv) Shrink-Swell Potential:	Moderate	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Slow	
(vii) Profile Drainage Class:	Poorly drained	
(viii) Flood Risk:	Moderate, locally high	
(ix) Seasonal Watertable:	Seasonally waterlogged	
(x) Erosion & Deterioration:	Low	

**CAPABILITY FOR SELECTED LAND USES****Dac****ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Poor (drainage, Unified Soil Group, localized flood risk)
(ii) Shallow Excavations	Poor (drainage, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Very Poor (percolates slowly, drainage)
(iv) Secondary Roads	Poor (drainage, Unified Soil Group)
(v) Car Parks	Poor (drainage, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Very Poor (drainage, localized flood risk)
(vii) Sewage. Lagoons	Fair (Unified Soil Group)
(viii) Farm Dams	Fair (Unified Soil Group)

**EARTH RESOURCES:**

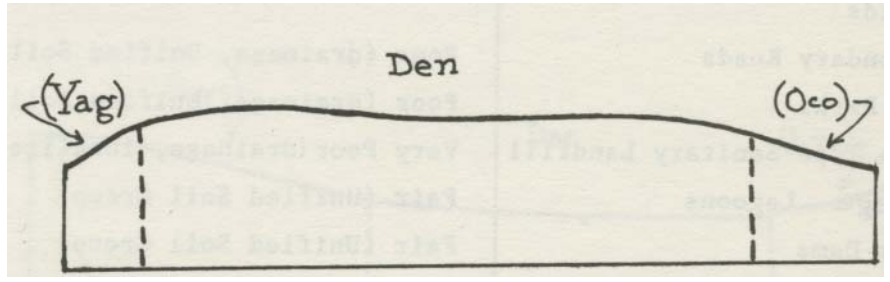
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (thin layer)
(ii) Source of Sand	Poor (thin layer, too clayey)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (drainage, percolates slowly)
(ii) Paths and Trails	Poor (drainage)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (drainage)
(iv) Playing Fields	Fair (drainage)
(v) Golf Courses	Fair (drainage)
(vi) Motor Bike Trails	Poor (drainage, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Poor	Buildings, septic tanks, roads.
Urban Subdivision	Very Poor	Buildings, roads, excavation, drainage.

<b>MAP UNIT:</b>	Devil Bend Undulating	Symbol: <b>Den</b>
<b>GENERAL DESCRIPTION:</b>	Undulating country with yellow-brown duplex soils on fine to medium textured sedimentary rocks.	
<b>TOPOGRAPHY:</b>	Undulating terrain, average gradient 2% ranging up to 5%. Relief of up to 3 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 3.21, Gn 3.91	
(ii) Profile Description:		
0-20 cm	Very dark greyish-brown (10YR 3/2) clay loams; weak crumb structure; consistence slightly hard when dry and friable when moist; pH 6.0 Gradual transition to:	
20-30 cm	Dark yellowish-brown (10YR 4/4) light clay with brownish-yellow mottling and up to 2% ironstone gravel; weak crumb structure; consistence hard when dry and friable when moist; pH 6.0. Gradual transition to:	
30-50 cm	Greyish-brown (10YR 5/2) medium to heavy clay with reddish-brown mottles and up to 5% ironstone gravel; medium angular blocky structure; consistence hard when dry and firm when moist; pH 6.0. Gradual transition to:	
50-120+cm	Brownish-yellow (10YR 6/8) medium to heavy clay with red, grey and brown mottling and 5% ironstone gravel; consistence very hard when dry and very firm when moist; pH 6.0. Continuing with depth.	
(iii) Unified Classification:	CL-ML/CH	
(iv) Shrink-Swell Potential:	Moderate to high (8% to 15%)	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Moderately well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Temporarily waterlogged	
(x) Erosion & Deterioration:	Moderate to high erosion hazard on exposed soil.	

**CAPABILITY FOR SELECTED LAND USES**

Den

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Good
(ii) Shallow Excavations	Fair (Unified Soil Group)
(iii) Septic Tank Absorption Fields	Good
(iv) Secondary Roads	Fair (drainage, Unified Soil Group)
(v) Car Parks	Fair (drainage, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Fair (drainage)
(vii) Sewage Lagoons	Fair (Unified Soil Group)
(viii) Farm Dams	Good

**EARTH RESOURCES:**

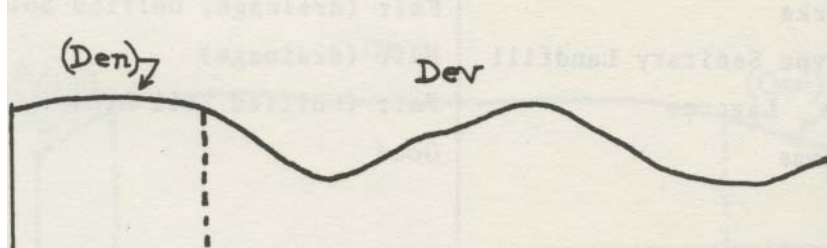
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (thin layer)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (drainage, Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Good
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Good
(iv) Playing Fields	Good
(v) Golf Courses	Very Good
(vi) Motor Bike Trails	Poor (Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	
Urban Subdivision	Good	

<b>MAP UNIT:</b>	Devil Bend	Symbol: <b>Dev</b>
<b>GENERAL DESCRIPTION:</b>	Hilly country on Paleozoic sedimentary rocks of fine to medium texture. Yellow-brown duplex soils predominate, with some gradational related soils.	
<b>TOPOGRAPHY:</b>	Convex and straight hill slopes with an average gradient of 15% ranging up to 25% Relief of up to 35 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 3.41, .31, Gn 3.04	
(ii) Profile Description:		
0-10 cm	Dark greyish-brown (10YR 4/2) fine sandy loam; massive structure, consistence hard when dry and firm when moist; pH 6.5. Abrupt transition to:	
10-30 cm	Yellow-brown (10YR 6/3) fine sandy loam, massive structure; consistence hard when dry and firm when moist; pH 6.5. Clear transition to:	
30-50 cm	Light yellow-brown (10YR 6/4) medium to heavy clay with yellow mottling; weak to strong angular blocky structure; consistence hard when dry and firm when moist; pH 6.0. Gradual transition; pH 6.0.	
50-110 cm	Yellowish-brown (10YR 5/6) medium to heavy clay with red, yellow and pale brown mottling; strong angular blocky structure; consistence very hard when dry and firm when moist; pH 6.0. Continuing with depth.	
(iii) Unified Classification:	CL to ML/CH	
(iv) Shrink-Swell Potential:	Moderate (5%-12%)	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Imperfectly drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Temporarily waterlogged	
(x) Erosion & Deterioration:	High erosion hazard on exposed soil	

**CAPABILITY FOR SELECTED LAND USES**

Dev

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Poor (too steep)
(ii) Shallow Excavations	Poor (too steep)
(iii) Septic Tank Absorption Fields	Poor (too steep, percolates slowly)
(iv) Secondary Roads	Poor (too steep)
(v) Car Parks	Very Poor (too steep)
(vi) Area Type Sanitary Landfill	Poor (too steep)
(vii) Sewage Lagoons	Very Poor (too steep)
(viii) Farm Dams	Poor (too steep)

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (too steep)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (too steep)

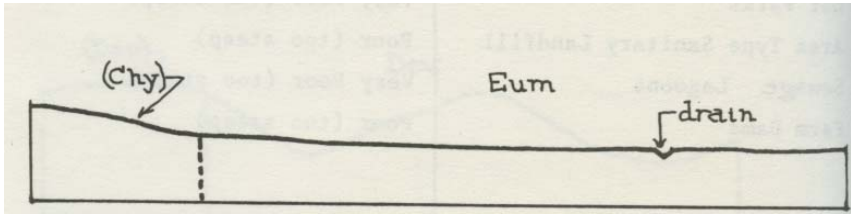
**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (too steep)
(ii) Paths and Trails	Fair (drainage, too steep)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (drainage, too steep)
(iv) Playing Fields	Poor (drainage, too steep)
(v) Golf Courses	Poor (too steep)
(vi) Motor Bike Trails	Poor (too steep, Unified Soil Group)



**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision	Fair	Buildings, septic tanks, roads, dams.
Urban Subdivision	Poor	Buildings, roads, excavation

<p><b><u>MAP UNIT:</u></b></p> <p><b><u>GENERAL DESCRIPTION:</u></b></p> <p><b><u>TOPOGRAPHY:</u></b></p> <p><b><u>SKETCH:</u></b></p>	<p>Eumemmering</p> <p>Flat alluvial plain of black cracking clay.</p> <p>Almost level plain with maximum slope of one per cent but commonly close to zero gradient. Relief is below 1.5 metres.</p>	<p>Symbol: <b>Eum</b></p>
<p><b><u>SOILS INFORMATION:</u></b></p> <p>(i) Factual Key:</p> <p>(ii) Profile Description:</p> <p>0-15 cm</p> <p>15-150 +cm</p> <p>(iii) Unified Classification:</p> <p>(iv) Shrink-Swell Potential:</p> <p>(v) Landslip Potential:</p> <p>(vi) Permeability Class:</p> <p>(vii) Profile Drainage Class:</p> <p>(viii) Flood Risk:</p> <p>(ix) Seasonal Watertable:</p> <p>(x) Erosion &amp; Deterioration:</p>	<p>Ug 5.24</p> <p>Very dark grey (10YR3/1) clay with strong crumb structure; high organic matter content; consistence hard when dry and very plastic when wet; pH 6.0. Diffuse transition to:</p> <p>Dark grey (10YR4/1) clay with fine yellow mottles; coarse angular blocky structure; consistence very hard when dry and very plastic when wet; pH 6.0. Continuing with depth.</p> <p>OH/CH</p> <p>Very high</p> <p>Nil</p> <p>Very slow</p> <p>Very poorly drained</p> <p>High</p> <p>Seasonally at surface</p> <p>Low</p>	

**CAPABILITY FOR SELECTED LAND USES****Eum****ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Very Poor (floods, shrink-swell)
(ii) Shallow Excavations	Very Poor (floods, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Very Poor (floods, percolates slowly)
(iv) Secondary Roads	Very Poor (floods, Unified Soil Group)
(v) Car Parks	Very Poor (floods, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Very Poor (floods)
(vii) Sewage Lagoons	Very Poor (floods, Unified Soil Group)
(viii) Farm Dams	Fair (floods, Unified Soil Group)

**EARTH RESOURCES:**

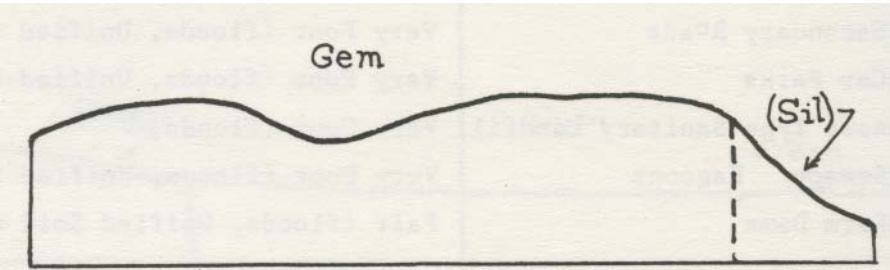
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (too clayey, drainage)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Very Poor (floods, percolates slowly, too clayey)
(ii) Paths and Trails	Poor (floods, too clayey)
(iii) Intensive Use Areas (Picnic areas, etc.)	Very Poor (floods, too clayey)
(iv) Playing Fields	Poor (floods, too clayey)
(v) Golf Courses	Poor (floods, too clayey)
(vi) Motor Bike Trails	Poor (floods, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Very Poor	Drainage, floods, septic tanks, buildings, roads.
Urban Subdivision	Very Poor	Drainage, floods, buildings, roads, excavations.

<b>MAP UNIT:</b>	Gembrook	Symbol: <b>Gem</b>
<b>GENERAL DESCRIPTION:</b>	Rolling hills on basalt with red friable gradational soils. Some areas prone to land slips.	
<b>TOPOGRAPHY:</b>	Convex to straight hill slopes with an average gradient of 8% ranging up to 15%. Relief varies between 8 and 15 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Gn 3.11	
(ii) Profile Description:		
0-15 cm	Very dark greyish brown (10YR3/2) silty clay loam with fine crumb structure; friable consistence; pH 5.7. Gradual transition to:	
15-60 cm	Reddish brown (5YR4/4) light silty clay with strong, fine to medium angular blocky structure; very friable; pH 5.5. Diffuse transition to:	
60-150 + cm	Dark reddish brown (2.5YR3/4) light clay with strong, fine to medium angular blocky structure; friable; pH 5.5.	
(iii) Unified Classification:	CL/CH to CL	
(iv) Shrink-Swell Potential:	Low	
(v) Landslip Potential:	Low	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Nil	
(x) Erosion & Deterioration:	Low	

**CAPABILITY FOR SELECTED LAND USES****Gem****ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Good
(ii) Shallow Excavations	Fair (Unified Soil Group)
(iii) Septic Tank Absorption Fields	Very Good
(iv) Secondary Roads	Fair (Unified Soil Group)
(v) Car Parks	Fair (Unified Soil Group)
(vi) Area Type Sanitary Landfill	Poor (percolates rapidly)
(vii) Sewage Lagoons	Very Poor (percolates rapidly, too steep)
(viii) Farm Dams	Poor (percolates rapidly)

**EARTH RESOURCES:**

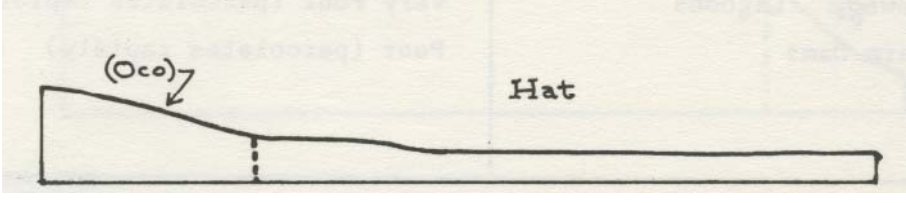
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (too clayey)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Good
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Good
(iv) Playing Fields	Fair (too steep)
(v) Golf Courses	Good
(vi) Motor Bike Trails	Poor (Unified Soil Group)

**SUBDIVISION:**

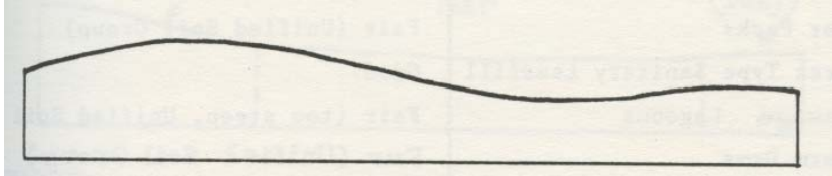
	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	
Urban Subdivision	Fair	Roads, excavation

<b>MAP UNIT:</b>	Hastings Tidal	Symbol: <b>Hat</b>
<b>GENERAL DESCRIPTION:</b>	Areas subject to frequent tidal inundation. Recent marine sediments with mangrove or samphire vegetation or bare areas.	
<b>TOPOGRAPHY:</b>	Almost level with slopes commonly less than 1% and relief up to 1 m.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Uf	
(ii) Profile Description:	Saline muds and silts, sometimes over old swamp deposits	

**CAPABILITY FOR VARIOUS USES:**

Tidal inundation on this unit results in very poor capability for all uses under consideration.



<b>MAP UNIT:</b>	Lysterfield	Symbol: <b>Lys</b>
<b>GENERAL DESCRIPTION:</b>	Undulating country on granodiorite with yellow duplex soils.	
<b>TOPOGRAPHY:</b>	Low, convex hills and rises with average gradient of 5% ranging up to 8%. Relief varies between 3 and 15 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 3.41, .31	
(ii) Profile Description:		
0-25 cm	Dark greyish brown (10YR4/2) Sandy Loam; massive structure; consistence hard when dry and firm when moist; pH 6.0; Clear transition to:	
25-45 cm	Brown (10YR5/3) clayey sand; massive structure; consistence very hard when dry although 'spewy' when wet; pH 5.8. Abrupt transition to:	
45 -80 cm	Brownish yellow (10YR6/6) medium clay with sand and with yellowish mottles, strong angular-blocky structure; consistence very hard when dry and very firm when moist; pH 6.0. Diffuse transition to:	
80-150 cm	Brownish yellow (10YR6/6) medium clay with sand and with reddish brown and yellow mottles; strong angular blocky structure; consistence very hard when dry and very firm when moist; pH 6.0.	
150 + cm	Continuing onto granitic out wash	
(iii) Unified Classification:	SM/CH	
(iv) Shrink-Swell Potential:	Moderate	
(v) Landslip Potential:	Low	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Moderately well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Temporarily ponded	
(x) Erosion & Deterioration:	Low hazard under vegetation; high on exposed soil	

**CAPABILITY FOR SELECTED LAND USES:**

Lys

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Good
(ii) Shallow Excavations	Fair (Unified Soil Group)
(iii) Septic Tank Absorption Fields	Good
(iv) Secondary Roads	Fair (Unified Soil Group)
(v) Car Parks	Fair (Unified Soil Group)
(vi) Area Type Sanitary Landfill	Good
(vii) Sewage Lagoons	Fair (too steep, Unified Soil Group)
(viii) Farm Dams	Fair (Unified Soil Group)

**EARTH RESOURCES:**

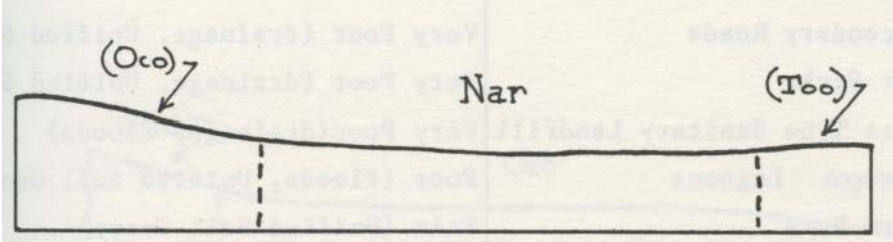
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (thin layer)
(ii) Source of Sand	Fair (overburden thickness, localized deposits)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Good
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Fair (drainage)
(iv) Playing Fields	Fair (too steep)
(v) Golf Courses	Very Good
(vi) Motor Bike Trails	Poor (Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	
Urban Subdivision	Good	

<b>MAP UNIT:</b>	Narre	Symbol: <b>Nar</b>
<b>GENERAL DESCRIPTION:</b>	Almost level valley floors and drainage lines with poorly drained fine textured gradational soils.	
<b>TOPOGRAPHY:</b>	Nearly level plains with gradients below 1.5 per cent. Relief generally below 1.5 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Gn 3.92, .90	
(ii) Profile Description:		
0-15 cm	Very dark greyish brown (10YR3/2) clay loam with faint yellowish root-line mottles; strong crumb structure; consistence hard when dry and friable when moist; pH 6.5. Clear transition to:	
15-30 cm	Dark greyish brown (10YR4/2) clay loam with faint yellow mottles; strong crumb structure; consistence hard when dry and firm when moist; pH 6.0. Diffuse transition to:	
30-65 cm	Dark greyish brown (10YR4/2) light clay with yellow and brown mottles; strong angular blocky structure; consistence very hard when dry and firm when moist; pH 6.0. Diffuse transition to:	
65-150 + cm	Yellowish brown (10YR5/4) heavy clay with yellow, brown and pale grey mottles; strong angular blocky structure; consistence very hard when dry and plastic when wet; pH 6.5. Continuing with depth.	
(iii) Unified Classification:	CL/CH	
(iv) Shrink-Swell Potential:	High	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Very low	
(vii) Profile Drainage Class:	Poorly to very poorly drained	
(viii) Flood Risk:	Moderate, locally high	
(ix) Seasonal Watertable:	Seasonally waterlogged	
(x) Erosion & Deterioration:	Low	

**CAPABILITY FOR SELECTED LAND USES**

Nar

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Very Poor (drainage, floods, shrink-swell)
(ii) Shallow Excavations	Very Poor (drainage, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Very Poor (percolates slowly, flood risk)
(iv) Secondary Roads	Very Poor (drainage, Unified Soil Group)
(v) Car Parks	Very Poor (drainage, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Very Poor (drainage, floods)
(vii) Sewage Lagoons	Poor (floods, Unified Soil Group)
(viii) Farm Dams	Fair (Unified Soil Group)

**EARTH RESOURCES:**

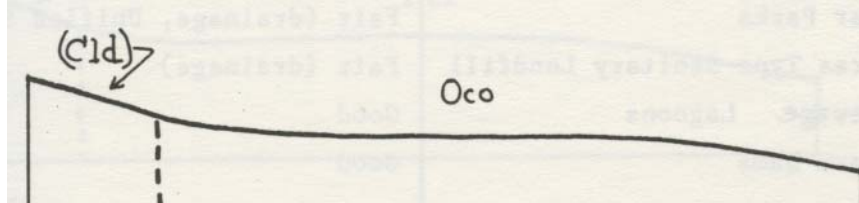
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (too clayey, thin layer, drainage)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Very Poor (drainage, percolates slowly)
(ii) Paths and Trails	Poor (drainage, too clayey)
(iii) Intensive Use Areas (Picnic areas, etc.)	Very Poor (drainage, too clayey)
(iv) Playing Fields	Fair (drainage)
(v) Golf Courses	Fair (drainage)
(vi) Motor Bike Trails	Poor (drainage, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Poor	Septic tanks, drainage, buildings, roads
Urban Subdivision	Very Poor	Drainage, buildings, roads, excavation

<b>MAP UNIT:</b>	O'Connor	Symbol: <b>Oco</b>
<b>GENERAL DESCRIPTION:</b>	Undulating country on the Baxter sandstone with yellow-brown duplex soils.	
<b>TOPOGRAPHY:</b>	Undulating terrain, either as lower slopes, or as larger unconfined areas; average gradient of 2.5% with a maximum of 5%. Relief of up to 5 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 3.41 .31	
(ii) Profile Description:		
0-15 cm	Dark brown (10YR 3/3) fine sandy clay loam; weak crumb structure; consistence hard when dry and firm when moist; pH 6.0. Clear transition to:	
15-35 cm	Pale brown (10YR 6/3) fine sandy loam to fine sandy clay loam with brown mottling; massive structure; consistence hard when dry and "spewy" when wet; pH 6.0. Clear to gradual transition to:	
35-45 cm	Yellowish-brown (10YR 5/6) medium to heavy clay with grey and red-brown mottling; angular blocky structure; consistence hard when dry and firm when moist; pH 6.0. Gradual transition to:	
45-120 +cm	Yellowish-brown (10YR 5/6) medium to heavy clay with grey and red mottling; strong angular blocky structure; consistence hard when dry and firm when moist; pH 6.5 up to 5 gravel. Continuing with depth.	
(iii) Unified Classification:	SM-ML/CH to CL	
(iv) Shrink-Swell Potential:	Moderate-High (10%-17%)	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Imperfectly drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Temporarily waterlogged	
(x) Erosion & Deterioration:	Low erosion hazard on exposed soil	

**CAPABILITY FOR SELECTED LAND USES**

Oco

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Fair (drainage, shrink-swell)
(ii) Shallow Excavations	Fair (drainage, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Fair (drainage, percolates slowly)
(iv) Secondary Roads	Fair (drainage, Unified Soil Group)
(v) Car Parks	Fair (drainage, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Fair (drainage)
(vii) Sewage Lagoons	Good
(viii) Farm Dams	Good

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (thin layer)
(ii) Source of Sand	Poor (too clayey)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (depth of overburden)

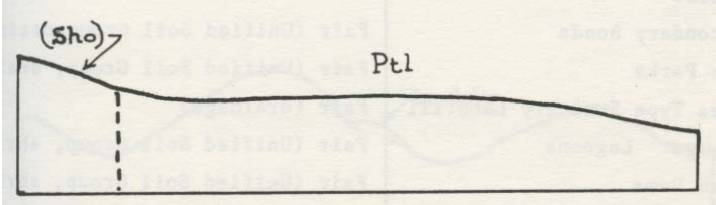
**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Fair (drainage)
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Fair (drainage)
(iv) Playing Fields	Good
(v) Golf Courses	Good
(vi) Motor Bike Trails	Poor (drainage, Unified Soil Group)



**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	
Urban Subdivision	Good	

<b>MAP UNIT:</b>	Point Leo	Symbol: <b>Ptl</b>
<b>GENERAL DESCRIPTION:</b>	Undulating country on basalt with brown duplex and gradational soils.	
<b>TOPOGRAPHY:</b>	Undulating terrain with long gentle slopes of up to 500 m. Average gradient 2-57, ranging up to 5%.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 3.41, Gn 3.84	
(ii) Profile Description:		
0-15 cm	Very dark greyish-brown (10YR3/2) fine sandy clay loam; weak structure; consistence, moist friable, dry slightly hard; pH 6.0. Clear transition to:	
15-35 cm	Pale brown (10YR6/3) silty clay loam with fine yellow brown mottles; apedal massive structure; consistence, moist firm, dry hard; traces of fine gravel (5-10 mm); pH 6.0. Clear transition to:	
30-50 cm	Yellowish-brown (10YR5/6) medium to heavy clay, with pale brown mottles; medium to strong fine angular blocky structure; consistence, moist firm, dry very hard; Occasionally traces of fine gravel; pH 6.5-7.5 Gradual transition to:	
50-100 + cm	Yellowish-brown (10YR5/6) medium to heavy clay with many fine strong red and pale brown mottles; medium to strong fine angular blocky structure; consistence, moist firm, dry very hard; pH 6.5-7.5.  Hard rock usually deeper than 2 m.	
(iii) Unified Classification:	ML/CH	
(iv) Shrink-Swell Potential:	Moderate to high (8% to 20%)	
(v) Landslip Potential:	Nil - batters slump	
(vi) Permeability Class:	Moderate to slow	
(vii) Profile Drainage Class:	Imperfect	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Temporarily waterlogged	
(x) Erosion & Deterioration:	Minor erosion of drains	

**CAPABILITY FOR SELECTED LAND USES**

Ptl

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Fair (Unified Soil Group, drainage)
(ii) Shallow Excavations	Fair (Unified Soil Group, drainage)
(iii) Septic Tank Absorption Fields	Fair (percolates slowly, drainage)
(iv) Secondary Roads	Fair (Unified Soil Group, drainage)
(v) Car Parks	Fair (Unified Soil Group, drainage)
(vi) Area Type Sanitary Landfill	Fair (drainage)
(vii) Sewage Lagoons	Fair (Unified Soil Group, shrink-swell)
(viii) Farm Dams	Fair (Unified Soil Group, shrink-swell)

**EARTH RESOURCES:**

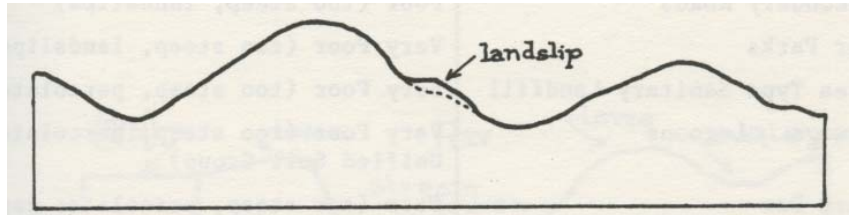
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (thin layer)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Fair (drainage, percolates slowly)
(ii) Paths and Trails	Fair (drainage)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (drainage)
(iv) Playing Fields	Fair (drainage)
(v) Golf Courses	Fair (drainage)
(vi) Motor Bike Trails	Poor (drainage, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Fair	Septic Tanks, buildings, roads
Urban Subdivision	Fair	Buildings, roads, excavation

<b>MAP UNIT:</b>	Red Hill South	Symbol: <b>Res</b>
<b>GENERAL DESCRIPTION:</b>	Hilly country on basalt, deep red friable soils, much of the area prone to landslips.	
<b>TOPOGRAPHY:</b>	Convex to straight hill slopes with an average gradient of 16%, locally to 25% (backslopes of landslips).	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Gn 3.11, .75	
(ii) Profile Description:		
0-15 cm	Reddish-brown (5YR4/4) clay loam with 2% ironstone gravel; medium to strong crumb structure; consistence slightly hard when dry and friable when moist; pH 7.0 Clear to gradual transition to:	
15.35 cm	Red (2.5YR4/6) light clay with 2% ironstone gravel; medium crumb structure; consistence hard when dry and friable when moist; pH 7.0. Clear transition to:	
35-60 cm	Red (2.5YR4/6) heavy clay with 3% ironstone gravel; strong angular blocky structure; consistence slightly hard when dry and very friable when moist; pH 7.5 Gradual transition to:	
60-100 cm	Dark red (2.5YR3/6) heavy clay with up to 5% ironstone gravel; strong angular blocky structure, consistence slightly hard when dry and very friable when moist; pH 7.0. Continuing with depth.	
(iii) Unified Classification:	ML to CL/CH to MH	
(iv) Shrink-Swell Potential:	Moderate to High (8% to 17%)	
(v) Landslip Potential:	High	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Well drained	
(viii) Flood Risk:	Ni	
(ix) Seasonal Watertable:	Nil	
(x) Erosion & Deterioration:	Slumping of batters; landslips.	

**CAPABILITY FOR SELECTED LAND USES**

Res

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Very Poor (landslips, too steep, Unified soil Group)
(ii) Shallow Excavations	Poor (too steep, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Poor (too steep)
(iv) Secondary Roads	Poor (too steep, landslips)
(v) Car Parks	Very Poor (too steep, landslips)
(vi) Area Type Sanitary Landfill	Very Poor (too steep, percolates rapidly)
(vii) Sewage Lagoons	Very Poor (too steep, percolates rapidly Unified Soil Group)
(viii) Farm Dam	Poor (too steep, percolates rapidly, Unified Soil Group)

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (too steep, thin layer)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (too steep, Unified Soil Group, shrinkswell)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (too steep)
(ii) Paths and Trails	Poor (too steep)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (too steep)
(iv) Playing Fields	Very Poor (too steep)
(v) Golf Courses	Poor (too steep)
(vi) Motor Bike Trails	Poor (too steep, Unified Soil Group)

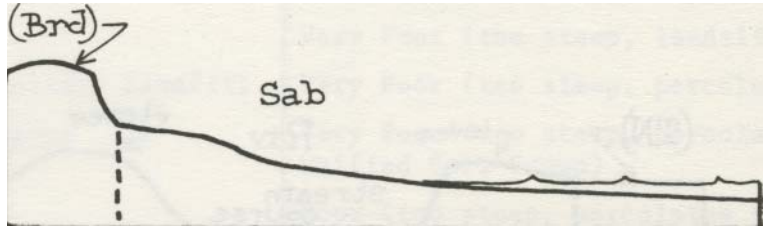
**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Poor	Landslips, buildings, road, dams
Urban Subdivision	Very Poor	Landslips, buildings, road excavations

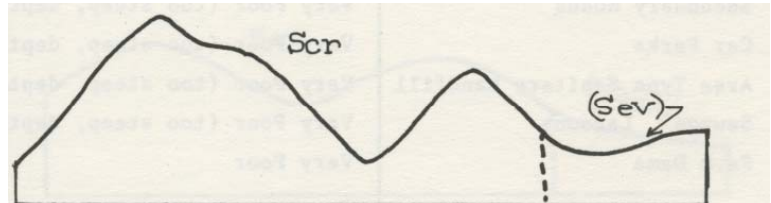
<b>MAP UNIT:</b>	Riverine	Symbol: Riv
<b>GENERAL DESCRIPTION:</b>	Areas of active levees and swales along streams and tributaries which are influenced by seasonal over-topping and by deposition. Recent alluvial soils on coarse to fine textured sediments, with some older soils on levees.	
<b>TOPOGRAPHY:</b>	Variable, ranging from stream banks and entrenched channels to almost level crests on levees and swampy depression.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Ucl, Uc5, Uf, minor Dy 3.	
(ii) Profile Description:	Coarse to fine sandy, layered soil in recent alluvium. Older levees show profile development with an increase of organic matter in the topsoil and the development of a weak A2 horizon. Fine textured alluvium occurs in swampy depressions where there is generally also a build up of organic matter.	
(iii) Unified Classification:	SP, SM, SC, ML	
(iv) Shrink-Swell Potential:	Nil to moderate	
(v) Landslip Potential:	Nil, but stream bank erosion is locally severe	
(vi) Permeability Class:	Rapid to slow	
(vii) Profile Drainage Class:	Well drained to very poorly drained	
(viii) Flood Risk:	High	
(ix) Seasonal Watertable:	Nil to seasonally at surface	
(x) Erosion & Deterioration:	High	

<b>CAPABILITY FOR VARIOUS USES:</b>	<b>Riv</b>
<p>Flooding, poor site drainage and high seasonal watertable in the swampy depression result in poor and very poor capabilities for all uses under consideration. Capability for farm dams is Poor, due to rapid percolation rates, or Very Poor due to Unified Soil Group, or risk of damage to, -embankment from high velocity flooding.</p>	



<b>MAP UNIT:</b>	Sandy Beach	Symbol: <b>Sab</b>
<b>GENERAL DESCRIPTION:</b>	Sandy beach, tidally influenced on the lower slopes and merging gradually into foredunes, or ending abruptly at a cliff face at the rear. Of variable width.	
<b>TOPOGRAPHY:</b>	Level to gently sloping terrain, slopes up to 2%.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>	Loose sand to varying depths (metre +), without vegetation.	

<b>CAPABILITY FOR VARIOUS USES:</b>
<p>These areas have very poor capability for most activities under consideration because of tidal inundation. The traditional use has been for recreation and, with appropriate management, serious deterioration can be minimised.</p>

<b>MAP UNIT:</b>	Schoolhouse Ridge	Symbol: <b>Scr</b>
<b>GENERAL DESCRIPTION:</b>	Steep hills on sedimentary rocks with shallow, stony gradational soils.	
<b>TOPOGRAPHY:</b>	Steep hilly, dissected terrain with generally straight slopes of average gradient 25% ranging between 20% and 45%. Relief varies between 10 and 45 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Gn 3,82, Dy 3.21	
(ii) Profile Description:		
0-10 cm	Dark greyish brown (10YR 4/2) fine sandy loam; weak crumb structure; consistence hard when dry and firm when moist; pH 5.5. Gradual transition to:	
10-20 cm	Pale brown (10YR 6/3) silty clay loam with 10% ironstone gravels; massive structure; consistence hard when dry and very friable when moist; pH 5.5 Clear transition to:	
20-50 cm	Yellowish brown (10YR 5/6) medium silty clay with dark brown and yellow mottles; medium sub-angular blocky structure; consistence very hard when dry and very firm when moist; pH 6.0. Diffuse transition to:	
50-80 cm	Yellowish brown (10 YR 5/6) medium-heavy clay with reddish-brown mottles and 25% rock fragments; medium angular blocky structure; consistence very hard when dry and very firm when moist; pH 6.0.	
80 +cm	Siltstone.	
(iii) Unified Classification:	ML/SM	
(iv) Shrink-Swell Potential:	Moderate	
(v) Landslip Potential:	Low	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Moderately well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Nil	
(x) Erosion & Deterioration:	Very high erosion on exposed soil	

**CAPABILITY FOR SELECTED LAND USES**

Scr

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Poor (too steep, depth to rock)
(ii) Shallow Excavations	Very Poor (too steep, depth to rock)
(iii) Septic Tank Absorption Fields	Very Poor (too steep, depth to rock)
(iv) Secondary Roads	Very Poor (too steep, depth to rock)
(v) Car Parks	Very Poor (too steep, depth to rock)
(vi) Area Type Sanitary Landfill	Very Poor (too steep, depth to rock)
(vii) Sewage Lagoons	Very Poor (too steep, depth to rock)
(viii) Farm Dams	Very Poor

**EARTH RESOURCES:**

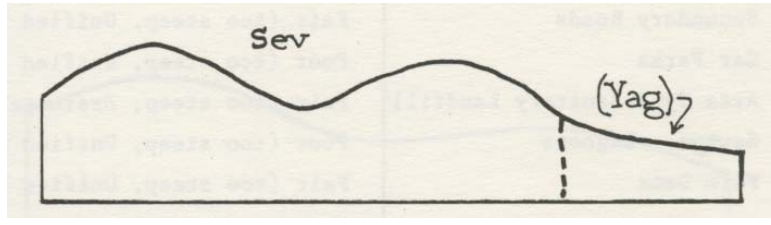
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Very Poor (too steep, thin layer)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (too steep)
(iv) Source of Roadfill	Very Poor (too steep)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (too steep)
(ii) Paths and Trails	Poor (too steep)
(iii) Intensive Use Areas (Picnic Areas, etc.)	Very Poor (too steep)
(iv) Playing Fields	Very Poor (too steep, depth to rock)
(v) Golf Courses	Very Poor (too steep)
(vi) Motor Bike Trails	Very Poor (too steep, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Poor	Buildings, roads, septic tank dams.
Urban Subdivision	Very Poor	Buildings, roads, excavation

<b>MAP UNIT:</b>	Seville	Symbol: <b>Se</b>
<b>GENERAL DESCRIPTION:</b>	Low hills on fine to medium textured sedimentary rocks with yellow-brown duplex soils and some gradational soils.	
<b>TOPOGRAPHY:</b>	Convex hills with an average gradient of 12% ranging up to 20%. Relief varies between 5 and 20 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 3.21, .31, Gn 3.91	
(ii) Profile Description:		
0-15 cm	Dark brown (10YR 3/3) silty loam; weak crumb to massive structures; consistence hard when dry and firm when moist; pH 6.0. Gradual transition to:	
15-50 cm	Pale brown (10YR 6/3) silty clay loam with 15% ironstone gravels; massive structure; consistence hard when dry and "spewy" when wet; pH 5.5. Abrupt transition to:	
50-120 cm	Yellowish brown (10YR 5/4) medium silty clay with brown and yellow mottles; strong sub-angular blocky structure; consistence very hard when dry and very firm when moist; pH 5.0. Diffuse transition to:	
120 +cm	Siltstone, either as bedrock or else as a deep layer of coarse fragments.	
(iii) Unified Classification:	CL to ML/CH	
(iv) Shrink-Swell Potential:	Moderate to high	
(v) Landslip Potential:	Low	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Moderately well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Temporarily ponded	
(x) Erosion & Deterioration:	High erosion hazard on exposed soil.	

**CAPABILITY FOR SELECTED LAND USES****Sev****ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Fair (too steep)
(ii) Shallow Excavations	Fair (too steep, depth to rock)
(iii) Septic Tank Absorption Fields	Fair (too steep, percolates slowly)
(iv) Secondary Roads	Fair (too steep, Unified Soil Group)
(v) Car Parks	Poor (too steep, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Fair (too steep, drainage)
(vii) Sewage Lagoons	Poor (too steep, Unified Soil Group)
(viii) Farm Dams	Fair (too steep, Unified Soil Group)

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (too steep, too clayey)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Poor (depth of overburden, too steep)
(iv) Source of Roadfill	Poor (depth of overburden, too steep)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (too steep, percolates slowly)
(ii) Paths and Trails	Fair (too steep, drainage)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (too steep, drainage)
(iv) Playing Fields	Poor (too steep)
(v) Golf Courses	Fair (too steep, drainage)
(vi) Motor Bike Trails	Fair (too steep, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	
Urban Subdivision	Fair	Buildings, roads, excavation

<b>MAP UNIT:</b>	Shoreham	Symbol: <b>Sho</b>
<b>GENERAL DESCRIPTION:</b>	Rolling low hills or crests and lower slopes of steeper hills, on basalt. Some areas prone to landslips.	
<b>TOPOGRAPHY:</b>	Convex to straight hill slopes with an average gradient of 6% ranging between 4% and 10%. Relief up to 20 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>	Gn 3.75, .21	
(i) Factual Key:		
(ii) Profile Description:		
<b><u>(a) Crests and Upper Slopes</u></b>		
0-15 cm	Dark brown (7.5YR4/3) clay loam with 3% ironstone gravel; medium crumb structure; consistence slightly hard when dry and friable when moist; pH 6.0 Clear transition to:	
15-35 cm	Brown (7.5YR4/4) light clay with 5% ironstone gravel; medium crumb structure; consistence hard when dry and very friable when moist; pH 6.5. Clear transition to:	
35-80 cm	Strong brown (7.5YR5/8) medium to heavy clay with red mottling and 2% ironstone gravel; strong angular blocky structure; consistence slightly hard when dry and friable when moist; pH 7.0. Clear transition to:	
80-120 + cm	Strong brown (7.5YR5/6) medium to heavy clay with yellow and red mottling and 5% ironstone gravel; strong angular blocky structure; consistence slightly hard when dry and friable when moist; pH 7.0 Continuing with depth.	
<b><u>(b) Lower slopes - profile description as for Pt. Leo</u></b>		
(iii) Unified Classification:	CL/MH-CH	
(iv) Shrink-Swell Potential:	High (10% to 20%)	
(v) Landslip Potential:	Nil to Low; batters slump	
(vi) Permeability Class:	Moderate to rapid	
(vii) Profile Drainage Class:	Well	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Nil	
(x) Erosion & Deterioration:	Nil	



**CAPABILITY FOR SELECTED LAND USES**

Sho

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Good
(ii) Shallow Excavations	Fair (Unified Soil Group)
(iii) Septic Tank Absorption Fields	Good
(iv) Secondary Roads	Fair (Unified Soil Group)
(v) Car Parks	Fair (Unified Soil Group)
(vi) Area Type Sanitary Landfill	Fair (Unified Soil Group, percolates rapidly)
(vii) Sewage Lagoons	Poor (Unified Soil Group, percolates rapidly, too steep)
(viii) Farm Dams	Fair (Unified Soil Group, percolates rapidly)

**EARTH RESOURCES:**

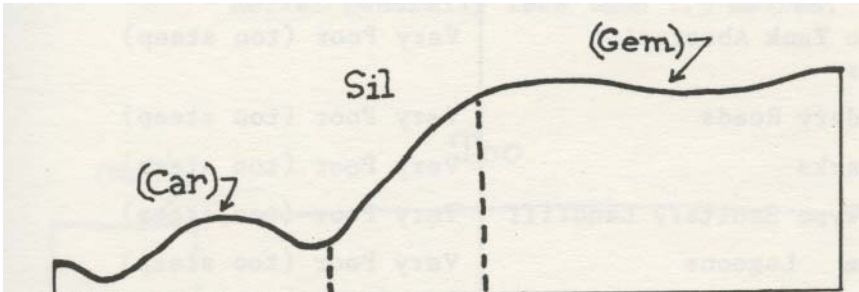
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Poor (thin layer)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Good
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Good
(iv) Playing Fields	Fair (too steep)
(v) Golf Courses	Good
(vi) Motor Bike Trails	Poor (Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Fair	Buildings, roads, dams
Urban Subdivision	Fair	Buildings, roads, excavation

<b>MAP UNIT:</b>	Silvan	Symbol: <b>Sil</b>
<b>GENERAL DESCRIPTION:</b>	Steep hills on basalt with red friable gradational soils. Some areas are prone to land slips.	
<b>TOPOGRAPHY:</b>	Straighthill slopes with an average gradient of 25% ranging up to 30%. Relief varies between 20 and 30 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Gn 3.11	
(ii) Profile Description:		
0-10 cm	Very dark greyish brown (10YR3/2) silty clay loam with fine crumb structure; friable consistence; pH 5.7. Gradual transition to:	
10-50 cm	Reddish brown (5YR4/4) light silty clay with fine to medium angular blocky structure; very friable; pH 5.5. Diffuse transition to:	
50-150 + cm	Dark reddish brown (2.5YR3/4) light clay with fine to medium angular blocky structure; friable; pH 5.5 Continuing with depth.	
(iii) Unified Classification:	CL/CH to CL	
(iv) Shrink-Swell Potential:	Low	
(v) Landslip Potential:	Moderate	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Nil	
(x) Erosion & Deterioration:	Low	

**CAPABILITY FOR SELECTED LAND USES****Sil****ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Very Poor (landslips, too steep, Unified Soil Group)
(ii) Shallow Excavations	Very Poor (too steep, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Very Poor (too steep)
(iv) Secondary Roads	Very Poor (too steep)
(v) Car Parks	Very Poor (too steep)
(vi) Area Type Sanitary Landfill	Very Poor (too steep)
(vii) Sewage Lagoons	Very Poor (too steep)
(viii) Farm Dams	Very Poor (too steep)

**EARTH RESOURCES:**

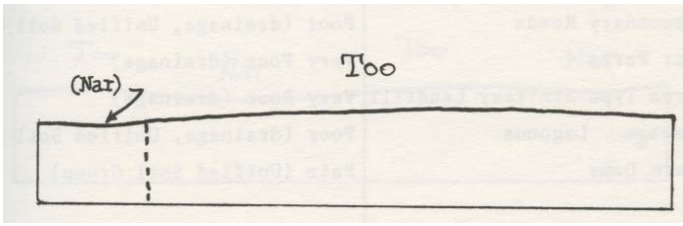
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Very Poor (too steep)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group, too steep)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (too steep)
(ii) Paths and Trails	Poor (too steep)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (too steep)
(iv) Playing Fields	Very Poor (too steep)
(v) Golf Courses	Very Poor (too steep)
(vi) Motor Bike Trails	Very Poor (too steep)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Very Poor	Buildings, roads, dams
Urban Subdivision	Very Poor	Buildings, roads, excavation

<b>MAP UNIT:</b>	Toomuc	Symbol: <b>Too</b>
<b>GENERAL DESCRIPTION:</b>	Almost level, broad plain on outwash consisting of poorly drained yellow mottled duplex soils with sandy top soils.	
<b>TOPOGRAPHY:</b>	Nearly level with gradients not exceeding 1.5 per cent. The lower portions tend to pond water seasonally and may flood. Relief generally less than 1.5 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:		
(ii) Profile Description:		
0-20 cm	Very dark greyish brown (10YR3/2) sandy loam often with fine yellowish brown rootline mottles; weak crumb structure; consistence slightly hard when dry and friable when moist; pH 6.0. Clear transition to:	
20-40 cm	Grey brown to pale brown (10YR5/2) sandy loam to clayey sand with fine yellow mottles; apedal massive structure; consistence hard when dry and "spewy" when wet, pH 5.5. Abrupt transition to:	
40-55 cm	Brown (10YR5/3) sandy clay with grey and yellow mottles; strong, coarse subangular-blocky structure; consistence very hard when dry and firm when moist; pH 5.5. Clear transition to:	
55-150 + cm	Grey brown (10YR5/2) medium to heavy clay (occasionally sandy) with yellow and reddish brown mottles; strong coarse subangular blocky structure; consistence very hard when dry and firm when moist; pH 5.5. Continuing with depth.	
(iii) Unified Classification:	ML/CH	
(iv) Shrink-Swell Potential:	High	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Very slow	
(vii) Profile Drainage Class:	Poorly drained	
(viii) Flood Risk:	Low	
(ix) Seasonal Watertable:	Temporarily waterlogged	
(x) Erosion & Deterioration:	Low	

**CAPABILITY FOR SELECTED LAND USES**

Too

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Fair (drainage, shrink-swell)
(ii) Shallow Excavations	Poor (drainage, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Poor (percolates slowly, drainage)
(iv) Secondary Roads	Poor (drainage, Unified Soil Group)
(v) Car Parks	Very Poor (drainage)
(vi) Area Type Sanitary Landfill	Very Poor (drainage)
(vii) Sewage Lagoons	Poor (drainage, Unified Soil Group)
(viii) Farm Dams	Fair (Unified Soil Group)

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (drainage, thin layer)
(ii) Source of Sand	Poor (too clayey)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group)

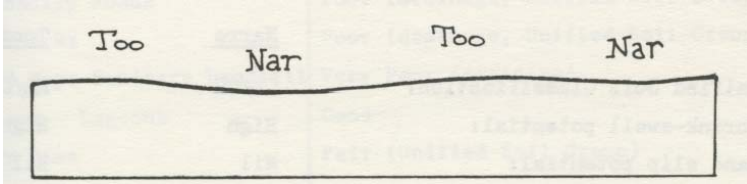
**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (drainage, percolates slowly)
(ii) Paths and Trails	Fair (drainage)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (drainage)
(iv) Playing Fields	Good
(v) Golf Courses	Fair (drainage)
(vi) Motor Bike Trails	Poor (drainage, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good (if not flooded)	
Urban Subdivision	Fair (if not flooded)	



<b>MAP UNIT:</b>	Toomuc - Narre Complex	Symbol: <b>TN</b>
<b>GENERAL DESCRIPTION:</b>	Complex map unit containing areas of Toomuc and Narre which cannot be distinguished at the scale of the pilot study. Essentially, area is a broad, almost level plain with both fine textured, gradational soils (Narre) and mottled duplex soils with sandy topsoils (Toomuc).	
<b>TOPOGRAPHY:</b>	Nearly level with gradients below 1.5%. Relief up to 4 metres.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Narre: Gn 3.92; Toomuc: Dy 3.41	
(ii) Profile Description:		
<b>Narre</b>		
0-15 cm	Very dark greyish brown (10YR3/2) clay loam with faint yellowish rootline mottles; strong crumb structure; consistence hard when dry and friable when moist; pH 6.5 Clear transition to:	
15-30 cm	Dark greyish brown (10YR4/2) clay loam with faint yellow mottles; strong crumb structure; consistence hard when dry and firm when moist; pH 6.0. Diffuse transition to:	
30-65 cm	Dark greyish brown (10YR4/2) light clay with yellow and brown mottles; strong angular blocky structure; consistence very hard when dry and firm when moist; pH 6.0. Diffuse transition to:	
60-150 + cm	Yellow brown (10YR5/4) heavy clay with yellow brown and pale grey mottles; strong angular blocky structure; consistence very hard when dry and plastic when wet; pH 6.5. Continuing with depth.	
<b>Toomuc</b>		
0-20 cm	Very dark greyish brown (10YR3/2) sandy loam often with yellow brown rootline mottles; weak crumb structure; consistence slightly hard when dry and friable moist; pH 6.0. Clear transition to:	
20-40 cm	Grey brown to pale brown (10YR5/2) sandy loam to clayey sand with fine yellow mottles; apedal massive structure; consistence hard when dry and "spewy" when wet; pH 5.5. Clear transition to:	
40-55 cm	Brown (10YR5/3) sandy clay with strong yellow mottling; strong coarse, subangular-blocky structure; consistence very hard when dry and firm when moist pH 5.5. Diffuse transition to:	
50-150 + cm	Grey brown (10YR5/2) medium to heavy clay (occasionally sandy) with strong yellow and red brown mottling; strong coarse subangular blocky structure; consistence very hard when dry and firm when moist pH 5.5. Continuing with depth.	

	<b><u>Narre</u></b>	<b><u>Toomuc</u></b>
(iii) Unified Classification:	CL/CH	ML/CH
(iv) Shrink-Swell Potential:	High	High
(v) Landslip Potential:	Nil	Nil
(vi) Permeability Class:	Very slow	Very slow
(vii) Profile Drainage Class:	Poorly to very poorly drained	Poorly drained
(viii) Flood Risk:	Moderate, locally high	Moderate to low
(ix) Seasonal Watertable:	Seasonally waterlogged	Temporarily waterlogged
(x) Erosion & Deterioration:	Low	Low

<b><u>CAPABILITY FOR SELECTED LAND USES</u></b>		<b>TN</b>
<b>ENGINEERING :</b>		
<i>Activity</i>	<i>Rating (limiting factors)</i>	
(i) Building Foundations	Fair (drainage, shrink-swell)	
(ii) Shallow Excavations	Very Poor (drainage, Unified Soil Group)	
(iii) Septic Tank Absorption Fields	Very Poor (percolates slowly)	
(iv) Secondary Roads	Poor (drainage, Unified Soil Group)	
(v) Car Parks	Poor (drainage, Unified Soil Group)	
(vi) Area Type Sanitary Landfill	Very Poor (drainage)	
(vii) Sewage Lagoons	Good	
(viii) Farm Dams	Fair (Unified Soil Group)	

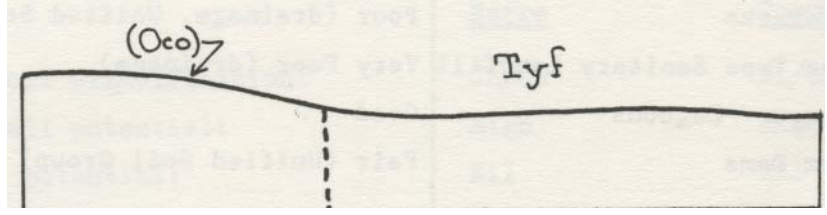
<b>EARTH RESOURCES:</b>	
	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (thin layer)
(ii) Source of Sand	Poor (too clayey)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Poor (drainage, percolates slowly)
(ii) Paths and Trails	Fair (drainage)
(iii) Intensive Use Areas (Picnic areas, etc.)	Poor (drainage)
(iv) Playing Fields	Good
(v) Golf Courses	Fair (drainage)
(vi) Motor Bike Trails	Poor (drainage, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Fair	Septic tanks, buildings, roads, drainage.
Urban Subdivision	Poor	Buildings, roads, excavation, drainage.

<b>MAP UNIT:</b>	Tyabb Flats	Symbol: <b>Tyf</b>
<b>GENERAL DESCRIPTION:</b>	Flat to slightly undulating land on Baxter Sandstone or broad alluvial areas. The mottled duplex soils remain waterlogged during winter/spring period with many areas ponding water and some area flooding.	
<b>TOPOGRAPHY:</b>	Flat to slightly undulating terrain with average slopes between 0 and 3 percent. Often includes drainage depressions.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 3.42, .32, .22	
(ii) Profile Description:		
0-15 cm	Very dark greyish-brown (10 YR 3/2) sandy clay loam; weak crumb structure; consistence moist friable, dry hard; pH 6.5. Clear transition to:	
15-35 cm	Pale brown (10 YR 6/3) sandy clay loam with approximately 5% gravel (gravel & ironstone content increases sharply in the lower 5 cm of this horizon); massive apedal structure; consistence moist firm, dry hard; pH 6.0 Clear transition to:	
35-45 cm	Brown (10 YR 5/3) medium clay with traces of gravel; weak blocky structure; consistence, moist firm, dry very hard; pH 6.0. Diffuse transition to:	
45-85 cm	Brownish yellow (10 YR 6/6) medium clay with traces of gravel; medium, coarse blocky structure; consistence moist firm, dry very hard; pH 6.5 Diffuse transition to:	
85-110 +cm	Unstructured light clay.	
(iii) Unified Classification:	SM to ML/CH to CL	
(iv) Shrink-Swell Potential:	Moderate to high	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Slow	
(vii) Profile Drainage Class:	Poorly drained	
(viii) Flood Risk:	High	
(ix) Seasonal Watertable:	Seasonal waterlogged	
(x) Erosion & Deterioration:	Very low erosion hazard.	

**CAPABILITY FOR SELECTED LAND USES**

Tyf

**ENGINEERING:***Activity**Rating (limiting factors)*

(i) Building Foundations	Poor (drainage, shrink-swell)
(ii) Shallow Excavations	Poor (drainage, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Very Poor (percolates slowly, drainage)
(iv) Secondary Roads	Very Poor (drainage, Unified Soil Group)
(v) Car Parks	Very Poor (Drainage, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Very Poor (drainage)
(vii) Sewage Lagoons	Poor (drainage, Unified Soil Group)
(viii) Farm Dams	Fair (drainage, Unified Soil Group)

**EARTH RESOURCES:***Rating (limiting factors)*

(i) Source of Topsoil	Poor (drainage, thin layer)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group)

**RECREATION:***Activity**Rating (limiting factors)*

(i) Camp Sites	Very Poor (drainage)
(ii) Paths and Trails	Poor (drainage)
(iii) Intensive Use Areas (Picnic areas, etc.)	Very Poor (drainage)
(iv) Playing Fields	Poor (drainage)
(v) Golf Courses	Poor (drainage)
(vi) Motor Bike Trails	Poor (drainage, Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Poor	Septic tanks, buildings, roads, drainage
Urban Subdivision	Poor	Buildings, roads, excavation, drainage

<b>MAP UNIT:</b>	Tyabb West	Symbol: <b>Tyw</b>
<b>GENERAL DESCRIPTION:</b>	Hilly country on the Baxter sandstone with yellow brown duplex soils.	
<b>TOPOGRAPHY:</b>	Hilly terrain with an average gradient of 12% ranging between 8% and 20%. Relief of up to 15 metres	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 3.41, Gn 3.75	
(ii) Profile Description:		
0-20 cm	Very dark greyish-brown (10YR 3/2) fine sandy clay loam; weak structure; consistence slightly hard when dry and friable when moist; pH 6.0 Gradual transition to:	
20-45 cm	Pale brown (10YR 6/3) fine sandy clay loam with up to 5% ironstone; massive structure; consistence very hard when dry and "spewy" when wet; pH 6.5 Abrupt transition to:	
45-75 cm	Yellow-brown (10YR 5/8) medium to heavy clay with red and brown mottling; strong angular blocky structure; consistence hard when dry and firm when moist; pH 7.0. Gradual transition to:	
75-100 +cm	Brownish-yellow (10YR 6/6) medium to heavy clay with yellow, red and reddish brown mottling; strong angular blocky structure; consistence hard when dry and firm when moist; pH 7.0 Continuing with depth.	
(iii) Unified Classification:	SM-MI/CH-CL	
(iv) Shrink-Swell Potential:	Moderate to high (4-12%)	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Moderately well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Nil	
(x) Erosion & Deterioration:	High erosion hazard on exposed soil	

**CAPABILITY FOR SELECTED LAND USES**

Tyw

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Fair (too steep)
(ii) Shallow Excavations	Fair (too steep, Unified Soil Group)
(iii) Septic Tank Absorption Fields	Fair (too steep)
(iv) Secondary Roads	Fair (too steep, Unified Soil Group)
(v) Car Parks	Poor (too steep, Unified Soil Group)
(vi) Area Type Sanitary Landfill	Fair (too steep)
(vii) Sewage Lagoons	Poor (too steep)
(viii) Farm Dams	Fair (too steep)

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (too steep, thin layer)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Poor (too steep, depth of overburden)

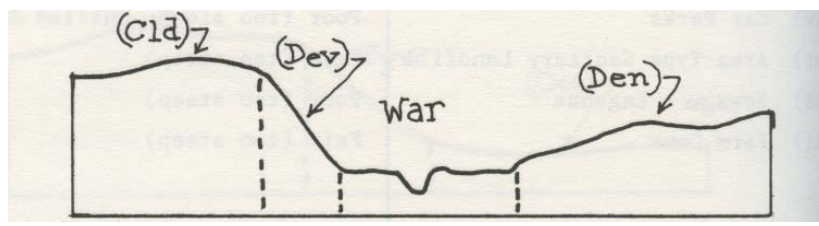
**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Fair (too steep)
(ii) Paths and Trails	Fair (too steep)
(iii) Intensive Use Areas (Picnic areas, etc.)	Fair (too steep)
(iv) Playing Fields	Poor (too steep)
(v) Golf Courses	Fair (too steep)
(vi) Motor Bike Trails	Fair (too steep, Unified Soil Group)



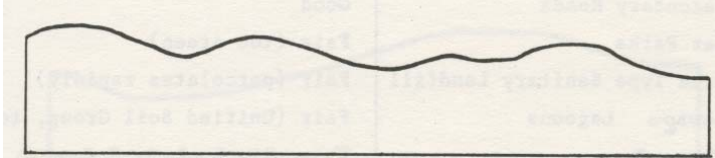
**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	
Urban Subdivision	Fair	Buildings, roads excavation

<b>MAP UNIT:</b>	Warrenquite	Symbol: <b>War</b>
<b>GENERAL DESCRIPTION:</b>	Well confined drainage lines cut down onto Paleozoic sediments and draining areas of predominantly Tertiary sandstone. Cld, Oco, and Dev are the dominant map units in the catchment.	
<b>TOPOGRAPHY:</b>	Stream grade averages 1.5%; unit width varies up to 50 metres. Incised channel flowing through narrow drainage floor.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>	<p>(i) Factual Key: Um, Uc.</p> <p>(ii) Profile Description: Alluvial soils reflecting parent material of soils in the catchment.</p>	

**CAPABILITY FOR VARIOUS USES:**

Flooding in this unit results in very poor capability for most uses. Where flash flooding does not occur, capability for farm dam construction is good.

<b>MAP UNIT:</b>	Watson	Symbol: <b>Wat</b>
<b>GENERAL DESCRIPTION:</b>	Rolling country with thin Quaternary sand sheets over Baxter sandstone sediments. The sand sheet varies in depth from 20-60 cm. Commonly used for horticulture.	
<b>TOPOGRAPHY:</b>	Rolling terrain with average slopes of 6% ranging up to: Relief of up to 10m.	
<b>SKETCH:</b>		
<b>SOILS INFORMATION:</b>		
(i) Factual Key:	Dy 5.41	
(ii) Profile Description:		
0-25 cm	Dark grey (10YR 4/1) to dark greyish brown (10YR 4/2) loamy sand to sandy loam; single grained to weak crumb structure; consistence, moist very friable, dry loose; pH 6.5. Clear transition to:	
25-45 cm	Light grey (10YR 7/2) loamy sand to sandy loam; single grained structure; consistence moist friable, dry loose to soft; pH 6.0. Abrupt transition to:	
45-50 cm	Iron impregnated dark brown (7.5YR 3/2) sandy loam; massive structure; consistence, dry hard, moist firm; pH 6.0. Gradual transition to:	
50 + cm	Yellow brown (10YR 6/6) medium clay with grey mottles; angular blocky structure; consistence, dry hard, or moist firm; pH 6.0.	
(iii) Unified Classification:	SM-SP/CL to CH	
(iv) Shrink-Swell Potential:	Moderate	
(v) Landslip Potential:	Nil	
(vi) Permeability Class:	Rapid	
(vii) Profile Drainage Class:	Well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Temporarily ponded	
(x) Erosion & Deterioration:	Low on bare soil	

**CAPABILITY FOR SELECTED LAND USES**

Wat

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Good
(ii) Shallow Excavation	Fair (too steep)
(iii) Septic Tank Absorption Fields	Good
(iv) Secondary Roads	Good
(v) Car Parks	Fair (too steep)
(vi) Area Type Sanitary Landfill	Fair (percolates rapidly)
(vii) Sewage Lagoons	Fair (Unified Soil Group, too steep)
(viii) Farm Dams	Fair (Unified Soil Group)

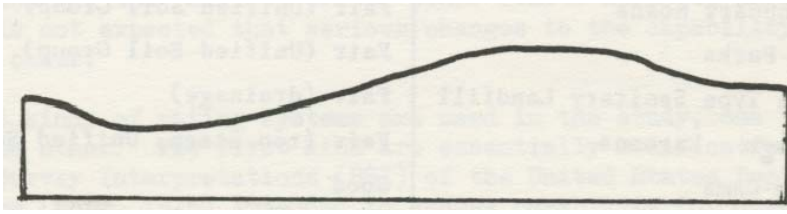
**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Good
(ii) Source of Sand	Fair (too clayey)
(iii) Source of Gravel	Very Poor (Unified Soil Group)
(iv) Source of Roadfill	Very Poor (Unified Soil Group)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Good
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Good
(iv) Playing Fields	Fair (too steep)
(v) Golf Courses	Good
(vi) Motor Bike Trails	Poor (Unified Soil Group)

<b>SUBDIVISION:</b>		
	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Very Good	
Urban Subdivision	Good	

<b><u>MAP UNIT:</u></b>	Yarra Glen	Symbol: <b>Yag</b>
<b><u>GENERAL DESCRIPTION:</u></b>	Rolling country on fine to medium textured sedimentary rocks and outwash with yellow brown duplex soils.	
<b><u>TOPOGRAPHY:</u></b>	Low convex hills and rises with average gradient of 5% ranging up to 8%. Relief varies between 3 and 10 metres.	
<b><u>SKETCH:</u></b>		
<b><u>SOILS INFORMATION:</u></b>		
(i) Factual Key:	Dy 3.31, .21, .41	
(ii) Profile Description:		
0-15 cm	Very dark greyish brown (10YR3/2) loam; massive structure; consistence hard when dry and firm when moist; pH 6.0. Gradual transition to:	
15-50 cm	Pale brown (10YR6/3) silty clay loam with 10% ironstone gravels; massive structure, consistence hard when dry and "spewy" when wet, pH 5.5 Abrupt transition to:	
50-150 cm	Yellowish brown (10YR5/6) heavy silty clay with strong yellow and brown mottles; strong angular blocky structure; consistence very hard when dry and firm when moist; pH 5.5 Diffuse transition to:	
150 + cm	Either siltstone bedrock or else a deep layer of coarse fragments.	
(iii) Unified Classification:	CL to ML/CH	
(iv) Shrink-Swell Potential:	Moderate to high (8% to 15%)	
(v) Landslip Potential:	Low	
(vi) Permeability Class:	Moderate	
(vii) Profile Drainage Class:	Moderately well drained	
(viii) Flood Risk:	Nil	
(ix) Seasonal Watertable:	Nil	
(x) Erosion & Deterioration:	Moderate erosion hazard on exposed soil.	

**CAPABILITY FOR SELECTED LAND USES**

Yag

**ENGINEERING:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Building Foundations	Good
(ii) Shallow Excavations	Fair (Unified Soil Group)
(iii) Septic Tank Absorption Fields	Good
(iv) Secondary Roads	Fair (Unified Soil Group)
(v) Car Parks	Fair (Unified Soil Group)
(vi) Area Type Sanitary Landfill	Fair (drainage)
(vii) Sewage Lagoons	Fair (too steep, Unified Soil Group)
(viii) Farm Dams	Good

**EARTH RESOURCES:**

	<i>Rating (limiting factors)</i>
(i) Source of Topsoil	Fair (thin layer)
(ii) Source of Sand	Very Poor (Unified Soil Group)
(iii) Source of Gravel	Poor (too much soil)
(iv) Source of Roadfill	Poor (depth of overburden)

**RECREATION:**

<i>Activity</i>	<i>Rating (limiting factors)</i>
(i) Camp Sites	Good
(ii) Paths and Trails	Good
(iii) Intensive Use Areas (Picnic areas, etc.)	Good
(iv) Playing Fields	Fair (too steep)
(v) Golf Courses	Very Good
(vi) Motor Bike Trails	Poor (Unified Soil Group)

**SUBDIVISION:**

	<i>Rating</i>	<i>Limiting Activities</i>
Rural Subdivision (2 to 10 hectares)	Good	
Urban Subdivision	Good	



## 7. Land Capability Rating Systems

The rating systems in this section represent a stage in the continuing development of a methodology for assessing land capability. As such, they should not be taken as absolute statements on the relationship between physical conditions and land capability. Further modifications will probably be made as feed-back on the relevance of certain land characteristics and the validity of the class limits comes to hand. However, it is not expected that serious changes to the capability ratings will occur.

Two different kinds of rating systems are used in the study, one based upon the other. The first kind are essentially modifications of the Soil Survey Interpretations (SSI) of the United States Dept.

of Agriculture (USDA, 1975) intended to assess capability for discreet activities associated with urban and related land development and land based recreation. The second kind of rating systems provide an assessment of more broadly defined land uses, notably rural subdivision for lots in the range of 2 to 10 hectare and area type urban development.

The SSI as used by the USDA provide three class systems for capability rating using soil and terrain conditions normally considered in the United States. Initially, the soils data collected in the course of this study were interpreted using these systems. It became apparent that modifications to the SSI rating systems were needed, both to the kinds of physical land characteristics considered and to the class limits defining the capability classes. At the same time the five class rating systems proposed by the F.A.O. (1976) were adopted. Thus, the need to modify the criteria was combined with increasing the number of capability classes. Subsequently, the modified criteria were applied and tested until an acceptable level of prediction was achieved.

Rating systems in this section provide assessments for:

### A. Specific Activities

1. Engineering Uses	(i) (ii) (iii) (iv) (v) (vi) (vii) (viii)	Building foundations Shallow excavations Septic tank absorption fields Secondary roads Car parks Area type sanitary landfill Sewage lagoons Small earthen dams (farm dams)
2. Earth Resources	(i) (ii) (iii) (iv)	Source of topsoil Source of sand Source of gravel Source of road fill
3. Recreation	(i) (ii) (iii) (iv) (v) (vi)	Camp sites Paths and trails Intensive use areas Playing fields Golf courses Motor bike trails

### B. Subdivision of Land

1. Rural Subdivision (2 to 10-hectare lots)
2. Urban Development

**Table 3 - The Capability Classes for the uses considered in this study**

Capability Class	Capability	Type and Degree of Limitation	General Description and Conservation Management
1	Very Good	None to Very Slight.  The limitations of long term instability, engineering difficulties or erosion hazard do not occur or they are very slight.	Areas with high capability  for .....*.development.  Standard designs and installation techniques, normal site preparation and management should be satisfactory to minimize the impact on the environment.
2	Good	Slight.  Slight limitations are present in the form of engineering difficulties and/or erosion hazard.	Areas with good capability  for. .... . development.  Careful planning and the use of standard specifications for site preparation, construction and follow-up management should minimize developmental impact on the environment.
3	Fair	Moderate.  Moderate engineering difficulties and/or high erosion hazard exists during construction.	Areas with fair capability  For .....* development.  Specialised designs and techniques are required to minimise developmental impact on the environment.
4	Poor	Severe.  Considerable engineering difficulties during development and/or a high erosion hazard exists during and after construction.	Areas with poor capability  For .....*development.  Extensively modified design and installation techniques, exceptionally careful site preparation and management are necessary to minimize the impact on the environment.
5	Very Poor	Very Severe.  Long term instability hazards; erosion or engineering difficulties cannot be practically overcome with current technology.	Areas with very poor capability  for .....*development.  Severe deterioration of the environment will probably occur if development is attempted in these areas.

## **Land Capability Rating Systems for Engineering Uses and Waste Disposal**

**LAND CAPABILITY RATING FOR BUILDING FOUNDATIONS:**  
**(For structures with nor more than two stories,)**

LAND FEATURES AFFECTING USE	TYPE OF CONSTRUCTION	CAPABILITY RATING				
		VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>ACCESS &amp; OPERATION</b>						
<b>SLOPE (1)</b>	<ul style="list-style-type: none"> <li>Stumps or strip footings</li> <li>Concrete slab</li> <li>Piles</li> </ul>	Less than 5%	5% to 8%	8% to 15%	15% to 33%	More than 33%
		Less than 2%	2% to 5%	5% to 10%	10% to 25%	More than 25%
		Less than 5%	5% to 10%	10% to 25%	25% to 45%	More than 45%
<b>SITE DRAINAGE</b>		Excessively well drained, well drained.	Moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained
<b>FLOODING</b>		None	-	-	Less than once in 100 years	More than once in 100 years
<b>QUALITY ASPECTS</b>						
<b>DEPTH TO HARD ROCK (2)</b>		More than 120 cm	120 cm to 80 cm	80 cm to 30 cm	Less than 30 cm	-
<b>STONES (Fragments 75 to 250 mm)</b>	<ul style="list-style-type: none"> <li>Stumps or strip footings or piles</li> <li>Concrete slab</li> </ul>	Less than 10% (of soil volume)	10% to 15%	15% to 30%	More than 30%	-
		Less than 10% (of soil volume)	10% to 20%	20% to 40%	More than 40%	-
<b>BOULDERS (Fragments over 250 mm) (3)</b>	<ul style="list-style-type: none"> <li>Stumps, strip footings or piles</li> <li>Concrete slab</li> </ul>	Less than 0.1% (of soil surface)	0.1% to 0.5%	0.5% to 5%	More than 5%	-
		Less than 0.2% (of soil surface)	0.2% to 1%	1% to 10%	More than 10%	-
<b>ROCK OUTCROP (3)</b>		Less than 0.05% (of soil surface)	0.05 to 0.1%	0.1% to 1%	1% to 5%	More than 5%
<b>DEPTH TO WATER TABLE (4)</b>		Deeper than 120 cm	120 cm to 80 cm	80 cm to 50 cm	50 cm to 30 cm	Shallower than 30 cm
<b>UNIFIED SOIL GROUP (5)</b>	<ul style="list-style-type: none"> <li>Stumps, strip footings or piles</li> <li>Concrete slab</li> </ul>	GW, SW, GP, GM, GC, SC	SP, SM, CL	MH, CH	OL, OH, ML	Pt
		GW, SW, GP, GM, SP, SC, SM,GC	CL, CH, MH	ML, OL	OH	Pt
<b>SHRINK-SWELL POTENTIAL (6)</b>	<ul style="list-style-type: none"> <li>Stumps, strip footings or piles</li> <li>Concrete slab</li> </ul>	Less than 4%	4% to 12%	12% to 20%	More than 20%	-
		Less than 12%	12% to 20%	More than 20%	-	-

**NOTES:**

(1) SLOPE: Downgrade by crest class in slops failure hazard areas

(2) DEPTH 10 HARD ROCK: Material which cannot be excavated by normal earthmoving equipment.

(3) BOULDERS & ROCK OUTCROP:

0.05%,	is m <sup>2</sup> per	2000 m <sup>2</sup>
0.1%	is m <sup>2</sup> per	1000 m <sup>2</sup>
0.2%	is m <sup>2</sup> per	500 m <sup>2</sup>
0.5%	is m <sup>2</sup> per	200 m <sup>2</sup>
1%	is m <sup>2</sup> per	100 m <sup>2</sup>
2%	is m <sup>2</sup> per	50 m <sup>2</sup>
5%	is m <sup>2</sup> per	20 m <sup>2</sup>
10%	is m <sup>2</sup> per	10 m <sup>2</sup>
15%	is m <sup>2</sup> per	7 m <sup>2</sup>

(4) DEPTH TO WATER TABLE: Depth is recorded to water which remains for more than five days after rain.

(5) UNIFIED SOIL GROUP: This is determined for material at the sides and base of excavation. Topsoil is ignored.

(6) SHRINK-SWELL POTENTIAL: Comments as for Unified Soil Group.

**LAND CAPABILITY RATING FOR SHALLOW EXCAVATIONS**  
**(Excavations for Level Construction Sites)**

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>ACCESS &amp; OPERATION</b>					
<b>SLOPE (1)</b>	Less than 2%	2% to 5%	5% to 10%	10% to 25%	More than 25%
<b>SITE DRAINAGE</b>	Excessively well drained, Well drained	Moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained
<b>FLOODING</b>	None	-	-	Less than once in 10 yrs	More than once in 10 yrs
<b>QUALITY ASPECTS</b>					
<b>UNIFIED SOIL GRUP TO DEPTH TO BE EXCAVATED</b>	CL (PI<15), GC, GM, SC	ML, SM (CL PI>15), OL	GW, SW	GP, SP, CH, Oh	Pt
<b>DEPTH TO HARD ROCK (4)</b>	More than 200 cm	150 cm to 200 cm	120 cm to 150 cm	80 cm to 120 cm	Less than 80 cm
<b>STONES (Fragments 75 to 250 mm)</b>	Less than 10% (of soil volume)	10% to 20%	20% to 40%	More than 40%	-
<b>BOULDERS (Fragments over 250 mm) (3)</b>	Less than 0.1% (of soil surface)	0.1% to 1%	1% to 5%	More than 5%	-
<b>ROCK OUTCROP (3)</b>	Less than 0.05% (of soil surface)	0.05% to 0.1%	0.1% to 0.2%	0.2% to 1%	More than 1%
<b>DEPTH TO WATER TABLE (4)</b>	Deeper than 200 cm	150 cm to 200 cm	120 cm to 150 cm	90 cm to 120 cm	Shallower than 90 cm

**NOTES:**

- (1) SLOPE: Reduce slop class limits by half in slope failure hazard areas
- (2) SITE DRAINAGE: Upgrade by one class for seasonal operation if seasonally dry
- (3) FLOODING: Upgrade by one class if floods are low velocity, shallow and easily directed with banks
- (4) DEPTH TO HARD ROCK: Material which cannot be excavated by normal earthmoving equipment
- (5) BOULDERS & ROCK OUTCROP:
  - 0.05% is 1m<sup>2</sup> per 2000 m<sup>2</sup>
  - 0.1% is 1 m<sup>2</sup> per 1000 m<sup>2</sup>
  - 0.2% is 1m<sup>2</sup> per 500 m<sup>2</sup>
  - 1% is 1 m<sup>2</sup> per 100 m<sup>2</sup>
  - 5% is 21 m<sup>2</sup> per 20 m<sup>2</sup>
- (6) DEPTH TO WATER TABLE: Upgrade by once class for seasonal operation if seasonally dry.

**LAND CAPABILITY RATING FOR ON-SITE EFFLUENT DISPOSAL**  
**(All waste septic tank absorption field for single family dwelling)**

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>SLOPE</b>	0 to 5%	5% to 8%	8% to 15%	15% to 30%	More than 30%
<b>SITE DRAINAGE</b>	Excessively well drained, well drained	Moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained
<b>FLOODING</b>	None	-	Less than once in 100 years	Once between 100 yrs. & 25 yrs.	More than once in 25 years.
<b>DEPTH TO SEASONAL WATERTABLE</b>	More than 200 cm	200 cm 120 cm	120 cm 90 cm	90 cm 60 cm	Less than 60 cm
<b>PERMEABILITY</b>	Faster than 100 1/n <sup>2</sup> day,	100 70 1/m <sup>2</sup> day	70 %) 1/m <sup>2</sup> day	50 25 1/m <sup>2</sup> day	Slower than 25 1 /m <sup>2</sup> day.
<b>DEPTH TO ROCK OR IMPERVIOUS LAYER</b>	More than 200 cm	200 cm 150 cm	150 cm 100 cm	100 cm 75 cm	Less than 75 cm
<b>GRAVEL (Fragments 2 to 75 mm)</b>	Less than 5% (of soil volume)	5% 20%	20% 40%	40% 75%	More than 75%
<b>STONES (Fragments 75 to 250 mm)</b>	Less than 2% (of soil volume)	2% 10%	10% 30%	30% 60%	More than 60%,
<b>BOULDERS (Fragments over 250 mm)</b>	Less than 0.02% (of soil surface)	0.02% to 0.2%	0.2% 2%	2% 10%	More than 10%
<b>ROCK OUTCROP</b>	Less than 0.01% (of soil surface)	0.01% 0.1%	0.1% 1%	1% 5%	More than 5%
<b>DISPERSIBLE CLAYS</b>	Less than 6%	6% 10%	10% 16%	More than 16%	-
<b>SHRINK SWELL POTENTIAL</b>	Less than 4%	4% 12%	12% 20%	More than 20%	-

- (1) 100 1/m<sup>2</sup>day approximates a 5 cm drop in head per hour in a 10 cm diameter test hole.  
(2) Where rate of absorption is well in excess of very good, risk of polluting water bodies must be considered.

**LAND CAPABILITY RATING FOR SECONDARY ROADS AND CAR PARKS**  
(Sealed Surfaces for Light Vehicles; Provision of Drainage and Kerbing)

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>ACCESS &amp; OPERATION</b>					
<b>SLOPE (1)</b>					
Secondary Roads	Less than 4%	4% to 8%	8% to 12%	12% to 25%	More than 25%
Carparks	Less than 3%	3% to 5%	5% to 8%	8% to 15%	More than 15%
<b>SITE DRAINAGE</b>	Excessively well drained, well drained	Moderate well drained	Imperfectly drained	Poorly drained	Very poorly drained
<b>FLOODING</b>	None	-	-	Less than once in 10 yrs	More than once in 10 yrs
<b>QUALITY ASPECTS</b>					
<b>UNIFIED SOIL GROUP FOR SUB-GRADE (4)</b>	GP, GW, SW, GC	SM, SC, GM	SP, CL, CH, MH, ML	OL, OH	Pt
<b>SHRINK-SWELL POTENTIAL (5)</b>	Less than 4%	4% to 12%	12% to 20%	More than 20%	-
<b>DEPTH TO HARD ROCK (6)</b>	More than 100 cm	100 cm to 75 cm	75 cm to 40 cm	Less than 40 cm	-
<b>STONES (Fragments 75 to 250 mm)</b>	Less than 10% (of soil volume)	10% to 20%	20% to 40%	More than 40%	-
<b>BOULDERS (Fragments over 250 mm) (7)</b>	Less than 0.1% (of soil surface)	0.1% to 0.5%	0.5% to 5%	More than 5%	-
<b>ROCK OUTCROP (7)</b>	Less than 0.5% (of soil surface)	0.05% to 0.1%	0.1% to 1%	1% to 5%	More than 5%
<b>DEPTH TO WATERTABLE (8)</b>	More than 150 cm	150 cm to 120 cm	120 cm to 90 cm	90 cm to 50 cm	Less than 50 cm

**NOTES:**

- (1) SLOPE: Downgrade by one class in slope failure hazard areas  
(2) SITE DRAINAGE: Upgrade by one class if construction is carried out when conditions are dry.  
(3) FLOODING: Upgrade by one class if floods are low velocity, shallow and easily diverted with banks.  
(4) UNIFIED SOIL GROUP: This is determined for the portion of the profile which will be below the level of the completed road base.  
(5) SHRINK-SWELL POTENTIAL: Comments as for Unified Soil Group  
(6) HARD ROCK: Material which cannot be ripped and would require blasting

(7) BOULDERS & ROCK OUTCROP:

- 0.05% is 1m<sup>2</sup> per 2000 m<sup>2</sup>  
0.1% is 1m<sup>2</sup> per 1000 m<sup>2</sup>  
0.5% is 1m<sup>2</sup> per 200 m<sup>2</sup>  
1% is 1m<sup>2</sup> per 100 m<sup>2</sup>  
5% is 1m<sup>2</sup> per 20 m<sup>2</sup>

- (8) DEPTH TO WATER TABLE: Record depth to water which remains more than several days after rain.

## LAND CAPABILITY RATING FOR ARE TYPE SANITARY LANDFILL

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>ACCESS &amp; OPERATION</b>					
<b>SLOPE (1)</b>	Less than 5%	5% to 8%	8% to 12%	12% to 20%	More than 20%
<b>FLOODING (2)</b>	None			Less than once in 50 yrs	More than once in 50 yrs
<b>SITE DRAINAGE</b>	Well drained	Moderately well drained	Imperfectly drained	Excessively well drained, poorly drained	Very poorly drained
<b>QUALITY ASPECTS</b>					
<b>PERMEABILITY (3)</b>	Slower than 40 1/m <sup>2</sup> day	40 to 50 1/m <sup>2</sup> day	50 to 75 1/m <sup>2</sup> day	75 to 100 1/m <sup>2</sup> day	Faster than 100 1/m <sup>2</sup> day
<b>DEPTH TO HARD ROCK (4)</b>	More than 300 cm	200 cm to 300 cm	150 cm to 200 cm	100 cm to 150 cm	Less than 100 cm
<b>BOULDERS (Fragments over 250 mm) (3)</b>	Less than 0.1% (of soil surface)	0.1% to 0.5%	0.5% to 20%	2% to 10%	More than 10%
<b>ROCK OUTCROP (5)</b>	Less than 0.05% (of soil surface)	0.05% to 0.1%	0.1% to 0.5%	0.5% to 1%	More than 1%
<b>DEPTH TO WATER TABLE (6)</b>	More than 300 cm	200 cm to 300 cm	150 cm to 200 cm	100 cm to 150 cm	Less than 100 cm

### NOTES:

- (1) SLOPE: Reduce class limits by half in slope failure hazard areas
- (2) FLOODING: Upgrade by once class if floods are low velocity, shallow and easily diverted with banks.
- (3) PERMEABILITY: Test is carried out in material at the expected depth of the base of the excavation. A rate of 50 1/m<sup>2</sup> day is approximately 2.5 cm drop in head per hour in a 10 cm diameter test hold.
- (4) DEPTH TO HARD ROCK: Material which cannot be ripped and would require blasting.
- (5) BOULDERS & ROCK OUTCROP:
- 0.05% is 1m<sup>2</sup> per 2000 m<sup>2</sup>
  - 0.1% is 1m<sup>2</sup> per 1000 m<sup>2</sup>
  - 0.5% is 1m<sup>2</sup> per 200 m<sup>2</sup>
  - 1% is 1m<sup>2</sup> per 100 m<sup>2</sup>
  - 2% is 1m<sup>2</sup> per 50 m<sup>2</sup>
  - 10% is 1m<sup>2</sup> per 10 m<sup>2</sup>

(6) DEPTH TO WATER TABLE: Depth is recorded to water which remains for more than five days after rain.



## LAND CAPABILITY FOR SEWAGE: LAGOONS

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>ACCESS &amp; OPERATION</b>					
<b>SLOPE</b>	Less than 2%	2% to 5%	5% to 8%	8% to 15%	More than 15%
<b>FLOODING (1)</b>	None	-	-	Less than once in 100 yrs	More than once in 100 yrs
<b>QUALITY ASPECTS</b>					
<b>DEPTH TO HARD ROCK (2)</b>	More than 200 cm	150 cm to 200 cm	100 cm to 150 cm	75 cm to 100 cm	Less than 75 cm
<b>UNIFIED SOIL GROUP (3)</b>	GC, GM, SC	SM, CL (PI<15)	CL (PI>15), ML, CH	OL, MH, OJ	SP, SM, GP, GW, Pt
<b>STONES (Fragments 75 to 250 mm)</b>	Less than 5% (of soil volume)	5% to 20%	20% to 50%	50% to 75%	More than 75%
<b>BOULDERS (Fragments over 250 mm) (4)</b>	Less than 0.2% (of soil surface)	0.2% to 0.1%	0.1% to 0.5%	0.5% to 5%	More than 5%
<b>ROCK OUTCROP (4)</b>	Less than 0.01% (of soil surface)	0.1% to 0.5%	0.5% to 0.2%	0.2% to 1%	More than 1%
<b>PERMEABILITY (5)</b>	Slower than 0.1 l/m <sup>2</sup> day	0.1 to 1 l/m <sup>2</sup> day	1 to 5 l/m <sup>2</sup> day	5 to 10 l/m <sup>2</sup> day	Faster than 10 l/m <sup>2</sup> day
<b>DEPTH TO WATER TABLE</b>	More than 300 cm	200 cm to 300 cm	150 cm to 200 cm	100 cm to 150 cm	Less than 100 cm
<b>SHRINK-SWELL POTENTIAL (6)</b>	Less than 4%	4% to 12%	12% to 20%	More than 20%	-
<b>DISPERSIBLE CLAYS</b>	More than 2% to 6%	6% to 10%	10% to 16%	More than 16% or less than 2%	-

### **NOTES:**

(1) FLOODING: Upgrade one class if floods are low velocity, shallow and easily diverted with banks

(2) DEPTH TO HARD ROCK: Material which cannot be ripped and would require blasting

(3) UNIFIED SOIL GROUP: Determined for material to be used in bank construction

(4) BOULDERS AND ROCK OUTCROP:

0.01% is 1 m<sup>2</sup> per 10000 m<sup>2</sup>

0.02% is 1 m<sup>2</sup> per 5000 m<sup>2</sup>

0.1% is 1 m<sup>2</sup> per 1000 m<sup>2</sup>

0.2% is 1 m<sup>2</sup> per 500 m<sup>2</sup>

0.5% is 1 m<sup>2</sup> per 200 m<sup>2</sup>

1% is 1 m<sup>2</sup> per 100 m<sup>2</sup>

5% is 1 m<sup>2</sup> per 20 m<sup>2</sup>

(5) PERMEABILITY: Test carried out in material at the expected depth of the base of the excavation. A rate of 10 l/m<sup>2</sup> day is approximately 0.5 cm drop in head per hour in a 10 cm diameter test hole.

(6) SHRINK-SWELL POTENTIAL: Determined for material to be used in bank construction

**LAND CAPABILITY RATING FOR EARTHEN DAMS**  
(Areas suitable for construction of small water storages with earthen embankments (1) )

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>ACCESS &amp; OPERATION</b>					
<b>SLOPE (2)</b>					
Gully Dam	2% to 4%	4% to 8%	0-2% to 8-12%	12% to 15%	More than 15%
Hillside tank	2% to 5%	5% to 10%	0-2% to 10-15%	15% to 20%	More than 20%
<b>FLOODING (3)</b>	None	-	-	Less than once in 25 yrs	More than once in 25 yrs
<b>QUALITY ASPECTS</b>					
<b>UNIFIED SOIL GROUP (4)</b>	GC, GM, SC	SM, CL (PI <15)	CL (PI >15)	OL, MH, OH	SP, SW, GP, GW, Pt
<b>THICKNESS OF CONSTRUCTION MATERIAL</b>	More than 200 cm	200 – 100 cm	100 cm – 75 cm	75 cm – 30 cm	Less than 30 cm
<b>STONES (75-250 mm)</b>	Less than 5%	5% to 20%	20% to 50%	50% to 75%	More than 75%
<b>BOULDERS (over 250 mm) (5)</b>	Less than 0.05% (of soil surface)	0.02% to 0.05%	0.05% to 0.5%	0.5% to 2%	More than 2%
<b>ROCK OUTCROP (5)</b>	Less than 0.02% (of soil surface)	0.02% to 0.05%	0.05% to 0.5%	0.5% to 2%	More than 2%
<b>PERMEABILITY (6)</b>	Slower than 0.1 l/m <sup>2</sup> day	0.1 to 1 l/m <sup>2</sup> day	1 to 5 l/m <sup>2</sup> day	5 to 10 l/m <sup>2</sup> day	Faster than 10 l/m <sup>2</sup> day
<b>SHRINK-SWELL POTENTIAL (7)</b>	Less than 4%	4% to 12%	12% to 20%	More than 20%	-
<b>DEPTH TO HARD ROCK (8)</b>	More than 400 cm	400 cm to 200 cm	200 cm to 150 cm	150 cm to 80 cm	Less than 80 cm
<b>DISPERSIBLE CLAY(9)</b>	2% to 6%	6% to 10%	10% to 16%	More than 16% or less than 2%	-
<b>DEPTH TO WATER TABLE</b>	More than 500 cm	500 cm to 300 cm	300 cm to 200 cm	200 cm o 100 cm	Less than 100 cm
<b>DEPTH OF TOPSOIL (10)</b>	10 cm to 25 cm	25 cm to 50 cm	50 cm to 100 cm 0 to 10 cm	100 cm to 200 cm	More than 200 cm
<b>ORGANIC MATTER</b>	None	0-2%	2% to 15%	15% to 25%	More than 25%

**NOTES:**

- (1) This rating table takes no account of catchment conditions, expected yield or spillway requirements, which must be considered.
- (2) SLOPE: Reduce slope class limits by half in slope failure hazard areas.
- (3) FLOODING: Upgrade by one class if floods are low velocity, shallow and easily diverted with banks.
- (4) UNIFIED SOIL GROUP: Determined for material to be used for bank construction.
- (5) BOULDERS & ROCK OUTCROP
  - 0.02% is 1 m<sup>2</sup> per 5000 m<sup>2</sup>
  - 0.05% is 1 m<sup>2</sup> per 2000 m<sup>2</sup>
  - 0.1% is 1 m<sup>2</sup> per 1000 m<sup>2</sup>
  - 0.5% is 1 m<sup>2</sup> per 200 m<sup>2</sup>
  - 1% is 1 m<sup>2</sup> per 100 m<sup>2</sup>
  - 2% is 1 m<sup>2</sup> per 50 m<sup>2</sup>
  - 5% is 1 m<sup>2</sup> per 20 m<sup>2</sup>

- (6) PERMEABILITY: This test is carried out in material at the expected depth of the base of the excavation. A rate of 10 l/m<sup>2</sup> day in approximately 0.5 cm drop in head per hour in a 10 cm diameter test hole after thorough wetting.
- (7) SHRINK-SWELL POTENTIAL: Determined for material to be used for bank construction
- (8) DEPTH TO HARD ROCK: Material which cannot be ripped and would require blasting.
- (9) DISPERSIBLE CLAY: Determined for material to be used for bank construction.
- (10) DEPTH OF TOPSOIL: Material to be stockpiled for re-spreading.

## **Land Capability Rating Systems for Earth Resources**

## LAND CAPABILITY RATING FOR SOURCE OF TOPSOIL

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>ACCESS &amp; OPERATION</b>					
<b>SLOPE (1)</b>	Less than 5%	5% to 8%	8% to 12%	12% to 15%	More than 15%
<b>SITE DRAINAGE (2)</b>	Excessively well drained, well drained	Moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained
<b>FLOODING (3)</b>	None	-	-	Less than once in 5 yrs	More than once in 5 yrs
<b>QUALITY ASPECTS</b>					
<b>TEXTURE OF DEPOSIT</b>	Loams, Sandy loams	Clay loams, Sandy loams	Sands	Light clays	Medium-heavy clays, Heavy clays
<b>THICKNESS OF DEPOSIT</b>	More than 60 cm	60 cm to 50 cm	50 cm to 40 cm	40 cm to 30 cm	Less than 30 cm
<b>pH OF MATERIAL</b>	Between 6.0 and 7.0	6.0 to 5.5 7.0 to 7.5	5.5 to 5.0 7.5 to 8.0	Less than 5.0 Less than 8.0	-
<b>ORGANIC MATTER</b>	More than 5%	5% to 3%	3% to 2%	Less than 2%	-
<b>DEPTH TO PERMANENT WATER TABLE</b>	More than 250 cm	250 cm to 200 cm	200 cm to 150 cm	150 cm to 120 cm	Less than 120 cm
<b>GRAVEL (Fragments 2 mm to 75 mm)</b>	Less than 5% (of soil volume)	5% to 10%	10% to 15%	15% to 25%	More than 25%
<b>STONES (Fragments 75 mm to 250 mm)</b>	Less than 2% (of soil volume)	2% to 5%	5% to 10%	10% to 25%	More than 25%
<b>BOULDERS (Fragments over 250 mm)</b>	Less than 0.1% (of soil surface)	0.1% to 0.5%	0.5% to 2%	2% to 5%	More than 5%
<b>ROCK OUTCROP</b>	Less than 0.05% (of soil surface)	0.05 to 0.27%	0.2% to 0.5%	0.5% to 1%	More than 1%
<b>DISPERSIBLE CLAYS</b>	Less than 6%	6% to 10%	10% to 16%	More than 16%	-

**NOTES:**

- (1) SLOPE: Reduce class limits by half in slope failure hazard areas.
- (2) SITE DRAINAGE: Upgrade by one class for seasonal operation is seasonally dry
- (3) FLOODING: Upgrade by one class if floods are low velocity, shallow and easily diverted by banks.

## LAND CAPABILITY FOR SOURCE OF SAND

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>ACCESS &amp; OPERATION</b>					
<b>SLOPE</b>	Less than 5%	5% to 8%	8% to 12%	12% to 15%	More than 15%
<b>SITE DRAINAGE (1)</b>	Excessively well drained, well drained	Moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained
<b>FLOODING (2)</b>	None	-		Less than once in 5 yrs	More than once in 5 yrs
<b>DEPTH TO PERMANENT WATER TABLE</b>	More than 250 cm	250 cm to 200 cm	200 cm to 150 cm	150 cm to 120 cm	Less than 120 cm
<b>QUALITY ASPECTS</b>					
<b>UNIFIED SOIL GROUP</b>	SW	SP	SM	-	All other groups in Unified System
<b>THICKNESS OF DEPOSIT</b>	More than 200 cm	200 cm to 150 cm	150 cm to 90 cm	90 cm o 60 cm	Less than 60 cm
<b>GRAVEL (Fragments 2 mm to 75 mm)</b>	Less than 5% (of soil volume)	5% to 10%	10% to 15%	15% to 25%	More than 25%
<b>STONES (Fragments 75 mm to 250 mm)</b>	Less than 2% (of soil volume)	2% to 5%	5% to 10%	10% to 25%	More than 25%
<b>BOULDERS (Fragments over 250 mm)</b>	Less than 0.1% (of soil surface)	0.1% to 0.5%	0.5% to 2%	2% to 5%	More than 5%
<b>ROCK OUTCROP</b>	Less than .05% (of soil surface)	0.05% to 0.2%	0.2% to 0.5%	0.5% to 1%	More than 1%
<b>THICKNESS OF OVERBURDEN</b>	Less than 2% of deposit thickness "D"	Less than 5% of D	5% to 10% of D	10% to 20% of D	More than 20% of D
<b>ORGANIC MATTER</b>	Less than 1%	1% to 2%	2% to 10%	More than 10%	-
<b>DISPERSIBLE CLAYS</b>	Less than 6%	6% to 10%	10% to 16%	More than 16%	-

**NOTES:**

- (1) SITE DRAINAGE: Upgrade by one class for seasonal operation if seasonally dry  
 (2) FLOODING: Upgrade by one class if floods are low velocity, shallow and easily diverted by banks.

## LAND CAPABILITY RATING FOR SOURCE OF GRAVEL

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>ACCESS &amp; OPERATION</b>					
<b>SLOPE (1)</b>	Less than 5%	5% to 8%	8% to 12%	12% to 15%	More than 15%
<b>SITE DRAINAGE (2)</b>	Excessively well drained, well drained	Moderately well drained	Imperfectly well drained	Poorly drained	Very poorly drained
<b>FLOODING (3)</b>	None	-	-	Less than once in 5 yrs	More than once in 5 yrs
<b>QUALITY ASPECTS</b>					
<b>UNIFIED SOIL GROUP</b>	GW	GP, GP-GM, GW-GM	GM, GP-GC, GW-GC	-	All other groups in Unified System
<b>THICKNESS OF DEPOSIT</b>	More than 200 cm	200 cm to 150 cm	150 cm to 90 cm	90 cm to 60 cm	Less than 60 cm
<b>THICKNESS OF OVERBURDEN</b>	Less than 5% of deposit thickness, D	5% to 10 % of D	10% to 20% of D	20% to 30% of D	More than 30% of D
<b>DEPTH TO PERMANENT GROUNDWATER TABLE</b>	More than 250 cm	250 cm to 200 cm	200 cm to 150 cm	150 cm to 120 cm	Less than 120 cm
<b>BOULDERS (Fragments over 250 mm)</b>	Less than 0.05% (of soil surface)	00.05% to 0.2%	0.2% to 1%	1% to 2%	More than 2%
<b>ROCK OUTCROP</b>	Less than 0.2% (of soil surface)	0.02 to 0.1%	0.1% to 0.5%	0.5% to 1%	More than 1%
<b>DISPERSIBLE CLAYS</b>	Less than 6%	6% to 10%	10% to 16%	More than 16%	-

**NOTES:**

- (1) SLOPE: Reduce slope class limits by half in slope failure hazard areas
- (2) SITE DRAINAGE: Upgrade by one class for seasonal operation if seasonally dry
- (3) FLOODING: Upgrade by once class if floods are low velocity, shallow and easily diverted with banks.

**LAND CAPABILITY FOR ROADFILL**  
**(Material for below Sub-base)**

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR

**ACCESS & OPERATION: TYPE OF MANAGEMENT**

SLOPE (1)					
Pit floor on gradient	Less than 5%	5% to 8%	8% to 15%	15% to 25%	More than 25%
Horizontal pit floor	Less than 8%	8% to 15%	15% to 20%	20% to 25%	More than 25%
SITE DRAINAGE (2)	Very well drained	Well drained, moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained
FLOODING (3)					
Short term operation	None	Once in 50+ yrs	Once in 50 yrs to 25 yrs	Once in 25 yrs to 5 yrs	More than once in 5 yrs
Long term operations	None	-	Once in 50+ yrs	Once in 50 to 10 yrs	More than once in 10 yrs

**QUALITY ASPECTS**

UNIFIED SOIL GROUP	GW, SW, GP	GM, GC, SP	SC, SM	CL, ML, OL, CH, MH, OH	Pt
PLASTICITY INDEX	Less than 5	5 to 15	15 to 25	25 to 45	More than 45
SHRINK SWELL POTNTIAL (4)	Less than 2%	2% to 5%	5% to 12%	12% to 17%	More than 17%
ORGANIC MATTER	Less than 0.5%	0.5% to 2%	2% to 5%	5% to 15%	More than 15%
STONES (Fragments 75 to 250 mm)	Less than 10%	10% to 20%	20% to 40%	More than 40%	-
BOULDERS (Fragments over 250 mm)	Less than 0.1% (of soil surface)	0.1% to 0.5%	0.5% to 2.0%	2.0% to 5.0%	More than 5.0%
ROCK OUTCROP	Less than 0.05 (of soil surface)	0.05% to 0.2%	0.2% to 1.0%	1.0% to 2%	More than 2%
THICKNESS OF DEPOSIT (or depth to hard rock)	More than 250 cm	250 cm to 150 cm	150 cm to 100 cm	100 cm to 30 cm	Less than 30 cm
THICKNESS OF BURDEN	Less than 5% of deposit thickness, D	5% to 10% of D	10% to 15% of D	15% to 20% of D	More than 20% of D

**NOTES:**

- (1) SLOPE: Reduce slop class limits by half in slope failure hazard areas
- (2) SITE DRAINAGE: Upgrade by one class for seasonal operation if seasonally dry
- (3) FLOODING: Upgrade by one class if flood are low velocity, shallow and easily diverted
- (4) SHRINK-SWELL POTENTIAL: The test is carried out on the finer (No. 40 sieve): these volumes therefore relate to that fraction, not the complete soil.

## **Land Capability Rating Systems for Recreation (Land Base)**



**LAND CAPABILITY RATING FOR CAMP SITES**  
**(Areas suitable for small groups of tents, and on-site disposal of small quantities of waste)**

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>SLOPE</b>	2% to 5%	5% to 8%	8% to 15% Less than 2%	15% to 25%	More than 25%
<b>FLOODING (1)</b>	Less than once in 10 yrs	-	-	Once between 10 yrs & 5 yrs	More than once in 5 yrs
<b>SITE DRAINAGE</b>	Well drained	Moderately well drained, excessively well drained	Imperfectly drained	Poorly drained	Very poorly drained
<b>A HORIZON TEXTURE</b>	Loams, Clay loams, Sandy loams	Loamy sands	Sands, Light clay	Medium to heavy clays	-
<b>DEPTH TO HARD ROCK</b>	More than 150 cm	150 cm to 100 cm	100 cm to 75 cm	75 cm to 45 cm	Less than 45 cm
<b>GRAVEL (Fragments 2 to 75 mm)</b>	Less than 10% (of soil volume)	10% to 20%	20% to 40%	More than 40%	-
<b>STONES (Fragments 75 mm to 250 mm)</b>	Less than 5% (of soil volume)	5% to 10%	10% to 20%	More than 20%	-
<b>BOULDERS (Fragments over 250 mm) OR ROCK OUTCROP</b>	Less than 0.1% (of soil surface)	0.1% to 0.5%	0.5% to 2%	2% to 5%	More than 5%
<b>PERMEABILITY (2)</b>	Between 75 & 300 l/m <sup>2</sup>	75 to 50 l/m <sup>2</sup> day	50 to 25 l/m <sup>2</sup> day More than 300 l/m <sup>2</sup> day	Less than 25 l/m <sup>2</sup> day	-
<b>DISPERSIBLE CLAY</b>	Less than 6%	6% to 10%	10% to 6%	More than 16%	-

**NOTES:**

(1) FLOODING: Down grade to Very Poor if floods occur during season of usage.

(2) PERMEABILITY: A rate of 50 l/m<sup>2</sup> day is approximately 2.5 cm drop in head per hour in a 10 cm diam test hole; 300 l/m<sup>2</sup> day is approximately 15 cm drop in head per hour.

**LAND CAPABILITY RATING FOR PATHS & TRAILS**  
**(Areas suitable for walking trails and bridle paths)**

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>SLOPE</b>	0 to 5%	5% to 8%	8% to 15%	15% to 25%	More than 25%
<b>FLOODING</b>	Less than once in 5 yrs	-	-	Once between 5 yrs & 1 yr	More than once per yr
<b>SITE DRAINAGE</b>	Well drained	Moderately well drained, excessively well drained	Imperfectly drained	Poorly drained	Very poorly drained
<b>A HORIZON TEXTURE</b>	Sandy loams, Loams, Clay loams	Loamy sands, Sands	Light clays, Silty textures	Medium to heavy clays	-
<b>STONES (Fragments 75 to 250 mm)</b>	Less than 20% (of soil volume)	10% to 20%	20% to 30%	More than 30%	-
<b>BOULDERS (Fragments over 250 mm) OR ROCK OUTCROP</b>	Less than 1% (of soil surface)	1% to 5%	5% to 10%	More than 10%	-
<b>DISPERSIBLE CLAYS</b>	Less than 6%	6% to 10%	10% to 16%	More than 16%	-

**LAND CAPABILITY RATING FOR INTENSIVE USE AREAS**  
**(Picnic areas, play grounds)**

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>SLOPE</b>	0 to 5%	5% to 8%	8% to 15%	15% to 25%	More than 25%
<b>FLOODING</b>	Less than once in 10 yrs	-	-	Once between 10 yrs & 5 yrs	More than once in 5 yrs
<b>SITE DRAINAGE</b>	Well drained	Excessively well drained	Moderately well drained, imperfectly drained	Poorly drained	Very poorly drained
<b>A HORIZON TEXTURE</b>	Loams, Clay loams, Sandy loams	Loamy sands	Light clays, Sands	Medium to heavy clays	-
<b>DEPTH TO HARD ROCK</b>	More than 150 cm	150 cm to 120 cm	120 cm to 80 cm	80 cm to 50 cm	Less than 50 cm
<b>GRAVEL (Fragments 75 to 250 mm)</b>	Less than 10% (of soil volume)	10% to 20%	20% to 40%	More than 40%	-
<b>STONES (Fragments 75 to 250 mm)</b>	Less than 5% (of soil volume)	5 to 10%	10% to 25%	More than 25%	-
<b>BOULDERS (Fragments over 250 mm) OR ROCK OUTCROP</b>	Less than 0.1% (of soil surface)	0.1% to 0.5%	0.5% to 2%	2% to 5%	More than 5%
<b>DISPERSIBLE CLAYS</b>	Less than 6%	6% to 10%	10% to 16%	More than 16%	-

**LAND CAPABILITY RATING FOR PLAYING FIELDS**  
**(Areas suitable for development of ovals and fields for organized sporting events)**

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>SLOPE</b>	0 to 2%	2% to 5%	5% to 8%	8% to 15%	More than 15%
<b>FLOODING</b>	Less than once in 10 yrs	-	-	Once between 10 yrs & 5 yrs	More than once in 5 yrs
<b>SITE DRAINAGE</b>	Well drained	Moderately well drained, excessively well drained	Imperfectly drained	Poorly drained	Very poorly drained
<b>A HORIZON TEXTURE</b>	Loams, Sandy loams	Loamy sand, Clay loams, Sands	Light clays, Silty textures	Medium to heavy clays	-
<b>SOIL DEPTH</b>	More than 150 cm	150 cm to 100 cm	100 cm to 75 cm	75 cm to 45 cm	Less than 45 cm
<b>GRAVEL (Fragments 2 to 75 mm)</b>	Less than 5% (of soil volume)	5% to 15%	15% to 30%	More than 25%	-
<b>STONES (Fragments 75 to 250 mm)</b>	Less than 2% (of soil volume)	2% to 5%	5% to 15%	15% to 30%	More than 30%
<b>BOULDERS (Fragments to over 250 mm)</b>	Less than 0.02% (of soil surface)	0.02% to 0.1%	0.1% to 1%	1% to 5%	More than 5%
<b>ROCK OUTCROP</b>	Less than 0.01% (of soil surface)	0.01% to 0.05%	0.05% to 0.5%	0.5% to 2%	More than 2%
<b>SHRINK-SWELL POTENTIAL</b>	Less than 4%	4% to 12%	12% to 20%	More than 20%	-

## LAND CAPABILITY RATING FOR GOLF COURSE FAIRWAYS

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>SLOPE</b>	0 to 5%	5% to 8%	8% to 15%	15% to 25%	More than 25%
<b>FLOOD HAZARD</b>	Less than once in 5 yrs	-	-	Once between 2 yrs & 1 yr	More than once per yr
<b>SITE DRAINAGE</b>	Well drained	Moderately well drained, excessively well drained	Imperfectly drained	Poorly drained	Very poorly drained
<b>A HORIZON TEXTURE</b>	Loams, Sandy loams	Loamy sand, Clay loams, Sands	Light clays, Silty textures	Medium to heavy clays	-
<b>SOIL DEPTH</b>	More than 150 cm	150 cm to 100 cm	100 cm to 75 cm	75 cm to 45 cm	Less than 45 cm
<b>GRAVEL (Fragments 2 to 75 mm)</b>	Less than 5% (of soil volume)	5% to 15%	15% to 25%	More than 25%	-
<b>STONES (Fragments 75 to 250 mm)</b>	Less than 2% (of soil volume)	2% to 10%	10% to 25%	More than 25%	-
<b>BOULDERS (Fragments over 250 mm) OR ROCK OUTCROP</b>	Less than 0.1% (of soil surface)	0.1% to 0.5%	0.5% to 2%	2% to 5%	More than 5%

**NOTES:**

(1) Depth of soil available for root penetration

### LAND CAPABILITY RATING FOR MOTOR BIKE TRAILS

LAND FEATURES AFFECTING USE	CAPABILITY RATING				
	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
<b>SLOPE</b>	0 to 5%	5% to 8%	8% to 15%	15% to 25%	More than 25%
<b>SITE DRAINAGE</b>	Excessively well drained, well drained	Moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained
<b>FLOODING</b>	Less than once in 5 yrs	-	-	Once between 5 yrs & 1 yr	More than once per yr
<b>UNIFIED SOIL GROUP OF SOIL SURFACE</b>	GW, GP, SW, SP	GM, GC, SC	CH, CL., OH, MH, ML	OH	Pt
<b>SOIL DEPTH</b>	More than 150 cm	100 cm to 150 cm	75 cm to 100 cm	45 cm to 75 cm	Less than 45 cm
<b>STONES (Fragments 75 to 250 mm)</b>	Less than 0.5% (of soil surface)	0.5 to 2%	2% to 5%	More than 5%	-
<b>BOULDERS (Fragments over 250 mm) OR ROCK OUTCROP</b>	Less than 0.1% (of soil surface)	0.1% to 0.5%	0.5% to 2%	2% to 5%	More than 5%

## **Land Capability Rating Systems for Subdivision of Land**

## **Land Capability Rating Systems for Subdivision of Land**

The rating systems for rural subdivision and for urban development as presented in the report are based upon the more detailed activity ratings and the sub-classes indicate the activity which is limiting the land use. Thus, the Capability Class for each of these kinds of use is determined by the class of the major limiting activity. The activities which are considered for each land use are:

### **1. Rural Subdivision (2 10 hectare)**

Secondary roads  
Septic tank absorption fields  
Building foundations  
Farm dams (where reticulated water is not likely be provided)

### **2. Urban Development**

Building foundations Secondary roads Shallow excavations

General definitions of capability classes for these uses are presented in Table 3.



## **8. Land Characteristics used in Land Capability Assessment**

The land characteristics used in capability rating systems can impose limitations the use of land through effects on the production, the management or the hazards. This section explains why these land features are important in determining capability.

### **A Horizon Texture: Texture of the Deposit**

Soil texture is directly related to the proportions of various sizes of the solid particles which make up the soil. It is therefore a useful guide the way the soil behaves.

It provides an indication of whether the soil will become sticky when wet (clay) or unstable when dry (sand). These are important considerations for many uses. High dispersibility is a property of some clays and results in high erodibility; most sandy soils lack coherence and are readily eroded, particularly by wind.

Texture is one of the soil characteristics which influences rate of water movement in the soil. It also affects the ability of the soil to retain moisture for plant use and the nutrient-supplying ability of the soil. This factor may limit plant yield in agricultural uses and affects the growth of lawns and gardens in urban use.

Some of the limitations imposed by soil texture can be reduced or overcome by special treatments, such as the addition of stabilising chemicals or organic matter, or simply by importing better quality topsoil.

### **Boulders or Rock Outcrop**

Boulders and rock outcrop provide physical obstacles to excavation, cultivation and plant growth, and so inhibit land uses involving these activities. In some cases it may be possible to reduce the effect of rock outcrop by blasting. For extensive uses, such as grazing, boulders and rock outcrop can be regarded as a permanent limitation as it is not economical to remove them. There may be additional costs involved in the increased management required as compared with rock and boulder free land.

### **Depth Hard Rock**

If bedrock is close to the surface, excavation will be costly and cultivation may be difficult or impossible. Plant growth and water penetration are adversely affected by shallow soils.

These limitations to engineering activities may be overcome by blasting. In low intensity uses bedrock at shallow depth is regarded as a permanent limitation and will result in increased costs of agricultural production through the difficulty of constructing farm dams, and reduced plant yield.

### **Depth of Topsoil**

Because topsoil is not favoured as a construction material, e.g. for earthen embankments, farm dams, the greater its thickness, the greater the cost of removing and stockpiling it. For many situations, the topsoil is required for respreading on construction sites to facilitate revegetation.

### **Depth to Watertable (seasonal, perched, permanent)**

For many uses the presence of a watertable close to the surface causes problems. Saturated soil has low strength so that for uses dependent on a stable foundation, e.g. house foundations, roads, even a watertable which nears the surface only occasionally is detrimental.

The presence of a watertable also restricts the drainage of added surface water such as rainfall or irrigation water, or septic effluent. In the former cases, trafficability and plant growth may be adversely affected. In the latter, public health aspects may be of concern.

A perched watertable which develops seasonally may be as serious a limitation as a ground watertable, although it may be more easily overcome by artificial drainage.

The presence of a permanent watertable may restrict the excavation depths of sand and gravel quarries.

Soils which are saturated periodically, as a result of a fluctuating watertable, are likely to have lost by leaching, the more mobile plant nutrients. They may also have poor aeration, which prevents root growth in the zone of saturation.

### **Dispersible Clays**

Dispersion and slaking are important for their influence on the erodibility of a soil. This is particularly important in construction activities where the B horizon, or sub-soil, is exposed in cut batters or where the material is used in earth embankments. It can also be important in other uses, such as paths and tracks, where the area has been denuded of vegetation and possibly some topsoil has been lost. Soils with a high degree of slaking or dispersion have a high erosion potential when exposed running water.

In a highly dispersible soil, soil pores may become blocked, thus reducing water infiltration and adversely affecting land uses requiring good drainage such as effluent disposal.

The problem of a dispersible B horizon may be overcome by careful management such as ensuring batters are well vegetated.

### **Flooding**

A useful distinction may be made between fast flowing flood waters (flash floods) and flooding caused by a rise in water levels with little flow (inundation). The type and severity of impact caused by these two forms of flooding differ and to minimise the hazard, different management may be required.

Flooding is an important factor in terms of human safety, damage to property and general inconvenience. This, flood-prone land should not be used for capital intensive uses, but may be capable of supporting extensive land uses such as grazing.

In some areas, the problem may be overcome by the building of levee banks or retarding basins. Some modification of flooding characteristics may be possible by special management aimed at delaying surface runoff. However, when dealing with large catchments, the problem can be regarded as a long-term hazard and a permanent limitation.

### **Infiltration**

The ability of soil to absorb applied water (rain or irrigation water) has an important effect on the production of surface runoff. It may also affect the ability of soil to provide moisture for plant growth, because of limitations on the amount of water entering the soil.

Raindrop splash loosens soil particles and, with surface wash, may cause the blocking of surface pores and reduce the amount of water penetrating the soil. The resultant increase in runoff effectively increases the erosion hazard. Soils differ in their resistance to surface sealing. Maintenance of an effective ground cover which prevents raindrop splash or surface wash is an appropriate means of retaining soil infiltration capacity.

### **Landslip Hazard**

Landslips are an important factor to consider with respect to their influence on human safety, damage to property and access. High landslip can be a permanent limitation to some land uses, because even where it may be technically possible to prevent landslips, the probable cost would be prohibitive. The existence of old landslips in an area is usually a good indication that the land has a landslip hazard.

### **Organic Matter**

Where soil materials are to be used as road fill or for earthen dams, the presence of organic matter reduces soil quality for these purposes. Soils containing even moderate amounts of organic matter are significantly more compressible and less stable than inorganic soils. The presence of organic material in sand for concrete is also undesirable. When used as a medium for plant growth, however, a high level of organic matter produces better structure and chemical fertility, and the soils are good for intensive cropping.

Low organic matter content may be overcome by management techniques, such as the growing of green manure crops or the addition of fertilisers.

### **Permeability**

Soils of low permeability drain poorly through the profile; on sloping land, lateral flow above an impervious layer may occur. Areas with such soils may become waterlogged above the impervious horizon, inhibiting plant growth, or producing conditions at certain times of the year that are too boggy for the use of agricultural machinery. The soils also cause problems when used for effluent disposal. However, low permeability is necessary in soils to be used for earthen dam construction. Low permeability, in the floor and the excavated parts of the walls of the dam, is essential.

Conversely, an extremely permeable soil may suffer from excessive leaching of plant nutrients or an

inability to retain moisture for plant growth. Such a soil may also drain too rapidly to perform the purification function required for septic effluent disposal.

**pH of Material** (see Soil Reaction)

### **Plasticity Index**

The plasticity index is a measure of the range of moisture content over which the soil is in the plastic state. A soil is most easily worked or is most readily deformed when in that state. A low index indicates that the range is narrow, which is desirable where the stability of the material is important, such as in a road subgrade. But where the soil is to be cultivated, a larger plasticity index is desirable to enable working over a wider range of moisture contents.

### **Shrink-Swell Potential**

Shrink-swell potential is a measure of how much the volume of a soil changes as it wets and dries.

Shrink-swell potential influences the capability for land uses such as roads or buildings which require a stable substrata. Buildings and roads shift or crack in soils which undergo large changes in volume during periodic wetting and drying.

Construction on soils with a high shrink-swell potential requires special techniques, such as laying a deeper than usual road paving or using a concrete slab, rather than strip footings, for dwelling foundations.

### **Site Drainage**

Site drainage is influenced by rainfall, soil permeability, the steepness of slope, slope shape and the position of the site in relation to the rest of the slope. It is important for most land uses that water flows freely from the site, since poor site drainage may result in the land becoming waterlogged and boggy, inhibiting plant growth, damaging roads and buildings through subsidence, and reducing the capacity for efficient effluent disposal.

Special practices or management to overcome poor site drainage will add to the cost of development and management.

### **Slope**

As slope increases, so erosion hazard increases because the erosivity of the runoff water increases, due to increased velocity of flow. Lack of adequate ground cover accentuates the erosion hazard occur during construction activities; on tracks and intensive use areas; at certain times under agricultural or forestry uses where cultivation is required; as a result of overgrazing.

An additional influence of slope, on the capability for urban and similar uses, is related to the increasing cost of providing engineering services as slope increases. The slope categories used in urban ratings have been chosen on the basis of relative cost per block, of building and providing services, as described by Neil and Scales (1976).

In agricultural and forestry activities, steeper slopes are more difficult and costly to use and impose limitations on the type of machinery which can be used.

Seepage problems on some soil types increase with slope and may increase the risk of mass movement, such as slumping of the batters of excavations and road cuts, or even of natural slopes. Problems with the absorption and retention of septic effluent below the soil surface increase as the slopes become steeper.

### **Soil Depth for Root Penetration**

The depth of rooting of plants may be restricted by such soil features as a heavy clay subsoil, or a hard pan. If this feature is close to the surface, root development, therefore plant growth, will be restricted. Increased costs would be incurred in overcoming the problem by methods such as deep ripping. On shallow soils perennial plants, such as orchards or plantation trees, may suffer growth restrictions or permanent damage if unseasonably dry or wet conditions occur. Moreover, trees are more prone to wind-throw on shallow soils.

### **Soil Reaction (pH)**

The pH of the soil is a measure of the acidity or alkalinity. Most plants have a limited pH range for optimum growth. Thus a pH which differs from the requisite optimum for high yield from specific plants will result in reduced production. Costly treatment may be needed to bring the pH closer to the optimum.

### **Stones and Gravel**

Excavation of soils with large amounts of stones and gravel requires special machinery. Furthermore, construction excavations in these soils are less stable.

Stones in a soil reduce the proportion of that part of the soil which provides plant nutrients and moisture, and consequently reduce the productive potential. Soils with stones and gravel are difficult to cultivate and are far less suited to intensive cropping and gardens than are stone-free soils. Stones also cause problems with mechanical harvesting of root crops, notably potatoes.

Soil micro-organisms are essential to the purification of septic effluent, but stony or gravelly soils provide a less suitable environment for these organisms than stone and gravel-free soils. Furthermore, the effluent flows quickly through stony soils thus reducing the time available for purifying processes.

For some land use activities, such as excavating, limitations imposed by stones and gravel can be overcome by special management or technology. In areas where plant growth is the objective, the limitations can be overcome by importing topsoil. Stones and gravel in soils intended for intensive cropping can be regarded as a permanent limitation, causing lower yields and increased management problems unless the importation of topsoil is economically justified. The problems of septic effluent disposal, by absorption in these soils, are difficult to overcome and may be regarded as a permanent limitation on the use of tile-drain disposal systems.

**Texture of the Deposit** (Refer: A Horizon Texture)

### **Thickness of Deposit: Thickness of Overburden: Thickness of Construction Material**

These site characteristics are related to the practicability and economics of excavating the desired material.

In extracting sand or gravel for roadfill, a thicker deposit results in greater efficiency in working the site, since establishment costs are distributed over a greater quantity of material. Conversely, the greater the amount of overburden which must be removed to enable the material to be extracted, the higher is the cost of obtaining the material. The proportion of overburden thickness to deposit thickness is a common form of expressing the importance of overburden thickness.

### **Unified Soil Group**

The Unified Soil Classification is used by engineers to group soils with similar engineering properties. Such properties include bearing capacity, drainage characteristics and the amount of shrinking and swelling a soil undergoes as the moisture content changes.

Surface soils are generally considered inferior for engineering purposes and usually are stripped before construction commences. The subsoil or B horizon is thus the material most usually involved in construction activities.

The symbols used to designate the group are shown in Section 5: Land Characteristics Used to Describe the Mapping Units.

## 9. Conservation Management Practices

### General Recommendations for Engineering Activities

Engineering activities will be cheaper, more efficient and less harmful to the environment if attention is given to erosion and sediment control in the planning and design phases of a project rather than applying ad hoc controls during construction. Basic principles in erosion and sediment control are:

- (i) Bare soils will erode more rapidly than vegetated, mulched or paved areas.
- (ii) Erosion rates are influenced significantly by the amount of overland flow, which in turn is affected by surface infiltration rates.
- (iii) Sand and silt-sized material is removed easily from drainage waters, but it is usually impractical to remove the finer particles that contribute to turbidity of drainage waters.

An erosion and sediment control programme is based on the following principles:

- (i) Keep to a minimum the area of soil exposed.
- (ii) Minimise the time the soil is exposed and, as far as possible, avoid having the soil exposed during prevailing periods of high intensity or prolonged rain.
- (iii) Carry out earthworks according to the different erodibility and fertility of topsoils and subsoils.
- (iv) Control surface drainage.
- (v) Trap eroded soil before it damages downslope land, structures or waterways.

Although the most suitable programme for a specific development is governed by local circumstances, the soil conservation program will usually involve one, or a combination, of the practices outlined below. More detailed information about conservation practices applicable to construction sites, "Guidelines for Minimising Soil Erosion and Sedimentation from Construction Sites in Victoria", or further advice, are available from the Soil Conservation Authority.

Some general conservation management objectives include:

- (i) Development should be programmed to minimise the area disturbed at any one time to allow rapid protection by revegetation, mulching or paving of the bared areas. This is particularly important on steep slopes, in areas where highly erodible soil horizons will be exposed, and if the area is to be bare during high intensity rains.

It may be necessary to establish temporary vegetative or other protection on areas that would otherwise be bare, but remain unworked, for long periods during construction.

- (ii) When planning sites for road and general levelling operations for building sites, steep slopes should be avoided as much as possible so that the amount of cut and fill needed is reduced. Aligning roads just off the contour in steep areas assists with surface drainage of the roads.
- (iii) Topsoil and subsoil should be handled separately and placed in separate stockpiles (if stockpiling is necessary). Stockpiles should not be established within flood zones or in drainage lines and, if they are to remain unworked for long periods, they should be protected by establishing a vegetative or other cover.
- (iv) Adequate compaction of soil used for backfilling trenches for fill batters and for general fill operations is necessary for short and long term stability. Allowance should be made for settlement of fill material where settlement could damage structures or interfere with surface drainage.
- (v) Where revegetation of bared areas is to be undertaken, the following measures, as appropriate, should be followed:

- (a) The surface of the subsoil should be loosened and/or roughened, e.g. by scarifying on broad areas, or by sawtooth finish of cut batters, prior to topsoil spreading.
  - (b) Topsoil should be spread when moist, i.e. neither too wet nor dry; depths of about 5 to 10 cm are probably sufficient in most cases; deeper layers of topsoil may slump on steep slopes.
  - (c) The area should be sown with grasses and legumes. Specific recommendations for seed and fertilizer mixtures can be provided by SCA district offices. Autumn sowings are generally most successful for establishing vegetation with minimum management inputs, such as follow-up watering or re-seeding.
  - (d) In critical cases, such as batters, steep areas, and drainage lines, early stability is assisted by chemical and/or organic mulches.
  - (e) Follow-up watering, fertilising and mowing may be necessary to establish and maintain a persistent and dense vegetative cover.
- (vi) Construction traffic should be confined where possible, to existing or proposed road alignments. Drainage line crossings which are to remain when construction activities have concluded should be established as early as possible. If it becomes necessary to cross drainage lines at sites other than where permanent crossings are to be established, temporary culverts or causeways should be established.
  - (vii) Measures should be undertaken to prevent construction traffic dropping or spilling soil on roads outside the construction site.
  - (viii) Roads, parking areas, footpaths and driveways should be paved as early as practical.
  - (ix) Control of drainage by either temporary, or preferably permanent works, is necessary from the start of construction. It is desirable that interception banks and/or channels be used to divert upslope drainage away from bared areas. This is particularly important for cut or fill batters. Cut-off drains to intercept surface and seepage flows may be required above cut batters. Berm drains will be required on high batters. Cross drains and/or channels and/or pipes should be established as necessary to prevent the uncontrolled concentration of surface drainage within the construction area.
  - (x) It is essential that drains are designed to discharge in a manner that does not cause scouring and erosion. Pipes, or paved or grassed channels, may be needed to convey water down steep slopes and batters. Prevention of erosion from drain outlets may require level-spreaders and concrete or rip rap aprons.
  - (xi) The increased flows that usually accompany development of an area and the possible need to stabilise natural water-ways must be allowed for in planning and construction. The increased flows may be modified by using grassed waterways, sediment/retardation basins and overland flow rather than concrete pipes and channels.
  - (xii) The larger sediment fraction, in water draining from bared areas, should be removed by passing the water through sediment basins, or over grass filter-strips, or by other means before it enters natural waterways or underground drains, or damages downslope land and structures. Sediment removal is generally easier if only small volumes of water are involved. Reducing the time between installing pipes and completing drainage pits and inlets, and providing temporary inlet protection during construction significantly reduces the sediment load leaving a construction site.
  - (xiii) Construction tracks, borrow pits and other temporary works that involve land disturbance need similar drainage control, surface stabilisation and sediment control measures to those used for permanent structures and works. Once they are no longer required for construction, the areas should be re-instated and stabilised. Careful planning and design can enable temporary works to become a permanent feature. For example, a sediment basin could become a water trap in a golf course or a lake in an urban park.

### **PART III THE MAPS**

The level of detail which can be presented in a report such as this is determined to a large extent by the mapping scale selected. Data for the study was initially compiled on 1:25 000 aerial photographs and subsequently reduced onto 1:50 000 map bases. While a map scale of 1:50 000 is eminently suited to the presentation of an overview of each of the pilot study areas (which are comparable in size to many municipalities), problems frequently arise with precise placement of map unit boundaries, particularly in relation to cadastral information. To overcome some of the difficulties in using the mapped information for more detailed applications, a program of re-interpreting and re-mapping at a larger scale was undertaken.

For the Berwick-Pakenham study, orthophotographic coverage of part of the area was available at 1:10 000 scale. Orthophotographs provide an excellent base for mapping land capability units at appropriate scales and have the advantage of providing a wealth of supplementary information which aids in locating and characterising mapped entities in the field. At present, however, only partial orthophoto coverage of the area is available. In the Shire of Hastings, the large scale bases were provided by the 1:10 000 Bass topographic map series. The topographic maps, while lacking the general utility of orthophotographs did, however provide cadastral boundaries and 10 m contours.

Maps of both pilot study areas have been prepared at 1:50 000 and are included in the envelope inside the back cover.

Larger, scale maps were also prepared and samples are provided on the following pages, to indicate the level of resolution and kind of information. Originals of the large-scale maps may be inspected at the Soil Conservation Authority, 378 Cotham Road, Kew 3101.

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