LAND CAPABILITY STUDIES IN THE CENTRAL GIPPSLAND REGION

Preliminary Report

L. D. RUSSELL

Catchment Investigation Officer

July 1980

SOIL CONSERVATION AUTHORITY

378 Cotham Road Kew Victoria 3101

PREFACE

The Soil conservation Authority has been requested to undertake land capability studies of the area around the Central Gippsland brown coal fields. The results of the studies will be used in the preparation and review of Planning Schemes for the area.

It is intended that the studies will provide data on the physical limitations of the various types of land to potential land uses, general management techniques to overcome limitations where applicable and recommendations to the Responsible Authority with respect to land use within the area. The Soil conservation Authority will also use the data in the discharge of its statutory responsibilities in Proclaimed Water Supply Catchments in the area.

This report has been prepared as a discussion paper. While it refers specifically to land in the Shire of Narracan, the objectives and methodology are generally applicable to other land capability studies within the area. Where different objectives or additional data are requires, the methodology can be adjusted accordingly at an early stage.

This report contains sample data and interpretations derived from a limited data base for the Shire of Narracan only. It indicates the nature and extent of the data collected and the interpretations made in a land capability study.

The data and interpretations presented here will be subject to amendment following further investigation and should not be used as a basis for planning decisions in their present form.

Apparent inconsistencies between the data and interpretations for the broad scale and detailed mapping units occur because of the difference in scales and the progressive refinement of the base data.

This report is being circulated to organisations involved in the planning process as part of the project definition for land capability studies within the area. Comment is therefore invited on the relevance and suitability of the proposed objectives and methods, specifically for the Shire of Narracan and generally for the area.

Comments should be forwarded to:

The Secretary
Soil Conservation Authority
378 Cotham Road
Kew 3101. (Telephone (03) 80 1381)

Senior Research Officer David Howe and Catchment Investigations Officer Les Russel are available to discuss aspects of the proposed studies and can be contacted at the above address.

ACKNOWLEDGEMENTS

The Broad-scale mapping presented is based on the Land System mapping of the Gippsland Regional Environmental Study by J. M. Aldrick of the Soil Conservation Authority, and modified as necessary to take account of localized variations.

The assistance of I. Sargeant in mapping the land in greater detail is gratefully acknowledged.

1

INTRODUCTION

1. INTRODUCTION

The increasing importance of the Central Gippsland Coalfields to the whole of Victoria highlights the need for co-ordinated land use planning in the area. There is potential for conflict between competing land uses associated with the short and mid-term needs of existing landholders, a the mid and long-term residential and recreational needs of an expanding population and the long-term needs of coal-based industry and power generation

Where the opportunity exists, planning may be able to encourage developments to occur in areas best suited to each type of development, (suitability being the net result of consideration of physical, economic, social and other factors).

Land Capability Assessment

The determination of the constraints on development imposed by the physical characteristics of the land may be described as Land Capability Assessment.

Assessments may be made to meet the requirements of different levels of planning. Regional planning requires only the delineation and assessments of units of land at a broad scale, while local planning requires consideration of more precisely defined units of land. The intensity of the proposed land use also dictates the intensity of mapping and assessments.

The limitations approach to land capability assessment adopted by the Soil Conservation Authority considers the manner in which the physical characteristics of the land affect the use of the land and subsequent effects of that use on the land.

It enables

a) comparison of the capability of a site for competing land uses.

b) comparison of the relative capabilities of a number of sites for a nominates use.

c) Development of management strategies for a specified land use at a specified site.

The concept is explained further in 5: Procedure.

Specific Objectives: Shire of Narracan Planning Scheme

Relevant specific objectives of the planning scheme to be prepared by the Shire of Narracan include:

i) the protection of prime agricultural land from intensive residential use,

ii) the promotion of orderly residential/hobby farm development of areas of lower agricultural capability where there is a demand.

iii) The regulation of residential development in areas of low and very low capability and in areas which would be difficult to service.

iv) The promotion of orderly urban development of areas of moderate and high capability close to existing townships and services.

v) The encouragement of appropriate land use with respect to water quality in the catchments to the Blue Rock Dam and the Moe offtake on the Tanjil River.

Note: These objectives were identified during discussions between Shire officers and SCA officers and should not be regarded as binding on the Shire.

Tentative objective: Assessment of the Shire of Narracan

It is intended that this study will provide an inventory of the land resource and an assessment of the capability of the various types of land to support various uses. The data may then be integrated with other considerations involved in the planning process to prepare a Planning Scheme.

Therefore, tentative objectives of this study are:

i) to identify and delineate prime agricultural land,

ii) to assess the capability of the land for rural residential/hobby farm development and to develop management guidelines for the orderly and safe development of land within the particular capability classes.

iii) To assess the capability for close urban subdivision of the land surrounding existing townships and to develop management guideline for the orderly and safe development of land within the particular capability classes.

iv) To assess the freehold land in the catchment areas for erosion hazard of bared soil and capability for the disposal of effluent and to develop management guidelines for those land uses which may conflict with the maintenance of acceptable water quality.

2

BROAD-SCALE MAPPING MAP UNIT DESCRIPTINS LAND CAPABILITY

2. BROAD-SCALE MAPPING, MAP UNIT DESCRIPTIONS, LAND CAPABILITY

This section is concerned with the delineation, descriptions and capability assessment of land at a broad scale (1: 1000 000 or 1 cm = 1 km).

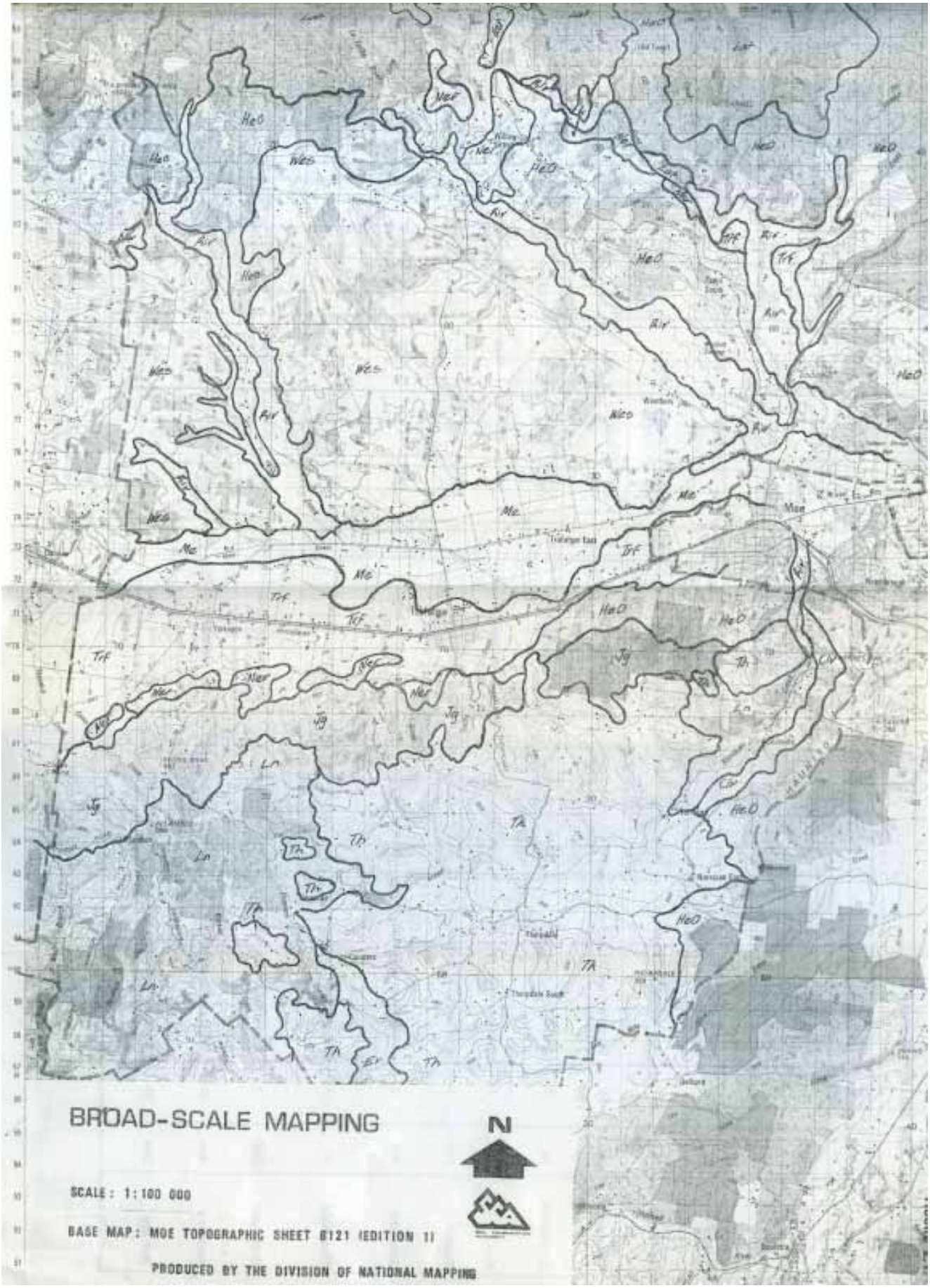
Each map unit is a complex of smaller units which occur in an identifiable pattern and which exhibit a reasonable degree of uniformity with respect to geology and topography.

Some of these broad-scale map units have been separated into two major slope classes for assessment because capability for most uses is highly slope-dependant. For example, in the Westbury unit there are at least two quite different types of land of approximately equal area – the weakly dissected plain where slopes seldom exceed 7%, and the moderately dissected areas where slopes commonly range from 8% to 20% (Table 2.1).

Figure 2.1 shows broad-scale map units of part of the Shire of Narracan marked onto a 1: 100 000 topographic base map. Table 2.1 describes briefly each map unit and where applicable indicates the major slope classes of each map unit. Each map unit has been assessed for capability for a number of activities such as on-site effluent absorption and intensive cultivation (Table 2.2) and these have been combined in various ways to arrive at capability assessments for various residential uses (Table 2.3). The assessment procedure and interpretation is explained further in Table 2.3 and in Section 5: Procedure.

Broad-scale mapping and capability assessment identifies the limitation to land use of quite large areas of land and is most useful in the delineation of zones in a Planning Scheme. For instance, the Thorpdale and Neerim units clearly have a high capability for intensive cultivation (Table 2.2); if the Responsible Authority wishes to protect such land from competing land uses, these areas can be readily identified and zoned accordingly.

Broad-scale mapping and assessment is however quite unsuited to the planning and management of small areas and should not be used as a substitute for more detailed investigation.



BROAD-SCALE MAPPING

N

SCALE : 1:100 000

BASE MAP : MOE TOPOGRAPHIC SHEET 8121 (EDITION 1)

PRODUCED BY THE DIVISION OF NATIONAL MAPPING

BROAD-SCALE MAP UNIT – SUMMARY

MAP UNIT	SYMBOL	% OF STUDY AREA	PARENT MATERIAL	TERRAIN	SOILS	SLOPE*	LANDSLIP HAZARD	FLOOD HAZARD	SEASONAL WATERTABLE	PRESENT LAND USE
Coalville	Clv	1	Mixed Tertiary sediments and older volcanics	Moderate to steeply sloping hillsides	Dark friable and dark sandy soils	A <25% B 10-20%	Moderate	Nil	Nil	Cleared, grazing
Hernes Oak	HeO	7	Tertiary sediments	Moderately sloping low hills	Pale yellow duplex and gradational	A >15% B <15%	Nil	Nil	Nil Temp. waterlogged	Cleared and uncleared; grazing, residential
Elizabeth Valley	Ev	2	Mixed Cretacious sediments and Tertiary Volcanics	Steep, dissected valleys; extensively landslipped	Variable w.r.t depth and parent material	Variable	High	Nil	Nil	Mostly cleared; grazing
Jeeraland	Jg	5	Cretacious sediments	Long steep slopes facing north and associated crests	Shallow grey brown loam soils	A >15% B <15%	High	Nil	Nil	Cleared; grazing
Latrobe	Lat	15	]Devonian and Silurian sediments	Well dissected, steeply sloping hill country	Pale yellow brown gradational soils	A >15% B <15%	Low	Nil	Nil	Uncleared; water production
Livingston	Ln	2	Cretacious sediments	Hilly with short slopes, extensively landslipped	Shallow grey brown loams	A <15% A >15%	Moderate High	Nil	Nil	Cleared; grazing, softwoods
Me	Me	2	Quaternary alluvium	Lowlevel flood plain	Deep uniform, fine textured soils	<5%	Nil	High	Seasonally at surface	Grazing
Neerim	Ner	1	Tertiary Volcanics	Gently sloping basaltic caps	Red and brown friable soils, some gritty areas	<15%	Low	Nil	Nil	Cleared; grazing
Riverine	Riv	2	Quaternary alluvium	Flood plain	Deep medium and heavy textured soils	<5%	Nil	High	Seasonally at surface to seasonally waterlogged	Grazing
Thorpdale	Th	15	Tertiary Volcanics	Hilly country, extensively landslipped and plateau surface	Deep red, friable soils	A <25% B >25%	Moderate High	Nil	Nil	Cleared; intensive cropping, grazing
Trafalgar	Trf	3	Quaternary alluvium/colluvium	Gently sloping plain	Uniform and gradational medium textured soils	A <5% A <5%	Nil	Moderate Low	Temp. waterlogged Temp. ponded	Cleared; grazing
Westbury	Wes	10	Tertiary sediments	Weakly to moderately dissected plain	Deep mottled yellow duplex and gradational soils	A <7% A 8-30%	Nil	Nil	Temp. waterlogged	Partly cleared; grazing
Baw Baw	Baw	35	Devonian granites and metamorphics	Moderately dissected plateau and slopes	Organic and sandy yellow duplex and gradational soils		Nil	Nil	Variable	Uncleared; water production, recreation

* Where there are 2 major sub-units of the map unit – A -represents the dominant or co dominant unit B - represents the sub-dominant unit

Table 2.2 LAND CAPA BILITY – BROAD-SCALE MAP UNITS

MAP UNITS	SYMBOL	**	A Building Foundations	B Secondary Roads	C Shallow Excavations	D Effluent Absorption	E Farm Dams	F Intensive Cultivation	G Erosion Hazard of Bare Soil	H Summer Grazing	I Winter Grazing
Coalville	Clv	A	4 (slope)	4 (slope)	4 (slope, USG)	4 (slope)	4 (slope, permeability)	3 (slope/structure)	4	3 (slope)	2
		B	3 (slope, USG)	4 (slope)	4 (slope)	3 (slope)	3 (slope, permeability)	3 (slope, structure)	3	3 (low WHC)+	2
Hernes Oak	HeO	A	4 (slope)	4 (slope)	4 (slope)	4 (slope)	4 (slope)	3 (slope/structure)	4	3 (slope)	3 (slope)
		B	3 (slope, shrink-swell)	3 (slope, USG of subgrade)	2 & 3 (slope)	3 (slope, site drainage)	3 (USG)	2 (slope/structure)	2 & 3	3 (low WHC)	2
Elizabeth Valley	Ev		4 (landslips, slope)	4 (slope, landslips)	4 (slope)	4 (permeability, slope)	4 (permeability, slope)	3 & 4 (slope/structure)	4	3 (slope)	3 (slope)
Jeeraland	Je	A	4 & 5 (slope, landslips)	4 & 5 (slope, landslips)	4 & 5 (slope, landslips)	4 (slope)	5 (slope, permeability)	4 (slope/sructure0	4	3 (slope)	3 (slope)
		B	3 (landslips)	3 (USG of subgrade)	4 (depth to rock)	2 (slope)	3 & 4 (slope, depth to rock, permeability)	3 (slope/structure)	3	2	2
LaTrobe	Lat	A	4 (slope)	4 (slope)	4 (slope)	4 (slope)	4 (slope)	4 (slope/structure, rooting depth)	4	3 (slope, low WHC)	3 (slope)
		B	3 (slope)	3 (slope, USG of subgrade)	3 & 4 (depth to rock)	3 (slope)	3 (slope)	3 (slope/structure, agg. Stability)	3 & 4	3 (low WHC)	2
Livingstone	Ln	A	4 (slope, landslips)	3 (slope)	4 (depth to rock)	2 (slope)	4 (permeability, landslips)	2 (slope/structure)	3	2	2
		A	4 (slope, landslips)	4 (slope, landslips)	4 (slopes, depth to rock)	4 (slope)	4 (permeability, slopes)	3 (slope/structure)	4	3 (slope)	3 (slope)
Moe	Me		5 (floods)	5 (floods, site drainage)	5 (floods)	5 (floods, site drainage)	4 (flood, slopes)	5 (floods)	1	1	4 (site drainage)
Neerim	Ner		2 (USG, shrink-swell)	2 & 3 (slope, USG of subgrade)	2 (slope, USG	2 (slope) & 1	4 (USG, permeability)	2 (A horizon texture)	2	2	1
Riverine	Riv		4 & 5 (floods, shrink-swell)	4 (floods, site drainage)	5 (floods, USG)	5 (floods, site drainage)	4 (floods)	5 (floods)	1	1	4 (site drainage)
Thorpdale	Th	A	3 (slope, USG)	3 & 4 (slope, landslips)	3 (slope)	3 (slope)	4 (USG, permeability)	2 (slope/structure & 1)	3	2	2
		B	4 (slope, landslip)	5 (slope, landslip)	4 & 5 (slope)	4 (slope)	5 (slope, USG permeability)	3 & 4 (slope/structure)	4	2	3 (slope)
Trafalgar	Trf	A	4 (floods, site drainage)	4 (site drainage)	4 (site drainage)	4 (site drainage)	3 (seasonal w. t)	4 (floods, site drainage)	1	2	3 (floods)
		A	3 (site drainage)	3 (site drainage, USG of subgrade)	3 (site drainage)	3 (seasonal w. t)	3 (seasonal w. t)	3 (sire drainage)	1	2	2
Westbury	Wes	A	3 (site drainage)	3 (UAG of subgrade)	2	3 (site drainage)	1 & 2	4 (site drainage)	2	3 (low WHC)	2
		A	3 (slope)	3 & 4 (slope, USG)	3 & 4 (slope)	3 (slope)	3 & 4 (slope)	4 (slope/structure)	3 & 4	3 (low WHC)	2

** A denotes dominant or co-dominant unit
B denotes subdominant unit
Minor units are not considered in this analysis

Baw Baw map unit is not considered as it is Crown land and not available for these uses.
*WHC – Water holding capacity

TABLE 2.3 - LAND CAPABILITY FOR RESIDENTIAL USE – SUMMARY BROAD-SCALE MAP UNITS

Type of Use Constituent Activities			URBAN ABCG	RURAL RESIDENTIAL ABCD	HOBBY FARM ABCDEGHI
Coalville	Clv	A B	4 (ABCG) 4 (BC)	4 (ABCD) 4 (BC)	4 (ABCDEG) 4 (BC)
Hernes Oak	HeO	A B	4 (ABCG) 3 (ABCG)	4 (ABCD) 3 (ABCD)	4 (ABCDEG) 3 (ABDEH)
Elizabeth Valley	Ev		4 (ABCG)	4 (ABCD)	4 (ABCDEG)
Jeereland	Je	A B	4 & 5 (ABCG) 4 (C)	4 & 5 (ABCD) 4 (C)	4 & 5 (ABCDEG) 4 (CE)
Latrobe	Lat	A B	4 (ABCG) 3 (ABCG)	4 (ABCD) 3 (ABCD)	4 (ABCDEG) 3 & 4 (CG)
Livingstone	Ln	A A	4 (AC) 4 (ABCG)	4 (AC) 4 (ABCD)	4 (ACE) 4 (ABCDEG)
Moe	Me		5 (ABCG)	5 (ABC)	5 (ABCD)
Neerim	Ner		2	2 & 3 (B)	4 (E)
Riverine	Riv		5 (AC)	5 (ACD)	5 (ACD)
Thorpdale	Th	A B	3 (ABC) 5 (BC)	4 (B) 5 (BC)	4 (BE) 5 (BCE)
Trafalgar	Trf	A A	4 (ABC) 3 (ABC)	4 (ABCD) 3 (ABCD)	4 (ABCD) 3 (ABCDE)
Westbury	Wes	A A	3 (AB) 4 (BCG)	3 (ABD) 3 & 4 (BC)	3 (ABDH) 3 & 4 (BCEG)
Map Unit	symbol	**			

** A denotes dominant or co-dominant unit
B denotes sub-dominant unit

Minor units are not considered.

Interpretation

The capability class* of a map unit is shown by a number followed by one r more letter; for example, the capability class of the Coalville B unit for Urban use is 4 (BC) (Table 2.3). This indicates that severe limitations to such development are imposed by the land and that secondary roads (B) and shallow excavations (C) are the activities which have the greatest constraints. Reference to Table 2.1 indicates that, in both instances, slope is the major constraint. In contrast, the Thorpdale A unit has a capability class of 3 (ABC) for urban use, indicating lesser (but still significant) constraints on building foundations, secondary roads and shallow excavations.

Capability for intensive cropping

It can be seen from Table 2.2 that the Neerim, Thorpdale, Livingstone and Hernes Oak map units have higher capability for intensive cultivation than do other map units. The Thorpdale unit has many extensive areas of high capability for intensive cultivation, Neerim and Hernes Oak have few such extensive areas and Livingstone has only small scattered areas of and with a high capability for intensive cultivation.

Capability for residential use

It can be seen from Table 2.3 that parts of the Hernes Oak, Latrobe, Neerim, Thorpdale, Trafalgar and Westbury have potential for residential development in some form (a capability class of 2 or 3). The nature and extent of the limitations to each type of development naturally vary between map units and between types of development.

Capability in relation to planning

The capability classes in Table 2.2 and 2.3 are the result of consideration of the relationship between the physical characteristics of the land and landuse; no direct consideration is given to various social and economic factors which may apply in a planning situation.

The capability class does not imply a recommendation for or against a particular landuse; it merely indicates the nature and extent of physical limitations to that landuse. This information may then be integrated with other planning considerations to determine a preferred or an acceptable land use for a given area, the conditions under which the land may be used for a specific purpose.

* The various capability classes are defined in Table 5.1

3

DETAILED MAPPING UNIT DESCRIPTIONS LAND CAPABILITY MANAGEMENT GUIDELINES

3. DETAILED MAPPING, MAP UNIT DESCRIPTIONS, LAND CAPABILITY, MANAGEMENT GUIDELINES

This section considers the and in more detail – it is mapped at a scale of 1: 25 000 (Figure 3.1) and the broad-scale map units are explicitly subdivided into smaller mapped units (Table 3.1 and 3.2). These detailed units are described in greater detail and are assessed individually for capability for individual activities and for the various residential uses (Table 3.2 and 3.3 are partially coloured capability maps indicating the land capability for rural residential use and for farm dams for portion of the area mapped in Figure 3.1)

Table 3.4 lists the various land characteristics which may affect a specified land use (on-site effluent absorption in this case) and the manner in which the use is affected. One or more management strategies which can be used to overcome each limitation are listed. These may be applied singly or in combination depending upon the specific circumstances.

The major use of this data is in the management of small areas of land, in the determination of permissible uses and the conditions under which those uses should be allowed. Therefore the management of a parcel of land for a specific use may be tailored to suit the site conditions.

FIGURE 3.1

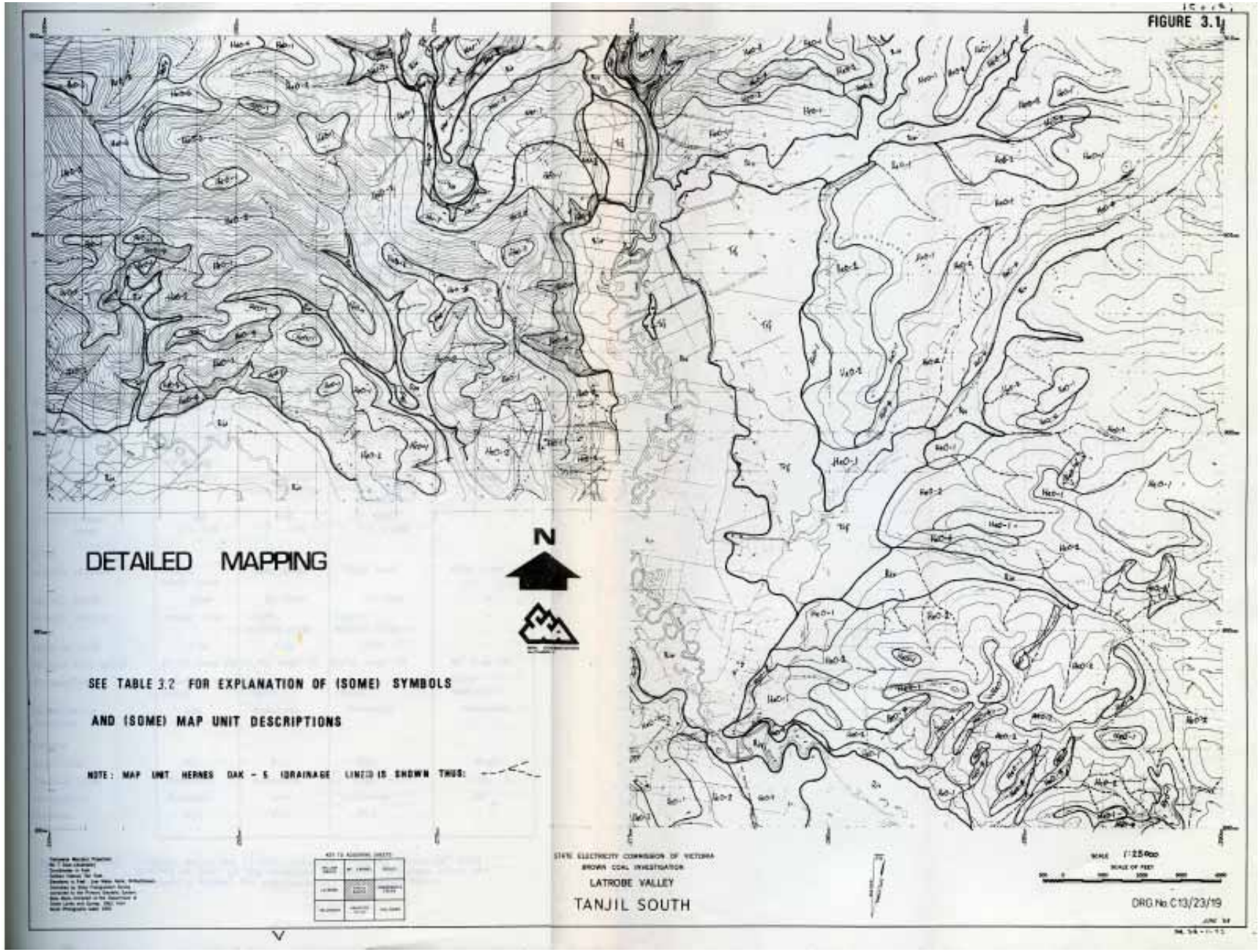
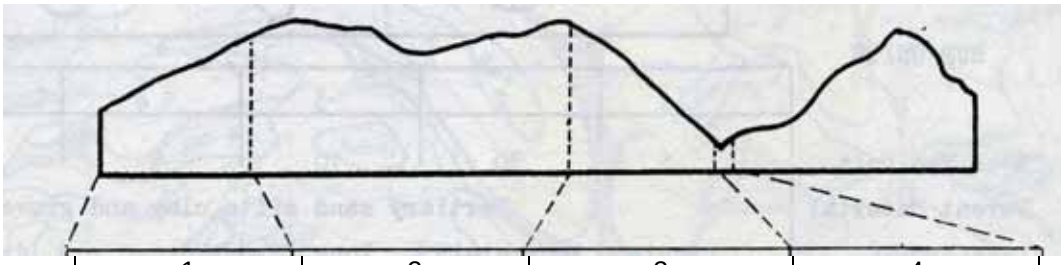

DETAILED MAPPING
N
SEE TABLE 3.2 FOR EXPLANATION OF (SOME) SYMBOLS
AND (SOME) MAP UNIT DESCRIPTIONS
NOTE: MAP UNIT HERNES OAK - S (DRAINAGE LINES) IS SHOWN THUS:
STATE ELECTRICITY COMMISSION OF VICTORIA
BROWN COAL INVESTIGATION
LATROBE VALLEY
TANJIL SOUTH
SCALE 1:25000
ORG No. C13/23/19

TABLE 3.1 - MAP UNIT DESCRIPTION

MAP UNIT: Thorpdale **SYMBOL**: Th

GENERAL DESCRIPTION: The map unit is comprised of a Tertiary volcanic plateau which has been moderately dissected. The basalt is a cap which overlies pre-volcanic Tertiary sediments which in turn overly Cretacious sediments. These Tertiary sediments are exposed at the periphery of the basalt and are included in this unit. Landslips are common throughout the map unit.

SKETCH:



SUB UNITS	1	2	3	4
% of Map unit	5	70	25	1
Parent Material	Pre-volcanic Tertiary sediments	Tertiary Basalt		
Landform	Hillside	Gently undulating surface	Moderately to steeply sloping hillsides	Drainage lines
Slope – common	10%	10%	30%	-
Range	0-15%	0-15%	15-40%	-
SOILS				
Topsoil texture	Coarse sandy loam	Clay loam	Clay loam	Clay loam
Topsoil depth	30cm	30-60cm	30-60cm	-
Subsoil texture	Sandy clay	Light medium clay	Light medium clay	-
Depth to rock	>2m	>2m	>2m	-
Unified soil group	SC/CL over CH	CL/CH over CH	CL/CH over CH	OH over CH
Permeability	Moderate-rapid	Moderate - rapid	Moderate - rapid	Slow – moderate
Shrink-swell potential	Low	Moderate	moderate	Moderate
HAZARDS				
Flood risk	Nil	Nil	Nil	High
Landslip risk	Moderate	Moderate	Moderate	Low
Erodibility	Moderate	Low	Moderate	Low
Seasonal watertable	Nil	Nil	Nil	-

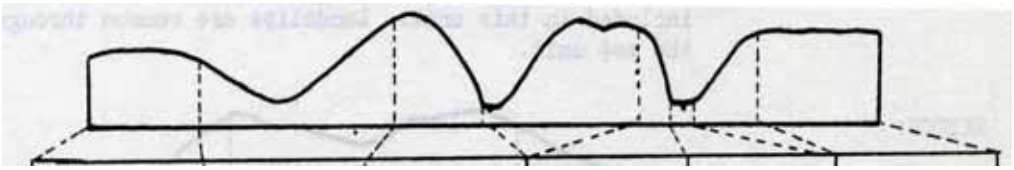
Present Land Use: Cleared; major use id for intensive cropping (potatoes) with grazing as part of the cropping rotation. Drainage lines are frequently dammed for supplementary irrigation water.

TABLE 3.2 - MAP UNIT DESCRIPTION

MAP UNIT: Hernes Oak **SYMBOL**: HeO

GENERAL DESCRIPTION: This unit consists of a weakly to moderately dissected Tertiary plateau surface forming low hills in the eastern areas while remnants of the plateau surface are interspersed among long low hills in the western areas. The topsoil of the crests and slopes generally consist of a high proportion of coarse sand.

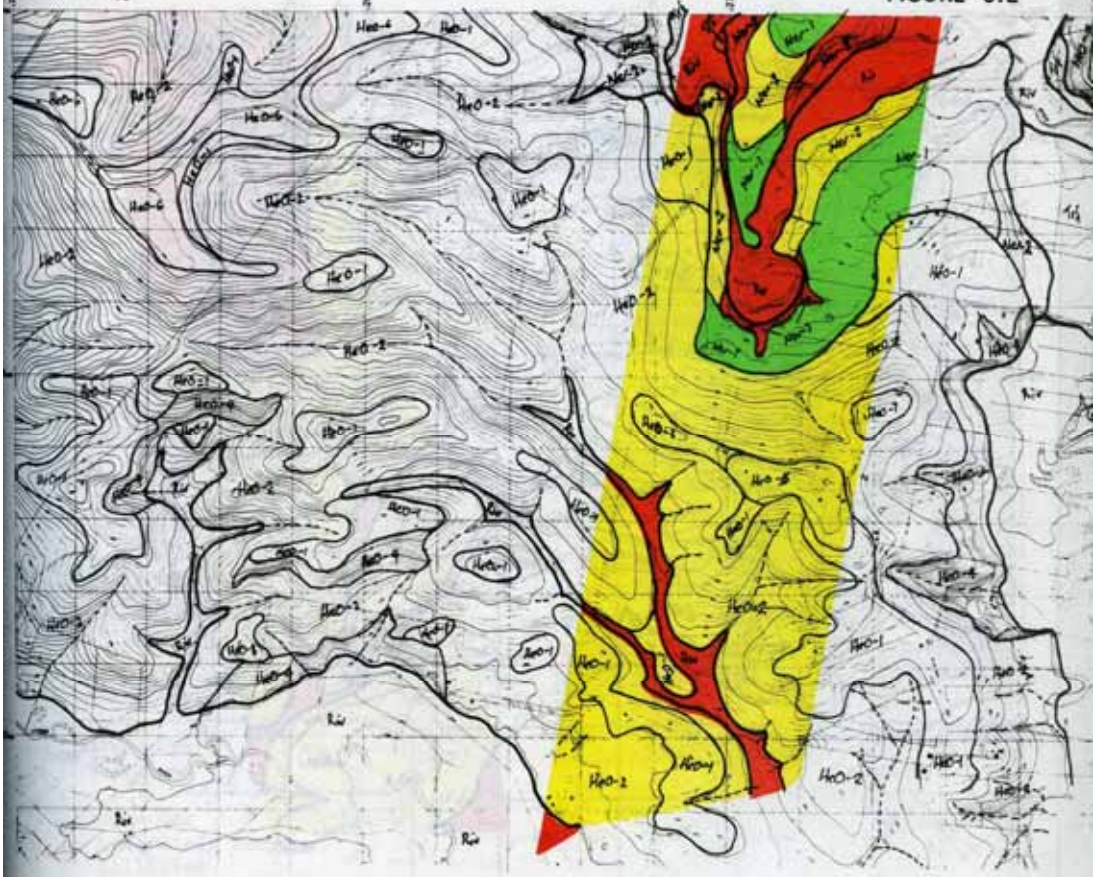
SKETCH:



SUB UNITS	1	2	3	4	5	6
% of Map unit	5	30	10	5	<1	50
Parent Material	Tertiary sand silts clay and gravels					
Landform	Crests	Moderately sloping hillsides	Long, steep hillsides	Short steep slopes and escarpments	Drainage lines	Gently undulating surface
Slope – common	5%	10%	20%	30%	-	2%
Range	0-8%	8-15%	15-25%	>25%	-	0-5%
SOILS						
Topsoil texture	Sandy loam	Coarse sandy loam	Loamy sand to sandy loam	Sandy loam	Sandy clay loam	Sandy loam
Topsoil depth	80-100cm		50-75cm		100cm	30-75cm
Subsoil texture	clay					
Depth to rock	>2m					
Unified soil group	SM/ML	SC over CL	SC over CL	SC over CL	ML/CL over CH	SM/ML over CL
Permeability	Moderate				Slow Moderate	Low
Shrink-swell potential	Low					
HAZARDS						
Flood risk	Nil				Low	Nil
Landslip risk	Nil					
Erodibility	Low		Moderate		Low	
Seasonal watertable	Temp. water-logged	Temp. water-logged	Nil		Season-ally at surface	Temp. water-logged

Present Land Use: Cleared and uncleared: cleared areas are primarily used for grazing but are being increasingly subdivided for hobby farm development.

FIGURE 3.2



LAND CAPABILITY FOR RURAL RESIDENTIAL USE

N

CLASS 2

CLASS 3

CLASS 4

CLASS 5

SCALE 1 : 25 000

KEY TO ADJOINING SHEETS

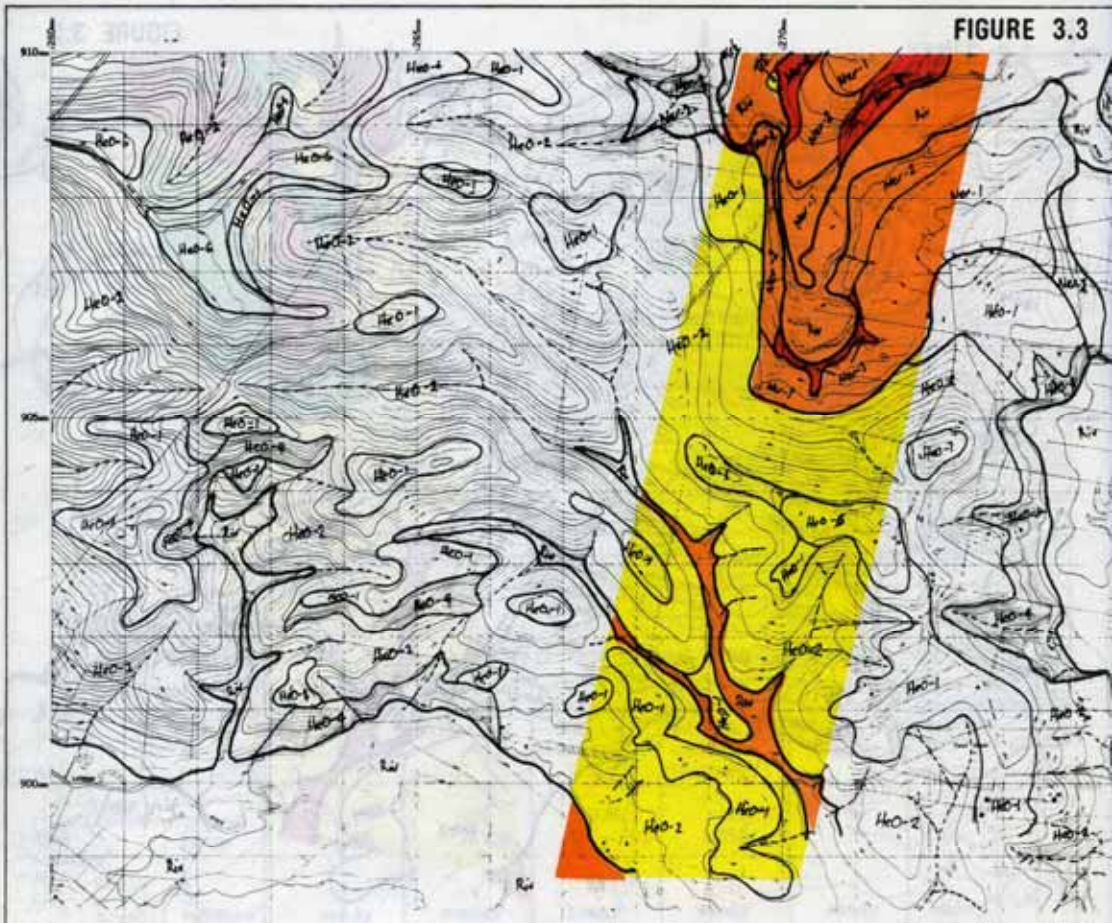
STATE ELECTRICITY CO

BROWN COAL

LATROBE

TANJIL

FIGURE 3.3



LAND CAPABILITY FOR FARM DAMS

N

CLASS 3

CLASS 4

CLASS 5

SCALE 1 : 25 000

Transverse Mercator Projection
No. 7 Zone (Australia)
Co-ordinates in Feet
Contour Interval Ten Feet
Elevations in Feet : Low Water Mark, Williamstown
Controlled by State Triangulation Survey
connected to the Primary Geodetic System
Base Maps compiled at the Department of
Crown Lands and Survey, 1962, from
Aerial Photographs taken 1960.

KEY TO ADJOINING SHEETS

STATE ELECTRIC
BROWN
LAT
TAN

TABLE 3.3 - LAND CAPABILITY – DETAILED MAP UNITS

* Relates to small (500-2000 m3) stock and domestic water supply; different criteria and/or class limits may apply to capability for irrigation water storages.

MAP UNIT	SYMBOL	A Building Foundations	B Secondary Roads	C Shallow Excavations	D Effluent Absorption	E * Farm Dams	F Intensive Cultivation	G Erosion Hazard of Bare Soil	Urban ABCG	Rural Residential ABCD	Hobby Farm ABCDEG
Thorpdale – pre volcanic Tertiary sediments	Th-1	3 (slope)	3 (slope, USG of subgrade)	3 (slope)	2 & 3 (slope)	4 (permeability)	2 (slope/ structure)	3	3 (ABCG)	3 (ABCD)	4 (D)
Thorpdale - gently undulating surface	Th-2	3 (shrink-swell)	3 (slope, USG of subgrade)	3 (slope)	2 & 3 (slope)	4 (permeability)	2 (slope/ structure)	3	3 (ABCG)	3 (ABCD)	4 (D)
Thorpdale -moderately to steeply sloping hillsides	Th-3	4 (slope, landslip risk)	5 (slope, landslip risk)	5 (slope)	4 (slope)	5 (slope)	4 (slope/ structure)	4	5 (BC)	5 (BC)	5 (BCE)
Thorpdale -drainage line	Th-4	5 (site drainage)	5 (site drainage)	5 (site drainage)	5 (site drainage)	4 (USG, floods)	5 (site drainage, floods)	2	5 (ABC)	5 (ABCD)	5 (ABCD)
Hernes Oak -crests	HeO-1	3 (site drainage)	3 (USG of subgrade)	3 (site drainage)	3 (site drainage)	3 (USG)	2 (soil drainage)	2	3 (ABC)	3 (ABCD)	3 (ABCDE)
Hernes Oak -moderately sloping hills	HeO-2	3 (slope)	3 (slope, USG of subgrade)	3 (slope)	3 (slope)	3 (slope, USG)	3 (slope/ structure)	3	3 (ABCD)	3 (ABCD)	3 (ABCDEG)
Hernes Oak -long steep hillslopes	HeO-3	4 (slope)	4 (slope)	4 (slope)	4 (slope)	4 (slope)	4 (slope/ structure)	4	4 (ABCG)	A (ABCD)	4 (ABCDEG)
Herns Oak -short steep slope and escarpments	HeO-4	4 & 5 (slope)	5 (slope)	5 (slope)	4 & 5 (slope)	5 (slope)	5 (slope/ structure)	5	5 (ABCG)	5 (ABCD)	5 (BCEG)
Hernes Oak -drainage lines	HeO-5	5 (site drainage)	5 (site drainage)	5 (site drainage)	5 (site drainage)	3 (USG)	5 (site drainage)	3	5 (ABC)	5 (ABCD)	5 (ABCD)
Herns Oak -gently undulating surface	HeO-6	2 (site drainage)	3 (USG of subgrade)	2 (site drainage)	2 (site drainage)	3 (slope)	3 (site drainage)	2	3 (B)	3 (BD)	3 (BDE)

NOTE: Some inconsistencies between data in this table and in the capability analyses of the broad scale map units occur due to the difference in scale and to the progressive refinement of the base data.

TABLE 3.4 - MANAGEMENT GUIDELINES TO OVERCOME CONSTRAINTS TO USE

The following tables list the physical constraints which the land may impose on some land uses, the manner in which they affect that use, and one or more means of minimising each constraint where possible. These may be applied singly or in combination, depending upon the level of constraint. Avoidance should always be considered as one option.

LAND USE: ON SITE EFFLUENT DISPOSAL

Physical Constraint	Potential Effect on Land Use	Kind of Management Required
Slope	May result in surface seepage of effluent, particularly in soils with an impervious layer near the surface. Incomplete purification of effluent, undesirable odours and contamination of surface waters may results.	- designed and installation of an appropriate system (e.g. series distribution trenches) - increased area devoted to effluent absorption - planting of evergreen trees in the absorption field.
Site drainage	Inadequate site drainage reduces the ability of the soil to purify and dispose of the effluent. Surface seepage with its attendant problems is likely if the soil moisture content exceeds field capacity.	- increased area devoted to effluent absorption - planting of evergreen trees in the absorption field - diversion of run-on water.
Flooding	Flooding can be considered an extreme case of inadequate site drainage.	- diversion of flood if shallow slow-moving flood water and other conditions permit - otherwise no effective management available.
Depth to seasonal water table	Restricts the depth of soil available to accept and purify effluent. May result in contamination of surface and subsurface water supplies.	- increased area devoted to effluent disposal - planting of evergreen trees in the absorption field.
Depth to rock or impervious layer	Restricts the depth of soil available to accept and purify effluent.	- Increased area devoted to effluent disposal.
Permeability	i) affects the rate at which the soil can accept and purify effluent	- Increased area devoted to effluent disposal - Planting of evergreen trees in the absorption field
	ii) excessive permeability rate may result in contamination of subsurface (and potentially surface waters).	- Locate absorption field well away from drainage lines and springs in very well drained soils
Presence of gravels and stones	Reduces the effective soil volume available to accept and purify effluent.	- Increased area devoted to effluent disposal

Physical Constraint	Potential Effect on Land Use	Kind of Management Required
Presence of boulders and rock outcrop	i) as above	- As above
	ii) physical impediment to installation of distribution system	- Remove boulders and/or adjust layout to avoid obstructions
Dispersible clays	Dispersion of soil aggregates results in blocking of soil pores and reduces the ability of the soil to accept effluent.	- Increase area devoted to effluent disposal
Shrink-swell	High shrink-swell soils are much less permeable when saturated than when dry; unsatisfactory disposal may result if design is based on permeability of the dry soil	- Allow for at design stage
Landslip risk	Additional moisture loading may reactivate an inactive slip or initiate further movement of an active slip.	- No effective management other than avoid locating absorption fields above or on active or inactive landslips.

4

LAND MANAGEMENT GUIDELINES

WATER SUPPLY CATCHMENT AREAS

4. LAND MANAGEMENT GUIDELINES, WATER SUPPLY CATCHMENT AREAS

The Soil Conservation Authority has, under Sections 21 and 23 of the Soil Conservation and Land Utilisation Act 1958, certain statutory responsibilities with regard to the use of land within water supply catchment viz: the definition of an area as a water supply catchment, determination of the most suitable use in the public interest of such land, and the conditions under which various forms of land use may be permitted.

Part of the catchment to the Moe offtake on the Tanjil River is mapped onto a photo base at a scale of 1: 20 000 (Figure 4.1). Authority officers have found this to be an extremely useful too in discussing with landholders, the relationships between land, land use and water quality.

This section represents a change in emphasis in the management requirements of land. The previous section considered the management required to achieve continued satisfactory performance – "production" and "hazard to the land" aspects. However this section considers the major land use to be water production and looks at the ways in which other land uses may affect water quality.

Table 4.1 is an assessment of the capability of the units of the Herns Oak land a) to dispose the effluent, and b) the erosion hazard of bared soil. (The erosion of bared soil or unsatisfactory disposal of effluent in a catchment is usually reflected by decreased water quality). The kind and degree of management required to reduce off-site effects of land use in catchment areas if listed against each of the hazards for each type of land.


Dwg no S-877
Base uncontrolled photomosaic
DETAILED MAP UNITS
PROCLAIMED W.S.C. (MOE OFFTAKE - part)
Land tenure
Crown
Catchment boundary
FIGURE 4.1

TABLE 4.1 - MANAGEMENT GUIDELINES FOR LAND USE IN PROCLAIMED WATER SUPPLY CATCHMENT AREAS

Map Unit	Symbol	Limitations to Effluent Disposal	Management required to overcome limitations		Erosion hazard of bared soil	Management required to reduce hazard to acceptable levels	
			Degree	Kind		Degree	Kind
Hernes Oak – crests	HeO-1	Perched water table affects the capability of the soil to accept and dispose of effluent during wetter months	Moderate	i) increase area devoted to effluent disposal ii) maximise transpiration of soil moisture by use of evergreen trees	Topsoil - wind: susceptible following extensive removal of vegetation eg. Clearing, overgrazing	Moderate	Avoid extensive removal of vegetation
					- water: loose soil susceptible during heavy rainfall and to concentrated run-on water	Low	i) avoid clean cultivation during summer ii) divert run-on water around construction sites
					Subsoil - water: subsoil is moderately dispersive, batters slump readily, table drains erode readily	Moderate	i) lay back exposed subsoil batters, respread topsoil and sow down ii) divert run-on water during construction iii) use of sedimentation devices during construction advisable
Hernes Oak – moderately sloping hillsides	HeO-2	As for HeO-1; Difficult to contain effluent below soil surface due to slope	Moderate	i) as for HeO-1 ii) design of disposal system (series distribution)	Topsoil - wind: as for HeO-1	Moderate	As for HeO-1
					- water: as for HeO-1	Moderate	As for HeO-1
					Subsoil - water: as for HeO-1	High	i) avoid where possible ii) otherwise as for HeO-1
Hernes Oak – long steep hillslopes	HeO-3	Surface seepage is likely due to slope factors	High	i) avoid where possible, otherwise as for HeO-1	Topsoil - wind: as for HeO-1	Moderate	As for HeO-1
					- water: as for HeO-1	High	i) as for HeO-1 with particular attention disposal of accumulated water ii) revegetation of disturbed soil essential
					Subsoil - water: as for HeO-1	Very high	Avoid
Hernes Oak – short steep slope and escarpments	HeO-4	As for HeO-1	Not feasible	Avoid	Topsoil - wind: as for HeO-1	Moderate	As for HeO-1
					-water: as for HeO-1	Very high	Avoid
					Subsoil -water: as for Heo-1	Very high	Avoid

Map Unit	Symbol	Limitations to Effluent Disposal	Management required to overcome limitations		Erosion hazard of bared soil	Management required to reduce hazard to acceptable levels	
			Degree	Kind		Degree	Kind
Hernes Oak – drainage lines	HeO-5	Soil is saturated for long periods, precluding acceptable effluent disposal	Not feasible	Avoid	Topsoil -wind: not susceptible	-	-
					- water: susceptible to erosion by surface flows	High	i) avoid where possible ii) respreading of topsoil and revegetation essential
					Subsoil -water: as for topsoil	High	As for topsoil
Hernes Oak – gently undulating	HeO-6	As for HeO-1	Moderate	i) avoid for HeO-1 ii) avoid low lying areas	Topsoil -wind: as for HeO-1	Moderate	As for HeO-1
					-water: as for HeO-1	Low	As for HeO-1
					Subsoil -water: as for HeO-1	Low	As for HeO-1

5

PROCEDURE

5. PROCEDURE

The Study Area

It is envisaged that most of the municipalities of the Central Gippsland Region will be assessed to varying extents, depending upon the specific requirements for planning for each municipality. Figure 5.1 shows the Shire of the area in relation to the Nominal Coal Protection Area.

The Shire of Narracan and the remainder of the catchment to the Blue Rock Dam constitute the pilot study area (Figure 5.2).

Land Uses considered

a) freehold land

- broad-scale map units will be assessed for capability for agricultural use and residential development.

- areas of land with moderate tot high capability for residential development (excluding prime agricultural land) will be mapped and assessed in more detail.

- Areas of high demand for residential development such as the periphery of existing townships and the northern slopes of the Strzeleki Range will be mapped in detail and assessed for rural and urban residential development where applicable. Land within 5 km of the Coal Protection Area will be mapped and assessed similarly.

b) Crown Land, State Forest

- will be mapped into broad-scale map units and may be used to test preliminary rating table for forestry.

c) Catchment areas

Water production (for the purposes of this study) will be considered as the prime land use, therefore the erosion hazard of bare soil and the capability of the land to dispose non-industrial effluent will be assessed.

As the demand for recreational use of an area of land is often determined by factors other than soil/terrain characteristics (for example accessibility, extent of native vegetation remaining proximity to a large water storage), assessment of land capability for recreational use will be made only on ad hoc basis – where a potential demand is identified. The SCA has developed tables to assess land for capability for cam sites, paths and trials, intensive use areas and playing fields. Management guidelines can then be developed to overcome site limitations.

FIGURE 5.1

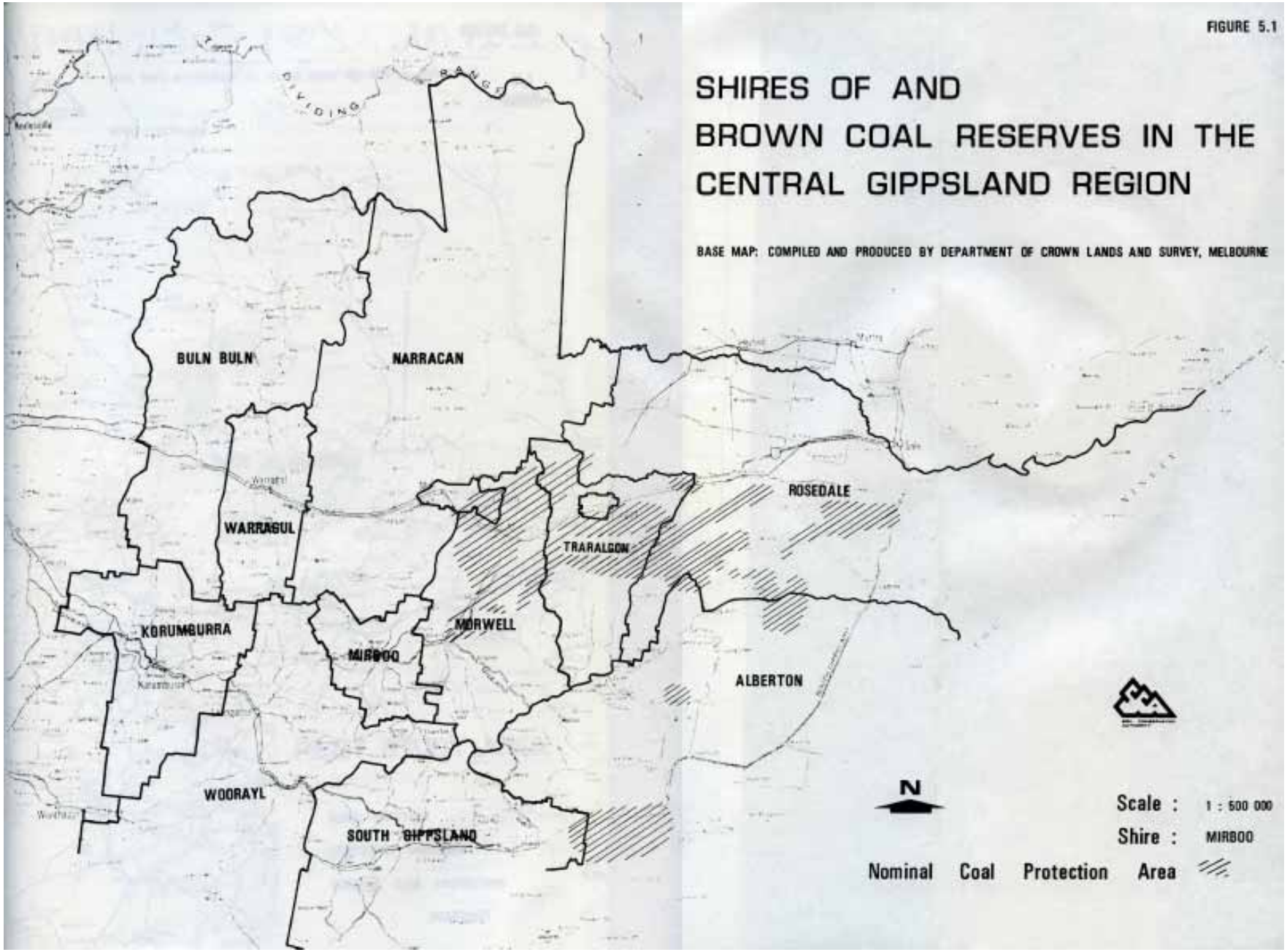

SHIRES OF AND
BROWN COAL RESERVES IN THE
CENTRAL GIPPSLAND REGION
BASE MAP: COMPILED AND PRODUCED BY DEPARTMENT OF CROWN LANDS AND SURVEY, MELBOURNE
DIVIDING RANGE
BULN BULN
NARRACAN
WARRAGUL
TRARALGON
ROSEDALE
KORUMBURRA
MORWELL
MIRBOO
ALBERTON
WOORAYL
SOUTH GIPPSLAND
N
Scale : 1 : 500 000
Shire : MIRBOO
Nominal Coal Protection Area

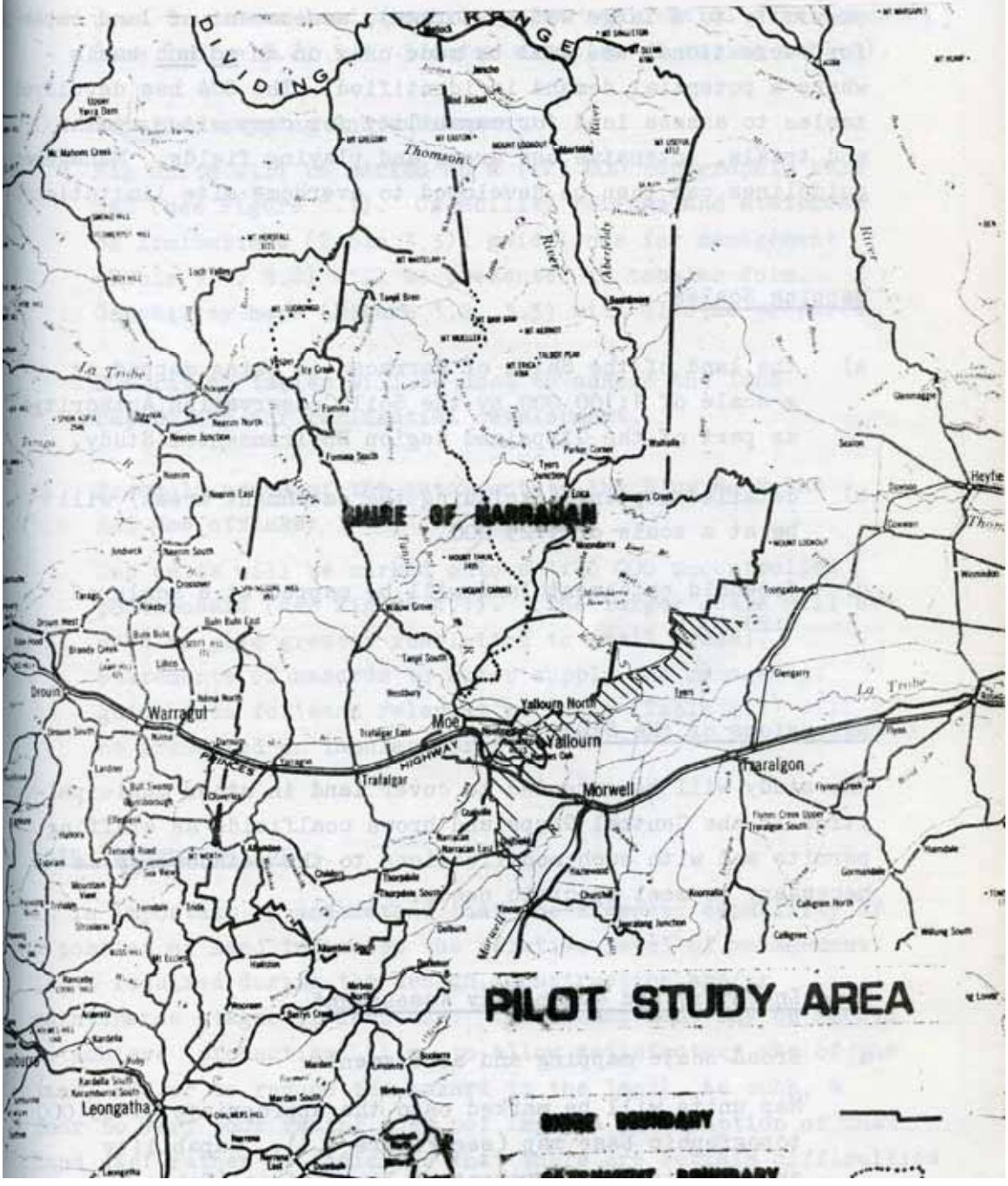
FIGURE 5.2

BASE MAP: DEPARTMENT OF CROWN LANDS AND SURVEY, MELBOURNE

SOIL CONSERVATION AUTHORITY

N

SCALE : 1: 25 000



Mapping Scales

a) the land of the Shire of Narracan is being mapped at a scale of 1: 100 000 by the Soil Conservation Authority as part of the Gippsland Region Environmental Study.

b) detailed mapping (excluding the catchment areas) will be at a scale of 1: 25 000.

c) Freehold catchment land will be mapped at a scale of 1: 20 000.

Extensions of the Study Area

The study will be extended to cover land in other municipalities in the Central Gippsland brown coalfields as staffing permits and with such modifications to the methodology as necessary to meet specific needs.

Land Inventory and Capability Assessment

a) Broad-scale mapping and assessment:

   Map units will be marked onto the appropriate 1: 100 000 topographic base map (see Figure 2.1). Capability assessments and statement of limitations (Table 2.2, 2.3) and map unit descriptions (Table 2.1) will be presented in tabular form.

   The experience of local SCA and Department of Agriculture officers will be drawn upon to make agricultural assessments while rating tables developed by the SCA will be used to assess land capability of residential development (see Tables 5.2, 5.3, 5.4 for examples of rating tables)

b) Detailed mapping and assessment:

   Map units will be marked on a 1: 25 000 topographic base map (see Figure 3.1). Capability ratings and statement of limitations (Table 3.3), guidelines for management (Table 3.1, 3.2) will be presented in tabular form. Capability maps (Figure 3.2, 3.3) will also be prepared.

   SCA rating tables will be used to assess the land capability for residential development.

c) Freehold areas of the catchment to the Blue Rock Dam and Moe offtake:

   Map units will be marked onto a 1: 20 000 uncontrolled photomosaic (see Figure 4.1). (The larger scale will be used to give greater resolution to small areas). Statements of hazards to water supply and management guidelines for each relevant map unit (Table 4.1) will be presented.

Data Interpretation

It is important to understand that he assessed capability of a portion of land indicates the relative level of management input required during the design, construction and/or maintenance stages of land use. This management may be needed to achieve ‘production’ (i.e. to allow satisfactory use of the land) and/or to reduce the hazard to the land). As such, a poor to very poor rating does not imply a proscription of that land use: rather it indicates that there are certain difficulties in using the land in that manner and alternative land uses may be preferred.

Five capability classes are use, ranging from “no limitation to use” to “severe limitation to use”. These classes are defined further in Table 5.1.

Capability of each map unit for a specified use is assessed by comparing the relevant land characteristics with the class limits of the appropriate rating table. The most limiting characteristic determined the capability class of that map unit for that use.

For example, from Table 2.2, the capability class of the steeper areas of Hernes Oak (sub unit a) of secondary roads is 4 (slope) while the capability class for Hernes Oak B is 3 (slope, Unified Soil group of the subgrade). This indicates that, for Hernes Oak A – steep slope is the major limitation and imposes severe limitations to use; roads would be very costly to construct and there is a risk of site deterioration after construction. Hernes Oak B has lesser limitations in the form of slope and unsuitable unified Soil Group of the subgrade. Road construction would be less costly in the B unit than the A unit and would pose fewer risks to site stability. Where land has a capability class of 5, it is unlikely that current technology can consistently and at reasonable cost overcome initial limitations to use and provide for continued satisfactory performance of the land.

Land capability of residential use has been assessed by consideration of the capability classes of the constituent activities as indicated in Table 5.5 and the most limiting activity determining the capability class of the land.

TABLE 5.1 - LAND CAPABILITY CLASSES

Land Class	Degree of Limitation	General Description
1	None to very slight	Areas with a high capability for the proposed activity or use. The limitations of long term instability, engineering difficulties or erosion hazard do not occur or they are very slight. Standard designs and installation techniques, normal site preparation and/or management should be satisfactory to minimise the impact on the environment.
2	Slight	Areas capable of the propose activity or use. Slight limitations are present in the form of engineering difficulties and/or erosion hazard. Careful planning and/or the use of standard specifications for site preparations, construction and follow-up management should minimise follow-up management should minimise developmental impact on the land.
3	Moderate	Areas with fair capability for the propose activity or use. Moderate engineering and/or high erosion hazard exist during construction. Specialised designs and techniques are required to minimise developmental impact on the environment.
4	High	Areas with poor capability for the proposed activity or use. There are considerable engineering difficulties during development and/or a high erosion hazard exists during and after construction. Extensively modified design and installation techniques, exceptionally careful site preparations and/or management are necessary to minimise the impact on the environment.
5	Severe	Areas with very poor capability for the proposed activity or use. Limitations, either long term instability hazards, erosion or engineering difficulties cannot be easily overcome with current technology. Sever deterioration of the environment will probably occur if the activity or use is attempted in these areas.

TABLE 5.2 - LAND CAPABILITY RATING FOR EARTHEN DAMS – Areas capable of being used of the construction of small water storages with earthen embankments (1).

LAND FEATURES AFFECTING USE	CAPABILITY CLASS				
	1	2	3	4	5
SLOPE (2) Gully Dams Hillside Tank	2% to 4% 2% to 5%	4% to 8% 5% to 10%	0-2% or 8-12% 0-2% or 10-15%	12% to 15% 15% to 20%	More than 15% More than 20%
FLOODING (3)	None	-	-	Less than once in 25 yrs	More than once in 25 yrs
UNIFIED SOIL GROUP (4)	GC, GM, SC	SM, CL (PI<15)	CL (PI>15) ML, CH	OL, MH, CH	SP, SW, GP, GW, Pt
THICKNESS OF CONSTRUCITON MATERIAL	More than 200 cm	200 cm to 100 cm	100 cm to 75 cm	75 cm to 30 cm	Less than 30 cm
STONES (Fragments 75 mm – 250 mm in construction material)	Less than 5%	5% to 20%	20% to 50%	50% to 75%	More than 75%
BOULDERS (Fragments over 250 mm on surface)	Less than 0.05%	0.05% to 0.1%	0.1% to 1%	1% to 5%	More than 5%
ROCK OUTCROP (5)	Less than 0.02%	0.02% to 0.05%	0.05% to 0.5%	0.5% to 2%	More than 2%
PERMEABILITY (6)	Slower than 0.1 $1/m^2$ day	0.1 to 1 $1/m^2$ day	1 to 5 $1/m^2$ day	5 to 10 $1/m^2$ day	Faster than 10 $1/m^2$ day
SHRINK-SWELL POTENTIAL (7)	Less than 4%	4% to 12%	12% to 20%	More than 20%	-
DEPTH TO HARD ROCK (8)	More than 300 cm	300 cm to 200 cm	200 cm to 150 cm	150 cm to 80 cm	Less than 80 cm
DISPERSIBLE CLAY (9)	2% to 6%	6% to 10%	10% to 16%	More than 16% or less than 2%	-
DEPTH TO TOPSOIL (10)	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 200cm

NOTES:

(1) This rating table does not consider catchment conditions, expected yield or spillway requirements

(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.

(4) UNIFIED SOIL GROUP: Determined for material to be used for bank construction.

(5) BOULDERS & ROCK OUTCROP:

0.02% is 1 m^2 per 5000 m^2	1% is 1 m^2 per 100 m^2
0.05% is 1m^2 per 2000 m^2	2% is 1 m^2 per 50 m^2
0.1% is 1m^2 per 1000 m^2	5% is 1 m^2 per 20 m^2
0.5% is 1m^2 per 200 m^2	

(6) PERMABILITY: This test is carried out in material at the expected depth of the base of the excavation. A rate of 10 $1/m^2$ day is 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 TO TOPSOIL: Material to be stockpiled for re-spreading.

TABLE 5.3 - LAND CAPABILITY FOR ON-SITE EFFLUENT DISPOSAL – Areas capable of being used for on-site soil absorption of all-waste septic tank effluent from a single family dwellings.

LAND FEATURES AFFECTING USE	CAPABILITY CLASS				
	1	2	3	4	5
SLOPE (1)	0 to 5%	5% to 8%	8% to 15%	15% to 30%	More than 30%
SITE DRAINAGE	Excessively well drained, Well drained	Moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained
FLOODING (2)	None	-	-	Less than once in 25 years	More than once in 25 years
DEPTH TO SEASONAL WATER TABLE	More than 150 cm	150 cm to 120 cm	120 cm to 90 cm	90 cm to 60 cm	Less than 60 cm
PERMEABILITY (3)	Faster than 1.0m/day	1.0m/day to 0.3m/day	0.3m/day to 0.1m/day	0.1m/day to 0.02m/day	Slower than 0.02m/day
DEPTH TO ROCK OR IMPERVIOUS LAYER	More than 200 cm	200 cm to 150 cm	150 cm to 100 cm	100cm to 75 cm	Less than 75 cm
GRAVEL (Fragments 75 mm to 250 mm in soil profile)	Less than 5%	5% to 20%	20% to 40%	40% to 75%	More than 75%
STONES (Fragments over 250 mm in soil profile)	Less than 2%	2% to 10%	10% to 30%	30% to 60%	More than 60%
BOULDERS (Fragments over 250 mm on surface)	Less than 0.02%	0.02% to 0.2%	0.2% to 2%	2% to10%	More than 10%
ROCK OUTCROP	Less than 0.01%	0.01% to 0.1%	0.1% to 1%	1% to 5%	More than 5%
SHRINK SWELL POTENTIAL	Less than 4%	4% to 12%	12% to 20%	More than 20%	-

NOTES:

(1) SLOPE: Reduce class limits by half in slope failure hazard areas.

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

(3)PERMEABILITY: Based on determination of hydraulic conductivity, “K”. Where K exceeds 6.0m/day, risk of polluting water bodies must be considered.

TABLE 5.4 - LAND CAPABILITY RATING FOR INTENSIVE CROPPING – Areas capable of being used for intensive production of crops such as potatoes, berry crops and crucifers. It is assumed that commonly used management techniques will be applied including adequate fertilizer applications, clean cultivation for weed controls, and that supplementary water is available.

LAND FEATURES AFFECTING USE	CAPABILITY CLASS				
	1	2	3	4	5
GRADIENT SOIL STRUCTURE Apedal-weak	0 – 4%	4% to 8%	8% to 15%	15% to 20%	More than 20%
Moderate, S.G.	0 – 8%	8% to 15%	15% to 20%	20% to 35%	More than 35%
Strong	0 – 15%	15% to 20%	20% to 35%	35% to 50%	More than 50%
FLOODING RETURN PERIOD	More than 20 yrs	20 yrs to 10 yrs	10 yrs to 5 yrs	5 yrs to 1 yr	Several times per year
SOIL RAINAGE CLASS	Well drained, Moderately well drained	Excessively well drained	Imperfectly drained	Poorly drained	Very poorly drained
ROOTING DEPTH	More than 50 cm	50 cm to 30 cm	30 cm to 20 cm	20 cm to 15 cm	Less than 15 cm
TEXTURE OF A HORIZON	L, SL, CL	SCL, LS, S	Lmc, hC	-	-
AGGREGATE STABILITY OF A HORIZON	1 (Stable)	2	3	4,5 (dispersing)	-
GRAVELS & STONES	Less than 4%	4% to 10%	10% to 20%	20% to 30%	More than 30%
BOULDERS & ROCK OUTCROP	Less than 0.01%	0.01% to 0.05%	0.05% to 1%	1% to 10%	More than 10%

TABLE 5.5

	URBAN	RURAL RESIDENTIAL	HOBBY FARM
Building foundation	*	*	*
Shallow excavation	*	*	*
Secondary roads	*	*	*
Effluent absorption		*	*
Farm dams			*
Erosion risk of bared soil	*		*
Summer grazing			*
Winter grazing			*

Reference to the capability table for the limiting activity will indicate the type of limitation and an appropriate management strategy can then be devised.