

ENGINEERING GEOLOGY OF MELTON -
THE MELTON DEVELOPMENT AREA

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ABSTRACT

An engineering geological mapping program has been conducted to provide essential geological information for use by planners and engineers working in the Melton Development Area, Victoria.

A review of past and current examples of thematic mapping for land use purposes was initially conducted. A data base of over 800 sampled locations was collated from previous work, and supplemented by additional drilling and testing in areas where little was known of the geological materials. This information was compiled using available computer facilities and combined with traditional field mapping methods. A map folio presenting individual aspects of the engineering geology was produced.

Large areas of expansive soil have been identified and mapped, and an area affected by soil subsidence was examined in detail. Statistical methods (block kriging) have been used to determine the thickness of soil in the map area. Assessments of the suitability for urban development have been made.

Computer draughting was used to produce the maps, providing the ability for rapid future revision.

This report - one of seven unpublished reports on the map area - describes the Melton Development Area.

KEYWORDS: Engineering Geological Mapping, Medium Scale, Maps, Urban Planning.

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LIST OF ABBREVIATIONS used in reporting the Melton Engineering Geology Mapping Project.

Abbreviation	Definition
AASHO	American Association of State Highway Officials
AEBIRA	Australian Engineering and Building Industry Research Association
AHD	Australian Height Datum
AMG	Australian Metric Grid
AS1276	Australian Standard AS1276 - SAA Site Investigation Code
AS1289	Australian Standard AS1289 - Methods of Testing Soils for Engineering Purposes
AS2870	Australian Standard AS2870 - Residential Slabs and Footings
CAD	Computer Aided Drafting/Design
CBD	Central Business District
CBR	California Bearing Ratio
CRB	Country Roads Board
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DITR	Department of Industry, Technology and Resources
DOE	Department of Environment
DVA	Dandenong Valley Authority
ECS	Engineering Computer Services Pty. Ltd.
EDP	Electronic Data Processing
EPA	Environment Protection Authority
F&L	Farley and Lewers Pty Ltd
FAO	Food and Agriculture Organisation
FS	Free Swell
GEOSIS	Geoscience Spatial Information System
GLQ	Genesis-Lithology-Qualifier
GSV	Geological Survey of Victoria
IAEG	International Association of Engineering Geology
IGS	Institute of Geological Sciences
LL	Liquid Limit
LPS	Land Protection Service
LS	Linear Shrinkage
MMBW	Melbourne Metropolitan Board of Works
MPE	Ministry for Planning and Environment
MSA	Melton Sewage Authority
MSICC	Melton - Sunbury Interim Co-ordinating Committee
MURL	Melbourne Underground Rail Loop
OGS	Ontario Geological Survey
PL	Plastic Limit
PI	Plasticity Index
RCA	Road Construction Authority
SAA	Standards Association of Australia
SCA	Soil Conservation Authority
SCS-USDA	Soil Conservation Service - United States Department of Agriculture
TDS	Total Dissolved Solids
UBR	Uniform Building Regulations
ULA	Urban Land Authority
USGS	United States Geological Survey
VBR	Victorian Building Regulations
WHO	World Health Organisation
XRD	X-Ray Diffraction

INTRODUCTION

The City of Melton is located on the Western Highway 39 km WNW of Melbourne and was chosen by the Victorian Government for satellite township development in 1973.

The Melton Engineering Geological Mapping Project commenced in March 1983, as part of an ongoing mapping scheme conducted by the Geological Survey of Victoria (GSV), now a branch of the Department of Industry, Technology and Resources (DITR). The project aims at the production of a map (or maps) depicting relevant geological features and properties in a useful manner for engineers and planners working in the Melton Development Area.

An engineering geological map is a thematic map which provides a generalized representation of all those components of a geological environment of significance in land-use planning, and in design, construction and maintenance as applied to civil engineering.

A 'state-of-the-art' review of mapping methods for land-use planning was conducted to examine the past and present progress in a broad context. In particular, medium-scale engineering and environmental mapping methods, and their map presentation formats, were examined.

A review of readily accessible data highlighted shortcomings in both the quality and quantity of data outside of the established City of Melton. Consequently, a drilling, sampling and testing program was conducted. Research of previous work and additional geological mapping supplemented the data analysis. The presentation of the study has been largely cartographic, with each component of the geology being a separate theme on a basic map.

Seven reports have been produced in the GSV Unpublished Report series:

Unpublished Report 1986/1
Engineering Geological Mapping - A Review

Unpublished Report 1986/2
Engineering Geology of Melton - The Melton Development Area

Unpublished Report 1986/3
Engineering Geology of Melton - Drilling, testing and mapping program

Unpublished Report 1986/4
Engineering Geology of Melton - Geology and geomorphology

Unpublished Report 1986/5
Engineering Geology of Melton - Engineering geology

Unpublished Report 1986/6
Engineering Geology of Melton - Map presentation of data

Unpublished Report 1986/7
Engineering Geology of Melton - Summary

THE MELTON DEVELOPMENT AREA

1 Physical and Social Setting

The City of Melton is located on the Western Highway 39 km. WNW of Melbourne (Fig. 1) and is situated entirely within the parishes of Djerriwarrh and Kororoit. Parts of the surrounding area fall within the parishes of Mooradoranook, Pywheitjorrk, Yangardook and Merrimu.

The history of European settlement dates from the late 1830's, with a substantial settlement emerging by the 1860's. Two Aboriginal tribes, the Woewurong and Woddowerong lived in the district, prior to the opening of the railway station in 1884. Little urban growth occurred from the early settlement days until the start of the present growth phase in the late 1960's. The current population is estimated at approximately 25,000.

The major regional roads serving Melton are the Western Highway, the Keilor-Melton Road and the Melton-Gisborne Road shown in Figure 2. The Western Highway passes through the existing City Centre and provides a vehicular route from Melbourne to Ballarat. A new route, the Western Freeway is currently under construction. The north-western railway is located south of the Western Freeway, traversing Melton South in an east-west direction.

Existing residential areas are mostly situated on both sides of the Western Highway between Toolern Creek and Bulman's Road. Newer residential areas are being developed north of Centenary Avenue and in West Melton.

Melton has two major retailing and service centres both located on the Western Highway. Industrial and service centres are located in the Melton Industrial Estate, south of the Western Highway and east of Toolern Creek. The most extensive existing recreation area adjoins Toolern Creek immediately east of the city. The facilities comprise a golf course and a recreation reserve and oval.

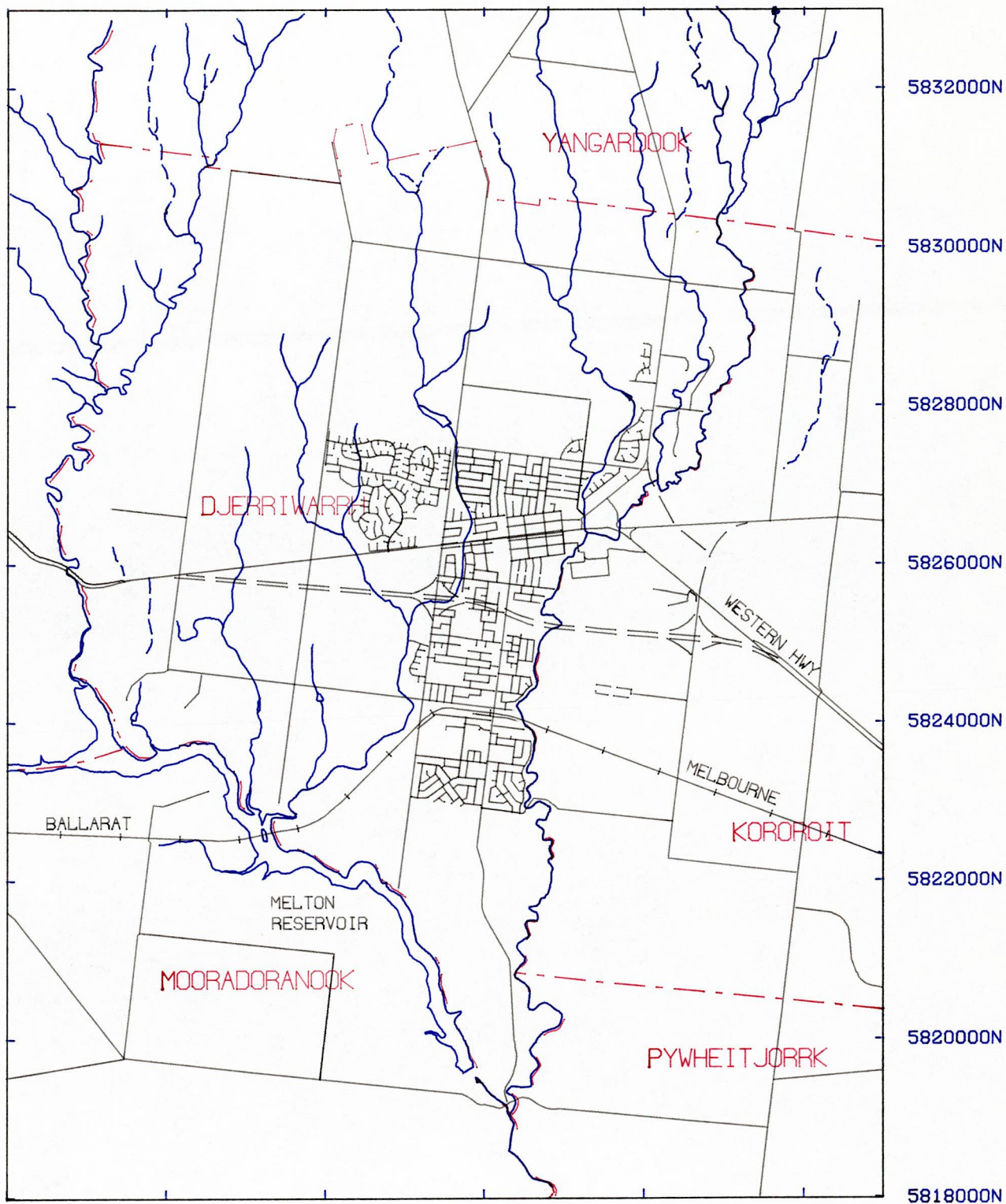
The climatic conditions at Melton differ markedly from those of Melbourne. The area falls within the zone termed the "Little Wimmera" (Fig. 3), since the rainfall is similar to that of the drier western areas of the State. The extremes of rainfall (Fig. 4) have caused flooding, severe erosion (Forbes, 1948), and distress in housing (due to expansive soils).

The City is serviced with a water supply system from the Merrimu Reservoir, which has been recently upgraded. Reticulated sewerage was installed in the late 1970's, and the majority of the dwellings are now connected to the system.

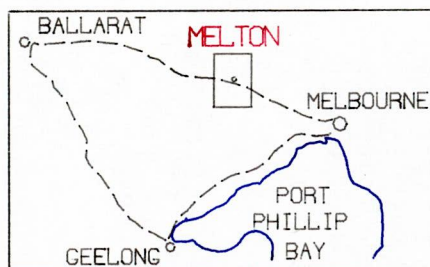


Figure 1. Location of the Melton Development Area.

280000E 282000E 284000E 286000E 288000E 290000E



0 1500 3000metres
SCALE 1:75000



ENGINEERING GEOLOGICAL MAPPING
OF MELTON, VICTORIA.

Figure 2. MELTON DEVELOPMENT AREA

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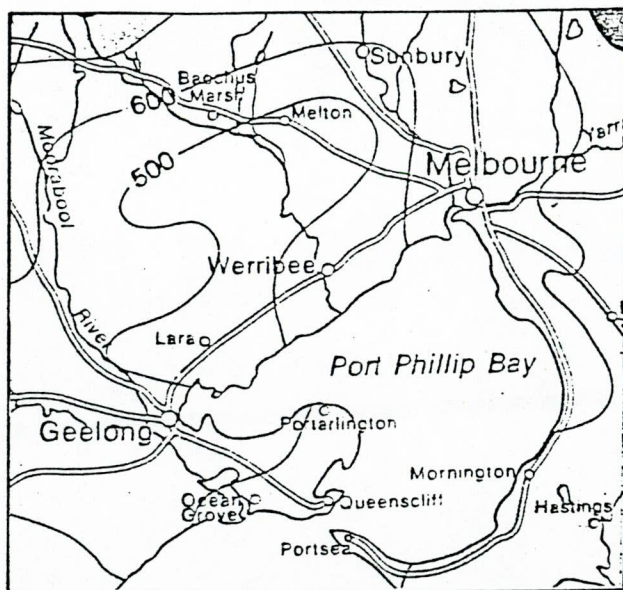


Figure 3. Mean annual rainfall of the Melbourne Region.
(Atlas of Victoria, 1983)

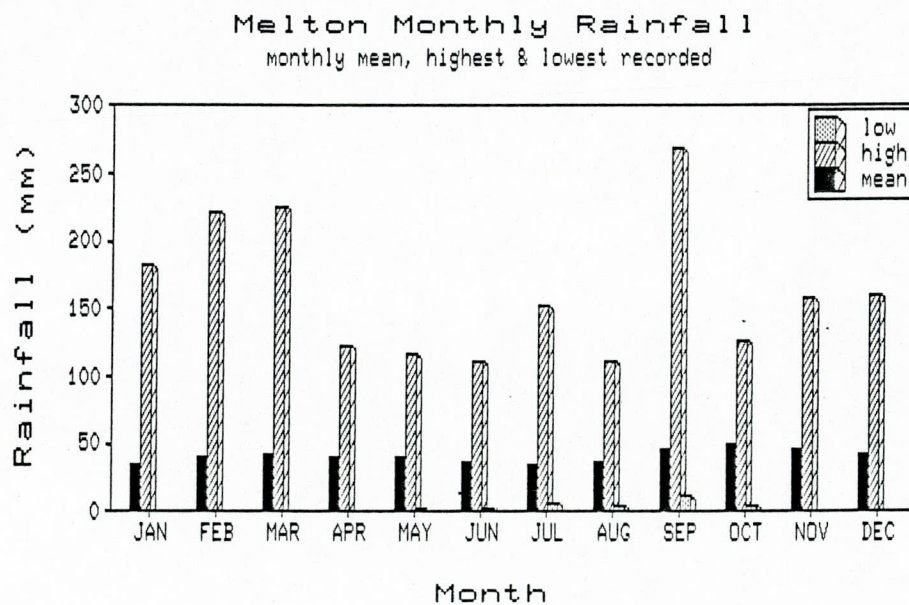


Figure 4. Rainfall statistics for Melton.
(compiled from Bureau of Meteorology Records - 1883 to 1983)

2 Melton Development Area Planning

Melton and Sunbury were chosen by the Victorian Government for satellite township development following an investigation by the Town and Country Planning Board (now MPE) which resulted in the designation of the two areas under the Development Areas Act 1973. The Melton-Sunbury Interim Co-ordinating Committee (MSICC) was established by State Cabinet in January, 1975 to guide planning control and planning studies pending the creation of a statutory authority.

The chosen development area for Melton is bounded by Mt Cottrell Rd, Minns Rd, Greigs Rd, Melton Reservoir and Djerriwarrah Creek (Fig. 5). This area comprises approximately 82 km².

The MSICC engaged planning consultants to prepare a series of reports on the social, demographic, and physical concept planning. The six resultant volumes were published during 1976 and 1977. Two of these reports are concerned with the physical planning of Melton; viz. Vol. 3 (Clarke-Gazzard, 1976), which presents an overall conceptual plan, and Vol. 4 (Llewelyn-Davies Kinhill, 1977) which suggests short and medium term actions. The first of these two reports recommended the structure concept illustrated in Figure 6. This particular plan was devised after careful consideration of many factors, although the only geological influence considered was the the soil characteristics (discussed more fully in Unpub. Rept. 1986/5)

3 Previous Work for Planning

Following a recommendation made in the second of these reports, a drainage study of the development area was carried out by the Dandenong Valley Authority (DVA) which was completed in 1980. This report made extensive recommendations for flood mitigation and improved drainage systems for the development area.

The DVA commissioned the SCA (now LPS) to report on "Erosion and its control during urban and drainage development of the Melton area". This SCA report, completed in 1978, was a good attempt at indicating some of the geological hazards for urban development. A number of limitations to suburban development such as the expansiveness of certain soil types, the unsuitability of some soils for standard septic effluent absorption, and a subsidence problem in one area were noted.

Further work carried out during 1984-85 by the LPS and MMBW is published in the "Land Resource Data Atlas" (White & Kelyneck, 1985). The atlas covered the Melton area at a 1:25000 scale as part a series of 55 land capability maps covering the Melbourne Metropolitan Planning Scheme (refer to Unpub. Rept. 1986/5).

280000E

282000E

284000E

286000E

288000E

290000E



5832000N

5830000N

5828000N

5826000N

5824000N

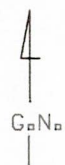
5822000N

5820000N

5818000N

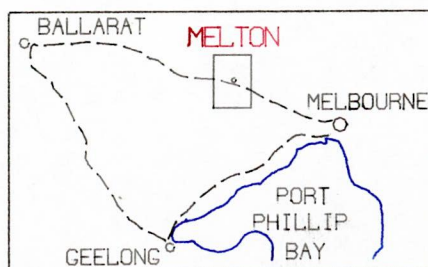
— BOUNDARY OF PROPOSED MELTON TOWNSHIP PLANNING SCHEME

— BOUNDARY OF LONG TERM URBAN AREA



0 1500 3000metres

SCALE 1:75000



ENGINEERING GEOLOGICAL MAPPING
OF MELTON, VICTORIA.

Figure 5. BOUNDARIES OF MELTON DEVELOPMENT AREA

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4 Engineering Geology of Melton - Current Work

The current work on the Melton engineering mapping project is summarised as follows:

- * Detailed aerial photograph interpretation of current and historical aerial photographs.
- * Study of previous published and unpublished geological, geomorphological and engineering geological reports.
- * Research historical accounts of land-use changes and natural disasters.
- * Research the needs of potential users of the engineering geological map.
- * Compile and assess data from past geotechnical, geological and hydrogeological projects conducted in the area.
- * Acquire additional data where required by drilling and testing programs.
- * Field mapping to supplement the drilling data.
- * Selection and preparation of base map information.
- * Process and assess the total data set to produce suitable map units.
- * Final draughting of map (or maps) with explanatory notes.