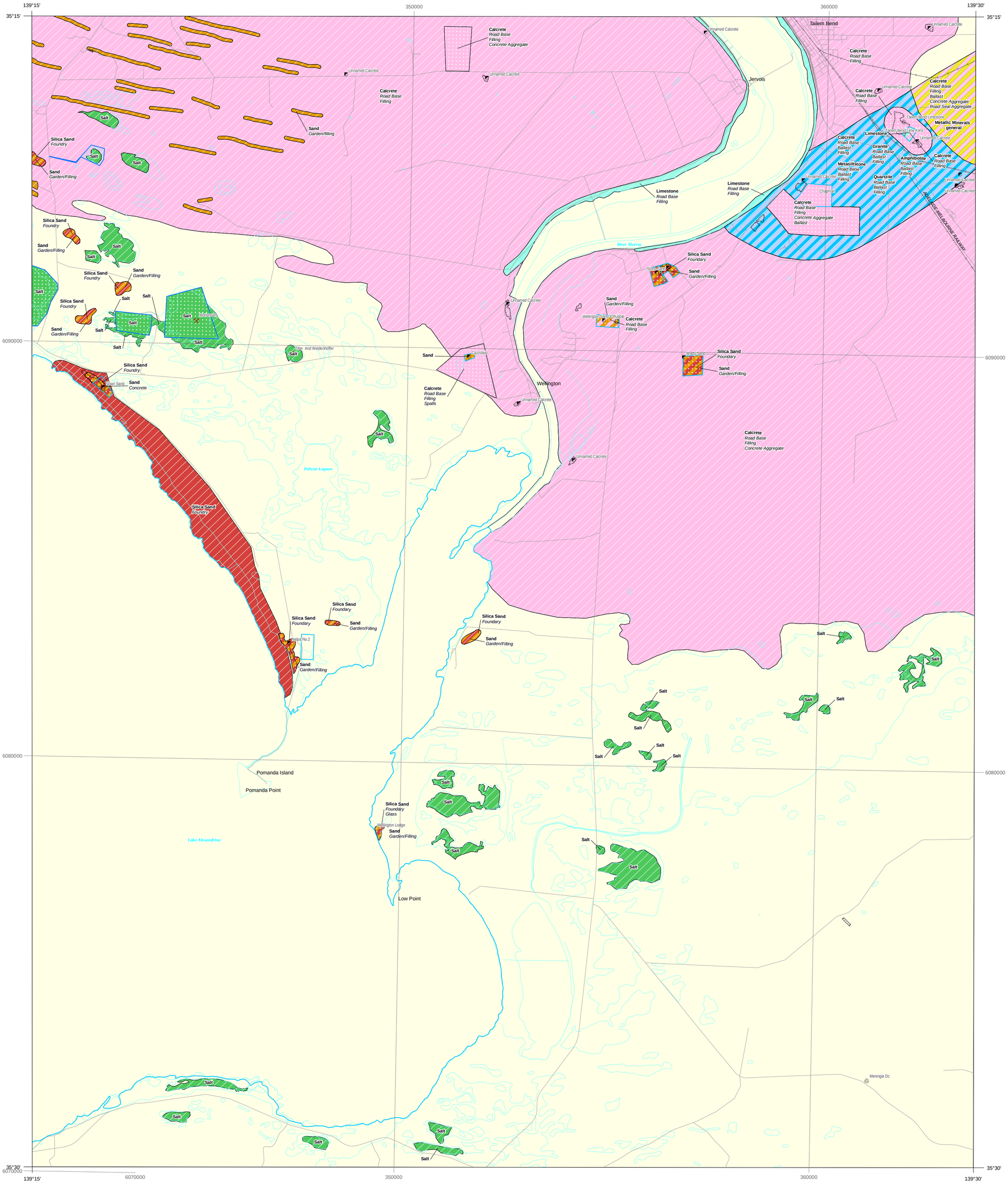
WELLINGTON

MINERAL RESOURCE POTENTIAL

GEOLOGICAL SURVEY OF SOUTH AUSTRALIA, DEPARTMENT FOR MANUFACTURING, INNOVATION, TRADE, RESOURCES AND ENERGY



REFERENCE

MINERAL RESOURCE POTENTIAL
South Australian Mineral Resource Potential Mapping translates geological mapping, current productive mineral tenement locations and a range of other resource information into a 3 level categorisation of resource potential and suggested planning response as below.

CATEGORY 1 - HIGH MINERAL POTENTIAL & /or Current Operation
Full planning protection required from incompatible development. Important mineral resource area. Current mining operation, current mineral tenement, Extractive Industry Zone, known economically viable mineral resource/reserve established by drilling, trenching etc. or high potential for resource/reserve although full investigation to resource/reserve status not yet undertaken.

CATEGORY 2 - MEDIUM MINERAL POTENTIAL
Mineral Potential should be considered in planning. Further consultation or investigation before incompatible development allowed. Moderate to good geological potential for significant resources known from preliminary geological studies but investigation required to establish resource and economic viability.

CATEGORY 3 - LOW MINERAL POTENTIAL
No specific planning protection required. No or very minor known mineral resource potential based on current information. May include some sources of construction material eg fill or other low specification material for local use from pits operated by councils.

Changes in mineral resource market requirements, in geological knowledge and information and in exploration techniques may significantly alter the mineral potential categories applicable to areas. The latter two factors are particularly relevant to the potential for metallic minerals.

South Australian Mineral Resource Potential Mapping is discussed further in MESA Journal 59 : 13-15.

MINERAL RESOURCE POTENTIAL - COMMODITIES

- Category 1 - Calcrete
- Category 1 - Limestone
- Category 1 - Sand
- Category 1 - Salt
- Category 1 - Silica Sand
- Category 2 - Amphibolite
- Category 2 - Metasiltstone
- Category 2 - Metallic Minerals - general
- Category 2 - Sand
- Category 2 - Salt
- Category 2 - Limestone
- Category 2 - Quartzite
- Category 2 - Granite
- Category 2 - Calcrete
- Category 2 - Silica Sand
- Category 3
- Overlapping - Cat 1 Limestone/Calcrete
- Overlapping - Cat 1 Sand/Silica Sand
- Overlapping - Cat 1 Sand/Calcrete
- Overlapping - Cat 2 Sand/Silica Sand
- Overlapping - Cat 2 Calcrete/Metallic Minerals - general
- Category 2 - More than 2 Commodities

MINERAL PRODUCTION TENEMENTS - ACTIVE

- Extractive Minerals Lease
- Mineral Lease

MINES AND OCCURRENCES (MinDep)

- Mine
- Pit
- Quarry
- Treatment Site
- Quarry

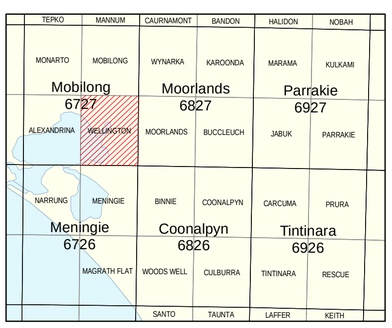
LABELS

- Metasiltstone — Commodity
- *Dimension Stone* — Uses
- Rosedale Quarry — Major Resource Area

GRID LINES ARE 10 000 METRE INTERVALS OF THE MAP GRID OF AUSTRALIA 1994

LOCALITY

INDEX TO ADJOINING SHEETS



SCALE 1 : 50 000

0 1 2 3 4 5

KILOMETRES

Compiled by G. Gordon, J. Talbot & R.S. Robertson (DMITRE Geological Survey of South Australia).

Incorporating information from Johnson (1994) - Non Metallic Resources Series Maps and geological mapping from SA Geology database.

Topographic detail based on information supplied by SA Department of Environment and Natural Resources. The relationship between this data and DMITRE data is not guaranteed.

A product of PIRSA Spatial Information Services.

January 09, 2014

DISCLAIMER
This mapping product is designed to assist land use planning and is **not suitable for use in mineral resource investment decisions**. Many areas categorised as having mineral resource potential do not have sufficient drilling or other information to define resources or reserves to mineral industry (JORC*) standards. The mineral resource potential information is largely interpretative in nature and is based on information available at the time of compilation. New information or further interpretation of existing information may significantly change the assessments of mineral resource potential shown on this map.

**The Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia. The JORC Code is the Australasian Code for reporting of Exploration Results, Mineral Resources and Ore Reserves*

CURRENCY OF INFORMATION
Mineral tenement locations and mineral resource potential information may have changed since production of this map on 9 January 2014.

Current tenement information is available online through the DMITRE SARIG site at www.sarig.pir.sa.gov.au

TOPOGRAPHIC FEATURES

- Highway
- Secondary Road
- Minor Road
- Railway
- Coastline (Mean High Water Mark)
- Watercourse; River; Channel
- Lake; Reservoir; Dam
- Quarry

Government of South Australia
Department for Manufacturing, Innovation, Trade, Resources and Energy

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Wellington Reference List

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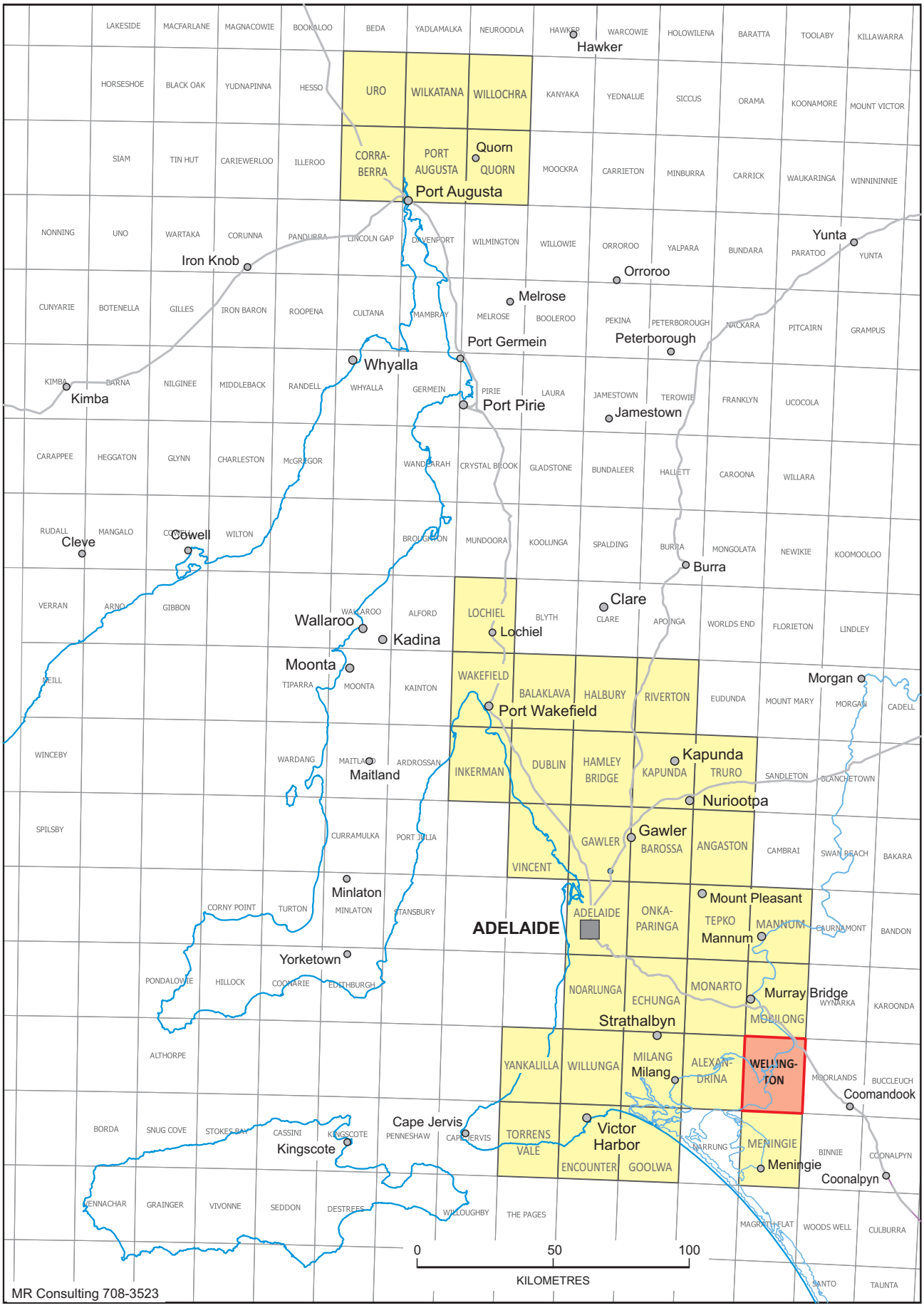
Nichol, D., 1974, Ballast supplies for Murraylands railways site investigations *at Tailem Bend*, SA Dept. Mines, Report Book 74/111.

Morris, B.J. & Nichol, D., 1974, *Basic Rocks of the Kanmantoo Group at Tailem Bend*, Geological Survey of SA, Quarterly Geological Notes, Volume 51 pp 9-12.



DIGIMAP Mineral Resource Potential Map Index - updated January 2020

Mineral resource potential mapping — a new mapping product to assist land use planning

R Stuart Robertson *(Geological Survey of South Australia, PIRSA)*

Introduction

The Geological Survey of South Australia has developed a mineral resource potential mapping (MRPM) system to assist land use planning in relation to significant mineral resource and mine operation areas. The mapping is particularly relevant to planning of residential and other developments that are incompatible with mining operations without appropriate separation distances, but will also assist with a wide range of other land use planning matters. Construction materials are a particular focus but industrial, metallic, energy and gem minerals are also considered.

The system categorises areas according to their interpreted mineral resource potential and suggested planning response. The mapping has already been used in consideration of mineral resources for the preparation of *The 30-Year Plan for Greater Adelaide* and in other planning matters. Mineral resource potential maps at 1:50 000 scale are now available as PDFs for most of the Greater Adelaide region (Figs 1, 2).

Adelaide region resources and development planning

The Adelaide region has excellent geological resources of construction materials (Pain 2001; Pain and Johnson 2002; Harvey 2010). Neoproterozoic (Adelaidean) and Cambrian metasediments uplifted in the Cenozoic to form the present Mount Lofty Ranges are the source of hard rock resources for road construction and concrete aggregate for metropolitan Adelaide (e.g. Linwood Quarry shown in Fig. 3). Fault-bounded Tertiary basins provide construction and filling sand and brick-making clay. Industrial minerals, such as Cambrian marble used in soda-ash production, sand for glass manufacture and weathered shale for cement production are important for local manufacturing industries. Copper, lead, zinc and gold mining in the Adelaide region were historically important and metallic mineral exploration and development is undergoing a revival. The Angas Mine, near Strathalbyn, is now producing Pb, Zn and Ag and development of the Kanmantoo Cu–Au deposit is planned.

Urban development has already 'sterilised' some significant mineral resources close to the city and put pressure on some operating quarries. Problems faced by quarries relate both to the encroachment of residential development and visibility on the fault scarps (Hills Face zones) that provide a backdrop for much of Adelaide. Partly in response to these pressures some construction material operations have been established further from the city. An example is the mining of a significant proportion of Adelaide's coarse construction sand from a Tertiary

Figure 1 *Index map of 1:50 000 mineral resource potential maps available December 2010.*

palaeochannel on northern Yorke Peninsula, about 130 km by road from the city centre. Greater transport distances impose a considerable cost and environmental penalty on construction materials. Even these more distant sources are under threat from conflicting land uses, including growth of regional centres and change of land use from rural to hobby farm/residential. Paradoxically, urban growth relies on the availability of construction materials at reasonable cost.

Mapping

MRPM translates a range of geological and resource information into GIS polygons with a straightforward three-level categorisation of resource potential and suggested planning response as summarised below:

- *Category 1 – High mineral potential and/or current operation*. Full planning protection required from incompatible development. Key or significant mineral

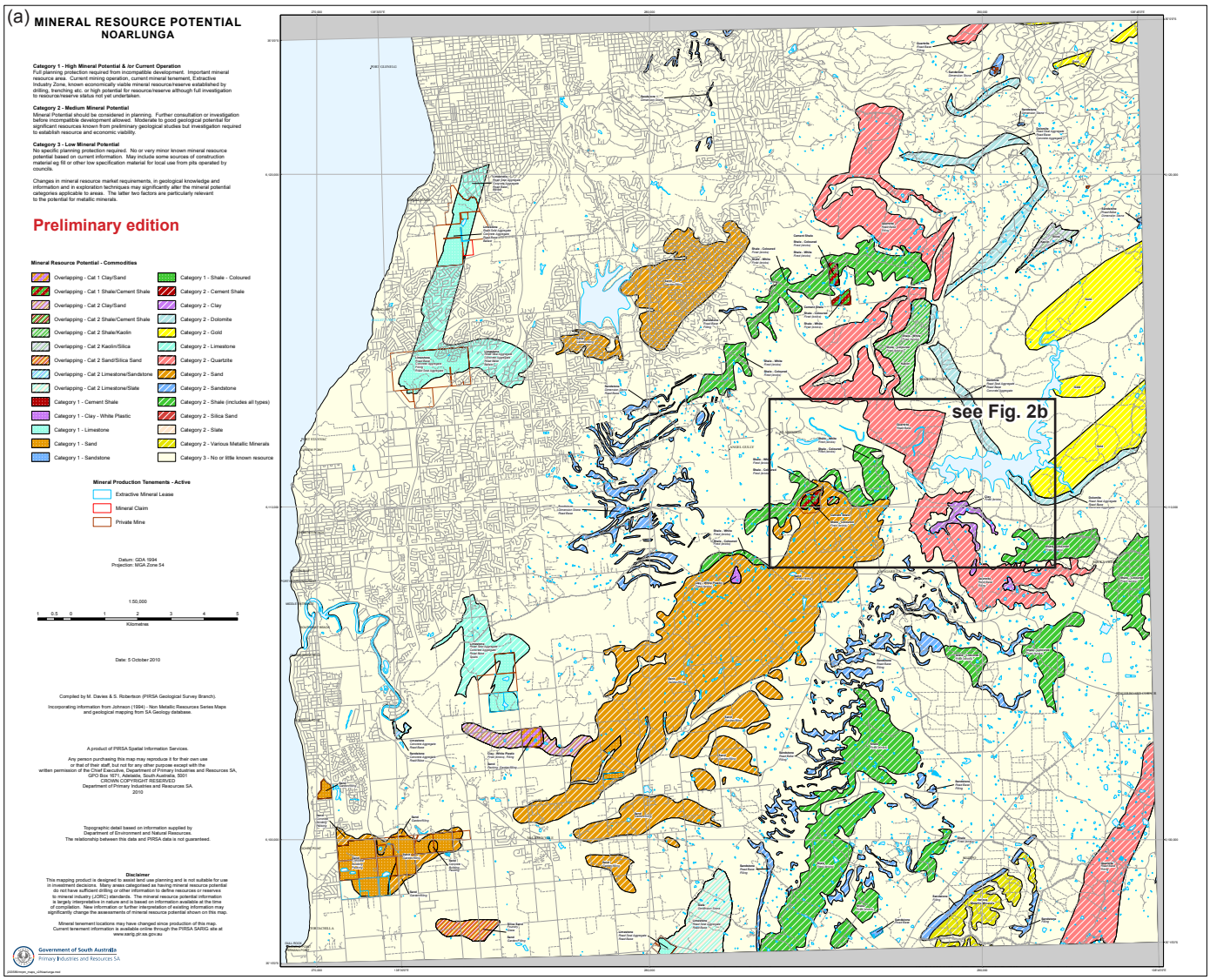


Figure 2 ***(a)*** Noarlunga, mineral resource potential, *South Australia 1:50 000 Geological Atlas Series Map, sheet 6627-IV.* ***(b)*** *Enlargement.*

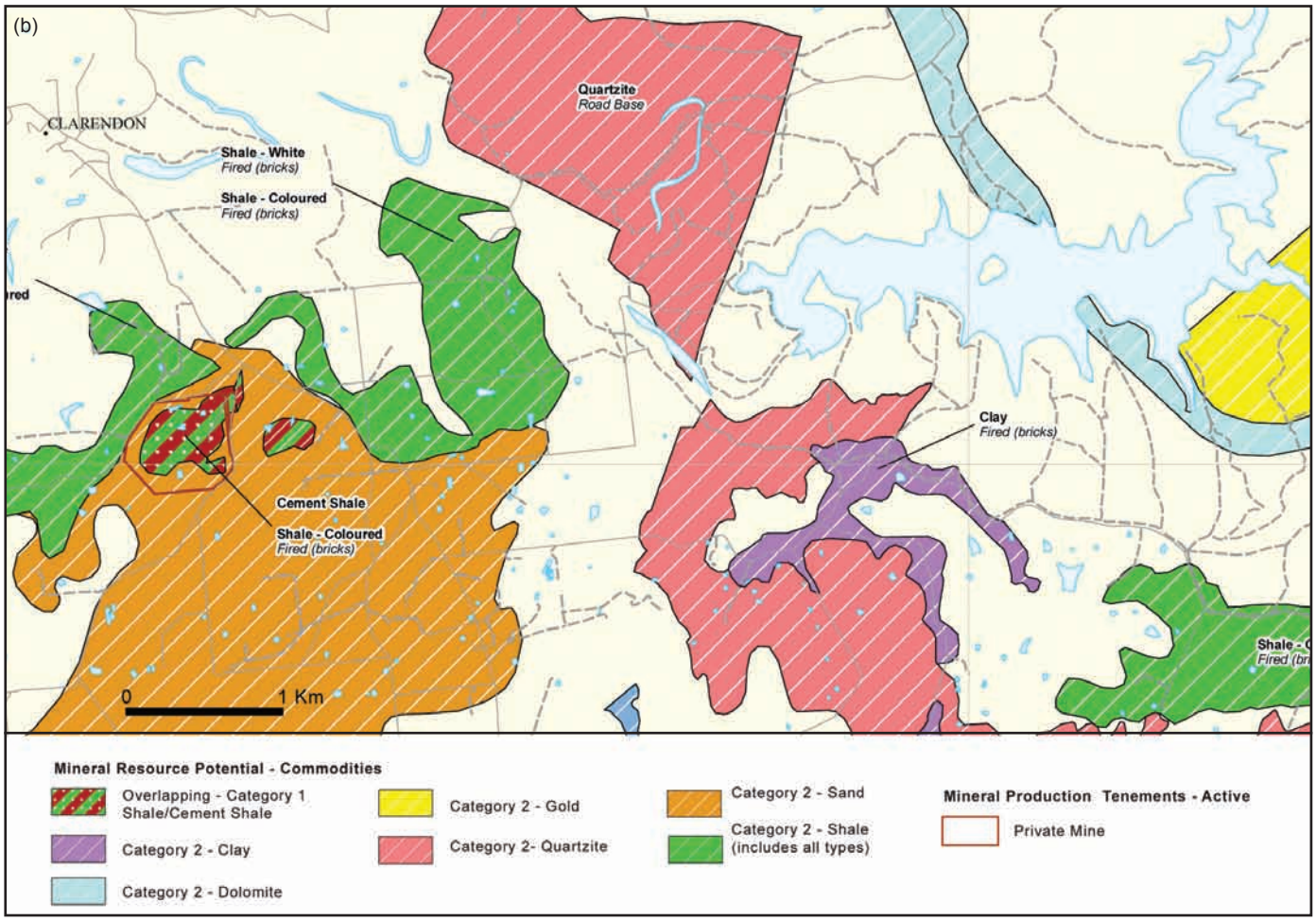
resource areas including current mining operations, most current mineral production tenements, established economically viable mineral resource/reserve or areas with high potential for resource/reserve.

- *Category 2 – Medium mineral potential*. Mineral potential should be considered in planning. Further consultation or investigation required before incompatible development allowed. Moderate to good geological potential for significant resources known from preliminary geological information.
- *Category 3 – Low mineral potential*. No specific planning protection required. No or very little known mineral resource potential based on current information.

The compilation uses geological mapping (usually the Surface Geology 100 000 GIS layer available in SARIG) and mineral resource information from departmental and some company reports. The category polygons have attribute information attached on potential commodities, uses, sources of spatial data and key information references for the resource areas. Some new polygon boundaries are interpreted by the map authors where appropriate.

Very few areas, even Category 1 areas, have sufficient drilling or other sampling information to define resources or reserves to Joint Ore Reserve Committee (JORC) standards. The maps are interpretations of resource potential, limited by availability of information, and are not suitable for use in investment decisions. Inherent in these limitations is the likelihood that significant resources have been missed by the mapping. Nevertheless resource mapping has become essential to make the sterilisation of important mineral resources less likely. Some areas of geological resource potential shown on the maps are already unavailable because of urban development and other constraints.

In preparation of the new MRPM data, extensive use was made of unpublished information in the Non-metallic Resource Map series prepared for the Department of Mines and Energy South Australia (now PIRSA) by consultant resource geologist Peter Johnson in 1994. This map series was essentially a precursor to the MRPM although metallic potential was not considered. PIRSA Spatial Information Services produce and manage the MRPM GIS data and maps from compilations prepared by the Geological Survey.



Future work

The MRPM will be periodically updated as new information becomes available. In addition to the Greater Adelaide area, mapping will be undertaken progressively in various regional growth areas of the state. Map compilation is underway for the northern Yorke Peninsula area. Current treatment of metallic, diamond and energy mineral potential is regarded as rudimentary and there is scope to improve this with open file company exploration information and interpretation of numerous other geoscientific datasets.

References

Harvey WG 2010. *Hardrock extractive minerals for metropolitan Adelaide – strategic review, Summary version*, Report Book 2010/19. Department of Primary Industries and Resources South Australia, Adelaide.

Pain AM 2001. Construction materials for metropolitan Adelaide. *MESA Journal* 21:8–10. Department of Primary Industries and Resources South Australia, Adelaide.

Pain AM and Johnson PD 2002. Summary of a strategic review of sand, clay and shale resources for metropolitan Adelaide, Open file Envelope 10724. Department of Primary Industries and Resources South Australia, Adelaide.

Copies of the MRPM 1:50 000 maps will be available in early 2011 for purchase from PIRSA Customer Services, phone +61 8 8463 3000, email <PIRSA.CustomerServices@sa.gov.au>, for $20 plus postage and handling.

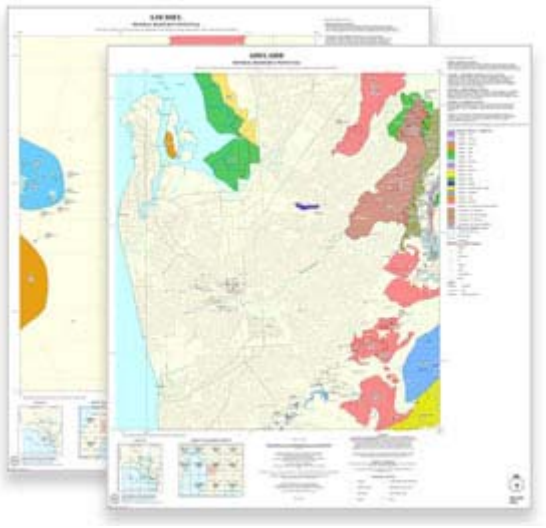
Further information is available through SARIG <www.sarig.pir.sa.gov.au> including the SA Geodata (mineral deposit, drillhole) and PIRSA Georeference datasets. It is intended that the maps will be available for free download in PDF format from the Databases, Publications and Reports page.

For other queries contact Stuart Robertson, phone +61 8463 3055, email, <Stuart.Robertson@sa.gov.au>.

Figure 3 *Linwood Quarry showing the view north to crushing plant and Adelaide city area. The quarry is located ~15 km SW of Adelaide CBD and produces limestone for aggregates, road base and rail ballast.* (Photo 408319)

Mineral resource potential maps

South Australian mineral resource potential mapping translates geological mapping, current productive mineral tenement locations and a range of other resource information into a three-level categorisation of resource potential and suggested planning:



1. **High mineral potential and/or current operation.** Full planning protection required from incompatible development. Key or significant mineral resource areas including current mining operations, most current mineral production tenements, established economically viable mineral resource/reserve or areas with high potential for resource/reserve.
2. **Medium mineral potential.** Mineral potential should be considered in planning. Further consultation or investigation required before incompatible development allowed. Moderate to good geological potential for significant resources known from preliminary geological information.
3. **Low mineral potential.** No specific planning protection required. No or very little known mineral resource potential based on current information.

The mapping process is described in ‘Mineral resource potential mapping – a new mapping product to assist land use planning’, *MESA Journal* 59:13–15

Current mapping covers the Adelaide and Upper Spencer Gulf regions. Mapping will be undertaken progressively in various other regional growth areas of the state including areas south of Port Augusta and around Whyalla. Maps will be periodically updated as new information becomes available.

Download the plot-on-demand map series and the digital dataset from SARIG via the **Mineral Resource Potential Maps** layer (located in the **Geology** layer group), or contact the Resource Information Centre for a hardcopy (Customer Services).

Note a previous series existed called ‘Non-Metallic Resource Map Series’ from 1990’s – 28 maps produced as colour plots at 1:50 000 [see next page]

NON-METALLIC RESOURCE MAP SERIES (DISCONTINUED)

1:50 000 scale maps, plotted on request. $27.50 each. Complete set available on CD $50.