National Elevation Data Framework

The Shared Digital Representation of Australia's Landform and Seabed

National Elevation Data Audit

DRAFT v1

October 2007

Acknowledgements

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Executive Summary

There is a long history of capturing elevation data by agencies at all levels of government in Australia. Initially, jurisdiction-wide topographic mapping programs producing maps of various scales and typically showing elevation by contour lines drove acquisition of elevation data. In the past ten years many of the earlier map-based sources have been converted to digital elevation models (DEM). Now acquisition and use of elevation data is predominantly digital.

There are now many digital elevation data sets, often held as gridded DEM, derived from mapping sources or directly acquired from new aerial, satellite or ship-borne sensors. These data sets have diverse coverage, resolution and accuracy. It is important that users have a clear picture of what data already exists and enough information to decide what data is fit for their purpose.

ANZLIC – the Spatial Information Council for Australia and New Zealand is currently facilitating development of the National Elevation Data Framework (NEDF). Knowledge of existing data held by government agencies is part of the broader picture of identifying, describing and providing access to existing elevation data. This data audit aims to provide a start to this process. It is being released with the NEDF User Needs Analysis so the determining gaps across Australia between user needs and current data availability can be viewed for the first time.

Data sets are reported for both national coverage and for each State and Territory. The conclusion is that digital elevation data of resolution at or better than 250m grid spacing and 20m vertical accuracy is available across Australia. At present there is only one nationally consistent DEM that meets this specification, with many others covering parts of the Australian continent. There are a growing number of very high resolution data sets with limited coverage, mainly over urban and vulnerable coastal areas.

Contents

Background

ANZLIC – the Spatial Information Council, with the support of the Australian Greenhouse Office (AGO) and Geoscience Australia (GA), is sponsoring development of a National Elevation Data Framework. A Project Team comprising representatives of ANZLIC, AGO, GA and CRCSI has been set up to guide the process.
This document is the National Elevation Data Audit, which was originally initiated through the Intergovernmental Committee on Surveying and Mapping's (ICSM) Permanent Committee on Topographic Information (PCTI). The committee agreed that the National Topographic Information Coordination Initiative would be an ideal avenue to identify all elevation data across all jurisdictions. This document aims to compile all the information provided into a single comprehensive list of elevation data.

Prior to starting this process, there was no listing of all existing elevation data. As a starting point it was agreed that each PCTI members would make an inventory of elevation data that their Jurisdiction was custodian of and any other elevation data that they were aware of residing with a third party. This would be sent to Geoscience Australia.

Introduction

The first high resolution national digital elevation model for Australia was developed in 1994 by AUSLIG. GEODATA 9 Second Digital Elevation Model (DEM-9S) was comprehensively revised in 2001 and is about to be released in 2006 as version 3. It's widely understood that 9 arc-seconds (approx 250 metres) is now too coarse for many applications.

The Shuttle Radar Topography Mission (SRTM) 3 arc-second (90m) DEM is a nationally consistent product, produced using radar interferometry, but it is not "bare earth" and contains artefacts due to tree canopy etc. There are significant questions about the viability of attempting to remove above ground topographic features.

There are a large number of initiatives being undertaken at Regional and National, State and Local government levels that require medium to high resolution DEM's. Clearly it is desirable that effort in this regard is coordinated to avoid duplication in the capture, production and management of DEM's. This approach will also maintain consistency and enhance discoverability and accessibility.

The NEDF aims to achieve better access to existing elevation datasets for Australia and to provide a framework for optimising investment in new data acquisitions. The project is being driven by the need to utilise the highest resolution data available from all sources to address the demands for an improved digital elevation model across all levels of government. The initiative will also address broader Australian Government priorities in relation to emergency management, natural resource management and water issues with the intention of seeking funding, support and partnerships under a whole-of-government approach.

Generally State and Territory government land information / mapping agencies maintain state wide or project based elevation data sets and coordinate work in that area. While project-based activities at the local government level are increasing, data capture is not necessarily well coordinated, or discoverable.

This audit aims to provide a snapshot of current digital elevation data sets and derived products held by government agencies around Australia. When used with the NEDF User Needs Analysis, it also provides the start of a process of matching known needs with available data and identifying gaps between demand and supply. Apart from including the Australian Bathymetry and Topography Grid, produced by Geoscience Australia, this document does not include bathymetric data.

This document uses various means for describing elevation data. Generally elevation data takes the form of contours, spot heights or some form of digital elevation model (DEM). Contours are described using the contour interval and or the mapping scale the aerial photography scale from which they were captured might also be given. DEMs are described with the cell size and vertical accuracy. So, a 25m DEM has a gridded cell or pixel size of 25m, representing 25m on the ground. Refer to the Science Case Introduction for definitions of digital elevation, terrain and surface models.

Data Summaries

National

Australia has a landmass of approximately 7.5 million square kilometres. Presently only one elevation dataset exits that has consistent coverage across the nation, Geoscience Australia's GEODATA 9 second DEM. Other data exist, but has patch coverage and or is not widely available. These national dataset are generally meet requirements for small scale, regional analysis, they do not support large scale modelling or analysis.

Refer map in Appendix A

Dataset	**Vertical Accuracy (metres)**	**Details**	**For further information**
GEODATA 9 second DEM, Version 2	7.5 - 20	The DEM has a post-spacing of 9 arc seconds (about 250m). Originating from 1:250 000 topographic maps, this data has since been improved by supplementary information such as spot heights from 1:100 000 topographic maps, sinks and radar altimetry, as well as lines from stream, cliff and coastline data. A drainage enforcement algorithm has been applied to improve stream networks. This is especially evident in low relief areas which are typically problematic in modelling surface drainage structure. Notably, this DEM preserves surface shape and for many applications, gains more significance than vertical accuracy. Note: The vertical accuracy values are theoretical. These values will be different depending on a number of factors with slope being predominant. For example, a relatively flat area can have a maximum error of 11m, whereas an area of undulating terrain can have a maximum error of 210m.	Sales Centre Geoscience Australia Mike Hutchinson Centre for Resource and Environmental Studies ANU
GEODATA 9 second DEM, Version 3	7.5 - 20	Version 3 is complete and awaiting final documentation. Improvements from the Version 2 DEM will be most evident in hydrological networks - the upgrade will not significantly affect vertical accuracy.	
Australian Bathymetry and Topography Grid	1:10 million	The DEM has a post-spacing of 9 arc seconds (about 250m), geographic extent is 8ºS to 60ºS and 92ºE to ºE. The data came from a variety of systems with differing data densities and levels of accuracy. In the geographic extents 34ºN – 79ºS, 90ºE – 180ºE, GA holds approximately 1400 surveys that collected bathymetric data. For ship-track data the typical spacing of point data along track is 25-200m, the two-dimensional spacing of points covered by swath surveys is of similar order. The coverage of ship-track surveys is widely variable, such that some points covered by grid lines are many tens of kilometres apart, whereas for swath bathymetry surveys, the areas of coverage are at relatively high density, but of very limited coverage.	Sales Centre Geoscience Australia

Dataset	Vertical Accuracy (metres)	Details	For further information
SRTM DTED Level 1 (3 seconds)	16	This height model has been derived from shuttle InSAR, such that in its current unprocessed form, there are artefacts associated with erroneous vertical profile strikes on vegetation canopies and building walls. Thus, it is neither a DEM or DSM and does not accurately represent the surface and bare earth. In addition, the radar coverage over Australia is inconsistent resulting in data voids and noise in some areas. There is potential to correct this data, which would take a year or more, such that the data could potentially provide national coverage at a scale of 1:100 000.	Craig Smith ACRES Geoscience Australia
SRTM DTED Level 2 (1 second)	16	SRTM data is being used to generate a digital topographic map of the Earth's land surface with data points spaced every 1 arc second for the United States of latitude and longitude (approximately 30 meters). The SRTM "finished" data meet the absolute horizontal and vertical accuracies of 20 meters (circular error at 90% confidence) and 16 meters (linear error at 90% confidence), respectively, as specified for the mission.	Defence Imagery and Geospatial Organisation
Coastal SPOT HRS Digital Surface Model	10	Minister for the Environment and Water Resources, Malcolm Turnbull recently announced the purchase of a national coastal digital surface model derived from stereo SPOT imagery.	Gary Richards Australian Greenhouse Office

Australian Capital Territory

Of all the states and territories, the ACT being the smallest, with a land area of just under 2.5 square kilometres, has the most comprehensive elevation data coverage. The ACT Planning and Land Authority has four DEM's that make up a complete coverage of the Territory. These were acquired from a variety of sources, and at differing resolutions.

A LiDAR DTM covers an area totalling 718 km², roughly 31 percent of the Territory. This is supplemented with a DEM produced from 1:16 000 aerial photography in 1998, area covered is 1,247 km², roughly 40 percent of the Territory. This constitutes all urban and urban capable areas in the Territory.

The NSW Department of Lands 25m DEM and the ACT 40m DEM cover off on the rest of the Territory.

Refer map in Appendix B

Dataset	**Vertical Accuracy (metres)**	**Extent**	**Details**	**For further information**
Airborne Laser Scanning DEM	0.3 or better	Urban and urban-capable areas of the ACT	Captured using laser technology from fixed wing aircraft. Terrain model is 3.0 metres estimated point density classified into ground and non ground points.	Greg Norman Principal Officer ACT Land Information Centre ACT Planning and Land Authority
Canberra Environs 20m DEM	5	Urban and urban-capable areas of the ACT	Acquired directly from 1:16,000 aerial photography as part of a Digital OPM (DOPM) programme in 1998, using digital photogrammetric methods. Estimated accuracy is ±0.5 metres. Ground spacing is 20 metres.	
ACT 40 m DEM	2.5	Generally to the ACT borders	Acquired by digitisation and interpolation from contour overlays of 1:10,000 ACT series mapping, plotted from 1:40,000 aerial photography. Contour interval 5 metres, 40 metres ground spacing.	
NSW Dept of Lands 25 m DEM	5	Central and Eastern Divisions of NSW	Acquired from Dept of Lands, as part of a co-operative mapping project with NSW over the ACT. Product derived from digitisation of earlier mapping projects. Ground spacing is 25 metres, derived from 10-metre contour interval photogrammetric plotting from 1:50K - 1:80K scale super-wide angle aerial photography. Estimated accuracy is ±5 metres.	Neil McArthur Supervisor Imagery Services Department of Lands

New South Wales

Less than one percent of NSW is covered by data acquired via airborne laser scanning (LiDAR). It exists predominantly over coastal local government areas (LGA). All Greater Sydney LGA's from Kiama to Gosford have full LiDAR capture.

The Murray Darling Basin Commission also has LiDAR data covering an area from Cowra to Robinvale between the Murray and Murrumbidgee Rivers.

There is complete coverage of the state with medium scale contours and or digital elevation models. Twenty metre contours cover the Western and Central Divisions (1:50 000 scale topographic index) and ten metre contours cover the Eastern Division (1:25 000 scale topographic index). These contours with drainage have been used to produce a twenty five metre drainage enforced digital terrain model over the Central and Eastern Divisions.

Further, the Department of Lands has five metre digital elevation models produced from two metre contours covering Greater Sydney extending from Nowra in the south to Newcastle in the north. Coverage also includes all major regional centres.

Refer map in Appendix C

Dataset	**Vertical Accuracy (metres)**	**Extent**	**Details**	**For further information**
2m Contours	1	Covers most of the population along the coast and all major towns in NSW	Approximately 60 out of 2200 of these blocks are not yet complete, they are produced on a needs basis.	Neil McArthur Supervisor Imagery Services Department of Lands
5m DEM	1	Extending Port Stephens to Kiama, then sporadically south to the Victorian border	Derived from the 2m contours	
1:25 000 DTM	5	1:25 000 topo index	1:25 000 scale 25m DEM produced from 10m contours and drainage enforced	
1:50 000 DTM	10	1:50 000 topo index	1:50 000 scale 25m DEM produced from 20m contours and drainage enforced	
20m Contours	10	Western Division (Zone 54)	DTMs covering the Western Division are very limited. 87% of the zone is covered by 3D stero plotted 20m contours (microstation design files).	

Dataset	Vertical Accuracy (metres)	Extent	Details	For further information
DoP's Coastal LGA's ALS Status Survey	0.3 or better	Greater Sydney	Coverage over the following local government areas; Pittwater, Warringah, Ku-Ring-Gai, Blacktown, Penrith, Fairfied, Liverpool, Parramatta, Ryde, Willoughby, Manly, Bankstown, Sutherland, Randwick, Leichhards, Manly, Lane Cove, Mosman, North Sydney, Hunters Hill, Auburn, Campbelltown	John Hudson Manager Climate Change Adaption Department of Planning
Climate Change Impacts and Adaptation Research Program	0.3 or better	NSW Central & Hunter Coast	Collection of LIDAR data to assess risk from sea level rise. Central and Hunter coast seen as priority areas.	
DoP's Coastal LGA's ALS Status Survey	0.3 or better	Coastal Local Government Area's	LIDAR in full or part: Hastings, Greater Taree, Lake Macquarie, Newcastle, Gosford, Woolahra, Sutherland, Woolongong, Waverley, Shoalhaven, Eurobooalla, Bega Valley, Coffs Harbour	

Northern Territory

With the smallest population, coupled with its remoteness, the Northern Territory is the most sparsely covered by large scale elevation data.

Darwin, along with all other major population centres, are covered by one metre contours derived from 1:10 000 scale photography. This is supplemented with broader coverage around those centres with two metre contours from 1:25 000 scale photography. Total area is just under eighteen thousand square kilometres which is about one precent of the Territory.

The northern part of the Territory, from 18°S latitude, is covered by 1:50 000 scale defence topographic mapping, consisting of ten metre contours. There is also a DTED Level 2 product produced from this mapping.

Refer map in Appendix D

Dataset	**Vertical Accuracy (metres)**	**Extent**	**Details**	**For further information**
NT Contours 1m	0.5	Darwin & Nhulunbuy	Derived from 1:2500 photogrammetry without field verificiation	Tony Gill Manager Land Information Services NT DPI
NT Contours 2m	1	Darwin region & Gove Penninsula	Derived from 1:10 000 photogrammetry without field verificiation	
Mapping Capture Program	0.5 - 1.25	Darwin (and some other townships: Maningrida, Milingimbi, Nhulunbuy, Yirrkala, Numbulwar)	Ongoing map update program which includes photogrammetry derived DEMs from aerial photography. Data is collected for the purposes of providing topographic maps.	Darren Flanagan Topographic Unit NT DPI
Defence 50K Contours	10	North of -18°	Data from Defence 1:50 000 scale topographic mapping. Formats vary. Currently being evaluated by Geoscience Australia.	Geoscience Australia

Queensland

Queensland has a total land area of about 1.7 million square kilometres. Data captured via airborne laser scanning covers less than one percent of the state. All of this high resolution data is captured along the coast over highly populated local government areas, including indigenous communities in the far north.

Less than one percent of the state is covered by large scale contours (1:2500, 1:5000 and 1:10 000 scales) and DEM's which are predominantly located in the highly populated south east.

There is a continuous coastal band of on average about 250km from the NSW border north to Cooktown of 1:25 000 scale contours. This represents approximately twenty five percent of the state.

There are a series of catchment based twenty five metre drainage enforced digital terrain models produced from scanned 1:100 000 scale data. These mostly cover the area east of longitude 144°E, and represent approximately thirty five percent of the state.

Refer map in Appendix E

Dataset	**Vertical Accuracy (metres)**	**Extent**	**Details**	**For further information**
QLD Coastal LGA LIDAR	0.2 approx	QLD Coast: 12 coastal LGAs	LIDAR acquired in part or whole: Brisbane City, Gold Coast City, Redlands Shire, Pine Rivers Shire, Maroochy Shire, Parts of Logan, Bundaberg City, Burnett Shire, Livingstone Shire, Burdekin Shire, Cairns City, Cape York - Mornington Island, Pormpuraaw, Aurukun, Naparanum, Mapoon, Umagico & Lockhart River	Peter Todd A/Manager Geodetic Operations Natural Resources & Water (DNRW)
Torres Strait	0.2 approx	Torres Strait Islands: 18 regions	Derived from contours for storm tide inundation mapping. Resolving geodetic, height and tidal datum issues.	
1m Contours for 1:2500 map	0.25	Mackay area	Approx 100 km of coast derived from 1:2500 contours and spot heights	Lyle Mansell Principal Cartographer

Dataset	Vertical Accuracy (metres)	Extent	Details	For further information
Ortho map repromat Contours	0.25 1 2.5	From NSW border north to Cooktown	Contours vectorised from scanned Orthophoto map repromat. • 1 metre contours for 1:2500 map • 1 metre contours for 1:5000 map • 2 metre contours for 1:10000 map • 5 metre contours for 1:25000 map	DNRW
Photogrammetric Contours & DEM's	2.5	Scattered coastal coverage from NSW to Bundaberg. Also includes Rockhampton, Bowen, Ingham, Tully and surrounds.	Contours created from photogrammetric processes. DEM Created from photogrammetric processes.	
Ortho Photo DEMs	5	Areas surrounding Goondiwindi, Gayndai, Middlemount, Clermont. Coastal areas include Maryborough, Mackay, Proserpine, Bowen, Tully, Carins.	Created from photogrammetric processes. Medium precision suitable for producing orthophotos and generating 20 metre contours.	
Natural Disaster Mitigation Program	0.2 approx	Bundaberg north to Cooktown	$4.4 million for accurate elevation models for emergency response mapping and storm impacts, funded for 2 years	Keith Wilson, DNRW; Anne Brierley, DES; Peter Todd, DNRW
Spatial Imagery Acquisition Plan (SIAP)	0.2 approx	Queensland	Will run from 2006 - 2010. A coastal DEM will be captured up to a height of 6m above sea level and incorporate 18,000 sq km of LIDAR.	Keith Wilson, Steve Jacoby & Peter Todd, DNRW
25m DEM	10	Wet Tropics,Murray Darling Basin, Burdekin River, Burnett River, Fitzroy River, Whitsunday Islands	Drainage enforced DEMs using ANUDEM with Geoscience Australia (nee AUSLIG) 1:100 000 scale contours, spot heights and hydrology.	Greg Payne, Principal Information Management Officer, DNRW

South Australia

The Department of Environment and Heritage in South Australia has elevation data covering about twenty three percent of the state.

An airborne laser scanning survey is currently underway in the south east extending into Victoria, this covers an area of about thirty two thousand square kilometres, about three percent of the state.

A five metre digital elevation model produced from two metre contours exists over Adelaide and surrounds. This covers a total area of just over two thousand square kilometres, less than one percent of the state.

A minimal edited orthophoto derived 10m DEM exists over Kangaroo Island, extending from the Fleurieu Peninsula through the Mid-North around the tip of the Spencer Gulf to Whyalla. Coverage also extends along the Murray River to the Victorian border and isolated pockets around Coober Pedy, Andamooka and Leigh Creek as well as major towns in the south east. A 25m DEM, produced from the states 1:50 000 scale topographic mapping. Further to the larger scale data previously decribed, the whole coast is covered by an unedited DEM produced from 1:40 000 scale ortho photography.

Refer map in Appendix F

Dataset	**Vertical Accuracy (metres)**	**Extent**	**Details**	**For further information**
2 metre contours	1	Adelaide area	1:2 500 scale topographic mapping	Kim Perkin, Planning SA
5 metre contours	2.5	Rest of the South Australian Coast	Topographic mapping	Murray Townsend, Coastal Protection, DEH, SA
Kingston Park region	0.1	South of Adelaide for 28km (starts at Kingston Park, extending south)	Better than 1 metre post spacing along the 'coastal zone' (that is the area which is likely to only extend as far as under crown land or national park)	Murray Townsend, Coastal Protection, DEH, SA
Port Adelaide Flood Study	0.2	Over 100sqkm. Includes councils: Port Adelaide - Enfield, City of Charles Sturt, and (possibly) City of West Torrens.	The study to work out the extent of the floodong is ongoing, but the elevation data is complete. Economies of scale mean that not only Port Adelaide was captured. 2.5m post spacing (increased to 1m for breakline areas). Flown 2001.	Murray Townsend, Coastal Protection, DEH, SA Iam McQueen, Planning SA

Dataset	Vertical Accuracy (metres)	Extent	Details	For further information
York Peninsula Photography	1	Whole of the York Peninsula	2m contours are to derived. The photographs are being processed. Funding from a National Disaster Mitigation Program grant. DEH (in South Australia) and Planning SA are cooperating on this.	Murray Townsend, Coastal Protection, DEH, SA
York Peninsula Photography - selected areas	0.1	Sections of the York Peinsula which are yet to be identified	A planned extention of the project to get 0.2m contours of the high intertidal water level for storm surge. They will attempt to reduce the data to a DEM. A DEH (in South Australia) initiative.	Murray Townsend, Coastal Protection, DEH, SA
[Deep benchmarks project]	2nd Order [centimetres]	Scattered across the state	[Related to DEM work] Deep benchmark project to reference aerial photography to a datum because there is a need to be able to reference photographs to their location on the earth's surface.	Murray Townsend
Upper South East project	0.2 approx	Just south of the Murray mouth, flood plain north of the Murray, Lake Alexandrina.	Some LIDAR work on drainage areas	Russell Flavel,
DEM for the South East	0.2 approx	From the Victorian border, nearly to the Murray mouth	This area is so flat that wind affects the water shed	

Tasmania

Land Information Systems Tasmania are responsible for all scales of mapping in the state, from the Cadastral level through to 1:250 000 scale topographic. Minimum level of relief data in the state is from a 25m DEM produced from 1:25 000 scale topographic mapping and aerial photography. Resolution and accuracy is increased for the Greater Hobart area, with a 12.5m DEM. Further, 1:5000 scale relief data exists over urbanised areas of the state.

Refer map in Appendix G

Dataset	**Vertical Accuracy (metres)**	**Extent**	**Details**	**For further information**
1:5000 scale Relief	2 (90%)	Urban centres	Photogrammetric data has been acquired directly from aerial photographs by digital stereoplotters. Data exists in scattered polygons over the more urbanized areas of the Tasmania	Mike Harding Manager, Geodata Services Information and Land Services
Greater Hobart DEM	2.5	Greater Hobart	Generated from the Land Information System Tasmania (LIST) 5m and 10m contours. The areas where 5m contours were used as the source data for the DEM creation have the greater height accuracy warranting the 12.5m grid interval. The remaining area uses the same LIST 10m contour data as used for the creation of the Tasmanian 25m DEM.	www.thelist.tas.gov.au
LIST Contours and DEM	5 (90%)	State wide	Majority was sourced from 1:25 000 topographic mapping, with some areas sourced from photogrammetry. Is 'compliant' with the hydrographic dataset which may or may not mean it has been hydrologically corrected.	

Victoria

Since the inception of the Coordinated Imagery Program, there have been numerous LiDAR surveys flown covering about eight percent of the state. The next level of data comes from large scale topographic data in the form of Greater Melbourne 1-5m contours. Then unedited DEMs from ortho photography and finally, the whole State is covered by a 20m DEM, produced from 1:25 000 scale relief and drainage data using ANUDEM.

Refer map in Appendix H

Dataset	**Vertical Accuracy (metres)**	**Extent**	**Details**	**For further information**
Vicmap DEM	5	State wide	Grid interval is 20m. Produced from 1:25 000 scale topographic mapping. 10m contours, vertical accuracy of 16m is stated as conservative. Traditionally, contours have an error of half their interval.	Christina Ratcliff Elevation Data Custodian DSE
Metro Contours Metro Surface Points Vicmap Elevation	0.5 - 2.5	Melbourne metropolitan	The line work and points were derived from the Vicmap Digital Topographic (VDT) map base coordinated by LIG. VDT evolved from Victoria's printed 1:25 000 Topographic Map Series.	
Werribee LIDAR	0.2 approx	15km (approx) of the coast at Werribee.	Flown as part of the Coordinated Imagery Project (CIP).	
Port Phillip Bay LIDAR	0.2 approx	50 km of the mainland coast facing onto French and Phillip Islands	Flown as part of the CIP project and open to fly more areas under this project subject to funding	
Metro Contours extension	0.3 - 0.5	Extended metropolitan area to Western Port and further west	1 – 2m contours. An extention of the existing metro dataset in keeping with Melbourne Water's extended responsibilities. Coordinated through the CIP.	
Raw DEM for Ortho Rectification	0.3 - 3	Scattered across state, refer Appendix H.	DEM data was derived by digital photogrammetry. DEMs data remains unedited and subject to random error.	
Vicmap DEM NAP funded improvement	5	State wide	Grid interval is 20m. Improvement program is in progress.	Georgina Race, SKM

Western Australia

Western Australia is the largest state covering a total area of 2.5 million square kilometres. The whole south west corner from Northhampton in the north to Esperance in the south is covered by the 10m Salinity DEM, derived from 1:40 000 scale photography, this represents about ten percent of the state.

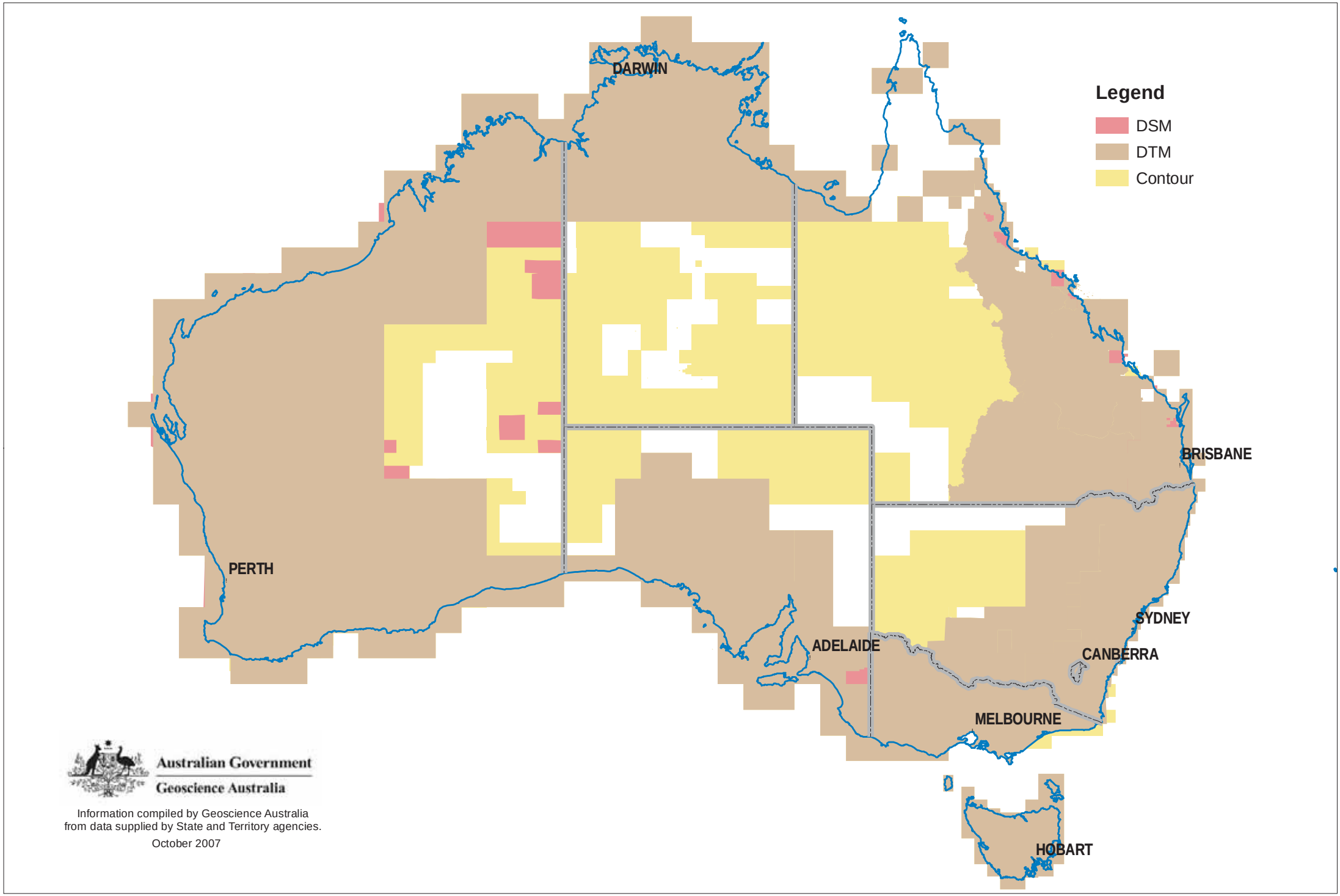
Perth including all major regional centres in the state are covered by 1:2000 scale contours captured using digital photogrammetric methods. Coverage then progresses through 1:25 000, 1:50 000 and 1:100 000 scale data to cover the state. Gaps in the topographic relief data have been filled with 3 second SRTM.

Refer map in Appendix I

Dataset	**Vertical Accuracy (metres)**	**Extent**	**Details**	**For further information**
1:2000 scale contours	0.33	Perth Metropolitan area and Regional Centres	Digital data is derived by photogrammetry sourced from 1:7000 to 1:7600 aerial photography. The information up to 2002 was captured directly into a digital format using analytical stereoplotters equipped with proprietary software and then translated into the stored data format. Current capture is via digital softcopy workstation directly in the stored format.	Marty Stamatis Topographic Restructure Geographic Services Branch Landgate
1:25 000 scale relief	Contours 2.7 Spot Heights 1.4	Perth, Peel, South West and Great Southern Regions	The information for this dataset was collected using analogue photogrammetric techniques and by hand digitising / scanning of compilations. Contour interval is 5m.	
1:50 000 scale relief	Contours 5.5 Spot Heights 12.7	Northern Kimberly, Eastern Pilbara, Eastern Gascoyne and Eastern Wheatbelt Regions	The information for this dataset was collected using analogue photogrammetric techniques and by hand digitising / scanning of compilations. Contour interval is 10m.	
1:100 000 scale relief	Contours 11 Spot Heights 5.5	Rest of WA not covered by either 1:25 000 or 1:50 000 scale relief data	The information for this dataset was collected using digital photogrammetric techniques or by hand digitizing / scanning of existing repromats / compilations. Souce material may be from DOLA or AUSLIG. Contour interval is 20m.	

Dataset	Vertical Accuracy (metres)	Extent	Details	For further information
Salinity DEM	1.5 (93% of points)	Perth, Peel, South West and Great Southern Regions, including SW half of the Wheatbelt.	DEM data was derived by digital photogrammetry sourced from 1:40 000 scale aerial photography that was flown specifically for the salinity project. Grid interval is 10m.	Paul Duncan Primary Capture Geographic Services Branch Landgate
Shark Bay DEM	2 (90% of points)	Carnivon, Dirk Hartog Island and Henri Freycinet Harbour	Sourced from various 1:25 000 scale colour air photos. Grid interval is 10m.	
Raw DEM for Ortho Rectificaiton	1.5 (90% of points)	Scattered across state, refer Appendix I.	DEM data was derived by digital photogrammetry sourced from 1:25 000 scale aerial photography that was flown for coverage of 1:100 000 map sheets. This DEM data remains unedited and subject to random error. Grid interval is 10m.	

National Elevation Data Audit - DEM and Contour Coverage - Appendix A



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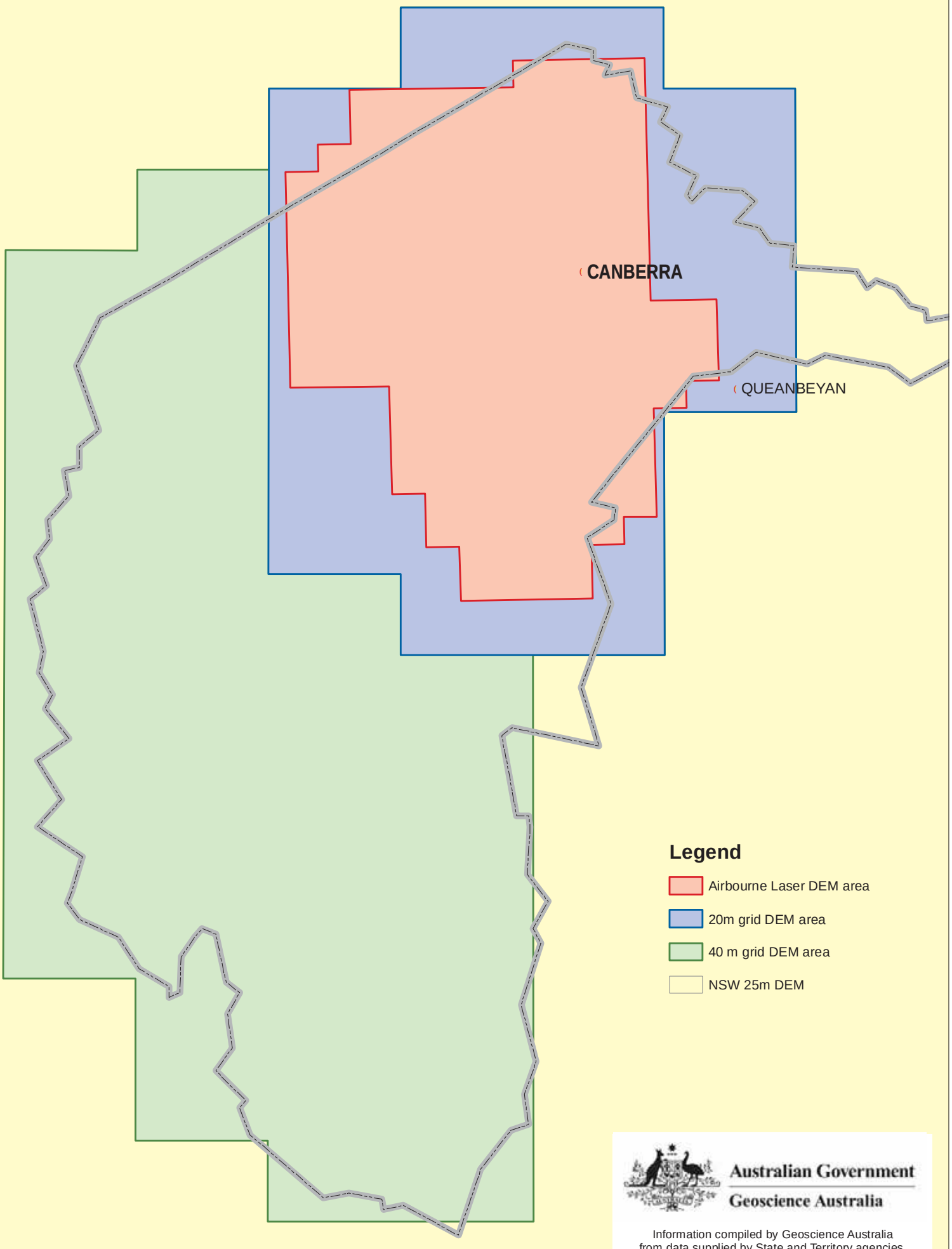
October 2007

National Elevation Data Audit - Australian Capital Territory - Appendix B



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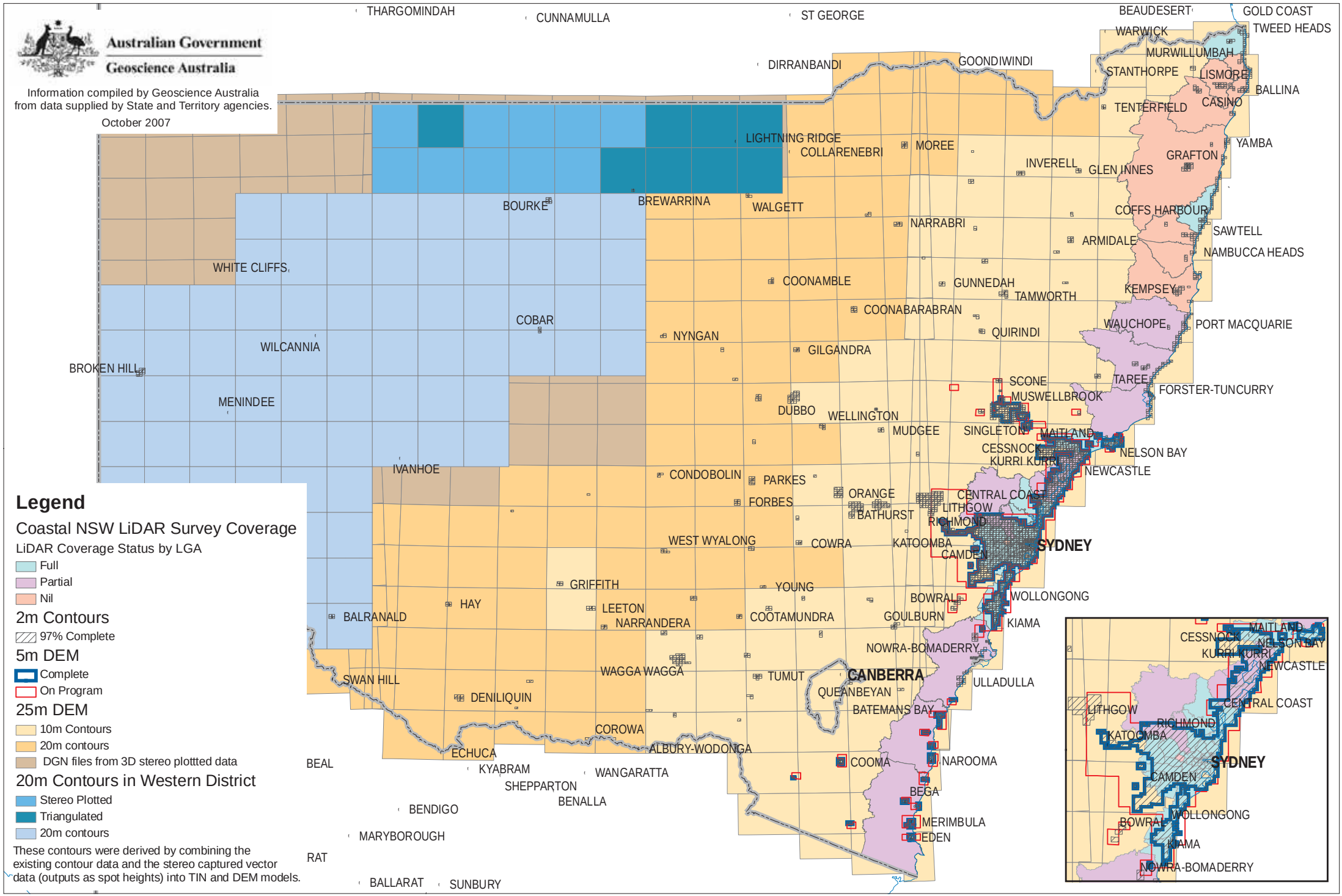
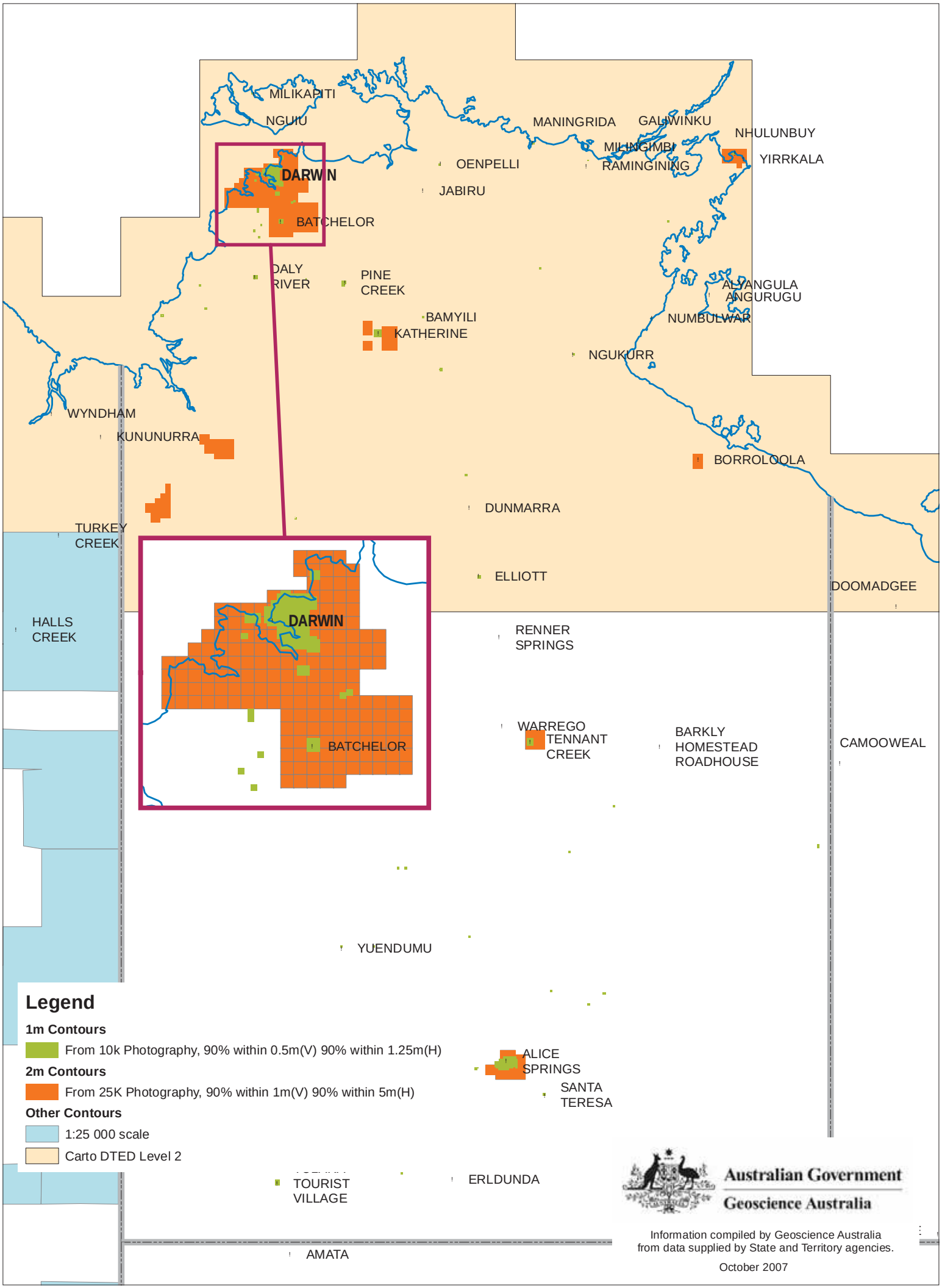
October 2007

National Elevation Data Audit - New South Wales - Appendix C



National Elevation Data Audit - Northern Territory - Appendix D



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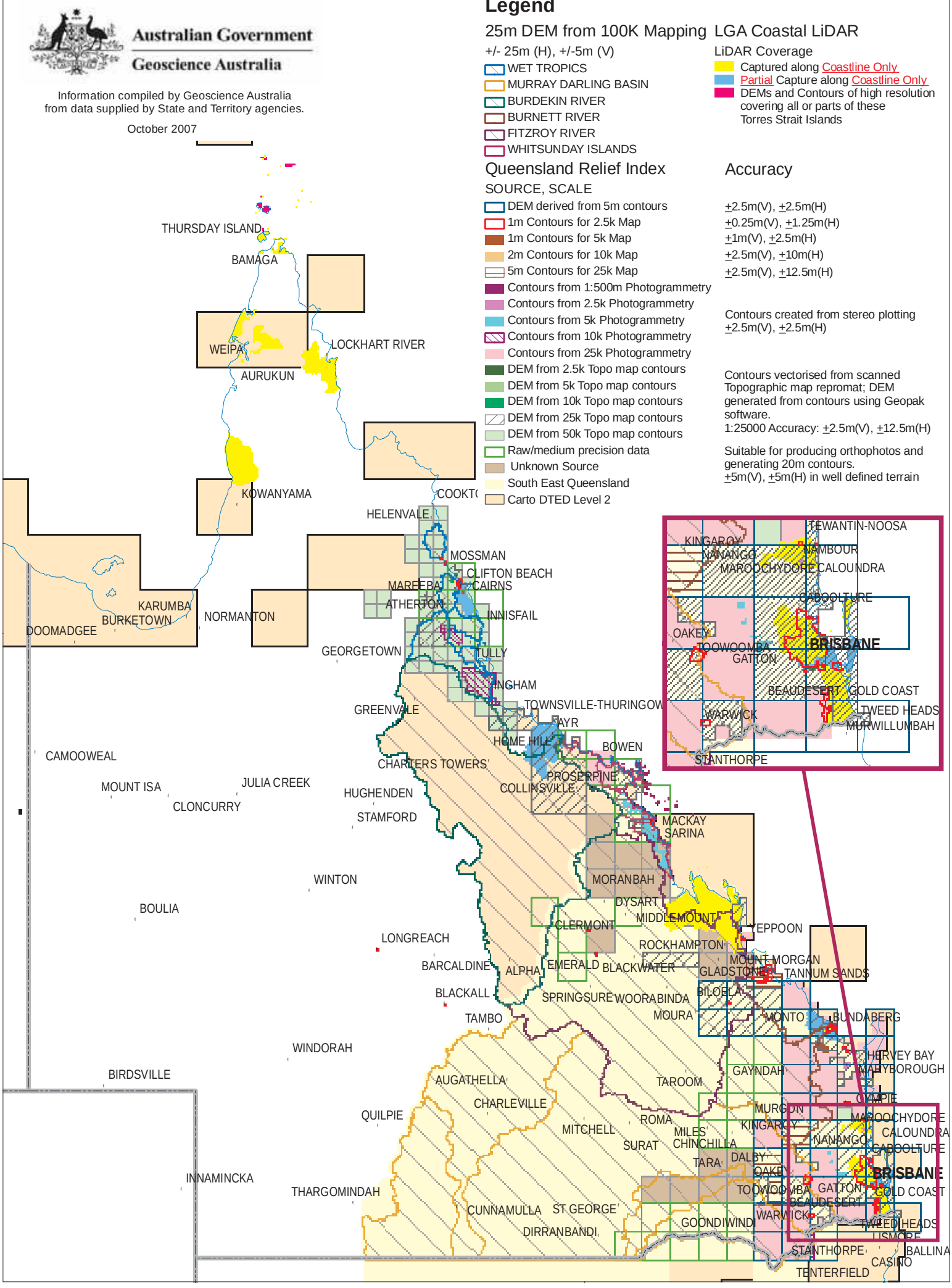
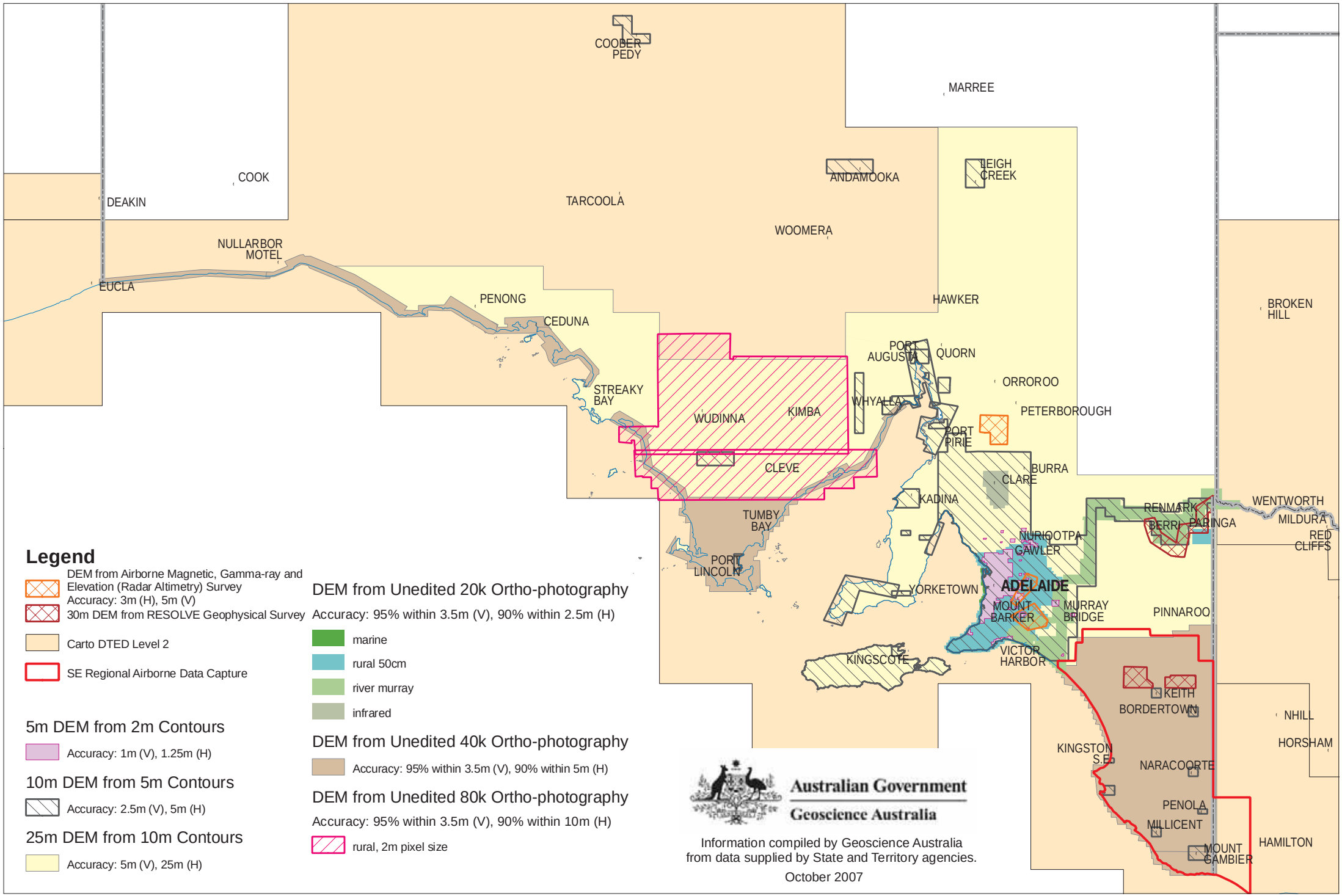
National Elevation Data Audit - Queensland - Appendix E



National Elevation Data Audit - South Australia - Appendix F



Legend

DEM from Airborne Magnetic, Gamma-ray and Elevation (Radar Altimetry) Survey
Accuracy: 3m (H), 5m (V)

30m DEM from RESOLVE Geophysical Survey

Carto DTED Level 2

SE Regional Airborne Data Capture

5m DEM from 2m Contours

Accuracy: 1m (V), 1.25m (H)

10m DEM from 5m Contours

Accuracy: 2.5m (V), 5m (H)

25m DEM from 10m Contours

Accuracy: 5m (V), 25m (H)

DEM from Unedited 20k Ortho-photography

Accuracy: 95% within 3.5m (V), 90% within 2.5m (H)

- marine
- rural 50cm
- river murray
- infrared

DEM from Unedited 40k Ortho-photography

Accuracy: 95% within 3.5m (V), 90% within 5m (H)

DEM from Unedited 80k Ortho-photography

Accuracy: 95% within 3.5m (V), 90% within 10m (H)

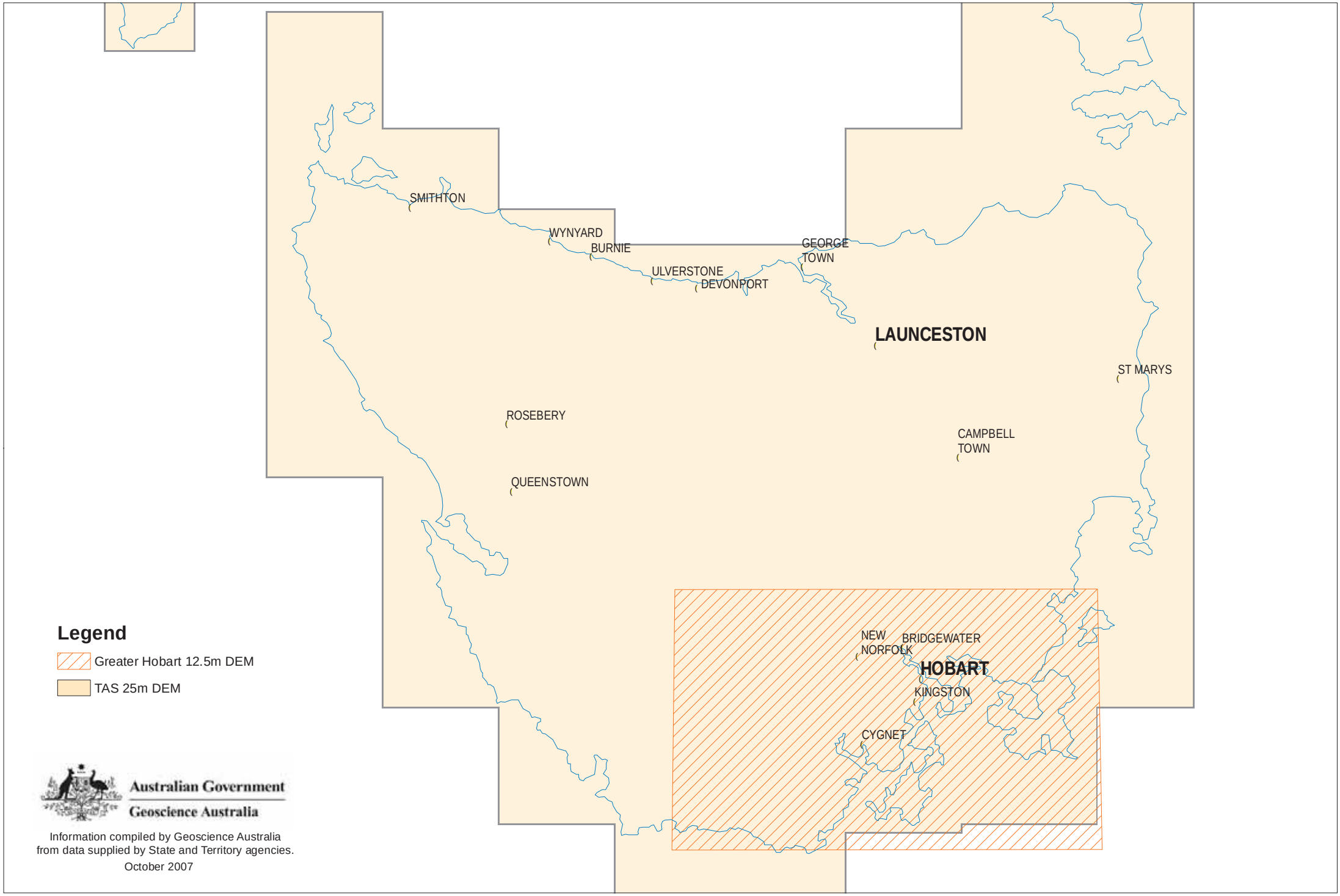
rural, 2m pixel size

Australian Government
Geoscience Australia

Information compiled by Geoscience Australia
from data supplied by State and Territory agencies.

October 2007

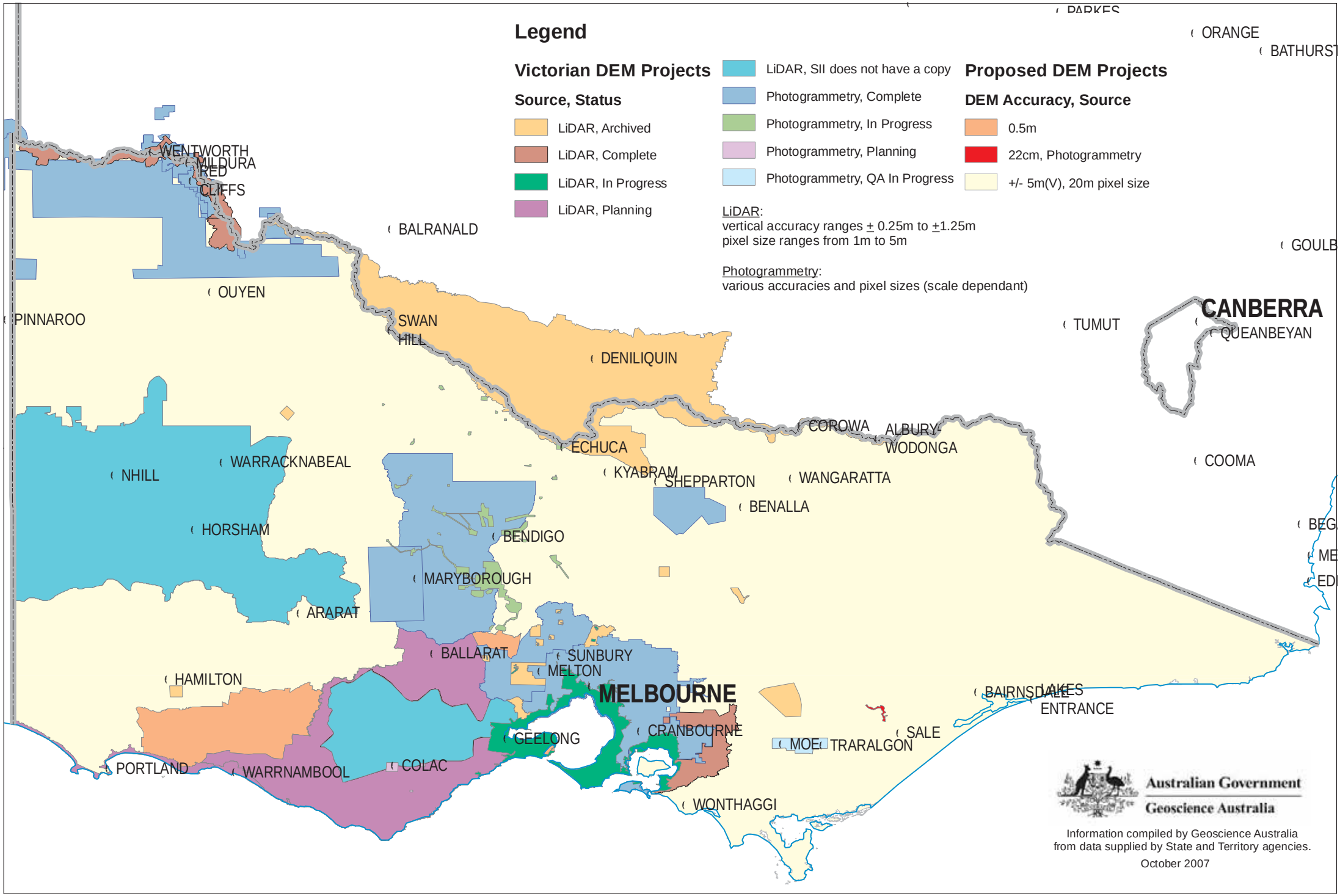
National Elevation Data Audit - Tasmania - Appendix G



Australian Government
Geoscience Australia

Information compiled by Geoscience Australia
from data supplied by State and Territory agencies.
October 2007

National Elevation Data Audit - Victoria - Appendix H



National Elevation Data Audit - Western Australia - Appendix I