

Victoria, Australia

Vicmap Topographic 1:30,000 On Line (2004—Enterprise System)

System Summary

Vicmap Topographic 1:30,000 is an initiative of Spatial Information Infrastructure (SII) of the Victorian State Government, Department of Sustainability and Environment (DSE), in the state of Victoria, Australia. It is an online topographic mapping system that delivers an A4 size standard topographic map of anywhere in Victoria. These topographic maps are compiled from the most up-to-date Vicmap Digital data.

Vicmap Digital is the authoritative spatial framework data for the State of Victoria. It is the foundation of Victoria's primary mapping and geographic information systems. Spatial Information Infrastructure is responsible for the development and maintenance of Victorian spatial information policy and infrastructure and is the custodian for Vicmap Digital.

The 1:30,000 scale Vicmap topographic maps cover all of Victoria and are provided on a predetermined A4 grid. The maps are based on and aligned to the existing 1:25,000 scale mapsheet grid across the state and have been designed so that four of the 1:30,000 scale maps will fit into a single existing 1:25,000 scale topographic map.

The Vicmap A4 topographic maps are created using the most current and accurate information from Victoria's spatial framework databases, which are maintained by the State Government and users. These depict the standard topographic map features such as roads, contours, rivers, lakes, built-up areas, towers, spot heights, etc.

Each sheet can be identified by its tile number (for example T8124-3-2-3) and referenced to the existing 1:25,000, 1:50,000, and 1:100,000 index systems. The map series uses the GDA94 datum and the Transverse Mercator Projection. The 1:30,000 scale A4 maps each cover an area five kilometers east to west and seven kilometers north to south.

Customers who obtain a topographic map online also receive a technical information sheet that includes standard information relevant to all mapsheets. This includes standard legend, generic

grid reference sample, projection, datum, compilation dates, and accuracy statements.

Accessed via the Internet, file sizes are predominantly small (under 1 megabyte) to enable immediate download. Delivery is easy—the user simply purchases his or her selection through the online Vicmap Topographic maps service, accessible from SII's Land Channel home page, <http://www.land.vic.gov.au>, and pays online using his or her credit card. The cost is minimal, with each A4 map costing \$1.50 plus administration fees. A PDF file of the purchased map is immediately available for the user to save to his or her computer for viewing and printing. There is no e-mail delivery involved.

Motivation for System Development

Victoria's most important topographic hard-copy mapping product is the state's 1:25,000 published topographic maps that cover 85 percent of the state. In total, there are 1,600 maps (not all of which are published). The majority of these maps were produced in the 1970s and 1980s using manual mapping processes. Since completion of this program, only a handful of maps have been updated. Of the total published maps, 50 percent are between 10 and 20 years old and 40 percent are more than 20 years old.

It has been estimated that it would cost the State of Victoria \$48 million to re-create a state-wide hard-copy topographic mapping program using the traditional manual methods. This is clearly cost-prohibitive.

Spatial Information Infrastructure (SII) is the custodian for 1:25,000 hard-copy mapping. It has been in a process of converting much of its analog data into digital data for almost two decades. This digital data, known as Vicmap, is current, accurate at 1:25,000 and state-wide.

A recommendation in the Review of the Regulatory and Administrative Framework for Survey and Spatial Information in Victoria, released in March of 2003, called for the state's map-

ping program to be “. . . reconstituted due to the prevalence of out-of-date maps and emerging Government liabilities.”

A Geospatial Information Reference Group (GIRG) Forum was held in July of 2003 in Melbourne. This group consists of relevant stakeholders in the areas of government, recreation, professional industry, emergency services, the education sector, and map retailers. The forum topic was “Hard-copy Topographic Maps” and was convened due to the concern raised by the lack of currency of hard-copy mapping.

In response to the recommendation and the GIRG forum, the Secretary of the Department of Sustainability and Environment asked SII (then known as the Land Information Group) to develop a strategy for the production and development of hard-copy topographic mapping for Victoria.

This request was incorporated in the SII business plan 2003–2004: “Develop multipurpose published mapping series with stakeholders by June of 2004.”

Vicmap Online Topographic 1:30,000 is the first product of the multipurpose published mapping series to be implemented.

System Benefits Achieved

Following are some significant benefits and impacts of Vicmap topographic 1:30,000:

- SII is now seen as the authoritative source of not only framework data sets but also standard topographic map symbolization and specifications for statewide topographic mapping.
- It has created enthusiastic response and stimulated discussions among state, national, and international map users and government agencies.
- Reinvigorated the hard-copy mapping program.
- Placed Spatial Information Infrastructure at the forefront of online topographic mapping technology.
- SII, DSE, and other government users no longer need to create their own topographic maps, therefore freeing up time and dollar resources for other activities.
- Vicmap Topographic is now used as a quality assurance tool as it enables SII to validate data not only in isolation but also in relation to other topographic data.
- Victoria now has a proven process of automated topographic mapping with high-quality cartographic outputs.
- As it uses digital data, this system is very cost-effective, at only a fraction of the cost of traditional hard-copy maps.
- The topographic map content can be duplicated over a range of further topographic products at various scales, sizes, and file outputs.
- Vicmap Topographic A4 1:30,000 accesses the most current data live from the source database so that any updates performed in the data will be reflected on the map product.
- For the first time the entire state of Victoria is covered by large-scale topographic mapping. Previously mapping for the northwest of the state, covering 15 percent in area, was only available at 1:100,000 scale.

- Vicmap Topographic 1:30,000 supersedes the currently available hard-copy 1:25,000 topographic maps that may be up to 30 years out-of-date.
- A statewide topographic map series is available for the first time in the new GDA94 datum.
- Anyone in Victoria (or the world!) who has Internet access and an A4 printer can immediately access and print an A4 topographic map. There is no dependency on being able to locate the nearest opened map store, which may or may not stock the user’s required map.
- A key result of the topographic digital data audit is that the status of the data has been evaluated for mapping purposes. Data problems have been identified and recommendations made to resolve these issues.
- In an Australian and maybe world version first, a topographic map series is available as an A4 size product. Each of the 6,350 A4 maps that make up this series is uniquely identified by a numbering system that links this product to other existing Victorian map series products.

System Design Issues Encountered and Overcome

Part of the evaluation exercise was to identify all the features depicted on a hard-copy topographic map. The corresponding digital data was then sourced, identified, and evaluated as part of an audit process. The digital data was audited according to mapping criteria that consisted of:

- Availability
The data required to duplicate on a map a feature on the ground must be available in digital form.
- Currency
The data set is current and up-to-date (all known updates incorporated into the data set).
- Accuracy
The digital data must be at least accurate at 1:25,000.
- Correct
The information depicted in the digital data is a true representation of the features on the ground.
- Completeness
The data set is available state-wide.
- Topological structure
The digital data must conform to digital data standards, i.e., no label errors, danglers, offshoots, multiple labels, etc.
- Cartographic structure
The digital data is captured and stored in such a way that no further processing is required to symbolize it on a map output.
- Consistency
The digital data must be consistent in terms of datum, projection, file type, and location.

Even though the majority of data meet most of the criteria, significant amounts of data were lacking in one or more criteria. A decision had to be made whether to portray the information on the map as it was, while identifying the problem, and resolve it later, or to remove it completely until the data was robust enough for portrayal on the map.

For instance, mangroves were identified as a fundamental feature but were available only as uncoded line work. Thus, in their present state they were unable to be portrayed on the map, but have been identified as needing to be topologically structured.

The digital line work for cliffs, also a fundamental feature, was inconsistent in its topological structure so that in some cases the strokes of the cliff symbology pointed upslope instead of downslope. Even though this was not cartographically correct, it was decided to retain this feature on the map, while also identifying the need to address this problem.

What Differentiates This System from Other Similar Systems

Online topographic mapping is a relatively new development in GIS that is becoming more prevalent with advances in hardware and software and the availability of georeferenced digital data.

State, national, and international government and private mapping agencies offer online topographic mapping, but Vicmap Topographic 1:30,000 is unique in that the user can access a current, high-quality topographic map immediately from the comfort of his or her home or office. And because it is A4 size, the user can then immediately print the map output onto a home or office printer. There is no delay involved in shipping the product to the user nor is there a requirement for the user to locate the nearest map shop or map kiosk for map access.

Vicmap Topographic 1:30,000 is regenerated every four months using the latest available digital information from Victoria's maintained data. This means that any changes in the data—for instance, road additions, road deletions, or road-name edits—will be dynamically reflected in the mapping product. The user can be confident that the information depicted on the map product is from the most current available data.

System Hardware, Software, and Data

Hardware:

ArcSDE Server

Solaris system	
OS version	SunOS 5.8
Hardware type	SUN4U sunw, Sun-Fire-280r
Memory size	2048 MB
CPU	2 x SUNW, sunw, Sun-Fire-280r sparc 1200 MHz

GIS server

Solaris/System	
OS version	SunOS 5.6
Hardware type	SUN4M sunw, SPARCstation 20
Memory size	512 MB
CPU	2 x SUNW, SPARCstation 20 sparc 200 MHz

Web Server

Sun Java Development Kit 1.4.0
Apache HTTP Server 2.0.42
Apache Tomcat 4.1.12 (Java servlet container)

PC Configuration

Intel Pentium 4
0.5 GB RAM
40 GB HDD
Windows 2000

Software:

The primary software components used to develop this system were:

- ArcIMS 4.01
Customized for new interface specifically for Vicmap Topographic 1:30,000
- ArcSDE 8.2
- Oracle 8.17
- ArcGIS 8.3 ArcMap
Customization for Vicmap Topographic 1:30,000, including product layout, data content, and cartographic rules.
- Microsoft Access 2000
Customized for digital audit database
- Adobe Acrobat Reader 5 and 6

Data:

The data utilized for this system is sourced from Spatial Information Infrastructure's Vicmap suite of data and from the Departmental Corporate Geospatial Data Library (CGDL).

The following list contains the framework themes:

- Vicmap Elevation
Includes contours, spot heights, rocky outcrops
- Vicmap Features
Includes built-up areas, fences, landmark areas
- Vicmap Hydro
Includes watercourses, water bodies, waterfalls
- Vicmap Transport
Includes primary roads, railways, gates
- Vicmap Vegetation
Includes, tree cover, orchards, vineyards
- Vicmap Admin
Includes local government areas
- CGDL data
Includes national park boundaries, homestead names, mountain names

Where Are We Now?/Future Directions

At the time of this writing, Vicmap Topographic 1:30,000 is approaching its one-year anniversary. During the preceding 12 months, more than 7,000 A4 maps have been purchased online. SII has revised this series on average once every three months, with a view to rationalizing this process by regenerating the mapsheets only where updates have occurred or only where sales have occurred.

During the preceding 12 months, SII has focused on 4 main areas: partnerships with government and industry, data improvement, content improvement, and product creation.

Partnership

Spatial Information Infrastructure has a continuing relationship with the Australian federal mapping agency, Geoscience Australia. This relationship provides SII with a number of potential partnership opportunities, including cost sharing in data acquisition, improvement of existing data sets, acquiring new data, and establishing external custodial relationships.

Partnerships are also being developed between SII, Emergency Services, and private industry to facilitate the delivery of the most current topographic mapping for emergency services use and for the general public.

Data Improvement

Data quality issues identified in the digital data audit report 2004 are being resolved using three different models:

1. Problems identified in data currently under a maintenance agreement are being sent back to the contractors for correction.
2. Problems identified in data not currently under maintenance are being referred to possible external custodians.
3. Problems identified in data not currently under maintenance and not sourced externally are being resolved internally by SII.

For instance, using model 1, roads with an “unknown” classification are being evaluated by SII and updated by the road maintenance contractor. Using model 2, SII has established custodial arrangements with the Department of Justice for state emergency offices, courts, etc. And using model 3, SII has created a mangrove layer.

Content Improvement

SII is continually improving the Vicmap Topographic content (see Figures 1, 2, and 3). Some enhancements incorporated include:

- Implementation of an automated cartographic text-placement tool.
- Extraction of map label information from digital data for map display purposes.
- Improvements to map symbology.

Product Creation

Additional state-wide products created using Vicmap Topographic content in the past 12 months are:

- Vicmap Topographic 1:25,000 mapping created to meet the needs of Victoria’s emergency management services.
- Vicmap Topographic 1:25,000 georeferenced. This product will enable GIS users to place thematic data over a backdrop of topographic information. It can also be used for customized topographic maps centered over a point of interest. It also has potential for use with GPS units, portable handheld devices, and mobile navigation systems.

Future Directions

The Department of Sustainability and Environment through Spatial Information Infrastructure has an ongoing commitment to providing the most current topographic mapping to all Victorian users. To that end, SII will continue to focus on the following four key areas:

- Partnerships with government and industry
- Data improvement
- Content improvement
- Product creation

Potential Vicmap Topographic products to be produced in the future include:

- Vicmap Topographic custom map print on demand using centroid
- Vicmap Topographic 1:50,000 double format

Evaluation is also progressing on the feasibility of map publishing for commercial purposes, thus physically replacing the existing 1:25,000 hard-copy topographic map stock with 1:25,000 and 1:50,000 digital topographic maps.

A new hard-copy mapping program will commence by the end of 2005.

Examples of System Images and Screen Shots

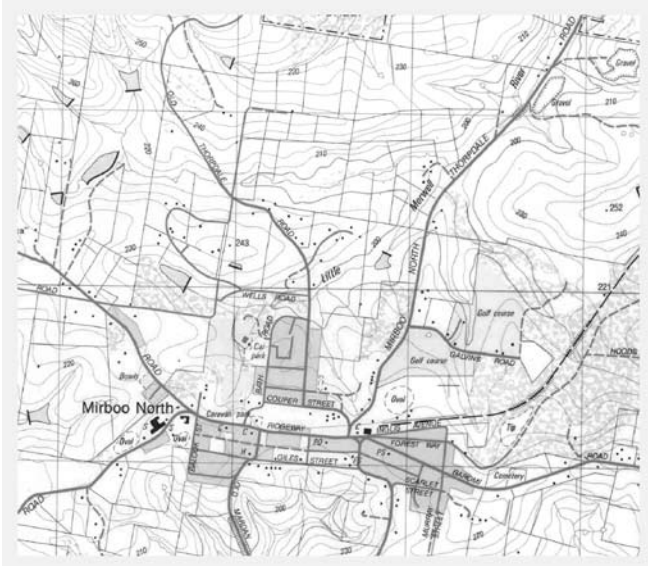


Figure 1. The Evolution of Victorian Topographic Mapping. A Portion of the Mirboo 8121-3-2 1:25,000 Topographic Hard-Copy Map. Compiled from 1982 aerial photography, field revision in 1986, printed in 1987.

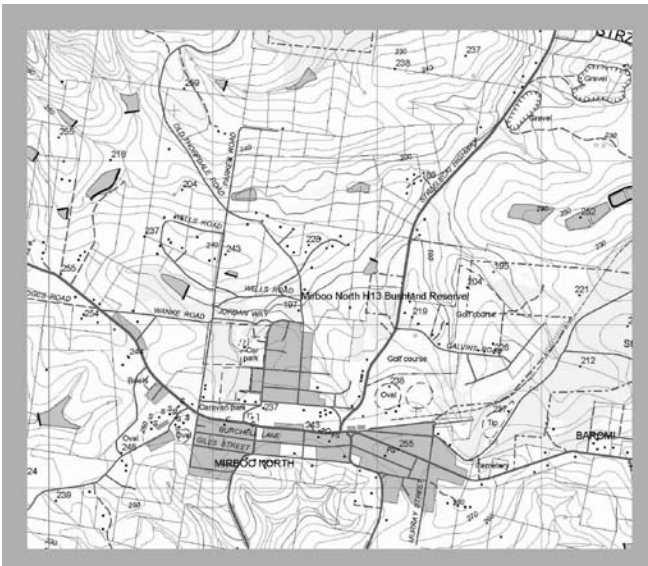


Figure 2. A Sample from the Digital Vicmap Topographic 1:30,000 8121-3-2-4 Sheet created in July of 2004.

Some changes to note in comparison with Figure 1:

- Mirboo North Thorpdale Road heading northeast out of Mirboo North has been upgraded and renamed Strzelecki Highway.
- New block of public land (Bushland Reserve) north of Mirboo North.
- Dismantled railway to the east of Mirboo North has been converted into a walking trail.
- New road network to the east of Mirboo North, south of Galvins Road.
- New spot heights to the northwest of Mirboo North.

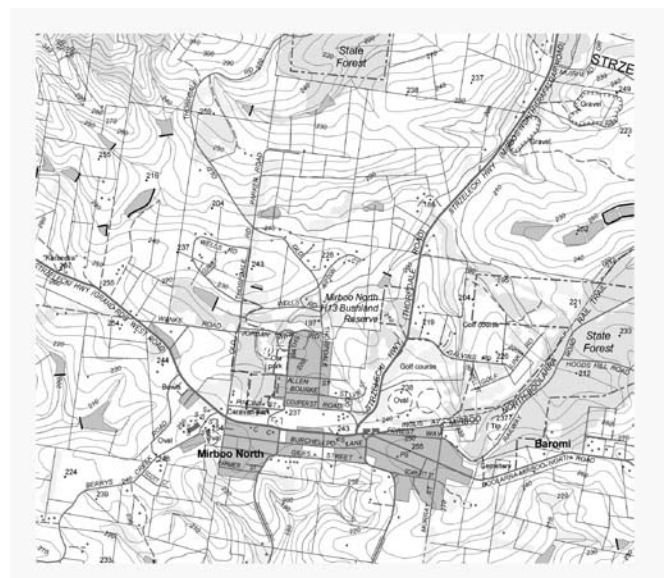


Figure 3. A Sample from the Vicmap Topographic A4 1:30,000 8121-3-2-4 Sheet Created in January of 2005 with Enhanced Cartographic Text Placement. Some changes to note in comparison with Figure 2:

- More roads labeled especially in the Mirboo North township.
- Rail trail to the east of Mirboo North labeled.
- The employment of dynamic road suffix abbreviations, i.e., CT., RD., ST.
- Text curved around linear features.
- Stacking of public land names.
- Road aliases labeled.

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