

ECONOMIC AND SOCIAL COUNCIL

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Item 11(d) of the provisional agenda*

Toponymic data files and gazetteers:

Data standards and interoperability;

Integration of Western Australia's gazetteer and topographic data

Submitted by Australia**

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** Prepared by Australia

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Summary***

In 2011, Western Australia's Geographic Names Committee (GNC) celebrated its 75th anniversary, recognising the long tradition the State has had with establishing and implementation of toponymic policies and standards. The Secretariat for the GNC is provided by Western Australia's land information agency, Landgate.

Landgate undertook a project to integrate the State's gazetteer with its topographic database. As a result, the agency has realized a number of benefits that result from implementing such a project. It has helped to positioned Landgate as a leader in the provision of spatial information whilst enabling the creation and maintenance of a "single source of truth" for definitive geographic names data.

Some of the benefits realised from implementing new spatial data management software and business maintenance processes for the management of geographic names has increased the efficiency of existing processes and ensure data management consistency and integrity.

INTRODUCTION: About Landgate

Landgate is a statutory authority responsible for Western Australia's land and property information. It is the State's primary source of land and geographic data, providing the high level of accuracy Government, business and individuals have come to depend on. Landgate provides easy access to location information including, the State's official register of geographical names, [property details](#), [titles](#), [valuations](#), [property sales reports](#), [maps](#), [aerial photography](#); and [satellite imagery](#)

Landgate recognises that to make the right decisions, access to authoritative location knowledge is essential.

A brief history of geographic naming in Western Australia

Apart from indigenous names, the earliest recorded Western Australian place names were left by the Dutch navigators including Dirk Hartog in 1616 and William de Vlamingh in 1696-97. They were followed by Englishmen, such as William Dampier in 1699 and then in the period 1790 to 1822, a number of navigators, English and French, such as, d'Entrecasteaux, Flinders, Baudin and PP King filled in much of the coastline and named most of the coastal features. Their naming practices were often descriptive, but frequently commemorative. For example Bernier Island was named after Pierre-François Bernier who was Dirk Hartog's astronomer during his 1616 expedition and Cape Riche was named by Admiral Bruny d'Entrecasteaux after Claude-Antoine-Gaspard Riche, physician and naturalist on board the Esperance in 1792.



Vlamingh



P P King



Dampier



D'Entrecasteaux



Baudin

Explorers who visited Western Australia from 1616 to 1792.

The first European settlement in Western Australia was established as a formal claim by Britain in 1826 for a military base situated at King Georges Sound. This settlement originally bore the name of Frederick's Town and was later renamed Albany. Both names were chosen to honour Frederick, the Duke of Albany and York, Commander in Chief of the British Army and the favourite son of King George III. In 1829, Britain took formal possession of the remainder of New Holland which had not already been claimed for Britain under the territory of New South Wales. This action was to halt any claims the French may have tried to make on the land. The colony of Western Australia was officially proclaimed on 8 June 1829, and two months later in August 1829, the now capital city of Perth was founded.

Early naming practices

Following the settlement of Western Australia, the naming practices used by the maritime explorers changed to commemorating the early settlers and explorers, although there were still many names from

the “home country” that were given. The other new development, was, of course the recording of indigenous names. It was not by accident that many of these are today recorded and preserved as the dominant image of Western Australian place names.

The use of local indigenous names for the areas was a practical approach as it was quickly recognised that Indigenous knowledge is local knowledge and was essential in identifying suitable places for settlement. When indigenous words were chosen by the explorers to describe these places, they had to be written down, usually for the first time ever. As a result of this there began a transformation from an oral tradition to a written form. It soon became evident that the process of translation need to be regulated and thus began the development of rules governing the transcription of all Australian indigenous place names.

In 1873 the Royal Geographical Society began to draft rules for the orthography of indigenous names, in the hope that the colonial governments would adopt them. This desire for standardisation was necessitated by the defense and foreign policy needs of the rapidly expanding empires. In 1878 the orthography rules received the approval of the Foreign, Colonial and India Offices, the admiralty and the War Office, and influenced strongly subsequent developments in the United States of America, France and Germany.

From the early 1900’s there was a keen public and government debate on the spelling of Indigenous names. In 1925 it was suggested to the Under Secretary for Lands that a small committee should be appointed to regulate the use, collection and spelling of indigenous place names in cooperation with the Western Australian Government. The Surveyor General responded by recommending to the then Department of Lands and Surveys the appointment of a small Geographic Board, composed of representatives of the University of Western Australia, the Director of the Library and the Surveyor General, and who would deal with rules for the orthography of geographic names. This Board would decide on cases of doubtful spelling, investigate the origins of names and collect original native names for inclusion on maps.



Original hand written place name cards currently held by Landgate.

It took several years before the first meeting was convened, and the newly named Nomenclature Committee held its inaugural meeting on July 27, 1936. This committee has continued to function for over 75 years. Whilst there have been a number of functional reviews and name changes, the Geographic Names Committee still meets quarterly to discuss and advise on naming matters within Western Australia. Today’s Committee includes representation from Landgate (Chairman and Executive Officer), Department of Mines and Petroleum, State Records Office, Main Roads WA,

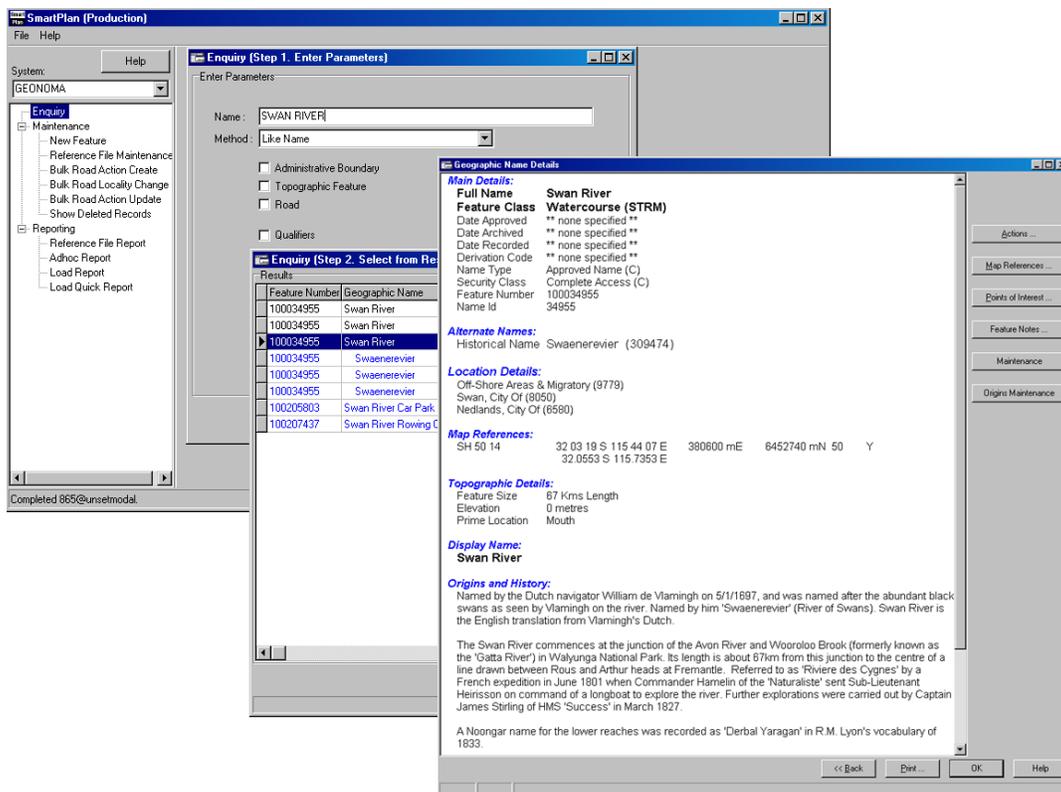
Department of Indigenous Affairs, Urban Development Institute of Australia – WA Division, Australia Post, Western Australian Local Government Association, Fire and Emergency Services, Western Australian Police Service and the Department of Environment and Conservation.

The Committee is served by a Secretariat which is provided by Landgate and it is this team who is responsible for the day to day activities involved in researching naming proposals, submitting requests for formal approvals, liaising with local governments and the community on naming issues. With changes in technology and community needs, the Secretariat is also responsible for the updating of the states names database and links to cadastre and topographic systems.

Western Australia’s gazetteer - GEONOMA

The Landgate Secretariat is also responsible for maintaining a database known as GEONOMA. This database contains the official names and geographical coordinates of features in Western Australia. GEONOMA is recognised by the Western Australian government as the primary source and register for all officially named geographic features, administrative boundaries and road names. Names added to or amended within GEONOMA are automatically propagated to features in other linked systems.

Other information essential to these names is also recorded and includes; the official position or extent to which the name applies; spelling of the name; feature type; classification; derivation; map number; coordinates and if known, any alternative and historical names.



Landgate’s GEONOMA screens showing results for the geographic name ‘Swan River’.

GEONOMA data currency and access

Western Australia's geographic names are approved and maintained on a daily basis. The currency of the data is indicated by the day, month and year incorporated as part of the file name, e.g. Date Approved; Date Archived or Date Recorded.

The positional accuracy of the data stored within GEONOMA is dependent on the accuracy of and scale of the original source materials. In the past such coordinate information was derived manually from hardcopy 1:250 000 and 1:50 000 published maps. In more recent times, with improvements in imagery and GPS technology, coordinates are sourced from GPS surveys, state-flown aerial photography and other inter-agency GIS data sources. The information stored within GEONOMA is able to be disseminated via a number of format types. These include Excel files (.xls); Comma Delineated files (.csv); Text files (.txt) and Word documents (.doc).

Access restrictions to some information may apply to features such as culturally sensitive Indigenous sites or dangerous area where knowledge of their locations is not in the best interests of the general public or the actual sites themselves, e.g., old mines, caves etc.. Such information may only be provided once approval has been granted by the original supplier of the information has given permission.

ABOUT THE GAZETTEER/ TOPOGRAPHIC DATA LINKING PROJECT

Purpose of the project

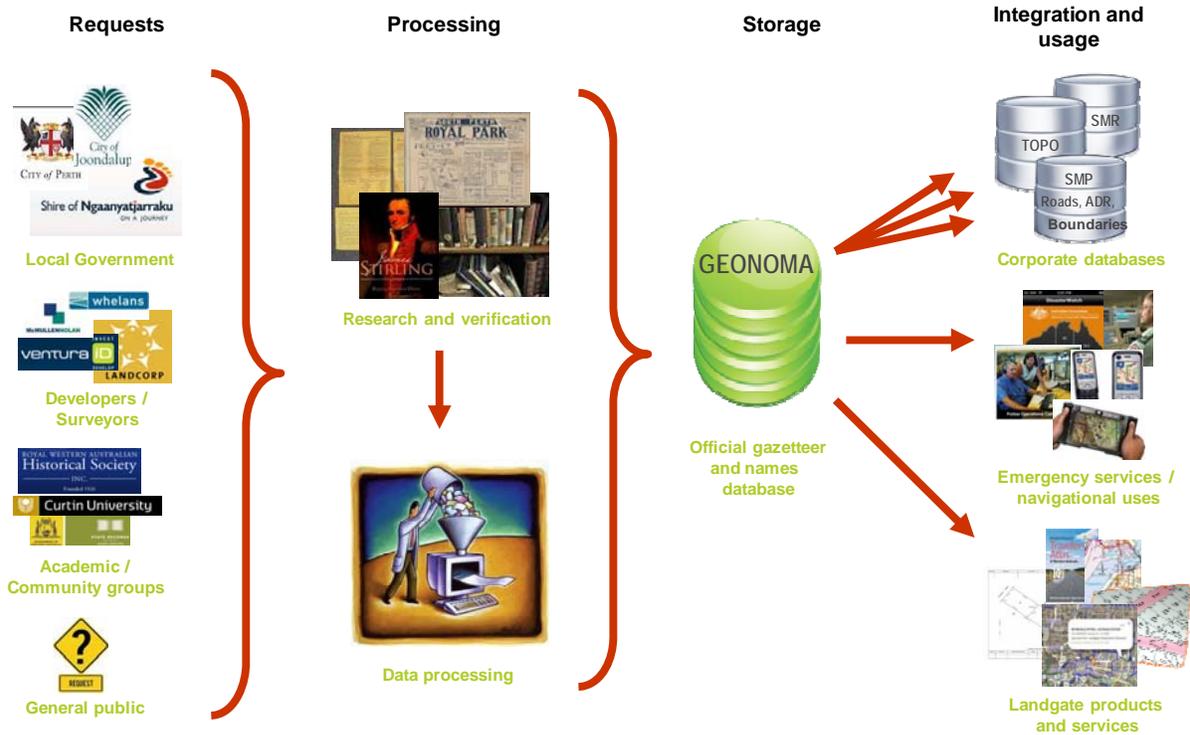
The project, in its simplest terms, was created to facilitate the efficient capture and sharing of fundamental geographic data to support emergency services, government requirements, community needs and decision making processes.

It involved the revision of the topographic and states gazetteer's data models; the migration of data from other disparate names datasets required data cleansing and matching to identify and remove duplications and errors; the development and implementation of new maintenance processes; the creation of the actual link between the POI and cultural information to the related gazetteer record and the deactivation of the remaining disparate names data sources.

Many of Landgate's mapping products obtained their POI information from a number of different sources and utilised POI in the production process which was complex, error-prone and time-consuming. The development of new dynamic spatial updating processes, online reporting and other GIS applications all required current and complete POI data in order to deliver real-time information and cost benefits to the agency. Therefore, Landgate became committed to rationalising POI data collection and maintenance processes and they were included into the data linking project.

The project was initiated to establish a live and dynamic link between Western Australia's official gazetteer and the states topographic database. The project also investigated the factors which had led to the creation of disparate feature name datasets within the agency.

After this investigation, it was resolved that the removal of data duplication in the use of feature names was essential. By ensuring a single source of truth for the states feature names, including cultural features and points of interest (POI) and their locations, the agency would be able to achieve efficiencies in the maintenance and integrity of spatial data whilst ensuring its referential integrity between various products and applications.



GEONOMA as the ‘single source of truth for names data in Western Australia

It was decided that the linking of the majority of the cultural features and POI would be undertaken by using bulk loading techniques by using validations scripts and automatic processes between the gazetteer and the topographic database. Data anomalies that occurred were investigated and resolved on a case by case basis to ensure data accuracy. New names and spatial data capture is undertaken as part of day-to-day activities as required.

By creating a dynamic link between such information, services to stakeholders was significantly improved. Non-official names such as shopping centres, schools and hospitals are managed in one names source. The centralisation of the collection, storage and management of POI and other cultural data has produced other improvements such as the timelier delivery of information for internal and external customers, stakeholders and the public. The inclusion of names information into Landgate’s systems, both topographic and cadastral, enables GIS capabilities to support natural resource monitoring, hazard waste management, disease risk preparedness and other economic and environmental decision support systems.

Project alignments to strategic plans and wider government objectives

The project directly aligned to a number of Landgate location information strategies. These included ensuring that the data was appropriate, readily available and digitally enabled.

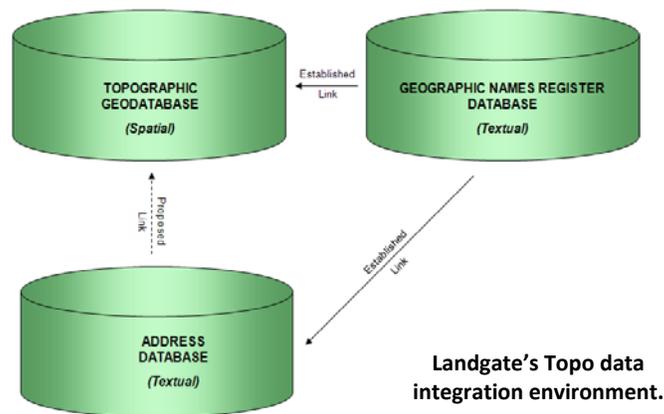
The enhancement of the quality of Landgate’s core datasets and the integration of this information in an online environment enables more efficient methods of dissemination online, thus reducing costs associated with the maintenance of multiple access environments. This strengthens Landgate’s commitment to improving and opening up access to information about land to enable spatial information users to make better informed decisions and plans thus leading to a sustainable future for all Western Australians.

The linking the geographic names information and their attributes to the topographic database this information becomes instantly available in a wide range of GIS formats thus meeting the strategic needs of government and the wider community.

Exceptions to the initial project

The project was initially restricted to the collections and reconciliation of feature, road and cultural features (including POI) names within the Perth metropolitan area. The project was not to capture any new names from sources other than Landgate’s existing databases, products or the textual information already stored within the topographic database as labels.

It was decided that the link to address information to the topographic data was not to be developed at this stage. This information is stored within Landgate’s cadastral database where the address is linked to land tenure. Future development of a direct link between the topographic feature (point, line or polygon) to the unique address identification number will be undertaken as part of another project.

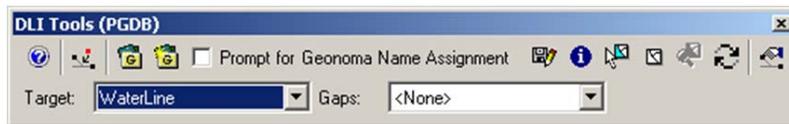


Creation of the database link and user interface

In order to enable feature-to-name linking, a direct database connection was established between the topographic database and GEONOMA so that any amendments to the data are automatically propagated to features in the topographic database. Similarly, newly approved names are consistently available for feature assignment when the spatial representation of a geographic feature is captured and updated in accordance with changes in the natural and built environment.

The creation of the link enabled names to be assigned, via unique feature identifier (FID), to the spatial representation/s held in the topographic database. This was achieved by the development of software which allows users to automatically assign names (within a given tolerance) to point and polygon feature types already captured in the topographic database. It was found that 55-60% of existing topographic features were able to be automatically assigned in this manner. This equated to approximately 20,000 features.

Anomalies which were flagged during this automatic data matching process were identified and investigated and resolved by linking the names to the topographic features manually. A semi-automated process was developed to allow users to traverse and link linear topographic features, such as rivers, in order to assign feature names to each feature segment. Both the data matching and linear traversing functions were developed as tools within the Topographic Database corporate environment to ensure software/tool reuse.



GEONOMA to Topo linking tools created in ArcGIS

Managing names of loosely defined (fuzzy) topographic features

The project also identified that there was a requirement to manage the linking of names to loosely defined, or fuzzy, geographic features such as mountain ranges and ocean straits. Traditionally mapping systems had poorly defined geographic knowledge-bases, and feature names in particular had little intelligence due to there being no structured relationship between the name and its associated spatial representation. As a result, **the project identified two options for managing such features;**

The first option proposed to capture the spatial extent of fuzzy geographic features, **such as valleys, plateaux and archipelagos**, in order to;

- (a) add considerable geographical meaning to the topographic information by defining the physical extent of features;
- (b) enable relationships to be defined between features and their corresponding names to support detailed search and query operations;
- (c) allow flexibility for deriving map theme variations at a range of map scales; and

- (d) enable a digital record of the official extent of geographic features.

The second option was to generate the point location of fuzzy features automatically from the stored geographical coordinates within the names database and the corresponding feature names to be automatically assigned.

Whilst this second option was recognised as the most expedient method for incorporating fuzzy feature names into the topographic database it was found that the drawback to this methodology was that the actual spatial extent of features is not captured. This would result in the hardcopy maps utilised for recording the official extent of fuzzy geographic features needing to be maintained for official reference purposes. The methodology would also have implications on derived digital products, as the point representation of fuzzy features is a generalised cartographic representation and therefore only suited to small scale outputs. As a result, customers would need to refer to the hardcopy reference material for the precise extent of features.

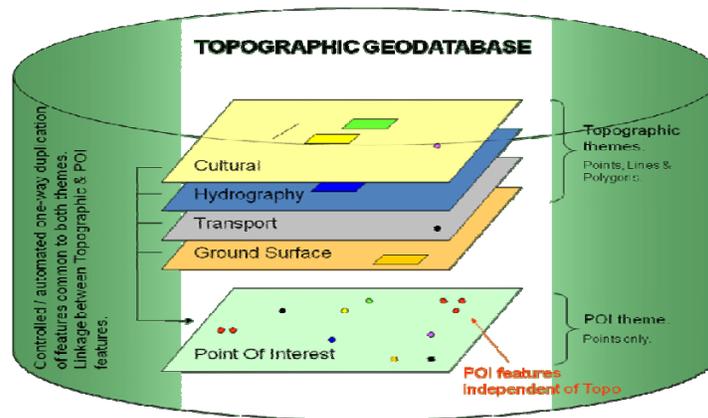
It was decided that though the first option was more time-consuming and costly to implement, it would however provide the best results and produce data that was able to be better utilised by the agency and its customers.

EXTENDING THE GAZETTEER TO INCLUDE POINTS OF INTEREST

Definition of a POI

It was recognised that a Point of Interest (POI) can mean many things to many different agencies. A generalised meaning is that a POI is any feature or service that people wish to visit or know the location of, and is of value to the community. POI include places such as theatres, museums, restaurants and other places for socialising. They can also include places of leisure such as parks, botanical gardens, community centres, libraries and churches. POI's can also be temporal by nature and include best value petrol stations, speed camera locations and emergency evacuation points.

A minimum data requirement sees POI information needing a latitude and longitude value, and a name and/or feature type for reference. Increased usability of this data is achieved by adding further feature characteristics such as an address, the type of structure identified, services available, contact details such as telephone numbers and email addresses, opening hours, tourist notes and warnings etc.



Various topographic data themes and their one-way duplication into a POI layer.

Social and public benefits from collecting and maintaining POI

Effective decision making capabilities can only be realised when geographical information systems evolve into extensive geographical knowledge-bases. It is the knowledge contained within these systems that supports effective emergency services management and commercial tourism; creates a well informed travelling public and engenders prosperous lifestyles.

Good, accurate information is therefore critical to successful decision making, location-based searching and navigation. By extending the database from simply storing a name and geographic location to include more attributes such as an address, historical information and relationships to other features, outcomes such as the following will occur:

- responding to emergencies where the direction given is “behind the big shed, near the windmill at the Old Farm”;
- have navigation systems give the origin and history of a place being visited or passed by;
- being able to locate wards, departments and doctors’ rooms within a hospital complex;
- warn the public of locations under threat of fire in real-time and provide safety routes from an individuals location;
- locate a lost person based on what they can see – rocky outcrop, cattle grid, windmill or electricity pole asset number;
- provide ‘up-to-date’ route map and itineraries of tourist attractions, and food and beverage stops for a journey, and have the ability to source other suggested locations whilst travelling;
- navigate to the cheapest petrol station in a given radius while avoiding black spots, speed cameras, road hazards and congested traffic zones.

Collaborative data management

With many agencies within Western Australia collecting POI data for their own purposes there is a duplication of data collection and maintenance processes occurring. As a consequence, Landgate determined that there needed to be a review of firstly, how POI’s are handled within the agency and secondly how such information is collected, used and maintained throughout the State.

As a result of its temporal nature, the maintenance of POI data is a resource intensive and costly to develop. As a consequence, many government and private agencies have resisted the urge to build an authoritative source preferring instead to collect POI data in an ad hoc manner in order to meet immediate business needs.

These datasets have over time been managed as independent data sets thus creating a high degree of duplication in its collection and management. Few agencies however hold complete theme coverage as information is generally collected for a key agency. In addition, agencies often use different systems and standards and this approach limits the use of common technologies, interoperability, streamlined system implementation and accessibility.

The need to establish a single authoritative POI data source has been identified so that government and commercial sectors can promote social and economical benefits and foster commercial opportunities. Every feature, whether it be a geographic feature or a POI, should be managed in an integrated environment, where information is captured and stored once, and made accessible to many agencies for various applications.

To achieve this it was important that common data standards, models, metadata and technology procedures were established. By creating a collaborative data management framework at the State level, this enables the Government to pool resources and eliminate the duplication of effort.

OUTCOMES

Better management of spatial data and maintenance of geographic names

The project introduced an electronic spatial data management component to the current geographic names approval process. Instead of identifying the extent of geographic features on hard-copy map sheets, features are able to be captured directly into the topographic database. This streamlines the spatial information updating process.

To ensure the integrity of the data during these automated data maintenance processes, new security locks were implemented to eliminate any accidental feature deletions between the two databases. These locks provide warnings to the system users that the action they are trying to undertake can not proceed until other remedial actions have taken place, i.e. the link between the name and the feature needs to be disconnected before any other actions can proceed.

The screenshot shows the 'Name Maintenance - Approved Name' window. The 'Name' field contains 'Swan River'. The 'Display Name' field also contains 'Swan River'. The 'Feature Class' is set to 'Watercourse (STRM)'. The 'Name Type' is 'Approved Name (C)'. The 'Name Security Class' is 'Complete Access (C)'. The 'Date Time Archived' field is empty, and a red circle highlights a message: 'Feature is used in another database'. The 'Feature Number' is '100034955' and the 'User ID' is 'SMARTPLAN'. The 'Feature Status' is 'C'. The 'Date Time Created' is '08/03/2001' and the 'Feature Date Time Created' is '08/03/2001'. The 'Date Time Modified' is '15/05/2012' and the 'Feature Date Time Modified' is empty. The 'Date Time Deleted' is empty and the 'Feature Date Time Deleted' is empty. The 'Number of Names' is '1 of 2'. The window has 'OK', 'Cancel', and 'Help' buttons at the bottom.

GEONOMA maintenance window showing the security lock.

Enhanced quality of core datasets

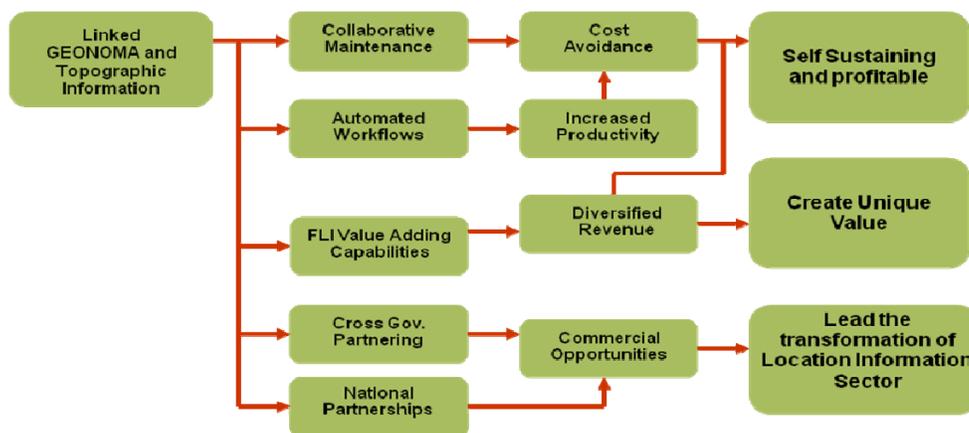
The geographic feature names database is used by the business community and general public as a key search criterion for retrieving spatial information in an online environment. By including the names-to-feature link, Landgate has strengthened its commitment to improving and opening up access to information about land for all Western Australians. Access to this quality spatial information enables individuals and organisations to better manage natural resources, make informed decision on environmental protection, plan and manage urban growth through enhanced geographic knowledge. By establishing this information into a digital information system which is compatible with other systems entrenched within the WA government, it has simplified the sharing processes between agencies and organisations.

Other advantages include the provision of a geographic knowledge-base that public and private sector agencies can derive value added products; businesses can incorporate into decision support systems; and research institutions can integrate with GIS to analyse spatial relationships to solve land related problems and develop risk preparedness strategies.

Business benefits and opportunities

The commercial and business sectors rely on consistent, accurate, complete, timely, and most importantly, spatially referenced geographic information. Spatial information management is no longer a specialised application - it now has a broader relevance to general business applications and IT. Integration of spatial information with the IT infrastructure makes intelligence about location accessible to more business applications. This results in better information and agile decision making.

In the past few years, the application geographic data has expanded exponentially. This is largely due to the increasing popularity of GPS-enabled devices and software applications that use digital maps and display data. Navigation devices, both hand-held and in-car, are saturating markets and increasing the demand for accurate information. Consumers are no longer satisfied with simple navigation tools, they are demanding in-built tourist guides, automated speed adaptation systems, and advanced driver guidance systems with automated rerouting to avoid traffic congested roads.



Benefits realised from linking geographic information.

The consumer market is actively engaged in applications that involve location data through social networking web sites, user-driven wiki-style knowledge-bases and crowd sourcing applications. This form of information interaction now extends to Geotagging applications, which allow users to add geographical identification metadata to locations, or conversely, search spatially referenced image databases to find images taken near a given location. The commercial opportunities are vast.

CONCLUSION

There are a number of benefits that result from implementing a project such as this. It has helped to positioned Landgate as a leader in the provision of spatial information. It enabled the creation and maintenance of a “single source of truth” for definitive geographic names data thus enhancing the dissemination of topographic information and ensuring referential integrity between the two databases.

The functionality of other systems such as the topographic data becomes expandable by enabling GIS, search and query capabilities. Such enhancements achieve an increase in the revenue received for the topographic data and supports other Landgate initiatives such as the Shared Land Information Platform, SmartPlan and My Landgate.

Other benefits from implementing new spatial data management software and business maintenance processes for the management of geographic names has increased the efficiency of existing processes and ensure data management consistency and integrity.

For customers, the benefits of including names into the topographic database are; the enhanced the useability of topographic data for customer value added product derivations; provision of a definitive and authoritative named topographic data set and provision of an accurate and continually updated source of named topographic information