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National Coastal Geomorphology Information Framework Implementation

Discovery and Distribution

M. Hazelwood, W. A. (Tony) Nicholas and M. Woolf

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1 Project background

Geoscience Australia collaborated with the Department of Climate Change and Energy Efficiency (DCCEE) in a national programme of work that focused on an assessment of the vulnerability of Australia's coastline to the impacts of sea level rise. This program aimed to:

- develop the first phase of a nationally consistent geomorphic classification of coastal landform types of the Australian coastal zone
- catalogue the available polygon geomorphology/geology digital maps and datasets of the Australian coastal zone.
- reclassify these maps and datasets with a nationally consistent geomorphic classification scheme, and develop a national geodatabase that contains the reclassified digital maps of geomorphology and landform types of the Australian coastal zone.

Completion of the programme of work described above (Schedule 1 under the Collaborative Head Agreement with the DCCEE) resulted in the creation of the National Coastal Geomorphology classification and geodatabase. This data is underpinned by pre-existing spatial data sourced from local, state and federal government agencies that were reclassified to conform to the new National Coastal Geomorphology classification scheme.

This report describes the rationale and workflow for the management and distribution of the National Coastal Geomorphology data undertaken as part of 'Schedule 10', the subsequent phase of this programme. Geomorphology data, together with elevation, hazard and exposure data, underpin assessments of coastal vulnerability for current and future climate conditions. Therefore it is critical that these data are made available to coastal scientists and land use management and planning stakeholders and the community. The purpose of the work described in this report is to establish a mechanism to manage and distribute the National Coastal Geomorphology data and the newly created National Coastal Geomorphic classification scheme.

The future work section of this report makes recommendations around the next stage in the development of this dataset. A key issue is the development of a formal governance model to enable a comprehensive revision and maintenance program of the data and the classification scheme, and ensure sustainability through continued stakeholder engagement in the product.

2 Rationale

Sea level around Australia is rising (Church et al., 2006) and all of Australia's major cities, with the exception of Canberra, are likely to be affected by higher tides and more frequent storm-related flooding (Walsh et al., 2004). This highlights the need to understand how the coastline will respond to hazards associated with climate change and sea level rise, such as erosion, recession, permanent inundation, and storm-related tides and flooding. The development of fundamental vulnerability indices for risk assessments of these coastal zones requires a detailed understanding and mapping of the coastal geomorphology. The impacts of climate change and sea level rise will continue into the future. The work described in this report will improve the national capacity to carry out coastal impact assessments underpinning adaptation planning.

Previously, geomorphological information frequently failed to match across jurisdictional boundaries because of differences in the definitions used in the maps. However, two national scale coastal geomorphology classifications and map products were created under a programme of work supporting an assessment of the vulnerability of coastal regions to the impacts of sea level rise, the National Coastal Risk Assessment (NCRA; DCC, 2009). First, the Smartline coastal geomorphic map, or 'Smartline' (Sharples et al., 2009), a polyline representation of the shoreline that maps the entire Australian coast by classifying geomorphic features within 500 m of shoreline at the mean high water mark. Secondly, utilising all existing digital polygon-based geomorphology/geology datasets Geoscience Australia developed a first version of a nationally consistent geomorphic polygon classification and map of the Australian coastal zone (Griffin et al., 2010). Jointly, the Smartline and polygon data constitute the National Coastal Geomorphology (NCG) dataset of Australia (Griffin et al., 2010). These data can be visualised as a landform map of the coastal zone. The classification scheme was also used to map the geomorphology of the Newcastle to Wollongong coast (Nicolas and Hazelwood, 2011) because several significant gaps in the available geomorphology and geology datasets were noted in the reclassification process. This gave an opportunity to test the polygon classification scheme for use in mapping. While the overall conclusion drawn from that exercise is that the classification as it stands is useable in the assessment of coastal vulnerability, a number of issues remain, including how to incorporate data from diverse sources into a national geomorphic mapping scheme, and the adequacy of the scheme for all sections of the Australian coast (Griffin et al., 2010).

The work described in this report aimed to make the National Coastal Geomorphology dataset a national product of enduring value by ensuring it is accessible and available to all stakeholders. This programme also included a process of engagement with the organisations who contributed to the original data, to promote use of the dataset, and seek feedback on the delivery mechanism and classification scheme. This report makes recommendations on how future stakeholder engagement should be structured to ensure continued sustainability of this national source of fundamental coastal geomorphological information. This report makes recommendations on how future stakeholder engagement should be structured to ensure sustainability of this national dataset.

3 Objectives

The two principal objectives of this project are:

- To provide stewardship for the completed National Coastal Geomorphology (Polygon and Smartline) data by maintaining it within the Geoscience Australia corporate data infrastructure.
- The establishment of a mechanism to make the data discoverable, accessible and in a format suitable for downloading via Geoscience Australia's MapConnect web delivery portal.

The project activities included:

- Incorporation of the reclassified National Coastal Geomorphology (Polygon and Smartline) data and the classification scheme into the Geoscience Australia corporate ESRI ArcSDE infrastructure.
- Delivery of the Geomorphology datasets via Geoscience Australia's MapConnect web interface with links to the GA corporate and OzCoasts websites.
- Formalising of licensing and data sharing agreements.
- Initiating the consultation process of revising the Geomorphology classification scheme with state government geological and mapping agencies to develop a strategy to undertake further revisions.

4 Methodology

The project was undertaken and delivered through two concurrent phases: i) storage and delivery of the National Coastal Geomorphology (NCG) data, and ii) engagement with contributing stakeholders.

4.1 Storage and delivery of the NCG data

The National Coastal Geomorphology dataset and classification have been incorporated into Geoscience Australia's geological geodatabase infrastructure. The initial data structure and classification scheme required some modification in order to be integrated with GA's national onshore regolith classification scheme and database structures (Pain, 2008, Pain and Oliver, 1995, Pain et al., 1991, 2007).

Unconsolidated regolith material covers a large portion of the Australian continental coastal margin. A comprehensive standardised scheme for the compilation of regolith data – RTMAP - was developed over the last 2 decades through the work of Australian geological surveys and the CRC for Landscape Evolution and Mineral Exploration (CRCLEME). The 1:1M scale Surface Geology of Australia dataset, first published in 2008, used a similar but more simplified classification scheme to harmonise classification of unconsolidated surficial map units at a broad scale across all of Australia. The classification scheme was well suited to the Coastal Geomorphology data because it too defines the fundamental characteristics of the geomorphology classification, such as form, function (process), slope and constitution of coastal features. The shelf and anthropogenic descriptors from version 1 of the National Coastal Geomorphology classification were added to the onshore regolith classification scheme to cover the whole 'land to shelf' coastal continuum. Lists of classification terms were also compared with recent emerging, but not currently complete, international standards.

The National Coastal Geomorphology data is compatible with international standards for spatial geoscience data, as defined by OGC¹, ISO, and IUGS. Broadly put, these standards define best practice for the exchange of geospatial and geological data over the internet by ensuring i) the use of standard terminology in a way that is recognised by the international geospatial and geoscience communities, and ii) that relevant metadata for the dataset is captured for data discovery, describing appropriate use and interpretation of the data, and facilitating integration with other standardised datasets, such as geology, coastline geometry, bathymetry, elevation, and soil maps. The ESRI geodatabase environment provides functionality such as dynamic access, which allows users to download dataset elements, rather than download the entire dataset at once.

The National Coastal Geomorphology data was modified and entered into the database via the following steps:

¹ Open Geospatial Standards website

4.1.1 Modification of the classification

The primary level attribute descriptions of the National Coastal Geomorphology (NCG) classification were changed to conform to the existing regolith classification terminology ([Table 1](#)).

Table 1 Changes made to the descriptions of each level of the classification scheme.

Level	NCG classification From	Regolith classification To
1	Substrate	Substrate
2	Coastal Depositional System	Environment
3	Coastal Geomorphic Feature	Landform type
3a	Geomorphic Feature Detail	Landform subtype

4.1.2 Matching the classification vocabularies

This involved introducing coastal geomorphology terms and their definitions not already in the regolith vocabulary and modifying them to integrate with existing terms based on international standards if available. [Table 2](#) shows examples of the changes made to the existing classification scheme in order to integrate with the continental regolith classification scheme vocabulary. See [Appendix 3](#) for the complete revised classification scheme.

Table 2 Changes to the classification scheme vocabulary.

NCG schema From	Regolith Schema To
Level 2- Coastal Depositional System	Level 2 - Environment
Alluvial Plain	Alluvial
Anthropogenic	Anthropogenic (Coastal)
Coastal Barrier	Coastal Barrier, Backbarrier
Bedrock	Coastal Bedrock
Unclassified	Unknown
Level 3 - Coastal Geomorphic Feature	Level 3 -Landform Type
Bar	Bar (Alluvial)
Bar	Bar (Coastal)
Palaeochannel	Abandoned channel
Undifferentiated	Alluvial landform/ Estuarine, delta landform

4.1.3 Create the geodatabase structure

The source data was captured at 1:250,000, 1:100,000 and 1:50,000 scale. In the geodatabase structure there was no attempt to create a single scale product by re-sampling or interpolating between scales. This was to ensure that users of the National Coastal Geomorphology data did not

utilise data at inappropriate scales, while retaining the maximum amount of information where it existed. [Table 3](#) details the high level geodatabase schema and the source data for feature.

Table 3 Name of the NCG data themes and the source of the data stored within.

NCG Data theme	Original dataset name	Data Custodian
Surface Geology Reclassified 1:500,000	QLD Geological Mapping (polygons created vector data) Regional Sheet areas	Dept. of Mining and Exploration (DME) QLD
Surface Geology Reclassified 1:250,000	Bedrock Geology - Comprehensive Coastal Assessment Toolkit 1:250,000	Dept. of Planning (DoP) NSW
	1:250,000 Geological Map Series	Dept. of Primary Industries (DPI) NSW
	1:250,000 Geology Sheets	Dept. of Resources (DoR- PIFR) NT
	Geoscience Australia 1:250,000 Geology Sheets	Geoscience Australia (GA)
	1:250,000 Digital Geology Polygons	Dept. of Infrastructure, Energy and Resources (DIER) TAS
	Vic geological polygons (GEOL250)	Dept. of Primary Industries (DPI) VIC
	1:250,000 Geological Maps	Department of Mines and Petroleum (DMP) WA
	1:250,000 Geological Maps	GA
Surface Geology Reclassified 1:100,000	1:100,000 Geological Map Series	DPI NSW
	Extractive Geology of the Outer Darwin Area	DoR – PIFR NT
	QLD Geological Mapping Data 1:100,000 Sheet areas	DME QLD
	QLD Geological Mapping Data Regional Sheet areas	DME QLD
	Detailed Surface Geology	Department of Environment and Natural Resources (DENR) SA
	Vic geological polygons (GEOL100)	DPI VIC
Surface Geology Reclassified 1:100,000	1:100,000 Geological Maps	DMP WA
Geomorphology Reclassified 1:100,000	Estuarine Macrophytes - Comprehensive Coastal Assessment Toolkit	DoP NSW
	CYPLUS - Cape York Peninsula Land Use Survey	GA
	Tasmanian Quaternary Coastal Sediments Digital Polygon Map Version 5	Department of Primary Industries, Parks, Water and Environment (DPIWE) TAS
Oz Estuaries Reclassified 1:100,000	NSW Geohabitats	GA
	NT Geohabitats	GA
	QLD Geohabitats	GA
	SA Geohabitats	GA
	Tas Geohabitats	GA
	Vic Geohabitats	GA

NCG Data theme	Original dataset name	Data Custodian
	WA Geohabitats	GA
Geomorphology Reclassified 1:50,000	Coastal Hazards, Sand Dunes and Inland Runoff Areas of SA	DEH SA
	Salt marsh and Mangrove Habitats of SA	DEH SA
	Coastal shoreline types and habitats mapped as part of the Coastal Resource Atlas program for Victoria (1990-98)	DSE VIC
	Regolith-Landform resources of WA	DMP WA
	1:50,000 Environmental and Urban Maps	DMP WA
Geomorphology Reclassified 1:25,000	Acid Sulphate Soils Risk Mapping	Department of Environment and Climate Change NSW
	Quaternary Geology - Comprehensive Coastal Assessment Toolkit	DoP NSW
	Land Resources of NT 1:25,000	Natural Resources, Environment, The Arts and Sport NT
	Foreshore, dune and shoreline stability classifications between Guilderton and Dongara	Department of Environment and Conservation (DEC) WA
	Marine Habitats of WA	DEC WA
Regolith Geomorphology 1:25,000	Schedule 4 - Infilling mapping	GA
Surface Geology Reclassified 1:25,000	The Geology of the Gold Coast Region	Gold Coast City Council
Surface Geology Reclassified 1:25,000	1:25,000 Digital Geology Polygons	DIER TAS

4.1.4 Migration of the data into the GA Enterprise Geodatabase

The process occurred in the following steps ([Figure 1](#)).

- Transfer of the NCG data into a development environment (SDEDEV) in order update the vocabulary and implement the modified data structure
- Transfer modified NCG data in the production environment (SDEPROD) and incorporate it into the corporate Geology geodatabase structure
- Undertake quality control and assurance checks on the data to ensure automated processing scripts were successful
- Creation of the OGC, ANZLIC² and ISO compliant metadata for each of the component dataset shown in [Table 3](#).
- Migrate data into the distribution environment (DISTPROD) for discovery and delivery via the MapConnect application.

² More information can be found here: <http://australia.gov.au/directories/australia/anzlic>.

GA Geodatabase environment

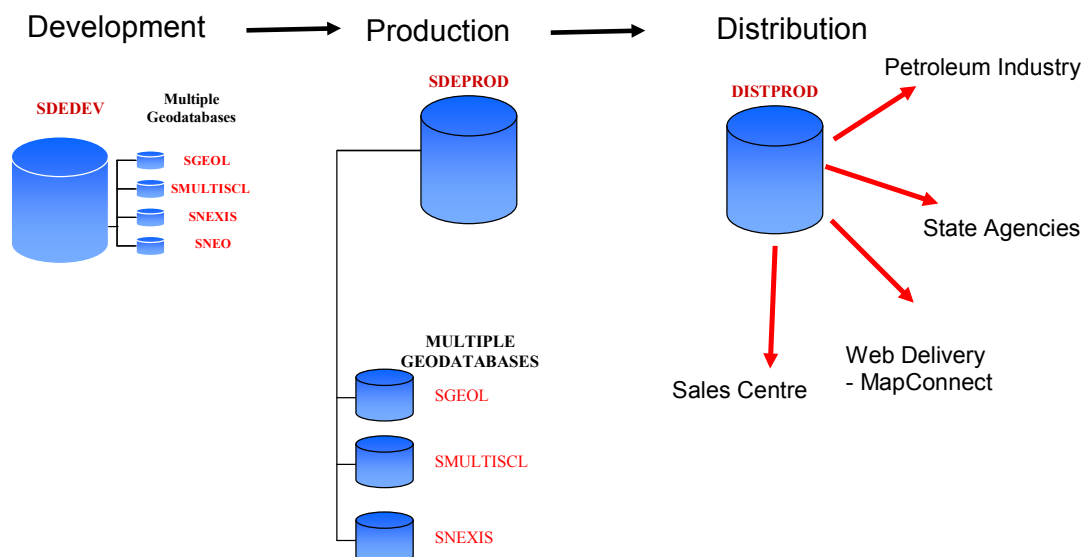


Figure 1 Schematic of Geoscience Australia's spatial geodatabase environment. Public access to the data is from the distribution environment DISTPROD.

4.1.5 Delivery of the National Coastal Geomorphology data via MapConnect.

MapConnect (<http://mapconnect.ga.gov.au/MapConnectMap/>) allows users to easily access spatial data, which is categorised by data themes. It allows users to download datasets from a standard web browser. In 2007, MapConnect won an ESRI Web challenge award and has since had over forty thousand free downloads to public, private and industry stakeholders. MapConnect was originally designed for discovery and distribution of GA's seamless 1:250,000 scale topographic map data, but has since been expanded to incorporate: 1:1,000,000 scale Global Map topographic data; 1:1,000,000 and 1:2,500,000 scale Surface Geology data and the national Groundwater dataset of basin scale recharge and discharge estimates.

MapConnect contains four different data themes to supply data to users.

- **Geology** – Includes 1:1 million scale and 1:2.5 million scale geological map data for download. Regolith-Geomorphology data (the National Coastal Geomorphology dataset) resides in this theme.
- **1:250,000 scale Topography** - The 1:250,000 theme is a convenient way to access the national topographic 1:250,000 scale Geodata Series 3 data.
- **GlobalMap topographic data**. The GlobalMap theme provides access to the national topographic 1:1 million scale data.
- **geoMAP** - The geoMAP theme allows you to select a project (a set of spatial data related by topic and scale) and download a high quality PDF map.

Data download

The Order Extract functionality within MapConnect allows the user to select an extent from the national dataset and choose individual layers to extract. There are several spatial data formats to choose from, and the maximum size of extract per order for more detailed datasets is as follows.

- Approximately 9 x 1:250,000 map tiles or 15 square degrees of area for 1:250,000 Topographic data.
- Approximately 250 square degrees of area (~ the size of Western Australia) for 1:1 million Geology and Geomorphology data.

The entire national datasets for Global Map 1:1 million Topography and 1:2.5 million Geology data including the National Coastal Geomorphology dataset are free to download. The entire 1:250,000 Topographic and 1:1 million Geological and Geomorphology datasets are too large for download and can be ordered on DVD from the Geoscience Australia Sales Centre (see related links in left-hand navigation of the MapConnect webpage; [Figure 2](#)).

On 29 February 2012, the beta version of MapConnect with the National Coastal Geomorphology data went live via a “blind” URL ([Figure 2](#); <http://mapconnect.ga.gov.au/MapConnectMap/>) in order to demonstrate the functionality and elicit feedback on the look and feel of the site and the product from the data providers. Over the past several months, all requests for access to the National Coastal Geomorphology data have been directed to the beta MapConnect site in order to test the discovery and download capability of MapConnect. Even in its limited release stage, the National Coastal Geomorphology data has been downloaded six times already. There will also be a link to the URL on the OzCoasts website.

MapConnect currently runs on ESRI's ArcIMS technology but will in the near future be replaced with ArcGIS Server and a new mapping portal to Geoscience Australia. The Web Service Delivery tool developed under this program will have advanced searching features and similar map production and extract functionality as MapConnect.

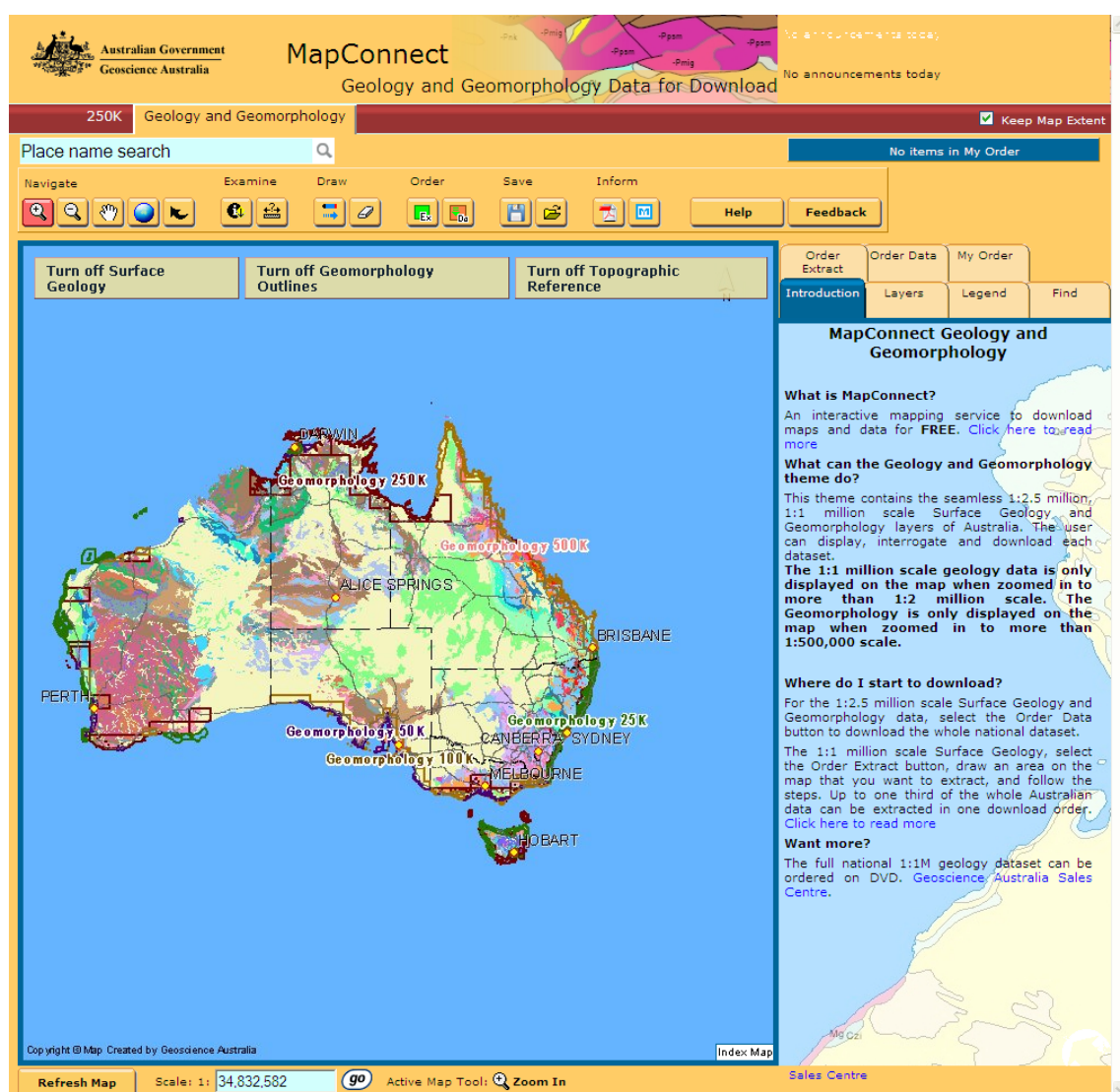


Figure 2 MapConnect front page for the National Coastal Geomorphology dataset

4.1.6 Formalisation of licensing arrangements

All National Coastal Geomorphology data is freely available to the public under Creative Commons By Attribution 3.0 (CC BY3.0). All data access requests and licensing agreements entered into by the Commonwealth during the production of the Smartline and polygon data constituting the NCG data were reviewed and assessed as appropriate for this license by GA prior to the release of the data on MapConnect. More information about the license can be found at the Creative Commons website.

4.2 Engagement with contributing stakeholders

The potential to develop a National Coastal Geomorphology dataset is dependent on the availability of geomorphology data supplied by states and territories. Continued stakeholder engagement is fundamental to ensure the data remains current and useful. It is essential to ensure that the product meets the requirements of the user community, and also to promote continued co-investment for future revision and additions to the data.

GA has started an engagement phase with the individual agencies to seek feedback on the product and its delivery mechanism, and most importantly, to discuss the strategy for the dataset into the future. The National Coastal Geomorphology classification and database were presented to stakeholders at the “Geomorphology” workshop organised by the DCCEE in Bateman’s Bay (NSW) in April 2012. Participants included around 35 of the leading coastal geomorphology researchers and state government officers from across the country.

One of the outcomes of this workshop was an initial agreement to set up a ‘National Coastal Geomorphology Information Committee’. This committee would provide governance for the management of the Geomorphology dataset, and take a structured approach to decisions on potential revisions of the dataset and its underlying classification scheme. The committee could also set priorities for strategic development of the data, and coordinate co-investment in resources to enable this. Membership would be open to all stakeholders on a self-selecting basis, although particular issues could be decided on by targeted sub-committees. The committee chair would be rotated on an annual basis, while the secretariat would be held by a Commonwealth agency. In this proposed form, the National Coastal Geomorphology Information Committee follows the highly successful model of the National Geological Information Committee, which includes members from all state geological surveys, with GA as secretariat.

After the Geomorphology workshop, each of the state and territory agency representatives was contacted either in person or by phone during June and July 2012. During these conversations, the state and territory officers were (again) thanked for their contribution to the creation of the national dataset. The conversation also reiterated how the state and territory data fed into the final product, the National Coastal Geomorphology data, which is now available through MapConnect. Officers were asked for initial feedback on the National Coastal Geomorphology data, in particular:

- the delivery mechanism (the MapConnect website)
- the classification system used
- which government agency would be best placed to take the role of the custodian for the data
- their views on how this product would serve their needs.

Furthermore, GA asked for feedback on the proposal to establish a National Coastal Geomorphology Information committee. The list of agencies and the outcomes of these discussions are summarised below in [Table 4](#).

Table 4 List of contributing agencies, their representatives and feedback.

State	Department /Agency and contact(s)	Discussion Outcomes	Next steps
NSW	Office of Environment & Heritage (within the Prime Minister and Cabinet portfolio) – David Hanslow and Jane Gibbs	With the creation of the Office of Environment and Heritage from the former Department of Environment, Climate Change and Water (DECCW) there have been a number of shifts in policy focus and priorities in relation to coastal activities. For example, the NSW Coastal Plan is currently being reviewed. This has resulted in a degree of uncertainty in terms of who within the NSW State government will be best placed to assume stewardship role over the NGC data.	GA has initiated ongoing dialogue with the representatives from the OEHL to ensure that at the conclusion of the review process an appropriate steward for the NCG Data is identified within the NSW government and the product is made available.
QLD	Department of Environment and Resource Management: Queensland Climate Change Centre of Excellence (QCCCE) – Kevin Chetwynd Natural Resources and Environment, Environmental Planning – Sel Sultmann	As of 30 March 2012 the Queensland Government announced machinery-of-government changes for all departments. The functions of the former Department of Environment and Resource Management are now be delivered by the following departments: Department of Environment and Heritage Protection Department of Natural Resources and Mines This resulted in the QCCCE being disbanded and many of the coastal programs pertinent to this Schedule of work being terminated. This has created a high degree of uncertainty as to which area within the QLD government will be best placed to assume stewardship role over the NGC data.	GA is engaged in dialogue with Kevin Chetwynd in order to determine which of the new government departments will be responsible for the coastal zone. Once the appropriate department and contact has been identified, GA will provide the NCG data.
VIC	Department of Sustainability and Environment (DSE) – Werner Hennecke	The DSE was in the process of being re-structured and the outputs of the Future Coasts program were being shelved for the time being. However, the Smartline for Victoria has been updated using a LiDAR derived (0m contour) coastline removing existing licensing issues with the VIC Department of Primary Industries.	Werner Hennecke has provided a number of potential contacts within the DSE that may be able to advise GA the appropriate government agency to take on the role of custodian of the NCG data. GA will initiate dialogue with these contacts once the re-structuring of the DSE is complete (August 2012).

State	Department /Agency and contact(s)	Discussion Outcomes	Next steps
SA	Department of Environment, Water and Natural Resources – Doug Fotheringham	Doug indicated that DEWNR is the appropriate department within the SA to undertake the role of custodian for the NCG data. DEWNR has also completed work on defining the sediment cells for their coastline (e.g. the Eyre Peninsular and for the Coorong) that can be incorporated into any work undertaken at the National level.	GA has presented the NCG data along with an overview of the proposed national Sediments Cells program to the SA Coastal Protection Board in order to establish the mechanism for ongoing support for the delivery and distribution of the data within the SA government. The NCG data is to be hosted by the SA government within the Science and Innovation branch within the Department of Environment, Water and Natural Resources.
TAS	Department of Primary Industries, Parks, Water and Environment DPIW – Rhys Stickler	DPIW is the Tasmanian government department that has agreed to be custodian of the NCG data.	The NCG data has been provide to Tasmania and will be hosted by Tasmanian NRM data library portal and include a link to GA's MapConnect web delivery tool.
WA	Geological Survey Western Australia (GSWA) – Bob Gozzard	GSWA have recently undertaken a comprehensive coastal mapping exercise for the entire WA Coastline. In key areas, the geomorphology has been mapped at <1:25 000. The quality of the new coastal mapping is superior to the data within the NCG, therefore GSWA have no interest in receiving back the NCG data for WA.	Maintain contact with the GSWA in order to source the new geomorphology mapping to be included in the next revision of the NCG data.

5 Outcomes and Recommendations for Future Work

5.1 National Coastal Geomorphology data

This fundamental coastal landform data is now freely available and will be useful to scientists, coastal engineers, planners and coastal managers. Comprising the Smartline landform mapping system and the coastal geomorphology polygon data, this product enables a nationally consistent approach to coastal management and adaptation for future climate. The database is fully compliant with international geoscience and geospatial standards. The National Coastal Geomorphology dataset will be available in September 2012 through MapConnect and linked with the OzCoasts website.

5.2 Stakeholder engagement

After the development of the dataset, all contributing stakeholders were contacted to discuss the dataset and its future. Stakeholders were also informed of the dataset and its potential use at the Coastal Geomorphology workshop, in April 2012. GA recommends continued stakeholder engagement is vital to making the National Coastal Geomorphology classification and data into a sustainable and useful product for governments at all levels. At the workshop and in subsequent stakeholder engagement, GA proposed the establishment of a Coastal Geomorphology Information Committee (CGIC). The committee is based on the successful and long running model of the Government Geoscience Information Committee (GGIC). The Coastal Geomorphology Information Committee would establish governance arrangements for the dataset, and decide on its future development, including revisions to the classification scheme, updates to the data, or alternative delivery mechanisms.

GA aims to promote the establishment of a Coastal Geomorphology Information Committee with a defined objective, structure, membership and Terms of Reference, and publish an official strategy for the data by June 2013. The first official Coastal Geomorphology Information Committee meeting was organised to be held at the 'Coast to Coast' conference in September 2012. All stakeholders attending the 'Batemans Bay 2012' workshop, state Geological Surveys, and other parties on the stakeholder engagement list ([Table 4](#)) were invited. The objective of the first meeting will be to agree a schedule and agenda for establishment of a CGIC, agree on potential membership and Chair and Secretariat roles, and discuss the options for governance arrangements.

The challenge in establishing the CGIC is identifying the appropriate stakeholder community and the associated governance structure. The Committee would gain credibility, authority and longevity if it was part of an overarching structure of data governance. This could be achieved by reporting up to a larger national body looking after similar datasets or stakeholders. One option is the Chief Government Geologists Committee; however, the geomorphological stakeholder community is more diverse than the geology community.

Another option is the Office of Spatial Policy. [Appendix 3](#) provides an overview of the functions of these potential higher level bodies.

5.3 Australian Coastal Compartments Conceptual Framework

During the Coastal Geomorphology workshop held in Batemans Bay in April 2012, broad agreement was reached on the importance of continuing the development of a conceptual classification framework to support coastal monitoring and management. The establishment of the National Coastal Geomorphology classification and dataset feeds into a potential future programme of work that would support coastal modelling, monitoring and management for current and future climate hazards. This work would focus on the implementation of a conceptual model of 'coastal compartments' based on the processes operating on the coasts, particularly sediment transport in the coastal zone.

A coastal compartment conceptual framework would integrate a range of different classifications, and optimise their contribution to coastal vulnerability assessments in current and future climate. For example, the coastal compartments framework would integrate and consolidate the Smartline and landform data in the National Coastal Geomorphology classification, and geomorphic types used in the OzEstuaries scheme (Ryan et al., 2003); [Table 5](#). This conceptual framework would need to extend to soft-rock and coral coasts to form a framework and classification scheme that covers the whole coastal continuum.

An implementation of the coastal compartments has been completed in Western Australia (Stul et al., 2012; Eliot et al., 2011) and is being considered in other locations. However, at this stage, there is no nationally consistent landform and process classification that integrates local and regional scales. The work required to continue the development of the Australian Coastal Compartments conceptual model can be broadly summarised as follows.

- The development of a nationally consistent Coastal Compartment conceptual framework and the classification that is useful to coastal management and planning at national, state, regional and local scales requires.
- An audit of existing coastal process literature (peer-reviewed, commissioned reports and other "grey" literature sources). Identifying and creating for digital data (including metadata) from sources identified and preparation for storage within the appropriate data model.
- A consistent methodology and for the development coastal compartments for around Australia.
- Development of an Australian coastal compartments data model to enable the effective description, discovery, storage, and delivery of the framework.

As the custodian of national scale geoscience data, GA can further advise government on how to incorporate the coastal compartments data and associated data products into a national, publicly available storage and distribution system.

Table 5. An example of how the Regolith polygon classification scheme adapted for the coastal zone.

Coastal Compartments Primary , Secondary, Tertiary			Landform Compartment/System (= level 2 of NCG classification)	Landform Pattern (= level 3 of NCG classification)	Landform elements (= level 3a of NCG classification)	Element details (= level 4 of NCG classification)
Compartment	Regional onshore cell	Local onshore sub-cell	Alluvial/colluvial/Fluvial (Transported)	Channel Floodplain Lakes Swamps Levee Meander scroll Terrace undifferentiated	Bar, terrace, floodplain, levee, lake, swamp, beach, dune,	Lithology, grainsize, thickness, Sedimentary structures Slope (0-90) Aspect (0-360)
			Anthropogenic (<i>in situ</i> , and transported)	Artificial water body Embankment Fill/excavation Floodplain undifferentiated	Fill/excavation Artificial water body Embankment, wharf, etc	
			Barrier coast (Transported)	Sandy Barrier and Dune systems	Beach Bar Lagoon Dune Dunefield Intertidal flat Sandshee, etc	
			Delta/Deltaic (Transported)	Delta	Bar Bayhead delta Beach Channel, etc	
			Estuarine (Transported)	Embayed coastlines		
			Bedrock including Rocky shores, backshores etc (<i>in situ</i>)	Cliff Scarp Rock platform	Shore platform	Igneous, metamorphic, sedimentary
			Regolith (weathered bedrock) including regolith shores, regolith backshores etc (<i>in situ</i>)	Indurated material Cemented duricrust Nodules		
	Regional shelf cell	Local shelf sub-cell	Shelf (part of littoral cell) (transported)	Intertidal flat Beach Sandsheet, etc		
			Shelf (part of littoral cell) (<i>in situ</i>)	Apron Basin Cay Escarpment Knoll Reef etc	e.g. reef detail (crescentic, fringing, lagoonal, patch, planar)	

6 Conclusions

There is a clear need nationally for open access to coastal landform data that is used by coastal scientists, managers and planners in climate change adaptation. The National Coastal Geomorphology data has been made available for public access through the Geoscience Australia “MapConnect” portal. MapConnect allows users to view, download and interaction with this fundamental spatial data.

This report sets out a strategy around further development of the National Coastal Geomorphology data, as part of an Australian Coastal Compartments conceptual framework and classification scheme. Part of this strategy is the setting up of a national Coastal Geomorphological Information Committee to provide governance for data management and facilitate engagement with relevant stakeholders in the development and implementation of an integrated coastal landform and physical process classification scheme.

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Appendix A Revised National Coastal Geomorphology Classification

Environment		Landform Type		Landform Subtype	MAP_SYMB
Alluvial	AL	Abandoned channel	ac	Abandoned channel detail	Alac
	AL			Backswamp	Alac01
	AL			Freshwater swamp	Alac02
	AL			Oxbow lake	Alac03
	AL			Saline swamp	Alac04
	AL			Swamp	Alac05
	AL	Alluvial fan	af		Alaf
	AL	Bar (alluvial)	br		Albr
	AL	Alluvial plain lake	al		Alal
	AL	Alluvial Plain	ap		Alap
	AL	Channel	ch		Alch
	AL	Crevasse splay	cs		Alcs
	AL	Flood plain	fp	Floodplain detail	Alfp
	AL			Braided plain	Alfp06
	AL			Meander plain	Alfp07
	AL	Lacustrine plain	lp		Allp
	AL	Levee	lv		Allv
	AL	Meander scroll	ms		Alms
	AL	Playa	py		Alpy
	AL	Alluvial terrace	tr		Altr
	AL	Alluvial landform	un		Alun
Estuarine, Delta	ED	Abandoned channel	ac	Abandoned channel detail	Edac
	ED			Backswamp	Edac01
	ED			Freshwater swamp	Edac02
	ED			Oxbow lake	Edac03
	ED			Saline swamp	Edac04
	ED			Swamp	Edac05
	ED	Bar (coastal)	br		Edbr
	ED	Bayhead delta	bd		Edbd
	ED	Beach	bc		Edbc
	ED	Beach ridge plain	bp	Beach ridge plain detail	Edbp

Environment		Landform Type		Landform Subtype	MAP_SYMB
	ED			Barrier lake	Edbp13
	ED			Interbarrier depression	Edbp16
	ED			Lunette	Edbp17
	ED			Transgressive dune	Edbp21
	ED	Central basin	cb		Edcb
	ED	Channel	ch		Edch
	ED	Chenier	cn		Edcn
	ED	Chenier plain	cp		Edcp
	ED	Coastal lagoon	cl	Lagoon detail	Edcl
	ED			Impounded lagoon	Edcl08
	ED			Tidal lagoon	Edcl09
	ED	Depression	dp	Depression detail	Eddp
	ED			Freshwater swamp	Eddp02
	ED			Saline swamp	Eddp04
	ED			Swamp	Eddp05
	ED	Dune, dunefield	dd	Dune detail	Eddd
	ED			Barrier lake	Eddd13
	ED			Blowout dune	Eddd14
	ED			Foredune	Eddd15
	ED			Interbarrier depression	Eddd16
	ED			Lunette	Eddd17
	ED			Parabolic dune	Eddd18
	ED			Perched dune	Eddd19
	ED			Scarp	Eddd20
	ED			Transgressive dune	Eddd21
	ED	Floodplain	fp		Edfp
	ED	Intertidal flat	if		Edif
	ED	Salt flat (coastal)	sf		Edsf
	ED	Sandsheet	ss		Edss
	ED	Subtidal flat	sb		Edsb
	ED	Supratidal flat	sp		Edsp
	ED	Tidal bank	tb		Edtb
	ED	Tidal delta	td		Edtd
	ED	Estuarine, delta landform	un		Edun
Coastal barrier, backbarrier	CB	Backbarrier flat	bf		Cbbf
	CB	Bar (coastal)	br		Cbbr

Environment		Landform Type		Landform Subtype	MAP_SYMB
	CB	Beach	bc	Beach detail	Cbbc
	CB			Tide-dominated	Cbbc22
	CB			Tide-modeified	Cbbc23
	CB			Wave-dominated	Cbbc24
	CB	Beach ridge plain	bp	Beach ridge plain detail	Cbbp
	CB			Barrier lake	Cbbp13
	CB			Interbarrier depression	Cbbp16
	CB			Lunette	Cbbp17
	CB			Transgressive dune	Cbbp21
	CB	Chenier	cn		Cbcn
	CB	Chenier plain	cp		Cbcp
	CB	Coastal lagoon	cl	Lagoon detail	Cbcl
	CB			Impounded lagoon	Cbcl08
	CB			Tidal lagoon	Cbcl09
	CB	Depression	dp	Depression detail	Cbdp
	CB			Freshwater swamp	Cbdp02
	CB			Saline swamp	Cbdp04
	CB			Swamp	Cbdp05
	CB	Dune, dunefield	dd	Dune detail	Cbdd
	CB			Barrier lake	Cbdd13
	CB			Blowout dune	Cbdd14
	CB			Foredune	Cbdd15
	CB			Interbarrier depression	Cbdd16
	CB			Lunette	Cbdd17
	CB			Parabolic dune	Cbdd18
	CB			Perched dune	Cbdd19
	CB			Scarp	Cbdd20
	CB			Transgressive dune	Cbdd21
	CB	Intertidal flat	if		Cbif
	CB	Platform beach	pb		Cbpb
	CB	Sandsheet	ss		Cbss
	CB	Scarp	sc		Cbsc
	CB	Sill	sl		Cbsl
	CB	Subtidal flat	sf		Cbsf
	CB	Supratidal flat	sp		Cbsp
	CB	Tombolo	tb		Cbtb
	CB	Washover fan	wf		Cbwf

Environment		Landform Type		Landform Subtype	MAP_SYMB
	CB	Coastal barrier, backbarrier landform	un		Cbun
Anthropogenic (coastal)	AF	Artificial water body	aw		Afaw
	AF	Embankment	eb		Afeb
	AF	Fill, excavation	fe		Affe
	AF	Anthropogenic floodplain	af		Afaf
	AF	Anthropogenic landform	un		Afun
Coastal Bedrock	BR	Cliff	cf		Brcf
	BR	Lithified dune	ld		Brlld
	BR	Platform beach	pb		Brpb
	BR	Reef	rf	Reef detail	Brrf
	BR			Crescentic reef	Brrf22
	BR			Fringing reef	Brrf23
	BR			Lagoon reef	Brrf24
	BR			Patch reef	Brrf25
	BR			Planar	Brrf26
	BR	Shore platform	sp	Platform detail	Brsp
	BR			Horizontal shore platform	Brsp27
	BR			Sloping shore platform	Brsp28
	BR	Sinkhole	sh		Brsh
	BR	Stack	sk		Brsk
	BR	Talus slope	ts		Brts
	BR	Undifferentiated slope	us		Brus
	BR	Bedrock landform	un		Brun
Shelf	SF	Cay	ca		Sfca
	SF	Escarpment	es		Sfes
	SF	Reef	rf	Reef detail	Sfrf
	SF			Crescentic reef	Sfrf22
	SF			Fringing reef	Sfrf23
	SF			Lagoon reef	Sfrf24
	SF			Patch reef	Sfrf25
	SF			Planar	Sfrf26
	SF	Sumarine apron, fan	af		Sfaf
	SF	Submarine basin	bs		Sfbs
	SF	Submarine canyon	cy		Sfcy
	SF	Submarine escarpment	ec		Sfec

Environment		Landform Type		Landform Subtype	MAP_SYMB
	SF	Submarine knoll, hill, mountain, peak	kn		Sfkn
	SF	Submarine pinnacle	pn		Sfpn
	SF	Submarine plateau	pl		Sfpl
	SF	Submarine ridge	rd		Sfrd
	SF	Submarine saddle	sd	''	Sfsd
	SF	Shoal, bank	sh		Sfsh
	SF	Sill	si		Sfsl
	SF	Slope	so		Sfsp
	SF	Submarine terrace	tr		Sftr
	SF	Submarine valley, deep, hole	vy		Sfvy
	SF	Subtidal flat	sb		Sfsb
	SF	Tidal bank	tb		Sftb
	SF	Self landform	un		Sfun
Unknown	Uk	Unknown	uk		Ukuk

Appendix B Regolith Geomorphology Geodatabase Schema

Field Name	Alias	Description/comments	Vocabulary/Domain/Constraints	Previous classification
UNITNO	Unitno	Unique unit number identifier (equivalent of STRATNO). Primary key link to other related tables.	an integer between 1 and 99,999,999	none
PROJECT	Project	eg: Gilmore Project, Kalgoorlie 1M Regolith Terrain, National Coastal Geomorphology	Project name	"National Coastal Geomorphology"
MAP_SYMB	MapSymbol	A text identifier for the map unit (eg, CHer1)	free text	none
PLOT_SYMB	PlotSymbol	A field to allow a broader grouping of mapsymbol. ie, to plot data based on broader groupings. (eg, CH)	free text	none
SUBSTRATE	Substrate	Hard, Soft	Substrate	Substrate
ENVIRONMNT	PrimaryEnvironment	Alluvial, Colluvial, Coastal, Aeolian, Glacial, Erosional, Volcanic, Anthropogenic, Abyssal, Shelf, Slope, etc	Environment	Coastal depositional system
LNDFM_TYPE	PrimaryLandformType	eg, Alluvial floodplain, alluvial fan, beach, canyon, reef, etc	LandformType	Coastal Geomorphic feature
LNDFM_SBT	PrimaryLandformSubtype	eg, Meander plain.	LandformSubtype	Geomorphic feature detail
ECOSYSTEM	Ecosystem	The type of floral/faunal habitat or vegetation	Ecosystem	Habitat
AGE	Age	Named geological age of the regolith landform unit. (eg, Holocene, Pleistocene, Eocene, etc)	Age	Age
LNDFM_SUMM	LandformSummary	Free text description of the landform of the unit.	free text	none
REGO_SUMM	RegolithSummary	Free text description of the regolith materials of the unit.	free text	none
ECOSY_SUMM	EcosystemSummary	Free text description of the vegetation or habitat of the unit.	free text	none
SOIL_SUMM	SoilSummary	Free text description of the soil charcater of the unit.	free text	none
RELIEF	Relief	Free text description of relief character of the primary landform.	free text	none

Field Name	Alias	Description/comments	Vocabulary/Domain/Constraints	Previous classification
STRCT_CNTL	StructuralControl	Basement geological control of the primary landform, if any.	StructuralControl	none
MIN_ELEV	MinimumElevation	expressed in metres above sea level. Negative numbers for below sea level.	an integer between 99,999 and -99,999	none
MAX_ELEV	MaximumElevation	expressed in metres above sea level. Negative numbers for below sea level.	an integer between 99,999 and -99,999	none
MIN_TKNS	MinRegolithThickness	A general indication of the minimum thickness (in metres) of the regolith	a decimal number between 0.0 and 999.9	none
MAX_TKNS	MaxRegolithThickness	A general indication of the maximum thickness (in metres) of the regolith	a decimal number between 0.0 and 999.9	none
SRC_DATA	SourceData	Description of the source of the data. eg, a field survey in 2007, a citation, another agency	free text	Data source field
CAPT_SCALE	CaptureScale	The scale at which the data was captured or interpreted. This scale may or may not be different from the scale at which the data is intended to be used.	an integer between 1 and 99,999,999	Data scale field
CAPT_DATE	CaptureDate	Date that the data was captured	date between 1900-01-01 and 2100-01-01	none
MOD_DATE	ModifiedDate	Date that the data was subsequently modified	date between 1900-01-01 and 2100-01-01	none
INT_METHOD	InterpMethod	eg, field mapping, synthesis of published data, geophysics, etc. Can use "unknown"	InterpretationMethod	none
CONFIDENCE	Confidence	Level of confidence in the attribute interpretation. eg, High, medium, low. Can use "unknown"	Confidence	none
LOC_QUAL	LocationalQuality	A text description of the spatial accuracy of the linear feature. eg, accurate, approximate, etc. Can use "unknown"	LocationalQuality	none
LOC_ACC	LocationalAccuracy	Estimated spatial accuracy of the linear feature, in metres	an integer between 1 and 999,999	none
SCALE_FLAG	ScaleFlag	The denominator of the scale at which the data is designed to be used.	an integer between 1 and 99,999,999	none

Appendix C Overview of the proposed Coastal Geoscience Information Committee

This section provides an overview the potential stakeholder group or organisations for the proposed Coastal Geoscience Information Committee.

C.1 Chief Government Geologists' Committee

The Chief Government Geologists' Committee (CGGC) is a subcommittee of the Ministerial Council for Mineral and Petroleum Resources which in turn reports to the Council of Australian Governments (COAG) via the Standing Council on Energy and Resources. The CGGC's work program includes collaborative geoscience data acquisition and research programs, and establishing standards for management and delivery of geoscience information. In 1998 the Government Geoscience Information Committee (GCIC) was established with a mandate to provide and promote a coherent national strategic direction for the management and delivery of geoscience information. The CGCI objectives include:

- Provision of advice to the CGGC on strategies and technical direction for the management and delivery of geoscience information.
- Ensure effective and uniform delivery of geoscience information.
- Define and influence national and international standards/guidelines.
- Ensure consistent capture and submission of geoscience information.
- Collaborate with relevant national and international organisations.

The GGIC meet twice yearly, rotating the chair between the Commonwealth/State/Jurisdictions annually. GGIC comprises of representatives from State, Territory and Australian government geoscience agencies with varying backgrounds including information management, information technology, geology, cartography and geographic information systems. The annual GGIC work program focuses on.

- Developing and implementing of national geoscience related information standards and data models.
- Providing data access and delivery solutions and monitoring new and emerging trends in the domain.
- Making recommendations to CGGC to sponsor projects that will improve data and information exchange.
- Overseeing the CGGC-approved geoscience information projects.

The governance model of the GGIC could be an option for the proposed Coastal Geomorphology Information Committee. However, the challenge will lie in obtaining buy-in from the CGGC, whose current area of focus relates to the acquisition and provision of geoscience information for the

petroleum and mining resource sector, rather than for reducing the threat of natural hazards posed to the national interest.

C.2 Office of Spatial Policy

The Office of Spatial Policy (OSP) is an organisation which exists within the Department of Resources, Energy and Tourism (RET). It is a central policy unit, responsible for facilitating and coordinating spatial data management across Australian Government agencies. The Australia New Zealand Land Information Council (ANZLIC) is the peak intergovernmental organisation providing leadership in the collection, management and use of spatial information in Australia and New Zealand. ANZLIC's role is to facilitate easy and cost effective access to the wealth of spatial data and services provided by a wide range of organisations in the public and private sectors.

The OSP will be working with jurisdictions through ANZLIC to provide leadership in the collection, management and use of spatial information in Australia. OSP is currently undertaking a survey of the Australian Government departments and agencies to determine the ideal requirements for each of the national framework datasets. A preliminary list of the datasets is as follows:

- Geodetic network (Positioning Services)
- Property boundaries
- Address – Physical/Allocated/Postal
- Transport
- Geographic names (Gazetteer)
- Elevation/Relief
- Imagery
- Administrative boundaries
- Hydrography/Bathymetry
- Hydrology – Surface Water Features
- Land cover (built environment and vegetation).

The OSP has sought input from GA in development of the data specification for the national framework datasets. There is potential for the NCG data to be integrated into the “Land Cover” theme which has been broadly defined as an essential and authoritative source of information that can provide insight into the response of land cover to a wide variety of drivers, both natural and anthropogenic. It envisaged that the dataset would be used as an input into moderate to coarse scale models of inundation and erosion risk, and groundwater recharge and discharge.

There is potential for involvement with the ANZLIC initiative in relation the NCG data. The National Coastal Geomorphology dataset would automatically gain longevity and authority if it was recognised as an essential dataset under the ANZLIC Land cover. To get this recognition, lobbying is required, and an active Coastal Geomorphology Information Committee with clear governance structure would help make this case.