Australian Government

Geoscience Australia

2004–05 business plan

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Part 1: Geoscience Australia overview

Introduction

Geoscience Australia plays a critical national role by producing first-class geoscientific information and knowledge that enables government and community to make informed decisions about the exploitation of resources, the management of the environment, the safety of critical infrastructure, and the resultant wellbeing of all Australians.

Planned outcomes

Geoscience Australia's corporate outcome is:

- enhanced potential for the Australian community to obtain economic, social and environmental benefits through the application of first class geoscientific research and information.

More specifically, Geoscience Australia's intermediate-level outcomes are:

- enhanced global attractiveness of Australia's offshore and onshore exploration and investment opportunities;
- improved resource management and environmental protection; and
- safer communities and infrastructure.

The geoscientific information and knowledge generated by Geoscience Australia accomplishes the dual aims of achieving the above-mentioned outcomes and contributing to the achievement of three of the government's cross-portfolio national research priority (NRP) outcomes, namely:

- an environmentally sustainable Australia;
- frontier technologies for building and transforming Australian industries; and
- safe-guarding Australia.

Vision, strategic goals and national research priority goals

Geoscience Australia's vision is to be a world leader in generating and delivering national geoscience information and knowledge. To ensure its vision is realised, Geoscience Australia plans to:

- increase its influence with stakeholders and the community (strategic goal 1);
- improve the capability of the organisation and its staff (strategic goal 2); and
- achieve excellence in all aspects of its performance (strategic goal 3).

Geoscience Australia's 2004–05 operational response to these goals is incorporated into the agency's work program (see part 3).

Within the context of achieving its vision, strategic goals and planned outcomes, Geoscience Australia also plans to contribute to the five national research structural objectives; namely:

- knowledge creation;
- human capacity building;
- infrastructure development;
- knowledge diffusion/awareness; and
- collaboration.

Geoscience Australia's *NRP implementation plan* details the agency's mid-longer term operational response to these objectives, with its 2004–05 operational response incorporated into the agency's work program.

2004–05 resourcing, modus operandi and performance information

Located within the Department of Industry, Tourism and Resources (DITR), Geoscience Australia operates independently with respect to financial matters[1] and with some degree of autonomy on most other matters. Under the Financial Management and Accountability Act 1997, the Chief Executive Officer (CEO) of Geoscience Australia is responsible to the Minister for the efficient, effective, and ethical use of the resources of Geoscience Australia[2]. The program does not otherwise encompass any statutory/executive authorities or office holders.

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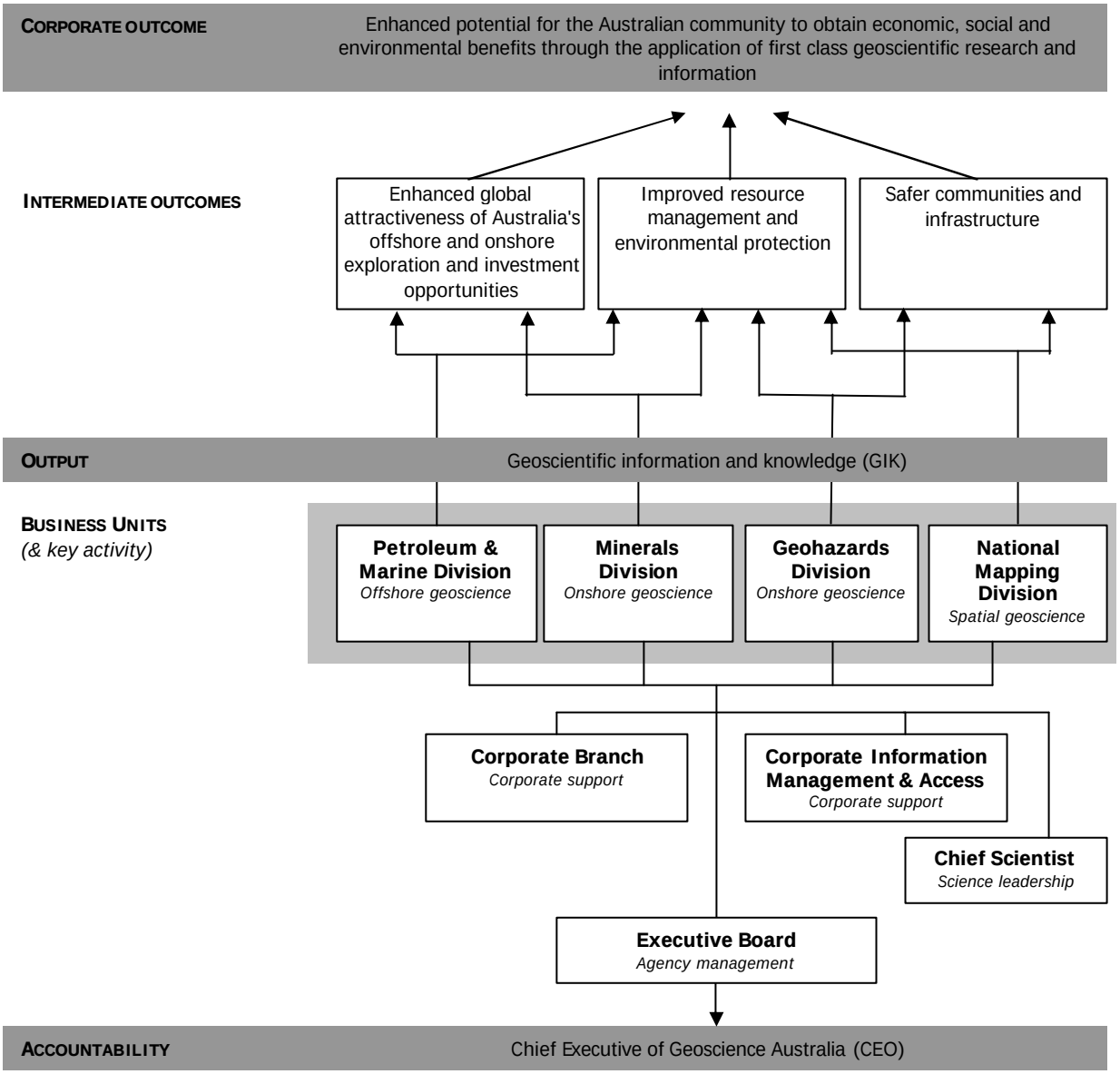
1 Under the Financial Management Act 1997, the program is required to operate as a "prescribed agency".

2 Although the program's executive team is internally referred to as the "Executive Board", it has no external authority (ie: the FMA Act 1997 doesn't encompass directors, councils nor governing bodies, such as those involved with agencies that operate under the CAC Act 1997).

Geoscience Australia overview

In 2004–-05, the total price of Geoscience Australia's output of geoscientific information and knowledge will be $110.872 million. The total appropriation for Geoscience Australia provided in the Australian Government's 2004–05 budget is $103 million. Attachment A details how the total 2004–05 appropriation and other revenue translates to total resourcing for Geoscience Australia's planned outcome. Attachment A also provides details of the movement in appropriation revenue between 2003-04 and 2004-05. Further detail about Geoscience Australia's funding is available from the 2004–05 portfolio budget statements.



At 1 July 2004, Geoscience Australia had 620 staff members: 88% were fulltime; 86% were ongoing; and 28% were female. Activities undertaken by the agency's four output-delivery divisions (i.e. the shaded business units in the diagram above) cover three broad areas of agency activity: offshore geosciences, onshore geosciences and spatial information. Geoscience Australia's:

- **offshore geoscience** activities are undertaken by staff in the agency's *Petroleum and Marine Division* and focus on identifying potential hydrocarbon areas and new prospective basins in Australia's offshore territories. Offshore geoscience activities also include mapping the outer limits of Australia's jurisdiction under the UN Convention on the Law of the Sea, and studies of the marine environment and estuarine health.
- **onshore geoscience** activities are undertaken by staff in the agency's *Minerals Division* and *Geohazards Division* and focus on enhancing mineral exploration, and environmental land-use planning, which is achieved through the production of geoscientific maps, databases and information systems, and conducting regional geological and mineral systems research. Onshore

geoscience activities also contribute to safer communities and critical infrastructure and the maintenance of fundamental gravity and seismic networks.

- **spatial information** activities are undertaken by staff in the agency's *National Mapping Division* and *Office of Spatial Data Management.* NMD focus on the provision of fundamental spatial data of Australia from national mapping, remote sensing and geodesy with emphasis on the requirements of emergency management, national mapping and marine zone management and the OSDM focus on the coordination of the implementation of the Commonwealth Policy on Spatial Data and Access and Pricing[3].

The senior levels of Geoscience Australia's management-accountability structure are summarised in the diagram above, with the relationship between Geoscience Australia's corporate and intermediate-level outcomes, output and output groups, and business units summarised in the diagram that follows. Details of the relationship between each business units and the NRP goals and structural objectives are provided in the Work-program and the NRP implementation plan.

Together with the Chief Executive Officer, the Chief Scientist and the Chief Financial Officer, the heads of the four geoscience-delivery divisions and the two geoscience-support areas collectively comprise the Geoscience Australia's Executive Board[2]. Geoscience Australia's:

- board focuses on strategic and program performance issues;
- CEO internally holds board members to account for managing the affairs of their respective programs in a way that promotes proper use of all resources allocated to that cluster.

Details of structural-terminology used in this plan are included in the glossary provided at Attachment B.

Geoscience Australia works in partnership with other Commonwealth agencies and State and Territory governments through the National Geoscience Agreement and the Australian and New Zealand Land Information Council (ANZLIC). It also encompasses the Office of Spatial Data Management (OSDM) to coordinate the implementation of the Australian Government's Policy on Spatial Data Access and Pricing.

Geoscience Australia is committed to providing outstanding service to the Government and to the people of Australia. We do this by being responsive to the needs of the Government and our clients.

To succeed we have an open culture of mutual trust and respect in which we foster expertise and professionalism. We strive for excellence in all that we do.

We encourage innovation and teamwork by providing a stimulating and supportive environment that recognises the contribution of our people and their need for challenge and development.

We communicate our discoveries, knowledge and advice clearly and effectively to each other and to our stakeholders and clients.

We work within the Australian Public Service Values and Code of Conduct and behave with integrity in all that we do.

The Australian Government uses the following key performance information to assess Geoscience Australia's effectiveness in achieving its planned outcomes.

1) Exploration companies behaviour influenced by Geoscience Australia's research and information products (e.g. evidence of exploration companies decisions being influenced)
2) Geoscience Australia information used by the Department of the Environment and Heritage and other government agencies to determine candidates for Marine Protected Areas (e.g. the level of satisfaction of agencies and other stakeholders with the information supplied)
3) Organisations concerned with land use, regional development and the environment use Geoscience Australia's spatial information products (e.g. Geoscience Australia is invited to forums on land use, regional and the environment – organisations are integrating Geoscience Australia products into natural resource planning etc.)
4) Government agencies uses Geoscience Australia's advice and information products to support national interest activities such as defence, border protection and emergency responses (e.g. feedback that shows Geoscience Australia meets defence requirements and meet standards when contributing to the national geographic information infrastructure that underpins management of our environment, natural resources and safety of Australians.)

The Australian Government uses the following key performance measures to identify the degree to which Geoscience Australia's outputs contribute towards achieving its corporate outcome.

5) Increase in private sector petroleum exploration investment
6) Increase in mineral exploration, and environmental land-use planning

[3] OSDM's business plan is not included in this plan due to its whole-of-government planning and management arrangements.

7) Government agencies continue to commission Geoscience Australia to undertake marine-zone geoscience products
8) Percentage technical acceptance of Australia's claim under the UN Convention on the Law of the Sea
9) Geohazard assessments lead to update of relevant standards (e.g. building codes)
10) Clients use Geoscience Australia's geohazard risk assessments as part of their decision-making processes

To measure the quality of Geoscience Australia's geoscientific information and knowledge, the Australian Government measures the level of uptake and satisfaction levels of key stakeholders with the agency's outputs.

To measure the quantity of Geoscience Australia's geoscientific information and knowledge, the benchmark used by the Australia Government is at least 50 project outputs in Geoscience Australia's annual work program.

To measure the price of Geoscience Australia's geoscientific information and knowledge, the benchmarked used by the Australian Government is a total price of $110.872million.

2004–05 key priorities

In 2004–05, Geoscience Australia's key business priorities include:

- promoting opportunities for mineral exploration through new pre-competitive geoscience information for the Gawler, Paterson and Tanami provinces;
- improving access to pre-competitive geoscience information and compilations by accelerating development of Internet-based delivery systems;
- promoting extended applications of geoscience through completion of the collaborative Burdekin-Fitzroy project which is designed to demonstrate applications of geoscience information for natural resource management;
- establishing a spatial information, risk analysis, and modelling capability to support national initiatives in counter terrorism and critical infrastructure protection;
- developing a national risk assessment framework for risk assessment models, methods and databases in support of the Disaster Mitigation Australia Package;
- acquiring and interpreting seismic data to build new investment opportunities in south western and northern Australia in support of the 2005 offshore petroleum acreage release, and in the quest for a new oil province for Australia;
- completing phase II of the preservation of deteriorating seismic records in the national archive of petroleum industry data;
- providing geoscientific advice supporting the follow-up to Australia's 2004 submission to the United Nations Commission on the Limits of the Continental Shelf (UNCLCS);
- assisting the development of geological sequestration of carbon dioxide, through the Greenhouse Gas Technologies Cooperative Research Centre (CO2CRC);
- beginning a 1:100,000 pilot mapping program to address areas of high bushfire risk; and
- commencing development of a Marine Spatial Information System for the Australian Marine Jurisdiction.

Part 2: Geoscience-delivery programs

Minerals Division overview

Minerals Division (MD) principle activities are focussed on the provision pre-competitive geoscience to minerals exploration industry, but it also provides geoscience information to address the problems associated with dryland salinity. The activities related to dryland salinity are delivered through the Cooperative Research Centre for Landscape, Environment and Mineral Exploration (CRCLEME) (see **www.crcleme.org.au**).

Mandates

Key policy documents of relevance to the MD are the Australian Government's Minerals and Petroleum Resources Policy Statement 1998 and the Spatial Data and Access Policy 2001.

The resources policy requires the Australian Government to "enhance Australia's international investment attractiveness for mineral and petroleum explorers through public investment in pre-competitive geoscientific surveys and analysis where the market does not yet provide such information and where community benefits outweigh public costs".

The work program of the MD's is endorsed by the Chief Government Geologists sub committee (CGGC) of the Ministerial Council for Mineral and Petroleum Resources (MCMPR).

Vision and mid-longer term directions

MD's vision is that the pre-competitive data, information, and technical advice generated by Geoscience Australia leads industry to the discovery, and appropriate development of, new onshore exploration resources in existing and new provinces.

MD's mission is to elucidate and promote Australia's hidden mineral prospectivity. This leads the MD to examine the mineral potential of Australia, promote that potential and provide advice to Government on issues requiring geological input or information.

MD's challenge over the next 5 years is to develop methodologies that assist the minerals exploration industry in Australia to explore effectively for concealed and buried deposits. MD has to become the master of the third dimension and find a way to reveal the hidden prospectivity of those vast tracts of Australia that are currently inherently difficult to explore. A new and important aspect of the investigation of subsurface geology will be the collection and analysis of groundwater data for exploration purposes and regional development.

If MD is able to achieve its mission, then it will contribute significantly to Australia achieving its vision by enhancing Australia's capacity to compete for international exploration capital and ensure a viable mining industry into the future.

If MD is successful in meeting this challenge it will become world renowned for capabilities in inversion and forward modelling, geoscientific integration and visualisation.

To conquer the tyranny of depth, there are several scientific and science management strategies that will need to be implemented. The key scientific challenge MD faces is the prediction of subsurface geology, which has become the principal step in technical risk reduction for the minerals exploration industry. This problem exists at all scales and in all phases of the exploration cycle. The ability to turn geoscience data into geological knowledge at the pre-competitive stage of the cycle is the major scientific challenge that MD will tackle over the next few years.

Key stakeholders

The key stakeholders for the MD's are the minerals exploration industry; the Department of Industry Tourism and Resources, particularly the Resources Division; the Department of Transport and Regional Services; and the State and Northern Territory geological surveys.

Key roles

MD has several key roles. It undertakes applied research into Australian mineral provinces using full range of geological and geophysical techniques. It has specialist expertise in geochronology, geochemistry, structural geology, mineral systems and metallogeny, sequence stratigraphy, geophysical data acquisition and analysis of potential field data, radiometrics, reflection and refraction

seismic, electromagnetic methods; geophysical inversion and forward modelling and the construction of regional three-dimensional geological models.

MD develops and maintains national geoscience databases and produces national maps of the geology of Australia and provides advice on Australian resources and the onshore geology.

MD also undertakes a role that coordinates the Australian Government and the States/NT promotional activities where it is necessary to present an Australian perspective in relation to the minerals exploration opportunities in Australia.

Modus operandi

MD's work in the provision of pre-competitive information for the minerals exploration industry is carried out in partnership with the States/NT under the National Geoscience Agreement (NGA). The NGA defines the roles and functions of the Australian Government and governments of the States and Northern Territory. The Chief Government Geologist Committee supervises the NGA, which is a sub-committee of the Ministerial Council for Minerals and Petroleum Resources. MGD participates in and is a member of, several State geological survey advisory committees and boards.

Where it helps MD realise its mandate, it participates in Cooperative Research Centres (CRC's) and cooperates with universities and other agencies in specific research projects. Geoscience Australia is a core partner in the CRC for Landscape, Environment and Mineral Exploration (CRCLEME) and the Predictive Mineral Discovery CRC (pmd*CRC).

MD in carrying out its work program has several strategic alliances that provide it with access to facilities or key skills. The major strategic alliances for access to facilities include contracts with ANU and Curtin Universities for access to age dating and microprobe facilities and a partnership with ANU for the management of the Major National Research Facility; ANSIR (Australian National Seismic Imaging Resource), which provides a seismic imaging capacity.

In addition, MD provides input to several research centres and agencies through membership of Advisory Boards or Research Committees. These include the Australian Research Council (Expert Advisory Committee), CODES (University of Tasmania), GEMOC (Macquarie University), RSES Advisory Committee (ANU), John de Laeter Centre (Curtin University), Global Centre for Metallogeny (University of WA) and Tectonics Special Research Centre (University of WA).

MD's work program is established through extensive consultation with minerals industry exploration, State and Territory NGA partners. These discussions, which occur at individual company level with Exploration Managers and Chief Geoscientist as well new venture staff, allow Geoscience Australia to ascertain key areas in which there is a significant exploration impediment due to to a lack of geological information.

These gaps are tested against a national and State/NT perspectives to determine a list of possible projects. These possible projects are then negotiated with NGA partners.

Internally the senior management team and project leaders meet for a workshop in the third quarter of the financial year to examine issues for the new financial year. MD's senior management team meet weekly to monitor and review work program. The first meeting of the month is devoted to a detailed examination of the financial status of the division. Group Leaders meet weekly with project leaders, or as needed, to monitor the work program.

2004–05 planned outcomes

Within Geoscience Australia, the MD is responsible for achieving the following planned outcomes:

- enhanced global attractiveness of Australia's onshore exploration and investment opportunities;
- improved resource management and environmental protection for the onshore region of Australia

MD ensures Geoscience Australia contributes towards the achievement of the following national research priority outcomes:

- an Environmentally Sustainable Australia, in particular the "Developing Deep Earth Resources" goal.
- an Environmentally Sustainable Australia — goal: overcoming soil loss, salinity and acidity

2004–05 key business priorities

The key business priority for 2004-05 is to deliver a suite of products from the Central Australia, Gawler, Yilgarn and Eastern Australian Palaeozoic provinces; and start two new pilot projects: one in the Paterson province of WA and the other a Proterozoic Synthesis project. In addition; we will begin

to develop a regolith thickness mapping capability in the context of the Gawler project. The suites of products are designed to enhance the attractiveness of exploration investment opportunities in each of the provinces we will be active in.

In addition, Geoscience Australia will provide advice to various parts of Government, but in particular the Resources Division of ITR, as and when it is requested.

MD will continue its role in leading and coordinating the 'Team Australia' promotion activities on behalf of and in cooperation with the States/NT.

In relation to the work being undertaken in Northern Australia there will be a focus on the Tanami province as we move into the WA sector of the province and undertake a major seismic program to test the structural models for the province.

In the Gawler project, we will focus on integrating the seismic data from the Stuart Shelf that was collected in 2003 into a 3D structural model for the region and further work on the Central Gawler Gold region. In particular, we are attempting to date and characterise the gold minerals systems but will also undertake a pilot regolith thickness mapping exercise to both tackle this issue in the CGG region but develop a methodology for application elsewhere.

MD will begin a Proterozoic Synthesis project, which will ultimately provide an overview of the geodynamic evolution of Australia in the Proterozoic with a view to identifying major data and knowledge gaps and possible unidentified mineral potential covered regions.

Geoscience Australia will continue to be a core partner in CRCLEME and pmd* CRC which deliver industry driven research outcomes in relation to mineral exploration challenges.

In addition, Geoscience Australia will start a project in the Paterson Province that will examine the impediments to mineral exploration in this region. This province is somewhat anomalous in having a single world-class copper/gold deposit, but it is largely covered and exploration is difficult. MD will improve the understanding of the regional geological framework in an attempt to reignite exploration interest in the province.

In relation to IM, MD will continue to improve its online delivery building on the success of the GADDS system.

All of the work in MD contributes to three of NRP's structural objectives; namely, knowledge creation, knowledge diffusion, and collaboration.

Geohazards Division overview

Mandates

In addition to those provided in the annual Portfolio Budget Statement, the Geohazards Division (GD) has the following mandates:

- The 2002 Council of Australian Governments (COAG) Review report of *Natural disaster relief and mitigation arrangements in Australia* itemises Geoscience Australia's geohazards role and functions in descriptions of the Commonwealth's contribution to disaster mitigation. The Council endorsed the findings and recommendations of the report in 2003. The Department of Transport and Regional Services (DoTaRS) has been charged by Government to administer a Disaster Mitigation Assistance Package (DMAP) in response to the COAG review, and DoTaRS has invited Geoscience Australia to be a technical adviser to help define new national risk-assessment guidelines and methods as part of the DMAP initiative. The partnership has been formalised through an exchange of letters between the Secretary of DoTaRS and the CEO of Geoscience Australia.
- The National Counter Terrorism Committee (NCTC), which reports to the Augmented Police Ministers' Council, has endorsed Geoscience Australia for the provision of spatial, critical infrastructure vulnerability and risk-assessment methods to support the NCTC Capability Development Program.
- In 2004 the Australia Government endorsed a new, multi-agency Critical Infrastructure Protection (CIP) Project that specifically includes funding for Geoscience Australia to work with AGD, AGIMO (formerly NOEI), and DIGO to develop a capability to model and analyse interdependencies and consequences of critical infrastructure failure across sectors on an 'all hazards' basis.
- GD's mandate for work in providing and applying spatial information for emergency-management and counter-terrorism purposes is also contained in an exchange of letters between the Secretary of AG's and the Secretary of DITR. The AG's letter (1) acknowledges the recommendations of the Final Report of the GeoInsight Project (funded through AusIndustry/ITR); (2) the requirement for EMA and the Protective Securities Coordination Centre (PSCC) to action the recommendations, and (3) Geoscience Australia's technical capability in assisting AG's in implementation.
- The mandate for GD's geodesy work is closely linked to the general mandate for Geoscience Australia's national mapping activities, given this work provides the fundamental geodetic infrastructure that underpins national topographic mapping. The mandate can be traced back to Federation and the early history of the Commonwealth of Australia
- The original mandate for Geoscience Australia's nuclear monitoring activities is derived from the Department of Foreign Affairs and Trade's requirement (1984) to establish an independent monitoring capability as part of the International Monitoring System) thereby contributing towards the attainment of the Comprehensive Nuclear Test Ban Treaty (CTBT). Geoscience Australia currently works by means of an annually negotiated Letter of Understanding with DFAT.

Vision and mid-longer term directions

GD's vision is to become a world leader in the national application of geoscientific results that help sustain and safeguard communities and infrastructure. It will achieve this by:

- monitoring the geophysical condition of the Australian continent and off-shore territories, including provision of the geodetic framework for national spatial data infrastructure mapping;
- using monitoring and other information to solve key geoscientific problems for the benefit of Australian society
- detecting nuclear explosions transmitted through the solid earth, oceans, and atmosphere;
- identifying the nature of the physical hazards that impact on Australian communities;
- providing assistance in establishing a national framework for risk assessment through creative use of spatial information and innovative analytical and visualisation techniques for assessing and reporting community vulnerability and the economic losses caused by natural and other disasters in Australian society.

The Geohazards Division concentrates its work in two key areas in order to achieve its vision:

1. A **Risk Research Group** of projects, which deals largely with the new national approach to risk assessment following announcement in the 2003-4 Budget of the national Disaster Mitigation Australia Package (DMAP) being managed by DoTaRS. This follows up on established research

work in Geoscience Australia's 'Cities' Project which is now linked with ongoing development of a national risk assessment framework and national spatial-data acquisition.

2. Coordinated work through a newly established **Geoscience Australia Earth Monitoring (GEM) Group** – a national integrated facility for geophysical and geodetic time-series monitoring of the Australia and its territories, including positioning services. GEM is made up of (1) the Geodesy Group from the former AusLIG, and (2) the Integrated Geophysical Network, Nuclear Monitoring, and Geomagnetism projects that existed in a former Geohazards program.

GD has the following four medium- to longer-term key strategic priorities.

1. Development of the GEM Group in order that the Group becomes a world-class, national facility for tracking changes in the geophysical state of the Australian continent using time-series, synoptic data.
2. Ongoing development of core capabilities in spatial-information management and risk assessment, in order that GD develops a core, multi-disciplinary capability in the use of spatially referenced information, GIS, and modelling and assessment of natural-hazard [and now terrorism] risk.
3. Implementation of aspects of the Disaster Mitigation Australia Package (DMAP), particularly in the areas of national risk assessments and national spatial-data acquisition, by acting as technical adviser to DoTaRS.
4. Development of regional partnerships in geophysical/geodetic monitoring in order to develop and strengthen new regional (southeast Asia and southwest Pacific) approaches to earthquake recording, nuclear monitoring, geodetic measurements, tsunami detection, and (in Papua New Guinea) volcanic-eruption alerts.

GD has the following seven key priorities that drive its work program:

1. To develop partnerships with new Australian Government stakeholders involved in DMAP and CIP Project and with counterparts in NMD, to influence and assist stakeholders in the use of spatial and related information and analytical capabilities for emergency-management purposes. Performance Indicators and metrics are as follows:
2. To provide innovative scientific results in the development of risk-modelling techniques and decision-support systems for national risk assessments in the context of DMAP and the CIP Project. Performance Indicators and metrics are as follows:
3. To achieve a stronger and better alignment of GD's information-management activities and strategies within Geoscience Australia in order to match the achievements in other divisions.
4. To develop GEM into an integrated core group within Geoscience Australia that provides geophysical and geodetic time-series data, information, and knowledge about the Earth and its systems that are of particular relevance to Australia, and to facilitate integration in order to provide the most efficient and cost-effective means for the acquisition and delivery of relevant, high-quality, data and products.
5. To review and explore GEM's key science directions with a view to affecting a shift in focus from measurement to priority research that makes full use of the group's data and infrastructure.
6. To form partnerships with geoscience agencies in the southeast Asia and southwest Pacific region, and elsewhere, in order to develop and strengthen new approaches to earthquake recording, nuclear monitoring, geodetic measurements, geomagnetic-field monitoring, tsunami detection, and (in Papua New Guinea) volcanic-eruption alerts.
7. To recover from the damaging effects of the January 2003 bushfires at Mount Stromlo, ACT, by re-establishing the Satellite Laser Ranging (SLR) and absolute gravity facilities and by ensuring effective operations through newly negotiated contracts.

Key stakeholders

GD has established relationships with a wide range of stakeholders and clients in government, academia and the private sector in Australia as well as internationally. These relationships span interests including defence, emergency/risk management, spatial information and public education.

Key stakeholders for the Risk Research Group are:

- Department of Transport and Regional Services (DoTaRS) and State/Territory emergency-management agencies involved in DMAP.

- Emergency Management Australia (EMA, Attorney General's Department): GD provision of earthquake and tsunami alerts and take-up of recommendations to the CoAG Review of Natural Disaster Risk Management.
- Bureau of Meteorology (BoM, Department of the Environment and Heritage): Australian Tsunami Alert Service and use of meteorological data for DMAP purposes.
- Critical Infrastructure Protection (CIP) Branch (Attorney General's Department): multi-agency CIP Project.
- Protective Security Coordination Centre (PSCC, Attorney General's Department): assistance with spatial-information aspects of counter-terrorism exercises.

Key stakeholders for the Geoscience Australia Earth Monitoring Group are the:

- Australian Safeguards and Non-Proliferation Office (Department of Foreign Affairs and Trade, DFAT): Nuclear Monitoring project.
- Comprehensive Nuclear Test Ban Treaty Organisation (CTBTO, Vienna): Nuclear Monitoring project.
- Department of Defence: Nuclear Monitoring project, geodesy projects, and GD's geomagnetism work program.
- Australian Agency for International Development (AusAID, part of DFAT): contracts for Rabaul Volcanological Observatory Twinning Project and the South Pacific Sea Level Rise and Climate Monitoring Project (SPSLRCMP), funded by AusAID.
- Ionospheric Prediction Service (DITR): key stakeholder for GD's geomagnetism work program.
- Geodesy projects' stakeholders include a wide range of users of spatial data and spatial positioning services. These include emergency services, Defence, transport, communications, and environmental authorities, as well as the Australian Marine Safety Authority (AMSA), and the Inter-governmental Committee on Surveying and Mapping (ICSM) and its State/Territory jurisdictions.

Key roles

GD plays an important role in four key areas, as follows

1. Natural-hazard disaster mitigation

GD generates public-benefit information and knowledge that underpins well-informed decisions on safety and the well-being of the community. The work of the Division covers geophysical hazard monitoring and alerts (earthquakes, tsunamis, geomagnetic storms), geodetic positioning, vulnerability of the built environment (including lifelines), collection and management of fundamental spatially referenced information on hazard, vulnerability, and risk, assessment of risk from natural hazards, and economic loss assessment.

Sudden-impact natural hazards (such as floods and earthquakes) account for more than $1.1 billion damage annually. Responsibility for the safety, security and sustainability of Australian people and the communities in which they live, is embedded strongly in all three levels of government in Australia. The Australian Government traditionally has provided natural-disaster relief and recovery funding through the National Disaster Relief Arrangements (NDRA), but disaster-mitigation policy has received much greater attention by the Australian Government and States/Territories in recent years. This change has been encapsulated in the 2002 report of a COAG Review that focuses on reform of disaster-mitigation, relief and recovery arrangements in Australia.

Geoscience Australia is identified by the COAG Review as a key Commonwealth scientific agency, providing science and research support to national disaster-mitigation efforts and hazard alerts. Application of spatial information and risk-assessment methodologies in urban environments is especially relevant to Geoscience Australia disaster-mitigation studies which are undertaken in partnership with State/Territory agencies. The Department of Transport and Regional Services (DoTaRS) is responding to the COAG Review recommendations through a Disaster Mitigation Australia Package (DMAP) that was announced in the recent Budget but which still (October 2003) depends on sign-off from the States and Territories. DMAP includes a new national approach to risk assessment and national disaster-mitigation strategies. Geoscience Australia has been invited to participate in this new approach that, in lieu of COAG approval, is referred to below as the National Risk Assessment Framework (NRAF).

2. Geodetic monitoring

Geodesy in Geoscience Australia currently has a national responsibility for determining changes in the shape, size, position, and orientation of the Earth in space and assessing the significance of these changes in the Australian context. Its function is to make accurate measurements of these parameters for (1) the development and maintenance of the fundamental national positioning (geospatial) infrastructure in Australia, including positioning infrastructure for navigation (for example, GPS), and (2) monitoring of global change, including climate change (e.g. sea-level rise) and tectonic movements of, and within, the Australian continent.

Geoscience Australia currently contributes to positioning infrastructure by providing data and solutions for definition of the International Terrestrial Reference Frame (ITRF) which is used for the Geocentric Datum of Australia. Development of new international space platforms for geomagnetic-field measurement and the detailed measurement of gravity has the potential to change the way in which geodesy is carried out in national geodetic surveys world-wide. These influences and the resultant expansion into new scientific endeavours are expected to impact significantly on geodetic and other areas of geoscience in Geoscience Australia in the medium term.

3. Critical Infrastructure

Critical Infrastructure Protection (CIP) and Counter Terrorism (CT) are important, contemporary, national-security issues being addressed by several newly formed Commonwealth and State/Territory councils, committees, and working groups. Establishment of these groups is a response to the 2001 World Trade Centre terrorist attacks and to the October 2002 Bali bombings, as Australia adjusts to a new world order and to the need to prepare for possible further terrorist attacks. The Protective Securities Coordination Centre (PSCC, Attorney General's Department) is responsible for managing Commonwealth responses to CIP/CT matters. These include science, engineering, and technology (SET) programs being developed in the CIP/CT context.

Geoscience Australia has an acknowledged role in this new arena through its use of spatial information, visualisation techniques, and risk analysis. The application of spatial information in assisting national CT efforts is developing strongly, following on from the Geohazards Cities & Critical Infrastructure Project presentation to PMSEIC in December 2002; the 2003 Conybeare Report resulting from the ANZLIC counter-terrorism project; the December 2003 endorsement by the National Counter Terrorism Committee of the formal engagement of Geoscience Australia for the provision of spatial, critical infrastructure vulnerability and risk assessment methods to support the NCTC Capability Development Program; the Critical Infrastructure Protection Project announced in the 2004 Budget and which includes GD; and Geoscience Australia membership of two Infrastructure Assurance Advisory Groups (IAAG): Energy and Buildings.

Geoscience Australia has been identified also as the agency that will provide evidence of GPS outages. This currently is undertaken by examination of post-processing records from its GPS network and incurs delays. Integrity monitoring therefore will be developed to provide near real-time status of GPS at selected sites.

4. Geophysical monitoring

GD has national responsibility in the Commonwealth for monitoring earthquakes in the Australian region, including the southwest Pacific, operating the Australian National Seismograph Network, as set out for example in the COAG Review report. Geoscience Australia provides a 24/7 earthquake-alert service to Emergency Management Australia (EMA, Attorney General's Department) for both Australian and regional earthquakes, and uses recorded data to assess national earthquake-hazard levels, particularly in the urban areas of Australia. Geoscience Australia, EMA, and the Bureau of Meteorology support the Australian Tsunami Alert Service (ATAS) concept.

Geoscience Australia also has national responsibility for monitoring the geomagnetic field in the Australian region, providing data to (1) the Ionospheric Prediction Service's (IPS, part of DoITR) Radio and Space Service, and (2) world data centres and international programs to complement similar data from the global network of geomagnetic observatories. IPS is the Commonwealth agency carrying primary responsibility for providing radio communications and space weather information and warnings.

Australia is a signatory to the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and is obliged under the CTBT Act (1998) to undertake several tasks before the Treaty comes into effect. Geoscience Australia undertakes operation of seismographs of the Australian component of the CTBT International

Monitoring System (IMS), including the Australian Antarctic Territory, as well as installation and operation of hydroacoustic (shock waves in the ocean) and infrasound (shock waves in the atmosphere) stations. Geoscience Australia is accountable to DFAT who are responsible for the development and implementation of Australian CTBT policy. Geoscience Australia continues to be responsible for reporting and provision of information to DFAT, PM&C, Defence, and the CTBT Organisation (CTBTO, Vienna). Geoscience Australia is expected to become involved in promoting, through approved DFAT arrangements, strengthening of IMS capability in the southwest Pacific region over the next few years.

GD also provides technical assistance in volcanological and geodetic (sea-level rise) monitoring through AusAID to recipient countries in the southwest Pacific region.

A key emerging issue in the field of Earth monitoring in general is the inexorable 'globalisation' of geophysical and geodetic monitoring systems and, therefore, the increasing inter-dependence of national monitoring capabilities with the development of international infrastructures. Increasingly sophisticated space platforms, widespread use of the Internet for data transmission, the International Nuclear Test-Ban Treaty monitoring system, and other international agreements at the political level, are amongst the drivers of these trends towards globalisation. This dependence has been accepted for many years in geodesy and geomagnetism - where data is provided to international data centres for production of the International Terrestrial Reference Frame (ITRF) and International Geomagnetic Reference Field (IGRF) – but increasingly the trend is affecting also the monitoring of earthquakes and tsunamis. Furthermore, the impact of the recent (July 2003), international, Ministerial-level, *Earth Observation Summit* hosted by the US State Department in Washington D.C, is likely to impact on the way in which Australia will contribute to the work of the newly established *Group on Earth Observations (*GEO). This represents an international effort towards a comprehensive, coordinated and sustained Earth observation system. Increasing 'regionalisation' of Earth monitoring in the Australian region, including southeast Asian and southwest Pacific countries, is inevitable.

Modus operandi

Geohazards operates with a simple, two-group structure in which each Group Leader has oversight of four or five projects, as shown below. Project Leaders in each group are accountable to the Group Leaders. Each person in the Division below Group Leader level has a nominated manager with whom the staff member negotiates an annual Performance Agreement. Nominated managers are expected to be mentors of the people they supervise (formal mentor relationships with third parties are discouraged). Several projects also have Project Managers who are responsible primarily for resource management and budgets, so leaving Project Leaders more opportunity to provide science leadership. Project Managers thus have an opportunity to develop management skills that will serve them in future leadership roles in the Division.

Geohazards has an *Information Management Committee* that reports to the Division Chief. The Committee liaises with the Risk Research Group Leader who represents all of Geohazards on the Geoscience Australia Information Management Reference Group chaired by CIMA.

2004–05 planned outcomes

Within Geoscience Australia, the GD is responsible for achieving the following planned outcomes (see diagram on page 2):

- safer communities and infrastructure.
- improved resource management and environmental protection

GD also ensures that Geoscience Australia contributes towards achievement of the following national research priorities (NRP) outcomes:

- Risk research in GD is identified as a major Geoscience Australia contribution to the *Critical-infrastructure protection* goal (Goal 1) of NRP 4, ***Safeguarding Australia.*** Measurement of the geomagnetic field is also included in this NRP-4 goal because of the links with the Ionospheric Prediction Service, space weather (magnetic storms), and related security/safety issues with communications and navigation. Improvement of integrity monitoring for GPS outages will also be developed under this NRP in order to provide near real-time status of GPS at selected sites. Development of the nuclear-monitoring services in Geoscience Australia is included in the *Transformational defence technologies* goal of NRP4.
- Geodetic projects in GD contribute to NRP 1, ***An environmentally sustainable Australia***, by providing the basic underpinning of positioning infrastructure. They contribute specifically to the *Climate change and variability goal* (Goal 7) of NRP 1 through its monitoring of global change,

including sea-level rise. GD has the potential to extend its work on spatial-information analysis and risk-assessment methods (for sudden-impact natural and technological hazards) into issues under NRP-1 by including climate change predictions into flood, severe wind and bushfire risk models, and by including slow-onset hazards such as urban salinity, water quality, and urban coastal impacts.

2004-05 key business priorities

The division's key business priorities are as follows:

1. Develop partnerships and information-management influence with new stakeholders

- Work closely with DoTaRS (Natural Disaster, Planning and Research Section) and State/Territory emergency-management agencies to advance DMAP objectives, including participation in the proposed Technical Risk Assessment Committee (TRAC) and promoting the use of web portals in the delivery of information for DMAP purposes.
- Continue GD involvement with the AusDIN Working Group with a view to greater acceptance of the importance of spatial information and web mapping in the delivery of information for emergency management purposes.
- Continue to develop the relationship with the Protective Security Coordination Centre (PSCC, AGD) to assist in the use of spatial information and related analytical capabilities in national counter-terrorism exercises.
- Strengthen relationship with DITR counterparts in the Energy and Environmental Division in relation to the Energy IAAG.
- Establish new partnerships with the other ten agencies involved in the CIP Project that was announced in the 2004 Budget, and particularly the CIP Branch in Attorney General's Department (AGD).
- Ensure a stronger focus on stakeholder requirements through the newly established NMD/Geohazards Emergency Management Reference Group in collaboration with staff from the recently restructured NMD, including on-going NMD membership of the AusDIN Portal Group.

2. Produce new computer models and scientific results in national risk assessment

- Develop storm surge and flood hazard models that capture essential elements of the dynamic process for application to vulnerability and risk assessments.
- Develop physical damage models for earthquake, flood and severe wind that capture the state of knowledge of the performance of structures for the most common building types in Australia.
- Develop social (or community) vulnerability models that capture key aspects of human vulnerability and resilience to natural hazards.
- Develop economic loss models that are able to capture both the direct financial losses to a hazard impact, as well as providing bounds on the indirect economic effects of disasters on a regional scale.
- Develop models for assessing risk that incorporate the elements of hazard, vulnerability and exposure into robust analytical tools for conducting risk assessments
- Develop decision support tools such as 3D visualisation techniques and hazard and risk mapping tools that can be used to assist in identifying sources of risk and exercising mitigation options.

3. Enhance GD information-management capability

- Strengthen the GD Information Management Committee ensuring that it serves the requirements of both GEM and RRG.
- Ensure that strong links are developed and maintained with the Geoscience Australia Information Management Reference Group and the overarching work in CIMA.
- Develop the NMD/Geohazards Emergency Management Reference Group in collaboration with NMD senior staff in order to benefit from NMD expertise and experience in information management.
- Continue development of Geohazards web pages.

4. Integrate the different operational elements of GEM into a new group with a common culture

- Foster a group culture based on scientific excellence, common goals, and shared resources through focused planning meetings and performance management.

- Evaluate the possible shift to satellite VSAT communication technology for remote monitoring sites in order to improve efficiency and reduce line rental costs.
- Continue the refresh of geomagnetic observatory equipment to improve data quality and reduce the incidence and impact of equipment failure.
- Purchase, install, and develop Antelope software for earthquake monitoring, and investigate its potential for geomagnetic and geodetic networks.
- Finalise arrangements for and then manage the new contract for Moblas5 Satellite Laser Ranging operations near Mingenew, WA.
- Advertise for and appoint to the Level 8 position in charge of GEM.

5. Define new science directions for GEM

- Investigate new science directions giving particular emphasis on the use of GPS, InSAR, absolute-gravity, and space-borne gravity-field technologies for groundwater resource and neotectonic studies. This will be achieved through a process that incorporates both an internal review of current research and research opportunities, and consultation with stakeholders external to Geoscience Australia.

6. Strengthen Earth monitoring in the region with neighbouring countries

- Develop the regional monitoring concept in association with international agencies including the Incorporated Research Institutions for Seismology (IRIS), the United States Geological Survey (USGS), CTBTO, the Japanese National Research Institute for Earth Sciences and Disaster Prevention (NIES), the Applied Geoscience Commission (SOPAC), the New Zealand Institute of Geological and Nuclear Sciences (IGNS), the Indonesian Bureau of Meteorology and Geophysics (BMG), and INTERMAGNET.
- Complete formation of the Australian Tsunami Alert Service (ATAS) in association with the Bureau of Meteorology and EMA and ensure its linkage with countries in the southeast Asian and southwest Pacific region using regional organisations such as SOPAC.
- Participate in Inter Departmental Committee meetings on Australia's response to recommendations from the 2003 Earth Observation Summit and the formation of the Group on Earth Observations (GEO)
- Continue leadership roles in the densification of the International Terrestrial Reference Frame through participation in the Regional Geodesy Working Group of the Permanent Committee for GIS Infrastructure for Asia and the Pacific.
- Continue geophysical and geodetic observatory work in the context of the international Scientific Committee for Antarctic Research (SCAR).

7. Mount Stromlo recovery after Canberra fires:

- Re-establish the Stromlo Satellite Laser Ranging (SLR) facility and commence operations as soon as possible in 2004-5
- Build a new absolute gravity facility at Mount Stromlo.

National Mapping Division overview

Mandates

National Mapping Division (NMD) delivers geographic information products to the Government and the people of Australia. Authority for this program stems from the assignment of Ministerial responsibilities, Portfolio Budget Statement, exchange of letters between the Minister for Defence and the Minister for Industry Tourism and Resources concerning national mapping responsibilities, the scientific work program endorsed by the Oceans Ministerial Board to support Oceans Policy and the National Research Priorities as amended in early 2004.

Vision and mid-longer term directions

Vision: To be a world leader in generating and delivering national geographic information and knowledge

Mission: To contribute to national prosperity and the management of the environment, our natural resources and the safety of Australian society through the provision of accessible, fundamental geographic information and knowledge.

NMD activities contribute to two Geoscience Australia intermediate outcomes as follows:

- Improved resource management and environmental protection.
- Safer communities and infrastructure.

NMD is embarking on a new strategic direction in 2004-05, which explicitly addresses key policy drivers of the Australian Government. These are Emergency Management, Defence and Australian Government national mapping needs generally, Marine Zone Management and Spatial Data Access Policy and Industry Development. The emphasis is on provision of geographic information at the national scale for government purposes and in a form that makes it accessible and useable in a digital environment. Products under the well-known brand names like NATMAP, GEODATA and ACRES will continue to be made available to the public. Some of these represent new directions; others build on current strategies.

The effect will be to move the relationship between NMD and its clients from a position based on a 'Product or Service Offering' to one based more on 'Needs and Relationships'. We will retain our product focus for meeting the mapping needs of the general public under the Spatial Data Access Policy. In meeting client needs we will capitalise on the newly developed "seamless topographic database" and develop an analogous system for the marine regime. Whilst maintaining and revising the national 1:250,000 and smaller scale topographic data sets, new mapping will be undertaken at larger scales to address particular needs such as emergency management and defence and will involve relationships with the relevant state and federal government agencies. A long-term program is being developed to create an Australian Marine Spatial Information System (AMSIS) as part of the agreed science plan to support Oceans' Policy in concert with other Australian Government agencies

The Australian Centre for Remote Sensing (ACRES) has been identified as having 'national facility' characteristics and will be re-positioned to take a more strategic role in meeting national needs for public good remote sensing data and services.

The new model will enable us to function in smarter ways, sharpen our impact on key clients whilst meeting the mapping needs of the community more broadly. Technological innovation will be a key component of the new directions and NMD is participating in the Spatial Information CRC both to develop and capture technological benefits. These include real time application of remotely sensed data and data visualisation methods to Geoscience Australia work. The strategic development and application of GIS techniques and provision of high quality geospatial services across Geoscience Australia will continue. At the same time maintenance of the existing seamless database and collection of new data will progressively switch from the 'map sheet' based system to a theme or layer based system. AMSIS will be similarly developed as an authoritative source of spatial data with interoperability as a key strategic objective. Increased access to public good data over the web and increased functionality including, eventually, web services will be a key focus of the new directions.

In implementing this business model, there will be key relationships internal to Geoscience Australia with the Geohazards Division for the Emergency Management driver, Petroleum and Marine Division for the Marine Zone Management Driver and Corporate Information Management and Access (CIMA) for the Spatial Data Access driver. In collaboration with CIMA, we will undertake development in the area of interoperability in a strategically important area involving geographic information. This will

provide a tangible implementation of the Spatial Data policy for which the CEO has responsibility through the Office of Spatial Data Management.

Through the contracting model, which NMD already operates, we will continue to aid industry development consistent with Geoscience Australia's position as an agency of the Industry, Tourism and Resources Portfolio through improved access to information and technology transfer. Geoscience Australia's contributions to interoperability in government and to the Spatial Information CRC and its relationships with contractors are ways in which Geoscience Australia can achieve innovation in its National Mapping Program and develop industry capability. The utilisation of contractors for the development and delivery of Geoscience Australia products leads to technology transfer to and from the small business sector which in turn strengthens industry capacity. This approach aligns with the objectives of the Spatial Information Industry Action Agenda for development of industry capability, particularly in relation to improved data access and innovation through research and development.

Through this strategy we are beginning the process of developing the capability to 'measure and monitor the impact of change' at the national level both in terms of the spread and development of infrastructure and assessing the impact of man's activities – in effect some of the elements of earth observation.

By focusing on the technological aspects of enabling the Spatial Data Policy in the geographic discipline, NMD would be moving to a position where geo-informatics and second generation web technologies are at the core of its efforts to make geographic data more readily available and interoperable.

Details of NMD's 2004–05 performance information and metrics provided in NMD's *2004–05 work program* (ref Part 3).

Key stakeholders

As a result of the new strategic directions, key government stakeholders are the Defence Imagery and Geospatial Organisation for defence mapping, state emergency management authorities and the Geohazards Division - Geoscience Australia for mapping for emergency management, the National Oceans Office and Attorney General's Department for the Australian Marine Spatial Information System, Airservices Australia for aeronautical charts and Australian Greenhouse Office for Landsat imagery. As NMD is the Australian receiver of public good satellite data, international satellite operators notably the US Geological Survey and the Japan Aerospatial Exploration Agency (JAXA) are important stakeholders in NMD's remote sensing program.

Mapping products and remote sensing imagery are used extensively by the public and federal and state government agencies and industry for defence and emergency management, resource development, agricultural assessment and environmental management, infrastructure and investment planning, navigation and recreation; and decision making in all areas of activity. CIMA and the Spatial CRC are key stakeholders in NMD's technological approaches to information analysis and delivery and interoperability over the web.

Key roles

As a result of the adoption of new strategic directions, NMD is now organised into two groups.

The *Mapping and Marine Information Group* has responsibility for planning and execution of several major projects aimed at producing maps and spatial data sets to meet the priority needs of emergency management, defence and other Australian Government agencies, marine zone management and the public more generally. Activities undertaken include:

- Liaison with clients regarding priorities, scoping of specifications and outputs.
- Design, development and maintenance of a seamless geographic database for the continent and in the future the Australian Marine Jurisdiction to hold current and historical geographic data and its mapping representation.
- Geographic research including identification of changes in the landscape and development of work packages for execution by panel contractors.
- Geographic research in the maritime zone to support the development of a marine spatial information system.
- Development and maintenance of databases of marine boundaries and provision of relevant advice and submissions for boundary delimitations and Law of Sea purposes.
- Production of map products in both printed and digital form.
- Marketing of products and management of public distribution networks.

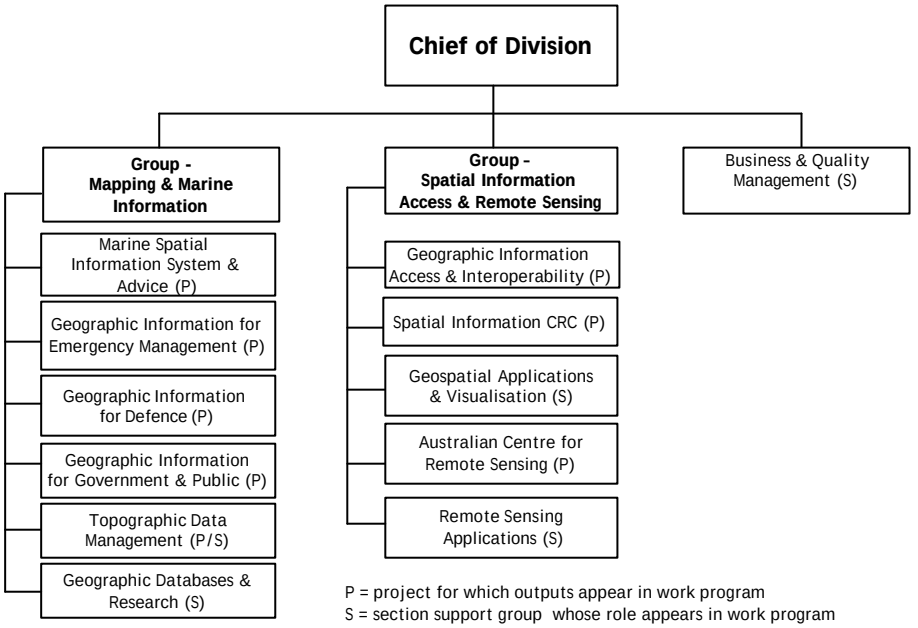
National Mapping Division

The *Spatial Information Access and Remote Sensing Group* has responsibility for delivery of geographic information to users including development and utilisation of modern technological approaches for the access and delivery of geographic, spatial and remote sensing data to enable integration and interoperability.

- Liaison with clients and satellite operators regarding priorities and development of systems for delivery of remotely sensed data and geographic information.
- Design and development of information access systems over the web and working with other agency partners and CIMA to enable interoperability.
- Operation of satellite receiving facilities and the acquisition, processing, archiving and delivery of public good satellite data to clients both in batch mode and increasingly for real time applications.
- Development and implementation of applications of remotely sensed data to Geoscience Australia programs in geohazards, minerals, petroleum and marine geoscience.
- Delivery of services in geospatial applications and visualisation to Geoscience Australia programs including strategic development of GIS and visualisation capabilities.

Modus operandi

The project responsibilities of the two groups are illustrated in the following diagram.



In the new business model, the aim is to advance government objectives by providing information and services to clients in key areas of government policy. This requires a shift from a "Product or Service Offering" represented by the product line to a position based on "Needs and Relationships" based on the priorities of specific clients.

Associated with this is an increasing complexity in the business relationship with clients. In each area of endeavour there is a need to develop an understanding of the client needs and to respond both in terms of priority and in adding value in meeting those needs. The business model also introduces a higher component of 'research-innovation' to the work of NMD both in terms of conceptualisation of the response in each area but also because there will be new areas of activity which will be at the leading edge of the discipline. These new areas of activity fall most notably in the development of the "Marine Spatial Information System" but also in "Geographic Information Access and Interoperability," the "Spatial Information CRC" and "Geospatial Applications and Visualisation"

However, in undertaking this change, it is important not to lose the very real strengths of the 'product model' and the associated discipline of quality management. This strength will be retained by focusing on the seamless topographic database as the core information asset to meet the needs onshore and by the development of a corresponding seamless product for the marine environment. The development of the outputs will be done in this context and the current arrangements involving contract producers to deliver digital and map outputs will be retained.

Given the nationally importance of the Australian Centre for Remote Sensing, it is proposed to establish a reference group comprising key stakeholders at the national and state level to advise the NMD Chief of Division on strategic directions. Similarly given the service role across Geoscience Australia of 'Remote Sensing Applications" and "Geospatial Applications and Visualisation" a client reference group comprising group leaders from other Geoscience Australia divisions will be established to help advise the Group Leader Spatial Information Access and Remote Sensing in the strategic directions and service priorities for these activities.

NMD will continue to operate its quality management system under the ISO 9001:2000 standard but will modify its implementation to reflect the new operating arrangements. A new management team for NMD, comprising group and project leaders, will meet weekly to consider day to day operational matters and facilitate communication. A periodic team briefing process will be introduced to facilitate divisional communication.

2004–05 planned outcomes

Within Geoscience Australia, NMD contributes to achieving the following planned outcomes:

- Improved resource management and environmental protection
- Safer communities and transportation

NMD's work underpins in a general way all national research policy outcomes, but also ensures Geoscience Australia contributes specifically towards the achievement of the following national research priority outcomes:

- Safeguarding Australia
- Frontier technologies for building and transforming Australia's industries.

2004–05 key business priorities

There are three main themes emerging from the review of NMD's strategic directions:

1. Geographic information to meet Australian Government policy priorities:

Emergency Management: Following the COAG agreement on emergency management arrangements and recent bushfire experiences, NMD is designing a project to meet emergency management needs for geographic information. This entails a pilot 1:100,000 mapping program to support State emergency management requirements and provision of geographic information to underpin a national natural hazard risk assessment program by the Geohazards Division.

Defence: Under a ministerial agreement and Service Level Agreement with the Defence Imagery and Geospatial Organisation, NMD will continue mapping of priority areas of Australia to defence specifications using NMD's contractor panel. This partnership in mapping facilitates national coverage and contributes to the spatial industry development through the contractor panel.

Marine Zone Management: As part of the science program to support Oceans Policy, NMD is commencing development of an Australian Marine Spatial Information System to meet the needs of the National Oceans Office and Australian Government marine agencies more broadly. NMD will also continue to work jointly with Petroleum and Marine Division and Departments of Foreign Affairs and Trade and Attorney General:

to deliver by November 2004 Australia's submission to the UN Commission on the Limits of the Continental Shelf on legal extensions to the continental shelf under the UN Convention on Law of the Sea and support its consideration by the Commission, and support negotiation of offshore boundaries with adjacent countries.

Other Government Priorities: The 1:250,000 national seamless database of topographic information will be updated so the oldest information will be *circa* 2000. This will provide a current fundamental database of topographic information both for access at 1:250,000 scale and will underpin the production of smaller scale products and reference maps. This database will also be used to produce a series of 1:1 million aeronautical charts with Airservices Australia and thematic layers and maps on demand for emerging priorities.

2. Public access to geographic information:

Geographic and spatial information is widely used by governments, academia and the public. The continued public availability of legacy and new map and spatial data products is a key objective particularly under the Spatial Data Access Policy. This policy provides for nominated fundamental data sets to be provided for free over the web or at the cost of transfer for physical products.

Product Management: Maps, data products are distributed through a retail distribution network. Maintenance and development of the distribution channel, development of new products and capture of customer feedback is ongoing.

Web Access: Delivery of data over the web is an increasingly important aspect of information delivery. MapConnect will be a tool for access and download over the web of extracts from the seamless topographic database by clients.

Remote Sensing: Public good remotely sensed data from a variety of satellite sources is acquired, processed and distributed by ACRES to government agencies, academia and industry in addition to Geoscience Australia programs. The key initiatives that will be undertaken in 2004-05 in addition to ongoing acquisition and distribution are:

- development of a national strategic remote sensing plan with the assistance of a new national reference group.
- development of the capability to acquire data from the new Japanese ALOS satellite
- assessment of the quality of current Landsat products and communication to clients the utitlity of current Landsat data
- development and communication to clients of a risk management strategy and contingencies in event of failure of a Landsat satellite.
- further improvements in acquisition systems and catalogue and access arrangements.

3. Spatial data services and technology development

Interoperability: A capability is being developed to improve access to a utility of geographic data by developing web services with CIMA web. A trial will be undertaken for a web service based on the gazetteer and in the long-term, it is proposed that AMSIS be developed as an interoperable service.

Technology Development: NMD will participate in the Spatial Information CRC with the aim of developing real time applications of remotely sensed data, automatic feature extraction from remotely sensed data and development in visualisation of geographic data and data structures and errors.

Spatial Data Services: Spatial data and remote sensing services are delivered to Geoscience Australia programs. Key initiatives are

- development of a corporate strategy for spatial data and remote sensing services with the assistance of a new reference group;
- development of a corporate GIS strategy;
- a major upgrade of visualisation capability; and
- an enhanced remote sensing application service to Geoscience Australia programs.

Petroleum and Marine Division

Mandates

Petroleum and Marine Division operates under a mandate that is drawn from the:

- 2004-2005 Portfolio Budget Statement;
- 2004 Energy White Paper, Securing Australia's Energy Future;
- Ministerial Petroleum Resource Policy;
- Offshore Petroleum Statement;
- Australian Marine Science and Technology Plan; and
- Australian Oceans Policy.

Vision and mid-longer term directions

Petroleum

That pre-competitive data, information, and technical advice generated by Geoscience Australia leads industry to the discovery, and appropriate development, of a new oil province, and of further oil and gas fields in existing provinces.

Opportunities for discovery of a new oil province to meet Australia's oil supply will be maximised by:

- acquisition of new geoscience data and information from selected geologic basins within the Australian Marine Jurisdiction, and
- identifying, through research and data analysis, frontier areas with oil potential.

Exploration interest in established areas, and particularly for oil, will be maintained by:

- researching and documenting the petroleum systems and the remaining potential in established areas, and emphasising new opportunities; and
- providing reference information on the geology, oil and gas families, and biostratigraphy to support the technical evaluation of these areas by industry.

Maintain exploration industry interest in Australia by:

- innovatively promoting the petroleum prospectivity of Australian basins to both the national and international oil industry, and with a focus on commercial objectives of companies of different sizes; and
- assisting the private sector where there are complementary promotional interests.

Provide economic options for mitigation of greenhouse gas emissions by:

- researching and documenting sites for the geological sequestration of carbon dioxide through the CRC for Greenhouse Gas Technologies; and
- contributing to the development of an appropriate regulatory regime for carbon dioxide capture and storage.

Maintain a transparent, efficient, and effective regulatory regime for the Commonwealth jurisdiction by:

- provision of high quality independent technical advice on proposals submitted under the PSLA and on the industry more generally, including reserves and production forecasts; and
- responding to resource management issues as, and when, they occur.

Under the terms of the Spatial Data and Access Policy, improve access to the stock of industry and government data and information concerning petroleum potential, petroleum exploration developments and the characteristics of Australian petroleum accumulations by:

- development, population and implementation of client focused information delivery systems; and
- improved management of and access to physical information assets.

Marine and coastal

Marine geoscience data, information and technical advice generated by Geoscience Australia is an essential element of the national oceans and coastal management, and underpins the success of Australia's case for an extended continental shelf.

Meet Geoscience Australia's obligations related to the UN Convention on the Law of the Sea by:

- completing geotechnical documentation of Australia's case for 'Legal Extensions to the Continental Shelf" as they relate to Australia, its offshore territories and the Australian Antarctic Territory; and

- supporting the presentation of the case to the UN Commission on the Limits of the Continental Shelf (CLCS) and subsequent interactions with the CLCS and their subcommission appointed to examine Australia's submission.

Establish a geoscientific knowledge base to underpin Regional Marine Planning, the establishment and management of Marine Protected Areas, and the Australian Marine Jurisdiction more generally by:

- researching the seabed – its form and character, including geochemistry as appropriate, and sediment dynamics particularly as they relate to benthic ecosystems and anthropogenic impacts, in part through CRC Torres Strait; and
- evaluating resource potential.

Contribute to a geoscientific knowledge base to underpin management of estuaries in Australia by:

- researching and developing models and decision support processes in part through the Coastal CRC to assist in the management of the coastal zone for:
  - the increasing effluent, sediment, nutrient and contaminant discharges and toxic spills into coastal waterways;
  - degraded coastal ecosystems; and
  - increased hazards due to storm surge, flooding and erosion exacerbated by climate change.

Under the terms of the Spatial Data Access and Pricing Policy, improve access to the stock of industry and government data and information to inform decision making in the management of the AMJ and the Coastal Zone by:

- development, population, and implementation of client focused information delivery systems; and
- working with other marine institutions to facilitate data availability data exchange and integration protocols.

Key stakeholders

Australian Government and industry

Department of Industry Tourism and Resources (DITR) and the Petroleum Industry: by providing technical advice and pre-competitive geoscientific information to maintain and attract exploration and production in Australia's offshore jurisdiction. PMD also provides advice on geological sequestration of carbon dioxide (CO2).

Department of the Environment and Heritage, National Oceans Office, and relevant State agencies: by providing technical advice and geoscientific research outcomes relevant to Australia's marine and coastal environment.

Department of Foreign Affairs and Trade (DFAT) and Attorney-General's Department: through technical advice and presentation to the United Nations Commission on the Limits of the Continental Shelf (CLCS) of Australia's case for extended continental shelf (ECS) under article 76 of the United Nations Convention on the Law of the Sea.

Department of Education Science and Training (DEST): through participation in CRC for Coastal Zone, Estuary and Waterway Management and CRC for the Great Barrier Reef World Heritage Area - Torres Strait Program, and the CRC for Greenhouse Gas Technologies (CO2CRC).

Key roles

Providing geoscientific leadership, technical advice, and information to underpin Australia's management of offshore oceans and coastal waterways and the petroleum resource industry. This includes custodianship of, and online access to, national geoscientific databases related to marine and petroleum roles, and through participation in Cooperative Research Centres (CRC); CRC for Coastal Zone, Estuary and Waterway Management and CRC for the Great Barrier Reef World Heritage Area - Torres Strait Program, and CRC for Greenhouse Gas Technologies (CO2CRC).

Modus operandi

The work program is developed after extensive consultation with key stakeholders; this includes relevant Australian Government, State and Northern Territory agencies, CRC's, and industry.

Consultation for the new petroleum acquisition program included visits to both international and national companies, and their peak body, the Exploration Committee of the Australian Petroleum Production and Exploration Association (APPEA) to present a portfolio of offshore opportunities, and to outline and discuss research methodology and delivery, in accord with 2001 Spatial Data Access and Pricing Policy.

The marine geoscience program is developed in close consultation with the key stakeholder, the National Oceans Office.

Reporting on progress is via Geoscience Australia's website, relevant publications, and presentations at seminars, and through regular contact with stakeholders, either in Canberra or through planned consultative visits by Geoscience Australia staff, at least once per annum. Other events include open days, Geoscience Australia seminars for staff and Industry participation, and a widely disseminated invitation to meet with PMD staff when company and other personnel are visiting Canberra.

The program is monitored by the management team of the Chief, Group Leaders, and Resource and Business managers. Scheduled meetings are held weekly between the Chief, Group and Project leaders.

To both monitor and develop strategic directions for the Division a meeting is held monthly between the Chief and Group Leaders. The Chief visits with Groups and Projects on an ad hoc basis.

Team briefings for all PMD staff are held on a monthly basis.

Science outputs are benchmarked through peer review of papers submitted for publication or for presentation at agency, national, and international meetings or conferences.

In addition to the divisional-wide monitoring, planning and reporting, Project Leaders meet formally with teams on a weekly basis.

2004–05 planned outcomes

Within Geoscience Australia, PMD is responsible for achieving the following planned outcomes:

- enhanced global attractiveness of Australia's offshore and onshore exploration and investment opportunities; and
- improved resource management and environmental protection

PMD also ensures Geoscience Australia contributes towards the achievement of the following national research priority outcome: *An Environmentally Sustainable Australia*.

PMD addresses three goals within this priority:

- *Developing Deep Earth Resources* - Petroleum Promotion and Technical Advice functions,
- *Sustainable Use of Australia's Biodiversity* - Marine and Coastal Environment function, and
- *Reducing and Capturing Emissions in Transport and Energy Generation* – Greenhouse Gas Advice function.

2004–05 key business priorities

- In the quest for a new oil province for Australia, acquire and interpret seismic data to build new investment opportunities in south western and northern Australia in support of the 2005 (and subsequent) offshore petroleum acreage release.
- Provide geoscientific advice supporting the follow-up to Australia's 2004 submission to the United Nations Commission of the Limits of the Continental Shelf (UNCLCS).
- Complete phase II of the preservation of deteriorating seismic records in the national archive of petroleum industry data.
- Provide geoscientific advice supporting the follow-up to Australia's submission to the United Nations Commission on the Limits of the Continental Shelf (UNCLOS).
- Assist in the development of geological sequestration of carbon dioxide, through the Greenhouse Gas Technologies Cooperative Research Centre (CO2CRC).
- Improve access to pre-competitive geoscience information and compilations by accelerating the development of Internet-based delivery systems.

Part 3: 2004–05 work program

Follows are the 2004–05 work programs for the:

- Minerals Division;
- Geohazards Division;
- National Mapping Division; and
- Petroleum and Marine Division.

2004–05 work program — Minerals Division

Introduction

Minerals Division is responsible for the following six work programs.

1. Mineral provinces group work program.
2. Regional studies and geochronology group work program.
3. National resources and land use advice group work program.
4. National projects group work program.
5. Geochemistry and metallogeny group work program.
6. Mineral exploration promotion work program.

1. Mineral provinces group work program

Projects in this group are designed to provide pre-competitive information to promote exploration opportunities and are mainly focused on key Australian mineral provinces. The projects are carried out under a number of banners, including the National Geoscience Agreement (NGA), Predictive Mineral Discovery Cooperative Research Centre (pmd*CRC).

This group contributes to Geoscience Australia's "Enhanced global attractiveness of Australia's offshore and onshore exploration and investment opportunities" intermediate-level outcome. It also contributes to the National Research Priorities 1, Goal 6: Developing Deep Earth Resources.

Mineral provinces manages the following two projects.

i. Predictive Mineral Discovery Cooperative Research Centre (pmd*CRC).
ii. Proterozoic Synthesis of Australia - Understanding Proterozoic Orogenic Gold Systems.

*1.i Predictive mineral discovery cooperative research centre (pmd*CRC)*

The *pmd*CRC* consists of 7 research partners who work in conjunction with mineral exploration industry and state government sponsors to focus research on issues that are of critical importance to ore discovery.

Project outcome

A fundamental shift in mineral exploration practice and cost-effectiveness through improved understanding of mineralising processes and a 4D understanding of the evolution of mineralised terranes.

Project output

1) Advice to *pmd*CRC* stakeholders on a regular basis through formal meetings (e.g. Executive Research Committee), and informally as requested.
2) Presentations to industry sponsors at formal *pmd*CRC* meetings.
3) Presentations to public domain conferences.
4) Final report on McArthur Basin seismic survey published as GA Record.
5) Contribute to final reports for *pmd*CRC* sub-projects which will be completed in 2004-05, and in which GA staff participate.
6) Research into national and international trends in GRID technologies, workshop on GRID technologies in Australia, conference presentations and papers.

1.ii Proterozoic synthesis of Australia - Understanding proterozoic orogenic gold systems

This project undertakes a synthesis of Australian Proterozoic provinces on a national scale, with a focus on geodynamics, and incorporating metallogenesis, both discovered and predicted/inferred.

Project outcome

Enhanced understanding of the geodynamic setting for Proterozoic orogenic gold systems and gaps in knowledge defined to assist in future project planning.

Project output

1) Pilot interpretation of one or more Proterozoic provinces as time-space plots to develop methodology and software tools.

2. Regional studies and geochronology group work program

Projects in this group are primarily carried out under the National Geoscience Agreement (NGA) which operates between Geoscience Australia and its State and Territory Geological Survey partners. The projects provide pre-competitive geoscience information to enhance the global attractiveness of Australia's onshore exploration and investment opportunities through the reduction of exploration risk. The group provides specialist geochronology services and conducts regional scale geological syntheses. The integrated geoscience outputs delivered in this program contribute toward a better understanding of deep earth resources. The group aims to contribute to National Research Priority 1 Goal by developing methodologies to permit the identification of mineral systems in areas having potential for concealed mineral deposits.

Regional Studies and Geochronology manages the following four projects.

i. Tanami.
ii. Gawler.
iii. Paterson.
iv. Geochronology.

2.i Tanami

The Tanami project determines 3D architecture of Tanami region and geological evolution of the Tanami gold mineral system.

Project outcome

Enhanced mineral exploration strategies for gold deposits in the Tanami.

Project output

1) 3D geometry of the Tanami mineral system.
2) Determined ages of events in the Tanami.
3) Mineralisation and regolith development in the Tanami.

2.ii Gawler

The Gawler project determines 3D architecture of the Olympic Copper-Gold Province and geological evolution of the Central Gawler Gold mineral system.

Project outcome

Better mineral exploration strategies and the promotion of the Gawler Craton for mineral exploration.

Project output

1) 3D Crustal Model for the central part of the Olympic Cu-Au province.
2) Reports and digital datasets synthesising regional scale basement geology and mineral system evolution in the Central Gawler Gold Province.
3) Promotion of the Gawler Craton as an exploration destination.

2.iii Paterson

The Paterson project synthesises current understanding of Paterson Province and its mineral systems. It will also scope and develop a plan for future research to address key questions.

Project outcome

Enhanced mineral exploration strategies and promotion of the Paterson region for mineral exploration through provision of an improved geological framework.

Project output

1) Scoping report and project plan for future studies of the Paterson region.

2.iv Geochronology

The Geochronology project determines the ages of rocks and geological events using U-Pb SHRIMP and Ar/Ar analytical techniques.

Project outcome

Enhanced mineral exploration strategies through a better understanding of the ages of geological events leading to the provision of an improved chronologic framework.

Project output

1) Processed rock samples that separate mineral grains suitable for dating the age of rocks and fluid flow events using SHRIMP and Ar/Ar techniques.
2) Geochronology web reports composed of a collection of individual reports that detail the analytical results of SHRIMP and Ar/Ar data collection sessions on a sample-by-sample basis.
3) Specialist peer-reviewed research reports on SHRIMP zircon analytical techniques

3. National resources and land use advice group work program

The National Resources and Land Use Advice Group prepare the inventory of Australia's identified mineral resources for all major and some minor commodities. This provides a basis for advice in support of policies and decisions related to enhanced global attractiveness of Australia's minerals mineral exploration investment opportunities.

The group also works in complementary ways with CRCLEME and NGA partners in producing geoscience information and approaches that is building an enhanced understanding of the layer of weathered and transported materials (regolith). This supports both, exploration under cover and improved resource management and environmental protection.

The work program contributes to the NRP *Environmentally sustainable Australia*, specifically the goals *Deep Earth resources* and *Overcoming soil loss, salinity and acidity*.

The Group undertakes some externally funded activities requested by Government agencies and, in the case of CRCLEME, from a range of external clients.

National Resources and Land Use Advice Group manages the following projects:

i. Mineral Resources and Advice.
ii. Geochemical Baselines.
iii. Cooperative Research Centre for Landscape Environments &and Mineral Exploration (CRC LEME).
iv. Australian Bid for International Geological Congress.

3.i Mineral resources & advice

This project provides a national assessment of mineral and solid fuel resources and provision of authoritative scientific and technical advice on minerals and related issues

Project outcome

Informed decision-making for mineral resource management, land use planning and environmental protection

Project output

1) Authoritative, independent scientific and technical advice on known and potential mineral resources; exploration and discovery (including offshore programs in Commonwealth waters, and uranium as required under the Atomic Energy Act); mining (including under the Environment Protection & Biodiversity Conservation Act); processing; land access, use; environment protection; metals and the environment (including waste management); and sustainable development.
2) National assessment of mineral resources.
3) Information and analysis for Australia's contribution to OECD/NEA-IAEA publication 'Uranium 2005, Resources, Production & Demand'.
4) Australian Government representation to Joint OECD/NEA-IAEA Uranium Group and associated duties as Vice Chair of the Group, including reports on uranium developments in Australia and resource classification issues.
5) Australian Government representation on the Ministerial Council of Mineral and Petroleum Resources' Subcommittee of Chief Inspectors of Mines.
6) Australian Energy GIS for ITR (Energy & Environment Division).
7) Indian Ocean Territories GIS for DoTaRS.
8) Web maps for Australian Greenhouse Office (AGO) and Office of Renewable Energy Regulator (ORER).
9) Australian Mines Atlas Stage 2 (new developments, themes and enhancements).
10) Revision of province scale mineral potential GIS (OZPOT) in consultation with States/NT and incorporation into the *Atlas of Australia's Mineral Resources, Mines and Processing Centres.*

3.ii Geochemical baselines

This project undertakes collaborative integrated regional studies to achieve a more comprehensive understanding of cover materials and processes in regions of significant mineral potential.

Project outcome

Increased influence with stakeholders and the community through improved information for mineral exploration, natural resource management, land use planning and environmental protection.

Project output

1) Reports on Central Gawler geochemical baselines and regolith thickness.

3.iii CRC LEME

GA works with CRC LEME to undertake research into regolith to develop a greater understanding of Australia's terrain when applied to mineral exploration and environmental management.

Project outcome

Effective strategies for mineral exploration through cover and an enhanced information base for natural resource management.

Project output

1) Map of Australian physiographic regions with accompanying report for Australian Collaborative Land Evaluation Project (Conditional on anticipated funding from ACLEP).
2) Regolith –landform map of the Northern Territory with accompanying report.
3) 3D Model of the Callabonna Sub-basin.
4) Promotion of hydro geochemistry (HGC) in mineral exploration.
5) Datasets and maps of pilot area for low-density geochemical surveys [Note: This is collaborative Geochemical baselines project, reported above].
6) Paper on the development of acid sulphate soil conditions in the Mid Tertiary on the margins of the Eucla Basin, for publication in an international journal.

7) Thematic papers on work conducted in South Australia under National Action Plan for Salinity and Water Quality (NAP) for international journal.
8) Final products for the Lower Balonne NAP project.
9) Models of basin and valley-fill for selected catchments in the Murray-Darling Basin.

3.iv Australian bid for international geological congress

This project oversights Australia's invitation to bid to host the International Geological Congress (IGC).

Project outcome

Competitive bid for the IGC of very high standard.

Project output

1) Australian bid for IGC.

4. National projects group work program

The National Projects Group manages the national endowment of geological and geophysical data. In keeping with the Australian Government's spatial data access policy, it develops and implements strategies to make them available to industry and the general public via the World Wide Web. The Group value-adds to many of the data sets by compiling them into seamless digital geological and geophysical coverages of the whole country. The Group is also developing future capability through the development of core skills in geophysical data acquisition and quantitative interpretation, targeted research into geophysical inversion techniques, and the management of a Major National Research Facility (MNRF) that was established through a grant from the MNRF Program administered by the Department of Education Science and Training. The National Projects Group is contributing to the National Research Priority "An Environmentally Sustainable Australia", particularly "Developing Deep Earth Resources".

National Projects manages the following projects.

i. The Australian National Seismic Imaging Resource (ANSIR) Project.
ii. National Geological Maps Project (MAPS).
iii. Geophysical Acquisition and databases Project (GAD).
iv. Inversion Methodology Project (Inversion).
v. Minerals Information Development and Access Solutions Project (MIDAS).

4.i Australian National Seismic Imaging Resource (ANSIR) project

This project supports a Major National Resource Facility (MNRF) providing a seismic data acquisition capacity for use by Australian and International researchers.

Project outcome

Enhancement of Australia's scientific and industrial competitiveness by keeping Australia at the leading edge of key technological developments in the field of seismic imaging.

Project output

1) Seismic data sets imaging the Earth's crust for projects approved by the ANSIR Access Committee and ANSIR Board.
2) Annual reports highlighting the activities of the ANSIR MNRF for the ANSIR Management Advisory Board and the Department of Education, Science & Training.

4.ii National geological maps

This project is building a seamless digital synthesis of Australian Geology.

Project outcome

Enhanced potential for the Australian community to obtain economic, social and environmental benefits through the delivery of continent wide, seamless, digital geology.

Project output

1) Synthesis of Australian geology in seamless coverages.

4.iii Geophysical Acquisition and Databases (GAD)

The GAD project is an active concentration of specialists engaged in acquisition, processing, archiving, enhancement, presentation, interpretation, and research in the fields of airborne geophysics and gravity.

Project outcome

Enhanced exploration strategies and promotion of mineral exploration opportunities in Australia, and improved environmental management

Project output

1) Updated datasets from the National Geophysical Databases.
2) New airborne geophysical and gravity datasets as required by clients.
3) Updated values at selected gravity base station sites.
4) Develop and implement methodology for generating continental-scale geophysical data sets, grids and maps.

4.iv Inversion methodology

This project develops and demonstrates inversion modelling methods for geophysical data for use by GA Projects and uptake by the exploration industry.

Project outcome

Enhancement of Australia's scientific and industrial competitiveness by keeping Australia at the leading edge of key technological developments in the field of inversion of geophysical data.

Project output

1) Reports on the efficacy of inversion methodologies for mapping and exploration undercover.

4.v Minerals Information Development and Access Services (MIDAS)

This project develops and maintains the Minerals Division's data management systems for clients.

Project outcome

Enhanced exploration strategies and promotion of mineral exploration opportunities in Australia through access to high quality information management systems.

Project output

1) Contribution to corporate IM activities that allow data input, storage and delivery to clients.
2) Management and development of the Minerals Division's Website content.
3) Management and development of the Minerals Divisions Databases.
4) Management and development of the Minerals Divisions Spatial Data Archive.

5. Geochemistry and metallogeny group work program

Projects in this group undertake specialist studies in geochemistry and metallogeny, with an emphasis on quantitatively developing an understanding of the critical, regional to district scale geological processes that were responsible for the distribution of Australian Ore deposits. The models developed are multifaceted and incorporate several physical and chemical processes with complex interdependencies. By placing a greater emphasis on the larger scale mineral system processes exploration models can translate into 3-D and 4-D graphical representations that are relevant to the local exploration area. All theoretical models are independently validated using quantitative geochemical modelling. Projects in this group are designed to

provide real time online access to pre-competitive information to promote exploration opportunities.

Much of the geochemical research is underpinned by high quality whole rock, mineral, fluid inclusion analyses using XRF, ICP-MS, Laser Raman, XRD and PIMA techniques. The focus of the geochemical laboratories is firstly to refine and develop inorganic geochemical analytical techniques that are relevant to data types relevant to metallogenic research. Secondly, to develop systems for storing and managing geochemical information; and for making these data accessible via the Australian Geoscience Portal.

Smart information management tools are utilised by this Group. In line with the significant changes in Information Management globally, the project is re-architecting databases and software to provide data and processing via re-useable modules that will enable multiple points of access, facilitate moves towards implementation of international standards such Open GIS Consortium (OGC) and ISO XML standards, and delivery of web services. XML technologies will be used for interfacing GA's geochemical databases and software with to those of our partners, clients and stakeholders to allow the projects in the Group to operate virtually, and collaborate both nationally and internationally via the Internet. The project also continues to develop high quality mass transfer modelling software to determine the products of critical chemical reactions in Australian Mineral Systems.

The projects function as part of the National Geoscience Agreement (NGA) and the Predictive Mineral Discovery Cooperative Research Centre (pmd*CRC). This group contributes to Geoscience Australia's "Enhanced global attractiveness of Australia's offshore and onshore exploration and investment opportunities" intermediate-level outcome. It also contributes to the National Research Priorities 1, Goal 6: Developing Deep Earth Resources.

The Geochemistry and Metallogeny Group manages the following projects.

i. Minerals Geochemistry Research and Development.
ii. Australian Mineral Systems.
iii. Felsic and Intermediate Igneous Rocks of Eastern Australia.

5.i Minerals geochemistry research and development

This project aims to firstly refine and develop inorganic geochemical analytical techniques and secondly to develop and improve systems for storing and managing geochemical information and for making these data accessible via the Australian Geoscience Portal. Specifically the project seeks to:

- provide research quality analytical data to GA geoscientists and their collaborators
- refine existing techniques for whole rock, mineral, fluid inclusion analyses using XRF, ICP-MS, Laser Raman, XRD and PIMA techniques and to research new analytical techniques of relevance to the Minerals industry;
- develop integrated databases for storing all geochemical data, including spectral data;
- utilise OGC standard XML technologies (in particular Observartion and Measurement ML and SensorML) to interface GA's geochemical databases and software with those of our partners and clients using the Internet; and
- ensure all geochemical information is interoperable with equivalent data from the State and Territory Surveys and accessible in real time through the Australian Geoscience Portal.

Project outcome

Improved understanding of the geochemistry of the Australian continent through the development of appropriate analytical techniques and improved online accessibility of data.

Project output

1) Analytical services to Onshore projects and external clients as required.
2) Documented user requirements for a database for storing geochemistry laboratory metadata, which is compatible with the OGC SensorML and ADX XMML standards.

5.ii Australian mineral systems

This project undertakes the study of mineral systems processes with an emphasis on defining geological processes on a regional to district scale that enhance an understanding of the

controls on the distribution in space and time of specific Australian ore deposit types. The project will develop 3-D and 4-D exploration models that have been validated by high quality hydrothermal modelling.

Project outcome

Enhanced understanding of the 3-D and 4-D processes that control the distribution of Australian Mineral Systems in space and time.

Project output

1) Report(s) on the ingredients and expressions of Intrusion-Related Gold Deposits (IRGs) in Australia.
2) Report on technical specifications for the collection and storage of mineralogical data in GA.

5.iii Felsic and Intermediate Igneous Rocks of Australia (FIGS)

This project will provide syntheses of publicly available data sets to assess the metallogenic potential of major Australian Phanerozoic granite suites and their associated host rocks. These datasets are seen as key factors in allowing better definition and targeting of potential granite-related Au - base metal mineralisation in brown- and green-field areas of eastern Australia. The data will also be important for explorers investigating new deposit styles, in particular the recently proposed Intrusion-related gold model.

Project outcome

Improved understanding of the relationship between, and respective roles of, granites and country rocks of Australia with regards to Australian Mineral Deposits, with emphasis on their relationship in space and time to regional petrographic and tectonic features of the Australian crust.

Project output

1) Compilation of data sets on granites and country rocks for central and southern Queensland.
2) Report on the Geophysical Interpretation of the Red Rock area.

6. Mineral exploration promotion work program

The Minerals Exploration Promotion Project aims to encourage increased investment in mineral exploration and discovery of mineral resources in Australia by increasing the awareness of mineral exploration opportunities in Australia.

Australia is one of the world's leading mineral exploration destinations accounting for about 16% of world mineral exploration budgets in 2003. Our objective is to facilitate an increase in that percentage by promoting the benefits of exploring in Australia and the geoscience information available to reduce exploration risk.

The project will contribute directly to Geoscience Australia's intermediate outcome of enhancing the global attractiveness of Australia's onshore exploration and investment opportunities. It contributes to national research priority outcome of an Environmentally Sustainable Australia through priority goal 6, Developing Deep Earth Resources.

6i Mineral exploration promotion

The Minerals Exploration Promotion Project aims to encourage increased investment in mineral exploration and discovery of mineral resources in Australia by increasing the awareness of mineral exploration opportunities in Australia.

Project outcome

Increased global awareness of mineral exploration opportunities in Australia.

Project output

1) Coordinated Australian Governments' technical promotions at 3 key national and international mining and mineral exploration conferences for the Ministerial Council on Minerals and Petroleum Resources (MCMPR).
2) Geoscience Australia's Minerals Exploration Seminar, Perth, 29 November.
3) Reports to CGGC on Australia's mineral exploration promotion activities.
4) Reports, reviews and maps on mineral exploration, discovery and resources.

2004–05 work program — Geohazards Division

Introduction

Geohazards Division is responsible for the following two work programs.

1. Earth monitoring group work program.
2. Risk research group work program.

1. Earth monitoring group (GEM) work program

This group makes synoptic Earth observations that contribute to a global understanding of the Earth and its systems. Earthquake activity in the Australian region is monitored as input to an alert system for emergency management and for the assessment of earthquake hazard. A network of seismic, infrasound and hydroacoustic stations monitor global nuclear activity as part of Australia's commitment to the Comprehensive Nuclear Test Ban Treaty. The geomagnetic field in the Australian region is monitored as input to space weather and communications warnings of geomagnetic activity, and for magnetic compass navigation applications. The Group also uses a range of space geodetic techniques to maintain the geodetic framework that supports all spatial information and associated applications in Australia and its offshore territories. The infrastructure facilitates, through international cooperation, millimetre precision for scientific research in fields such as neotectonics and earthquake risk, groundwater monitoring, sea level monitoring and climate change.

The group contributes to the following GA intermediate level outcomes:

- Improved resource management and environmental protection; and
- Safer communities and infrastructure.

The group contributes to the following National Research Priority goals:

- An environmentally sustainable Australia; and
- Safe-guarding Australia.

The Geoscience Australia Earth Monitoring Group manages the following projects.

i. Geodetic Operations.
ii. Space Geodesy and Geomagnetism.
iii. Integrated Geophysical Networks.
iv. Nuclear Monitoring.
v. Rabaul Volcanological Observatory Twinning Program.

1.i Geodetic operations

This project provides ongoing maintenance & improvement for the geodetic infrastructure of Australia and its territories by continually monitoring the geophysical condition of the Australian continent and offshore territories, including provision of the geodetic framework for national spatial data infrastructure. This is necessary to ensure that the geodetic infrastructure underpinning Australia's spatial framework meets the evolving needs of science and the Australian community.

Project outcome

An improved globally related geodetic framework for science and as the basis for compatible geospatial information in Australia and its territories.

Project output

1) Enhanced Geodetic InfrastructureGPS OperationsSatellite Laser RangingSouth Pacific Regional GPS network

1.ii Space geodesy and geomagnetism

This project undertakes data processing and analysis of multiple space geodetic techniques and absolute gravity for the maintenance and enhancement of global, regional and national geodetic infrastructure. The infrastructure is used for downstream research by the project in

areas such as neotectonics and sea level monitoring. Variations in the Earth's magnetic field are monitored for input to space weather warnings and for applications such as magnetic compass navigation and mineral exploration.

Project outcome

Accurate, consistent, globally compatible, continuously monitored and accessible celestial and terrestrial reference frames and their mutual relationships; an improved understanding of the neotectonics of the Australian continent; greater understanding of the impacts of climate change in the Australian region through sea level monitoring; Geomagnetic data for space weather warnings, and robust models of the secular variation in the Earth's magnetic field for industrial and science applications.

Project output

1) Reference Frames and Earth Orientation Parameters as input to the Australian Geodetic Infrastructure.
2) Geodetic support for the South Pacific Sea Level Monitoring and Climate Change Program.
3) Absolute Gravity support for the Australian Geodetic Infrastructure.
4) Geodetic Monitoring of Groundwater and Hazards.
5) Geomagnetic monitoring operations for industrial applications, hazard mitigation and navigation.

1.iii Geophysical networks

This project provides on-going maintenance and development of the 66 seismic, geomagnetic, hydroacoustic and infrasound monitoring network stations that underpin nuclear monitoring and hazard assessment in the Australian region. $295,000 of the external funding for this project is for supporting Nuclear Monitoring activities (see Nuclear Monitoring project).

Project outcome

Improved seismic, geomagnetic, hydroacoustic and infrasound monitoring networks that provide cost-effective, high quality data in a timely fashion that is suitable for hazard assessment and nuclear monitoring purposes.

Project output

1) Ongoing provision of high quality seismic, geomagnetic, hydroacoustic and infrasound data.

1.iv Nuclear monitoring

This project monitors nuclear explosions worldwide on behalf of the Dept. of Foreign Affairs and Trade following a 1984 government decision. In 1996, Australia signed the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and ratified the Treaty in 1998. As part of the ratification process new legislation had to be passed and a new Act, the "Comprehensive Nuclear-Test-Ban Treaty Act 1998" was passed. The Nuclear Monitoring project fulfils Australia's obligations under the CTBT through monitoring nuclear explosions worldwide and strengthening Australia's commitment to the global verification system. Note that an additional $295,000 of external funds goes to the Geophysical Networks project to provide operational and maintenance support for the Nuclear Monitoring project.

Project outcome

Enhanced Australia's national technical means to monitor nuclear explosions worldwide and strengthened Australian commitment to the establishment of the global verification system to monitor future compliance to the Comprehensive Nuclear-Test-Ban Treaty.

Project output

1) Technical advice and information for the Departments of Foreign Affairs and Trade, Prime Minister and Cabinet & Defence, Comprehensive Nuclear-Test-Ban Treaty Organization

(CTBTO), media and the public, to meet Australian national technical means requirements and obligations to the CTBT.
2) Developed enhanced discrimination procedures for Australia and the international community to improve Australia's capability to discriminate nuclear explosions. This involves research and development of applications in seismic, hydroacoustic and infrasound technologies.
3) Nuclear monitoring data for funding and collaborative agencies.

1.v Rabaul vocanological observatory twinning program 2003-2008

This project provides service and support to the Rabaul Volcanological Observatory (Fully funded AusAID Project).

Project outcome

Reduction of the impact of volcanic hazards on Papua New Guinean communities through the provision of effective volcano monitoring capabilities.

Project output

1) A high rate of data flow and improved security at 4 remote volcano monitoring sites.
2) Installation of new generation of monitoring equipment at RVO remote sites.

2. Risk research group work program

The Risk Research Group conducts applied research into the risks to Australia from sudden-impact hazards, particularly earthquake, tsunami, flood (riverine and storm surge) severe wind (tropical cyclone and severe storm), landslide, and, more recently, bushfire and counter terrorism. Of these hazards, the Group conducts basic research into the origin and consequences of earthquakes and landslides; whereas for other hazards the Group relies in part on basic data and hazard parameters from other agencies (e.g., the Bureau of Meteorology) for input to hazard and risk model development. The Group has a breadth of technical expertise in the geosciences, civil engineering, mathematics, socio-economics, computer programming, GIS and database engineering.

This group's activities contribute to the following National Research Priority goals:

- Safe-guarding Australia; and
- An environmentally sustainable Australia.

The Risk Research Group manages the following projects.

i. National Risk Assessment.
ii. Risk Assessment Methods.
iii. Earthquake Hazard and Neotectonics.
iv. Critical Infrastructure Protection.

2.i National risk assessments

This project assists the delivery of a national risk assessment program to implement natural disaster Reform Commitments 1 and 2, agreed to in-principle by the Council of Australian Governments in 2003. The risk assessment program includes development of methods, tools, risk assessments and data collection. Reform Commitments 1 and 2, among other recommendations, are implemented through the Disaster Mitigation Australia Package coordinated by DOTARS. This project is undertaken in close collaboration with whole of government agencies and non-government organisations.

Project outcome

Australian communities and infrastructure are safer because of prioritised, cost effective mitigation measures, introduced as a consequence of the risk assessment program.

Project output

1) An agreed National Risk Assessment Framework in consultation with stakeholders.

2) Initial reports on National Assessments of Risks from major, sudden impact natural hazards.
3) Final reports and databases for multi-hazard risk assessments in Cities Project, Perth.

2.ii Risk assessment methods

This project aims to bring together natural hazard research and the vulnerability of the elements at risk in order to define the national threat from a range of rapid onset natural hazards.

Project outcome

The application risk assessment models, methods and tools to support funding and mitigation decisions across all levels of government in support of the Disaster Mitigation Australia Package.

Project output

1) National Risk Model Development.
2) Computational Framework for Risk Assessments.
3) Loss and Vulnerability Model Development.

2.iii Earthquake hazard and neotectonics

This project provides the Australian government and public with accurate and timely information on past, current, and probability of future occurrence of earthquakes in and around Australia.

Project outcomes

1) Improved response of emergency managers and disaster relief authorities to earthquakes and tsunami events in the Australian region.
2) Development and improvement of earthquake and tsunami hazard assessments for Australia.
3) High quality fundamental data supporting earthquake hazard assessment in Australia.

Project output

1) Earthquake alerts and implementation of new earthquake monitoring & analysis software to improve data quality and efficiency of service.
2) Development and improvement of earthquake and tsunami hazard assessments for Australia, based on an improved Australian earthquake catalog as well as on the results of research into the earthquake mechanism and earthquake and tsunami events prior to European settlement of Australia.
3) Ensuring that the fundamental data supporting earthquake hazard assessment in Australia, such as earthquake strong motion data and ground motion attenuation models, is of a quality that meets international standards and is readily accessible to the Australian earthquake engineering community.

2.iv Critical infrastructure protection

This project provides spatial information, risk analysis and modelling capability to support national initiatives in CIP.

Project outcome

Improved understanding of the vulnerability of the built environment, particularly critical infrastructure, through development of geographic information, knowledge and analysis in a risk assessment framework.

Project output

1) A preliminary analysis tools/methods for a national CIP risk assessment framework.
2) A pilot CIP Case Study (in NSW).
3) Geospatial training, tools and data to support the NCTC Capability Development Program.

2004–05 work program — National Mapping Division

Introduction

National Mapping Division is responsible for the following two work programs.

1. Mapping and marine information group work program.
2. Spatial information access and remote sensing group work program.

1. Mapping and marine information group work program

The Mapping and Marine Information Group has responsibility for planning and execution of several major projects aimed a producing maps and spatial data sets to meet the priority needs of emergency management, defence and Australian Government agencies more broadly, marine zone management and the public generally. Defence mapping is undertaken under a Service Level Agreement with the Defence Imagery and Geospatial Organisation.

Activities undertaken by this group provide fundamental spatial information that underpins many of the National Research Priority goals.

The Mapping and Marine Information Group manages the following projects.

i. Marine Spatial Information System and Advice
ii. Geographic Information for Emergency Management
iii. Geographic Information for Defence
iv. Geographic Information for Government and the Public
v. Topographic Data Management
vi. Geographic Databases and Research

1.i Marine spatial information and advice

Under the Oceans Policy, there is a growing demand for geographic information and advice on boundary matters in the Australian Marine Jurisdiction (AMJ) for purposes of Law of the Sea, regional marine planning, fisheries management, resource lease management, immigration and legislative drafting. An Australian Marine Spatial Information System (AMSIS) will be developed to meet this need. AMSIS will accurately locate marine features, interests and rights over the AMJ as well as incorporate the legal boundary information already held by Geoscience Australia. Geoscience Australia will work with agencies with custodial responsibilities for particular sectors as to the best way to provide access to their information through the system. It forms part of the national science work program agreed by the Ocean's Ministerial Board to support Ocean's Policy. Advice will continue to be provided on marine boundaries particularly in the context of submission of Australia's case for an extended continental shelf under UNCLOS.

Project outcome

Improved management of Australia's Marine Jurisdictions through application geographic and spatial information.

Project output

1) A fully scoped Project Plan for AMSIS.
2) A revised Australian Marine Boundary Information System.
3) Provision of expert advice to government on marine boundary issues.

1.ii Geographic information for emergency management

This project aims to provide the fundamental geographic data required at regional scale to underpin emergency management and regional risk assessment. The data and information required will be obtained from and through further development of the seamless topographic database. This database will be used by Geohazards Division for regional risk assessment and for the production of maps derived from this database. These are called on extensively by a

wide variety of users for emergency management purposes. The priority for new data capture and publication of maps will be determined by the risk assessment needs and by the priorities agreed with State and Territory emergency management authorities for updating of maps.

Project outcome

Improved geographic information to aid emergency management.

Project outputs

1) Phase 1 of 100K pilot mapping program.
2) Procedure for providing public access to 1:100K legacy data

1.iii Geographic information for defence

Given the benefits and efficiencies of obtaining a wide range of products from a common data base of information, the Minister of Defence and the Minister of Industry Tourism and Resources have agreed that GA should develop and use contractor panels to produce Australian maps as required to defence specifications. The work in this project is carried out under a MOU between GA and the Defence Imagery and Geospatial Organisation (DIGO), which funds the activity.

Project outcome

Improved geographic information on Australia for defence purposes.

Project output

1) Defence topographic line maps and specials.
2) Aircharts.

1.iv Geographic information for government and the public

Consistent with the Spatial Data and Access Policy, this project aims to maximise the use of mapping information held and generated for the benefit of government and the public more broadly. The seamless topographic database can be developed to meet a wide range of needs. Funding for specific developments by other agencies outside of immediate GA priorities helps underwrite the population, development and maintenance of the data set to the benefit of all users and increases the economic efficiency and relevance of the database in meeting national needs. The project also produces specific products to facilitate transfer of the information to the public via a retail network.

Project outcome

Improved geographic information for government and public use.

Project output

1) Updated 1:250,000 topographic seamless data base coverage to year 2000 currency or better including raster coverage.
2) Revision strategy for regional and thematic priorities for 1:250,000 and coverage of offshore territories.
3) Revision of 8 World Aeronautical Charts in partnership with Airservices Australia.
4) Thematic and General Reference Maps - 2 x 1: 5 million scale and Gazetteer.
5) Intergovernmental Committee on Surveying and Mapping (ICSM) support services.
6) Public access to geographic information.

1.v Topographic data management

The project undertakes the development and maintenance of seamless database environment to manage and deliver topographic information to government and the public. Ongoing development of the onshore database allows extraction of information at a variety of scales. The development of the database to hold marine spatial data is to be undertaken. Quality

control of data is also the key responsibility of this project These databases represent a strategic national asset for all NMD's topographic mapping activities.

Project outcome

Improved accessibility to and knowledge of Australia's topographic information.

Project output

1) Updated seamless database to include additional data sets.
2) Data Model for Australian Marine Spatial Information System.
3) Project scope for "TOPO_250K Seamless" product.
4) Update 1:1 million Global Map for Tasmania.

1.vi Geographic databases and research

Assessing and documenting geographic change is fundamental to the maintenance of a modern topographic information database. This is undertaken on a priority basis to prepare the information to enable contractors to update the seamless geographic database and published maps and datasets.

Project outcome

Improved knowledge and access to data relating to Australia's topographic themes and features.

Project output

1) New database to support 'all scale' mapping programs.
2) Australian Government Land Tenure database.

2. Spatial information access and remote sensing group work program

The Spatial Information Access and Remote Sensing Group has responsibility for he operation of Australia's public good satellite data reception facilities (Australian Centre for Remote Sensing) and access and delivery of geographic, spatial and remote sensing data using modern technological approaches. It works to facilitate data integration and interoperability where required. It also delivers spatial data and remote sensing services to Geoscience Australia programs. It accesses leading edge technological research through participation in the Spatial Information CRC.

Activities undertaken by this group provide fundamental spatial information that underpins many of the National Research Priority goals.

The Spatial Information Access and Remote Sensing Group manages the following projects.

i. Geographic Information Access and Interoperability.
ii. Spatial Information CRC.
iii. Australian Centre for Remote Sensing.
iv. Remote Sensing Applications and Research.

2.i Spatial/Geographic information access and interoperability

This project develops the technology solutions jointly with the Corporate Information Management and Access Group to allow access to geographic information over the web and enable interoperability with other agencies, including with clients own data sets. An area of focus is development of pilot projects which have the potential to develop into full operational systems – e.g. a pilot related to Marine Zone Management.

Project outcome

Improved accessibility to Australia's topographic information and utilisation for government administration, management and policy development.

Project output

1) A web-enabled pilot for access to the seamless database to deliver custom client-selected geographic imagery and data – MapConnect.
2) A pilot web services system to deliver Gazetteer data to internal and external clients.
3) A scoping study for system to provide web enabled access and interoperability to the Australian Marine Spatial Information System (AMSIS).
4) A position paper on how to deliver imagery (including satellite imagery) in a web service style environment.

2.ii Spatial information CRC

This project undertakes or accesses the necessary research through the Spatial Information CRC to support GA's role in the provision of spatial information. The work program is developed through the CRC Executive and Board. The current focus is on application of near-real time satellite imagery; a new multi-resolution national digital elevation model; automated feature extraction from imagery for map updates; improved geodetic positioning. The latter is carried out in the Geohazards Division.

Project outcome

Improved technology and methods to acquire, use and display spatial information.

Project output

1) CRC-SI Project 1.1 ~ Enhancing Australia's Core Geodetic Infrastructure.
2) CRC project 2.1 ~ Improved models for satellite sensor calibration.
3) CRC-SI Project 3.1 ~ A snap shot of selected current SDI initiatives around Australia.
4) CRC Project 3.1 ~ Preliminary set of concepts for Virtual Australia.

2.iii Australian centre for remote sensing

This project manages the acquisition and distribution to users of public good satellite data for Australia. This is achieved through access agreements with satellite providers and collection of satellite data through reception facilities at Alice Springs and Hobart. These facilities are operated by the private sector under a management contract. The project maintains and supplies data, manages an archive of historical data and develops strategies for the acquisition of new satellite data to meet emerging client needs including reception of real time data as required. Use of the imagery occurs across a wide range of fields including environmental and crop monitoring, mapping, resource exploration and emergency management.

Project outcome

Ready availability of public good satellite data to meet client needs in government academia and the private sector.

Project output

1) Reception of remote sensing data and distribution of processed products as required.
2) Systems for acquisition of remotely sensed data from Advanced Land Observation Satellite (ALOS).
3) Improvements to the quality of Landsat products to meet customer requirements.Upgraded ACRES online catalogue and customer interface.
5) Upgraded ACRES data acquisition systems.
6) National Remote Sensing Data Acquisition Strategy.
7) Release of new products – ASTER, National Landsat Mosaics, ERS-2 LGR.
8) Activity 1: A renewed ACRES Facility Management Contract.
9) Activity 2: Effective customer access to ACRES products.

2.iv Remote sensing applications

This project undertakes or develops the necessary processes and research to apply remote sensing to a range of project activities across Geoscience Australia. The emphasis is on the application of remote sensing to solve problems in petroleum and mineral resources, land and

marine environment, mapping, emergency management and the acquisition and processing of imagery. Priorities will be determined with advice received from a cross-organisational reference group.

Project outcome

Improved organisational outputs through the application of remote sensing technology

Project output

1) Technical Advice to Australian Centre for Remote Sensing.
2) Imagery for the Topographic Map Revision Program, National Mapping Division.
3) Applications of multi-and hyper-spectral remote sensing for geological and alteration mapping, Minerals Division.
4) Advice on application of imagery to support oil seep detection, Petroleum and Marine Division.
5) Base Satellite image maps for Minerals Division.
6) Advice on dentification of building footprints from high spatial resolution imagery, Geohazards Division.
7) Remote Sensing support for Coastal Marine and Environment Group.

2004–05 work program — Petroleum and Marine Division

Introduction

Petroleum and Marine Division is responsible for the following five work programs.

1. Marine and coastal environment group work program.
2. Law of the sea group work program.
3. Petroleum prospectivity and promotion group work program.
4. Innovation and specialist services group work program.
5. Petroleum and greenhouse gas group work program.

1. Marine and coastal environment group work program

The Marine and Coastal Environment Group delivers geoscientific advice and information products to support the implementation of the Government's Oceans Policy, the Marine Science and Technology Plan, the Antarctic Treaty, and the National Land and Water audit. Work effort is spread across projects in the coastal and offshore marine environments and includes the collection of data at sea using research vessels like the RV Southern Surveyor, construction of computer databases and the participation in Government marine science initiatives and technical committees. Government agencies with which we regularly do business include the National Oceans Office, Department of the Environment and Heritage and the Australian Antarctic Division.

Activities undertaken by this group contribute to the National Research Priority goal of an environmentally sustainable Australia.

The Marine and Coastal Environment Group manages the following projects.

i. Seabed Mapping and Characterisation.
ii. Torres Strait CRC.
iii. Antarctic Geoscience.
iv. Geoscience for Coastal Waterway Management.
v. CRC for Coastal Zone Management.

1.i Seabed mapping and characterisation

The Seabed Mapping and Characterisation (SMAC) Project aims to emplace geoscientific knowledge and understanding into the government's decision-making process regarding the implementation of Oceans Policy. This will be achieved in 2004-05 by building improved knowledge-based systems of seafloor geomorphology, sediment properties and physical processes, by conducting marine surveys to map and characterise the seafloor and by raising awareness of the relevance and application of geoscience information to environmental management.

Project outcome

Government agencies involved with marine environmental management are provided with and use high quality geoscience information and advice to implement the Oceans Policy. New marine science data sets are collected from priority regions to support marine planning goals.

Project output

1) MARS Marine Sediment Database.
2) Sediment Record of Biodiversity.
3) GEOMAT Modelling of Shelf Sediment Mobility.
4) Report on survey to the Southern Gulf of Carpentaria.
5) Report on survey to the Arafura Sea.
6) National Bioregionalisation.
7) Publication of previous FRAME survey results.
8) Report on survey to the Mellish Rise.
9) SMAC Advice Services.

1.ii Torres Strait CRC

This project has four major tasks: (1) writing of a draft post-cruise report from the first cruise to Torres Strait by project staff; (2) participation on the RV James Kirby for Geoscience Australia's marine survey to the Torres Strait by project staff; (3) develop an improved ocean hydrodynamic model for the Torres Strait region using existing hydrodynamic models and data collected from the marine surveys; and (4) participate in meetings and conferences to advise National Oceans Office, CRC Reef, Torres Strait Regional Authority, Queensland Department of Primary Industries, and CSIRO representatives so that Geoscience Australia is fully engaged with stakeholders, scientific community and environmental managers.

Project outcome

Develop an improved understanding of the biophysical processes controlling the stability of seagrass habitats in Torres Strait. This information is required by the Torres Strait Islanders and government agencies to manage the sustainable use of Torres Strait's marine resources.

Project output

1) Post cruise report Survey 266 of March 2004.
2) Report on 2nd survey to Torres Strait, October 2004.
3) Model Development.

1.iii Antarctic geoscience

This project supports Government goals for Antarctic research which are; Maintenance of the Antarctic Treaty System and enhancement of Australia's influence within the System; protection of the Antarctic environment; and improved understanding of the role of Antarctica in the global climate system.

Project outcome

Improved resource management and environmental protection in the Antarctic.

Project output

1) Post-survey report on multi-beam and seabed character data collected on Italian survey to George V-Wilkes Land margin.
2) Review of sediment data and sea bed character around Australian station at Casey.
3) Annual report to DEH on Australian Antarctic geoscience research and reports to international bodies involved in the Antarctic.

1.iv Geosciences for Coastal Waterway Management (GCWM)

This project enhances our understanding of coastal water quality and aims to assist and support coastal resource management. Through field based studies in collaboration with local and regional natural resource managers and desk-top studies, the project examines nutrient processing and fluxes in estuaries. A 'Ready Reckoner' of nutrient processing in estuaries and coastal waterways will be developed and shared with stakeholders. Sediment and nutrient loads in estuaries will be compiled and made accessible through the OzEstuaries database. Reports on nutrient processes will be compiled for stakeholders. The project will begin to focus on estuaries and coastal waterways in tropical Australia.

Project outcome

Effective management of eutrophication, maintenance of good water quality and ecosystem habitats in Australian estuaries and coastal waterways

Project output

1) Framework for sediment & nutrient processing in temperate estuaries.
2) Report on nutrient dynamics in St. Georges Basin.
3) Plan for future projects on nutrient dynamics in tropical estuaries.

1.v Coastal CRC

The project's goal is to help bridge the gaps between science, the community and policy making organisations by providing geoscientific input to quality science within three of the five Coastal CRC interlinked projects. The Fitzroy River Estuary Project is focused on a specific study area to provide a predictive model of estuary nutrient and sediment export that will be relevant to other tropical tide-dominated estuaries. In the Coastal Water Habitat Mapping project we are adopting new acoustic and proven geological techniques to more effectively map and classify coastal benthic habitats at sites that typify Australia's broad coastal regions. The SEAS Project will provide online coastal data and information and generic coastal management decision support tools via the internet, and new information on our near-pristine estuaries that will enhance their protective management. This research will be undertaken with a range of partners in other Australian government agencies and universities and includes a participatory approach with local, regional and state-based stakeholders.

Project outcome

To improve the knowledge and understanding of Australia's coastal zone, estuaries and coastal waterways for their effective management and ecosystem health.

Project output

1) Fitzroy River Estuary - Contaminants: Field surveys and reports; data analysis reports.
2) OzEstuaries: Additional datasets and functionality.
3) Comparative Estuary Geomorphology – Near-Pristine Estuaries: Literature Review and GIS maps.
4) Coastal Water Habitat Mapping – Coastal Geomorphology & Classification: Field surveys and reports; data analysis report.

2. Law of the sea group

This group undertakes studies to define Australia's Marine Jurisdiction under the terms of the United Nations Convention on the Law of the Sea.

It addresses the intermediate outcome 'Improved resource management and environmental protection'.

The Law of the Sea Group manages the following project:
i. Law of the Sea Project

2.i Law of the sea

This project is working with the Department of Foreign Affairs and Trade (DFAT) and the Attorney General's Department (AGD) to finalise Australia's submission to the United Nation Commission on the Limits of the Continental Shelf (CLCS) for extended continental shelf under article 76 of the United Nations Convention on the Law of the Sea. The submission will most likely be lodged with the United Nations in the October/November 2004 time period. Post submission, the project will be heavily involved in interactions with CLCS and a sub-commission established by the CLCS to examine and make recommendations on Australia's submission. These interactions are likely to commence at the April - May 2005 meeting of the CLCS and continue for an uncertain period of time.

Australia's extended continental shelf submission covers ten areas of extended continental shelf. These areas are in the regions of Lord Howe Rise, Kerguelen Plateau, Norfolk/Three Kings Ridge, Naturaliste Plateau, Great Australian Bight, South Tasman Rise, Exmouth and Wallaby Plateaus, Argo, Macquarie Ridge and the Australian Antarctic Territory. The submission involves a major integration of technical, legal and diplomatic aspects.

In addition to its extended continental shelf work, the project provides technical advice for international maritime boundary negotiations, and a commissioner to the CLCS.

The project works closely with the Maritime Boundaries Section of Geoscience Australia's National Mapping Division, the Department of Foreign Affairs and Trade and the Attorney General's Department.

Project outcome

1) Definition of the outer limit of the extended continental shelf around Australia, its island territories and off the Australian Antarctic Territory, and submission of the data and other

information supporting this definition to the UN Commission on the Limits of the Continental Shelf (CLCS).
2) Input to CLCS activities through Australian member.
3) Provision to Government of technical advice for international maritime boundary negotiations.

Project output

1) Advice, reports and maps related to maritime boundary negotiations and continental shelf definition.
2) Participation in the deliberations of the UN Commission on the Limits of the Continental Shelf as a member of the Commission, and associated activities.
3) Finalise preparation and present Australia's submission for extended continental shelf under article 76 of the United Nations Convention on the Law of the Sea to the Commission on the Limits of the Continental Shelf, in conjunction with Department of Foreign Affairs and Trade and the Attorney General's Department.

3. Petroleum prospectivity and promotion group

Projects in this group undertake studies of the petroleum potential of offshore basins to provide advice to government and to encourage investment in Australian exploration opportunities. The promotion of Australia's petroleum prospectivity includes the technical component of the annual release of offshore petroleum acreage.

In 2004-05 a focus area will be the Bremer Sub-basin and other frontier basins of the southwest margin where a major seismic survey will be acquired. Studies of natural hydrocarbon seepage will be undertaken in the Arafura Basin. The undiscovered petroleum resources of the Carnarvon and Gippsland basins will be assessed. A business analysis capability will be developed. Selected specialist studies will continue in the established hydrocarbon basins of Northwest and Southern Australia.

Projects in this group address the intermediate outcomes of:

- "enhanced global attractiveness of Australia's offshore and onshore exploration and investment opportunities" and
- "improved resource management and environmental protection".

The project contributes to the achievement of the National Research Priority outcome of:

- an environmentally sustainable Australia.

The Petroleum Prospectivity and Promotion Group manages the following projects.

i. South West Frontiers.
ii. Commercial Seismic Survey - south west frontier basins.
iii. Existing Oil & Gas.
iv. Acreage Release & Promotion.
v. Seeps & Signatures Project.
vi. Arafura Survey.
vii. Business Analysis & Resource Assessment.

3.i Southwest frontiers

This project encompasses basin studies and other petroleum-related activities undertaken within the Australian Marine Jurisdiction (AMJ) along Australia's southern western continental margin, extending from Esperance in the southeast, to Carnarvon in the north. The area incorporates sedimentary basins from offshore Western Australia with either no previous exploration or no current exploration activity, including the Bremer and Denmark sub-basins (Bight Basin), the Mentelle Basin, and the Vlaming and Zeewyck sub-basins (Perth Basin).

Project outcome

An improved understanding of the petroleum prospectivity and resource potential of frontier basins in the south western offshore region of Australia to maximise opportunities for the discovery of a new oil province, to underpin promotion of selected areas for petroleum exploration, to enhance understanding of petroleum potential and aspects of exploration risk, and to underpin future marine planning.

Project output

1) New geophysical data to underpin petroleum exploration of frontier areas of southwest Australia as part of the Big New Oil Program.
2) A report on the geology and petroleum prospectivity of the Bremer Sub-basin to underpin petroleum exploration of this frontier basin as part of the Big New Oil Program.
3) Provision of scientific advice and supporting documentation/data on the petroleum potential of offshore southwestern Australia to government and industry for acreage release, promotion of exploration investment and for planning purposes.
4) A report presenting new biostratigraphic data from the Bremer Sub-basin.
5) A report presenting new geochemical results from the Bremer Sub-basin.
6) A scoping study of the geology and petroleum prospectivity of southwest frontier basins to underpin future program activities.

3.ii Commercial seismic survey - SW Frontiers

This project undertakes the collection of industry quality seismic data in the Bremer, Mentelle and Zeewyck Basins to determine a new oil province.

Project outcome

Through the collection of industry standard seismic data an enhanced regional framework study will be undertaken with the intent of encouraging oil exploration investment in these areas. This will lead to the promotion of offshore acreage.

Project output

1) Documentation in the 2005 acreage release package to promote the Bremer area, with industry access to newly acquired and reprocessed seismic data in areas promoted.

3.iii Existing oil and gas

This project undertakes regional and focussed specialist studies to improve the understanding of the petroleum prospectivity of, and develop new opportunities for exploration investment in, established hydrocarbon exploration areas offshore Northwest and Southern Australia.

Project outcome

An improved understanding of the petroleum prospectivity and exploration opportunities in established hydrocarbon exploration areas, offshore Northwest and Southern Australian margins.

Project output

1) Scientific advice on the petroleum potential of offshore Northwest and Southern Australia to Government and Industry for promotion of exploration investment
2) Advice on new opportunities for exploration investment and acreage release offshore Northwest Australia.
3) A report on the oil families of Western Australia (Oils of WA 2).
4) Advice on New opportunities for exploration investment and acreage release on the Southern margin.
5) A report on geohistory modelling and regional petroleum systems of the Otway Basin.

3.iv Acreage release and promotion

This project provides scientific and technical support to ITR for the release of the 2005 Offshore Petroleum Exploration Areas and to promote the petroleum prospectivity of Australia.

Project outcome

Broad awareness and acceptance of the technical opportunities of the acreage offered by the Australian government for petroleum exploration investment**.**

Project output

1) A report and seminars on the 2005 acreage release to the Australian and international petroleum industry.

2) Promotion of Australia as an attractive exploration destination at national and international petroleum conferences.

3.v Seeps & signatures

The emphasis of this project is on understanding of natural hydrocarbon seepage and related geology across Yampi Shelf and Arafura Sea. This is done by the development of best practice methods for the detection and sampling of hydrocarbon seepage, through formation of strategic alliances with international groups already proficient in this field. Promotion of offshore acreage through the application of an integrated geological program using hydrocarbon seeps as indicators of active petroleum systems

Project outcome

Improved understanding of the importance of natural hydrocarbon seeps for the exploration of offshore oil and gas.

Project output

1) Development of tools and technology for detecting hydrocarbon seepage.
2) An investigation into aspects of the petroleum geology of the Arafura Basin to underpin future promotion of the area for petroleum exploration.

3.vi Arafura survey

This project undertakes the identification of suitable survey sites for natural hydrocarbon seepage and the characterisation of these sites by marine survey.

Project outcome

Improved understanding of the importance of natural hydrocarbon seeps for the exploration of offshore oil and gas. Promotion of offshore acreage through the application of an integrated geological program using hydrocarbon seeps as indicators of active petroleum systems.

Project output

1) Marine survey in Arafura Sea for natural hydrocarbon seepage.

3.vii Business analysis and resource assessment

This project provides information to government, industry and the public relating to the petroleum prospectivity of offshore Australia, and reports on exploration and production activities within the upstream petroleum industry. Collectively, this information is utilised to underpin strategies for promotion and marketing of investment opportunities in offshore Australia.

Project outcome

An improved understanding of the petroleum prospectivity and resource potential of the offshore region of Australia to maximise opportunities for new hydrocarbon discoveries, to underpin promotion of areas for petroleum exploration, to enhance understanding of petroleum potential and aspects of exploration risk, and to underpin future marine planning.

Project output

1) Advice to government and industry on market intelligence, industry activity and the petroleum prospectivity of offshore Australia, to promote investment opportunities, offshore acreage release and for strategic planning purposes.
2) Assessments of the remaining hydrocarbon resources of the Carnarvon and Gippsland basins, offshore Australia.
3) Internal review of Australia's offshore basins using existing data and knowledge — to be used in marketing investment opportunities to the global petroleum industry, and to underpin future research activities to identify new oil provinces.
4) An assessment of the petroleum prospectivity of offshore areas for environmental and regional marine planning purposes.

4. Innovation and specialist services group

The Innovation and Specialist Services Group provides: 1) Information Management services in database development, database population, application support and product development; and 2) Specialist Research Services in geophysics, biostratigraphy, petroleum geochemistry, laboratory sample preparation and analysis, and marine survey engineering support; to all projects within the Petroleum and Marine Division as well as to external collaborative agencies and clients.

Projects within this group address the intermediate outcome "Enhanced global attractiveness of Australia's offshore and onshore exploration investment opportunities", and the National Research Priority 1 of "An environmentally sustainable Australia" Goal 6 "Developing deep Earth resources".

The Innovation and Specialist Services Group manages the following projects.

i. Database Development Project, which develops prioritised divisional databases as required to the Geoscience Australia corporate standards.
ii. Petroleum Data and Information Management Project, which manages and populates Geoscience Australia's petroleum databases for access by other projects and external clients, prioritised to reflect annual acreage release areas.
iii. Geophysical Processing and Data Access Project, which provides specialised geophysical and swath acquisition and processing expertise, and manages digital geophysical data.
iv. Basement and Crustal Studies Project, which investigates the type and nature of the basement and crust underlying Australia's offshore basins to provide an improved understanding of the role of crystalline basement and crustal structure in the formation and development of sedimentary basins.
v. Timescales and Virtual Centre of Economic Micropalaeontology and Palynology, which provides improved schemes for biostratigraphic correlation and resolution of the geological timescale.
vi. Organic Geochemistry Laboratory, which provides specialist analysis of a range of samples either collected in the field or provided by external sources
vii. Palaeontology and Sedimentology Laboratories, which provides specialist analysis of a range of samples either collected in the field or provided by external sources.

4.i Database development

This project undertakes the design, development, maintenance and support of oracle databases, database applications and database WEB pages for the Division, including; Accumulations, Deviant, Geodisc, Lab submissions, Mars, Orgchem, Ozestuaries, Ozmar, Palaeo, PIMS, Provinces, Public Reserves, Resfacs, Stratdat, Titles, Wells (Pedin). The project also contributes to the development and delivery of Geoscience Australia's Corporate Data Model (CDM), Corporate Database Development Infrastructure (CDDI) and external data entry.

Project outcome

Improved access to and management of petroleum and marine data.

Project output

1) Database and database application Maintenance and Support.
2) Design and development of new databases.

4.ii Petroleum data and information management

This project manages and populates key Geoscience Australia petroleum databases.

Project outcome

Improved access to comprehensive and accurate petroleum exploration data for Geoscience Australia projects and industry through management and population of petroleum databases. Databases include PEDIN, STRATDAT, RESFACS, ORGCHEM and DEVIANT.

Project output

1) Management, population and delivery of the corporate PMD petroleum databases (STRATDAT, RESFACS, ORGCHEM, PEDIN, DEVIANT).

4.iii Geophysical processing and data access

This project provides geophysical and swath services for internal and external clients. This project is committed to providing 120 days of swath processing/collection services under Geoscience Australia's obligations to the National Facility. Additional time is also being provided for Geoscience Australia and collaborative partners (NOO & CMR). This project provides the majority of the support for the Geoquest seismic interpretation platform within Geoscience Australia, and developing/producing specialist geophysical products for projects within the Division (this role is expected to expand in 2004-2005).

Project outcome

- Newly acquired seismic data sets in frontier exploration areas available to the Petroleum industry.
- An improve understanding of the Australian marine environment through the development of an enhanced national bathymetric grid.
- Enhanced capacity for scientific research through the use of acoustic techniques on the *R/V Southern Surveyor* National Facility.
- Improved geophysical techniques and processes to detect evidence of hydrocarbon migration and seepage.
- Cost effective and stable Geoquest and Petrel seismic analysis platforms.

Project output

1) The collection, processing and distribution of swath mapping products.
2) Geophysical products and Services.
3) Integration of Seismic & Navigation into Geoquest & Petrel platforms plus ongoing support of the applications.
4) Non-Seismic Processing Products and Services.

4.iv Basement and crustal studies

This project undertakes systematic studies of the basement underlying Australia's offshore basins, focussing on basement features that have a profound effect on the petroleum potential of a region, including; crustal provinces and crustal scale boundaries, basement type and depth, crustal thickness and type, and heat flow.

Project outcome

An improved understanding of the role of crystalline basement in the formation and development of sedimentary basins and improved definition of the extent and thickness of depocentres in the Australian Marine Jurisdiction to maximise opportunities for the discovery of a new oil province and to underpin promotion of selected areas for petroleum exploration.

Project output

1) Reports on basement and crustal structure in priority areas for the Big New Oil Program.
2) Regional potential field grids, reports and maps of the crustal structure and sediment thickness for offshore Australia.

4.v Timescales and virtual centre of economic micropalaeontology & palynology (VCEMP)

This project undertakes biostratigraphic research to refine and document the biozonations used in hydrocarbon exploration in Australia, as well as to improve the correlations of events and biozonations to the standard chronostratigraphic scale. This will be done in-house at Geoscience Australia, and also by funding external specialists through the mechanism of the VCEMP, which supports and promotes biostratigraphic research relevant to the Australian petroleum industry. The project also provides biostratigraphic support to other Geoscience Australia projects.

Project outcome

Better quality and higher resolution biostratigraphy for time intervals important for hydrocarbon exploration, and improved correlation of biozones and geologic events to standard chronostratigraphic and numeric time scales.

Project output

1) Biostratigraphic support to GA national marine surveys.
2) Improved biozonation schemes and resolution of the geologic timescale.
3) VCEMP Strategic Plan.

4.vi Geochemistry laboratory

This project provides specialist laboratory support to PMD and CRC projects in organic & marine geochemistry

Project outcome

Effective support and data delivery to all PMD & CRC projects.

Project output

1) Ongoing and timely support to all PMD & CRC projects.

4.vii PMD palaeontology and sedimentology laboratory

This Project provides specialist laboratory support to PMD & CRC projects in Palaeontology and Sedimentology

Project outcome

The timely delivery of palaeontology and sedimentology data and support to PMD & CRC Projects

Project output

1) Ongoing and timely support to all PMD & CRC projects.

5. Petroleum and greenhouse gas advice group

Projects in this group provide technical advice to government on the administration of the petroleum industry in Australia and administer geological and geophysical data relevant to the industry. The group also contributes to the Cooperative Research Centre for Greenhouse Gas Technologies.

Projects in the group address aspects of 3 priority goals in national research priority 1 (NRP1 - An environmentally sustainable Australia) priority goal 4 (reducing and capturing emissions in transport and energy operations) through studies on geosequestration and priority goals 5 and 6 (sustainable use of Australia's biodiversity and developing deep earth resources) through its management and preservation of geoscientific data.

Petroleum and Greenhouse Gas Advice Group manages the following projects.

i. Geological Sequestration of Carbon Dioxide — Project 1.01 CO2CRC.
ii. Greenhouse Gas Advice.
iii. Geological and Geophysical Data Repositories.
iv. Remastering.
v. Petroleum Engineering and Identified Resources.
vi. Exploration and Environmental Advice.

5.i Geological sequestration of carbon dioxide — Project 1.01 CO2CRC

This project is part of Geoscience Australia's contribution to the Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC). The project is researching three areas of Australia, SE Queensland, The Otway Basin and the Perth Basin to identify potential environmentally sustainable sites for CO_2 injection (ESSCIs) with the intention of proposing one (or more) for a pilot project to demonstrate the feasibility of the concept.

Project outcome

Increased understanding of the sub-surface processes associated with CO2 storage and development of the technology for assessment of potential storage sites.

Project output

1) Geological Models and Reports.

2) GA & ITR Representation at International Meetings

5.ii Greenhouse gas advice

This project provides technical advice to government about greenhouse gas issues including carbon dioxide capture and storage and associated regulation.

Project outcome

Improved resource management and environmental protection by provision of technical advice to government about greenhouse gas issues including carbon dioxide capture and storage and associated regulation.

Project output

1) Greenhouse gas advice.

5.iii Geological and geophysical data repositories

This project provides access to the seismic, well logs and other digital data, from PSLA and other sources, to clients effectively and with minimum resource demands on Geoscience Australia. This includes the remastering, concatenation and QC of older media types carried out by industry

Project outcome

Increased and improved exploration and resource management by access to PSLA and Geoscience Australia collections held within the Repositories.

Project output

1) Maintenance and Access to the PSLA Seismic Collection.
2) Maintenance and Access to the PSLA Core & Cuttings.
3) Rock Store Audit (NON PSLA – Internal Collection).
4) Assimilation of legacy GA Remastered and Processed data.
5) Web Access to Collections.

5.iv Remastering

This project undertakes the remastering and concatenation of seismic data from older tape media (21 track, 9 track and 3480 tapes) to high density modern media.

Project outcome

A more efficient petroleum exploration industry. The remastering will enable the provision of faster and more cost-efficient access from the seismic collections to the petroleum industry allowing maximisation of data resources required by private industry exploration. The storage space required for this data will be greatly reduced.

Project output

1) Remastering and Transcription.

5.v Petroleum engineering and identified resources

This project provides advice about petroleum engineering issues, identified petroleum resources and carbon dioxide for agencies which administer the P(SL)A, Excise Tariff Act, Petroleum Resource Rent Tax Assessment Act, Trade Practices Act and the Joint Petroleum Development Area (JPDA) issues

Project outcome

Improved scientific resources management by provision of advice about petroleum engineering issues, identified petroleum resources and carbon dioxide for agencies which administer the P(SL)A, Excise Tariff Act, Petroleum Resource Rent Tax Assessment Act, Trade Practices Act and the Joint Petroleum Development Area (JPDA).

Project output

1) Advice about petroleum engineering issues, identified petroleum resources and carbon dioxide for agencies which administer the P(SL)A, Excise Tariff Act, Petroleum Resource Rent Tax Assessment Act, Trade Practices Act and the Joint Petroleum Development Area (JPDA).
2) Engineering and production geological reports on Australian Petroleum Accumulations.

5.vi Exploration & environmental advice

This project provides technical advice to other areas of government about petroleum exploration, environmental and marine issues under the P(SL)Act and other upstream petroleum industry matters

Project outcome

Improved scientific resource management and environmental protection by provision of scientific advice on petroleum exploration, environmental issues and other upstream petroleum matters

Project output

1) Exploration advice.
2) Environmental advice.
3) Advice on data and related upstream petroleum regulatory matters.

Attachment A: Total outcome resourcing

The table below shows how the 2004-05 Budget appropriations translate to total resourcing for Geoscience Australia's corporate outcome, including administered expenses, revenue from government (appropriation), revenue from other sources, and the total price of outputs.

Total resources for outcome 1 ($'000)

	Estimated actual 2003-04 $'000	Budget estimate 2004-05 $'000
Administered appropriations		
to UN Grants-in-aid	20	20
Total administered appropriations	20	(I1) 20
from Special Accounts (estimated payments from Special Account balances)[1]		
Australian Geological Survey Organisation - s20 FMA Act[2] (A)	167	120
Australia New Zealand Land Information Council - s20 FMA Act (A)	667	440
Total Special Account Outflows	834	560
Departmental appropriations		
Output 1 - Geoscientific information and knowledge	96,893	101,055
Subtotal output 1	96,893	101,055
Total revenue from government (appropriations)	96,913	(C1) 101,075
Contributing to price of departmental outputs	89%	91%
Revenue from other sources		
Sale of goods and services	12,341	9,797
Total revenue from other sources	12,341	9,797
Total price from departmental outputs (Total revenue from government and from other sources)	109,254	(E1) 110,872
Total estimated resourcing for outcome 1 (Total price of outputs and administered appropriations)	109,254	110,872
	2003-04	2004-05
Average staffing level (number)	590	626

1: Special Account outflows are shown in the payments column of Table 1.6 (Special Accounts). The estimated payments from special account balances are provided by way of note only and do not form part of the total estimated resourcing.

2: FMA Act = *Financial Management and Accountability Act 1997.*

The movement in appropriation revenue between 2003-04 and 2004-05 is shown in the table below, with details of 2004–05 budget measures provided in part 2 of this plan.

Movement in appropriation revenue ($'000)

Appropriation 2003–04 ($000)[4]	**96,893**
Plus 2004-05 Budget Measure - Critical Infrastructure Protection	200
Plus Core Petroleum Measure increase (2003-04)	200
Plus Seismic Data Measure increase (2003-04)	2,500
Plus AASOP funding transferred from DoFA (by s32 instrument outside Budget context)	534
Less lapsing Comcover supplementation 2003-04	(180)
Plus Comcover supplementation 2004-05	180
Other (mainly indexation)	728
Appropriation 2004–05	**101,055**
Plus operating loss (PMD)	2,000
Total appropriation funds available	**103,055**
Net increase	6,162

[4] Includes adjustments from Additional Estimates as published in the Portfolio Additional Estimates Statement (PAES)

Attachment B: Glossary

Generic terms	Description
Outcome	A measurable impact on some aspect of Australia (e.g. economy, environment, community) Outcomes are specified in terms of the impact government is aiming to have on some aspect of society. They should be stated in a way that allows the relevant target group(s) to be identified, be measurable, clear and succinct.
Output	A good or service, or a set of like goods &/or services, delivered to someone outside the agency in order to contribute (either fully or in part) to the desired outcome Outputs should express clearly & succinctly what is to be produced, rather than how goods & services are produced. Outputs need to contribute to specific outcomes. A combination of lower level outputs can at times be considered as a proxy for determining the delivery of higher level outputs.
Service	An act done for someone external to this agency.
Good	A tangible physical item created for someone external to this agency.
Product	A good / set of goods recorded in GeoCat. A product is a form of output
Terms that are linked to a level within the agency	**Description**
Chief Executive Officer (CEO)	The head of Geoscience Australia The CEO is externally held to account for Geoscience Australia's performance.
Agency-level - Corporate outcome / outcome 1 - Output 1	A term used to describe the whole-of-Geoscience Australia. In the PBS, the agency-level outcome is referred to as the "corporate outcome" and "outcome 1". In the PBS, the agency-level output is referred to as "output 1"
Executive Board (EB)	A structural entity that the CEO uses to assist him meet his agency management responsibilities. Geoscience Australia is a prescribed agency under the FMA Act (eg: its not a "Board" in the CAC Act/private-sector sense as the EB its not externally accountable for agency performance - the CEO is.)
Intermediate -level – 2nd level outcomes – Output groups	A term used to describe the next level down from the agency-level In the 2004-05 portfolio budget statement, the agency's intermediate-level outcomes are called "second level outcomes". In 2004-05, there are four output groups at the intermediate/second-level.
Division – Chief of division (Chief/CoD)	A term used to describe a structural entity that comprises a number of like Groups. *Chief of division* is the name of the officer internally held to account by the *Executive Board* and the *CEO* for performance of a division.
Group - Group leader (GL) - Group-level	A term used to describe a structural entity that manages a set of like projects. *Group leader* is the name of the officer internally held to account by the *Chief of division, EB* and *CEO* for the performance of a group. *Group-level* is a term used to describe the level at which a group operates, which is lower than a division
Branch - General manager (GM)	A structural entity that manages a set of like issues that are higher than section-level, but lower than the agency-level. *General manager* is the name of the officer internally held to account by the *EB* and *CEO* for the performance of their Branch.
Projects - Project leader (PL)	A term used to describe the structural entity that manages a discrete set of like activities, which has defined resources for achieving one/more project-level outcomes through delivery of specific project-level outputs, with clear links to one or more intermediate-level outcomes.

	Project leader is the name of the officer internally held to account by their *Group Leader* for the performance of a project.
Project-level - Project-level outcomes - Project-level outputs	A term used to described the operational/activities-management level, which is lower than a group. Project -level outcomes and outputs are listed in the Geoscience Australia Work Program
Sections - Director - Section leader	A structural entity that manages a set of like issues that are lower than office/branch-level. *Director* / *Section leader* is the name of the officer internally held to account by their *General Manager/Group Leader* for the performance of their section.