Bring forward discovery

Review of NT Exploration Investment Attraction Programs 1999–2007 and recommendations for future strategies and work

Prepared for the Northern Territory Department of Primary Industry, Fisheries and Mines
by ACIL Tasman Pty Ltd

Darwin, November 2007
ACIL Tasman Pty Ltd
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ACIL Tasman
Economics Policy Strategy
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Executive summary

Review overview

This report reviews the effectiveness of programs mounted by the Northern Territory Government since 1999 to attract mineral and petroleum exploration. They are known as the Northern Territory Exploration Initiative (NTEI) and its successor program, the current Building the Territory's Resource Base (BTRB). The Review has been commissioned by the Department of Primary Industry, Fisheries and Mines (DPIFM).

The four elements of the BTRB program are:

1. Accelerated acquisition and management of contemporary pre-competitive geo-scientific data, increasingly being delivered to industry over the Internet;
2. An enhanced capability to process and manage exploration and mining tenure;
3. A commitment to working with the mining industry and Indigenous organisations to encourage partnerships and employment; and
4. Promotion of the Territory as a preferred exploration destination

The Review is to assess these elements and any other factors affecting attraction of exploration to the Territory.

The Review is conducted in the light of world competition for exploration investment, developments in the mining and petroleum industries and policy imperatives for the Territory Government.

Policy imperatives

Those policy imperatives are: strong economic growth, further regional development and greater Indigenous participation in the mainstream economy – all within a context of sustainable development with economic, social and environmental objectives.

NT's largest industry

Mining, mineral processing and petroleum production together form the Territory's single largest industry, contributing 20 per cent of Gross State Product. The industry also employs some 4 000 Territorians. The minerals industry is particularly important to regional areas of the Northern Territory, bringing jobs and economic and social infrastructure to remote people. The Territory Government is seeking to involve Aboriginal people more in these developments.
The NTEI and BTRB programs will have met most of their output goals by the end of 2006/07. The questions for the Review therefore include:

- How effective have NTEI and BTRB been in attracting investment?
- How do these programs compare with those in other jurisdictions?
- What are the options, including lower cost options, for such programs in the future?

The report focuses on strategies to maintain or improve the Territory’s competitive position in attracting global resource investment. It recommends in confidence to Cabinet strategic programs to maintain and grow the mineral and petroleum industries in the long term, through increased exploration leading to discovery and development.

**Review findings**

**Overview**

The Northern Territory has an imperative to sustain and preferably to expand the mining industry. Successful exploration is the key to this. The NTEI/BTRB program has been the most focussed and single biggest investment attraction program that the NT Government has mounted. It has been a success in several ways. Several indicators are disturbing, however:

- The NT has not had major discoveries in minerals or on-shore petroleum for a generation. The lack of discovery affects perceptions of prospectivity of acknowledged highly prospective geological terranes.
- The NT has the longest delays in access to the most prospective terranes of any State/Territory (up to 20 years) and delays of two years or more over large prospective areas. This alone partly neutralises the NTG’s initiatives to attract exploration.
- The NT has the lowest intensity of exploration, ie expenditure per prospective area, of the large jurisdictions.

The focus of all effort therefore must be to “Bring forward discovery”, and to concentrate on potential for major discovery. The most important factor by far in attracting exploration is perceived unexplored prospectivity. The four main elements necessary to increase mineral and petroleum discovery in the Territory are:

1. Maintaining the provision of pre-competitive regional geoscience information directed towards upgrading regional prospectivity;
2. Making key land available for exploration, facilitated by development of partnerships between Aboriginal people, government and industry and much greater Indigenous involvement in mining;
3. Increasing the intensity of exploration drilling;  
4. Promoting the Territory as a desirable location for exploration investment relative to other locations, gaining greater support for exploration and mining within the Territory and having all relevant groups working positively to the same goals.

A survey of current and potential exploration investors conducted for this Review found that the work of the Northern Territory Geological Survey (NTGS) is highly regarded, but the reputation of the Northern Territory for access to land is very poor. This was reinforced by the latest results of the authoritative Fraser Institute survey, which rated the NT 56th worst out of 64 global jurisdictions in “Uncertainty of Native Land Claims”, with 41 per cent of respondents claiming this is a disincentive to explore in the Territory. This view is supported by other discussion with companies around Australia.

Land access and investor perceptions of it are thus critical factors to resolve if the NT is to rank highly as an investment destination. The issue is how Aboriginal people, government and companies, each having different as well as common interests, work better together, after decades of effort by all sides have proved to be not enough.

Review Objective 1: Review of the NTEI and BTRB, 1999-2006

The most important success factor for BTRB has been the integration of all four elements in one program – increasing supply of technical information, improving tenement administration, working for Indigenous partnerships, and promotion of Territory attractiveness. The Territory has done well in all, and pioneered many approaches that are to be stepped up in future.

The cost of the programs should be assessed as the total cost for Elements 1 to 4, including the total budget of the NTGS. The whole of government cost is therefore around $7.95 million per year, not just the additional BTRB funding of $15.2 million over 4 years.

Minerals exploration has delays of some years from gaining information to commencing major programs. It therefore is too early to judge results of the BTRB in terms of the exploration dividend, let alone the discovery dividend. The major uptake of information in recent years is only now resulting in on-ground expenditure.

In petroleum, the NTGS effort has increased the success rate offshore, and after many decades of still-stand, the main on-shore basins being tested. This results from much higher oil prices and more demand for oil and gas, as well as from good promotion by DPIFM.

In summary, the assessments of the elements of BTRB are as follows.
Element 1, provision of geoscientific information

NT has done as well as any jurisdiction in the world in the quality and scale of its technical programs, from the field mapping to databases and website.

The quality of the regional technical programs is as good as any. The programs were well-judged and well-focused; there was a massive regeneration of the NTGS and its outputs. Some of the geophysical productions and commodity reviews are outstanding, and new ways were pioneered in geophysics, regolith and geology. Major improvements were made in the quality and availability of information products but they still lag the best jurisdictions.

The output goals of NTEI and BTRB will be met substantially by June 2007.

To date, the NTGS programs have, like those of other jurisdictions, concentrated on huge releases of regional data. The trend from now on is to move to integrated regional syntheses of the regional data in order to upgrade mineral and petroleum prospectivity. This is necessary in order to compete globally and successfully for exploration investment. Therefore, training, hiring and retention of top scientists is a major but not costly priority. The aim is world's best, to be taken very seriously, as the Government has long been promoting.

The on-going programs recommended are mainly of a different type and balance from BTRB.

Element 2, improving tenement administration

Tenement administration needs reform to make land available sooner, by increasing the intensity of exploration required, especially drilling, and to increase turnover on the “get on with it or get out” principle.

Tenement numbers are no longer a measure of success, as grants and relinquishments are about in equilibrium. In any case, most favourable ground is under tenements already.

Element 3, encouraging indigenous partnerships and employment

Problems of access to Aboriginal land are the major issue for explorers, but there are some positive signs that attitudes and approaches of Aboriginal people are becoming more oriented to economic development. Impending legislative changes should also provide a better framework for land access. Now is the time for a renewed approach to developing direct win-win partnerships with Aboriginal people that conform with but do not depend on legislation.
Element 4, promotion of Territory attractiveness

The Government’s promotion campaigns have been of a high standard and the close engagement of the Minister for Mines and Energy has helped to differentiate the Territory. Darwin, however, lacks the strength of local industry presence and support that larger jurisdictions use to their advantage.

Promotion of the industry now needs to be stepped up to opinion makers and communities across the Territory, to gain acceptance of the importance of mineral and petroleum development. The Territory should also take a lead in promoting itself to Asian governments and investors, who are looking for equity opportunities from exploration to development to secure mineral and petroleum supplies. It is pleasing to note the success of mining investment attraction ministerial visits to the world’s leading exploration conference in Canada and to China to meet with Chinese investors.

Review Objective 2: the scope and impact of programs in other jurisdictions

Before this Review, the Review Team had detailed involvement in planning or reviewing programs in all other jurisdictions except Queensland. Very few lessons can be learnt from the other States now except at the detail level, as all but one of such initiatives have been considered for adaptation to the needs of the Territory. The Territory’s programs compare favourably with those of other jurisdictions.

The initiative that is of most interest to the NT is South Australia’s government-industry drilling partnerships. Importantly, South Australia’s resources strategy is an integral part of a whole-of-government strategic plan which has wide and enthusiastic support.

Review Objective 3: Propose future options

The Review Team made 20 major recommendations with relevant detail and context. Other recommendations are included in the body of the Report. The Review Team proposed four costed options to the Government for the next phase of exploration investment attraction and recommended one.

Partnerships and improving access to land

The most fundamental recommendation is to enhance efforts to overcome the chronic problems of access to Aboriginal land. Unless land access can be dramatically improved – and potential investors can be convinced that land access is not the problem that it once was – then the Government’s efforts to
attract exploration investment will fall well short of their objective.

**Recommendation 1**

The integrated approach within the NT Government to facilitating land access and Indigenous participation should be strengthened through closer cooperation between relevant agencies and through re-establishing a specialist facilitation unit in DPIFM.

**Recommendation 2**

The NT Government and the Australian Government should continue to work closely on implementation of amendments to the Aboriginal Land Rights (NT) Act, of proposed amendments to the Native Title Act, and of the provisions of the Indigenous employment and economic development schedule to the inter-governmental Overarching Agreement.

**Recommendation 3**

The NT Government should seek to achieve with Land Councils, Traditional Owners and the mining industry a “step change” in approach that results in true partnerships that help to give effect to the aspirations of Aboriginal people, explorers and miners and the people of the Territory.

**Recommendation 4**

Funding and management support should be provided to strengthen Land Councils’ administration to deal with mining, to promote best practice in both agreement-making and Aboriginal involvement in mining, including co-location of Land Council and NT Government personnel.

**Recommendation 5**

Government and industry personnel at all levels should be trained to deal better with Aboriginal people and should spend more time with Aboriginal people and organisations to develop mutual understanding and relationships, with staff secondments and exchanges a key approach.
Information to “Bring forward discovery”

Technical initiatives

The Review Team makes the following recommendations for a strong focus by NTGS on providing information to “Bring forward discovery”.

Drilling partnerships

**Recommendation 6**
The Territory should enter into drilling partnerships with companies for holes selected for the Territory’s purposes, sharing drilling costs.

Regional theme mapping

**Recommendation 7**
A new approach should be taken to mapping called Regional Theme Mapping, focused on features related to regional prospectivity and projection of relevant formations, facies and structures under cover.

Gravity surveys

**Recommendation 8**
Increased acquisition of gravity data is proposed as appropriate to the need and Territory resources, mainly to aid discovery of major deposits.

Geoscience knowledge management

**Recommendation 9**
Geoscience knowledge management is an ongoing core function for the NTGS and further systems up-grading work should be undertaken.
Minerals and petroleum titles

**Recommendation 10**
Increased expenditure requirements per area of mineral tenement should be required of explorers from the second year of tenure on.

**Recommendation 11**
Mineral tenement rental fees should not be increased in an effort to encourage relinquishment.

**Recommendation 12**
The consolidation of mineral exploration licences proposed in the revision of the Mining Act should be for administrative and reporting purposes only in order to require continued expenditure on each tenement.

**Recommendation 13**
The NT Government should limit the size of exploration licences as proposed under the review of the Mining Act, and administer exploration and mining tenure rigorously to encourage turnover of ground.

**Recommendation 14**
DPIFM should require digital reporting on line or by CD by companies of mineral and petroleum exploration data in standard formats.

**Recommendation 15**
The NT Government should encourage private airborne geophysical surveys over any ground, including existing tenements and applications, at any time, subject to strict rules, especially as to Aboriginal, landowner and environmental consents.
Promotion of Territory attractiveness

Recommendation 16
The Northern Territory should continue with its innovative approach to promotion, and make highest-level approaches to involve China, India and Japan more in significant exploration and development projects.

Recommendation 17
The Territory’s unusual royalty regime needs promotion for its favourable treatment of companies in start-up phase and periods of lower prices, to counter the wide perception that it is onerous.

Recommendation 18
The NT Government and industry should increase the promotion of the mining industry to opinion makers in the Territory, so that explorers see a consistent public commitment to resource development.

Recommendation 19
The NT Government should develop and promote the concept of “net environmental gain” related to mining, using the wealth generated from mining to promote wide area land management.

In addition to making these recommendations, the Review Team advocated development of a set of performance indicators to provide a future assessment of the effectiveness of the ongoing program.

Current funding of BTRB
The current funding for BTRB is $3.8 million per year over four years. The figure that should provide the benchmark for future options, however, should be the total funding of the NTGS (including its BTRB allocation) plus the BTRB allocations to the other agencies involved – in 2005/06 totalling about $7.95 million.

It should be noted that total NTGS funding (including BTRB allocations) has declined since 2000.
Options for future program

In its report to the Government, the Review Team proposed four costed options for future exploration investment attraction and recommended one: significant technical effort to “bring forward discovery”.

Review Team believes that this option would maintain and increase Territory impact on world explorers and assist them significantly in finding major ore or petroleum deposits. It should assist in discoveries and production in the billions of dollars, but when over the next ten years discovery can be expected, no-one can forecast.
1 Introduction

This report reviews the effectiveness of mineral exploration investment attraction programs mounted by the Northern Territory Government since 1999 and makes recommendations for future strategies and work. The report has been prepared by ACIL Tasman in conjunction with Ross Fardon and Associates.

Since this report is publicly available, the Review Team speaks not just to the Department of Primary Industry, Fisheries and Mines (DPIFM) and the Minister for Mines and Energy, but partly to other stakeholders – the mining industry, Indigenous people and the general public. Attitudes to mining have evolved dramatically in one generation, and many of the issues affecting mining are still principally a matter of perceptions and behaviours. A common commitment to sustainable development, as broadly defined, should hold the key to a consistent approach from key stakeholders.

This Review of the effectiveness of the Northern Territory’s efforts to attract exploration expenditure comes at an opportune time:

- It is the first in Australia to review a nearly-complete entire “exploration initiative” whose major surveys will have covered the priority areas of the Territory, and it is timely to review achievements and costs, and to assess new directions;
- The mining industry in the Territory is currently growing rapidly and income from mining is rising, creating both an opportunity and an imperative to examine how to sustain the economic contribution that mining generates; and
- In the context of the first two points, the focus now needs to be on what should come after the current Building the Territory’s Resource Base (BTRB) program so that the Territory can continue to be a leader with dollar-effective initiatives.

This report is in several parts:

- Part 1 is an overview and description of the Review and discussion of the economic and social context;
- Part 2 reviews the NT Exploration Initiative (NTEI) and BTRB;
- Part 3 examines the mining industry and its role the NT, and the impact of exploration investment on its sustainability;
- Part 4 examines future options for exploration investment attraction and makes recommendations.
Purpose and scope of the Review

This Review focuses on strategies to maintain or improve the Territory’s competitive position in attracting global resources investment, with the ultimate objective of growing its mineral and petroleum resource base and adding to the economic wealth of the NT and its people.

The Review comprises four principal tasks:

1. Identify and report against appropriate (quantitative and qualitative) measures to review the effectiveness of the NTG’s overall and ongoing strategy to maximise exploration interest, activity and expenditure over the period from 1999-2007.

2. Investigate the scope and impact of exploration investment attraction programmes in competing jurisdictions in Australia and undertake an assessment of the current and likely future environment for investment in mineral exploration.

3. Examine and propose future options, including lower cost options, to maintain and grow the mineral and petroleum sectors’ contribution to the Territory’s GSP, and make any other recommendations for enhancing the Territory’s national and international reputation as an attractive destination for exploration investment.

4. Prepare a review report and summary.

The scope of the Review is not limited. The Review Team has been asked to comment on any issue relevant to the Government's aims.

The Review Team particularly emphasises the need to “bring forward discovery”, as failure to make major new discoveries leads companies to question the priority of such inherently prospective terranes\(^1\). Conversely, new discoveries, more than any other activity, provide the greatest stimulus for exploration leading to further discovery. This has been demonstrated in every terrane for generations, industry follows new discoveries.

The four elements of the current BTRB program that are reviewed are:

1. Accelerated acquisition and management of contemporary pre-competitive geoscientific data, increasingly being delivered to industry over the Internet;

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\(^1\) A geological “terrane” is a block or fragment of the earth’s crust that preserves a distinctive geologic history that is different from the surrounding areas.
2. An enhanced capability to process and manage exploration and mining tenure;
3. A commitment to working with the mining industry and Indigenous organisations to encourage partnerships and employment; and
4. Promotion of the Territory as a preferred exploration destination.

Although this Review is largely technical and economic, the major issue is how industry and government relate to Aboriginal people and how mining can enhance the achievement of their aspirations.

3 Approach to review and analysis

The Review Team utilised a range of approaches and techniques in conducting this Review. Key elements of the process were:
1. Project inception meeting with senior DPIFM personnel to refine and finalise the project scope and discuss issues;
2. Research and data gathering from DPIFM and mining agencies in other jurisdictions;
3. Detailed discussions with personnel from DPIFM and other Northern Territory Government departments;
4. A survey of mining and petroleum exploration companies, plus interviews with selected company personnel to ascertain company views about the NT and the Government’s exploration attraction initiatives;
5. Quantitative assessment of the effects of such programs (or their absence) using input-output analysis and mining case studies;
6. Expert assessment of elements of the exploration attraction initiatives;
7. High level assessment of the programs conducted by other jurisdictions and assessment of how the Territory’s programs compare;
8. Drawing of conclusions and formulation of recommendations;
9. Preparation of a report to the Government; and

The results of the review are not surprising, because these types of programs have been reviewed formally and informally across Australia for a decade, and there is widespread consensus on the need for the programs and their quality. The Northern Territory Government can be confident that its programs were well-planned and constituted, and should be proud of the outputs and the engagement of exploration companies. With respect to commitment of exploration funds, however, the Government should note that exploration based on results of NTEI and BTRB is still in its early stages.
The mining industry plays a very large role in the Northern Territory economy. Mining, mineral processing and petroleum production together form the Territory’s single largest industry in terms of contribution to Gross State Product (GSP). While some other sectors generate more employment than mining, the economic activity mining generates leads to many indirect jobs, especially in regional and remote areas of the Territory.

Since 1990, mining has contributed an average 20 per cent of Territory GSP compared with the national average of approximately 5 per cent. The sectoral contribution to total factor income in the Territory in 2004/05 reveals an economy heavily dependent on mining and government, with relatively low contributions from manufacturing and service industries.

The growth of the mining industry, together with other major industries in the NT, such as gas processing, defence and marine, is stimulating the rapid development of a robust service sector that is already exporting its expertise to nearby countries. The growth of the service sector is broadening and deepening the NT economy, making it more sustainable and less prone to economic shocks of downturns in one or two sectors. Without the stimulus of petroleum and mining industry demand, this sector would barely exist.

Continuation of strong mining activity is therefore essential to maintaining strong economic growth in the Territory.

Mining is also pivotal in facilitating regional development and achieving greater Indigenous participation in the mainstream economy. Stronger economic participation is an essential ingredient to social development amongst Indigenous people. The mining industry offers growing opportunities for employment and training of Indigenous people and for Indigenous-owned businesses. In several regions of the Northern Territory, mining is the principal industry or has the potential to be the major contributor to regional development and employment. In particular, mining provides an entry point for Indigenous participation in the mainstream economy and technical industry in particular.

The industry also provides transport and communication infrastructure, and local amenities to assist people in remote areas.

The outlook for minerals and the contribution of mining to the NT economy are discussed in more detail in sections 14 and 15.
5 Attracting exploration investment

This section examines factors affecting industry perceptions of regional favourability for exploration investment.

It must be noted, however, that the most important factor by far in attracting exploration is perceived unexplored prospectivity. Discovery is a key to this, and the lack of major discovery in the Territory, for many reasons, is starting to affect its promotion despite agreement on its geological prospectivity.

5.1 The market for investment

In the past, Australia’s – and the Northern Territory’s – rich resource endowments were sufficient in themselves to ensure that new exploration and resource development would proceed eventually, despite some impediments such as difficulties of land access.

Project economics could often stand such costs and governments took the attitude that developers had little choice and enough incentive.

In recent decades however, there have been fundamental changes to the nature of international investment and to the relative positions of resource “owners” (states and nations) and resources developers. These changes have resulted in a shift for Australia – from being a seller in a seller’s market to being a buyer of exploration and mining investment. Australia faces competition from other countries and investors often face internal competition for investment funds between locations. Without continued discoveries, Australia looks more and more “old exploration” relative to continents like Africa where exploration has been far less intense and exciting potential awaits. The judgment of explorers is in favour of places with high potential for major resources.

The challenge now for Australian governments, therefore, is to develop and enhance the exploration potential and the investment climate.

The investment climate has a number of dimensions: land access, approvals processes, regulation, energy supply, and infrastructure – as well as the other more generic issues such as taxation regimes, exchange rates and sovereign risk. Success in attracting exploration investment requires attention to all of these.

This is not to say that governments should do everything that an investor wants them to do. Governments need to be flexible, but firm within the bounds of clear, certain and consistent policies. In the context of exploration investment, this means making rules clear and rewarding good performance, not poor performance.
5.2 **The unique nature of exploration investment**

Exploration investment is a subset of resource industry investment that has some special and changing characteristics:

- Exploration investment inherently has high technical risk, with companies trialing new theories about mineral and petroleum deposits and their genesis, new technologies and new understanding of terranes;
- Exploration investment also carries greater sovereign risk, due to the nature of exploration tenure, issues of disjunctive development arrangements and land access problems, and very long lead times so that investors have to assess risks several elections in the future;
- These risks can mean that there is little space between great exploration success and failure;
- Exploration investment by companies is also discretionary and footloose: that is, companies regularly vary the amount being spent on exploration and the location of that expenditure between states and continents.

These characteristics make exploration investment inherently “fragile” and subject to technical decisions in exploration divisions and perception-based decisions at board level in addition to overall financial issues. Jurisdictions looking to attract exploration investment therefore ensure that:

- Technical information meets explorers’ needs; and
- The political, policy and administrative climate is attractive for investment in exploration and mining.

The timeframe for governments to gain the big leverage from their pre-competitive work is many years longer than the normal 10-20 years from exploration to production by companies. However, for any one region as large as the Territory's 1.35 million square kilometres, government risk is lower than for companies. The NT Government gains from all discoveries by all companies in its land.

5.3 **The rationale for government provision of regional geoscientific surveys**

Governments around Australia have long provided geoscientific information to the mining industry so as to attract exploration leading to mining. This has evolved from geological mapping (which is still an important tool) to sophisticated regional geoscientific surveys such as those conducted under BTRB. The basic rationale has remained essentially the same and in recent years the following have been the principal reasons for governments to undertake regional surveys:
Attracting exploration investment requires that jurisdictions have to compete for the exploration dollar with attractive new information and investment-friendly conditions.

Large areas of Australia, including much of the Territory, are not fully explored. There is much more to be found. History shows that even explorers underestimate the richness of the earth’s crust. Now that outcropping deposits have mainly been found, there are only two ways to find major new deposits: with better regional analysis of features related to mineralisation, and with new technology and drilling to locate hidden deposits. That technology and drilling are so expensive they need to be focused by regional synthesis. Regional geo-surveys thus become more important.

Companies are not permitted to run regional ground surveys over tenements held by others, only government can. And companies cannot capture the benefits of regional work that reveals prospects under competitors’ ground. Only governments can do this regional work and only governments (and the communities they serve) benefit from discovery on any and every tenement.

Proactive government surveys done once on behalf of all industry are vastly more effective than confidential surveys done by one company for its own use and gradually released to open file. Scores of companies use the new data releases, especially the small expert and entrepreneurial companies that are disproportionately successful in frontier exploration. These companies cannot afford large regional surveys, nor could they capture the benefits if they did.

Governments are the major beneficiaries of resource development relative to company shareholders, in all but highly profitable times. They receive company taxes and royalties, plus taxes on all of the service and supply companies, and PAYE tax on those employees. They often gain regional infrastructure and benefit from the economic activity generated by mining. Therefore talk of “user pays” or “let the big boys look after themselves” is often misguided. A government acts for its own interests at least as much as those of companies by stimulating exploration and discovery.

While it is often difficult to draw a direct link between government expenditure on pre-competitive exploration and rates of industry exploration and discovery, it is easier to demonstrate that governments that do not undertake such expenditures lose exploration investment to other jurisdictions and therefore reduce the likelihood of mineral discoveries and setting up of new mines.
5.4 The imperative for land access and Indigenous partnerships

The Northern Territory has the unenviable reputation of being one of the most difficult mineral provinces in the world in which to gain access to Aboriginal-owned and native title land. This is a problem without blame, because large numbers of people on all sides have been attempting to solve problems for many decades. It remains a significant impediment, however, to investment in the Territory. Overcoming the barriers to land access and the poor perceptions of the mining industry is the top priority. Without a viable land access regime, any future exploration investment attraction initiatives will not succeed in generating a major increase in investment.

The new regime must be based on much stronger commitment and cooperation between Aboriginal people, industry and governments. Partnerships with Aboriginal people are an indispensable part of the way forward – both to facilitate land access and to underpin the necessary engagement of Aboriginal people in the mainstream economy.

All parties agree on the principle of greater economic participation of Aboriginal people as a fundamental plank of overcoming economic and social disadvantage. They also agree that effective partnerships are a key to this.

There are a range of initiatives being implemented in the Territory that will help build partnerships with Aboriginal people. Section 10 of this report proposes how a future exploration investment attraction program should be underpinned by successful partnerships, which in turn need to be underpinned by much better personal and professional understanding and relationships between people from all stakeholder groups.
Part 2: Review of NTEI and BTRB

6 Overview of NT exploration initiatives: 1999-2007

NT Government investment in exploration initiatives has been in response to a decline in both the real and comparative (against competitor Australian jurisdictions) private sector exploration investment in the NT over the past decade. This decline threatens the sustainability of the mining industry in the Territory and puts at risk the continuation of the massive economic contribution made by the industry.

The NTEI/BTRB program suite has been the most focussed and single biggest investment attraction program that the NT Government has mounted. It has been a success in several ways, but new approaches are required to achieve a sustained increase in exploration investment.

6.1 Northern Territory Exploration Initiative

The Northern Territory Exploration Initiative (NTEI) commenced in 1999 after adapting the recommendations of a review of the NTGS by Fardon in 1997. The budget was an extra $4 million per year: a total of $16 million from 1999/2000 to 2003/04. The main features were:

• A major increase in regional airborne magnetic and radiometric surveys;
• A start on modernising, upgrading and digitising the historic databases, and creating an effective website;
• Promotion of the NT in Australia and overseas;
• Appointment of a new Director of the NTGS who would have impact on industry perceptions, followed by appointment of a similar person to head the large geophysical programs; and
• Transforming the regional geological mapping process.

The effect on outputs of this program was dramatic. Figure 14 on page 27 shows the increase in number of map products released annually. Figure 16 on page 29 highlights the jump in annual releases of geophysical data.

The NTEI program was reviewed very thoroughly by Dugmore and Fardon (2003). The main conclusions to be drawn are similar to those about the other big “exploration initiatives” in other Australian States:

• The new data releases were important for their information value and impact, as planned and attracted greater exploration interest, if not immediate increases in investment.
Bring forward discovery

• The target was overwhelmingly the minerals industry, as basic regional work including seismic for the petroleum industry is in general too expensive for governments. However, the regional surveys were also of considerable value for assessing petroleum prospectivity.

• The data releases from all jurisdictions, in Australia followed by Canadian provinces, Namibia, South America, Fiji and others, were unprecedented and gigantic on a world scale. They resulted in the world exploration industry being swamped with quality information and promotion became highly competitive. It became imperative for geological surveys to force their prospectivity onto the desks of world explorers by various means.

• When features are obvious, the time taken for explorers to absorb the huge data sets and to relate geology, geophysics and geochemistry with exploration models, is sometimes instantaneous. However, it generally takes many years, with the maximum usefulness increasing with time up to some unknown period, perhaps between 5 and 10 years.
  – There is evidence from the graphs of releases of information and uptake and enquiries from industry for the Territory that much current activity derives from data releases 3 to 5 years old. Figure 10 shows the increase in industry reports from 2002 to 2005, and Figure 13 indicates the increase in number of enquiries received.

• The NTEI (and part of the BTRB) coincided with the historic downturn of world exploration after 1997 driven in part by long-term decline in metal prices and partly by a decline in confidence in exploration by the major companies. That exploration regime, suddenly ended between 2004 and 2006, had several components:
  – Greenfields exploration was considered relatively unimportant in the short term as brownfields drilling and cost savings generated more economic ore near existing mines;
  – A change in roles between major and minor companies;
  – A drastic decline in research related to exploration;
  – A disputed but real decline in exploration expertise as too many geologists got smothered in data manipulation and new theories not related to ore localisation; and
  – A decline in exploration success in Australia and the world since the early 1990s as the industry found that discovery under cover was much more difficult than expected.

• The results of these changes were:
  – A breakdown of common assumptions amongst explorers as to what is important and what to expect from exploration management, including risk management, and
  – The difficulty of assigning a “score” or a dollar value to the government initiatives for attracting exploration amongst dominating negative and now positive world economic trends.
• Industry has made it clear, however, that the huge data releases dramatically affect company assessments and commitments to a region, amongst other factors.

• The main impediments to exploration in the Territory, long well-known to the industry and government and highlighted in all reviews, have been
  – Difficulty in accessing land, particularly Aboriginal land, and
  – To a lesser extent, tenement administration that makes ground available.

The NTEI, which by no means completed the huge tasks of mapping and improving databases, therefore led to the more integrated Building the Territory’s Resource Base (BTRB) program, including improving tenement administration and building Aboriginal partnerships.

6.2 Building the Territory’s Resource Base

The 2003/04 NT budget allocated funding of $15.2 million over four years to Building the Territory’s Resource Base (BTRB).

Its predecessor NTEI program focussed on the acquisition, management and delivery of pre-competitive geoscientific data. A review and assessment of the program was completed by Dugmore and Fardon (2003). Kirby (2004) reviewed the composition, trends and issues in private sector mineral and petroleum exploration in the NT. A full review of BTRB, on which this report draws, is in Dunster (2006). Several charts in this report have been updated from Kirby’s original graphs.

Funding for the BTRB program was generated by an amendment to the Exploration Expenditure Certificate (EEC) aspect of the Mineral Royalty Act, which cancelled certificates to the approximate value of the new program. The arrangement was an enforced swap of one approach to attracting exploration to the Territory, for another. The BTRB program, which commenced on 1 July 2003, comprises four main elements:

1. Accelerated acquisition and management of contemporary pre-competitive geoscientific data, increasingly being delivered to industry over the Internet;
2. An enhanced capability to process and manage exploration and mining tenure;
3. A commitment to working with the mining industry and Indigenous organisations to encourage partnerships and employment; and
4. Promotion of the Northern Territory as a preferred exploration destination.
Planning, implementation and management of the BTRB program is the responsibility of the Minerals and Energy Group of the Department of Primary Industry, Fisheries and Mines (DPIFM).

Elements 1 and 4 are the responsibility of the NTGS and DPIFM’s Resource Development and Policy Division, respectively. These elements account for more than 85 per cent ($13 million) of the allocated funding.

DPIFM’s Titles Division manages Element 2 ($1 million).

The Indigenous Business and Industry Services Branch (IBIS) of the Department of Business, Economic and Regional Development (DBERD) has prime responsibility for outcomes relating to Element 3 ($1.2 million).

The program will conclude on 30 June 2007. Reports tracking progress against each of the elements of BTRB are provided to the Minister for Mines and Energy on a six-monthly basis.

### 6.3 BTRB resource allocation and NTGS budget

The Review Team does not differentiate between BTRB and baseline funding as all current work is taken to be under the auspices of BTRB. The overall NTGS budget has been declining in real terms since 2000/01, down 17.5 per cent over this period, and the proportion of overall budget assigned to operating has reduced from 54.8 per cent to 42.3 per cent (Figure 1).

![Figure 1: NTGS total budget during NTEI and BTRB](chart)

Note: The overall budget is less under BTRB than under NTEI. The 2005/06 figure may be subject to change.

Data source: DPIFM
7 Assessment of BTRB and continuing influence of NTEI

7.1 Highlights of BTRB

The main feature of BTRB is that it comprises a comprehensive coverage of the suite of initiatives that a State/Territory government is able to take to attract exploration and development. BTRB includes initiatives that:

- Dramatically improve the information infrastructure, over a very wide range needed by industry;
- Improve tenement administration;
- Develop Aboriginal partnerships; and
- Promote all of these things in a continuing campaign.

Promotion is not just the promotion program element, but also permeates what information is collected, the way it is collated and presented, all means of dissemination and engagement of both the industry and NT opinion leaders.

The Review Team believes that the Territory has performed well in its promotion activities.

Mineral exploration depends on a wide range of data sets to explore something as complex as the earth’s crust with all available technologies. The NTGS has provided about the right balance to support all approaches, for this time.

The comprehensive review of BTRB, prepared by Dunster (2006), is recommended reading.

7.1.1 Output highlights

Map products

The completion of so many products across all fields (see Figure 16), increasingly in digital format, is an impressive achievement. These products are all high quality in Australian and world terms, but the magnetic maps, the radiometric maps, the regolith map, and the well-conceived seismic lines and some geophysical processing are standouts.

Petroleum publications

The NTGS Petroleum Section with minimal staff has produced more promotional reports than for a generation, and the NTGS is upgrading the assessment of the important Amadeus Basin with two stratigraphic drill holes.
Minerals publications

There has been a revision of the mineral-controlling structures of the McArthur River area and the southern Georgina Basin; a revision of prospectivity for various minerals in the Arunta Region, including recognition of a belt of rocks west of Alice Springs of the same age as Mt Isa and Broken Hill systems; new understanding of ore controls in the Tanami, including development of a 3-D geological model that is perhaps the best in Australia so far. All such 3-D geological models are still at the early stage and the Tanami project requires much cooperative work between industry, NTGS and Geoscience Australia (GA).

Commodities reviews

The NTGS has produced outstanding commodity reviews of the Territory, eg tin/tantalum, gold, uranium, iron ore and the important diamond exploration database. These are important attractors of investor interest.

Web-based delivery

Initiatives include, amongst a wide range: redesign of the website; implementation of STRIKE to webserve geoscientific data; a major upgrade to the webserver for leading-edge geophysical images and datasets; major updates to the geospatial data being web served; and digitising most of the historic company reports.

Promotion activities

The promotion of the Territory to companies is as good as that of any jurisdiction, given the resources at the disposal of such a small agency. The Territory has adopted a planned, integrated program. Elements include:

• Regular email alerts to targeted stakeholders;
• Promotion at national and international conferences like the annual convention, trade show and investors exchange presented by the Prospectors & Developers Association of Canada and the China Mining Conference;
• Individual meetings at important head offices, interstate and overseas such as recently in China;
• Convening special conferences like the Central Australian Basins Symposium or Annual Geoscience Exploration Seminar (AGES) to showcase new prospectivity, with quality presentation and large attendances from the exploration sector;
Bring forward discovery

• The “Top End Secret” Roadshow, which successfully promoted the NT as an exploration and mining destination, attracting exceptional attendances (more than 800) and resulting in increased enquiries and applications.

The NT Government is regarded by some other Australian jurisdictions as a major competitor in promotion. The Minister for Mines and Energy and DPIFM involve companies in joint promotion and are seeking research partnerships to help generate and promote information.

Other activities

These highlights are not to overlook the crucial but behind the scene improvement of geoscience knowledge management, the titles outputs and the thought that has gone into improving relations with Aboriginal people.

The proposed changes to the Mining Act will dramatically improve its operation and will enhance the investment attractiveness of the NT.

Indigenous relations are dependent more on Aboriginal people having evidence of major benefits from mining and petroleum development, and therefore “A will for development” instead of against it. The positive “partnership” concept has to break from generations of well-founded tiredness or cynicism on all sides.

The Indigenous Business and Industry Services Division (formerly located in the DPIFM building and now a branch within the separate DBERD) has done a creditable job to date in educating Aboriginal people and explorers alike about working together, building a foundation for the emerging next stage of the relationship. There are now some excellent examples of where the mining industry, the NT Government and Aboriginal people are working productively together for their mutual benefit. There remains a long way to go, however, to develop a Territory-wide positive relationship that motivates Aboriginal people and explorers alike.

7.1.2 Outcome highlights

The desired outcome of BTRB – greater commitment by companies to exploration in the Territory – depends mainly on:

• Prolonging the world minerals and petroleum exploration upturn;
• An improvement in accessing land;
• Overall perceived prospectivity;
• Excitement of discovery; and
• The attraction efforts of government, delivering exciting new information and clear advances in policy.
In the Territory, there has been only a little recent discovery and land access remains a problem. Investor perceptions regarding land access are an equal problem. The kudos for recent increases in mineral and petroleum exploration is shared by the world upturn and the efforts of the NT Government to upgrade the information base, prospectivity and promotion.

The NTEI and BTRB have played a significant part in the following:

- Timor Sea drilling success rate has improved markedly, partly as a result of NTGS work;
- A large increase in petroleum applications and work commitments across several onshore basins. This is a regeneration of interest in the onshore potential:
  - 22 new applications onshore in the last two years from nine new operators; the private sector has committed $55M over five years to onshore exploration with nine out of 33 permits now granted;
  - the first onshore seismic work since 1999 is about to commence.
- A large increase in mineral tenement applications which now approaches a steady state level.
- A significant increase in mineral exploration expenditure, from a low of $42.5 million in 2003/04 to a $74.8 million in 2005/06. However, the NTEI could not prevent a slide down to the 2003/04 low and the Territory recovered a few years later than the other States (see Figure 2).
- A large increase in the number of mineral exploration reports to NTGS for statutory assessment, which in itself is another measure of activity.
- An increase in diamond exploration, and a modest contribution to increased uranium exploration.
- Very large numbers of responses to all government promotion (a sign of increasing interest).
- Fast-tracking approvals for Matilda Minerals’ zircon minerals sands project on Melville Island and OM Manganese’s Bootu Creek manganese mine.

After a complex and sometimes difficult process, the Government has also successfully facilitated development of the McArthur River open cut project, which will take mining of one of the world's largest zinc and lead deposits to the next phase.

Considerable stimulatory success from government efforts is undoubted, but what actually contributed to these outcomes? It was not solely the NTEI and BTRB funding of up to $4 million per year for the last 7 years, but the total funding of the NTGS plus other agencies involved – between $7.5 million and $10 million a year since 1999.
The real cost of government attraction of exploration is as set out in section 7.4. Tenement administration and other regulatory activities are fundamental to the government role in attracting companies. The current NTGS component is $6.9 million per year, including its promotional activity.

A reasonable conclusion is that all relevant government programs support the achievement of the BTRB’s aims, but are dependant on the focussed efforts of BTRB. The other programs could not achieve these results without BTRB.

The desired outcome of any exploration investment effort is of course petroleum and mineral discovery and production. To what extent has BTRB contributed to this?

Most recent discoveries in the Territory, in mineral sands, iron ore, base metals, rare earths, manganese, garnet, have depended on historical information. Several of the proposed developments are on “brownfield” sites that have had a history of mining. Others are in greenfields locations but involve deposits that have been known for many years.

The lead time from start of exploration to discovery is commonly 5-10 years, and the further lead time to production another 5-10 years, or more. For example, indications of the heavy mineral sands deposits on the Tiwi Islands were first discovered in the 1955 by the Australian Government’s then Bureau of Mineral Resources, which was undertaking pre-competitive regional exploration. The deposits were first commercially explored by Central Uranium NL and then by RGC Exploration Pty Ltd before Matilda Minerals conducted additional exploration and in 2005 decided to develop a mining project.

The first outputs of the NTEI came only 6 years ago, and the commencement of resultant exploration generally only in the recent few years, or not yet. Industry up-take of information is still increasing (see Figure 12).

It is therefore too early to assess the ultimate success of the NT Government’s efforts.

7.2 Exploration overview

The mining and petroleum sector is the major contributor to the NT’s economy. In 2002/03, the total value of mineral products accounted for 13 per cent of GSP. In 2004/05, this was more than 20 per cent – the second highest proportion in Australia after Western Australia.

Mineral exploration expenditure in the NT fell to $42.5 million during 2003/04 (ABS 2004). This was redressed by a 30 per cent increase to $55.6 million in 2004/05, and a further increase to $74.8 million in 2005/06.
For clarity, exploration expenditure for Western Australia and Australia as a whole is shown separately.

Note: In 2004/05, expenditure in South Australia surpassed the Territory for the first time ($66.8 million c.f. $55.6 million) and in calendar 2005 it has reached $96 million as against the Territory $68 million.

Data source: ABS Cat. 8412.0
While the Territory’s market share of Australian exploration expenditure has been trending downwards in recent years, the Territory at least managed to increase its market share from 2004 and 2005 levels.

There are several likely reasons for the Territory’s market share declining to 2004-05 levels and exploration expenditure not lifting as much as in other jurisdictions:

- In a time of exploration upturn, relative expenditure between the Australian jurisdictions depends on land access and expectations of discovery, where WA and Queensland are ahead over the long term and South Australia has had recent drilling successes;
- The lack of major new discoveries in the NT to stimulate investor interest;
- Competition from many superb regional data packages from other jurisdictions since 1993; and
- The Territory also commenced its attraction initiatives 6 years later than its main competitors, and may be starting to reap its exploration upturn at this time.

Comparison of Figure 2 and Error! Reference source not found. with Figure 8 indicates a lower intensity of exploration per area in the Territory relative to Western Australia, South Australia and Queensland.
Figure 5  Proportions of mineral exploration spending in NT by commodity (2005)

- gold, 45%
- uranium, 20%
- diamonds, 10%
- rare earths, 3%
- base metals, 7%
- manganese, 3%
- other, 2%
- nickel, 5%
- mineral sands, 5%

Data source: DPIFM

Figure 5 is based on DPIFM data because ABS figures can be misleading due to confidential reporting issues. It is still only an estimate because companies are not obliged to disclose their target commodity and many companies are exploring for multiple commodities over the same ground. It is strictly exploration and excludes expenditure on mine and near-mine activity.

A comparison between Figure 5 and Figure 6 shows the NT broadly mirrors the global pattern of mineral exploration investment, particularly in gold and diamonds. The major exceptions are in base metals (copper, lead, zinc, nickel) and uranium.
Expenditure on petroleum exploration in the NT increased from previous near-20-year-lows to $99.1 million in 2004/05. In 2003/04, expenditure in the NT represented less than 4 per cent of the Australian total; in 2004/05 it was over 12 per cent, but still below the 30 per cent in the late 1980s. Currently, $55 million over five years is committed to onshore NT alone, representing a major re-appraisal of the onshore potential.
7.3 NT prospectivity relative to other mainland States

More than 43 per cent of the NT’s landmass is prospective for minerals and could be explored using current technology. About 28 per cent of the land area is prospective for petroleum. In addition, 50-60 per cent of the offshore area administered by the NT is prospective for petroleum. Dissimilarity in geology must be borne in mind when making any direct comparison between the NT and other States. Comparison of Figure 7 and Figure 8 shows that the Territory, despite its large area of prospective rocks, does not have the perceived prospectivity of Western Australia and Queensland, which have much higher mineral production.

Note that NSW, Tasmania and SA have incomplete figures and have been omitted individually but are included in the Australian total.
7.4 **Technical work of BTRB (Element 1)**

The complete list of work done under BTRB has been compiled by Dunster (2006) in consultation with the Review Team. It indicates the huge range and variety of information bases that industry requires for effective exploration, and the government will increasingly need for land use planning.

### 7.4.1 NTG technical projects and uptake by users

Before recommending those projects to be funded under BTRB, NTGS consulted with companies, the NT Minerals Council, other State geological surveys and Geoscience Australia (GA), and took note of recommendations of Dugmore and Fardon (2003).

These types of projects have now been planned and reviewed with industry and government agencies around Australia for 14 years. The processes have been thorough and transparent, and the Territory can be confident the allocation of priorities, between major technologies and regions, has been as well done as present knowledge allows.

The technical programs were carried out in geological regions labelled in Figure 9. The charts and tables following provide performance information.
Bring forward discovery

Assessment of BTRB and continuing influence of NTEI

Figure 9  Geological provinces of the Northern Territory

Source: DPIFM

Assessment of BTRB and continuing influence of NTEI
Bring forward discovery

Figure 10  Entries and updates in Industry Reports Management System (IRMS): minerals

Note: Year to date is to 30 November 2006
Data source: DPIFM

As at November 2006, the number of minerals reports in the IRMS was 17,718.

Figure 11  Entries and updates in Industry Reports Management System (IRMS): petroleum (including offshore)

Note: Year to date is to 30 November 2006. Logarithmic scale used on vertical axis.
Data source: DPIFM

Note that for petroleum reports, a logarithmic scale is used so that years 2000 and 2005 at more than 3,000 dwarf all other years at less than 200. As at November 2006, the number of petroleum records in the IRMS (many representing multiple data sets) was 4,091.
These figures demonstrate that exploration company interest in the Territory is still growing strongly, and the main exploration dividend is still to come.
Bring forward discovery

Table 1  **NTGS performance measures**

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<tbody>
<tr>
<td>Quality – customer satisfaction</td>
<td>89%</td>
<td>88%</td>
<td>N/M</td>
</tr>
<tr>
<td>Quality – cartographic products to national standards</td>
<td>100%</td>
<td>100%</td>
<td>N/M</td>
</tr>
<tr>
<td>Timeliness – customer satisfaction</td>
<td>92%</td>
<td>89%</td>
<td>90%</td>
</tr>
</tbody>
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Note: N/M = not measured 2005-06
Data source: DBIRD and DPIFM Annual Reports

These requests vary from instant advice on prospecting to provision of major data sets to order, taking some days to collect.

Figure 14  **Number of map products released annually**

Data source: DPIFM

Note that a logarithmic scale is used. The year 2001 had as many as the preceding 17 years. The recent surge includes very complex maps.
This recent update of large amounts of data indicates that many companies are still capturing and assimilating existing data and may have not yet commenced work on the ground.
Figure 16  Status of mapping and GIS digital information as of November 2006

1:250K OUTCROP GEOLOGY GIS DATA - NOVEMBER 2006

Source: DPIFM
This mapping is the base, along with outstanding magnetic and radiometric data, and modest gravity data, on which this report recommends that the NTGS convert to Regional Theme Mapping, mainly projections into covered ground of important prospective systems, irrespective of standard 1:250 000 scale map sheet boundaries.

7.4.2 Mineral publications and reports

NTGS reviews of regional mineral records and potential under BTRB include:
- Geology of the highly prospective Musgrave Province;
- Digital commodity reviews of iron ore, manganese and bauxite;
- Gold systems of the Tanami Region;
- Tin-tantalum mineralisation in the NT; and
- Rare-earth mineralisation in the Arunta Region.

These reports are a valuable review service to industry and some are technically outstanding.

7.4.3 Petroleum publications and reports

In the interval from 1990 to 1998, NTGS produced only two external petroleum publications. Since then, there have been 29. This has been achieved by one or two staff and by using contractors. Under BTRB, NTGS has produced more than a dozen papers and nine data CDs dealing with the petroleum prospectivity of NT and has promoted the potential at conferences.

7.4.4 Geophysical surveys

NTGS has undertaken some of the largest and highest quality magnetic and radiometric surveys of modern times, as keys element of NTEI. Several companies cited them as one of the main reasons they took up exploration licences (eg Elkedra Diamonds quoted in Dugmore and Fardon 2003). Targeted gravity surveys were also undertaken, some in collaboration with industry, GA and academia. Pre-existing data were also reprocessed to a better standard and re-released.

From 1999 to 2002, 1.75 million line km of magnetic/radiometric surveys, or 557,000 km² were acquired at a cost of $6.96 million, or an average of $4/line km. NTGS profited from the collapse of costs from the previous $10/line km when the major state surveys began. During BTRB, magnetic and radiometric surveys covered a total of 101 950 km². In 2003, an Australia-first airborne gravity survey was flown in western Arnhem Land, mainly funded by Cameco and Rio Tinto with support from NTGS and GA.
The major previous magnetic surveys were flown under the National Geoscience Mapping Accord with the then Australian Geological Survey Organisation, now Geoscience Australia (GA). The important change is that since 1999 whole provinces have been surveyed instead of patches across the Territory, as an aid to assessing regional prospectivity.

By the end of BTRB, NTGS will have excellent Territory-wide mosaics of its geophysical and elevation data. In particular, the quality of the uranium (radiometric) compilation, obviously of use to uranium explorers, is superior to that of any other jurisdiction.

**Figure 17**  
Geophysics acquired annually (post-1998 gravity surveys only)

Data source: DPIFM

Amongst the most important things the NTGS can do now is more value-adding processing of data. Current impressive examples include deep-magnetic imaging and re-processing of the Territory-wide radiometric mosaic as an important contributor to regolith mapping.

### 7.4.5 Web delivery

Web delivery of products and user-interactive information was a priority under BTRB. The Minerals and Energy and NTGS websites were extensively redesigned and launched in early 2004. In mid 2004, DPIFM’s new geoscience web mapping system STRIKE (Spatial Territory Resource Information Kit for Exploration) was launched. In 2005 there were over 4 000 hits on STRIKE. This is not an addition to, but a multiplication of user access.
Geophysics image webserver (GIWS) and geophysical standards and formats

GIWS was introduced under NTEI to enable clients to view, manipulate and download geophysical images of the NT over the Internet including, importantly, during survey acquisition. After considerable effort under BTRB, NTGS geophysical data are now up to the Australian best-practice benchmark. Geoscience Australia (GA) can web-serve NTGS data as part of the Australia-wide data set. NTGS geophysical data are now in a format suitable for the next generation of data delivery and in this regard NTGS is ahead of other States and even GA.

8 Review of the NT's performance

8.1 Survey of mining companies

The Review Team conducted a survey of companies who have experience of exploring in the NT (past or present) or have expressed an interest in doing so. Of the more than 100 survey forms distributed, 22 were returned. In addition, members of the Review Team interviewed another five company representatives regarding the questionnaire and others for particular discussion relevant to the Review.

Although the proportion of survey responses was relatively low, respondents represent a cross section of companies:

- 41 per cent of responses came from companies with market capitalisation of less than $20 million;
- 41 per cent of responses came from companies with market capitalisation of between $20 and $100 million
- 18 per cent of responses were from very large companies with market capitalisation in excess of $2.5 billion.

Importantly, as Figure 18 shows, mineral company respondents are also involved in exploring for a wide range of commodities including gold (47 per cent), copper (32 per cent), uranium (32 per cent) and diamonds and nickel (21 per cent).

The Review Team believes that the sample is representative.
Not surprisingly, after almost a decade of exploration initiatives and programmes across Australia, there appears to be widespread consensus on both the need for the sort of initiatives and programs introduced by the NTGS and their quality. However, given typical exploration expenditure lead times of 5-10 years, it is also apparent from the survey that exploration activity based on recent initiatives and BTRB is still in its infancy.

Overall, mineral companies returned encouraging results with the NTGS unanimously regarded as facilitating exploration activity. However, the results also reiterate the importance of access to prospective land and security of land title as key drivers of exploration activity (Figure 19). In this regard, respondents cited Aboriginal land access regimes, legislation and procedures, and the risk of delays arising from entrenched processes and institutions, as significant impediments to Territory exploration. While responses also suggest that the degree of concern over these obstacles varies, the consensus opinion is summarised in the statement from one respondent that “serious mining companies do not waste money on exploration in jurisdictions that cannot deliver security of tenure”. Moreover, companies generally viewed these issues as more important to explorers and miners than free geological information.
Nonetheless, access to and quality of geoscience data is still considered a pivotal factor in contemplating or conducting exploration. In fact, several respondents cited this as a particularly favourable factor in their exploration decision making in the Territory. At the other end of the spectrum, land access and the regimes surrounding this (including tenement administration) were most commonly raised as exploration ‘stoppers’ or impediments. Again, this is entirely in keeping with previous studies of NT mineral exploration attractiveness such as the 2004-2005 and 2005-2006 Fraser Institute Annual Survey of Mining Companies, and Dugmore and Fardon (2003).

In relation to future exploration activity, the survey suggests a 50-50 split between companies projecting an increase in their NT exploration activity and those anticipating their current exploration activity or budget to remain unchanged in the near future. Notably, none of the survey respondents are forecasting a reduction or cessation of exploration activity in the NT although several expressed difficulty in attributing greater exploration activity to any specific initiative introduced by the NTGS, particularly during the current global commodity boom. Others suggested that it may also be premature to make such an attribution given the timeframe involved. Notwithstanding these reservations, however, respondents who ranked (1-5, 5 is the highest) the most important elements of extra government services since 1999 in terms of their ability to raise explorers’ assessment of the NT (Figure 20) identified:
Bring forward discovery

- Geophysical surveys;
- Geological maps and reports;
- Past exploration record; and
- Land access facilitation.

Compared with geological survey services offered by other regions of Australia where companies might explore, the NTGS scored well. In particular, access to, and quality of geoscience data is rated highly (3, 4 or 5 – see Figure 21) with 83 per cent of respondents scoring the NT as either best or second best in Australia.

Interestingly, although title issues were identified as an impediment to NT exploration elsewhere in the survey, more than 90 per cent of respondents rated title administration and certainty of title as average or above average relative to other regions of Australia. This suggests that the main difficulty is not DPIFM titles administration. Rather, it is long delays due to the reluctance of indigenous communities to allow mining on their land. Another key title issue is relinquishments.

Data source: 2006 Mineral Company Survey
Mineral companies also complimented the NTGS on the quality and relevance of its services relative to other geological surveys in Australia. A high 76 per cent rated the NT Government’s geological survey as either best or above average in Australia and none of the respondents returned a below average rating overall. Respondents also remarked favourably on the NT Government’s radiometric coverage and commended its provision and organisation of data as well as the enthusiasm of NTGS staff. In no category was the NTGS considered worst in Australia, although 22 per cent of respondents rated the Territory below average on land access facilitation.
In relation to channels of information delivery, the overwhelming majority of respondents cited website access and personal contact with NT staff as the most popular and frequently utilised means of learning about new NT information. Conferences and roadshows are appreciated while other information sources such as email alerts are gaining wider acceptance.

Companies were also asked (where they have direct experience) to evaluate the effectiveness of the initiatives of other States in attracting exploration (see Table 1). Since only ten companies responded to this question, the results are presented in the Table below. The clear winner with more outstanding scores than any other initiative is South Australia’s PACE Drilling Partnership. This is particularly well regarded by small- to medium-sized exploration companies some of whom suggest that the introduction of a similar initiative in the NT would encourage high risk-high reward exploration and perhaps increase the prospectivity of poorly understood and covered areas.
Table 2  

<table>
<thead>
<tr>
<th>QLD</th>
<th>SA</th>
<th>SA</th>
<th>TAS</th>
<th>WA</th>
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</thead>
<tbody>
<tr>
<td>Digital Exploration Reports System (QDEX)</td>
<td>PACE Government-Industry Drilling Partnership</td>
<td>PACE Resource Development and Sustainable Communities</td>
<td>3-D Geological Model of Tasmania</td>
<td>Inventory of Abandoned Mine Sites</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>1</td>
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</table>

Data source: 2006 Mineral Company Survey

Respondents also commended South Australia’s access to open file exploration company reports, which can be downloaded directly from the web and compared this favourably to the NT where information is only available on DVD.

The thorny issue of tenement administration provoked a strong response from many respondents when asked how they would advise the NT to speed up testing and relinquishment of ground. Although a clear majority are in favour of tougher relinquishment requirements, several companies advocate other methods of speeding up testing and relinquishment of ground including:

- Limiting the ability of individual explorers to tie up large areas of the NT by re-introducing some performance-based incentive to explore. For example, turnover of land could be encouraged by setting an upper limit on the number of blocks that any group can hold or apply for based on its total annual exploration expenditure in the NT over a set number of years.
- Providing incentives for maintenance of expenditure (particularly via joint ventures).
- Introducing an expenditure formula with reductions required unless there is a sound geological argument for a new approach on a particular tenement or access difficulties due to Indigenous or similar issues.

Although many commentators applaud NTGS efforts, there is a strong sense that the NT Government could be doing more to facilitate and attract
Bring forward discovery

exploration activity. While some believe that more incentives are required to offset the significant cost of exploration in the NT and to encourage and maintain ongoing exploration activity, others believe that many of the issues affecting projects are placed beyond the scope of the minerals sector of Government these days. Nonetheless, there appears to be some agreement that the work of the NTGS has a critical role to play in stimulating exploration activity. Importantly, there is also a belief that this needs to go hand in hand with a government attitude that is more positively disposed to resource development.

The reviewers find it hard to see, in light of actions before and since the first report in April, how the Government can be any more pro-resource development, except in helping to effect some breakthroughs in Aboriginal commitment in key areas like the Roper and East Arnhem Land.

Key recommendations regarding the one or two government actions or policy changes that would most improve respondents’ assessment of the favourability of the NT include:

• Expansion of web delivery of exploration reports and basic geophysical and mapping data to encourage remote target development studies.
• Enhance efforts to emphasise the potential of the mining industry for remote communities.
• Maintain and expand geoscience initiatives through the provision of incentives to encourage and maintain exploration activity.
• Introduce a PACE-type drilling partnership especially for tenements under pressure due to underspending.
• Continue producing integrated (GIS) data packages for key regions incorporating all available geoscientific data sets as well as highlighting the prospectivity of areas for certain commodities, or styles of mineralisation.
• A major review of royalties to simplify but not necessarily to reduce effective rates.
• A reduction in the administrative complexity surrounding Exploration Licences.
• Reform the Government’s Mine Management Plan for Exploration to emphasise assets relevant to exploration.

This Review does not endorse the recommendation above for government drilling partnerships to help companies meet expenditure commitments. Regarding the royalty system, this Review does not regard it as important to change it, as the complex formula is sensible and needed for a profit-based royalty, but the matter has to be promoted well. It is complex compared with ad valorem systems, but is necessary to share the good times of high mineral prices with the Government, especially with such a small industry base as the
Territory has. The industry has come through a long time of low prices when the NT royalty system would have given it an easier ride than an ad valorem system.

8.2 Performance relative to other jurisdictions

The NTGS was rated as best in Australia for the quality and availability of its information by Dugmore and Fardon (2003), and 6th out of 64 jurisdictions worldwide by the Fraser Institute survey in 2004-2005, but has slipped in the 2005-2006 report.

The Fraser Institute, an independent public policy organisation based in Canada, conducts the most authoritative annual global survey of mining companies. Reviewers should be careful in interpreting the Fraser Institute report, as it is biased towards North American views, which are important but not the whole story. The 2005-2006 report was compiled from 322 responses of 1435 polled, representing a third of world exploration. That is still a far higher number of explorers than have ever replied to surveys in Australia.

In summary, the Report for 2005-2006 shows that:

- The Territory ranks 24th out of 64 world jurisdictions (and 6th out of 7 in Australia) in Current Mineral Potential Index, considered by Fraser to be the best overall measure for investment attractiveness. This ranking was down from 8th globally for the previous two years;
- It ranks 20th globally (and 5th in Australia) in the Policy Potential Index, a composite measure of the attractiveness of its policy climate. This improved from a 25th ranking in 2004-2005;
- The NT ranks very highly in certainty of regulations and environmental regulations, and equal best in the world for political stability (ahead of SA and WA);
- It ranks very badly, 56th worst out of 64 in Uncertainty of Native Land Claims, with 41 per cent claiming this is a disincentive to explore in the Territory;
- It ranks 7th or last in Australia and 11th of 64 in the world for the quality of its geological databases (down from 6th globally in 2004-2005).

The reviewers find this last ranking curious and difficult to understand, as an objective assessment against other jurisdictions in Australia ranks the NTGS databases quite highly.

The decline in rankings of the Territory does not imply any fall-back in the quality or effort of BTRB, but simply the continuing growth in competition, particularly from other Australian States, the Canadian provinces, and some African and Latin American countries. The Territory has to keep running to
Bring forward discovery

hold its place. The big break was by South Australia, which lifted its rankings for 2005-2006. The Review Team believes that this was due to the SA drilling partnerships and some early announced successes.

Other important results of the 2005-2006 survey are:

- Australia has fallen below many jurisdictions in North America and Latin America, and because of its great unexplored potential, much of Africa is drawing off exploration despite its social, health and policy problems;
- Differences between Australian jurisdictions in the various categories are not great (so that the perceived attractiveness is largely a matter of promotion and of recent discovery or lack of it); and
- The big issue out of this survey for the Territory is “Uncertainty of Native Land Claims”, confirming the findings in this report.

It is clear that the Territory has to go on improving its investment attractiveness or lose slightly in standing year by year. This report advises on the most cost-effective ways to do that.

It is clear that the most important promotional need of the Territory is several important discoveries. While this is not something that the NT Government can control, it is an outcome that the NT Government can influence through innovative and bold approaches.

8.3 Survey of petroleum companies

While the mineral company survey elicited a wealth of comments and recommendations from industry participants, petroleum companies were significantly more reluctant to complete survey forms and were more muted in their responses. The Review Team believes that this may be a reflection of the “boom” state of the industry and the differing technical and cultural characteristics of the petroleum sector.

It may also reflect the NT Government’s success in helping to promote important offshore areas and have long-neglected onshore basins tested. It also reflects the different scale, culture and technical requirements of the petroleum sector compared with the minerals sector.

Doubtless recent exploration activity has benefited from a combination of higher oil prices, and strong global, Asian and US demand for gas and LNG. However, respondents still appear to appreciate the efforts of the NTGS. Survey participants rated the NTGS above average compared with other jurisdictions both in Australia and areas overseas where their companies might explore.
Certainty of title and access to prospective areas are viewed as the most important factors in considering and conducting exploration activity. Like mineral explorers, access issues and land title administration are also cited as major inhibitors to NT exploration interest.

In particular, continued lack of co-operation on the part of the Central Land Council (CLC) in handing over information on sacred site clearances to the Aboriginal Areas Protection Authority (AAPA) is viewed as counter productive. Additionally, the recent push for separate applications over Aboriginal freehold land and pastoral leases in favour of single conjunctive applications is viewed as running the risk of making applications even more tedious and complex to administer.

In terms of key recommendations for the NT Government, respondents favour greater interaction and discussion between NT staff and oil companies in relation to prospectivity and potential work plans, as well as initiatives to reduce the complexity of administrative procedures that petroleum explorers typically encounter in the NT.

9 Administration of tenements (Element 2 of BTRB)

Stanton Partners has conducted a separate review of tenement administration. This report therefore makes overall comments on tenement administration as it affects attraction of exploration.

The industry survey conducted as part of this Review revealed that tenement administration is regarded by explorers and miners as very good, but highlighted tenement administration as a particularly thorny issue with a clear majority of respondents in favour of tougher relinquishment requirements and/or the introduction of new exploration expenditure based formula to simplify administration.

What is also clear is that tenement administration performance is largely negated by the chronic land access problems and explorers’ perceptions of them.

9.1 Administration

Of the 848 mineral titleholders (granted and applications, mining and exploration and extractives) as at the end of 2005, 461 were individuals and 387 were companies. Most of the Mineral Claims (MCs) and many of Mining Leases (MLs) are held by individuals, and half are languishing with no activity.
Proposals for the changes to the Mining Act are designed to reduce this stagnant element.

Most geological provinces have a healthy mix of small, medium and large companies. GBS Gold has many titles in the Pine Creek Orogen and the Tanami Region is dominated by Tanami Gold and Newmont, but there are no monopolies. Twelve of the leaseholder companies in the NT are Aboriginal corporations. In December 2000, there were 286 granted Exploration Licences (ELs); as at December 2005, there were 719.

Despite the pleasing increase in licence uptake (Figure 23) and a big increase in Exploration Licence Applications (Figure 24) the present level is probably close to a steady-state balance. This steady-state scenario means that the principal way by which the Territory can increase total exploration spending is by increasing the intensity of exploration on tenements. Since most of the tenements are new, they will have increased exploration commitments each year, and if encouragement is found to continue, then it follows that the rate of expenditure will increase for a few years.

The very high proportion of favourable ground taken up also acts as a brake on fervour generated by one of the most successful promotional conferences ever, the 2006 AGES Conference. The aim is to have some discoveries so that the confidence level rises, and companies either spend more or agree on farm-ins to increase expenditure on existing tenements.
9.1.1 Exploration licence applications

Figure 24 Number of EL applications received per year

The recent large increase in the number of EL Applications (ELAs) seems to be in response to the recent greatly increased uptake of information via the web or direct client contact, but the figures below show that in a steady state, the area applied for can be only some portion of the relinquished ground.

9.1.2 Turnover of ground

Under the *Mining Act*, explorers are required to relinquish 50 per cent of each EL annually starting in year two. The Act also allows for waivers of reduction at the discretion of the Titles Advisory Board. The series of maps in Figure 25 show that relinquishment of land is now at a higher level but little land is available for new entrants to exploration. This has been specifically addressed in the review of the *Mining Act*.

For decades the Territory has had a problem with amount of land available for exploration. One of the Review Team has confronted it himself. In this case, the ability of major companies to implement new ideas was stalled for 20 years in the McArthur Basin. Repeatedly at different times and with different targets, major companies were unable to access large areas of key interest. This problem occurs in all jurisdictions, but has been severe in the Territory.

The maps in Figure 25 show newly granted ELs and the amount surrendered or relinquished in each of the major geological provinces from 2001/02. The increasing amount of red areas through time shows proportionally more
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ground being freed-up for turnover, in rough equilibrium with the area of new grants.

Figure 26 shows the land-availability that a mineral explorer confronts in the Territory. When such a large proportion of prospective terranes is under tenement, it means that all areas considered priority for several different geological models and commodities may have been taken, as for lead-zinc and diamonds in the McArthur Basin. It follows that increased exploration on granted tenements depends on increased intensity per area – mainly drilling – and not necessarily on new tenements. The exception is highly prospective land still under application in eastern Arnhem Land. Note the extent of tenements lapping off major terranes, targeting mineralisation under sedimentary cover. All of this denotes a determined attitude to exploration in the Territory, but much more drilling is needed.

Figure 27 shows the land-availability that a petroleum explorer confronts. Tenements blanket the main on-shore basins, a big turnaround – in part as a result of the BTRB. To increase the expenditure intensity over the $55 million committed for the next five years will need discovery success and farm-ins by larger companies.
Figure 25  **Maps showing newly granted and relinquished Exploration Licences**

Note: Ground that is relinquished, applied for again by another company and granted within the timeframe specified will appear as green.

Source: DPIFM

Administration of tenements (Element 2 of BTRB)
Figure 26  **Land tenure and mining tenements as at November 2006**
Figure 27  Land tenure and petroleum tenements as at November 2006

Source: DPIFM
9.1.3 Intensity of exploration

The principal factor that increases intensity of exploration per area is discovery in the same terrane. For example in minerals exploration, while the northern McArthur Basin has been largely off-limits due to access problems, it is also underexplored over decades even in the available areas. It has only the one identified major deposit, McArthur River, which is only about one quarter the size of the total Mt Isa Valley resource. The Mt Isa Inlier, smaller than the McArthur Basin in the Territory, also has three other deposits comparable with McArthur River – Cannington, Ernest Henry and Century – all found in the late 1980’s to early 1990’s, smaller but important deposits in Osborne and Lady Loretta, and very interesting emerging copper prospects being drilled north and south of Cloncurry. By contrast, McArthur River was the last major discovery in its region, in the 1950’s.

It is likely that exploration money will continue to favour the Queensland sector until the Territory has some modern discoveries.

An interesting comparison of historic drilling to 1999, shown in Table 3, gives the number of diamond drillholes considered significant enough to have been captured in a corporate database of drilling for zinc in the Mount Isa Inlier and McArthur Basins. It shows a factor of 9 in favour of the Queensland terrane to that time, and it would be just as imbalanced since, or more so.

Table 3 Comparison of significant diamond drilling holes

<table>
<thead>
<tr>
<th>State</th>
<th>250K map sheet</th>
<th>Number of DDH captured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qld</td>
<td>Mount Isa</td>
<td>1853 (includes about 500“brownfields”)</td>
</tr>
<tr>
<td></td>
<td>Cloncurry</td>
<td>782 (incomplete only selected formations)</td>
</tr>
<tr>
<td></td>
<td>Camooweal</td>
<td>242 (incomplete only selected formations)</td>
</tr>
<tr>
<td></td>
<td>Lawn Hill</td>
<td>266</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>786</td>
</tr>
<tr>
<td>NT</td>
<td>Robinson River</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>Calvert Hills</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Bauhina Downs</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>Mount Young</td>
<td>199</td>
</tr>
<tr>
<td></td>
<td>Urapunga</td>
<td>15</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>87</td>
</tr>
</tbody>
</table>

Data source: Dunster 2006, written communication, based on company sources

2 The economically mineable reserve of the Mt Isa valley from Mt Isa Mine to the Hilton leases depends heavily on metal prices and whether the Isa Mine continues as an open cut. Published reserves and resources are an inexact guide with the potential of future high prices to lower the cut-off grade.
9.1.4 Processing of applications on Aboriginal land

As at June 2005, the area of mineral titles granted on Aboriginal freehold land was 21,400 km², and 74,600 km² on non-Aboriginal land.

**Figure 28 Comparative areas of Aboriginal land in the most-prospective geological provinces of the NT**

![Graph showing comparative areas of Aboriginal land in the most-prospective geological provinces of the NT.]

Data source: DPIFM

**Rate of grant on ALRA land remains low**

The grant of ELs on pastoral lease (native title affected land) is now relatively routine and few objections are experienced. However, as shown in Figure 29, the number of grants of ELs on Aboriginal-owned land (ie subject to ALRA) is still a concern, with the rate of grant very low compared with other land. As at 31 January 2006, there were 325 outstanding applications on Aboriginal land, which included 229 in the negotiating process, 58 pending grant of Deed and 38 awaiting proposals to Land Councils. There were 152 in moratorium and 53 new applications pending. These numbers have not significantly improved over the past few years.

The issue of gross delays in grant of tenements is being addressed at several levels within DPIFM’s Titles Division and by the Stanton Partners review. The Division’s case management approach is most useful in facilitating land access relating to specific titles. The Review Team believes, however, that there are risks of moving backwards in relation to development of government-Aboriginal-industry partnerships and new approaches to Aboriginal involvement in mining.

**Mining Act review will help**

Access to Aboriginal land will be assisted by implementation of proposals in the Mining Act review and upcoming revisions to ALRA legislation. Significant improvements, however, depend on changes in Aboriginal attitudes to mining.
Bring forward discovery

and the ability of government, companies and Aboriginal people to develop partnerships.

All of this also depends on government, industry and Aboriginal people working out how Aboriginal people can share in the benefits of mining so that mining is not seen as an imposition, but rather a winning of benefits from an endowment in the land that is vitally important to Aboriginal people. In the past they relied on the surface of the land and its waters, flora and fauna, but underground mineral wealth can be just as important for their futures. Aboriginal people are not the problem for miners; the challenge is for very disparate interests trying to work together for mutual benefit.

The dip in grants on non-Aboriginal land between 1997 and 2000 shown in Figure 29 is believed to stem from uncertainty created over the process for granting exploration titles on Crown land following the *Native Title Act* coming onto force in 1994 and the Wik High Court decision in December 1996, which created uncertainty over pastoral holdings as well.

Figure 29  **Mineral exploration licences granted on Aboriginal vs non-Aboriginal land by fiscal year**

Data source: DPIFM

**Mining Act Review**

This Review was privy to the draft *Proposals for Change to the Northern Territory Mining Act* as of September 2005. Titles Division and NTGS were contributors to the *Mining Act* review.

As discussed in section 16.3, the Review Team supports the proposed changes and makes some recommendations for additional change.
9.2 Indigenous liaison and knowledge building programs

The Indigenous Business and Industry Services (IBIS) Branch of DBERD, formerly the Indigenous and Mining Industry Services Division of DBIRD (which included the Minerals and Energy Group), has continued its efforts to facilitate land access and Indigenous participation in mining. Knowledge-building programs throughout the Territory are a key element of BTRB. IBIS has assisted traditional owners and Indigenous companies, co-ordinated workshops to formulate new perspectives and partnerships, visited communities, provided and access support for NTGS, developed resource kits to assist mining and petroleum companies and participated in the Indigenous Mining and Enterprise Task Force (IMETF).

Discussion on the effectiveness of IBIS and DPIFM’s Indigenous liaison programs is contained in section 10.

10 Encouraging partnerships (Element 3 of BTRB)

10.1 Overview

The relationship between Aboriginal people and the mining industry in the Northern Territory historically has been difficult. In some locations, it appears that Aboriginal people resent the social impact of mining, particularly when it has been imposed such as occurred until about 30 years ago. In other locations, though, they welcome it. For miners, the *Aboriginal Land Rights (NT) Act* and *Native Title Act* are overly restrictive and unwieldy. Some Aboriginal people and some miners have “opted out” of engagement in mining and investment in the Territory respectively. Relationships have sometimes been acrimonious, driving the parties apart even further.

For the future of Aboriginal people and the wider Territory population, it is important that there be a concerted move by all parties to “opt in” to exploration and mining. The aim is to have Aboriginal people support and participate in the industry through employment and business; and to use this support to lift the burden of the Territory’s very poor reputation for land access.

The third element of *Building the Territory’s Resource Base* seeks to lay the foundations for this through “a commitment to working with the mining industry and Indigenous organisations to encourage partnerships and employment”. The success of this long-term program is vital to increasing...
Bring forward discovery

Indigenous involvement in mining and the mainstream economy and in achieving a viable land access regime.

Under BTRB, land access support and Indigenous liaison activities have been funded with $1.2 million over 4 years.

Approximately 50 per cent of the Northern Territory is Aboriginal freehold land, with much of the remainder being subject to native title.

Indigenous people comprise 30 per cent of the Northern Territory population, which is projected to increase to more than 50 per cent within the next 25 years. More than 70 per cent of Indigenous people live on Aboriginal-owned land, mostly remote from major towns and economic activity.

Aboriginal people in the NT (as in other parts of remote Australia) suffer severe economic and social disadvantage. The reasons are historic and complex, but there is a very strong push to start to redress this disadvantage. A key is for Aboriginal people to participate much more in the mainstream economy. Mining is one of the few industries that offer opportunities for Aboriginal participation in remote parts of the NT.

As noted in section 8, the Northern Territory scored very poorly in relation to land access both in the Fraser Institute survey and in the survey of mining companies conducted for this Review. These attitudes are reflected in the position of the Northern Territory Minerals Council.

For these reasons, it is imperative to have Indigenous people more closely engaged with, and generally supportive of, exploration and mining. While there has been long-standing antipathy towards mining amongst Aboriginal people in some parts of the NT, many Aboriginal people and their representative organisations are coming to the view that mining offers unique opportunities to participate in the mainstream economy. Aboriginal organisations, industry and governments are all seeking ways to achieve greater participation, but so far with mixed success.

Enhanced commitment and effort from all parties are required to achieve the necessary progress to both improve land access and enhance the circumstances of Aboriginal people.

The partnerships element of BTRB is delivered through several mechanisms. In summary, they are:

- Upgrading the services provided by the Government through expanding the Indigenous Mining and Industry Services group (IBIS), now a branch within DBERD and expanding its programs to Tennant Creek and Alice Springs;
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- Educational programs that explain the practice and value of mining on a minimum three-year cycle;
- Identification of regions where exploration access negotiations are about to commence, with timely information being provided to people in those areas;
- Forums and manuals designed to help explorers and miners to understand the requirements for access to land and for dealings with Indigenous people, and for Indigenous organisations to understand the needs of miners;
- Facilitating the grant of exploration and mining titles – in particular through case management – while ensuring compliance with the Commonwealth's *Aboriginal Land Rights (Northern Territory) Act* (ALRA) and the *Native Title Act*; and
- Promotion of Indigenous participation in the mineral resource sector through the Indigenous, Mining & Enterprise Task Force (IMETF).

Other NT Government policies and programs also support partnerships:

- The Northern Territory *Indigenous Economic Development Strategy* of May 2005 emphasises Indigenous participation in mining and identifies goals to increase exploration on all NT land and the number of operating mines, and increasing contracting opportunities for Indigenous businesses;
- In 2003, the NT Government, together with Land Councils, also made a detailed submission³ to the Australian Government setting out proposals aimed at improving the “workability” of the ALRA;
- The NT Government’s new arrangements for regional development will establish local regional development advisory committees in many areas that have high Aboriginal populations; and.
- A new schedule to the *Overarching Agreement on Indigenous Affairs*⁴ between the NT and Australian Governments will set out actions to boost Indigenous employment and economic development, including cooperation on funding.

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⁴ Overarching Agreement on Indigenous Affairs between the Commonwealth of Australia and the Northern Territory of Australia 2005 - 2010
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In addition, discussions are being held within the DPIFM Titles Division on how case management of land access and granting of titles can be facilitated through closer relationships with Land Councils.

At the cross-government level, efforts are under way to develop Regional Partnership Agreements between Aboriginal people, State/Territory Governments, the Australian Government and the mining industry (see section 10.3.2).

Despite these efforts and some success in fast tracking land access and mining approvals in certain areas, the perception of the bulk of the industry remains that the Northern Territory is problematic for land access, particularly Aboriginal land. The Review Team believes that this perception represents the single biggest barrier to exploration investment.

The Review Team notes that IBIS, now within DBERD, has refocussed on providing more general support to Indigenous business and away from its previous focus of facilitating exploration and mining. There is therefore a gap in provision of facilitation services that needs to be filled. This is discussed in section 10.4 below.

Indigenous participation in mining is increasing, but remains low overall, despite some notable successes. These include: the Jawoyn Association’s participation in the Mt Todd gold project; YBE Pty Ltd, a civil and housing construction company in East Arnhem Land that contracts to Alcan Gove operations; training and employment programs at Newmont’s Tanami operations; and contracting to Giants Reef gold mine near Tennant Creek.

10.2 Titles backlog

Despite some encouraging signs, the backlog of applications for exploration titles on ALRA land remains very large and will take a long time to clear at current rates of negotiation and agreement.

Notwithstanding the proposed changes to ALRA, the mining industry remains concerned about the complexity of land access, the time taken and the cost. In particular, the industry is concerned that under the current Part IV of the ALRA, the processes by which the mining industry gains access to Aboriginal land are complex and inflexible, and often lead to unproductive adversarial outcomes and very slow granting of ELs.

As noted in section 9, as at January 2006 there were 229 applications for mining title on Aboriginal land in the negotiating process. Given that negotiations on the bulk of these are managed by just two Land Councils, the
administrative burden alone must account for some of the delay. Action is required to alleviate the administrative constraint leading to the backlog.

## 10.3 The changing environment

There are encouraging indications on several fronts that the environment for land access and mutually productive partnerships is improving and should continue to do so. This section summarises the key developments that are likely to affect the environment for land access.

### 10.3.1 Land Council policies

Land Council policies on, and approaches to exploration and mining on Aboriginal land are changing. Recent indicators of such changes include:

- Rapid agreement between the Tiwi Land Council and Matilda Minerals for the Tiwi Islands Mineral Sands Project;
- Agreement by Traditional Owners, facilitated by the Northern Land Council, for the proposed Blacktip gas project and now cancelled Trans-Territory Pipeline to proceed;
- Project agreements and Indigenous participation agreements in place or in train at Bootu Creek and Francis Creek projects;
- Statements by Land Council heads about the desire of Indigenous people to participate in mining and other mainstream economic activities (see Box); and
- Agreement between Land Councils and the Northern Territory Government to proposed changes to the ALRA as discussed above; and
- A demonstrated desire by a number of Indigenous landowner groups to participate in mining.

Despite these positive indicators, many explorers and miners report that there is little practical change to land access processes within Land Councils. They and governments perceive that the statements and the realities do not yet match. Part of the problem lies with lack of resources; another reason is that some of the “old ways” are still apparent amongst all parties (see section 10.5).

There is also evidence that Land Councils do not yet fully understand how the mining industry operates. In particular, while relationships with several larger companies may have improved, there is comparatively little interaction with smaller companies that are increasingly important in exploration.

It is fair to note also that many smaller companies lack the capacity and sometimes the culture to relate well to Land Councils and Indigenous people.
Building of knowledge and capacity is therefore important for both parties – plus government.

Box 1  **Land Council statements on mining and land access**

In a speech to the South East Asia Australia Offshore Conference in Darwin in June 2005, the head of the Northern Land Council, Norman Fry laid out the new agenda for economic development.

“The Northern Land Council is focussed on jobs and focussed on the environment that creates jobs – that is, an environment that leads to economic prosperity,” he said.

“We have land and we have labour. Both are important economic assets. Both are under-used.”

Norman Fry said that Aboriginal people want a better future for their children through participation in the economy. He said that this means both education and economic development.

“When companies approach the Northern Land Council about using Aboriginal land or native title land for a particular business venture, we want to know about the opportunities the proposal might bring for the traditional owners and the local community.

“We want to see social and economic projects that have the potential to improve the quality of life of the Aboriginal people of our region. We want to see jobs. We want to see improvements in infrastructure. We want to see joint ventures, we want to see equity partnerships and we want commitments to sub-contract, wherever possible, with Aboriginal enterprises.

In a speech to the Minerals Council of Australia’s Global Sustainability Conference in 2004, Central Land Council Director, David Ross, said that in the CLC’s area of operations there are many good examples of things working well for miners and Aboriginal stakeholders alike.

He cited the cooperation of Newmont and the CLC, plus government departments and other Aboriginal organisations to provide pre-vocational education and life training to equip people who have grown up on remote communities to live and work on minesites. He said those lessons are being taken to places such as Tennant Creek.

David Ross expressed concern about statements by the NT Minerals Council with respect to problems with the Aboriginal Land Rights Act.

He finished his address by saying: “At the end of day – when the mill is shut down - and the miners go back to their country... We’ve got to be able to say: “Brothers-Sister... its going to be all right... we got a fair share out of that mine too - we shared in the wealth taken from our country; and yes – our young people worked on that mine and they got new skills; and yes – we got benefits that will last – and we invested for our future generations.”

“Only then we will know what the promise of sustainable development means.”

Sources: Native Title Developments in the Northern Territory, address at the South East Asia Australia Offshore Conference (SEAAOC), Norman Fry, Director, Northern Land Council, 8 June 2005, Beyond the Partnership Rhetoric: Aboriginal Rights and Realities, David Ross – Director Central Land Council, Global Sustainability Conference, Minerals Council of Australia, 25 October 2004
10.3.2 Regional partnerships

Australian Government policy in Indigenous affairs focuses on establishing collaborative partnerships to respond to and address local issues. This ‘whole-of-government’ approach depends upon building effective collaborations between governments and with local Indigenous groups. It also involves engaging the private sector as the mechanism by which Indigenous people can participate more in the mainstream economy.

The Council of Australian Governments has endorsed this approach and is seeing to implement it in all States and Territories.

The NT and Australian Governments signed their Overarching Agreement in 2005 to work together and in partnership with Indigenous people and communities “in order to take action and address entrenched levels of disadvantage among Indigenous people in the Northern Territory”. One of the agreed priority areas for the agreement is “building Indigenous wealth, employment and entrepreneurial culture, as these are integral to boosting economic development and reducing poverty and dependence on passive welfare”. A schedule to the agreement was finalised in 2006 to set out joint measures to boost long-term employment and economic development opportunities.

In June 2005 the Australian Government and the Minerals Council of Australia (MCA) signed a Memorandum of Understanding to increase Indigenous employment and support Indigenous businesses to build prosperous and sustainable communities in regions associated with mining operations. Indigenous Land Use Agreements between traditional owners and mining companies often include a commitment to direct employment. Over the past seven years the mining industry has increased employment to become the largest employer nationally of Indigenous people outside the government sector.

While there has been some success in recruiting and retaining local Aboriginal employees, mining companies have also realised that there are barriers for many people that prevent them taking up employment. During the current growth in the resources industry there are many more opportunities for local people to be employed than those people who are able or qualified to participate. Mining companies have realised that the key to tackling this is collaboration with government.

The MoU between Australian Government and MCA offers a framework for mining companies and government to work together with Indigenous people to build sustainable, prosperous communities in which individuals can create and take up social, employment and business opportunities in mining regions.
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In the Northern Territory, this approach is being trialled in the Tanami region, in cooperation with Newmont Mining (see box). There is good potential for such partnerships to be implemented in other regions. The regional partnership approach offers an adaptable framework.

Box 2  Minerals Council of Australia MOU and Newmont Tanami operations

Newmont has been one of the Minerals Council of Australia (MCA) member companies at the forefront of development of strong partnerships with local Traditional Owners and Land Councils. Like other mining companies Newmont has a strong business case to engage with Traditional Owners and local Indigenous communities. Newmont’s Tanami operations currently have between 10 and 18 percent Indigenous employment, which has been achieved through a successful pre-vocational program run in partnership with the Central Land Council. Newmont is moving to increase employment opportunities beyond direct mining to encompass their suppliers and contractors.

Tanami is one of seven pilot sites to implement the MoU between the MCA and the Australian Government and develop industry, government and Indigenous community regional partnerships.

The following organisations are involved in the development of the Tanami partnership pilot site:

Communities: Central Land Council, Traditional Owners

Corporation: Newmont

Governments: Australian Government (DEWR, FaCSIA/OIPC, Health & Ageing), Northern Territory Government

While still early days, the work in the Tanami is establishing new pathways for addressing economic development in remote communities. The partnership pilot seeks to be responsive to the needs and demands of communities, enables services to be customised to a specific community or region; does not use a ‘one size fits all’ approach; works closely with communities as equal partners; and breaks down artificial barriers between communities, businesses and governments.

In particular, the partnership pilot seeks to address barriers to employment – literacy, numeracy, fitness for work and access to skills training.

An information paper about the partnerships under the MoU emphasises the new approach:

The design of a Regional Partnership Agreement is developed in direct response to local Indigenous community needs. There is an opportunity to take a radically different approach to Indigenous employment and business enterprise. Thinking outside the box – looking for new ways of engaging in the region is essential if this partnership is to deliver something other than more of the same.
In establishing a new paradigm the model should not ignore good practice and experiences that have made a difference. It is about maximising the investment by government, community and employers to make a difference. It is about learning to build relationships and work across the different cultures.

It is this sort of thinking that should characterise the approach to Aboriginal engagement in mining throughout the Territory. It is therefore important for the NT that this approach is extended to other areas and to activities by large and small companies alike. As part of this, the MCA approach also needs to be taken up by the NT Minerals Council.

10.3.3 Legislative amendments

Both Commonwealth Acts that govern Indigenous rights and interests in land – the Native Title Act 1993 (NTA) and the Aboriginal Land Rights (Northern Territory) Act 1976 (ALRA) – have been reviewed by the Australian Government. Land Councils are statutory bodies under the Acts. Amendments to ALRA have been enacted. Amendments to the NTA are currently before the Parliament.

Primary objectives of the amendments are to streamline agreement-making, including for land access for exploration and mining. Several amendments aim to provide greater incentives for Land Councils to perform better, including tying funding more closely to performance. The Australian Government is keen to make the Land Councils more accountable to the people they serve and more responsive to other stakeholders, including the mining industry and the NT Government.

ALRA amendments

NT Government and Territory Land Councils agreed in 2003 to a package of proposals to enhance the workability of ALRA as it relates to mining. They made a joint submission to the Australian Government for amendments to the Act, including amendments to exploration and mining provisions in (Part IV). The proposals amendments aimed to achieve:

• More flexible and less complex processes;
• Resolution of issues through negotiation rather than punitive and time consuming regulation;
• Greater collaboration between the Land Councils and the NT Government; and
• A more efficient interface between the operation of Part IV of ALRA and the Mining Act.
The amendments to ALRA were enacted in September 2006. Those related to exploration and mining are expected to commence on 1 July 2007. Major changes are as follows:

- Day-to-day decisions about exploration and mining matters on Aboriginal land will be delegated to the Northern Territory Minister responsible for Mining—this includes the monitoring of negotiations between Land Councils and applicants for exploration licences.
- The negotiating timeframe for Land Council consent to applications for exploration licences will be streamlined—there will be a standard negotiating period of approximately two years, covering two field seasons in the Northern Territory (April to October); following this, the Land Council and the applicant for an exploration licence will be able to agree time-limited extensions; the Northern Territory Mining Minister will be able to set a minimum 12-month deadline for negotiations once the standard period has expired.
- Existing exploration licence applications will move to a corresponding point in the new system.
- The five-year moratorium period following a refusal to consent to an exploration licence may be set aside at any time if the traditional owners agree.
- The Northern Territory Government will be able to withdraw a company’s consent to negotiate where the company has not seriously pursued negotiations.

Native title amendments

The Native Title Amendment Bill was introduced into Parliament on 7 December 2006. The Bill includes a package of coordinated measures designed to improve the performance of the native title system. Relevant items in the package are:

- Measures to improve the effectiveness of Native Title Representative Bodies (NTRBs)\(^5\);
- Reform of the native title non-claimants (respondents) financial assistance program to encourage agreement making rather than litigation;

\(^5\) Land Councils in the Northern Territory were established under ALRA and are also NTRBs under the Native Title Act.
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- Preparation of exposure draft legislation for consultation on possible technical amendments to the NTA designed to improve existing processes for native title litigation and negotiations;
- An independent review of native title claims resolution processes to consider how the National Native Title Tribunal and the Federal Court may work more effectively in managing and resolving native title claims;
- Consultation with relevant stakeholders on measures to encourage the effective functioning of Prescribed Bodies Corporate (PBCs), the bodies established to manage native title once it is recognised; and
- Increased dialogue and consultation with State and Territory Governments to promote and encourage more transparent practices in the resolution of native title issues.

Now that the details of the amendments have been put before the Parliament, all parties have a major stake in ensuring that the amendments are workable and provide the right mix of incentives and performance measures for Land Councils. The Australian Government has indicated that it is prepared to consider changes to the amendments as the Bill progresses through the legislative process in 2007.

10.4 Need for facilitation

Given the role of mining in NT and regional economies, and the importance of land access, it is of concern to the Review Team that there is no longer a specialist group within DPIFM to facilitate land access and Indigenous involvement in mining. With the creation of separate departments in 2005, the Indigenous Business and Industry Services (IBIS) Branch has moved out of the DPIFM Minerals and Energy Group to DBERD. As a consequence, the IBIS role has moved away from facilitating land access and Indigenous participation in mining towards broader Indigenous business facilitation across all industries.

The Review Team understands that under this new arrangement, IBIS is tasked with providing services to DPIFM around land access and related Indigenous engagement. In practice, however, the physical location of IBIS personnel away from DPIFM, together with a heavy IBIS business facilitation workload, inhibits the performance of IBIS in land access.

The importance of land access and Indigenous engagement to exploration and mining investment and to the Northern Territory economy makes it imperative that the old core services of IBIS are continued and strengthened. It is a key accountability of DPIFM that it improves access to land, in support of its major industry role. The Review Team considers that either:
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- The IBIS personnel charged specifically with mineral and petroleum industry facilitation should be located within DPIFM, and cooperative arrangements with DBERD are strengthened; or
- A new unit should be established within DPIFM to work closely with DPIFM case managers, Land Councils, local Aboriginal people and mining companies.

10.5 Organisation culture issues

This Review acknowledges genuine efforts from all stakeholders to improve relations between Aboriginal people, governments and industry, and to seek to engage more Aboriginal people in mining.

To date, however, the outcomes have fallen well short of the parties’ hopes. Discussions with stakeholders have also revealed concerns about some remnant attitudes within the NT Government towards land access legislation and dealing with Aboriginal organisations. At the same time, concerns were expressed about similar attitudes and behaviours within Land Councils.

In particular, it was asserted by more than one stakeholder representative that while many government officials are helpful and constructive, a few officials were “living in the past” in relation to Aboriginal relations and the operation of legislation. The same was observed about some Land Council officials.

Concerns have also been expressed by Land Councils about the confrontational style of the NT Minerals Council, which they have observed is at odds with the constructive approach of some of their members.

In all cases, these behaviours are at best at odds with the policies expressed by leadership of governments, industry and land councils and send mixed messages to parties that they are dealing with. At worst, the attitudes have led to old-style stand-off situations and destructive rather than constructive outcomes.

Future approaches must be different if all parties are to benefit.

It is clear that relations between the three groups – Aboriginal people, industry and governments – need a major boost in mutual generosity, cooperation and above all, expectations and delivery.

In all cultures true partnerships depend as much on personal relationships as on formal arrangements, and more so in Aboriginal society. Yet relations between industry, government and Aboriginal people are often sparse and formal.
Greater effort must be made from top to lower levels of the public service, and by industry, to forge strong personal listening, understanding and cooperation with Aboriginal people at all levels. The barbecue is as important as the round table. People from each group must be a common sight in gatherings of the others. There should be exchanges of personnel, and Aboriginal people in the corridors of DPIFM and mining companies, with government and industry personnel frequent invited visitors to communities.

Figure 30 presents a model put forward by the mining industry for community, government and corporate partnerships at a regional level. Where interests coincide, the parties work together, in others, the partners remain independent. The mining industry diagram has quite a small “zone of cooperation”, whereas the Review Team believes that the zone of potential overlapping interests in the NT context is larger. Figure 30 is drawn to indicate this.

In this model all partners are equal. However, with the severe disadvantage experienced in Indigenous communities there is not equity between parties. The challenge is to recognise this lack of equity and to seek increasing social, cultural, political and economic parity. While companies control footloose investment funds and can go elsewhere, an investment from industry as well as government to such a partnership is essential to move the relationship and the parties forward.
The way forward must involve consistency of policy and behaviour and a more constructive approach from all parties towards resolving land access issues.

The amendments to ALRA and proposed changes to the *Native Title Act* provide a unique opportunity for a comprehensive step change in approaches to land access. Such an approach should include much of the following:

- Amendments to ALRA and *Native Title Act* as outlined in section 10.3;
- High level discussions between the NT Government, Land Councils and industry aimed at reaching agreement on how to develop a more sustainable approach to land access and Aboriginal involvement in mining both within and outside the legislative framework;
- Development of regional partnership approaches in key mining areas between all parties including mining companies;
- A stronger focus within DPIFM on land access and Aboriginal involvement in mining, including either co-location of IBIS personnel with relevant DPIFM personnel or a new specialist group within DPIFM;
- Careful selection of staff for key roles in DPIFM that deal with Aboriginal people and organisations;
- Specific skills and cultural training of staff who deal with Aboriginal people and organisations;
- Enlarging of land access units within Land Councils and provision of resources by governments to Land Councils to facilitate processing of land access applications;
- Co-location of Land Council land access staff with DPIFM personnel to facilitate communication, understanding and speedy processing of applications;
- Further development of agreed codes and guidelines that guide each party; and
- Adoption of a best practice, continuous improvement approaches to agreement-making by all parties.

The Review Team recommends that before the legislative amendments pass through Federal Parliament, high level discussions be held to begin charting the step change approach and to try to maximise points of agreement on the changes to legislation.
11 Promotion of the Territory as a preferred exploration destination (Element 4 of BTRB)

Active marketing of the NT’s exploration potential and of the government services available to support exploration and mining was essential to meet the objectives of BTRB. Funds were allocated to the Resource Development and Policy Division within DPIFM and a full-time staff member was dedicated to the role.

11.1 Overview of promotion program

11.1.1 Advertising

The STRIKE website has been advertised on the Miningnews.net website and advertisements have appeared in trade journals such as Paydirt, Gold Mining Journal and AIG News.

11.1.2 Top End Secret

The Top End Secret Campaign was conceived to support more exploration and mining by promoting BTRB, government services and the Territory as an investment destination.

The centrepiece of the campaign, the Top End Secret Roadshow, was conducted in partnership with KPMG, Clayton Utz, AMEC, Australian Gold Council and Minter Ellison. The Minister for Mines and Energy led a combined NT Government-industry delegation to Brisbane, Sydney, Perth, Adelaide and Melbourne in 2005. The Minister’s participation was noted favourably by industry clients.

The Roadshow attracted over 800 exploration, mining, banking, finance and investment executives. About 35 per cent of enquiries to DPIFM (through its Minerals and Energy Information Centre [MEIC]) between April and June 2005 were from Roadshow participants and 29 per cent of the new applications for ELs over the same three months were also from participants.

11.1.3 NT Investment Alert

The NT Investment Alert is an email ‘alert’, sent every 6-8 weeks, to in excess of 500 clients. It is another way of breaking in to the plans of explorers anywhere, with a new mention of the Territory on their screens.
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The alerts have generated web hits from around a third of those receiving them – a very good result that shows that the material is both interesting and relevant to industry.

11.1.4 NTGS Update email subscription

The quarterly and ad hoc email service is now managed through automated listserv software and concentrates on listing new geoscience products and promoting events. There are currently 250 subscribers.

11.1.5 Conferences and trade show participation

DPIFM, NTGS and associated government groups attend selected national and international conferences and actively market using booths and plenary presentations.

11.1.6 Annual Geoscience Exploration Seminar (AGES)

AGES is an annual conference convened by NTGS in Alice Springs. As well as presenting NTGS results to industry, presentations are invited from selected industry representatives, other NT Government groups, GA, academia, Land Councils and other stakeholders. Attendance has remained high during BTRB. In 2006, AGES was combined with DBERD’s Mining Services Expo, and succeeded in attracting 198 delegates, a 42 per cent increase on the previous year’s attendance.

11.1.7 Central Australian Basins Symposium (CABS)

CABS was convened by NTGS in Alice Springs during 2005. It attracted over 100 geoscientists, both international and domestic. The symposium covered petroleum and minerals exploration topics. NTGS staff contributed 15 out of a total of 52 papers (including 3 keynote addresses).

11.2 Assessment of promotion program

The promotion program mounted as part of BTRB is well-conceived, well executed and highly effective. There has been effective engagement of Mines Ministers in promoting the Northern Territory to investors.

However, the key to promotion is ultimately the content, and the Territory, with no new discoveries and continuing access problems, seems a little stalled and stale despite the acknowledged excellence of its presentations. The improver has been the quality and access of its databases, but the Fraser Institute survey for 2005-2006 shows that others have gone ahead in that field.
The promotion of the NT also constitutes its best feedback mechanism. NTGS gets more feedback than most agencies, at all levels and all the time, from face-to-face and all other responses. This Review, like those in all jurisdictions since major initiatives began, finds a geological survey very well aware of industry needs and responses and what “works”. Translating this feedback into designing and implementing the most effective programs is the issue.

12 Programs in other jurisdictions

12.1 Scope of programs

The idea of very large state exploration initiatives commenced in South Australia in 1992 in response to particular state financial difficulties and the need to generate future wealth. Outputs were to be immediate and dramatic, outcomes long term – several elections away.

The main aim was to carry out geophysical surveys of whole geological terranes, more than half of the State, instead of the large program of scattered patches all over Australia that had been progressing for a decade. The patches were interesting in themselves, but nowhere gave the overall picture of the geological systems, and so were difficult to interpret. The second aim was to combine many data sets of geology, geophysics and geochemistry into major databases together and make them readily and cheaply available, digitally, and gradually via the Internet that was new at that time.

The initiatives were immediately successful in making an astounding impact on regional geoscientific understanding that looked more advanced than it was. It takes many years to interpret the new information on such a scale.

However, the other States could not stand by and watch the new information and data being provided very cheaply, and world-wide promotion of South Australia. Consequently, Victoria, then NSW soon followed suit with advice from South Australia, and then Queensland on the same model. The elements of the model were varied in relative importance depending on the geology of the State. Until recently, Western Australia did not fly large regional magnetic surveys, despite recommendations to do so, for reasons of its prospective geology in mature areas and huge self-driving minerals industry. The Northern Territory commenced, on models again adapted from the others, in 1999, and Tasmania, a tiny area with very different geology, commenced on the most different model of all, paid for mainly by the Commonwealth, in 2003.
The one constant in creating or advising on all of the programs except those of WA, was one of the present Review Team. The great initiatives were all to be a short term (undefined) phase, not a long-term constant.

### 12.2 Overall data

The quality of the geophysical programs, mainly by world’s best contractor companies, was almost identical in all places; the quality of the databases was much the same depending on the stage of building the system; and the geological mapping was of much the same quality. There is a close similarity between products, not only at the visual level but in aim and content. In all States, there was a swing in emphasis from producing “geology of record” after prolonged and delayed editing, to producing and supplying information as it was developed, that would ramp up exploration interest. However, as predicted, this emphasis still made the biggest addition to the geology of record in generations.

The efficiency and effectiveness of the mapping and interpretation have never been reviewed except incidentally to reviews like the present one, and it would be nearly impossible to compare jurisdictions because each Geological Survey had to wrestle with its own geological systems and challenges. The local geological conditions, both soil cover and hard rock, were the main determinant in the quality and relevance of the outputs. However, reviews in all jurisdictions including the present one have noted worrying inefficiencies in geoscience work, due to lack of training, mentoring and effective management of teams and processes.

The transformation of geoscience knowledge was largely proportional to the area under cover of soils and sands and modern sediments (the “regolith”), areas where the geology was scarcely known before. Large tracts in all States and the Territory are in this category. Simply because the ore deposits that outcrop have largely been found, it can be argued that this geology and hence prospectivity under cover is almost ALL of the challenge of discovery for the future. It is therefore almost all of the challenge for the NTGS. Hence the emphasis on geophysics such as magnetics and gravity that can penetrate cover, relative to traditional mapping. However, the interpretation of rock formations under cover is a complex integration of geology, geophysics and geochemistry, and later this Review proposes a new emphasis in geological mapping in support of this aim.

As a consequence of the above, very little can be learnt by comparison with other jurisdictions since they all danced to the same tune unless their geology and exploration industry were very different. NTGS staff members are aware of what the other jurisdictions are doing and what may be applied in the
Territory. The many conferences organised and attended by NTGS managers, frequent industry contacts, company reports, and the websites of other jurisdictions keep them abreast of technology and policy issues.

Tribute has also to be paid to Geoscience Australia (GA), previously Australian Geological Survey Organisation (AGSO), which has carried out programs and assisted with expertise and funding in all jurisdictions to great effect. It is a major goal of DPIFM to keep close to ideas and services available from GA, and where possible to attract GA participation and intellectual property exchange. From programs in several states, it seems that the National Geoscience Agreement at present is in the best shape it has ever been, with well-worked complementary work between Geoscience Australia and the geological surveys.

It is difficult to total the expenditure on these new initiatives across all jurisdictions since 1992, as much regular work of geological surveys was re-badged, and the States did not separate new initiatives from ongoing work in the same ways. However, the total spent and committed on initiatives since 1992 is about $300 million. For comparison, the Territory has committed about 10 per cent of that total from a population of 1 per cent of the total. The rationale is not the spend per person but the need to guarantee the future wealth of the Territory, and to help to end the “remoteness” and under-developed nature of the region. Without that 10 percent, the world industry would have lost sight of the Territory until some major discoveries awaken interest.

12.3 Queensland

Queensland has had a broad program of regional airborne geophysical (magnetic and radiometric) surveying, updating GIS databases, putting geochemical records in good order, and new mapping. The result is the expected large increase in regional geoscientific knowledge, which should in time lead to more discovery. The lead times are longer than any jurisdiction would like, but that is not cause for lessening the effort but for maintaining it, or there could be prolonged falls in mineral production pending new discovery.

- The new Smart Exploration initiative has a centre-piece in re-mapping the Mt Isa Inlier of over 100 000 km$^2$ at 1:100 000 scale over 5 years.
- Much of this program is common with those of the Territory, and the differences, especially the new mapping at Mt Isa, are particular to that area and are not relevant to the Territory at this stage. The Queensland approach to that mapping is not recommended for the Territory.
- The Queensland exploration attraction initiatives are credited rightly with bringing much more exploration expenditure to the State, but Queensland has not had large exploration successes since the great rush of discoveries.
in the Mt Isa region in the late 1980s-early 1990s. Important copper discoveries are again being made, at Rosebee and Rocklands west of Cloncurry and elsewhere, but it is early to predict whether they will become major mines. That experience is actually promising for the Territory in the long term. The fact that no Olympic Dam-type deposits have been found in the Arunta Region after a decade of exploration does not seem so bad when it is recorded that the world’s best explorers broke their optimism in the Mt Isa Inlier for 30 years before the great discoveries of Osborne, Ernest Henry and Cannington east of Mt Isa, and for a hundred years before the discovery of Century to the north. It is not easy, and in provinces with the requisite geology for large deposits, there will be more discoveries. The main way to find them is by projection under cover of the mapping that the NTGS provides, by means of the regional geophysical data.

The Review is asked to comment on QDEX, the Queensland Digital Mining and Exploration Reports System. The system has worked well for nearly two years. It requires companies to make all reports on tenements in digital form, with strict guidelines, so that non-conforming reports will not be accepted. Clear instructions are given, and the Department has been very helpful with advice and assistance. The industry appreciates such a sensible system, especially as company reports are now all of similar format, and when they are released to open file it is done automatically. The Department intends to have all 33,000 company reports from the past in digital format by mid-2006.

QDEX is fairly easy to search, not as easy to navigate to other information on the website as with South Australia. Experts in NTGS scan all jurisdictions for technical or design points that may be useful to the Territory.

It is recommended that the Territory move to require digital reporting on-line or by CD by companies in similar format, as an obvious saver of time and cost, and providing a customer service through similarity of layout and access.

Two important initiatives have been announced in Queensland in the second half of 2006 that constitute a marked up-grade in support for minerals and petroleum investment attraction. A specialist Ministry and Department of Mines and Energy have been re-created to give clarity of leadership and support by separating them from administration of natural resources, mainly the huge issue of water, and environmental issues.

Secondly, the large Smart Exploration initiative of $20 million over 4 years has been extended with a Queensland Smart Mining program of $29.08 million over a further 4 years. It includes a technical Queensland Exploration Development (QED) initiative of $19 million, and a drilling fund of $6 million for drilling partnerships on the South Australian model. This initiative is backed up by outstanding technical contributions from Geoscience Australia,
especially in seismic and spectral imaging and in regional synthesis of the Isa Inlier. The program also includes $800 000 in grants to assist companies to share drilling resources, and $480 000 to encourage the growth of junior mineral exploration companies in Queensland.

These moves show how much competition is coming from neighbouring jurisdictions in minerals investment attraction.

### 12.4 South Australia

South Australia started the Exploration Initiatives and has generally kept ahead, as industry surveys show. The SA Government has made very good use of all possible strengths of the State and of Adelaide as a base, and they are considerable. They now regard the Territory as their main promotional competition, for good reason.

The Plan for Accelerating Exploration (PACE) program fits within an impressive State economic growth strategy, available on the Internet, and is part of a program to increase the level of mineral exploration to $100 million per year, achieving $95.7 million in 2005. Few of those involved thought the target would be reached, but a combination of elements similar to BTRB, the rise in world exploration, and especially their drilling partnerships, have achieved it.

South Australian and Northern Territory geological systems and landforms have much in common, and many SA programs apply just as well across the Territory border. This Review recommends government-industry drilling partnerships along similar lines, but tailored for the Territory as to scale and procedures.

**PACE Theme 2, Drilling Collaboration with Industry,** has been touted as a success in its first year, because of significant intersections that open up big new province potential. It is being geared up from $1.35 million in its first year to over $2 million in the second year of a notional five years at $2 million per year.

South Australians, government and companies alike, make the point that the drilling partnerships scheme has been a triumph for promotion. It signifies the State’s strong commitment, its close partnership with industry, a get-up-and-go approach. The very deep Carrapateena copper-gold drill intersection was sensational. Though it will take long and costly drilling to prove it is economic below 500m, it has made a resounding point around the world that the State participated in proving another highly prospective area for mega-deposits of the same type as Olympic Dam and Prominent Hill. It immediately attracted a joint venture with a global major company, Teck-Cominco.
Positive drilling results have been achieved with nine other companies in the first year. Though most are not spectacular, they all warrant more drilling, which is the aim of the program.

The lessons from the early results of partnership drilling in South Australia have been noted by NTGS managers. They have the potential to generate a step change in the mindsets of explorers.

During 2006, South Australia has had another huge success with its collaborative drilling, the three wide-spaced Punt Hill intersections of Olympic Dam type. These, with Carrapateena, suggest there might be several more of these giants after Olympic Dam and the much smaller but still large Prominent Hill. People are talking of the possibility of a world-scale province, Olympic Dam being the size of half a province in itself.

**PACE Theme 5, Resource Development and Sustainable Communities,** “aims to develop training and employment opportunities for Indigenous people in South Australia’s remote areas while ensuring that culture, communities and families remain strong”. It has also had recent success in the noted APY Agreement in the far north-west. The State provides legal and anthropological assistance, and the Indigenous people involved have signed a standard deed of agreement for mineral exploration. South Australia is progressing similar arrangements in other areas.

The lessons for the Territory are negative and positive: it took South Australia more than 12 years with many twists and turns to achieve it; there is a confident outlook as a result, and the result was helped by learning from the experience at Argyle in the Kimberley region. Given the difficulties of engaging Aboriginal people in a sustainable manner, in activities so unusual to them as modern mining, lessons from around the country and especially elsewhere in remote Australia, should be taken into account when designing the Territory’s programs.

Government agencies DBERD and DPIFM are well aware of all such elements, are taking advice and example from wherever they can, and doing good work towards building partnerships in the Territory. South Australia is also progressing arrangements in other areas. It is easy to criticise and many mistakes have been made but there does not seem to be a time when more attitudes were right, nor more sensible steps taken in both jurisdictions. It remains the chief theme of this Review that the Territory has to raise its efforts and commitment another level to achieve breakthroughs in Indigenous willingness to welcome mining.

There is a confident mutual appreciation and commitment to the approach of South Australia from all sides in Adelaide: the Premier, ministers, public...
servants, companies, the Chamber of Mines and Energy and the Expert Group of supporters. The Territory should aspire to developing a similar approach, ethos and commitment shared by all relevant groups.

### 12.5 Tasmania

Tasmania is a special case, one twentieth the size of the Territory, mountainous, and where electromagnetic methods work well. The main features of Tasmania's initiatives, mainly paid for by the Commonwealth, were the airborne magnetic/electromagnetic (EM) survey of the western belt and King Island, the 3D geological model of the State, and putting mining company records in digital easy-access format. The result has been a great increase in exploration, which had fallen to very low levels. It is helped by the historic record of five major deposits and several small-to-medium ones in such a small area. Pasminco had also made available its large records of key exploration. The difficult exploration terrain covered by dense cold temperate rain forest really needed an intense geophysical method to raise knowledge to another level, and that is one of the few terranes in Australia where airborne EM systems penetrate deeply and can be interpreted satisfactorily. Nowhere in the Territory is a state-funded EM survey like that justified yet.

The **3D Geological Model of Tasmania** was constructed from seismic results right around the coast in an impressive technical initiative. It has shown a few major structural features that as yet have not contributed to any new discoveries, but made an advance in understanding a State where regional geological structure has been difficult to unravel.

The main result was that the 3D model available on the GA website was good bait to attract explorers to look closely at the mass of related data. We have to keep in mind the psychological factors – an interesting new concept gets people to look more seriously.

### 12.6 Western Australia

#### 12.6.1 Overview of WA initiatives

Western Australian was comparatively late to develop an integrated program to attract exploration investment, although the Geological Survey of Western Australia (GSWA) has been gathering, synthesising and publishing information on the geology and mineral and petroleum resources of the State since the 1880s.

Land access issues and the desire to open up new mineral provinces provided stimulus to establishing an integrated program in the 1990s. It was the steady
downward trend in exploration investment from mid 1997 that stimulated a rethink about the approach to attracting exploration investment to this mineral-rich State. Overall mineral exploration activity nearly halved by 2001/02 from the 1996/97 peak. Greenfields exploration fell by 63 per cent. Industry and then government concerns reached a point where a Ministerial Inquiry into Greenfields Exploration in Western Australia (the Bowler Review) was established in 2002. Its purpose was to investigate the reasons for the reduced levels of greenfields exploration expenditure in Western Australia and to recommend actions to the WA and Federal Governments to stimulate the level of expenditure necessary to sustain the future of the resources sector in the State.

The emphasis of the Inquiry was on mineral exploration, although onshore petroleum exploration was also considered.

A total of 33 recommendations were made, including seven high priority recommendations to:

1. Reduce the backlog of mineral tenement applications;
2. Increase the availability of pre-competitive geoscience information;
3. Issue special greenfields exploration titles;
4. Improve Aboriginal heritage protection protocols;
5. Provide support to prospectors and small companies to deal with Native Title;
6. Introduce a flow-through shares scheme (Commonwealth responsibility);
7. Review the *Aboriginal Heritage Act*.

Further recommendations went to managing native title issues, improving mineral title management, and access to farmland and the conservation estate.

The WA Government accepted many of the recommendations and has provided additional resources to implement initiatives. These included $12 million commitment over four years (now on-going at $3 million per annum) to double the area of the State covered by airborne geophysical surveys. A program also commenced to accelerate the public release of archival information contained in 7 000 non-confidential exploration reports from exploration companies, in order to encourage greenfields exploration activity.

One criticism that had been levelled at GSWA about its pre-competitive geoscience surveys was that too much was being spent in mature areas and too little in greenfields areas. It emerged in 2002 that a driver of the program
decisions was an industry advisory process that was dominated by representatives of companies that operate in these mature areas. A strong signal was sent in the 2005/06 GSWA program and State Budget, which included commitments to “maintain a sustainable level of resource exploration activity and assist investors to identify successful exploration opportunities”. The program has included:

- Collection and release of data in 2005/06 from aerial geophysical surveys over the Paterson, Southern and Eastern Yilgarn and Gascoyne regions (much of which are greenfields areas);
- Collection and release of further survey data in late 2006 for the Warburton-Giles and the West Officer Basin, east of Newman, areas;
- Further surveys in 2006/07 in the West Officer Basin and the Ashburton areas in central and northern WA; and
- Commencement of a major five-year program of geoscience field mapping in the Tanami region, including participation in the collection of data from a deep seismic line across the region, in collaboration with Geoscience Australia.

As a direct result of the first release of data from the surveys, many mining tenement applications have been lodged for under-explored land in the southern Yilgarn, Paterson, Gascoyne and Eastern Yilgarn areas.

A lesson for the NT is that while industry consultation processes, including reference groups are desirable, decisions on program priorities ultimately must be taken in the best interests of the NT and its people.

### 12.6.2 Inventory of abandoned mine sites

The GSWA’s Western Australian Inventory of Abandoned Mine Sites (WABMINES) is a comprehensive digital database, growing by about 25 000 records per annum, that provides baseline data, including photographs, on abandoned mining-related features in Western Australia (Ormsby et al., 2003).

Included in this information in recent years are the geological descriptions of all types of former mine workings from small prospecting pits to major shafts and opencuts (GSWA, 2004, 2005).

Overall, about 40 per cent of the known 11 411 abandoned mine sites in Western Australia have been documented, and the vast majority of these sites produced gold. The WABMINES database now aims to include every mining-related feature within the surveyed areas, and currently has more than 138 000 records and 34 000 digital photographs.
The project’s key objectives are to accurately locate and document abandoned mine sites, and to document factors relevant to public safety and the environmental hazards the sites may pose.

In the context of this Review, of particular interest is that the inventory has also recently been demonstrated to assist exploration targeting, and to contribute towards the understanding of controls on mineralisation.

To date, mining companies operating in regions where this analysis has been undertaken have shown moderate interest in the approach. GSWA is awaiting feedback on exploration usefulness.

The use of WABMINES as an exploration tool is in the R&D stage and its on-ground usefulness to explorers is still to be assessed. For this reason, the NT should simply monitor development for now.

Of course, the precursor to use of such a tool for exploration is the development of an inventory for public safety and environmental purposes. If that cannot be justified, then an inventory probably should not proceed. It should be noted that the NT’s existing historic mining and exploration records underpin a number of the new mine developments underway in the NT. These records in fact form the basis of a defacto inventory, albeit one with more recent lineage than in WA.

### 12.7 Comparison with the NT

The reasons why comparisons are not very valuable are the three mentioned above:

- The initiatives were all of much the same models except for Tasmania;
- The differences were due to different geological terranes; and
- The main programs, which were geophysics and improved databases, used the same types of contractors and technology.

The NT has done some of the best magnetic and regolith mapping, and probably the best radiometric processing. However, that regolith map, on the cutting edge of what can be done, needs revision already on the basis of remarkable geophysical work done since by NTGS geophysicists.

The NTGS is doing its own type of geological-geophysical synthesised interpretations in central Australia, with mixed results to date, but this is a program that must continue and be refined. Each jurisdiction produces some excellent special pieces. For example, the NTGS boasts impressive new magnetic depth interpretations and a synthesis of the southern Georgina Basin for mineral prospectivity, as well as the 3-D geological model of the Tanami.
To the credit of the Territory, its own 3-D model of the Tanami, while constructed on a very different set of data, is more useful, better presented and user-friendly than the Tasmanian example, and in fact superior to the 3-D models from other jurisdictions on the Web. It was composed with close assistance from GA and the main explorers in the area. It is another example of expertise, excellent policy and cooperation in the Territory.

The Fraser Institute survey and other reviews, and anecdotal comment amongst Australian explorers have for many years shown that the Territory ranks with the best in the world in the quality of its geoscientific databases, and acknowledged somewhat behind the best in access and delivery until it updates its knowledge management systems.

The NTGS was independently reviewed in more thorough fashion than the Fraser Institute report by Dugmore and Fardon (2003) and in that survey the Territory was rated better than the other Australian States. The jockeying between the jurisdictions since has not altered matters in a major way, though the Territory has slipped in rank. The slippage may not make a huge difference, but even say a 5 per cent slippage in commitment from a current $70 million of exploration per year is serious business.

The differences between the top-ranked jurisdictions, being the other Australian States and Ontario and Quebec, are minor, and largely terrane-dependent. One of the differences that hurt the Territory is the number of expert company executives based in the other jurisdictions who can promote the quality of their work.

13 Assessment of investment attraction 1999 - 2007

13.1 Minerals

As always, it is almost impossible to separate the influence of world exploration trends from local influences on the level of exploration expenditure in the NT. Further, local influences include many factors other than new information, especially access to ground and perceived prospectivity, which rises with new discoveries or languishes otherwise. All jurisdictions suffered the severest downturn in modern times after the high of 1996/97. The recovery since has improved exploration levels in all regions. The NT, however, has not recovered as much, which is worrying, and many explorers in the NT are giving increased preference to Africa and Latin America at the NT’s expense.
The question that cannot be answered accurately is: how much the rate of exploration in the Territory would have risen or fallen without the NTEI and BTRB? Companies have been considering Territory prospectivity for a long time, and even they have trouble breaking out the relative effect of new knowledge over accumulating “old knowledge” and their own growing expertise over the years. Dugmore and Fardon (2003) answered the question as well as it can be done by industry survey to 2003, and the industry survey conducted as part of this Review reiterates the message.

There is no doubt, from discussions with companies around Australia, that some of the new interest in diamonds, nickel, base metals and gold is due not just to increases in prices of the metals but to the great information releases since 1999, which transformed the geological understanding of the Territory. However, the lack of recent discovery and the lack of access to key ground have prevented the tidal rise of interest that would lead to more exploration offices being established, geologists and drill rigs transferred in.

The recent increase in the number of IPOs and capital raisings by minerals companies developing mines in the Territory is both encouraging for the NT Government and sends positive signals to the rest of the industry.

The Territory needs to review its mining operating regulations. It is not the purpose of this Review to assess the Mining Management Act, but the Review Team received 35 pages of forms that needed to be considered before drilling one hole. The same number of forms sufficed for a drilling program of many holes, and some of the forms were blank as inapplicable. However, the situation would badly impress a newcomer, used to not having to do more than notify a government of proposed drilling, and then proceed according to regulations and guidelines regarding clearances and environmental and safety performance.

As one explorer commented on the issue: “The Territory is probably as bad as any for bureaucracy, but if you stay a while you can get used to anything”. Coming new is the main problem, and the aim is “to promote the Territory as a preferred location for exploration”. Ordinary low impact drilling should be “as of right under the regulations and guidelines,” subject to penalties for malpractice.

A related more general comment is that the Territory, despite the small size of its economy and population, has many of the negative hallmarks of “big government”, with some slower processes and longer decision-making than much larger jurisdictions. Potential investors could reasonably expect the Territory Government to be responsive and fast on its feet, but often it is not.
There are some exceptions to this problem – most recently the fast-tracked approvals for the Matilda Minerals Tiwi Islands mineral sands project – but such efficiency should be the norm.

13.2 Petroleum

The petroleum section of this report is brief for a good reason. It has long been the intention of the Territory to help promote the important offshore areas, to increase activity and to help improve the success rate of drilling; and to have the long-neglected onshore basins tested. It has succeeded in both. The petroleum tenement map in Figure 27 is a long-hoped-for result.

The success is due primarily to the current high commitment to petroleum exploration around the world, but the efforts of the NTGS are acknowledged by industry and they take considerable credit. It is an indication of what a small section of DPIFM can do for the Territory when its personnel have industry experience, and an example of what is needed in the NTGS in future.

The Territory must continue to promote its petroleum potential, especially the on-shore potential, as the commitment of $55 million over five years is not a fact yet, and only if the perceived attractiveness persists will all that money be spent. This is the best example that what is needed is discovery - that will ensure much more than $55 million is spent. NTGS should continue to upgrade the content and quality of databases and monitor new data submitted as a result of the increased activity to ensure clients can access and use the full set of data when required.

The petroleum program is fairly complete. A priority is to promote the NT’s petroleum attractiveness to Asian companies, which as discussed earlier, are looking for upstream investment opportunities.
Part 3: The mining industry and the NT

14 Demand outlook for NT minerals

Economic sources including the Australian Bureau of Statistics, International Monetary Fund (IMF) and the Organisation for Economic Cooperation and Development (OECD) are forecasting average global economic growth of around 3.8 per cent per annum over the next five years. Although this represents a deceleration from the average 4.9 per cent growth rate experienced from 2004 through 2006, world GDP growth of this magnitude is still at the high end of historical long term trends.

The Australian Bureau of Agricultural and Resource Economics (ABARE) forecasts of export earnings reflect this optimism. Total earnings from Australia’s mineral and energy exports are projected to rise by some 18 per cent to $108.1 billion during 2006-07 underwritten by higher export volumes and prices. ABARE also anticipates export earnings from energy commodities to reach $43 billion in 2006-07, spurred by stronger LNG exports from the new Darwin LNG plant and shipments from the North West Shelf to Asia. Over the next five years, export volumes are forecast to increase across the board for mineral resources. The outlook for LNG and iron ore is considered to be particularly robust.

Since demand for minerals such as iron ore, bauxite, and mineral sands are heavily dependent on trends in global industrial output, continued strong global economic growth (see Table 4) should support prices of many mineral and energy commodities. Although long term economic forecasts are for strong industrial production growth to continue, the world commodity outlook to 2010 depends critically on China’s economic growth prospects. Specifically, China’s economic growth and rapid industrialisation over the last ten years have underpinned a huge increase in the country’s demand for mineral resources.

Industrial production in China has expanded at an average annual rate of 13 per cent over the last ten years compared with an OECD average of just 2.1 per cent during the same period. As a result, China now rivals the US as the world’s primary consumer of mineral resources.

Other Asian nations are also exhibiting strong growth. In particular, India is emerging as a powerful economy while other Asian economies that have traditionally exhibited strong growth – notably South Korea and Japan – have moved back to stronger growth trajectories (Japan after a decade-long downturn). The only foreseeable damper on growth over the coming four
years could be sustained very high oil prices, a hard landing for the US economy or a pandemic.

Table 4  

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Data sources: Australian Bureau of Statistics; International Monetary Fund; OECD; Reserve Bank of Australia; ABARE

Demand for minerals will be led by those countries that are engaged in significant construction and in the industrial sector, especially in new and emerging technologies.

Other major influences on world commodity prices and demand for minerals include:
- Economic performance in the United States, Europe and India
- Political risks which could have an unsettling impact on global consumer and business confidence.

Nonetheless, both ABARE and the International Energy Agency expect the commodity boom to continue. Global demand for minerals seems destined to remain firm buoyed by strong growth in global industrial production to 2010. Against this positive macroeconomic backdrop, exploration activity in minerals and petroleum in the NT should probably pick up.

14.1 Market outlook

14.1.1 Oil and gas

Oil prices have been in the US$60 a barrel plus bracket for some time now, enough for the industry to factor in long term prices above expectations only a few years ago. ABARE and the International Energy Agency are forecasting global oil prices to remain high throughout 2006 and 2007 (averaging around US$65 a barrel for West Texas Intermediate (WTI) crude oil in 2006 and US$56 a barrel in 2007). Recent spot WTI prices are the lowest since February 2005.
However, although world oil production is expected to increase over the next five years, because it is not envisaged to expand rapidly, firm oil prices are likely to continue for a number of years. In the meantime, movements in world oil prices are likely to remain sensitive to market perceptions about supply disruptions and production capacity. The message for explorers overall is that prices should continue to support new exploration activity.

Natural gas has increased from about 18 to 24 per cent of the total world energy mix since 1970, while oil and coal have both lost market share. Gas is plentiful, convenient, efficient in many applications, and environmentally friendly. As a result, energy industry forecasters expect gas to continue to capture an increasing share of the total energy market for the foreseeable future.

The high level of oil prices experienced from mid-2004 to the present is the single most significant feature of today’s energy markets. The high prices have an enormous impact on the total cost of energy, not only because of the direct impact of oil prices, but because of the influence of oil prices on the prices of other energy commodities including gas. Oil price trends will therefore continue to influence gas price and push up gas demand at least over the next five years.

North America, Europe and the Asia Pacific region represent about 65 per cent of global gas consumption. The relatively low cost of shipping gas over very long distances in the form of LNG, and continuing growth of the LNG trade will largely drive globalisation of the gas industry. Nonetheless, while LNG is expected to capture an increasing market share in North America, Europe and Asia (China and India), pipeline gas suppliers will continue to compete aggressively and will continue to supply the large majority of gas into these markets for the foreseeable future.

North America has fewer large new pipeline gas supply options than Europe so it is likely to be more dependent on LNG to supply market growth. For Europe, Russia is still by far the largest gas exporter in the world, the largest gas reserves holder and the largest gas producing country. China and India both lack sufficient indigenous supply, and LNG is likely to be the primary source of new supply for both countries.

Given accommodative global demand and supply conditions, the outlook for Australia’s (and the NT’s) LNG trade over the next five years is promising. Indeed, Australia’s LNG exports rose by some 38 per cent to $4.4 billion in 2005-06 underwritten, in part, by shipments from the new Darwin LNG project that began production in February 2006. This year, ABARE expects the LNG exports to reach $5.7 billion as the Darwin LNG project ramps up production.
Despite the comparatively low prices for gas in Australia, plans for long-distance pipelines across the country make remote on-shore gas developments more prospective than in past decades.

### 14.1.2 Base metals

Australia’s position as the world’s largest miner and exporter of lead, and one of the world’s leading producers of zinc and related processing technology, promotes the country as a global commodities heavyweight. The Northern Territory has been and continues to be a significant base metal producer. As a result, forecasts of strong demand and prices for base metals (lead, zinc and copper) and iron ore concentrates in the medium term should confer benefits to producers by way of exceptional profits, and to commodity based economies like the NT through enhanced economic growth and government revenue. As long as the global economic backdrop remains bright, this robust outlook for commodity-based economies and commodity producers should remain intact.

### 14.1.3 Uranium

Since Australia holds the largest known low cost resources of uranium in the world, the recent surge in uranium prices (from US$10/lb in 2002 to more than US$60 in November 2006) must be a boon for the NT economy given its known uranium resources and its high prospectivity for additional discoveries. Although global production of uranium has been fairly steady since the mid-1980s due to the large volume of inventory and secondary supply from reprocessed weapons-grade uranium, declining inventory and supply from secondary sources of late has underwritten strong price gains. Prices are expected to remain around 20 year highs. Potential for uranium discoveries in the NT means that the region is likely to continue as a major uranium producer for many years – provided new mines are permitted to open.

### 14.1.4 Diamonds

Australia is currently the largest supplier of diamonds by volume in the world. The Argyle deposit in the North Kimberley region is the world’s largest diamond mine. The Northern Territory has diamond production from its Merlin deposit in the McArthur Basin. There are other known diamond deposits at Abner Range, also in the McArthur Basin, and at Timber Creek in the Victoria Basin.

Recent strong economic growth in Asia and the OECD has underpinned demand. This is expected to continue to strengthen in the near term as robust economic growth continues and the size of the consumer middle class,
especially in Asia, expands. Improved demand has also been reflected in strong prices for rough diamonds, which are expected to remain strong for the next few years.

### 14.1.5 Manganese

Australia supplies approximately 7 per cent of the global manganese market. Manganese occurs in all Australian States and the Northern Territory with the most significant mines being located on Groote Eylandt in the Northern Territory and Woodie Woodie in Western Australia. The opening of the Bootu Creek mine near Tennant Creek will lift production by 600 000 tonnes per year.

Most manganese mined in Australia is exported but some is processed further to form ferromanganese, silicomanganese and manganese dioxide.

Since approximately 90 per cent of manganese currently produced is used in steel production. Global demand is therefore heavily dependent on industrial growth. At present, China is the largest single consumer of steel whilst Asian countries collectively account for nearly half of global consumption. Future prices for manganese are expected to remain high with demand being led by strong growth forecast for China.

### 14.1.6 Bauxite/alumina

Australia is the world’s largest producer of bauxite and alumina, accounting for about 40 per cent of world’s bauxite and over one third of the global supply of alumina. During the first eight months of 2006, alumina prices rose by some 37 per cent to an average of US$2520 a tonne supported by strong demand from China and the US and declining global stocks.

There are a number of small known bauxite occurrences along the north-eastern coastline of the Northern Territory. Current total known bauxite resources in the Northern Territory are estimated at 170 million tonnes.

Global demand over the next five years is expected to be driven primarily by China, which is forecast to outpace the United States as the world’s largest aluminium consumer. The current $2 billion expansion by Alcan at Gove is expected to raise NT alumina production by 90 per cent to 3.8 Mtpa from 2006/07, with an associated increase in bauxite production.

### 14.1.7 Iron ore

Global demand for iron ore is very strong, with upward volume and price trends reflecting the excellent market for producers. As a whole, Asia currently
accounts for close to 48 per cent of global steel production with China consuming around 33 per cent of world steel consumption. Overall consumption is forecast to continue to rise. China is anticipated to lead this increase in demand for the remainder of the decade whilst consumption in the rest of the world is expected to remain fairly steady.

Australian iron ore production is projected to continue to increase steeply. Strong prices are making previously sub-economic deposits, including deposits with small reserves, attractive for development. While NT deposits are generally small and the larger ones low grade, sustained high iron ore prices and reduced transport costs as a result of the railway and East Arm Port will enhance project economics and allow smaller scale mines to open up.

14.1.8 Heavy mineral sands

The Northern Territory has not been regarded as a significant mineral sands province. However, recent discoveries of heavy mineral sands in beaches in the northern part of Melville Island have resulted in a potential new small scale mining venture there. This should stimulate further mineral sands exploration.

14.1.9 Extractive minerals

Extractives are traditionally the “poor cousin” of other mineral products and attract little attention. However, in the context the role of infrastructure development in the NT and the Government’s regional and Indigenous development agenda, the extractives sector is important.

DPIFM estimated production in 2000 at 2.6 million tonnes per annum (Doyle 2001). Today, the industry is worth approximately $25 million. About half of the total is produced in the Darwin region, close to the centre of demand. The main minerals produced are: fine and coarse sand, natural gravel, construction rock, crushed rock, porcellanite, clay, soil and dimension stone.

Doyle (2001) estimated that Darwin region demand will rise to 2.2 million tonnes per year by 2020. As the Territory, led by the Darwin region, continues to grow it is vital that low-cost materials are available to support construction of new industrial plants, urban development and infrastructure. The availability of competitively-priced extractives is thus a key component of the Territory’s competitiveness in attracting investment.

Contrary to popular belief, extractives that are available at competitive quality and cost close to demand centres can be quite scarce. Often, this is because resources have been “sterilised” by encroaching urban or lifestyle development. Transport costs comprise a large proportion of the cost of construction materials, rising rapidly with distance. An example is the cost of
aggregate in remote Top End Aboriginal communities – more than three times the cost of aggregate in Darwin, due solely to transport costs. If long term sources of extractives are not available close to demand centres, the costs of construction will rise, potentially stifling development. Several major Australian cities are already experiencing this.

Doyle (2001) said that reserves of several extractives, including fine sand and rock are ample to meet projected demand in the Darwin region to at least 2020, but that new sources of other minerals (eg, coarse sand and natural gravel) will need to be opened up by then. It is possible that a similar situation exists on a smaller scale at Alice Springs. Doyle (2001) strongly recommended that the government should adequately protect long-term access to extractive mineral resources through planning processes. The Review Team concurs.

Development of regionally-based extractives industries will be an important component of the Government’s regional and Indigenous development strategy, for the following reasons:

• The demand for extractives in regions is rising in response to growing construction of housing, roads and other infrastructure to service communities and should grow strongly from its recent $22-25 million level;

• Development of new resources projects and associated infrastructure requires construction materials;

• As discussed, the delivered cost of materials is extremely sensitive to transport distance, providing powerful incentives for local production;

• Local mining, processing and transport of extractives can be ideal entry points for Aboriginal people into mining and business generally, and provide a good way for Traditional Owners to use their land for generation of income and employment.

The Review Team knows of several Traditional Owner groups that have identified mining of extractives as a primary business development aspiration.

The Review Team therefore recommends DPIFM places a greater focus on extractives definition and development.

14.1.10 Other minerals

There are a number of other minerals found in the Northern Territory. Although of less significance, they represent an economic potential. These include rare earth elements, phosphate, tin, tungsten and limestone/quicklime.
15 The mining sector and its impact on the NT economy

15.1 Current contribution to the NT economy

The mining sector, which includes mineral exploration, supporting services and oil and gas production, is a key contributor to Territory economic activity, job creation and factor income and Gross State Product (GSP). Since 1990, mining has contributed an average 20.3 per cent of Territory factor income compared with the national average of 5.2 per cent.

Figure 31 Mining as a percentage of NT and Australia factor income

<table>
<thead>
<tr>
<th>Value</th>
<th>NT mining as a proportion of state factor income</th>
<th>Australia mining as a proportion of total factor income</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Note: Contribution to GSP is derived by adding gross operating surplus and gross mixed income plus compensation of employees deemed to be employed in the industry.
Data source: ABS Cat No 5220.0

Table 5, which outlines the sector’s contribution to total factor income in each State and Territory in 2005/06, reveals an economy heavily dependent on mining and government, with low contributions from manufacturing and key service industries. Mining, government administration and defence together account for 33 per cent of factor income in the Northern Territory compared with a national average of only 11 per cent. Notably, amongst Australia’s States and territories, only Western Australia is more dependent on mining activity than the Northern Territory economy.

6 Factor income is defined by ABS as that part of the cost of producing the gross domestic product which consists of gross payments to factors of production (labour and capital). It represents the value added by these factors in the process of production and is equivalent to gross domestic product less taxes plus subsidies on production and imports. For the purpose of this report, factor income is a proxy for GSP. The two measures are very close.
Although mining is not a large direct employer, the economic activity it generates leads to many indirect jobs, especially in regional and remote areas of the Territory.

As a result of its sector concentration and the fact that large resource-based projects can have a substantial impact on economic growth patterns in a small economy like the NT, Territory GSP tends to more volatile than Australia’s GDP growth. This is demonstrated in Figure 32, which plots economic growth in Australia and the NT from the mid 1990’s.

### Table 5  Industry contribution to total factor income

<table>
<thead>
<tr>
<th>Industry</th>
<th>NSW</th>
<th>Vic</th>
<th>Qld</th>
<th>SA</th>
<th>WA</th>
<th>Tas</th>
<th>NT</th>
<th>ACT</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Agriculture, forestry and fishing</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Mining</td>
<td>3</td>
<td>2</td>
<td>12</td>
<td>3</td>
<td>27</td>
<td>2</td>
<td>26</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>11</td>
<td>14</td>
<td>9</td>
<td>15</td>
<td>8</td>
<td>14</td>
<td>6</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Electricity, gas and water supply</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Construction</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Retail trade</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Accommodation, cafes and restaurants</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Transport and storage</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Communication services</td>
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<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Finance and insurance</td>
<td>11</td>
<td>9</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Property and business services</td>
<td>15</td>
<td>14</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>8</td>
<td>13</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Government administration and defence</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>27</td>
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<td>Education</td>
<td>4</td>
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<td>4</td>
<td>6</td>
<td>5</td>
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<tr>
<td>Health and community services</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>5</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Cultural and recreational services</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Personal and other services</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Ownership of dwellings</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>6</td>
<td>7</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>General Government</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

* — nil or rounded to zero (including null cells)
(a) Industries may not add to total due to rounding differences.
(b) State details for general government gross operating surplus by industry are not available.

Data source: ABS Cat No 5220.0
During the mid 1990s, the Territory economy outperformed the rest of Australia, driven by a build-up of defence forces in the region and associated spending on housing and infrastructure. However, as the defence force program stimulus eased, growth began to weaken culminating in mild GSP growth in 1999/2000.

In 2000/01 and 2001/02, GSP was boosted by significant increases in offshore oil production, which partially offset weakness in the onshore economy. In 2002/03, however, the NT economy marked time as a result of continued decline in offshore oil production. The economic outcome in that year would have been worse had strengthening in the onshore economy not occurred.

Growth in 2003/04 recovered to 0.3 per cent and accelerated to 3.6 per cent in 2004/05 on the back of concurrent commodity price and housing price booms.

According to Access Economics’ Business Outlook (December 2005), the medium term outlook for the NT economy is positive with average GSP growth of 4.4 per cent (3.5 per cent for the country as a whole) forecast in the five years to 2009/10; supported by a robust commodity outlook, and higher than average population growth.

The levels of mining industry investment and production in the NT – and hence economic activity and government revenue – over the next five years are likely to be at a high. There is a strong case for utilising some of this revenue in an investment attraction program for the future.

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15.2 Analysis of changes in mineral exploration investment and its impacts

15.2.1 Quantifying impacts

Although key investments within the mining sector can be identified with relative ease, quantifying the impact of enhanced DPIFM services on exploration and mining investment is not strictly possible. However, by applying input-output analysis to different mineral investment scenarios, some estimation of the impact of mineral investment on the NT economy is feasible.

An input-output table provides a summary, or a “snapshot”, of the transactions occurring within an economy over a selected period. These tables show the consumption and sales patterns of over 100 industries. In simple terms, they show, for a given industry, which other industries it purchases from and to which other industries it sells. As a result, input-output multipliers capture the direct and indirect effects of an economic stimulus on a region.

For example, if demand for transport services from the Northern Territory were to increase, input-output multipliers can be used to estimate the total impact of this increased demand on employment and value-added in the Territory. The total economic impact identified by use of input-output multipliers includes the direct effect of the initial increase in demand and the indirect (or “flow-on”) effects. The flow-on effects result from the linkages between industries in the economy. Transport service providers in the Northern Territory purchase inputs from other local industries. When demand for their output increases, the transport companies will increase their purchases from other local businesses, who themselves must increase their consumption, some of which will be from other local firms, and so on.

Input-output multipliers that capture the flow-on effects of inter-industry interactions are said to be simple multipliers. Where the multipliers also capture the impacts of increased employment and a subsequent increase in private consumption, then the multipliers are said to be total multipliers. Because “consumption induced” effects are included in total multipliers, they are larger than the corresponding simple multipliers.

In this review, both simple and total multipliers are used to provide a plausible range of results.

8 Background to input-output analysis is contained in Appendix C
15.2.2 Mining data

The starting point for the input-output analysis in this report is the data in Table 6. The table shows production, in quantity and value terms, of minerals and energy in the Northern Territory in 2004/05 (except for crude oil and natural gas which have their 2003/04 data shown as 2004/05 data was not available at time of analysis). Also shown is 2005/06 data for comparison. This data became available after the analysis was conducted, but 2004/05 data still provides a valid basis for the discussion below.

Includes the value of exploration expenditure, which was $55.6 million in 2004/05. Table 6 also includes the value of alumina production and the value of bauxite production. The value of alumina production is shown net of feedstocks, i.e. net of bauxite inputs, to prevent double counting. For the analysis to follow it is preferable that alumina is valued in gross terms rather than net, and that bauxite used for alumina production is removed. Assuming that the grade of the bauxite mined is approximately 50 per cent available alumina, then the 1.9 million tonnes of alumina produced in 2004/05 required 3.8 million tonnes of bauxite, leaving 2.0 million tonnes of bauxite for export.
Table 6  Northern Territory mining production 2004/05 and 2005/06

<table>
<thead>
<tr>
<th></th>
<th>2005/06 QUANTITY Produced (t)</th>
<th>2005/06 VALUE</th>
<th>2004/05 QUANTITY Produced (t)</th>
<th>2004/05 VALUE ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Metallic Minerals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alumina Produced (a)</td>
<td>1,700,985</td>
<td>506,060,051</td>
<td>1,905,515</td>
<td>446,107,071</td>
</tr>
<tr>
<td>Bauxite</td>
<td>5,432,143</td>
<td>172,562,872</td>
<td>5,807,869</td>
<td>165,473,079</td>
</tr>
<tr>
<td>Copper Concentrate (t)</td>
<td>275</td>
<td>355,368</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gold (grams)</td>
<td>12,145,523</td>
<td>270,945,407</td>
<td>17,472,347</td>
<td>383,669,715</td>
</tr>
<tr>
<td>Manganese</td>
<td>2,937,298</td>
<td>359,759,475</td>
<td>2,999,439</td>
<td>362,412,478</td>
</tr>
<tr>
<td>Silver (grams)</td>
<td>928,781</td>
<td>264,930</td>
<td>1,340,807</td>
<td>438,189</td>
</tr>
<tr>
<td>Zinc/Lead Concentrate</td>
<td>224,276</td>
<td>367,425,270</td>
<td>336,538</td>
<td>207,357,247</td>
</tr>
<tr>
<td><strong>Sub total:</strong></td>
<td>23,369,281</td>
<td>1,677,373,373</td>
<td>1,565,457,779</td>
<td></td>
</tr>
<tr>
<td><strong>Non-Metallic Minerals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barite</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crushed Rock</td>
<td>562,748</td>
<td>8,522,157</td>
<td>938,546</td>
<td>14,502,282</td>
</tr>
<tr>
<td>Diamonds</td>
<td>12,980</td>
<td>1,596,540</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diamond Stone</td>
<td>1,536</td>
<td>275</td>
<td>341,792</td>
<td></td>
</tr>
<tr>
<td>Gravel</td>
<td>175,399</td>
<td>2,621,865</td>
<td>219,985</td>
<td>1,159,055</td>
</tr>
<tr>
<td>Quicklime Produced (a)</td>
<td>13,504</td>
<td>n.p.</td>
<td>17,203</td>
<td>n.p.</td>
</tr>
<tr>
<td>Salt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>96,352</td>
<td>710,693</td>
<td>130,258</td>
<td>697,679</td>
</tr>
<tr>
<td>Soil</td>
<td>19,181</td>
<td>218,916</td>
<td>11,734</td>
<td>161,594</td>
</tr>
<tr>
<td>Vermiculite</td>
<td>9,392</td>
<td>2,982,560</td>
<td>8,769</td>
<td>3,314,497</td>
</tr>
<tr>
<td><strong>Sub Total:</strong></td>
<td>957,177</td>
<td>19,785,830</td>
<td></td>
<td>24,470,808</td>
</tr>
<tr>
<td><strong>Energy Minerals (b)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude Oil (ML)</td>
<td>1,435</td>
<td>752,437,599</td>
<td>2,517</td>
<td>715,137,804</td>
</tr>
<tr>
<td>Natural Gas (GL)</td>
<td>490</td>
<td>54</td>
<td>470</td>
<td>43,116,680</td>
</tr>
<tr>
<td>Uranium Oxide</td>
<td>2,886</td>
<td>123,011,345</td>
<td>5,729</td>
<td>230,796,906</td>
</tr>
<tr>
<td><strong>Sub Total:</strong></td>
<td>2,886</td>
<td>875,448,998</td>
<td></td>
<td>828,186,952</td>
</tr>
<tr>
<td>Exploration</td>
<td>74,800,000</td>
<td>55,600,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>24,329,344</td>
<td>2,647,408,201</td>
<td></td>
<td>2,473,715,539</td>
</tr>
</tbody>
</table>

a  a  Crude oil and Natural gas data are for 2003/04.

b  Value is net of feedstocks

c  Total value does not include Limestone or Quicklime produced

np  Not publishable

Data sources: Northern Territory Mining Production 2003/04 & 2005/06, Northern Territory Government, Department of Primary Industry, Fisheries and Mines (2005, 2006). Exploration expenditure data was obtained directly from the Northern Territory Government, Department of Primary Industry, Fisheries and Mines.

Table 7 contains the 2004/05 quantity and value information from Table 6, adjusted so that alumina production is valued in gross terms and so that only bauxite for export is valued. Limestone and quicklime produced, for which no sales values were available, have been removed from the table. This is expected to have an insignificant impact on the analysis.
**Table 7 Northern Territory mining production 2004/05** adjusted

<table>
<thead>
<tr>
<th>Category</th>
<th>Quantity</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Metallic minerals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alumina produced</td>
<td>1,905,515</td>
<td>554,687,838</td>
</tr>
<tr>
<td>Bauxite for export</td>
<td>1,996,839</td>
<td>56,892,312</td>
</tr>
<tr>
<td>Gold</td>
<td>17,472,347</td>
<td>383,669,715</td>
</tr>
<tr>
<td>Manganese</td>
<td>2,999,439</td>
<td>362,412,478</td>
</tr>
<tr>
<td>Silver</td>
<td>1,340,807</td>
<td>438,189</td>
</tr>
<tr>
<td>Zinc-Lead concentrate</td>
<td>336,538</td>
<td>207,357,247</td>
</tr>
<tr>
<td><strong>Non-metallic minerals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crushed rock</td>
<td>938,546</td>
<td>14,502,282</td>
</tr>
<tr>
<td>Dimension stone</td>
<td>2,750</td>
<td>341,792</td>
</tr>
<tr>
<td>Gravel</td>
<td>205,585</td>
<td>1,053,481</td>
</tr>
<tr>
<td>Sand</td>
<td>120,258</td>
<td>662,951</td>
</tr>
<tr>
<td>Soil</td>
<td>4,134</td>
<td>52,020</td>
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<tr>
<td>Vermiculite</td>
<td>8,769</td>
<td>3,314,497</td>
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<td><strong>Petroleum and energy minerals</strong></td>
<td></td>
<td></td>
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<tr>
<td>Crude oil</td>
<td>2,517.0</td>
<td>715,137,804</td>
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<tr>
<td>Natural gas</td>
<td>470.1</td>
<td>43,116,680</td>
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<td>Uranium oxide</td>
<td>5,729</td>
<td>230,796,906</td>
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<td><strong>Exploration</strong></td>
<td>55,600,000</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>2,630,036,192</td>
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</table>

*a* Crude oil and Natural gas data are for 2003/04.

*b* Total value does not include Limestone or Quicklime produced.

Data source: ACIL Tasman calculations and as per Table 6

### 15.2.3 Analysis and results

The impact that the Northern Territory Government’s exploration attraction initiative has actually had on exploration, discovery and subsequent development and production is difficult to quantify. In the analysis to follow it will be assumed that it has resulted in a 5 per cent increase in exploration expenditure and a 5 per cent increase in production from all minerals categories shown in Table 7.

A range of input-output multipliers are available for the Northern Territory: output, income, employment and value-added multipliers. In general, it is the employment and value-added multipliers that are of the most interest as they answer the two most common questions regarding economic impact: how many jobs will be created and how much will the economy grow? For this reason we present results from only employment and value-added multipliers.

As stated earlier, both simple multipliers (which capture only the impacts of inter-industry interactions) and total multipliers (which also capture consumption effects) will be used in the analysis and will provide a plausible range of economic impacts.

The results of this analysis are presented in Table 8. This shows that a 5 per cent across-the-board increase in exploration and minerals production is
estimated to generate 359 to 513 new jobs and to add $85 to $97 million annually to the Northern Territory economy.

The major contributor to employment growth would be the alumina industry, followed by the gold and manganese sectors. In terms of value-added, it is the crude oil sector that would add the most to the Territory economy, followed by alumina, gold and manganese respectively.

<table>
<thead>
<tr>
<th>Table 8</th>
<th>Impact of a 5 percent increase in exploration and mining</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increased value ($)</td>
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<tr>
<td></td>
<td>Simple</td>
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<tr>
<td><strong>Metallic minerals</strong></td>
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<tr>
<td>Alumina produced</td>
<td>27,734,392</td>
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<td>Bauxite for export</td>
<td>2,844,616</td>
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<td>Gold</td>
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<td>Manganese</td>
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<td>Silver</td>
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<td>Zinc-Lead concentrate</td>
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<td><strong>Non-metallic minerals</strong></td>
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<td>Crushed rock</td>
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<td>Dimension stone</td>
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<td>Vermiculite</td>
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<td><strong>Petroleum and energy minerals</strong></td>
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<tr>
<td>Crude oil</td>
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<td>Natural gas</td>
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<td>Uranium oxide</td>
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<td>Exploration</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>131,501,810</td>
</tr>
</tbody>
</table>

Data source: ACIL Tasman calculations

15.2.4 NT Government revenue

In 2004/05, mining and petroleum royalties contributed $41.5 million to Government revenue in the Northern Territory. On the basis of an across-the-board 5 per cent increase in production from minerals and energy producers one can estimate that royalty revenue would increase by approximately 5 per cent × $41.5 million ≈ $2.1 million.

15.3 Mine development scenarios

Another way of assessing the impact of exploration, or lack of it, is to examine the benefits to the Territory of discovery leading to new mines being opened.
Conversely, there is an opportunity cost of not opening new mines to replace those that reach the ends of their economic lives.

The Review Team has assessed two plausible mining scenarios that could result from successful exploration. These scenarios are theoretical but the figures used are based on previous studies conducted by ACIL Tasman.

15.4 Mine development case studies

The hypothetical case studies outlined in the boxes below explore the potential impact of the opening of a base metal mine and a new uranium mining facility on the NT economy. In each case the impact is significant. A base metal mine producing in the order of 300 000 tonnes per annum is estimated to add close to 1 per cent to Territory GSP while the combined direct and flow-on effects of a substantial uranium facility, producing 5 000 tonnes of product per annum, could add another 1 to 1.5 per cent to NT economic growth.

By way of comparison, in 2004/05 McArthur River mine produced approximately 337 000 tonnes of zinc-lead concentrate, and Ranger mine produced more than 5 700 tonnes of uranium oxide.

15.4.1 Case study 1: Base metal mine

Mining activity directly impacts the economy via its production, employment and investment. However, this is only part of an activity’s impact since a considerable amount of support from other entities is also usually required. Mining operations are typically supported by suppliers who provide a range of intermediate inputs such as explosives, fuel, electricity, tyres, vehicles, communication services, barge services etc. Mining activity therefore generates demand for a range of goods and services, which in turn indirectly generates value added (the building block of GSP) and employment.

This means that if exploration activity culminated in the opening of a new base metal mine, the direct and indirect impact on the NT economy would likely be significant.

For the purposes of this scenario analysis, we assume a new base metal mine producing in the order of 300 000 tonnes of bulk concentrate a year opens in the NT. In a hypothetical case where only basic processing (concentration) of the new mine’s output is undertaken in the Northern Territory, based on examples of other mine operations, the mine would probably require around 300 to 350 employees and subcontractors with almost as many jobs again created indirectly. A mine of this capacity could therefore generate in the region of 500 to 600 jobs in the NT with positive macro economic impacts on
income, consumption, investment, exports and government revenue through royalty payments and taxation.

Using very basic general equilibrium modelling assumptions, a mine of this capacity could add close to 0.9 per cent to Territory GSP in current prices. In inflation-adjusted terms, consumption and investment could also increase by between 0.8 and 1 per cent.

### 15.4.2 Case study 2: Uranium mine

A hypothetical scenario analysis of the opening of a new large scale uranium mine producing in the region of 5,000 tonnes of uranium oxide per annum, suggests that an operation of this size has the ability to generate between 800 and 900 jobs in the Northern Territory.

Flow-on effects through sales to other industries in the Territory and to final demand (private consumption, government consumption, capital expenditure and exports) mean that even if all of the output is exported, the impact on Territory GSP of a mine operation of this size is substantial with estimates of direct and flow-on effects ranging from 1 to 1.5 per cent of GSP. As long as uranium prices remain firm, value-added to the NT economy from mining operations has the potential to increase further.
Part 4: Future options for exploration investment attraction

The review offered 5 options as to overall program and costs, and recommended one of them.

16 What the NT Government should do to attract investment

16.1 Recommendations on encouraging partnerships and improving access to land

In light of the poor land access situation in the Northern Territory, the Review Team’s first five recommendations go to development of partnerships to facilitate land access and Aboriginal participation in mining. Workable and mutually rewarding arrangements are fundamental to the future of both mining activity and Indigenous development.

Recommendation 1

The integrated approach within the NT Government to facilitating land access and Indigenous participation should be strengthened through closer cooperation between relevant agencies and either by co-locating key IBIS personnel with DPIFM or re-establishing a specialist facilitation unit in DPIFM.

The importance of land access and Indigenous participation to exploration and mining investment and to the Northern Territory economy require that the land access and Indigenous engagement services of IBIS are continued and strengthened. DPIFM has a key accountability to improve access to land for exploration and mining. The Review Team considers that either:

• The IBIS personnel charged specifically with mineral and petroleum industry facilitation should be located within DPIFM, and cooperative arrangements with DBERD are strengthened; or

• A new unit should be established within DPIFM to work closely with DPIFM case managers, Land Councils, local Aboriginal people and mining companies through re-establishing a specialist facilitation unit in DPIFM.

In any event, an integrated whole-of-government approach is required to creating the conditions to attract more exploration investment.
Recommendation 2

The NT Government and the Australian Government should continue to work closely on implementation of amendments to the Aboriginal Land Rights (NT) Act, of proposed amendments to the Native Title Act, and of the provisions of the Indigenous employment and economic development schedule to the inter-governmental Overarching Agreement.

The support of the Australian Government in facilitating land access and Indigenous engagement in mining can be within the framework of this legislation and the Overarching Agreement.

Recommendation 3

The NT Government should seek to achieve with Land Councils, Traditional Owners and the mining industry a "step change" in approach that results in true partnerships that help to give effect to the aspirations of Aboriginal people, explorers, miners and the people of the Territory.

A step change approach could include:

- Development of regional partnership approaches in all key mining areas between all parties including mining companies of all sizes and in all locations;
- Careful selection and focussed training of staff for key roles in DPIFM that deal with Aboriginal people and organisations (Recommendation 5);
- Programs for building knowledge about the mining industry and capacity within Land Councils and knowledge about Indigenous relations within the mining industry and government;
- Further development of agreed codes and guidelines that guide each party;
- Co-location of staff as proposed in Recommendation 4; and
- Joint promotion of the Territory as an investment destination, as in South Australia.

Recommendation 4

Funding and management support should be provided to strengthen Land Councils' administration to deal with mining, to promote best practice in both agreement-making and Aboriginal involvement in mining, including co-location of Land Council and NT Government personnel.
Bring forward discovery

This could encompass:

- Enlarging of land access units within Land Councils;
- Funding of positions within Land Councils that are devoted exclusively to exploration mining title matters;
- MoUs between the NT Government and Land Councils that encompass joint case management, regular meetings and co-location of staff dedicated to land access agreements;
- Arrangements for cooperation and funding between NT and Australian Governments under the proposed schedule on Indigenous employment and economic development to be attached to the *Overarching Agreement on Indigenous Affairs*;
- Private funding and support of Land Councils and Indigenous people to facilitate engagement in mining and related economic development.

It should be noted that best practice is a dynamic concept. It encompasses continuous improvement in approaches to agreement-making and Aboriginal involvement.

### Recommendation 5

**Government and industry personnel at all levels should be trained to deal better with Aboriginal people and should spend more time with Aboriginal people and organisations to develop mutual understanding and relationships, with staff secondments and exchanges a key approach.**

Development of strong personal and professional relationships with Aboriginal people is a key requirement for industry and government staff, as is avoidance of the adversarial, win-lose approaches of the past.

The recommendations on titles administration below also go to facilitating access to land.

### 16.2 Recommendations on technical initiatives

The role of NTGS must go on – providing regional geoscience information mainly in support of petroleum and mineral exploration. It is proposed to focus that even more on providing information to “Bring forward discovery”. As noted, the NTEI/BTRB program to date has been the most focussed and single largest investment attraction program mounted by the NT Government.

The importance of the NTGS role increases in the new era for several reasons:
Bring forward discovery

- Resource development is the most important pillar of regional development across most of the Territory, and it can falter without discovery;
- Discovery of resources under cover becomes more difficult and relies more on regional geological projections, rather than prospecting;
- There is increasingly powerful national and especially international competition for exploration;
- When almost all of the prospective ground is taken up in tenements, the NTGS is the only organisation with rights of access to do regional work across all tenements. Companies cannot do it if they wished, and nor could they capture the benefits.

The rationale for government regional geoscientific surveys was outlined in section 5.3.

Failure to maintain high exploration rates means forgoing much of the economic benefit of mining in the next generation. Government-provided regional surveys are a significant contributor to facilitating exploration investment, as acknowledged by industry in all reviews.

The Territory currently benefits greatly from the easy-to-find major deposits of Gove, Groote Eylandt, Ranger and McArthur River. Such easy discoveries may not be made again, except possibly on Aboriginal lands long quarantined from exploration throughout the modern era. Yet it is certain that other large deposits are to be found in an area as large and prospective as the Territory. Indeed, a promotional feature for the Territory is that much of it has been explored only superficially for the last generation compared with other parts of Australia.

The lack of discovery under cover is world-wide and is serious. Regional syntheses are not just an option but a necessity. Further, the government geological surveys with their regional emphasis are to open new frontiers to company geologists – like diamonds in wide regions of the Territory, or recognition of Olympic Dam equivalent systems in the Arunta or Tennant Regions, or finding potential nickel belts, or a new Broken-Hill-equivalent terrane; or drilling the Amadeus Basin to open new attitudes to petroleum exploration. The NTGS must lead in new ideas.

This calls for more technical expertise and a close melding of industry expertise, geology, geophysics, geochemistry, databases, data packages, efficient delivery mechanisms, and promotion.

In a time of change for the NTGS, the following program recommendations and rationales are presented.
16.2.1 Drilling partnerships

This Review recommends government-industry drilling partnerships, with the objective to “Bring forward discovery”.

From the start of the exploration initiatives in South Australia in 1992, and in several reviews since, top exploration managers have recognised that state partnerships in drilling would be one of the most effective ways to advance discovery and the interpretation of geological provinces where there is little exposed rock. Roy Woodall (acknowledged as the greatest Australian exploration manager of all), was a strong advocate. All around Australia there is important regional potential untested because companies rate the prospectivity lower than some other region on earth where they operate - before it is really known. It is important that government regional geologists first recognise new potential in their region – like nickel now in South Australia and the NT. Often it needs drilling to find out, drilled by the entity most concerned, in this case the NT Government.

The Government should not over-rate the judgement of the market – the flood of information around the world means companies cannot master all of it, they look for ideas that spark their thinking. The Territory on the other hand has only one goal – maximising discovery in its area. Petroleum exploration is also marked by group-think as well as sober analysis, and as with the Bremer Basin in WA at this time, it commonly needs government scientific initiative to “take off”.

NT Government geologists are the only ones who ask every day, “What can I do for the Territory?” NTGS is not to drill second-rate holes for companies, but to drill important holes for the Territory.

The aim is not general drilling subsidies. Australia has experience of this approach especially in petroleum and one of the Review Team had close involvement. Too much lax exploration is paid for by government.

The Review Team’s recommendation is for the NT Government to be more choosy – holes have to be for its aims, and the meterage might not otherwise be drilled. Often the Government’s aim should be to test potential for many tenements or none currently existing, not just the company’s current interest in its one play or tenement. It is not subsidising company interest, it is drilling the Territory’s interest.

Either a company or government may propose a hole and sound guidelines need to be in place before submissions are called for.
Bring forward discovery

If a significant company is going to drill a hole anyway, that the Territory also needs, there is no need for a partnership. The guidelines must make this point: the Territory is in partnership for its purposes.

The holes are to test an important regional model of prospectivity.

Often the partnership will require that a hole be drilled deeper than a company would, or moved somewhat to a place that will satisfy company and Territory needs. Or the hole may be proposed by government, not quite where the company wishes, but has to be important enough for the company to contribute – or no partnership. The partnership concept is a practical answer to the question whether NTGS geologists are competent to know where to drill particular holes – a different game from regional mapping. These partnership holes straddle the (government) regional and (company) local disciplines in order to “Bring forward discovery”.

Preparation for the hole needs to be thorough – drilling makes the biggest difference but is the biggest waste if undertaken in the wrong place. Both parties need to be satisfied.

The amount to be spent in drilling partnerships is another judgement call. It has to be enough to make a difference.

The full case is made in Appendix B, including management of the program.

Recommendation 6

The Territory should enter into drilling partnerships with companies for holes selected for the Territory's purposes, sharing drilling costs.

Gaining access and doing sufficient preparatory work will cause delays, so that the time period cannot be accurately forecast. The Territory, with fewer resources than South Australia, should then re-assess before committing more money.

The drilling partnerships will be a technical boost but even more a promotional boost.

16.2.2 Geological, geochemical and geophysical field mapping

A major re-orientation of approach is proposed, building on many initiatives already begun. The full rationale is in Appendix A.

The quality of geological mapping in the NT has been as good as any, and the problem of interpreting magnetic formations in the Tanami and Arunta regions (eg Mt Solitaire 1:250 000 map sheet) is leading to experimental types of maps.
Bring forward discovery

that will evolve with time and understanding. Joint assessment with industry and academic specialists is needed to hone these interpretations. However, as regional mapping becomes more important, more of this new approach is required.

Though the Territory has mainly been covered with standard series maps, the quality is variable and in many cases re-assessment for regional prospectivity is called for. However the aim is no longer to up-grade standard sheet series, but to focus on mineral- or petroleum-related features, irrespective of map sheet boundaries. Mapping outcrop features in order to improve interpretative projections of mineral- or petroleum-related features under cover, becomes the purpose of NTGS field scientists. Those features can be structures and their history, formational environments from limestones to granites, more geochronology and isotopic analyses, facies variations, alteration trends, or magnetic or density properties of rocks to aid in geophysical interpretation.

The case can be summed up in a question: If field mappers cannot be usefully employed searching for features that improve regional prospectivity and interpretations under cover, why should the Territory fund re-mapping of the traditional standard sheet-map series?

The two reasons for state-funded geological surveys for more than a century have been to provide the geological framework of the State, and to encourage economic discovery and production. The two are vital and inter-dependent. There has been a century of mapping, especially in the last 60 years, and the phenomenal amount of structural and stratigraphic information generated during NTEI and BTRB, much still to come before 30 June 2007. Some will lap over for another year or so, but it is a minor matter. The basic geological map series of the Territory, as of the States, will then be sufficient for some time, but interpretation is still rudimentary in some major geological issues. Further developments will come from academic study of the geological development of Australia and the world, and from the Regional Theme Mapping proposed. The development of the basic geology of the Territory will be an important side-effect from studies directed at bringing forward discovery, not the traditional other way around.

The Territory Government is now to support discovery of petroleum and mineral resources by regional field mapping for these purposes directly, not indirectly.

This view is for now. It is likely that some decades from now, basic re-mapping will be required, but even then it would be a mistake to revert to sheet map series rather than re-mapping specific terranes for specific purposes.
Regional Theme Mapping

Recommendation 7

A new approach should be taken to mapping called Regional Theme Mapping, focused on features related to regional prospectivity and projection of relevant formations, facies and structures under cover.

This simple proposal is a watershed in geological surveys, and has been seen as a likely outcome of the Australia-wide exploration initiatives.

This approach calls for closer industry-NTGS cooperation and the creation of an Advisory Panel. It requires close integration of geology, geophysics and geochemistry. It will be partly model-driven, and the clear statement of the model assumptions, and questioning and refining of them by all involved, are crucial.

It requires an increased emphasis on expertise of professional staff to maintain world’s best standards of interpretation of the huge new databases. It calls for several forms of training of staff. It requires more creative and rigorous management and review of ideas, projects, teams and processes. Creativity and rigour are to challenge and refine each other.

The NTGS should record its work, expenditure and outputs related to each major province, and record feedback from industry individually, at committees and conferences and in company reports, in order to build an input/output/outcomes assessment of each province.

Management of the new approach

The choice of areas and themes and of what to map or measure, will need to be decided yearly in cooperation with an industry panel, reviewed by the same panel, and discussed with industry in between. The NTGS must have the technical expertise needed on the government side of the table.

The review by the panel and feedback from explorers are as important as the planning aspect.

The advisory panel for each of minerals and petroleum should include, in addition to senior NTGS managers: active expert explorers who do not have projects in the Territory; a representative from Geoscience Australia, which has a wide range of independent expertise and exposure to world exploration trends; two Territory explorers; a nominee from the NT Minerals Council.

This new approach lends itself to promotion both to industry and to Territory communities.
Bring forward discovery

16.2.3 Gravity surveys

Gravity data is very costly relative to magnetics. Not only is such data valuable in itself, it adds another independent data set to resolving the multivariant problems of interpreting rock systems under cover. Promoting and aiding exploration under cover is the main role of the NTGS.

The role of regional gravity is only now being recognised because so little was available at sufficient density before. Wherever the density is close enough, important interpretations can be made. The situation is analogous to the beginning of the great State exploration initiatives built around magnetic surveys, because few exceptionally effective magnetic surveys were available before then as examples. Experts now think that important advances will come from more detailed gravity surveys.

Gravity data serves in two ways. Firstly, it is important in resolving major crustal structures, especially in partnership with seismic and magnetic data. Secondly, it can be crucial in direct search for Olympic Dam and other styles of major deposits. The spacing of regional gravity measurements to be provided by the NTGS will serve mainly for giant deposits – no bad objective for the Territory.

The importance of gravity can be illustrated by inspection of the large number of regional geological maps published with a gravity map besides. In all known cases, the gravity reveals a crustal structure different from that surmised from surface geology and magnetics. In other words, not enough is known about fundamental crustal structure, and every decade deep structure becomes more important in predicting where major deposits will be located. Some work is needed over all of the major geological terranes.

Therefore major gravity programs are proposed, much in the same way that major airborne magnetic programs were proposed for the NTEI. The detail as to spacings and the choice of airborne or ground surveys is to be decided by terrane and the acquisition systems available. The choice of priority areas should be made in consultation with Geoscience Australia and industry. The NTGS has the expertise to manage gravity surveys effectively, but must retain this expertise.

Industry participation should be sought in key areas. The cost of ground gravity surveys is mainly the location costs, and the addition of closer stations along traverse lines, say at 500m or 1km spacings on traverses 2km apart, would allow significant extra resolution of features for a reasonable outlay.

The role of this Review is not to decide actual surveys, but to propose the priority and the scale of the program. Such proposals have been discussed in many jurisdictions for many years and become clearer as the profession gains
understanding of the use of gravity.

**Recommendation 8**

Increased acquisition of gravity data is proposed as appropriate to the need and Territory resources, mainly to aid discovery of major deposits.

### 16.2.4 Geoscience knowledge management

The geoscience knowledge management program should be one of the core businesses of the Territory’s investment attraction efforts.

The large commitment to reforming and updating the information management systems will not be completed as scheduled by mid-2007 for various reasons. Geological databases are amongst the largest and most complex of all, and the NTGS, before 1999 and during the NTEI, neglected to integrate and synthesise the way data is handled in their many information systems.

The Review endorses the effective management of geoscience knowledge as one of the keys to attracting exploration by making all information bases compatible and more readily available. It is an area where both the 2004 Australian Geological Surveys benchmarking report and the 2005-2006 Fraser Institute survey show the Territory somewhat behind – as a generalisation. The lack of a corporate database management system affects not only ease of access, but it causes internal time-wasting in the creation and cross-checking of data sets from many sources. It is enough to prevent all but highly expert users from accessing the full range of information needed. Many explorers that the Territory wishes to attract are not top IT systems people but those whose focus is field work and mineral systems.

NTGS has commenced the development of a corporate database, with a data management platform that can engage with a variety of delivery mechanisms. The initial proof-of-concept phase will be completed during 2006/07.

Knowledge management is an example of where wholesale reform is needed rather than half-patching. DPIFM should plan to make all databases compatible and accessible via Oracle or other standard forms across Australia. This includes integrating STRIKE with the Titles Information Management system to provide clients a “one stop shop” for spatial data.
Recommendation 9

Geoscience knowledge management is an ongoing core function for the NTGS and further systems upgrading work should be undertaken.

Such systems are never finished, new data and new hardware and software make for continual improvements. It is necessary to maintain and develop information management systems long-term, well beyond the three-year recommendations of this Review.

Past company exploration is as important for assessing potential of an area as the regional geoscience information – both are fundamental. However, once title to ground is granted, ready access to data and information collected on previous exploration campaigns is crucial to detailed design of new programs.

16.2.5 Magnetic surveys

The major priority airborne magnetic surveys will be almost complete by mid-2007. No further major surveys are recommended for the time being. Small surveys of particular prospective areas will be important to “Bring forward discovery”.

16.2.6 Seismic surveys

The value to industry of targeted seismic surveys is shown by the participation of industry in previous surveys, and by the fact that the McArthur and Tanami seismic programs both modified current thinking about mineralised systems in a major way. The cost to the Government was small. Further major seismic lines are planned by Geoscience Australia in the Territory and industry contributions and add-ons should be strongly pursued. GA is willing to re-draft seismic proposals with local industry and the NTGS.

Some proposed GA seismic lines may be important for regional petroleum assessment.

16.3 Recommendations for titles administration

This Report generally endorses the Proposals for Change to the Northern Territory Mining Act, especially the proposed smaller size of ELs. The proposals are the clearest and best summary seen by the Review Team in Australia in 35 years. However, the Review Team makes the following recommendations.
**Recommendation 10**

Increased expenditure requirements per area of mineral tenement should be required from the second year of tenure on.

The policy could also favour those programs with a large drilling component, but the expenditure requirement should take care of this. The penalties for non-performance are heavier relinquishment requirements. There is a fear that these measures will lead to “negative exploration”, that is companies concentrating on areas likely to be relinquished to ensure nothing valuable is there. This has been shown elsewhere to be a small effect: most companies when asked to spend more concentrate on testing their main targets faster, which is the Government’s aim.

**Recommendation 11**

Mineral tenement rental fees should not be increased in an effort to encourage relinquishment.

Strict but sensible enforcement of expenditure levels and statutory relinquishment will handle the need for turnover of ground. The high front-end opportunity costs that the Territory has in addition to exploration expenditure should not increase, as it hurts the small companies most.

**Recommendation 12**

The consolidation of mineral exploration licences proposed in the revision of the Mining Act should be for administrative and reporting purposes only, in order to require continued expenditure on each tenement.

The expenditure requirement for each tenement must remain, or a company which finds something of interest in one corner of an extensive consolidated tenement block could sterilise the rest while it explores that area. This “reward for discovery” or protective measure for the company is not what the Territory needs. A large company has the resources to explore the entire area, while a small company can raise finance or a joint venture on the basis of discovery. If not, then the area has become prime ground for others who can. The Government’s aim is to “Bring forward discovery” – the more the better – and this requires a hard-headed approach.
Bring forward discovery

Recommendation 13
The NT Government should limit the size of exploration licences as proposed in the review of the Mining Act and administer exploration and mining tenure rigorously to encourage turnover of ground.

The principal aim of DPIFM is to increase the rate of discovery. Titles Division is to encourage and support exploration by facilitating access to ground at the beginning, but then to regulate the tenement in the interests of the Territory by requiring performance. If there is performance failure, make the ground available by relinquishment, for others to take up (“get on with it or get out”). Even if industry will not support a stricter regulation (the industry survey indicates that it will) the Territory requires it and will not lose exploration by doing so.

Recommendation 14
DPIFM should require digital reporting on line or on CD by companies of mineral and petroleum exploration data in standard formats.

Company reports in digital format will be ready to load into the corporate database and subsequently into STRIKE when the data comes on open file.

Recommendation 15
The NT Government should encourage private airborne geophysical surveys over any ground, including existing tenements and applications, at any time, subject to strict rules, especially as to Aboriginal, landowner and environmental consents.

Such expenditure over a company’s own tenement application may be charged against the first year’s exploration commitments, but not carried to any later year. The aim is to require companies, by means of expenditure requirements in later years, to progress to drilling as soon as possible. Companies flying over the tenement of another company in a responsible way can harm no-one. Apart from the company that pays for the flying, it can help the owner with potential joint venturers and in suggesting they consider the same method. For the Government, it helps “Bring forward discovery”.

What the NT Government should do to attract investment
Bring forward discovery

Of course low flying needs notification to landholders and tenement holders, Aboriginal clearance over their lands, and a veto during special times like mustering or the nesting of birds. Liaison with Aboriginal people should be assisted by the Government to prevent vetos of such surveys that do not affect the land. Such surveys are beneficial to Aboriginal people in helping to resolve whether there is in fact strong prospectivity beneath their land. Guidelines should be issued.

16.4 Recommendations for promotion of Territory attractiveness

The recommendations below are to keep up the good work being done, for more promotion to Asia, and internal promotion to opinion makers in the Territory. They do not involve significantly different expenditure relative to the present.

**Recommendation 16**

The Northern Territory should continue with its innovative approach to promotion, and make highest-level approaches to involve China, India and Japan more in significant exploration and development projects.

Overall, the Review recommends a continuation of the Territory approach to promotion. From the Minister down, all concerned are trying innovative ways to put Territory prospectivity on the desks of the companies, and to use whatever cooperation with companies that is mutually beneficial.

As recommended for partnerships in section 10, ways must be found to involve Aboriginal people and their representatives in promotion of the Territory. Aboriginal leaders standing alongside the Minister for Mines and Energy at events saying “we are working together” and “come, invest in the Territory” would be a powerful symbol of the proposed step change in approach.

China, India and Japan are jockeying against the marketing power of the dominant western mining companies, and increasingly in competition with each other, and are funding even grass-roots exploration. Japan tried that a generation ago and withdrew. However, the new world resources balance determines national strategy and the mineral resource agencies of Japan’s Ministry of Economy, Trade and Industry (METI) are taking a new interest in exploration.
Bring forward discovery

Chinese companies in particular are looking for equity positions in upstream minerals and petroleum projects.

**Recommendation 17**

The Territory's unusual royalty regime needs promotion for its favourable treatment of companies in start-up phase and periods of lower prices, to counter the wide perception that it is onerous.

The royalty rate is high in prosperous times and is meant to share the benefits of those good times. The Territory royalty regime benefits companies in the high-risk capital payback phase, and in tough times when profits are low.

**Recommendation 18**

The NT Government and industry should increase the promotion of the mining industry to opinion makers in the Territory, so that explorers see a consistent public commitment to resource development.

The main innovation recommended is to target opinion makers in the Territory. Despite the domination of mining in the NT economy, it is not well understood by many stakeholders, and some important opinion-leaders oppose mining.

A strategy needs to be carefully formed, as promotion to external stakeholders is littered with false assumptions, mistakes and unforeseen messages, and the wrong presenters. One of the Review Team gained unprecedented regional and media support for mining in South Australia. A generous, cheerful, direct and honest message of economic, environmental and social gains is a winner for regional media.

Above all, mining is ultimately for the people, not for huge earthworks, giant trucks, huge plant and equipment, not even for the beauty and brilliance of some geoscientific and engineering work. It brings not only trade and labouring jobs, but many of the highest educated workers in the Territory, which needs them. It also brings vital roads, services and communications and amenities to people in remote areas.

**Recommendation 19**

The NT Government should develop and promote the concept of “net environmental gain” related to mining, using the wealth generated from mining to promote wide area land management.
One of the strongest commitments industry and government should make is to the concept of “net environmental gain”. Mines do severe damage to small areas (large local areas in the case of flat surficial deposits like those at Gove and Groote Eylandt, but still tiny in a region), but generate wealth from these concentrated sources that can be used for wide area land care as well as social and employment gains. Taking this wide area effort, and the rehabilitation in future of most of the drastically affected area, mining should be good for regional environments. It is a preferred activity in the sense of maximum wealth generated per unit of harm to the environment.

The argument assumes protection of vital areas for Aboriginal people except in the case where they willingly waive them for their own or the common good.

This idea is perhaps best illustrated by the fact that Australia generates minerals for more than ten times its population from an area less than the nation’s hotels. The idea is demonstrated around the Olympic Dam mine in South Australia. Whereas much casual harm was done to the environment in the past, Rum Jungle and Mount Todd being the worst examples in the Territory, mining even in pristine areas of Tasmania’s west coast is now done with no damage to adjacent areas. The upcoming Gorgon gas project on Barrow Island in WA has been approved in part on the basis of net environmental benefits through off-island conservation activities.

Work on regional environmental care can increase Aboriginal employment related to mining, and in the most congenial ways that relate to traditional landowner obligations. It is a policy that can appeal to the community, and puts the seal on the triple bottom line policy of economic, social and environmental benefits.

16.5 Performance measurement

It is important that the effectiveness of the ongoing program is able to be assessed periodically. The Review Team recommends that DPIFM develops a range of measurable performance indicators in addition to the current suite.

The desired outcomes of course are increase in exploration expenditure, and in the long term, development and production. However, these are so dependent on influences outside government control, especially world economic, mining industry and commodity trends, that they cause more confusion than enlightenment when used as performance indicators.

One measure that does not depend so much on world trends is the Territory’s share of Australian exploration expenditure, and this is a primary indicator the Government should use.
Another indicator is industry exploration in an area or commodity where there was little or no activity before NTGS information was published.

In the NT land access context, trends in grant of titles on Aboriginal land are likely to form a useful leading indicator.

Another potential measure is feedback from industry and Aboriginal communities and representatives, about attitudes, outputs and outcomes. The NTGS already measures industry feedback (see Table 1 on page 27).

As proposed in section 16.2.2, the NTGS should record its work, expenditure and outputs related to each major province, and continue to record feedback from industry relating to each province.
A Rationale for Regional Theme Mapping

Geological surveys have been producing “geology of record” in standard sheet series for the world scientific community, the exploration industry being simply a main user. Now they must concentrate on that main user. To finish complete sheet-area maps with no main gaps leads to emphasis on features and formations of little practical value, while regional mappers, even in remote areas where it is costly to visit again, routinely neglect features critical for explorers. The Territory has examples of this from the McArthur Basin to the Arunta and the Amadeus Basin.

It is argued that explorers do not always know what is important to map, because models of ore formation change with time. That is true. However they are also often right. Good models just take years of working out in the regions in order to pinpoint ore deposits, the needles in the haystack, deep below the surface. Regional guides to finding ore are more likely to be found by mapping features that are considered most important, than by mapping without purpose. In petroleum, the industry does know what to look for, and what geological surveys should map.

The key is to spell out clearly the assumptions of the model, so that investigating what can be found with the model also tests the model itself. This is being done for example in the current study of the southern Georgina Basin. To see a map produced according to a model, and to list the assumptions, is instantly to see other possibilities if the explorer is aware of them.

While in the field mapping features according to a model, a good scientist also looks for variants on the model – “multiple working hypotheses” is a basic tenet of the natural sciences.

It is not proposed to "narrow" the geologists of the NTGS. Mappers still need a broad mindset and broad regional knowledge. This is the basis of Geological Surveys. Modern exploration draws on the wide regional knowledge – the recent NTGS analyses of the Tanami 3D model and the southern Georgina Basin are good examples. Shales might be the target, but adjacent sandstones may have the structures or facies changes that help point to where the shales develop features favourable to mineralisation. Of the limitless things that can be recorded about rocks, choose those things related to discovery.

“Pure geologists” will find that their careers are not limited but given impetus by focused field work.
Bring forward discovery

The Review Team proposes a new name: “Regional Theme Mapping” to replace: “Regional geological sheet series”. The resultant maps might be of any outline and vary widely in type. Some of this has been done in all jurisdictions for a long time, on notable geological features. It is to become the main game. The matter is serious.

Geologists are also to be liberated from the limitations of having to present information at one scale. Mapping in the field was always at all scales from almost 1:1 to regional, but what was selected for the final map had to be presented in a map (a diagram) at say 250 000 scale, with local detail in figures in explanatory notes. With relational data bases, all of the mapping, from detailed local sketches and measured sections to regional traverses, can be accessed, and the one map may contain portions at different scales. There is no need to “finish” the mapping of lesser features just to complete a sheet area – the aim is to record what is important. This approach is also more scientifically honest, always representing the maps as "works in progress", more like sketches than finished paintings. The traditional beautifully drafted map series were actually perpetuating errors and out-dated mapping for decades.

The aim is also to release information as soon as possible for others to use and build and modify, not to wait until all elements are finished to some “geology of record” standard. This growing trend in NTGS is to be expanded. New mapping is released, with working suppositions and conclusions, when basic editorial standards are reached, if necessary with a note as to map status and further information to be released later. Any breakthroughs are released as soon as the information is verified. NTGS must retain its credibility, not release material on the whim of one of its geologists. The GSQ is facing this issue in the re-mapping of the Isa Inlier.

When notable changes have been made to a regional map, then stitch those changes into the map and release the revision. The proposal is dynamic. When a publishable article of record is justified, publish in internal series or external journals, to their standards.

As an example, there will be a temptation for the bedrock interpretation of the Tanami to proceed by standard sheet areas, but it is more important to release interpretations along key formations and structural blocks.

The change in mindset is actually large, and training is a priority, in cooperation with industry.
A.1 The relationships between geologists, geophysicists and geochemists

Existing maps demonstrate that it is very difficult to project rock formations under cover by their magnetic and density properties, because these can vary, even drastically in the case of magnetics, in one rock formation. Geologists and geophysicists need to be asking each other’s questions and checking each other’s interpretations. The explanatory notes will deal largely with careful description of underlying data and assumptions, as well as with alternative interpretations – they will be much more “works in progress” than “finished” reports/maps of record. This too accords with best scientific practice – the framing of questions and possibilities is as important as the recording of facts.

The new interpretative maps will vary from standard stratigraphic nomenclature, because magnetic and radiometric surveys map facies, not formations. So will geologists, in say the Heavitree Quartzite and the Bitter Springs Formation. Regional gravity could be said to map bulk facies. The Mt Solitaire map demonstrates the issues. Geologists and geochemists will map and sample regional alteration facies. Regional facies maps can easily be modified to stratigraphic maps to update existing map series where needed.

Whether geophysicists spend much time in the field or not depends on the particular rock system and the main technical and field sampling issue. They may be desk-bound or lab-bound most of the time. There is no rule as to whether the specialists are included in teams or serve functional roles for several teams, or a mix of the two. It is a simple matter of project planning, accountabilities, clear reporting and periodic review.

The geophysics section needs to be strengthened by addition of one expert interpreter of regional magnetic and gravity data, with a good geological experience. The high-class re-processing and reinterpretation of the large magnetic and radiometric surveys also needs to be given more promotion.

Geochemists must be in the field on detailed sampling of rocks and alteration and specialist soil geochemical surveys.

A.2 Management of the new approach

The choice of areas and themes and of what to map or measure, will need to be decided yearly in cooperation with an industry panel, reviewed by the same panel, and discussed with industry in between. Decision, after consultation, should be made by the stewards on behalf of the Territory, ie DPIFM. The NTGS must have the technical expertise needed on the government side of the table.
Bring forward discovery

The review by the panel and feedback from explorers is as important as the planning aspect.

The NTGS has a large amount of good two-way feedback, from conferences, from visitors, and from reports of exploration companies. The managers are in contact with companies and academia and other researchers throughout the year. The sources of advice are far wider than the Advisory Panel, whose role is to help the DPIFM synthesise wide-ranging advice into actual priority programs.

Many obvious important projects are waiting, if one takes precedence for reason of access to land or available expertise, then just do it. Do the decisive things, to advance understanding of a terrane in snakes and ladders ways, or chess ways, not just in small steps.

Projects may, as with all regional work, be on tenements or on open ground, because the Territory does not mind which company makes a discovery. NTGS work will always advantage those companies holding the areas involved. The NT Minerals Council needs to help make sure favouritism does not enter the play. The situation is analogous to deciding on drilling partnerships for the Territory's interest, see below. The company whose tenements miss out can hardly object if the Government's interest is stronger elsewhere, and a major discovery for any company helps all others by attracting new expertise, services, infrastructure and finance for exploration in the Territory.

The management of planning, operations, reporting and review requires improvement to handle the new ways. The management of ideas is not simple and depends even more than normal activity on culture and open rigorous processes.

A.3 Actual discovery by NTGS and confidentiality

The aim of NTGS is to provide regional guidance to where explorers should focus, not detailed exploration. The proposal does not change the regional charter for NTGS. Yet the new approach will increase the chance that NTGS staff will find mineralisation.

Whenever signs of significant mineralisation appear, of course the NTGS field geoscientist will switch to detailed local prospect evaluation and sampling for an hour or a day or more. After the information is released according to protocols, companies are to take it from there.

Reporting a discovery within NTGS and then to a tenement-holder or the public needs to be in accord with strict confidentiality and ethical guidelines. If a discovery is on open ground the same issues of honesty and confidentiality
Bring forward discovery

arise as with any mapping – instantly notifying head office which may reserve the ground as of that day, for application by tender instead of by first lodgement. These are the best problems the Territory Government could have.

If a company exploring adjacent is the first to hear of good results on open ground and the NTGS has observed confidentiality procedures, then it is a bonus for the company being in the right area in the first place.
B The Case for Drilling Partnerships

B.1 Rationale

From the start of the State exploration initiatives in South Australia in 1992, and in several reviews since, top exploration managers have recognised that State partnerships in drilling would be one of the most effective ways to advance discovery and the interpretation of provinces where there is little outcrop. Roy Woodall, acknowledged as the greatest exploration manager of all, was a strong advocate.

All around Australia there is important regional potential untested because companies rate the prospectivity lower than some other region on earth where they operate – before it is really known. It is important that the NTGS regional geologists first recognise new potential in their region – like nickel now in South Australia and the Territory. Often it needs drilling to verify a new regional potential, done by the entity most concerned, in this case a government.

The NT Government should not over-rate the judgement of the market – the flood of information around the world means companies cannot master all of it, they look for ideas that spark their thinking. The Territory on the other hand has only one goal – maximising discovery in its area. Petroleum exploration is also marked by group-think as well as sober analysis, and as with the Bremer Basin in WA it commonly needs government scientific initiative to “take off”.

Territory staff members are the only ones who ask every day, “What can I do for the Territory?” NTGS are not to drill the second or third choice holes for companies, but to drill important holes for the Territory.

The aim is not general drilling subsidies. Australia has experience of this approach especially in petroleum and one of the reviewers had close involvement. Too much lax exploration is paid for by government.

The Review Team’s recommendation is for the NT Government to be more choosy – holes have to be for its aims, and the meterage might not otherwise be drilled. Often the Government’s aim is to test prospectivity for many tenements or none currently existing, not just a company’s current interest in its one tenement. It is not subsidising company interest; it is drilling the Territory’s interest. If a significant company is going to drill a hole anyway, that the Territory also needs, there is no need for a partnership. The guidelines must make this point: the Territory is in partnership for its purposes.
Either company or government may propose a hole, and good guidelines need to be in place.

Often the partnership will require that a hole be drilled deeper than a company would, or moved somewhat to a place that will satisfy both company and Territory needs – or no partnership. One of the big new trends in exploration is deeper drilling than in the past, and geologists are being stretched to project structures and ideas far from primary surface data.

The case for drilling has become stronger in recent decades and can be summarised in a diagrammatic graph of exploration and discovery.

From the end of World War 2 until about 1990, it was assumed that for large regions with overall diverse mineral endowments, discovery was roughly proportional to exploration. Each drove the other. However, after the great discoveries of base metals and gold in Australia from about 1975 to the early 1990’s, discovery rates fell as surface and near-surface deposits had largely been found in well-explored regions. Discovery under cover is ten times as hard as explorers had expected, despite powerful new technical tools and geoscience expertise.

Combined with a century-long decline of about 1 per cent per year in real metal prices, this failure of discovery led to a collapse of exploration effort, from the major companies then the juniors.

The present world resources boom, seen as long-lasting and variable but not cyclical this time, has rejuvenated exploration, but discovery rates are just starting to improve around the world.
Bring forward discovery

The old adage “The best geologist is a diamond drill” is now becoming truer. Many holes are needed to calibrate interpretations of covered terrains, or simply to demonstrate whether a model of prospectivity works or not, in a particular target district.

The role of DPIFM is not just to provide precompetitive regional geoscience information to industry, though that is the major means to the end. It is to do or encourage those things that increase the wealth of Territorians, and that means bringing forward discovery. What do we want? New mines, and the sooner, bigger and longer lasting the better. More drilling is one of the keys.

Government-industry drilling partnerships are also outstanding promotional material. Nothing shows more clearly a government commitment to bringing forward the discovery of mines and petroleum fields.

Conclusion: In answer to the Government asking “What must be done for the Territory?” it is now clear that more strategic drilling is needed. Fortunately, the Territory Government has done some stratigraphic drilling over many earlier decades, and it has been successfully demonstrated in similar terranes by South Australia under its PACE Theme 2 of drilling partnerships with companies. It has paid off there very rapidly.

B.2 Management of drilling partnerships

The aim is for the Territory, through its steward organisation DPIFM, to decide where it most needs real underground information for two purposes:

- To interpret a geological region as to petroleum or mineral prospectivity; and
- To test a model of major petroleum or mineral occurrence in a particular setting.

For petroleum, it generally means a stratigraphic well or deepening a well, for the Territory’s reasons. Again, companies may explore anywhere, so it is for the Territory to demonstrate if a basin in its territory has potential greater than companies currently assign to it on general grounds.

The Government would enter into partnership with companies, and no longer drill alone as it has in the two Amadeus Basin holes.

Either the Government or a company may initiate a proposal, under clear guidelines.

The drilling may be a few deep holes or many shallow ones – whatever is more likely to make a breakthrough. There has to be commercial reality: drilling to
see if favourable host rocks occur under deep cover is not likely to have commercial implications in mining, but could be crucial in petroleum.

The Government needs to be entrepreneurial. It should have arrangements in place so that if the government-partnered hole dramatically improves prospectivity or finds ore or petroleum, the company pays back the government share, or a multiple of it. Companies drill so many “failed” holes, and discovery is everything, so that they can afford to pay a bonus for successful holes. However, each situation is different. The terms in each area are to be negotiated in advance.

Where the NT Government contributes a large amount, it should require the company to get on with follow-up drilling, or relinquish ground. The drilling is to increase decisiveness.

The “success” or “failure” of drilling is more easily assessed than any other geoscience activity, though it is not simple. For example the aim is not to make “cheap” successes by drilling obvious vein mineralisation with little significance for big deposits.

Preparation for the hole needs to be thorough – drilling makes the biggest difference but could be the biggest waste if done in the wrong place. A hole that is misplaced, which does not test the prospectivity intended and seems to disprove potential when it has not done so, is the worst possible outcome.

The government-partnered drilling also has to be within the competence of the NTGS, and the program should be a fund, not necessarily all committed each year, and reviewed with industry. It is a true technical and commercial partnership, and the Government needs to be canny. The industry partner is not thinking of benefits to the NT.

The proposal is another reason the Government needs to have industry-experienced people and commercial savvy at senior positions in DPIFM and the NTGS.

A critical issue is Aboriginal permissions. In areas of high regional prospectivity where exploration has not been permitted in recent years, there has been no modern exploration. Permission would need to be granted for extensive exploration by ground and air, sometimes within a distance of up to 50km in some directions, in order to decide on the placement of the test hole for petroleum or metals. If the Government were to negotiate for this clearance, then it would need prior agreement that in the case of success, clearance would be negotiated for the company to do further work within some reasonable time. The potential difficulties are large.
The aim is to “Bring forward discovery” for the sake of the Territory. This is about commercial advancement, not pure scientific knowledge.

South Australia has an independent panel to decide on final allocations. The Territory should instead use the same advisory panel as above, or a variant of it, as drilling partnerships would be an integral element in planning NTGS regional programs. The Territory’s steward agency, i.e. DPIFM, should be responsible for the decisions, not any other group.

A Geoscience Australia representative would be an important independent part of any advisory panel, and GA will cooperate in this way.
C Input-output analysis

An input-output table provides a summary, or a “snapshot”, of the transactions occurring within an economy over a selected period. The Australian Bureau of Statistics (ABS) produces input-output tables at the national level. These tables show the consumption and sales patterns of over 100 industries. In simple terms they show, for a given industry, which other industries it purchases from and to which other industries it sells. The national (Australian) input-output tables also show the use of industry production in private and government consumption, the use in public and private investment and sales to foreigners (exports).

While the ABS produces national input-output tables, they do not produce state or regional tables. In 2004, ACIL Tasman produced an input-output table for the Northern Territory economy for 2001/02. This input-output table was an update of the input-output table produced by the Office of Resource Development in 2001 representing the Northern Territory economy in 1997/98. The ACIL Tasman table is now used by DBERD for its economic analysis.

C.1 Input-output multipliers

Input-output tables provide a snapshot of the economy of a given region. They are therefore very useful in a descriptive sense, and they allow for a detailed analysis of an economy to be performed. However, input-output tables are most frequently used to generate input-output multipliers, which are used to conduct economic impact analysis.

Input-output multipliers capture the direct and indirect effects of an economic stimulus on a region. For example, if demand for transport services from the Northern Territory were to increase, input-output multipliers can be used to estimate the total impact of this increased demand on employment and value-added in the Territory.

Value-added, it should be noted, represents the sum of wages, profits and indirect taxes, and is the standard measure used in Australia to represent the size of an economy. At the State/Territory level, the increase in value-added represents the increase in Gross State Product (GSP); while at the national level it represents the increase in Gross Domestic Product (GDP).

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The total economic impact identified by use of input-output multipliers includes the direct effect of the initial increase in demand and the indirect (or “flow-on”) effects. The flow-on effects result from the linkages between industries in the economy. For example, transport service providers in the Northern Territory purchase inputs from other local industries. When demand for their output increases, the transport companies will increase their purchases from other local businesses, who themselves must increase their consumption, some of which will be from other local firms, and so on.

Input-output multipliers that capture the flow-on effects of inter-industry interactions are said to be simple multipliers. Where the multipliers also capture the impacts of increased employment and a subsequent increase in private consumption, then the multipliers are said to be total multipliers. Because “consumption induced” effects are included in total multipliers, they are larger than the corresponding simple multipliers.

C.2 Limitations of input-output analysis

The input-output analysis technique is based on certain restrictive assumptions, including:
• constant prices
• fixed technology
• fixed import shares
• unlimited supplies of all resources, including labour and capital
• a fixed relationship between income and private consumption.

As a result of these assumptions, there is no substitution between goods and services or between capital and labour in the production process and no substitution between goods and services in consumption. Also, there are no limitations on the supply of labour or capital to industry, and so no supply-side limits on growth.

Total multipliers, as described above, include consumption induced effects. These consumption induced effects assume that all of the labour used in the project and all of the labour employed as a result of the flow-on effects was previously unemployed and with zero expenditure. Furthermore, it is assumed that this newly employed labour spends its income in the same pattern as the existing working population. As a result, total multipliers are generally considered to overestimate economic impacts.

In this Review both simple and total multipliers are used to provide a plausible range of results.
D References

Bowler, J, MLA, 2002. Report of the Ministerial Inquiry into Greenfields Exploration in Western Australia


