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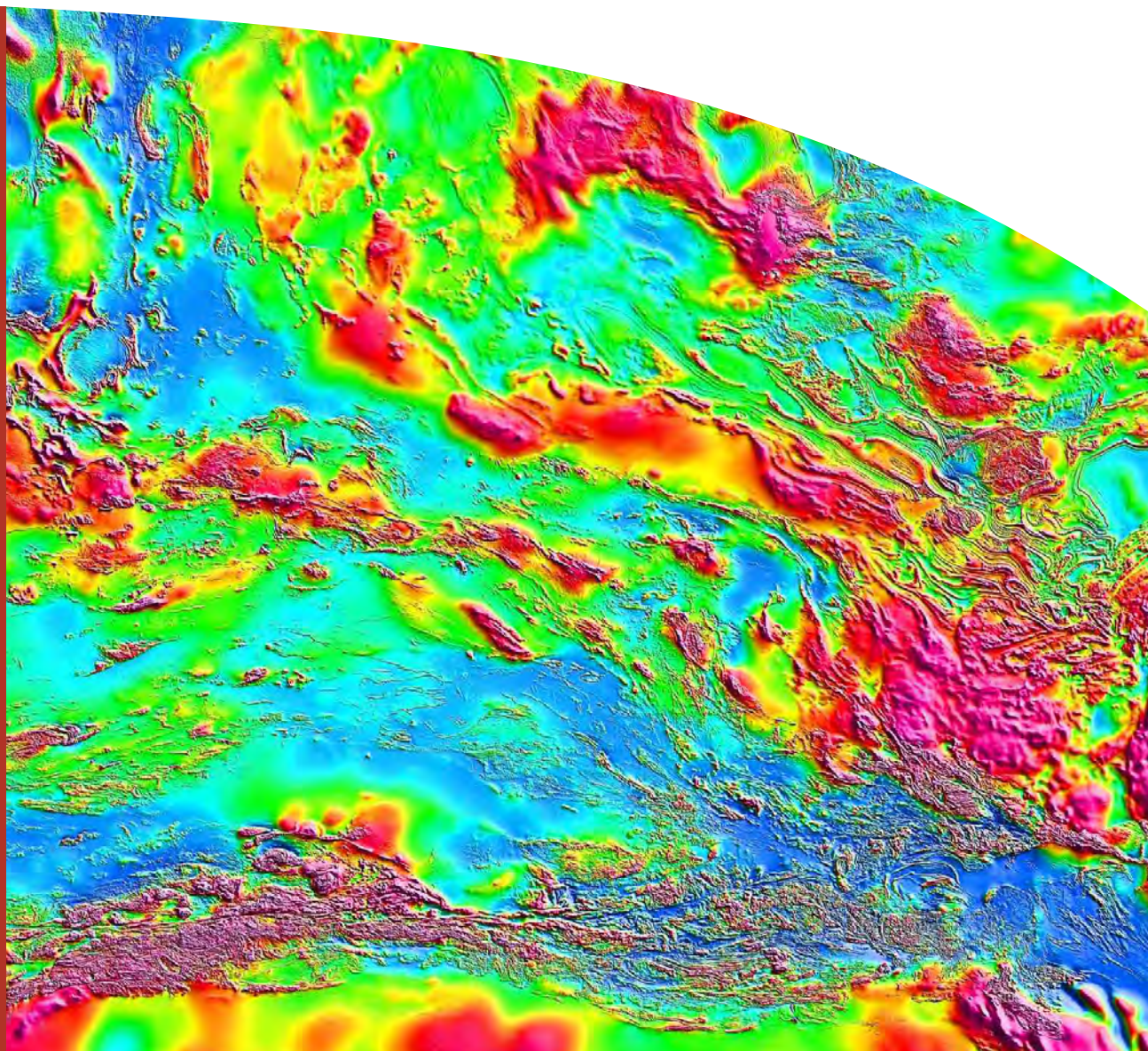
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Archive of results from the North Australia and Tanami National Geoscience Accord Projects

Compiled by Huston, D.L. Larson R. Gerner E.

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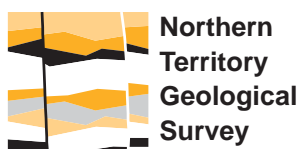


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David L. Huston, Richard Larson and Edward Gerner



Australian Government
Geoscience Australia



Department of
Industry and Resources

Department of Industry, Tourism & Resources

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Archive of results from the North Australia and Tanami National Geoscience Accord Projects

David L. Huston, Richard Larson and Ed Gerner, compilers

Background

The North Australia Project (NAP) was initiated in July 2000 following negotiations between the Northern Territory Geological Survey (NTGS) and the Australian Geological Survey Organisation-Geoscience Australia (now Geoscience Australia: GA). The NAP was a joint project undertaking geoscientific studies in the Tanami, Arunta and Tennant regions of central Australia to help encourage mineral exploration. The project continued until June 2004, when the Geological Survey of Western Australia (GSWA) began regional data acquisition in the western Tanami region. In July 2004, the Tanami Project, a joint initiative between GA, NTGS, and GSWA to increase mineral exploration replaced the NAP. Although NTGS and GSWA have continued interests in the Tanami and Arunta regions, the collaborative Tanami Project will finish in December 2006.

The purpose of this product is to provide reports and datasets summarising the results of the project at this time. The only major products not included in this DVD are the results of the Tanami seismic survey and modifications to the on-line 3D models required by the seismic results. These will be released separately, beginning in August 2006.

As this report is intended to be as up-to-date as possible, it refers to a number of manuscripts that are either in press or in preparation. Although these manuscripts cannot be provided here, much of the data upon which the conclusions are based are presented in summary, either in abstracts, presentations, or data tables.

Scientific background

At the initiation of the NAP, the North Australian Craton (NAC) was considered one of the least understood elements in GA's Australian Crustal Elements Map (Fig. 1). As defined in this map, the NAC was bound in the south by a continental-scale magnetic anomaly (Fig. 2), and included mostly Palaeoproterozoic basement terranes that extended east from the Kimberley Craton in Western Australia to North Queensland. This area includes the Pine Creek, Tanami, Arnhem, Tennant, and Murphy regions of the Northern Territory. As the Arunta region lies largely to the south of the magnetic anomaly (Fig. 2), it was not considered part of the NAC. The original purpose of the NAP was to document the geological history and mineral systems of Palaeoproterozoic rocks older than the c. 1850 Ma Barramundi Orogeny, as defined by Etheridge et al. (1987), including the Arunta region, and the NAC, as defined in the Australian Crustal Elements Map (Shaw et al., 1995).

The later history of the NAC and Arunta region is dominated by the deposition of Proterozoic superbasin sequences, including the McArthur and Victoria-Birrindudu Basins, which have been the focus of studies under the North Australian Basins Resource Evaluation (NABRE) project and NTGS regional mapping projects (Southgate, 2000; Cutovinos, 1999), and the Neoproterozoic to Palaeozoic Georgina and Amadeus Basins (Marshall and Dunster, 2004; Dunster et al., 2003). These aspects were not considered directly by the North Australia and Tanami Projects. However, as part of this project, Maidment (2005) addressed the

implications of the recognition that high-grade rocks of the Irindina Supracrustal Assemblage in the eastern part of the Arunta region are late Neoproterozoic to early Palaeozoic in age (Buick et al., 2001), and not Palaeoproterozoic as initially thought, and include inferred correlatives with units of the Amadeus and Georgina Basins.

The Tanami and Tennant regions, along with the Pine Creek and McArthur River regions, are the most highly mineralised terranes in northern Australia. The Tanami region is Australia's largest Palaeoproterozoic gold province, and the Tennant region historically has been a major producer of Au, Cu, and Bi. Although not apparently as well endowed in mineral deposits as the Tanami and Tennant regions, the Arunta region contains a large variety of Au, Cu-Au, Zn-Pb-Ag, Ni-Cu, U, W, and Mo deposits. Prior to this project, important aspects of these deposits had not been described, and geological controls were not well understood. The main purpose of the project was to place these deposits into the 4D evolution of the Tanami, Tennant, and Arunta regions.

Participants

During the six years of the North Australia and Tanami Projects, over 30 geoscientists have made significant contributions in the understanding of the NAC. Scientists from GA included Mario Bacchin, Tim Barton, Ed Chudyk, Jon Claoue-Long, Alan Crawford, Andrew Cross, Anita Dwyer, Geoff Fraser, Bruce Goleby, Dean Hoatson, David Huston, Subhash Jaireth, David Johnstone, Leonie Jones, Russell Korsch, Patrick Lyons, Richard Larson, David Maidment, Tony Meixner, Terry Mernagh, Yanis Miezitis, Narelle Neumann, Malcolm Nicoll, Julie Smith, Alastair Stewart, and Kurt Worden. Scientists from NTGS included Dot Close, Andrew Crispe, Alison Dean, Nigel Donnellan, Christine Edgoose, Max Frater, Adrian Goldberg, Mike Green, Mark Hendrickx, Kelvin Hussey, Andrew Johnstone, Barry Pietsch, Ian "Bunge" Scrimgeour, Kerry Slater, Andrew Wygralak, and Leon Vandenberg. Leon Bagas was the main contributor from GSWA. In addition to the government geological surveys, the project also involved participation by the Australian National University, Adelaide University, and, recently, the Centre for Exploration Targeting, University of Western Australia. Exploration companies, including Newmont Australia Ltd, Tanami Gold NL, Arafura Resources NL, and AngloGold Australia Ltd allowed access to their properties and provided logistical support. We also thank the traditional owners, represented by the Central and Kimberley Land Councils, for land access.

Research program

Because of the large area covered by the project, research effort was focussed to address geological issues within specific areas or mineral systems. Objectives for research were defined through discussion between the three partners in consultation with industry. Table 1 summarises the research streams as a series of modules. Further information on the program is available at http://www.ga.gov.au/minerals/research/regional/nap/NAP_science_oview.jsp.

Table 1. Summary objectives for research modules of the North Australia-Tanami Project.

Module	Objectives
Overview	
Geochronology	<ul style="list-style-type: none"> To acquire geochronological data from the Tanami and Arunta regions that allows correlation of units and serves as a basis for regional correlations and a synthesis of the geological history
Mineral systems and mineral potential	<ul style="list-style-type: none"> To provide an up-to-date analysis of the mineral potential of the NAC for use by the Commonwealth Department of Industry, Tourism and Resources.
Diamond potential	<ul style="list-style-type: none"> To reduce exploration risk for diamonds by better defining areas of higher

	potential.
Regional synthesis and GIS development	<ul style="list-style-type: none"> To improve the understanding and correlation of geological events across the Arunta, Tanami and Tennant regions, leading to a better understanding of mineral potential.
Early Proterozoic Foundations	
Deep seismic profiling	<ul style="list-style-type: none"> To improve the knowledge of the deep crustal character of the Arunta region by reprocessing, documenting and archiving the existing central Australian deep seismic lines recorded by Bureau of Mineral Resources (BMR) in 1985 through the Amadeus Basin, Arunta region and Ngalia Basin. To understand the architecture and controls on mineral systems in the Tanami region by acquiring, processing and interpreting new seismic data.
Tanami mineralisation	<ul style="list-style-type: none"> To provide specialist input to improve the understanding of mineral systems in this significant gold province using a combination of fluid inclusion analysis, geochronology, structural analysis, whole rock geochemistry, mineral paragenesis, wall-rock alteration, and thermodynamic modelling. This will provide a better understanding of geological controls on ore deposition, which will assist in exploring for deposits in the Tanami and northern Arunta regions.
Tennant Creek gravity and mineralisation	<ul style="list-style-type: none"> To assist exploration in the Tennant region by the provision of semi-detailed gravity data.
Marginal Mobile Belts	
Arunta South Geophysical Interpretation	<ul style="list-style-type: none"> To provide geophysical interpretation of the Mt Rennie, Mt Leibig, Lake Mackay and Mt Doreen 1:250 000 sheets in conjunction with NTGS's South Arunta project.
Arunta Mafic Igneous Suites	<ul style="list-style-type: none"> To constrain the Proterozoic mafic-ultramafic magmatic systems within the event chronology of the Arunta region, and to provide a geoscientific framework for assessing the mineral prospectivity and resource potential of the intrusions.
East Arunta Cu-Zn-Pb deposits	<ul style="list-style-type: none"> To assess the significance of small base-metal occurrences in the eastern part of the Arunta region, including the Oonagalabi and Jervois deposits. The origin and geological controls on these deposits will be established so that their potential can be assessed.
Structure and metamorphism of the Arunta Province	<ul style="list-style-type: none"> To determine the structural and metamorphic history and the metamorphic facies distribution of the Arunta region.

Important results

Regional mapping by the NTGS and GSWA combined with geochronology by GA, and mineral system studies by all organisations have allowed the development of a much better understanding of the evolution of the Tanami, Arunta and Tennant regions and the development of their mineral systems. The following are some of the more important consequences of this work:

- The Arunta region has been divided into three, the Aileron, Warumpi and Irindina Provinces. The Aileron Province, which comprises the majority of the Arunta region, was mostly deposited between c. 1850 Ma and 1740 Ma. The Warumpi Province, which forms the southern margin of the Arunta region, evolved mostly between c. 1690 Ma and c. 1610 Ma. Sedimentary rocks of the Irindina Province, which is located in the southeastern Arunta region, were deposited during the Neoproterozoic to Cambrian (Maidment, 2005).
- Regional correlations between the Aileron Province, and the Tanami and Tennant regions have been developed based on geochronological data and regional mapping (Fig. 3; also see Scrimgeour, 2003). Although some of these correlations are not

definitive, the scheme provides a foundation for further work. Important specific correlations include:

1. Possible exposure of Archaean rocks (c. 2500 Ma) are restricted to the Billabong Complex in the eastern part of the Tanami region (cf. Page et al., 1995). Re-interpretation of geochronological data of Page et al. (1995) by A Cross (unpub. data) has questioned the existence of Archean rocks in the Browns Range Dome (northwest Tanami region).
 2. Similarities in the age (c. 1864 Ma: D Maidment, unpub. data) of a high-level rhyodacitic sill intruding sedimentary rocks in the Bald Hill area (western Tanami region) to felsic volcanic rocks in the Tennant region (Compston, 1995) suggest correlation of the sequence at Bald Hill with the Warramunga Formation of the Tennant Region. Rocks of similar age have not been recognised in the Aileron or Warumpi Provinces.
 3. Similarities in zircon populations suggest that part of the Lander Rock beds in the Aileron Province and the Killi Killi Formation in the Tanami region have similar provenances, and that these units are probably coeval and were deposited after c. 1840 Ma (Claoué-Long, 2003). These units are coeval, in part, with the Ooradidgee Group in the Tennant region (Claoué-Long et al., 2005: Fig. 3).
 4. Zircon population profiles alone distinguished the c. 1810 Ma Century Formation from the Killi Killi Formation in the Tanami region. Similarly, differences in zircon age populations in the Lander Rock beds suggest that this unit may require subdivision (J. Claoué-Long, unpub. data).
 5. Deposition of the Ware Group appears to be coeval with the Ongeva Package (i.e. the Strangways Metamorphic Complex, Bonya Schist, Deep Bore Metamorphics, Cackleberry Metamorphics, and Mount Bleechmore Granulite) in the southeastern part of the Arunta region and the lower parts of the Tomkinson Creek Group in the Tennant region (Claoué-Long et al., 2005).
 6. In the southeast part of the Arunta region, the relatively young (c. 1765-1740 Ma) Ledan Package of rocks has been recognised, which includes the Ledan Schist, Mendip Metamorphics, Utopia Quartzite, and Bungitina Metamorphics.
- The Warumpi Province includes the c. 1690-1670 Ma Madderns Package, the c. 1660-1650 Ma Yaya Package, and the c. 1620-1610 Ma Iwupataka Package (Scrimgeour et al. 2005).
 - The Tanami region, Aileron Province, and Tennant region have broadly similar thermotectonic histories, which are described below.
 1. The c. 1835-1825 Ma Tanami Orogeny: regional metamorphism to greenschist (locally amphibolite) grade accompanied by tight to isoclinal folding. This event may be correlated with the Murchison Event in the Tennant region, which is marked by an angular unconformity and is constrained to between c.1840 Ma and c. 1810 Ma (Donnellan, 2005; Claoué-Long et al., 2005).
 2. The c. 1820-1800 Ma Stafford Event: intrusion of granites and mafic bodies, accompanied by thermal metamorphism, in the Tanami region and the northern Aileron Province. In the Tanami region, where this event may have continued to c. 1795 Ma, magmatism was accompanied by early folding and later transpressional faulting (Vandenberg et al., 2001). This event was marked by deposition of volcanoclastic rocks of the Ongeva Package in the southeastern Aileron Province.

3. The c. 1780-1770 Ma Yambah Event (formerly the Early Strangways Orogeny): intrusion of granites and minor mafic bodies mostly in the southern Aileron Province. Local high-grade metamorphism may be related to the emplacement of magma. The Yambah Event and Stafford Event may be diachronous expressions of a single broad event.
 4. The c. 1740-1690 Ma Strangways Orogeny: prolonged thermal event expressed as granulite-facies metamorphism in the Strangways Range and amphibolite-facies metamorphism elsewhere in the southeastern Aileron Province (Hussey et al., 2005). Further to the north in the Aileron Province and in the Tennant region, this event is expressed as the intrusion of ovoid granite plutons. In the Tanami region, this event is recorded by thermal isotopic resetting of mica (Fraser, 2002). Overall, the intensity and temperature of this event appears to decrease from the southeast to the northwest.
 5. The c. 1590-1560 Ma Chewings Orogeny: moderate- to high-grade metamorphism that affects the Warumpi and Aileron Provinces. Extensive granite bodies on the Mt Doreen 1:250000 sheet area (SF52-12) are attributed to this event.
- In addition, five local thermotectonic events have been recognised:
 1. The c. 1850 Ma Tennant Event: formation of east-trending open folds and associated axial-planar slaty cleavage. These structures were accompanied by regional greenschist facies metamorphism and the intrusion of the Tennant igneous suite. This event has only been recognised in the Tennant region. The event is marked by the regional unconformity between the Warramunga Formation and the overlying Ooradidgee Group (Donnellan, 2005; Claoué-Long et al., 2005; Maidment et al., 2006).
 2. The c. 1760-1740 Ma Inkamulla Event: intrusion of voluminous granites and possibly minor mafic bodies in the southeastern Aileron Province. The extent of this event broadly correlates with the age range of the Ledan Package.
 3. The c. 1680-1660 Ma Argilke Event: intrusion of granite and extrusion of volcanic rocks in the Warumpi Province.
 4. The c. 1640-1630 Ma Leibig Orogeny: granulite to amphibolite facies regional metamorphism accompanied by voluminous granite and minor mafic intrusions in the Warumpi Province and the southern Aileron Province (Scrimgeour et al., 2005).
 5. The c. 1615-1600 Ma Ormiston Event: minor felsic magmatism in the Warumpi Province.
 - New geochronological data have called into question the former Yuendumu Event and suggest that the Anmatjira Uplift is relatively minor.
 - The age of the unconformity between the Lander Rock beds and the Reynolds Range Group in the Reynolds Range is <1810 Ma (J. Claoué-Long, unpub. data). This date is constrained by the youngest detrital zircon age from a sandstone unit just below the unconformity (GA sample 2001082048). The unconformity may represent the Stafford Event or a younger event in the Arunta region. There are at least four regional to semi-regional unconformities in the combined Tanami region, Aileron Province, and Tennant region.
 - Geological relationships and geochronological data suggest that most of the Tanami region and Aileron Province were deposited after c. 1850 Ma. Therefore, the c. 1870-

1850 Ma Barramundi Orogeny of Etheridge et al. (1987) did not affect as large an area as previously thought. However, the age of the unconformity associated with the Tennant Event in the Tennant region is possible coeval with the Barramundi Orogeny.

- Base-metal deposits in the eastern Aileron Province have been classified into the Utnalanama-type, Johnnie's-type, and Oonagalabi-type (Hussey et al., 2005). The Utnalanama-type includes the Utnalanama [Johannsen's], Edwards Creek, Coles Hill and Harry Creek prospects, which are classified as volcanic-hosted massive sulphide (VHMS) deposits. The Johnnie's-type includes the Johnnie's Reward and Jervois prospects, classified as iron-oxide copper-gold (IOCG) deposits. The Oonagalabi-type comprises the Oonagalabi prospect, which is classified as a carbonate-replacement deposit. All of these examples were classified as VHMS deposits (Warren and Shaw, 1985), however, metal ratios and assemblages for the Johnnie's-type of deposits are atypical of VHMS deposits and more typical of IOCG deposits. These interpretations are supported by field relationships and Pb-isotope model ages.
- Eight possible metallogenic events have been recognised in the Tanami, Arunta and Tennant regions (Fig. 1):
 1. *c. 1850-1845 Ma*: formation of Tennant Creek ironstones. The age is constrained by maximum deposition of the host Warramunga Formation at *c.* 1860 Ma and by intrusion of felsic dykes at *c.* 1845 Ma that cut ironstone at the White Devil deposit (Compston, 1995; Maidment et al., 2006).
 2. *c. 1850-1825 Ma*: introduction of Au-Cu-Bi ores into Tennant Creek ironstones. The age is nominally constrained by ^{40}Ar - ^{39}Ar dating of Au-related muscovite to 1830-1825 Ma (Compston and McDougal, 1996). However, as some workers (e.g. Min et al., 2000) have suggested that the ^{40}Ar - ^{39}Ar system yields ages that are systematically ~1% younger than U-Pb ages, it is possible that the ages reported by Compston and McDougal (1996) should be increased by 1% to for comparison with U-Pb zircon ages. If so, the age of Tennant Creek Au-Cu-Bi mineralisation is *c.* 1848-1843 Ma, which is within error of the age of ironstone formation and the intrusion of Tennant suite igneous rocks. If the *c.* 1830-1825 Ma age is retained, Tennant Creek Au-Cu-Bi mineralisation is coeval with the emplacement of the Treasure magmatic suite (Budd et al., 2001).
 3. *c. 1825 Ma*: possible age for "early" gold in the Tanami region at The Granites goldfield and deposits in the Bald Hill area. This timing for "early" gold in the region is based solely on structural relationships.
 4. *c. 1810-1790 Ma*: major lode-gold mineralising event in the Tanami region. The age is constrained by dating of Au-related xenotime at the Callie (Cross et al., 2005) and Coyote deposits (Tanami Gold, Unpub. data), and by Pb isotope model ages at the Callie and Groundrush deposits (Huston et al., 2003). This is also the possible age of lode-gold mineralisation in the Kurinelli goldfield of the Tennant region, and the Dodger prospect in the north part of the Aileron Province. The latter inferences are based on the age of the host units and Pb isotope model ages. IOCG deposits in the Babylon (Rover) mineral field may also have formed during this interval based on maximum depositional age of host units (*c.* 1798 Ma; Smith, 2001: GA sample 99066302). Lode-gold deposits in the Kurinelli district may also be of this age as auriferous veins cut dolerite which has an age of *c.* 1811 Ma (Maidment et al., 2006).
 5. *c. 1790-1770 Ma*: possible age of IOCG deposits in the eastern Aileron Province (Johnnie's-type) and Tennant region (Babylon field). The Johnnie's-

type deposits are constrained by Pb isotope model ages. The Babylon deposits are poorly constrained by the maximum age of their host rocks.

6. *c. 1760 Ma*: maximum age of Oonagalabi-type carbonate-replacement deposits. This age is constrained by the maximum depositional age of the host unit to the Oonagalabi deposit.
7. *c. 1710-1690 Ma*: age of carbonate-replacement and skarn-type W-Mo deposits in the eastern Aileron Province (e.g. Molyhil) and the southern Tennant region. These ages are constrained by ^{40}Ar - ^{39}Ar ages of ore-related amphibole and muscovite (G. Fraser, unpub. data) and are consistent with the age of Strangways-aged granites that are interpreted to be genetically related to mineralisation.
8. *c. 1640 Ma*: potential age of stratabound Zn-Pb-Cu deposits and possible IOCG deposits in the Warumpi Province. The age for Zn-Pb-Cu deposits is constrained by the maximum depositional age of protoliths of metasedimentary rocks that host the Stokes Yard prospect. The potential for IOCG in the Warumpi Province was suggested by Wyborn et al. (1999) and Budd et al. (2001), and likely age of this predicted deposit type is based on the age of the Mount Webb Granite. The alteration assemblages in this area, which includes sodic-calcic zones, sericitic zones, hematite-bearing zones and epidote-bearing zones, is typical of IOCG-related systems in the Gawler Craton of South Australia and the Eastern Succession of the Mt Isa region in Queensland.

Products

Table 2 lists major outputs of the project. A comprehensive list of all products, including abstracts, presentations, and outside publications is presented as Appendix 1. Most products are available on this DVD set as pdfs or in GIS datasets. In cases where the product is not on this DVD set, a complete reference, including internet addresses, is provided. Products are grouped in the DVD set according to project module, except where the product has been incorporated into a GIS file. Products that cover more than one module (e.g. abstract volumes) are grouped under a general category in the DVD set.

Table 2. Major products of research modules in the North Australia-Tanami Project.

Module	Major products (italics indicate products available on CD)
Overview	
Geochronology	<ul style="list-style-type: none"> • <i>Smith, J.B., 2001. Summary of Results. Joint NTGS – AGSO Age determination program 1999-2001. Northern Territory Geological Survey, Record 2001-007.</i> • <i>Cross, A., Claoué-Long, J.C., and Crispe, A.J., 2003. Summary of Results. Joint NTGS – GA geochronology project: Tanami region 2001-2002. Northern Territory Geological Survey, Record 2003-006.</i> • <i>Cross, A., Claoué-Long, J.C., Scrimgeour, I.R., Close, D.F., and Edgoose, C.J., 2004. Summary of Results. Joint NTGS – GA geochronology project: southern Arunta region. Northern Territory Geological Survey, Record 2004-003.</i> • <i>Cross, A., Claoué-Long, J.C., Scrimgeour, I.R., Crispe, A., and Donnellan, N., 2005. Summary of results. Joint NTGS-GA geochronology project: northern Arunta and Tanami regions, 2000-2003 Northern Territory Geological Survey, Record 2005-003.</i> • <i>Cross, A., Claoué-Long, J.C., Scrimgeour, I.R., Ahmad, M., and Kruse, P.D., 2005. Summary of Results. Joint NTGS – GA geochronology project: Rum Jungle, basement to southern Georgina Basin and eastern Arunta region 2001-2003. Northern Territory Geological Survey, Record 2005-006.</i>

	<ul style="list-style-type: none"> • Worden, K.E., Claoué-Long, J.C., Scrimgeour, I., and Lally JH, 2004. <i>Summary of Results. Joint NTGS – GA geochronology project: August 2003-December 2003. Northern Territory Geological Survey, Record 2004-004.</i> • North Australia Project on-line GIS (www.ga.gov.au/map/nap) • <i>Summary geochronology of the Tanami, Arunta, and Tennant regions (includes all SHRIMP data, published Ar-Ar data and selected other published data).</i> • <i>Summary of Ar-Ar geochronology produced by North Australia-Tanami Project.</i> • <i>Summary of Pb isotope data for the Tanami, Arunta and Tennant regions.</i>
Mineral systems and mineral potential	<ul style="list-style-type: none"> • Unpublished reports and GIS files (not publicly available). • Hoatson D.M., 2002. Metallogenic potential in the Arunta Province. (http://www.ga.gov.au/minerals/research/regional/nap/NAP_home.jsp#outputs) • Hoatson, D.M., 2001. <i>Metallogenic potential of mafic-ultramafic intrusions in the Arunta Province, central Australia: some new insights. AGSO Research Newsletter 34, 29-33.</i>
Diamond potential	<ul style="list-style-type: none"> • Jaques, A.L., 2004. <i>Australian diamond deposits, kimberlites and related rocks. 1:5 000 000 scale map. Geoscience Australia, Canberra.</i>
Regional synthesis and GIS development	<ul style="list-style-type: none"> • <i>Tanami region GIS dataset (GeoCat No. 63971).</i> • <i>Tennant region GIS dataset (GeoCat No 63970).</i> • <i>Arunta region GIS dataset (GeoCat No. 63912).</i> • <i>Extract from OZROX geochemical database covering Tanami, Arunta and Tennant regions.</i>
Early Proterozoic Foundations	
Deep seismic profiling	<ul style="list-style-type: none"> • Korsch, R.J., Goleby, B.R, and Chudyk, E., 2002. <i>Deep seismic reflection profiling in the Northern Territory: past work and future directions, In Annual Geoscience Exploration Seminar (AGES) 2002. Record of Abstracts. Northern Territory Geological Survey, Record 2002-2003.</i> • <i>Tanami seismic acquisition proposal.</i> • Results of the Tanami seismic acquisition (formal report to be available August 2006).
Tanami mineralisation	<ul style="list-style-type: none"> • Wygralak, A.S., Mernagh, T.P., Huston, D.L., and Ahmad, M., 2005. <i>Gold mineral system of the Tanami region. Northern Territory Geological Survey, Report 18.</i> • Bagas, L., and Huston, D., 2005. <i>The Bald Hill gold deposits in the Palaeoproterozoic Tanami Group, Western Australia. Geological Survey of Western Australia Annual Review 2004-2005. p. 64-69.</i> • Tanami 3D model VRML (http://www.ga.gov.au/map/web3d/tanami/index.jsp: to be updated December 2006).
Tennant Creek gravity and mineralisation	<ul style="list-style-type: none"> • <i>Tennant Creek gravity dataset; incorporated into Tennant region GIS (GeoCat No 63970).</i>
Marginal Mobile Belts	
Arunta South Geophysical Interpretation	<ul style="list-style-type: none"> • Goldberg, A., Meixner, A.J., Edgoose, C.J. 2005. <i>Mt Doreen Northern Territory (first edition) 1:250 000 Interpreted geological map series, SF 52-12 Northern Territory Geological Survey Darwin and Alice Springs; incorporated into South Arunta GIS dataset.</i> • Meixner, A.J., Close, D.F., Scrimgeour, I.R., and Edgoose, C.J., 2004. <i>Mt Rennie Northern Territory (first edition) 1:250 000 Interpreted geological map series, SF 52-15 Northern Territory Geological Survey; incorporated into South Arunta GIS dataset.</i> • Meixner, A.J., Scrimgeour, I.R., Close, D.F., Edgoose, C.J., 2004. <i>Mt Liebig Northern Territory (second edition) 1:250 000 Interpreted geological map series, SF 52-16 Northern Territory Geological Survey; incorporated into South Arunta GIS dataset.</i> • Meixner et al. <i>Lake Mackay Northern Territory (first edition) 1:250 000 Interpreted geological map series, SF52 Northern Territory Geological Survey (in press); available in early 2006 from NTGS</i>
Arunta Mafic Igneous Suites	<ul style="list-style-type: none"> • Hoatson, D.M., and Stewart, A.J., 2001. <i>Field investigations of Proterozoic mafic-ultramafic intrusions in the Arunta Province, central Australia. Canberra: Geoscience Australia Record 2001/39</i>

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Figure captions

Figure 1. Map showing crustal elements and mineral deposits and prospects in the North Australia Project area.

Figure 2. Reduced-to-pole total magnetic intensity image of the North Australia Project area.

Figure 3. Space-time diagram showing correlations of sedimentation, igneous activity, deformation and mineralisation between the Tanami region, the Aileron Province and the Tennant region from c. 1860 Ma and c. 1680 Ma.