Overview of mineral and petroleum exploration and production in 2016

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Exploration statistics

Minerals

Mineral exploration remained at relatively subdued levels in the Northern Territory (NT) in 2016 although there was recovery for some commodities such as base metals and lithium. According to Australian Bureau of Statistics (ABS) figures, mineral exploration expenditure in the NT in 2015–16 was $100.8 million, a 5% increase on the $95.7 million spent in 2014–15 (**Figure 1**). This increase was encouraging given that mineral exploration expenditure Australia-wide in 2015–16 was $1.42 billion, down 10% from the $1.58 billion the previous year. The Territory's share of total Australian mineral exploration expenditure increased from 6.1% to 7.1% over the year.

In addition to ABS exploration statistics, which include the costs of feasibility studies and mine site exploration, the NT Geological Survey (NTGS) collects statistics on the admissible exploration expenditure on exploration leases reported by industry to the Department of Primary Industry and Resources (DPIR). This shows that expenditure reports submitted during 2016 (which may relate to activity in 2015 and/or 2016) totalled $56.8 million in admissible exploration expenditure; this is down 56% from the peak of $131 million in 2011. Of expenditure reported to DPIR in 2016, 27% ($15.4 million) was from exploration conducted in the McArthur Basin, 21% ($11.7 million) in the Arunta Region and 19% ($10.6 million) in the Pine Creek Orogen (**Figure 2a**). Reported expenditure was also collected by commodity for the first time (**Figure 2b**) with the bulk of expenditure spent on three commodity groups: base metals (41%; $23.4 million), gold (19%; $10.9 million) and uranium (13%; $7.3 million).

At the end of 2016, there were 882 granted non-extractive mineral exploration licences (compared with 906 at the end of 2015) and 629 outstanding exploration licence applications. During 2016, 183 applications were received, 146 granted and 340 licences were relinquished. The area of

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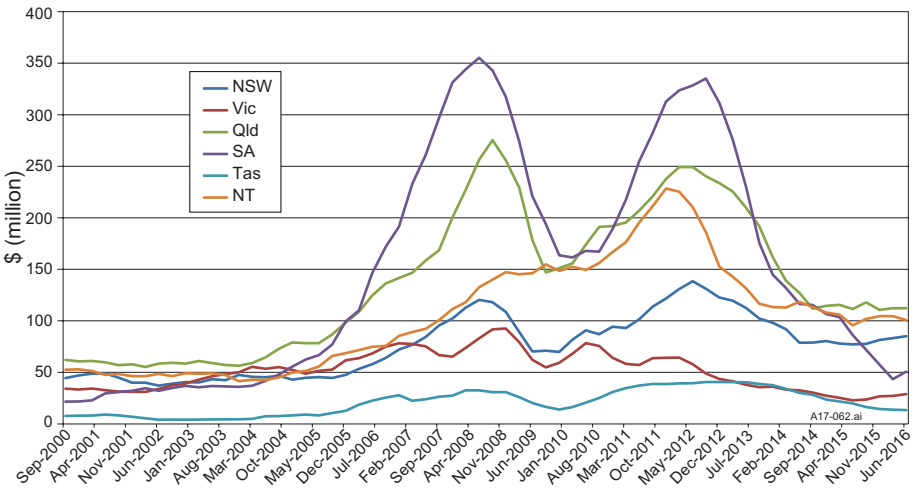

Figure 1. Annual exploration expenditure for all minerals except coal and petroleum, for all Australian states (excluding Western Australia, who had $871 million in expenditure in 2015–16), calculated quarterly, for the 17 years to the June 2016 quarter.

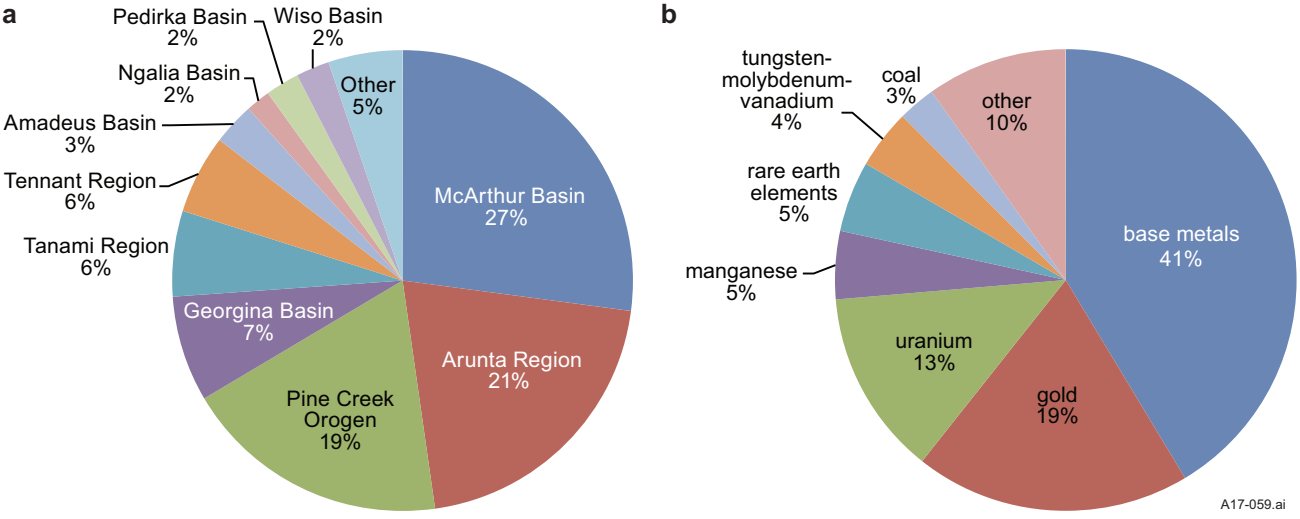

Figure 2. Summary of admissible exploration expenditure reported to DPIR during 2016 broken down by (**a**) geological region and (**b**) primary commodity of interest. Note that exploration reported during 2016 may have occurred during either 2015 or 2016.

the NT covered by granted exploration tenure is now 12% compared to 29% in 2011.

Petroleum

During 2016, onshore petroleum exploration activity was largely limited to the McArthur Basin and Amadeus Basin, with four new exploration wells drilled, one horizontal well tested, and one new seismic survey conducted. The reported expenditure for onshore petroleum exploration activities in the NT in 2016 was about $60 million. At the end of 2016, in the onshore NT and coastal waters, there were 53 active exploration permits, 3 retention licenses and 5 production licenses.

Exploration and production highlights

Figure 3 shows selected mineral exploration highlights for 2016. In the following summary of exploration and mining results for the Territory during 2016, all mineral resources are assumed to have been reported in accordance with the JORC or NI43-101 codes. Where resource categories

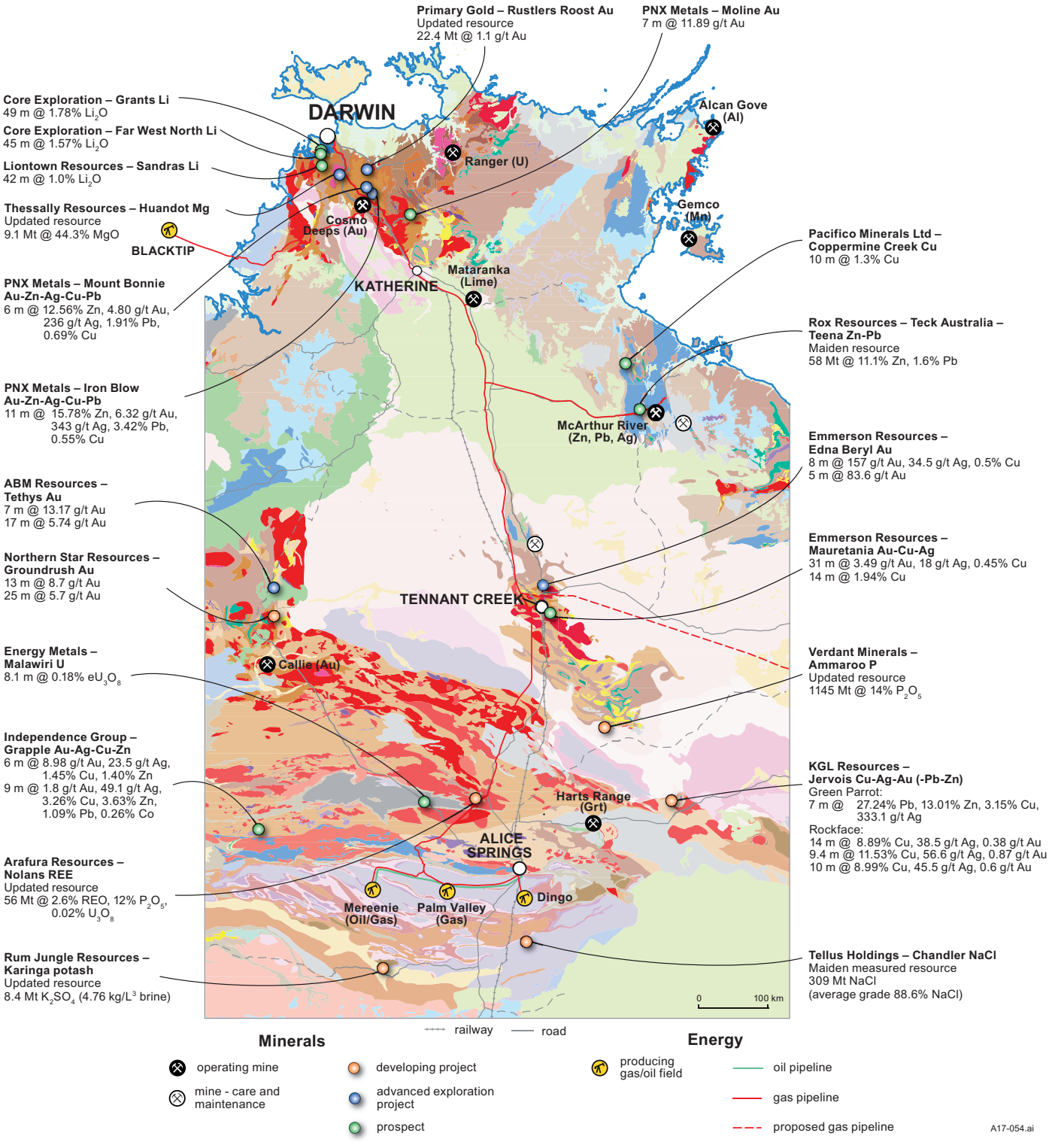

Figure 3. Map of the Northern Territory showing selected mineral exploration highlights for 2016.

are not listed, readers are directed to the original sources for this information. Most material cited here has been sourced from company websites, news releases and stock exchange announcements. As a result, details of exploration by some private and other non-listed companies that do not report publicly could not be included. Mineral production statistics for the NT for 2015–16 collected under the NT *Mineral Titles Act* are given in **Table 1**.

Gold and copper-gold

Pine Creek Orogen

Newmarket Gold Incorporated (Newmarket), now Kirkland Lake Gold Ltd, continued gold production from their ***Cosmo Deeps*** underground mine north of Pine Creek (**Figure 4**). Gold production from Cosmo Deeps in 2016 totalled 55 765 oz at an average grade of 2.87 g/t from 646 848 t milled, a 12% decrease in gold production from 2015. At the end of 2015, the Mineral Resource for Cosmo mine included a Measured Resource of 1.65 Mt at 3.63 g/t Au, an Indicated Resource of 2.99 Mt at 2.99 g/t Au and an Inferred Mineral Resource of 0.68 Mt at 2.76 g/t Au, for a total contained mineral resource of 0.54 Moz of gold. In August 2016, Newmarket announced the results of 13 834 m program of diamond drilling that intersected mineralisation down plunge of existing mineral resources at Cosmo Deeps. Drill intersections included 7.75 m at 8.76 g/t Au from the Sliver Lode, and discovered two new lodes, named Redbelly and Taipan. Twenty-seven holes were subsequently drilled into the Redbelly lode, the uppermost parts of which are only 25 m from existing underground development; intersections here including 11.8 m at 4.29 g/t Au. The Taipan Lode extends to within 20 m of the planned development of the Sliver Lode; mineralised intersections here including 10.15 m at 11.3 g/t Au. New decline development had commenced to access the Sliver Lode and the Redbelly Lode.

In May 2016, Newmarket announced the results of a Preliminary Economic Assessment on the ***Maud Creek*** project; the study suggests positive project economics for a 9.5 year mine with average annual gold production of 52 000 oz, and total recovered gold of 496 000 oz with a life of mine diluted head grade of 4.2 g/t Au. Maud Creek has an Indicated Mineral Resource of 7.7 Mt at 3.50 g/t Au for 871 000 oz of gold and an Inferred Mineral Resource of 4.2 Mt at 2.50 g/t Au for 343 600 oz of gold.

In late 2016, Ark Mines Ltd (Ark) announced that they had acquired necessary approvals for the commencement of mining at the ***Mount Porter*** gold project located 20 km north of Pine Creek. The Mount Porter deposit has Indicated and Inferred Resources of 355 000 t at 3.0 g/t Au for 34 200 oz Au (1.7 g/t cut-off). Ark has an agreement to toll treat the ore from Mount Porter at Newmarket's Union Reefs plant. Ark has announced plans to commence mining in 2017 following the wet season. They also commenced resource definition drilling at Mount Porter South in December 2016. Ark also has gold prospects at Frances Creek located 5 km northeast of Mount Porter where drilling at the ***Golden Honcho*** prospect in late 2015 intersected gold in 22 holes, including 3 m at 13.4 g/t Au from 15 m. During 2016, Ark also announced that it had purchased the ***Glencoe*** deposit

Table 1. 2016 Northern Territory mining production.

Commodity	Unit of quantity	2015-16[1,5]		
		Quantity produced	Quantity sold[3]	Quantity sold ($)
Metallic Minerals				
Alumina [6]	Tonnes	0	0	$0
Alumina hydrate [6]	Tonnes	0	0	$0
Bauxite	Tonnes	8,325,262	8,400,405	$447,686,761
Gold [7]	Grams	482	0	$0
Gold dore [8]	Grams	17,549,932	17,367,908	$885,066,997
Iron ore	Tonnes	0	46,692	$822,690
Manganese	Tonnes	5,532,731	5,655,850	$829,280,863
Mineral sands	Tonnes	0	268	$191,821
Lead concentrate	Tonnes	6,682	25,268	$29,619,509
Zinc concentrate	Tonnes	47,002	78,777	$70,617,810
Zinc Lead concentrate	Tonnes	452,401	404,830	$404,266,250
Metallic minerals value	n/a			**$2,667,552,700**
Non-metallic minerals				
Crushed rock	Tonnes	1,701,360	1,453,017	43,138,580
Dimension stone	Tonnes	0	0	$0
Gravel [9]	Tonnes	380,395	332,980	$4,797,781
Limestone	Tonnes	0	5,313	$87,470
Mineral specimen	Tonnes	0.70	0.40	$73,175
Quicklime [10]	Tonnes	29,703	29,323	$7,729,445
Sand	Tonnes	499,706	460,885	$12,505,643
Soil	Tonnes	21,316	21,016	$351,981
Vermiculite	Tonnes	0	0	$0
Non-metallic minerals value	n/a			**$68,684,075**
Energy minerals				
Uranium Oxide	Tonnes	2,208	2,077	$313,671,957
Total minerals value	n/a			**$3,049,908,732**

Explanatory notes
1. Fiscal year is 1st July to 30th June.
2. Data is from production returns lodged by operators under statutory obligations.
3. Amount for quantity sold is in Australian Dollars and presumed to be the gross amount paid to the operator.
4. Data has been rounded and autosum applied.
5. Data is correct as at 31 August 2016 and may be subject to revision due to late lodgements and/or receipt of superior data.
6. Alumina and alumina hydrate will be removed from future summaries following the closure of the Gove Operations Bauxite Mine Alumina Refinery.
7. Pure gold (100%); does not include gold reported as gold dore.
8. Estimated metallic content of gold dore is 92.5% gold and 7.5% silver.
9. Average sales values have been applied to some non-metallic minerals if this information was not supplied.
10. Quicklime is derived from limestone. Processing input and output data is deemed operator commercial-in-confidence.
Source: https://dpir.nt.gov.au/mining-and-energy/mines-and-energy-publications-information-and-statistics/mineral-production-statistics

from Newmarket; Glencoe has a Mineral Resource of 704 000 t at 1.9 g/t Au, for 42 900 oz of gold.

During 2016, Thor Mining PLC sold the ***Spring Hill*** gold project, located 25 km north of Pine Creek, to private company PC Gold Pty Ltd. Spring Hill has an Indicated Mineral Resources of 4.0 Mt at 2.32 g/t Au for a contained 300 000 oz gold at a 1 g/t Au cut-off; the mineralisation remains open at depth.

PNX Metals Ltd (PNX) undertook their first drilling program at the historic ***Moline*** goldfield located 38 km east-northeast of Pine Creek. Moline comprises four key prospects hosted within the Mount Bonnie Formation: Moline, School, Tumbling Dice and Hercules. Twelve reverse circulation (RC) holes were drilled for 1497 m during November 2016. At the School prospect, high-grade gold was intersected beneath the historic open pit with a best result of 7 m at 11.89 g/t Au from 115 m. At Moline, the best intersection was 9 m at 2.57 g/t Au from 92 m; at Tumbling Dice, a broad zone of gold-zinc mineralisation was intersected with 30 m at 2.29 g/t Au and 0.70% Zn. A narrow intersection of polymetallic mineralisation at Moline (2 m at 4.66 g/t Au, 177 g/t Ag, 4.92% Zn, and 4.41% Pb from 89 m) suggests the area may have potential for mineralisation similar to the Iron Blow and Mount Bonnie gold-silver-zinc deposits. An eight hole, 602 m drilling program at the ***Langleys*** prospect near Hayes Creek intersected gold mineralisation with a best intersection of 2 m at 5.10 g/t Au; the gold mineralisation was typically narrower and lower-grade than that previously drilled at the prospect.

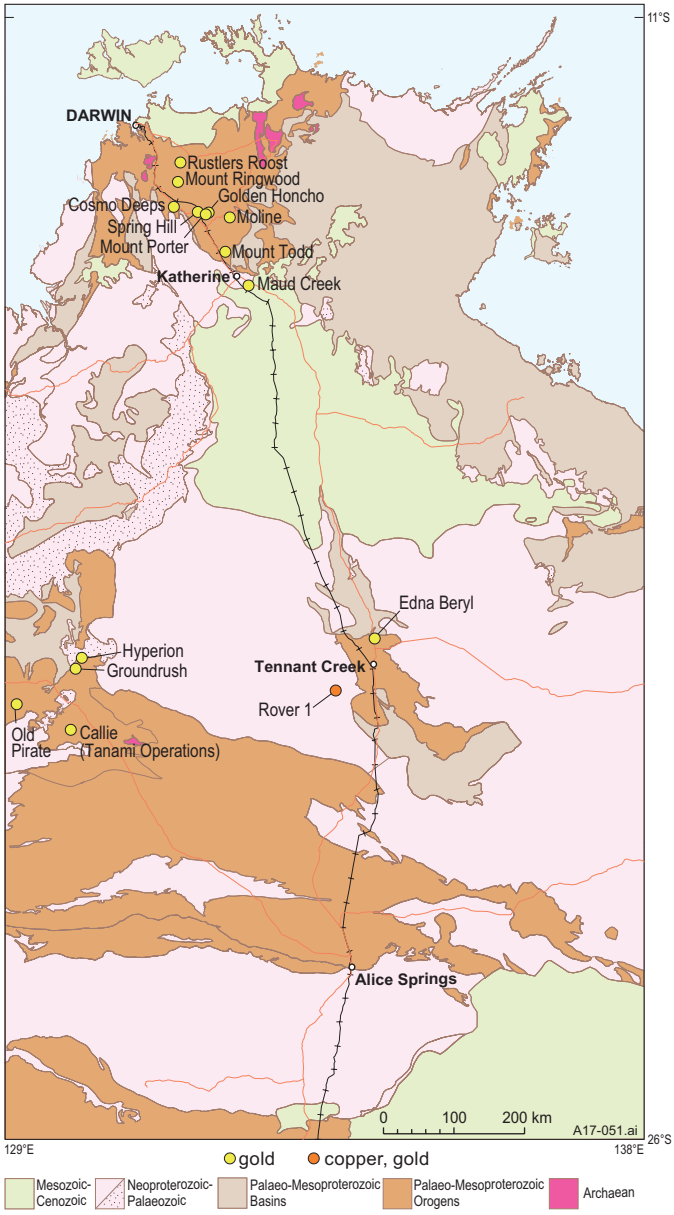

Figure 4. Location of gold and copper-gold deposits and projects mentioned in the text.

Monax Mining completed a maiden drilling program at their ***Mount Ringwood*** project with nine drillholes for 564 m. Six holes were completed at the Great Northern area, two holes at the Great Western prospect and one hole at the Star of the North area located 35 km east of Adelaide River. Best results came from the Great Northern area with 1 m at 8.6 g/t Au; anomalous gold (>0.5 g/t) was reported from most holes.

Primary Gold Ltd's ***Mount Bundey*** project, located 90 km southeast of Darwin, includes the Toms Gully, Rustlers Roost and Quest 29 deposits. In June 2016, Primary Gold announced an updated resource for the *Rustlers Roost* deposit of Indicated and Inferred Resources of 22.4 Mt at 1.1 g/t Au for 772 000 oz of gold. This forms part of a larger resource for the Mount Bundey project area of 26.9 Mt at 1.5 g/t Au for a contained 1.24 Moz of gold.

Vista Gold Corporation (Vista) continued permitting and project optimisation work at their ***Mount Todd*** project located northwest of Katherine. Mineralisation at Mount Todd is contained in a stockwork of quartz veins that are hosted within metamorphosed, interbedded siltstone, shale and minor tuff of the Burrell Creek Formation. Mineral resources at Mount Todd include Measured and Indicated Mineral Resources of 279.6 Mt at 0.82 g/t Au containing 7.40 Moz of gold, and Inferred Mineral Resources of 72.5 Mt at 0.74 g/t Au containing 1.73 Moz of gold. Proven and Probable Ore Reserves are 222.8 Mt at 0.82 g/t Au containing 5.90 Moz of gold.

Tanami–Arunta regions

Newmont Mining Corporation's (Newmont) ***Tanami Operations,*** located 550 km northwest of Alice Springs, has produced about 8 Moz of gold; it is the Territory's largest gold operation, producing 436 000 oz of gold during 2015. Mineralisation consists of high-grade gold-quartz veins in folded carbonaceous siltstone in the lower part of the Dead Bullock Formation. The operations include the flagship Callie deposit (>7.6 Moz), the Auron deposit (>3.8 Moz) and the Federation Limb deposit (>0.5 Moz). As of 31 December 2015, Proven and Probable Ore Reserves were 17.7 Mt at 5.80 g/t Au containing 3.31 Moz of gold. Additional Measured and Indicated Mineral Resources total 5.5 Mt at 5.51 g/t Au for 0.97 Moz of gold; Inferred Mineral Resources are 5.8 Mt at 6.29 g/t Au for 1.16 Moz of gold. Newmont sees potential to double the current reserve and resource base through continued expansion down-plunge of the Callie and Auron orebodies, together with further resource growth from the Federation Limb and 2015 Liberator discoveries. An expansion of the Tanami operation is underway,

including a second decline and an increase in plant capacity. The expansion is due to be completed and in full production by the second half of 2017.

In April 2016, ABM Resources NL (ABM) completed mining at their ***Old Pirate*** mine, 90 km west-northwest of Callie near the WA border. During 2016, 73 948 t of ore was processed for a recovery of 10 785 oz of gold. Total production for the life of the mine from May 2015 to April 2016 was 157 092 t ore processed at an average grade of 5.9 g/t Au for total recovered gold of 29 376 oz. Following the completion of mining, ABM announced an updated remaining Indicated and Inferred Mineral Resource for Old Pirate of 760 000 t at an average grade of 4.7 g/t Au for 114 900 oz of contained gold. When combined with the reconciled mined production, this represents a significant reduction in both tonnage and grade to the September 2014 Mineral Resource of 1.7 Mt at 11.7 g/t Au containing 640 000 oz of gold. ABM announced that they are looking at options including the potential divestment or farm out of the Old Pirate project and immediately surrounding tenure.

ABM focussed their exploration during 2016 in their Suplejack project area that includes the ***Hyperion*** deposit, which has an Inferred Resource of 2.98 Mt at 2.11 g/t Au. In June, ABM completed an 84 hole, 8460 m drilling project at Suplejack. This included 33 holes at the ***Tethys*** prospect, located about 500 m east of Hyperion on the same structural trend. Of the 33 holes, 22 returned significant gold intersections, including 17 m at 5.74 g/t Au and 7 m at 13.17 g/t Au. These results confirmed that gold mineralisation on the Hyperion trend extends over a strike length of at least 1300 m. The drilling program also intersected significant gold mineralisation at two new prospects: Pandora (9 m at 6.32 g/t Au) and Brokenwood (3 m at 9.34 g/t Au). They are located 5 and 7 km south of Hyperion respectively. A further 8 hole drilling program at Tethys in July 2016 returned multiple significant intersections in each hole, including 21 m at 3.96 g/t Au from 61 m and 14 m at 5.32 g/t Au from 67 m. A 7 hole, 1906 m drilling program in November provided information on the newly discovered Suess Breccia. This discovery lies immediately east of Tethys in a north–south striking structure containing arsenopyrite in quartz breccia; drill intersections included 13 m at 5.6 g/t Au. ABM has announced that they plan to release an update of the Hyperion-Tethys Mineral Resource in the first quarter of 2017.

During 2016, Northern Star Resources Ltd (Northern Star) continued to explore the Central Tanami project as part of a purchase and farm-in agreement with Tanami Gold NL. In January 2013, the total mineral resources for the Central Tanami project stood at 25.50 Mt at 3.2 g/t Au containing 2.63 Moz of gold. This includes the flagship ***Groundrush*** deposit with a mineral resource of 6.72 Mt at 4.8 g/t Au containing 1.04 Moz of gold. In late 2015 and early 2016, Northern Star undertook a 118 hole program at Groundrush with over 27 000 m of diamond drilling and 11 000 m of RC drilling; the program aimed at improving the confidence level of the existing resource by infill drilling down to a vertical depth of 300 m. Significant intersections included 24.6 m at 5.7 g/t Au, 2.4 m at 36.0 g/t Au and 4.2 m at 13.8 g/t Au. Northern Star are targeting a re-start of the Central Tanami project production as a +125 000 oz per annum operation. Northern Star also purchased a package of exploration licences in the Tanami from Northern Minerals Ltd and Toro Energy Ltd giving Northern Star an extensive area of exploration tenure throughout the Tanami Region.

Warramunga Province (gold-copper-bismuth)

Tennant Creek-style gold-copper orebodies are believed to have formed from mineralised hydrothermal fluids passing along shear zones and reacting with Proterozoic iron-rich sedimentary rocks of the Warramunga Formation, resulting in what are now steeply plunging, zoned, high-grade Au-Cu-Bi sulfide orebodies. Exploration for this style of orebody is focused on the historic Tennant Creek mineral field, and on the Rover field where Tennant Creek-style mineralisation occurs beneath 150–300 m of overlying Wiso Basin sedimentary rocks.

Emmerson Resources Ltd (Emmerson) continued to explore the Tennant Creek mineral field as part of a major exploration joint venture with Evolution Mining (Evolution) under which Evolution can invest up to $25 million in exploration to earn up to 75% of the project. Emmerson's exploration program in 2016 was strongly focussed on the high-grade ***Edna Beryl*** deposit, 40 km north of Tennant Creek. In March, Emmerson reported the results of underground drilling at Edna Beryl East that was conducted as part of preparation for proposed small-scale tribute mining; drilling returned high-grade intersections including 1.8 m at 309 g/t Au. The first major drill campaign for the year focussed on Edna Beryl West; results included 5 m at 27 g/t Au and 13 m at 8.7 g/t Au, and suggested that mineralisation might continue from Edna Beryl West to the high-grade Edna Beryl mine. This was followed by a second 3900 m drill campaign at Edna Beryl West, with numerous high-grade intersections including 5 m at 35.6 g/t Au from 120 m. A third program of 6500 m of diamond and RC drilling at Edna Beryl yielded bonanza intersections including 8 m at 157 g/t Au, 34.5 g/t Ag and 0.5% Cu from 146 m, and 5 m at 83.6 g/t Au and 3.1 g/t Ag from 89 m. Emmerson consider that the mineralisation at Edna Beryl is typical of the Tennant Creek field, except that it is associated with hematite rather than magnetite. The drilling has identified numerous, shallow, sub-parallel ironstones (ironstones 2, 3 and 4) bounded by steeply dipping shear zones that coalesce into a master shear (ironstone 1) at 160 m depth. In December, Emmerson planned to commence a drilling program at the ***Retsina*** prospect, located 7 km southwest of Edna Beryl; this new prospect is thought to be in an analogous structural setting with brecciated hematite ironstone and a 'near ore' geochemical signature.

In November 2016, Emmerson announced that they had entered into a Heads of Agreement with Adelaide Resources Ltd to form the Rover Farm-in and Joint Venture over Adelaide Resources' tenements in the Rover field, including the Rover 1, Rover 4 and Rover 12 copper-gold prospects. The Rover field, 70 km southwest of Tennant Creek, has strong geological similarities to the Tennant Creek field with a number of copper-gold deposits occurring under overlying sediments of the Wiso Basin. The most advanced exploration project in the Rover field is the ***Rover 1***

deposit, which straddles tenements owned by Metals X Ltd (who have the majority of the defined mineralisation) and Adelaide Resources Ltd. The deposit has Indicated and Inferred Mineral Resources of 6.8 Mt at 1.73 g/t Au, 1.21% Cu, 2.1 g/t Ag, 0.14% Bi and 0.1% Co for a contained 1.22 Moz AuEq (gold equivalent), including a high-grade gold zone of 1.32 Mt at 7.01 g/t Au and 0.81% Cu. No on-ground exploration work was reported by Metals X or Adelaide Resources in 2016

Copper, lead, zinc, silver

Arunta Region

During 2016, KGL Resources Ltd (KGL) continued exploration and assessment of the ***Jervois*** copper-silver-lead-zinc-gold project northeast of Alice Springs (**Figure 5**). Mineralisation at Jervois occurs in a series of stratabound, subvertical sulfide-rich deposits along a 12 km strike length hosted within the Bonya Metamorphics in the Aileron Province. The project has a total resource of 30.5 Mt at 1.07% Cu and 23.0 g/t Ag for 327 000 t of contained copper; this includes 10.6 Mt at 1.37% Cu at Marshall-Reward, and 5.4 Mt at 1.62% Cu at Bellbird at a 0.75% Cu cut-off. The existing lead-zinc resource is 3.8 Mt at 3.7% Pb, 1.2% Zn, 0.72% Cu and 67.5 g/t Ag. Drilling of shallow mineralisation at the Green Parrot deposit in early 2016 intersected very high grade lead and zinc mineralisation including 7 m at 27.24% Pb, 13.01% Zn, 3.15% Cu, 333.1 g/t Ag and 0.07 g/t Au from 39 m. For the remainder of 2016, exploration focussed on newly discovered high grade chalcopyrite mineralisation at the Rockface Prospect. The drilling program at Rockface demonstrated the utility of down-hole electromagnetic (DHEM) surveys in identifying numerous conductors associated with massive, semi-massive and veined chalcopyrite-pyrite mineralisation within altered magnetite-garnet rich host rock (**Figure 6**). Drilling programs targeting Conductor 3 at Rockface intersected 14 m at 8.89% Cu, 38.5 g/t Ag and 0.38 g/t Au from 435 m; 10.5 m at 8.76% Cu, 42.9 g/t Ag and 0.51 g/t Au from 478 m; and 9.4 m at 11.53% Cu, 56.6 g/t Ag and 0.87 g/t Au from 535 m. Drilling of Conductor 5 intersected 15 m at 7.11% Cu, 29.4 g/t Ag and 0.89 g/t Au from 558 m and 10.05 m at 8.99% Cu, 45.5 g/t Ag and 0.6 g/t Au from 645 m. KGL have reported that the goal of finding larger, high grade resources at Rockface may now be achievable; they also note that a number of DHEM conductors, including the strongest conductor identified to date, remain untested.

Independence Group NL continued their greenfields exploration in the remote southwestern Aileron Province targeting polymetallic mineralisation as part of the Lake Mackay exploration alliance with ABM. This followed the 2015 discovery of polymetallic copper-silver-gold-zinc mineralisation at the ***Bumblebee*** prospect located 54 km northeast of Kintore. Discovery intersections from 2015 included 7 m at 3.2% Cu, 3.3 g/t Au, 37.7 g/t Ag, 0.9% Pb, 1.3% Zn and 0.08% Co from 30 m. Four diamond and three RC holes for a total of 1135 m were drilled at Bumblebee in the first half of 2016 to test a strong electromagnetic conductor that coincided with the 2015 discovery intersections. The conductor was found to be associated with an extensive

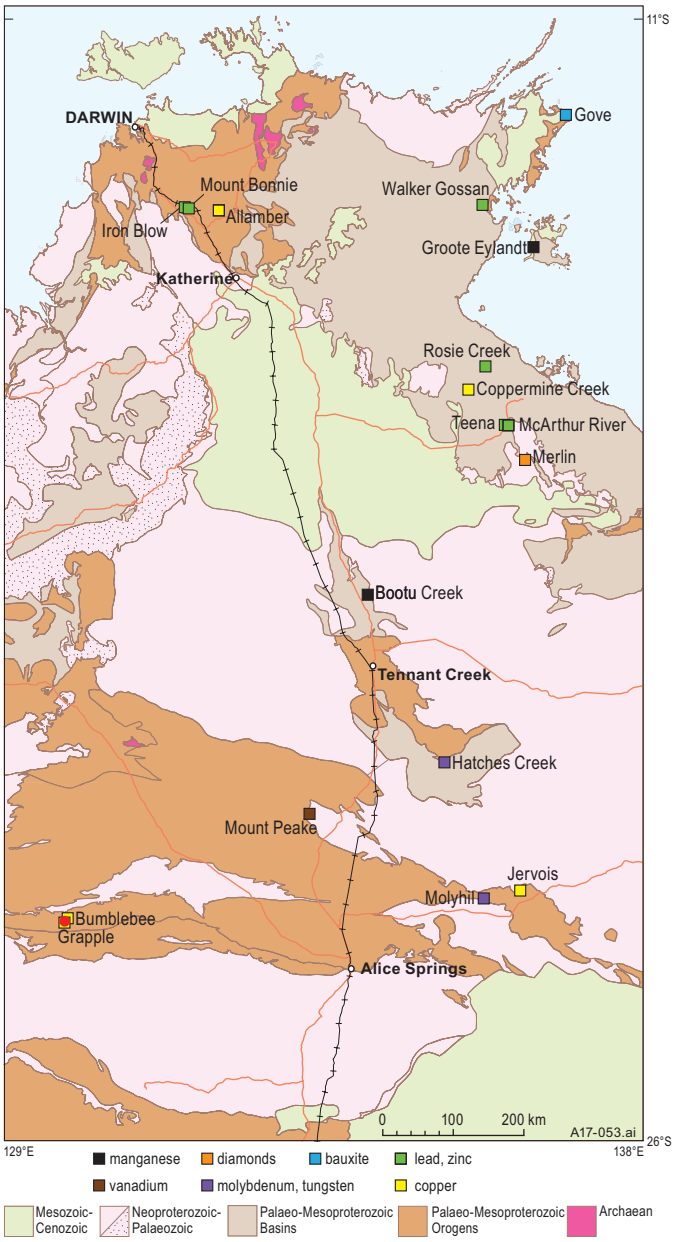

Figure 5. Location of copper, lead-zinc-silver, diamond, manganese, tungsten-molybdenum, vanadium and graphite deposits and projects mentioned in the text.

Figure 6. High-grade chalcopyrite mineralisation from the Rockface prospect, Jervois. Source: KGL Resources ASX Announcement, 13 December 2016.

pyrrhotite-rich zone intercepted in the deeper holes. Low tenor base metals mineralisation including chalcopyrite, sphalerite and galena was logged in all seven holes, with narrow higher grade intercepts including 1 m at 3.74 g/t Au and 1.07% Cu with anomalous Ag, Co, Pb and Zn. Independence Group interpret the Bumblebee prospect as a modified volcanogenic massive sulfide (VMS) system. A subsequent 18 hole RC drilling program was undertaken in the project area in November 2016; this program included 11 holes at the ***Grapple*** Prospect. Significant mineralisation was intersected in 8 holes at Grapple, with best intersections of 6 m at 8.98 g/t Au, 23.5 g/t Ag, 1.45% Cu, 1.40% Zn, 0.26% Pb and 0.15% Co from 38 m; 9 m at 1.8 g/t Au, 49.1 g/t Ag, 3.26% Cu, 3.63% Zn, 1.09% Pb and 0.26% Co from 85 m; and 9 m at 5.23 g/t Au, 12.8 g/t Ag, 1.40% Cu, 0.57% Zn, 1.09% Pb and 0.26% Co from 85 m. Mineralisation consists of pyrrhotite, pyrite, chalcopyrite, sphalerite, and galena matrix sulfides within a sedimentary rock package that is in close proximity to low-K tholeiitic amphibolites of the Dufaur Suite. In addition, 3 holes were drilled at the Springer prospect and 4 holes at the Prowl prospect; assays are pending.

Pine Creek Orogen

PNX Metals Ltd (PNX) completed a scoping study and further exploration and resource drilling at their ***Hayes Creek*** project, which comprises the Iron Blow and Mount Bonnie polymetallic gold-silver-zinc deposits in the basal Mount Bonnie Formation and Gerowie Tuff of the Pine Creek Orogen. In early 2016, PNX announced a maiden resource for *Mount Bonnie* of 1.3 Mt at 4.2% Zn, 1.3 g/t Au, 133 g/t Ag, 1.3% Pb, and 0.3% Cu. The nearby *Iron Blow* deposit has an existing resource of 2.6 Mt at 2.4 g/t Au, 130 g/t Ag, 4.8% Zn, 0.9% Pb and 0.3% Cu. In March 2016, PNX released results of a scoping study based on a 7 year mine producing zinc concentrate and gold-silver doré from both open pit and underground operations. A 27 hole infill and extensional drilling program was undertaken at Mount Bonnie in 2016; the drilling intersected high-grade zones including 6 m at 4.80 g/t Au, 236 g/t Ag, 12.56% Zn, 1.91% Pb and 0.69% Cu. The drilling also identified a near-surface southerly extension to mineralisation, including an upper gold-silver-lead oxide zone (6 m at 2.61 g/t Au, 345 g/t Ag, 0.22% Zn, 3.20% Pb and 0.40% Cu from 3 m) and a lower zinc and gold rich sulfide zone (10 m at 2.22 g/t Au, 21 g/t Ag, 4.86% Zn, 0.27% Pb and 0.51% Cu from 46 m). On the basis of 2016 drilling, the Mount Bonnie Mineral Resource was upgraded to 1.55 Mt at 3.8% Zn, 1.34 g/t Au, 127 g/t Ag, 1.1% Pb, and 0.2% Cu with 90% of the Resource in the Indicated category. The first diamond hole from a planned 32 hole, 3500 m drilling program at the Iron Blow deposit intersected high grade mineralisation including 11 m at 15.78% Zn, 6.32 g/t Au, 343 g/t Ag, 3.42% Pb and 0.55% Cu from 139 m. A prefeasibility study is underway for the Hayes Creek project.

Thundelarra Exploration Ltd undertook a five hole, 863 m drilling program at their ***Allamber*** project located north of Pine Creek. At the *Ox-Eyed Herring* prospect, a zone of massive sulfides comprising pyrrhotite with blebs of chalcopyrite and thin zones of quartz breccia with chalcopyrite yielded an intersection of 9 m at 1.21% Cu, with elevated silver, bismuth, tin and tungsten.

McArthur Basin

The ***McArthur River*** mine, situated about 70 km southwest of Borroloola in the McArthur Basin, is operated by McArthur River Mining Pty Ltd (MRM), a subsidiary of Glencore. At 31 December 2015, the McArthur River mine had total Reserves and Resources of 180 Mt at 9.9% Zn, 4.7% Pb and 48 g/t Ag, including Ore Reserves of 102 Mt at 10% Zn, 4.9% Pb and 49 g/t Ag. During 2015, MRM produced 272 700 t of zinc, 53 000 t of lead and 1.72 Moz of silver. The very fine-grained, thinly bedded sulfide ore is hosted in the HYC Pyritic Shale Member of the Barney Creek Formation.

A maiden resource was announced in June 2016 for the ***Teena*** zinc deposit, part of the ***Reward*** project located 10 km west of the McArthur River mine. Teena was discovered in 2013 by a Teck Australia–Rox Resources joint venture. Fourteen holes were drilled for 14 679 m from 2013–2015 (**Figure 7a**). The maiden Inferred Mineral Resource at Teena is 58 Mt at 11.1% Zn and 1.6% Pb for 6.5 Mt of zinc and 0.9 Mt of lead metal (at a 6% Zn+Pb cut-off). The resource is divided into a thicker and higher grade Upper Lode (45 Mt at 12.0% Zn, 1.8% Pb) and a Lower Lode (14 Mt at 8.2% Zn, 1.2% Pb). The mineralisation occurs as finely laminated sphalerite-galena mineralisation within carbonaceous shales and calcareous siltstones of the Barney Creek Formation in a similar style to McArthur River. The Barney Creek Formation at Teena is interpreted to have been deposited within a local half-graben related to the steeply south-dipping Jabiru Fault (**Figure 7b**); the half-graben is interpreted be a basin growth fault and possibly the fluid pathway for the migration of lead-zinc mineralising fluids into the Teena Sub-basin. Several phases of mineralisation have been observed ranging from near-syngenetic depositional to late stage hot influx events during diagenesis and remobilisation and replacement related to basin inversion. In late 2016, Rox announced that Teck was purchasing Rox's share of the joint venture, and would take on 100% ownership of the Reward project including Teena. No further drilling was reported at Teena in 2016.

During 2016, Pacifico Minerals Ltd (Pacifico) undertook a 17 hole, 2477 m RC drilling program at their Borroloola West JV with Sandfire Resources NL (Sandfire). At the ***Coppermine Creek*** prospect, 100 km northwest of McArthur River, stratabound copper, cobalt and silver mineralisation occurs associated with an interpreted evaporate bed in the Amelia Dolostone. One hole was drilled at Coppermine Creek and intersected 10 m at 1.3% Cu and 8 g/t Ag from 35 m in a zone of quartz-dolomite veining. The outcrop length of the mineralisation is 700 m. Pacifico believe there is potential for a large volume of low grade stratabound Mount Isa/Nifty-style copper mineralisation, within which there may be localised higher grades. At the ***Mariner*** prospect, 12 km south of Coppermine Creek, oxidised lead mineralisation occurs at the base of the Roper Group where it is interpreted to have been remobilised form the underlying McArthur Group. Four holes were drilled at Mariner with a best intersection of 6 m at 2.4% Pb. A total of eight holes

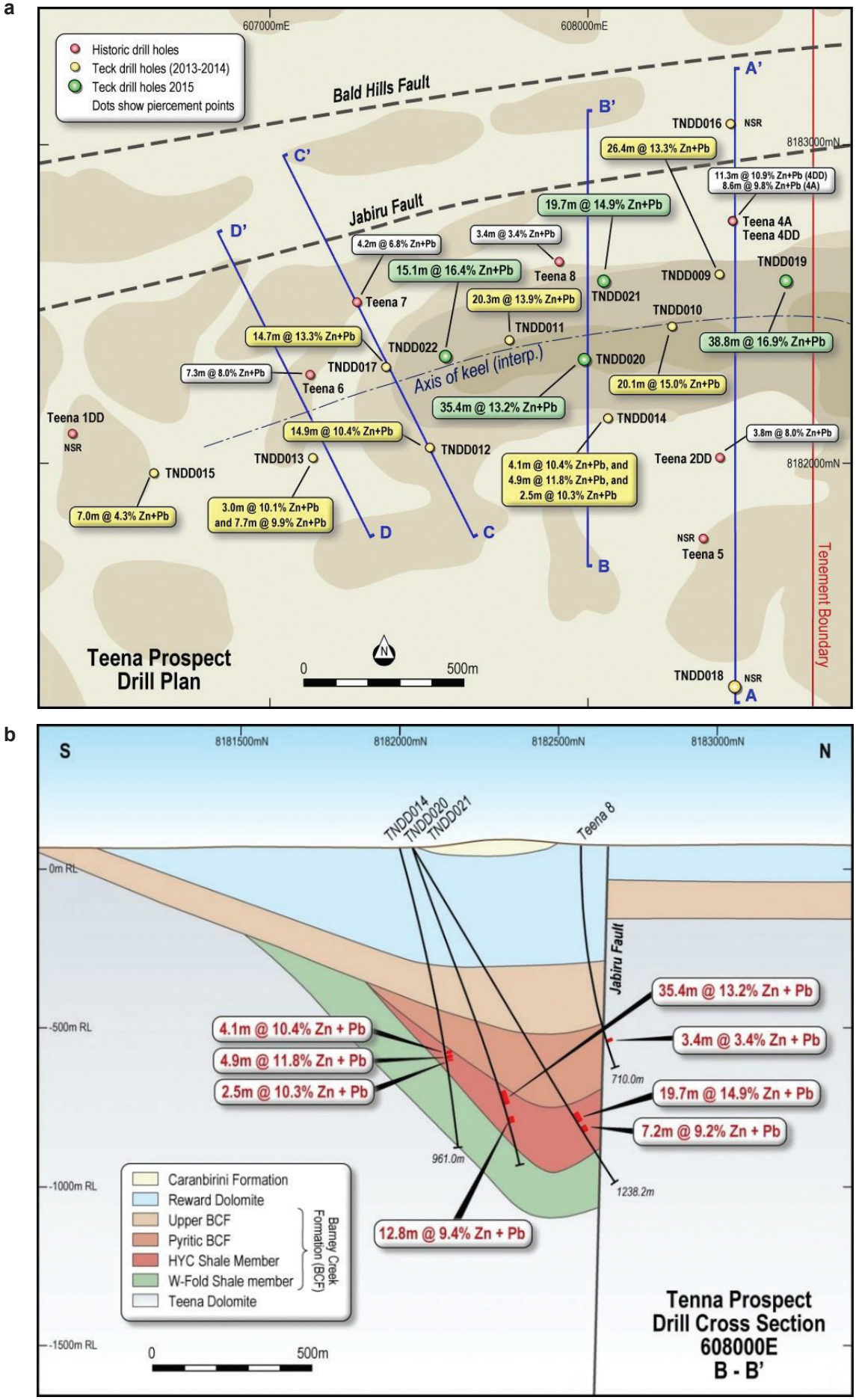

Figure 7. Teena zinc deposit. **(a)** Drill plan; **(b)** Schematic cross section for section B-B' on drill plan. Source: Rox Resources ASX Announcement, 1 June 2016.

were drilled into carbonaceous and pyritic Barney Creek formation at their Berjaya and Four Mile prospects, but no significant base metals mineralisation was reported.

MMG Exploration Pty Ltd (MMG) continued to explore in the Batten Fault Zone area in the McArthur Basin both under their North Batten JV with Sandfire and on their own tenure. During 2016, MMG undertook a 7 hole drilling program following an airborne gravity survey flown early in the year. This included drillholes at the ***Rosie Creek*** prospect, and one at their ***Berjaya NW*** prospect near McArthur River that intersected minor zinc mineralisation in favourable stratigraphy.

Canadian-listed GPM Metals Inc (GPM) undertook its maiden drilling program at ***Walker Gossan*** project in eastern Arnhem Land as part of a joint venture with Rio Tinto Exploration Pty. Ltd. GPM drilled seven diamond holes for 953 m along 3200 m of strike length targeting SEDEX-style base metals mineralisation. The initial target area was based on encouraging surface geochemistry with soil and chip sample results of anomalous Pb, including a 1400 m long contour of plus 500 ppm Pb with a maximum of 2800 ppm Pb in soils, and rock chips containing up to 1.8% Pb. The drillholes tested an iron and silica altered carbonate unit (the 'gossan') hosted in the Balbirini Formation; they also intersected a carbonaceous siltstone and basal sandstone further down sequence from the gossan that unconformably overlies the Jalma Formation. Stratigraphic thickness from the top of the ferruginous dolostone to the basal unconformity is about 35 m. GPM reported that the presence of pyritic, carbonaceous siltstones and base metals mineralisation was confirmed by the drilling; assays were consistent with surface geochemical sampling and are typical of a sulfur-poor outflow zone of a SEDEX style base metals system. GPM consider that the intense sideritic (iron carbonate) alteration observed and the presence of pyritic carbonaceous sediments in the Balbirini and Jalma formations supports the prospectivity of the area. In November 2016, GPM announced that a second phase of RC drilling had commenced to infill the wide spaced diamond drill pattern and to test a combined magnetic and gravity anomaly located farther northwest that has been interpreted to be a basin margin fault and a potential conduit for mineralising fluids.

Diamonds

Merlin Diamonds Ltd's ***Merlin*** project in the McArthur Basin comprises 14 kimberlite pipes of which nine were mined by open cut between 1998 and 2003 producing 507 000 ct of diamonds. The 2014 combined Probable Ore Reserve for all diamond pipes at Merlin is 2.02 Mt at 0.15 carats per tonne (ct/t) for a total of 0.61 Mct. The Indicated and Inferred Mineral Resource is 27.8 Mt at 0.16 c/t for a total of 4.35 Mct. In October 2016, Merlin announced that they had recommenced small-scale operations at the mine with processing of stockpiled material and mining of 16 000 t of ore from the Kaye open pit. At the end of November, 38 000 t of ore had been processed. Diamond recovery included a 35.26 ct brown diamond (the fifth largest diamond discovered in Australia) and a 14.6 ct brown diamond, as well as a number of smaller white diamonds and a small blue diamond. No regional diamond exploration was reported.

Bauxite and alumina

Rio Tinto Ltd operates the ***Gove*** bauxite mine and alumina refinery in northeastern Arnhem land, which has been in production since 1971. Bauxite at Gove occurs in deeply lateritised, dissected plateau remnants overlying the Cretaceous Yirrkala Formation. At the end of 2015, the Gove operation had Proven and Probable Ore Reserves of 145 Mt at 49.4% Al_2O_3, with additional Measured, Indicated and Inferred Mineral Resources of 46 Mt at 49.3% Al_2O_3. During 2016, the Gove operation produced 9.09 Mt of bauxite. On the Dhupuma Plateau, immediately south of the Gove mineral lease, Gulkula Mining Company Pty Ltd were granted a mining lease in January 2017 for a bauxite mining operation associated with a Mining Training Centre for local Indigenous people with the support of Rio Tinto.

Iron ore

All iron ore operations in the Northern Territory remained in care and maintenance during 2016 due to relatively low iron ore prices. No significant iron ore exploration was reported.

Manganese

Oolitic and pisolitic material in Mesozoic sedimentary rocks on ***Groote Eylandt*** in the Gulf of Carpentaria forms one of the world's highest-grade manganese deposits with total mineral resources of 159 Mt at 44.1% Mn. The mineralisation is a stratiform sedimentary deposit in shallow marine Cretaceous sediments. It was discovered in 1960 and has been continuously mined by the Groote Eylandt Mining Company (GEMCO) since 1966. GEMCO is majority owned by South32 Ltd. Production from Groote Eylandt in 2015–16 totalled 5.11 Mt of manganese ore. A $US139 million Premium Concentrate Ore (PCO2) project was completed in June 2016, raising production capacity by 0.5 Mt to 5.3 Mtpa. Also in June, South32 obtained consent from the Anindilyakwa Land Council to access the Eastern Leases and the Southern Areas. The Eastern Leases will enable the company to mine new areas within their existing operating footprint; access to the Southern Areas will substantially increase the company's exploration footprint on Groote Eylandt.

A second manganese mine in the NT is hosted in Proterozoic rocks at ***Bootu Creek***, 110 km north of Tennant Creek. OM Manganese Ltd began mining operations at Bootu Creek in November 2005. At 31 December 2014, the Total Reserves and Resources for Bootu Creek were 20.5 Mt at 22.24% Mn. In December 2015, OM announced that it was temporarily suspending mining operations at Bootu Creek due to the fall in manganese price, but that it aimed to recommence operations when market conditions improve. In January 2016, OM Manganese entered voluntary administration, and subsequently came out of

administration in August 2016. No mining was conducted during 2016.

Tungsten (-molybdenum)

Thor Mining PLC continued to pursue options for development of the ***Molyhil*** molybdenum-tungsten project located near the Plenty Highway northeast of Alice Springs within the Arunta Region. Molyhil is a skarn-related scheelite-molybdenite-magnetite deposit. It has a mineral resource of 4.71 Mt at 0.28% WO_3, 0.22% MoS_2 and 18.1% Fe, most of which is in the Indicated category, with an open cut Probable Ore Reserve of 3.0 Mt at 0.31% WO_3 and 0.12% MoS_2. During 2016, the company drilled 65 short holes, up to 18 m in depth, to sample bedrock beneath shallow alluvium in five target areas within 6 km of Molyhil. Prospective host rocks (skarn and calc-silicate, with proximal granite) were confirmed to exist under shallow alluvial cover in three tested prospects (Cattle Track, Gap Track, and Think Big), with anomalous tungsten intersected at Cattle Track and Gap Track.

In 2016, GWR Group Ltd took ownership of the historic ***Hatches Creek*** tungsten field in the Davenport Province. The field contains numerous underground mines that were mined between 1915 and 1957 exploiting quartz veins containing wolframite with lesser scheelite, bismuth and copper oxides. Surface stockpiles of historically mined material have an Inferred Resource of 225 066 t at 0.58% WO_3 for 1311 t WO_3. During 2016, GWR undertook a program to sample previously untested waste dumps; 128 of the 138 samples assayed returned tungsten results of greater than 0.10% WO_3, with 12 samples returning tungsten results higher than 1.0% WO_3. At the Copper Show prospect, four samples assayed high-grade tungsten (up to 3.47% WO_3) and copper (up to 3.7% Cu). In November 2016, GWR undertook an 18 hole, 1739 m RC drilling program at the Pioneer, Copper Show, Hit or Miss and Treasure prospects; assays are pending.

Vanadium-titanium-iron

TNG Limited's ***Mount Peake*** project, located 60 km west-southwest of Barrow Creek, is a vanadium-titanium-iron prospect hosted in the Mount Peake Gabbro in the northern Arunta Region. It contains Measured, Indicated and Inferred Mineral Resources of 160 Mt at 0.28% V_2O_5, 5.3% TiO_2 and 23.0% Fe; and a Probable Ore Reserve of 41.1 Mt at 0.42% V_2O_5, 7.99% TiO_2 and 28.0% Fe at a cut-off grade of 15% Fe. Following a Definitive Feasibility Study released in 2015, activities in 2016 largely focussed on project optimisation, securing offtake agreements, regulatory approvals and project financing.

Magnesite

A number of high-grade magnesite (magnesium carbonate) deposits occur near Batchelor in the Pine Creek Orogen (**Figure 8**) where they form as stratabound bodies within the Celia and Coomalie dolostones. The most notable are ***Winchester*** (Korab Resources Ltd) with Indicated and Inferred Mineral Resources of 16.6 Mt at 43.2% MgO and ***Huandot*** (Thessaly Resources Pty Ltd), 7 km northeast of Winchester, with Indicated and Inferred Mineral Resources of 9.1 Mt at 44.3% MgO. Both companies are investigating potential development options. No substantial on ground exploration was reported during 2016.

Mineral sands

In September 2016, Australian Abrasive Minerals Pty Ltd announced that they had reached the production phase of development of the ***Harts Range*** garnet sand deposit (formerly known as Spinifex Bore) located near Harts Range community, 170 km northeast of Alice Springs. No resource has been publicly announced for the deposit, but the company has stated that the reserves would support a 29 year mine life at full production, with potential for significant additional resources. The project involves

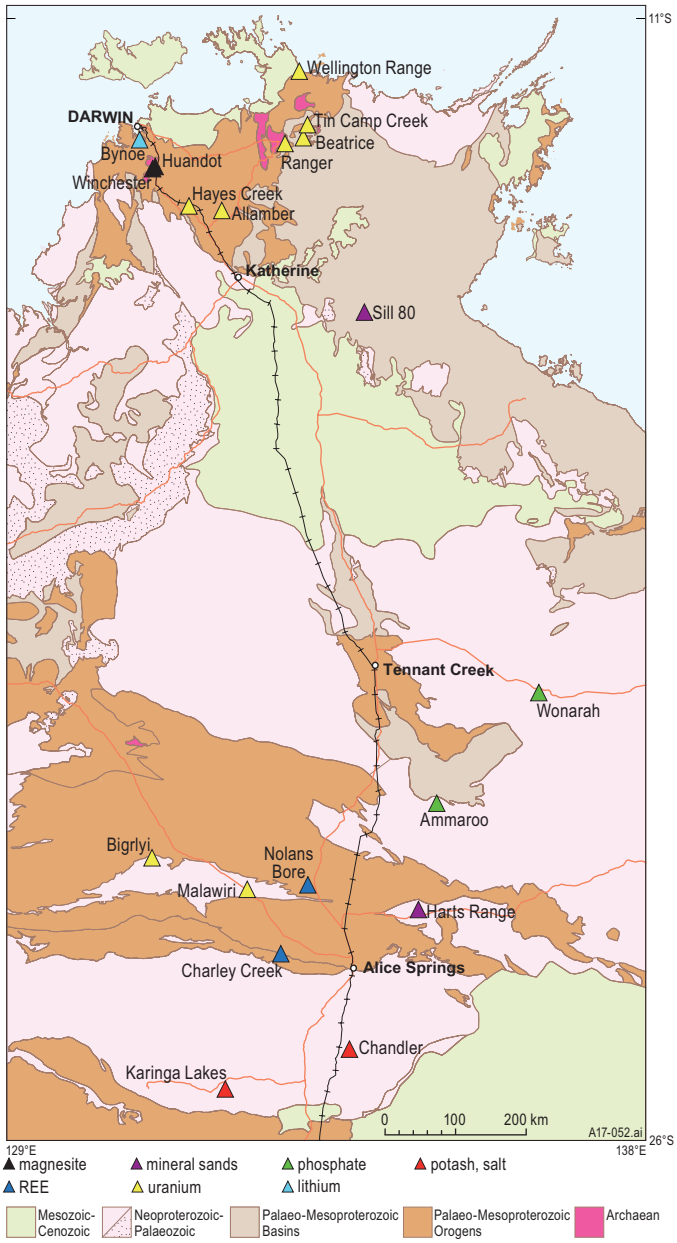

Figure 8. Location of magnesite, mineral sands, rare earths, lithium, phosphate, potash, salt and uranium deposits and projects mentioned in the text.

open cut mining with an onsite processing wet screening plant to produce concentrate, and dry magnetic and electrostatic separation. The final product is trucked to Alice Springs and transferred to the Adelaide–Darwin railway. Australian Ilmenite Resources Pty Ltd also undertook exploration at the ***Sill 80*** ilmenite prospect in the Roper region where ilmenite occurs in surficial cover overlying sills of Derim Derim Dolerite; no results have been publicly announced.

Rare earth elements

Arafura Resources Ltd (Arafura) continued feasibility and project optimisation studies on the ***Nolans*** rare earth elements (REE) project located in the Reynolds Range, 135 km northwest of Alice Springs. Measured, Indicated and Inferred Mineral Resources total 56 Mt at 2.6% rare earth oxides (REO), 11% P_2O_5 and 0.02% U_3O_8 containing 1.46 Mt of REO. The Probable Ore Reserve for Nolans is estimated at 24 Mt at 2.8% REO, 12% P_2O_5 and 0.02% U_3O_8. Nolans is a hydrothermal, stockwork vein-style REE deposit hosted in metasedimentary and igneous rocks of the Aileron Province of the Arunta Region. During 2016, Arafura announced a number of project improvements and efficiencies, including the addition of phosphoric acid as an additional revenue source, and a reduction in planned annual production to 14 000 t total REO including 3601 t of neodymium-praesodymium (NdPr) oxide.

Crossland Strategic Metals Ltd undertook test work at its ***Charley Creek*** alluvial rare earths project, located 120 km west of Alice Springs. The resource is contained within unconsolidated alluvial outwash, sourced largely from the Teapot Granite Complex in the Warumpi Province to the south. The deposit includes an Indicated Mineral Resource of 387 Mt at 295 ppm TREO and an Inferred Mineral Resource of 418 Mt at 289 ppm TREO, hosted in xenotime and monazite. During 2016, Crossland assayed 341 samples from resource drilling conducted in 2013.

Lithium

One of the highlights of exploration in the NT during 2016 was an unprecedented level of exploration for lithium following a substantial increase in global lithium prices. Most exploration was focussed in the ***Bynoe*** pegmatite field, 20–50 km south-southwest of Darwin where potentially economic grades of lithium were discovered in multiple pegmatite bodies during 2016. Lithium mineralisation in the Bynoe region occurs as spodumene (**Figure 9**) in north-trending pegmatites up to 40 m in width along a 30 km north-trending corridor. The most aggressive exploration program was by Core Exploration Ltd (Core) who commenced drilling at their Finnis project in late August and by the end of 2016 had completed two phases of RC drilling (66 holes for 8209 m), four diamond drillholes for 475 m, 354 shallow RAB holes for 2066 m and 238 aircore holes for 2325 m. Core's maiden drilling campaign intersected high-grade spodumene mineralisation including 34 m at 1.60% Li_2O from 71 m at the BP33 prospect, and 49 m at 1.78% Li_2O from 71 m at the Grants prospect. Follow-up drilling at other prospects resulted in further high-grade intersections including 45 m at 1.57% Li_2O from 62 m (including 8 m at 2.48% Li_2O) at the Far West North prospect. The most intensive drilling by Core was at Grants where Core reported continuity of high grade spodumene mineralisation in drilling over 250 m in length and up to 30 m in true width, with mineralisation open at depth to at least 200 m.

In July 2016, Liontown Resources Ltd (Liontown) undertook their maiden drilling program in the Bynoe field with 21 RC holes drilled for 2170 m. Results included intersections of 16 m at 1.1% Li_2O from 52 m at BP33 (north of their tenement boundary with Core) and 42 m at 1.0% Li_2O from 93 m at Sandras. A follow-up drilling program of 34 holes for 3750 m tested 15 prospects; the best intersection was 27 m at 1.1% Li_2O from 94 m at Sandras.

Kingston Resources Ltd (Kingston) also have tenure in the Bynoe pegmatite field, and undertook soil geochemistry

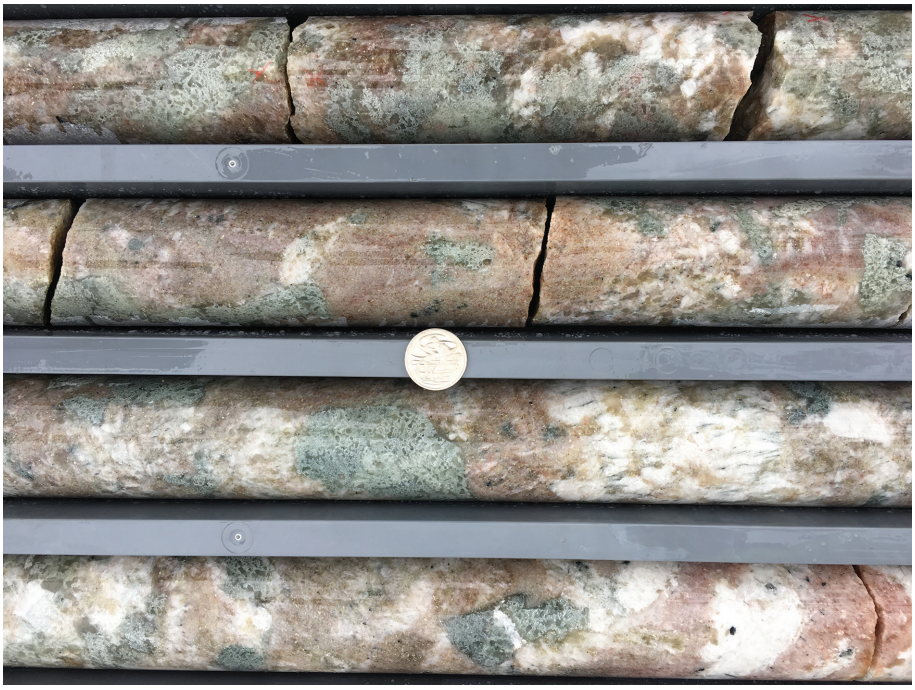

Figure 9. Coarse grained spodumene (green minerals) in pegmatite from drill core at the Grants prospect, Bynoe field (photo courtesy of Core Exploration Ltd).

that has defined drill targets to be tested in the 2017 dry season.

In early 2017, Core, Liontown and Kingston collaborated in a 2234 line km, 385 km^2 airborne magnetic and radiometric survey over the Bynoe field at 50 m line spacing.

A number of companies including Core and Kingston have applied for or acquired exploration tenure for lithium exploration in the Aileron Province of the Arunta Region in central Australia, particularly targeting known tin- and tantalum-bearing pegmatite fields that have never been tested for their lithium potential. No on-ground exploration in this area has been reported to date.

Graphite

As part of base metals exploration at the North Brumby prospect at their ***Allamber*** project north of Pine Creek, Thundelarra Exploration Ltd (Thundelarra) drilled a thick carbonaceous shale package between the quartz arenite of the Masson Formation and a granitic batholith. The stratigraphic horizon shows strong local continuity and according to Thundelarra, has significant potential for graphite. Petrology carried out on several samples showed an average graphite flake size of about 70 microns. Drill core was cut and sampled in selected lengths of 10 cm to 25 cm to determine an indication of the tenor of the graphite mineralisation. Samples were taken from 61.5 m downhole depth across the sequence to 246.6 m downhole depth; the 18 samples delivered total graphitic carbon grades averaging 11.5% within a range of 5.6% to 17.4%

Phosphate

Verdant Minerals Ltd (Verdant), formerly Rum Jungle Resources Ltd, commenced a bankable feasibility study (BFS) for their ***Ammaroo*** phosphate project located in the southern Georgina Basin about 80 km east of Barrow Creek. The Ammaroo deposit has Measured, Indicated and Inferred Mineral Resources of 1.145 Bt at 14% P_2O_5 (at 10% P_2O_5 cut-off) or 348 Mt at 18% P_2O_5 (at 15% cut-off). The BFS will focus on the development of a surface mining operation and a flotation beneficiation facility and associated infrastructure with a maximum annual capacity of 2 Mt of export quality phosphate rock concentrate (30% P_2O_5). During 2016, Verdant drilled 201 RC holes for 4885 m to convert inferred mineral resources to indicated category and to enable mine planning at a BFS level of accuracy for the shallow, lower-cost part of the resource that contains low iron-content phosphate. An additional 29 diamond core holes were drilled for geochemical, bulk density and metallurgical sampling of the proposed mining area.

Avenira Ltd operates the ***Wonarah*** phosphate project located close to the Barkly Highway. Wonarah has Measured, Indicated and Inferred Mineral Resources of 842 Mt at 18% P_2O_5 (at 10% P_2O_5 cut-off) comprising 707 Mt in the Main Zone and 135 Mt in the Arruwurra deposit. No on-ground work was reported in 2016 as the company awaited the commercial validation of the Improved Hard Process (IHP) owned by JDC Phosphate Inc. Avenira hope to utilise the IHP at Wonarah to produce superphosphoric acid at around 70% P_2O_5 with a by-product of usable inert spent pellets.

Potash

The Territory's only advanced potash project is Verdant's ***Karinga Lakes*** project located between Erldunda and Curtin Springs, 200–300 km southwest of Alice Springs. The project area contains hundreds of salt lakes representing the eastern extension of the Lake Amadeus system. Measured, Indicated and Inferred Mineral Resources at Karinga Lakes are 8.4 Mt K_2SO_4 at an average resource thickness of 17 m contained beneath 25 lakes with a total area of 132 km^2. The average potassium grade in the resource is 4760 mg/l (at 3000 mg/l cut-off). Two distinct aquifers are present: one contained in unconsolidated near-surface lake sediments and the second hosted in siltstone and sandy interbeds of the Devonian Horseshoe Bend Shale of the Finke Group (Amadeus Basin). During 2016, Verdant announced the completion of stage one of a prefeasibility study on the project. They also announced the results of an 11 hole, 1574 m RC drilling program that was undertaken in late 2015 to test of deeper brine around the edges of selected salt lakes. These were drilled to an average depth of 143 m and a maximum depth of 200 m. Previous drilling had generally targeted the top 15–30 m from surface so the top 12–30 m was cased off to ensure only deeper brines were sampled and flow tested. Five holes successfully flowed brine below the collar, four of which had levels significantly above the 3000 mg/L cut-off for the existing resources. No further on-ground work was reported.

Salt

Tellus Holdings Ltd (Tellus) continued to progress plans to develop an underground rock salt mine at their ***Chandler*** project located near Titjikala in the Amadeus Basin, 120 km south of Alice Springs. The business model is based on the usage of the voids from salt mining for the storage, recovery and permanent isolation of waste, and for equipment and archive storage. The project is focussed on a halite resource within a flat-lying, extensive evaporite unit (in excess of 200 m thick) within the Cambrian Chandler Formation (**Figure 10**). The deposit contains a Measured Mineral Resource of 309 Mt NaCl, plus Indicated and Inferred Mineral Resources of 1.128 Bt NaCl and 3.103 Bt NaCl respectively, at an average halite grade of 88.6%. There are individual layers of high grade halite (~98%). The total thickness of the deposit varies between 220–261 m. In October 2016, Tellus lodged a draft Environmental Impact Statement for the Chandler project.

Uranium

The ***Ranger*** uranium deposit is hosted in the lower Cahill Formation in the Pine Creek Orogen close to the structural contact with the underlying Archaean Nanambu Complex. The Ranger mine has been in production since 1981. During 2016, Energy Resources of Australia Ltd (ERA) produced 2351 t of uranium oxide, a 17% increase from 2015. All

production was from stockpiles from the Ranger 3 open pit, which is now backfilled and being used as tailings facility. At the end of 2015, Ore Reserves at Ranger (entirely within stockpiles from Ranger 3 pit) are 10 Mt at 0.081% U_3O_8 for 8081 t of U_3O_8 (at 0.06% U_3O_8 cut-off). There are also Mineral Resources (in stockpiles and in Ranger 3 Deeps) of 50.18 Mt at 0.11% U_3O_8 for 55 971 t of U_3O_8. In addition, the Ranger 3 Deeps deposit, currently in care and maintenance, has a Mineral Resource of 19.58 Mt at 0.224% U_3O_8 for 43 858 t of contained U_3O_8. No exploration was undertaken in 2016.

Western Arnhem Land continued to be an important focus for uranium exploration in the NT in 2016. Cameco Australia Pty Ltd (Cameco) conducted a significant exploration program in their ***Wellington Range*** project area located near the north coast of western Arnhem Land. No exploration results have been publicly released from their 2016 program, but results from co-funded drilling in 2015 under the Geophysics and Drilling Collaboration were open filed during the year. The four co-funded holes were drilled at four different prospects under Cenozoic and/or Cretaceous cover. At the Emu prospect, three intervals of anomalous uranium were intersected, including 0.5 m at 0.12% U_3O_8; at Condor South, Cameco identified what is interpreted to be prospective Ranger Mine stratigraphy with anomalous uranium under 200 m of Cretaceous cover.

Alligator Energy Ltd (Alligator) continued exploration at their ***Beatrice*** and ***Tin Camp Creek*** project areas in western Arnhem Land. Work in 2016 targeted the 'Violet-Orion Zone', a 40 km zone of uranium mineralisation, anomalism and pathfinder elements that stretches across the Beatrice and Tin Camp Creek tenements. Alligator utilised uranium decay pathfinder element sampling of covering sandstone in an attempt to define the footprint of large, concealed, unconformity uranium deposits. This technique, in combination with geophysical interpretation to identify basement conductors, has identified two main targets (TCC4 and BC12) for follow-up exploration.

Energy Metals Ltd (Energy Metals) have uranium projects in the Ngalia Basin in central Australia, including ***Bigrlyi*** uranium deposit with a total Indicated and Inferred Mineral Resources of 7.5 Mt at 0.13% U_3O_8 and 0.12% V_2O_5 (at a 500 ppm U cut-off) for a contained 9600 t of U_3O_8 and 8900 t of V_2O_5. During 2016, Energy Metals undertook a four hole, 840 m drilling program and associated passive seismic survey at the ***Malawiri*** project area in the eastern Ngalia basin, both of which were co-funded by NTGS under the Geophysics and Drilling Collaborations program. The aim of the program was to better understand the undercover geology of the poorly explored eastern Ngalia Basin and to assist in exploring for buried uranium deposits of a similar style to Malawiri and Minerva prospects. A hole drilled 3.5 km north of the Malawiri prospect intersected several intervals of uranium mineralisation within reduced Mount Eclipse Sandstone including 3.3 m at 198 ppm eU_3O_8 from 137 m. One hole was drilled at the Malawiri prospect and intersected 8.1 m at 0.18% eU_3O_8 including 2.0 m at 0.62% eU_3O_8.

Figure 10. Examples of halite from drill core from the Chandler salt deposit, Amadeus Basin. Photo courtesy of Tellus Holdings Ltd.

Onshore petroleum

Exploration activity in the onshore basins of the Northern Territory in 2016 was focussed on the McArthur Basin (including the Beetaloo Sub-basin) and the Amadeus Basin. In the McArthur Basin, four new wells were drilled for a total of 4354 m, and one horizontal well stimulated and tested. In the Amadeus Basin, a 1300 km seismic survey commenced. **Figure 11** shows NT's petroleum tenure and basins with the locations of wells drilled or tested in 2016.

McArthur Basin

The ***Beetaloo Sub-basin*** is a significant depocentre of Mesoproterozoic Roper Group sedimentary rocks that underlies the Mesozoic Carpentaria Basin in the vicinity of Dunmarra and Daly Waters. The sub-basin is the NT's most advanced shale gas and shale oil play.

Origin Energy Ltd (Origin) continued their exploration program in the Beetaloo Sub-basin as part of their farm-in with Sasol Petroleum Australia Limited into Falcon Oil & Gas Australia Ltd's (Falcon) tenements. In late 2015, Origin drilled the first horizontal appraisal well at Amungee NW-1 after plugging back the vertical section of the well. Falcon announced that the joint venture had discovered a prospective and laterally extensive sweet spot with excellent gas shows that indicated the likelihood of high levels of gas saturation across the entire horizontal section of 'B Shale' interval of the middle Velkerri Formation. In August–September 2016, Origin undertook multi-stage hydraulic fracturing of the horizontal well, followed by

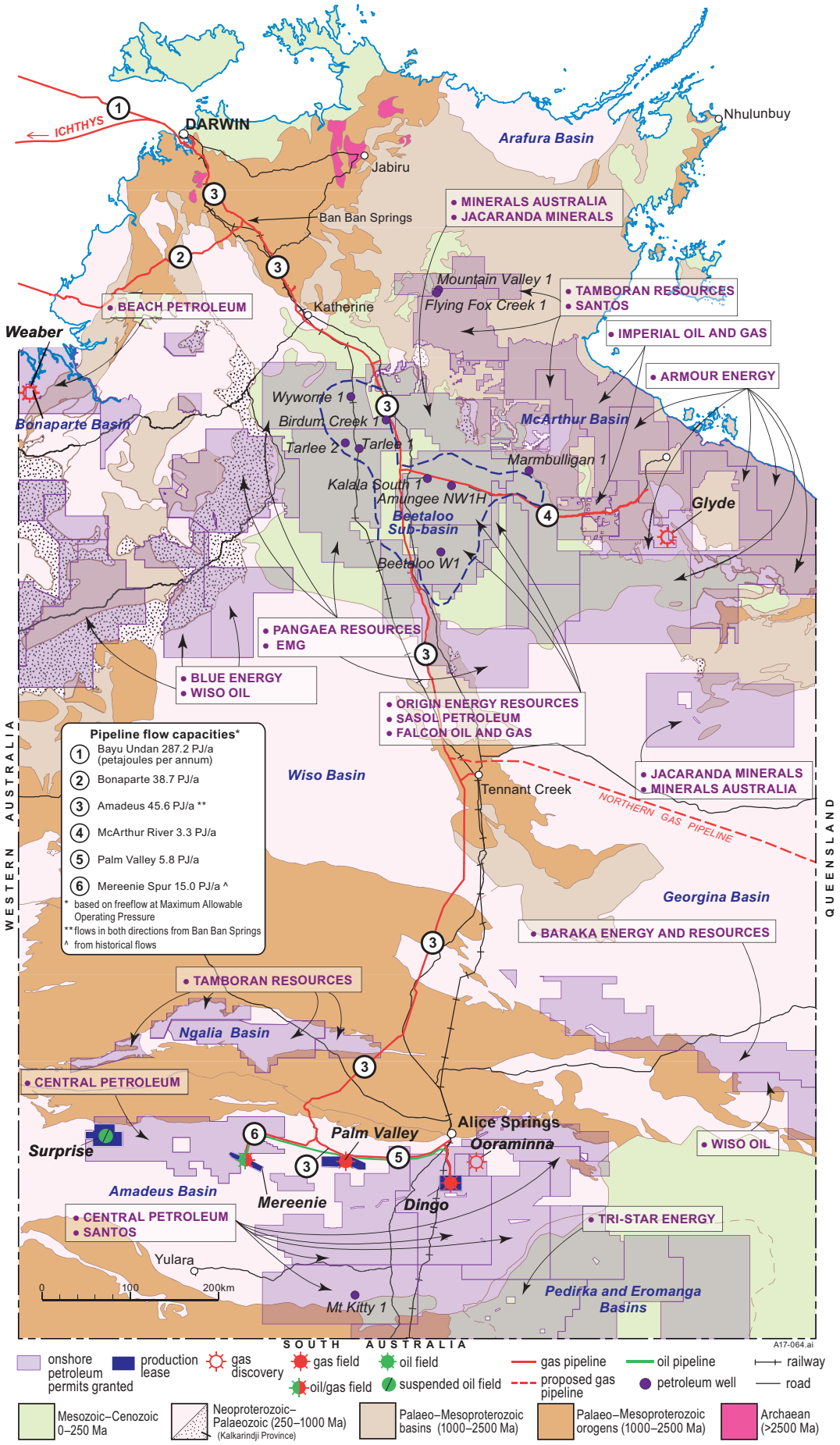

Figure 11. Map of geological regions of the Northern Territory showing granted exploration permits as of January 2017, along with wells and prospects mentioned in the text.

production testing and core and log data analysis. This testing and analysis led to the announcement by Origin in October 2016 of a discovery at Amungee. Gas flow rates ranged between 0.8 and 1.2 million standard cubic feet per day with continuing flow back of hydraulic fracture stimulation fluid of volumes between 100 and 400 barrels per day. Initial estimates suggest a dry gas composition with less than 4% CO_2. The discovered accumulation has a thickness of 30 m, between 4.0% and 7.5% porosity, a gas saturation range of 50% to 75%, and permeability between 50 and 500 nano-Darcys.

During 2016, Origin also drilled the Beetaloo W-1 well to a total depth of 3173 m, confirming the continuation of the regionally extensive middle Velkerri formation about 85 km south of the Kalala S-1 and Amungee NW-1H wells. The well intersected a gross interval of over 570 m of shale gas sequence with net pay exceeding 150 m, and with excellent gas shows in the middle Velkerri formation. The lower Kyalla formation also provided excellent gas shows within a 150 m thick liquid-rich sequence.

Pangaea Resources Pty Ltd (Pangaea) have a large tenement holding located west of the Stuart Highway near Larrimah over the Gorrie Sub-basin, which is a poorly explored, western extension of the Beetaloo Sub-basin. Pangaea drilled four appraisal wells in 2015: Birdum Creek-1 (1931.9 m), Tarlee 1 (1335.5 m), Tarlee 2 (1180 m) and Wyworrie-1 (1385 m). In February 2016, Pangaea announced that it was suspending its 2016 exploration program.

Santos Ltd (Santos) is farming-in to three exploration tenements owned by Tamboran Resources located to the north and east of the Beetaloo Sub-basin, including the OT Downs Sub-basin. In 2016, Santos announced they had drilled three stratigraphic cored wells (Flying Fox Creek-1, Marmbulligan-1 and Mountain Valley-1) to further understand the geology, geomechanics and reservoir characteristics of the McArthur Basin. Two of the three stratigraphic holes, Flying Fox Creek-1 and Mountain Valley-1, cored the base Roper Group and upper Mt Rigg Group succession in the northern Maiwok Sub-basin of the greater McArthur Basin. The third stratigraphic hole, Marmbulligan-1, cored the entire middle Velkerri Formation on the margin of the OT Downs Sub-basin.

No on-ground exploration was reported in 2016 by other explorers that hold exploration tenure in the McArthur Basin, such as Armour Energy Ltd and Imperial Oil and Gas Ltd.

Amadeus Basin

Onshore oil production in 2016 was sourced entirely from the ***Mereenie*** field west of Alice Springs in the Amadeus Basin. Mereenie is operated by Central Petroleum Ltd (Central Petroleum) and produced 0.233 million barrels (mmbbls) of oil in 2016, a 16.2% decrease on 2015.

The Territory's onshore gas production is sourced from the ***Mereenie***, ***Dingo*** and ***Palm Valley*** fields in the Amadeus Basin. In 2016, 4.203 billion standard cubic feet (bscf) of gas was produced, comprising 3.230 bscf from Mereenie, 0.046 bscf from Palm Valley, and 0.926 bscf from Dingo. Production of gas at Mereenie increased by 34.9% in 2016 relative to 2015 as Central Petroleum transitioned the field from oil to gas production. The increase in gas production at Mereenie led to Central Petroleum placing the Palm Valley field on standby.

Central Petroleum also has a farm-in agreement worth up to $150 million with Santos for a large area in the Amadeus Basin. Santos has assumed operatorship of the tenements and drilled the Mount Kitty well in 2014. Santos are targeting sub-salt and intra-salt plays of the Neoproterozoic lower Gillen-Heavitree Quartzite System in the southeastern part of the basin that have potential for large gas and helium accumulations hosted in the Heavitree Quartzite. In November 2016, Santos commenced a 1300 km 2D seismic program, targeting the Dukas, Mahler and Rossini leads.