

Highlights of mineral and petroleum exploration and development in 2020

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Introduction

The year 2020 presented unique challenges for the Northern Territory's resources sector as access restrictions and state border closures related to the COVID-19 (COVID) pandemic adversely impacted on the ability of explorers to visit their tenements and source contractors for exploration programs. This affected the Territory more than most jurisdictions as most explorers and drilling and geophysical contractors are located outside of the Northern Territory. However, there were still positive developments in the Territory's resources sector: liquids-rich gas discoveries in the Beetaloo Sub-basin, the recommencement of iron ore mining, and an emerging exploration boom for copper and gold in the Barkly Tableland. The resources sector and government also worked collaboratively to successfully keep all of the Territory's mines and petroleum fields operating through the pandemic and with no adverse health impacts.

According to the Australian Bureau of Statistics (ABS), mineral exploration expenditure in the Territory in 2019–2020 was \$123.0 million, a 7% drop on 2018–2019 when \$131.9 million was spent. This fall could be largely attributed to a substantial drop in activity in the June 2020 quarter, with only \$24.4 million spent on mineral exploration in the Territory, down 25% on the June 2019 quarter. For the 2020 calendar year, mineral exploration expenditure in the Territory was \$110.8 million, a 16% drop on 2019. This is the lowest figure since 2017 when \$91.2 million was spent but remains at higher levels than the downturn from 2014 to 2017. (Figure 1). The proportion of exploration expenditure in the Territory that is in greenfields areas declined from 38% to 31%.

In addition to ABS exploration statistics, the Northern Territory Geological Survey (NTGS) collects statistics on the admissible exploration expenditure on exploration leases (EL) reported by industry to the Department of Industry, Tourism and Trade. This shows that expenditure reports submitted during 2020 (which may relate to activity in 2019 and/or 2020) totalled \$50.4 million, a 31% decrease from the previous year.

At the end of 2020, there were 773 granted non-extractive mineral exploration licences (compared with 777 at the end of 2019) and 617 outstanding exploration licence applications. Of these applications, 429 are on aboriginal freehold land. During 2020, 174 new applications were received (down from 184 in 2019), 71 were granted (down from 90 in 2019) and 146 licences ceased (down from 247 in 2019). The area covered by EL applications has increased to 20%.

At the end of 2020, in the onshore Territory and coastal waters, there were 38 granted petroleum exploration permits, 3 retention licences and 5 production licences.

Exploration and production highlights

Figure 2 shows selected mineral exploration highlights for 2020. In the following summary of exploration and mining results for the Territory during 2020, all mineral resources are assumed to have been reported in accordance with the JORC or NI43-101 codes. Where resource categories 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, which do not report publicly, could not be included. Mineral production statistics for the Territory for 2019–2020 collected under the NT *Mineral Titles Act* are given in Table 1. This shows mineral production value totalled \$4.40 billion in 2019–2020.

Gold – Tanami Region and Aileron Province

Newmont Corporation's *Tanami Operations*, located 550 km northwest of Alice Springs (Figure 3), remains the Territory's largest gold operation, reporting 500 000 oz of gold production during both 2019 and 2020. 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 5.83 Moz Auron deposit, the >0.5 Moz Federation South Limb, and the 2016 Liberator discovery. As of 31 December 2020, Proven

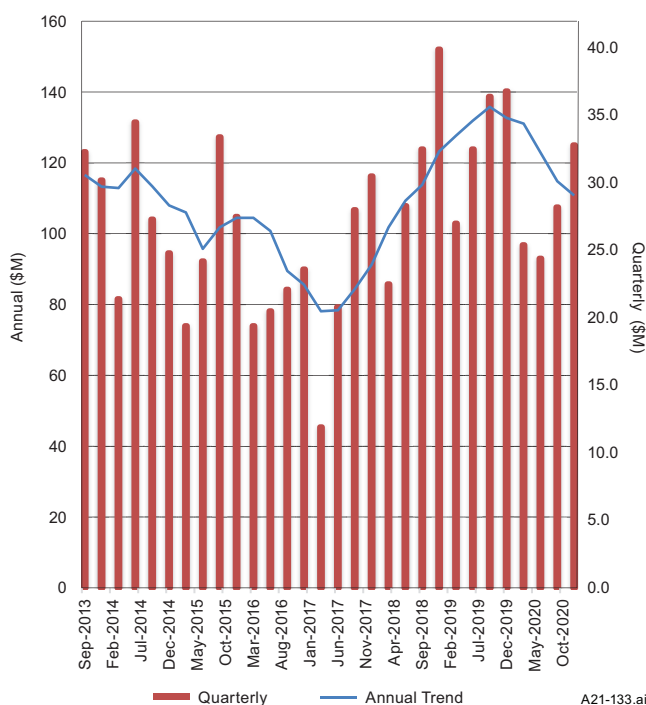


Figure 1. Annual and quarterly mineral exploration expenditure from 2013 to 2020 for the Northern Territory according to the ABS.

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and Probable Ore Reserves were 36.2 Mt at 5.05 g/t Au, containing 5.07 Moz of gold. Additional Measured and Indicated Mineral Resources total 21.1 Mt at 2.19 g/t Au for 1.49 Moz of gold; Inferred Mineral Resources are

19.6 Mt at 4.29 g/t Au for 2.71 Moz of gold. This follows a major increase in Reserves and Resources in the December 2019 with the addition of 1.5 Moz of Reserves, 1.1 Moz of Measured and Indicated Resources and 1.6 Moz of

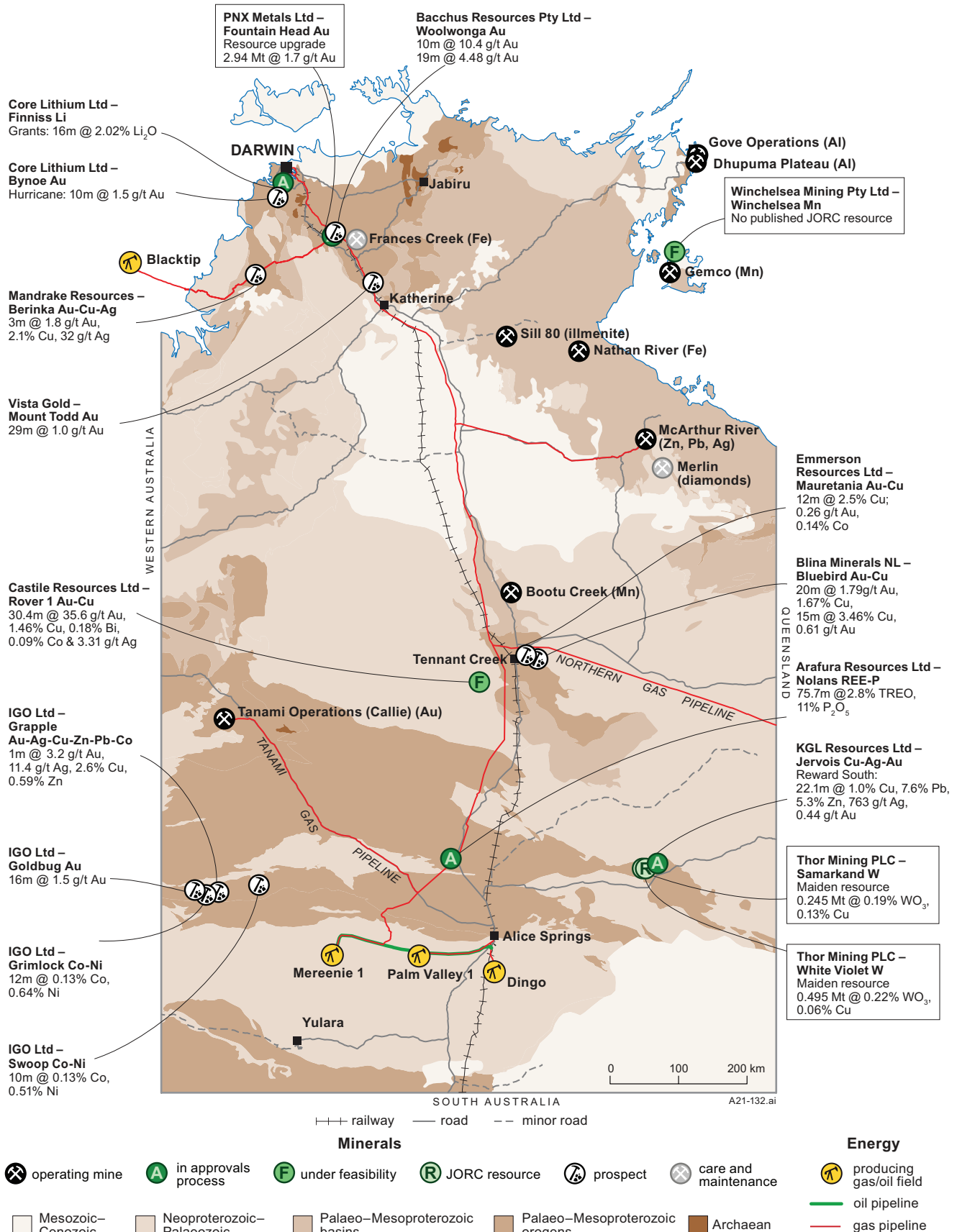


Figure 2. Map of the Northern Territory showing selected mineral exploration highlights for 2020.

Inferred Resource. Further resource growth of 0.6 Moz was achieved in 2020 from additional drilling at Auron and Federation. Newmont's Phase 2 Expansion at the Tanami Operations entered the execution stage in 2020. The expansion includes construction of a 1460 m shaft, additional capacity in the processing plant, and supporting infrastructure to enable mining at a depth of 2140 m below surface. The expansion is expected to increase average annual gold production by ~150 000 to 200 000 oz per year for the first five years, and reduce operating costs by around 10%. As of early 2021, capital costs for the project were estimated to be in the range US\$850–950 million, with a commercial production date in the first half of 2024.

Newmont also undertook regional exploration during 2020, although this was limited by COVID restrictions. In the Tobruk JV with Prodigy Gold NL, located immediately southwest of the Callie Mine, Newmont is sole funding up to A\$12 million in exploration expenditure to earn up to a 70% interest. The only activity reported in 2020 was an airborne gravity survey. A joint venture with Nova Minerals Limited over the **Officer Hills** project area, 34 km southwest of Callie, was terminated by Nova during 2020, with Nova's share of the project released to Newmont. Newmont also applied for a mining lease over the **Oberon** deposit, 25 km north of Callie.

Northern Star Resources Limited have a significant presence in the Tanami through their purchase and farm-in agreement in the Central Tanami project with Tanami Gold NL, as well as their 100%-owned Tanami Regional project. No significant on-ground exploration occurred in 2020 due to COVID restrictions and the utilisation of the Central Tanami camp by police and defence forces as part of a COVID-related border checkpoint and Tanami Road patrols. A revised *in-situ* resource inventory estimate of the **Jims** deposit was completed during 2020; this incorporated 2018 exploration drilling beneath the main Jims open-pit and unmined supergene mineralisation immediately west of the pit. Preliminary assessment showed that further drilling is required to confirm the potential for primary mineralisation below the supergene zone and to test lateral and depth extensions of mineralisation below the main Jims pit.

Prodigy Gold's exploration activities in the Tanami were also impacted by COVID restrictions and could not commence until late in the field season. In the second half of 2020, Prodigy Gold drilled 110 aircore holes for 9288 m at the **Bonanza West** prospect, close to the Western Australian border, with a best intersection of 1 m at 0.27 g/t Au from 107 m. At the **Bluehart** prospect, 53 km west-northwest of Callie, 57 aircore holes were drilled for 1869 m, targeting a 1000 m long high-grade soil and rock chip gold anomaly associated with a northwest-trending splay off the Trans-Tanami Fault Zone. No significant assays were returned from the program. At the **PHD** prospect, 30 km northwest of the existing Hyperion gold deposit, a 9 km soil gold anomaly has been defined. Interpretation of the 2019 NTGS Tanami airborne magnetic survey highlighted the extensions of the structure along strike and the potential for parallel structures. An additional 147 soil sampling results support the continuity of the anomaly interpreted

Table 1. 2019–2020 mining production statistics for the Northern Territory.

Commodity	Unit of quantity	2019–2020 ^{1,4,5}		
		Quantity produced ²	Quantity sold	Quantity sold (\$) ³
Metallic minerals				
Bauxite	tonnes	12,135,492	12,423,766	\$547,511,496
Gold ⁶	grams	2,123	0	\$0
Gold dore ⁷	grams	15,836,843	15,974,559	\$1,189,797,722
Iron ore	tonnes	0	0	\$0
Manganese	tonnes	6,293,557	6,248,295	\$1,609,821,632
Mineral sands concentrate	tonnes	37,325	37,325	\$12,361,417
Lead concentrate	tonnes	26,867	24,804	\$34,364,886
Zinc concentrate	tonnes	178,014	174,529	\$219,597,551
Zinc lead concentrate	tonnes	407,443	387,711	\$540,764,325
Metallic minerals value	n/a			\$4,154,219,029
Gemstones				
Diamonds	carats	0	0	\$0
Gemstones	carats	0	0	\$0
Mineral specimens	kilograms	800	350	\$49,228
Gemstones value	n/a			\$49,228
Non-metallic minerals				
Crushed rock	tonnes	885,133	967,557	\$25,790,289
Dimension stone	tonnes	151	150	\$101,206
Gravel	tonnes	222,542	216,836	\$4,112,984
Sand	tonnes	279,264	250,477	\$7,006,483
Soil	tonnes	52,458	52,219	\$693,228
Garnet sands	tonnes	5,409	3,168	\$1,054,451
Limestone	tonnes	0	6,795	\$26,579
Quicklime ⁸	tonnes	22,864	23,816	\$6,072,188
Vermiculite	tonnes	0	0	\$0
Non-metallic minerals value	n/a			\$44,857,408
Energy minerals				
Uranium oxide	tonnes	1,613	1,492	\$202,504,327
Total minerals value	n/a			\$4,401,629,992

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 AUD and is the gross amount paid to the operator.
4. Data has been rounded and autosum applied.
5. Data is correct as at 05 October 2020 and may be subject to revision due to late lodgements and/or receipt of superior data.
6. Pure gold (100%); does not include gold reported as gold dore.
7. Gold dore is primarily comprised of gold with additional silver and accessory elements.
8. Quicklime is derived from limestone. Processing input and output data is deemed operator commercial-in-confidence.

from airborne magnetics data, and this will be a target of drilling in 2021.

At Prodigy Gold's Euro project area in the eastern Tanami, Newcrest Mining Limited withdrew from their farm-in agreement in November 2020, with Prodigy Gold retaining a 100% interest in the project.

In the northern Aileron Province, northwest of Barrow Creek, Prodigy Gold undertook a 28 hole, 1551 m drilling program at the **Tulsa** target, 17 km northwest of the previously drilled Kroda prospect. Tulsa was a priority target based on highly anomalous soil geochemistry. Regional reconnaissance aircore was completed on 7 lines testing the full strike length of the 5 km x 3 km soil gold anomaly. Gold anomalism was intersected in a single hole with best result of 3 m at 0.15 g/t Au from 48 m. The absence of a large scale bedrock gold or pathfinder multi-element anomaly has downgraded this target.

In the southwestern Aileron Province, immediately adjacent to the Western Australian border northwest of Kintore, IGO Limited, as part of the Lake Mackay joint venture with Prodigy Gold, undertook a maiden three hole, 278 m reverse circulation (RC) drilling program at

the **Goldbug** prospect in late 2020. Goldbug is a 600 m long soil gold anomaly over orthoamphibolite of the Dufaur Suite. The target was originally identified through systematic soil sampling. Initial drilling in 2019 failed to identify the bedrock source of the soil gold anomaly. Drilling in 2020 successfully intersected bedrock gold mineralisation associated with pyrite and quartz veining within orthoamphibolite. Two of the three holes intersected mineralisation; the third hole was too shallow and did not intersect the mineralisation now defined. Best results included 16 m at 1.15 g/t Au from 48 m and 4 m at 1.54 g/t Au from 92 m.

Gold – Pine Creek Orogen

In March 2020, Kirkland Lake Gold Ltd announced the closure of trial mining operations at **Cosmo Deepes**, suspension of exploration activities, and suspension of operations at the Union Reefs processing plant. About 5000 oz of gold had been produced in 2020 prior to closure. The closure of the operation followed an announcement by the company in February 2020 that it was designating the Northern Territory assets as non-core, with plans to consider all strategic options for maximizing value. During 2020, Kirkland Lake Gold's activities were largely focused on rehabilitation to lower environmental liabilities. As part of this commitment, a three-year, \$60–\$65 million water rehabilitation program was launched in the second half of 2020. This involves management of the Howley Streak waste dumps, rehabilitation of dams, and treatment of site water inventory. Combined Mineral Resources for all of Kirkland Lake Gold's NT assets at the end of 2020 comprises Measured and Indicated Resources of 25.2 Mt at 2.3 g/t Au and an Inferred Mineral Resource of 19.2 Mt at 2.3 g/t Au, for total contained 3.22 Moz of gold.

In November 2019, Kirkland Lake Gold submitted an environmental impact statement (EIS) for the Union Reefs North decline for an underground mine, which is proposed to access the Prospect orebody. An Environmental Assessment Report was issued by the NT Environment Protection Authority (EPA) in June 2020 and Federal environmental approval was issued in September.

PNX Metals Limited continued to progress their **Fountain Head** gold project, located 50 km northwest of Pine Creek. After drilling 79 holes for 7402 m in 2019 and early 2020, PNX Metals announced an upgraded Mineral Resource Estimate in June 2020, reporting a combined Indicated and Inferred Resources for Fountain Head and Tally Ho of 2.94 Mt at 1.7 g/t Au, containing 156 000 oz of gold. The gold system extends ~1.6 km along strike of the Fountain Head anticline. An Environmental Impact Statement and feasibility study were commenced during 2020 and are expected to be submitted in the second quarter of 2021. During the year, the company altered the proposed process route for the project from heap leaching to a milling and carbon-in-leach process. PNX Metals also finalised an agreement to acquire the nearby **Glencoe** gold deposit from Ausgold Pty Ltd in order to expand the project resources. PNX Metals reported no further exploration at their **Hayes Creek** project, which comprises the Iron Blow

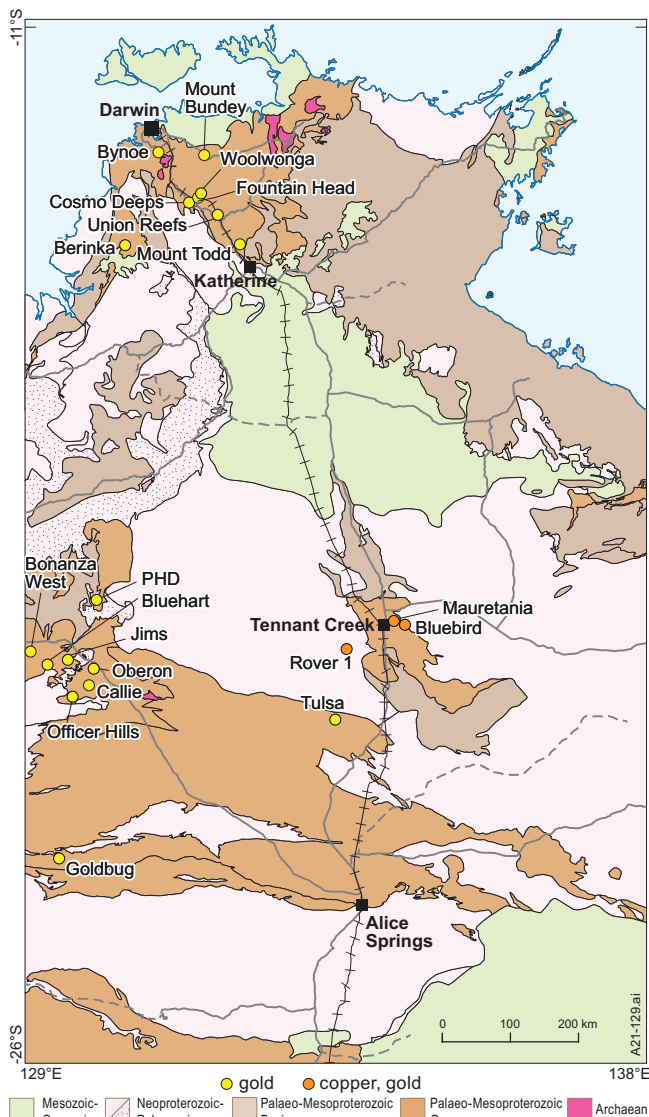


Figure 3. Location of gold and copper-gold deposits and projects mentioned in the text.

and Mount Bonnie polymetallic gold-silver-zinc deposits as the company focused on development of the Fountain Head gold project.

Privately-owned Bacchus Resources Pty Ltd continued gold exploration in the Pine Creek Orogen in 2020, including at their *Woolwonga* project. A summary of exploration at Woolwonga from 2017 to 2019 was summarised in the AGES 2020 volume. Although there has been no formal public reporting of 2020 drilling (11 235 m), results posted by the company on social media include intersections of 7 m at 15.6 g/t Au within 52 m at 3.0 g/t Au, and 10 m at 10.4 g/t Au. The company continued to drill at Woolwonga through the 2020–2021 wet season, with a reported drill intersection of 19 m at 4.48 g/t Au within 49 m at 2.12 g/t Au located 154 m vertically beneath the pit floor. During 2020, the company also completed the acquisition of MLN1139 at Brocks Creek, which includes infrastructure to support potential development of Woolwonga, along with further resources at the Zapopan (high-grade underground), Faded Lily, Raising Tide, Burgan, and Alligator deposits. Planning is underway for the construction of a mill at Brocks Creek.

Hanking Australia Pty Ltd's *Mount Bundey* project, located 90 km east-southeast of Darwin, includes the Toms Gully, Rustlers Roost and Quest 29 deposits. The project has total Indicated and Inferred Resources of 54.1 Mt at 1.03 g/t Au for a contained 1.795 Moz of gold. The company is progressing towards a potential restart of underground mining at Toms Gully, which has a Mineral Resource of 1.1 Mt at 8.9 g/t Au. The Environmental Assessment Report for the Tom Gully project was issued by the NT EPA in February 2020. In February 2021, Hanking Australia commenced the environmental assessment process for a proposed open-cut mining operation over a seven year mine life at the Rustlers Roost and Quest 29 deposits within the Mount Bundey project area. No exploration results were publicly announced in 2020.

Vista Gold Corporation's *Mount Todd* gold project, northwest of Katherine, contains 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 for 5.90 Moz of gold. In late 2020, Vista Gold commenced an eight-hole, 2400 m proof of concept drilling program to test targets known as the Batman Hanging Wall Lode and the Batman North Extension; the drilling is designed to test the existence of mineralisation with vertical and lateral continuity within and immediately adjacent to the planned Batman pit. Results from the first four holes include 29 m at 1.0 g/t Au in the Batman North Extension, and 60 m at 0.72 g/t Au from the Batman Hanging Wall Lode. The results suggest that additional drilling could provide the basis for an increase in the mineral resource estimates both within and outside the currently designed Batman pit.

During 2020, Core Lithium Ltd discovered numerous new gold prospects at its newly named *Bynoe* gold project, located in the same area as its Finniss lithium project, 20–60 km south of Darwin. In September and October 2020, Core announced assays up to 106.5 g/t Au in rock

chips at the Covidicus West prospect in the southern part of their project area. Core Lithium also identified gold in soil of up to 1.9 g/t Au at the nearby Pickled Parrot prospect. The company subsequently reported that over 1000 gold nuggets up to 8 grams in weight had been found within a gold-in-soils anomaly close to the Grants and BP33 lithium deposits, now named the Far East belt. Four new prospects were identified in the belt along a 1600 m trend of gold-bearing, sulfide-rich veins. A reconnaissance RAB drilling program of 74 holes for 1500 m along the Far East belt confirmed the presence of gold mineralisation with a best intersection of 10 m at 1.5 g/t Au from 7 m at the Hurricane prospect.

In October 2020, Mandrake Resources Limited reported results of their first drilling (five holes for 733 m) at the *Berinka* gold project in the southwestern Pine Creek Orogen, 190 km south of Darwin. The drilling targeted two prospects (Vegetation Anomaly and Terry's Gap) identified from airborne magnetic data and historic costeans. Drilling at the Vegetation Anomaly returned a best intersection of 3 m at 1.8 g/t Au, 2.1% Cu and 32 g/t Ag from 124 m. Gold appears to be hosted in a series of veins in close proximity to a faulted contact between a gabbro and granite; the gold mineralisation is associated with sulfides, particularly pyrite and chalcopyrite.

Gold and copper-gold – Warramunga Province

Exploration for copper and gold in the Tennant and Rover fields was delayed for much of 2020 due to COVID restrictions but recommenced in the second half of the year.

Following its public listing in February 2020, Castile Resources Ltd has been focused on the exploration and development of the Rover field, 70–100 km southwest of Tennant Creek. A four hole drilling program at the company's flagship Rover 1 deposit commenced in late August and continued until December. The first hole delivered the best gold intercept ever produced from Rover 1: 30.4 m at 35.6 g/t Au, 1.46% Cu, 0.18% Bi, 0.09% Co and 3.31 g/t Ag. This includes 13.2 m at 76.3 g/t Au and 1.16% Cu. The second hole intersected three zones of high-grade gold-copper mineralisation, including 12.3 m at 4.51 g/t Au and 1.49% Cu from 540 m, and 12.3 m at 5.09 g/t Au and 0.44% Cu from 579 m. The third and fourth holes were wildcat exploration holes targeting conceptual structural targets and did not intersect significant mineralisation. The company has announced plans for a diamond drilling program of up to 10 000 m at numerous advanced prospects in 2021.

Emmerson Resources Limited continued to progress its exploration and development activities within the Tennant Creek mineral field. In April 2020, Emmerson Resources announced it was entering into a Strategic Alliance with NT Bullion Pty Ltd for the Northern Project Area at Tennant Creek, but this agreement was terminated in August. In November 2020, Emmerson announced that had entered into a Strategic Alliance with Tennant Consolidated Mining Group (TCMG) over the Northern Project Area under which TCMG will fund \$5.5 million in exploration over five years to hold a 75% equity interest; the alliance also includes a 'small mines joint venture', for development of

deposits of <250 000 oz gold equivalent. A drilling program funded through the Strategic Alliance commenced in late November at the high-grade **Mauretania** prospect, part of the Northern Project Area. Results from two drillholes were released in February 2021; they include intersections of 8.8 m at 3.44 g/t Au from the lower primary gold zone, and 12 m at 2.5% Cu, 0.26 g/t Au and 0.14% Co from the upper oxide zone. The company announced that the Mauretania project is progressing to more detailed studies to support an application for mining approval.

In August 2020, Emmerson Resources announced a joint venture agreement with the Marnturla Aboriginal Corporation relating to exploration and development in previously restricted areas in the Northern Project Area, including Jasper Hills, Golden Slipper and Hermitage. The agreement provides an equity interest in the projects and employment opportunities during exploration.

In November 2020, the company announced that it was terminating its joint venture with Territory Resources Pty Ltd over the Southern Project Area, which includes the Eldorado, Susan, Black Snake, TC8, and Malbec West, with Emmerson retaining 100% ownership of the project.

In November 2020, King River Resources Limited announced the results of an 11 hole, 2376 m drilling campaign that led to the discovery of new ironstone bodies under Cambrian cover rocks, 35 km east of Tennant Creek. At the Commitment prospect area, two holes were drilled for 474 m targeting a large northwest-striking, coincident magnetic and gravity, 10 km east of the eastern-most known copper-gold deposit on that trend. Drilling through only 30–70 m of Cambrian cover, both holes intersected ironstones with anomalous copper, cobalt and bismuth in interpreted Warramunga Formation basement. Eight holes were drilled to test three gravity and magnetic targets at the Lone Star trend, less than 1 km east of Emmerson Resources' Mauretania deposit. Drilling intersected strongly hematite-altered shales with best results from the main gravity anomaly, where broad veining and zones of very strong hematite alteration are associated with elevated bismuth, arsenic, antimony and zinc.

In March 2020, Blina Minerals NL announced results of its first drilling campaign at the **Bluebird** ironstone-hosted copper-gold prospect, 45 km east of Tennant Creek. The prospect forms a prominent magnetic and gravity anomaly along a west-northwest fault trend. The program included 7 holes for 1169 m, with best intersections of 15 m at 3.46% Cu and 0.61 g/t Au from 172 m, and 20 m at 1.67% Cu and 1.79 g/t Au from 156 m.

Copper and copper-gold – Barkly Tableland

The Barkly Tableland area east of Tennant Creek was a focus of substantial exploration interest in 2020 with the commencement of exploration by a number of companies following up encouraging results from the collaborative pre-competitive geoscience studies in the area by Geoscience Australia and NTGS. Large areas of previously vacant ground between Tennant Creek and the Queensland border are now covered by exploration licences and applications from numerous companies (**Figure 4**). Exploration in the

area is targeting mineralisation in Proterozoic basement underlying Cambrian cover of the Georgina Basin, with key targets being iron-oxide copper gold in Warramunga Province basement, and sediment-hosted copper and/or zinc in Palaeo–Mesoproterozoic basin successions.

In December 2020, Middle Island Resources Limited announced the discovery of surface copper mineralisation at their newly defined **Crosswinds** prospect, 13 km southeast of Barkly Homestead. The company interpreted the surface copper mineralisation as reflecting the secondary migration of copper along growth faults that extend from primary mineralisation in Proterozoic basement rocks through the younger Georgina Basin cover. In March 2021, the company announced their intention to demerge their Barkly copper-gold assets into a new company.

In late 2020, King River Resources undertook an airborne magnetic survey over their tenements, located 65 km southwest of Barkly Homestead, together with a passive seismic survey to test depth of the Cambrian cover. Strategic Energy Resources Limited undertook detailed gravity surveys over their tenements, located 80 km west-southwest and 40 km northeast of Barkly Homestead. The geophysical surveys by both companies were co-funded by NTGS under the *Geophysics and Drilling Collaborations* program.

Inca Minerals Limited undertook airborne magnetic surveys, also co-funded by NTGS, at their Frewena Fable project area, 50 km west-southwest of Barkly Homestead, and their Frewena Far East project, 40 km east-northeast of Barkly Homestead. In March 2021, the company announced they had completed a soil sampling program over the Frewena East project area, immediately adjacent to Middle Island Resources' Crosswinds prospect.

In August 2020, Greenvale Mining Ltd acquired Knox Resources Pty Ltd, including nine exploration tenements across the East Tennant area. In late 2020, the company acquired 15 328 line km of airborne magnetic data over three of their tenements in the region.

Newcrest Mining also has a substantial tenement holding in the East Tennant region and is planning field activity to commence after the 2020/21 wet season.

Encounter Resources Limited have secured a large tenement holding across the Barkly Tableland, predominantly targeting sediment-hosted copper deposits. The Jessica project covers ~5500 km² along key structural corridors, 80–150 km north and northeast of Barkly Homestead. Systematic assessment of drill chips from water bores at Jessica by Encounter Resources and previous explorer, Natural Resources Exploration, returned assay results of 1.5% Cu from water bore RN28419. Visual inspection of this interval by Encounter Resources' geologists confirmed the presence of abundant copper carbonate in the form of malachite. The company is planning an aircore drill program in 2021 to confirm this copper mineralisation identified in the water bore cuttings and determine the lateral extent of the near surface copper mineralisation.

In March 2020, Encounter Resources had its first tenements granted at their Elliott copper project, 200 km north of Tennant Creek, where the company is targeting sediment-hosted copper deposits on the margin of the

Beetaloo Sub-basin. In September 2020, BHP Group Limited and Encounter Resources entered into an option agreement that provides BHP Group with the right to enter joint venture agreement to earn up to 75% interest in the Elliott copper project by spending up to \$22 million over 10 years.

Encounter Resources has an additional project at Carrara, 110 km north of the Barkly Highway close to the Queensland border, targeting sediment-hosted copper and zinc in potential Isa Superbasin rocks identified through the 2017 GA–NTGS South Nicholson Seismic Survey. Teck Resources Limited have also taken a large tenement holding extending from this area south-southwest to the Barkly Highway (Figure 4).

Polymetallic base metals - Aileron Province

KGL Resources Limited continued to progress **Jervois**, the Territory's most advanced copper project, located 380 km 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 in the Bonya Metamorphics. In September 2020, The company announced a substantial upgrade in the total resources at Jervois to 21.0 Mt at 2.03% Cu and 31.9 g/t Ag, containing 426 200 t of copper and 21.4 Moz of silver. The resource also contains 175 700 oz of gold. The resource upgrade

was achieved in part through an improved understanding of the geological and structural controls on mineralisation. In October 2020, KGL Resources released a prefeasibility study including an associated Probable Reserve of 9.4 Mt at 2.41% Cu, 32.9 g/t Ag and 0.39 g/t Au. The prefeasibility study was based on a 7.5 year operation producing 30 000 t copper in concentrate per year. In January 2021, the company received approval of their Mine Management Plan for the project, the final regulatory approval for the project. A full feasibility study for the project is expected in the first half of 2021.

In March and April 2020, KGL Resources announced the results of drilling at Jervois below the proposed pits at Reward and Bellbird, reporting intersections of 10.2 m at 2.4% Cu, including 4.7 m at 3.9% Cu at Bellbird; and 24.9 m at 1.5% Cu, including 8.1 m at 3.6% Cu at Reward. Very high silver grades were intersected over wide intervals of polymetallic mineralisation at Reward South, with 22.1 m at 763 g/t Ag, 1.0% Cu, 7.6% Pb, 5.3% Zn and 0.44 g/t Au from 225 m, including 6.2 m at 1708 g/t Ag, 2.4% Cu, 16.3% Pb, 8.9% Zn and 0.81 g/t Au. Activity on the Jervois site was suspended in March due to COVID with no further drilling results reported. Drilling recommenced in February 2021.

Todd River Resources Limited did not undertake planned magnetic surveys and aircore drilling in 2020 at their **Mount Hardy** copper-zinc project area, 300 km northwest of Alice Springs, due to COVID-related hard border closures with

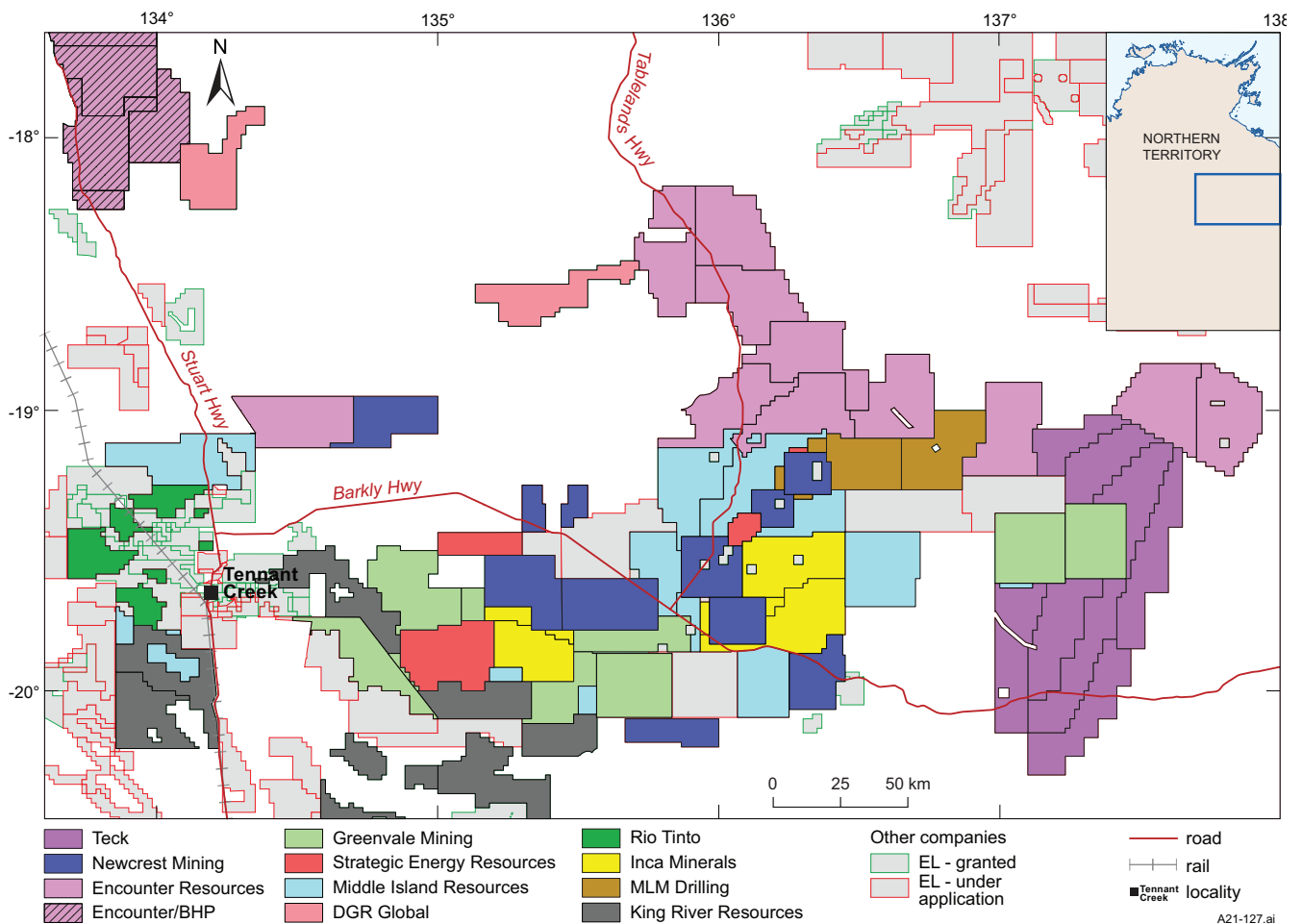


Figure 4. Map of exploration licences and applications in the Barkly Tableland in March 2021, showing the distribution of tenure for selected exploration companies. Most highlighted exploration licences were applied for since early 2019.

Western Australia. The Mount Hardy project includes the Hendrix deposit, which has an Inferred Resource of 2.6 Mt at 6.7% Zn, 0.9% Cu, 1.5% Pb and 35 g/t Ag.

IGO Limited continued their greenfields exploration in the remote southwestern Aileron Province over a large project area north and northeast of Kintore, targeting polymetallic mineralisation as part of the Lake Mackay exploration alliance with Prodigy Gold. After a delayed start to the field season, the company completed four-hole, 235 m program at **Grapple**, where previous drilling encountered polymetallic copper and gold mineralisation associated with sulfides along a strike length of ~800 m. The program aimed to define shallow mineralisation up-plunge of previous drilling along 300 m of strike. Three of the four holes intersected mineralisation, with best intersections of 5 m at 0.2 g/t Au, 46.1 g/t Ag, 0.5% Cu, 0.9% Pb, 3.2% Zn and 0.2% Co; and 1 m at 3.2 g/t Au, 11.4 g/t Ag, 2.6% Cu and 0.59% Zn. The results limit the continuity of shallow mineralisation to the east, but mineralisation remains open down plunge to the west.

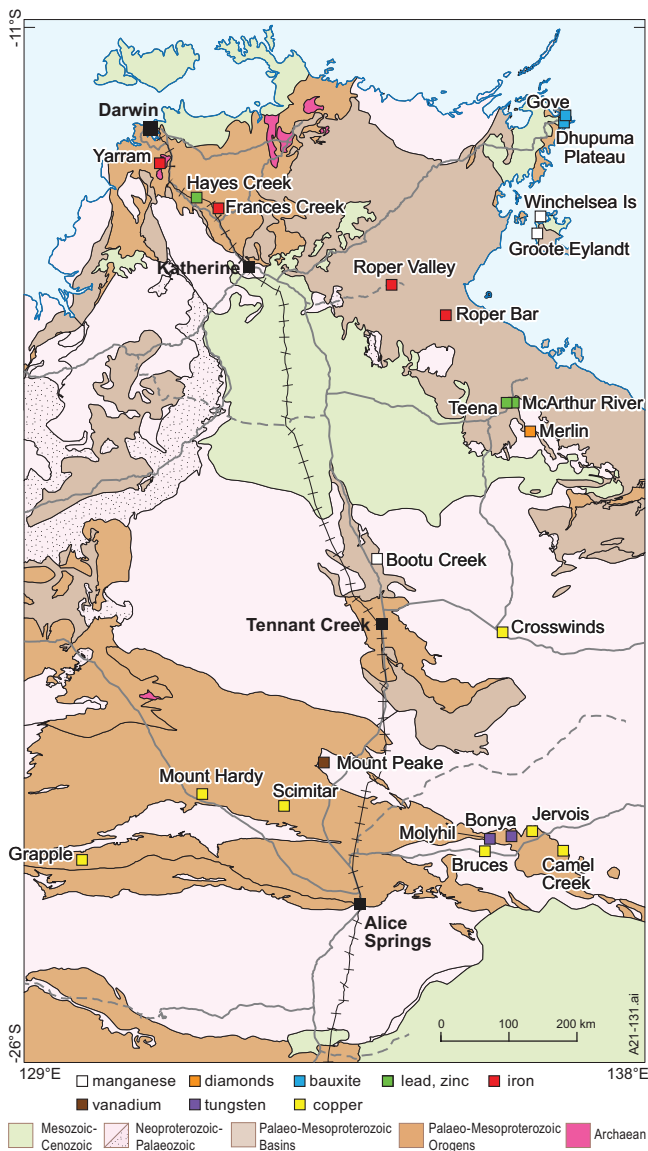


Figure 5. Location of manganese, diamonds, bauxite, lead-zinc, iron, vanadium, tungsten and copper deposits and projects mentioned in the text.

In late 2020, Prodigy Gold undertook exploration at their Reynolds Range exploration project area in the central Aileron Province, focusing on the **Scimitar** prospect. A moving loop electromagnetic survey at Scimitar in October 2020 revealed a strong electromagnetic conductor coincident with surface copper, lead, silver, zinc, and gold anomalism. Detailed mapping identified copper mineralisation at surface within a 3 km long geochemical anomaly with separate copper-gold and silver-lead zonation. Following the identification of this conductor, a 400–500 m diamond drillhole commenced in November, co-funded by NTGS through the *Geophysics and Drilling Collaborations* program. The drillhole intersected sulfidic sediments with elevated silver, lead, and zinc assay values at 286–302 m depth.

In June 2020, Shree Minerals Limited entered into a farm-in and joint venture agreement with Territory Lithium Pty Ltd to explore Territory Lithium's tenements in central Australia for gold and base-metals. In October 2020, the company announced the results of reconnaissance exploration at the **Bruce's** prospect in the Irindina Province northeast of the Harts Range, which was designed to locate extensions to copper- and gold-bearing quartz veins and determine the extent and thickness of soil cover. New mineralised veins were identified, including one 250 m south of known mineralised veins that assayed 0.52 g/t Au and 1.07% Cu.

In October 2020, Inca Minerals undertook reconnaissance exploration at their newly acquired Jean Elson IOCG project area, 40–60 km southeast of Jervois; the company confirmed visible copper-iron mineralisation and identified significant extensions of mineralisation at the historic **Camel Creek** and Mount Cornish South prospects. Thirty-two rock chip samples were collected at the Ningaloo prospect at Camel Creek, with 11 samples returning between 1.62% and 10.3% Cu from six parallel veins within a 500 m wide corridor.

Base metals – McArthur Basin

The **McArthur River** mine, located 70 km southwest of Borroloola in the McArthur Basin, is operated by McArthur River Mining Pty Ltd, a subsidiary of Glencore plc. At 31 December 2020, the McArthur River mine had total Reserves and Resources of 162 Mt at 9.7% Zn, 4.4% Pb and 45 g/t Ag, including Ore Reserves of 87 Mt at 9.2% Zn, 4.2% Pb and 42 g/t Ag. During 2020, the mine produced 279 300 t of zinc, 54 900 t of lead and 1.614 Moz of silver in concentrate, representing a 3% increase in zinc production from 2019. The very fine-grained, thinly-bedded sulfide ore is hosted in the HYC Pyritic Shale Member of the Barney Creek Formation. In November 2020, the mine received regulatory approvals for its Overburden Management Project, which will enable continuation of mining activities. Open cut mining is currently planned to be completed in 2038.

A second major shale-hosted zinc resource occurs at Teck Resources' **Teena** zinc deposit, located 10 km west of the McArthur River mine, which was discovered in 2013. The 2016 Inferred Mineral Resource at Teena was 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). No exploration results have been publicly reported from Teena during 2020.

In early 2020, Teck Resources entered into an option and joint venture agreement with Sandfire Resources Ltd over Sandfire Resources' North Batten tenements in the northern Batten Fault Zone area, which was previously the subject of a joint venture with MMG Limited. Under the agreement, Teck Resources has the right to earn up to a 75% interest in the project by spending \$27 million on exploration over ten years, and 51% interest earned with \$7 million expenditure by August 2025. A minimum expenditure of \$1 million is required by August 2021.

During 2020, Redbank Copper Limited substantially increased its exploration tenure in the southern McArthur Basin and recommenced exploration in the area of the Redbank copper project. Activities included a regional soil sampling program, resampling of historic drill core at the Redbank project, and a 302 hole drilling program on the Tailings Storage facility to establish a JORC 2012 Resource Estimate of contained copper.

Diamonds

No diamond mining activity occurred in the Territory in 2020. Merlin Diamonds Limited, the owner of the **Merlin** diamond mine in the McArthur Basin, was subject to liquidation and sale. Merlin comprises 14 kimberlite pipes of which nine were subject to open cut mining, producing 507 000 ct of diamonds between 1998 and 2003. The 2014 combined Probable Ore Reserve for all diamond pipes at Merlin was 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.

Bauxite

Rio Tinto Limited operates the **Gove** bauxite mine in north-eastern 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 2020, the Gove operation had Proven and Probable Ore Reserves of 80 Mt at 50.4% Al_2O_3 , with additional Measured, Indicated and Inferred Mineral Resources of 34 Mt at 48.7% Al_2O_3 . During 2020, the Gove operation produced 12.30 Mt of bauxite, a 1% increase on 2019.

A second bauxite mine on the **Dhupuma Plateau**, immediately south of the Gove mineral lease, is operated by the Aboriginal-owned Gulkula Mining Company Pty Ltd. The operation opened in August 2017 and is expected to ramp up to full annual production of 500 000 tpa bauxite within the first four years, then continue this rate of production for a projected 15 year mine life. The mine is associated with a Mining Training Centre for local Aboriginal people, established with the support of Rio Tinto. The ore is sold to Rio Tinto's Gove operation.

Iron ore

A highlight of 2020 was the recommencement of iron ore mining in the Northern Territory after a hiatus in

production since 2014. In October 2020, Nathan River Resources Pty Ltd, a subsidiary of British Marine Ltd, commenced production at the **Roper Bar** iron ore mine, 55 km southeast of Ngukurr. Iron ore at Roper Bar is hosted within the Sherwin Iron Formation of the Mesoproterozoic Roper Group. The mine had been in care and maintenance since 2014. Production commenced with transport of iron ore stockpiles to Bing Bong on October 5, followed by the commencement of mining in the Danehill pit on October 30. By December 2020, two shipments of iron ore had been exported from Bing Bong. The company plans to produce 1.5 Mtpa of direct shipping ore; with the addition of a 1.5 Mtpa dense media separation plant, the operation expected to produce 1.5–2.0 Mtpa at 60% Fe for 5 years.

In February 2021, Al Rawda Resources Ltd, the parent company of Northern Territory Iron Ore Pty Ltd (NTIO), entered into a binding agreement with Dragon Resource Investment Pty Ltd to sell their 100% ownership of NTIO for an undisclosed sum. NTIO own the **Roper Valley** project, located 150 km east of Mataranka. The Roper Valley deposit is geologically similar to the Roper Bar project.

The **Frances Creek** iron ore deposit, north of Pine Creek in the Pine Creek Orogen, has been the Territory's largest historical iron ore producer with production from 1966–1974 and 2007–2014. During 2020, NT Bullion Pty Ltd undertook a project testing German ore-sorting technology on the large iron ore stockpile at Frances Creek to produce a high-grade premium export-grade lump product. In September 2020, the company commenced processing using the ore-sorting technology; in November 2020, they entered into an agreement with Anglo American plc to market iron ore from Frances Creek. The first iron ore shipment was railed to Darwin port in December 2020, although no iron ore was shipped in 2020.

In December 2020, Fe Limited completed a transaction to acquire a 50% share of the **Yarram** iron project near Batchelor from Yarram Iron Ore Pty Ltd (formerly part of Territory Resources Pty Ltd). Fe Limited is the operator of the joint venture and has announced an exploration target of 4–6 Mt at 60–62% Fe. The company plans infill and extensional drilling in 2021 to raise the resource estimation to JORC 2012 standard.

Manganese

Oolitic and pisolitic ore in Mesozoic sedimentary rocks on **Groote Eylandt** in the Gulf of Carpentaria forms one of the world's highest-grade manganese deposits; the remaining resources at the end of 2020 total 138 Mt at 43.4% 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 2019–2020 totalled 5.78 Mt of manganese ore. In 2020, the company submitted a mining management plan for RC and diamond drilling on the Southern Lease project area.

Winchelsea Mining Pty Ltd has a granted exploration licence covering part of **Winchelsea Island**, off the northwest coast of Groote Eylandt. The company is a joint venture between the Anindilyakwa Advancement Aboriginal Corporation (representing the two Traditional Owner clans of Winchelsea Island) and AUS China International Mining. Since exploration commenced in September 2019, a total of 779 drillholes and 110 costeans have been completed across five phases of exploration. The drilling program has delineated a significant, shallow mineralised zone covering an area ~1 km by 2 km in the central southern region of the tenement that displays good geological and grade continuity. The combined near-surface mineralised intervals are generally 2 m in thickness and locally up to 5 m. In addition to this zone, further satellite deposits are located to the north and northwest within the proposed mineral lease area. In December 2020, the company submitted a referral document to the NT EPA for a staged open cut mine plan that targets an annual production rate of ~1.4 Mtpa with a potential mine life of 14 years. Ore processing, including dense media separation, is being evaluated. The mineral resource estimate for the project has not been publicly announced.

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 2020, the Total Reserves and Resources for Bootu Creek are 10.03 Mt at 16.51% Mn, including an Ore Reserve of 8.93 Mt at 15.29% Mn. This was a substantial increase in the Resource and Reserve from 2019 due to the addition of tailings and rejects, which will be feed for the ultra-fines plant. The remaining *in-situ* Resource is 3.83 Mt at 22.90% Mn. During 2020, the company produced lumps and fines totalling 738 019 t at 28.10% Mn, a 29% increase on 2019. The ultra-fines plant to process tailings at the mine was commissioned in March 2020 and produced 9080 t of product, although it was hampered by technical start-up issues, including poor screening efficiencies.

Tungsten (-molybdenum)

Thor Mining PLC continued to pursue project finance and offtake agreements to support development of the **Molyhil** tungsten-molybdenum project, located near the Plenty Highway, northeast of Alice Springs. Molyhil is a skarn-related scheelite-molybdenite-magnetite deposit with a Mineral Resource (October 2019) of 4.71 Mt at 0.28% WO₃, 0.14% Mo, 0.05% Cu and 18.1% Fe, most of which is in the Indicated category.

Thor Mining also announced maiden Mineral Resources in early 2020 at their **Bonya** project, which is a joint venture with Arafura Resources Limited. Inferred Mineral Resources for the White Violet and Samarkand deposits are 0.495 Mt at 0.22% WO₃ and 0.06% Cu, and 0.245 Mt at 0.19% WO₃ and 0.13% Cu respectively. The company reported that both deposits outcrop and remain open at depth; Samarkand in particular also shows potential for strike extension to the copper mineralisation

Vanadium

TNG Limited's **Mount Peake** project contains a vanadium-titanium-iron deposit hosted in the ca 1062 Ma Mount Peake Gabbro in the northern Aileron Province, 60 km west-southwest of Barrow Creek. It contains Measured, Indicated and Inferred Mineral Resources of 160 Mt at 0.28% V₂O₅, 5.3% TiO₂ and 23.0% Fe, and a Probable Ore Reserve of 41.1 Mt at 0.42% V₂O₅, 7.99% TiO₂ and 28.0% Fe, at a cut-off grade of 15% Fe. During 2020, TNG continued to progress front-end engineering and design studies, and submitted a supplement to their Environmental Impact Statement for their proposed processing plant in Darwin.

Mineral sands

In 2019–2020, Australian Ilmenite Resources Pty Ltd produced 37 000 t of ilmenite concentrate from the **Sill 80** ilmenite mine in the Roper region (**Figure 6**). Ilmenite at Sill 80 occurs in surficial cover overlying sills of Derim Derim Dolerite intruding the Roper Group.

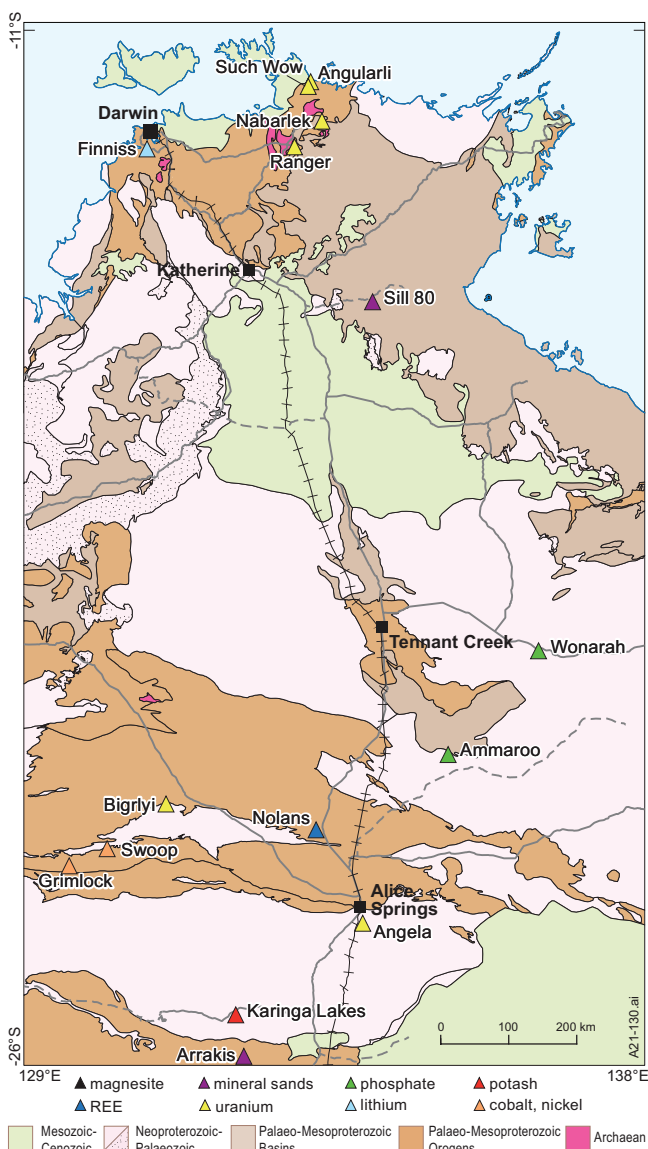


Figure 6. Location of magnesite, mineral sands, phosphate, potash, REE, uranium, lithium and cobalt/nickel deposits and projects mentioned in the text.

In July 2020, TNG announced that it had acquired two tenements adjacent to the South Australian border that include the **Arrakis** mineral sands deposit. Arrakis has Indicated and Inferred Resources of 364 Mt at 6.3% heavy minerals; it is hosted in dune sands overlying the Musgrave Province with 10 km of strike extent. The heavy mineral fraction is dominated by ilmenite, with minor zircon content. TNG will focus on determining if the vanadiferous titanium-iron oxide heavy mineral concentrate is amenable to treatment using TNG's TIVAN® technology to provide feed for their proposed processing plant in Darwin. The resource was defined by the previous owners, Globe Mineral Resources International, who drilled 1749 shallow aircore holes at the deposit in 2012–13.

Rare earth elements

Arafura Resources continued to progress the **Nolans** rare earth-phosphate project located in the Reynolds Range, 135 km northwest of Alice Springs. Measured, Indicated and Inferred Mineral Resources at Nolans Bore total 56 Mt at 2.6% total rare earth oxides (TREO), 11% P_2O_5 and 0.02% U_3O_8 , containing 1.46 Mt REO. In March 2020, the company announced an increase in Ore Reserves, with Proven and Probable Reserves now totalling 29.5 Mt at 2.9% TREO and 13% P_2O_5 , which could support a mine life of at least 33 years. The most abundant rare earth-bearing minerals at Nolans Bore are apatite, monazite and allanite, with 26.4% of the mix represented by neodymium and praseodymium (NdPr). In March 2020, the company released final results of a nine-hole drilling program that included four deep exploration holes targeting down-dip extensions of Indicated and Inferred Resources in the deposit's North and Southeast zones. Three of the four holes intersected thick zones of rare earths mineralisation up to about 200 m vertically below the planned final mining pit, with a best result of 75.68 m at 2.8% TREO and 11% P_2O_5 from 364 m in the North Zone. During 2020, the company was granted a mineral lease over the Nolans deposit, and continued execution readiness programs and financing discussions.

Lithium

Core Lithium continued to grow their resource and progress towards production at their **Finniss** lithium project, which forms part of the Bynoe pegmatite field, 20–50 km south-southwest of Darwin. Lithium mineralisation in the Bynoe field occurs as spodumene in north-trending pegmatites up to 40 m in width along a 30 km north-trending corridor. In June 2020, the company announced a substantial increase in the combined Mineral Resource at Finniss to 14.72 Mt at 1.32% Li_2O for 208 600 t of Li_2O . The resource increase was due to additional resources defined at BP33 (3.24 Mt at 1.51% Li_2O), Hang Gong (2.02 Mt at 1.2% Li_2O) and Carlton (3.02 Mt at 1.28% Li_2O), as well as a maiden resource at Booths/Lees Link (1.47 Mt at 1.06% Li_2O). This was followed by an updated Ore Reserve of 5.7 Mt at 1.3% Li_2O , which could support a 7-year mine-life using open pit mining methods at the Grants deposit and underground mining methods at the BP33 and Carlton deposits. In late

2020, Core Lithium undertook a drilling program at the Grants designed to strengthen the resource model. Best intersections were 31 m at 1.65% Li_2O from 197 m, including 16 m at 2.02% Li_2O ; and 36 m at 1.34% Li_2O from 183 m, including 3 m at 3.38% Li_2O . The company also progressed their approvals for mine development at Finniss, with the mine management plan for the Grants mine approved in April 2020. In September 2020, the NT EPA advised that the environmental assessment for Core Lithium's BP33 underground mine can be via a Supplementary Environmental Report rather than a full EIS; the mineral lease for BP33 was granted in January 2021.

Nickel-cobalt

IGO Ltd, as part of the Lake Mackay joint venture with Prodigy Gold, undertook a 38 hole, 993 m drilling campaign at the **Grimlock** nickel-cobalt prospect northeast of Kintore. Grimlock has shallow enrichment of cobalt and nickel developed over weathered ultramafic phases of the margins of a gabbro-norite intrusion. The program aimed to follow up 2019 drilling and define the potential scale of the prospect with a 300–400 m-spaced grid of holes along 3.5 km long area. Best results included 12 m at 0.07% Co and 1.17% Ni from 20 m, including 4 m at 0.11% Co and 1.56% Ni, and 12 m at 0.13% Co and 0.64% Ni from 8 m. The pyrolusite associated with high-grade cobalt in previous drilling was not intersected. A maiden drilling program of 18 holes for 342 m was undertaken at the **Swoop** Co-Ni-Mn prospect where lag sampling of outcropping duricrust (announced in February 2019) returned 2.0% Co, 1.0% Ni and 11.2% Mn. Best results included 4 m at 0.15% Co and 0.67% Ni from 14 m, and 10 m at 0.13% Co and 0.51% Ni. The joint venture reported that both the mafic/ultramafic intrusion and surface enrichment at Swoop appears similar to Grimlock, and that there is potential for several other mafic/ultramafic intrusions identified at Lake Mackay to host further cobalt and nickel mineralisation.

Phosphate

Verdant Minerals Limited's **Ammaroo** phosphate project is located in the southern Georgina Basin, ~80 km east of Barrow Creek. The project has Indicated Mineral Resources of 165 Mt at 15.5% P_2O_5 , and total Measured, Indicated and Inferred Mineral Resources of 1141 Mt at 14% P_2O_5 using a 10% P_2O_5 cut-off. The company have completed a bankable feasibility study, and environmental approvals are in place.

A second major phosphate project in the Georgina Basin is Avenira Limited's **Wonarah** project, which has a Measured Resource of 64.9 Mt at 22.4% P_2O_5 , an Indicated Resource of 133 Mt at 21.1 % P_2O_5 , and Inferred Resource of 353 Mt at 21% P_2O_5 , using a 15% P_2O_5 cut-off. During 2020, the company progressed scoping studies on the potential development of the resource.

Potash

Verdant Minerals' **Karinga Lakes** potash project is 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. Parkway Minerals NL have a \$3 million agreement to earn up to 40% of the project through staged evaluation of their aMES™ mineral processing technology to produce sulfate of potash (SOP) at Karinga Lakes. In November 2020, they released the results of a prefeasibility study that utilised an aMES™ flowsheet for a small-scale operation targeting annual SOP production of 40 000 t over an initial mine life of 20 years. The study also included the release of an Indicated Mineral Resource of 1 Mt of potassium over 24 salt lakes, of which 520 000 t was ‘mineralisation contained in drainable porosity’. The mine plan is based on eight salt lakes with a combined Resource of 580 000 t of potassium. In total, the planned production comprises ~430 000 t potassium dissolved in ~130 million m³ brine at an average life of mine grade of ~3.3 kg/m³ K.

Uranium

In January 2021, the Territory’s only operating uranium mine **Ranger** ceased production after 40 years of continuous operation since 1981; during this time, about 132 000 t of uranium oxide was produced. During 2020, Energy Resources of Australia Ltd (ERA) produced 1751 t of uranium oxide from the Ranger mine, a 10% decrease from 2019. Under the Ranger Authority, ERA was required to cease mining and processing activities in the Ranger Project Area by 8 January 2021, with final rehabilitation to be completed by January 2026. The Ranger 3 Deeps Mineral Resource was written off at the end of 2020, and the company will commence remediation of the decline. ERA has also entered into a long-term care and maintenance agreement in relation to the Jabiluka Mineral Lease, north of Ranger, and have stated that future mining developments at Jabiluka will not occur without the consent of the Mirarr Traditional Owners.

Vimy Resources Limited continued to explore the King River–Wellington Range project in western Arnhem Land and assumed 100% of the project after acquiring Rio Tinto’s share of the joint venture in early 2021. The project contains the **Angularli** prospect, which was discovered by Cameco; it has a 2018 defined Inferred Resource of 0.91 Mt at 1.3% U₃O₈ for 11 558 t U₃O₈. The planned field program for 2020 was delayed by COVID, and planned drilling programs could not be undertaken. During the year, Vimy Resources carried out ground geophysics (passive seismic) and termitaria surveys at the Emu, Such Wow North, and Angularli North prospects. The company completed rock chip sampling programs, acquired high-resolution drone imagery, and conducted low-level environmental surveys. The company also completed a successful test of the application of ore-sorting technology for mineralisation from Angularli.

In June 2020, Eclipse Metals Ltd was granted a tenement in western Arnhem Land that includes the existing Devils Elbow uranium, gold and palladium prospect. The company undertook an initial field reconnaissance program in August. Elsewhere in western Arnhem Land, no on-ground

work was reported by DevEx Resources Limited at their Nabarlek project.

Energy Metals Limited have uranium projects in the Ngalia Basin, northwest of Alice Springs, including the **Bigirlyi** uranium deposit, which has total Indicated and Inferred Mineral Resources of 7.5 Mt at 0.13% U₃O₈ and 0.12% V₂O₅ at a 500 ppm U cut-off, containing 9600 t of U₃O₈ and 8900 t of V₂O₅. Field programs in 2020 were suspended due to COVID.

Eclipse Metals announced that they planned to commence exploration programs for sandstone palaeochannel-style uranium mineralisation in the Ngalia Basin, following up a gravity survey conducted in 2019; no activity was reported in 2020.

In November 2020, Marenica Energy Limited announced that it had recalculated the Mineral Resource for the **Angela** uranium project, south of Alice Springs, to JORC 2012 standards, reporting an Inferred Mineral Resource of 10.7 Mt at 0.131% U₃O₈. The company also released results from a proof of concept metallurgical test work program on ore from Angela utilising their proprietary U-pgrade™ beneficiation process, which removed 84% of the acid consuming minerals prior to acid leaching. The company reported that this would lead to substantially reduced acid consumption for the project, enabling lower operating costs and environmental impacts.

Onshore petroleum

Petroleum exploration activity in the onshore basins of the Northern Territory was also impacted by COVID restrictions, although substantial progress was made in demonstrating the liquids-rich gas potential of the Beetaloo Sub-basin. **Figure 7** shows granted petroleum tenure and basins in the Territory, and the location of wells and fields mentioned in the text.

McArthur Basin

The **Beetaloo Sub-basin** is a significant depocentre of Mesoproterozoic Roper Group sedimentary rocks underlying the Mesozoic Carpentaria Basin in the vicinity of Dunmarra and Daly Waters; it is the Territory’s most advanced shale gas play. The most prospective shale units in the Roper Group occur within the Velkerri and Kyalla formations. Drilling of the middle Velkerri Formation has demonstrated the consistent presence of gas-saturated, quartz-rich shale source rocks that are mature for gas over extensive areas and appear to meet all of the physical and chemical parameters for a successful shale gas play. The discovery reports for wells drilled to date by Santos Limited, Origin Energy Limited and Pangaea Resources indicate a P50 Gas-In-Place Resource for the Velkerri B-shale alone of at least 500 Tcf, with the additional potential for liquids across the basin.

Exploration in the central part of the Beetaloo Sub-basin is operated by Origin Energy in joint venture with Falcon Oil & Gas Ltd. In 2020, Origin Energy continued to test the **Kyalla 117 N2-1** well, which was spudded in October 2019 and designed to test the liquids-rich shale gas play in the

Kyalla Formation. The well reached a vertical total depth of 1895 m and intersected nearly 900 m of Kyalla Formation, including three source-rock reservoir intersections with thicknesses of between 75 and 125 m. Drilling of a 1579 m lateral section (Kyalla 117 N2-1H ST1) in the lower

Kyalla Formation was successfully completed in February 2020. Activity at the well paused from March 2020 due to COVID. Operations recommenced in September 2020 with 11 hydraulic stimulation stages along the lateral section. In January 2021, the joint venture announced that following

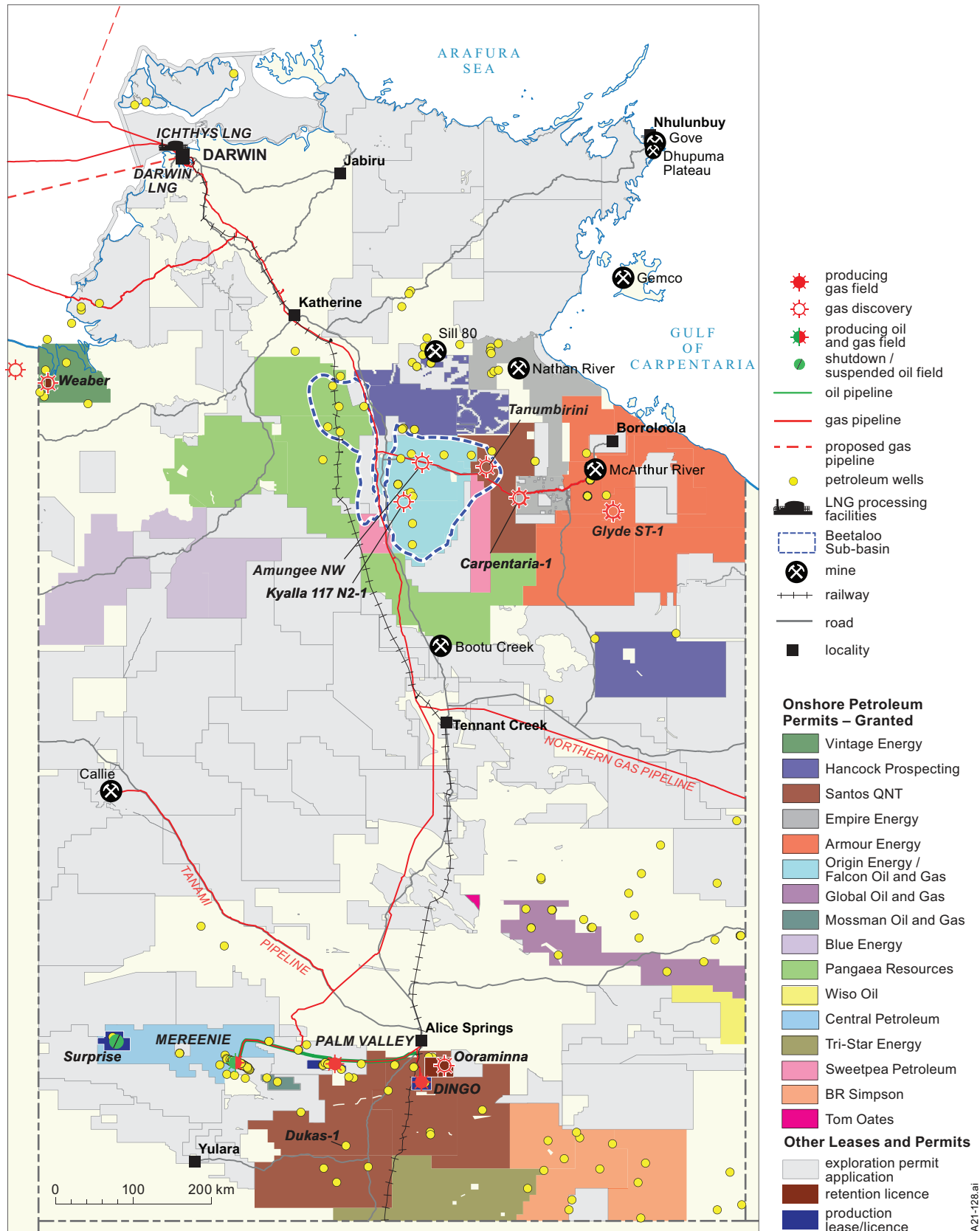


Figure 7. Map showing granted petroleum exploration permits in the onshore Northern Territory as of January 2021, coloured by operator, along with wells mentioned in the text.

the introduction of nitrogen to lift the fluids in the well, the well flowed unassisted for seventeen hours at rates of 0.4–0.6 million cubic feet per day (mmscf/d). Initial gas composition data indicates liquids-rich gas with 65% methane, 18.8% ethane and a C₃₊ gas component of 14.4%, with low CO₂ (0.9%). An extended production test of the well is expected at the start of the 2021 dry season.

During 2020, Santos continued flow testing of the **Tanumbirini-1** vertical well following a four-stage stimulation program in late 2019. Initial production test results confirmed a gas discovery in the Middle Velkerri shale gas play with gas flow rates exceeding initial expectations for the vertical well. Preliminary gas composition analysis indicated >90% methane, less than 5% total inert content and 3% ethane. During the first quarter of 2020, the 130-day flow test surpassed 1.2 mmscf/d and settled at 0.4 mmscf/d with minimal decline. The flow test was ended prematurely due to COVID. After being shut-in for over 160 days, the well was reopened in October and initially flowed 10 mmscf/d and achieved an average flow rate of 2.3 mmscf/d during the first 90-hours of testing.

In September 2020, Empire Energy Group Limited spudded the **Carpentaria-1** well near the eastern margin of the Beetaloo Sub-basin. This was drilled to a total depth of 1916 m and intersected extensive intervals of liquids-rich gas within shales of the Velkerri Formation. The Velkerri Formation was intersected from 833–1831 m depth and exceeded the company's expectations in both the thickness of the shales and the presence of higher value liquids. Based on the results of Carpentaria-1, Empire Energy Group's best estimate prospective gas resource for EP187 increased to 3.5 Tcf, with a prospective condensate resource of 27 million barrels. The company also booked a maiden contingent gas resource of 41 Bcf. They are planning for hydraulic stimulation and flow testing of the well in 2021.

In December 2020, Tamboran Resources Limited announced that it had acquired Sweetpea Petroleum Pty Ltd, making Tamboran Resources the owner-operator of three exploration licences within and close to the Beetaloo Sub-basin.

In February 2021, Armour Energy Limited announced that they had lodged Retention License (RL) applications covering 491 km² over conventional gas discoveries in the McArthur Basin. The RL applications cover conventional discoveries within the Coxco Dolostone at **Glyde-1 STI** and **Cow Lagoon-1**. The company reported that granting of the licences would allow them to progress the discoveries towards commercial development and the award of production licences.

South Nicholson Basin/Lawn Hill Platform

In early 2021, Armour Energy announced the completion of the sale and purchase agreement with Santos of Armour's remaining shares in several South Nicholson Basin permits

in Queensland and the Northern Territory, including EPA172 and 177 in the Territory.

Amadeus Basin

The Territory's current onshore gas production is entirely sourced from fields in the Amadeus Basin operated by Central Petroleum Limited. In 2020, 13.699 billion standard cubic feet (bscf) of gas was produced in the onshore Territory, a 25% decrease on 2019. This comprised 9.207 bscf from Mereenie, 3.326 bscf from Palm Valley and 1.166 bscf from Dingo (**Figure 7**). Onshore oil production in the Territory in 2020 was sourced entirely from the Mereenie Field, with 0.157 million barrels (MMbbls) of oil produced.

In July 2020, Central Petroleum announced an update in Proven and Probable (2P) gas reserves in the Amadeus Basin. Updated 2P reserves are 91.8 PJ gas and 0.97 MMBbl oil at Mereenie, 27.7 PJ gas at Palm Valley and 36.1 PJ gas at Dingo. Central Petroleum planned to drill a number of exploration wells in 2020, but logistical constraints resulting from the COVID disruption meant the exploration wells were deferred beyond 2020. The company has announced that their planned 2021 exploration program will include three wells: Dingo Deep (Dingo 5), Orange 3, and Palm Valley Deep. Two of these wells (Dingo Deep and Palm Valley Deep) are designed to produce from the shallower producing formations, as well as for deeper exploration. If successful, and in conjunction with subsequent development, the company has reported that the program would more than double their oil and gas reserves. The program is subject to a planned farm-out process for an interest in its Amadeus Basin producing tenements that will fund their exploration program in 2021.

Central Petroleum also has a farm-in agreement worth up to \$150 million with Santos for a large area in the Amadeus Basin. Santos are targeting sub-salt and intra-salt plays of the Neoproterozoic lower Gillen-Heavitree System in the southeastern part of the basin that have potential for large gas and helium accumulations hosted in the Heavitree Formation. The **Dukas-1** wildcat well, 175 km southwest of Alice Springs, was drilled by Santos in 2019, reaching a depth of 3704 m before being suspended after encountering an exceptionally over-pressured zone above the target reservoir formation. In 2020, Central Petroleum reported that due to the need to import specialised high-pressure equipment and the impact of COVID, the joint venturers are targeting the first half of 2022 to drill a follow-up well.

In August 2020, Central Petroleum announced it had signed an agreement with Australian Gas Infrastructure Group and Macquarie Mereenie Pty Ltd to progress towards a Final Investment Decision for the development of the Amadeus to Moomba Gas Pipeline. The proposed 950 km pipeline would provide direct access from the Amadeus Basin in the Northern Territory to the Moomba gas supply hub in South Australia.