

# **TODD RIVER METALS PTY LTD**

# McARTHUR PROJECT

# **GROUP ANNUAL AND FINAL REPORT**

## **GR367**

EL 27711 - 9/07/10 to 9/05/23 EL 30085 - 11/04/14 to 17/04/23 EL 31703 - 8/05/18 to 9/05/23 EL 31704 - 8/05/18 to 9/05/23 EL 32597 - 23/06/21 to 9/05/23

EL27711, EL30085, Tenement/s

EL31703, EL31704,

Todd River Metals Pty Ltd

EL32597

1:250 000 Sheet

Name

Walhallow (SE5307)

Bauhinia Downs (SE5303)

1:100 000 Sheet

Name

Bloodwood Creek (5963)

Kilgour (6063) Lancewood (6163) Mallapunyah (6064)

Manager N/A Datum GDA94-53

Operator Todd River Metals Pty Ltd

Commodity Cu, Pb, Zn, Ag

**Elements** Analysed

Holder

Keywords Prospective stratigraphy, Wollogorang Formation, Tawallah Group, McArthur

Group, Settlement Creek Dolerite, Mallapunyah Formation, base metal

mineralisation, Zn, Cu, Pb, Surrender, Annual and Final Report.

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#### **EXECUTIVE SUMMARY**

The McArthur River Project is operated by Todd River Metals Pty Ltd, a wholly owned subsidiary of Todd River Resources Limited.

The project comprises five exploration licences, EL 27711, EL 30085, EL 31703, EL 31704 and EL32597 which lie in the McArthur Basin and in the southwestern portion of the Batten Fault Zone.

Licences were granted from July 2010 through to June 2021 and after a review of all the company's projects and exploration commitments along with all exploration undertaken over the life of the tenure, the licences have been surrendered in April and May 2023.

This report summarises all exploration that has been undertaken across the project area over the life of the licences. This includes a comprehensive review of historical data and exploration, mapping, surface sampling, drilling and airborne geophysical surveys.

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### 1. INTRODUCTION

The McArthur River Project is operated by Todd River Metals Pty Ltd (TRM), a wholly owned subsidiary of Todd River Resources Limited.

The project comprises five exploration licences, EL 27711, EL 30085, EL 31703, EL 31704 and EL32597 (Figure 1) which lie in the McArthur Basin and in the southwestern portion of the Batten Fault Zone.

Group reporting was approved in May 2015 (GR367) with a reporting period of 9 July to 8 July. EL31703 and 31704 were added to this group reporting in January 2019 and EL32597 in August 2022.

No significant field-based exploration has been undertaken across the project area since 2018 and after a full review of the McArthur Project, other company projects and exploration commitments the licences were surrendered in April and May 2023.

This report provides a summary of exploration completed over the life of the project.

#### 2. LOCATION AND ACCESS

The project area is located approximately 750km southeast of Darwin (900km by road), 50km to the SSE of Cape Crawford, and 60-80km SSW of the McArthur River Zinc Mine. The project area falls on three pastoral lease properties, Mallapunyah Springs (PPL 1075), McArthur River (PPL 1051), and Kiana (PPL 1065) and lies on the Walhallow (SF5307) and Bauhinia Downs (SE5303), 1:250,000 mapsheets.

Access to the area is via the Carpentaria Highway from Daly Waters and then the Tablelands Highway, south from Cape Crawford. The turnoff to Mallapunyah Homestead is 35km down the Tablelands Highway and along the Kiana Road. Access along the Kiana Road is good, with only a few minor gully crossings. The Kilgour River crossing (just east of the proposed activity area) is a flat sheet of hard limestone that is usually able to be crossed from May through November.

#### 3. TENURE

Exploration Licences 27711, 30085, 31703, 31704 and EL32597 form the McArthur River Project Area (Figure 1). The licences are 100% held by Todd River Metals Pty Ltd, a wholly owned subsidiary of Todd River Resources Limited. EL27711 has been renewed four times (in 2016, 2018, 2020 and 2022) since grant in 2010 and EL30085 has been renewed twice (in 2020 and 2022). A partial reduction was undertaken on EL31703 in 2020 and on EL31704 in 2020 and 2022. All licences were surrendered in April and May 2023. Tenure details are summarised in Table 1.

•					
Title	Area (blocks)	<b>Grant Date</b>	Surrender Date		
EL 27711	52	09/07/2010	09/05/2023		
EL 30085	16	11/04/2014	17/04/2023		
EL 31703	18	08/05/2018	09/05/2023		
EL 31704	31	08/05/2018	09/05/2023		
FI 32597	250	23/06/2021	09/05/2023		

Table 1: McArthur River Project tenement details.

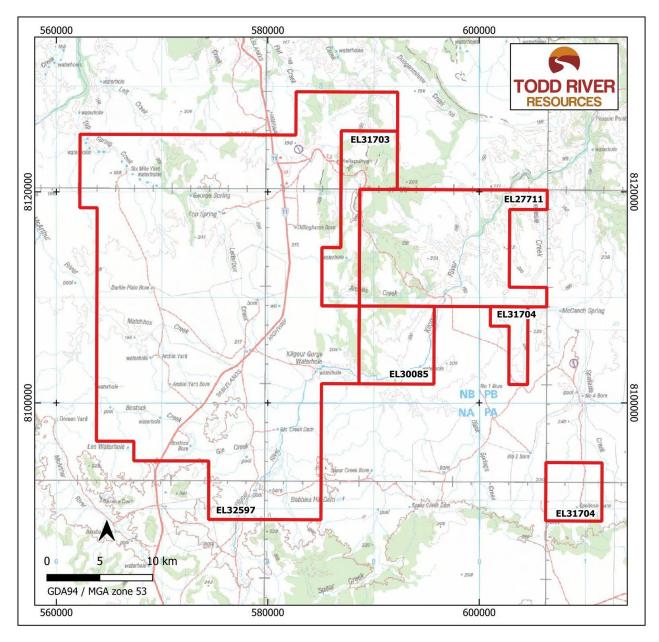


Figure 1: Location of McArthur River project area.

### 4. REGIONAL GEOLOGY

The Project lies within the McArthur Basin, and in the southwestern portion of the Batten Fault Zone (Ahmad et al., 2013). It falls on the northern margin of the WALHALLOW (SE5307) and southern margin of the BAUHINIA DOWNS (SE5303) 1:250,000 mapsheets (Figure 2).

Within EL27711 the Mallapunyah Dome (Figure 2) exposes basement Settlement Creek Dolerite, of the lower Tawallah Group (Redbank Package). Surrounding the Dome a sequence dips gently away (at 5-30 degrees) including the Wollogorang Formation, Gold Creek Volcanics (intermittently), and an overlying sandstone unit (Warramana Sandstone) and this sequence is then unconformably overlain by the McArthur Group (Masterton Formation, Mallapunyah Formation).

Exploration work by Todd River and previous explorers has outlined the Wollogorang Formation as being prospective for base metals (Zn-Pb-Cu-Ag) within carbonaceous black shales and areas with both extensive Zn-Pb geochemical anomalies and geophysical conductor targets.

The Wollogorang Formation is interesting as both a base metal host and also a source of organic material/unconventional hydrocarbons. It is dated to 1725 +/- 5 Ma, from U-Pb dating of zircons (Rawlings, 2002). Recent petrographic work by TNG has highlighted the abundant organic material present in the Wollogorang shales/argillite, with 57-89% organic material present in the three samples described. This unit is the main target of this drilling program and it also warrants detailed assessed of its potential to host unconventional hydrocarbon accumulations.

Figure 3 shows the regional setting of the Project area, with two significant faults cutting/wrapping the eastern margin of the dome. Both are the Mallapunyah and Tawallah Faults were active during Redbank depositional time, and collectively form the western boundary of the Batten Fault Zone in this area. Figure 4 shows the local stratigraphy within the project area.

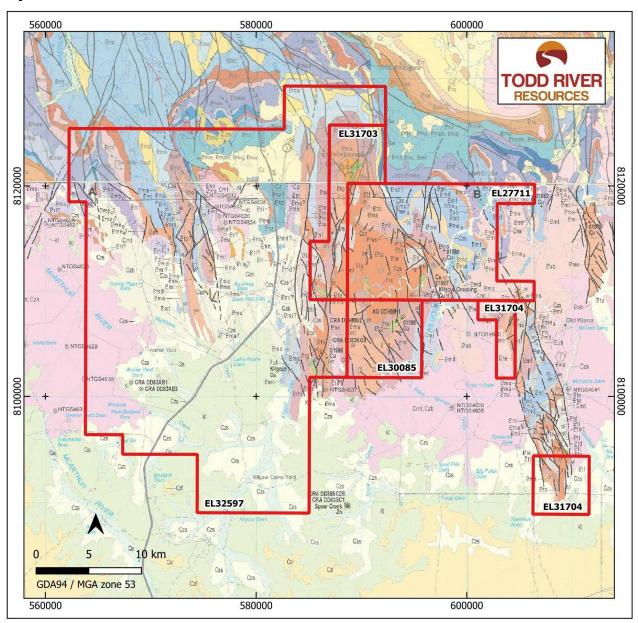


Figure 2: Regional geological setting of the McArthur project area.

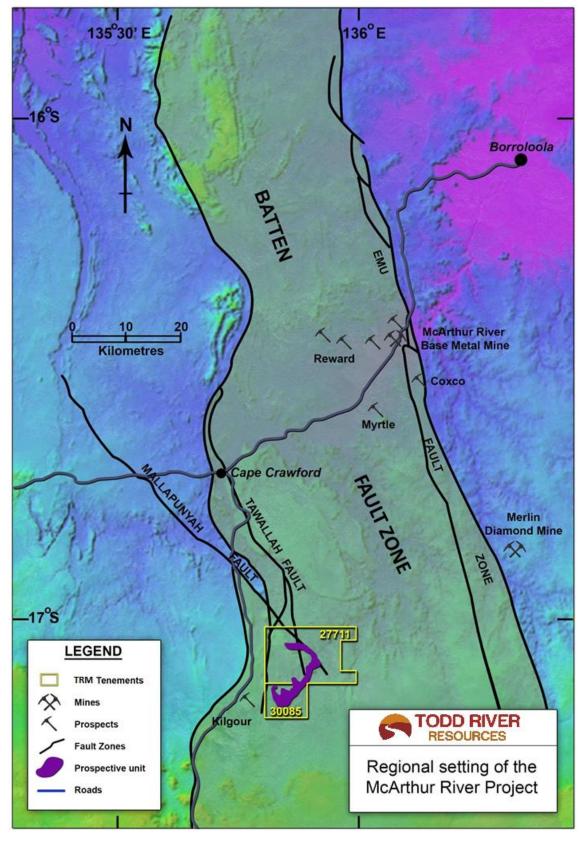


Figure 3: Regional structural setting of the McArthur Project Area, showing the Mallapunyah and Tawallah Faults along the western margin of the Batten Fault Zone.

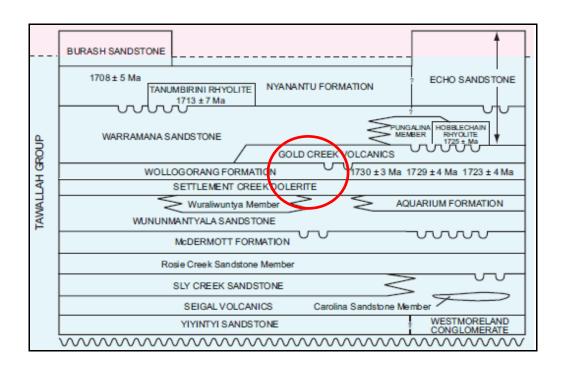


Figure 4: The Tawallah Group of the Redbank Package (from Ahmad et al., 2013), the main stratigraphy in the project area indicated by the red circle.

#### 5. PREVIOUS EXPLORATION

The Project area has been partially explored for a variety of commodities including gold, copper, lead, zinc and diamonds. This exploration is summarised below with full references and a more detailed summary found in Wetherley and Moyle (2011).

- From 1966 to 1967 the Mallapunyah Dome was geologically mapped, rock chip and extensively soil sampled by Australian Geophysical Limited. IP geophysical surveys were also carried out around the Dome covering the Wollogorang and Gold Creek Formations.
- From 1967 to 1976 Carpentaria Exploration Pty Ltd undertook stream sediment, soil and rock chip sampling along with a minor geophysical programme.
- In the years following A.O Australia, Shell Company of Australia and Perilya mines returned to the Kilgour prospect however only completed very minor work.
- From 1993 1995 Mt Isa completed an extensive stream sediment program over the whole tenement area. Cu, Mn and Zn all returned anomalous results.
- In later years Aberfoyle Resources (1997) and Kiana Project Pty Ltd (2006 2007) were granted tenements in the McArthur River area.

AGPL did the most detailed work and more mapping, sampling and geophysics than all subsequent explorers (NTGS Open file report CR1967-0007). They were focused on copper exploration with a "Redbank-Style Breccia Pipe" model being used (Ahmad, et al, 2013). At the time the only base metal mine in the McArthur Basin was at Redbank, where chalcopyrite/malachite copper was mined from breccia, hosted by either Wollogorang Formation or Gold Creek Volcanics. This target style has modest tonnage potential and is not the primary target being considered by TNG.

Over 3000 -80 mesh soil samples were taken by AGPL, and several large multi-element anomalous areas were outlined (Figure 5a), particularly along the eight kilometre eastern margin of the Mallapunyah Dome. These were informally divided into:

- A central zinc-rich zone (straddling TNG's tenements)
  - 3000m long and up to 450m wide,
  - with results up to 1400ppm Zn that has
  - o coincident Pb (to 670ppm), and
  - o partially coincident Cu with
  - associated IP anomalies.
- A northeastern zone
  - o 850m long and up to 550m wide
  - zinc results up to 650ppm,
  - Copper to 1000ppm and lead to 520ppm
  - Coincident (down dip) IP
- A southwestern zone
  - o 1200m long with results of up to 800ppm Zn and 1150ppm Cu.

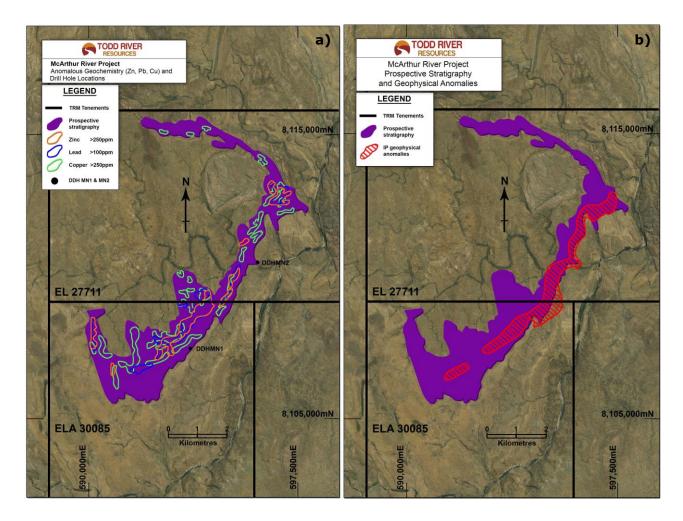


Figure 5: a) Prospective stratigraphy (Wollogorang Formation, purple outline) and anomalous Zn-Pb-Cu geochemistry. b) IP Anomalies (mod - strong IP response and metal factor values).

The Wollogorang Formation was split by AGPL into eight informal units (Table 2). The thicker central "Ovoid Beds" unit is responsible for much of the anomalous Zn-Pb geochemistry and at surface is light yellow brown siltstone to dolomitic silt/mudstone containing abundant stromatolitic bioherms (Ahmad, et al, 2013).

Table 2: Wollogorang Formation informal subdivision (by AGPL) in the Mallapunyah Area and thicknesses of subunits (measured by TNG).

Wollogorang Formation Thickness in the Mallapunyah Dome Area						
PTOU	Upper (PTO-04 to PTO-08)					
1.00	Average 60m (13-150+m)					
PTOO	Ovoid Beds (PTO-03)					
1100	Average 50m (10-70m)					
PTOL	Lower (PTO-01 and PTO-02)					
PIOL	Average 20m (less than 50m)					
OR						
PTO8	8 <b>Dolomite</b> . Massive, fgr, cream/purple					
PTO7	Algal chert marker. Thinly interbedded algal dol./chert					
PTO6	Dolomitic siltstone. Red wthd, poorly outcropping					
PTO5	Thin bedded <b>pink dolarenite, sandstone</b> , and sandy dolomite					
PTO4	Silty dolomite, dolomitic siltstone, dolomite. Dark wthg.					
PTO3	<b>Ovoid Beds</b> . Thin bedded and fissile. Black bituminous to grey wthd. Dolomitic siltstone, shale, argillite, and dolomite. Lower section - black mgr dolomite ovoids 10-30cm, becoming progressively smaller and more irregularly shaped					
PTO2	Dolomite beds, f-mgr sugary, white to dark grey					
PTO1 Basal <b>silty dolomite</b> /dolomite, fgr, greenish grey						

AGPL completed 15 lines of IP over the Wollogorang Formation in 1967. This work produced moderate to strong conductors in 9 of the 10 lines over the eastern margin of the Dome (Figure 5b). These anomalous zones are immediately below and down dip of the central Wollogorang Formation Ovoid Beds unit, and indicate significant sulphide (pyrite+/- sphalerite, galena) content in this carbonaceous unit.

The only historical drilling conducted within the tenement area was by AGPL in 1969-70 (NTGS Open file report CR19700005) with two diamond holes (Figure 6a) that are still in the NTGS Core Library Store in Darwin. These two holes were drilled on two separate targets – being the Wollogorang Formation Zn-Pb geochemical anomaly (DDHMN1), and a copper breccia target in the Gold Creek Volcanics (DDHMN2).

The original AGPL analyses from DDHMN1 returned a broad anomalous interval of 26.82m @ 0.14% Zn and 250ppm Pb (from 95.71 to 122.53m).

All exploration carried out by TNG Ltd (under subsidiary Enigma Mining Limited – Enigma) and Todd River Resources Limited (under subsidiary Todd River Metals Pty Ltd – TRM) is detailed in Section 6.

## 6. EXPLORATION UNDERTAKEN 2010-2023

## **6.1 Exploration Completed by TNG Ltd**

TNG (Enigma) completed several programs of mapping and sampling on EL 27711 and EL 30085 with the mapping confirming both the accuracy of the original (1967 AGPL) mapping and the position and levels of the soil anomalism outlined by AGPL.

The first programme was carried out in May 2011 with the aim to map a copper-anomalous horizon with in the Wollogorang Formation. A total of 57 samples were collected for analysis with a number of samples exceeding 100ppm Cu. The programme was deemed successful in outlining and confirming a number of target areas.

A second programme was undertaken in September 2013. Soil sampling was completed over anomalous areas outlined by the AGPL work. Fourteen pXRF lines were sampled covering three main geochemical anomalies and the 1967 IP anomalies. The sampling confirmed the validity of the 1967 data with anomalous copper, lead and zinc closely associated with historic values as well as having a strong correlation with stratigraphy. Soil sampling returned a maximum of 3616ppm pXRF copper, 525ppm pXRF lead and 1587ppm pXRF zinc all within the central area.

195 soil samples (-80 mesh) were also collected across areas of anomalous geochemistry and sent for ICP multielement analysis. The sample results correlate well with both the pXRF and AGPL soil sampling. Maximum values included 3230ppm copper, 430ppm lead and 1740ppm zinc.

A total of 75 rock pXRF readings were also taken with 31 rock chip samples submitted for ICP analysis. Soil anomalism was confirmed by rock sampling with whole rock ICP analysis returning a maximum of 5680ppm copper, 1100ppm lead and 2030ppm zinc. This sampling was primarily concentrated near the base of the "Ovoid Beds" unit (an informal mapping unit) within the central portion of the Wollogorang Formation.

In November 2013 core from DDHMN1 and DDHMN2, drilled by Australian Geophysical Pty Ltd (AGPL) in 1969, and the only historical drillholes within the current tenure, was relogged and resampled.

In April 2014 TNG submitted a proposal to the NT Government applying for funding under the Geophysics and Drilling Collaborative Funding Programme, which provides co-funding assistance for exploration work in greenfields areas with a paucity of geological information.

The funding of \$70,000 was approved and two deep diamond drill holes were positioned, (14MCDDH001 within EL 27711 and 14MCDDH002 within EL30085) to intersect the Wollogorang Formation where anomalous geochemistry, geology, major structures, and existing IP anomalies support a strong Sedex model target adjacent to the Mallapunyah and Tawallah Faults.

The programme was undertaken from the 14<sup>th</sup> to the 30<sup>th</sup> of September (17 shifts for 351.8m, average 21m/shift). HQ core was drilled from surface.

193 samples of half cut drill core (84 samples from 14MCDDH001 and 109 samples from 14MCDDH002) were submitted to ALS laboratories for ICP analysis.

The best intersections are outlined below, with all mineralisation found in the central to lower PTO3 "Ovoid Beds portion" of the Wollogorang Formation. Zinc in fine sphalerite is associated with very fine grained stratiform sulphides (pyrite and galena) in highly bituminous black shales.

Hole No.	Interval	Thickness Grade (%)
14MCDDH001	60.0 to 69.0m	9.0m @ 0.08% Zn
14MCDDH001	80.0 to 84.0m	4.0m @ 0.08% Zn, including
	82.0 to 83.0m	1.0m @ <b>0.14% Zn</b>
14MCDDH002	19.0 to 20.0m	1.0m @ <b>0.21% Cu</b>
14MCDDH002	79.0 to 92.0m	13.0m @ 0.09% Zn, including
	80.0 to 81.0m	1.0m @ <b>0.20% Zn</b>
14MCDDH002	94.0 to 102.0m	8.0m @ 0.08% Zn

Maximum assay values were 2,020ppm zinc, 380ppm Pb, and 2,140ppm Cu, with nine values of zinc over 0.1%. There was a strong correlation between zinc, lead and silver, but copper values are low within the higher-grade Zn-Pb stratiform mineralisation.

Twelve samples were sent for petrographic analysis and hylogging of the core and carbon analysis were completed by the NTGS.

The drilling programme has proved successful with sampling of the drill core returning anomalous intersections within the Wollogorang Formation. Numerous sulphides are present and results of over 0.2% have been returned for both zinc and copper.

A third mapping and sampling programme was undertaken in September 2014 in conjunction with the diamond drilling programme. Two days' worth of sampling were completed following the Wollogorang Formation to the NW of the existing AGPL geochemical anomaly area. A total area of 300m x 1800m was sampled over six lines (78 samples), initially four lines at 50m x 400m spacing, with infill of the fourth line (to 25m spacing) and additional lines 200m either side to define the anomaly. Anomalous Zn-Pb results were returned from the central Ovoid Beds unit, to 401ppm Zn and 174ppm Pb over an area of 150m x 200m.

Another programme was completed in April 2015 and focused on outcropping rocks containing malachite and chalcocite (copper-bearing minerals) which were observed during the drilling programme. The field work confirmed the high prospectivity of the McArthur River Project, with results indicating a newly discovered zone of sedimentary-hosted stratiform copper-silver mineralisation which represents a significant exploration target and potential new mineralisation style for this area.

An additional mapping and sampling programme completed in May 2016 in the north eastern corner of EL 27711 resulted in successfully extending the known strike length of geochemically anomalous Wollogorang Formation sediments to 25km.

A total of 265 portable XRF (pXRF) soil samples were taken over an area of 3km<sup>2</sup>. Lines were on 400m spacing, in-filled as required to 200m and 100m spacing, and up to 500m long, as dictated by the stratigraphy.

# 6.2 Exploration Completed by Todd River Metals Pty Ltd

Initial exploration by Todd River involved a SKYTEM airborne electromagnetic survey flown in August 2017. The survey covered approximately 600 line-kilometres of 400m and 200m spaced lines across both EL 27711 and EL 30085.

Following data validation and levelling the datasets provided by the contractor were processed by Todd River's consultant providing several products, including a 3D inversion model of conductivity, a 3D TMI magnetic inversion, sectional conductivity and resistivity on flight lines and depth slices generated from the 3D conductivity and resistivity model. The data products outlined the stratigraphy beautifully, with four conductor units within the Wollogorang and Mallapunyah Formations that could be traced over tens of kilometres and to over 400m depth.

The two conductors identified in the Wollogorang Formation correspond with the two stratigraphic horizons outlined by mapping and geochemical surveys. These were tested by drilling in 2014.

A strong signal was also returned in the Mallapunyah Formation. There has been little geochemistry or detailed mapping and sampling to confirm the prospectivity of this unit. The type section of the Mallapunyah Formation is located between the two collaboration drill holes and was sampled in detail while the drill program was in progress.

Ten anomalies were outlined from the SkyTEM survey in 2017. Five of the ten anomalies outlined are strong conductors, while all the shallower ones warrant ground checking. Of the deeper targets, with no surface expression or geochemical support, further ground geophysics and/or drill testing is being considered. Drilling in 2018 tested three of these conductors, target B, D and I.

In May 2018 Todd River submitted a proposal to the NT Government applying for funding under the Geophysics and Drilling Collaborations Program. The application was successful and a total of \$75,000 was awarded towards the programme.

A total of 1393.1 metres were drilled in August/September 2018. This was composed of 417 metres of HQ core and 976.1 metres of NQ core.

Each hole targeted conductors within different stratigraphic sections and the drilling also assessed the potential for Zn-Pb and Cu mineralisation in these units.

The first hole MCDD0003 provided a sequence through part of the Tawallah Group (SKYTEM Target D). The hole collared into the Wollogorang Formation. Todd River Resources logging recognised the lower four sub-units in the Wollogorang, also recognised by Rawlings' 2014 McArthur Basin field guide and AGPL 1969 Mapping Legend.

#### MCDD0003

- 36-49m 13m @ 0.14% Zn with 190ppm Pb, 0.77g/t to 1.1g/t Ag and background Cu (<100ppm). Sulphide content of ~3%.
- 66-67m 1m @ 0.19% Cu with background Pb/Zn of 30ppm.

The second hole, MCDD0004, provided a sequence through part of the Umbolooga Subgroup, Tatoola Sandstone through to the Mallapunyah Formation (SKYTEM Target B). A thick layer (>200m) of Amelia Dolostone was intersected after a thin Tatoola cover sequence.

#### MCDD0004

• 190.8-193.15m - 3m @ 1.61% Pb and slightly elevated Cu (>100ppm) 0.17% Zn @ 191.38m. Vein style mineralisation. Elevated sulphides, pyrite, galena and chalcopyrite

The third hole, MCDD0005, provided a sequence through part of the Umbolooga Subgroup (SKYTEM Target I). Tatoola Sandstone outcropped in the area around the drill collar, consisting of cross-stratified quartz sandstone. Less than 10 vertical metres below this drilling intersected the interpreted Amelia Dolostone contact.

#### MCDD0005

- 264-364m A broad zone exhibiting an elevated sulphide content, containing very little base metals with maximums of Cu 25ppm, Pb 14ppm and Zn 36ppm. Samples contained up to 3.44% S and averaging around 1.0-1.5% S. Most likely pyritic (or pyrrhotitic) only sulphide content which could explain the conductor.
- 533.7-553.3m 12.1m @ 0.10% Zn. Averages of 163ppm Pb, 96ppm Cu, 0.76g/t Ag and 1.46% Sulphides. Maximums of 350ppm Pb, 187ppm Cu, 1.2g/t Ag and 2.67% Sulphides.

Downhole EM was carried at the conclusion of drilling and while there was evidence of conductors being present the data did not provide any substantial new information.

An Innovation Connect Project (ICG000705) was undertaken between Todd River and CSIRO focusing on the McArthur Project. The project sought to build on the previous studies undertaken by Todd River and others in the area, with the aim to generate, a petrophysically consistent geological model for the McArthur River project area to help gain a better understanding of the origin and cause for the conductors mapped by previously acquired SkyTEM and to assist any future exploration drilling. It also sought to combine a facies and sequence stratigraphic interpretation of the area (including surrounding regions) to ascertain the area's prospectivity.

No significant field-based exploration has been undertaken across the project area in recent years. The COVID-19 pandemic significantly affected staff movements during the 2020 and 2021 field seasons.

Prospective stratigraphy already identified within EL27711 and EL30085 and from existing NTGS 250K mapping appears to extend into EL31703, EL31704 and EL32597. Field work was planned but has not been undertaken to confirm the extent of the stratigraphy.

All data from previous exploration programmes is included in previous Annual Reports.

## 7. CONCLUSION

After an assessment of the company's current projects and exploration commitments along with a comprehensive review of all exploration undertaken over the life of the McArthur tenure, the licences have been surrendered in April and May 2023.

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