Unveiling opportunities: Geophysics in Tanami North Project target definition

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Introduction

Prodigy Gold's Tanami North Project area is located along strike of the 2 Moz+ gold-endowed Central Tanami Mine Corridor. This includes the >1 Moz Groundrush deposit, located ~20 km to the south of Hyperion (**Figure 1**). Gold mineralisation within the region, including that at Hyperion, Tregony, Thomas, Tregony North and Boco, is associated with the Suplejack Shear Zone (SSZ) or with closely associated parallel structures and splay faults. Mineralisation at Crusade, located to the north of the project area, is associated with D5 reverse thrusting within the Nannygoat Volcanics (Hillyard 2011).

Regionally, the stratigraphic package can be broadly divided into the highly magnetic and prospective north-trending Mount Charles Formation, which has been thrust against/over the younger Killi Killi Formation, part of the Tanami Group. The north-trending SSZ, which runs the length of belt, is the contact between these two formations.

The Tanami Group has undergone several phases of deformation during the Granites–Tanami Orogeny (GTO), resulting in folding, thrusting, faulting, and metamorphism of these lithologies. Metamorphism peaked at lower- to mid-greenschist facies, with amphibolite facies locally attained around GTO-related granitic bodies (Ahmad *et al* 2013).

Gold mineralisation in the region is associated with all Tanami Group units: Mount Charles Formation (Central Tanami Goldfields), Dead Bullock Formation (Dead Bullock Soak and The Granites Goldfields) and Killi Killi Formation (Coyote, Old Pirate). Gravity and magnetic geophysical techniques are both valuable exploration tools due to their ability to effectively survey vast areas of favourable stratigraphy with limited outcrop exposure; they provide the optimal modern exploration methods for expansive regions.

2023 Geophysical surveys

Prodigy Gold was granted collaborative funding under the NT Government's *Resourcing the Territory* initiative for two programs in 2023, the first being a regional gravity survey over the Tanami North project area and the second, a diamond drillhole TGRD2301 at Tregony, which included funding for downhole wireline logging.

Gravity survey

In total, 1233 new gravity stations were acquired during the project by Daishsat Geodetic Surveyors. Of these, 93 (7.5%) were revisited for survey quality control. Additionally, six existing stations were reacquired for merging purposes. The survey took 22 field days to complete.

The gravity survey was aimed at increasing the resolution of the currently available 4 km-spaced gravity data for the project area (**Figure 2**). Previously acquired detailed geophysical surveys have successfully resolved Tanami Group lithologies and the overlying cover sequence(s). In magnetically quiet areas, it has previously been possible to interpret additional stratigraphic units that are blind to magnetic surveys by using gravity methods. At Hyperion, the 2019 ground gravity survey was able to resolve gold-mineralised structures that are subtle or unresolvable in the magnetic surveys.

Another objective of the gravity survey was to assist in defining the southern boundary for the Suplejack Downs Sandstone (SDS). Prodigy Gold completed a 9 hole RC program at Boco North in mid-2023 aimed at testing the thickness of the SDS and potentially outlining areas of underlying prospective basement rocks. The drilling program failed to reach the basement below the SDS with a vertical hole drilled to 300 m bottoming out within the SDS. As drilling 3 km to the south at Boco showed no SDS and returned encouraging gold results, the gravity data will assist in outlining the southern boundary of the SDS, allowing Prodigy Gold to better design future exploration programs along the SSZ.

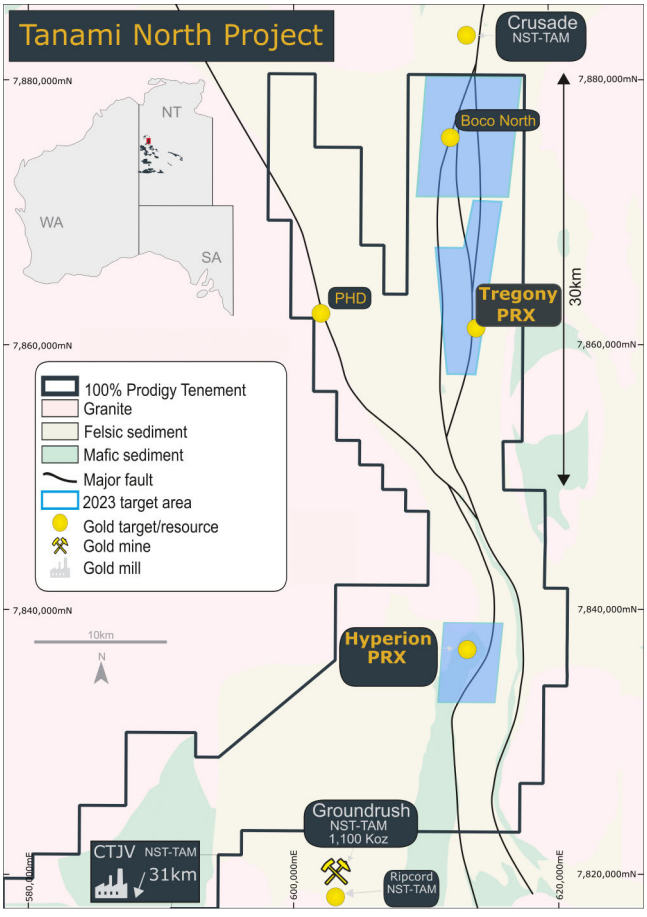

Figure 1. Location of Prodigy Gold's Tanami North Project.

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The new gravity data, together with recent NTGS aeromagnetic data at 200 m line spacing, has outlined new target areas. The area between Tregony and Boco has only been tested by shallow RAB drilling (mostly <20 m) and requires deeper drilling to penetrate the up to 10 m of transported cover.

Early iterations suggest that the gravity surveys are highlighting key structures that can be used to target/focus exploration. These findings underscore the significance of gravity data in developing a comprehensive prospectivity model for the area. Further refinement of target areas will be conducted by integrating additional factors such as rock type, folds, magnetic properties, geochemical results, and newly acquired downhole wireline data.

Downhole wireline survey

In recent years, advancements in downhole wireline logging technology have improved its application in gold exploration. High-resolution imaging tools, such as borehole optical scanners and magnetic resonance imaging (MRI) devices, offer unprecedented detail and clarity in imaging the borehole wall and detecting subtle geological features. These tools can in some ways mimic what is available from photo analysis of diamond core. Additionally, advancements in data processing software allow for more sophisticated analysis and visualisation of the logged data, facilitating better interpretation and decision-making in exploration programs.

The downhole wireline logging was completed on drillholes at the Tregony area by Wireline Services Group over 6.5 field days. The program consisted of completing the full-tool-suite on the diamond hole (TGRD2301, **Figure 3**) as well as on five RC holes (averaging 140 m), and partial-tool-suite on an additional three RC holes. The full-tool-suite included density, gamma, conductivity, full-wave sonic, formation imaging via high resolution acoustic, and optical surveys.

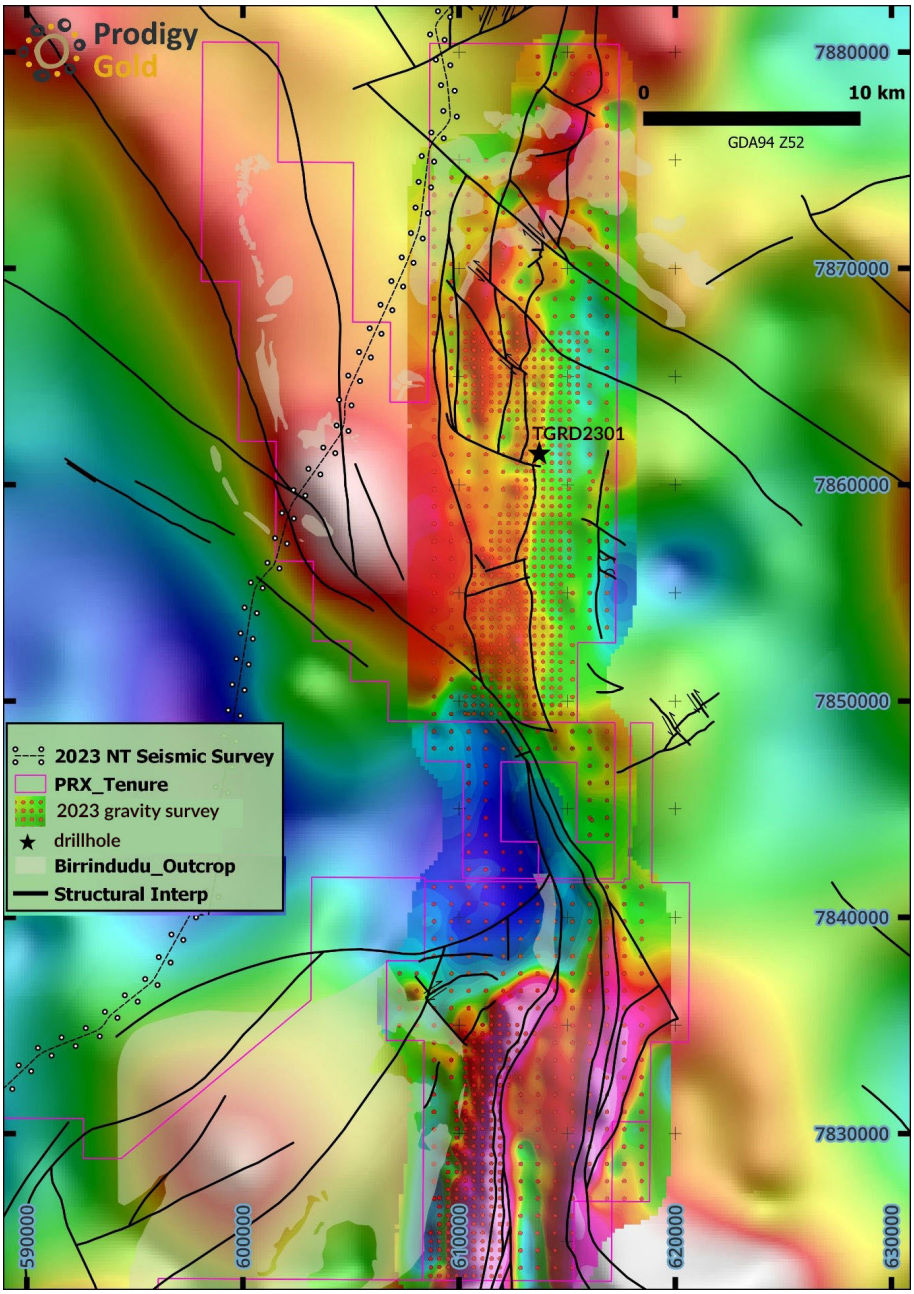

Figure 2. Location of TGRD2301 and the 2023 regional gravity survey within the Tanami North Project area, showing comparison of 4 km spaced regional gravity data (background image) and new gravity image (central overlay).

The aim of the survey was to:

- investigate the structures (observable in a multitude of downhole wireline techniques) related to the higher grade gold mineralisation at Tregony
- understand vein orientation and any other detectable structures associated with mineralisation/veining
- investigate relatable stratigraphy (marker shales and/or sandstone beds) through gamma/resistivity
- understand the relationship between grainsize (sandstones/shales/veins) and mineralisation
- look for indications of folding/faulting, which may govern high(er) grade mineralisation
- compare barren rock with mineralisation downhole responses
- understand observable downhole regolith boundaries with gamma for the base of oxidation and top of fresh rock, which may assist in quick assessment of mineralised vs non-mineralised areas with downhole logging techniques
- use calliper measurements to assist in our understanding of possible voids and aid with areas of lost core (historically); and to measure the resource and assist understanding on possible nugget/volume effects
- compare pyrite logged by the geologist with possible conductivity relationships
- compare gold with possible conductivity relationships caused by localised clay destruction by structural deformation/mechanical/chemical weathering
- bulk density measurements of the mineralisation vs barren rock.

The recently concluded downhole wireline surveys conducted at Tregony have demonstrated a notable capability in characterising and gauging the directional aspects of mineralised structures, both in RC and diamond drillholes (**Figure 3**). These surveys revealed that downhole spectral gamma readings serve to accentuate sandstone beds and discrepancies in grain sizes, providing pivotal insights into the placement of veins and associated gold mineralisation. Furthermore, density log readings identified distinctions between veining and the surrounding country rock, offering a reliable means to ascertain accurate vein widths and volumes across homogenised 1-metre composite RC samples. The recorded, downhole bulk density measurements will be used for extrapolating and corroborating physical bulk density calculations derived from diamond core samples; this process will eventually aid in calculating the bulk densities used in any future mineral resource estimates for the deposit.

Below the water table, downhole acoustic scanning affirmed the capacity to discern the orientation of mineralised veins, presenting a cost-efficient approach to tracking structures that could hold significance in predicting mineralisation governed by structural factors. Similarly, above the water table (typically at depths ranging from 80 to 100 m), optical televiewer surveys have proven effective in furnishing directional measurements of veining, bedding, jointing, and fracturing within the drillhole, all information that is generally not available from RC drilling in isolation. The establishment of relationships between drillholes along sections offers an opportunity to refine the existing lithological model and compare it against the recently updated mineral resource model for the Tregony deposit. This survey has underscored the potential to highlight geologically significant structures prior to laboratory analyses, thereby enhancing the strategic direction of future exploration efforts.

Interpretation of the downhole wireline data is expected to deliver a deeper comprehension of the Tregony deposit

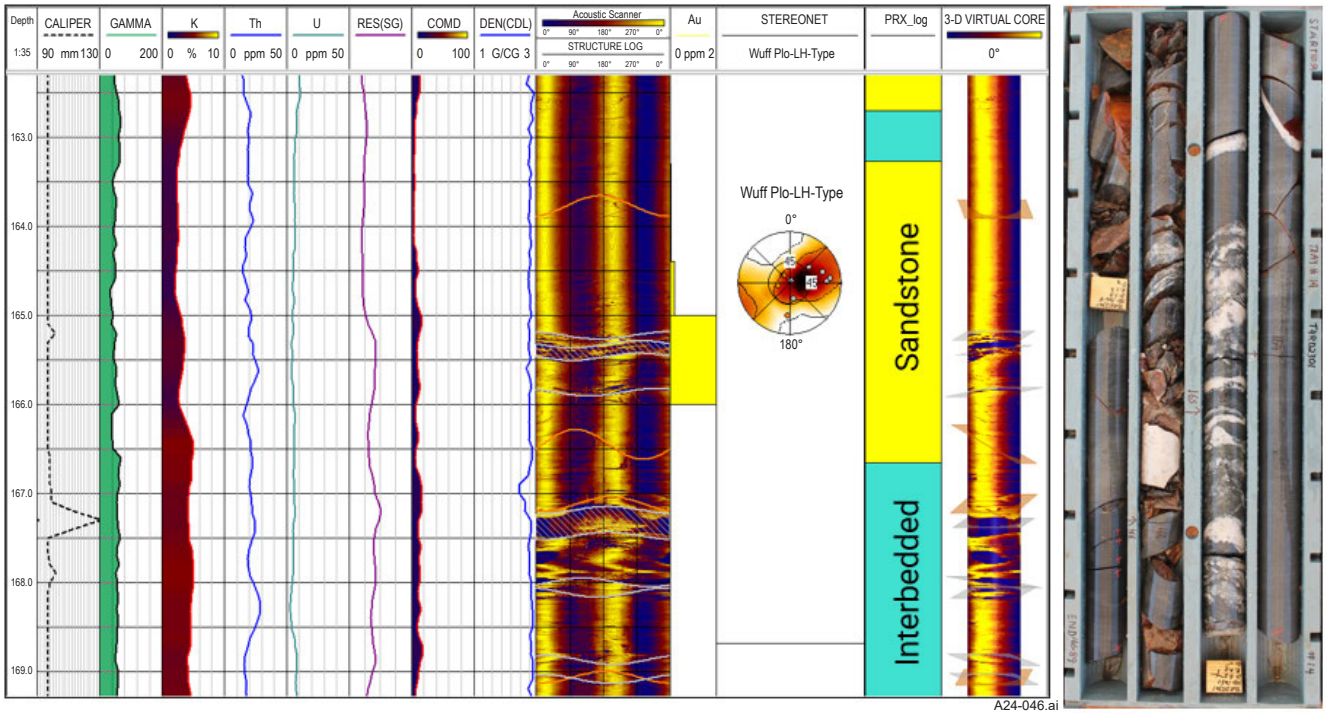

Figure 3. Section (163–169 m) of TGRD2301 highlighting downhole rock property relationships to significant mineralisation; 1 m @ 2.39 g/t Au from 165 m. Note the relationship between vein location and measurable density contrast with adjacent sediments. Note the columns labelled 'Acoustic Scanner' and 'STEREONET' highlight mineralised measurable vein directionality.

setting and mineralisation controls. Moreover, these findings will assist in identifying new exploration prospects in areas adjacent to the current resource. Ongoing efforts are focused on interpreting drillhole structural observations and rock properties across the deposit. The interpretation of results from downhole wireline information will be integrated with other pertinent project data, including recent geological mapping, geophysical surveys, geochemical sampling, and drillhole data, to plan follow-up exploration and expansion of the mineral resource base within the Tanami North Project area.

Summary

Prodigy Gold continues to analyse the recently obtained gravity and downhole wireline data to aid in the planning for the upcoming 2024 field season. Following a comprehensive review of the gravity and magnetic data, along with radiometric data (omitted from this discussion), several target areas have been identified for follow-up exploration. The gravity data will play a crucial role in assessing the southern boundary of the SDS, which marks the effective limit of explorable ground in EL31331 where depths exceeding 300 m are deemed impractical. Additionally, interpretation of downhole wireline data has significantly enhanced the understanding of the Tregony deposit, prompting further drilling initiatives based on the insights gleaned from the survey results.

References

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