GABBRO OFFSET DRILLING

Ashburton Basin, Pilbara - Western Australia

M08/196

Exploration Incentive Scheme Final Report

I. Fielding and L. Stokes, January, 2014.

1:250 000 map sheet:	Wyloo SF 50-10
1:100 000 map sheet:	n/a
Target Commodity:	Au
Keywords:	RC and diamond drilling, 2D seismic, gold, Wyloo Dome, Paulsens Mine.
Tenement Holder:	Northern Star Resources Ltd.
List of Assays:	Au, Ag, As, Bi, Cu, Mo, Pb, Pd, Pt, Sb, Ta, W and Zn.

ABSTRACT:

Location: The Gabbro Offset Prospect is located on M08/196 within the Paulsens Project Area, approximately 180km west of the Paraburdoo and 10km north of the Wyloo Homestead.

Geology: The prospect area is located in the Wyloo Dome and hosts rocks of the Hardy Formation. Volcaniclastic conglomerates or diamictites and thick basalt flows overlie a fining upward sequence of sedimentary rock. The sequence is intruded by dolerite and gabbro dykes and sills and has been influenced by deformation from the Opthalmina and Capricorn Oroginies.

Work done: 2 drill holes totalling 1251m were completed.

Results: No significant assay results were returned.

Conclusions: Drilling confirmed that seismic surveys predicted locations of prospective intrusives and structure and will help guide future drill targeting in the Paulsens Project Area.

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1 INTRODUCTION

Northern Star Resources Ltd (NST) completed drilling at their Gabbro Offset Prospect to test targets identified from a 2D seismic survey in a similar structural setting to the Paulsens Gold Mine. A grant from the Exploration Incentive Scheme (EIS) fund was awarded to NST as a part of the Royalties for Regions co-funded government – industry drilling programme.

The following report summarises the results and methodologies employed for the Gabbro Offset drilling programme located in the Wyloo Dome, Western Australia.

2 LOCATION AND ACCESS

The Gabbro Offset Prospect is situated on M08/196 and is located in the Ashburton Region of Western Australia, approximately 180km west of Paraburdoo and 10km north of the Wyloo Station Homestead (**Figure 1**). Access to the area is gained via the sealed Nanutarra-Paraburdoo Road and well maintained gravel mining roads.

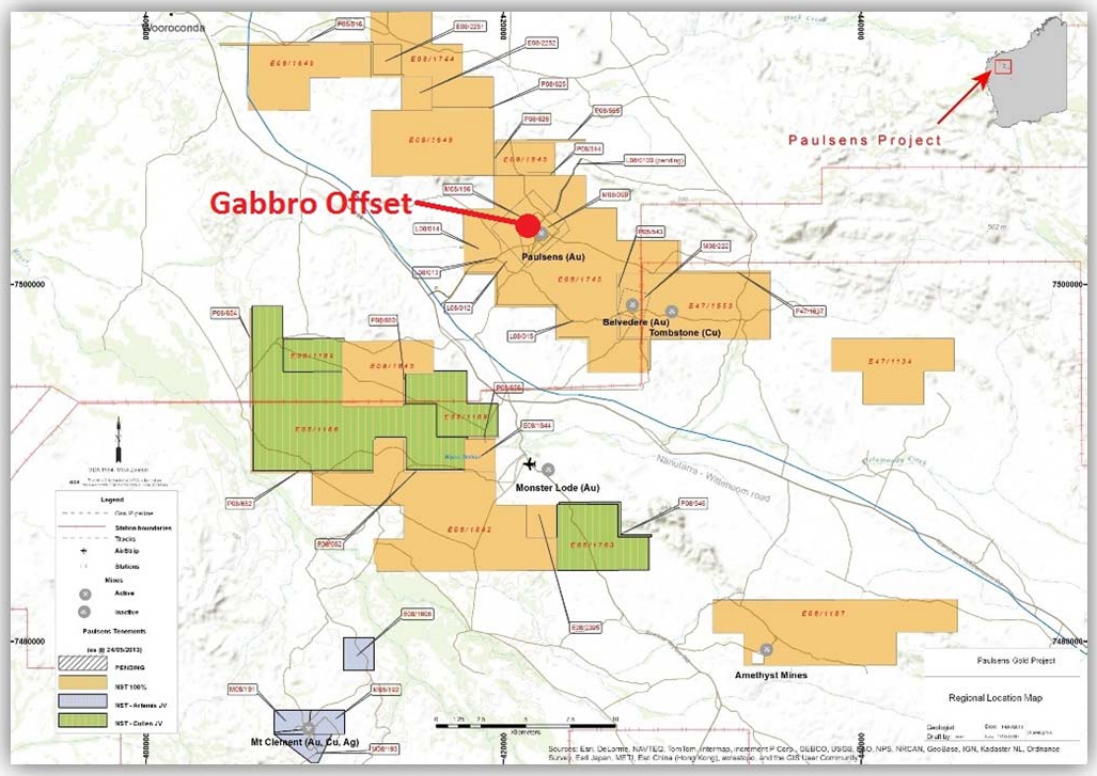

Figure 1: Gabbro Offset Location.

3 SUMMARY OF EXPLORATION (29TH OCTOBER – 21ST NOVEMBER, 2013)

Table 1 is a summary of the drilling which was completed as a part of the EIS grant.

Hole ID	Easting MGA	Northing MGA	Azi MGA	Dip	RC depth (m)	Diamond depth (m)	Total depth (m)	Tenement
PGORCD0010	421729	7503185	220	-62	200	401	601	M08/196
PGORCD0011	421650	7503278	220	-65	154	496	650	M08/196
					354	897	1251	

Table 1: Summary of drilling completed at Gabbro Offset as a part of the EIS grant.

4 REGIONAL GEOLOGY

The project is located within the Wyloo Dome, a northwest trending, regional doubly-plunging anticlinorium (Tyler and Thorne, 1990). The Wyloo Dome covers an area of 60 by 25 kilometres. Detailed geological descriptions of the area can be sourced from the Wyloo 1:250,000 geological sheets completed by the Geological Survey of Western Australia (Seymour *et al*, 1988) or summarised in Martin, 2013. The geomorphology of the area is dominated by the Wyloo Dome which has formed flanking ridges and a central core of low rolling hills.

The Wyloo Dome preserves a complete stratigraphic succession from the Achaean Metawandy Granite basement in the core, through the Mt Bruce Supergroup, to the Paleoproterozoic Ashburton Formation in the upper Wyloo Group (**Figure 2**). The Mt Bruce Supergroup, which unconformably overlies the Pilbara Craton basement, comprises the Fortescue, Hamersley and Turee Creek Groups. The Fortescue defines most the prospective stratigraphy for gold and base-metal exploration in the Wyloo Dome, and is characterised by a locally conformable succession of predominately mafic volcanics with intermittent sedimentary sequences. The Lower Wyloo group overlies the Mt Bruce Supergroup on a regional unconformity at the base of the Beasley River Quartzite that locally cuts down as far as the basal Hamersley group (Marra Mamba Iron Formation). The Upper Wyloo group, also known as the Ashburton Basin, comprises the Mount McGrath Formation, Duck Creek Dolomite and Ashburton Formation, the latter comprising the bulk of the upper Wyloo Group.

The preserved structural architecture of the Wyloo Dome originated with structures formed during the 2.1–2.2 Ophthalmia Orogeny which produced inclined to overturned, N-verging folds. A younger, 1.7–1.8 Capricorn Orogeny is believed to be responsible for broadly coaxial reactivation of previous structures into upright and open fold geometries. Later strike-slip faulting related to the regional Nanjilgardy Fault resulted in a 20–30° clockwise rotation of the Wyloo Dome with respect to these regional fold orientations.

At least four suites of intrusive sequences are recognised in the Wyloo Dome. Based on their general orientation they are referred to as northwest, north, northeast, and E-W tending dykes. The curvilinear NE-trending dykes termed the 755Ma Mundine Well Suite are regarded as the youngest in the area (Martin, 2013). The N and NW trending suites are considered the oldest based on regional and local observations and are considered prospective for gold mineralisation in the Wyloo Dome.

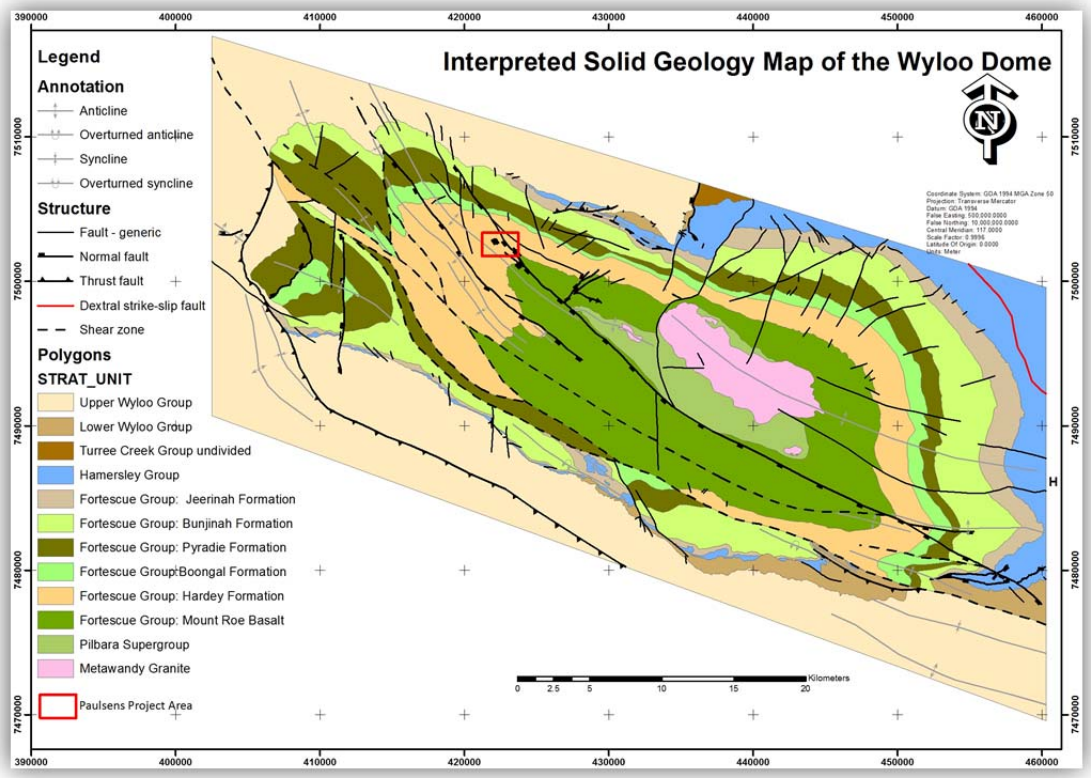

Figure 2: Regional Geology Map of the Wyloo Dome (Martin, 2013).

5 LOCAL GEOLOGY

Gabbro Offset is positioned along the northeastern inflection point of the Wyloo anticline. Its geology is characterised by rocks comprising the Hardey Formation of the lower Fortescue group sequence. The Hardey Formation has been informally subdivided into five members termed the Horsewell Sandstones, Melrose Argillite, Madang Clastics, Tin Hut Basalt and the Beaghy Sandstones (**Figure 3**). The members are defined as a predominately sedimentary succession of siliclastics with minor mafic flows which have been intruded by doleritic to gabbroic dyke swarms and sills of varying ages. The prominent structural grain is defined by the trend of the regional dome, where local stratigraphy plunges 30° towards the northwest. A penetrative south-dipping axial planar fabric is typically present and is locally overprinted by a steeper, sub-parallel fabric which develops discrete and narrow shear zones with undefinitive origins. Towards the east of the project area, a regional brittle fault termed the "Hardey Fault" offsets stratigraphy some 600m with apparent sinistral strike-slip kinematics.

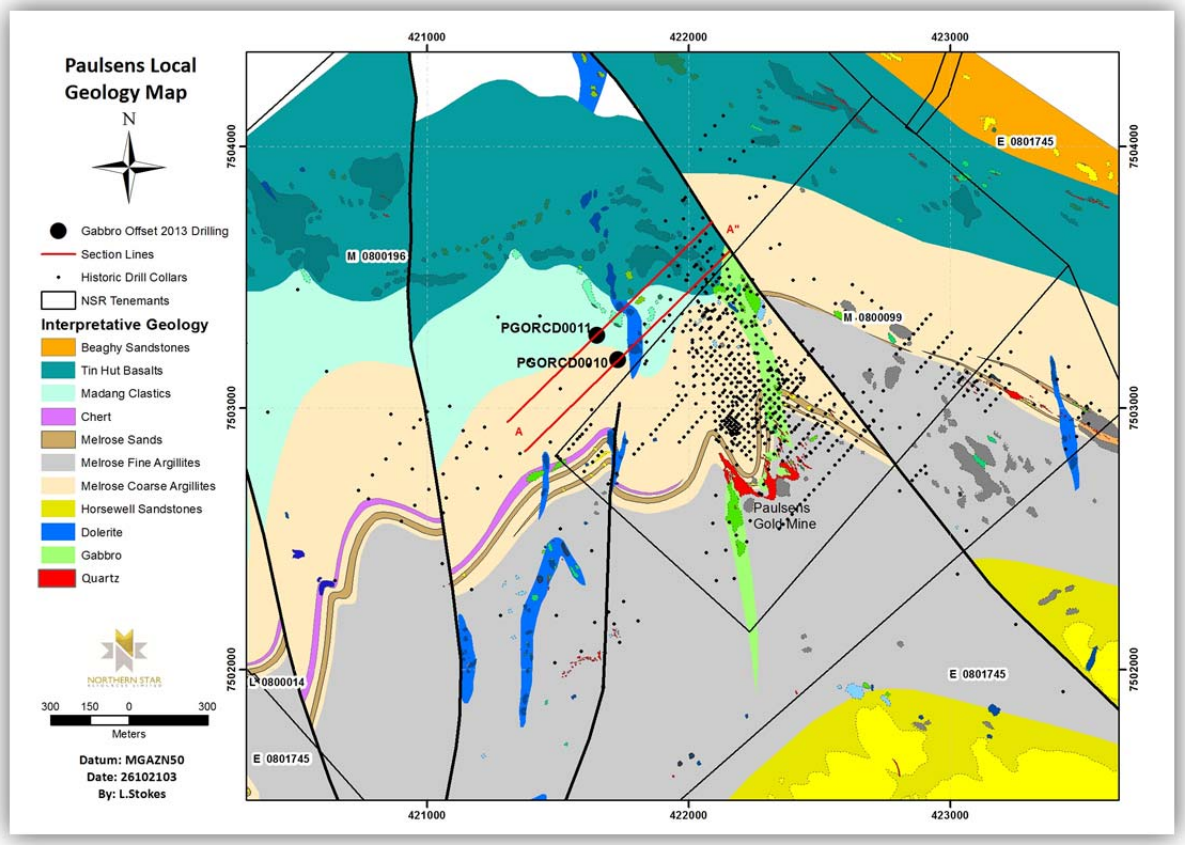

Figure 3: Paulsens Local geology map (based on mapping by Leishman, 2001 and Davies et al. 2009).

6 EXPLORATION MODELS & MINERALISATION

Paulsens is named after the historic Paulsen Mine (also known as Melrose Mine), located at the foot of a prominent quartz hill in the centre of M08/99, which was active during the period 1935 to 1940 (Finucane, 1939). According to Seymour *et al* (1988) reported mine production was 2955t for 28.549kg gold (average recovered grade 9.55g/t). The ore body at the old workings comprised a partially oxidised quartz-carbonate-sulphide vein generally less than 2m wide and dipping roughly 30° to the northeast. The quartz-carbonate-sulphide vein was worked over a strike length of roughly 50m (140 feet), stoping extended to approximately 17m (57 feet) below surface, and the deepest shaft to 32m (106 feet). It is now recognised that the reef at the old mine represented a small splay/linkage vein at the western edge of a much larger mineralised vein system which to date has delivered over 2.43M Tonnes @ 7.6g/t Au for a total contained gold of 592,000oz (Laswon, 2012).

Paulsens is a mesothermal, orogenic lode style gold deposit with mineralisation occurring where a regionally-trending gabbroic dyke intercepts and briefly sills along a contact between coarse and fine argillites of the Melrose Argillite member. This kink focused brittle failure of the gabbro and subsequent quartz-sulphide emplacement defining the Upper Zone Ore mineralisation at the Paulsens Mine. The Lower zone ore lode is characterised as a laminated and stylolitic vein considered to have developed under localised flexural slip conditions as a result of progressive deformation. This vein system is approximately 40m thick, 200m wide, and plunges over 2km to depth conforming to the regional axial trend.

Pyrite is the principal sulphide phase, occurring mainly as irregular coarse-grained veins and pyrite-cemented quartz-wallrock breccias at the margins of the quartz-carbonate veins. Gold mineralisation is associated with, but not limited to, massive sulphides but is also frequently native within stylolites and mafic rafts entrained in quartz veins around its margins.

Both upper and lower zone ore positions are crosscut by southerly dipping shear zones termed the "Apollo Shear System" (ASS) and are reconstituted into a series of northward-verging parasitic folds. Steeply dipping, narrow zones of high, occasionally mylonitic strain crosscut and sub-parallel original fabrics and are suspected to have been the conduit for auriferous fluid (**Figure 4**).

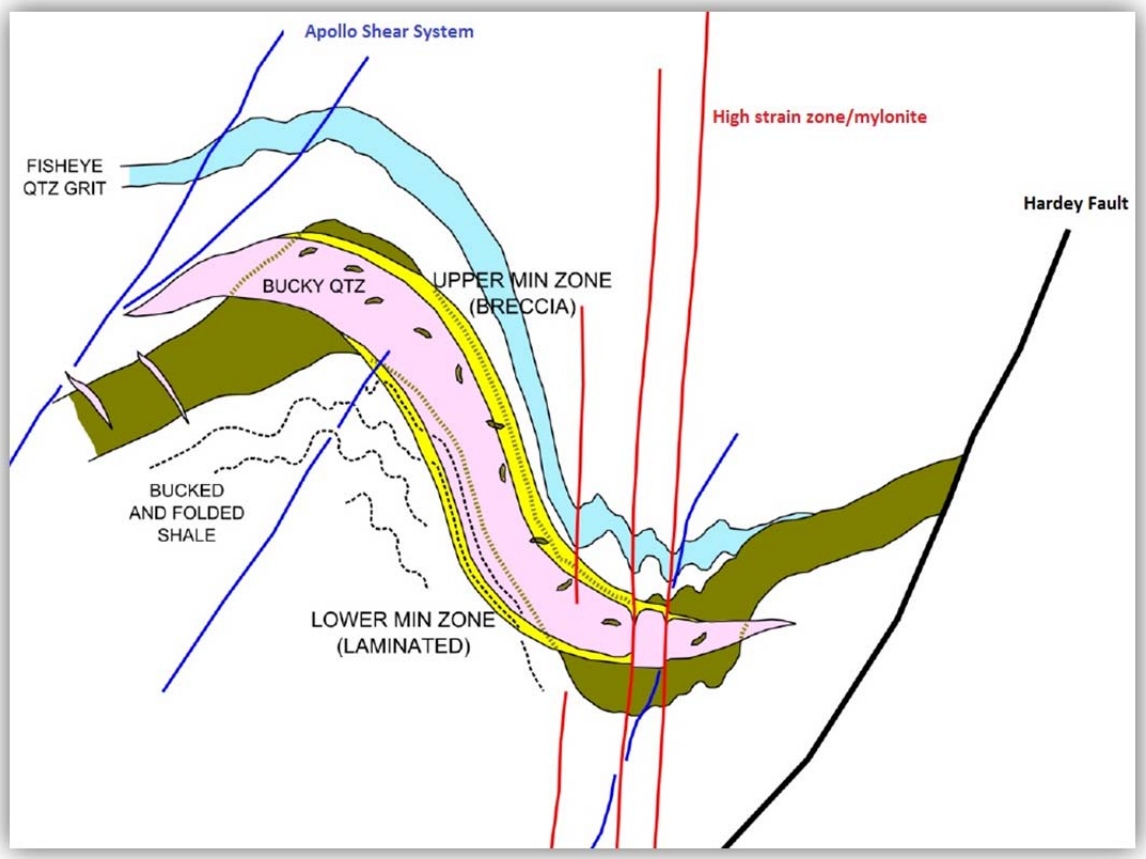

Figure 4: Schematic of the Paulsens ore body (Augenstine et al, 2013).

7 EXPLORATION ACTIVITIES COMPLETED: 29TH OCTOBER TO 21ST NOVEMBER, 2013

Two drill holes, consisting of RC pre-collars with diamond tails, were completed to test a target defined from interpretation of 2D seismic data. Interpretations suggested that similar structure and potential intrusive host rocks to the nearby Paulsens Gold Mine may exist in the Gabbro Offset target area.

7.1 Target Generation

In November 2012, NST completed a shallow, hard-rock seismic survey along three 3km lines that transect the Paulsens Gold Mine. The lines were positioned to include the Gabbro Offset Prospect to the south of the mine and the Hardy Fault to the north. The objective was to outline the main stratigraphic and structural trend outside of their known extents as an innovative way of delivering new, near-mine targets. Interpretation of results varied, with emphasis being noted on the apparent structural grain in sections and presence of predominately flat-lying intrusives. Correlations were made between known Gabbro intercepts at the mine and the interpreted intrusives in seismic sections. Structures were also interpreted as being south-dipping, with apparent discordant relationships with the interpreted intrusives. Both of these features combined to generate the target offsets that defined the 2013 drill program discussed in this report. Interpretative sections of seismic results are shown in

Figure 5**.**

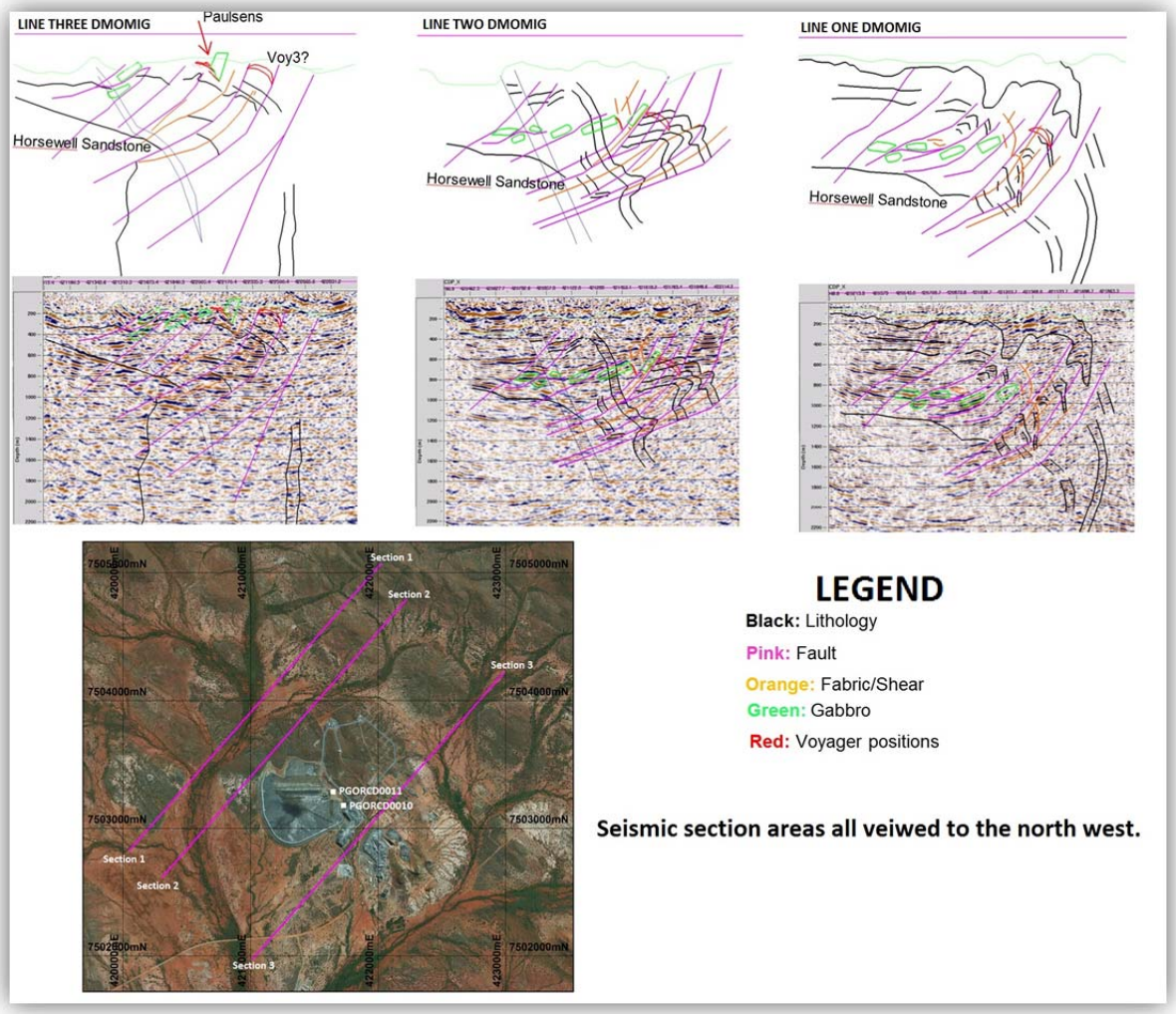

Figure 5: Interpretation schematic of Paulsens Seismic Data.

7.2 Drilling and sampling methods

Two drill holes for a total of 1251m were completed to test targets identified from the 2D seismic survey. Both holes consisted of an RC pre-collar and diamond tail as summarised in **Table 2**.

Prospect	Hole ID	RC depth (m)	Diamond depth (m)	Total depth (m)	Tenement	Comments
Gabbro Offset	PGORCD0010	200	401	601	M08/196	
Gabbro Offset	PGORCD0011	154	496	650	M08/196	Pre-collar ended early due to deviation.

Table 2: Summary of Gabbro Offset drill holes.

Ranger Drilling Services were contracted to complete the RC pre-collars using a DRA 600 RC rig (500psi @ 1350cfm), Air-research booster (800psi @ 1800cfm) and Sullair auxiliary (350psi @ 900cfm). The barrel configuration included a stainless steel starter rod, down hole hammer and 5.5" face sampling drill bit. No stabilisers or reamers were used for this programme. The area is known for having large deviations to the dip/azimuth and slow rates which averaged at 113m per shift. No unexpected problems or excessive ground water was encountered.

Surveys were completed at 30m intervals. The stainless steel started rod allowed for both dip and azimuth measurements to be recorded using a Pathfinder Single shot camera. Deviations to the drill hole path were closely monitored by the rig geologist. PGORCD0011 lifted 6.8° over 150m and was ended early to avoid missing the intended target.

Boart Longyear was contracted to complete diamond tails using a UDR1000 drill rig. Pre-collars were cased with HQ rods and the diamond tails were drilled with NQ. A stainless steel starter rod allowed for both dip and azimuth measurements to be collected at 30m intervals using Reflex EZ-Shot camera. Several barrel configurations were used to keep the drill holes straight. The chrome barrel was used to encourage the drill holes to drop, whereas a standard barrel caused the hole to lift slightly. No problems were encountered during drilling with an average of 39.5 meters per shift.

Core trays were marked with the hole id, tray number and where the start of the tray with an arrow pointing down hole. Core blocks detailing the hole id, depth, run length and core loss were placed in the core tray each run. Breaks made by the driller crew were marked by a cross with a red chinagraph pencil. Orientation measurements were obtained using a Reflex ACT II digital tool. A red line was drawn on the core representing the bottom of the drill hole.

7.3 Data collection

The RC component of the hole was logged at the rig to ensure sample integrity. A speared portion of the sample was collected and dry/wet sieved. Once the interval was logged a portion of the cleaned sample was retained in a chip tray labelled with the hole id and depth information.

Diamond core was marked up by NST field assistants by extending the orientation lines provided by the driller. An 18m length of angle line was used so that three orientation lines could be matched. Meter marks were placed on the core at the same time taking care that no errors were made.

Structural data was collected using an NQ_2 Kenometer. Alpha and Beta measurements were collected and later converted to dip and dip direction using the conversion tool in Micromine, allow it to be plotted in 3D space.

Toughbook computers, loaded with OCRIS mobile (expedio field logging software) were used for logging the drill holes. Data collected included collar, survey, drill specifications, lithology, veining, alteration, sulphides, structural interval and sampling details. Addition information collected in the diamond tails included basic geotechnical logging (RQD/FPM), structural measurements and core photos. Data exports were loaded into the GBIS by the NST database administrator.

7.4 Sampling and analysis

RC samples were collected form a static cone splitter directly from the cyclone. 12.5% of each meter sample was collected in a calico bag labelled with the depth and the reaming 87.5% was collected in a green mining bag. Samples were lined up in rows on the drill pad ready for logging and sampling. 4 meters speared composite samples were placed in pre-numbered calico bags and sent to Ultratrace Laboratories for multi element analysis.

Diamond tails were processed and selective samples were taken at the rig geologists' discretion focusing on areas with veins, sulphides and alteration. The core was cut in half using an Almonte Core saw with the orientation line and geologists marking retained. All samples were sent to Ultratrace Laboratories for analysis.

At Ultratrace all samples were weighed and dried. Primary preparation included crushing the whole sample to 3mm. The sample was then split using a riffle splitter and pulverised using a vibrating pulveriser to pass through a -75µm sieve.

Au, Pd and Pt were analysed by firing a 40 gram portion of the sample. Values were determined by Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OME). All other samples were digested and refluxed with

a mixture of acids, including Hydrofluoric, Nitric, Hydrochloric and Perchloric Acids. Cu and Zn were also determined by ICP-OME, whereas Ag, As, Bi, Mo, Pb, Sb, Ta and W were determined by Inductively Coupled Plasma Mass Spectrometry (ICP-MS).

7.5 Surveys

On completing of the drill holes; gyro, magnetic susceptibility and gamma data were collected by Surtron Technologies. A surface referencing gyro collected directional information by taking measurements every 20 meters. A north seeking reference point was obtained using an Azimuthal Positing System which was corrected for grid north during processing. Natural Gamma and Magnetic Susceptibility were obtained using a combination tool. Raw data files were loaded directly into the GBIS database by NST's database administrator.

Collars were picked up using a Trimble Nomad differential GPS by NST field assistants on completion of the drilling.

7.6 Geological Interpretation

Both drill holes were dominated by sedimentary rocks of the Melrose Formation which have been intruded by dolerite and gabbro dykes and sills. The Gabbro and faults identified in the diamond core and show close correlation with those interpreted in the seismic sections and will be discussed in detail below.

7.6.1 PGORCD0010 summary log

The hole is dominated by moderately foliated, bedded to laminated sandstone, siltstone and shale. A general decrease in grainsize coincides with the strata becoming more carbonaceous down hole. The sequence is intruded by several dolerite dykes with carbonate alteration and sharp chilled margins. Strongly foliated and altered gabbro was intersected between 363m–389m. The sediments surrounding the gabbro show pervasive calcite - sericite ± chlorite ± ankerite alteration from 342m to 406m. A zone of significant veining with up to 80% quartz - ankerite veins and up to 20% sulphides extends from 366.5–393.5m. No significant assay results were returned from this intersect.

7.6.2 PGORCD0011 summary log

The start of the drill hole intersected fine grained, ophitic dolerite to depth 58m. Moderately foliated crystal tuff with occasional basaltic flows extended to 105m. Bedded and laminated siltstone, shale ± carbonaceous shale and minor sandstone were the dominant lithologies logged in the drill hole. The sequence is intruded by several dolerite dykes with sharp contacts and strong carbonate alteration. The sediments surrounding the dolerite is often strongly altered.

A zone of broken core, fault gouge, stylolitic quartz-ankerite reefs and steeply oriented hydrothermal quartz-ankerite breccias with up to 10% pyrite was intersected between 296.5m to 310.4m and 326.3m to 330.9m. The sediments in this zone were strongly graphitic with polished fracture planes and bedding surfaces.

Gabbro, with up to 70% quartz ankerite veining, was intersected from 426m to 531m with a cross cutting dolerite dyke between 439.7m and 470.45m. The gabbro is strongly altered with 2–5% blebby pyrite. The veins have minor sulphides and are stylolitic towards their contacts. The sediments surrounding the gabbro were strongly altered with the alteration decreasing away from the gabbro.

A narrow cohesive catalastitie with narrow fault gouge was intersected at a high angle to the core axis between 585m to 589m was surrounded by unaltered, laminated shale and siltstone.

No significant gold results were returned from this drill hole.

7.6.3 Interpretation

Data from recent drill holes was used to help determine if 2D seismics is a practical method for target generation near to the Paulsens Gold Mine.

Quantified structural data showed that faults in the area are either are near vertical or dip steeply to the south west. This is consistent with data collected from outcrop mapping. The steep features are difficult to identify in seismic processing and as a result are often overlooked during the interpretation process. The south west dipping faults are highlighted from the seismic interpretation and have been validated with measurements taken from the diamond core.

A large fault zone in PGORCD0011 was intersected with brecciated sedimentary rocks with quartz-ankerite cement with abundant sulphides. Structural measurements for the diamond core indicate that this fault dips steeply to the south west which is consistent with the interpretation of the faults in the seismic interpretation (**Figure 6**). The offset in the location of the faults in the seismic interpretation to the location in drill holes is due to the holes being drilled off the seismic sections.

The gabbro units in the seismic imagery were close to the location of the gabbro intersected in the diamond drill holes as seen in **Figure 6**. The gabbro has a high percentage of veins +/- sulphides and pervasive alteration. Based on recent modelling completed by Jigsaw Geoscicences gabbro with intense veining has the potential to be a trap site for a Paulsens Style ore body. These drill holes have proven that the seismic imagery has identified structural and lithological units which are in the Gabbro Offset Project area.

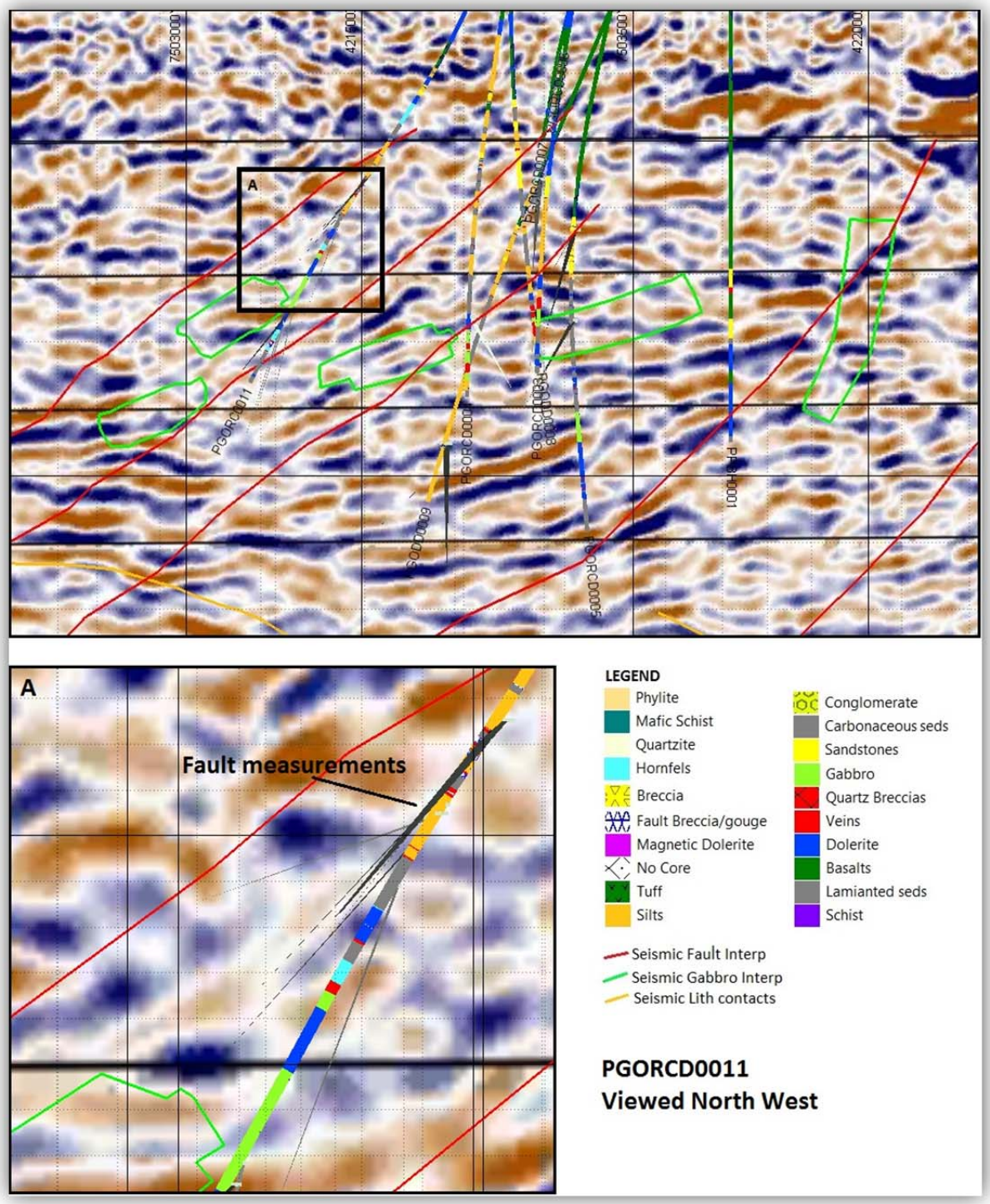

Figure 6: Drill holes comparisons to seismic interpretations.

8 CONCLUSIONS AND RECOMMENDATIONS

Although no significant mineralisation was intersected in the drill holes, information about the structure and stratigraphy away from the Paulsens Ore Body was obtained while validating interpretations made from 2D seismic sections. The drilling successfully identified the approximate location of the Mine Gabbro and major faults as interpreted from the seismic survey.

The seismic survey has proven to be a useful tool for identifying targets outside the known mineralisation at the Paulsens gold mine. Abundant quartz was intersected in the gabbro offset target area as defined from the seismic interpretation. However, further investigation is required to see if these veins become mineralised in the surrounding area.

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VERIFICATION LIST

Exploration Work Type	File Name	Format
Office studies		
Literature search		
Database compilation		
Computer modelling		
Reprocessing of data		
General research		
Report preparation	GO_2013EIS	pdf
Other (specify)		
Airborne exploration surveys		
Aeromagnetics		
Radiometrics		
Electromagnetics		
Gravity		
Digital terrain modelling		
Other (specify)		
Remote sensing		
Aerial photography		
LANDSAT		
SPOT		
MSS		
Radar		
Other (specify)		
Ground exploration surveys		
Geological Mapping		
Regional		
Reconnaissance		
Prospect		
Underground		
Costean		
Ground geophysics		
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Isotope		
Whole rock		
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Air-core		
Auger		
Groundwater drilling		

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