CENTAMIN

DOROPO GOLD PROJECT

PEA UPDATE

JUNE 2021

Revision 0

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1 SUMMARY

This report is an updated Technical Report prepared by Centamin Plc (Centamin) on the Doropo Mineral Resource estimate. The Doropo Project currently covers thirteen deposits over an area of 1,847km^2 named Souwa, Nokpa, Chegue Main, Chegue South, Tchouahinin, Kekeda, Han, Enioda, Hinda, Nare, Kilosegui, Attire and Vago. Most of the deposits (11) are within a 7km radius with Vako and Kilosegui at a ~15km and ~30km radius respectively.

Centamin PLC (Centamin) has completed a review of the current information available to the Doropo Gold Project located in the north east of the Ivory Coast. The resource and reserve estimates have been updated from previous studies while the metallurgy remains unchanged. A reasonable level of project development work across most disciplines was completed in 2018/2019 by H&SC Consultants Pty Ltd (H&SC), resulting in a NI 43-101 being issued on SEDAR in March 2019.

Processing rates are estimated as 4.0 Mtpa for fresh, semi-refractory ore requiring flotation with intensive concentrate treatment and 4.5 Mtpa of blended oxide / transition free milling ore to produce 1.96 Moz over an operating life of 13 years with average gold production of 208 koz/annum for the first 5 years.

The initial capital cost, inclusive of working capital and contingency is estimated to be US$ M275 (based on a like project) with all in sustaining costs (AISC) of US$ 904/oz.

The project is predicted to produce, at a gold price of US$1,450/oz an after tax a NPV of US$ M234 and IRR of 21% increasing to US$ M487 and IRR of 33% at a consensus gold price of US$ 1,829/oz.

1.1 Property Description and Ownership

The Doropo Project is located in north-eastern Cote d'Ivoire, in the Bounkani region, 480 km north of the capital Abidjan and 50 km north of the city of Bouna.

The Doropo Project is contained within seven (7) current exploration permits that were granted to Ampella Mining Cote d'Ivoire and Ampella Mining Exploration Cote d'Ivoire, which are both 100% owned Ivoirian subsidiaries of Centamin. The block of permits covers a total area of 1,847 km^2.

The 2021 mineral resource estimate identified thirteen (13) deposits namely: Souwa, Nokpa, Chegue, Chegue South, Tchouahinin, Kekeda, Han, Enioda, Hinda, Nare, Kilosegui, Attire and Vako. These deposits are located on five (5) out of the seven (7) exploration permits The thirteen deposits that form the resource estimates detailed herein occur within a 25 km radius centred on about UTM 482,450mE and 1,074,951mN (WGS84, zone 30N).

1.2 Geology and Mineralisation

The block of exploration permits lie entirely in the Tonalite-Trondhjemite-Granodiorite (TTG) orthogneiss suite of the Birrimian domain in the Leo-Man shield. The TTG is bounded on its eastern side by the Boromo-Batie greenstones belt, in Burkina Faso, and by the Tehini greenstones belt on the west.

At the Project scale, the geology consists of fairly homogeneous medium to coarse grained granodiorite. Several of the deposits are intersected by regional, post-mineralisation diorite dykes.

Gold mineralisation occurs associated with discrete structurally controlled zones of intense silica-sericite alteration, focused within and along the margins of narrow (5-10 m wide to locally 20-25 m) shear zones. Outside of the mineralised zones, the granodiorite is fairly undeformed. The mineralised zones generally form clearly identifiable tabular bodies although this is complicated where two structures intersect, such as at the Nokpa deposit.

Gold grades within the mineralised zones are generally very variable and exhibit positively skewed grade distributions with relatively high Coefficients of Variation (CVs).

1.3 Status of Exploration, Development and Operations

The first exploration permits of the area were granted to Ampella Mining Cote d'Ivoire, in June 2013. Prior to that time, no mineral exploration has ever been conducted. At the end of 2013, Ampella Mining Limited conducted a preliminary reconnaissance program, leading to the highlight of the various prospects, with initial high grade rock chips.

Centamin acquired Ampella Mining Cote d'Ivoire via the takeover of Ampella Mining Ltd. in March 2014. Centamin has continuously conducted exploration activities on the Doropo Project since mid-2014. Preliminary exploration activities have included geological mapping and rock chip sampling surveys, an airborne aeromagnetic and radiometric survey, extensive soil sampling and auger drilling programs and Gradient Array Induced Polarisation (GAIP) surveys.

Targets identified by the preliminary exploration activities have been continuously followed up by trenching and aircore drilling programs, followed by Reverse Circulation (RC) and diamond drilling programs. To date, thirteen deposits have been drilled with RC and diamond drilling to a sufficient level of detail to support mineral resource estimates. The exploration strategy continues to be applied to the pipeline of targets on the Project.

Centamin started RC and diamond drilling in November 2015 and has totalled 321,043 m of RC and 15,382 m of diamond drilling at the time of the effective date of this report within the Project area. Some of this drilling is located outside the eight deposits included in the resource estimates.

Centamin has set up a relatively well developed permanent exploration camp in the village of Danoa, which is located about 4 km south of Enioda and 14 km east-south-east of Souwa. The majority of exploration activities are conducted from this site. Centamin also maintains an office and smaller exploration camp in the town of Doropo. The regional exploration work is based out of fly camps or other temporary camps depending on the location of the programs.

1.4 Mineral Processing and Metallurgical Testing

Limited testwork has been completed on the various deposits to date and what has been completed largely covers the oxide and fresh material from each source with limited optimisation. A view was taken early that fresh ores exhibiting poor recovery by conventional free milling/CIL processing where tested via a sulphide float/UFG concentrate grind.

The result summary is indicated in the table that follow. Extensive previous testwork has been undertaken on the project, commencing in 2015. Periods of review have followed this, with Lycopodium undertaking the most recent review in 2019 and again in 2020.

A representative suite of Upper Oxide, Lower Oxide, Transition and Upper and Lower Fresh composite samples were selected for testing from each of the main Doropo resource deposits (Except for Kilosegui which was added to the MRE in 2020).

The first stage of metallurgical test work was conducted on the Doropo fresh resource materials to establish the primary ore characteristics and process recovery options. The central objective was to compare overall gold extraction via:

- Gravity gold recovery and whole-ore cyanide leaching.

- Gravity gold recovery and flotation, with cyanide leaching of the flotation tails and re-grinding of the flotation concentrate prior to cyanide leaching of the flotation concentrate (separate to the flotation tail leach).

Subsequently, oxide and transition ore type composites from the main resource sources were tested by grinding a 10 kg composite of each sample to P80 passing 150, 106 and 75 µm and evaluating the gravity gold recovery test work ahead of cyanide leach test work on the gravity tailings.

The optimum process recoveries are listed in Table 1.1.

Table 1.1 Metallurgical recoveries for Doropo weathering zones

Weathering Type	Gold Recovery	Source
Saprolite	92.5 %	Lycopodium 28-Nov-2018
Transition	89.8 %	Lycopodium 28-Nov-2018
Fresh	88.8 %	Lycopodium 28-Nov-2018

1.5 Mineral Resource Estimates

An updated Mineral Resource performed by Cube Consulting was completed for Doropo on the 5th February, 2021 with the close out of the drillhole database on the 31st October, 2020.

Using the drillhole database, mineralised domains were defined using 1m composites at a statistically derived cut-off of 0.2 g/t, with maximum consecutive waste of 3 m, maximum included waste of 6 m and a minimum mining width of 2 m. The mineralised domains were constructed in Leapfrog Geo software using the vein method.

A total of 49 mineralised domains were defined within 13 prospect areas with no previous significant mining activity over the project area. Two phases of estimation were undertaken - the initial phase consisted of an ordinary kriged (OK) model of all prospect areas and the second phase consisted of a re-estimation by Localised Uniform Conditioning (LUC) within selected domains with sufficient data density. The estimation by LUC provided an appropriate SMU scale estimate for comparison to the reported Multiple Indicator Kriging (MIK) estimate completed by H&SC in March 2020. Domains and portions of domains not estimated by LUC retain the phase 1 OK gold grade.

With drill spacing over the majority of the deposits at 50 m x 50 m, the use of relatively sophisticated geostatistical estimation methodology carries a degree of risk, as non-linear methods (MIK and LUC) and the assumptions on which they are based, place a heavy reliance on the variogram defining the spatial characteristics of the grade in three dimensions. With drilling at this distance well-structured variograms did not exist in all three directions and this weakens the underlying assumptions. This risk has been addressed by Cube with the majority of resources classified as Inferred. A small portion of Indicated resources has been identified at Nokpa.

The Cube resource estimates have been reported at 0.5 g/t gold cut-off, a maximum average distance to composite data of 80 m and 250 m below surface. A summary of the resource estimates are shown below in Table 1.2 and Table 1.3.

Table 1.2 Mineral Resource Estimate by Pit

Pit	Tonnes (Mt)	Grade (g/t)	Contained Au (Moz)
Souwa	23.65	1.31	1.00
Nokpa	10.72	1.66	0.57
Chegue Main	10.52	1.05	0.36
Chegue South	10.48	1.11	0.37
Tchouahinan*	4.64	0.99	0.15
Kekeda	6.48	1.14	0.24
Han	7.78	1.33	0.33
Enioda	10.41	1.09	0.36
Hinda*	1.82	0.92	0.05
Nare*	0.89	1.12	0.03
Kilosegui	43.89	1.02	1.44
Atirre	3.58	1.56	0.18
Vako*	10.30	0.88	0.29
Total	145.2	1.15	5.37

*These deposits were excluded from the mine estimate given their low grade and contained gold but may be reviewed in future studies.

Table 1.3 Mineral Resource Estimate by Classification

Classification	Tonnes (Mt)	Grade (g/t)	Contained Au (Moz)
Measured	-	-	-
Indicated	2.34	2.13	0.16
Inferred	142.9	1.13	5.21
Total	145.2	1.15	5.37

1.6 Mine Design

Cube Consulting ("Cube") was engaged by Centamin PLC ("Centamin") to carry out Mine Engineering Services as part of this PEA effort for the Doropo Gold Project. The work involved open pit optimisations, based on supplied preliminary resource models, with operational costs and geotechnical parameters based on the recent Batie West Optimisation study, which geographically, is located approximately 30 km to the East of Doropo. Open pit optimisations for Doropo were completed for each pit in the mineral resource estimate and mine production was then scheduled for each of the selected pit shells.

Using typical input parameters, an economic assessment was made during the optimisation and for reasons including economics, in some cases the low grade and small size of the deposits, Tchouahinan, Nare, Hina and Vako were excluded from the evaluation and the mining estimate generated. There may be potential to re-evaluate these deposits during future project study phases.

An annualised pit production schedule was produced with the primary aim of supplying ore grade material to the processing facility at a rate of 4.0 Mtpa for fresh ore and 4.5 Mtpa for the softer oxide and transition ores. This feed rate was achieved with a plant feed schedule and associated run of mine stockpile to facilitate a constant ore feed supply approximately thirteen years and at an average target head grade of 1.30 g/t Au over LOM

The Project basis is a contract mining operation, delivering nominally 4.0 Mtpa of ore to the ROM pad annually based on 100% fresh ore feed. The process plant will operate with campaign feed periods alternating between free milling (direct leaching) and semi-refractory (fine grinding of a flotation concentrate) ores. The plant feed will be structured to suit the mine production while trying to maintain a target gold production range.

1.7 Infrastructure

Key aspects of Infrastructure include:

- A provisional sum only for 24 km of access roads.
- An airstrip with a runway length of 750 m to accommodate aircraft such as Cessna Caravan which is a Class B1 to BII aircraft.
- Following a detailed power study for a nearby project by ECG engineering, considering a range of power supply options, the current intent is for an Independent Power Provider (IPP) to build and operate an LNG generator power station, with Centamin taking a tariffed feed to the process plant. The installed power capacity is estimated at 27 MW.
- Water supply is yet to be fully investigated but there are a number of existing water ways that will likely provide an adequate supply of water. At this stage construction of a harvest dam and separate 2.2 Mm3 water storage dam has been allowed.
- Onsite storage of LNG for power station, and diesel for mining operations.
- A 200 bed accommodation village has been included.
- On site buildings for mining, plant and administration, comprising a range of fit for purpose, steel frame or block work type design.
- A Mining Services Area (MSA) to be developed by the successful contractor in consultation with Centamin.

1.7.1 Tailings Storage Facility (TSF)

The tailings facility will be constructed from mine waste and in a similar fashion to a similar project from the region and recently estimated by Knight Piésold. Costs have been factored up for the longer project life/tails capacity required and include the following elements:

- The TSF is proposed to be incorporated as an integrated landform into a proposed Waste Dump development to reduce construction costs. The embankment alignment is designed to take advantage of natural topography (ridgelines) to reduce the volume of embankment construction materials required.

- An initial starter cell of 6.75 Mt capacity, for 18 months of operation.
- The downstream embankments will be constructed in staged raises, with core zones being constructed by a specialised earthworks contractor and the structural fill zones being progressively constructed by the mining fleet as part of the mine operations.
- A total capacity of 56 Mt of tailings, with stormwater storage capacity to contain supernatant and runoff from wet rainfall events up to a 100 year average recurrence interval (ARI) storm event.
- The design incorporates an underdrainage system to reduce pressure head acting on the HDPE geomembrane liner, reduce seepage, increase tailings densities, and improve the geotechnical stability of the embankments.
- A decant turret system (comprising floating pump/s attached to a HDPE 'turret') will recycle water from the TSF supernatant pond for use in the process throughout operation.

1.8 Capex Estimate

The Capital Cost Estimate for the Doropo PEA Study is based on a similar project of the same throughput recently completed and adjusted for increased mining rates, tails capacity and local community conditions. Centamin PLC have provided project specific portions of Mining and Owners costs. The capital cost estimate is summarised in Table 1.4.

Table 1.4 Capital Cost Estimate Summary (US$, Q1 2021)

Main Area	Project Total US$M
Treatment Plant	71.33
Reagents & Plant Services	14.23
Infrastructure	30.75
Mining	22.86
Construction Distributables	17.62
Subtotal	**156.79**
Management Costs (EPCM & Specialist Consultants)	19.62
Owners Project Costs	59.80
Subtotal	**79.42**
Project Total (excl Cont.)	236.21
Contingency 16.5%	38.98
Project Total	**275.19**

Note - Cyanide detoxification capital costs are included in the above summary.

1.9 Opex Estimate

A summary of the LOM average process operating costs is shown in Table 1.5. A power unit cost of US$0.159 /kWh was used.

Operating costs, including labour rates, consumables and G&A have been recently estimated for a similar project in the same region and applied to Doropo for the purposes of this PEA. Brief metallurgical testing indicates the same process flow sheets will be applied to Doropo ores and there is significant opportunity to reduce reagent consumptions carried over from the comparative study.

Table 1.5 Summary of LOM Operating Cost Estimates (US$, Q1 2021, ±30%)

	2021 Revised Flowsheet	
	Free Milling Ores	**Flotation Ores**
Proportion of LOM*	**38%**	**62%**
Annual Throughput	**4.5 Mtpa**	**4.0 Mtpa**
Cost Centre	**US$/t**	**US$/t**
Power Incl. Infrastructure Power	3.35	5.36
Consumables	3.67	6.27
Maintenance & Vehicles	0.77	1.08
Process & Maintenance Labour	1.31	1.50
Laboratory	0.12	0.14
Total Processing	**9.21**	**14.34**
Administration Labour	1.05	1.20
General & Administration	1.05	1.20
Total G&A	**2.10**	**2.41**
Total Processing / G&A	**11.31**	**16.74**

Based on "Centamin Doropo_Schedule_v2_Run05 Annual_4p5mt_MazMining Constrained_stepdown_1p3HeadgradeTarget" plant feed schedule, February 2021

Cyanide detoxification costs are excluded from the above operating cost summary. Detoxification operating costs amount to $0.38 /t when included in the scenarios.

Note that the total G&A cost is approximately M$10.3 for both free milling and flotation ores. The difference in unit costs for this (and other) fixed cost categories is due to the different annualised feed rate for oxides and fresh / transition material.

1.10 Financials

An economic analysis has been undertaken by Centamin and incorporates Study outputs including milled tonnages and grades for the ore and the associated recoveries, gold price (revenue), operating costs, bullion transport and refining charges, government royalties and capital expenditures (both initial and sustaining).

The evaluation method considers the Project has been evaluated on a 100% ownership basis, with no debt financing.

The results of the economic model show potential within the asset. The model applies a long-term gold price of $1,450/oz, below consensus forecasts, on a flat line basis from commencement of production.

A summary of key outputs from the economic evaluation are presented in Table 1.6 .

Table 1.6 Key Economic Model Outputs

LOM Average ($US 1,450/oz)	Value	Unit
Physicals		
Mine Life	13	Years
Total Gold Production	1,962,432	oz
Average Annual Gold Production	150,956	oz / Year
Average Annual Ore Mined	4,182	ktpa
Average Annual Waste Mined	19,587	ktpa
Strip Ratio	4.7	W:O
Average Grade	1.25	g/t Au
Average Recovery	90.1%	%
Mining Cost	2.5	US$/t Mined
Processing Cost	11.9	US$/t Processed
G&A	2.4	US$/t Processed
Non Sustaining Capex	278	US$M
Sustaining Capex	90	US$M
Cash Costs	796	US$/oz Sold
All-in Sustaining Costs	904	US$/oz Sold
Average Yr 1 to 5		
Cash Costs	666	US$/oz Sold
All-in Sustaining Costs	769	US$/oz Sold
Average Annual Gold Production	207,800	oz
Pre - Tax Economics		
Project NPV@ 5%	480	US$M
IRR	34	%
Post - Tax Economics		
Project NPV@ 5%	234	US$M
IRR	21	%
Payback	5.1	Years
LOM Average – Consensus Price ($US 1,829/oz)		
Pre - Tax Economics		
Project NPV@ 5%	919	US$M
IRR	50	%
Post - Tax Economics		
Project NPV@ 5%	487	US$M
IRR	33	%

1.11 Conclusions

Centamin is of the opinion that this Preliminary Economic Assessment which includes updated Mineral Resource estimates is suitable for public reporting and is a fair representation of the potential economic outcome for the Doropo Project.

While all efforts have been made to provide the best estimate by combining linear and nonlinear estimation techniques, the drill spacing is often not sufficient to ensure robust and reliable results. Most of the drilling is currently on a 50 x 50 m pattern, with a minor area at NOK at a 25 x 25 m pattern. In fact, as seen in the variographic analysis, density of information did not make possible the choice of a plunge direction of the mineralisation and there are no structures in the semi-major direction. Poor variograms will have an impact on the estimation robustness. LUC was limited to domains with sufficient drilling density.

With only a small number of additional drill holes across the Doropo Project between the 2019 H&SC and 2020 Cube estimates the expectation is that only minor differences will be reported between the models.

The reported H&SC MRE 2019 has been classified as Measured, Indicated and Inferred and limited by depth below surface, a maximum extrapolation of 80 m from informing data and above a cut-off of 0.5 g/t Au. The comparison tonnages and grades reported from Cube models have been limited to classified blocks within an average of 80 m from informing data and above 0.5 g/t Au.

1.12 Recommendations

Centamin plans to continue exploration on the Doropo permit with work focused towards growing the resources and the generation of further resource quality drill targets.

Drilling for 2021 and 2022 on the Doropo Permit is budgeted to include approximately 75,000 m of RC to test new targets and infill resources. Further diamond drilling is budgeted to target deep plunge models and provide further definition for the metallurgical test work. The metallurgical testwork programme will also include variability testwork for all the deposits. Particular focussed metallurgical testwork will commence on Kilosegui which to date has no specific metallurgical data. A total of USD $14M has been budgeted for this work as well the required work for developing a comprehensive Pre-Feasibility Study.

2 INTRODUCTION

Centamin has completed a number of updates on their Doropo Project since H&S Consultants Pty Ltd (H&SC) issued a Mineral Resource Estimate NI 43-101 to SEDAR in March 2019. The updates focussed primarily on reclassifying the resource and mine optimisation studies, both of which were completed and reported by Cube Consulting.

No site visit has been undertaken by a Qualified Person, since the H&SC visit by Rupert Osborn in November 2017 and again in December 2018. During these visits H&SC observed diamond and RC drilling and sample handling procedures, which were found to be industry standard. H&SC also selected several diamond and RC drill holes in order to cross-check the geological logs against the drill core and chip trays and to better understand the geology and reliability of the logs. The method of measuring the density of the drill core was demonstrated to H&SC. H&SC spoke to many of the key personnel including senior and junior geologists and the database administrator. The location of around 30 drill hole collars was checked against the database records using a handheld GPS.

In December 2018 Rupert Osborn visited the Bureau Veritas Mineral Laboratory in Abidjan in order to observe sample preparation and fire assaying procedures.

3 RELIANCE ON OTHER EXPERTS

For the purposes of this updated PEA there has been no recent site visits undertaken and therefore the updated data has not been independently verified since the H&SC visit in 2018. The information contained in this report has been compiled from a number of project development phases of Doropo and relevant sources.

Sections 4,5,6,7,8,9,10,11 and 12 have remained largely unchanged from the H&SC PEA 43-101 lodged on SEDAR on the 29th of March 2019.

Section 13 has been compiled by Centamin based on metallurgical testwork on Doropo material. ALS Metallurgy Services (Perth) conducted all test work on the Doropo resource materials between 2017-2018, under the direct supervision of Paul Elms (ELMSMET PTY Ltd), a consultant metallurgist working on behalf of Centamin on the Cote d'Ivoire Projects. No further testwork has been completed since.

Section 14 was based off Cube Consulting's Mineral Resource Estimate report completed in February 2021 for Centamin. However, reporting of the Mineral Resources remains the responsibility of Centamin, as Cube has not had the opportunity to undertake all the actions required for an independent mineral resource under any recognised reporting code.

Section 15 and 16 was based on Cube Consulting's mining optimisation studies using inputs and assumptions provided by Centamin. Section 18 has been compiled by Centamin based off Knight Piesolds study on Doropo in 2019.

Section 17 and remaining sections 19 to 26 have been compiled by Centamin.

Centamin is not aware of any litigations potentially affecting the Doropo Project.

4 PROPERTY DESCRIPTION AND LOCATION

The Doropo Project is located in north eastern Cote d'Ivoire, in the Bounkani region, 480 km north of the capital Abidjan and 50 km north of the city of Bouna. The block of permits lies between the border with Burkina Faso and the Comoe National Park (Figure 4.1).

The coordinate system utilised for the Project is the Universal Transverse Mercator (UTM) projection, WGS84, zone 30 north. It is centred on about UTM 475,000mE and 1,068,000mN, otherwise Latitude 9°39'42'' N and Longitude 3°13'40'' W.

The resource area, which fits in a 30 km radius, is centred on about UTM 482,450mE and 1,074,951mN, otherwise Latitude 9°43'28'' N and Longitude 3°9'36'' W.

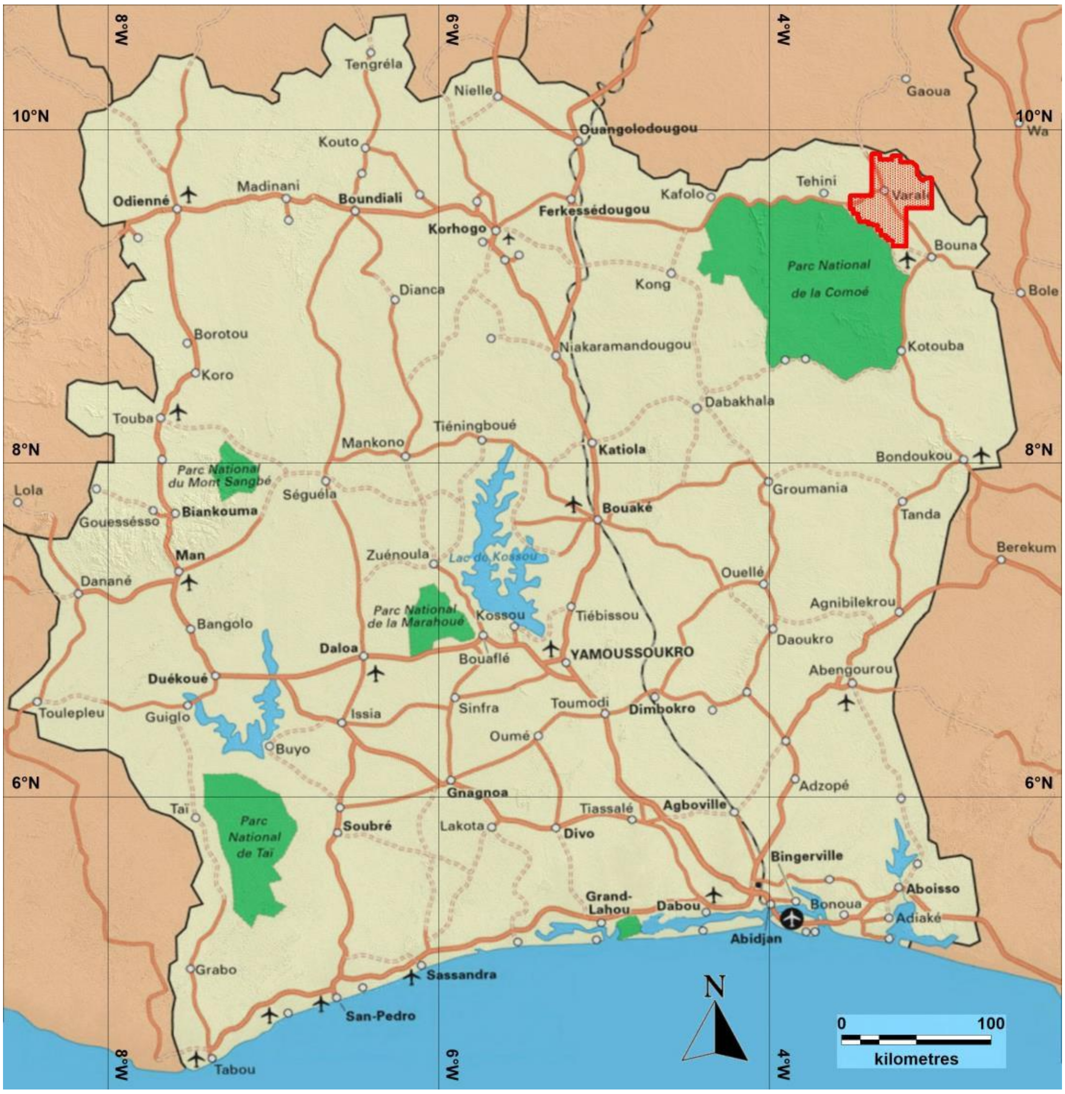


Figure 4.1: Location of the Doropo Project – map of Cote d'Ivoire

The block of permits includes seven (7) granted exploration permits, all covering granitic rocks. Ampella Mining Cote d'Ivoire and Ampella Mining Exploration Cote d'Ivoire, both 100% owned Ivoirian subsidiaries of Centamin own these permits, as detailed in Table 4.1. The block of permits covers a total area of 1,847 km^2.

The mineral resources reported in this report are located in five (5) out of the seven (7) exploration permits. The permits are owned through two Centamin group subsidiaries, Ampella Mining Côte d'Ivoire (AMCI) and Ampella Mining Exploration CI SA (AMEXCI). All of the exploration permits are subject to the 2014 Ivorian Mining Code.

The 2021 mineral resource estimate identified 13 (thirteen) deposits namely: Souwa, Nokpa, Chegue, Chegue South, Tchouahinin, Kekeda, Han, Enioda, Hinda, Nare, Kilosegui, Attire and Vako.

Each presidential decree sets minimum expenditure requirements and type of work by year in order to maintain the rights on the permits. The total expenditures, the work achieved and the results are summarized in bi-annual and annual reporting to the Direction of Mines. Regular field visits are conducted by representatives of the Direction of Mines in order to reconcile the reports.

The exploration activities, including the drilling, need no other specific permitting in the field other than the normal compensation for crop destruction to the local communities. These compensations are paid according to the guidelines set by the Ministry of Agriculture directly to the landowners.

Table 4.1: Summary of the Exploration Permits – as of June 2021

Permit name	Permit ID	Surface (km^2)	Status	Company	Date granted	Expiry date
Varale	PR 335	284.9	Granted	Ampella Mining Cote d’Ivoire S.A.	13/06/2013	12/06/2022
Kalamon*	PR 334	398.9	Granted	Ampella Mining Cote d’Ivoire S.A.	13/06/2013	12/06/2022
Danoa*	PR 559	240.3	Granted	Ampella Mining Cote d’Ivoire S.A.	10/06/2015	09/06/2022
Tehini 1*	PR 535	253.0	Pending	Ampella Mining Exploration C.I. S.A.	08/03/2017	07/03/2021
Tehini 2*	PR 536	228.0	Pending	Ampella Mining Exploration C.I. S.A.	01/03/2017	28/02/2021
Tehini 3	PR 778	241.0	Granted	Ampella Mining Exploration C.I. S.A.	16/04/2018	15/05/2022
Gogo	PR 633	201.93	Granted	Ampella Mining Exploration C.I. S.A	19/10/2016	01/10/2023

*These permits host the estimated mineral resources reported in this document

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

The area of Doropo shows relatively low relief, due to the nature of the underlying rocks – the granites. The surface soils are mostly sandy and outcrops are rare. The ridges form small plateaus and covered by laterites and occasionally duricrust of limited thickness. Large peneplains bound the area on the north and on the south while hill chains bound the eastern and the western sides where greenstone belts crop out (the Tehini-Hounde belt on the West and the Bonomo/Batie belt on the East).

Elevations range from about 250 m to 407 m at the highest point, which is more or less in the middle of the Doropo Project, and forms a drainage divide between the Volta Noire basin on the East and the Comoe basin on the West as shown in Figure 5.1. Streams and rivers on the Project are seasonal.

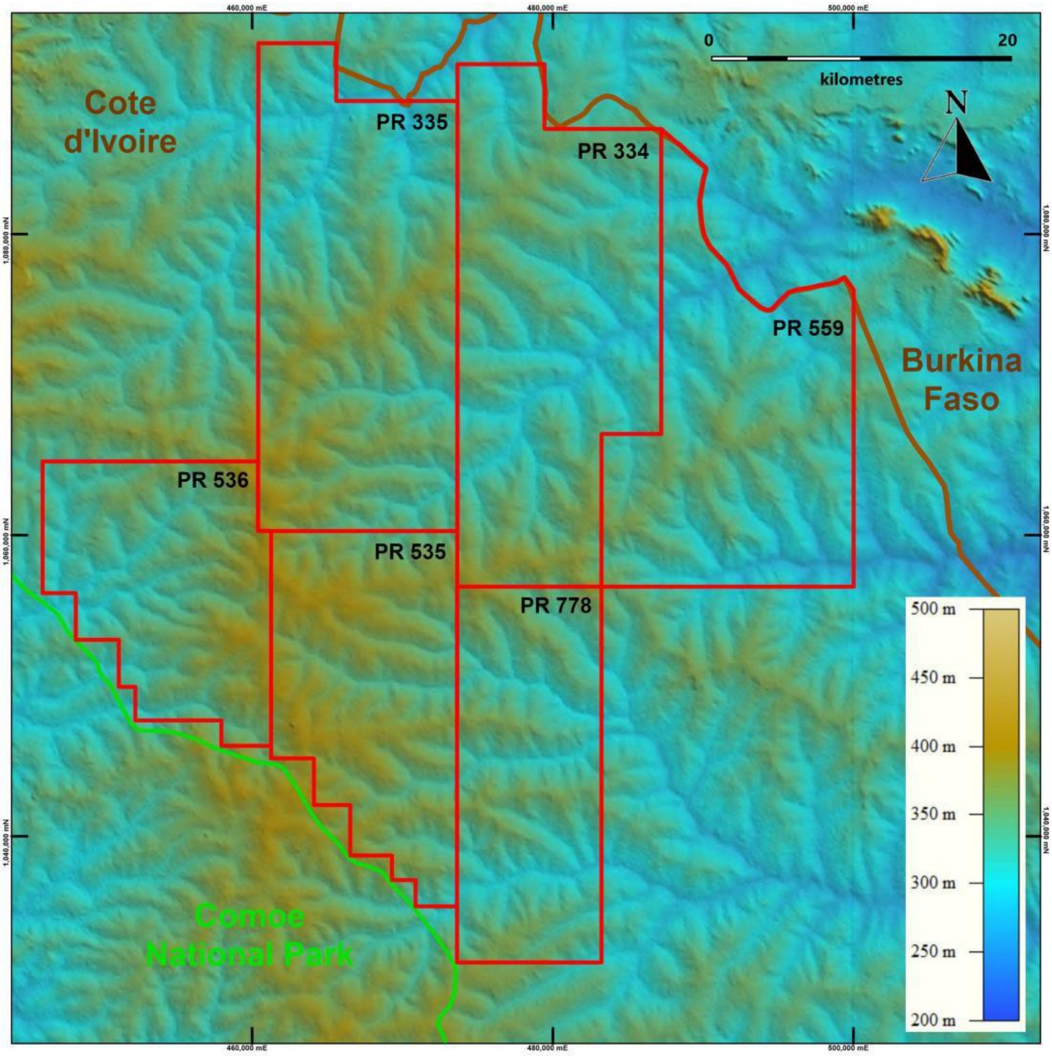


Figure 5.1: Elevations over the project – SRTM data

The climate is of Sudanese type, with two distinct seasons, a rainy season and a dry season. The rainy season extends from May/June to September/October when rainfalls total between 1,100 mm and

1,200 mm. The dry season extends from September/October to May/June. The Harmattan, a hot dry wind coming from the Sahara regions, blows generally in December and January, sometimes extending to March, and brings dust clouds, which reduce visibility.

The average temperature is of 28°C, ranging between 21°C and 33°C. The hottest times of the year occur at the change of seasons.

The vegetation is characterised by the sparse forests and savannah where natural environment exists, as shown in Figure 5.2. However, a large extent of ground is covered by seasonal crops, mostly yams, peanuts, rice, millet and sorghum and plantations of cashew trees – Cote D'Ivoire is one of the main producers of cashew nuts in the world.

The National Comoe Park limits the Project all along its South-West side. The park covers 11,500 km^2, which is the largest protected area in West Africa. It is a biosphere reserve and a UNESCO world heritage site since 1983.

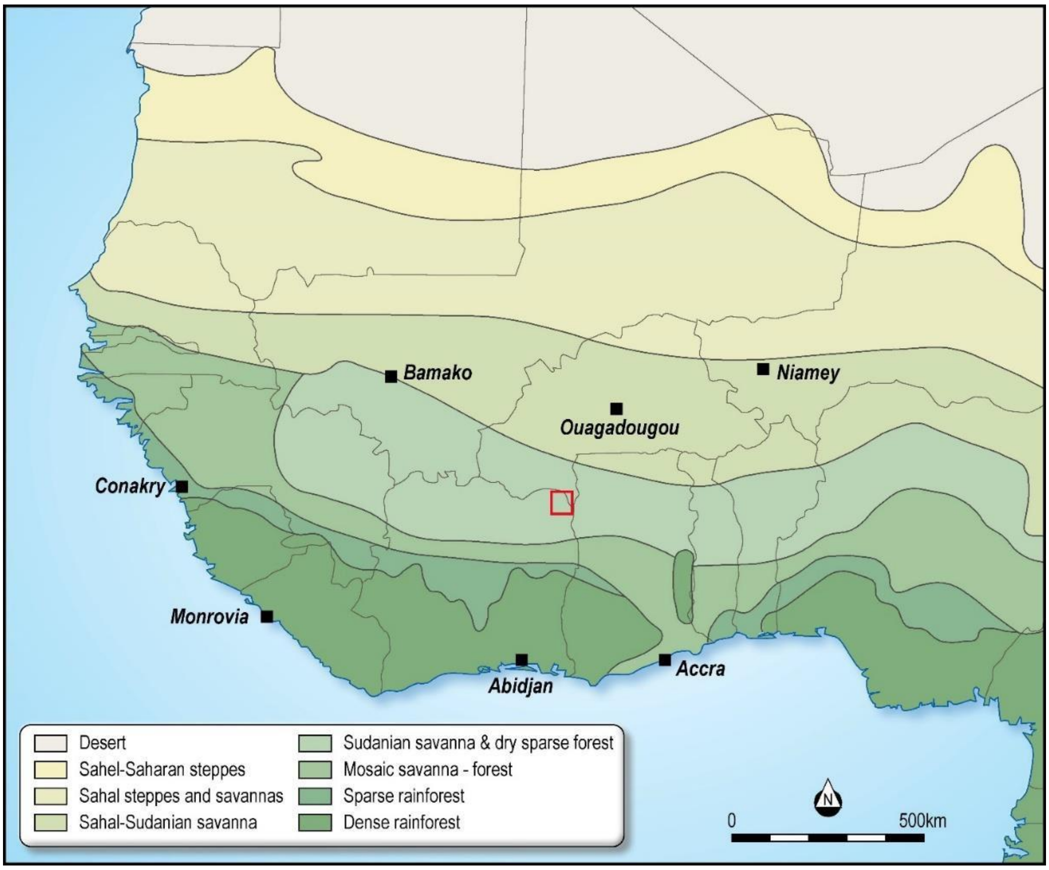


Figure 5.2: Main vegetation zones in West Africa

The Doropo Project is accessible by a national sealed road called the A1 which crosses through the centre of the Project. The A1 is a major road that joins Abidjan and Ouagadougou, the Capital of Burkina Faso. Doropo, Prefecture or Department, is 76 km (about 1.5 hours' drive) from Bouna, the Capital of the Bounkani Region. It is also at 240 km (about 3.5 hours' drive) from Bondoukou, the capital of District and 645 km (about 10 to 11 hours' drive) from Abidjan, the economic capital. A dense network of small dirt/ sandy roads allows easy access to all parts of the Project, even during the wet season. The sandy nature of the soil allows a rapid drainage of the water on the access roads generally.

There is a dense network of rural villages in the area of the Project, mostly populated by the ethnic group of Lobi. Bigger villages, such as (but not only) Danoa, Kalamon, Kodo, Varale, Niamoin, are mostly populated by the Koulango ethnic group. The third ethnic group present in the area is the Fula, who are often nomads, living from cattle farming.

The main economic activity is represented by rural agriculture and farming. However, for several years, mostly since the civil war times, some villagers also live from artisanal gold mining (mostly superficial rocks digging and laterite panning). To some certain extents, the illegal mining increased more recently with the arrival of nomadic Burkinabes (Mossi and Dioula ethnic groups mainly).

Local infrastructure remains limited so a Project development will have to include a self-sufficient aspect or backup options.

The power grid, coming from a Ghanaean source of power, currently supplies the main villages and cities along the A1 road, and is being extended to the secondary villages (Kalamon, Danoa, etc). However, it remains an unstable supply during some periods of the year.

The mobile phone network is well deployed, from at least two main national providers. Internet access has overall proven reliable, via the general 3G mobile connections, or dedicated microwave connections for the sites.

Water is abundant underground, even if not flowing at surface during the wet season. No studies have yet been conducted but there are expectations to find a sufficient source of water for a mining project.

Due to the rural aspect of the area, the specialized professional skills and trade skills are very limited in the near vicinity, but adequate workforces are available from elsewhere in the country.

6 HISTORY

The first exploration permits of the area were granted to Ampella Mining Cote d'Ivoire, Ivoirian subsidiary, in June 2013. Prior to that time, no mineral exploration had ever been conducted.

The region (the North-East part of the country) was first mapped by French Geologists from 1950 to 1958, in order to produce the first Geological map at the scale 1:500,000, prepared by the Bureau de Recherche Geologique et Minière (BRGM), printed in 1963.

Some evidence of historical gold mining during the Colonial time (under the French management) are seen at Varale, where a small open pit type operation occurred. However, this operation seems to not have been documented.

The granitic domain that characterises the Doropo Project has always been considered as non-prospective for gold deposits.

At the end of 2013, Ampella Mining Limited conducted a preliminary reconnaissance program, leading to the highlight of the various prospects, with initial high grade rock chips.

Centamin acquired Ampella Mining Cote d'Ivoire via the takeover of Ampella Mining Ltd. in March 2014. Exploration activities then started on the Doropo Project from mid-2014.

7 GEOLOGICAL SETTING AND MINERALISATION

7.1 Regional Scale Geology

The West African craton covers a surface area of 4.5M km2, extending from the northern parts of Mauritania in the north, to the southernmost West African countries of Liberia, Cote d'Ivoire, Ghana in the south. It crops out in two major areas, the Reguibat shield in the north and the Leo-Man shield in the south, as shown in Figure 7.1. The Leo-Man shield includes the major gold producing provinces in Ghana, Burkina Faso, Southern Mali, Guinea and Cote d'Ivoire.

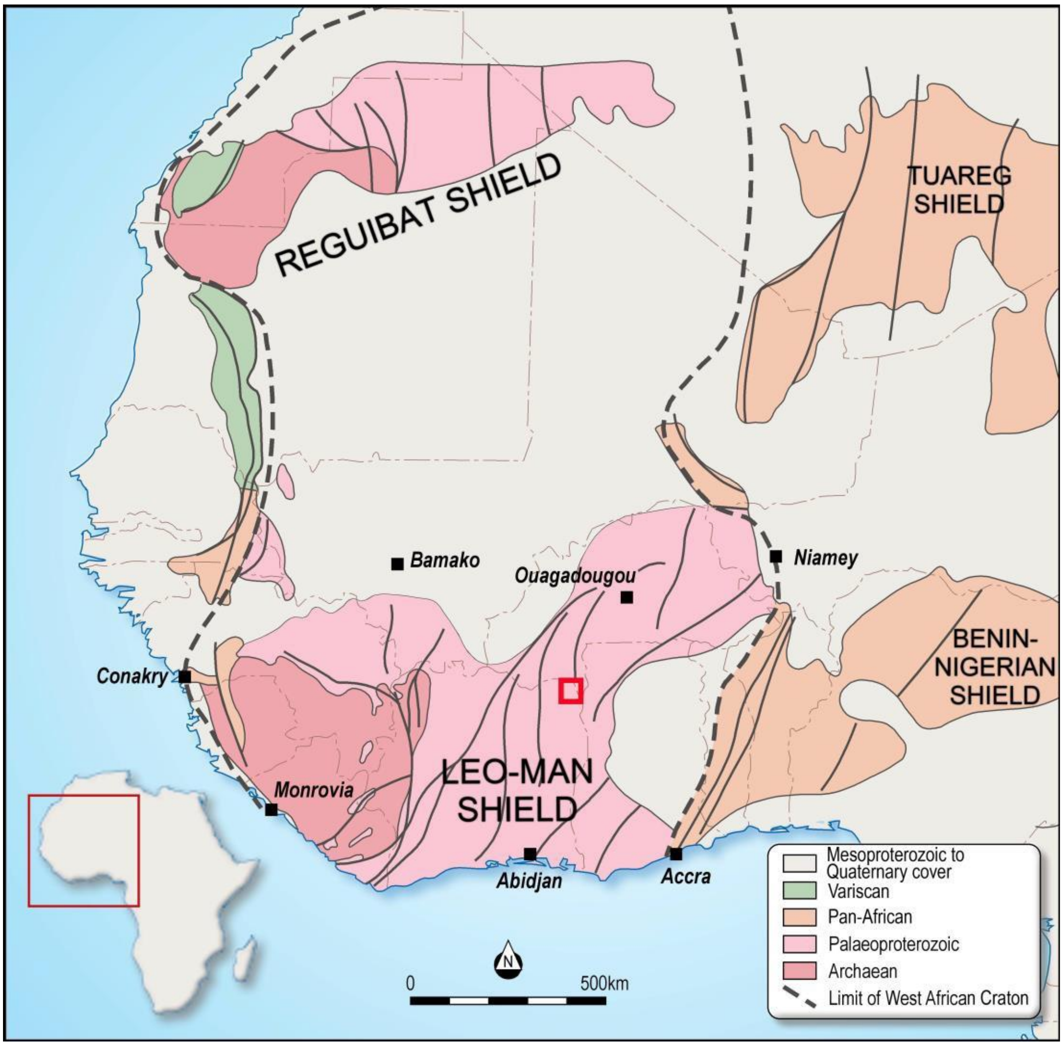


Figure 7.1: Map of West African Craton

In the Leo-Man shield, shown in Figure 7.1, Paleoproterozoic rocks, known as the "Birrimian domain" are tectonically juxtaposed to the Archaean basement, separated by the Sassandra fault. The gold deposits largely lie within the Birrimian domain, which covers about 85% of the Cote d'Ivoire ground.

The structure within the Birrimian domain was formed during the Eburnean megacycle between 2.5 to 1.6 billion years ago and the main tectono-metamorphism events occurred between 2.2 to 2.0 billion years ago. This Paleoproterozoic domain includes greenstones belts (volcano-sediments) bounded by large areas of tonalitic granite-gneiss, trondhjémite and granodiorite (TTG orthogneiss suite, Tonalite- Trondhjemite-Granodiorite). Later stages of alkaline and calc-alkaline granitic plutons intrude this rock package.

The post Eburnean deformation events ended with large regional brittle deformation, often of a NW- SE orientation marked by the doleritic dykes.

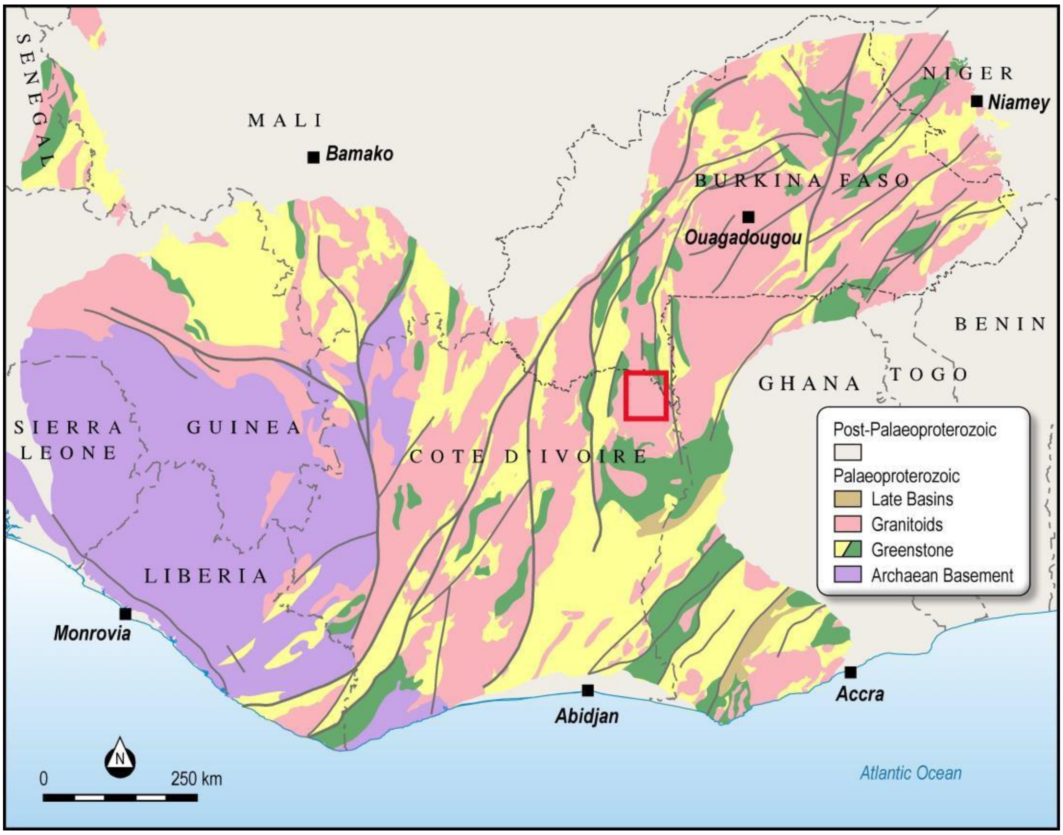


Figure 7.2: Geology of the Leo-Man Shield – from the BRGM interpretations

The Doropo permits, shown in Figure 7.2, lie entirely within the Tonalite-Trondhjemite-Granodiorite (TTG) domain, bounded on its eastern side by the Boromo-Batie greenstone belt, in Burkina Faso, and by the Tehini greenstone belt on the west. At the Project scale, the geology consists of granite-gneiss terrain, the granite being mostly of granodioritic composition. Outcrop is sparse, and generally confined to some slope sides with the flat ridge tops and low-lying areas being covered by lateritic soils and transported sediments (alluvium & colluvium). The transitions with the greenstone belts, on both sides of the granitic domain, span progressive changes in the lithologies, encompassing layers of volcanic rocks (greenstones), as pyroxenites, amphibolites or more generally migmatites (mostly on the western side).

The granites are intruded by an abundant series of pegmatitic veins and quartz veins, ranging from the decimetre scale to several hundreds of metres scale. Some of this veining hosts gold mineralisation, often as primary native gold, across the entire area. This generates regular dispersed gold anomalism in the surface geochemistry; it is also the main source of the gold extracted by the artisanal miners but is mostly uneconomic at the industrial scale.

Large late doleritic dykes criss-cross the whole domain at the regional scale.

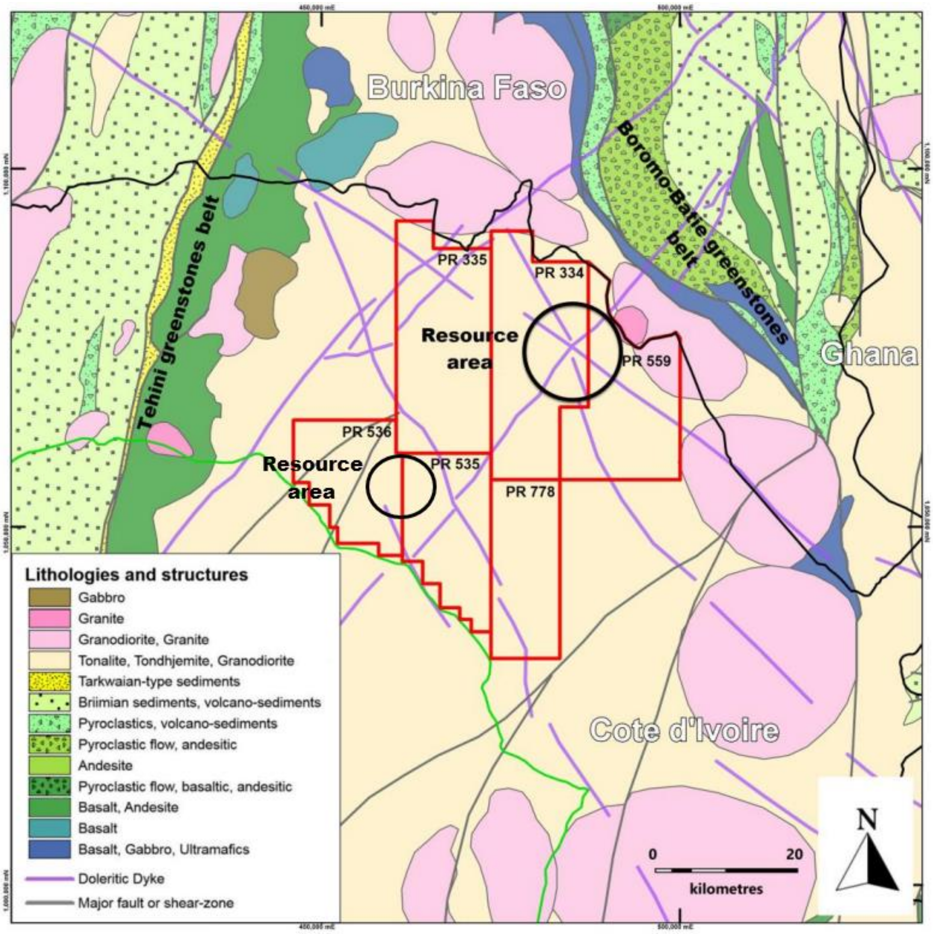


Figure 7.3: Geology map of Doropo

The resource estimates presented in this document cover thirteen deposits named Souwa, Nokpa, Chegue Main, Chegue South, Tchouahinin, Kekeda, Han, Enioda, Hinda, Nare, Kilosegui, Attire and Vago. Most of the deposits (11) are within a 7km radius with Vako and Kilosegui ~15km and ~30km to the SW of the main deposit camp, respectively (see Figure 2).

The host rock is a homogeneous medium to coarse grained granodiorite, locally intruded by biotite rich or aplitic dykes, mostly associated with the Enioda deposit, which also shows some amphibolite layers.

Mineralisation is associated with discrete structures of intense silica-sericite alteration, focused within and along the margins of narrow (5-10 m wide to locally 20-25 m) dextral shear zones. Outside of the mineralised zones, the granodiorite is fairly undeformed.

The planar zones of mineralisation define a great circle on the stereonet with a plunge of 30->295 (excluding Kilosegui). This direction appears to be coincident with the linear shoot directions within the planar zones of mineralisation and can be used to further explore the deposits (e.g. Nokpa).

Even though Kilosegui appears to be in a completely different strike orientation to the planar zones of gold mineralization at Doropo, the trend could well be related and may have been formed under the same stress conditions. If Kilosegui is completely unrelated to Doropo, the poles of the planar grade continuity would not lie close to the great circle defined by the poles of the Doropo zones. With the inclusion of Kilosegui the average pole to the great circle that fits through the local planar orientations is 25->266. Further drilling is required to support this hypothesis.

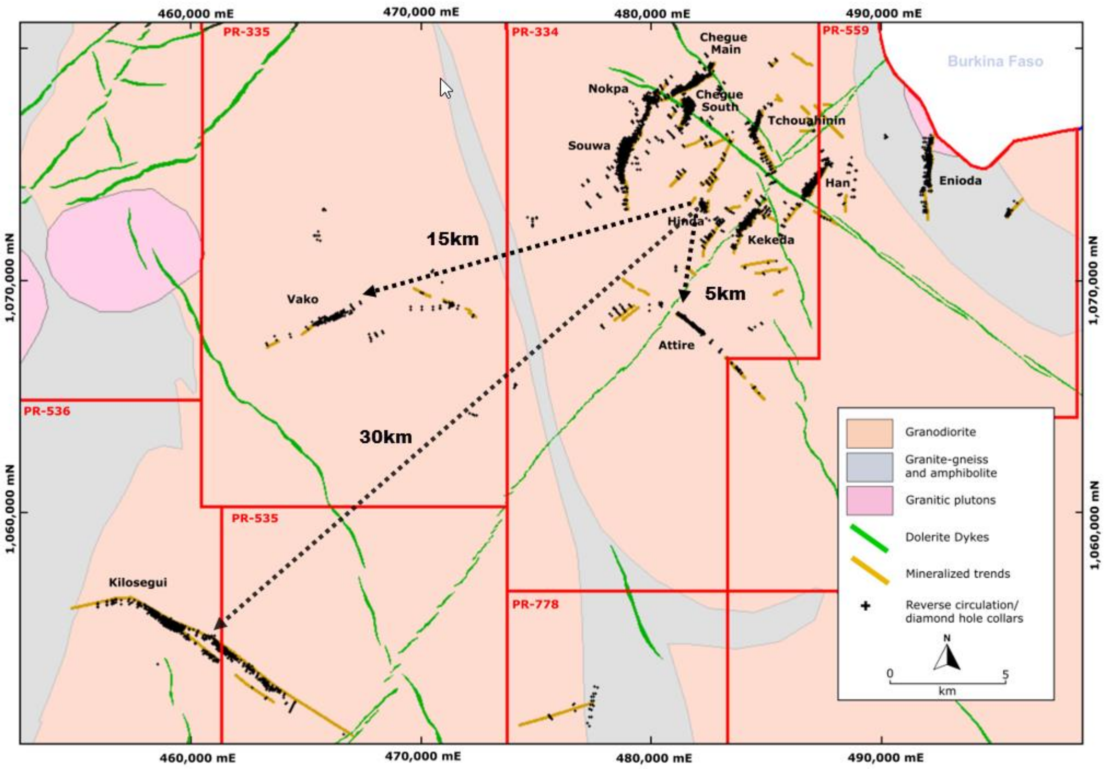


Figure 7.4: Deposit scale Geology and Locations.

7.2 Project Scale Geology

The block of exploration permits, shown in Figure 7-3, lies entirely in the TTG domain, bounded on its eastern side by the Boromo-Batie greenstones belt, in Burkina Faso, and by the Tehini greenstones belt on the west.

At the Project scale, the geology consists of granite-gneiss terrain, the granite being mostly of granodioritic composition. Outcrop is sparse, and generally confined to some slope sides with the flat ridge tops and low lying areas being covered by lateritic soils and transported sediments (alluvium, colluvium).

The transitions with the greenstones belts, on both the sides of the granitic domain, span progressive changes in the lithologies, encompassing layers of volcanic rocks (greenstones), as pyroxenites, amphibolites or more generally migmatites (mostly on the western side).

The various rock types are distinguished on the basis of aeromagnetic, radiometric and soil geochemical attributes. There is an ongoing research study, conducted by PhD students from the Felix Houphouët-Boigny University of Abidjan, focusing on identifying the regional scale litho-structural context of the Project, which aims to accurately map, interpret and date these various granitic facies. However, first results will not be available before 2020.

The granites are intruded by an abundant series of pegmatitic veins and quartz veins, ranging from the decimetre scale to several hundreds of metres scale. Some of this veining hosts gold mineralisation, often as primary native gold, across the entire area. This generates regular dispersed gold anomalism in the surface geochemistry; it is also the main source of the gold extracted by the artisanal miners but is mostly uneconomic at the industrial scale.

Large late doleritic dykes criss-cross the whole domain at the regional scale.

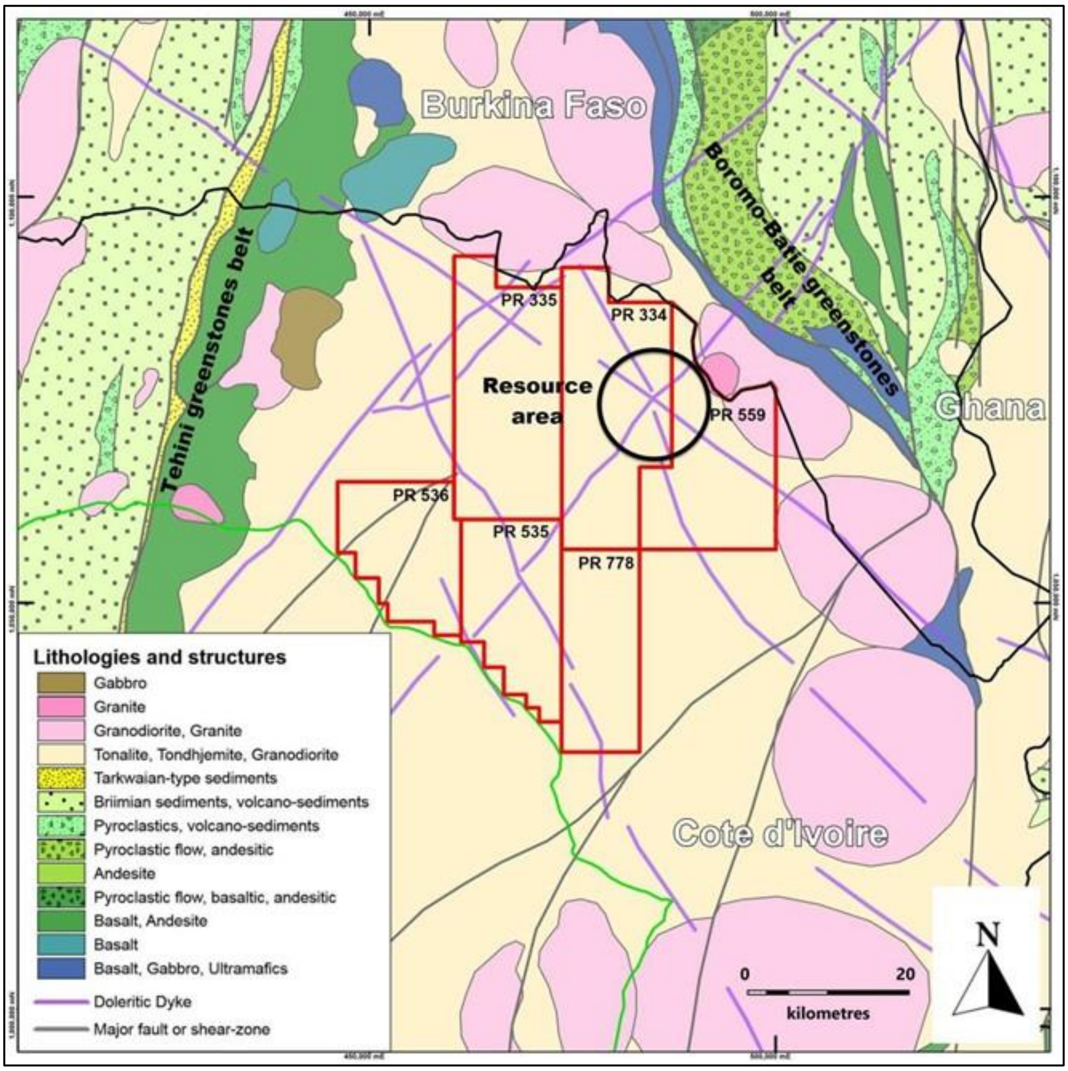


Figure 7.5: Geology map at the Project scale

The resource estimates presented in this document cover thirteen deposits named Kilosegui, Vako, Attire, Souwa, Nokpa, Chegue Main, Chegue South, Kekeda, Han, Enioda, Nare, Hinda and Tchouahinin. These deposits are shown in Figure 7-4 and are located fairly close to each other, within a 7 km radius except for Vako (16km) and Kilosegui (28km). This area also includes numerous mineral occurrences that have not been tested to date and prospects yet to be further tested and developed.

The host rock is a fairly homogeneous medium to coarse grained granodiorite, locally intruded by biotite rich or aplitic dykes, mostly on the Enioda deposit, which also shows some amphibolite layers. Mineralisation occurs associated with discrete structurally controlled zones of intense silica-sericite alteration, focused within and along the margins of narrow (5-10 m wide to locally 20-25 m) shear zones. Outside of the mineralised zones, the granodiorite is fairly undeformed.

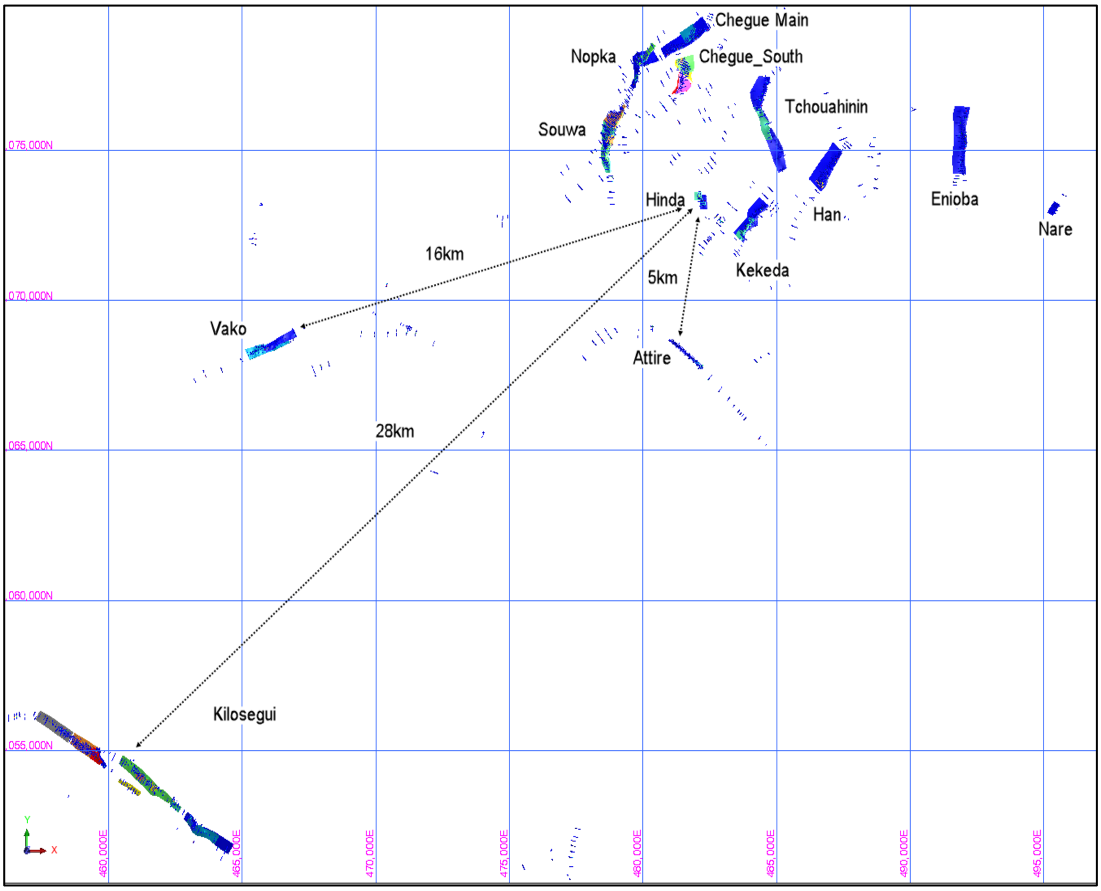


Figure 7.6: Resource area: location of deposits

From August 2017 Centamin commissioned Orefind, an Australian based structural geology and geological modelling consulting company, to investigate the geological history of the Doropo Project area. The following text is an extract of their detailed report (Orefind, 2017) “overprinting relationships indicate a massive deformation-controlled fluid flow system acting in tandem with a deformation regime that progressed from ductile through to brittle/brittle-ductile in the waning stages of fluid ingress. Broadly similar sequences of quartz-carbonate veining were introduced at all prospects and indicate the following history:

- Ductile shear zone initiation,
- Ingress of the first silica-dominated fluid phase during ductile deformation,
- Hiatus in fluid flow,
- Ingress of the second major silica dominated fluid phase with deposition of base metals and gold in the waning stages of this fluid deformation cycle. Deformation caused pervasive brecciation of the first stage of quartz dominant veins, with cementation and silicification of the breccias being facilitated by massive second-stage silica inflow,
- Hiatus in fluid flow,
- Deformation progresses to a dominantly brittle system. Deformation of the earlier silica stages, with breccia being cemented/ silicified by the final major silica-dominant fluid phase.

The progressive/repeated reactivation of the host structures has channelled numerous fluid cycles. Each of the three major silica-dominated fluid flow episode described above will have comprised many individual fluid pulses, resulting in progressive increases in vein volume. Silicification of the host structures will have modified the rheology of the host rock, resulting in strain accumulation and ongoing localisation of deformation."

"the first major stage of quartz rich fluid is inferred as being controlled by permeability associated with the accommodation of strain on structures that initiated as ductile shears in the granite. These structures likely also accommodated the greatest volume of silica bearing fluids, resulting in incremental formation of the largest white quartz veins seen in the deposits.

The second largest stage of quartz rich fluid was coeval with cycles of brittle deformation that overprinted the large, first generation quartz veins. Angular breccia fragments were produced and then "cemented" by a matrix of translucent to grey to black quartz infill and veining. The distinctive dark coloured veins are commonly the host to sulphides and are inferred as coeval with, and host to, gold mineralisation. Accumulation of shearing strain at the margins of the first generation veins commonly produced shear-induced lamination. Brecciation was sponsored in zones where the strain rate was great to accommodate ductile deformation. Overall, the special distribution of highest grades coincides with the deformed margins of the early formed veins.

The third major stage of quartz rich fluid was the volumetrically smallest, and manifests as cross-cutting white to translucent veins that inferred as forming under dominantly brittle conditions."

7.3 Weathering Profiles

The most common weathering profile includes transported sediments and granitic derived soils at surface that directly cover indurated mottle zones or gravelly profiles. The saprolite splits into an upper profile and a lower profile and the transition zone to fresh rock is very sharp.

The indurated mottled zone, shown in Figure 7.7, is very sandy, usually of a few tens of centimetres to a metre scale. It represents a reliable level to host in situ gold anomalies at the Project scale. Most of the soil sampling programs reach this level for sampling.

Figure 7.7: Sandy indurated mottled zone (left) and gravelly level showing fragments of mineralised quartz veins (right)

The upper saprolite, shown in Figure 7.8, has very little to no fabric preserved. The granitic origin can be interpreted by the remaining coarse quartz grains that are supported by clay matrix. Thicknesses vary from a couple of metres to a maximum of about 40 metres, being very irregular across the drill sections and the deposits. Overall, the thickest profiles have been found at the Souwa and Enioda deposits and the thinnest profile at the Han deposit.

Figure 7.8: Upper saprolite (where the original fabric is partially preserved)

The lower saprolite, shown in Figure 7.9, has most of its original fabric preserved; the rock is usually consolidated but can still be broken by hand. Thicknesses are more regular than the upper level across the deposits, varying from about 10 to 30 metres.

Figure 7.9: Lower saprolite

The transition zone from saprolite to fresh rock, shown in Figure 7.10, is generally very sharp and normally of no more than one to three metres thick. A maximum thickness of about ten metres can be found in a few places where weathering is controlled by the fractures in the rock. Figure 7.11 shows a photograph of fresh granodiorite drill core for comparison.

Figure 7.10: Transition zone between lower saprolite and fresh rock

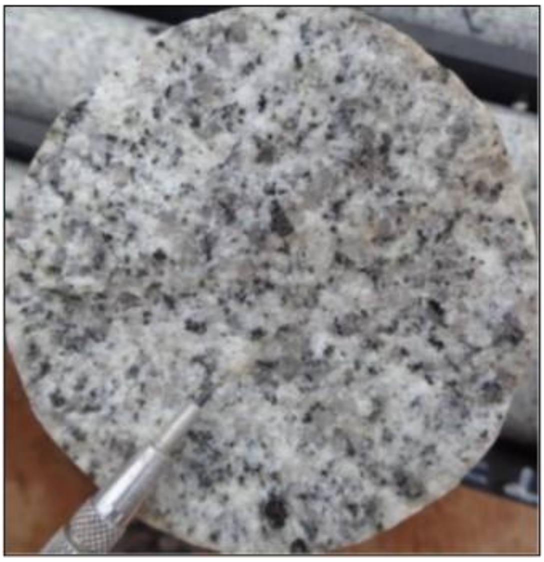


Figure 7.11 Fresh granodiorite

7.4 Alteration and Mineralisation

Mineral assemblages distal to the mineralised zones include epidote-chlorite and hematite. Examples of these can be seen in Figure 7.12 and Figure 7.13. Hematite alteration is then pervasive at weak to medium intensity. This hematite alteration can be very strong in the vicinity of the doleritic dykes, making the vectoring towards mineralisation difficult in such areas; this is particularly demonstrative at the Nokpa deposit.

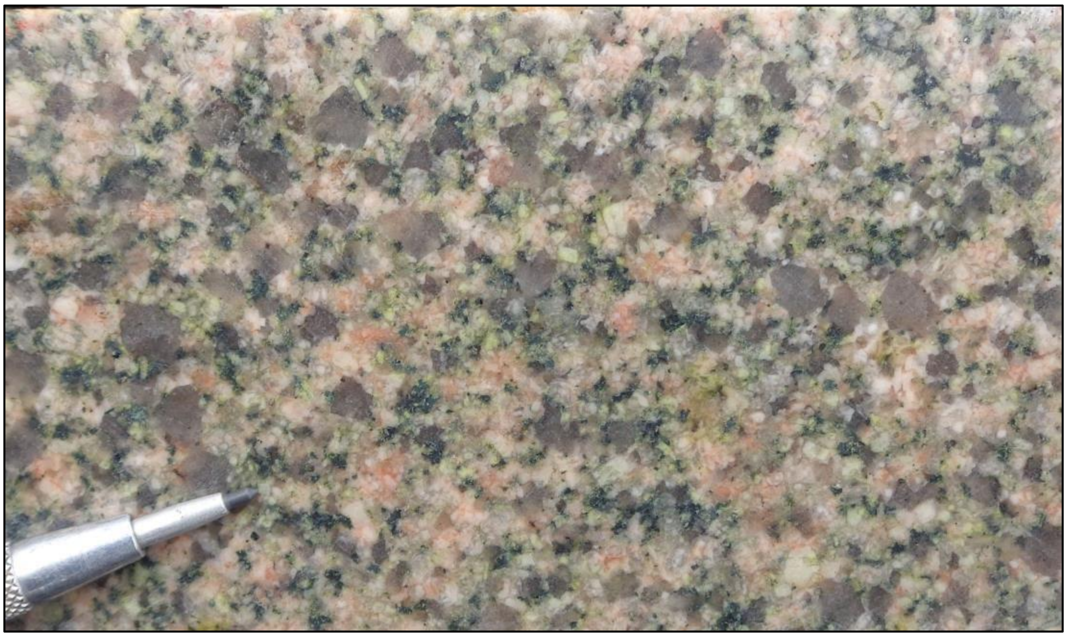


Figure 7.12: Distal epidote-chlorite-weak hematite alteration on granodiotite

(From foowall zone at Souwa - DPDD1382 at 103.4m depth)

Figure 7.13: Distal alteration: hematite-chlorite pervasive alteration

(From direct footwall of mineralisation at Souwa - DPRC0504 at 157m depth; 0.12 g/t Au)

Proximal mineral assemblages, as shown in Figure 7.14 and Figure 7.15, include strong silica-sericite alteration that often overprints earlier hematite and silica alteration. The sulphides, mostly pyrite, are abundant throughout the core of the shear zone; they host part of the gold mineralisation. The other part of the gold mineralisation occurs as native gold in the quartz veins and selvages.

Figure 7.14: Proximal intense sericite and fine grained disseminated pyrite alteration

(From the Han deposit– DPRD0470 at 94m depth; 0.34 g/t Au)

Figure 7.15 shows a photograph of a sheared granite with strong silica-sericite overprinting earlier weak hematite alteration. This interval contains disseminated coarse pyrite and returned a gold assay of 3.9 g/t.

Figure 7.15: Strong silica-sericite alteration - high grade mineralisation

(From the Han deposit – DPRD0470 at 98.7m depth; 3.9 g/t Au)

8 DEPOSIT TYPES

The Doropo Project currently includes thirteen distinct mineralised bodies that host the actual resource plus numerous prospects and geochemical surface anomalies yet to be tested, fitting an area of about 170 km2, or within a circular area of 28 km radius.

The mineral occurrences tested to date include two model types, a “classic” shear hosted gold deposit model and a quartz vein hosted gold deposit model. Both these models are coherent in nature with the majority of the other West African deposits, except on the issue of the host environment (the granitic domain).

The granitic complex displays lozenge-shaped arrays of anastomosing shear zones. The shears have a broad South-South-West to North-North-East orientation, dipping shallowly towards the NW. This interpreted model has been developed by several authors but was formalised in 3D by the OreFind geologists. The mineralisation occurs all along the shears, which were all channel ways for the fluid flows, however at a generally low grade gold deposition. Significant higher grade mineralisation occurs on specific localised trend orientations, or when shears intersect, and often spatially associated with doleritic dyke swarms (Davis, 2017).

The quartz veins mainly occur along the NW-SE orientation, as sub-vertical or steeply dipping towards the SW. These veins show significant gold grades and often visible gold but have a limited width.

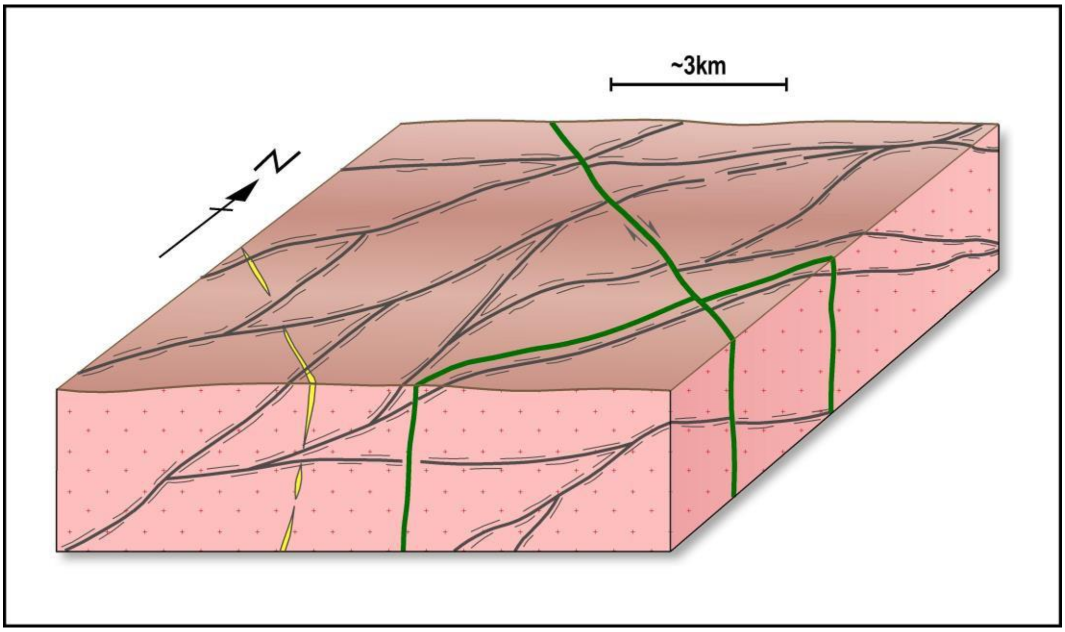


Figure 8.1: Schematic geological model interpretation of the resource area (shear zones in black, quartz veins in yellow and doleritic dykes in green) (From Centamin, March 2019)

9 EXPLORATION

Only minor exploration work was conducted before Centamin took over the Doropo Project in 2014. This work was limited to field reconnaissance and rock chip sampling and was carried out by Ampella Mining Ltd. Centamin started exploration work in 2014, progressing from the regional field mapping, to the surface geochemistry sampling, via soils and auger, to the geophysical surveys, ground surveys and airborne surveys, to trenching, aircore drilling and then reverse circulation and diamond drilling.

The above strategy currently remains unchanged, and continues to be applied to the pipeline of targets on all the Projects in the country.

All exploration work has started from a fixed base setup in the Doropo town. Following up the momentum in drilling activities on the prospects host of the actual resource, a second camp was set up in the Danoa village, located closer to the drill sites, about 45 km by tracks from Doropo. The regional exploration work (mapping, soil sampling, auger sampling, aircore drilling) is based out of fly camps or other temporary camps depending on the location of the programs.

9.1 Coordinates, Survey Controls and Topographic Surveys

The default coordinates system used on the Project is based on the UTM coordinates, Zone 30 North in the World Geodetic System (WGS) 84. The Shuttle Radar Topography Mission (SRTM) digital data is used as the topographic reference for all the exploration work carried out to date.

GEDES International SARL Surveyors (Geo-Engineering Design and Surveying) is an accredited surveying company that is contracted to carry all ground surveys on the Project, including recording the location of all drill hole collars.

Ground fixed control points are regularly established, to follow the exploration progress. At the end of 2018, height control points were setup by GEDES. They are cemented in the ground, generally located on duricrust plateaus in the vicinity of the major prospects.

All drill hole collars (including RC and diamond collars) are surveyed using differential GPS unless accuracy is deemed to be low due to issues such as poor satellite coverage or abundant vegetation cover. In these cases, a total station is used to record the location of the collars. All other programs including soil samples, rock samples, auger collars, trenches, aircore collars are located using hand-held GPS units. The collar elevations are linked to the NGCI system (Nivellement General de Cote d'Ivoire), that is the standard system for recording elevation in Cote d'Ivoire.

9.2 Geological Reconnaissance, Mapping and Rock Chip Sampling

Outcrops on the Project area are uncommon due to the granitic nature of the underlying rock. In the resource area, the main access to outcrops is generated by the artisanal mining.

The initial reconnaissance focused on mapping all the artisanal mining spots, the outlines of the excavations and any data on the quartz veins that were mined. All quartz vein, and the veins selvages were sampled by rock chipping. The interpretation of the results of the regolith mapping can be seen in Figure 9.1.

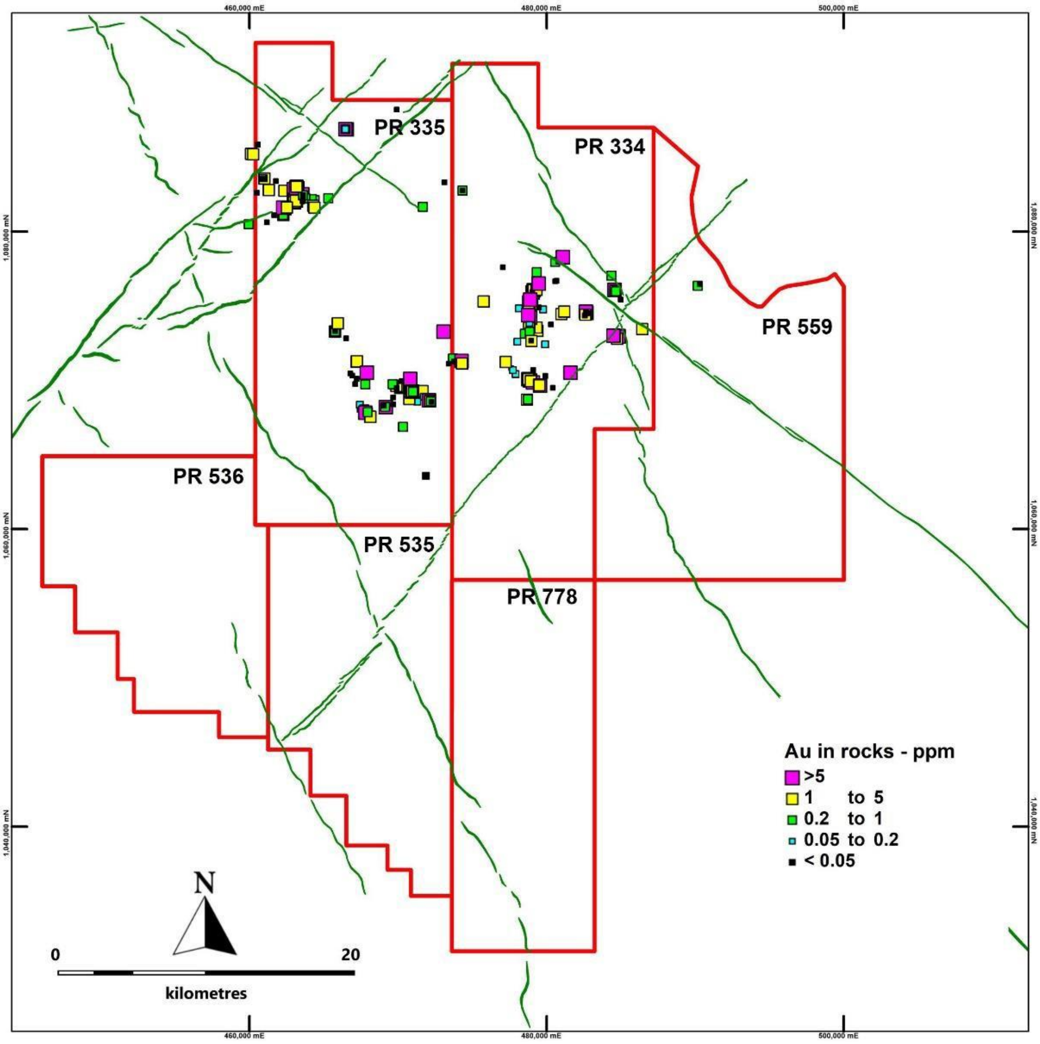


Figure 9.1: Location and results of rock chip sampling programs

9.3 Airborne Geophysical Survey

A regional aeromagnetic and radiometric survey, with additional detailed infill surveying over the Doropo Project, was flown by UTS Geophysics/Geotech Airborne Limited (UTS) between March 24 and May 27 in 2015 (Wood, 2015). The survey was flown using NNW-SSE oriented survey lines spaced either 200 m or 100 m apart, and covered a total of 21,827 line km.

The resulting imagery supported the initial regional interpretations and then the first regional exploration programs. The results of the magnetic imagery can be seen in Figure 9.2.

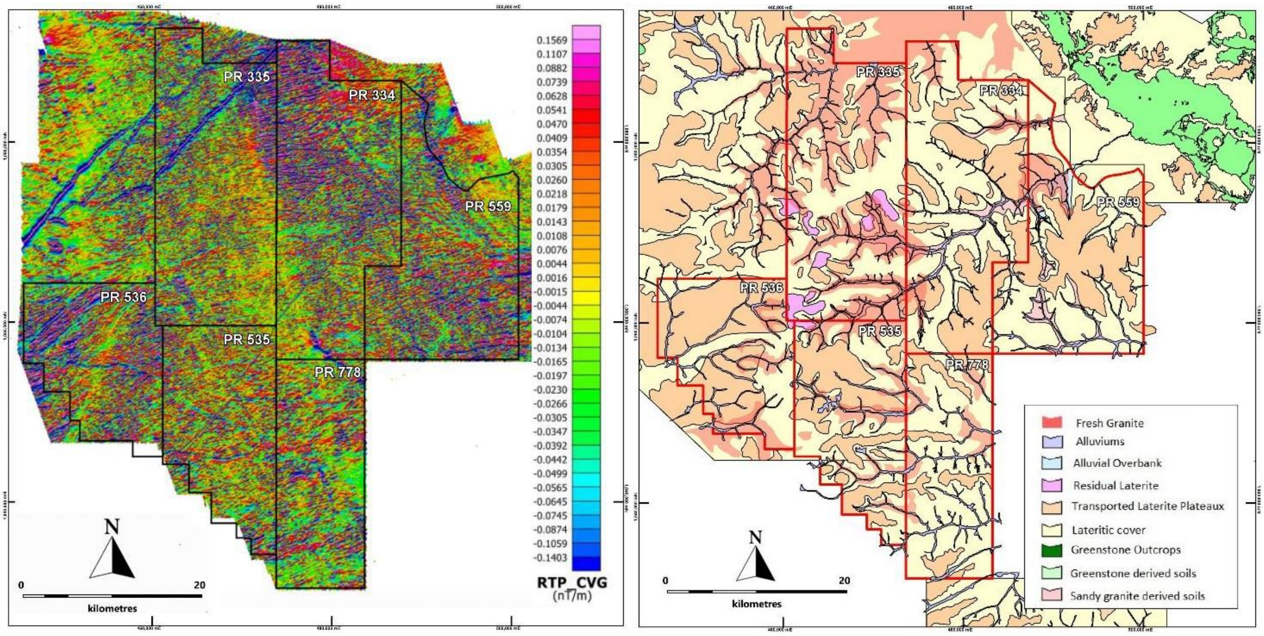


Figure 9.2: Exploration data: magnetic imagery and regolith mapping

9.4 Soil Sampling

Soil sampling remains an efficient reconnaissance tool on the granitic domain, and has proven to return representative results.

Several orientation surveys were originally conducted within the permit areas, across zones of artisanal mining activity as well as areas with no specific activity. The results showed that the upper most surface material, of sandy composition and often transported, is not representative at the prospect scale and returned irregular widespread dispersions of the gold anomalism. However, the horizon of mottle zone, or sometimes stripped top of saprolite, returned more coherent and reliable gold anomalism in the vicinity of the mineralised structures.

All subsequent soil sampling surveys sampled these representative levels, which are accessible from about 0.5 m depth to about maximum 3 m depth by quick pitting. Beyond this depth, the auger drilling methods are more efficient.

The regional soil grid is set on a staggered 400 m x 400 m grid. Infill sampling is then carried out where necessary on 200 m or 100 m spaced grids.

All soil samples (and geochemistry samples in general) are analysed using a standard 50 g gold fire assay with an atomic absorption finish at Bureau Veritas Laboratories in Abidjan. Multi-elements are also analysed by four-acid digest with ICP-AES and ICP-MS finish at the ACME Laboratories in Vancouver.

In total, 26,630 soil samples were collected between 2014 and December 2018, including 12,254 samples on infill grids on the Project. Most of the deposits and current prospects are well highlighted by the soils results. A map showing the location and results of the soil sampling programs can be seen in Figure 9-3 and the combined results of the soil sampling and auger drilling surveys can be seen as a colour contour map in Figure 9.4.

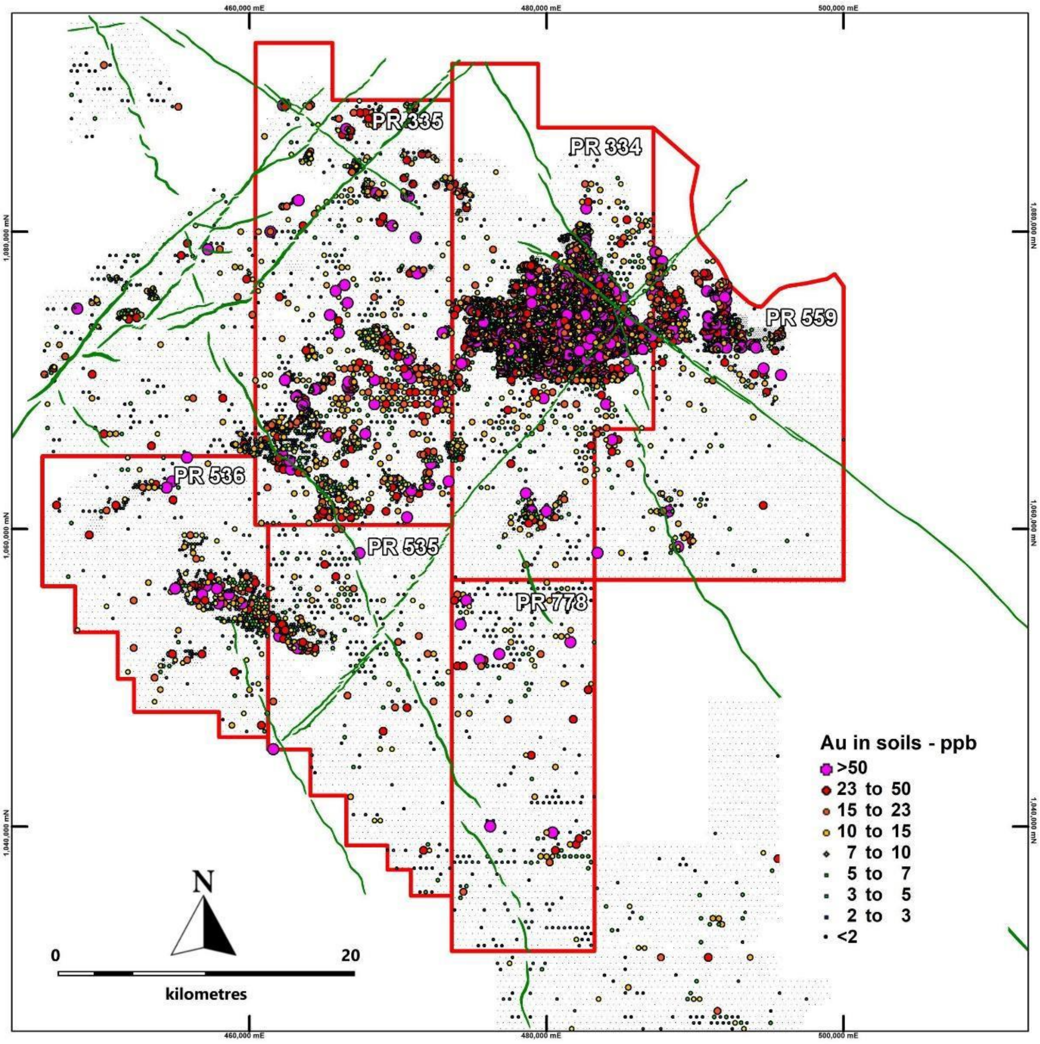


Figure 9.3: Location and results of soil sampling programs

9.5 Auger Drilling

Auger drilling was largely used on the Project to complete the soil grid surveys where the thickest lateritic plateaus cover the in-situ material and where the transported horizons (alluvium, sand) average over 3 m thickness.

The powered augers, mounted on Land Cruisers, from Sahara Mining Services have been used on the Project to date. Generally, one sample from the top of the saprolitic horizon is collected per auger hole and is analysed for gold only (same analysis methods as the soils). In some cases, a second sample is also collected at the base of the lateritic horizon, aiming to test for mineralised lateritic layers. The samples collected from the auger drilling carried out in 2014 were analysed for gold by aqua regia digest with atomic absorption finish at SGS Laboratory in Ouagadougou.

A map showing the location and results of the auger drilling programs can be seen in Figure 9.4 and the combined results of the soil sampling and auger drilling surveys can be seen as a colour contour map Figure 9.5.

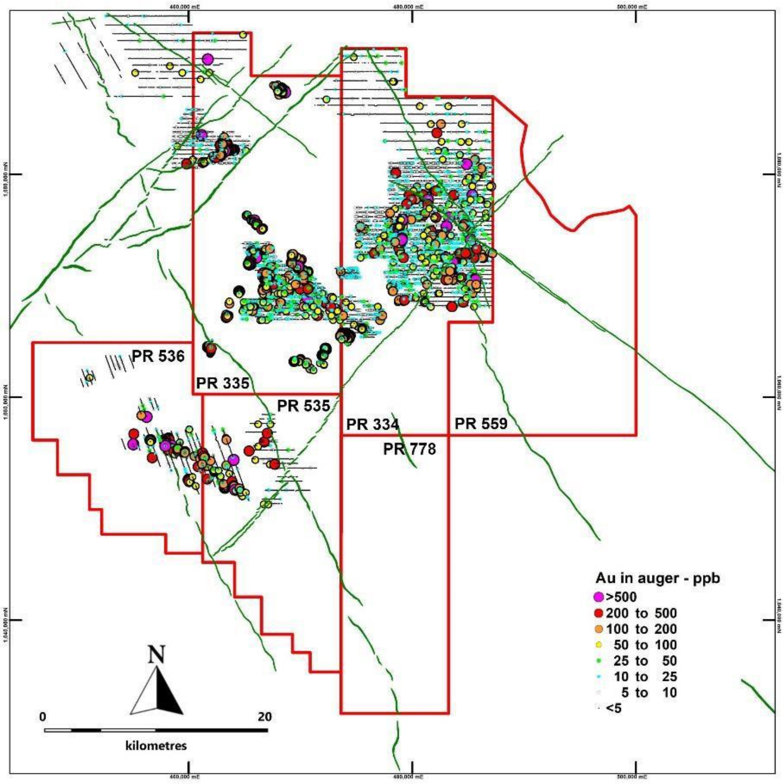


Figure 9.4: Location and results of auger sampling programs

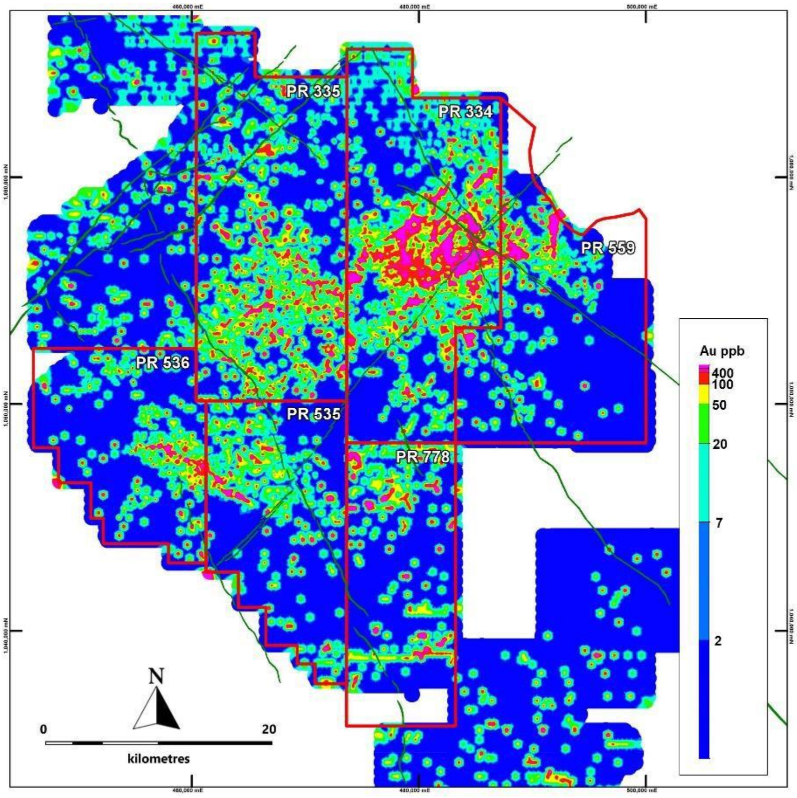


Figure 9.5: Exploration data: gridded gold values in surface geochemistry (merged soils and auger data)

9.6 Trenching

Trenching was used on some remote areas to verify in-situ mineralised structures highlighted by geochemical sampling.

9.7 Regolith Mapping and Interpretation

The regolith map was generated to cover the entire Project area, using a combination of satellite imagery, radiometrics, soils database and field checking.

Weathering processes result in the depletion of potassium and relative enrichment of thorium and uranium, therefore radiometric maps including Th, K and U are extremely useful in identifying lateritic plateaus, as well as areas with little to no weathering profile. Large areas of lateritic plateaus, rivers and alluvial deposits can be easily identified using satellite imagery.

The soil sample descriptions, that include comments on the surface landscape, also provided good insight into the profile of the regolith.

9.8 Gradient Array Induced Polarisation Survey

Gradient Array Induced Polarisation (GAIP) surveys are regularly used to interpret the continuity of structures when already highlighted by other methods. Multiple blocks were surveyed in 2015 and 2016 in the resource area (Toni, 2017). The Nokpa deposit was targeted directly from the interpretation of the GAIP imagery. SAGAX is used to run the ground survey while RESPOT works on the QAQC and data processing.

9.9 Aircore Drilling

Campaigns of aircore drilling are regularly conducted to quickly test coherent geochemical gold anomalism, conceptual targets or extensions to known mineralised structures. From June 2015 to December 2018, 121,811 metres were drilled on the Project. A map showing the combined aircore, RC and diamond drill hole locations can be seen in Figure 10-5. Aircore drilling is used as an exploration tool but is not included in the database used for resource estimates due to issues relating to sample representivity. All the drilling completed to date was conducted by Geodrill Ltd. The aircore holes are usually planned on lines across the targets to test; collars are planned heel to toe based on ground refusal along the lines.

The aircore programs identified several mineralised structures which have now been followed up by RC and diamond drilling, including Souwa, Kekeda, Enioda. Several other structures are yet to be followed up by further drilling programs. The samples are composited on 2 m lengths and analysed for gold by fire assay at the Bureau Veritas Laboratories in Abidjan.

10 DRILLING

The drilling programs (RC and Diamond) ran continuously on the Doropo Project since the end of November 2015, following the first significant hits from the aircore programs. This drilling is the first to have been completed for exploration purposes in the whole North-East region of Cote d'Ivoire. All the procedures applied have been specifically adapted to the Project from the experience previously gained by the team on previous projects – they respect the highest standards applied in the industry.

All the drilling was completed to date by the same drilling company, a reputable contractor who respects the best industry practices, Geodrill Limited. The drill rigs are well maintained and the maintenance crew is quickly responsive. All the staff, from the drillers to the offsiders, are well trained and operate smoothly. The drill rigs used on the Project are UDR200 (for diamond drilling only), UDR650 (small multipurpose rig, truck mounted) and UDR900 (big multipurpose rig, track mounted).

The drilling programs are planned using on-site interpretations, which are based on previous exploration programs, surface geochemistry, aircore drilling or other previous drilling completed, geophysical imageries and on conceptual interpretations.

The drill sites are marked by hand held GPS, prepared by hand clearing or dozer depending on the areas. By default, infill lines are cleared by dozer. The drill pad sizes are set by the needs from the drilling contractor.

Downhole surveys are taken every 30 m down hole, the first one being at 12 m depth (after two RC rods drilled), with single shot Relfex EZ SHOT system. Every survey is validated at the rig site by the geologist before being entered in the database. The geologist measures the hole orientation at surface using a compass, which is used as the collar downhole survey value.

The location of all drill collars is initially surveyed by the geologist using a hand held GPS, to rapidly enter the data into the database. Regular surveying campaigns are conducted by an independent surveyor company (GEDES International) to accurately pick up collar coordinates with either the Total Station or differential GPS. No dedicated ground topographic survey has yet been completed on the project. A topographic surface created from the drill hole is used for the resource work purpose.

After the completion of a drill hole, the drill site is cleaned of any rubbish and any contaminated soil (from oil spill, gasoil spill) is removed. A concrete block of approximatively 40 cm x 40 cm x 20 cm is set around the PVC casing for future reference.

The database is stored under the Acquire system, directly managed on site.

10.1 Reverse Circulation drilling

The Reverse Circulation (RC) drilling has been continuously used on the Project from the end of November 2015. One to three multipurpose rigs (to keep the opportunity to switch to diamond drilling) are rotating, depending on the program. In total, 321,043 metres have been drilled up to December 2020, including all the infill drilling achieved for the resource definition purpose.

The drilling is dominantly dry and the moisture content (dry, moist or wet) of the bulk sample has been recorded since the end of 2016. For resource definition drilling, the drilling stops when the water table is reached and the air pressure cannot keep the samples dry. The hole may then be continued by diamond drilling if the targeted mineralisation was not intersected yet.

The RC drilling uses hammer bits of nominally 5 ¼, 5 ½ and 5 ¾ inch diameter; the bit size was poorly recorded by drill holes until November 2016. From this time onward, the bit sizes used by depth and by hole has been recorded.

10.2 Diamond drilling

The diamond drilling is used as drilling tails after RC pre-collar in case of the deepest drilling (over about 180 m depth) as well as holes drilled to get structural data. Some diamond drilling was also completed to composite for metallurgical test-work samples, in which case, either quarter core or half core (depending on the needs) were kept and analysed for gold assays to include for resource estimates.

A total of 15,382 metres of diamond drilling were completed on the Project until December 2020, including 4,102 metres for metallurgical sampling.

10.3 Sample Recovery and Grade

The relationship between drill hole recovery and assay grade was investigated with the use of a series of conditional expectation plots. In grade-recovery analysis, the main concern is higher grades associated with lower recoveries, which may indicate an upgrading of samples due to the preferential loss of gangue material. This would lead to biased sampling, resulting in an over-estimation of resources. A lesser concern is lower grades associated with lower recoveries, which may indicate a preferential loss of gold, resulting in an under-estimation of resources.

RC Drill Holes

From the total of 142,939 RC assays from the deposits estimated 139,310 intervals (97%) had records of the weight of the recovered interval. H&SC calculated the expected weight of the interval using the drill diameter data and the average density for each weathering domain in order to calculate the recovery. Figure 10-1 shows a conditional expectation plot of the gold grade of diamond drill core assays against recovery. It can be seen that there is a slight association between lower recoveries and lower grades.

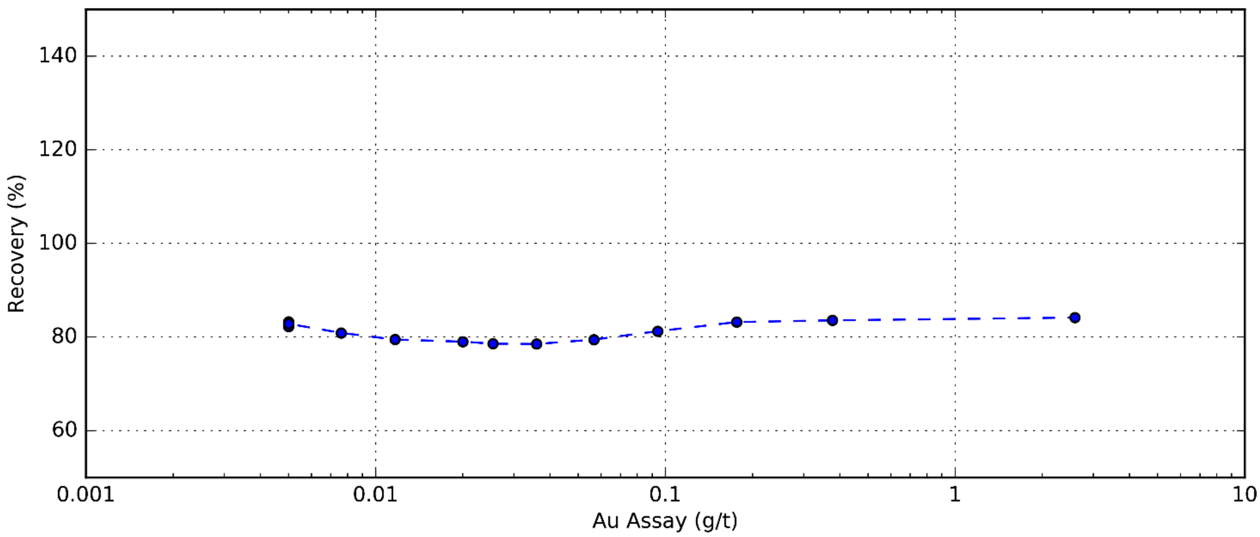


Figure 10.1: Conditional expectation plot of RC hole recovery and gold grade

The association between lower recoveries and lower grades shown in Figure 10-1 was investigated further. It was noticed that shallower RC intervals, below around 40 m are associated with lower recoveries. This relationship can be seen in Figure 10-2 and is considered to be common for RC drilling. Shallow RC drill samples are less likely to intersect mineralisation then deeper samples due to the dipping nature of the mineralised bodies. When the relationship between grade and recovery of RC intervals within the mineralised wireframes is compared, as shown in Figure 10-3, the association between lower recoveries and lower grades is not observed.

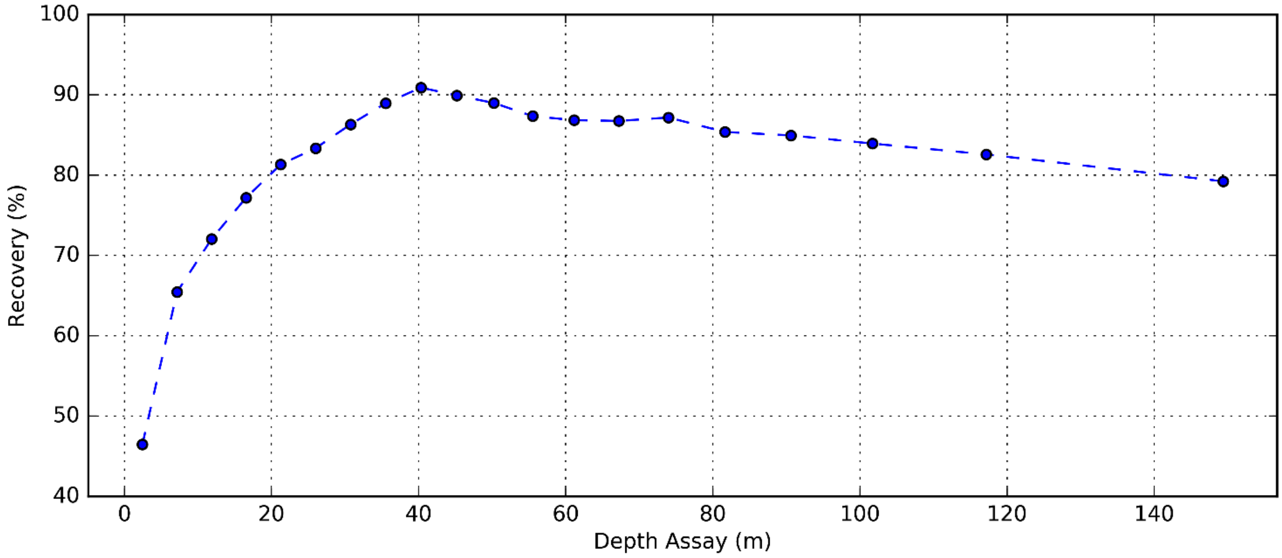


Figure 10.2: Conditional expectation plot of RC hole recovery and depth

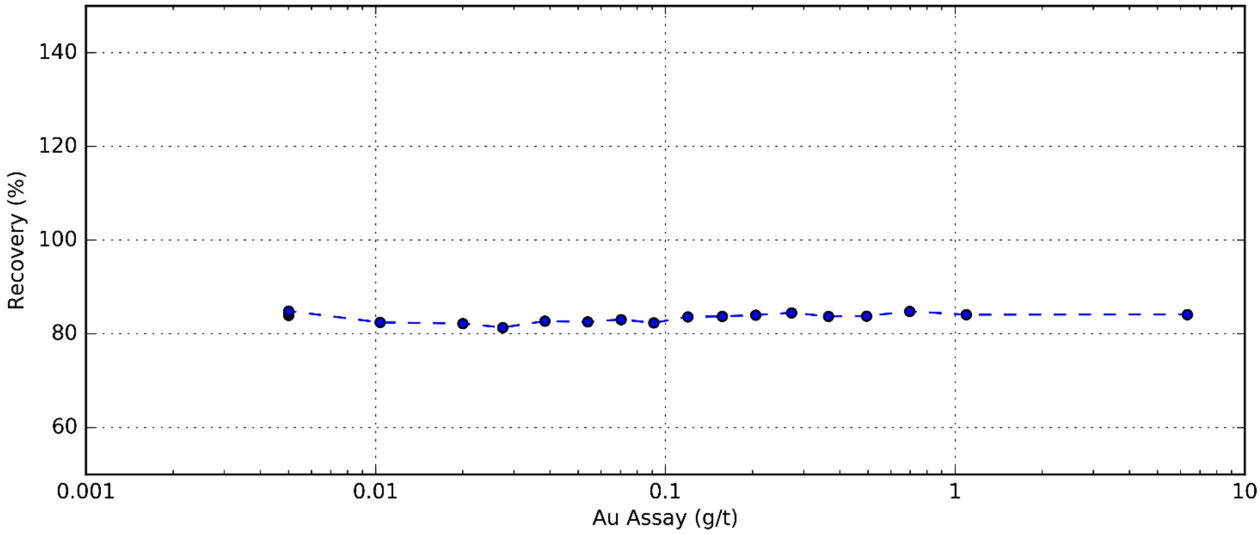


Figure 10.3: Conditional expectation plot of RC hole recovery and gold grade from mineralised zones

The relationship between recovery and grade was also assessed on an individual hole basis for 50 random drill holes through a series of downhole plots. No significant relationships were identified.

Diamond Drill Holes

From the total of 8,629 core assays from the deposits estimated 8,143 intervals (98%) had recovery data. Figure 10-4 shows a conditional expectation plot of the gold grade of diamond drill core assays against recovery. Overall, the recovery of diamond drill core is high but there does appear to be a slight decrease of recovery associated with higher-grade gold mineralisation.

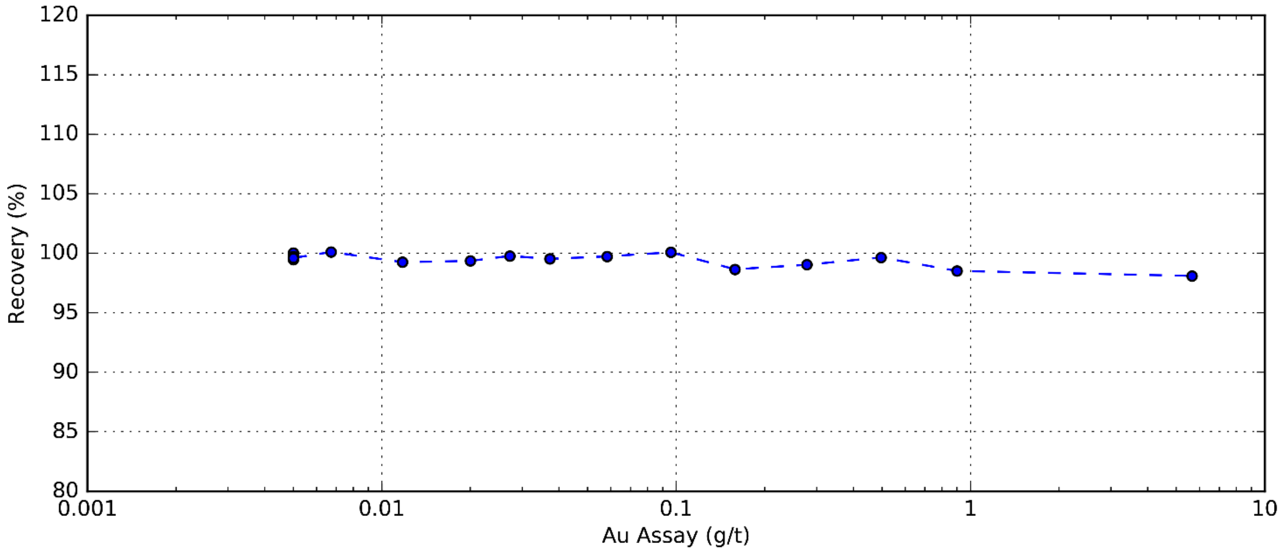


Figure 10.4: Conditional expectation plot of diamond drill hole recovery and gold grade

10.4 Twin Holes

Centamin has drilled a total of eight diamond drill holes that are within 15 m of an RC drill hole. In order to investigate whether the RC drill holes are fairly representing the mineralisation, H&SC plotted the downhole gold assays for each pair and compared summary statistics. In general the RC assays was found to match the DD reasonably well and differences are believed to be due to the nuggety nature of the gold mineralisation. Within the mineralised zones the average RC grade was found to be slightly higher (0.08g/t) than the average DD grade. Three out of the eight DD holes had higher grades than the twinned RC holes.

10.5 Wet RC Samples

RC drilling in wet conditions can sometimes cause problems with sample recovery and can lead to downhole smearing. H&SC plotted the downhole gold assay and recovery data along with an indicator to identify moist or wet intervals for each of the 216 RC drill holes that had over 10 m of intervals logged as moist or wet. Each plot was assessed with an eye to identifying differences between the wet and dry sampling. No obvious pattern or downhole smearing was observed.

10.6 Drill Hole Coverage

This report presents Mineral Resource estimates of the Doropo deposits and it is considered by the Qualified Person that a drill plan and representative examples of drill sections through each of the deposits are more informative than a tabulation of mineralised intercepts. A map showing all the drilling covering the entire Doropo Project can be seen in Figure 10.5. A map showing the drill hole collar locations covering the deposits estimated can be seen in Figure 10.6. Maps and sections of each of the eight estimated deposits can be seen in Figure 10.7 through to Figure 10.22. The section line for each cross-section can be seen as a red line in the inserted plan maps.

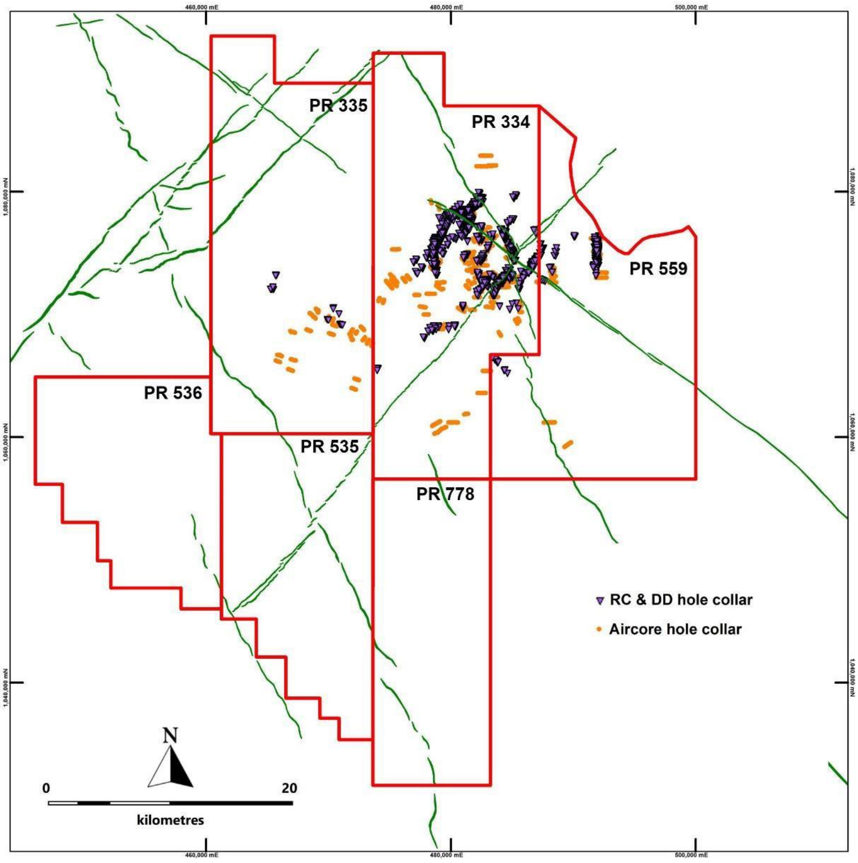


Figure 10.5: Map showing drill hole locations – Project scale

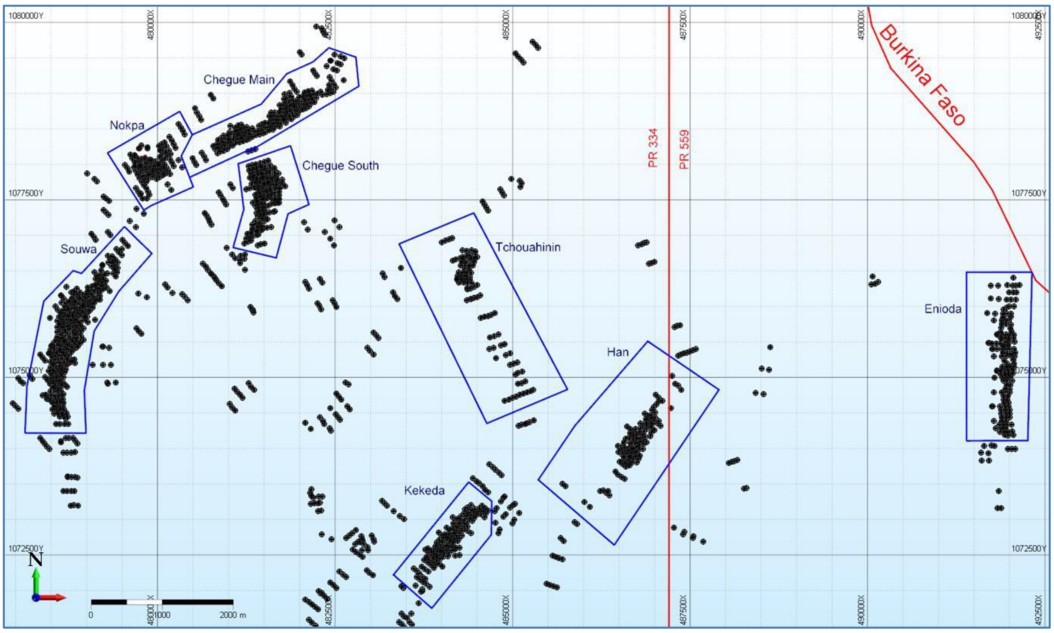


Figure 10.6: Map showing drill hole locations for estimated deposits

(Produced by H&SC, March 2019)

Souwa Map and Cross-Sections

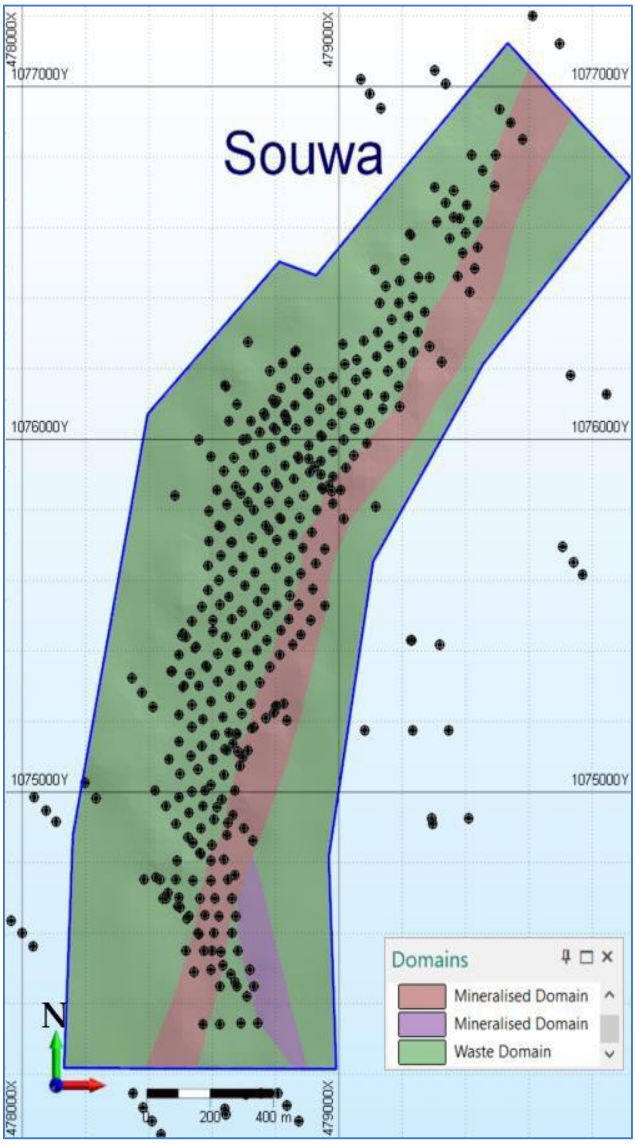


Figure 10.7: Map of the Souwa deposit (showing drill hole locations and mineralisation wireframes)

(Produced by H&SC, March 2019)

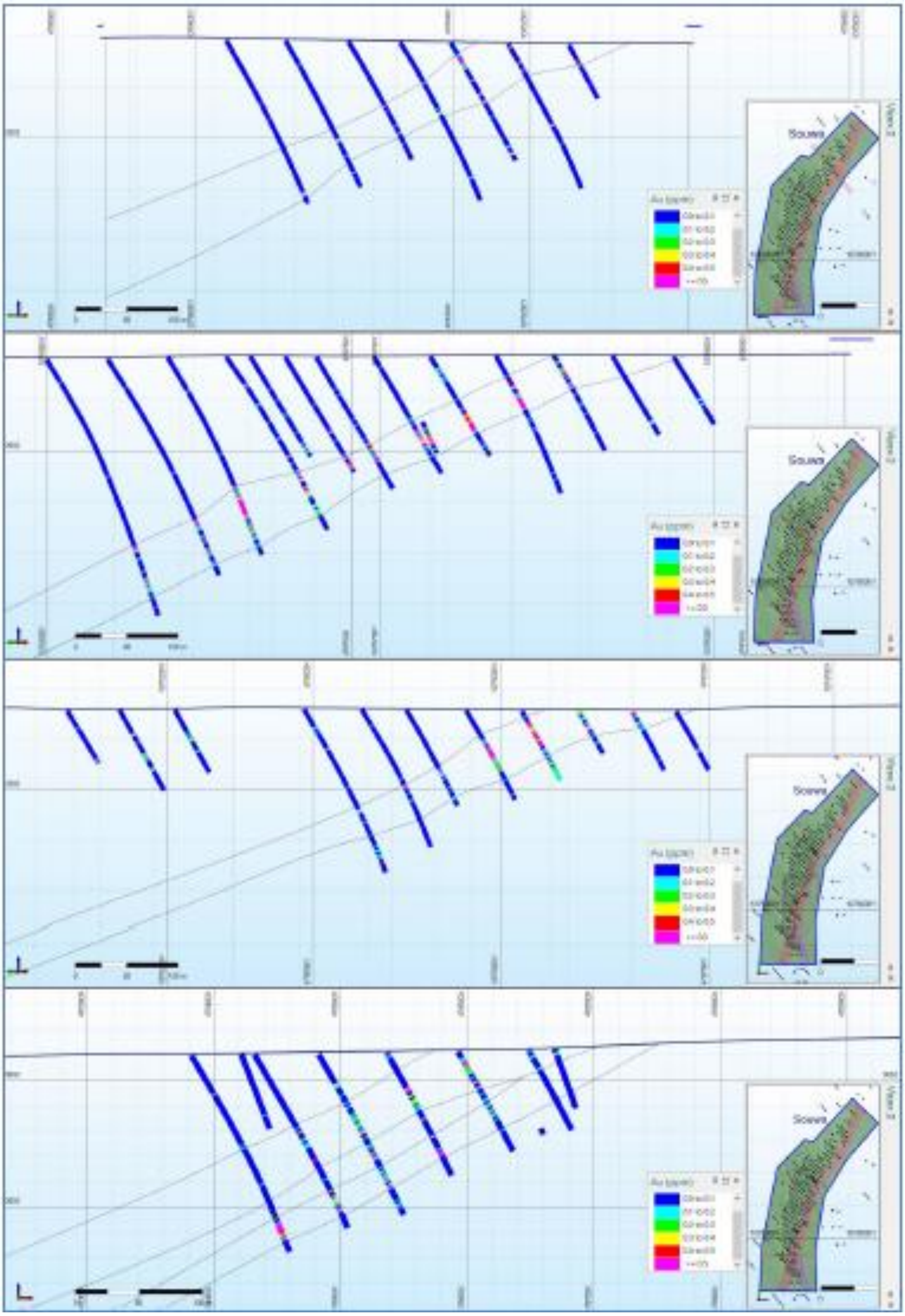


Figure 10.8: Cross-sections of the Souwa deposit (Showing gold drill hole assays and mineralisation wireframes) (Produced by H&SC, March 2019)

Nokpa Map and Cross-Sections

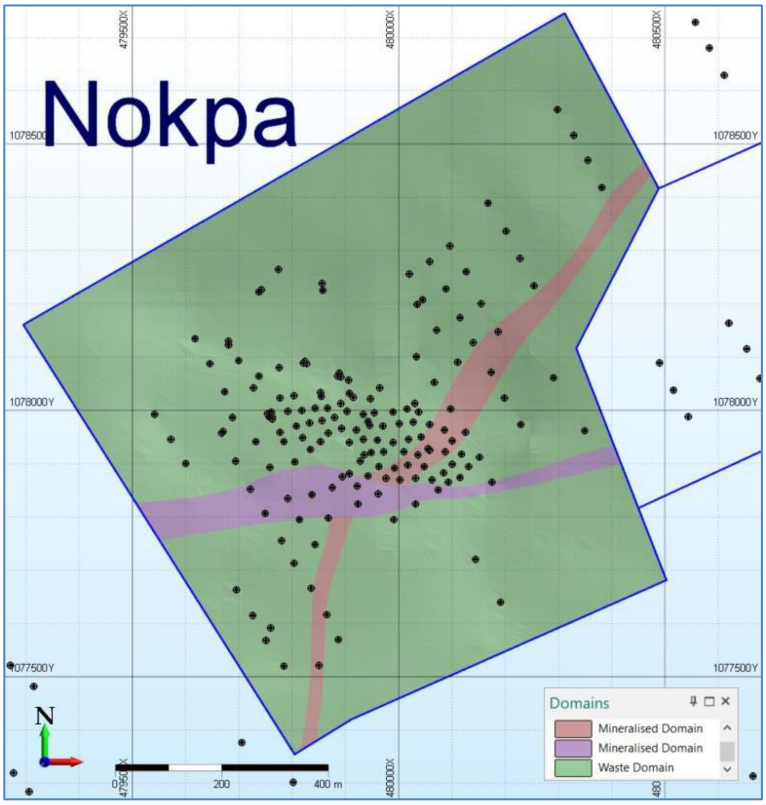


Figure 10.9: Map of the Nokpa deposit (showing drill hole locations and mineralisation wireframes) (Produced by H&SC, March 2019)

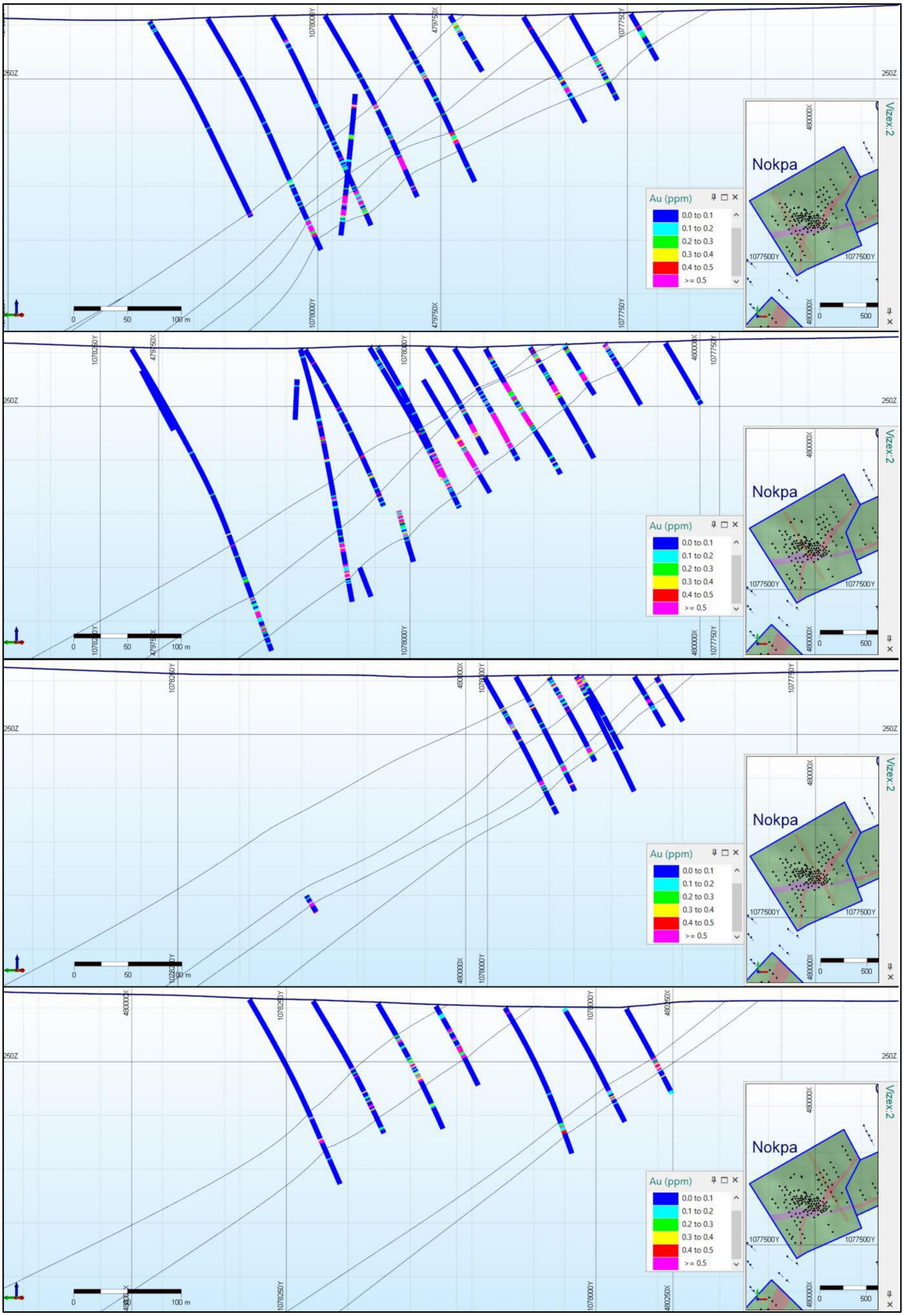


Figure 10.10: Cross-sections of the Nokpa deposit (Showing gold drill hole assays and mineralisation wireframes (Produced by H&SC, March 2019)

Chegue Main Map and Cross-Sections

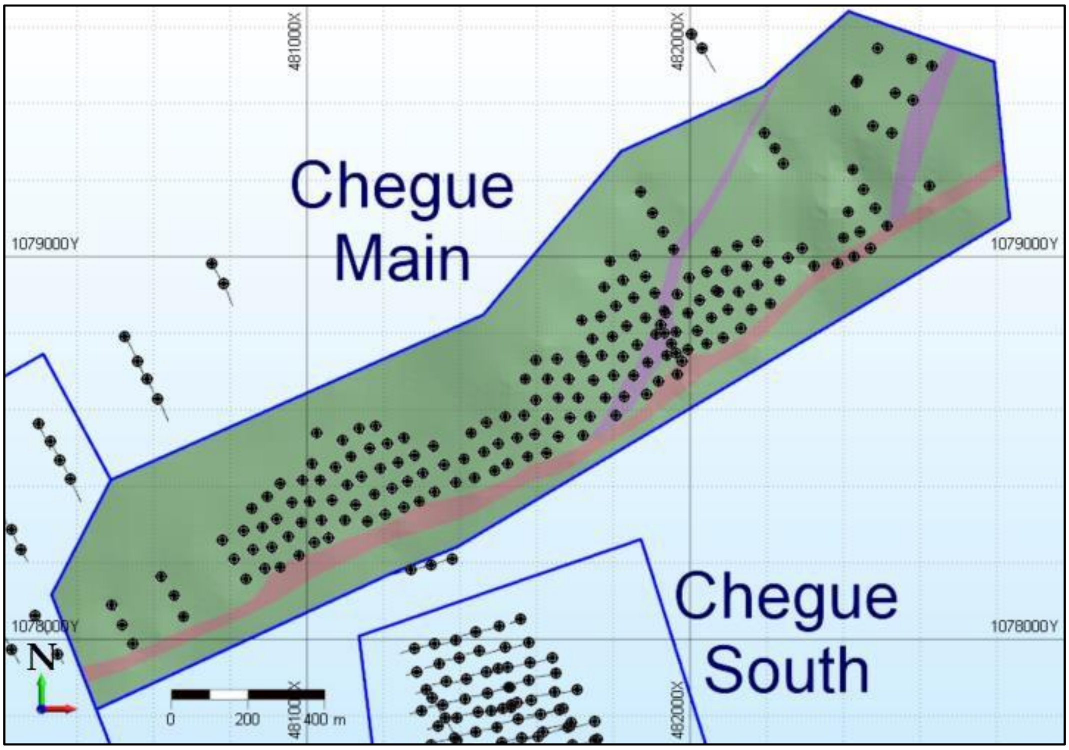


Figure 10.11: Map of the Chegue Main deposit (showing drill hole locations and mineralisation wireframes)

(Produced by H&SC, March 2019)

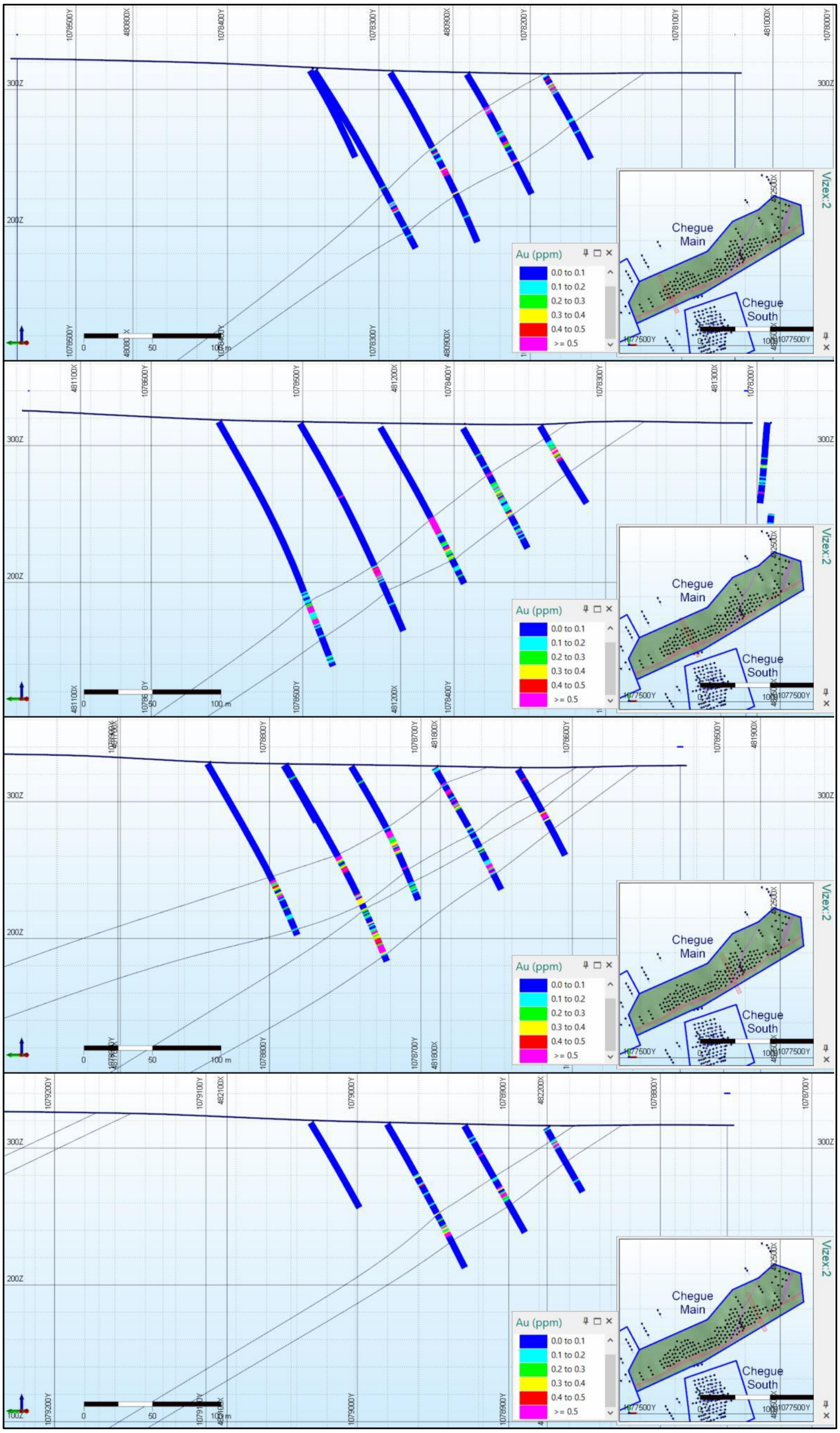


Figure 10.12: Cross-sections of the Chegue Main deposit (Showing gold drill hole assays and mineralisation wireframes) (Produced by H&SC, March 2019)

Chegue South Map and Cross-Sections

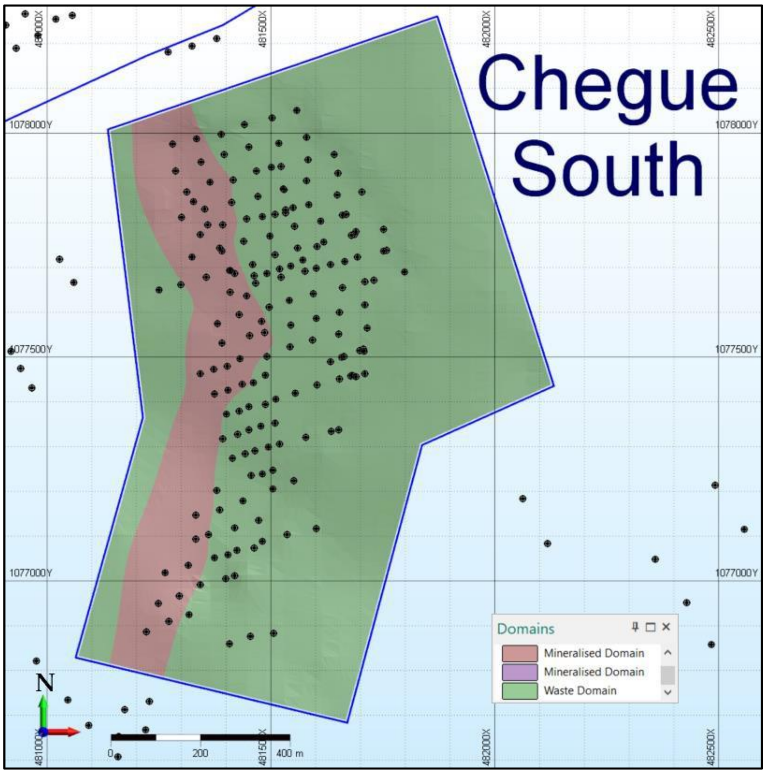


Figure 10.13: Map of the Chegue South deposit (showing drill hole locations and mineralisation wireframes)

(Produced by H&SC, March 2019)

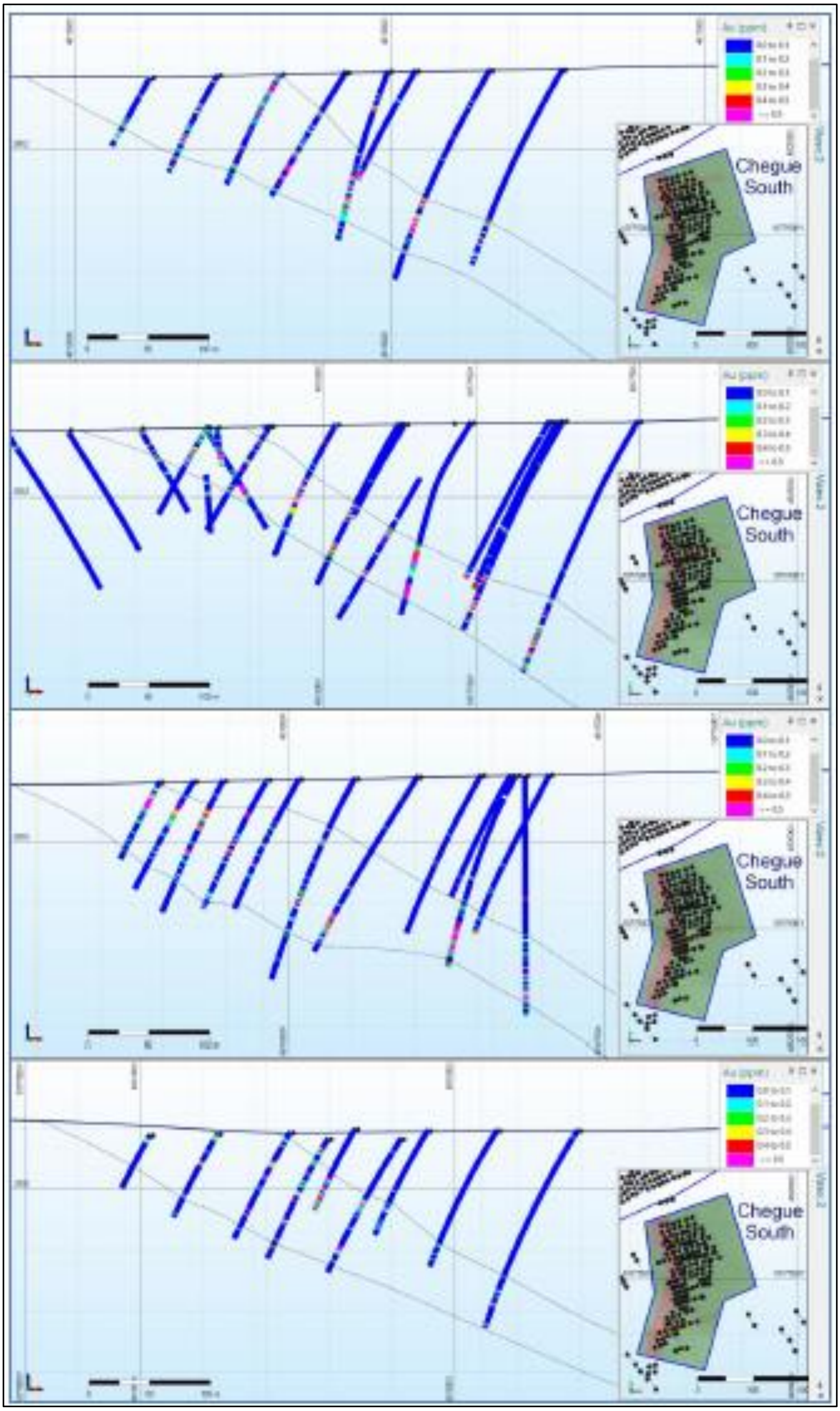


Figure 10.14: Cross-sections of the Chegue South deposit (Showing gold drill hole assays and mineralisation wireframes) (Produced by H&SC, March 2019)

Tchouahinin Map and Cross-Sections

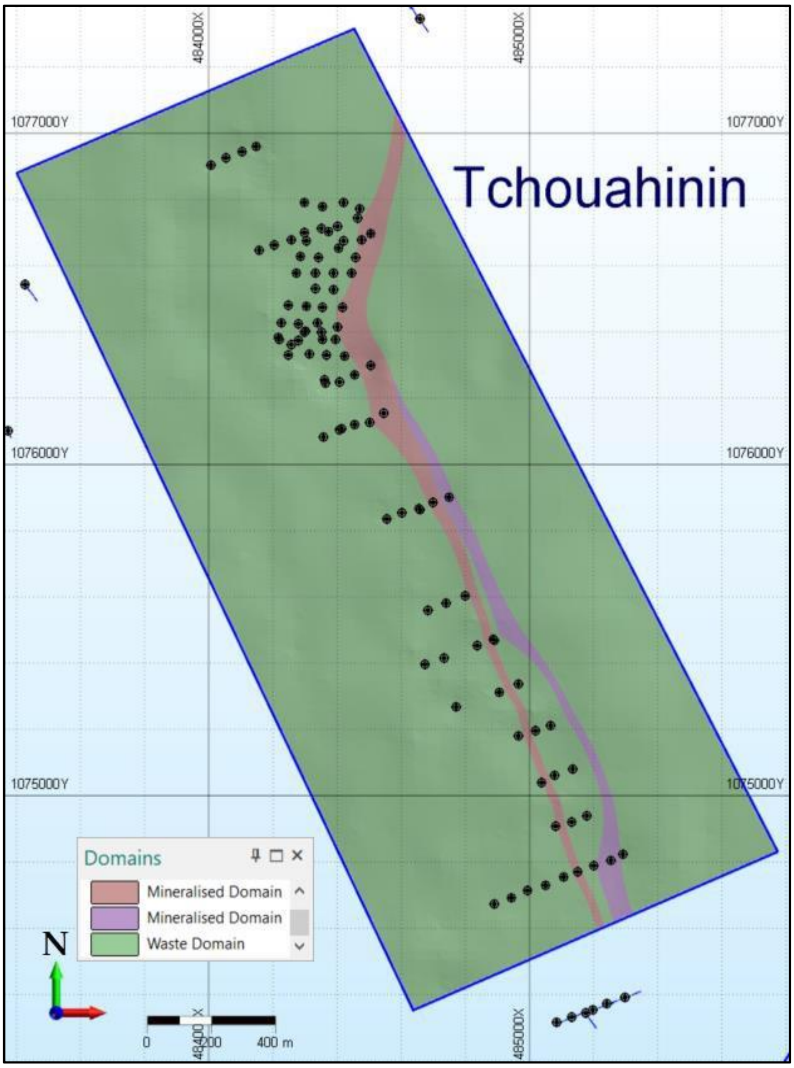


Figure 10.15: Map of the Tchouahinin deposit (showing drill hole locations and mineralisation wireframes)

(Produced by H&SC, March 2019)

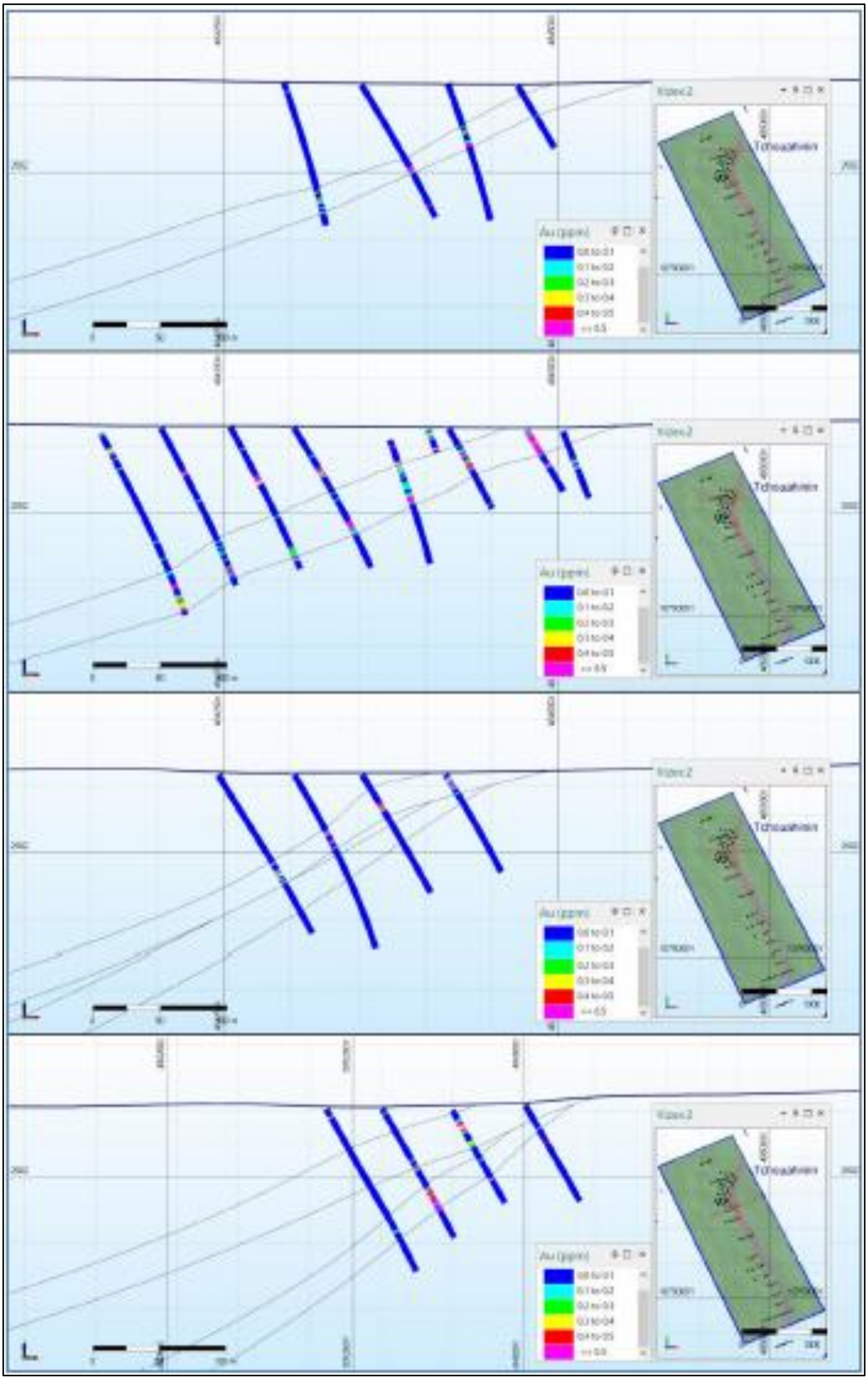


Figure 10.16: Cross-sections of the Tchouahinin deposit (Showing gold drill hole assays and mineralisation wireframes) (Produced by H&SC, March 2019)

Kekeda Map and Cross-Sections

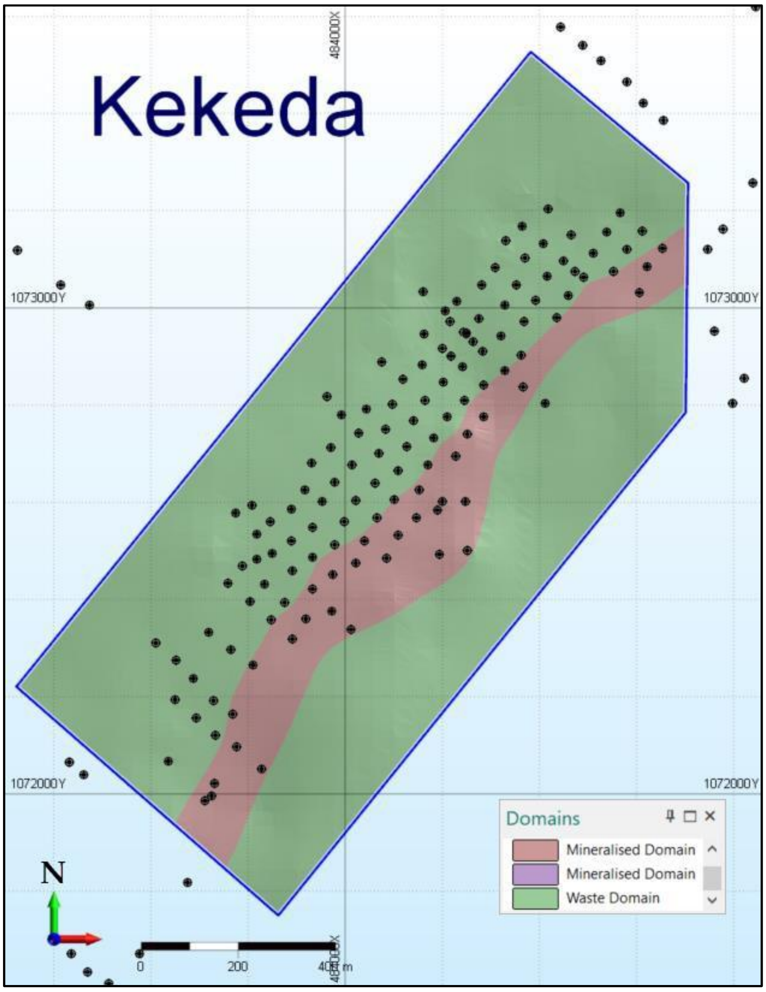


Figure 10.17: Map of the Kekeda deposit (showing drill hole locations and mineralisation wireframes)

(Produced by H&SC, March 2019)

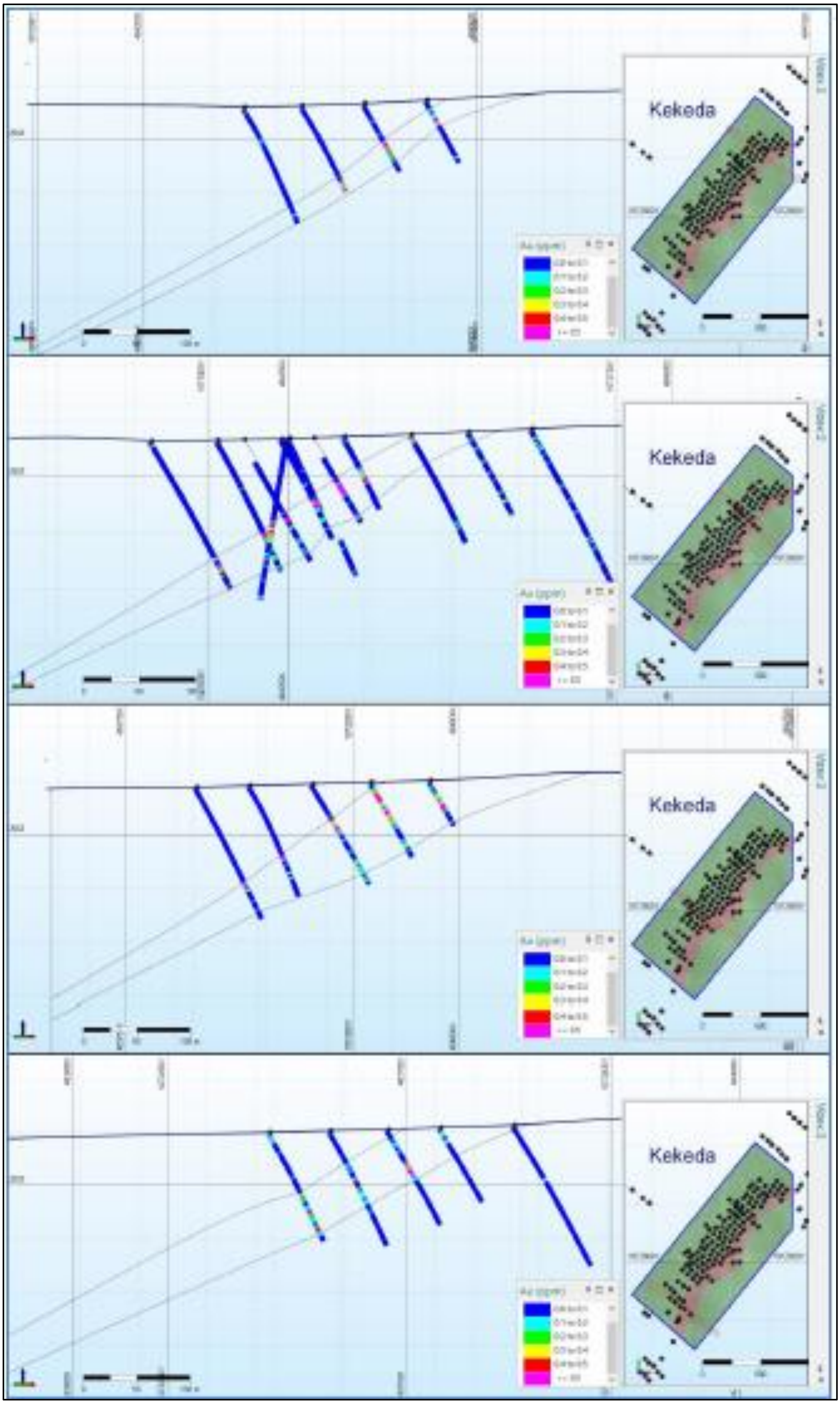


Figure 10.18: Cross-sections of the Kekeda deposit (Showing gold drill hole assays and mineralisation wireframes) (Produced by H&SC, March 2019**)**

Han Map and Cross-Sections

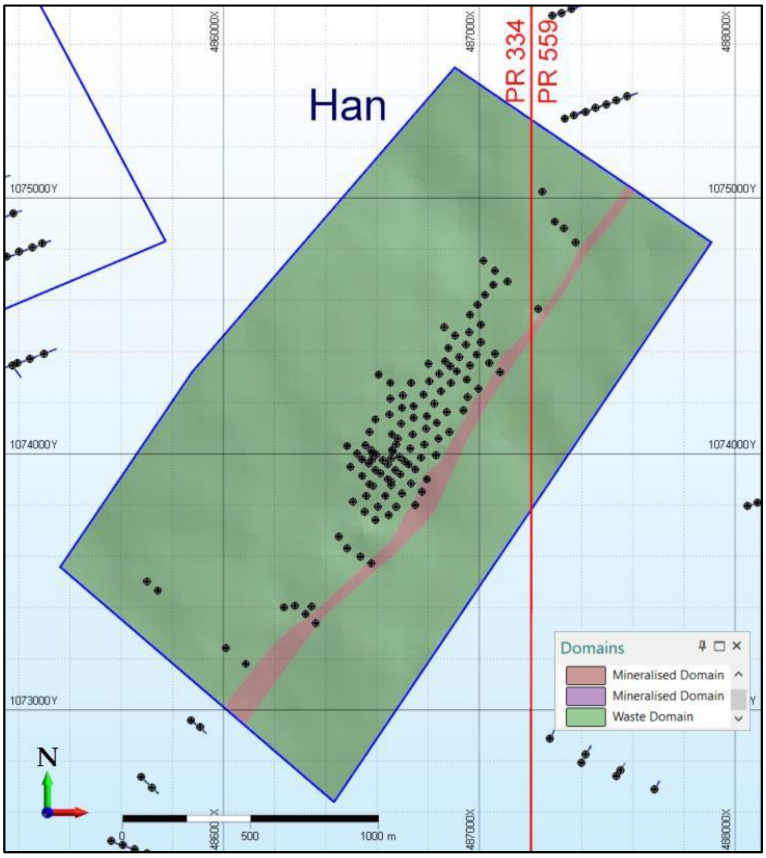


Figure 10.19: Map of the Han deposit (showing drill hole locations and mineralisation wireframes)

(Produced by H&SC, March 2019)

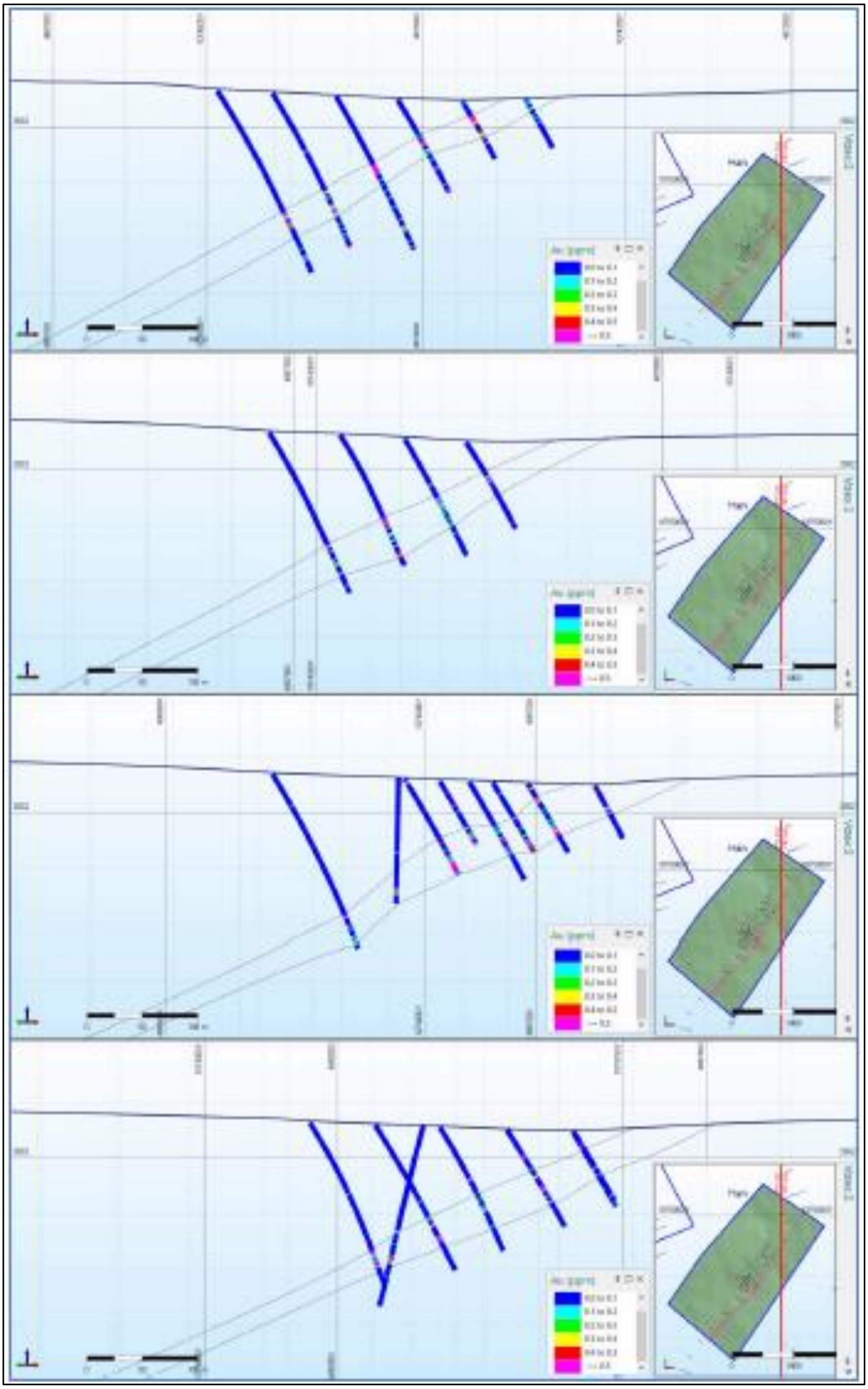


Figure 10.20: Cross-sections of the Han deposit (Showing gold drill hole assays and mineralisation wireframes) (Produced by H&SC, March 2019)

Enioda Map and Cross-Sections

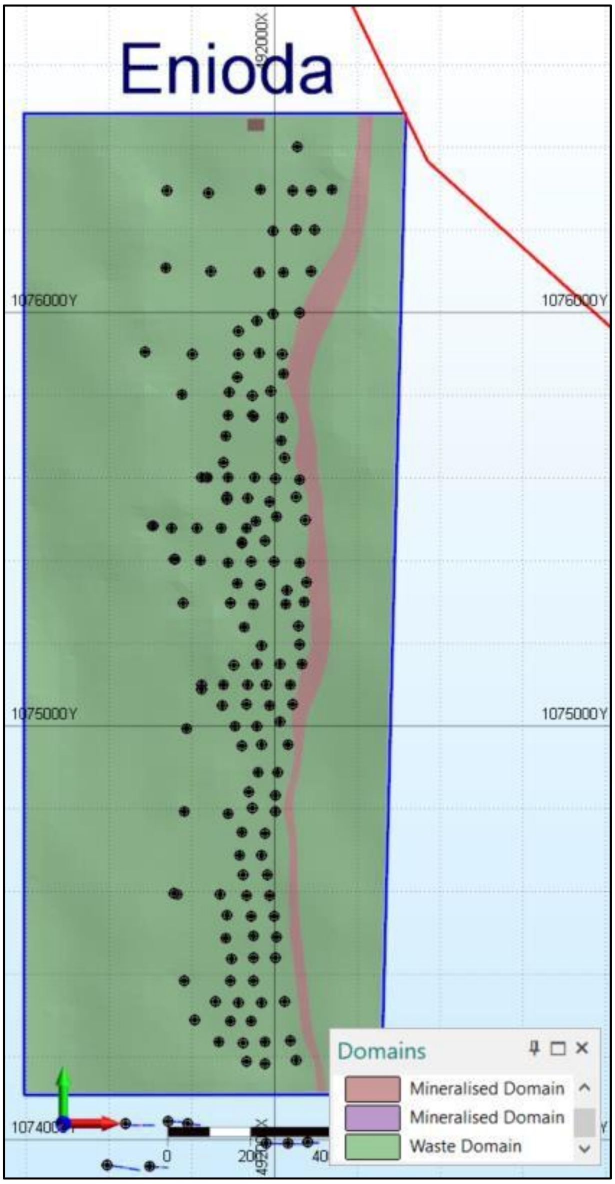


Figure 10.21: Map of the Enioda deposit (showing drill hole locations and mineralisation wireframes)

(Produced by H&SC, March 2019)

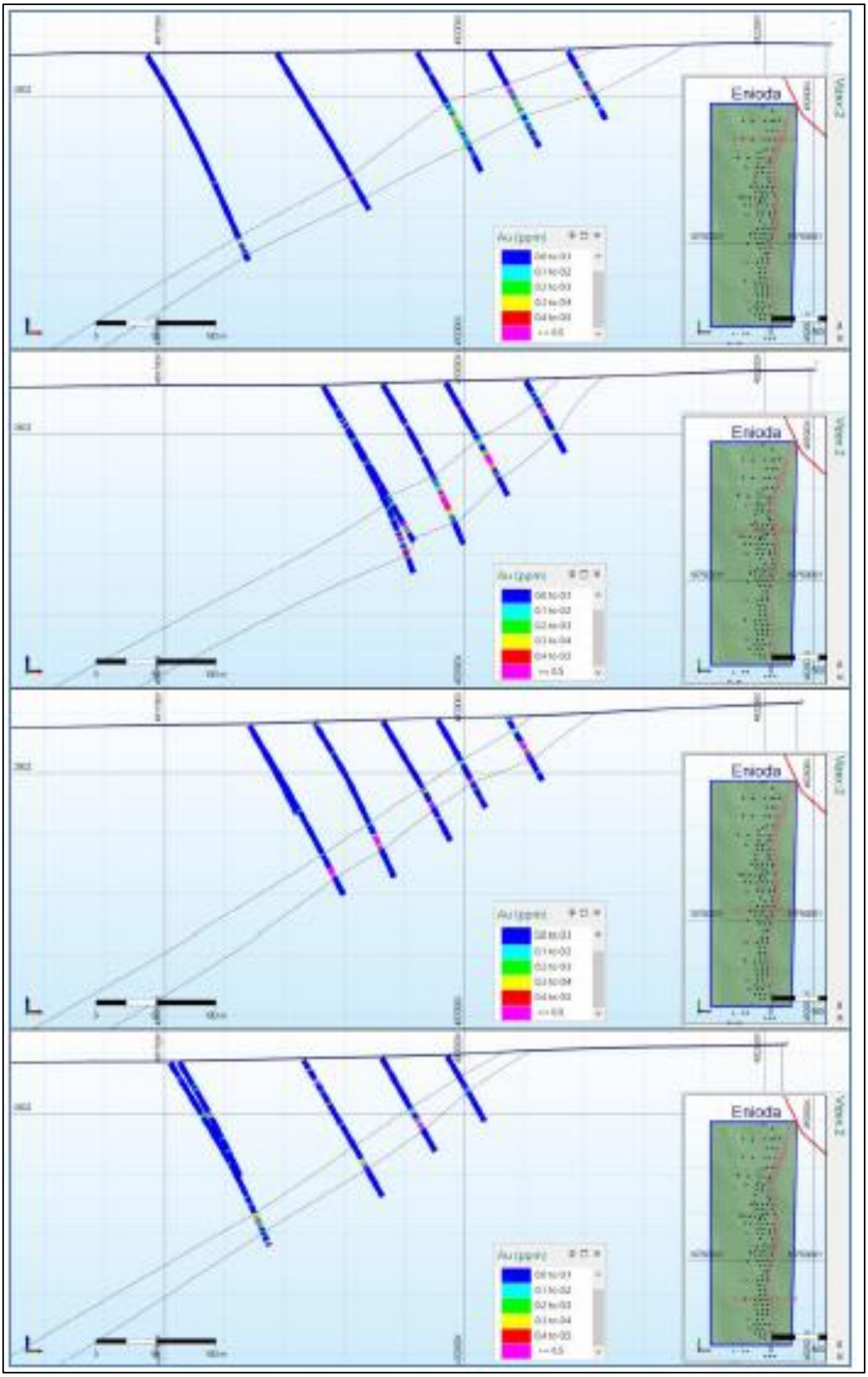


Figure 10.22: Cross-sections of the Enioda deposit (Showing gold drill hole assays and mineralisation wireframes) (Produced by H&SC, March 2019)

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

Bureau Veritas Minerals Laboratory (BVML) in Abidjan, Côte d'Ivoire, was the only analytical laboratory used for gold fire assaying on the Doropo project. The BVML head office is in Paris, France, and is independent of Centamin.

BVML Abidjan, Côte d'Ivoire, is in the process of ISO17025 accreditation (general requirements for the competence of testing and calibration laboratories). Currently the laboratory uses the same protocols and procedures as the accredited parent labs in Vancouver, Canada and Australia. BVML also falls under the Bureau Veritas group's certificates listed below:

- ISO9001 certificate
- ISO14001 certificate
- IFIA certificate
- OHSAS 18001 Certificate

11.1 Reverse Circulation Sampling Methods

During the RC drilling, samples are collected from the cyclone attached to the drill rig at 1 m intervals in large plastic bags. Each individual sample is weighed and then run through multi-stage riffle splitter until the sample is reduced to approximately 5 kg in weight. The sample is then passed through a single stage 50/50 splitter so that the final sample weighs between 2 and 3 kg which goes to the laboratory. Small plastic bags are used to bag the samples. A sample number is written on the outside of the bag with black marker and a stub from a sample ticket stapled to the top of the bag. Field duplicate samples are taken as another split of the original RC sample that followed the same sampling methodology as the primary sample. The final stubs of the sample tickets are stored at the site office. The sample bags that go to the laboratory are weighed and stored in polywoven bags containing 10 to 15 samples each. At the end of every day, Centamin personnel transport these samples back to the processing area. The batch of samples are collected by a Laboratory truck from the exploration camp once a week.

Quality Assurance and Quality Control (QAQC) samples are inserted on a regular pattern of one QAQC sample every 10th sample. As a general rule, QAQC samples follow the pattern: one blank sample, one Certified Reference Material (CRM) sample, and then one field duplicate sample. However, the geologist at site may decide to change or adapt this succession depending on the mineralisation intersected, for example by adding additional blank samples in close proximity to a possible high grade gold sample or adjusting the CRM used to the type of rocks intersected. In addition to this, a selected field duplicate from an interval assumed to be of a good gold grade from the hole is inserted at the end of the hole. Blanks and standards are inserted once the samples have been returned to the processing area to increase efficiency and reduce error.

The sample reject from the riffle splitter is returned to the original plastic bag and marked with the hole number and the downhole metre range of the sample. These samples are held in reserve for around four to six months at the drill site in case further resampling is required.

11.2 Diamond Core Sampling Methods

Core is oriented and placed in plastic core trays at the drill site. Rock Quality Designation (RQD) and core recovery are measured at the rig and core trays returned by Centamin personnel to the processing facility.

Once logged, the core is placed in a cradle and cut with a core saw. The cut is made to the left of the orientation line and both halves returned to the core tray. The right side of the core is then sampled and put in a calico bag. Sample intervals are at the discretion of the logging geologist but are regularly at 1 m intervals. The sample number is written on the outside of the bag and a sample ticket sub placed in the bag with the sample. The core trays with the remaining half-core are then moved to the core storage area.

QAQC procedures consisted of the insertion of either a CRM, a blank sample or a non-certified spike (previous RC samples with grade) every 10th sample. No sample duplicates of core have been taken.

11.3 Chain of Custody and Transport

All RC samples and core trays are transported by Centamin personnel between the drill sites and the sample processing facility. The processing area consists of an open logging area for core trays and a covered sample handing area for the staging of the RC and DD samples for transport. The sample processing area is adjacent to the main office and in the main compound. The compound is completely fenced and under 24 hour guard.

The core is laid out, logged and sampled by Centamin personnel. After RC and core samples are prepared, they are placed in sealed rice sacks in groups of 10 – 15 samples per sack.

Samples are transported to Abidjan by a BVML truck directly to the lab facility. A sample submission form accompanies each shipment of samples. An email copy of the submission form is also sent to the laboratory. No formal receipt of samples is received from BVML when they take custody of the samples.

All pulp rejects are returned by BVML transport to the site office and stored in locked shipping containers.

11.4 Sample Preparation and Analysis

After samples are received at BVML, they are sorted and weighed. RC and DD samples both followed the same preparation path.

11.5 Sample Preparation by laboratory:

Samples are dried for 12 hours at 105°C after which they are crushed in a jaw crusher until 70 percent passes 2 mm. The sample is then passed through a riffle splitter until approximately 1 kg in weight and pulverized using an LM2 until 85 percent passes 75 microns. A 250 g sample of the pulp is then placed in a pulp packet in preparation for final analyses.

11.6 Samples Analyses at Laboratory:

A standard fire assay for gold (FA450) was performed by BVML. A 50 g sub-sample is taken from the pulverised material, mixed with flux and then fired. The resultant lead button is then transformed to a prill using cupellation. The prill is then dissolved in Aqua Regia solution and the resultant liquor read by AAS with a detection limit of 0.01 g/t Au. This is considered to be a total assaying technique.

Internal laboratory QAQC analyses consists of:

- a size analysis 2mm after crushing for one in every 30 samples
- coarse duplicate was taken at 1 in 50 samples
- size analysis 75 microns after pulverising 1 in every 20 samples
- pulp repeat approximately one in 25 samples

H&SC considers the sample preparation, security, and analytical procedures to be at least industry standard and is adequate to for the style of mineralisation of the Doropo deposits.

11.7 Quality Assurance and Quality Control sampling

Centamin has adopted a reasonably stringent QAQC program with the use of Certified Reference Materials (CRMs), blanks, RC field duplicates and 'spike' samples. Centamin routinely monitors QAQC sample results when assay results are returned from the laboratory. Any concerns or questions are immediately raised with the laboratory.

Centamin has not conducted any inter-laboratory cross-checks to verify the results from BVML. H&SC recommends that at least 200 samples from within the mineralised zones are reassayed in a second independent, internationally accredited laboratory.

Quality control procedures employed by Centamin include industry standard drill core and RC sample processing techniques discussed in Section 10.

For RC drill holes either a CRM, a blank sample or a field duplicate are inserted every 10th drill hole sample. For diamond drill core either a CRM, a blank or a spike sample are inserted every 10th drill hole sample.

Drilling at the Doropo project includes prospects that are outside the areas assessed by the current resource estimates. The QAQC sampling discussed in the following sections is limited to the deposits that form the reported mineral resources.

Certified Reference Materials

Centamin routinely inserts a CRM nominally every 30 drill hole samples. A total of 20 different CRMs, ranging in grade from 0.047 to 9.25 g/t have been used to verify the BVML gold assays. Seventeen of the 20 CRMs are sourced from Ore Research & Exploration Pty Ltd and the remaining three CRMs were produced by Geostats Pty Ltd. Both of these providers are considered to produce high quality CRMs that are suitable for use on the Doropo project. The number of CRM samples submitted for each of the deposits estimated are shown in Table 11.1.

Table 11.1: Number of CRM samples from each estimated deposit

Deposit	Count
Souwa	1,625
Nokpa	849
All Chegue	1,435
Tchouahinin	364
Kekeda	569
Han	517
Enioda	593
Total	5,952

Centamin compares the expected and assayed CRM values at the time that the assays are imported into the database. Centamin has reported to H&SC that a batch will fail if any one of the following criteria are met.

- One CRM +/- 3 standard deviations from expected
- Two CRM assays in a row outside 2 standard deviations on the same side from expected

- Three CRM assays in a row +/- 2 standard deviations from expected

The batches identified by the above rules are investigated thoroughly by reviewing photos of the standards and reviewing sample tickets to identify CRM mix-ups, and transcription or sampling errors. If no obvious errors can be found, then 5 samples above and below the “failing” standard are requested for reassay by the laboratory. If the results of the reassay are not significantly different from the originals, the originals are kept and the reassay results rejected, along with the original failing standards.

H&SC is informed that only two batches were identified as problematic. In total fifteen drill core samples had their original assays rejected in favour of the reassay values. Thirteen of these were for gold grades less than 0.1 g/t and two were of higher grade 0.21 and 1.05 g/t

Figure 11-1 shows a Shewart control chart of all 5,952 CRM assays from the deposits that were estimated. The y axis shows the relative difference from the expected CRM value. Relative difference values over 100% indicate that the assay value is higher than the expected value. The x axis in this graph is ordered by the expected CRM value and then the assay date as this is believed to produce a more readable graph. The vast majority of CRM assays performed well within acceptable limits. The most notable exceptions are discussed below.

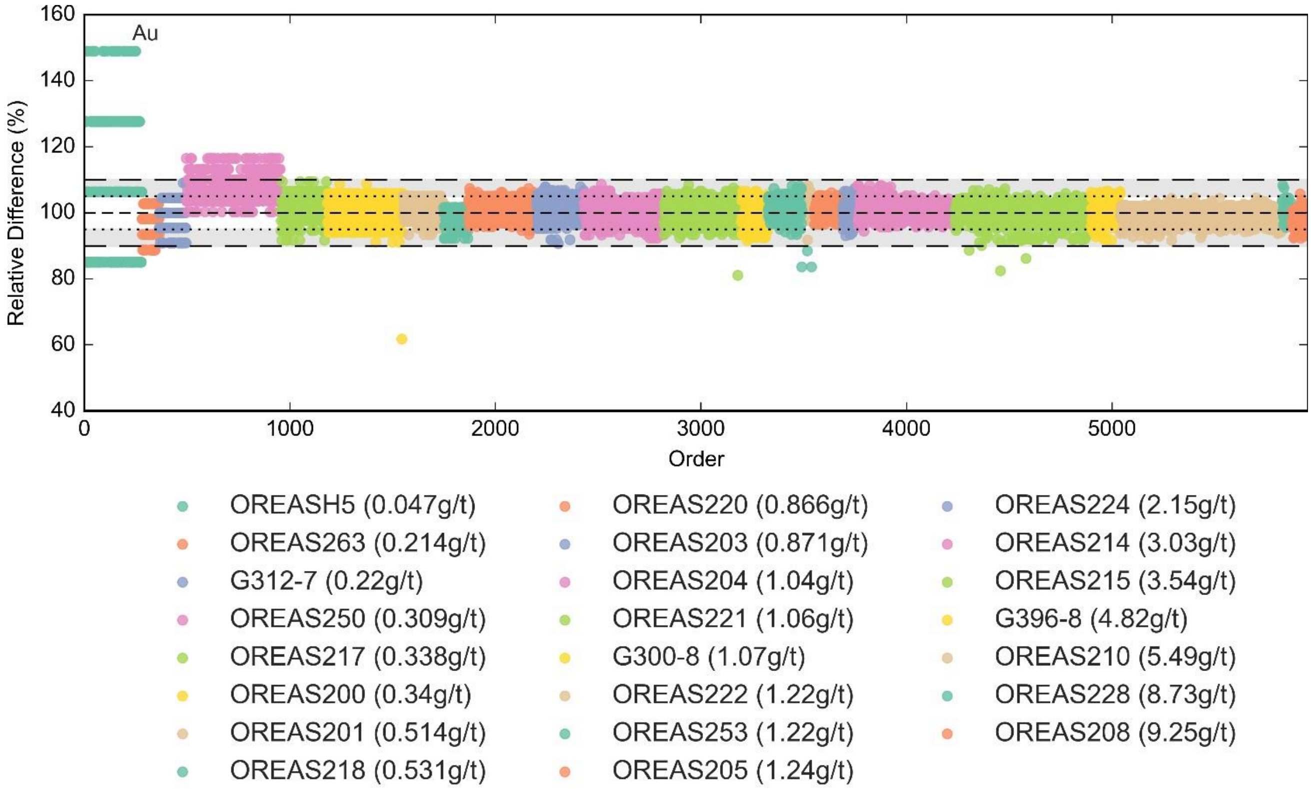


Figure 11.1: All CRM assays from estimated deposits

Table 11.2 shows a summary of the all of the CRM assays from the estimated deposits. It can be seen that the bias for all the CRMs except two (OREASH5 and OREAS250) is within tolerable limits.

Table 11.2: Summary of Certified Reference Material samples

		Au Expected (g/t)	Au Mean (g/t)	Bias	Au Minimum (g/t)	Au Maximum (g/t)
OREASH5	279	0.047	0.052	8.3	0.04	0.07
OREAS263	84	0.21	0.21	-3.0	0.19	0.22
G312-7	131	0.22	0.21	-2.8	0.2	0.24
OREAS250	460	0.31	0.33	7.7	0.31	0.36
OREAS217	227	0.34	0.34	0.9	0.31	0.37
OREAS200	368	0.34	0.34	-0.1	0.21	0.37
OREAS201	197	0.51	0.52	1.2	0.48	0.54
OREAS218	121	0.53	0.52	-1.8	0.49	0.54
OREAS220	331	0.87	0.87	0.4	0.81	0.93
OREAS203	231	0.87	0.88	0.6	0.79	0.94
OREAS204	389	1.04	1.04	-0.1	0.96	1.13
OREAS221	377	1.06	1.07	0.6	0.86	1.15
G300-8	129	1.07	1.06	-1.5	0.98	1.14
OREAS222	58	1.22	1.24	1.7	1.12	1.32
OREAS253	168	1.22	1.23	1.0	1.02	1.32
OREAS205	138	1.24	1.25	0.8	1.2	1.32
OREAS224	73	2.15	2.14	-0.4	2	2.31
OREAS214	473	3.03	3.04	0.5	2.86	3.28
OREAS215	661	3.54	3.53	-0.4	2.92	3.8
G396-8	143	4.82	4.87	1.0	4.42	5.14
OREAS210	789	5.49	5.46	-0.7	5.03	5.74
OREAS228	47	8.73	8.80	0.8	8.35	9.46
OREAS208	78	9.25	9.09	-1.7	8.54	9.78

H&SC created a Shewart control chart for each of the CRMs in order to compare the assayed values to the expected values. Presentation of each of the 23 charts is beyond the scope of this report although a select few have been chosen to represent CRMs across a range of grades and to highlight issues.

The lowest grade CRM, named OREASH5 and shown in Figure 11.2, performed reasonably badly and indicates a significant bias. Although this artefact is worrying, H&SC considers the variation acceptable bearing in mind that the expected value is within an order of magnitude of the assay method detection limit.

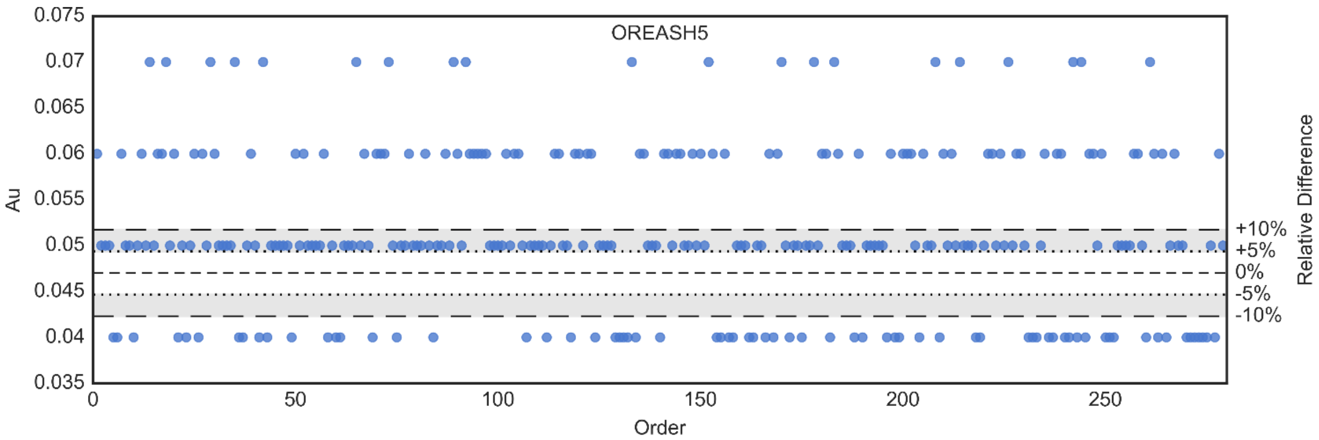


Figure 11.2: Shewart control chart of OREASH5 (0.047 g/t)

Figure 11.3 shows the Shewart control chart for OREAS250. This CRM has an expected value of 0.309 g/t but the assayed values show a significant positive bias. H&SC investigated this issue further and found that the CRM OREAS200, shown in Figure 11-4, was submitted over the same period. OREAS200 has an expected grade of 0.34 g/t. H&SC believe that the majority of the CRMs recorded in the database as being OREAS250 were actually OREAS200.

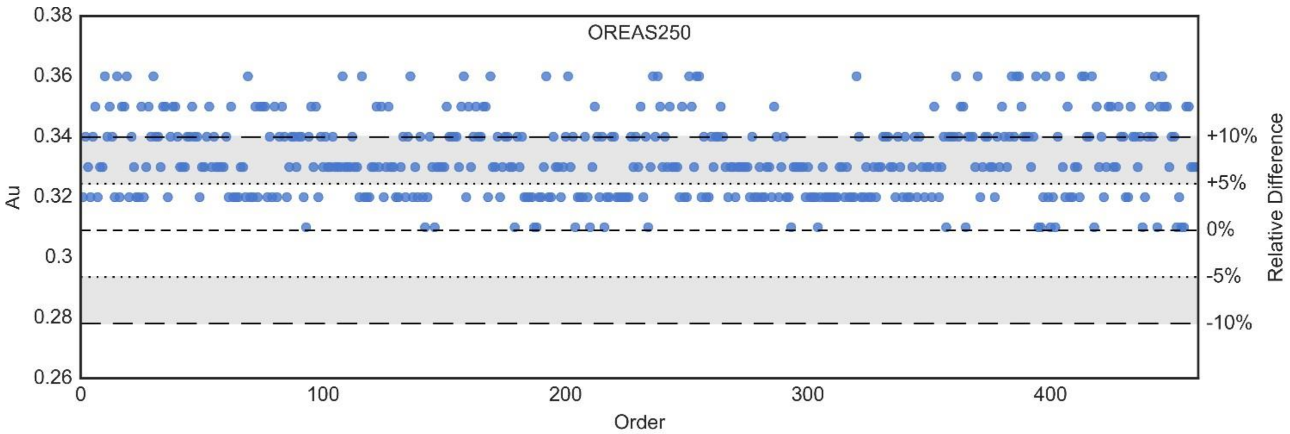


Figure 11.3: Shewart control chart of OREAS250 (0.309 g/t)

Figure 11.4 shows the assay results for OREAS204, which has an expected grade of 1.04 g/t. This plot is shown as it is moderately high grade and shows typically good performance.

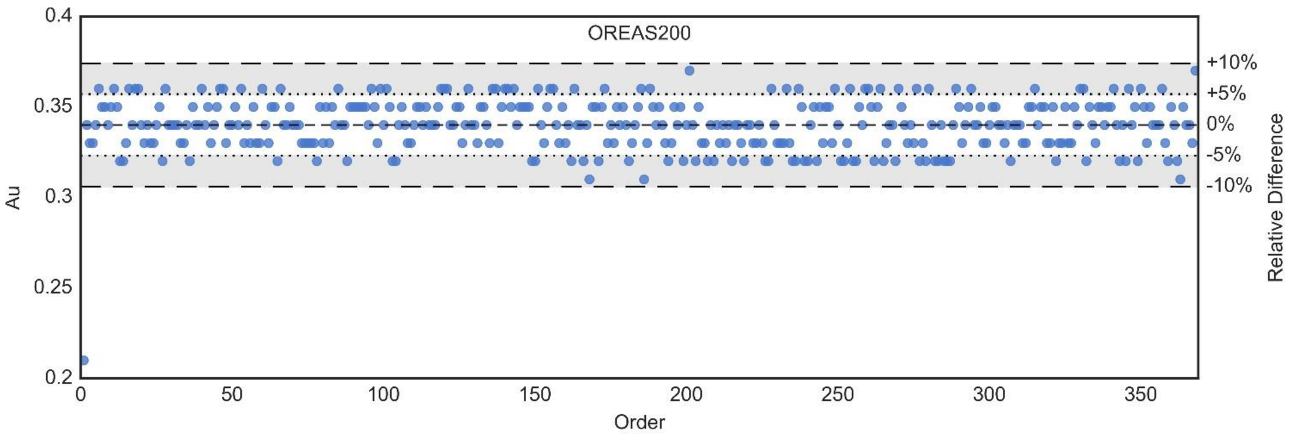


Figure 11.4: Shewart control chart of OREAS200 (0.340 g/t)

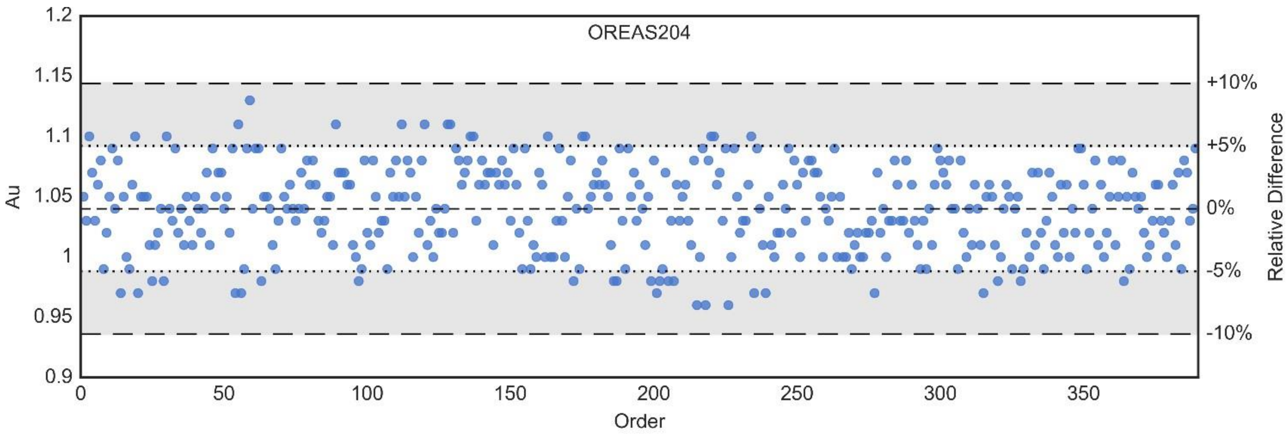


Figure 11.5: Shewart control chart of OREAS204 (1.04 g/t)

Figure 11.6 shows the control chart for OREAS215, which has an expected value of 3.54 g/t. In general the results from this CRM are within acceptable limits although there is clearly a period where this CRM was consistently underreporting. The results of these samples were received between 29 March and 22 September 2017. Centamin investigated this issue at the beginning of 2018 and found that the CRM OREAS214, with a grade of 3.03 g/t gold, had been submitted instead of the intended OREAS215. Following this investigation the sample procedure was modified to limit future mix-ups. Now, all QAQC standard samples are photographed with the sample ticket and respectively labelled sample bag. These photos are then archived on the file system so that they can be used in verifying any new anomalous standard results. A decision was also made that OREAS 214 would not be used at the same project that was currently using OREAS 215 (Keleman, 2019).

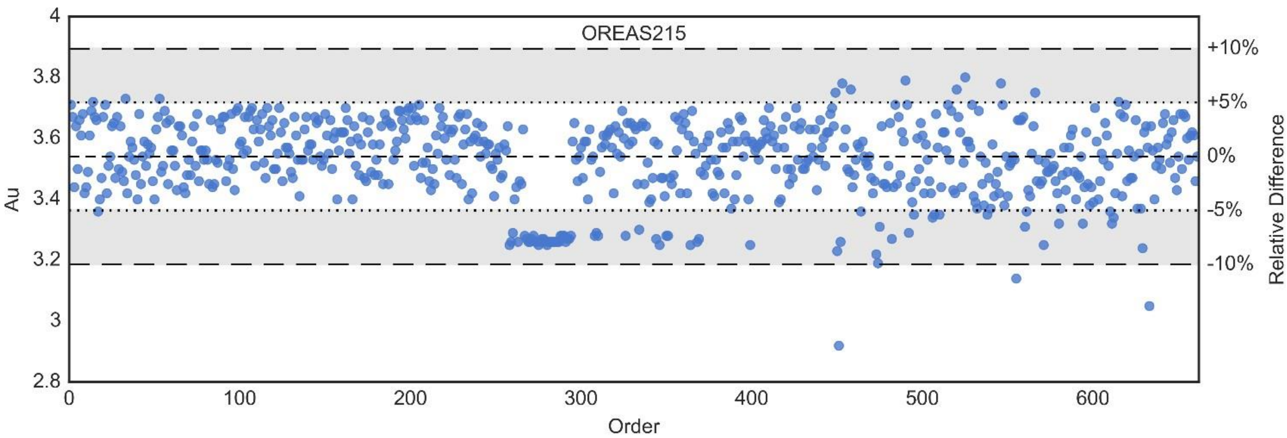


Figure 11.6: Shewart control chart of OREAS215 (3.54 g/t)

Figure 11.7 shows the assay results for OREAS210, which has an expected grade of 5.49 g/t. This plot is shown as it is high grade.

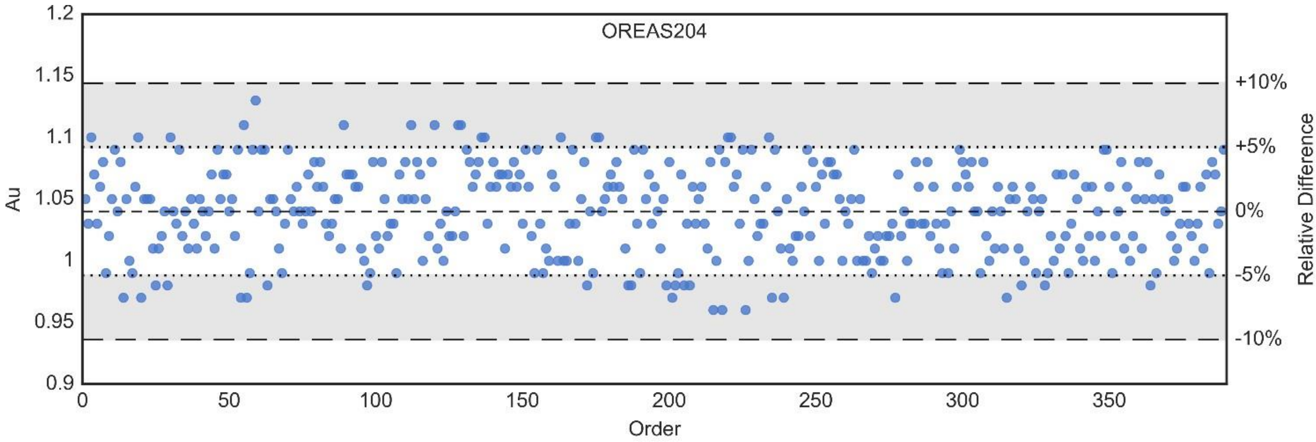


Figure 11.7: Shewart control chart of OREAS204 (5.49 g/t)

In conclusion the CRM assaying indicates that the BVML analysis is within acceptable levels of precision and accuracy. Furthermore, the constant monitoring of CRM results by Centamin and proactive response to unexpected results provide confidence in the way the QAQC sampling process is conducted.

RC Field Duplicates

Centamin routinely inserts an RC field duplicate every 30 RC samples. Field duplicates are used to check the sub-sampling technique is not biasing results and to give an indication of the representivity of the sub-sample.

Field duplicate samples are taken as another split of the original RC sample that followed the same sampling methodology as the primary sample. H&SC produced Percentage Half Difference (PHD) plots and summary statistics of field duplicates from each of the deposits. PHD=(x+y)/(x-y), where x is the original value and y is the duplicate.

No noticeable difference was found between the different deposits so they are summarised together here. Figure 11.8 shows a PHD plot of all the RC field duplicates from the areas estimated. It can be seen that a large scatter is apparent, indicating that the repeatability of gold duplicate grades is reasonably poor. Table 11.3 shows a summary of the RC duplicate pair statistics. No significant bias is evident for any of the RC field duplicates.

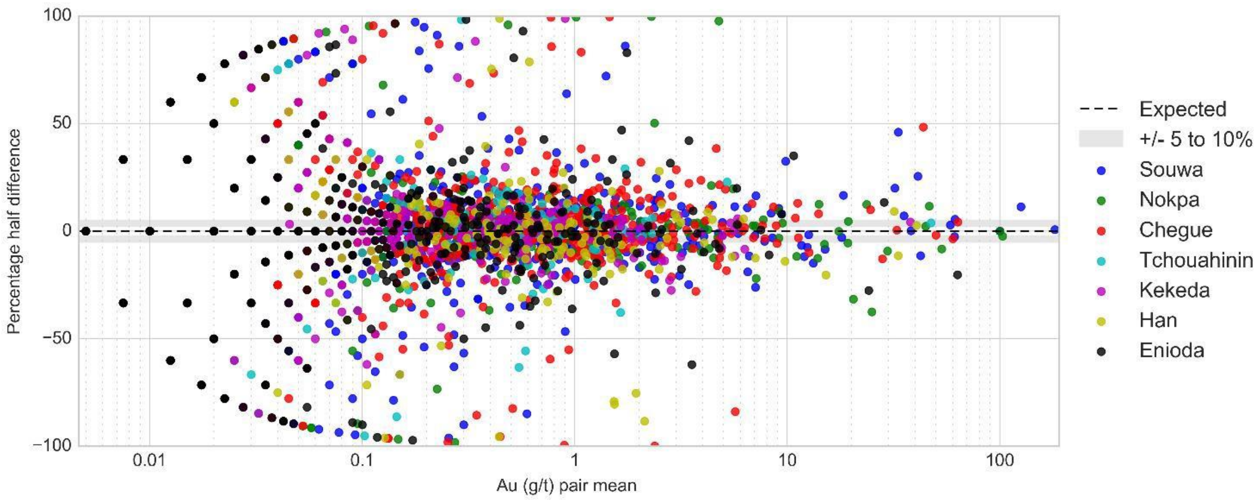


Figure 11.8: Percentage half difference plot of RC field duplicates

Table 11.3: RC field duplicate summary statistics

Statistics	Original	Duplicate	Differences
Minimum	0.005	0.005	0
Maximum	182.4	179.9	2.5
Mean	0.57	0.56	0.01

Blanks

Centamin routinely inserts a blank sample for every 30 samples from drill holes. Blanks are used to check for contamination within the laboratory sample preparation procedure. Centamin uses blanks produced from RC intervals that have been assayed and shown to be barren and a long way from mineralised intervals. In total, Centamin has submitted 7,289 blank samples, which are shown in Figure 11.9. Two assays, with gold grades of 0.24 and 0.96 g/t are omitted from this graph. The vast majority of blank samples returned assays at, or just above, the assay detection limit of 0.01 g/t gold. All but three of the 7,289 blank assays returned values that are significantly below 0.1 g/t gold, which is ten times the detection limit. H&SC considers that the blank samples indicate that contamination between samples is not significant.

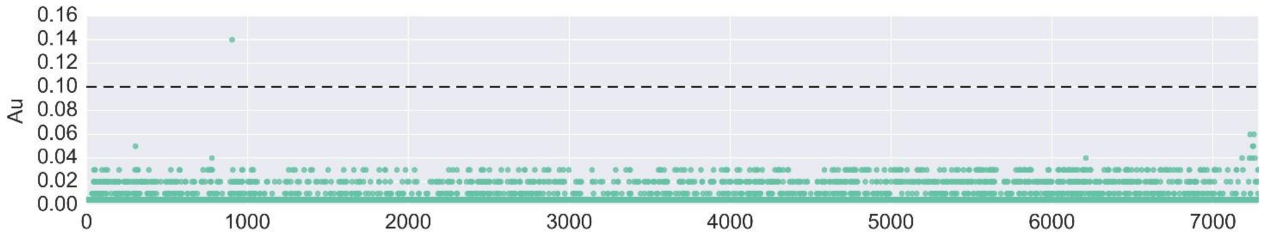


Figure 11.9: Blank samples

12 DATA VERIFICATION

H&SC conducted several checks in order to verify the data veracity and data quality in 2018 and 2019. The steps taken are summarised below. H&SC considered that sufficient verification of the data that underpin the resource estimates that were carried out up to 2019.

H&SC was of the opinion that the quality of the data up to 2019 at least met industry standard and was suitable to form the basis of the resource estimates at the time of their NI 43-101 submission in 2019.

12.1 Data Verification by Centamin

The exploration database has been maintained on site in acQuire since the beginning of the project. Field data is collected on paper and transcribed to excel spreadsheets by field geologists and a dedicated data entry person. Spreadsheets are then imported to acquire by a dedicated database manager.

Data is internally validated by acquire as it is entered and ensures:

- Collar, survey, assay and geology end of hole depths are compatible
- No overlapping intervals are allowed
- No repeat sample identification numbers can occur within the database
- Laboratory assays are loaded to the correct sample identification number
- All analytical results are stored in the database as reported by the laboratory. Assay values below detection are converted to half detection limit for reporting and modelling purposes
- All logged codes adhere to the accepted libraries.

12.2 Site visit

Rupert Osborn of H&SC visited the Doropo project site for three days in November 2017 and again for a day in December 2018. During these visits, H&SC observed diamond and RC drilling and sample handling procedures, which were found to be industry standard. H&SC also selected several diamond and RC drill holes in order to cross-check the geological logs against the drill core and chip trays and to better understand the geology and reliability of the logs. The method of measuring the density of the drill core was demonstrated to H&SC. H&SC spoke to many of the key personnel including senior and junior geologists and the database administrator.

12.3 Database Audit

H&SC checked that the drill hole database was internally consistent. Validation included checking that no assays, downhole surveys, density measurements or geological logs occur beyond the end of hole and that all drilled intervals have been geologically logged. The minimum and maximum values of assays, density measurements and downhole survey measurements were checked to ensure values are within expected ranges. Further checks included testing for duplicate samples and overlapping sampling or logging intervals. H&SC found the data to be of good quality and consistency, owing largely to the fact that Centamin continuously conducts its own validation internally.

In addition to the basic checks described above, H&SC conducted extra verification of data as described below.

Collar Location Check

In November 2017, the location of around 30 drill hole collar locations was checked by H&SC against the database records using a handheld GPS. The collar locations contained in the database are surveyed using either a Differential GPS or Total Station, both of which are significantly more accurate than a handheld GPS. All Easting and Northing coordinates were found to be within four metres of the database records and this difference is believed to be due to the accuracy of the handheld GPS unit. Variations in elevation were more significant but are not believed to be significant as handheld GPS measurements are known to be poor for measuring elevations.

Laboratory Certificate Check

H&SC checked that the assay values were identical to those provided by BVML by reimporting the entire assay database from the csv files provided by BVML. These values were then compared to the data provided in the assay database provided by Centamin. No differences were found. H&SC additionally visually checked a small selection of the csv files against the pdf versions of the laboratory certificates in order to ensure that the csv files had not been altered since their creation. Again, no differences were identified.

Laboratory visit

In December 2018, Rupert Osborn visited the BVML in Abidjan in order to observe sample preparation and fire assaying procedures. H&SC found the laboratory to be professional, clean and using processes that are considered to be standard industry practices.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

ALS Metallurgy Services (Perth) conducted all test work on the Doropo resource materials between 2017-2018, under the direct supervision of Paul Elms (ELMSMET PTY Ltd), a consultant metallurgist working on behalf of Centamin on the Cote d'Ivoire Projects.

Limited testwork has been completed on the various deposits to date and what has been completed largely covers the oxide and fresh material from each source with limited optimisation. A view was taken early that fresh ores exhibiting poor recovery by conventional free milling/CIL processing where tested via a sulphide float/UFG concentrate grind. The result summary is indicated in the tables below.

Extensive previous testwork has been undertaken on the project, commencing in 2011. Periods of review have followed this, with Lycopodium undertaking the most recent review in 2019 and again in 2020.

A representative suite of Upper Oxide, Lower Oxide, Transition and Upper and Lower Fresh composite samples were selected for testing from each of the main Doropo resource deposits (Except for Kilosegui which was added to the MRE in 2020). A summary of the test work conducted in 2017-2018 on the Doropo resource materials is outlined in Table 13.1.

Table 13.1: Metallurgical test work conducted by ALS 2017-2018

	Souwa		Nokpa	Cheque	Han	Kekeda	Kona	Doropo Oxide	
Testwork Description									
In-situ SG	✓								
SMC	✓								
Ai	✓						✓		
Rwi	✓		✓	✓	✓	✓	✓		
Bwi	✓		✓	✓	✓	✓	✓		
Head Assay	✓		✓	✓	✓	✓	✓	✓	✓
Mineralogy	✓						✓		
Gravity/CN leach	✓				✓	✓	✓	✓	
Gravity/float/CN leach	✓								
Bulk float/CN leach		✓	✓	✓	✓	✓	✓		
Gravity/float/oxidative leach/CN leach		✓							
CN leach									✓
CN leach (coarse-crush)									✓
CN leach (column)									✓

QEMSCAN quantitative mineralogical studies were conducted on each of the test work composite samples. Doropo ore mineralogy is dominated by pyrite hosting a range of gold particles down to fine gold below 20µm. The oxide and transition mineralogy is the weathered equivalent with more free liberated gold particles within the corroded sulphides and leached, fractured quartz.

Full SMC comminution test work was conducted and the fresh ores classified as moderately hard and abrasive, with Bond Ball and Rod Mill Work Index averaging 17.4 kWh/t with an abrasion index of 0.246.

Table 13.2: Metallurgical test work conducted by ALS Met Services

Option 1	Gravity + whole ore leach @ P_{80} 75 µm
Option 2	Gravity + whole ore leach @ P_{80} 75 µm +100 g/t $Pb(NO_3)_2$
Option 3	Gravity + whole ore leach @ P_{80} 53 µm +100 g/t $Pb(NO_3)_2$
Option 4	Gravity + flotation @ P_{80} 106 µm + leaching of float tail and con (CIL) @ as-received size
Option 5	Gravity + flotation @ P_{80} 106 µm + leaching of float tail and con (CIL) @ P_{80} 45 µm
Option 6	Gravity + flotation @ P_{80} 106 µm + leaching of float tail and con (CIL) @ P_{80} 30 µm
Option 7	Gravity + flotation @ P_{80} 106 µm + leaching of float tail and con (CIL) @ P_{80} 15 µm
Option 8	Gravity + flotation @ P_{80} 106 µm + leaching of float tail and con (CIL) @ P_{80} 10 µm
Option 9	Gravity + flotation @ P_{80} 106 µm + leaching of float tail and con (CIL) @ P_{80} 7 µm

The first stage of metallurgical test work was conducted on the Doropo fresh resource materials to establish the primary ore characteristics and process recovery options. The central objective was to compare overall gold extraction via:

- Gravity gold recovery and whole-ore cyanide leaching.
- Gravity gold recovery and flotation, with cyanide leaching of the flotation tails and re-grinding of the flotation concentrate prior to cyanide leaching of the flotation concentrate (separate to the flotation tail leach).

Table 13.3: A Summary of the Doropo Fresh recovery test work

FRESH Test Work	Souwa	Souwa	Nokpa	Nokpa	Chegue Main	Han	Kekeda
	UF	LF	UF	LF	UF	UF	UF
Bond Abrasion Index	0.2625	0.2175	0.2726	0.2296	0.2484	0.2241	0.2532
Bond Rod Mill Work Index (kwh/t)	18	17.2	16.7	16.9	18.4	14	15.5
Bond Ball Mill Work Index (kWh/t)	17	16.8	17.1	17	19.3	15.1	16.7
Au Head assays(g/t)	3.53/2.93	1.54/1.20	1.78/1.42	1.26/0.76	0.88/0.74	1.16/1.11	1.89/1.94
Gravity Recovery (%)	21.6	14.5	21.6	8.4	8.6	25.3	11.4
Overall Gold Extraction via Gravity and Cyanide Leaching at P80 75um	78.25	83.49	78.4	69.1	63.3	78.7	68.2
Overall Gold Extraction via Gravity, flotation and Cyanide Leaching and float con reground to P100 63um	87.87	81.15	86	78.7	69.2	86.4	84.3
Overall Gold Extraction via Gravity, flotation and	90.59	84.6	90.6	89	84	95.2	96.2

FRESH Test Work	Souwa	Souwa	Nokpa	Nokpa	Chegue Main	Han	Kekeda
	UF	LF	UF	LF	UF	UF	UF
Cyanide Leaching and float con reground to P80 10um							
Overall Gold Extraction via Gravity, flotation and float con reground to P80 10um and Cyanide Leaching of Oxidized float concentrate	94.54	91.69					

Subsequently, the oxide and transition ore type composites from the main resource sources were tested by grinding a 10 kg composite of each sample to P80 passing 150, 106 and 75 µm and evaluating the gravity gold recovery test work ahead of cyanide leach test work on the gravity tailings. The objective was to optimise gold extraction evaluating grind size, gravity gold recovery and cyanide leach kinetics. The results of the oxide recovery test work are summarised in Table 13.4

Table 13.4 Oxide Metallurgical Testwork Summary

Process / Pit	Upper Oxide			Lower Oxide		
	Head Grade (assay)	Head Grade (calc)	Recovery (%) 24hr	Head Grade (assay)	Head Grade (calc)	Recovery (%) 24hr
Gravity + Whole Ore Cyanide Leach **Grind P_{80} 75µm**						
Souwa North	1.55/1.35	1.82	94.7%	1.98/2.11	2.16	89.5%
Souwa South	1.88/1.58	1.80	93.5%	2.08/3.74	1.31	92.6%
Souwa						
Nokpa				0.84/0.95	1.02	94.9%
Chegue	0.98/1.15	1.11	95.5%			
Chegue South				1.33/1.39	1.38	96.5%
Han						
Kekeda						
Grind P_{80} 106µm						
Souwa North	1.55/1.35	1.78	95.6%	1.98/2.11	2.18	88.3%
Souwa South	1.88/1.58	1.80	94.1%	2.08/3.74	1.32	92.9
Souwa						
Nokpa				0.84/0.95	1.04	92.9%
Chegue	0.98/1.15	1.09	95.0%			

Process / Pit	Upper Oxide			Lower Oxide		
	Head Grade (assay)	Head Grade (calc)	Recovery (%) 24hr	Head Grade (assay)	Head Grade (calc)	Recovery (%) 24hr
Chegue South				1.33/1.39	1.39	95.6%
Han						
Kekeda						

The Chegue South Lower Oxide sample contained high gravity-recoverable gold (GRG), with over 40% of the gold recovered via intensive cyanidation of the gravity concentrate. All Souwa samples contain moderate-high GRG, ranging from 28%-34%. The Chegue Main UPOX GRG is moderate, at just over 20%, whilst the Nokpa LWOX sample contains relatively low GRG, at less than 15%.

Overall gold extraction was high for all samples, across the range of grind sizes tested, at 93% or more.

The only exception was the Souwa North Lower Oxide sample. For this sample, overall gold extraction at P80 150 µm was 89.4%, increasing to 91.7% at P80 75 µm. This was the only sample that contains detectable sulphide levels.

The Souwa North Lower Oxide and Nokpa Lower Oxide samples were the only samples for which there appeared to be a clear improvement in leach kinetics at finer grind.

The optimum process recoveries are listed in Table 13.5.

Table 13.5: Metallurgical recoveries for Doropo weathering zones

Weathering Type	Gold Recovery	Source
Saprolite	92.5 %	Lycopodium 28-Nov-2018
Transition	89.8 %	Lycopodium 28-Nov-2018
Fresh	88.8 %	Lycopodium 28-Nov-2018

14 MINERAL RESOURCE ESTIMATES

14.1 Introduction

Cube was requested to conduct a check estimate for the Doropo Gold project which is in the Boukani region of the Zanzan district, in the far northeast of Cote d'Ivoire. The Doropo gold project comprises thirteen prospects, namely Kilosegui, Vako, Attire, Souwa, Nokpa, Chegue Main, Chegue South, Kekeda, Han, Enioda, Nare, Hinda and Tchouahinin. The aim of this work was to confirm the reported MRE and to provide updated models where new drilling allowed with the models to be suitable for internal economic assessment. This assessment would allow Centamin to prioritise the planned work for maximum benefit. Cube was additionally requested to provide recommendations regarding the possible classification of the newly estimated models based on the estimation quality only, as a guide to resource risk of the new models.

Reporting of the Mineral Resources remains the responsibility of Centamin, as Cube has not had the opportunity to undertake all the actions required for an independent mineral resource under any recognised reporting code.

14.2 Data provided to Cube

The following dataset were received from Centamin:

- CSV files of Collar, Survey, Assay and Lithology
- CSV files of GEOTECH, RECRQD, Sampling, Structure and SG tables for DH holes.
- Previous wireframes of the mineralised lodes in each prospect
- wireframes of the weathering surfaces of the entire project area

14.3 Database

The data from the DHAC and DH holes were combined into separate tables for collar, survey, assay and lithology and were imported into Microsoft Access to create a database to be used for the estimation process "Cube_DRP_20201104.mdb".

There are a total of 7,948 holes within the database, which is made up of Air core, Hammer on air core, RC, Diamond Drillholes, and RC pre-collared DD holes. Table 14.1 lists the number of holes per hole type with the corresponding metreage. A total of ~480,000 m was drilled within the Doropo project area.

Table 14.1 Summary of the hole types in the database provided to Cube.

Hole Type	No Holes	Total Metres
AC	4,613	135,608
AC/HM	214	5,959
HM	56	1,380
DD	50	5,301.54
RC	2,965	321,043.00
RC/DD	50	10,081.25
TOTAL	7,948	479,372.79

The distribution of the holes per prospects of interest is summarised in Table 14.2.

Table 14.2 Details of the drilling metreage per hole type per prospect area

Prospect	Description	Drill Type metreage					
		AC	AC/HM	HM	DD	RC	RC/DD
KLG	Kilosegui					54,907	
VAKO	Vako					15,100	
SWA	Souwa	20,034	624	34	1,439	53,405	2,360
NOK	Nokpa	2,170	89		1,740	20,494	6,061
CHG	Chegue	5,789	92	78	1,104	43,496	
THN	Tchouahinin	5,653	135			12,208	
HND	Hinda	25,058	1647	213		13,662	
KEK	Kekeda	9,880	556	843	482	15,594	625
HAN	Hanoda	2,755	103		374	20,287	1,035
ENI	Enioda	10,128	736	212	162	20,082	
NAR	Nare					1,521	
ATI	Atirre	2,483				15,180	

14.4 Wireframe review and data coding

Log probability plots of the raw data indicates a 0.2 g/t low threshold (Figure 14.1) is suitable for defining the zones of mineralisation. Economic compositing (a LeapFrog process) at a cut-off of

0.2 g/t with maximum consecutive waste of 3 m, maximum included waste of 6 m and a minimum mining width of 2 m was used to define the mineralised zones. This strategy was used for each of the thirteen prospects to define a broad mineralised zone which can be used for the proposed LUC estimation. The mineralised domain wireframes supplied by Centamin were also used as a guide during this process. The mineralised lodes were then modelled as veins in Leapfrog Geo to create 3D wireframe volumes.

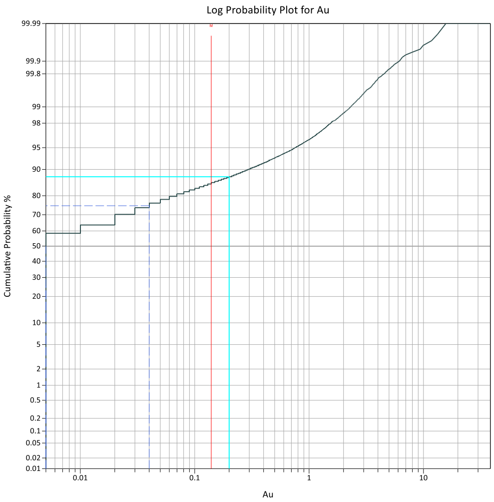


Figure 14.1 Example log probability plot from Kilosegui showing grade threshold for mineralised zone definition at 0.2g/t

Kilosegui (KLG):

The drilling at Kilosegui extends over 8 km strike length and is generally on 50 m x 50 m spacing. Fourteen mineralised lodes were interpreted, and they are labelled from 1001 to 1009, 1011, 1012 and 1014 to 1016. Three out of the 14 lodes (1012, 1014 and 1015) are considered small domains with less than 100 informing samples. The lodes strike NW-SE and dip moderately between 20 and 25^{o} to the SW. The major domains, which consist of 1001, 1004, 1006 and 1009, have a strike extent between 1,100 m and 2,300 m with an average thickness from 10 m to up to 50 m. Most of the metal is located within domains 1006, 1004, 1009 and 1001.

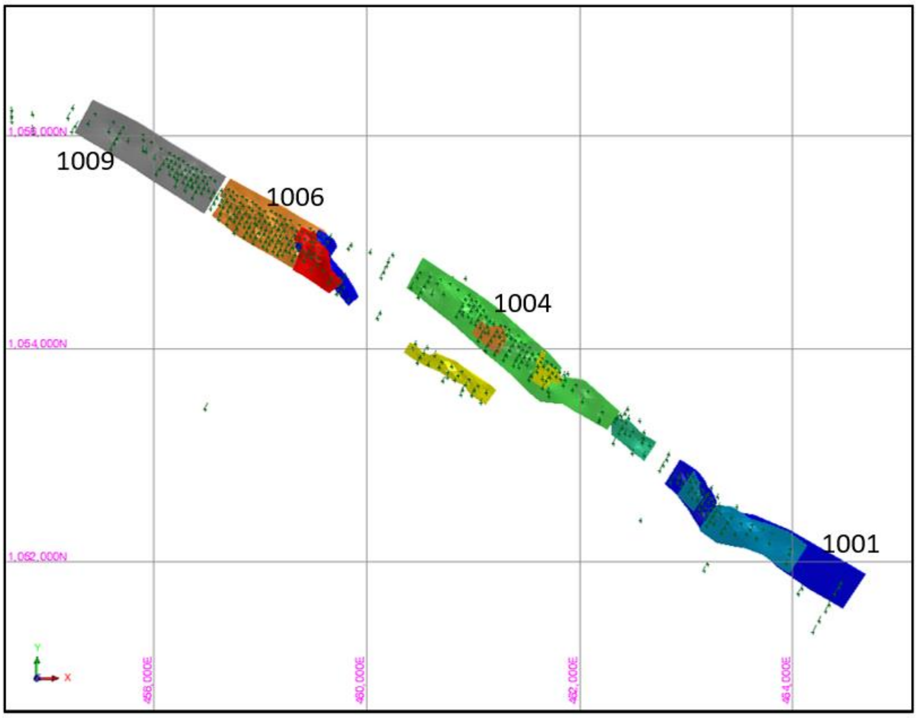


Figure 14.2: Kilosegui interpreted mineralised lodes with drill holes and major domains labelled

VAKO:

Two main mineralised lodes were interpreted at Vako. The lodes strike ENE -WSW and dip 25 to 30° to the north. The domains were labelled 2001 and 2002, with domain 2002 extending over a strike length of 1,600 m and domain 2001 over a strike length of 1,200 m (Figure 14.3). Drillhole spacing at Vako averages 50 m x 50 m in general. Average thickness varies from 10 to 25 m for domain 2002 and 10 to 15 m for domain 2001. Domain 2002 contains the most metal.

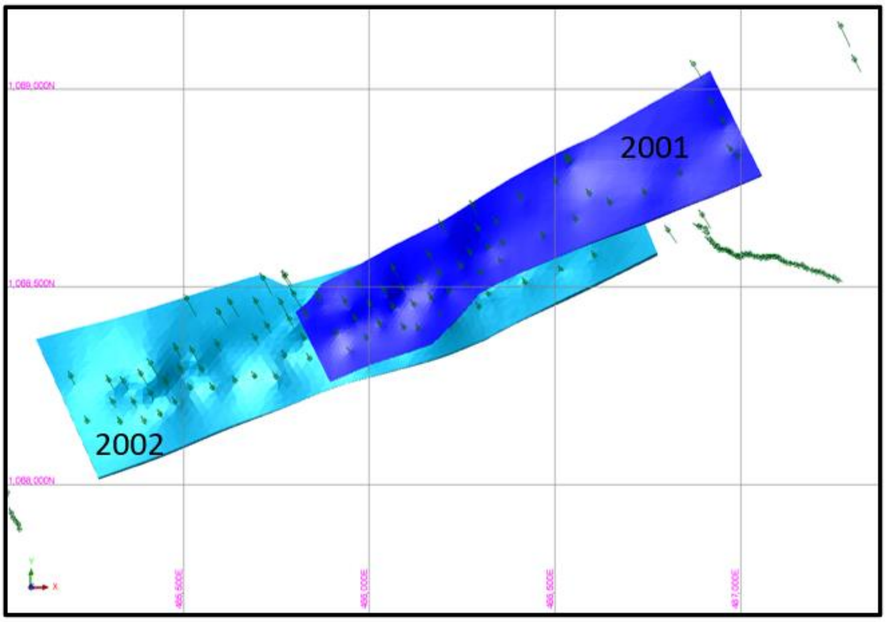


Figure 14.3: Vako interpreted mineralised lodes with drillholes and major domains labelled

Souwa (SWA):

The drilling at Souwa covers a strike extent of 2.4 km with an average drillhole spacing of 50 m x 50 m. Six mineralised lodes were interpreted and are labelled 3003 to 3006 and 3009 and 3010. There are three major domains (3003, 3004 and 3006), which contain most of the metal within Souwa. Domain 3010 is interpreted to be flat lying in the oxidised zone and is mainly intersected by the Air core holes. It extends over 350 m strike distance. Domain 3003 has a strike extent of 1,900 m and dips 25° to the West. Domain 3004 extends over 900 m with a shallow dip of 25° to the west. Domain 3006 strikes NE-SW and dips 25° to the NW, with a strike extent just over 900 m (Figure 14.4). The thickness of mineralised lodes varies between 10 and 20 m.

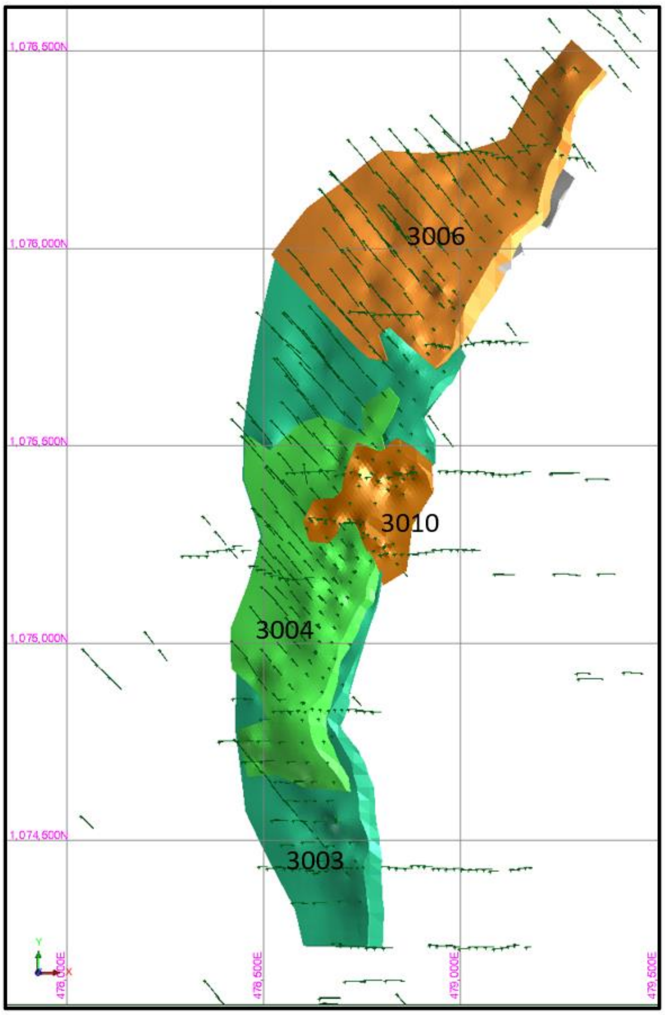


Figure 14.4 Souwa interpreted mineralised lodes with drillholes and major domains labelled

NOKPA CHEGUE MAIN and CHEGUE South (NOK, CHG_main, CHG_south):

The Nokpa, Chegue South and Chegue Main prospect areas are in close proximity.

Nokpa is drilled at 50 m x 50 m and in places 25 m x 25 m collar spacing. The main mineralised lode at Nokpa is domain 4001 and consists of an anticline with fold axis striking NNW. The mineralisation is concentrated on the fold axis and is open at depth. The northern and southern limb of the fold are not as well mineralised. Domains 4004 is a splay off the northern limb of domain 4001. Domain 4002 consists of a hanging wall lode off the southern limb of domain 4001 (Figure 14.5). A NW-SE dyke crosscuts the anticline of domain 4001. The lodes at Nokpa dip between 30 and 35° to the North -NW. The thickness of the main lode around the fold axis varies between 20 and 40 m. The northern and southern limbs are thinner with an average thickness around 4 or 5 m.

Chegue Main is drilled at 50 m x 50 m. Two mineralised lodes were interpreted at Chegue main and are named domain 5001 and 5002 (Figure 14.5). Domain 5001 strikes NE-SW and dips 35° to the NE. Domain 5002 is a splay off the main shear 5001. The average thickness of the lodes is around 20 m.

Chegue South is drilled at 50 m x 50 m. The mineralised lodes at Chegue south were crosscut by a NW-SE trending dyke (Figure 14.5). Three lodes were interpreted north of the dyke and consist of domain 5004 to 5006. South of the dyke, two mineralised lodes were interpreted and include 5007 and 5008. North of the dyke lodes have an average thickness between 15 and 20 m and dip shallowly to the E at 25-30°. South of the dyke the average thickness for domain 5008 is between 10 to 16 m and for 5007 is between 5 to 10 m thick. Most of the metal for Chegue south is located within lode 5005.

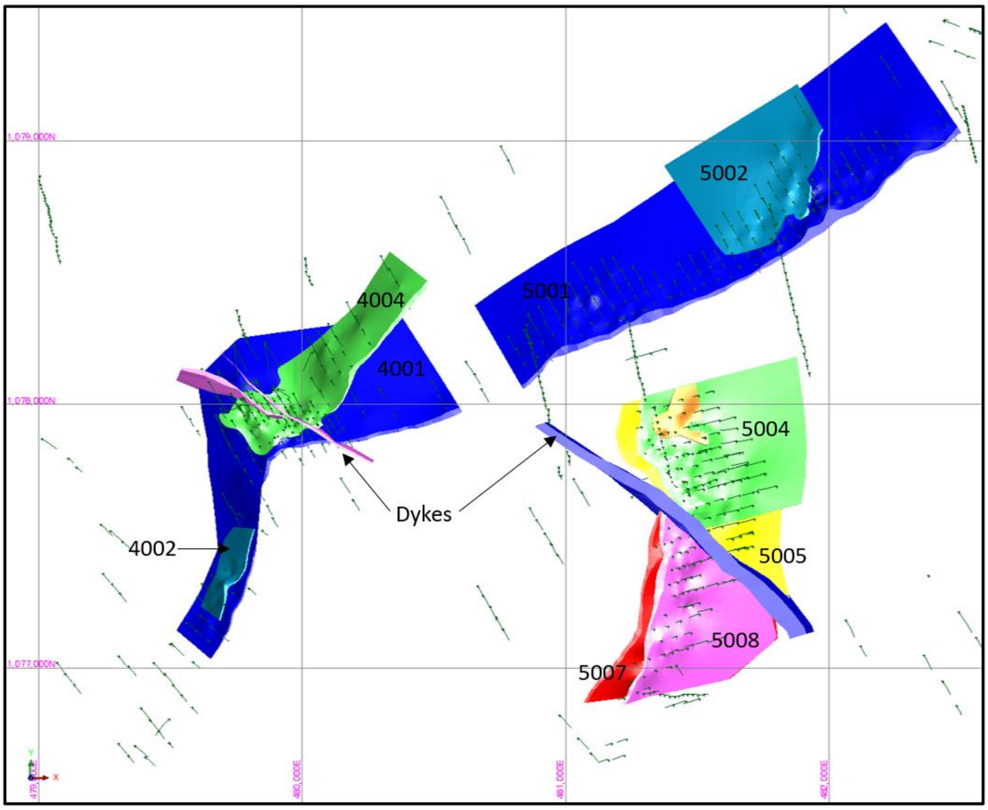


Figure 14.5 Nokpa Chegue interpreted mineralised lodes with drillholes and major domains labelled

Tchouahinin (THN):

Tchouahinin extends over a strike length of 3.2 km where the northern part is drilled at 50 m x 50 m, but the southern part is more sparsely drilled at 150 m x 50 m to 300 m x 50 m. The main mineralised lode interpreted is domain 6001, which strikes NW-SE in the south and swings to NE-SW to the north, through an open fold structure (Figure 14.6). Domain 6001 dips shallowly at 25° to the W and NW, with an average thickness between 5 and 15 m thick. Domain 6003 is a small lode off the hanging wall of the southern limb of domain 6001, with a strike extent of 1,150 m and dips 35° to the west with an average thickness of 4 to 8 m.

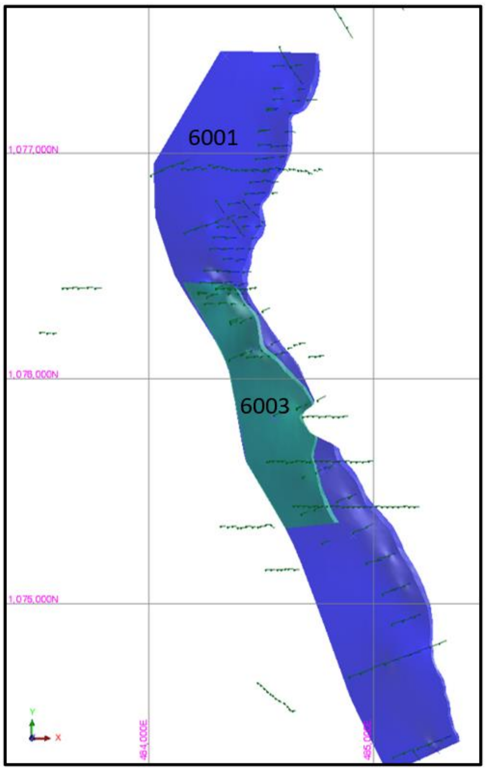


Figure 14.6 Tchouahinin interpreted mineralised lodes with drillholes and major domains

Hinda (HND):

Hinda is drilled at an average drillhole spacing of 50 m x 50 m. Three NS striking mineralised lodes were interpreted: 7001 to 7003. The main mineralised domain consists of 7001 and extends over 500 m. All three lodes dip 25° to the west with an average thickness between 5 and 8 m thick.

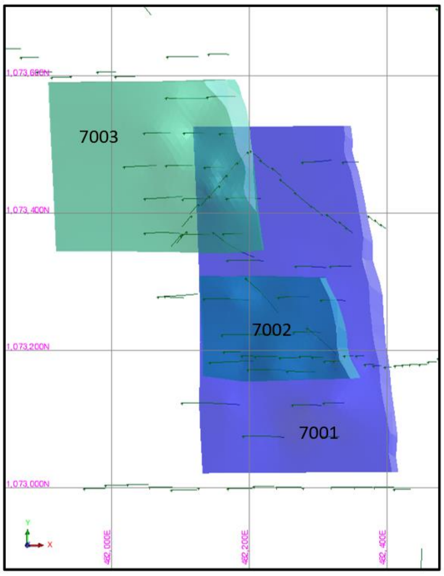


Figure 14.7 Hinda interpreted mineralised lodes with drillholes

Kekeda (KEK):

Kekeda mineralised lodes strike NE-SW with the main shear 8001 extending over 1,500 m. Domain 8003 is a smaller lode off the hanging wall of domain 8001. Drilling was carried out at an average spacing of 50 m x 50 m. The lodes dip shallowly at 25° to the NW. The main lode has an average thickness between 10 and 20 m.

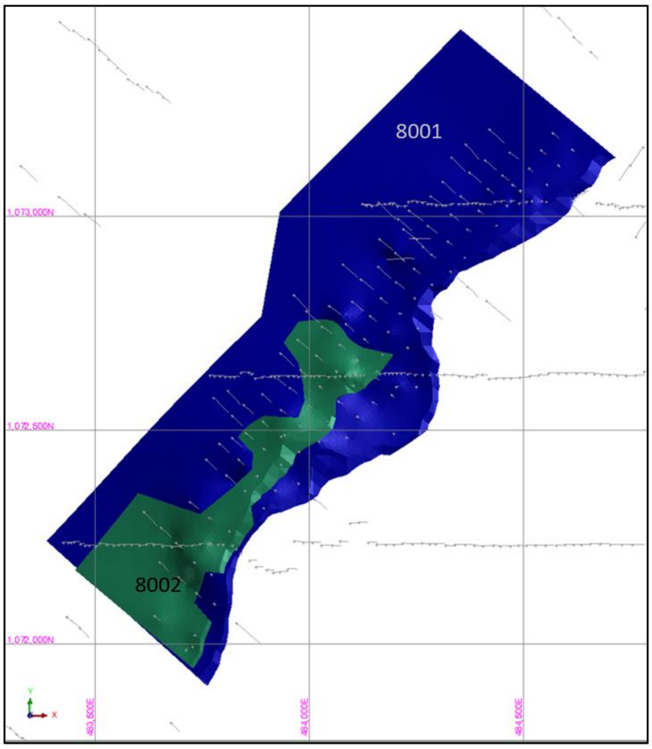


Figure 14.8: Kekeda interpreted mineralised lodes with drillhole

Han (HAN):

Domain 9001 is the main mineralised lode interpreted at Han (Figure 14.9), which also contains most of the metal. There are four other interpreted minor lodes (9003 to 9006). The shears are oriented NE-SW and dip 25° to the NW. Average drillhole spacing is 50 m x 50 m. The main lode is between 10 and 15 m thick.

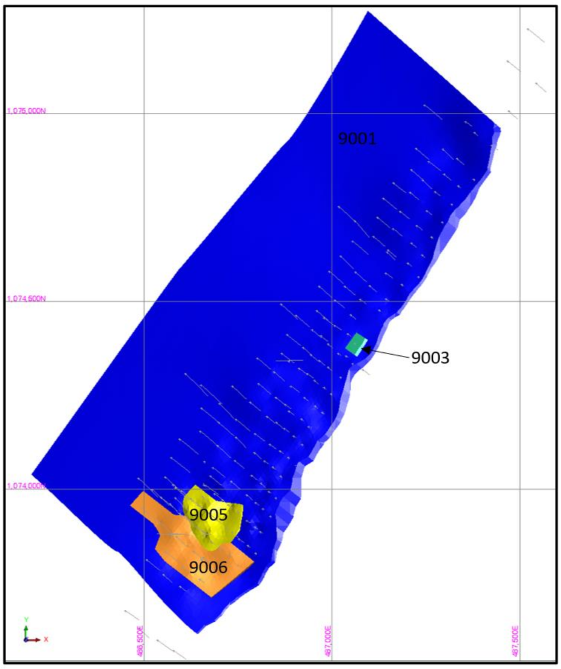


Figure 14.9 Han interpreted mineralised lodes with drillholes

Enioda (ENI):

The main shear interpreted at Enioda is 10001 and strikes NS, dips 30° to the west. It covers a strike distance of 2,200 m (Figure 14.10) with thickness varying between 10 and 20 m. Mineralisation is open at depth. The drillhole spacing averages 50 m x 50 m.

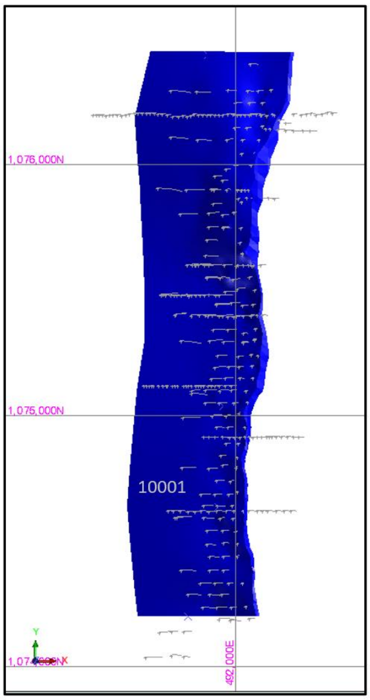


Figure 14.10 Enioda interpreted mineralised lode with drillholes

Nare (NAR)

Domain 11001 interpreted at Nare extends over 450 m and strikes NE-SW, dipping 40° to the west. Drill holes that were used to define the mineralised lode are located on a 50 mx 50 m spacing. Mineralisation is open at depth.

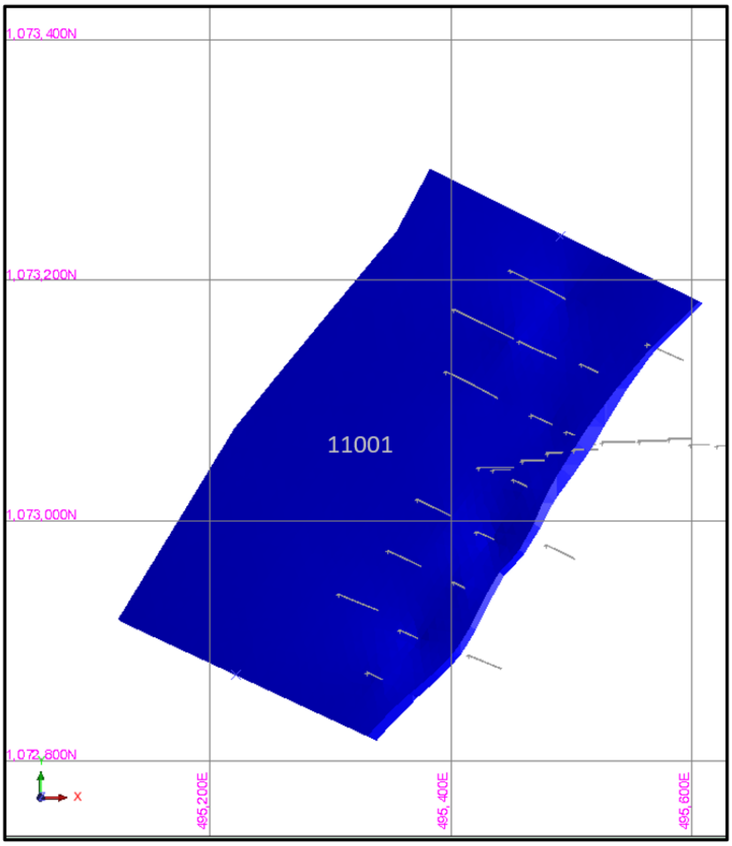


Figure 14.11 Nare interpreted mineralised lode with drillholes

Atirre (ATI):

Drilling at Atirre covers a strike extent of 1.6 km on an average spacing of 50 m x 50 m (Figure 14.12). There are three lodes interpreted: 12001, 12002 and 12003. Most of the metal is contained within domain 12001. The lodes strike NW-SE and dip steeply to the NE at 70° with an average thickness between 5 and 8 m thick. Mineralisation is open at depth.

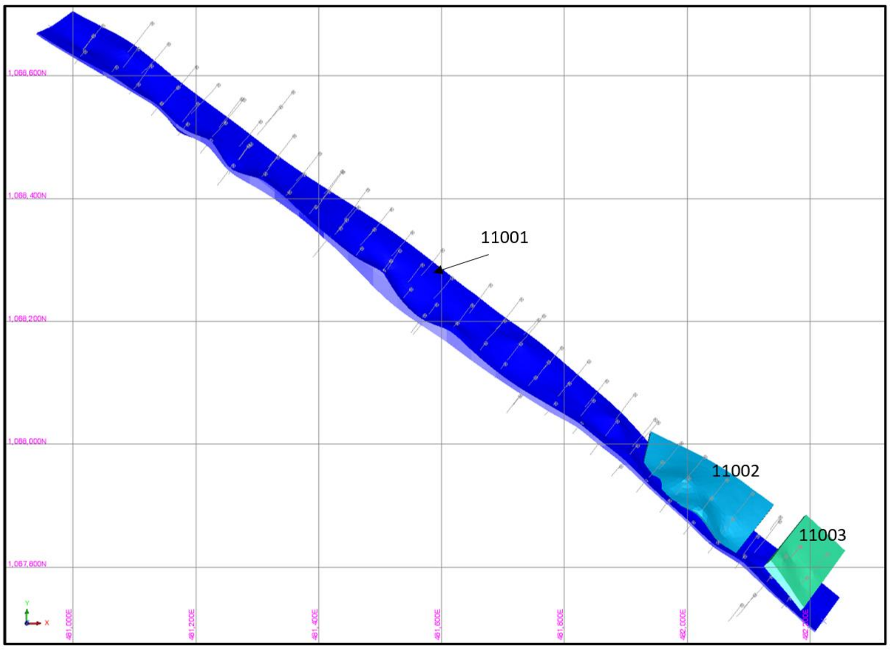


Figure 14.12 Atirre interpreted mineralised lodes, with drillholes

14.5 Exploratory Data Analysis

Sample Compositing Method

Cube carried out an assessment of the raw assay interval length and raw gold assays in order to determine the most appropriate length for compositing of the samples. The analysis was carried out on RC, RC/DD and DD samples only. A sample length of 1 m is the most common as shown in Figure 14.13, with no apparent relationship between sample length and assay grade.

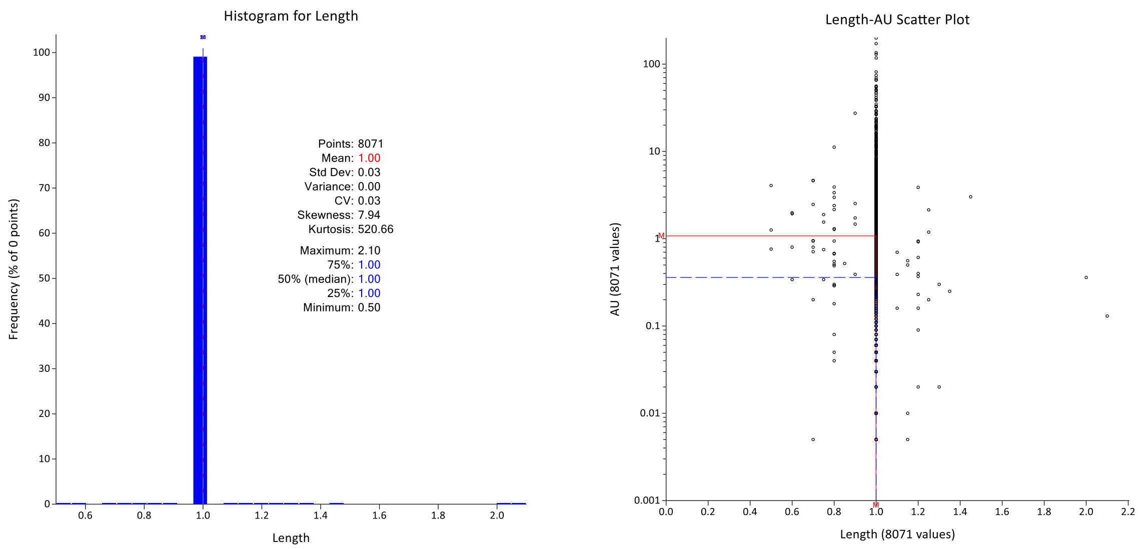


Figure 14.13 Histogram of raw sample length (left) and scatter plot between sample length and Au grade (right)

Samples were composited downhole to 1 m using the best fit methodology in Surpac with a minimum threshold of 50%, resulting in a minimum allowable composite size of 0.5 m.

Boundary analysis on weathering surfaces

The composites were coded by weathering domains using the DTM surfaces provided by Centamin. Domain codes were updated using 100 series for the fresh composites and 200 series for the oxide composites. For example, composites in the fresh zone in domain 1001 at Kilosegui prospect, the domain code given would be 1101 and for oxide composites 1201.

The prospect areas had sufficient samples in each weathering domain for a meaningful analysis. An example of the boundary analysis chart is shown in Figure 14.14. The analysis shows that there is not a significant difference in the mean grade between the oxide and fresh domain and the gold grade changes gradationally across the boundary. Therefore, there is no need to separate the two weathering domains and the estimation domain as modelled will serve as the only hard boundary in the estimation process.

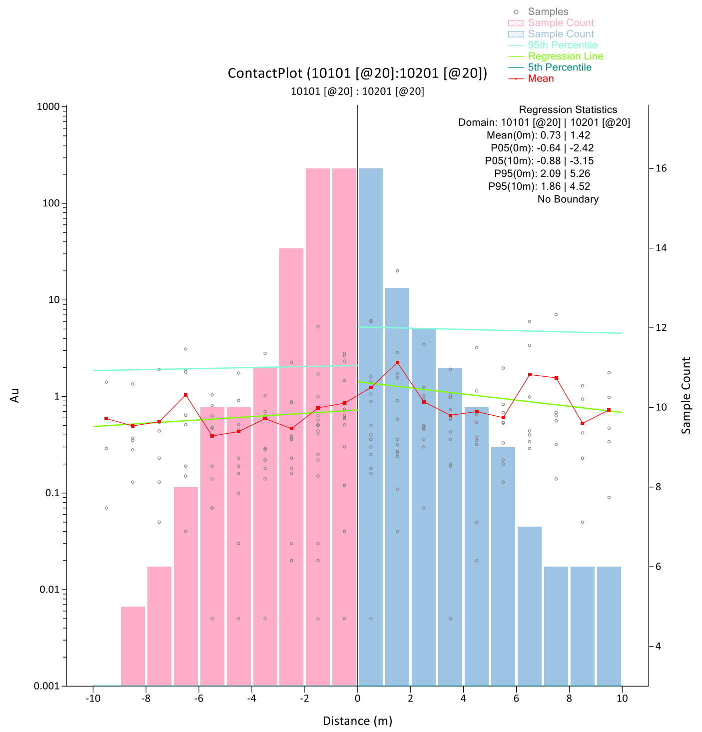


Figure 14.14 Boundary analysis between oxide (200 series) vs fresh (100 series) at Enioda prospect

Basic Statistics

Statistical analysis was carried out on the 1 m composites per domain and per prospect area and is summarised in Table 14.3 . The Au distribution are strongly positively skewed for most domains in all prospect areas except for prospect KLG (1000 series domains) where the CV is relatively low (Table 14.3).

Table 14.3 Basic statistics of all domains in the 13 prospect areas

Prospects	Domain	N	Min	Max	Mean	Median	Std Dev	Coeff Var
KLG	1001	880	0.01	6.33	0.67	0.45	0.7	1.05
	1002	175	0.01	3.85	0.55	0.42	0.54	0.98
	1003	200	0.01	5.19	0.9	0.55	0.96	1.07
	1004	1,470	0.01	38.07	0.98	0.46	1.95	1.98
	1005	286	0.01	10.39	0.56	0.16	1.15	2.05
	1006	2,162	0.01	13.28	0.93	0.57	1.13	1.22
	1007	248	0.01	14.46	0.94	0.41	1.7	1.82
	1008	228	0.01	5.31	0.46	0.26	0.7	1.51
	1009	1,167	0.01	13.46	0.75	0.42	1.08	1.44
	1011	352	0.01	13.71	0.58	0.3	1.03	1.78
	1012	64	0.01	3.57	0.45	0.29	0.54	1.19
	1014	80	0.01	5.45	0.51	0.27	0.82	1.59
	1015	84	0.01	3.4	0.36	0.23	0.49	1.35
	1016	117	0.01	3.19	0.45	0.3	0.53	1.18
VAKO	2001	465	0.01	4.74	0.39	0.17	0.59	1.52
	2002	1,658	0.01	19.81	0.55	0.31	0.89	1.62
SWA	3003	2,847	0.01	105.56	0.92	0.36	3.76	4.08
	3004	1,368	0.01	110.1	1.19	0.44	4.49	3.78
	3005	173	0.01	18.87	0.52	0.16	1.78	3.45
	3006	1,700	0.01	182.39	1.8	0.64	7.66	4.25
	3009	246	0.01	38.25	0.78	0.21	2.76	3.52
	3010	289	0.01	306.13	1.79	0.38	18.03	10.09
NOK	4001	2,272	0.01	100.5	1.78	0.59	5.13	2.89
	4002	81	0.01	2.91	0.41	0.24	0.49	1.21
	4004	806	0.01	83.05	0.83	0.21	4	4.82
CHG main	5001	2,119	0.01	27.02	0.78	0.37	1.57	2.02
	5002	401	0.01	21.06	0.72	0.24	1.88	2.62
CHG	5004	1,117	0.01	229.77	0.76	0.2	7.23	9.52
	5005	1,583	0.01	113.15	0.91	0.24	4.86	5.37
	5006	187	0.01	5.5	0.29	0.05	0.68	2.3
	5007	596	0.01	66.2	0.55	0.12	3.14	5.71
	5008	723	0.01	74.25	1.02	0.22	4.53	4.44
THN	6001	1,023	0.01	117.9	0.79	0.33	4.46	5.65
	6003	202	0.01	74.28	0.82	0.2	5.29	6.44
HND	7001	135	0.01	6.21	0.49	0.2	0.86	1.74
	7002	87	0.01	11.3	1.3	0.45	1.95	1.5
	7003	131	0.01	15.02	1.09	0.33	2.24	2.05
KEK	8001	1,420	0.01	81.4	0.94	0.37	3.46	3.69
	8003	312	0.01	55.11	0.93	0.34	4.02	4.33
HAN	9001	1,576	0.01	199.6	1.54	0.41	8.38	5.43
	9003	4	0.22	2.98	1.33	1.01	1.17	0.88
	9004	72	0.01	7.44	0.44	0.21	0.96	2.16
	9005	144	0.01	41.58	0.87	0.35	3.53	4.07
	9006	142	0.01	26.57	1.3	0.5	3.31	2.54
ENI	10001	1,771	0.01	56.1	0.92	0.39	2.45	2.66
NAR	11001	89	0.01	16.16	1.2	0.68	1.9	1.58
ATI	12001	857	0.01	81.44	1.39	0.3	5.26	3.79
	12002	54	0.01	4.64	0.56	0.34	0.85	1.51
	12003	33	0.01	6.07	0.76	0.47	1.18	1.56

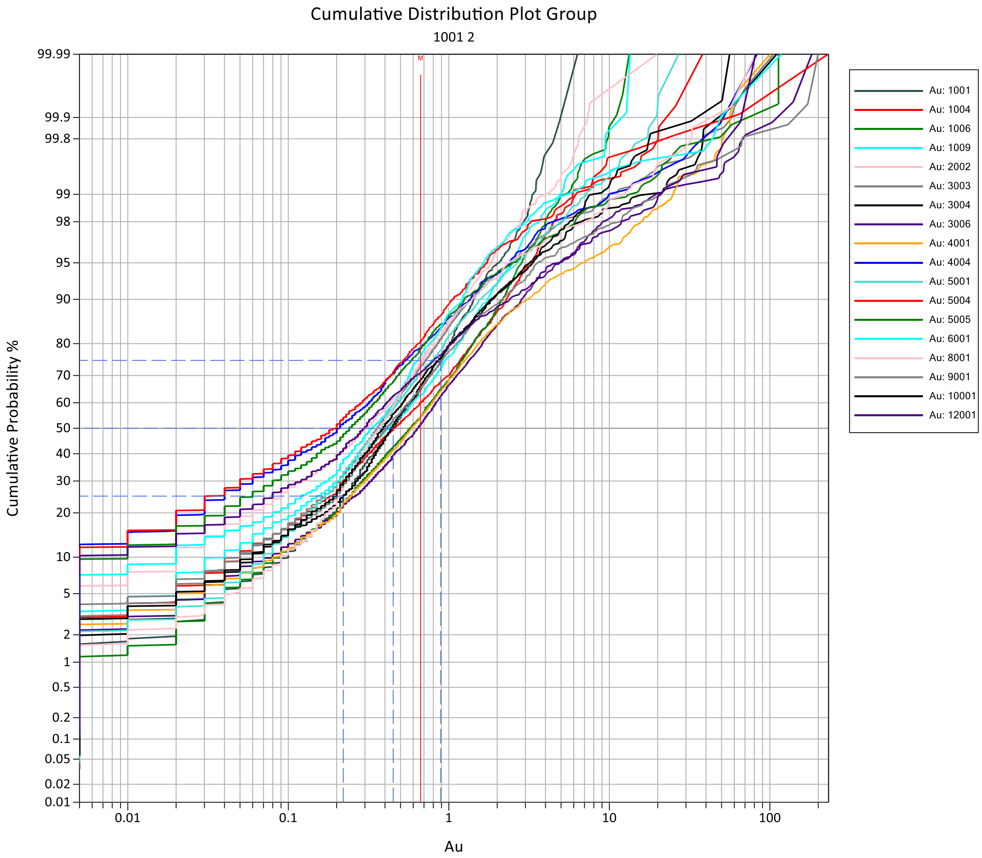


Figure 14.15 Log probability plots of the major domains on all 13 prospect areas

Gold Grade Caps

Most of the domains display extreme outliers with a high Coefficient of variance (CV). Visual inspection of the histograms and log-transformed probability plots were used to identify the top cut to apply to the respective domains. The chosen top cut values are detailed in Table 14.4 as well as the revised statistics of the top cut domains. The method of applying top cuts replaces composite assay above the top cut selected with the top cut value.

Local top cutting was also used during estimation for selected domains to limit the spatial influence of isolated high-grade below values and mitigate excessive smearing of block grades. This local top cutting consists of restricting the extrapolation distance of gold values above a chosen threshold. The restriction distance used was the drillhole spacing of 50 m.

Table 14.4 Top cut values and mean comparison for the top cut domains.

Prospect	Domain	Top Cut	Top Cut Count	Uncut Mean	Cut Mean	%Mean Reduction
KLG	**1004**	20	4	0.98	0.9	8.89%
	1005	6	3	0.56	0.54	3.70%
	1007	8	4	0.94	0.78	20.51%
	1011	6	2	0.58	0.55	5.45%
VAKO	**2002**	10	1	0.55	0.55	0.00%
SWA	**3003**	60	2	0.92	0.9	2.22%
	3004	50	2	1.19	1.14	4.39%
	3005	6	2	0.52	0.44	18.18%
	3006	100	3	1.8	1.66	8.43%
	3009	15	1	0.78	0.72	8.33%
	3010	30	1	1.79	0.82	118.29%
NOK	**4001**	60	2	1.78	1.53	16.34%
	4004	30	3	0.83	0.72	15.28%
CHG main	**5001**	15	5	0.78	0.76	2.63%
	5002	10	4	0.72	0.71	1.41%
CHG	**5004**	65	1	0.76	0.65	16.92%
	5005	60	2	0.91	0.79	15.19%
	5006	3	2	0.29	0.27	7.41%
	5007	30	2	0.55	0.58	-5.17%
	5008	30	5	1.02	0.74	37.84%
THN	**6001**	40	3	0.79	0.7	12.86%
	6003	30	1	0.82	0.6	36.67%
HND	**7003**	10	3	1.09	1.03	5.83%
KEK	**8001**	40	2	0.94	0.9	4.44%
	8003	16	2	0.93	0.73	27.40%
HAN	**9001**	80	3	1.54	1.38	11.59%
	9005	12	1	0.87	0.66	31.82%
ENI	**10001**	25	3	0.92	0.88	4.55%
NAR	**11001**	5	1	1.2	1.08	11.11%
ATI	**12001**	40	5	1.39	1.28	8.59%

14.6 Variography:

Cube used Supervisor software to carry out the analysis of the spatial continuity of the data through variography. The analysis was carried out on the top cut 1 m composites for the well-informed domains. As the gold grade population is mostly highly skewed, a normal score transformation was applied to the data to convert the data to a normal distribution. The normal score transformation reduces the effect of outliers and helps to identify the underlying structure of the variable. The variogram models were back-transformed to real space for use in the estimation process. The nugget effect was defined using downhole variograms for the domain to be assessed. The variogram model parameters are summarised on Table 14.5.

The nugget effect for KLG and VAKO domains varies between 25 to 35% of the total sill compared to the other prospect areas where the nugget is moderate and ranges between 45 to 55%. The variograms overall are not robust as there are not enough informing samples to delineate the short-range structures of the variogram, due to the widely spaced data. An omnidirectional model in the plane of mineralisation was created for all of the domains. Up to three spherical structures were used to model the experimental variograms. On average, 85% of the total modelled variance is captured by the first structure, with range varying between 5 to 10 m. The range of the second structure varies between 20 to 100 m, averaging 45 m.

Table 14.5 Variogram parameters of estimated domains per prospect area

Prospect	Domain	Nugget	Spherical 1				Spherical 2				Spherical 3				Surpac Rotation		
			sill	major (m)	semi (m)	minor (m)	sill	major (m)	semi (m)	minor (m)	sill	major (m)	semi (m)	minor (m)	Bearing	Plunge	Dip
KLG	1001	0.39	0.33	16	16	3	0.28	93	93	16					125	0	-30
	1004	0.31	0.54	7	7	7	0.15	60	60	23					174	-26	-24
	1005	0.3	0.44	8	8	7	0.26	20	20	11					120	0	-40
	1006	0.36	0.39	6	6	4	0.17	18	18	12	0.08	100	100	25	120	0	-25
	1007	0.3	0.47	9	9	5	0.15	31	31	11	0.08	130	130	13	145	0	-25
	1009	0.35	0.42	6	6	6	0.17	20	20	12	0.06	143	143	17	120	0	-30
	1011	0.37	0.46	5	5	4	0.17	30	30	9					145	0	-20
VAKO	2001	0.26	0.53	8	8	5	0.21	88	88	9					65	0	25
	2002	0.3	0.56	6	6	6	0.14	50	50	12					70	0	30
SWA	3003	0.53	0.42	6	6	5	0.05	98	98	14					5	0	25
	3004	0.53	0.36	6	6	3	0.04	57	57	6	0.07	160	160	8	10	0	25
	3005	0.39	0.43	7	7	2	0.18	30	30	8					25	0	25
	3006	0.54	0.35	11	11	6	0.07	35	35	15	0.04	169	169	19	35	0	30
	3010	0.45	0.44	8	8	3	0.11	66	66	5					0	0	0
NOK	4001	0.36	0.5	6	6	6	0.08	32	32	10	0.06	80	80	20	122	29	28
	4004	0.43	0.45	5	5	5	0.08	18	18	18	0.04	62	62	19	45	0	35
CHG main	5001	0.44	0.44	6	6	6	0.12	89	89	13					65	0	35
	5002	0.36	0.49	11	11	7	0.15	71	71	16					30	0	25
CHG	5004	0.57	0.37	4	4	4	0.06	32	32	9					340	0	-25
	5005	0.57	0.37	5	5	4	0.06	34	34	8					150	0	30
	5007	0.55	0.35	4	4	4	0.1	33	33	16					10	0	-30
	5008	0.54	0.4	7	7	5	0.06	73	73	8					15	0	-30
THN	6001	0.54	0.39	5	5	5	0.07	48	48	9					15	0	25
	6003	0.36	0.5	6	6	6	0.14	23	23	8					335	0	35
HND	7001	0.35	0.48	10	10	4	0.17	81	81	9					0	0	25
KEK	8001	0.46	0.39	5	5	3	0.14	27	27	10					45	0	25
HAN	9001	0.59	0.31	5	5	3	0.1	17	17	8					35	0	25
	9005	0.46	0.31	9	9	9	0.21	24	24	20	0.02	82	82	21	45	0	30
ENI	10001	0.41	0.44	3	3	3	0.05	37	37	10	0.1	105	105	20	0	0	30
NARE	11001	0.56	0.11	10	10	2	0.33	71	71	3					35	0	40
ATI	12001	0.5	0.31	5	5	5	0.11	25	25	12	0.08	85	85	27	305	0	-75

For domains where variogram models couldn't be generated, the substitute variogram used are listed in Table 14.6, which was based on statistical similarity between estimation domains.

Table 14.6 Variogram model substitutions

Variogram Model Domain	Substituted into Domains:
1001	1002
1004	1003
1005	1008, 1012, 1014, 1015, 1016
3005	3009

Variogram Model Domain	Substituted into Domains:
4004	4002
5007	5006
7001	7002, 7003
8001	8003
9005	9004
9001	9006
12001	12002

KNA:

Cube has undertaken an estimation search neighbourhood analysis to determine the optimal search parameters for a Dynamic Ordinary Kriging (DOK) estimation of gold grade. This analysis was carried out on the well-informed domains and a multiple blocks approach was used rather than a single block analysis.

- The data spacing is 50 m x 50 m and a parent block size of 40 mX x 40 mY x 10 mZ was considered to carry out the KNA analysis.
- The parameters of the variogram models were referenced for the optimal search ellipse orientation and the long range of the variogram or the drillhole spacing was used as the search distance, whichever is the greatest.
- Kriging Neighbourhood Analysis (KNA), using the Slope of Regression and Kriging Efficiency, was undertaken to decide on optimal minimum and maximum numbers of samples to use during estimation.
- Cube's estimation experience was used to make a choice on other search parameters, such as block discretisation and maximum number of samples per hole.

14.7 Block Model Definition

A block model was defined per prospect area, except for Nokpa and Chegue (main and south) which were combined in one block model as they are within close proximity of each other. Some of the block models were rotated to conform to the orientation of the lodes. The parent block size used took into account the data spacing per prospect area. The sub-block selected was deemed appropriate to honour the modelled lodes. The details for each block model definition are listed in Table 14.7.

Table 14.7 Block model definition per prospect area

Prospects		X	Y	Z
KLG	Minimum Coordinate	464,260	1,050,710	0
	Maximum Coordinate	466,860	1,060,010	450
	Block Size	20	20	5

Prospects		X	Y	Z
	Minimum Sub-block Size	5	5	2.5
	Rotation	0	-60	0
VAKO	Minimum Coordinate	464,850	1,068,420	0
	Maximum Coordinate	465,590	1,070,760	450
	Block Size	20	20	5
	Minimum Sub-block Size	5	5	2.5
	Rotation	0	70	0
SWA	Minimum Coordinate	478,000	1,074,000	-50
	Maximum Coordinate	479,560	1,076,720	450
	Block Size	20	40	10
	Minimum Sub-block Size	5	5	2.5
	Rotation	0	0	0
NOK-CHG	Minimum Coordinate	478,370	1,077,200	-200
	Maximum Coordinate	481,690	1,081,680	450
	Block Size	20	20	5
	Minimum Sub-block Size	5	5	2.5
	Rotation	0	35	0
THN	Minimum Coordinate	483,850	1,074,000	-50
	Maximum Coordinate	485,890	1,077,720	450
	Block Size	20	40	10
	Minimum Sub-block Size	5	5	2.5
	Rotation	0	0	0
HND	Minimum Coordinate	481,700	1,072,900	-50
	Maximum Coordinate	482,620	1,073,700	400
	Block Size	40	40	10
	Minimum Sub-block Size	5	5	2.5
	Rotation	0	0	0
KEK	Minimum Coordinate	483,000	1,072,030	-50
	Maximum Coordinate	484,120	1,074,090	400
	Block Size	20	20	5

Prospects		X	Y	Z
	Minimum Sub-block Size	5	5	2.5
	Rotation	0	35	0
HAN	Minimum Coordinate	485,550	1,073,780	-50
	Maximum Coordinate	486,830	1,076,080	400
	Block Size	20	20	5
	Minimum Sub-block Size	5	5	2.5
	Rotation	0	35	0
ENI	Minimum Coordinate	491,250	1,074,000	-50
	Maximum Coordinate	492,510	1,076,600	400
	Block Size	20	40	10
	Minimum Sub-block Size	5	5	2.5
	Rotation	0	0	0
NAR	Minimum Coordinate	494,950	1,072,860	0
	Maximum Coordinate	495,450	1,073,560	400
	Block Size	20	20	5
	Minimum Sub-block Size	5	5	2.5
	Rotation	0	30	0
ATI	Minimum Coordinate	482,200	1,067,500	-50
	Maximum Coordinate	482,750	1,069,400	400
	Block Size	5	20	10
	Minimum Sub-block Size	2.5	1.25	2.5
	Rotation	0	-55	0

14.8 Grade Estimation:

In the first instance, dynamic ordinary kriging was used to estimate the gold grade in all project areas.

This initial OK estimation was undertaken to assess the viability of using a nonlinear estimation methodology to refine the resource estimates for comparison to the existing MIK nonlinear reported Mineral Resources. In addition, the initial OK estimate was intended to provide the final gold estimate in domains and at the peripheral of domains where LUC was deemed unviable.

The OK estimates identified seven of the thirteen deposit areas which contained sufficient data and modelled variograms suitable for estimation by Uniform Conditioning with localisation (LUC). This estimation methodology provides a proportional style estimate above a set of cut-offs of metal within a panel on an assumption of SMU support. The panel proportional model is localised to produce SMU sized block estimates which should reproduce the grade and tonne curves which can be mined. The LUC model is considered appropriate for comparison to a MIK estimate.

The deposit areas selected for LUC estimation were HAN (9001, 9005); KEK (8001); KLG (1004, 1006, 1009); NOK (4001); CHG (5001, 5004, 5005); VAKO (2002); SWA (3003, 3004, 3006).

Domains within the projects which were not estimated by LUC retained the initial panel OK estimation on panel support. While this is not ideal, resulting in estimates of different support within domains and prospects, it was considered by Cube to represent a lower risk strategy than to apply advanced geostatistical techniques without the appropriate support for the assumptions required.

Initial Panel Ordinary Kriging

The details of the estimation parameters are listed in Table 14.10. The first pass search distance varies between 50 and 120 m. The minimum and maximum samples used varies between 5-6 and 18-24 based on the KNA analysis conducted. A maximum of four samples per drillhole was selected to ensure more than one drill hole was used in any block estimate. The estimate made use of a second pass search distance which was double the first pass search distance. Domain 4001 was the only domain to be estimated using third pass, where the search distance was increased five times from the first pass to fill the interpreted volume. Material estimated by third pass was not reported by Cube and should not be classified.

Local top cutting was applied to selected domains, where gold grade above a chosen threshold is not used in the estimation beyond 50 m, which is the approximate drillhole spacing (Table 14.8). This is to limit the spatial influence of local high-grade values that potentially causes smearing of block grade and overestimation of metal locally.

Table 14.8 List of local top cutting for selected domains

Prospect	Domain Code	Threshold Max
KLG	1003	3
	1004	15
	1007	6
SWA	3003	40
	3006	60
NOK	4001	40
CHG	5002	5
	5005	40
THN	6001	20
KEK	8001	40
	8003	10
HAN	9001	40
	9005	7

Prospect	Domain Code	Threshold Max
ENI	10001	15
ATI	12001	30
	12002	4

Wireframe volumes that were not populated by the second pass were in general assigned a background grade of 0.001 g/t Au. Two domains with low composite numbers have been assigned average domain grades. These domains listed in Table 9 represent very small volumes and have not been classified for reporting.

Table 14.9 List of assigned Au values.

Prospect	Domain	Estimated Au (Median/Mean) g/t
HAN	9003	1.33
ATI	12003	0.76

Table 14.10 Search neighbourhood parameters for Dynamic Kriging estimation

Domain	Search Radii			Min Samp	Max Samp	Block Discretisation			Max Samp/Hole
	major (m)	major/semi	major/minor			E	N	RL	
1001	50	1	2	5	18	4	4	2	4
1002	50	1	2	5	18	4	4	2	4
1003	80	1	2	6	20	4	4	2	4
1004	80	1	2	6	20	4	4	2	4
1005	60	1	2	5	18	4	4	2	4
1006	50	1	2	6	18	4	4	2	4
1007	50	1	2	6	18	4	4	2	4
1008	60	1	2	5	18	4	4	2	4
1009	60	1	2	6	20	4	4	2	4
1011	60	1	2	6	18	4	4	2	4
1012	60	1	2	5	18	4	4	2	4
1014	60	1	2	5	18	4	4	2	4
1015	60	1	2	5	18	4	4	2	4
1016	60	1	2	5	18	4	4	2	4
2001	50	1	2	6	20	4	4	2	4
2002	50	1	2	6	20	4	4	2	4
3003	50	1	2	6	20	4	5	2	5
3004	60	1	2	6	18	4	5	2	4
3005	60	1	2	6	18	4	5	2	4
3006	60	1	2	6	22	4	5	2	4
3009	60	1	2	6	18	4	5	2	4
3010	80	1	2	6	18	4	5	2	4
4001	50	1	2	8	18	4	4	2	4
4002	100	1	2	8	18	4	4	2	4
4004	50	1	2	6	18	4	4	2	4
5001	50	1	2	6	18	4	4	2	
5002	100	1	2	6	18	4	4	2	4
5004	80	1	2	8	22	4	4	2	4
5005	60	1	2	8	18	4	4	2	4
5006	60	1	2	6	18	4	4	2	4
5007	100	1	2	6	18	4	4	2	4
5008	80	6	22	6	18	4	4	2	4
6001	50	1	2	6	20	4	5	2	4
6003	50	1	2	6	20	4	5	2	4
7001	120	1	2	6	24	5	5	2	4
7002	120	1	2	6	24	5	5	2	4
7003	120	1	2	6	24	5	5	2	4
8001	60	1	2	6	20	4	4	2	4
8003	60	1	2	6	20	4	4	2	4
9001	60	1	2	6	20	4	4	2	4
9004	100	1	2	6	20	4	4	2	4
9005	50	1	2	6	20	4	4	2	4
9006	60	6	24	6	20	4	4	2	4
10001	50	1	2	5	20	4	4	4	4
11001	120	1	2	5	24	4	4	2	4
12001	50	1	2	6	22	4	4	2	4
12002	120	1	2	6	22	4	4	2	4

14.9 Initial panel ordinary Kriging Validation

Visual validation of the OK estimate was carried out by comparing the block estimate with the drill hole data per estimation domain and per prospect area. Swath plots in the X, Y and Z directions were also carried out for the first pass and second pass. Statistical comparison between the average composite grade and mean estimated block grade was calculated and is summarised in Table 14.11.

Table 14.11 Global validation statistics for OK gold grade in estimated domains

Prospect	Domain	1m Composites		Block estimate	Difference	
		Capped Mean	Declustered Mean	AUOK	Decl. /Estimate	Capped/Estimate
KLG	1001	0.67	0.62	0.69	90%	97%
	1002	0.55	0.57	0.64	89%	86%
	1003	0.9	0.86	0.9	96%	100%
	1004	0.97	0.9	0.95	95%	102%
	1005	0.54	0.61	0.5	122%	108%
	1006	0.93	0.87	0.89	98%	104%
	1007	0.88	0.78	0.86	91%	102%
	1008	0.46	0.51	0.47	109%	98%
	1009	0.75	0.72	0.72	100%	104%
	1011	0.55	0.55	0.53	104%	104%
	1012	0.45	0.42	0.37	114%	122%
	1014	0.51	0.54	0.4	135%	128%
	1015	0.36	0.38	0.35	109%	103%
	1016	0.45		0.46		98%
VAKO	2001	0.39	0.41	0.35	117%	111%
	2002	0.54	0.55	0.54	102%	100%
SWA	3003	0.9	0.86	0.92	93%	98%
	3004	1.14	1.07	1.09	98%	105%
	3005	0.4	0.44	0.41	107%	98%
	3006	1.73	1.66	1.74	95%	99%
	3009	0.69	0.72	0.69	104%	100%
	3010	0.83	0.82	0.78	105%	106%
NOK	4001	1.76	1.53	1.56	98%	113%
	4002	0.41	0.41	0.35	117%	117%
	4004	0.73	0.72	0.67	107%	109%
CHG	5001	0.76	0.76	0.79	96%	96%
	5002	0.65	0.71	0.62	115%	105%
	5004	0.61	0.65	0.56	116%	109%

Prospect	Domain	1m Composites		Block estimate	Difference	
		Capped Mean	Declustered Mean	AUOK	Decl. /Estimate	Capped/Estimate
	5005	0.84	0.79	0.86	92%	98%
	5006	0.27		0.28		96%
	5007	0.49	0.58	0.52	112%	94%
	5008	0.9	0.74	0.74	100%	122%
THN	6001	0.7	0.65	0.67	97%	104%
	6003	0.6	0.71	0.52	137%	115%
HND	7001	0.49	0.53	0.52	102%	94%
	7002	1.3	1.13	1.06	107%	123%
	7003	1.03	0.94	0.95	99%	108%
KEK	8001	0.9	0.85	0.81	105%	111%
	8003	0.73	0.7	0.7	100%	104%
HAN	9001	1.38	1.25	1.26	99%	110%
	9004	0.44	0.49	0.42	117%	105%
	9005	0.66	0.73	0.73	100%	90%
	9006	1.3	1.25	1.14	110%	114%
ENI	10001	0.88	0.87	0.94	93%	94%
NAR	11001	1.08	1.04	1.12	93%	96%
ATI	12001	1.28	1.26	1.16	109%	110%
	12002	0.56	0.58	0.53	109%	106%

14.10 Density and Weathering

DTM wireframes of the weathering surfaces were supplied to Cube by Centamin per prospect area. The following surfaces were modelled:

- Bottom of transported.
- Bottom of saprolite.
- Top of fresh.

Each block model was coded using their corresponding surfaces. Density was assigned as per the weathering status, which was that which was used in the H&SC MRE report and is summarised in Table 14.12.

Table 14.12 Assigned weathering code and corresponding density.

weathering status	weathering code	Density
Transported	3	2.01
Saprolite	2	2.05
Transition	1	2.53
Fresh	0	2.7

14.11 Localised Uniform Conditioning Estimate

The Localised Uniform Conditioning (LUC) estimation was undertaken in Isatis Mining Software and represents a combination of linear and nonlinear methods.

For domains 1004, 1006, 1009, 2002, 3003, 3004, 3006, 4001, 5001, 5004, 5005, 8001 and 9001 the OK on panels was re-estimated, followed by a UC and a localisation to provide a SMU scale gold grade estimate. An EDA was undertaken on the composite data within the LUC domains to reconfirm appropriate top limits to reduce the influence of outlier gold grades. The OK panel estimate included the application of top-cuts and the limiting by distance approach in a similar approach to the initial OK block estimates. Table 14.13 provides details of the domains which had a distance limit applied during estimation.

Table 14.13 LUC Domain OK estimate distance limits applied.

	Domain	DistLim Threshold	Distance
KLG	1004	9	25
	1006	9999	9999
	1009	9999	9999
VAKO	2002	9999	9999
SWA	3003	25	25
	3004	30	25
	3006	40	25
NOKPA	4001	30	25
CHEGUE	5001	20	25
	5004	10	25
	5005	20	25
KEK	8001	30	25
HAN	9001	40	25

UC and LUC require specific constraints and assumptions, listed below:

- The grade architecture must be diffusive, i.e., the transition from low grade to high grade is continuous and gradual.
- The variable of interest (gold in this case) must be bi-Gaussian.

Domains should preferably be sufficiently informed to provide the variogram modelling process with some short scale information.

At Doropo, the drill spacing is relatively wide and so the SMU grade distribution produced by the LUC will be of medium to low confidence. While LUC is the method recommended by Cube to reproduce variability at local scale, it does not replace drilling data and results are only robust in the areas sufficiently drilled within the experimental variogram ranges. In this case, the ranges of the variograms are less than the drill spacing which potentially creates geometric artefacts in the LUC and impacts the robustness of any estimate.

To minimise this artefact, the LUC was limited to within the best-informed areas. Panel estimates are provided in less informed areas.

Quantitative Kriging Neighbourhood Analysis (QKNA)

A QKNA was performed on the main domains (1009, 3006 and 5005) to define the best estimation neighbourhood for the OK panel step of the LUC process. Those have then been reviewed and optimised to provide the best estimate on panel support both locally and globally.

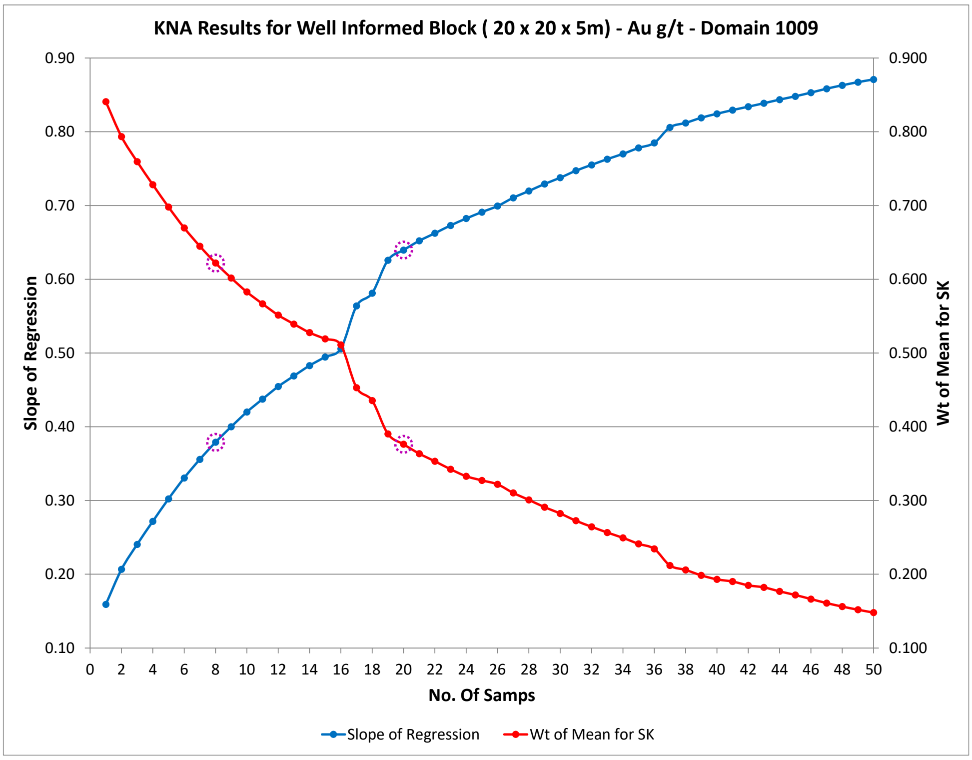


Figure 14.16: KNA Analysis of domain 1009.

Figure 14.16 shows the KNA plot for domain 1009 from which the minimum and maximum composite data used was selected.

LUC Estimation validation

At completion of the LUC process the estimated domains were validated. Validation was performed both locally and globally for each domain via careful analysis of the statistics of the estimated values against the input datasets, visual cross-section checks and swath plots. The global domain validation shows no material bias in the estimates and generally close correlation of composite grade and estimated grade as shown in Table 14.14.

Table 14.14 Global mean comparison of composites to LUC/OK estimated grade.

Domain	Variable	N	Min	Max	Mean	Std Dev	CoV
1004	Composites (undecl.)	1,470	0.005	20	0.97	1.71	1.77
	Composites (decl.)	1,470	0.005	20	0.74	1.33	1.79
	luc_ok_au_ppm	195,561	0.03	11.11	0.81	0.77	0.95
1006	Composites (undecl.)	2,162	0.005	13.28	0.93	1.13	1.22
	Composites (decl.)	2,162	0.005	13.28	0.84	1.04	1.24
	luc_ok_au_ppm	141,930	0.069	8.51	0.9	0.61	0.67
1009	Composites (undecl.)	1,167	0.005	13.46	0.75	1.08	1.44
	Composites (decl.)	1,167	0.005	13.46	0.63	1.03	1.65
	luc_ok_au_ppm	159,509	0.021	6.18	0.67	0.52	0.78
2002	Composites (undecl.)	1,658	0.005	8	0.54	0.78	1.43
	Composites (decl.)	1,658	0.005	8	0.54	0.73	1.35
	luc_ok_au_ppm	157,798	0.014	4.77	0.56	0.41	0.74
3003	Composites (undecl.)	2,850	0.005	45	0.88	2.95	3.36
	Composites (decl.)	2,850	0.005	45	0.79	2.6	3.28
	luc_ok_au_ppm	143,171	0.057	16.39	0.87	1.04	1.2
3004	Composites (undecl.)	1,374	0.005	45	1.13	3.46	3.07
	Composites (decl.)	1,374	0.005	45	0.93	2.79	3.01
	luc_ok_au_ppm	46,302	0.092	14.18	0.98	1.02	1.04
3006	Composites (undecl.)	1,701	0.005	80	1.69	5.74	3.39
	Composites (decl.)	1,701	0.005	80	1.81	6.48	3.58
	luc_ok_au_ppm	70,339	0.095	29.4	1.79	1.98	1.11
4001	Composites (undecl.)	2,285	0.005	60	1.76	4.84	2.75
	Composites (decl.)	2,285	0.005	60	1.18	3.3	2.8
	luc_ok_au_ppm	128,065	0.066	22.74	1.31	1.51	1.16
5001	Composites (undecl.)	2,119	0.005	20	0.77	1.52	1.97
	Composites (decl.)	2,119	0.005	20	0.64	1.1	1.73
	luc_ok_au_ppm	172,576	0.078	8.04	0.65	0.53	0.82
5004	Composites (undecl.)	1,118	0.005	15	0.51	1.27	2.46
	Composites (decl.)	1,117	0.005	15	0.45	1.02	2.28
	luc_ok_au_ppm	96,844	0.016	5.12	0.44	0.33	0.76
5005	Composites (undecl.)	1,587	0.005	40	0.79	2.83	3.57
	Composites (decl.)	1,587	0.005	40	0.77	2.5	3.24

Domain	Variable	N	Min	Max	Mean	Std Dev	CoV
	luc_ok_au_ppm	98,729	0.052	20.27	0.78	1.05	1.33
8001	Composites (undecl.)	1,427	0.005	35	0.89	2.6	2.94
	Composites (decl.)	1,427	0.005	35	0.76	2.13	2.81
	luc_ok_au_ppm	123,373	0.058	9.45	0.77	0.74	0.96
9001	Composites (undecl.)	1,578	0.005	80	1.38	5.29	3.85
	Composites (decl.)	1,578	0.005	80	0.84	2.92	3.49
	luc_ok_au_ppm	127,419	0.078	23.26	0.84	0.99	1.17

Swath plots of domains 4001, 2002 and 1009 by Easting, Northing and RL are displayed in Figure 14.17 to Figure 14.19.

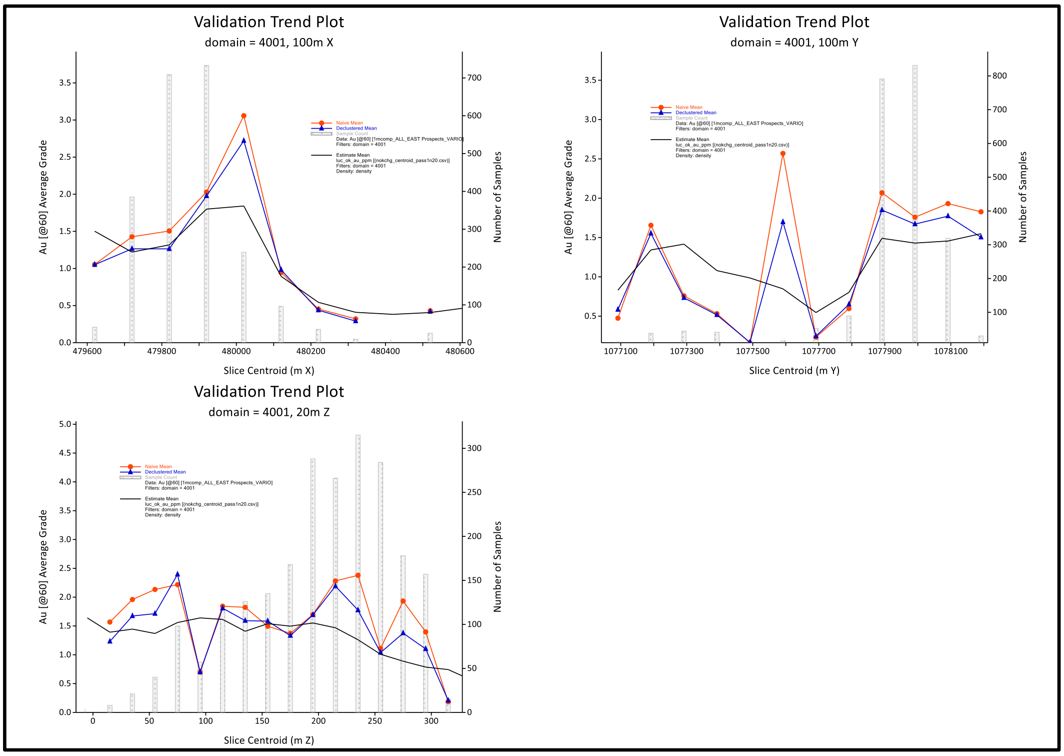


Figure 14.17: Swath plot validation of LUC/OK gold estimation Domain 4001

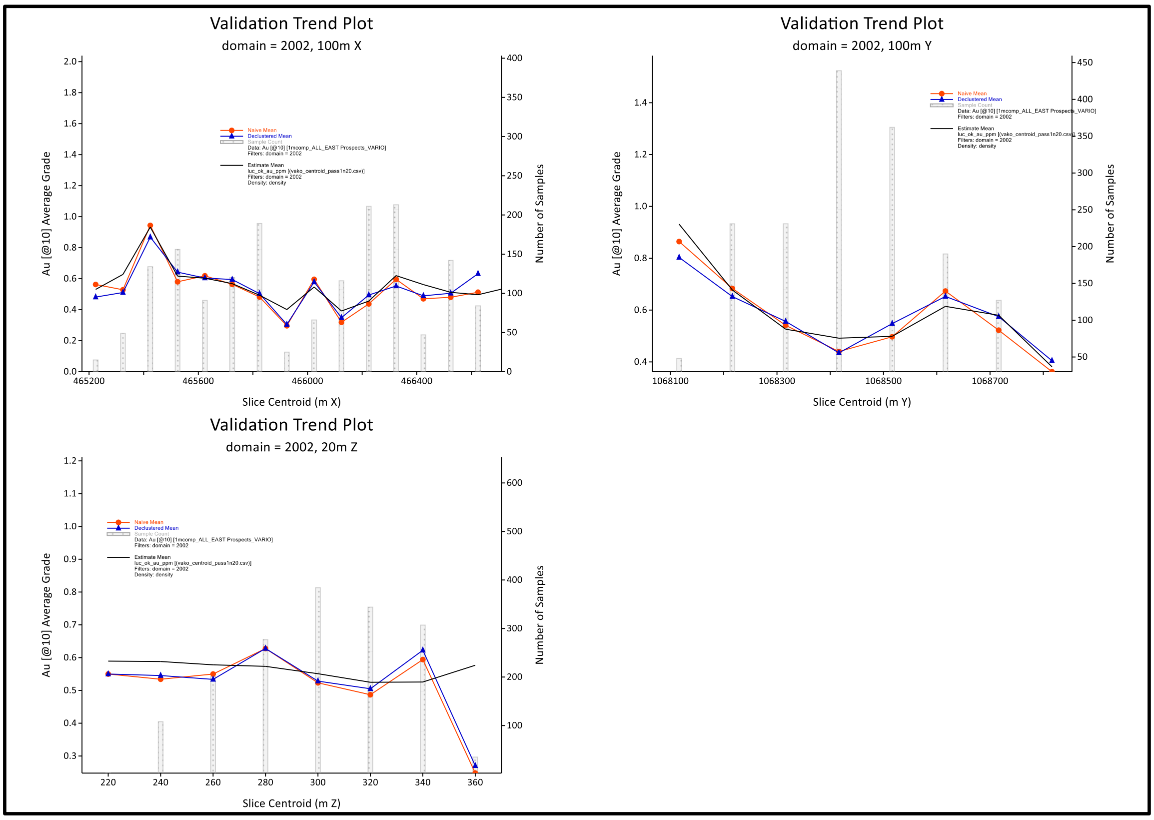


Figure 14.18: Swath plot validation of LUC/OK gold estimation Domain 2002

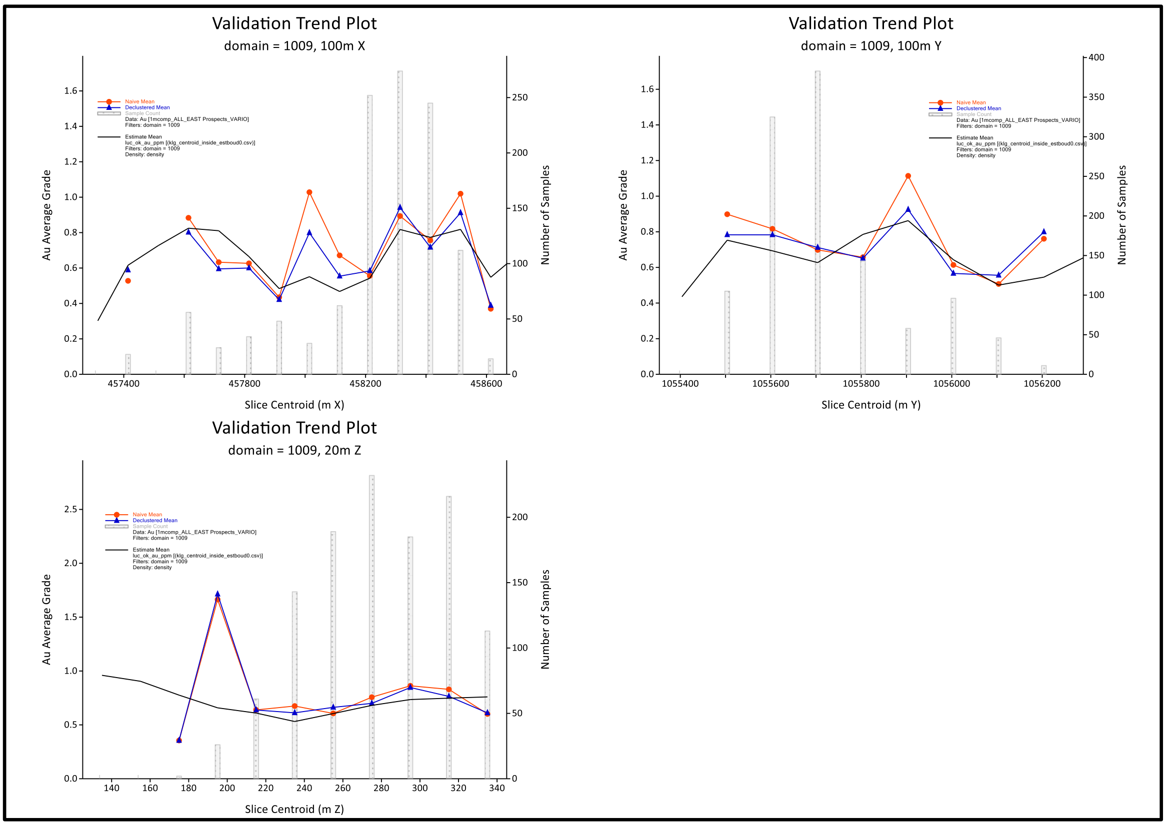


Figure 14.19: Swath plot validation of LUC gold estimation Domain 1009

14.12 Classification and reporting

H&SC 2020 MIK estimates have been classified as Measured, Indicated, and Inferred. Cube has recommended classifications of Indicated and Inferred based primarily on the estimation quality parameters, including the quality of the domain variograms, the conditional bias slope and average distance to informing data.

Figure 14.20 and Figure 14.21 show Nokpa Inferred and Indicated and Nokpa Indicated Mineral Resources respectively. The Indicated volume has been defined using a 3DM interpreted on oblique sections to encompass the mineralisation within the infilled drill pattern at Nokpa. The mineralisation classified as Indicated at Nokpa has been estimated using composite data within an average of 25 m and exhibits a conditional bias slope average of 0.26. The mineralisation classified as Inferred at Nokpa has been estimated using composite data within an average of 50 m and exhibits a conditional bias slope average of 0.09.

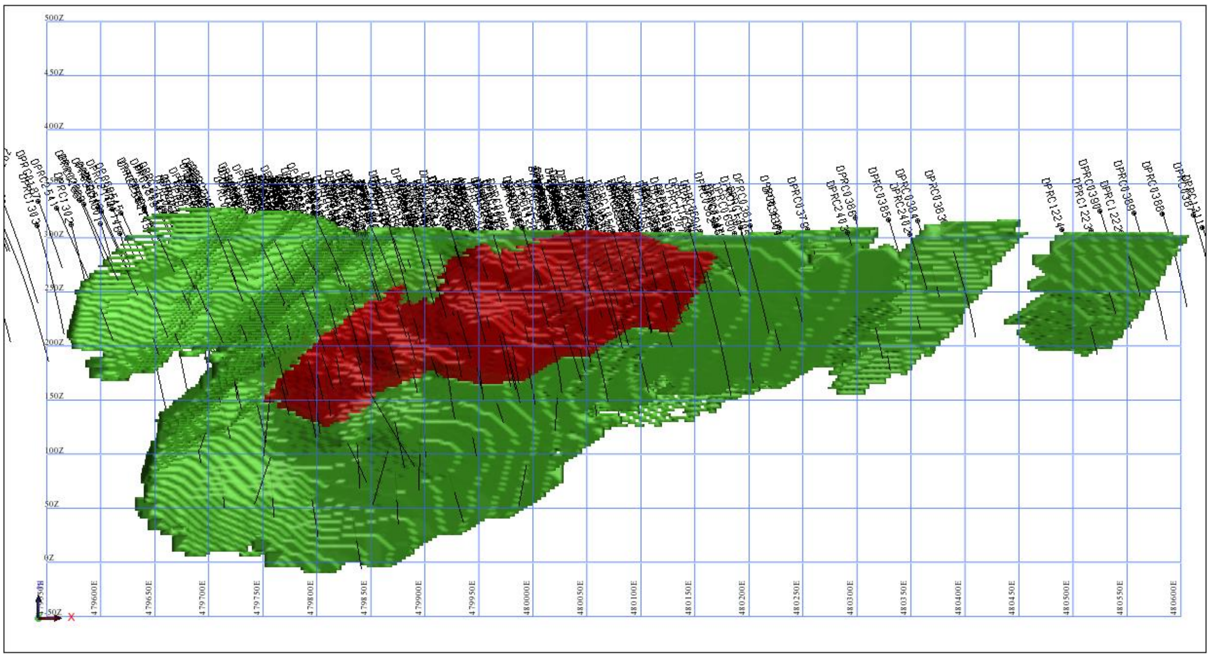


Figure 14.20: Long section View of Nokpa Indicated and Inferred.

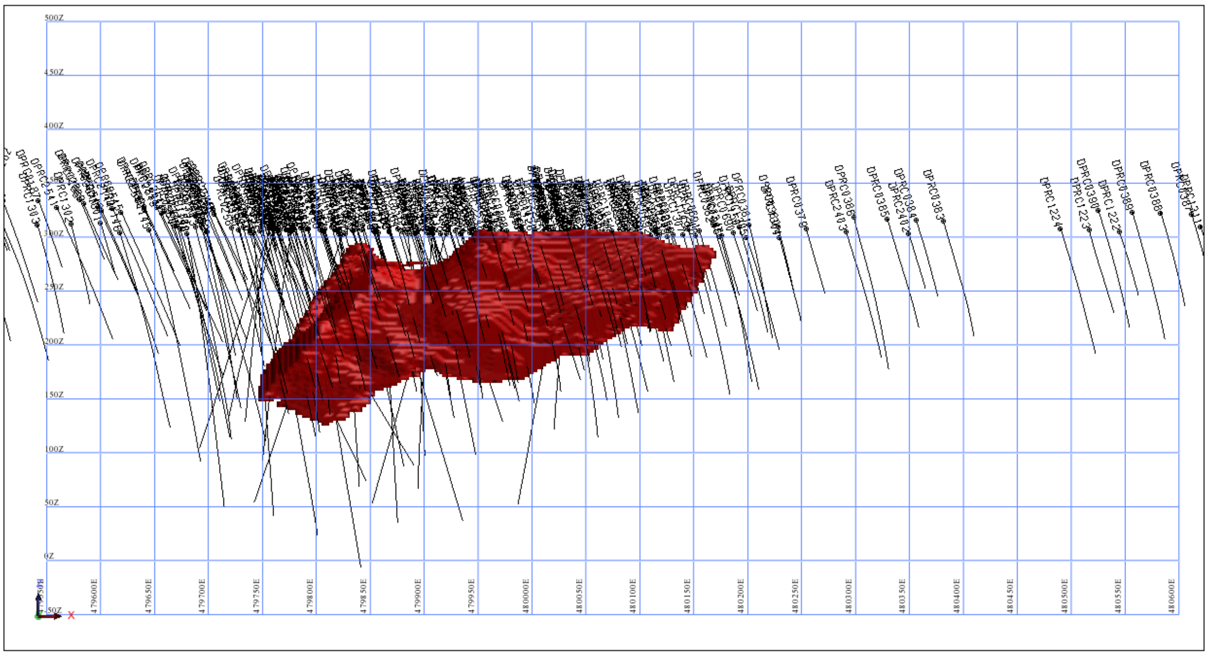


Figure 14.21: Long section View of Nokpa Indicated.

Both the H&SC and Cube estimates have used the same density assignment strategy and differences are not material.

The H&SC MRE has been reported by prospect above a 0.5 g/t gold cut-off, a maximum distance from informing composite data of 80 m and with reasonable expectations of economic extraction defined using a depth below surface. This depth below surface varies between 250 m and 175 m between prospect areas.

The Cube LUC/OK estimates have been reported at 0.5 g/t gold cut-off and within a maximum average distance to composite data of 80 m. The use of a depth below surface limit on the reported Cube estimates has no material impact on the comparison to the H&SC MRE and at the time of this report work was underway to produce optimisation shells on each prospect an aid to defining the reasonable prospects of eventual economic extraction.

14.13 Conclusion

While all efforts have been made to provide the best estimate by combining linear and nonlinear estimation techniques, the drill spacing is often not sufficient to ensure robust and reliable results. Most of the drilling is currently on a 50 x 50 m pattern, with a minor area at NOK at a 25 x 25 m pattern. In fact, as seen in the variographic analysis, density of information did not make possible the choice of a plunge direction of the mineralisation and there are no structures in the semi-major direction. Poor variograms will have an impact on the estimation robustness. LUC was limited to domains with sufficient drilling density.

With only a small number of additional drill holes across the Doropo Project between the 2019 H&SC and 2020 Cube estimates the expectation is that only minor differences will be reported between the models.

The H&SC MRE was undertaken using MIK within mineralised domains generally defined on a 0.07 g/t Au cut-off and an assumed selectivity of 5 x 12.5 x 5 m (E, N, RL). The estimates were made into a panel size of 50 m on strike, 25 m across strike and 10 m vertical. These panel estimates used a minimum of 16 and a maximum of 48 composite data. The MIK proportioning of grade above cut-off used an assumed minimum SMU of 12.5 m on strike, 5 m across strike and 1.5 m vertical.

Cube OK estimates have been made into panels of 20 x 20 x 5 m, generally using a minimum of 8 and a maximum of 24 composite data. The portions of the Cube models estimated by LUC have an assumed SMU of 5 x 5 x 2.5 m, which is significantly smaller than the H&SC MIK but similar enough for comparison.

The reported H&SC MRE 2019 has been classified as Measured, Indicated and Inferred and limited by depth below surface, a maximum extrapolation of 80 m from informing data and above a cut-off of 0.5 g/t Au. The comparison tonnages and grades reported from Cube models have been limited to classified blocks within an average of 80 m from informing data and above 0.5 g/t Au.

Table 14.15 Souwa – Reported by H&SC above 250 m below topography and above a 0.5 g/t Au cut-off.

Estimate	Mt	Au g/t	Moz gold
H&SC 2019	25.52	1.34	1.10
Cube 2020	23.65	1.31	1.00
Change	-1.87	-0.03	-0.10
Change %	-7%	-2%	-9%

Souwa correlates within expectations given the SMU differences between Cube and H&SC.

Table 14.16 Nokpa – Reported by H&SC above 250 m below topography and above a 0.5 g/t Au cut-off.

Estimate	Mt	Au g/t	Moz gold
H&SC 2019	9.01	1.34	0.39
Cube 2020	10.72	1.66	0.57
Change	1.72	0.33	0.18
Change %	19%	24%	46%

The Nokpa Cube estimate reports a significantly higher grade above cut-off with similar tonnes. Nokpa domain 4001 has been estimated by LUC and the validation of this domain appears to be sound. Domain 4001 contributes the majority of metal and the conclusion is that the Cube LUC estimate of grade and tonnage differs from H&SC due to the use of fewer composite data by Cube into smaller panels. This has the potential to deliver more metal per panel as the higher-grade composites are not swamped by excessive numbers of low grade composite data. However, this conclusion remains speculative in the absence of a more detailed analysis of the H&SC estimation approach.

Table 14.17 Chegue Main - Reported by H&SC above 220 m below topography and above a 0.5 g/t Au cut-of.

Estimate	Mt	Au g/t	Moz gold
H&SC 2019	7.61	1.02	0.25
Cube 2020	10.52	1.05	0.36
Change	2.91	0.03	0.11
Change %	38%	3%	42%

The Chegue Main Cube LUC estimate produces significantly more tonnes above cut-off than H&SC. Checks on the depth above which the resources were reported show no volume reported by Cube lies below 220 m.

Table 14.18 Chegue South - Reported by H&SC above 250 m below topography and above a 0.5 g/t Au cut-of.

Estimate	Mt	Au g/t	Moz gold
H&SC 2019	10.36	1.27	0.42
Cube 2020	10.48	1.11	0.37
Change	0.12	-0.16	-0.05
Change %	1%	-12%	-11%

The Chegue South LUC correlates within expectations given the SMU differences between Cube LUC and H&SC.

Table 14.19 Tchouahinin - Reported by H&S C above 180 m below topography and above a 0.5 g/t Au cut-of.

Estimate	Mt	Au g/t	Moz gold
H&SC 2019	2.44	0.99	0.08
Cube 2020	4.64	0.99	0.15
Change	2.20	0.00	0.07
Change %	90%	0%	84%

The Cube Tchouahinin estimate is an OK on panel support and could be expected to produce more tonnes at a lower grade than the H&SC MIK.

The difference in tonnes at Tchouahinin can be partly explained by the original interpreted volumes. H&SC mineralisation extended south to 107600m, whereas Cube interpreted well south of 107600m.

Re-reporting Cube limited to 107600m results in 3.92 MT at 0.99 for 0.12 Moz. Still resulting in 61% more volume above cut-off and reporting 50% more metal. The reason for this difference is uncertain given that the details of the H&SC estimation approach are unknown.

Table 14.20 - Kekeda - Reported by H&SC above 150 m below topography and above a 0.5 g/t Au cut-of.

Estimate	Mt	Au g/t	Moz gold
H&SC 2019	5.90	1.06	0.20
Cube 2020	6.48	1.14	0.24
Change	0.58	0.08	0.04
Change %	10%	7%	19%

The Kekeda LUC correlates within expectations given the SMU differences between Cube and H&SC. No reported Cube mineralisation extends below 150 m below topography.

Table 14.21 Han - Reported by H&SC above 170 m below topography and above a 0.5 g/t Au cut-of.

Estimate	Mt	Au g/t	Moz gold
H&SC 2019	6.15	1.37	0.27
Cube 2020	7.78	1.33	0.33
Change	1.63	-0.04	0.06
Change %	27%	-3%	23%

The Han Cube LUC estimate produces significantly more tonnes above cut-off than H&SC. Re-reporting the Cube HAN estimate above 170m below topography reduces the tonnes to 7.75Mt at the same grade, still considerably more than H&S. Again, without specific knowledge of the H&SC estimation approach, the reasons for the observed difference are unknown.

Table 14.22 Enioda - Reported by H&SC above 190 m below topography and above a 0.5 g/t Au cut-of.

Estimate	Mt	Au g/t	Moz gold
H&SC 2019	7.74	1.02	0.25
Cube 2020	10.41	1.09	0.36
Change	2.67	0.07	0.11
Change %	35%	7%	46%

The Enioda Cube estimate is an OK on panel support and could be expected to produce more tonnes at a lower grade than the H&SC MIK. While the extra tonnes can be accounted for by method difference the marginally higher grade is slightly anomalous.

Table 14.23 Hinda - Reported by H&S above 0.5 g/t cut-off.

Estimate	Mt	Au g/t	Moz gold
H&SC 2019	2.08	0.98	0.07
Cube 2020	1.82	0.92	0.05
Change	-0.26	-0.06	-0.02
Change %	-13%	-7%	-23%

The Hinda Cube estimate is an OK on panel support and could be expected to produce more tonnes at a lower grade than the H&SC MIK.

Hinda correlates within expectations given the estimation differences between Cube and H&SC.

Table 14.24 Nare - Reported by H&SC above 0.5 g/t cut-off.

Estimate	Mt	Au g/t	Moz gold
H&SC 2019	0.79	0.79	0.02
Cube 2020	0.89	1.12	0.03
Change	0.10	0.33	0.01
Change %	13%	41%	60%

The Nare Cube estimate is an OK on panel support and could be expected to produce more tonnes at a lower grade than the H&SC MIK.

Table 14.25 Kilosegui - Reported by H&SC above 0.5 g/t cut-off.

Estimate	Mt	Au g/t	Moz gold
H&SC 2019	14.06	0.99	0.45
Cube 2020	43.98	1.02	1.44
Change	29.92	0.03	0.99
Change %	213%	4%	221%

The Cube Kilosegui estimate is an OK on panel support and could be expected to produce more tonnes at a lower grade than the H&SC MIK.

The difference in tonnes at Kilosegui can be partly explained by the original interpreted volumes. H&SC mineralisation terminated at 105475mN, whereas Cube interpreted north of 105475m. Significant more drilling (~39.5km) had occurred between models which has impacted the tonnes and grade.

Re-reporting Cube limited to 105475m results in 21.23 MT at 1.05 for 0.72 Moz, which still results in 51% more volume above cut-off and reporting 59% more metal.

Overall, the check estimates undertaken by Cube have failed to confirm the reported H&SC MIK estimates. A significant amount of work will be required to cross check the H&SC 2019 estimate with Cube estimates to identify what the source of the differences are. Small variations are expected given, the different base panel sizes used, and the significantly different numbers of composite data used. H&SC have used a materially larger number of composites to estimate their panels, yielding a smoothed panel outcome. However, other unknown factors must also be at play, as demonstrated by the Cube OK panel estimates consistently predicting more metal than H&SC MIK outcomes.

At this stage, the most significant contributing factor seems to be that the current drill data spacing is inadequate to support robust nonlinear estimation either by LUC or MIK, leaving great leeway for disparate outcomes. The drill spacing and variability of the domain composite data alone would indicate to Cube that many of the estimated resources should be classified as Inferred at best.

15 MINERAL RESERVE ESTIMATES

15.1 Mineral Reserve Estimates

A Mineral Reserve has not been estimated for the Project as part of this PEA. The PEA includes only Inferred Mineral Resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as Mineral Reserves.

15.2 Mining Methods

The Inferred Mineral Resources used in this PEA are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as Mineral Reserves, and there is no certainty that the PEA will be realized. The words “production”, “mineable” and “mine plan” are used in the PEA in an operational sense and not in an accounting sense.

16 MINING METHODS

Cube Consulting ("Cube") was engaged by Centamin PLC ("Centamin") to carry out Mine Engineering Services as part of this PEA effort for the Doropo Gold Project in Ivory Coast, West Africa. The work involved open pit optimisations, based on supplied preliminary resource models, with costs and geotechnical parameters based on the recent Batie West Optimisation study, which geographically is some 30 km to the East. Open pit optimisations were completed for each pit and mine production scheduled of the selected shells.

Pit optimisation were completed for each of the deposits identified in the mineral resource estimate. Using typical input parameters, an economic assessment was made during the optimisation and for reasons including economics, low grade and small size of the deposit, Tchouahinan, Nare, Hina and Vako were excluded from the current evaluation and the mining estimates generated. There may be potential to re-evaluate these deposits during future project study phases.

An annualised pit production schedule was produced with the primary aim of supplying ore grade material to the processing facility at a rate of 4.0 Mtpa for fresh ore and 4.5 Mtpa for the softer oxide and transition ores. This feed rate was achieved with a plant feed schedule and associated run of mine stockpile to facilitate a constant ore feed supply approximately eleven years and at an average grade of 1.30 g/t Au over the LOM

16.1 Input Parameters

The Project basis is a contract mining operation, delivering nominally 4.0 Mtpa of ore to the ROM pad annually based on 100% fresh ore feed. The process plant will operate with campaign feed periods alternating between free milling (direct leaching) and semi-refractory (fine grinding of a flotation concentrate) ores. The plant feed will be structured to suit the mine production while trying to maintain a target gold production range. The following inputs were used for the initial pit optimisation modelling.

Table 16.1 Input Parameter for Pit Optimisation.

	Item	Unit		Comment
Mining	Basic L&H rates Basic D&B rates	$/bcm $/bcm	Variable Variable	
Mining Dilution		% Ox % Tr % Fr	5 5 5	
Mining Recovery		% Ox % Tr % Fr	100 100 100	
Throughput	Oxide Transitional Fresh CIL	Mtpa Mtpa Mtpa	4.50 4.50 4.00	
Process Cost	Oxide Transitional Fresh CIL	$/t ore $/t ore $/t ore	9.45 10.58 15.02	
G&A Cost	Oxide Transitional Fresh CIL		2.31 2.80 2.89	
Mining Handling Cost (ROM)	Ore Handling ROM	$/t ore	0.10	

	Item	Unit		Comment
	Ore Overhaul	$/t ore	0.47	
Total Ore Cost	Oxide Transitional Fresh CIL	$/t ore $/t ore $/t ore	11.39 12.95 17.26	
Cut-off	Oxide Transitional Fresh CIL	g/t g/t	0.30 0.30 0.40	
Process Recovery (%)	Oxide Transitional Fresh CIL	% % %	92.5% 89.8% 88.8%	
	Discount Rate Metal Price Gov Royalties Refining Gold Loss Tenement Royalty based on NSR Refining Charges	% USD$/oz % % % $/Oz	5.0% 1500 4.0% 0.1% 0.75% 3.91	

Table 16.2 Load and Haul Rates

	Unit	Unit Rate $/bcm	Comments
Load Average – Ore & LG	bcm	$ 2.867	Excludes Diesel
Load Average -Waste	bcm	$ 2.092	Excludes Diesel
Flat Haulage	bcm.100m	$ 0.051	Excludes Diesel
Downhill Loaded – Horizontal Distance	bcm.100m	$ 0.029	Excludes Diesel
Uphill loaded – Horizontal Distance	bcm.100m	$0.054	Excludes Diesel

Table 16.3Drill and Blast Rates

Ore Type	Approximate % of Total Volume	Base Rates per BCM blasted	% Blasted	Base Rates per BCM mined	All inclusive with R&F	Comments
Oxide	20%	$ 2.72	25%	$ 0.68	$ 0.68	Free dig with allowance
Transition	10%	$ 2.72	50%	$ 1.36	$ 1.36	Free dig with allowance
Fresh	70%	$ 2.72	100%	$ 2.72	$ 2.72	Based on actual mine contract Sept 2019
					$ 2.18	LoM Average BCM
					$ 0.76	LoM Average Tonnes

Table 16.4Pit Slopes

Rock Type	Inter-ramp Angle	Overall Angle
Oxide	38°	33°
Transition	43°	38°
Fresh	52°	46°

16.2 Methodology

Economic parameters received from Centamin used in completing open pit optimisations using WHITTLE® software, which uses the Lerchs-Grossman algorithm to determine a range of optimal shells at varying metal prices. The program generates economic shells based on input parameters consisting operating costs (mining & processing costs, royalties, selling costs), metallurgical recoveries, geologic and geotechnical (slope) considerations. The optimal pit shells derived from the open pit optimisation are then used to develop open pit mine plans for the deposit. The sections below discuss the parameters used in the pit optimisation process.

All dollars ($) quoted are in 2020 United States (US) dollars unless otherwise specified.

16.3 Mining Dilution and Ore Loss

The models supplied were MIK with information effect adjustments and have been treated as recoverable resource models thereby not requiring additional mining dilution and ore loss factors.

16.4 Metal Processing, Price, Royalties, and Selling Costs

Centamin provided the economic parameters for the project.

16.5 Mining Costs

The mining costs were based on the collective knowledge and experience of Cube and Centamin in relation to similar recent mining operations within the region. They were based on a contract mining model undertaken with the use of standard open pit mining equipment which includes diggers consisting of back-hoe configured excavators in the 100t to 200t class size, loading into circa 100t off-highway mining dump trucks delivering material to the waste dump, stockpiles and ROM pad locations in line with the material classifications. Drilling and blasting is included within the estimated mining costs as part of the contract mining assumption, with drilling and blasting typically assumed to be over 10m bench heights which were planned to be mined in 2.5m to 5m high mining flitches based on grade control determinations for selective mining practices. The mining costs were inclusive of all ancillary mining related activities such as haul road maintenance, face dressing, de-watering, management and supervision of the mining operations.

16.6 Cut-off Grade Calculation

Treatment plant breakeven cut-off grade was calculated to demonstrate a theoretical break-even point within the resources. A theoretical, calculated cut-off was determined by:

$$Cut - Off\ Grade\ (\%) = \frac{Treatment\ Plant\ Costs}{Metal\ Price * (1 - Royalty) * Recovery}$$

Where: *Treatment Plant Costs* = *processing and all ore related costs ($/t)*

Metal Price	=	*Gold price*
Royalty	=	*State Royalty plus land title royalty*
Recovery	=	*Metallurgical Recovery (%)*

The calculated breakeven cut-off grade using the above input parameters is different for each oxidation type and deposit which form part of the input basis for the pit optimisation modelling.

16.7 Pit Optimisations

Optimisations were carried out on the total model (to check deposit boundaries) with two scenarios being run for each based on indicated and inferred only and indicated, inferred and unclassified. The optimisations were evaluated by reviewing theoretical schedules based on a "best-case" and a "worst-case" schedule and an undiscounted cash flow. The best-case scenario simulates the mining of each individual nested shell completely before the next nested shell is mined. This is usually impractical to achieve operationally as the minimum mining width required to mine a stage is far greater than the actual width between the nested shells.

The so-called worst-case scenario simulates the mining of an entire bench of a pit before the next bench is mined. In practice, a compromise between the two cases is generally achievable by staging the pit by using suitable cutbacks. The cash flows as described above exclude capital expenditure or project start-up costs and are used for pit optimisation evaluation as relative values only to assist in the selection of shells on which pit designs can be based.

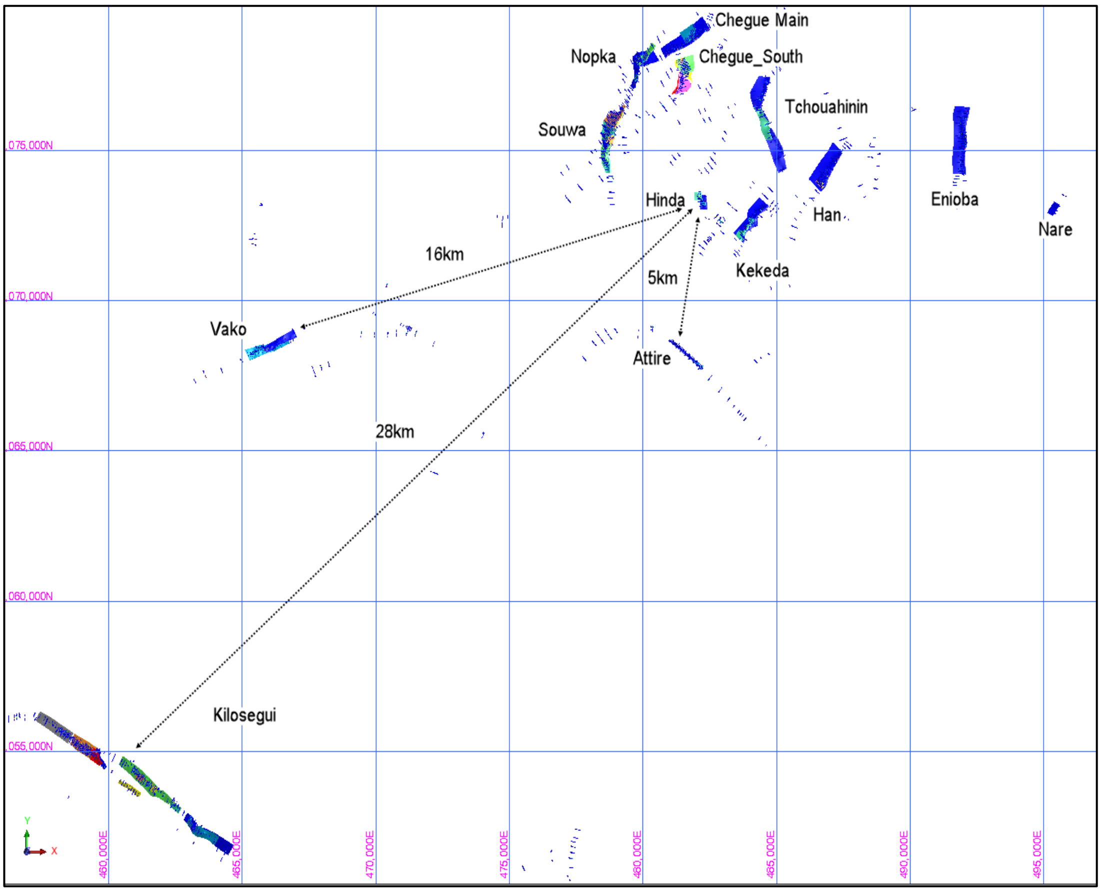


Figure 16.1 Doropo Pit Layout

The mineable Inventory for the ROM mineralisation inside the pit designs is presented in Table 16.5. This includes Inferred resources.

Table 16.5 Mineable Inventory

Pit	Waste Tonnes (Mt)	Strip Ratio	Ore Tonnes (Mt)	Grade (g/t)	Contained Au (Moz)
Souwa	59.30	4.0	14.77	1.27	0.60
Nokpa	30.67	8.3	3.67	1.78	0.21
Chegue Main/South	41.85	4.9	8.59	1.04	0.29
Tchouahinan*					
Kekeda	6.47	2.5	2.57	1.28	0.11
Han	27.46	6.3	4.33	1.51	0.21
Enioda	21.38	5.0	4.31	1.28	0.18
Hinda*					
Nare*					
Kilosegui	62.98	4.1	15.48	1.11	0.55
Atirre	4.52	7.2	0.63	1.64	003
Vako*					
Total	**254.62**	**4.7**	**54.35**	**1.25**	**2.18**

16.8 Pit Designs and Selection

No pit designs were undertaken for this study and the selected pit shells the tonnages of which were factored to simulate ore losses of 5% and waste gains of 10% to simulate anticipated inventories from detailed pit designs.

The following supplies a brief overview of the preliminary level hydrogeological assessment for the Doropo project undertaken by GCS Water and Environmental Consultants. This study will be updated as required to provide input into the pit design in the next phase of study.

- An initial groundwater level survey was undertaken in 2018 on approximately 100 exploration boreholes.
- Identified exploration boreholes were re-measured in 2019 and 2020 to determine any seasonal fluctuations. The additional pit areas of Kilosegui and Vako were added in June 2020. Limited seasonal fluctuations were observed.

Table 16.6 Pit groundwater levels and ranges.

Area	Maximum Pit Depth (m)	Depth of Saprolite (m)	Depth of Groundwater (m, range)	
Souwa Starter	108	54	10	22
Souwa Final Pit	144	60	10	22
Nokpa	150	36	2	4
Chegue Main	84	42	7	16
Chegue South	168	48	4	10
Han	120	18	7	10
Kekeda	90	30	9	13

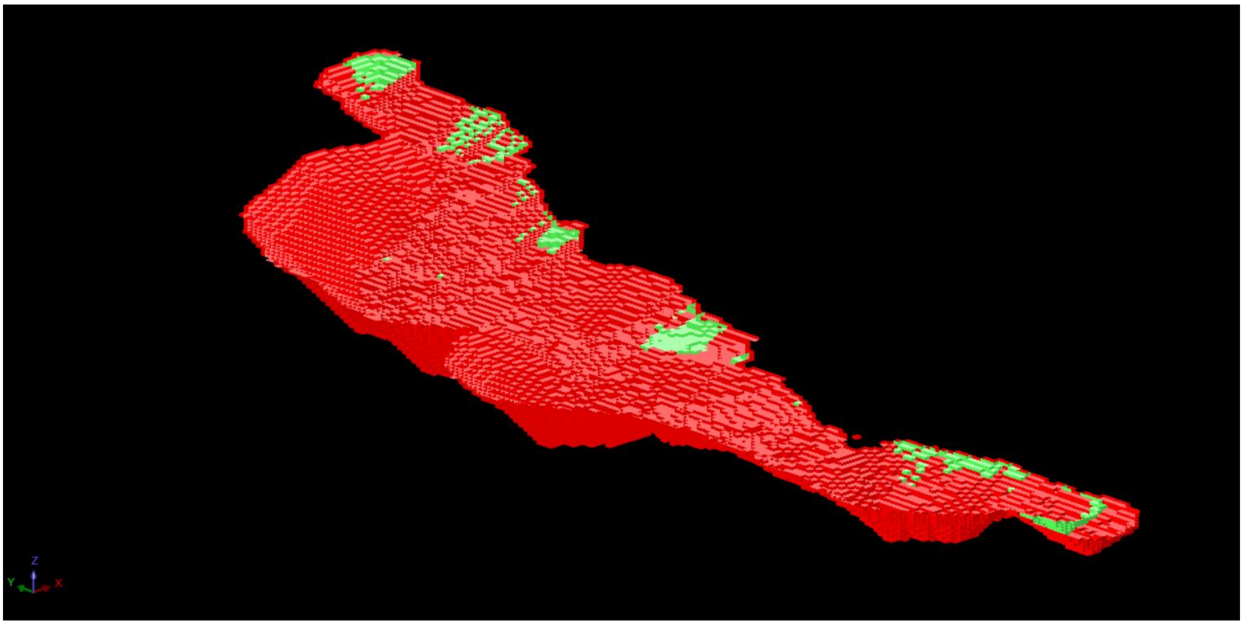
Area	Maximum Pit Depth (m)	Depth of Saprolite (m)	Depth of Groundwater (m, range)	
Enioda	126	48	12	17
Tchouahinin	102	48	8	17
Kilosegui			4	10
Vako			6	12

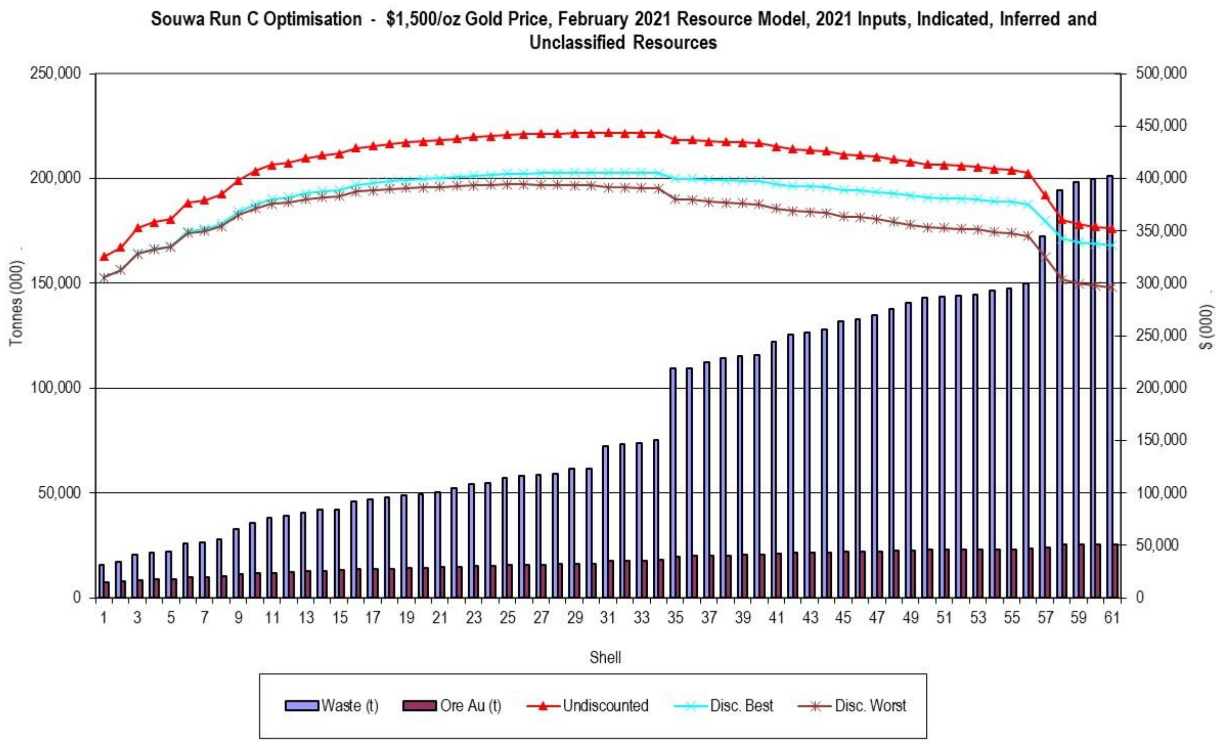
The initial assessment identified a lack of baseline aquifer information and a preliminary hydrogeological assessment was completed to enable a broad understanding of the local and regional hydrogeological characteristics. Eight (8) hydrogeological test boreholes were drilled and pump tested, boreholes were drilled in four (4) pairs, consisting of a shallow (saprolite /saprock aquifer) borehole and a deeper fractured rock aquifer borehole.

Pit Shell Selections

The selected pit shells do not form single pit entities due to the geometry of the orebodies, and the shells were able to be separated into individual pits as follows:

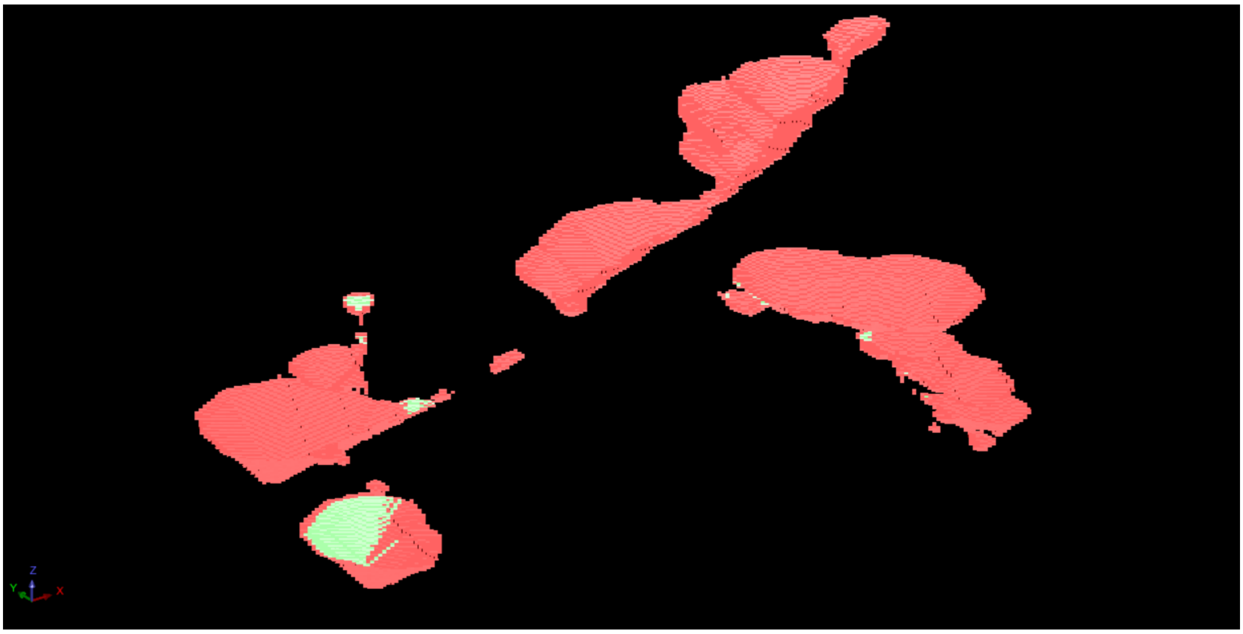
Souwa Pit

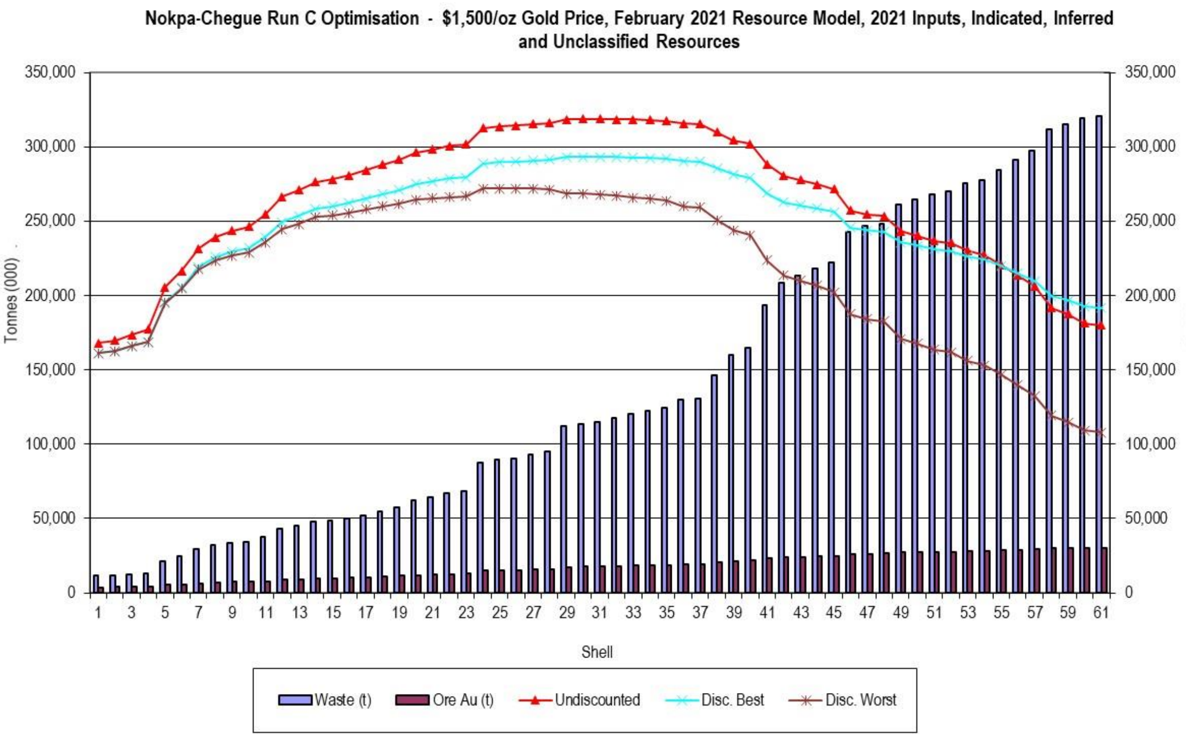




Pit 23 Selected

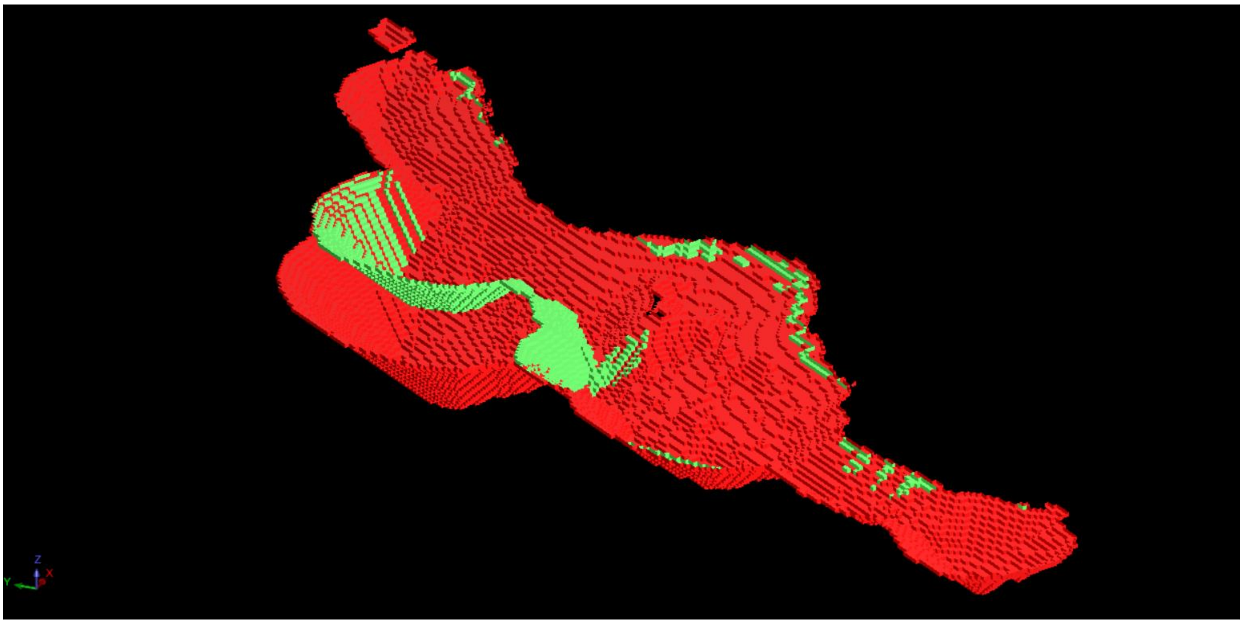
Nokpa and Chegue Pit

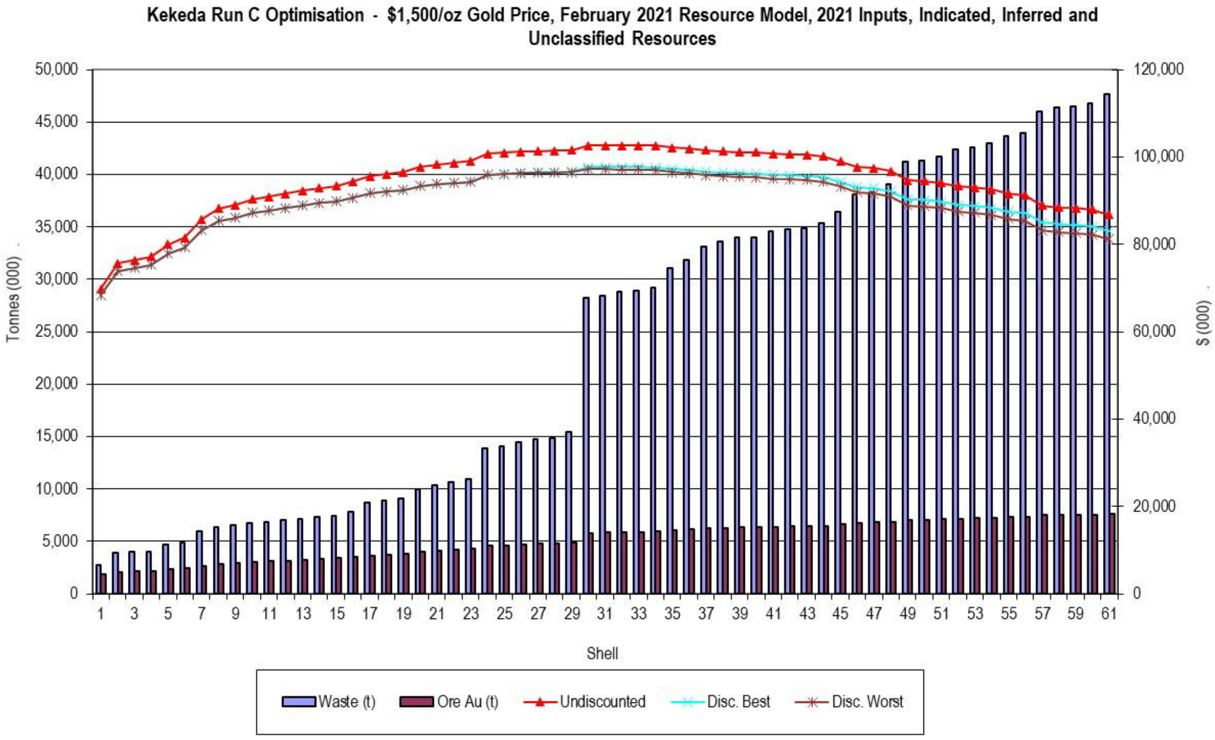




Pit 22 Selected

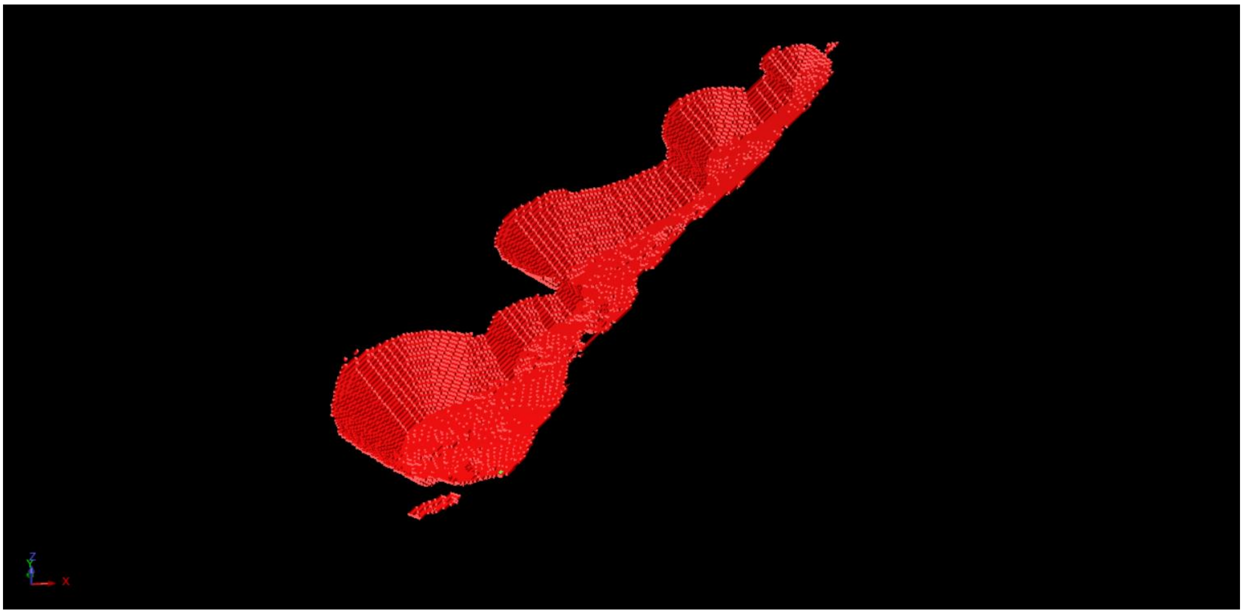
16.9 Kekeda Pit

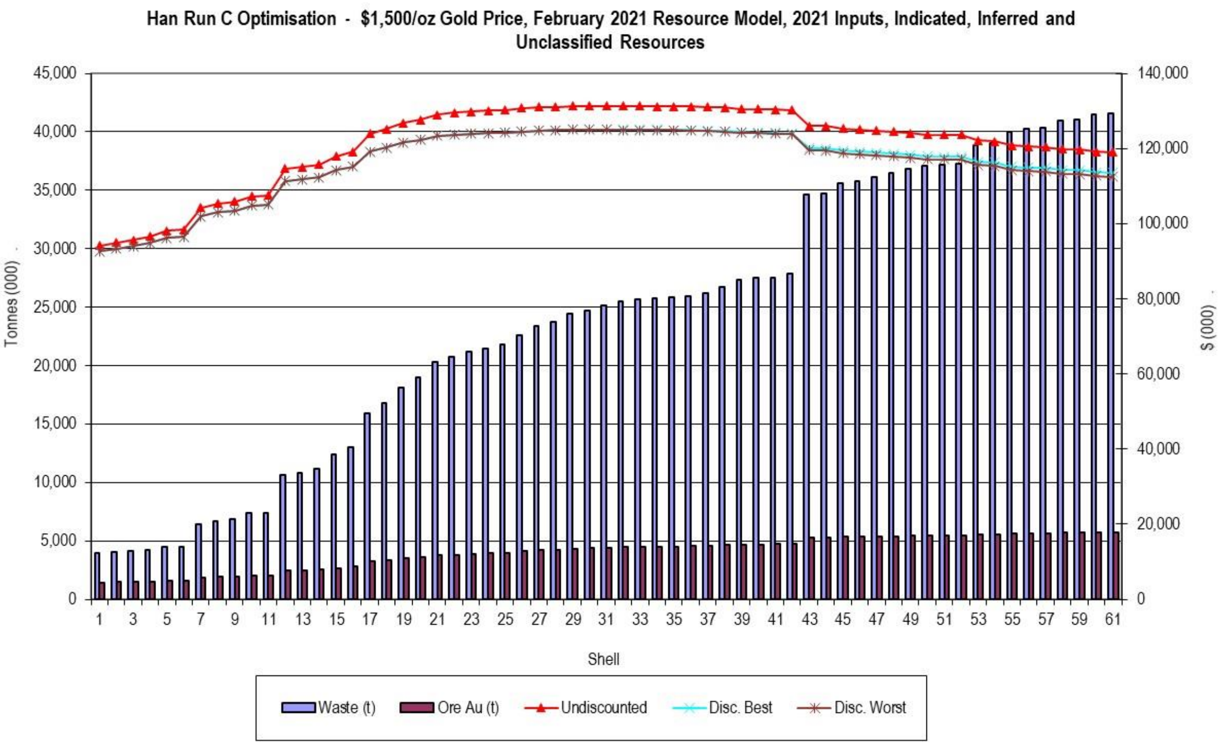




Pit 7 Selected

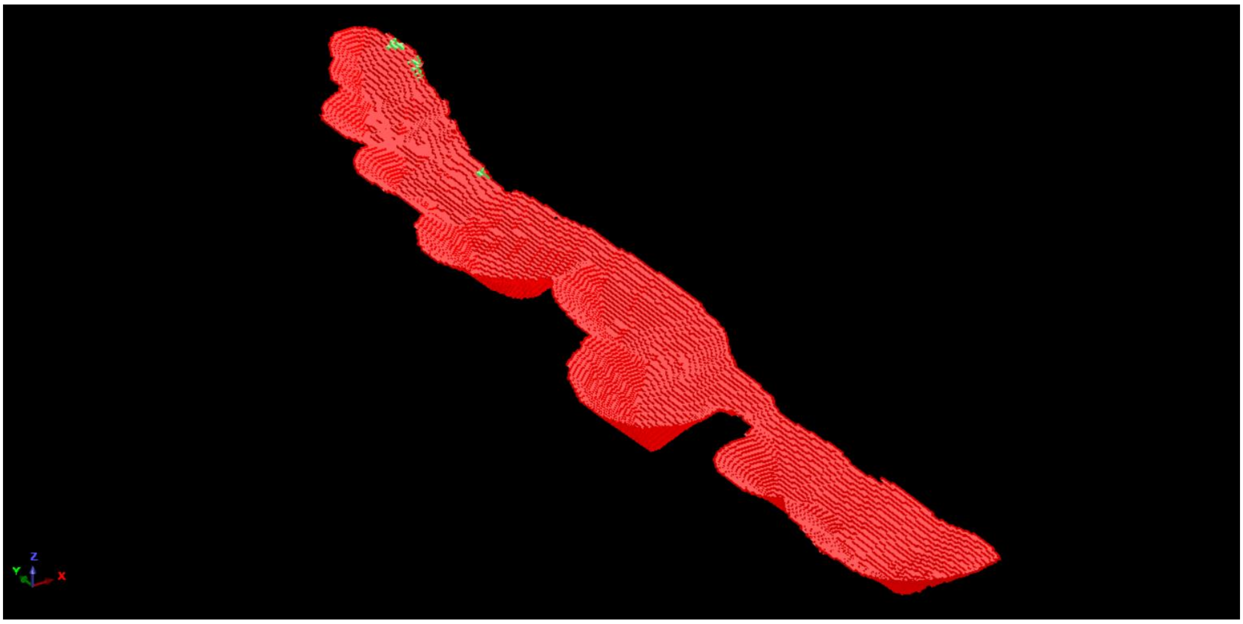
16.10 Han Pit

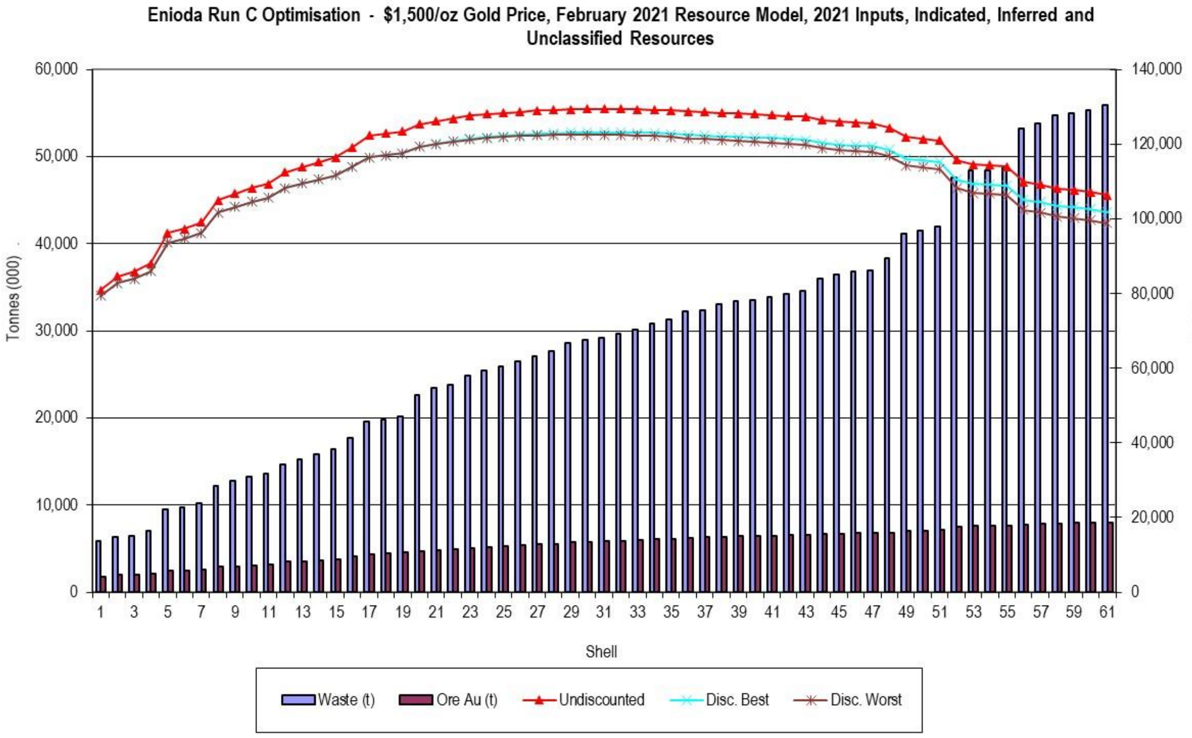




Pit 31 Selected

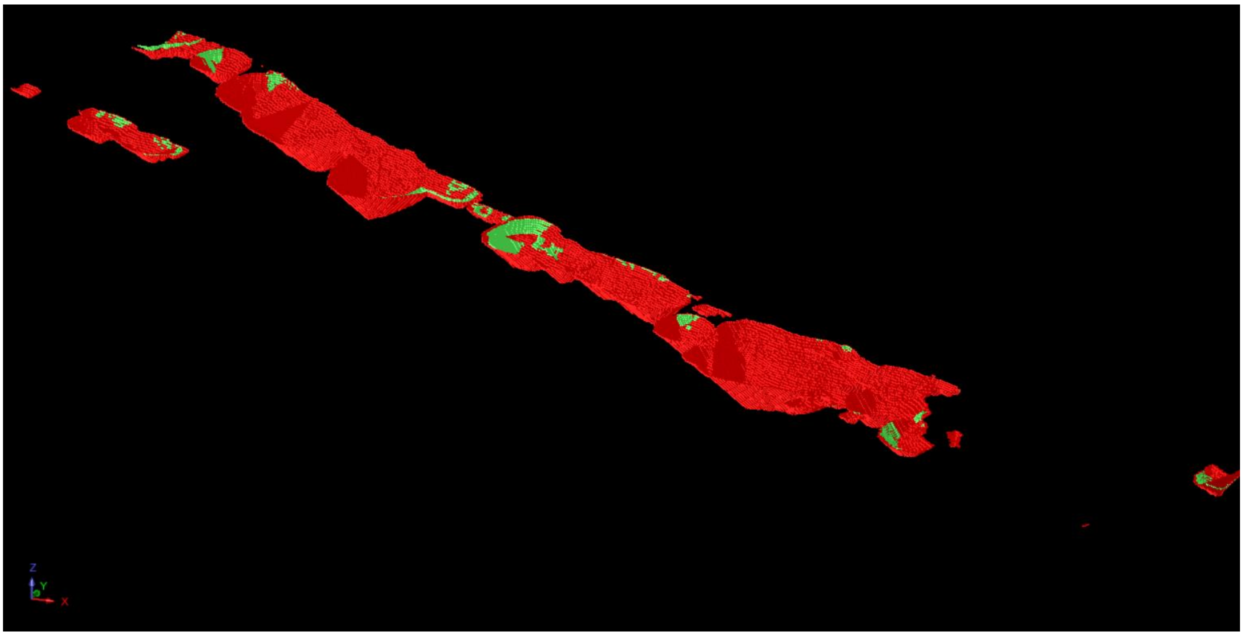
16.11 Enioda Pit

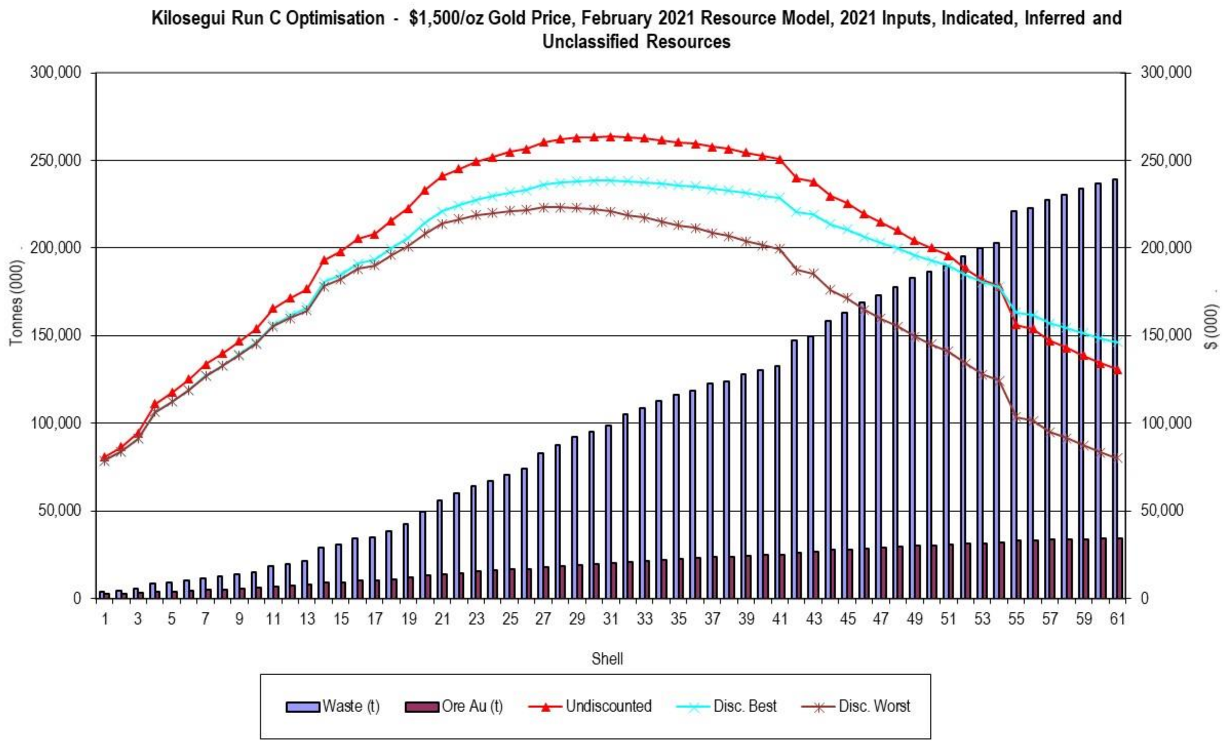




Pit 17 Selected

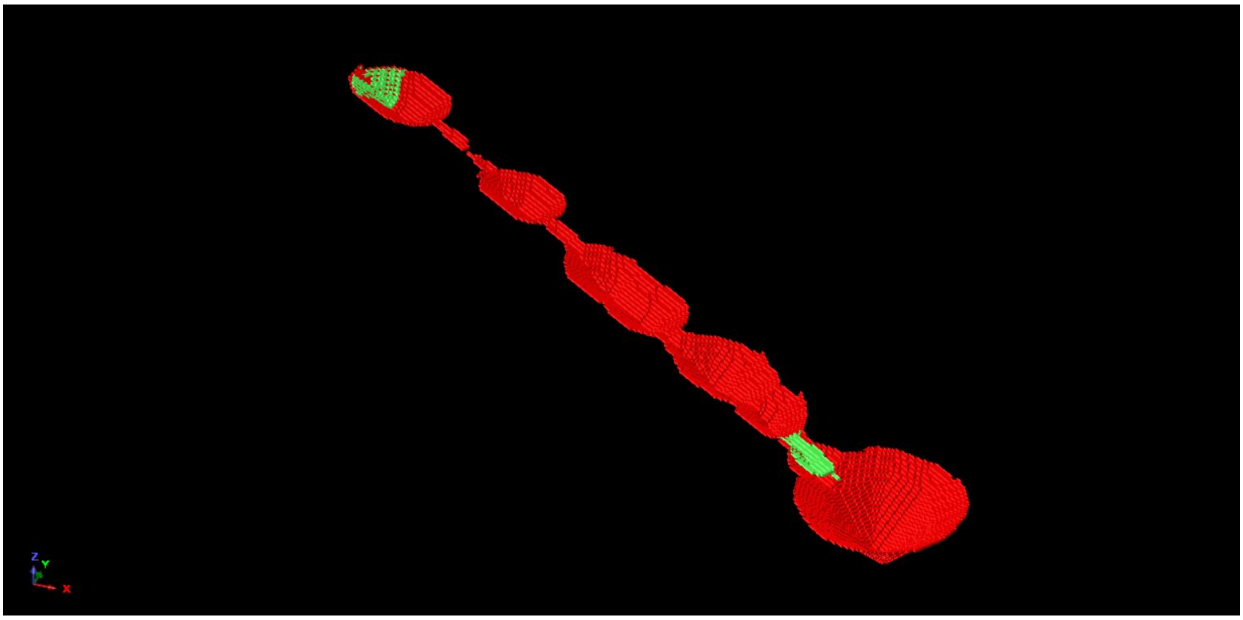
16.12 Kilosegui Pit

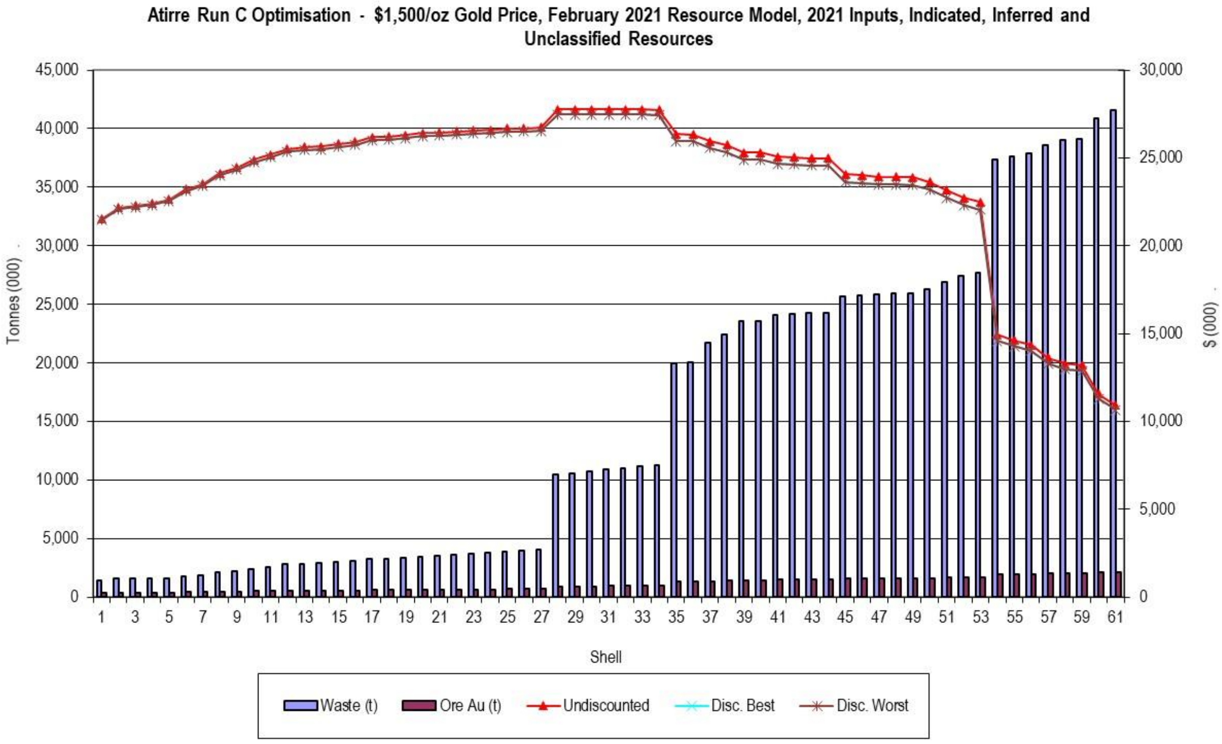




Pit 22 Selected

16.13 Atirre Pit





Pit 28 Selected

16.14 Production Schedule

Cube completed a mining production schedule using the selected pit shells which include staging of the developments. The primary aim of the production schedule was to produce an ore feed within the prescribed design capacity of 4.0 to 4.5 Mtpa plant requirements and utilising limited low grade stockpiling to smooth out production and give marginal improvements in early gold production.

16.15 Scheduling Inputs, Constraints and Drivers

The input parameters used for the scheduling were the same as those previously tabulated.

One of the major scheduling constraints in relation to practical mining is a limit on the vertical rate of advance. This schedule was limited to a vertical advance rate of no more than 70 metres in a 12-month period. This limit is imposed based on Cube's experience of practical bench turn-over rates with this type of mining.

The mining schedule would include a pre-production TMM period of 6.7 Mt during which mining benches are established, ore exposed and waste mined for use in the infrastructure build.

The mining rate was smoothed by running schedule iterations to determine a practical and sensible mining rate. This resulted in upper and lower limits of 27 -25 Mtpa which was maintained for the first 6 years of the 9 year production life of the operation, after which production naturally tapered down as the pits reached their final lower bench limits.

The timing of the pit staging was determined on a project discounted value basis inherent within the scheduling software, MineMax Scheduler. The software also undertakes dynamic stockpile and reclaiming in order to facilitate the smoothed mining profile together with achieving the best available feed grade.

16.16 Schedule Results

The schedule resulted in a eleven year production life during which the processing facility is able to produce at full capacity for the LoM.

Using the above mentioned schedule optimisation software, the resultant schedule brought maximum value forward by mining to bring higher grade forward within the schedule without the need for above average mining rates. This is best illustrated by Figure 16.2 and Figure 16.3 where it can be seen that the average grade mined and processed in the first two years of the schedule is well above the average feed grade for the project.

This is in contrast to previous studies in which mining focussed on accessing the free mill ores ahead of the semi-refractory ores and resulted in much higher pre-production costs prior to processing commencement as well as lower grade ore in the early years of plant processing.

Figure 16.4 illustrates the differentiation of the ore tonnes mined and waste tonnes mined as a result of the strip ratio in the different pits.

Figure 16.2 Tonnes Processed by Oxidation & Mine and Process Grade

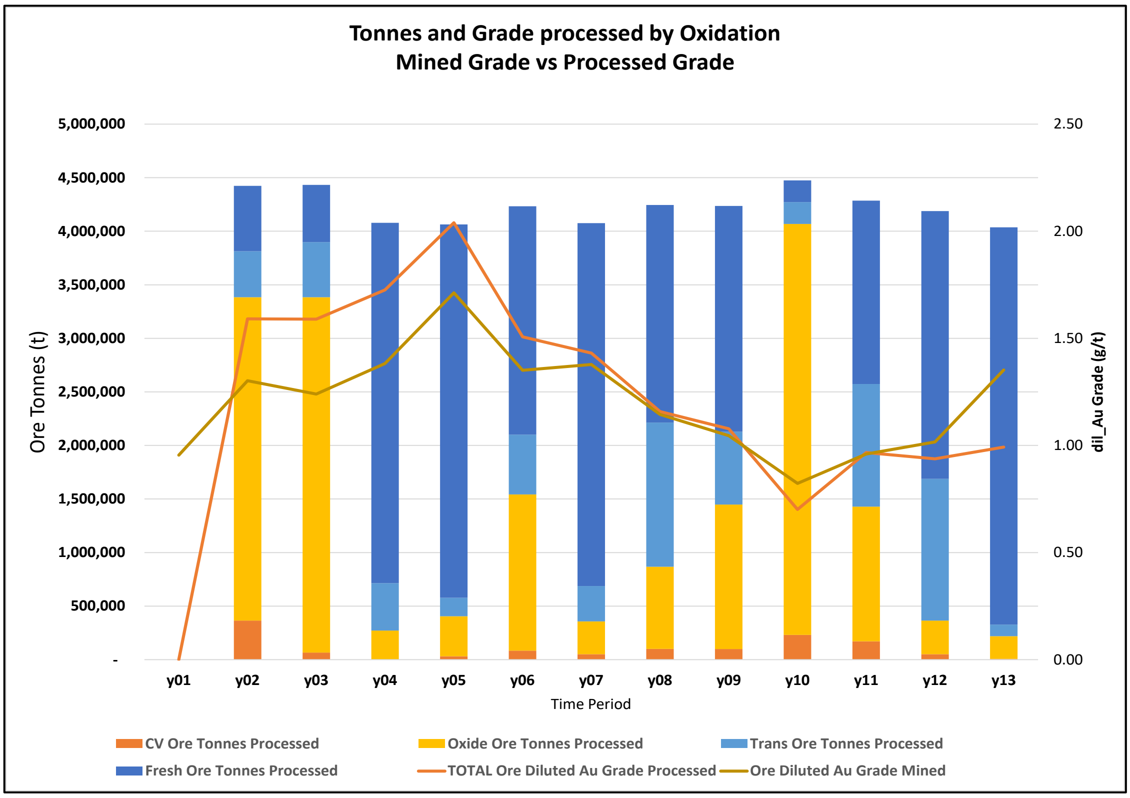


Figure 16.3 Total Material Movement by Pit Stage

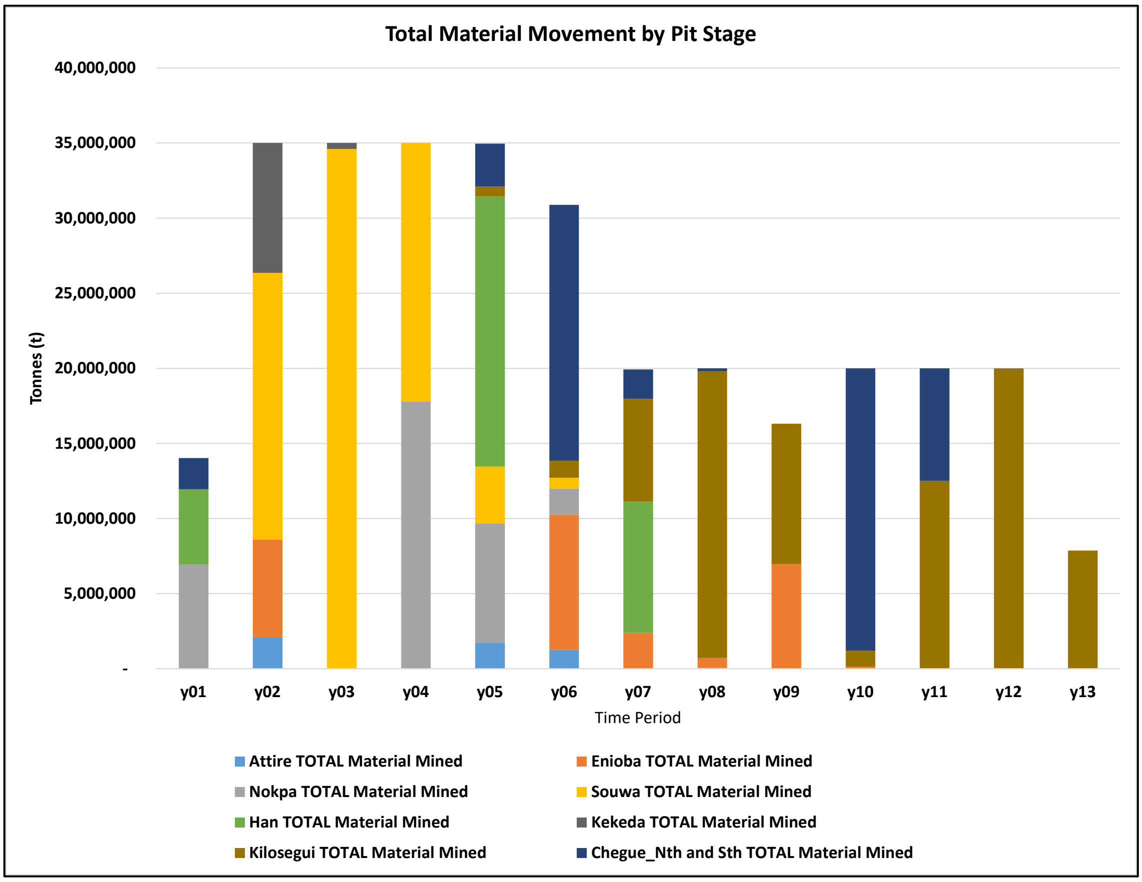
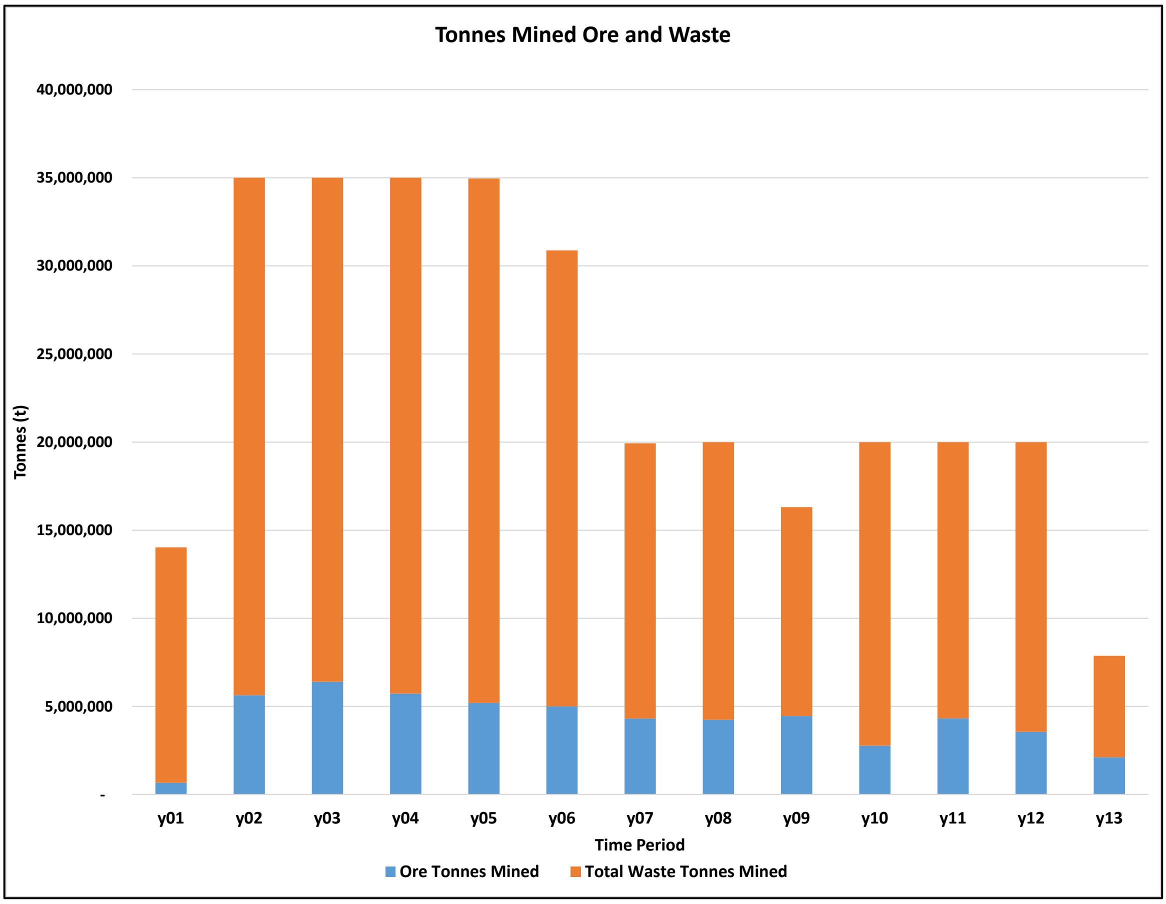


Figure 16.4 Ore and Waste Tonnes Mined



17 RECOVERY METHODS

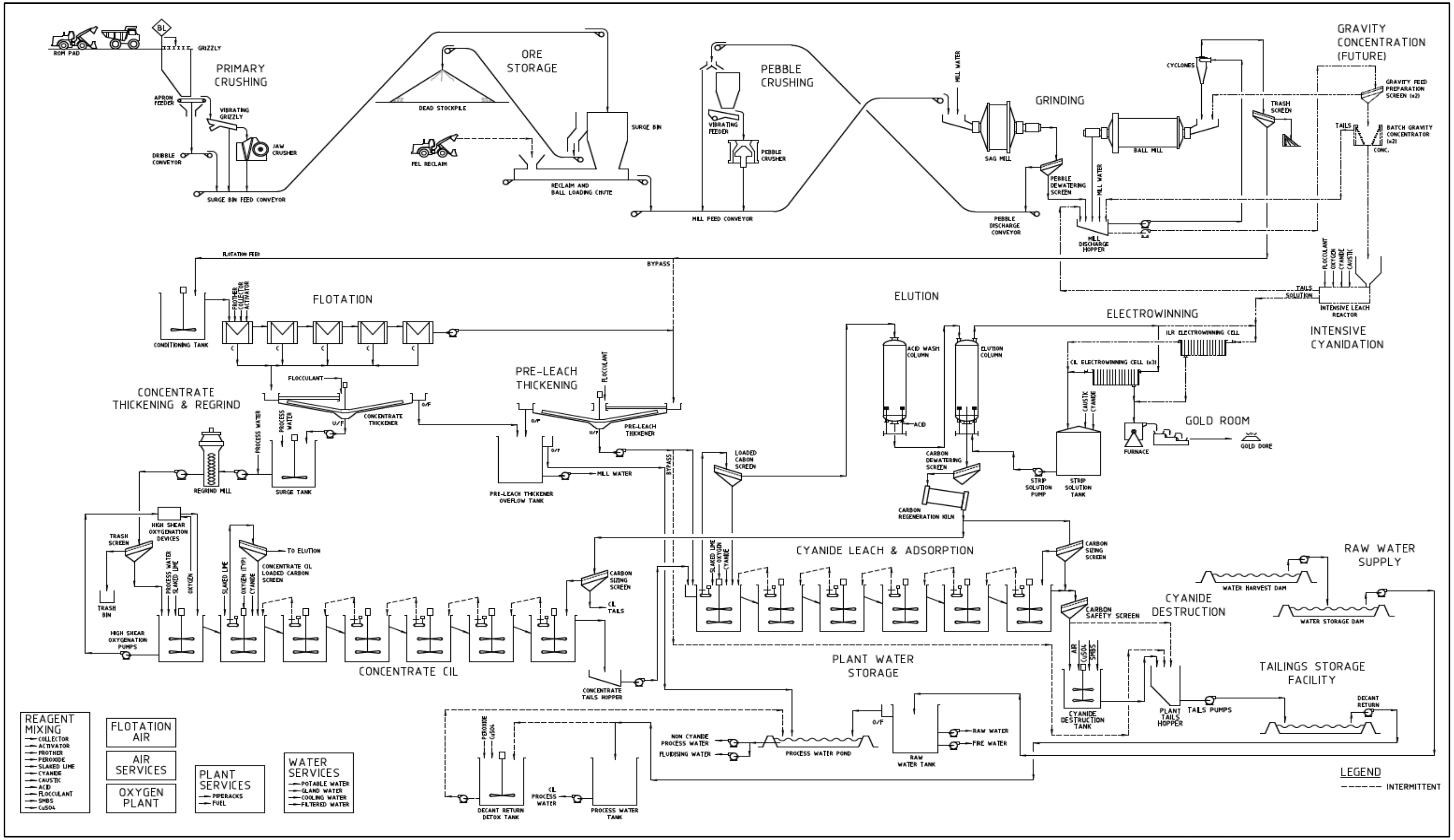
17.1 Operating Methodology

The process plant design is based on campaign operation to alternately treat 4.0 Mtpa of fresh, semi-semi-refractory ore requiring flotation and more intensive concentrate treatment and up to 4.5 Mtpa of blended oxide / transition free milling ore. Campaign durations will depend on mine ore delivery and grade blending to maintain gold production targets.

The flowsheet, as shown in Figure 0.1, assumes the following:

- The plant will campaign treat blended free milling ore and fresh semi-refractory ore separately. For the purposes of design, it has been assumed that all oxide ores will be blended with free milling transitional / fresh ore to avoid the potential materials handling problems and viscous slurries that can occur when treating feeds comprising high clay rich oxide fractions. The blended free milling ore will ensure a more consistent gold head grade and improved material handling properties for the processing plant.
- During the campaign processing of the blended free milling ore, the flotation circuit, concentrate thickener, regrind mill and concentrate CIL circuit will be bypassed. The trash screen undersize will be thickened in the pre-leach thickener and processed directly in the conventional CIL circuit.
- When treating fresh, semi-refractory ore, the trash screen undersize will be directed to the flotation circuit with recovered flotation concentrate being dewatered in the concentrate thickener, followed by regrinding and leaching in the concentrate CIL circuit. The flotation tailings will be thickened in the pre-leach thickener and pumped to the conventional CIL circuit. Flotation tails from the fresh ore will be thickened, but will bypass the tails CIL and report directly to final tails. Tailings from the flotation concentrate CIL circuit will be combined with the feed to the conventional CIL circuit.

Figure 0.1 Overall Doropo Plant Flowsheet



17.2 Overall Flowsheet for Treatment of Free Milling Ore

The free milling ore treatment flowsheet will comprise the following key unit operations:

- Primary jaw crushing to produce a coarse primary crushed product suitable for conveying and feed to the milling circuit.
- Intermediate crushed ore storage will use a surge bin arrangement. Excess feed to the surge bin will overflow and be conveyed to a dead stockpile. Under normal operation, ore will be withdrawn from the surge bin by a belt feeder and conveyed to the SAG mill. During periods of crusher downtime, a front end loader will reclaim ore from the dead stockpile to maintain feed continuity to the milling circuit. Reclaimed ore from the dead stockpile will be fed to the mill feed conveyor via the common surge bin belt feeder. This arrangement will also be used for charging balls to the SAG mill.
- A SABC milling circuit operating in closed circuit with classifying cyclones to produce a P_{80} grind size of 75 µm for the free milling ore.
- The plant design will allow for the future installation of a gravity gold circuit should this be justified.
- Trash screening of the milled slurry (cyclone overflow) to remove any plastic or wood trash and other oversize material.
- Pre-leach thickening of the trash screen undersize to dewater the CIL feed. This reduces CIL tankage volume and reagent requirements. With the change to campaign operation it would be advisable to maintain cyanide free process water for all ore feeds as far as possible for the front end circuits with decant return only being added to the downstream leach feed. Cyanide destruction of all plant tails as well as peroxide polishing of the return water when required has been allowed in the design when treating the semi-refractory ore.
- A CIL circuit with air sparging to leach and adsorb gold and silver values onto activated carbon in six tanks.
- A 14 tonne pressure Zadra elution circuit, electrowinning and gold smelting to recover gold from the loaded carbon to produce doré.
- SO_2 / Air cyanide detoxification to ensure maximum CN_{WAD} discharge levels to tails of 50 ppm can be achieved.
- Tails handling and pumping to the tailings storage facility (TSF).
- Reagent systems, water storage, treatment and distribution, utilities and air services.

17.3 Overall Flowsheet for Treatment of Semi-Refractory Fresh Ore

The semi-refractory fresh ore treatment flowsheet will utilise all of the above unit operations with the following operating differences and circuit additions:

- The SABC milling circuit P_{80} grind size target increases to 106 µm for the semi-refractory fresh ore.

- Trash screen underflow will gravitate to the flotation circuit via a conditioning tank. Flotation to recover the majority of gold (and pyrite) to a low mass (~6%) sulphide flotation concentrate.
- Thickening of the flotation concentrate for downstream processing and overflow recovery as cyanide free process water for use in milling. Cyanide will depress pyrite flotation and cyanide contamination of front end process waters must be avoided.
- Flotation concentrate regrind to a P_{80} grind size of 10 µm prior to feeding to the concentrate CIL circuit. A concentrate storage surge tank will be provided ahead of the regrind mill to cater for the differing mill shutdown requirements that will arise.
- Diluting of the reground concentrate with process water (decant return) prior to leaching in the concentrate CIL.
- A concentrate pre-oxidation and CIL circuit (one pre-oxidation and six CIL tanks). High shear oxygen sparging in the pre-oxidation stage will assist with oxidation of the sulphides and other reactive minerals prior to leaching. Lime will be added to manage the slurry pH ahead of cyanidation. Cyanide will be dosed to the CIL stages to leach the gold and silver values from the ore so the value metals can be adsorbed onto the activated carbon. Oxygen sparging will maintain dissolved oxygen levels in the CIL.
- High grade concentrate CIL carbon will be treated separately to flotation tails CIL carbon. The concentrate CIL loaded screen will discharge loaded carbon into a 14 tonne carbon holding vessel. The loaded carbon from the concentrate CIL circuit will be stripped once weekly by the Zadra elution circuit. The loaded carbon will be transferred hydraulically by pressurised raw water from the carbon holding column to the acid wash column. After elution and carbon regeneration, the regenerated concentrate CIL carbon batch will be transferred to a surge hopper and will be bled into the final stage of the concentrate CIL circuit at the required carbon advance rate.
- Concentrate CIL tails will report to the conventional CIL circuit for further leaching and reagent recovery.
- Flotation tailings will be thickened in the pre-leach thickener and report to the conventional CIL circuit. The pre-leach thickener overflow will be recovered for use as non-cyanide process water in the milling circuit with any excess gravitating to the process water pond.
- Non cyanide water will be stored in the process water pond for use upstream of the concentrate CIL and conventional CIL circuits.
- A cyanide destruction circuit (hydrogen peroxide / copper sulphate) will be provided to treat decant return water for use as cyanide free process water make-up when there is excess decant return water and the supernatant pond must be drawn down.
- Two 6.5 tonne per day oxygen plants to provide oxygen for concentrate oxidation and leaching.

The comminution circuit design is also based on Batie West where OMC modelled and selected all comminution equipment for the circuit.

17.4 Process Plant Layout

General layout considerations include:

- A low profile primary crushing station with less concrete in the crusher chamber and a lower ROM pad height.
- The combined surge bin with belt feeder and low level loader reclaim provides a lower cost arrangement without the tipping ramp and retaining walls as well as facilitating faster reclaim with shorter tramming distance and more space for turning.
- The flotation circuit has been positioned to allow gravity flow to the conditioning tank with the free milling ore gravity feeding directly to the pre leach thickener.
- The concentrate thickener legs will be raised so that it will have a common overflow height with the pre-leach thickener. Cyanide free areas will have combined bunding to increase the holding capacity.
- The concentrate CIL tanks will be located proximate to the head end of the tails CIL train. This facilitates common bunding of cyanide and carbon areas, minimum carbon transfer distances to and from elution and regeneration, and possibly extended use of the CIL gantry crane to service the concentrate CIL top of tanks area as well.
- The overall layout is compact and fit for purpose with a central piping and cable service corridor and good maintenance crane access to the unit operations arranged along this spine.

18 PROJECT INFRASTRUCTURE

18.1 Site Infrastructure

Site infrastructure design for Doropo has been a combination of Centamin benchmarking off their nearby projects and using infrastructure consultants, specifically for the TSF design and estimation. The aspects of Infrastructure include:

- A provisional sum only for 24 km of access roads.
- An airstrip with a runway length of 750 m to accommodate aircraft such as Cessna Caravan which is a Class B1 to BII aircraft. This is based off Centamin's Batie West study.
- Following a detailed power study for Batie West by ECG engineering, considering a range of power supply options, the current intent is for an Independent Power Provider (IPP) to build and operate an LNG generator power station, with Centamin taking a tariffed feed to the process plant. The installed power capacity is estimated at 27 MW.
- Water supply is yet to be fully investigated but there are a number of existing water ways that will likely provide water an adequate supply. At this stage construction of a harvest dam and separate 2.2 Mm3 water storage dam has been allowed.
- Onsite storage of LNG for power station, and diesel for mining operations.
- A 200 bed accommodation village has been included.
- On site buildings for mining, plant and administration, comprising a range of fit for purpose, steel frame or block work type design.
- A Mining Services Area (MSA) to be developed by the successful contractor in consultation with Centamin.

18.2 Tailings Storage Facility (TSF)

Knight Piésold completed a preliminary TSF site selection and ranking assessment for the Doropo project in 2019. A number of potential TSF locations were evaluated for selection.

In order to select the preferred TSF option, each option was evaluated independently by scoring against engineering, financial, social and environmental criteria. The individual criteria and the assigned weighting factors took into consideration the scale of the project.

KP allocated a 35%, 25%, 20% and 20% weighting for engineering, financial, social and environmental criteria respectively. The highest ranking TSF option was selected for purposes of the PEA design and estimate (TSF Option No 4).

The tailings facility will be constructed from mine waste and in a similar fashion to a similar project from the region and recently estimated by Knight Piésold. Costs have been factored up for the longer project life/tails capacity required and include the following elements:

- The TSF is proposed to be incorporated as an integrated landform into a proposed Waste Dump development to reduce construction costs. The embankment alignment is designed to take advantage of natural topography (ridgelines) to reduce the volume of embankment construction materials required.
- An initial starter cell of 6.75 Mt capacity, for 18 months of operation.

- The downstream embankments will be constructed in staged raises, with core zones being constructed by a specialised earthworks contractor and the structural fill zones being progressively constructed by the mining fleet as part of the mine operations.
- A total capacity of 56 Mt of tailings, with stormwater storage capacity to contain supernatant and runoff from wet rainfall events up to a 100 year average recurrence interval (ARI) storm event.
- The design incorporates an underdrainage system to reduce pressure head acting on the HDPE geomembrane liner, reduce seepage, increase tailings densities, and improve the geotechnical stability of the embankments.
- A decant turret system (comprising floating pump/s attached to a HDPE 'turret') will recycle water from the TSF supernatant pond for use in the process throughout operation.

18.3 Raw Water Supply

The Project area is drained by the Pouene River with a network of tributaries. Localities were indented along some of the tributaries for in-stream catchment dams to serve as the main raw water resource for the mine project. It may be required to harvest water from the main river during the dry months. Mine pits already mined can also be considered as water storage facilities, depending on hydrogeological and geotechnical characteristics.

Detailed civil engineering, hydrology, hydrogeology and geotechnical engineering site test work will be required to support a PFS level recommendation for the proposed Water Storage Facilities.

Raw water supply will be supplemented with groundwater resources, sourced from pit de-watering. It is estimated that between 20 to 40% of the make-up requirement could be obtained from pit de-watering during the operational life of the mine. However, pit water will be variable depending on the pit development rate and intersection of geological and regional structures. De-watering volumes are likely to peak when pits reach maturity in terms of depth.

Additional well-field development can be considered if raw water supply is low.

19 MARKET STUDIES AND CONTRACTS

Gold is a readily traded commodity and no specific market study was carried out. Advice regarding the forward looking gold price was provided by Centamin and the Project financial case assumes US$1,450/oz at the date of this PEA study.

19.1 Mined material from the conceptual economic pit

Haulage of the materials from the Doropo deposits will be on a contract basis with contract terms as per industry norms particular to the West African region where the Doropo deposit is located.

19.2 Gold Doré

For the doré produced from the proposed Doropo treatment plant, in the absence of letters of interest or letters of intent from potential smelters or buyers of gold, general smelter terms for similar projects have been applied:

20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

20.1 Permitting, Land Tenure and Environmental and Social Management

Exploration Permits

- The Doropo Project consists of a block of seven (7) exploration permits that cover an area of approximately 1,847 km^2 and owned through 2 (two) Centamin group subsidiaries, Ampella Mining Côte d'Ivoire (AMCI) and Ampella Mining Exploration CI SA (AMEXCI). All of the exploration permits are subject to the 2014 Ivorian Mining Code.
- The exploration permits are in northeast Côte d'Ivoire, approximately 650 km north of Abidjan, between the Comoè National Park and the international border with Burkina Faso.
- The 2021 mineral resource estimate identified 13 (thirteen) deposits namely: Souwa, Nokpa, Chegue, Chegue South, Tchouahinin, Kekeda, Han, Enioda, Hinda, Nare, Kilosegui, Attire and Vako. These deposits are located on five (5) out of the seven (7) exploration permits as listed in Table 20.1 following.

Table 20.1 Doropo Permit Status – June 2021

Permit and Titleholder	Licence and Period	Area Km^2	Deposits
Varale Permit No: 335 AMCI	• Exploration Licence • Decree Number 2013-426 of 13/06/2013 • First renewal Arrete Number 180 of 19/12/2016 • Second renewal Arrete Number 00044 of 01/07/2019 • Valid 3 years expiring 12/06/2022 • 2 year exceptional renewal possible for finalisation of Feasibility Studies	284.9	• Vako
Kalamon Permit No: 334 AMCI	• Exploration Licence • Decree Number 2013-427 of 13/06/2013 • First renewal Arrete Number 0157 of 20/11/2016 • Second renewal Arrete Number 00058 of 22/07/2019 • Valid 3 years expiring 12/06/2022 • 2 year exceptional renewal possible for finalisation of Feasibility Studies	398.9	• Nokpa • Chegue • Chegue South • Souwa • Kekeda • Han • Tchouahinin • Hinda • Attire (small part in Danoa)
Danoa Permit No: 559 AMCI	• Exploration Licence • Decree Number 2015-435 of 10/06/2015 • First renewal Arrete Number 00043 of 01/07/2019 • Valid 3 years expiring 09/06/2022	240.3	• Enioda • Nare • Attire (partly)

Permit and Titleholder	Licence and Period	Area Km^2	Deposits
Tehini 1 Permit No: 535 AMEXCI	• Exploration Licence • Decree Number 2017-173 of 08/03/2017 • Valid 4 years, expired 07/03/2021 • Renewable for 2 more terms of 3 years • First 3 year renewal application pending	253	• Kilosegui (partly)
Tehini 2 Permit No: 536 AMEXCI	• Exploration Licence • Decree Number 2017-146 of 01/03/2017 • Valid 4 years, expired 28/02/2021 • Renewable for 2 more terms of 3 years • First 3 year renewal application pending	228	• Kilosegui (partly)
Tehini 3 Permit No: 778 AMEXCI	• Exploration Licence • Decree Number 2018-482 of 16/05/2018 • Valid 4 years until 15/05/2022 • Renewable for 2 more terms of 3 years	239.83	
Gogo Permit No: 633 AMEXCI	• Exploration Licence • Decree Number 2016-849 of 19/10/2016 • Valid 4 years until 18/10/2020 • First renewal Arrete number 00045 of 07/4/2021 • Valid until October 2023 • Renewable for 1 more terms of 3 years	201.93	
	TOTAL	**1,847**	

- Most of the deposits (11) are within a 7km radius with Vako and Kilosegui ~15km and ~25km to the SW of the main deposit area. Pit optimisation studies subsequently excluded the Tchouahinin, Nare, Hinda and Vako deposits for reasons including economics, but there may be potential to re-evaluate these deposits during future project study phases.
- The Kalamon Exploration Permit (PR 334) and Danoa Exploration Permit (PR 559) are hosts to the following target deposits: Souwa, Nokpa, Chegue, Chegue South, Kekeda, Han and Enioda.
- The Kilosegui deposit intersects both Exploration Permits PR 536 (Tehini 2) and PR 535 (Tehini 1) which are both currently pending their first 3 year renewal.

- It is anticipated that the exploration permits hosting the remaining target deposits will have to be converted to separate exploitation licences as the 2014 Mining Code precludes the consolidation of exploitation permits over separate exploration licence areas.

Work Completed to Date

- In Q3 2018 Digby Wells Environmental (Digby Wells) was engaged to undertake an environmental and social scoping study to characterise the biophysical and socio-economic values of the Doropo Project and to draft an initial Terms of Reference (TOR) for the Environmental and Social Impact Assessment (ESIA) process.
- In Q4 2018 PAH Consulting was engaged to undertake an environmental and social scoping study to characterise the biophysical and socio-economic values of the Doropo Project, as input to a Preliminary Economic Assessment. Refer memo dated February 2019. The 2017 resource model, pit shells and water infrastructure wre used to estimate the settlements and number of houses that may require physical resettlement. Details regarding other project infrastructure was not known at this time.
- In September 2019, PAH Consulting updated its earlier memo based on updated Project information and a conceptual design for mine infrastructure developed by John Wyche. Baseline data collection included: drone fly-over of villages in the Project impact area; preliminary survey of cashew plantations; installation of 2 noise and dust monitoring stations; surface and groundwater quality monitoring campaign.
- GCS Water and Environmental Consultants (GCS) issued a hydrogeology report based on preliminary studies undertaken between 2018 and 2020. An initial groundwater level survey was undertaken in 2018 on approximately 100 exploration boreholes. Following this GCS identified exploration boreholes which were re-measured in 2019 and 2020 to determine any seasonal fluctuations. The additional pit areas of Kilosegui and Vako were added in June 2020.

Key Environmental and Social Risks and Impacts

- The Project is located in Zanzan District and Bounkani Region. The Kalamon Exploration Permit and Danoa Exploration Permit are located within the Communes of Doropo and Danoa. The border with Burkina Faso is located approximately 10km to the east of the Project area.
- The Project area falls within the Sudanian climatic zone which is characterised by a dry season from November to May with no rain, and a wet season from June to October with average rainfall between 900 and 1,200 mm per annum. The Harmattan wind, a dry and dusty north-easterly from the Sahara Desert, blows from January to March.
- The Project is located in a rural area and is one of the least developed regions of Cote d'Ivoire. The economic benefits (both direct and indirect) accruing from the Project will be significant for the local area, including employment, procurement and community investment.
- The development of multiple pits and associated infrastructure has potential to fragment the bio-physical and socio-economic landscape of the area, including: land access and livelihoods; habitat connectivity; hydrology and water quality.

- The local vegetation is predominantly woodland savannah which comprises an open canopy of trees and shrubs.
- Centamin's Exploration Permits PR 535 and PR 536 border the northeast of Comoè National Park. The National Park is located ~35km SW of the main deposit camp and ~5km SW the closest pit of Kilosegui. The Park is a United National Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Site, and the largest protected area in West Africa. The Park is considered the most biodiverse savannah in the world and remains unfenced with no physical barriers between the Park and the Project area. The Park provides habitat for a number of emblematic threatened species including: Western Chimpanzee (Pan troglodytes), African Elephant (Loxodonta africana) and Leopard (Panthera pardus). The UNESCO and its scientific advisor IUCN, will likely be steadfast opponents to the development of the Doropo Project if there is risk of impact (directly or indirectly) to the integrity of the Comoè National Park. Terrestrial and aquatic ecology studies will be needed to confirm the presence of threatened species in the Project area.
- The Project area is drained by the Pouene River which is a tributary of the Black Volta River. The confluence of the Pouene River with the Black Volta River is located approximately 50km downstream of the Project Area in Burkina Faso. The streams and drainage lines in the Project area are predominantly ephemeral. The low-lying reaches of the Pouene River and its tributaries are subject to flood during the wet season. Subject to detailed hydrological studies, it is expected that surface water and flood control will an important design consideration with the potential requirement for upstream coffer dams and diversion structures to control wet season flow in the Project Area.
- Community boreholes are poorly distributed throughout the Project area, with some communities having no access to groundwater.
- The larger villages and centres of economic activity adjacent to the Project area are Doropo, Kalamon, Danoa and Varalè. These larger villages are predominantly inhabited by the Koulongo ethnic group, who claim to be the original landowners of the area, while the Lobi ethnic group occupy the smaller settlements within the Project area and have been granted land use rights by the Koulongo. In addition, there is a seasonal movement of cattle through the area by Peul or Fulani pastoralists. This mosaic of traditional land ownership and use is likely to be complex. Land acquisition processes will require informed consultation and participation with affected persons.
- The primary economic activities in the Project area includes subsistence agriculture, cashew nut, artisanal and small-scale mining, livestock husbandry (cattle, goats), small trade and ecosystem services. The primary cultivated crops include cashew, maize, sorghum, millet and yams. Cashew nut orchards occupy approximately half of the cultivated farmlands in the Project area and represent a significant economic activity in the region. Rice cultivation is limited to wetland areas, in particular the tributaries of the Pouene River.
- Artisanal mining is prevalent in the Project area and concentrated on the deposits where ore is extracted and then transported for processing in the villages. Artisanal mining has attracted persons from elsewhere within Code d'Ivoire and neighbouring countries of Burkina Faso and

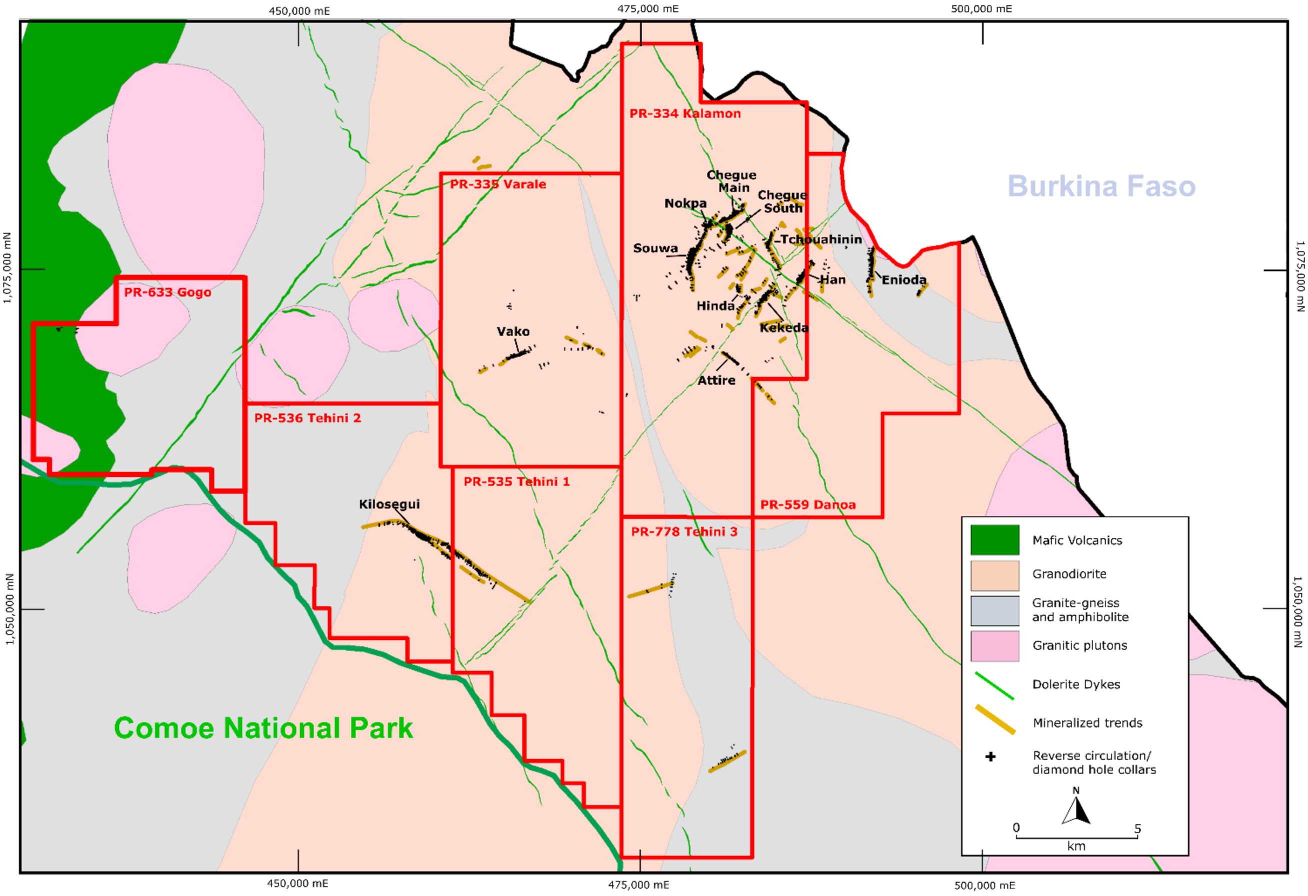
Ghana, Mali, Liberia, Sierra Leone and Guinea Conakry. Project development is likely to result in a level of economic displacement of artisanal mining from the Project area.

- Numerous settlements are located within the Project area and a number of these will be significantly impacted by Project development, including the potential for physical resettlement, loss of lands and livelihood, loss of access. This will necessitate rigorous social planning and impact mitigation.
- Several settlements are located within 500 m of the Project's current pit shells, including: Lagbo, Herewedou, Olidouoh, Yadreduo, Wadaraduo. Due to the proximity of the proposed pits to communities and their agricultural fields, economic and physical displacement is expected. A Resettlement Action Plan (RAP) and Livelihood Restoration Plan (LRP) will be required for the economic and physical displacement associated with Project land acquisition. The RAP and LRP will need to have a clear entitlement framework to address both land ownership and land occupation.
- Project development has potential to exacerbate levels of in-migration, including artisanal mining, and place additional pressure on social infrastructure, social cohesion and security. An effective strategy will be needed to manage the adverse impacts of in-migration in collaboration with local authorities and communities.
- Since 2016 the Company has recorded incidents where local authorities and security forces of Burkina Faso have made unofficial claims to land within Cote d'Ivoire, including land extending into the Company's Exploration Permits. This has resulted in the application of force and intimidation by artisanal miners to displace Company personnel from their exploration activities. The issue has been reported to the Minister of Mines and awaits resolution.

Table 20.2 2018 House count

Settlement name	Number of houses	Comment
Lagbo	397	500m Buffer zone of Han pit shell
Herewedou	167	500m Buffer zone of Nokpa pit shell
Olidouoh	67	In the Enioda pit shell
Yadredou	23	500m Buffer zone of Tchouainin pit shell
Wadaraduo	37	500m Buffer zone of Kekeda pit shell

Figure 1.2.1 Project Permits as of June 2021



Permitting Strategy

- The primary environmental approval required to develop the Project is decreed by the Ivorian Minister of Environment and Sustainable Development and is necessary for the issuance of mining licenses.
- The Ivorian Mining Code (Law No. 2014-138 of 24 March 2014) outlines the requirements of an exploitation permit application. Article 28 of the Mining Code includes the requirements of the feasibility study, including studies associated with the socio-economic and environmental impacts of a project to be undertaken in accordance with the Environmental Code (Law No. 96-766 of 3 October 1996). The Environmental Code and its implementing Decree No. 96-984 of 8 November 1996 outlines the requirements for the ESIA studies.
- The ESIA Report must be lodged to the National Environment Agency (ANDE) by a nationally certified environmental consultant. Subject to capability assessment, it is likely that the national consultant will require supplementary support for complex aspects, i.e. expertise in: water resources, ecology, resettlement and livelihood restoration. Separate to the ESIA, a RAP will be developed for any physical or economic displacement of people as a results of Project development.
- It is understood that the Mining Convention and Environmental Compliance Certificate issued following approval of the ESIA, will provide authority for most aspects of Project development. Subject to confirmation with the regulator, supplementary permits may be required for matters

including: water abstraction; forestry clearance; hazardous facilities; emergency response and resettlement.

- It is proposed to commence the formal ESIA permitting process during the PFS phase through lodgement of the ESIA TOR as soon as the preferred project configuration has been developed. The ESIA will advance in parallel with engineering design detail and is expected to extend into the DFS phase, including: formal public consultation; submission of the draft ESIA Report to ANDE; public inquiry led by the local administrative authorities; examination of the Report by an interministerial commission for validation; and submission of the revised and final Report to ANDE for validation by the Minister of Environment.
- The ESIA scope will encompass the nine target deposits, namely Souwa, Nokpa, Chegue, Chegue South, Kekeda, Han, Enioda, Kilosegui and Attire. Noting the potential for inclusion of other deposits during future project study phases.
- As a minimum the Project will be designed to meet national regulatory requirements, with reference to international standards as deemed appropriate. Environmental and social design criteria to be developed at the start of the PFS and agreed with the design team. These design standards will include commitment to conduct a rigorous assessment of all options and alternatives to avoid and mitigate the impact of physical and economic resettlement.
- Given proximity to the Comoe National Park, undertake a Critical Habitat assessment early in the PFS and preliminary ecology field studies to verify the presence / absence of threatened species. Specifically assess the potential impact of the Project on the integrity of the Park, supported by good science, in accordance with World Heritage guidance.
- Under Decree No. 2014-397, an operating mining company must contribute each year a levy of 0.5% on gross revenue to a Local Development Fund for the benefit of villages identified as “affected areas” by the ESIA. A Local Mining Development Committee is created to oversee the implementation of the Fund.

Table 20.3 National legislative framework

No. 2016-886 dated 8 November 2016, Constitution of the Republic of Cote d’Ivoire
No. 96-766 dated 3 October 1996, Environmental Code
No. 98-755 dated 23 December 1998, Water Code
No. 2014-138 dated 24 March 2014, Mining Code
No. 2004-412 dated14 August 2004, Rural Land Property Code
Decree No. 96-894 dated 8 November 1996, Rules and procedures applicable to studies relating to environmental impact of development projects
Decree No. 2017-125 dated 22 February 2017, Air quality
Decree No. 2014-397 dated 25 June 2014, Application of the Mining Code

Ruling No. 01164/MINEEF/CIAPOL/SDIIC dated 4 November 2008, Regulation of releases and emissions from classified facilities for the protection of the environment
Inter-ministerial Order No. 453/ MINADER/ MIS/ MIRAH/ MEF/ MCLU/ MEER/ MPEER/ SEPMBPE/ dated 1 August 2018, Fixing the scale of compensation for destruction or project of destruction of crops or other investments in rural areas as well as killing of wild animals
Order No. 2014-148 dated 26 March 2014, Fixing the charges and taxes proportion to the activities governed by the Mining Code

PFS Environment and Social Work Programme

Environmental and social scoping:

- In consultation with the environmental regulator confirm all Project elements that require permitting and define a strategy for efficient and timely approvals.
- Perform high-level risk assessment for the permitting and approval of the Project.
- Environmental and social design criteria defined and agreed with the engineering design team.
- Broad area of Project impact and influence defined based on potential direct and indirect impacts.
- Stakeholder mapping and preliminary engagement plan.
- Engage a nationally certified environmental consultant and other technical resources to support PFS program.

Environmental and social screening:

- Commence broad environmental and social baseline studies over the Project area of impact and influence.
- Commence stakeholder engagement, including consultation with potential affected villages.
- Establish a GIS database and prepare high-level thematic environmental and social constraint maps, including: land use and livelihood; settlements and access; artisanal mining; drainage lines and catchment boundaries; surface and groundwater use; critical and natural habitat.
- Support the design team to identify and evaluate Project design options / alternatives.
- Identify fatal flaws, critical values and uncertainties. Design targeted studies for these to be addressed. Given proximity to the Comoe National Park, undertake a Critical Habitat assessment early in the PFS and preliminary ecology field studies to verify the presence / absence of threatened species. Specifically assess the potential impact of the Project on the integrity of the Park, in accordance with World Heritage guidance
- Elaborate a draft ESIA Terms of Reference and submit to the environmental regulator for approval.

Preliminary impact assessment:

- Continue to conduct broad environmental and social baseline studies over the Project area of impact and influence.

- Conduct targeted baseline studies to evaluate the preferred design option(s) with a higher degree of certainty. Engage with affected villages on potential requirements for land acquisition, physical and economic displacement.
- Prepare a preliminary environmental and social assessment report for the preferred design option(s).
- Perform public consultation on the preferred design options(s) and preliminary environmental and social assessment results.
- Pilot potential social impact mitigation measures – such as livelihood programs – through realignment of existing community investment.

21 CAPITAL AND OPERATING COSTS

21.1 Introduction

The Capital Cost and Operating Cost Estimate for Doropo has been based off the Batie West Optimsation Study which was developed by Lycopodium Minerals Pty Ltd with input from Knight Piésold on various infrastructure. Centamin PLC provided project specific portions of Mining and Owners costs.

21.2 CAPEX

CAPEX Summary

The costs for Initial and Future capital are summarised in Table 21.1,

Table 21.2 Capital Cost Estimate Summary (US$, 1Q 2021, ±30%)

Main Area	Project Total US$M
Treatment Plant	**71.33**
Earthworks & Fencing	0.89
Feed Preparation	5.01
Milling (Inc. Reclaim / Surge Bin)	32.04
Trash Screening and Thickening	4.37
Flotation & Concentrate Handling	13.97
Leaching (CIL)	8.37
Elution, Gold Room	5.00
Tails Handling	1.67
Reagents & Plant Services	**14.23**
Infrastructure	**30.75**
Mining	**22.86**
Mining Mobilisation	3.61
Mining Establishment, Pre-strip and Pre-production	17.30
Mining Facilities (Earthworks only)	0.59
Construction Distributables	**17.62**
Subtotal	**156.79**
Management Costs (EPCM & Specialist Consultants)	19.62
Owners Project Costs	59.86
Subtotal	**79.47**
Contingency	38.98
Project Total	**275.24**

All costs are expressed in US$ ($) unless otherwise stated and based on database pricing escalated to 1Q21 where applicable. The estimate is deemed to have an accuracy of ±30%.

Where costs used in the estimate were provided in other than US dollars the following exchange rates were used:

- 1 AUD = 0.7706 USD
- 1 CAD = 0.7850 USD
- 1 EUR = 1.2072 USD
- 1 GBP = 1.3930 USD
- 1 ZAR = 0.0662 USD

General Estimating Methodology

A mechanical equipment list and general arrangement drawing were produced with sufficient detail to permit the assessment of the engineering quantities for concrete, steelwork, and mechanical for the crushing plant, processing plant, conveying systems and plant infrastructure.

The process plant was broken down into unit operation areas with quantity take-offs based on similar facilities from previous projects to provide an acceptable level of confidence required for a Scoping Study (SS) estimate.

Unit rates were established for bulk commodities, materials and labour that were drawn from previous projects and studies within the region.

Capital equipment pricing was based on the Lycopodium database of similar projects either recently completed or currently under construction.

The rates used in the estimate have been reviewed and deemed to reflect the current market conditions.

Engineering Status

The design status for Doropo is preliminary as it is based off Batie West. However, the basis of design is a Lycopodium derived basis which includes completed facility designs and modified construction and as-built drawings of current and past project facilities.

Estimate Basis

The capital cost estimate was based off Batie West and was prepared in accordance with Lycopodium's standard estimating procedures and practices. The basis and methodology are summarised in Table 21.3.

Table 21.3 Capital Cost Estimate Basis

Description	Basis
Site	
Geographical Location	Site Plan
Maps and Surveys	Topo provided
Geotechnical Data	Assumed Competent.
Process Definition	
Process Selection	Preliminary PDC
Design Criteria	Preliminary
Plant Capacity	4.0 – 4.5 Mtpa
P&IDs	Not Required
Mass Balances	N/A

Description	Basis
Equipment List	Preliminary based on PDC
Process Facilities Design	
Equipment Selection	Preliminary
General Arrangement Drawings	Preliminary
3D model	Not Required
Piping Drawings	Not required
Electrical Drawings	Not required
Specifications / Data Sheets	Not required
Infrastructure Definition	
Existing Services	N/A
Power	LNG Generators (IPP)
Water	Water Harvest & Storage dams
Accommodation	200 bed camp
TSF	Preliminary Design
Mine Services	Included
Security / Fencing	Included
Design Basis	Preliminary
Layout	Preliminary
Bulk Earthworks	Bulk Earthworks included as an allowance as site considered reasonably flat, not quantified by engineering at this time
Detailed Earthworks	Detailed Earthworks allowance included
Concrete Installation	Quantities estimated from the layout and completed like projects
Structural Steel	Quantities estimated from the layout and completed like projects
Platework & Small Tanks	Platework items as per the mechanical equipment list
Tankage Field Erect	Tanks as per the mechanical equipment list
Mechanical Equipment	Items as per the mechanical equipment list. Costs for all items taken from the Lycopodium database of current or recently completed projects
Plant Piping General	Factored from mechanical costs where the factor was determined from completed project data
Overland Piping	Sized by engineering including MTO and specification
Electrical Costs	Factored from mechanical costs where the factor was determined from completed project data
Commodity Rates – General	Appropriate rates taken from the Lycopodium database
Installation Rates – General	Appropriate rates taken from the Lycopodium database
Large Cranage	250 t crawler crane for major lifts
Freight General	Combination of freight tons and percentages
Contractor Mobilisation / Demobilisation	Estimate based on historical data
EPCM	Percentage based on the EPCM controlled scope
Mining Costs	Centamin provided project specific portions of the Mining costs
Owner's Costs	Centamin provided project specific portions of the Owners costs

Pricing Basis

Pricing has been identified by the following cost elements, as applicable, for the development of each estimate item.

21.2.1.1 Plant Equipment

This component represents prefabricated, pre-assembled, commonly available mechanical equipment.

21.2.1.2 Bulk Materials

This component covers all other materials, normally purchased in bulk form, for installation on the Project.

21.2.1.3 Installation

This component represents the cost to install the plant equipment and bulk materials on site or to perform site activities.

21.2.1.4 Temporary Construction Facilities

Facilities will be capable of servicing the EPCM and Owners team.

21.2.1.5 Heavy Lift Cranage

A heavy lift crane of 250t capacity has been included in the estimate to assist the SMP contractor(s) with heavy lifts only.

21.2.1.6 Contractor Distributables

Costs for mobilisation / demobilisation of labour and equipment to / from the Project site were based on projects of a similar size and adjusted to suit the Project location.

Qualifications

The estimate is subject to the following qualifications:

- Prices of materials and equipment with an imported content have been converted to US$ at the rates of exchange stated previously in this document. All pricing received has been entered into the estimate using native currency.
- All database labour rates, materials and equipment supply costs have been escalated to 1Q21 where applicable. Contingency has been allowed based on the quality of the various estimate inputs, however no allowance for escalation between the completion of the estimate and expected construction has been included.
- Contractor rates and distributables include for mobilisation / demobilisation, recurring costs, direct and indirect labour, construction equipment, construction cranes up to 100 t, materials, materials handling and offloading, temporary storage, construction facilities, off site costs, insurances, construction fuel, tools, consumables and PPE.
- Site construction offices will be containerised units only and will be demobilised after each phase of construction.
- Earthworks that include imported material are based on the assumption that suitable construction / fill materials will generally be available from borrow pits within 2 km of the project site.
- There is no allowance for blasting in the bulk earthworks.
- Concrete imported materials have been included in the concrete installation rates.
- The estimate allows for aggregate and sand for concrete batching to be provided by the concrete contractor and are assumed available locally to the project site.

- The estimate allows for all reinforced bar and mesh for construction to be provided by the concrete contractor. Free issue of materials would be a project capital opportunity.
- Contractor accommodation costs per day for the contractor's direct workforce have been included in the individual contractor's rates.
- Meals and accommodation for the EPCM team, Owners Team and Senior Contractors staff has been included in the estimate.
- The estimate allows for the supply of structural steel and fabricated platework from South East Asia.
- Project spares have been allowed as a percentage of the mechanical supply cost that was based on similar size projects.
- Vehicles and mobile equipment to be purchased early for use by the EPCM team during construction are included in the Owner cost estimate
- A commissioning assistance crew is included in the EPCM allowance.

Owner Cost Estimate

In general the Owner cost estimate is based on establishment of the site prior to construction activities, permitting and various sustaining costs associated with community and environmental requirements. This also includes mine preproduction and operational team preproduction costs, (wages, insurance, capital and operating spares and consumables etc)

Utilising previous experience, the Owner cost estimate in this study covers all aspects of running a project from the end of the study phase to first gold production.

The main components include (but not limited)

- Access roads and bypasses
- Resettlement (RAP) and land/crop compensation
- Community and Environment programmes
- Computing, software and communications
- Light vehicles, cranage (to 250t), extensive mobile equipment for running Operations
- First fill and 3 months reagents
- Insurance, commissioning and operating spares
- Owner Project team labour, office staff, and all supporting departments (medical, logistics, procurement, accounts, E&S etc)
- Accommodation, Travel and catering costs
- Project and personal insurance
- Operations team recruitment, labour, training, ancillary equipment etc)
- Establishment costs for fuel, power and laboratory contractors
- Owner transport and logistics

- Mine stripping and pre-production
- Fuel and power for construction phase

Contingency

An amount of contingency has been provided in the estimate to cover anticipated variances between the specific items allowed in the estimate and the final total installed project cost. The contingency does not cover scope changes, design growth, etc., or the listed qualifications and exclusions.

Contingency has been applied to the estimate as a deterministic assessment by assessing the level of confidence in each of the defining inputs to the item cost being engineering, estimate basis and vendor or contractor information. It should be noted that contingency is not a function of the specified estimate accuracy and should be measured against the project total that includes contingency.

A contingency analysis has been applied to the estimate that considers scope definition, materials / equipment pricing and installation costs. Contingency applicable to various Owners inputs have been specified by Centamin.

The resultant contingency for the project is 17.2%.

Escalation and Foreign Exchange

21.2.1.7 Escalation

Escalation between the completion of the estimate and expected construction is excluded from the estimate.

21.2.1.8 Exchange Rates

All items in the capital cost estimate have been expressed in United States Dollars and no allowances for exchange rate variations are included in the estimate.

21.2.1.9 Preproduction Costs

Preproduction costs that include first fills, opening stocks, preproduction labour and vendor representative costs have been included in the estimate.

Working and Sustaining Capital

Allowance for working capital has been included in the Owner cost estimate.

Allowance has been made for sustaining capital costs in Owner estimates.

Inclusions, Exclusions and Assumptions

The estimated is subject to the following inclusions, exclusions and assumptions:

- All sunk costs (costs prior to project execution such as testwork, lease costs, exploration costs and feasibility studies), interest and financing costs are excluded from this capital estimate.
- All taxes including with-holding tax, VAT (or similar), duties, permits and fees are excluded from this capital estimate.
- Ground conditions are assumed adequate to support plant loads without major remediation requirements.
- Escalation and foreign exchange variations are excluded from estimate.
- Future capital costs are presented as a separate estimate from the initial capital requirement.

- Sustaining capital are included in Owner cost estimates.
- Financing costs and interest during construction are included in the Owner cost estimate.

21.3 Operating Costs

Summary

The processing operating costs have been estimated by Lycopodium for Doropo using Batie West. The operating costs were calculated by applying the process throughput of 4.5 Mtpa of free milling oxide / transition / fresh ore blends and nominally 4.0 Mtpa fresh semi refractory ore following the flotation flowsheet. The process plant will operate 24 hours per day, 365 days per year at 91.3% utilisation (nominal 8,000 hours per year).

A summary of LOM average process operating costs is shown in Table 21.4. A power unit cost of US$0.159 /kWh was used in line with adopting an IPP LNG power generation offer.

Table 21.4 Summary of LOM Operating Cost Estimates (US$, Q1 2021, ±30%)

	2021 Revised Throughput	
Power Unit Cost	US$/kWh 0.159	
	Free Milling Ores	Flotation Ores
Proportion of LOM*	38	62%
Annual Throughput	4.5 Mtpa	4.0 Mtpa
Cost Centre	US$/t	US$/t
Power Incl. Infrastructure Power	3.35	5.36
Consumables	3.67	6.27
Maintenance & Vehicles	0.77	1.08
Process & Maintenance Labour	1.31	1.50
Laboratory	0.12	0.14
Total Processing	***9.21***	***14.34***
Administration Labour	1.05	1.20
General & Administration	1.05	1.20
Total G&A	***2.10***	***2.41***
Total Processing / G&A*	**11.31**	**16.74**

* Cyanide detoxification costs are excluded from the above operating cost summary. It is assumed that cyanide discharge levels will generally be managed to meet discharge targets without detoxification. Provision for detoxification of the CIL tails has been made should this be required at times. Operating cost allowances for the associated reagents and power required amounts to $0.38 /t if the scenario where the detoxification is operating is to be taken into account.

The fixed and variable components of the operating costs have been applied to the mining schedule and financial model on the basis of ore type to provide an indication of cost variation on an annualised basis

Process Operating Cost Estimate Basis by Cost Centre

21.3.1.1 Power

The process plant power will be supplied by an IPP LNG power plant at an all-in power unit supply cost of US$0.159/kWh, as advised by Centamin based on an options study completed by ECG. The power unit cost accounts for the spinning reserve.

External consultant OMC modelled the comminution circuit and estimated circuit throughput, grinding energy required, liner wear rates and grinding media consumption for the nominated SAG and ball mills and liner wear rates for the jaw and recycle crushers.

Flotation concentrate regrind power was based on an IsaMill signature plot developed for the Konkera North flotation concentrate. Regrind consumables were based on typical industry values for gold pyrite concentrates. Power consumption for the balance of the plant and the infrastructure was estimated based on the installed power with load and utilisation factors being applied to reflect average drawn power.

21.3.1.2 Operating Consumables

Supply costs for the key operating consumables were based on recent vendor West Africa CIF vendor pricing. Other minor consumables costs were estimated from Lycopodium's database of costs for similar operations in the region.

The consumption of reagents and other consumables has been estimated from the Batie West ore composite laboratory testwork as discussed in Section 6.0, Metallurgy. Comminution circuit modelling and database referencing has also been used to determine consumption rates where applicable. In instances where characteristic test results have not been reported e.g. concentrate leach oxygen uptake rates, consumption has been estimated based on first principle calculations/ experience with similar ore types at other operations. No additional allowances for process upset conditions or wastage of reagents have been made.

Note that (as discussed in section 6.2) the detail costing by ore source excludes leaching of the flotation tail from Konkera Main as this is uneconomic.

A diesel price, delivered to site, of US$0.98 per litre has been used as advised by Centamin. Diesel will be used in plant mobile equipment, elution heating and the carbon regeneration kiln.

Allowances have been made for water treatment reagents and operator supplies. Lubricants are excluded, assumed to be covered under maintenance materials.

21.3.1.3 Maintenance and Vehicles

The maintenance cost allowance has been factored from the capital supply cost using factors from the Lycopodium database. The maintenance cost covers mechanical spares and wear parts, but excludes crushing and grinding wear components, mill media and general consumables (covered in the consumables cost estimate). The maintenance cost estimate includes maintenance of infrastructure and buildings. Site maintenance labour is excluded from the maintenance cost as it is included in the labour cost.

The maintenance cost for mobile equipment was estimated based on unit costs for maintenance of the vehicles and other mobile or portable equipment.

Contract maintenance costs allow for contract labour relating to the replacement of mill wear liners and assistance at plant shutdowns.

Provision has been made for general maintenance expenses, such as specialist maintenance software, maintenance manuals and control system licence fees.

21.3.1.4 Process Plant and Maintenance Labour

The processing labour cost includes all direct and overhead labour costs associated with plant operations, maintenance and administration personnel. This includes salary and wages, allowances, bonus, insurances and pension provisions.

Labour costs and manning structure were agreed with the owner and reflect typical allowances for a project of this scale in West Africa.

21.3.1.5 Laboratory

Laboratory costs were based on Lycopodium's database for a contract operated facility including mine grade control and plant assay costs.

21.3.1.6 General and Administration

General and Administration (G&A) cost was calculated from Lycopodium's database and reflects typical costs for a project of this scale in West Africa.

21.3.1.7 Pre-Production Costs

The costs incurred by operations during the latter stages of construction and commissioning have been estimated for inclusion in the capital cost estimate. First fill reagents and opening stocks costs are included. Pre-production costs associated with contract mining and general overheads were advised by the owner.

Working capital has been made estimated within the Owner costs and includes 3 months of commissioning, operating and insurance spares plus Operational team costs prior to handover and commercial operation

21.3.1.8 Process Operating Cost Exclusions

The operating cost estimate presented in this section is exclusive of the following:

- Owner head office costs. (National head office included in Owner costs).
- Any duties or taxes. (included in Owner costs).
- Impact of foreign exchange rate fluctuations.
- Escalation from the date of the estimate.
- Ongoing land or crop compensation costs. (included in Owner sustaining costs).
- Rehabilitation or closure costs. (included in Owner sustaining costs).
- Licence fees or royalties. (included in Owner costs).
- Mining costs. (included in Owner costs).
- Tailings storage costs, including future lifts and rehabilitation. (included in Owner sustaining costs).
- Government charges. (included in Owner costs).
- Government monitoring / compliance costs. (included in Owner sustaining costs).
- Cost for doré transport and refining. (included in Owner costs).
- Contingency allowance.

22 ECONOMIC ANALYSIS

An economic analysis has been undertaken by Centamin and incorporates Study outputs including milled tonnages and grades for the ore and the associated recoveries, gold price (revenue), operating costs, bullion transport and refining charges, government royalties and capital expenditures (both initial and sustaining).

The evaluation method considers the Project has been evaluated on a 100% ownership basis, with no debt financing.

The results of the economic model show potential within the asset. The model applies a long-term gold price of $1,450/oz, below consensus forecasts, on a flat line basis from commencement of production.

A summary of key outputs from the economic evaluation are presented in Table 22.1 and Table 22.2.

Table 22.1 Financial Summary – Long Term Gold Price

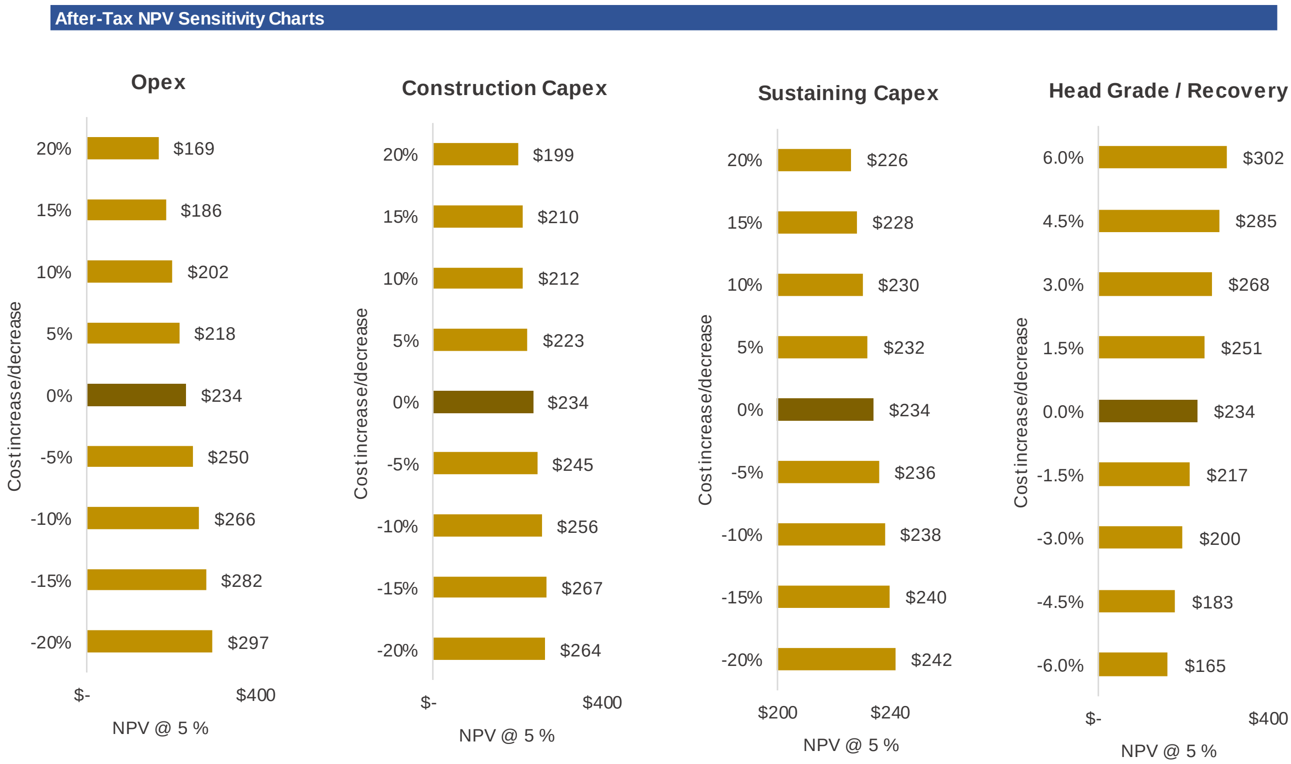
LOM Average ($US 1,450/oz)	Value	Unit
Physicals		
Mine Life	13	Years
Total Gold Production	1,962,432	oz
Average Annual Gold Production	150,956	oz / Year
Average Annual Ore Mined	4,182	ktpa
Average Annual Waste Mined	19,587	ktpa
Strip Ratio	4.7	W:O
Average Grade	1.25	g/t Au
Average Recovery	90.1%	%
Mining Cost	2.5	US$/t Mined
Processing Cost	11.9	US$/t Processed
G&A	2.4	US$/t Processed
Non Sustaining Capex	278	US$M
Sustaining Capex	90	US$M
Cash Costs	796	US$/oz Sold
All-in Sustaining Costs	904	US$/oz Sold
Average Yr 1 to 5		
Cash Costs	666	US$/oz Sold
All-in Sustaining Costs	769	US$/oz Sold
Average Annual Gold Production	207,800	oz
Pre - Tax Economics		
Project NPV@ 5%	480	US$M
IRR	34	%
Post - Tax Economics		
Project NPV@ 5%	234	US$M
IRR	21	%
Payback	5.1	Years

Table 22.2 Financial Summary – Consensus Gold Price

LOM Average – Consensus Price ($US1,700 – 1,900/oz)		
Pre - Tax Economics		
Project NPV@ 5%	919	US$M
IRR	50	%
Post - Tax Economics		
Project NPV@ 5%	487	US$M
IRR	33	%

22.1 Sensitivity Analysis

Table 22.3 Sensitivity Analysis (NPV@5%)



22.2 Production Charts

Table 22.4 Ore, Waste and Grade LoM Profile

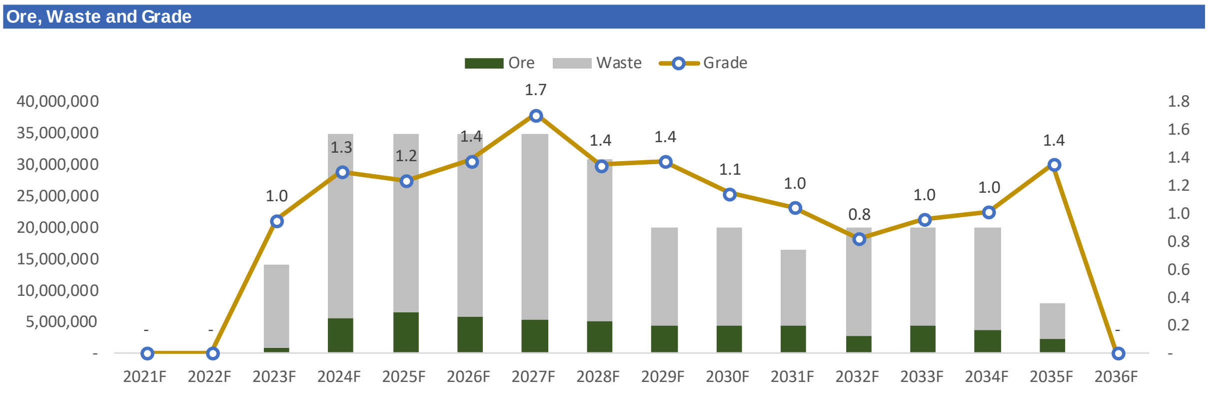


Table 22.5 Gold Production vs All In Sustaining Costs

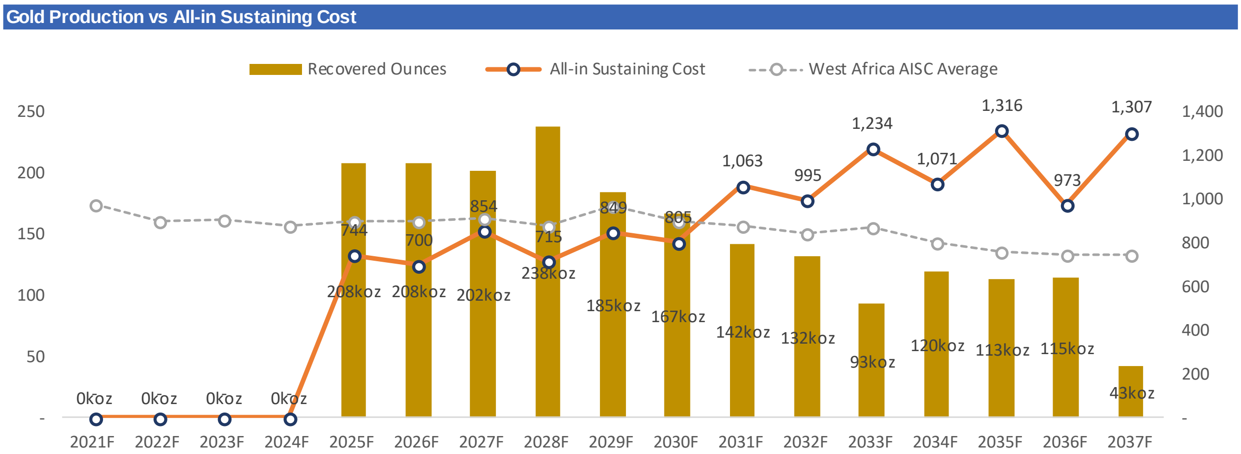


Table 22.6 Doropo Technical and Financial Metrics

	Unit	LOM	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
Mining schedule																	
Total material moved	kt	**308,991**	-	14,030	35,000	35,000	35,000	34,961	30,883	19,931	20,000	16,314	20,000	20,000	20,000	7,873	-
Total waste moved	kt	**254,625**	-	13,366	29,368	28,604	29,280	29,762	25,886	15,620	15,760	11,861	17,234	15,675	16,449	5,760	-
Total ore mined	kt	**54,366**	-	664	5,632	6,396	5,720	5,199	4,996	4,310	4,240	4,453	2,766	4,325	3,551	2,113	-
Stripping ratio	w:o	**4.7**	0.0	20.1	5.2	4.5	5.1	5.7	5.2	3.6	3.7	2.7	6.2	3.6	4.6	2.7	0.0
Au grade - ore mined	g/t	**1.2**	0.0	1.0	1.3	1.2	1.4	1.7	1.4	1.4	1.1	1.0	0.8	1.0	1.0	1.4	0.0
Contained gold - ore mined	oz	**2,179,828**	-	20,379	235,849	254,893	254,182	286,224	217,055	190,952	156,073	149,673	73,188	133,475	116,012	91,872	-
Processing schedule																	
Total ore processed	kt	**54,365,736**	-	-	4,423,704	4,433,258	4,079,354	4,064,116	4,233,389	4,076,406	4,245,898	4,236,450	4,474,731	4,285,910	4,187,558	4,036,318	3,588,642
Au grade - ore processed	g/t	**1.2**	0.00	0.00	1.59	1.59	1.73	2.04	1.51	1.43	1.16	1.08	0.70	0.97	0.94	0.99	0.41
Contained gold - ore processed	oz	**2,179,828**	-	-	226,329	226,583	226,360	266,567	205,109	187,536	158,071	146,806	100,822	133,232	126,260	128,751	47,401
Au recovery	%	**90%**	0%	0%	92%	92%	89%	89%	90%	89%	90%	90%	92%	90%	89%	89%	90%
Recovered gold	oz	**1,962,432**	-	-	207,568	207,612	201,706	237,575	184,539	167,115	141,657	132,039	92,737	119,914	112,708	114,578	42,683
Payable gold	oz																
Cash flow summary																	
Gross revenue	$M	**2,831**	-	-	299	300	291	343	266	241	204	190	134	173	163	165	62
Less: Royalties	$M	**127**	-	-	13	13	13	15	12	11	9	9	6	8	7	7	3
Less: Refining & transport charges	$M	**8**	-	-	1	1	1	1	1	1	1	1	0	0	0	0	0
Net revenue	$M	**2,696**	-	-	285	285	277	326	254	230	195	181	127	165	155	157	59
Operating costs																	
Mining	$M	**769**	-	-	74	73	82	84	72	54	69	58	43	58	67	33	-
Processing and maintenance	$M	**647**	-	-	44	44	55	55	50	55	50	50	43	48	52	57	44
Site G&A	$M	**146**	-	-	12	12	11	11	12	11	12	12	12	12	12	11	6
Total operating costs	$M	**1,562**	-	-	130	129	148	151	134	121	131	120	98	118	131	101	50
Operating margin	$M	**1,135**	-	-	155	157	129	175	120	109	64	62	29	47	24	56	9
Construction capital	$M	**278**	185	92	-	-	-	-	-	-	-	-	-	-	-	-	-
Sustaining capital	$M	**90**	-	-	10	2	10	2	10	2	10	2	10	2	10	2	3
Change in Working capital	$M	**-**	-	-29	0	-3	-2	5	3	-1	2	5	-4	-2	5	11	10
Net project cash flow before tax	$M	**766**	-185	-121	145	151	117	178	112	106	56	64	15	43	19	65	16
Income Tax	$M	**177**	-	-	25	17	26	38	24	21	9	9	0	4	-	3	-
Net after-tax cash flow	**$M**	**589**	-185	-121	120	134	91	140	89	85	47	55	15	38	19	61	16
Cumulative after-tax cash flow	$M		-187	-307	-187	-53	38	178	266	351	398	453	468	507	526	587	603
Cash operating cost per ounce*	$/oz	**796**	-	-	627	619	736	636	725	721	923	908	1,059	984	1,160	885	1,171
All-in sustaining cost per ounce	$/oz	**904**	-	-	744	700	854	715	849	805	1,063	995	1,234	1,071	1,316	973	1,307

23 ADJACENT PROPERTIES

The Doropo Gold Project site is located approximately 30 km South West from Batie West in Burkina Faso.

24 OTHER RELEVANT DATA AND INFORMATION

The authors are not aware of any omissions or other relevant data and consider the explanations provided are not misleading.

25 INTERPRETATION AND CONCLUSIONS

This PEA study is preliminary in nature. It includes Inferred Mineral Resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorised as Mineral Reserves, and there is no certainty that the conclusions of this preliminary economic assessment will be realised.

26 OTHER

26.1 Project Implementation

With the Project at an early stage of development, the implementation plan described in this report is intended as conceptual. The anticipated approach for Project execution is to engage a suitable Engineering, Procurement and Construction Management (EPCM) contactor for design and construction management of the process plant and infrastructure. The site will then be progressively handed over to the Owner's operating team.

The construction of the mining operations will be self-performed by the Centamin operations team and selected mining contractor. The Centamin Owner's team will be responsible for mine design, resource modelling, survey and geotechnical management.

The Centamin project team will manage both the onshore and offshore activities of the principal EPCM contractor and specialist subcontractors as well as providing specialist technical input into the Project design.

Centamin also intends to manage and self perform a range of early works required for the Project, which would include:

- All bulk earthworks, roads and drainage construction including camp, treatment plant, culverts and drainage, water and sewage, access roads and tracks and airstrip.
- Any necessary resettlement construction.
- All security systems design, supply, installation and commissioning.
- All site building furniture, equipment and fit-out procurement.
- Site security services and management.
- All fencing.
- In-pit dewatering including installation of all related piping, supply and installation of pumps, bores and power.
- Power supply system, including switchyard and power station provided by Independent Power Provider (IPP).
- ROM pad - including building up of ROM pad and supply and placement of rock and soil for backfill around primary crusher vault.
- Fuel storage and distribution system, to be supplied by contracted fuel supplier.

The estimated durations of and timing of key activities based on the current schedule are provided in Table 26.1. The dates and durations are based on receipt of the relevant authorisations to proceed and project approval.

Table 26.1 Key Project Activities

Item	Target Start	Target Finish
PFS Phase	May 2021	Mid-2022
DFS Phase	Jun 2022	Mid-2023
Owners Early works	Dec 2022	Q3 2023
FEED	Apr 2023	Q3 2023
Detailed Design	July 2023	Q2 2024
Procurement and Delivery	July 2023	Q4 2023
Construction on Site	Sept 2023	Q4 2024
Commissioning	Sept 2024	Q1 2025
First Gold Pour	Q1 2025	
Commissioning Complete and Handover	Q1 2025	