
XIX
2026
International Society for Mine Surveying Congress
VENUE: CENTURY CITY, CAPE TOWN
22-24 SEPTEMBER 2026 - CONFERENCE
25 SEPTEMBER 2026 - TECHNICAL VISITS
Hosted by Institute of Mine Surveyors of Southern Africa
and the International Society of Mine Surveying.

Institute of Mine Surveyors of Southern Africa

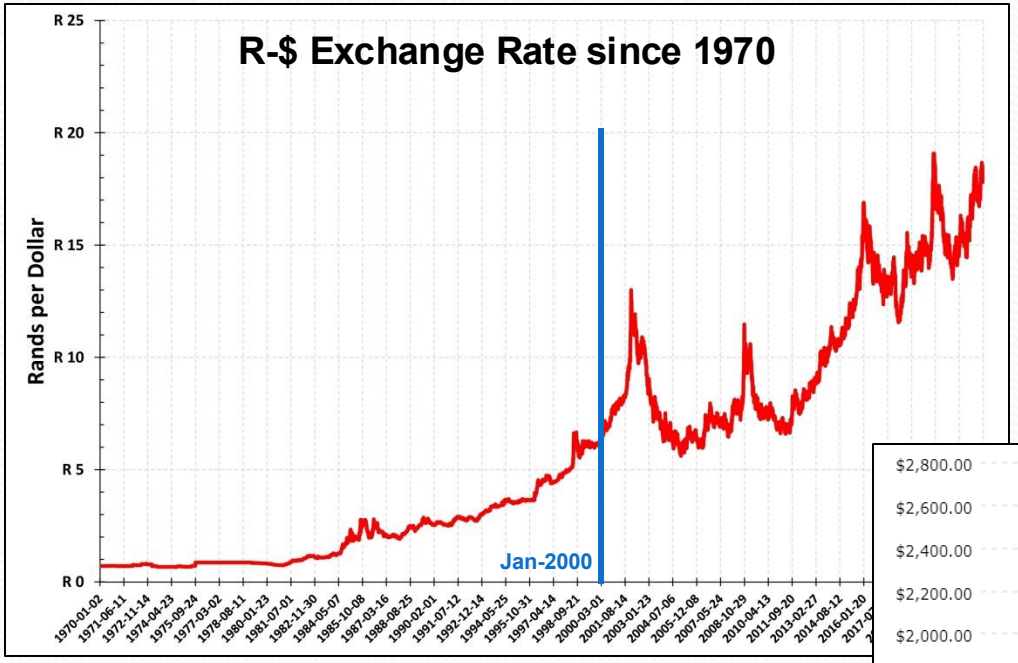
Transforming historic data into a SAMREC-compliant Independent Technical Report

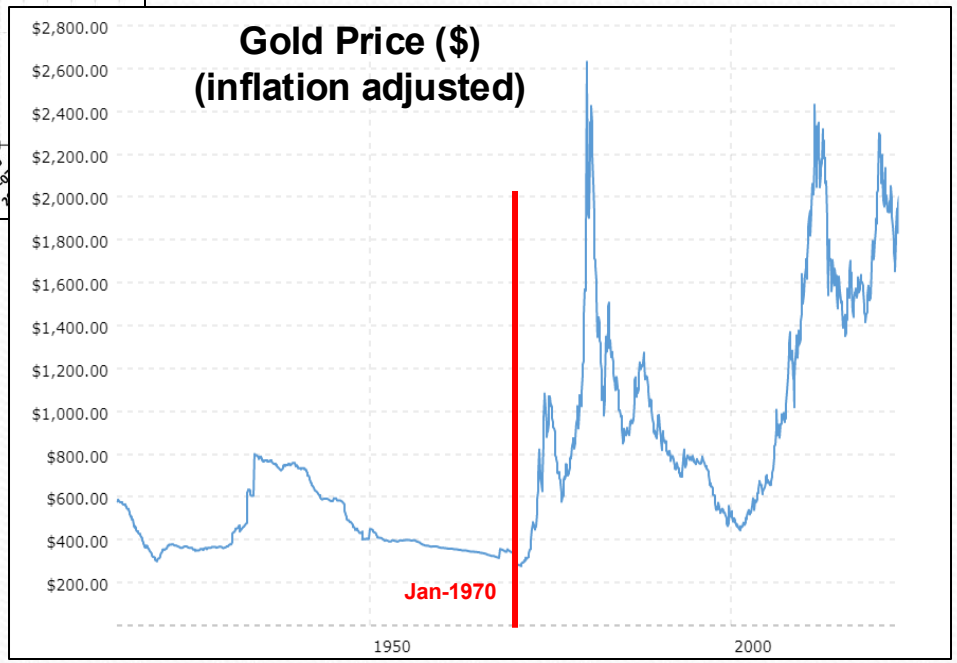
ISM Commission 2 meeting, 4 September 2025

First presented at the IMSSA 100th ANNIVERSARY in Clarens, 18 October 2023

By Alex Bals and Jurgens Visser

VIABILITY OF RE-EVALUATING OLD GOLD MINES





ESTIMATED LIFE OF GOLD AND PLATINUM

Gold

Product	Province	Unit of measure	Reserves	Total Exclusive Resource	Reserves/Exclusive Resources*	Total output	Years left*
Gold	Free State	Moz	3.37	39.96	0.08	0.55	6
	Gauteng	Moz	56.88	66.84	0.85	1.56	37
	Mpumalanga	Moz	3.31	9.27	0.36	0.20	16
	North West	Moz	4.53	7.61	0.60	0.25	18
	Total	**Moz**	**68.09**	**123.68**	**0.55**	**2.56**	**27**

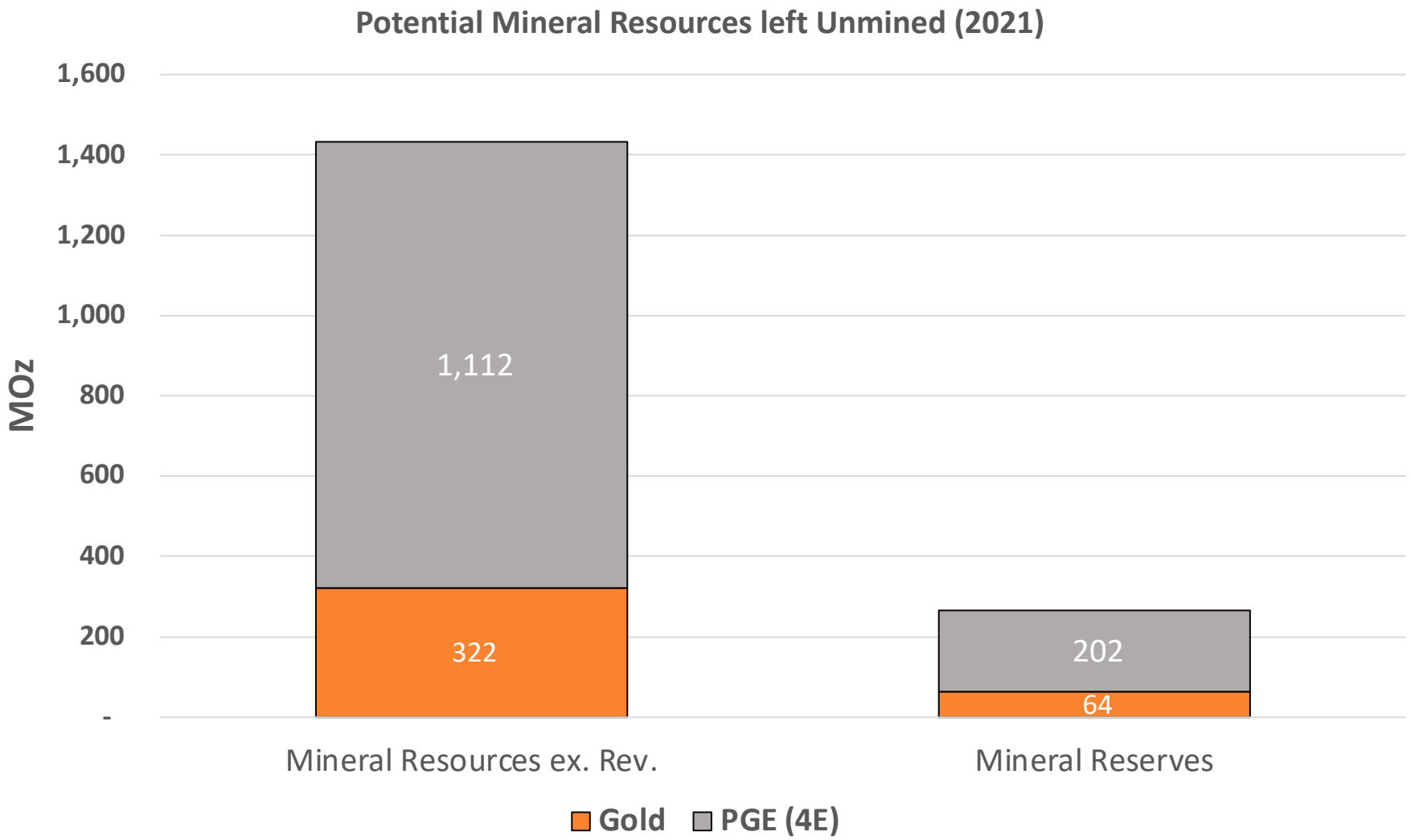
The ratio of mineral reserves to exclusive mineral resources of 0.85 indicates a fair degree of flexibility and optionality for Gauteng gold producers to convert existing mineral resources into mineral reserves.

Platinum Group Metals (PGM)

Product	Province	Unit of measure	Reserves	Total Exclusive Resource	Reserves / Exclusive Resource*	Total output	Years left*
PGMs	Limpopo	Moz 4E	188.80	549.59	0.34	3.19	59
	North West	Moz 4E	72.21	287.22	0.25	3.74	19
	Total	**Moz 4E**	**261.01**	**836.81**	**0.31**	**6.94**	**38**

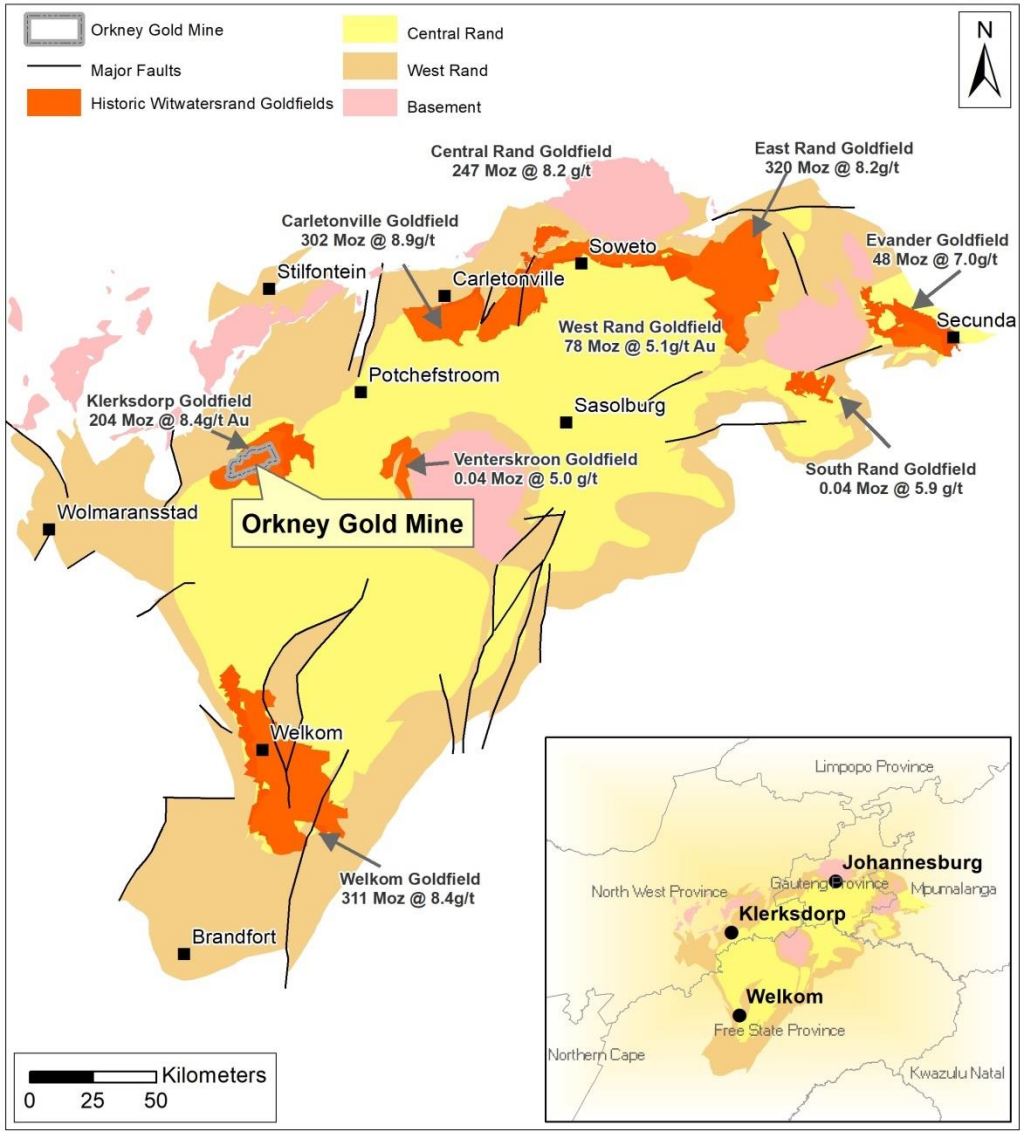
Source: PWC Report "Adapt to thrive" Oct 23 and J Visser Minerals Council Study 2021

MINERAL RESOURCES AND RESERVES

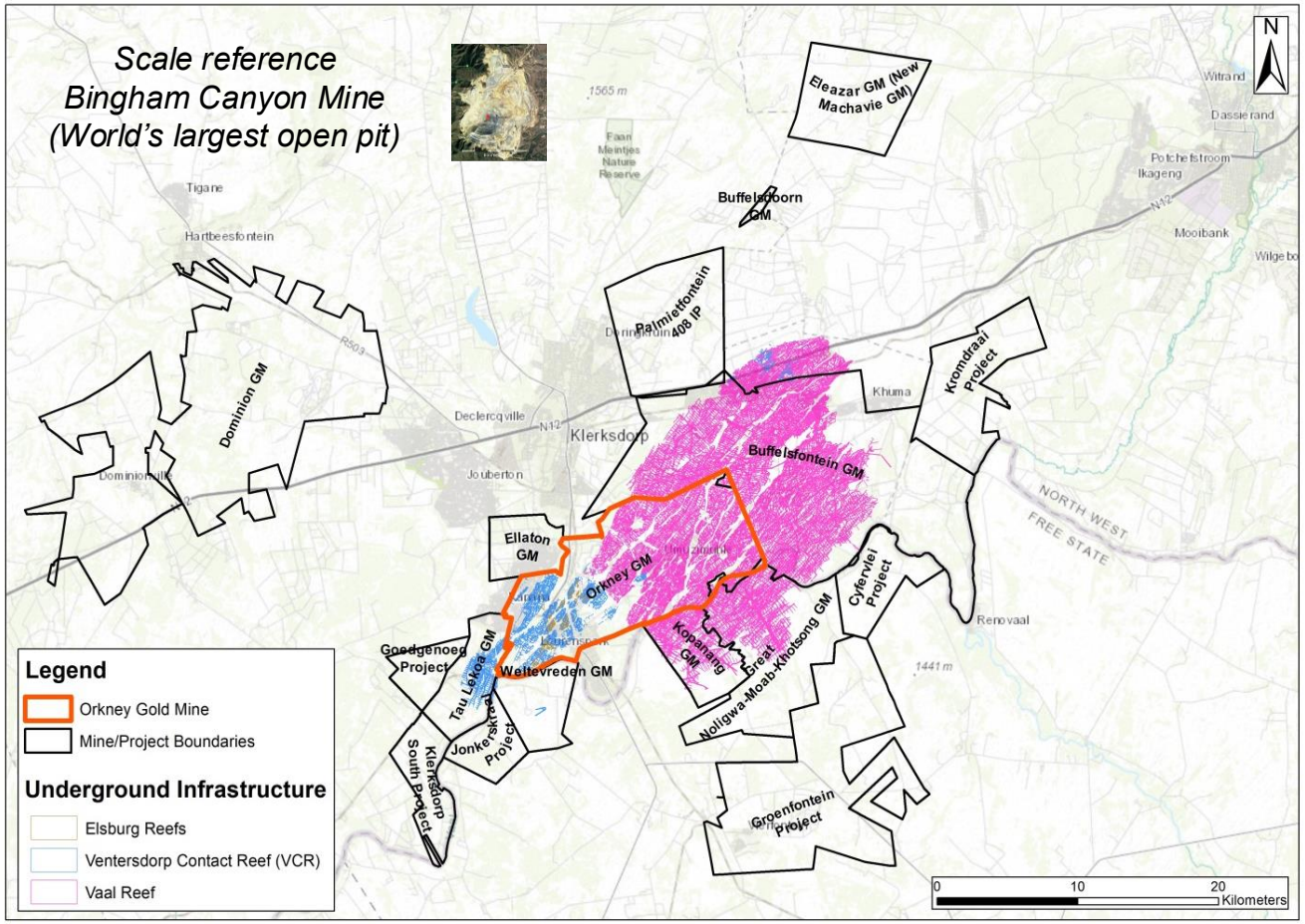


PWC Report "Adapt to thrive" Oct 23 and J Visser Minerals Council Study 2021

WITWATERSRAND BASIN



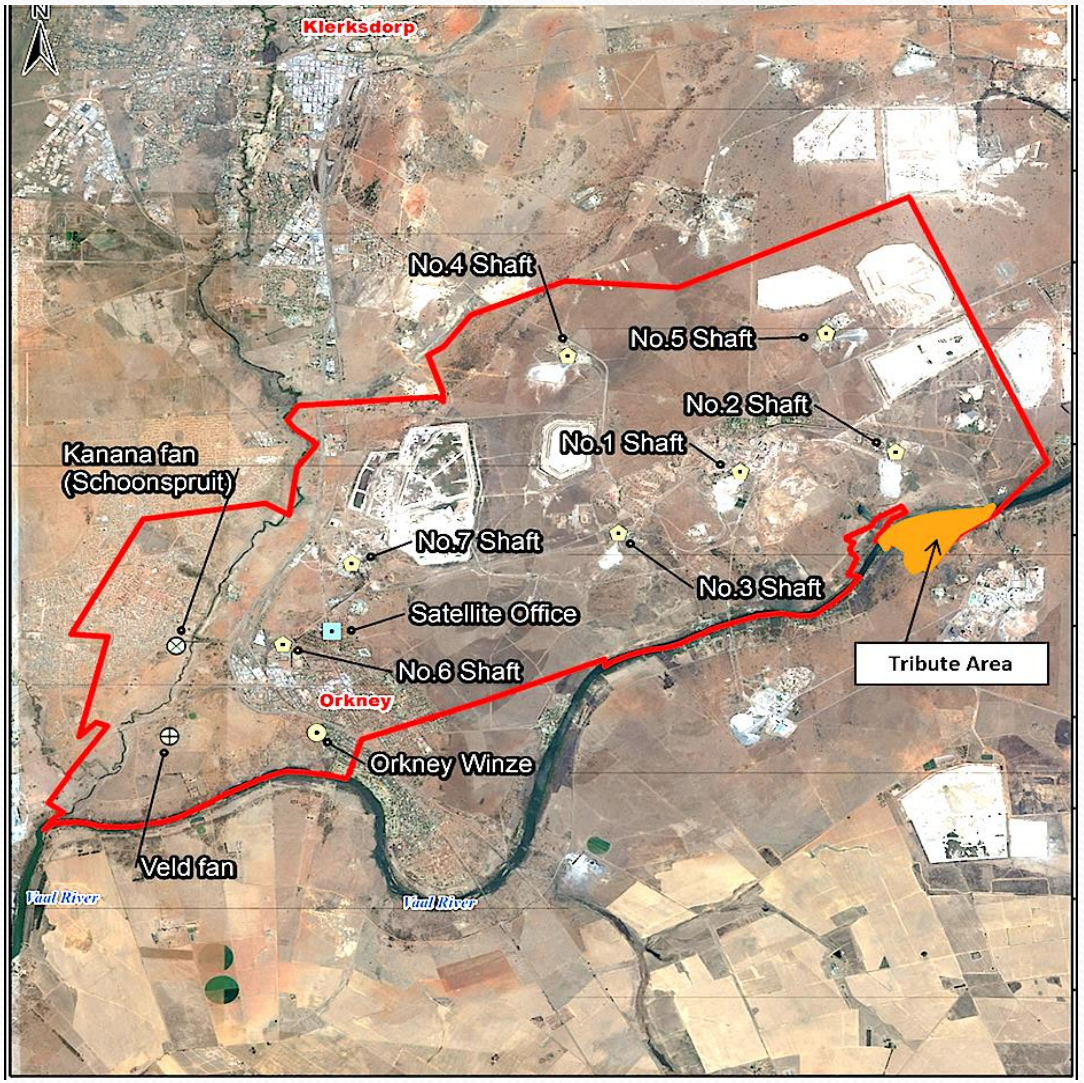
KLERKSDORP GOLDFIELD



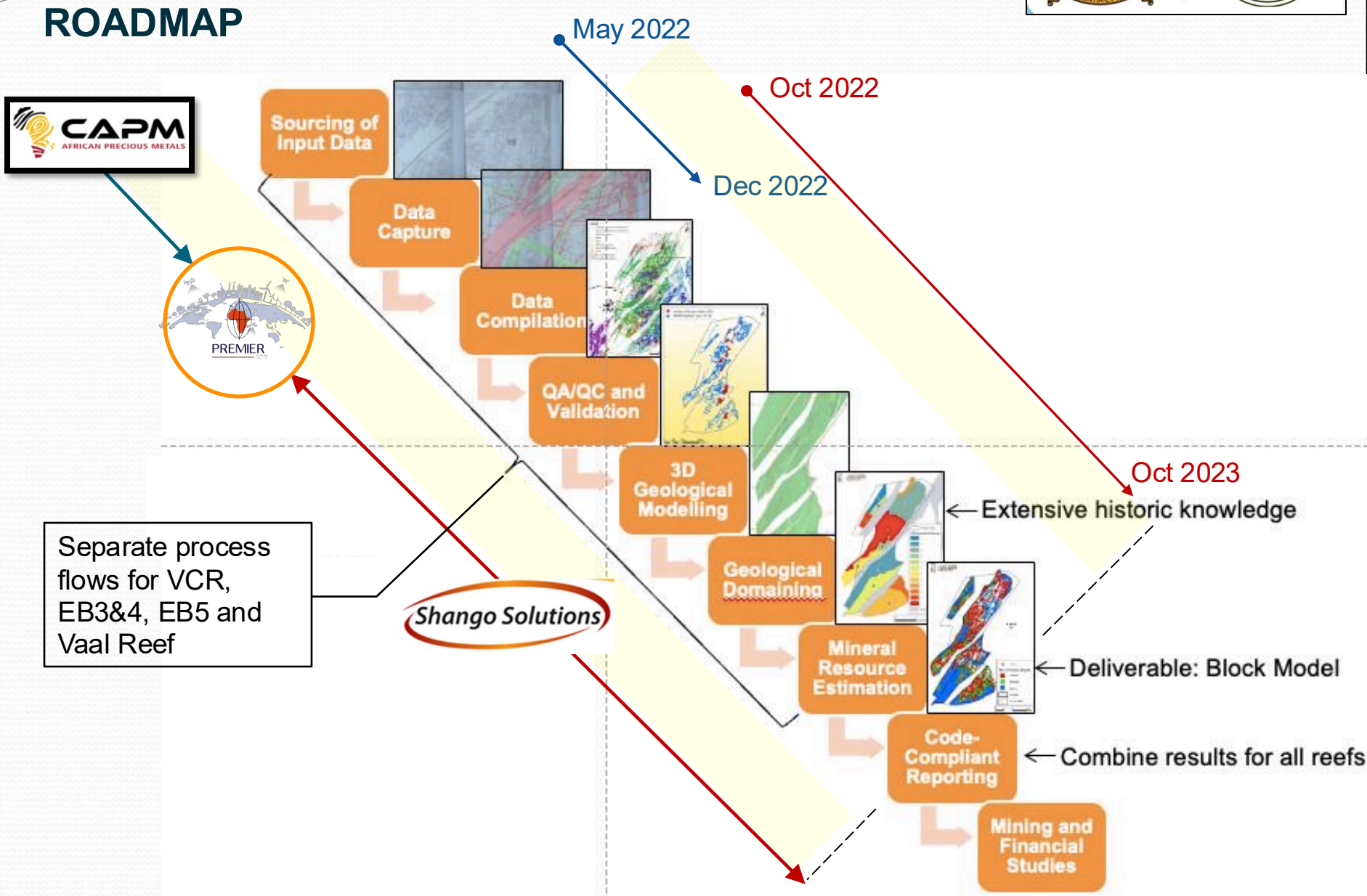
- Production history starts in 1886.
- Large-scale production in the 1940s.
- Reefs occurring 80-4 000 m deep.
- Primary reefs Vaal Reef, VCR.
- Secondary reefs Elsburgs (and others)

MINING LEASE AREA

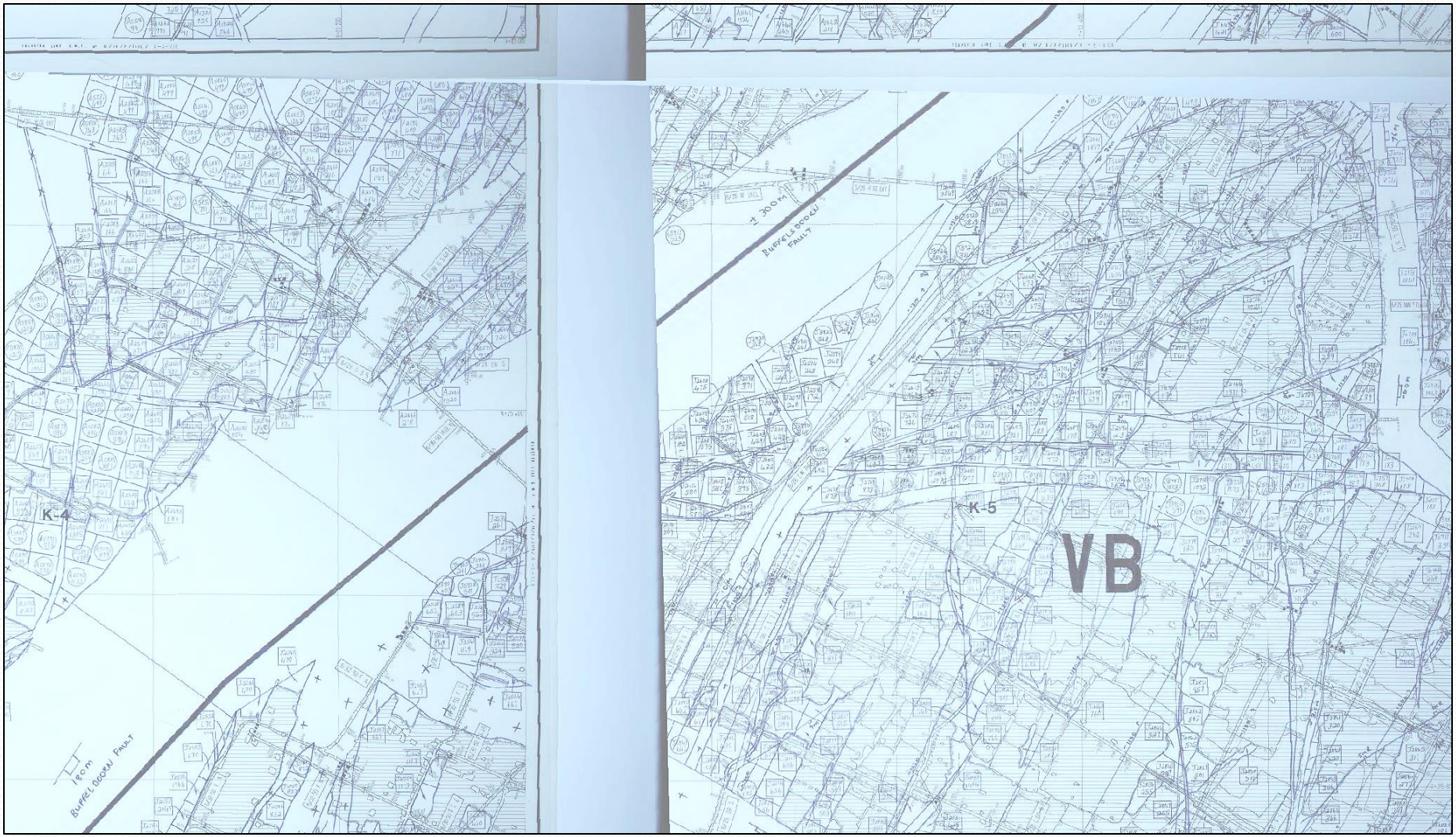
- Operated by Anglo American Gold and Uranium Division.
- Acquired by Pamodzi in 2008.
- Pamodzi went into liquidation and the mining right was acquired by CAPM in 2011.
- Anticipating mining activities from Orkney Winze, 1, 4, 6, 7 shafts with expansion to 3 Shaft.



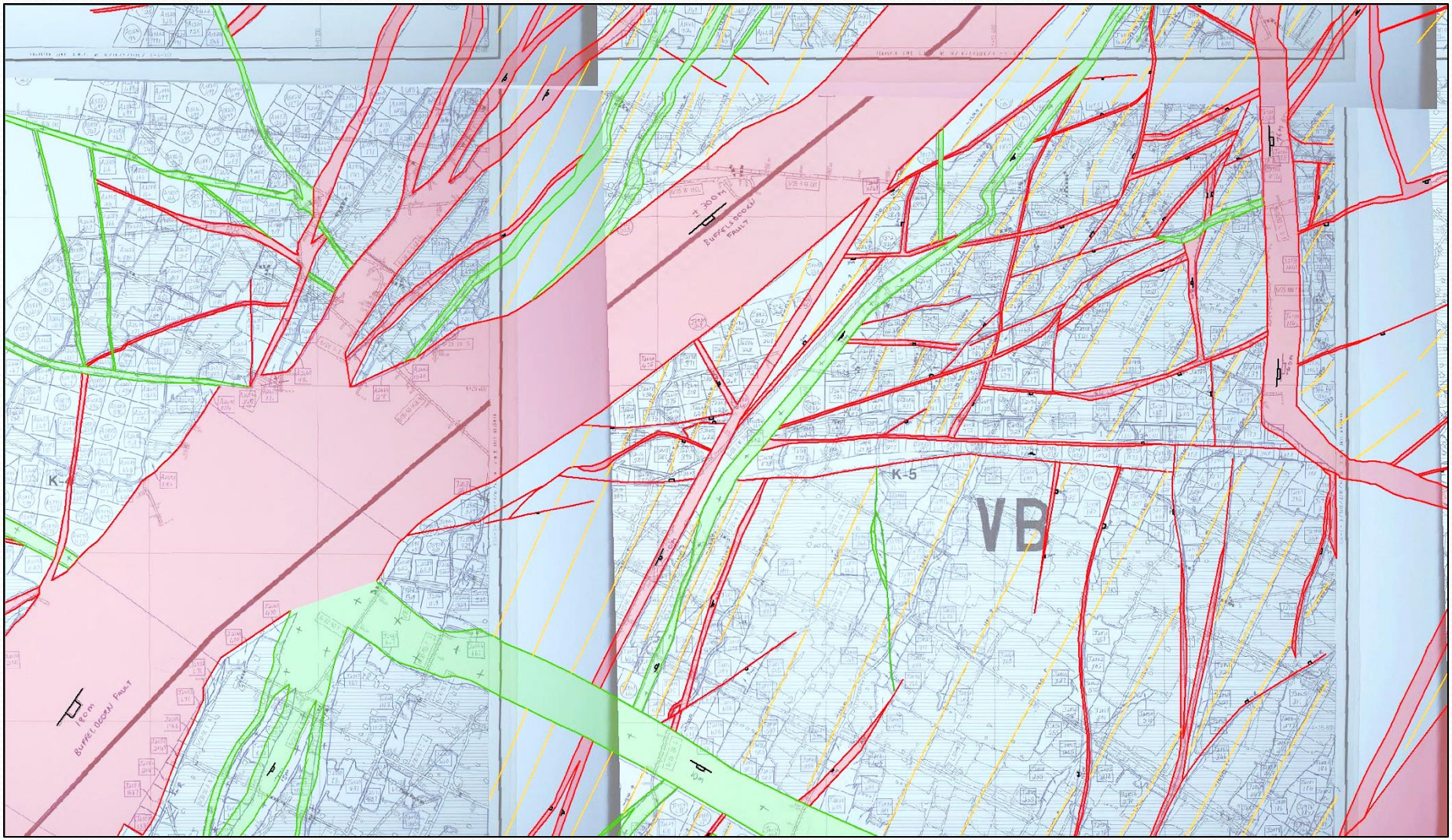
ROADMAP


May 2022
Oct 2022
Dec 2022
Oct 2023
CAPM
AFRICAN PRECIOUS METALS
PREMIER
Sourcing of Input Data
Data Capture
Data Compilation
QA/QC and Validation
3D Geological Modelling
Geological Domaining
Mineral Resource Estimation
Code-Compliant Reporting
Mining and Financial Studies
Extensive historic knowledge
Deliverable: Block Model
Combine results for all reefs
Separate process flows for VCR, EB3&4, EB5 and Vaal Reef
Shango Solutions

1 : 1 000 GME PLANS

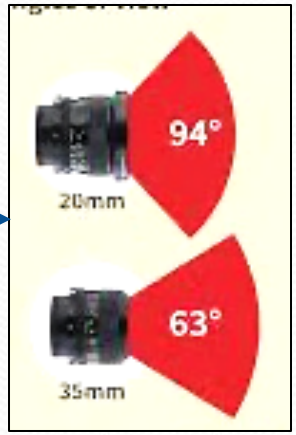


1 : 1 000 STRUCTURE PLANS

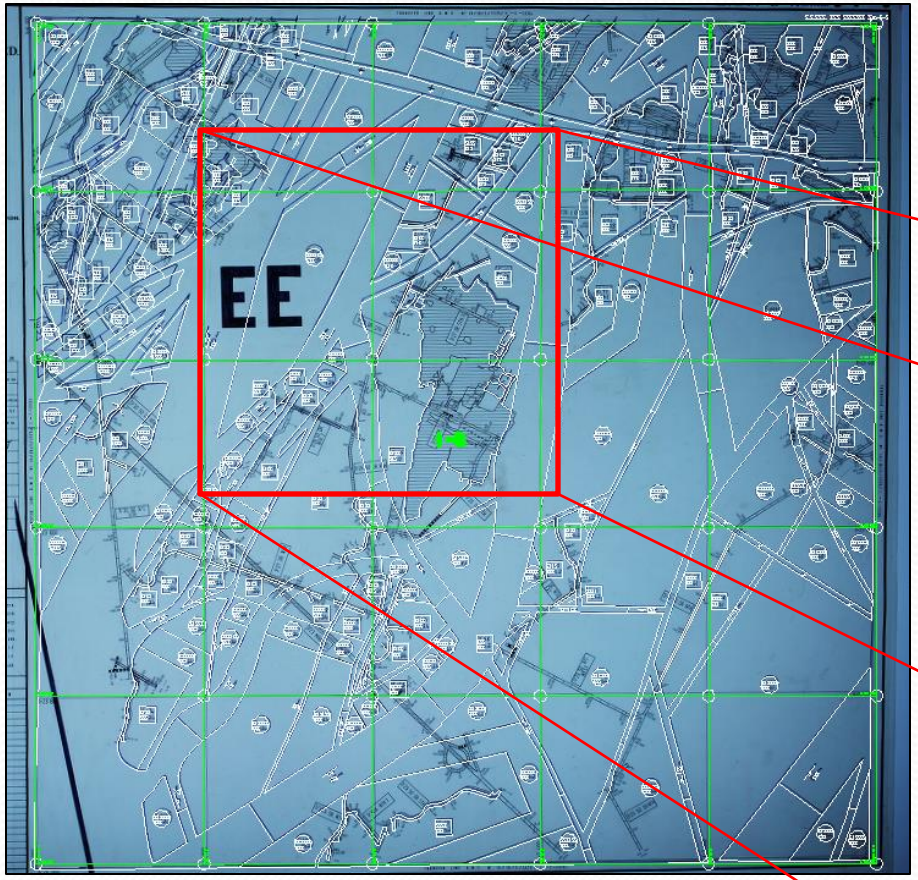


DATA CAPTURING VIA CAMERA

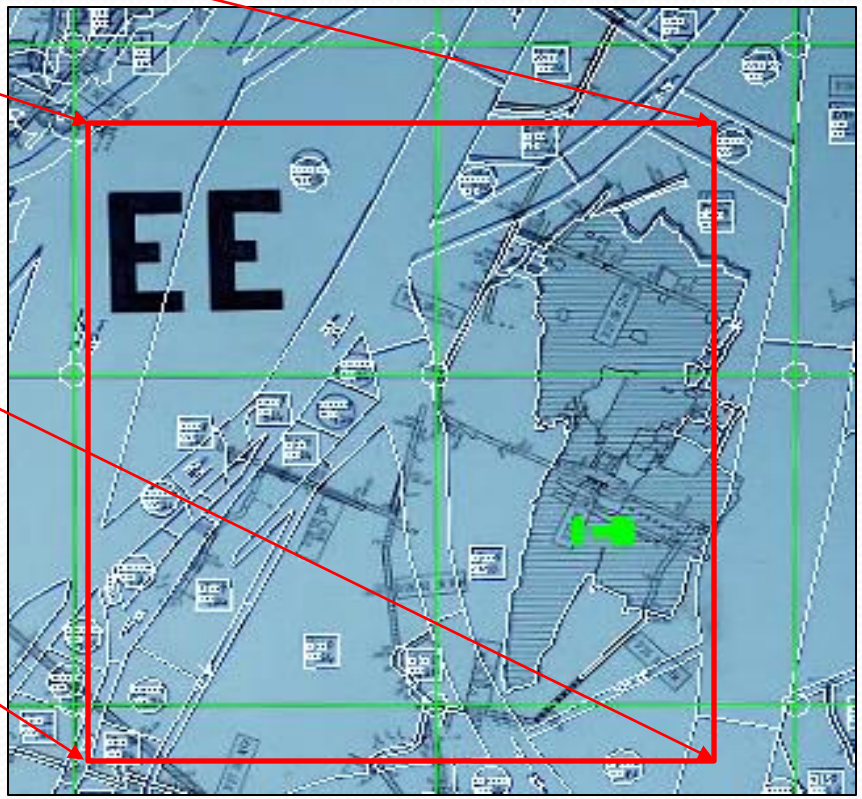
- Camera Sony Alpha 7iii – 63 Mpixel
- Lens 35 mm Sony Micro - fixed
- Camera mount and light box
- Dark room requirements
- Condition and shape of plans



WARPING THE IMAGERY - ORTHORECTIFICATION

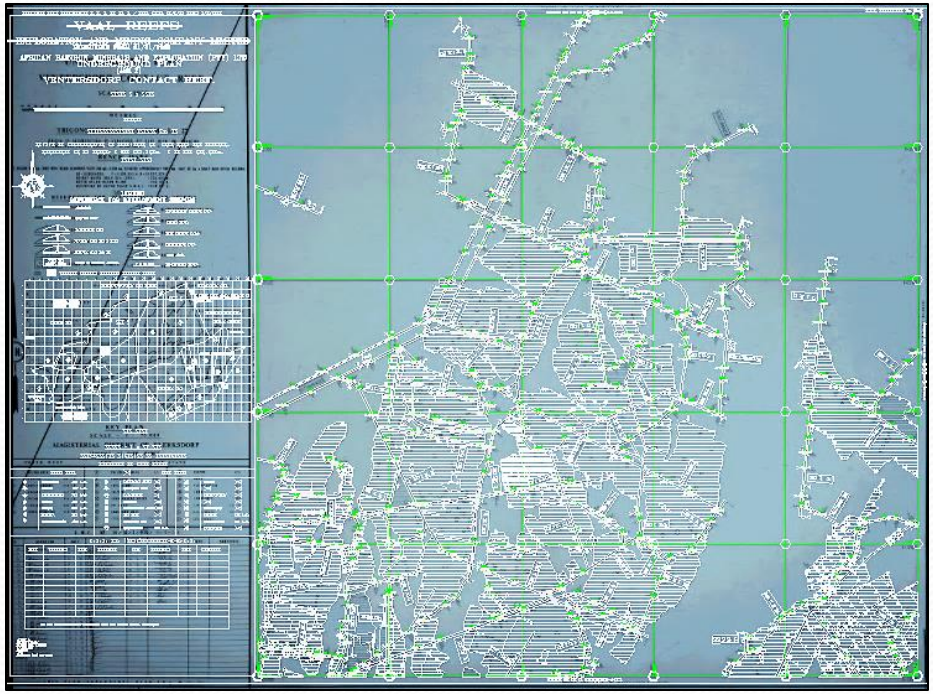


- 9 Reference points per block
- Block-by-block for geofitting
- 1 : 200 Sheets corrected for dip
- Dip correction on feature matching



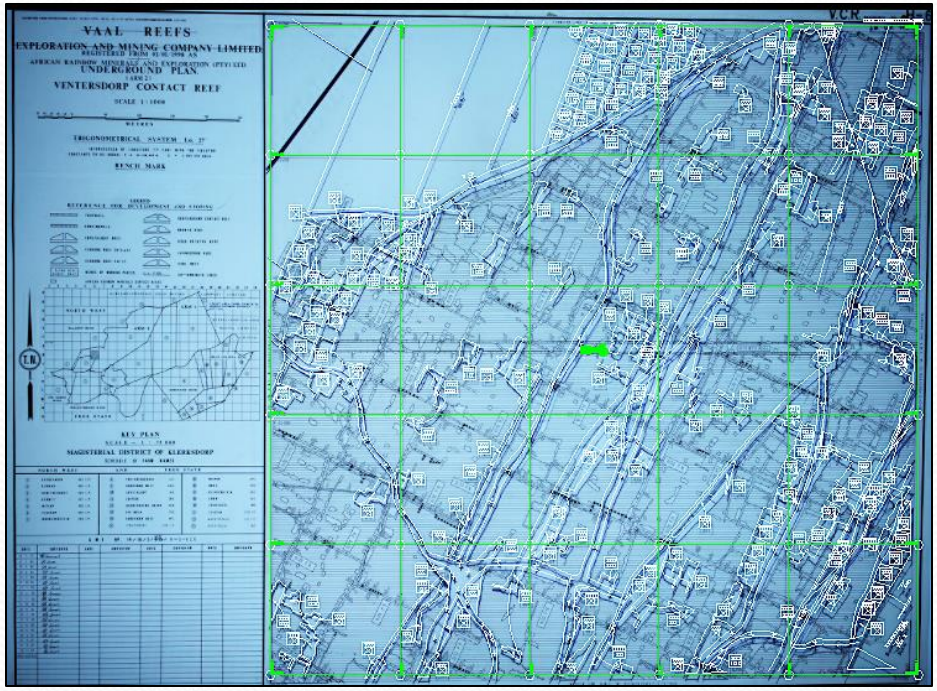
CREATING VALUE EARLY: NEW STATUTORY PLANS

1 : 1 000 GME plans



- Full title block and key index plan
- All features on their own levels
- Pegs with elevations included
- Schedule 2 symbology

1 : 1 000 geology plans



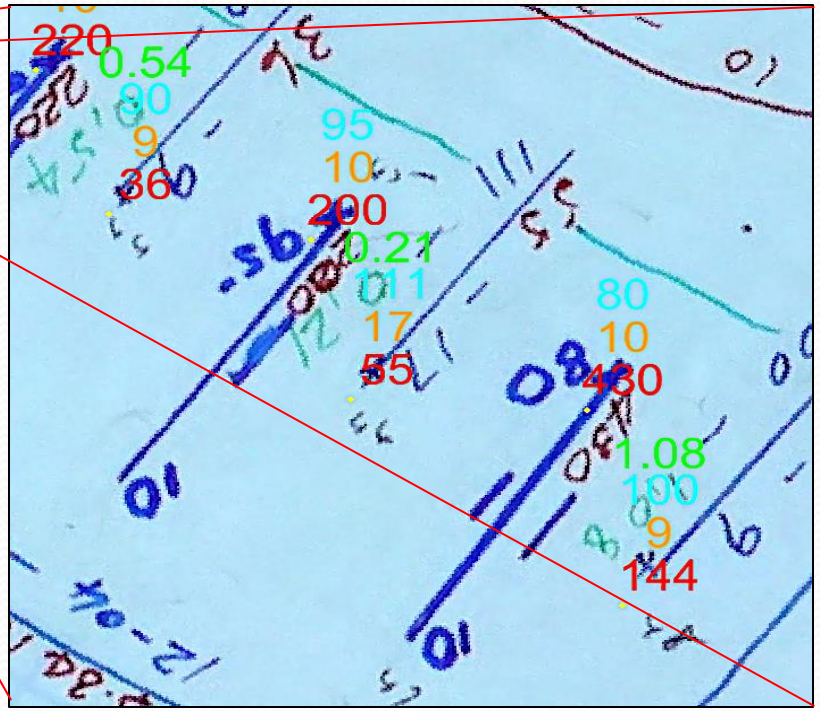
- No title blocks, overlain on GME plans
- All features on their own levels

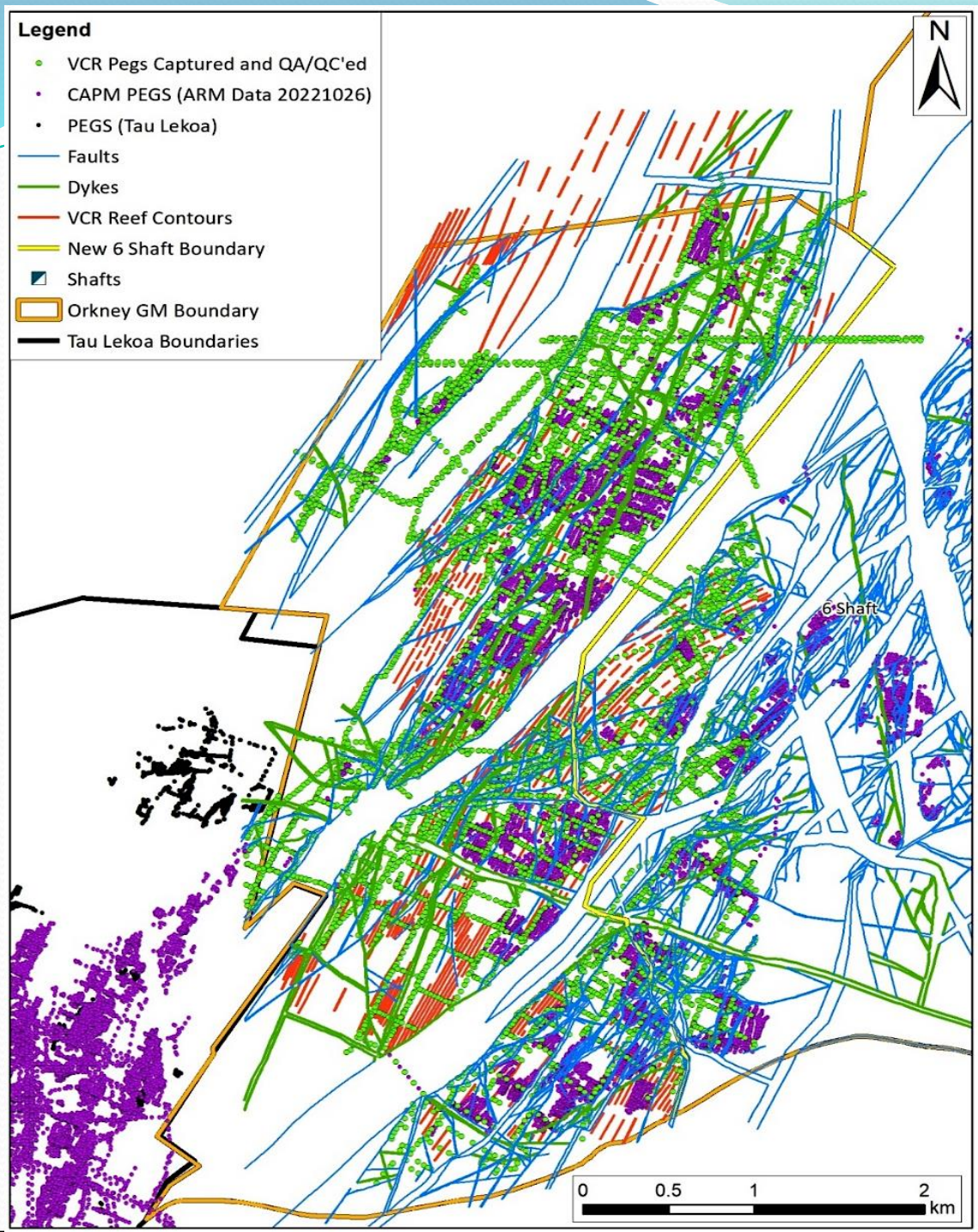
SAMPLING DATA DIGITISED AND ATTRIBUTED

1: 200 Assay tracings

- Gold value
- Uranium value
- Channel width
- Stope width

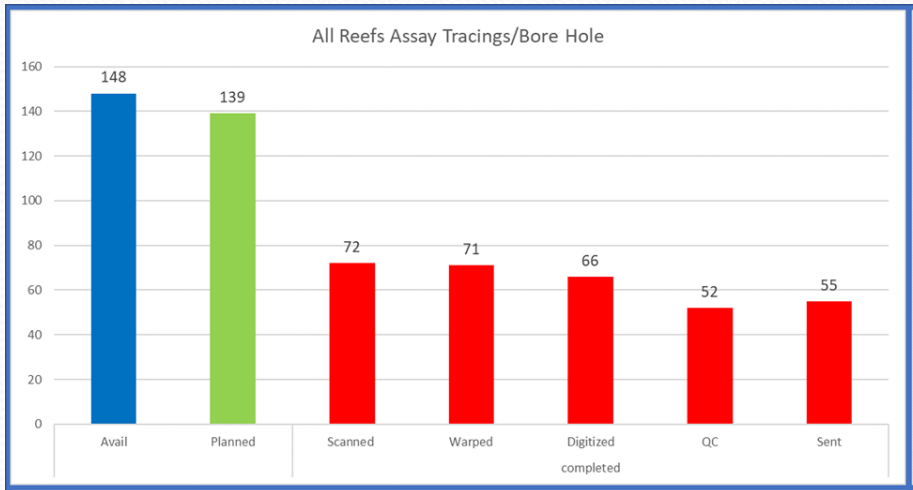
- Stretch values decomposited
- All output in x, y, z, and attribute
- Output on plan and in ASCII
- .csv Files for easy importing
- 999 values for databases

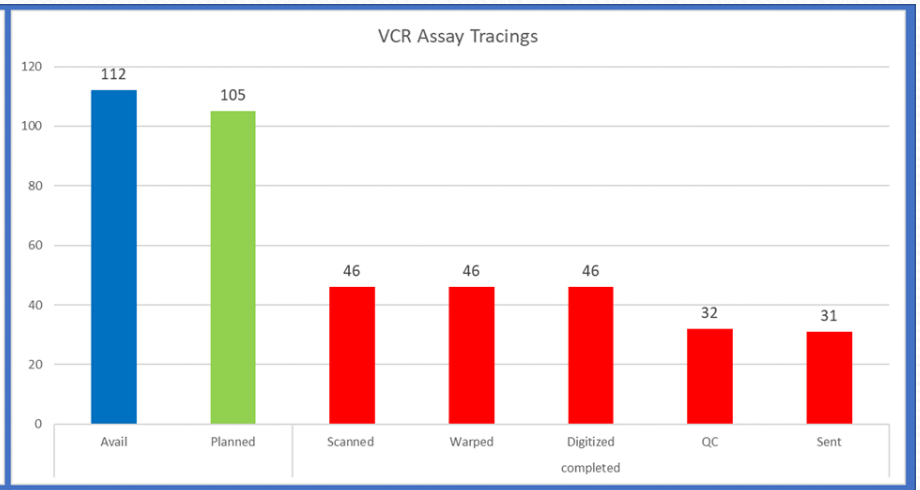


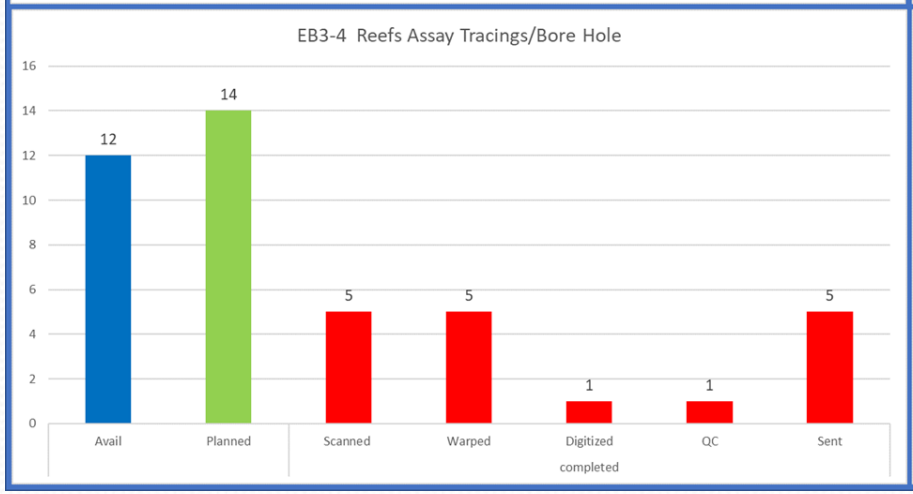


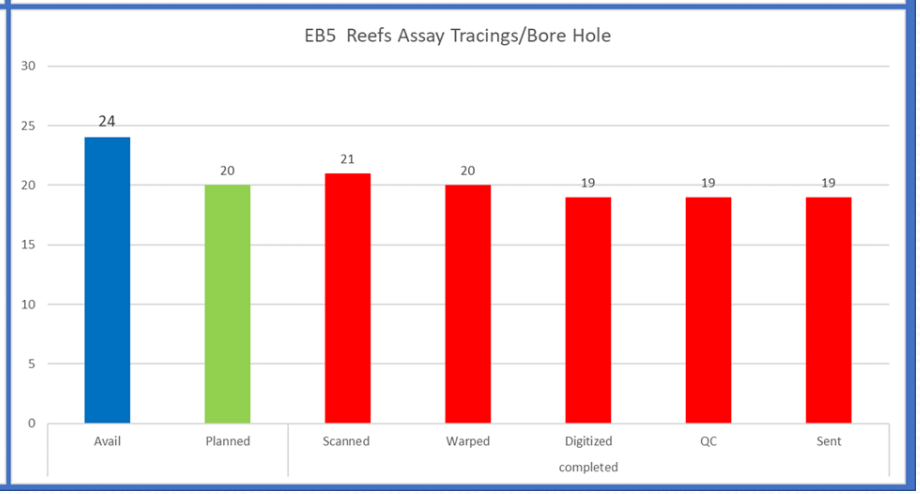
- > 900 plans and sheets digitized and orthorectified.
- All features digitized with 100% QA/QC.
- 3D referencing by local best-fit on peg data and/or reef contours.
- Manual interpretations of suboutcrops.
- Pillars < 500 m2 and features < 1 m ignored
- 2 m accuracy (1 : 200)

PROGRESS TRACKING OF SCANNING WORK

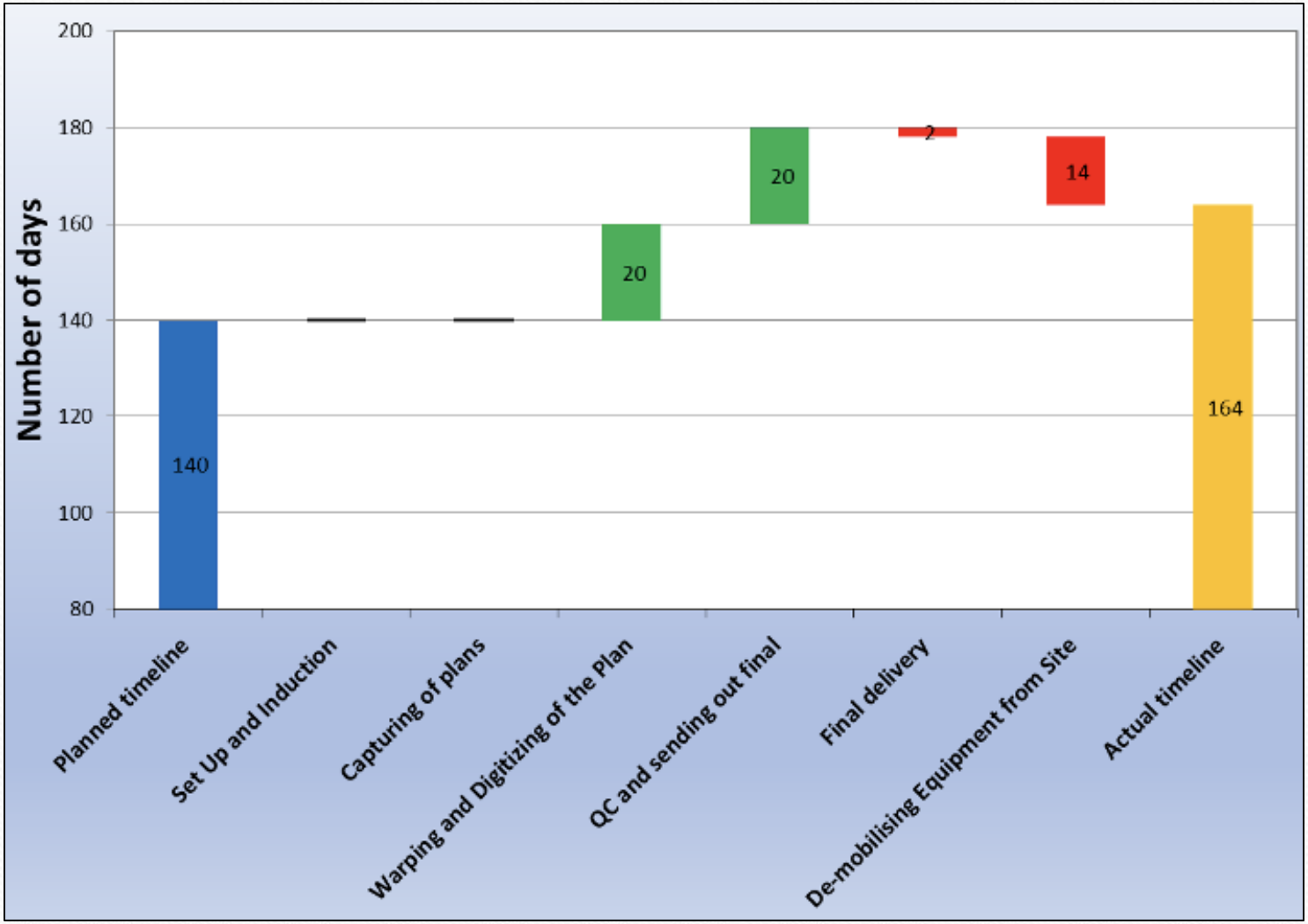




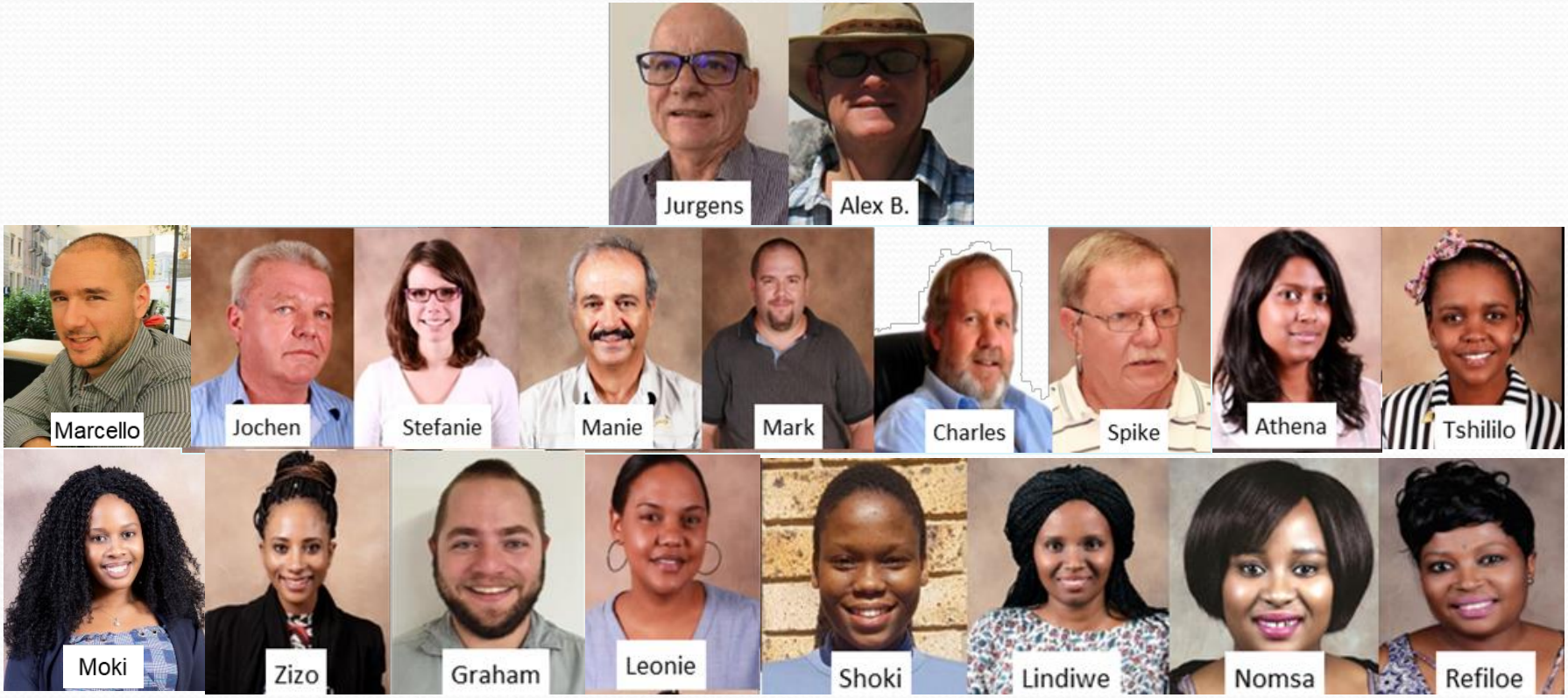




MONITORING SCOPE CREEP



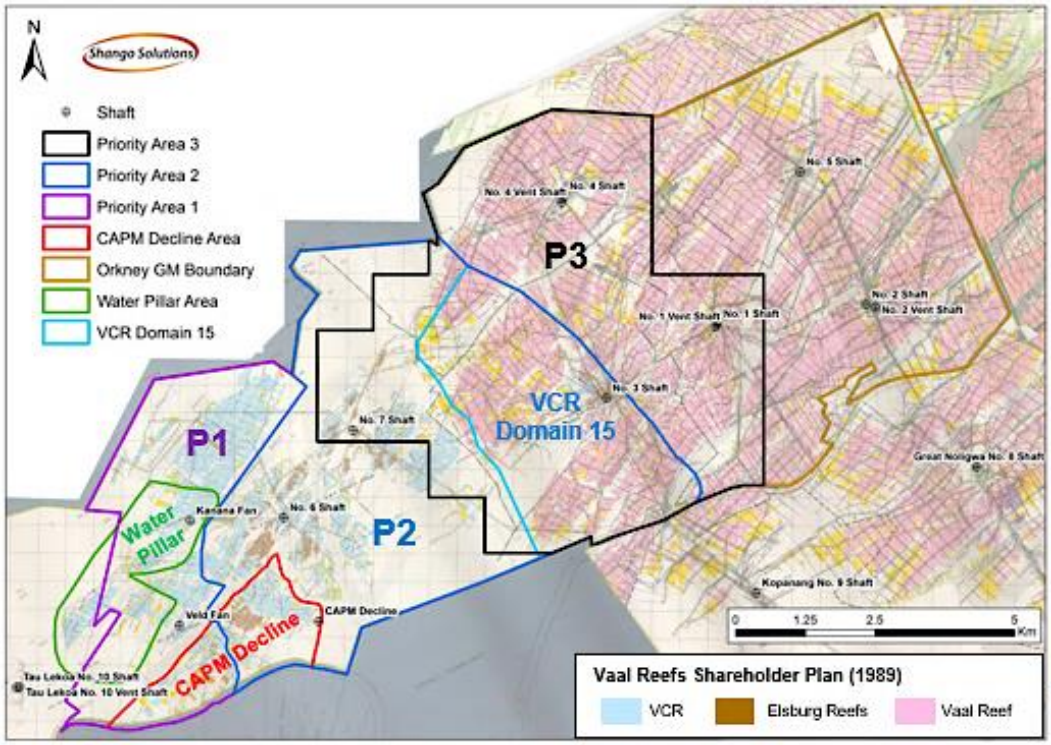
BUILDING THE GEOLOGICAL MODEL



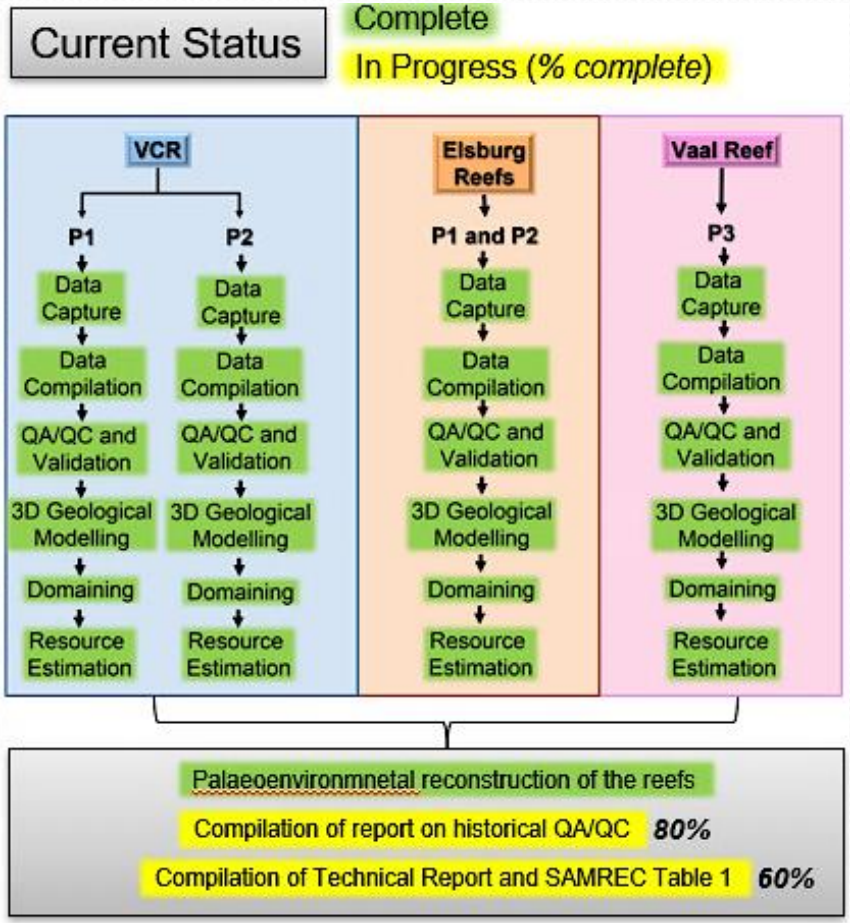
Independent advisors with requisite experience in mine management, mine planning, survey, Mineral Resource estimation, 3D modelling, data compilation and QA/QC as well as reporting according to various codes.

With invaluable support from the CAPM team of senior mining and MRM practitioners with many decade of experience in the Klerksdorp Goldfield.

WEEKLY PROJECT REVIEWS



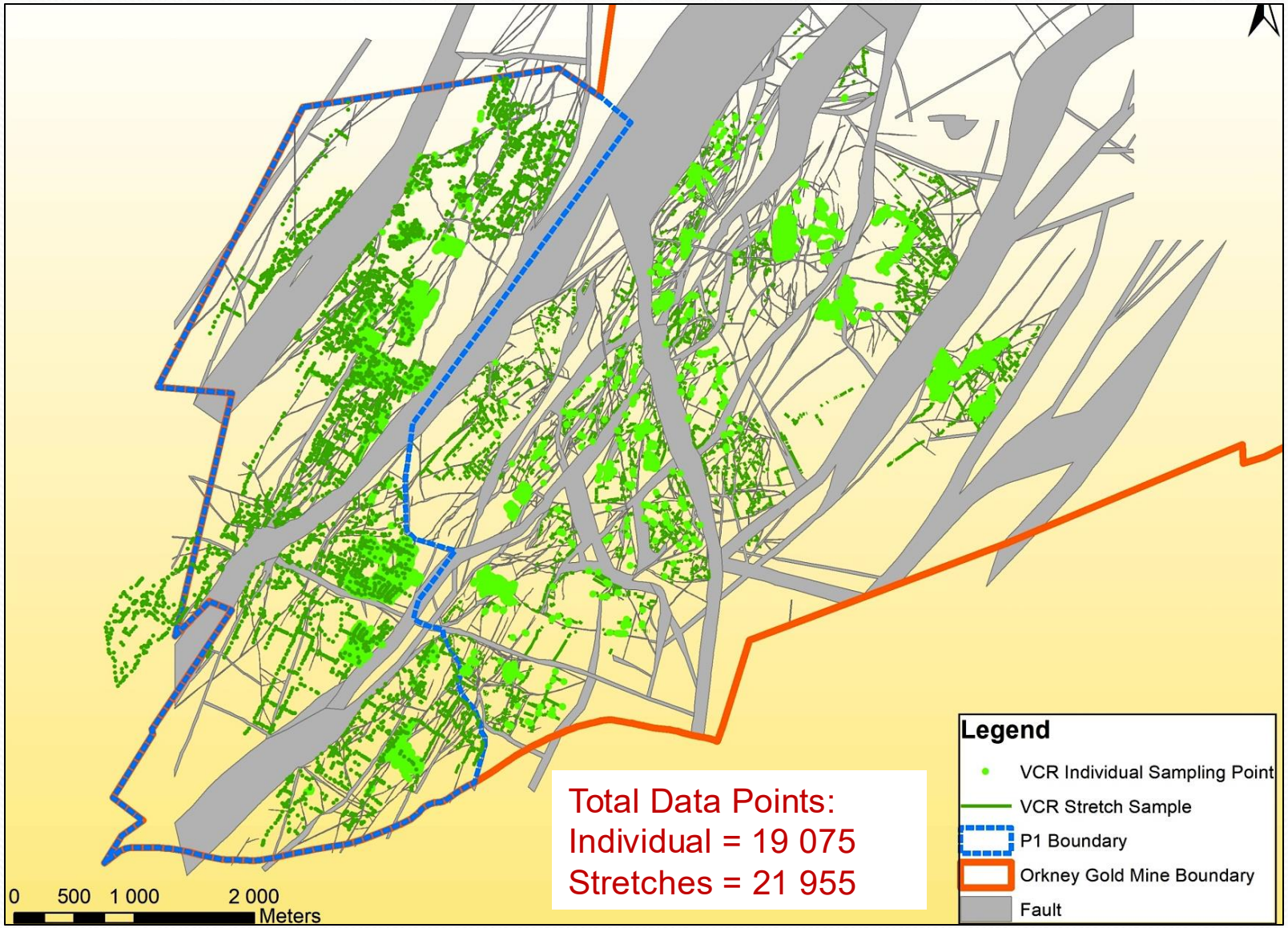
Note: The presented information has not been signed-off yet.



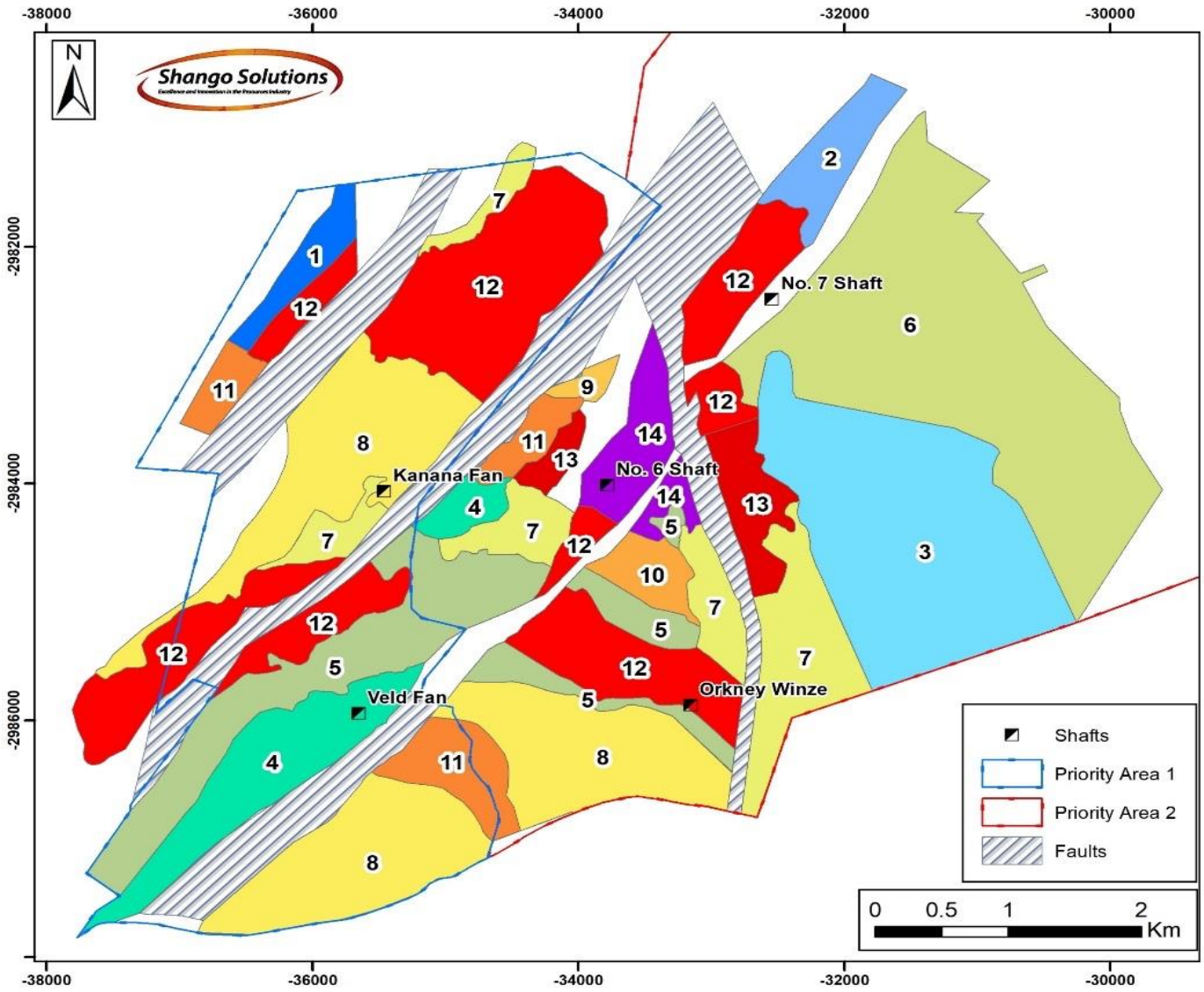
- 3 Workstreams – priority areas
- 5 Phases – 3 conducted concurrently

ASSAY TRACING CONTROL SHEET

ASSAY DATA USED

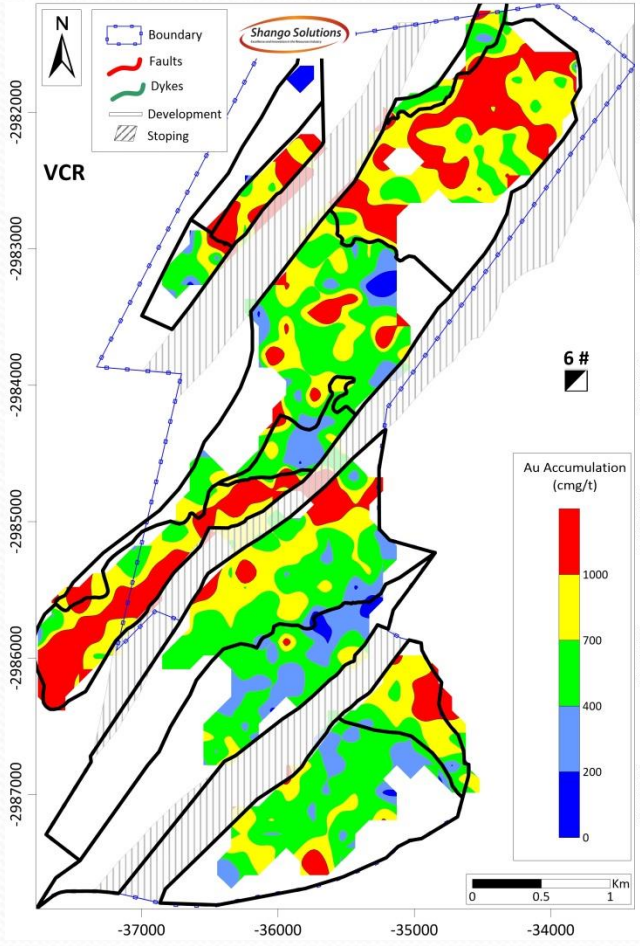


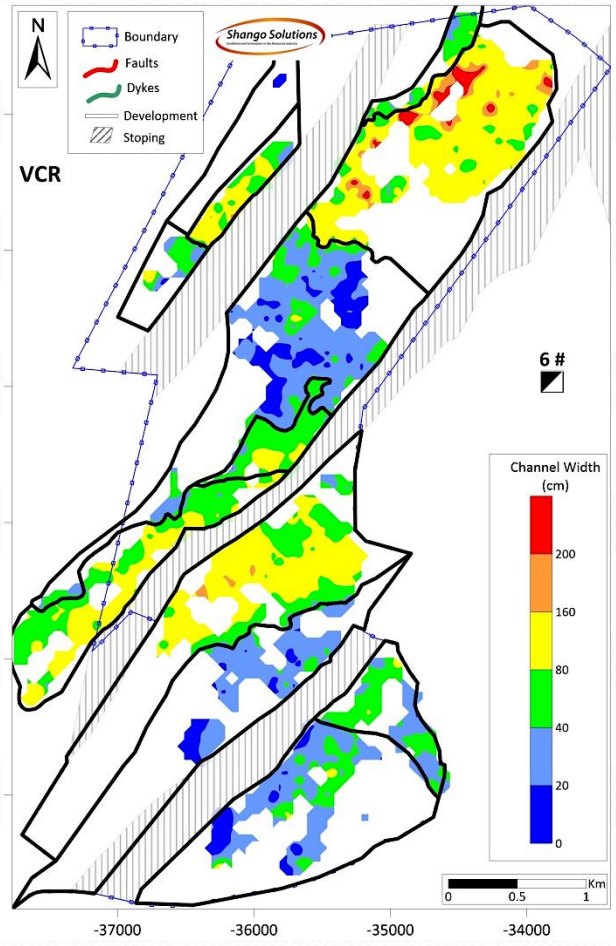
GEODOMAINING

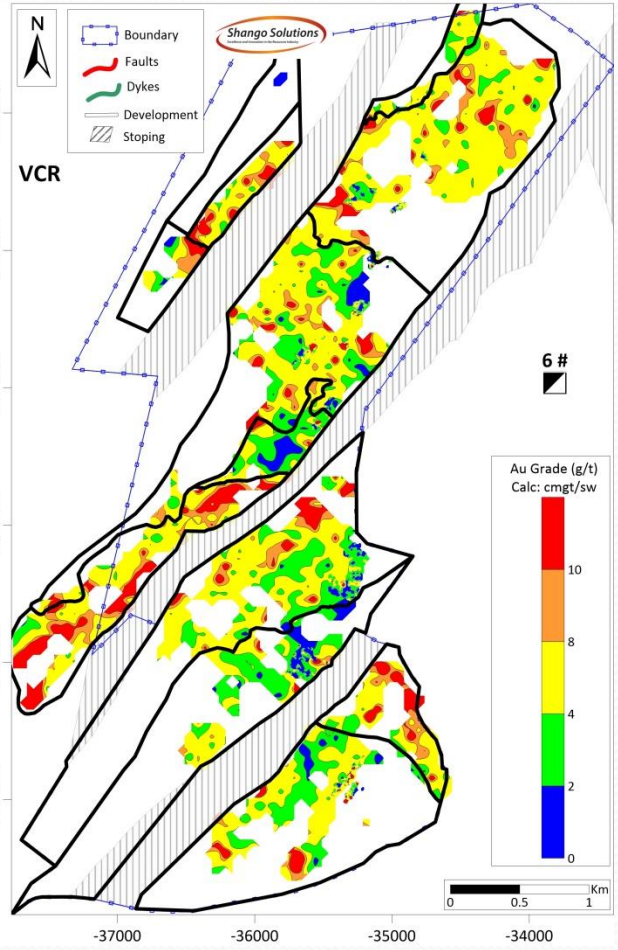


Domain	Distance (m)
1	148
2	99
3	250
4	22
5	267
6	158
7	87
8	64
9	94
10	53
11	167
12	170
13	107
14	38

CONTOUR PLOTS

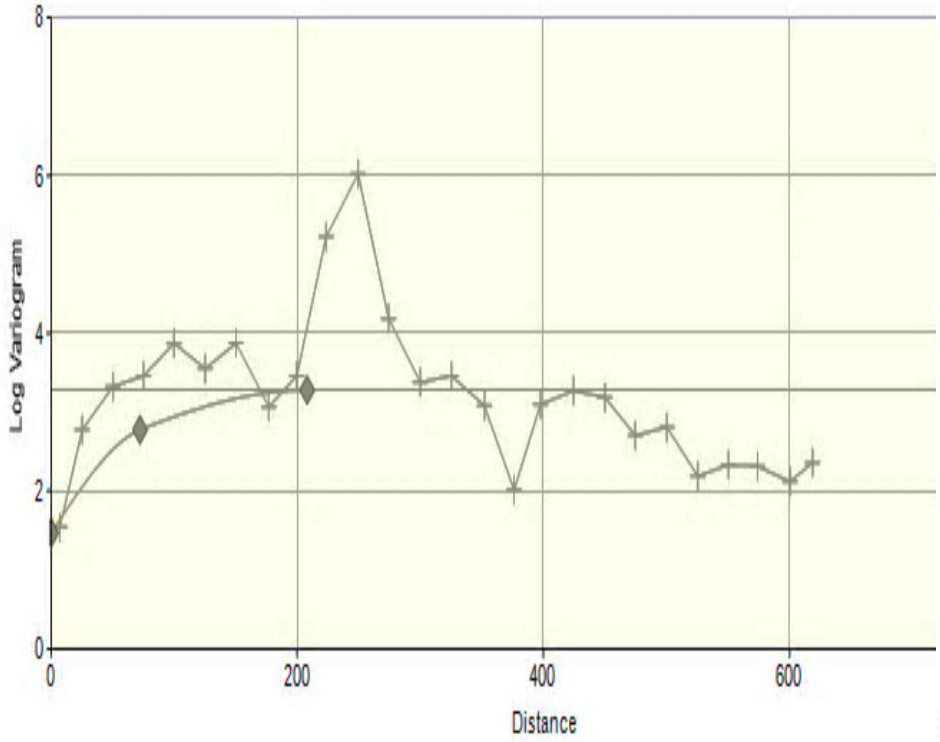


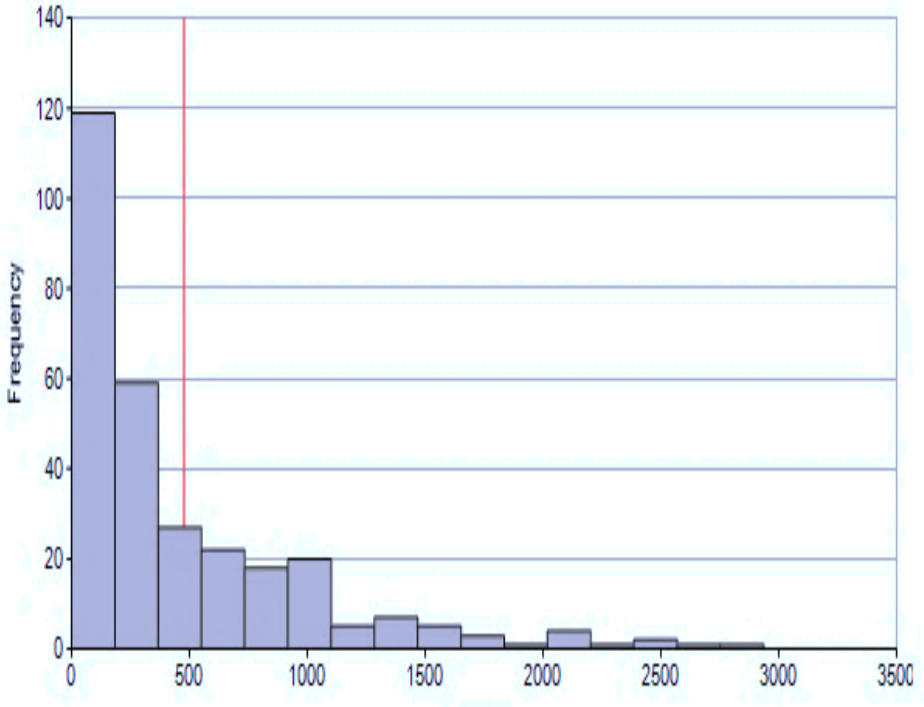




Stoping width rule:
If CW <= 100 cm, SW = 120 cm OR IF CW > 100 cm, CW + 20 cm until a maximum of 200 cm

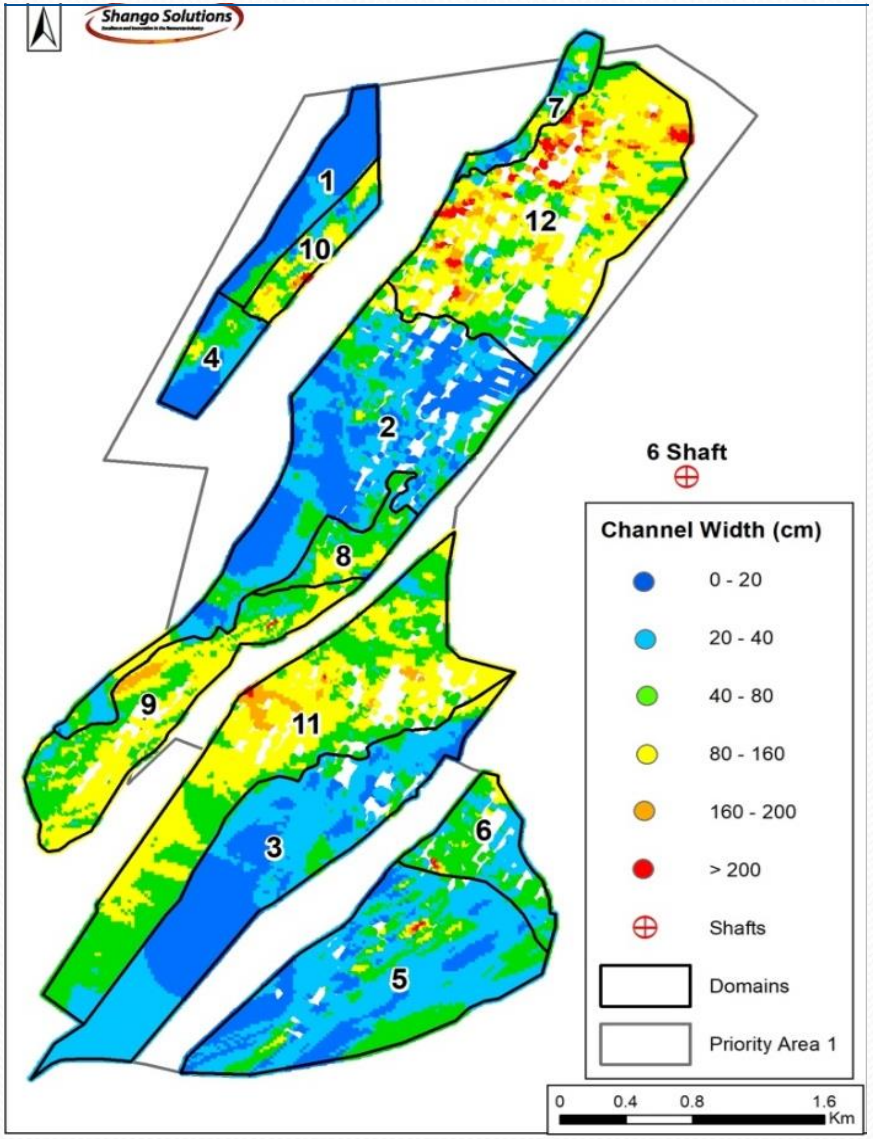
GEOSTATISTICAL MODELLING

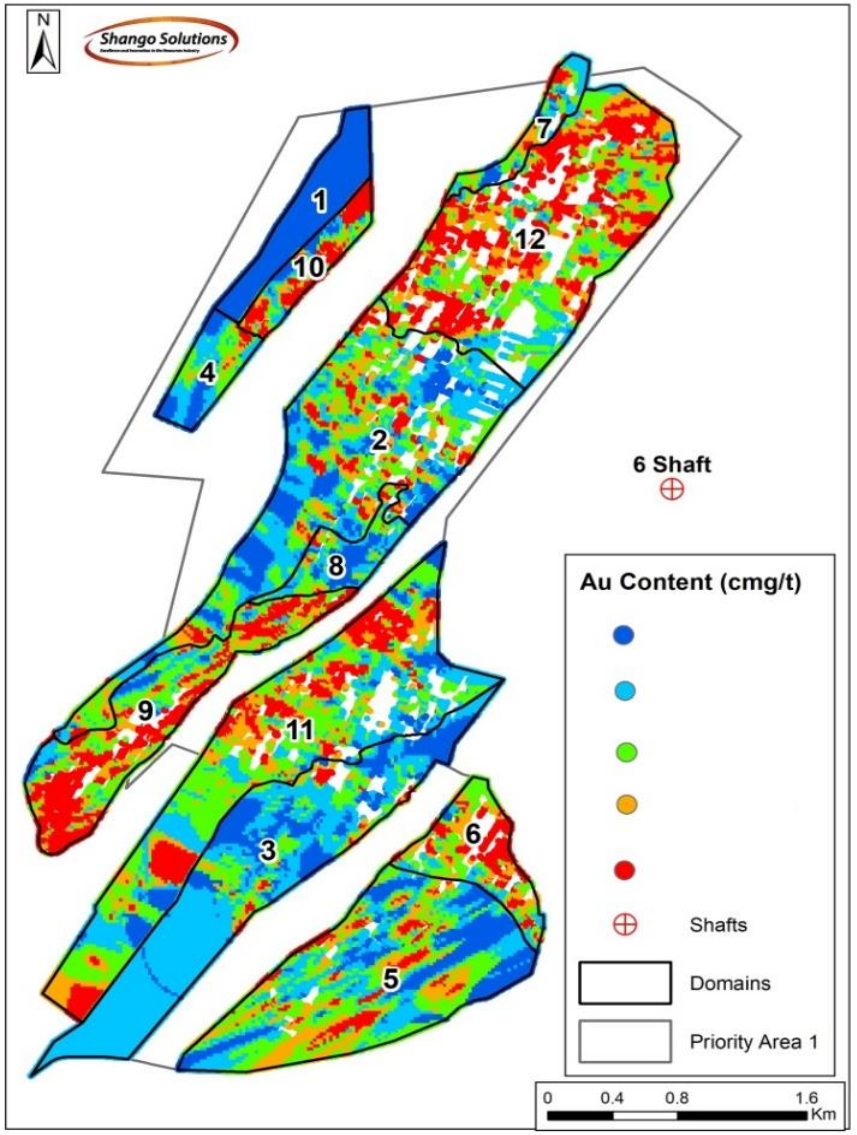




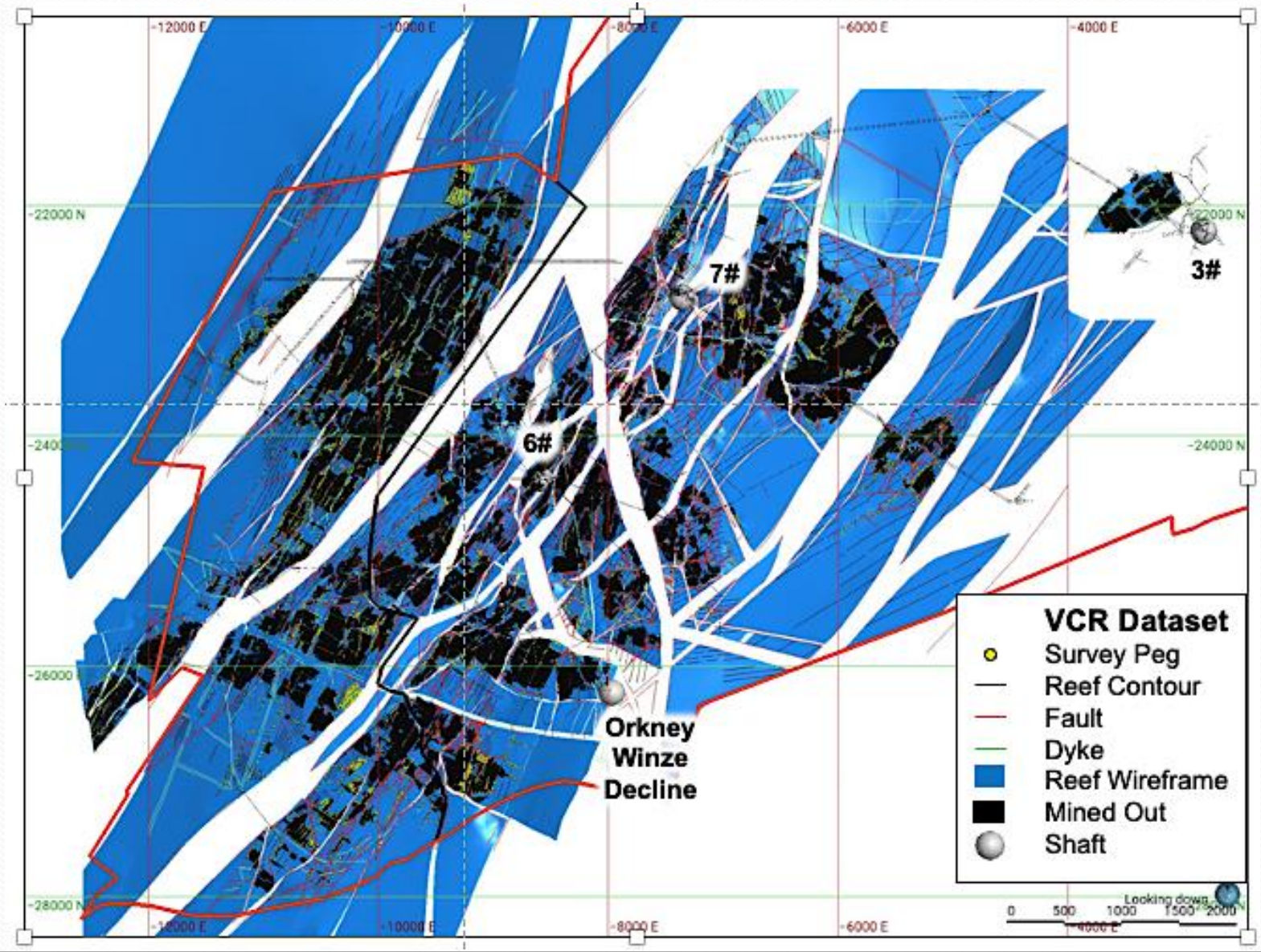
- Data used comprised assay points as well as decomposited stretches
- The semivariogram ranges followed well-established norms for the area

ESTIMATES WITH STOPE WIDTH RULE APPLIED

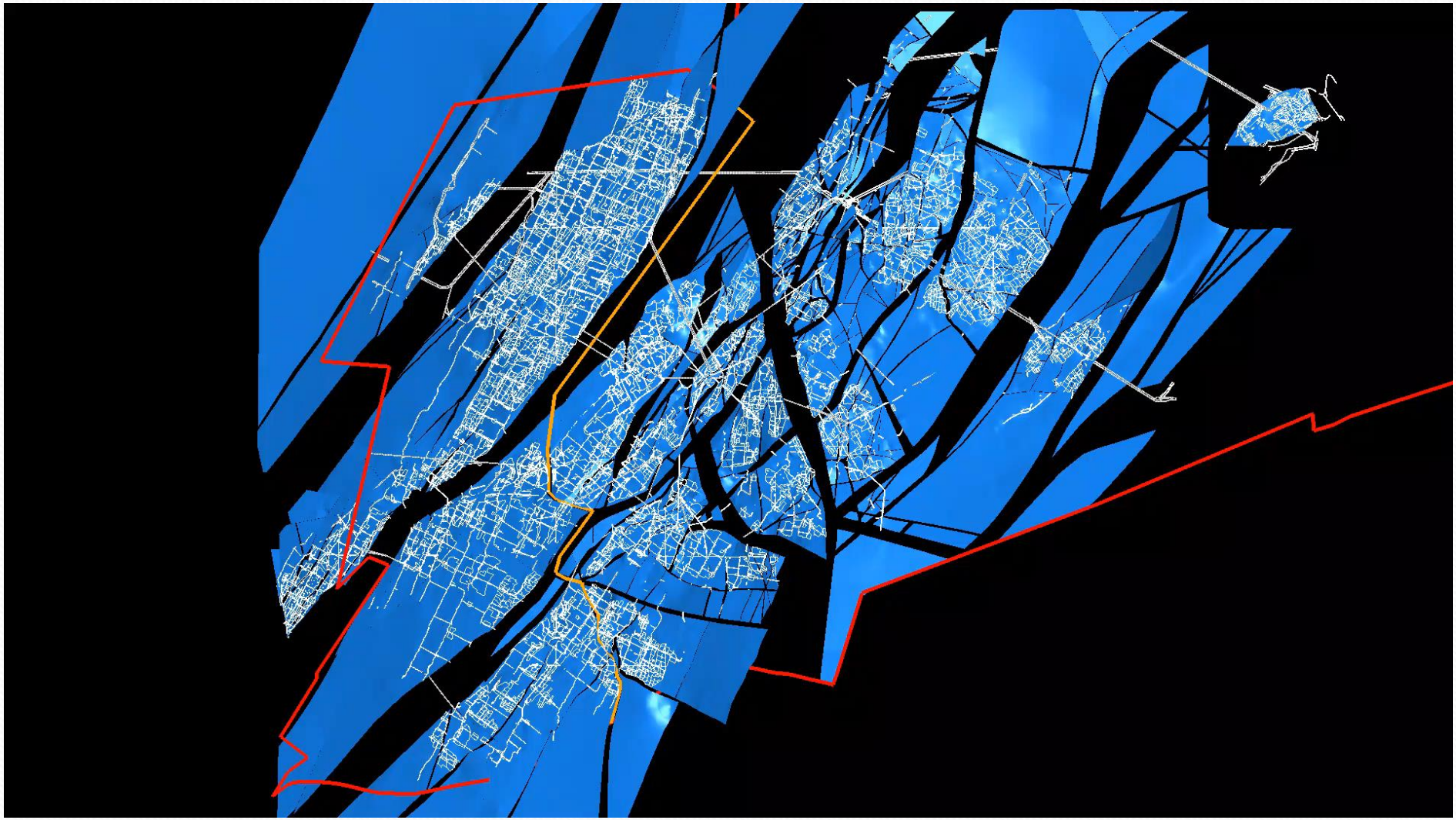




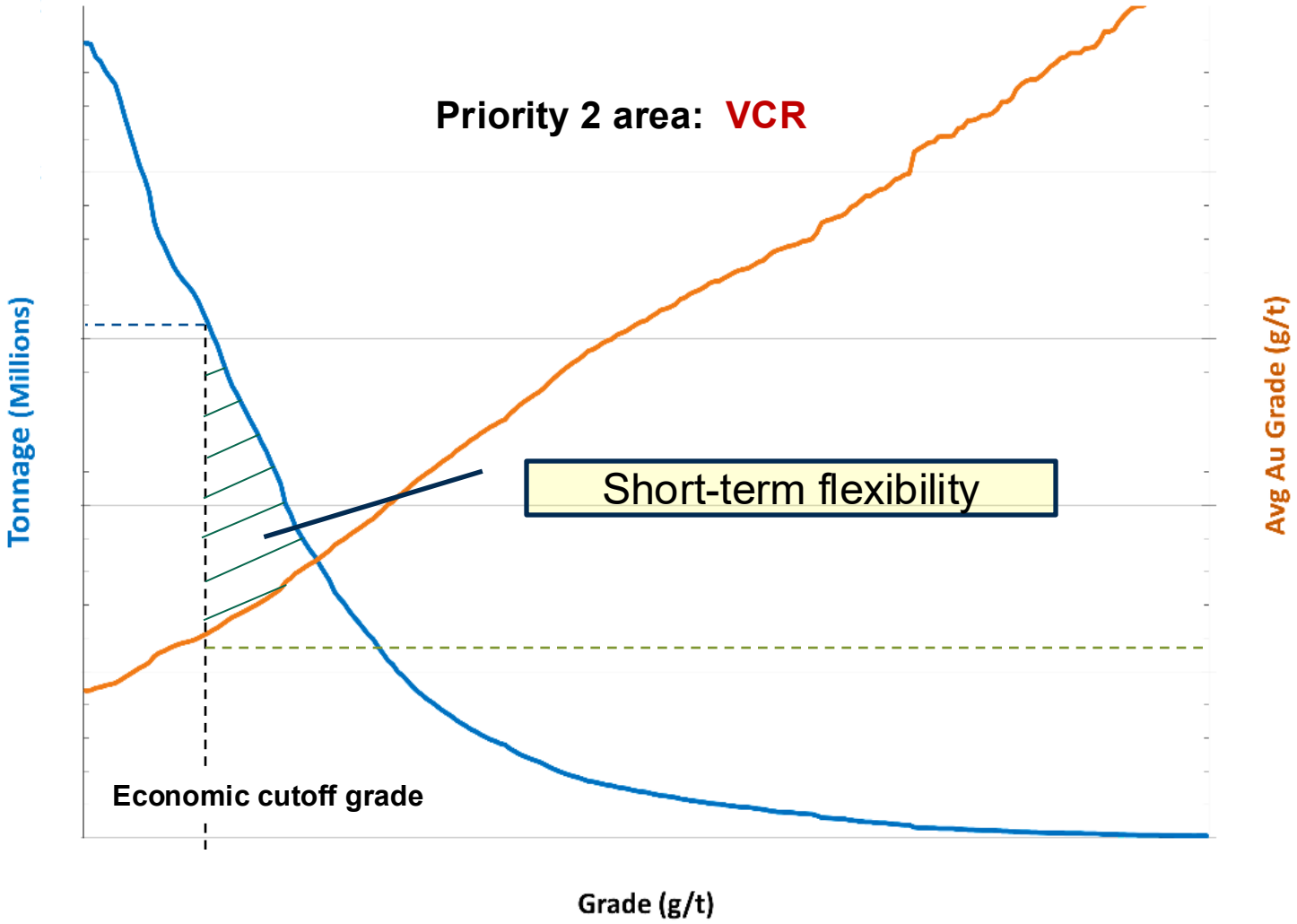
GEOLOGICAL MODEL WITH MINED OUT AREAS



3D GEOLOGICAL MODEL



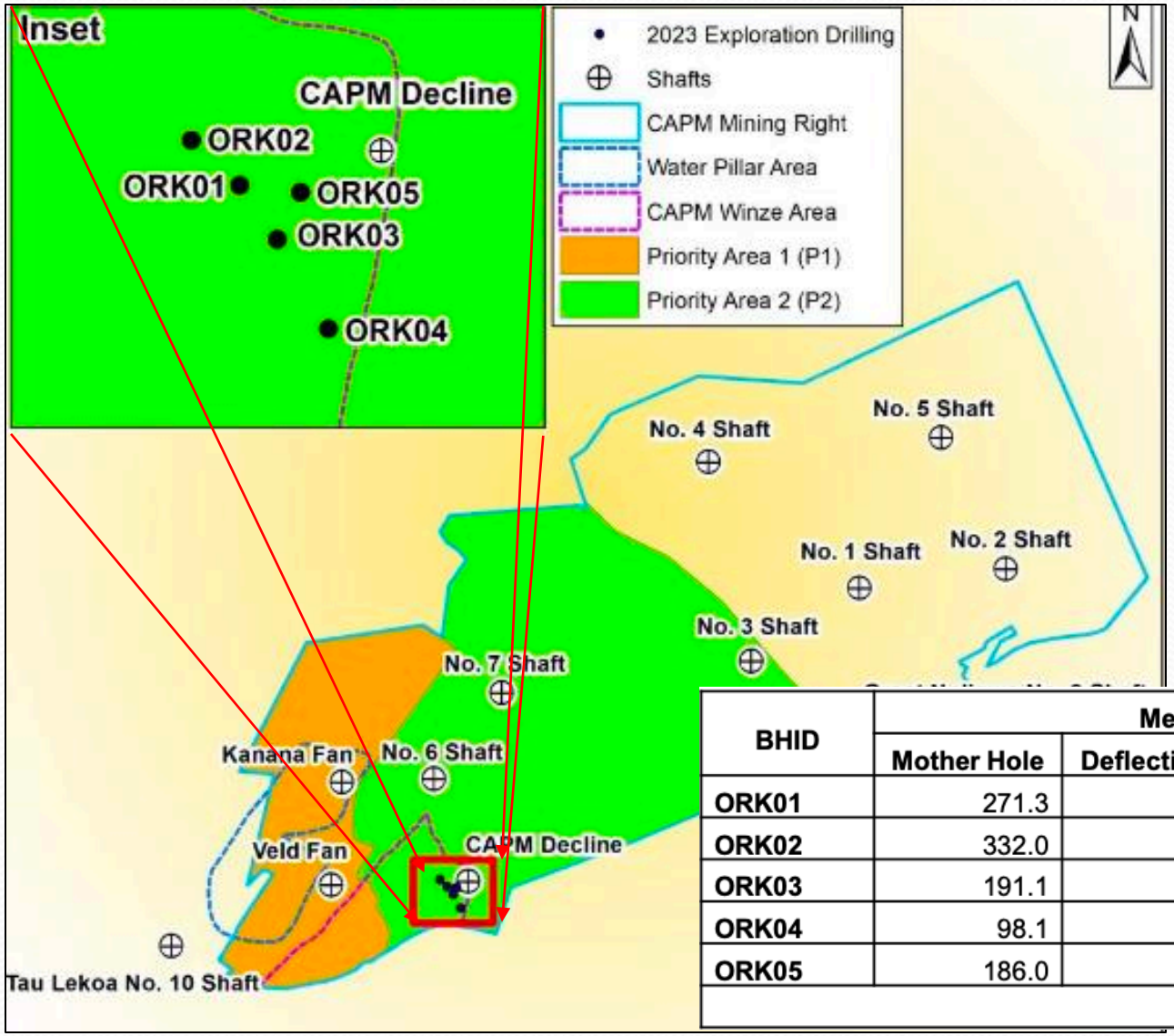
GRADE-TONNAGE CURVES



MINERAL RESOURCE TABULATION

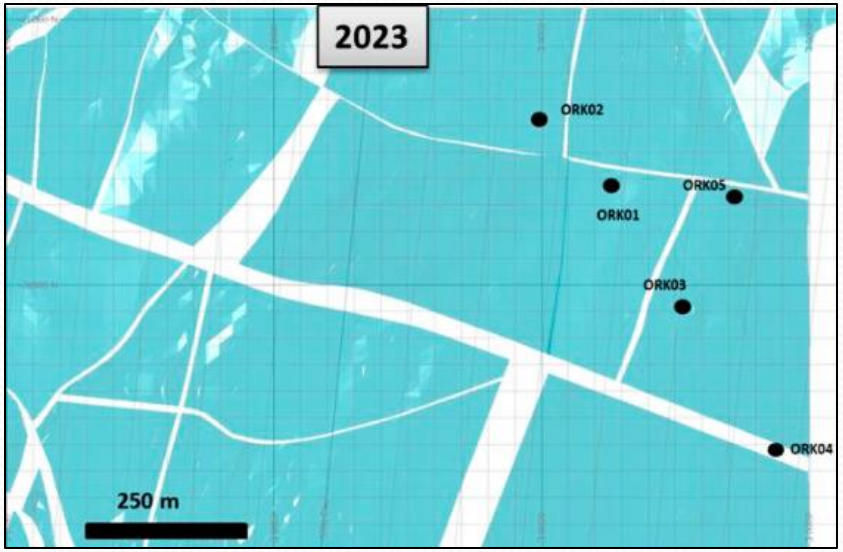
Mineral Resource Statement CAPM (above CUTOFF g/t)								
Mineral Resource Category	Shaft	Area	Tonnage	Gold Grade	Stope Width	Gold Accumulation	Metal Content	
Date: August 2023			t	g/t	cm	cmg/t	kg	Moz
Measured	6 & 7 Shafts	P1 VCR						
	6 & 7 Shafts	P1 EB 3-4						
	6 & 7 Shafts	P1 EB 5						
	Total Measured P1 6 & 7 shafts							
	6 & 7 Shafts	P2 VCR						
	6 & 7 Shafts	P2 EB 3-4						
	6 & 7 Shafts	P2 EB 5						
	Total Measured P2 6 & 7 shafts							
	Total Measured 6 & 7 shafts							
	1 Shaft	P3 Vaal Reef 1 Shaft						
	3 Shaft	P3 Vaal Reef 3 Shaft						
	4 shaft	P3 Vaal Reef 4 Shaft						
	Total Measured Vaal Reef 1,3,4							
Total Measured	Total Measured All Reefs							
Indicated	6 & 7 Shafts	P1 VCR						
	6 & 7 Shafts	P1 EB 3-4						
	6 & 7 Shafts	P1 EB 5						
	Total Indicated P1 6 & 7 shafts							
	6 & 7 Shafts	P2 VCR						
	6 & 7 Shafts	P2 EB 3-4						
	6 & 7 Shafts	P2 EB 5						
	Total Indicated P2 6 & 7 shafts							
	Total Indicated 6 & 7 shafts							
	1 Shaft	P3 Vaal Reef 1 Shaft						
	3 Shaft	P3 Vaal Reef 3 Shaft						
	4 shaft	P3 Vaal Reef 4 Shaft						
	Total Indicated Vaal Reef 1,3,4 shafts							
Total Indicated	Total Indicated All Reefs							
Total Measured and Indicated	Total Measured and Indicated All Reefs							
Inferred	6 & 7 Shafts	P1 VCR						
	6 & 7 Shafts	P1 EB 3-4						
	6 & 7 Shafts	P1 EB 5						
	Total Infered P1 6 & 7 shafts							
	6 & 7 Shafts	P2 VCR						
	6 & 7 Shafts	P2 EB 3-4						
	6 & 7 Shafts	P2 EB 5						
	Total Infered P2 6 & 7 shafts							
	Total Infered 6 & 7 shafts							
	1 Shaft	P3 Vaal Reef 1 Shaft						
	3 Shaft	P3 Vaal Reef 3 Shaft						
	4 shaft	P3 Vaal Reef 4 Shaft						
	Total Inferred Vaal Reef 1,3,4 shafts							
Total Inferred	Total Inferred All Reefs							
Total Measured,Indicated and infered	Total Measured,Indicated and Inferred (All Reefs)							

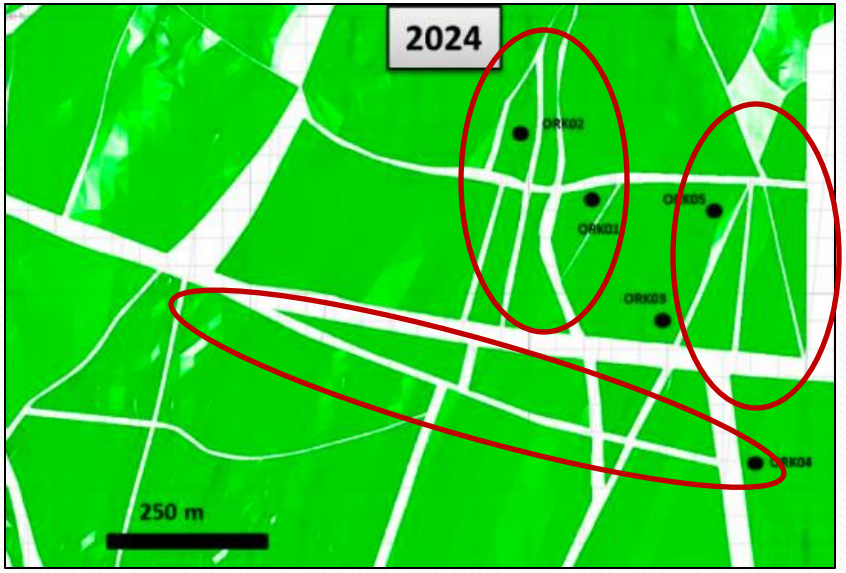
NEED FOR EXTRA DRILLING IDENTIFIED

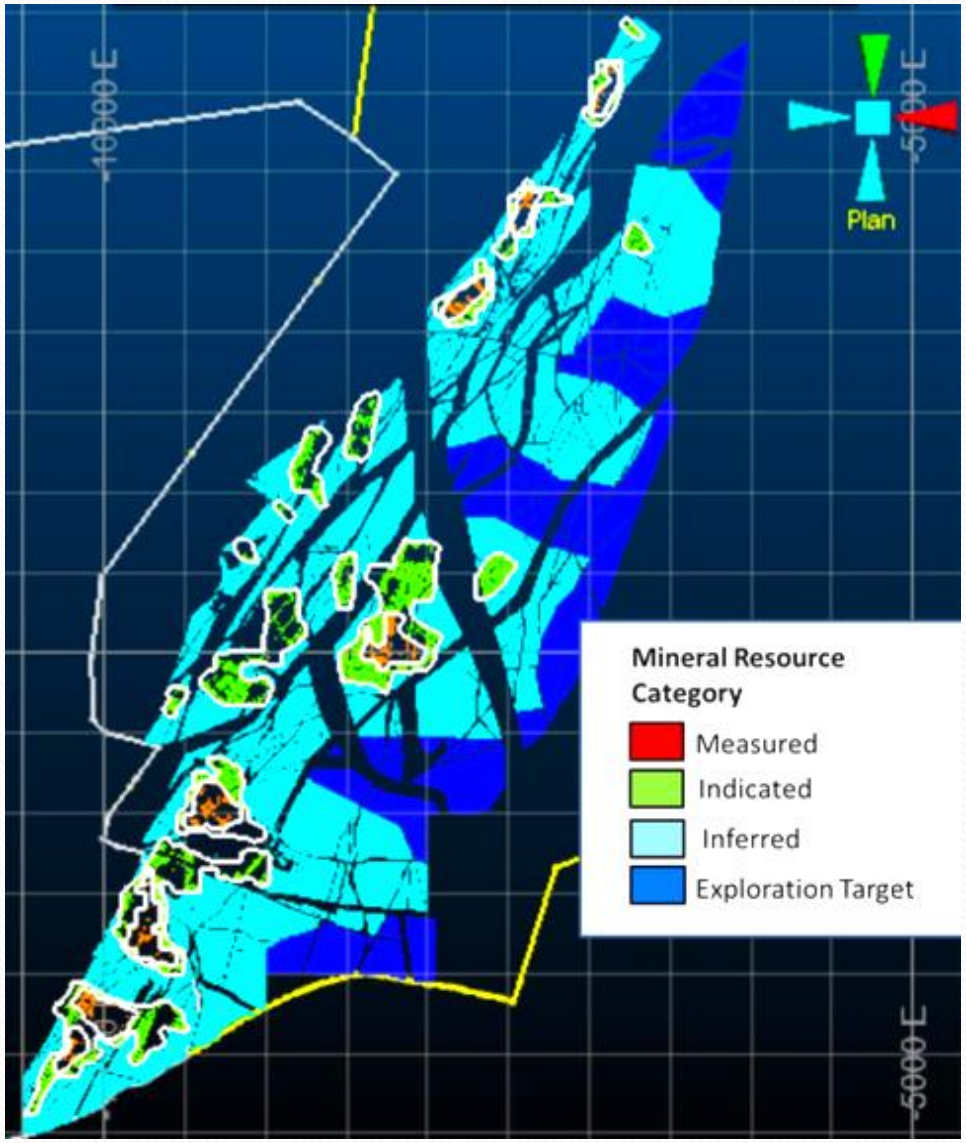


BHID	Meters Drilled				Planned
	Mother Hole	Deflection 1	Deflection 2	Actual	
ORK01	271.3	79.1	-	350.4	348.0
ORK02	332.0	84.3	54.0	470.3	526.0
ORK03	191.1	93.0	87.9	372.0	269.0
ORK04	98.1	-	-	98.1	210.0
ORK05	186.0	58.4	90.3	334.7	268.0
			Total m	1 625.5	1 621.0

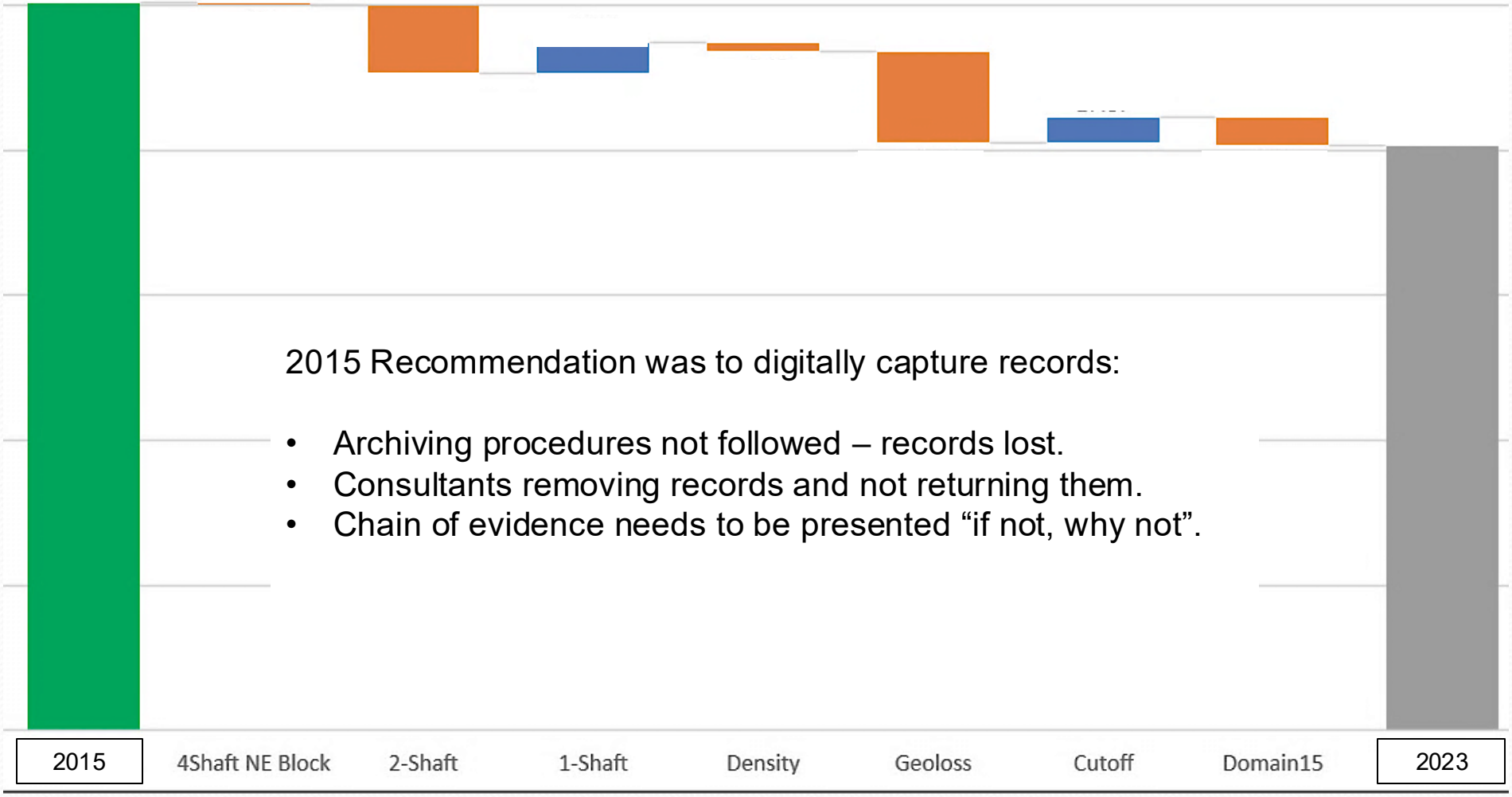
MINERAL RESOURCE RECLASSIFICATION







RECONCILIATION TO EARLIER WORK



2015 Recommendation was to digitally capture records:

- Archiving procedures not followed – records lost.
- Consultants removing records and not returning them.
- Chain of evidence needs to be presented “if not, why not”.

LESSONS LEARNT

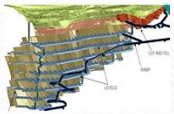
Safeguard all **statutory records** – we could not get departmental copies.

Create a **register** of all records as soon as possible.

Resource the capturing work properly, anticipate extra line detail.

QAQC

Expect to QA/QC **100%** of digitized data.



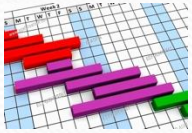
Familiarity with mining methods and underground symbology is important.

Relevant **experience** is key: we had > 500 years between the various teams.

Local and regional **knowledge** was invaluable – especially mined-out areas.

FINAL TAKEAWAYS

Break the work up in phases and designate controllers.

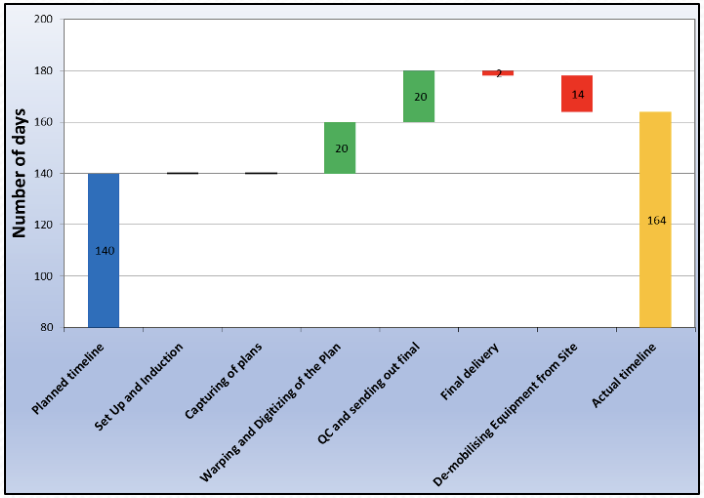


Track **progress** at least weekly.

Provide monthly **feedback** to sponsor.

Reaffirm **priorities** on the go.

Watch out for **scope creep**.



We gratefully acknowledge the permission to present from the CAPM executive team, the work done by the Premier Mapping and Shango teams, and the support from the CAPM management team, specifically Mr. Ian Kitchin.