

**ORE RESOURCE ESTIMATION
FOR
GRAPHITE DEPOSIT
AT
RS MINE- KOTUHENA
(Based on Bore Holes data)
ACCORDING TO JORC CODE 2012**

Investigated and Report Prepared

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LIST OF ABBREVIATIONS

JORC	Joint Ore Reserve Committee
OB	Over burden
QzIMP	Impure quartz
G_Bio_Gn	Garnet Biotite Gneiss
Bio_Gn	Biotite Gneiss
Qz	Quartzite
H_Bio_Gn	Hornblende Biotite Gneiss
Ch_Gn	Charnockitic Gneiss
RF	Rock fracture
GF	Graphite fracture
GV	Graphite vein
IP	Iron pyrite fracture
Qt	Quartz

1 INTRODUCTION

1.1 HISTORY OF GRAPHITE MINING

Graphite mining in Sri Lanka carries a history of nearly two centuries. Even though the mining activities are extensively carried out, methods of exploration are not up-to-date when compared to rest of the world. Mineralization of vein graphite in the country shows a systematic pattern with respect to the surrounding geology. Understanding of local geology and structures is vital for explorations in extensively deformed terrains like Sri Lanka. Use of immature tools and technology in earlier days restricted the local mining activities to shallower levels, mainly due to the collapsing of pit walls as the excavation depth increases. Deeper subsurface mineralization in such regions can be further prospected with advanced modern geophysical methods.

The RS Mine Kotuhena which is situated in the Kurunegala District (2km from Khatagha graphite mine), is an area where open pit shallow graphite mining had been carried out at thirteen locations in early 20th century. One of the pits is called Ragina pit (English meaning is Queens's mine) and it appears that the operation has been in considerable extent. Mining operations has been abandoned after some time back due to decrease in demands and lack of technology to go deeper.

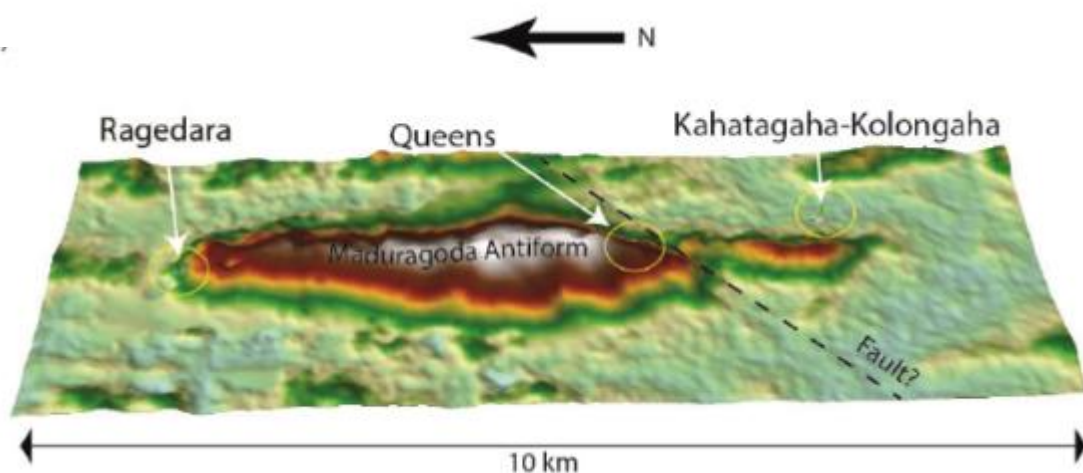


Fig1.1 Illustrates RS mine owned area between Ragedara mine and Kahatagaha -Kolongaha mine

1.2 LOCATION MAP

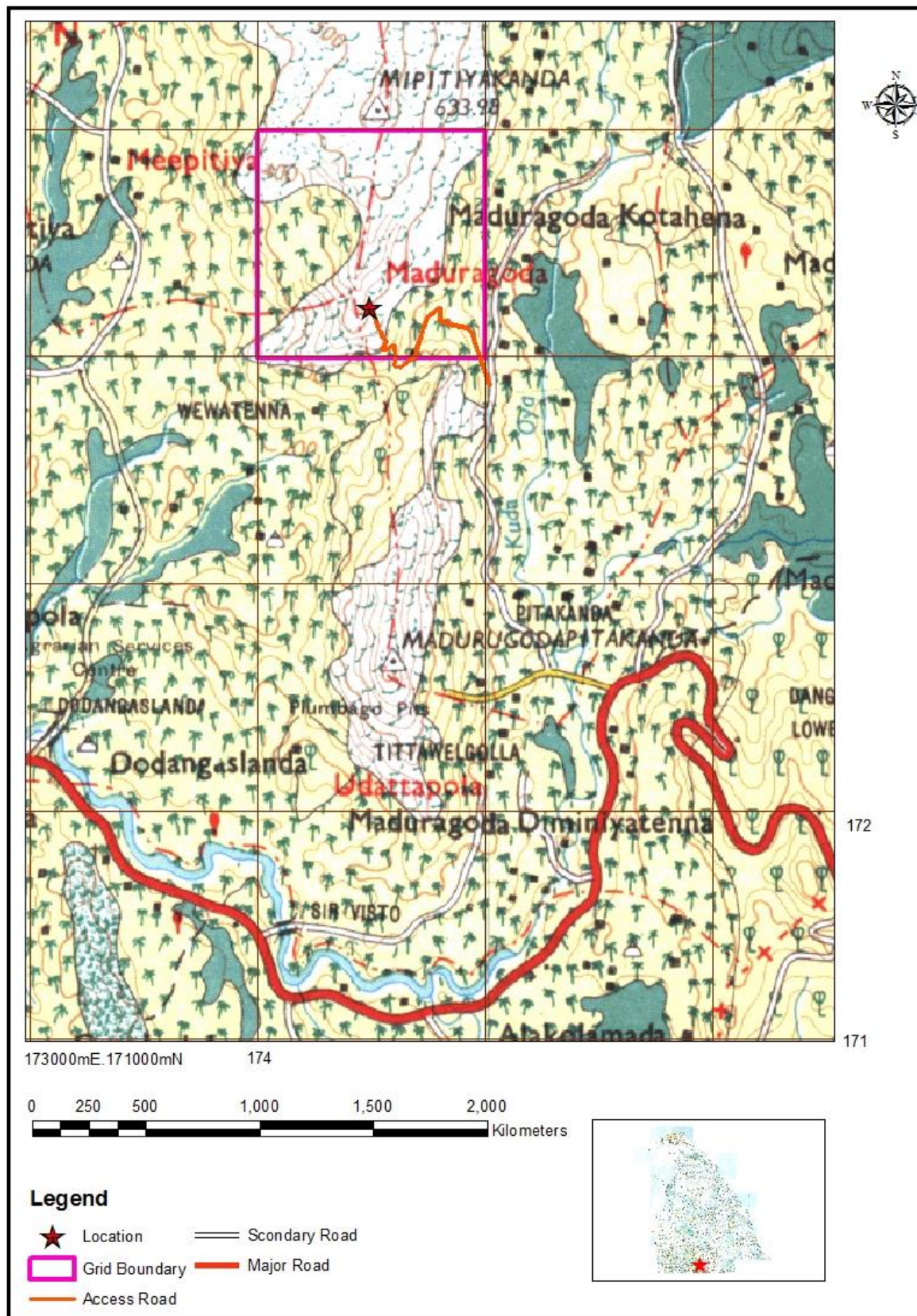


Fig 1.2 Grid Boundary shows Mining License area 1Km² and explored area

1.3 GEOPHYSICAL STUDY

The RS mine situates in high potential graphite mineralization zone in Sri Lanka. According to the result of the airborne survey done by Bora bora company in year 2014, the positive anomalies were identified at mine land and its covering exploration areas.

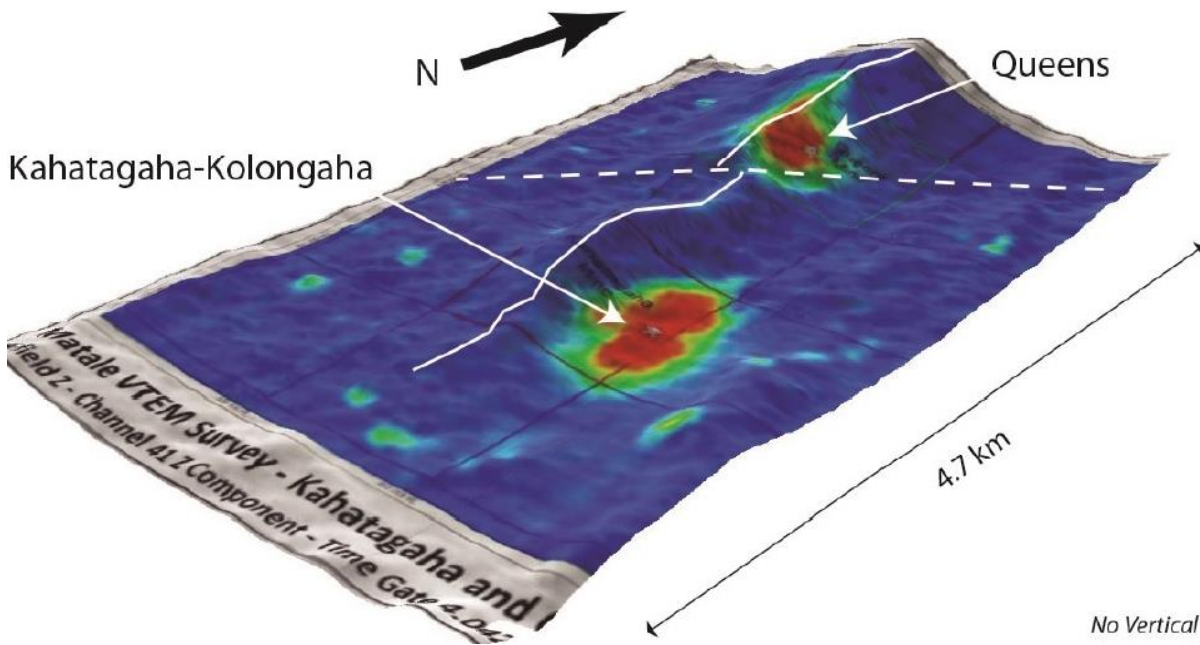


Fig 1.3 Positive anomaly show in terrain (red color) around Kahatagaha -Kolongaha and RS Mine premises area (Queens pit)

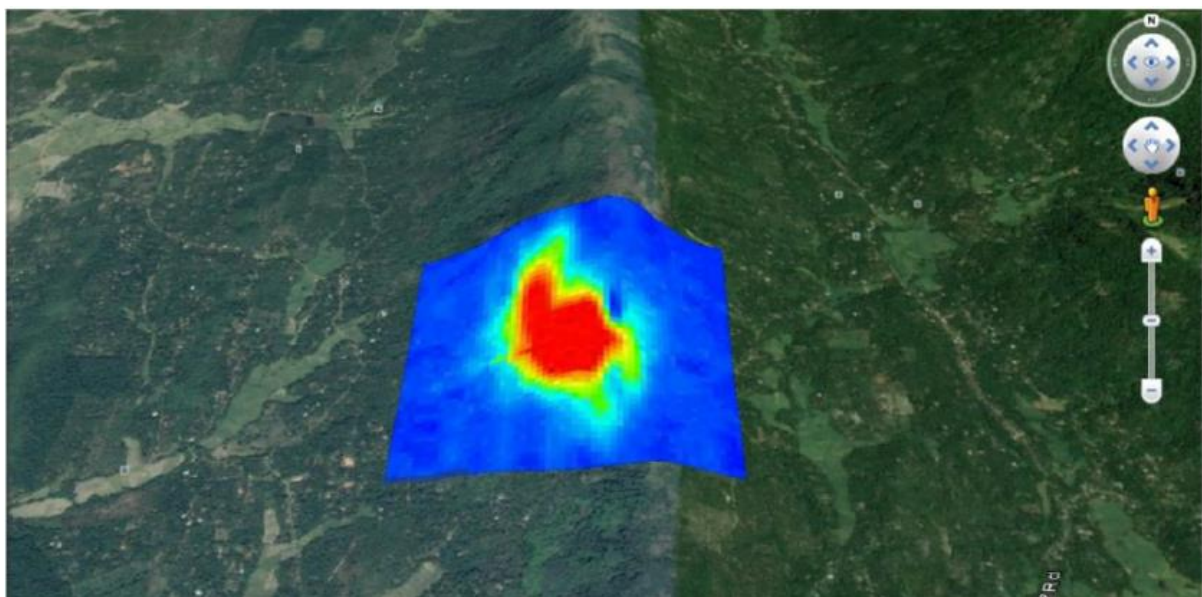


Fig 1.4 The blue square (1km) owned by RS mine with in positive anomaly is identified

1.4 CURRENT INVESTIGATION

Seven core drill holes were completed exploring 60m to 200m vertical depth from each drill holes location by focusing on major mineralization at Top, middle and bottom of the “Maduragoda antiform”(mountain). The graphite mineralization is intersected from 10cm to 60cm in six drill holes. The result analyzed, and calculations done by following guidelines of JORC 2012 code.

The JORC 2012 code is Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (‘the JORC Code’) is a professional code of practice that sets minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Ore Reserves.

The JORC Code provides a mandatory system for the classification of minerals Exploration Results, Mineral Resources and Ore Reserves according to the levels of confidence in geological knowledge and technical and economic considerations in Public Report

2. GENERAL GEOLOGY

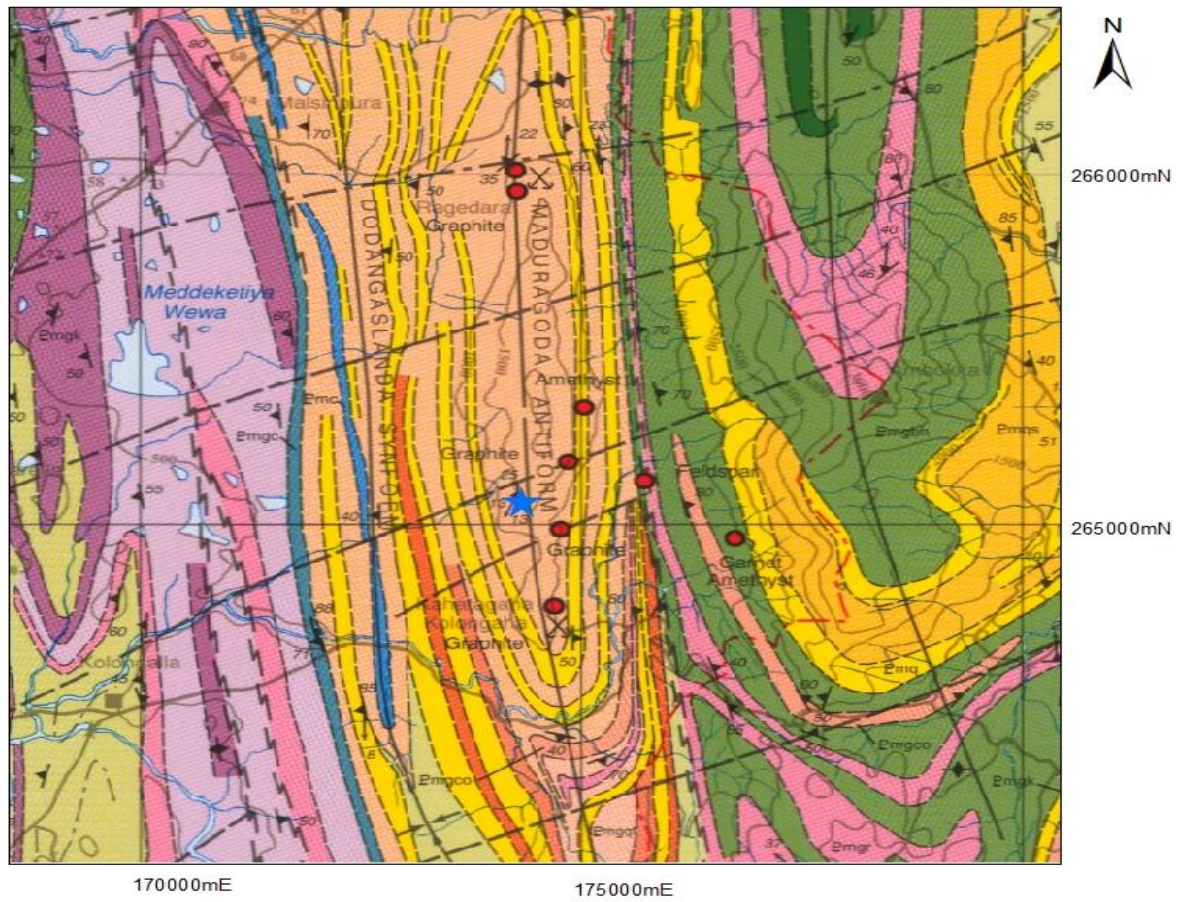
2.1 GEOLOGY OF THE STUDY AREA

The study area is belongs to the Highland Complex (Cooray 1994) of Sri Lanka and the dominant rocks in the area are Garnetiferous quartzofeldspathic gneiss rich in hornblende and biotite , Charnokitic gneiss, quartzite ,Hornblende biotite gneiss and Charnockitic biotite gneiss. Present study of the graphite mineralization at RS Mine revealed that the veins are found in Garnetiferous quartzofeldspathic gneiss, Hornblende biotite gneiss and in Charnockitic biotite gneiss.

The general rock structure in the basement rock is indicated by a penetrative foliation averaging N10W. Regionally, several episodes of intense deformation have resulted in complex fold pattern in the area. The supracrustal rocks of the region have been faulted or sheared during the deformation episodes. The fracture systems in the area indicates north-west and south-east with steep dips. These are well exposed in the abandoned pits.

The RS Mines area is located closer to the fold axis of the “Maduragoda antiform” indicating higher possibility for the occurrences of thick graphite veins. The association of the deposits with high grade metamorphic rocks, their wide lateral extent and the grade and flake size of the graphite, suggests that they are ,most probably ,of hydrothermal origin (Katz 1987).

Presence of thick bands in the deeper parts of the presently active mines (Kahatagaha-Kolongha mines) located to the south of the area, indicates the possibility of thick veins of graphite occurrences in the target area too.



Legend

★ Location of RS Mine

Emgr	Granite Gneiss
Emggb	Hornblende biotite gneiss
Emq	Quartz
Emqs	Impure Quartz
Emqs ^g	Garnetiferous quartzofeldspathic gneiss
Emqs ^b	Charnockitic biotite gneiss
Emgb	Biotite Hornblende gneiss

Figure 2.1 Geological map of the study area

3. EXPLORATION PROGRAM

3.1 DRILL HOLE COLLAR SUMMARY

The exploration program conducted by Geological Survey and Mines Bureau Sri Lanka. Seven drill holes completed in entire locations. The summary shown in table 3.1



DRILL HOLE COLLAR SUMMARY

Apr 07, 2018

Hole Id	Northing	Easting	Elevation	Depth	Dip	Azimuth
DH001	265218.00	174501.00	387.81	67.90	-60.00	330.00
DH002	265224.00	174500.00	387.85	150.20	-60.00	280.00
DH003	265109.00	174535.00	352.80	200.30	-60.00	317.00
DH004	265259.62	174403.52	425.71	111.70	-60.00	330.00
DH005	265318.18	174492.92	432.56	71.30	-60.00	330.00
DH006	265344.19	174429.98	443.57	81.30	-60.00	330.00
DH007	265147.25	174436.49	409.55	265.60	-60.00	317.00

Table 3.1 All coordinate and depth shown in meters and dip and azimuth shown in degree

3.2 DETAILS OF COMPLETED DRILL HOLES

Seven drill holes completed (out of eight drill holes planned) at the selected locations (shown map 3.1) covering seven hectares at the mine promises. The azimuth of drill hole number two is not in position to intersect the veins. The five number of drill holes intersected veins of considerable thickness shown in table 3.2, 3.3, 3.4, 3.5, 3.6, 3.7 and 3.8. (**depth from** and **depth to** are in meters).



DRILL HOLE LOG

Apr 07, 2018

HOLE ID : DH001

NORTHING : 265218 EASTING : 174501 ELEVATION: 387.807

MAXDEPTH: 67.9 AZIMUTH : 330 DIP : -60

From	To	Vein	Fracture
29.10	30.00	GBR	
45.90	46.00	10cm	
48.54	48.84	30cm	
51.33	51.43	10cm	
61.60	61.80	QzBGr	
62.30	62.35		GF

Table 3.2



DRILL HOLE LOG

Apr 07, 2018

HOLE ID : DH002

NORTHING : 265224 EASTING : 174500 ELEVATION: 387.846

MAXDEPTH: 150.2 AZIMUTH : 280 DIP : -60

From	To	Vein	Fracture
45.20	45.25		GF

Table 3.3



DRILL HOLE LOG

Apr 07, 2018

HOLE ID : DH003

NORTHING : 265109 EASTING : 174535 ELEVATION: 352.8

MAXDEPTH: 200.3 AZIMUTH : 317 DIP : -60

From	To	Vein	Fracture
48.73	48.88	15cm	
86.70	86.73	3cm	
106.65	107.15	50cm	
109.65	109.68	3cm	
110.00	110.60	60cm	
111.00	111.02	2cm	
112.10	112.15		GF
150.30	150.35		GF
160.35	160.40		GF

Table 3.4



DRILL HOLE LOG

Apr 07, 2018

HOLE ID : DH004

NORTHING : 265259.617 EASTING : 174403.521 ELEVATION: 425.712

MAXDEPTH: 111.7 AZIMUTH : 330 DIP : -60

From	To	Vein	Fracture
45.90	46.00	10cm	
86.00	86.15	15cm	
99.60	100.00	40cm	

Table 3.5



DRILL HOLE LOG

Apr 07, 2018

HOLE ID : DH005

NORTHING : 265318.176 EASTING : 174492.921 ELEVATION: 432.562

MAXDEPTH: 71.3 AZIMUTH: 330 DIP : -60

From	To	Vein	Fracture
48.80	48.85		GF
62.30	62.65	35cm	

Table 3.6



DRILL HOLE LOG

Apr 07, 2018

HOLE ID : DH006

NORTHING : 265344.192 EASTING : 174429.977 ELEVATION: 443.573

MAXDEPTH: 81.3 AZIMUTH: 330 DIP : -60

From	To	Vein	Fracture
67.90	68.10	20cm	
68.40	68.60	20cm	

Table 3.7



DRILL HOLE LOG

Apr 07, 2018

HOLE ID : DH007

NORTHING : 265147.245 EASTING : 174436.486 ELEVATION: 409.549

MAXDEPTH: 265.6 AZIMUTH: 317 DIP : -60

From	To	Vein	Fracture
86.70	86.75		GF
114.50	114.60	10cm	
175.30	175.90	30cm	

Table 3.8

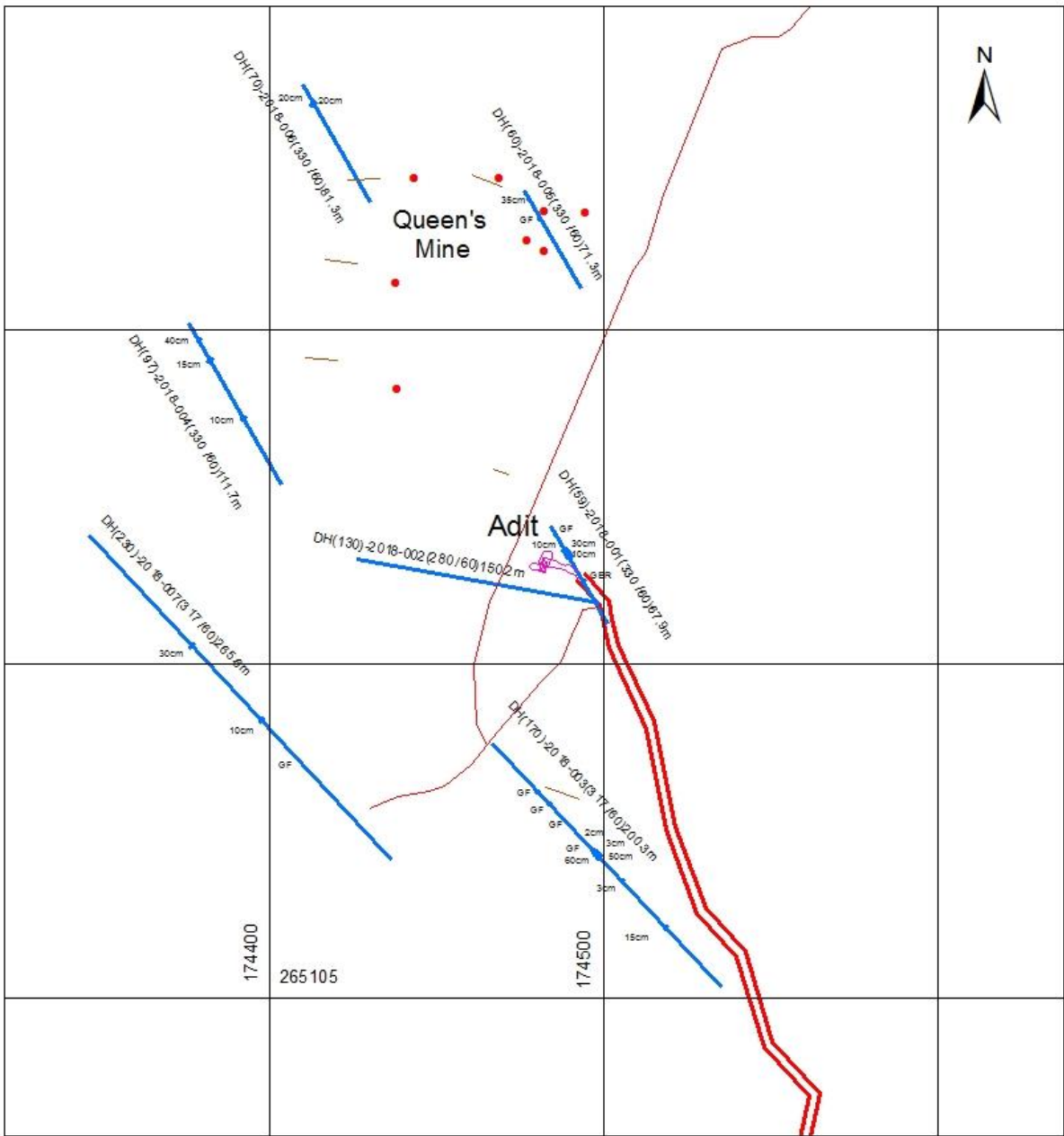


Fig 3.1 Details of completed drill holes at RS Min

3.3 LITHOLOGY OF DRILL HOLES



DRILL HOLE LOG

Apr 08, 2018

HOLE ID : DH001

NORTHING : 265218 EASTING : 174501 ELEVATION: 387.807

MAXDEPTH: 67.9 AZIMUTH: 330 DIP : -60

From	To	Rocktype
0.00	7.05	OB
7.05	7.10	G_Bio_Gn
7.15	9.90	Bio_Gn
9.90	10.90	Qzimp
10.90	14.88	Bio_Gn
14.93	15.80	Bio_Gn
15.85	19.38	Bio_Gn
19.43	26.44	G_Bio_Gn
26.44	29.10	Bio_Gn
30.00	35.40	QzIMP
35.40	45.90	Bio_Gn
46.00	48.54	Bio_Gn
48.84	51.33	Bio_Gn
51.43	51.90	Bio_Gn
51.90	60.34	G_Bio_Gn
60.34	61.80	Bio_Gn
61.80	62.30	G_Bio_Gn
62.35	66.50	G_Bio_Gn
66.50	67.90	Bio_Gn

Table 3.9



DRILL HOLE LOG

Apr 08, 2018

HOLE ID : DH004

NORTHING : 265259.617 EASTING : 174403.521 ELEVATION: 425.712

MAXDEPTH: 111.7 AZIMUTH: 330 DIP : -60

From	To	Rocktype
0.00	6.00	OB
6.00	27.10	G_Bio_Gn
27.15	43.80	G_Bio_Gn
43.80	45.90	Bio_Gn
46.00	54.20	G_Bio_Gn
54.20	62.30	Bio_Gn
62.35	70.30	Bio_Gn
70.35	86.00	G_Bio_Gn
86.15	90.00	G_Bio_Gn
90.00	99.60	Bio_Gn
100.00	110.00	Bio_Gn
110.00	111.70	G_Bio_Gn

Table 3.10



DRILL HOLE LOG

Apr 08, 2018

HOLE ID : DH002

NORTHING : 265224 EASTING : 174500 ELEVATION: 387.846

MAXDEPTH: 150.2 AZIMUTH: 280 DIP : -60

From	To	Rocktype
0.00	4.20	OB
4.20	8.95	Bio_Gn
8.95	11.90	Qz IMP
11.90	13.75	G_Bio_Gn
13.75	16.90	Ch_Gn
16.90	18.50	G_Bio_Gn
18.55	21.15	G_Bio_Gn
21.20	21.25	G_Bio_Gn
21.30	27.70	Bio_Gn
27.70	27.75	IP
27.75	40.20	G_Bio_Gn
40.20	45.20	Bio_Gn
45.25	49.00	G_Bio_Gn
49.05	50.00	G_Bio_Gn
50.05	51.00	G_Bio_Gn
51.05	52.00	G_Bio_Gn
52.05	54.20	G_Bio_Gn
54.25	56.40	Bio_Gn
56.45	61.50	Bio_Gn
61.55	63.00	G_Bio_Gn
63.05	68.25	G_Bio_Gn
68.30	77.60	Bio_Gn
77.60	79.10	Qz
79.10	83.57	H_Bio_Gn
83.57	84.20	Ch_Gn
84.20	138.20	G_Bio_Gn
138.20	138.25	IP
138.25	150.20	G_Bio_Gn

Table 3.11



DRILL HOLE LOG

Apr 08, 2018

HOLE ID : DH005

NORTHING : 265318.176 EASTING : 174492.921 ELEVATION: 432.562

MAXDEPTH: 71.3 AZIMUTH: 330 DIP : -60

From	To	Rocktype
0.00	8.10	OB
8.10	16.30	G_Bio_Gn
16.30	23.20	Bio_Gn
23.25	30.30	Bio_Gn
30.30	31.30	QzIMP
31.30	44.20	G_Bio_Gn
44.20	48.80	Bio_Gn
48.85	53.20	Bio_Gn
53.20	62.30	G_Bio_Gn
62.65	71.30	G_Bio_Gn

Table 3.12



DRILL HOLE LOG

Apr 08, 2018

HOLE ID : DH003

NORTHING : 265109 EASTING : 174535 ELEVATION: 352.8

MAXDEPTH: 200.3 AZIMUTH: 317 DIP : -60

From	To	Rocktype
0.00	9.50	OB
9.50	11.00	QzIMP
11.00	12.00	SL
12.00	13.10	QzIMP
13.10	14.00	SL
14.00	35.40	G_Bio_Gn
35.40	37.35	Bio_Gn
38.30	45.25	Bio_Gn
45.25	48.73	G_Bio_Gn
48.88	54.90	G_Bio_Gn
54.95	69.00	G_Bio_Gn
69.05	75.00	G_Bio_Gn
75.00	77.00	QzIMP
77.00	77.80	G_Bio_Gn
77.85	86.70	G_Bio_Gn
86.73	108.65	G_Bio_Gn
107.15	109.65	G_Bio_Gn
109.68	110.00	G_Bio_Gn
110.80	111.00	G_Bio_Gn
111.02	112.10	G_Bio_Gn
112.15	120.30	G_Bio_Gn
120.30	121.90	QzIMP
121.90	131.10	G_Bio_Gn
131.10	139.30	QzIMP
139.30	150.30	G_Bio_Gn
150.35	160.35	G_Bio_Gn
160.40	178.60	G_Bio_Gn
178.65	200.30	G_Bio_Gn

Table 3.13



DRILL HOLE LOG

Apr 08, 2018

HOLE ID : DH006

NORTHING : 265344.192 EASTING : 174429.977 ELEVATION: 443.573

MAXDEPTH: 81.3 AZIMUTH: 330 DIP : -60

From	To	Rocktype
0.00	9.80	OB
9.80	15.20	G_Bio_Gn
15.20	23.20	Bio_Gn
23.25	30.30	Bio_Gn
30.30	31.30	QzIMP
31.30	44.20	G_Bio_Gn
44.20	53.20	Bio_Gn
53.20	67.90	G_Bio_Gn
68.10	68.40	G_Bio_Gn
68.60	81.30	G_Bio_Gn

Table 3.14



DRILL HOLE LOG

Apr 08, 2018

HOLEID : DH007

NORTHING : 265147.245 EASTING : 174436.486 ELEVATION: 409.549

MAXDEPTH: 265.6 AZIMUTH: 317 DIP : -60

From	To	Rocktype
0.00	11.00	OB
11.00	13.10	QzIMP
13.10	28.00	G_Bio_Gn
28.00	48.70	Bio_Gn
48.70	65.00	G_Bio_Gn
65.00	65.05	RF
65.05	88.70	G_Bio_Gn
88.75	100.10	G_Bio_Gn
100.10	114.50	Bio_Gn
114.60	128.50	G_Bio_Gn
128.50	136.00	Bio_Gn
136.00	175.30	G_Bio_Gn
175.90	200.50	G_Bio_Gn
200.55	265.60	G_Bio_Gn

Table 3.15

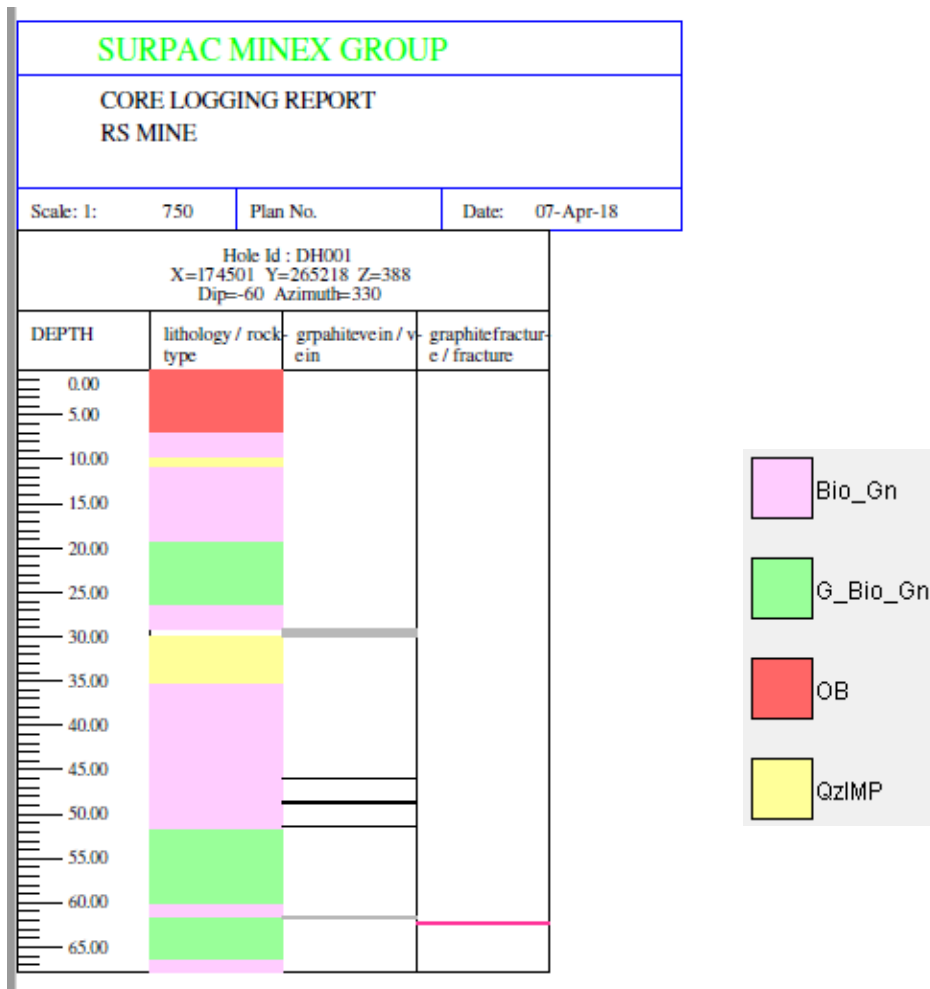


Fig 3.2

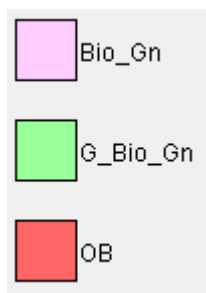
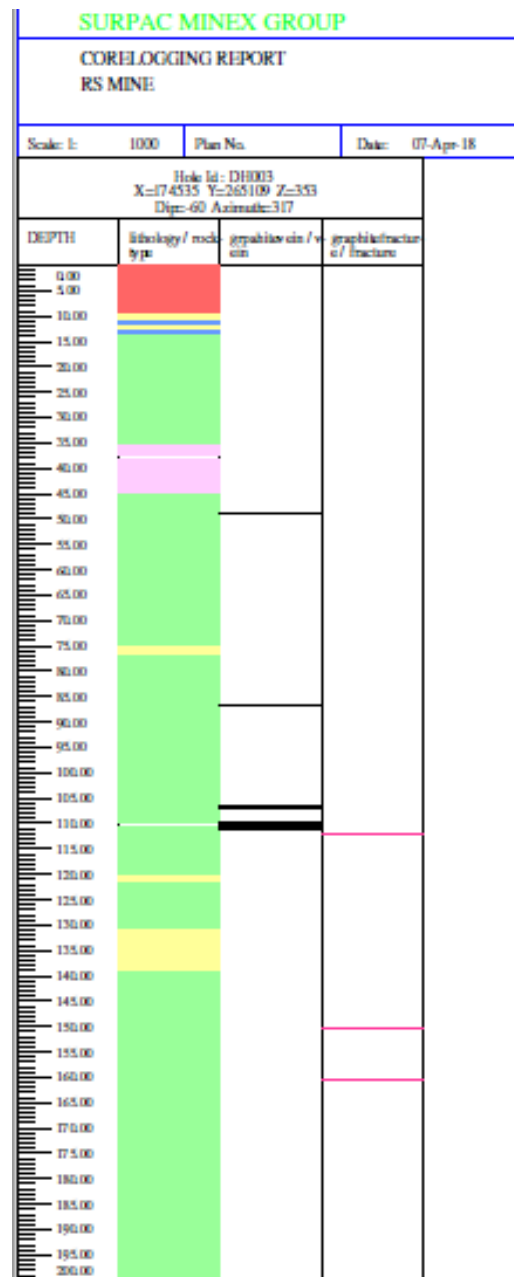
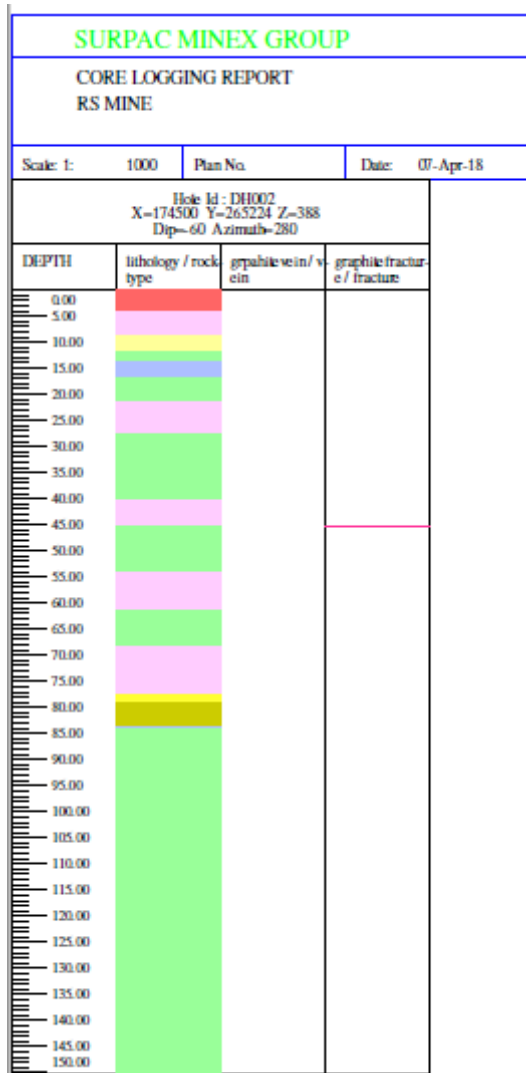


Fig 3.3 & Fig 3.4

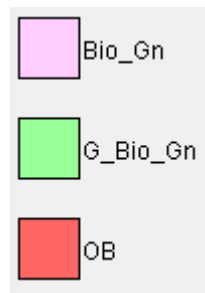
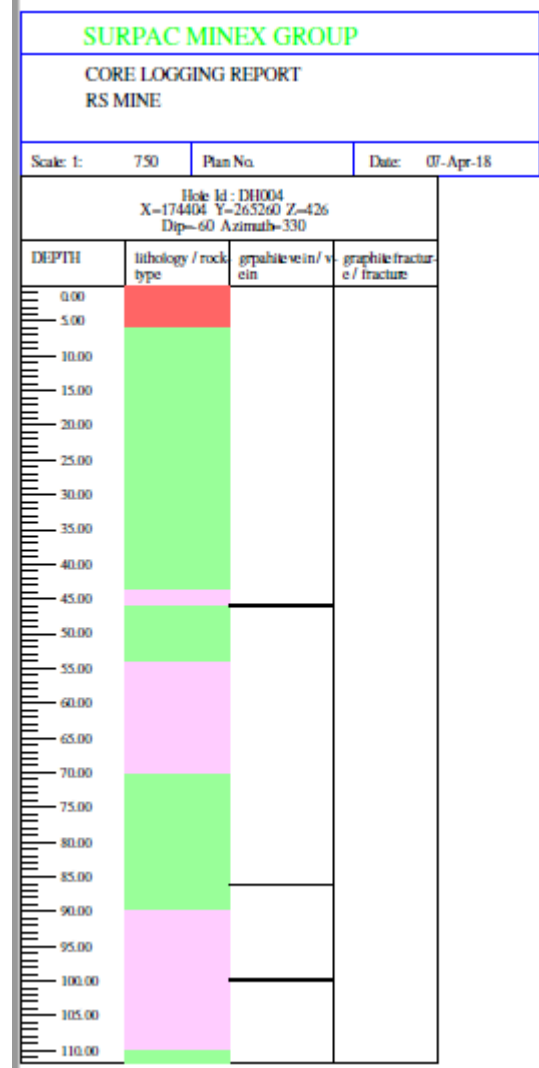
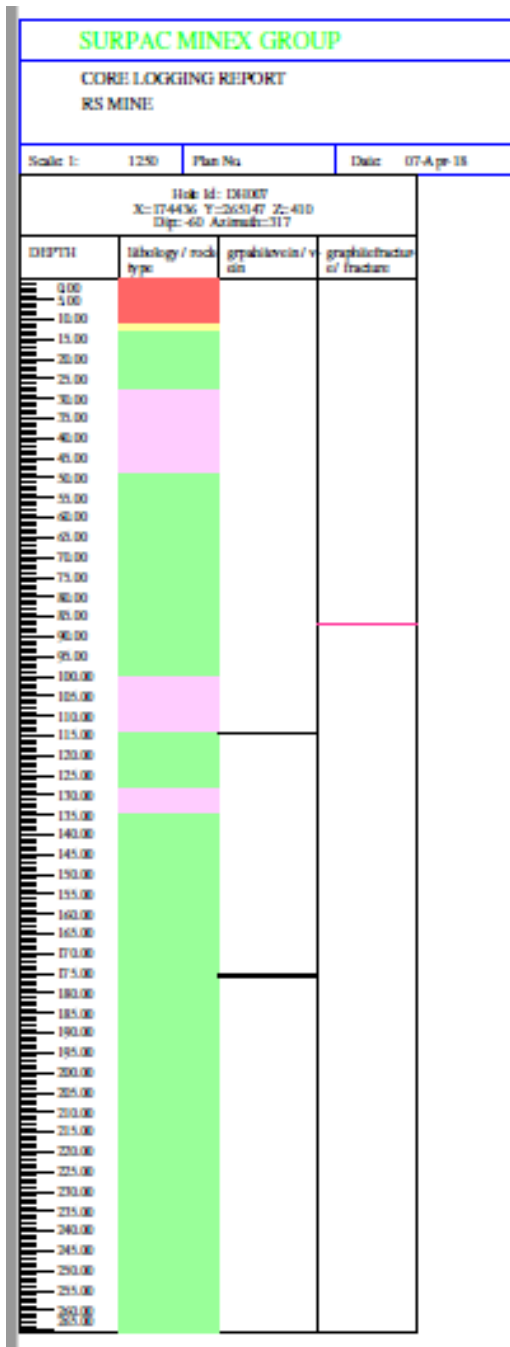


Fig 3.5 & Fig3.6

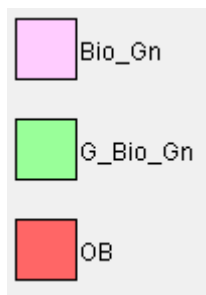
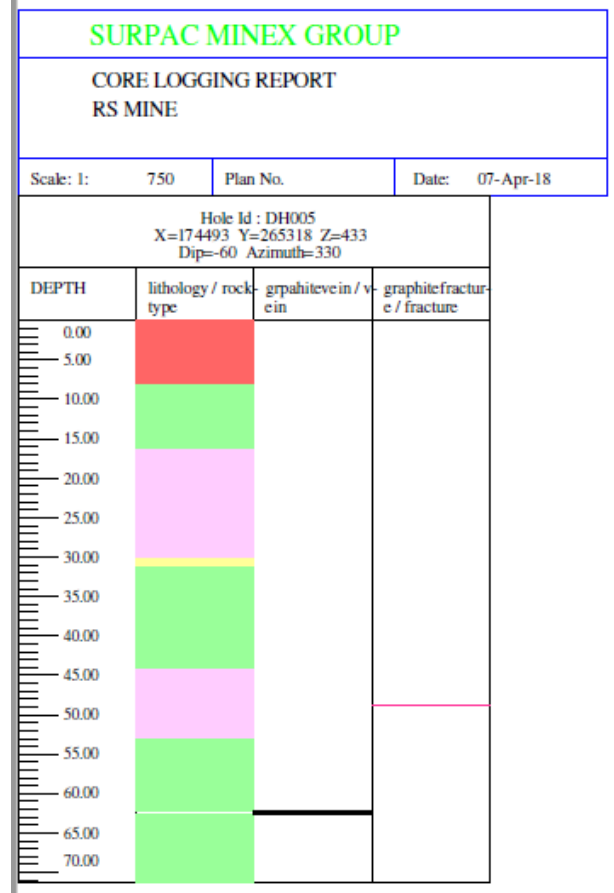
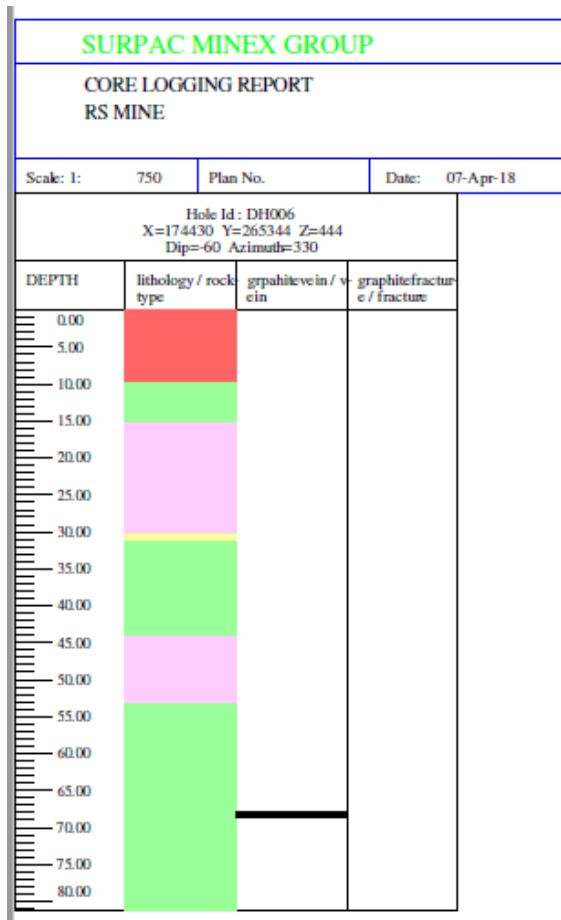


Fig 3.7 & Fig 3.8

4 DATA INTERPRITATION

4.1 MINERALIZATION PATTERN

According to the result of drilling data major four graphite mineralization were identified in entire drilling areas which are VEIN-2, VEIN-3, VEIN-4 and VEIN-5. The VEIN-1, VEIN-4P, VEIN-5P, VEIN-6 and VEIN-7 shown in Fig 4.1

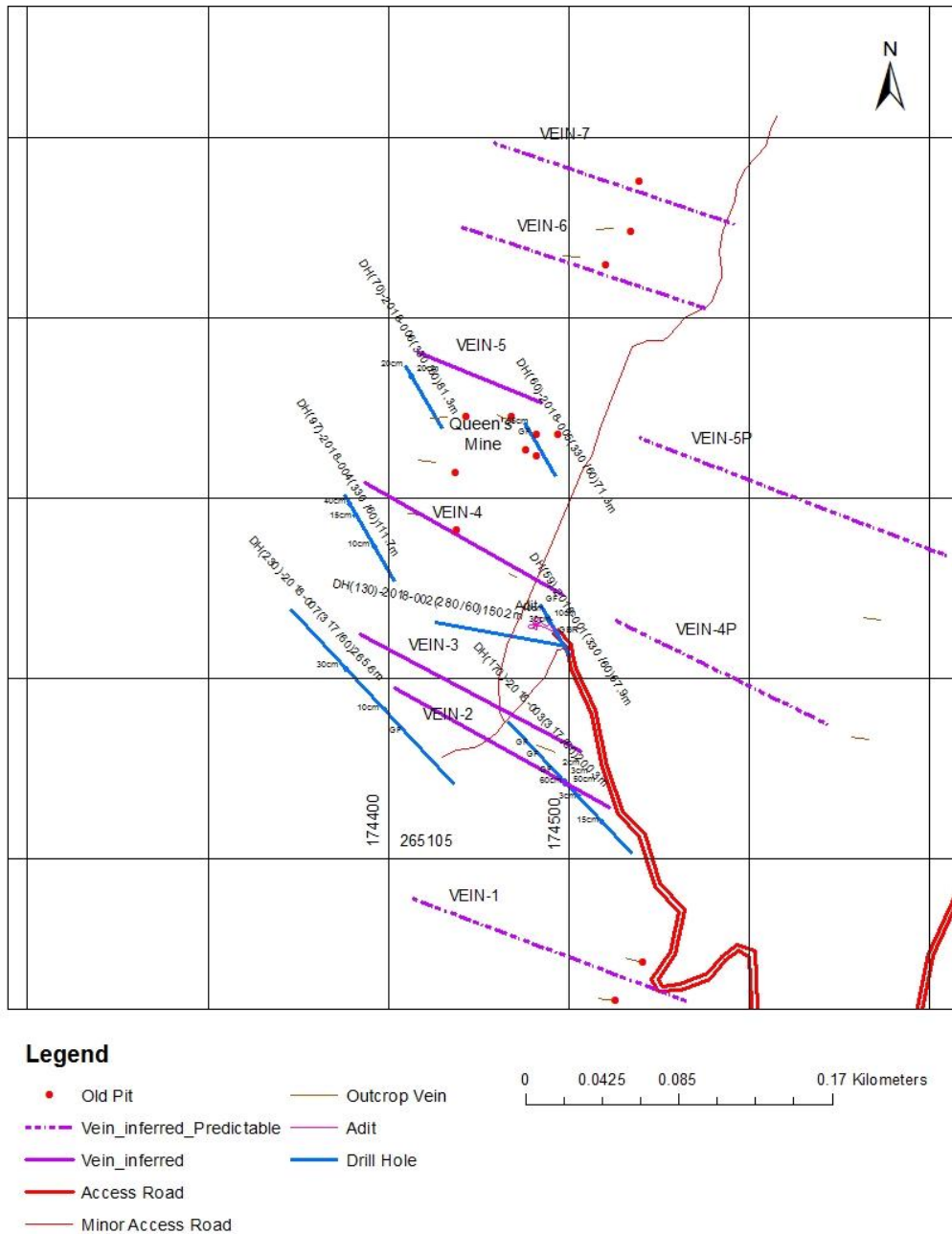
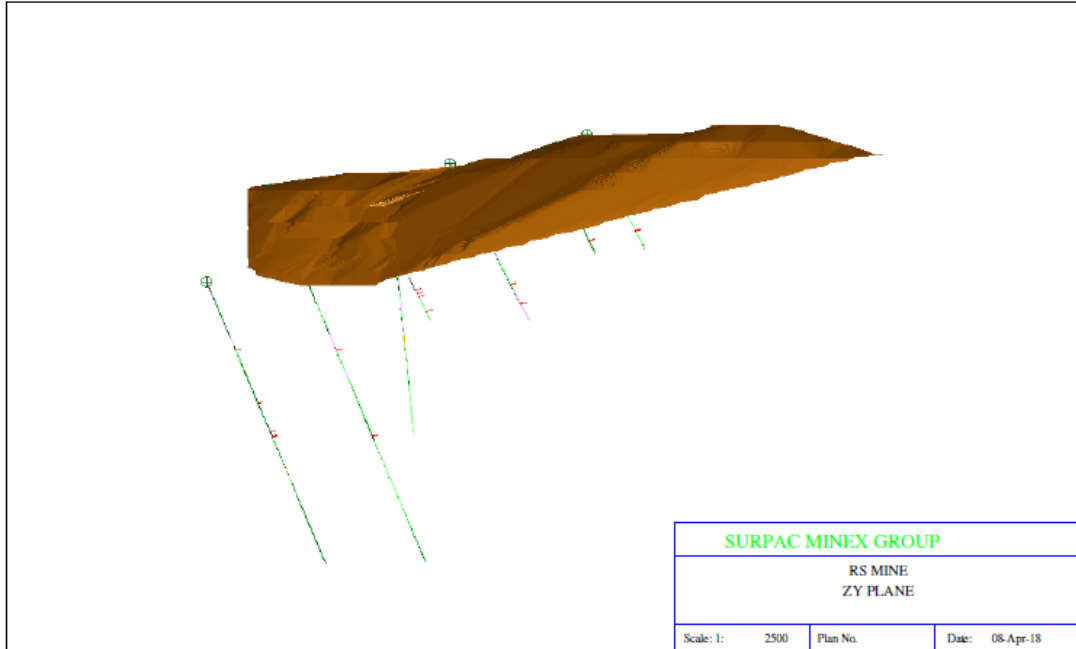


Fig 4.1

4.2 3D MODELLING

The result of the exploration program and data were obtained from total station survey and GPS survey. Mine model is created with graphite mineralization shown in fig 4.2.



4.2 ZY plane with core drill holes rust brown color shown terrain of RS mine

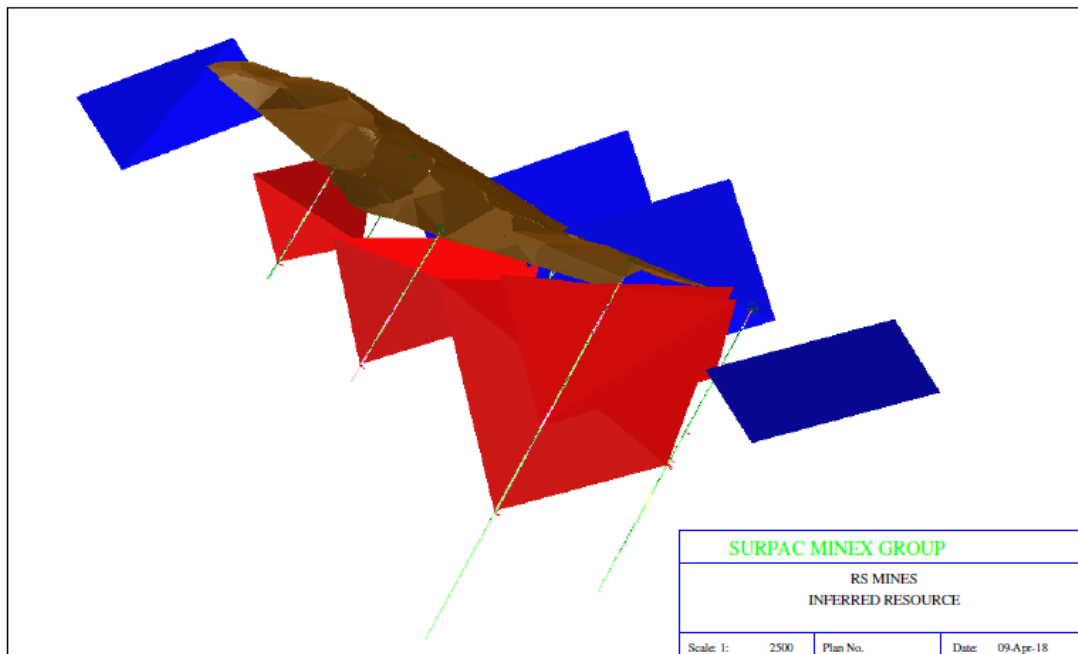


Fig4.3 Inferred resource is shown by red color and the blue and rust brown color show inferred resource predicted and terrain of RS Mine respectively

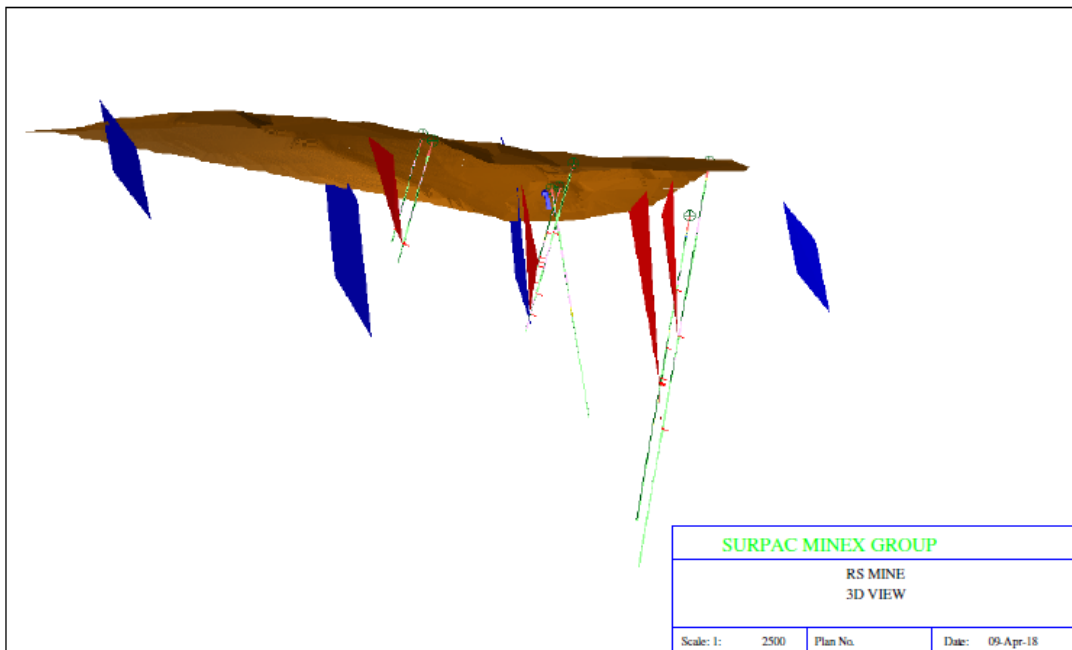
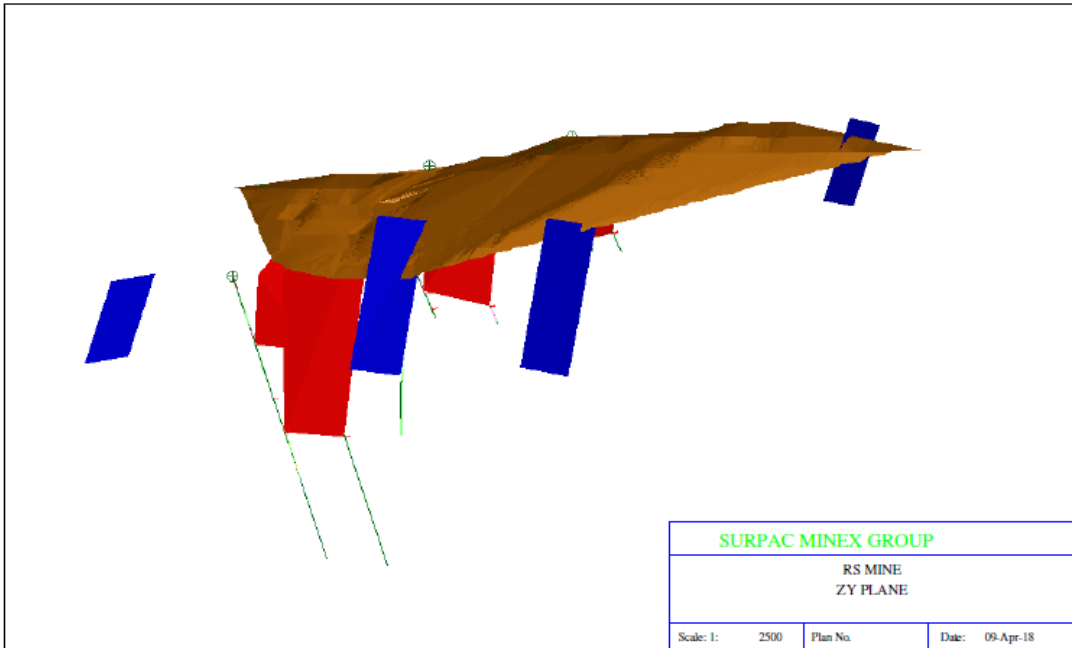


Fig4.4 & 4.5 Inferred resource is shown by red color and the blue and rust brown color show inferred resource predicted and terrain of RS Mine respectively

5 FIELD OBSERVATION AND DATA ANALYZING

5.1 DATA COLLECTION FROM BORE HOLES



Fig 5.1 The graphite vein (60cm) was identified from bore hole number DH003



Fig5.2 The graphite vein (30cm) was identified from bore hole number DH001

5.2 DATA COLLECTION FROM OUT CROP



Fig-5.3 Adit portal of the Mine (Picture taken year 2011)



Fig-5.4 Old graphite pit near queen's mine

5.3 SAMPLE ANALYZING

Sample analyzing was done by laboratory of Geological Survey and Mines Bureau report are shown below



භූ විද්‍යා සමීක්ෂණ හා පතල් කායකීංශය புவிச்சரிதவியல் அளவை, சுரங்கங்கள் பணியகம் GEOLOGICAL SURVEY & MINES BUREAU


නො. 569, ඊපිටමුල්ල පාර,
පිටකොට්ටේ, ශ්‍රී ලංකා.
இல. : 569, எப்பிட்டமுல்லை வீதி,
பிடகோட்டே, இலங்கை.
No.: 569, EPITAMULLA ROAD,
PITAKOTTE, SRI LANKA.

RESULTS OF CHEMICAL ANALYSIS

Laboratory Reference No. : AL/18/38/GEN-31
Material : Graphite
No. of Samples : 01
Submitted by : R.S.Mines (Pvt) Ltd.
Submitted Date : 05.04.2018

Parameter	Results
Percentage of Carbon	95.73%
Density	2.2g/cm ³

Note. 1: The analysis on Carbon was performed on the powdered sample dried at 105°C
2: The density was determined after visible rock fragments were removed.


Authorized signatory


H.A.P. Jayalath
Analyst

06.04.2018
Date

Y. P. Shamalie Siriwardana
Chief Chemist
Analytical Laboratory
Geological Survey & Mines Bureau
No. 569, Epitamulla Road,
Pitakotte.

6 RESOURCE ESTIMATION

6.1 RESOURCE BLOCKS

Resource estimation is done by using resource blocks created by core drilling data and out crop findings of four major mineralization and its predictions

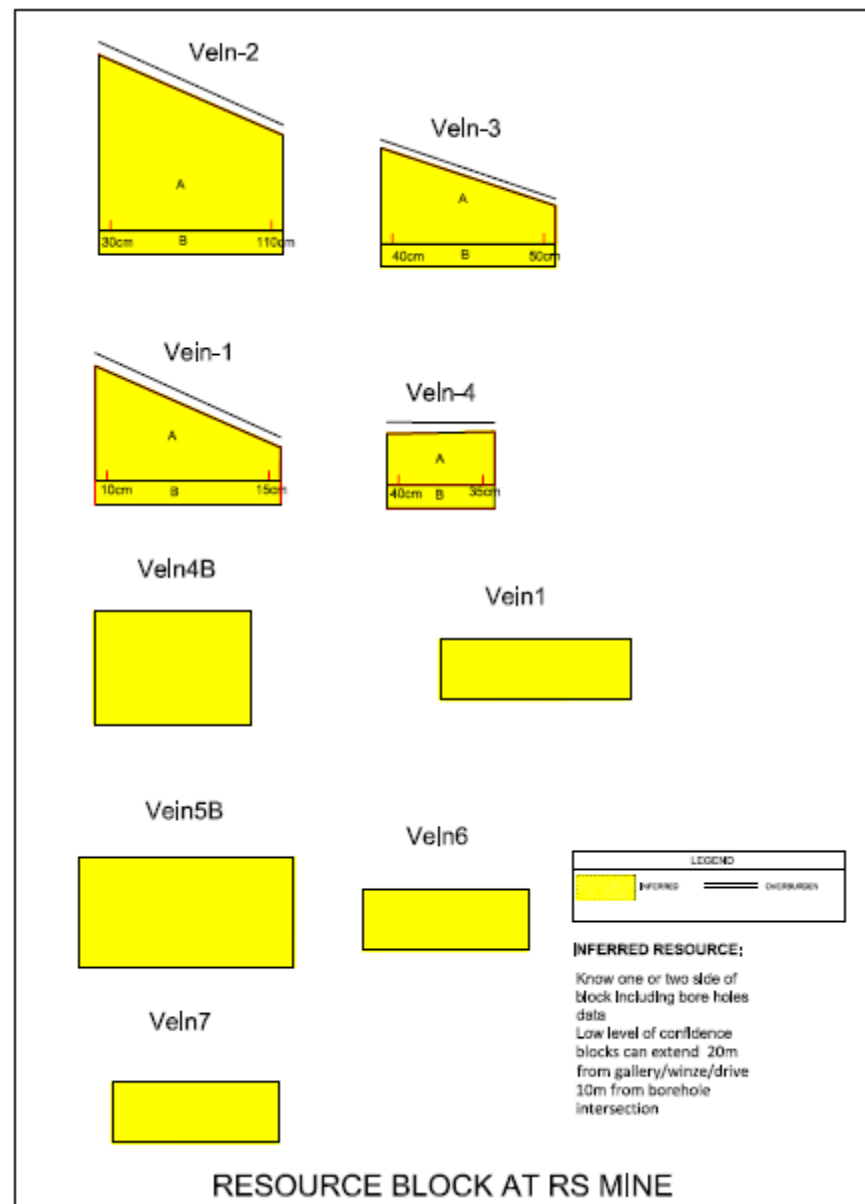


Fig6.1 Inferred resource blocks at RS Mine

Ore resource computation for the block from the vein																				
Level/vein	Block	Length of the block			Height of the block			Area of the block			Thicknesses				Length of influence	Average block thickness	Block volume	Density	Tonnage	Resource category (type)
(symbol)	(symbol)	top drive	bottom drive	west side	east side	H _{top}	H _{top}	H _{top}	H _{top}	S _b	W _{top}	W _{bottom}	W _{west}	W _{east}	P	W _{ap}	V _b	ρ	R _s	
		[m]	[m]	[m]	[m]	[m]	[m]	[m]	[m]	[m ²]	[m]	[m]	[m]	[m]	[m]	[m]	[m ³]	[t/m ³]	[ton]	
		L _{top}	L _{bottom}	H _w	H _e	H _w	H _e	H _w	H _e	S _b	W _{top}	W _{bottom}	W _{west}	W _{east}	P	W _{ap}	V _b	ρ	R _s	
		average	average	average	average	average	average	average	average	average	average	average	average	average	C ₁ -C ₂ -C ₃ -C ₄	C ₁₅ /C ₁₀	C ₃ *C ₁₆	C ₁₇ *C ₁₈		
		annex I	annex I	annex I	annex I	annex I	annex I	annex I	annex I	annex I	annex I	annex I	annex I	annex I	annex I					
Column number		1	2	3	4	5	6	7	8	9	10	16	17	18	19	20				
Vein1	A	174.6	159.00	99.00	28.8	10225	0.00	0.13	0.00	0.00	159	0.125	1278.13	2.29	2927	INF				
Vein1	B	159	159.00	20.00	20	3198	0.13	0.00	0.00	0.00	159	0.125	399.75	2.29	915	INF				
Total level						13423														
Vein2	A	173.4	159.00	143.60	82.4	18610	0.00	0.70	0.00	0.00	159	0.700	13027.00	2.15	28008	INF				
Vein2	B	159	159.00	20.00	20	3180	0.70	0.00	0.00	0.00	159	0.700	2226.00	2.15	4786	INF				
Total level						21790														
Vein3	A	158.9	150.9	82.6	32.6	8699	0.00	0.45	0.00	0.00	150.9	0.450	3914.55	2.15	8416	INF				
Vein3	B	150.9	150.9	20	20	3018	0.45	0.00	0.00	0.00	150.9	0.450	1368.10	2.15	2920	INF				
Total level						11717														
Vein4	A	93	93	44.2	45.9	4194	0.00	0.38	0.00	0.00	93	0.375	1572.75	2.15	3381	INF				
Vein4	B	93	93	20	20	1860	0.38	0.00	0.00	0.00	93	0.380	706.80	2.21	1562	INF				
Total level						6054														
Total vein(Ton)						52,984										0.462	24,483	2.16	52,916	

Table 6.1 Ore resource computation of the block

Ore resource computation for the block from the possible vein(predictable)

Vein	Area of the block	Average Block thickness	Density	Tonnage	Resource category (type)
Vein1	8553	0.462	2.17	8575	INF
Vein4B	13129	0.452	2.17	12877	INF
Vein5B	17436	0.452	2.17	17102	INF
Vein6	7426	0.452	2.17	7284	INF
Vein7	7436	0.452	2.17	7294	INF
Total Vein(Ton)				53,131	
Grand Total (Ton)				106,047	

7.1 CONCLUSIONS AND RECOMMENDATIONS

According to the resource calculation the total resource can be categorized into two parts which are Inferred resource (prepared by based on core drilling program and out crop data) and predictable Inferred resource (prepared by vein thickness of the immediate inferred resource). The total calculated resource is 107,729 tons (Inferred +predictable). The recommended mining activity is to start an adit towards SW, NE direction and perpendicular to the said graphite veins. A development program associated with activities such as an adit, drives and winzes, is required to convert resource blocks into indicated or measured blocks according to the JORC standard. Furthermore, a comprehensive underground core drilling program is needed to predict the location of mine shaft.

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BSc. Msc Dip in project management
(Senior Mine Geologist)

