

**Regional Exploration Proposal (G-4 level) for Basemetals & Silver
in Satdudhiya-Lakhola-Bharak Block, (Block ID Raj-06) in 105 Sq Km
Area, District: Bhilwara, Rajsamand & Chittorgarh, (Rajasthan)**

1.0.0 Introduction:

- 1.1.1 Copper, Lead, Zinc and Silver has played a vital role in the industrial growth of a nation. In India, around 75% of demand is met through imports. The increasing demand of base metals and silver has been accorded high priority in the XIIth Plan document.
- 1.1.2 During the last three decades, no large base metal or silver deposit has been discovered in India. However, the possibility of working of small mineral bodies in proximity to each other, through technological advances and increased operational efficiency, cannot be ruled out. Therefore, it is necessary to locate and explore such small size deposits in clusters.
- 1.1.3 In view of the MMDR amendments act – 2015, Mineral (Evidence of Mineral Contents) Rule 2015 and Mineral Auction Rule – 2015, Ministry of Mines, GSI identified the block for exploration & MECL decided to take up the block for G-4 level of exploration under NMET funding. MECL requested Ministry of Mines, Government of India to reserve the block to carry regional exploration.
- 1.1.4 Ministry of Mines, Government of India allotted 30 Regional Mineral Exploration Blocks for G-4 exploration from the 100 Reports handed over by GSI to MoM. The Regional Exploration for Basemetals & Silver in Satdudhiya-Lakhola-Bharak Block, (Block ID Raj-06) in 105 Sq Km Area, District: Bhilwara, Rajsamand & Chittorgarh, (Rajasthan) is one of the block allotted to MECL. Accordingly MECL prepared proposal for regional exploration and put up for approval of Technical Committee of NMET.

1.2.0 Location of the Block:

- 1.2.1 The Gangapur township in the northern portion of the block is 40 km from district township Bhilwara on state highway 76 B in the south west direction, the block is located in the survey of India Toposheet No 45 K/4 & 45 K/8, the Co-ordinates of the corner points of the block is given below and covers an area of nearly 105 sq.km.

- | | |
|---|---|
| A) 25° 15' 00"N and 74° 15' 00"E | B) 25° 14' 59"N and 74° 18' 46"E |
| C) 25° 04' 10"N and 74° 13' 47"E | D) 25° 03' 30"N and 74° 16' 00"E |

1.3.0 Physiology and Drainage:

- 1.3.1 The block area in general is of undulating terrain. A ridge extending from Surawas in the SW corner of the block runs NE through Mataji-ka-Khera, Bharak and Lakhola villages in the block is further extending to village Satdudhiya (outside the block boundary) in the same direction. The highest peak of 2030 m is in the SW portion of the block. The isolated hillocks in general have reduced level of 500 m from mean sea level.

1.3.2 The Banas River passes from 2 km south of the southern boundary of the block and river Chandrabhaga which is a tributary to Banas River from the western boundary of the block Joins Banas at the south western corner of the block. The Drainage pattern in the block is of dendritic type merging into either of these rivers.

2.0.0 Previous work:

2.1.1 During the field season 1975-76, GSI carried out regional geochemical survey over a 30 km long zone extended from Kaladuha Village in the NE to near Sindesar Kalan village in the south west. Anomalous bismuth values 1.08 to 2.8 ppm is recorded in stream sediments (NGCM) samples from Gangapur area.

2.1.2 Geochemical survey carried out in Mataji-ka-Khera and Baghera blocks indicated localised high values of base metals. Silver values higher than 100 ppm are recorded in 13 samples. 4 samples indicated 780-1200 ppm of silver. Several shear zone related to F3 deformation appear to have played significant role in localizing silver mineralization at the contact of marble & metamarl.

2.1.3 The Silver mineralization in Baghera block is confined within three meters at the lowest level of siliceous dolomite near the contact with underlying Calc-silicate rock. The silver mineralization is strata bound.

2.1.4 A total of 4735.25 m drilling was carried out by GSI in 33 boreholes. Out of this & boreholes (BRB-1 to 6, 15 & 16) have been drilled in Mataji-ka-Khera and 25 boreholes (BRB-7 to 14) and (BRB-17 to 33) have been drilled in Baghera block for Basemetal & Silver mineralization. The ground geophysical survey by self-potential method has delineated a broad low SP zone which is formational & may be due to carbonaceous phyllite/graphitic schist, the moderate SP anomalies located on the flanks of the formation low be more significant.

3.0.0 Geology and Structure:

3.1.0 Regional geology and structure of the area.

3.1.1 The Litho units exposed in and around the region of the block belongs to the Dowda group of Aravalli Supergroup, Pur-Banera and Rajapur-Dariba groups of Bhilwara Supergroup belonging to Lower- Proterozoic age. Widely exposed lithounits belongs to Mangalwar Complex group of Bhilwara Supergroup belonging to the Archaean age forming outliers. The lithounits exhibit strike NNE-SSW trend. There are parallel shears trending NE-SW related to F3 deformation. The Regional stratigraphic sequence of lithounits (after GSI) is given below.

The Regional Stratigraphic sequence of lithounits (after GSI)

Age	Super group	Group	Lithounits
Recent			Soil
Lower Protero-zoic	Aravalli		Pegmatite's & Quartz veins
		Dowda	Biotite schist, Gneiss, Marble, Hornblende schist, gneiss.
	Bhilwara	Pur-Banera	Quartzites, Conglomerates, Calc gneiss, marble, mica schist
			Pegmatites & Quartz veins.
		Rajpura Dariba	Calc-schist, Calc silicate marble, Sulphide bearing mica schist, Quartzite .
Archaean		Mangalwar Complex	Migmatites, Composite, gneisses, Biotite schist, quartzite, dolomite. Amphibolites.

3.2.0 Geology and Structure of the block:

3.2.1 Satdudhiya-Lakhola-Bharak belt is a part of Dariba-Sindesar-Bethumbi belt. The metasediment are represented by garnet-staurolite-mica schist, Calc silicate rocks, interbedded with marble, quartzite, calc-schist and migmatites. They are intruded by pegmatites & quartz veins. The sequence of the metasediments shows NNE-SSW to N-S trend with generally steep dips towards east. The main sulphide minerals present are chalcopyrite, pyrite, pyrrhotite, arsenopyrite, bornite, sphalerite and cubanite. The stratigraphic sequence of lithounits of the block (after GSI) is given below

The Stratigraphic Sequence of Lithounits of the Block (after GSI)

Age	Super group	Group	Lithounits
Recent			Soil
Lower Protero-Zoic	Bhilwara		Pegmatite's & Quartz veins
		Rajpura Dariba	Calc-schist, Calc silicate Marble, sulphide bearing Mica schist, Quartzite.
Archaean		Debari	Migmatites, Composite Gneisses, Calc-schist rocks, Amphibolites, Quartzite, Biotite schist, Dolomite.

4.0.0 Objective of the proposed exploration programme

4.1.1 The basic Geoscience data provided by GSI has been studied and evaluated. Based on the evaluation the present exploration programme has been formulated to fulfill the following objectives.

- i) To carry out geological mapping on 1:12,500 scale and demarcate the rock types on Copper & Gold bearing formations with the structural features to identify the surface manifestations and lateral disposition of the ore body.
- ii) To collect surface samples to analyze them for Copper, Pb, Zn & Ag and decide further course of exploration programme.
- iii) In case, surface samples give positive results and Geophysical survey associated with remote sensing studies show probable extension of concealed mineralised zones(ore body) then to drill 5 scout boreholes which in turn will decide the future course of exploration programme at G-3/G-2 category of UNFC.
- iv) To estimate reconnaissance basemetals & silver resources along with accessory elements as per UNFC norms and Minerals (Evidence of Mineral Contents) Rule-2015 at G-4 level.

5.0.0 Proposed scheme of Exploration:

5.0.1 In accordance to the objectives set for the block, the exploration programme is proposed. The exploration shall be carried out as per Minerals (Evidence of Mineral Contents) Rule-2015. Accordingly, the following scheme of exploration is formulated in order to achieve the objectives. The details of different activities to be carried out are presented in subsequent paragraphs.

5.1.0 Geological mapping:

5.1.1 Geological Mapping will be done on 1:12,500 scales. Rock types, their contact, structural features will be mapped. Surface manifestations of the mineralised zones (ore bodies) available along with their surface disposition will be marked on map. Surface samples of various litho-units for petrological studies and from ore bodies for base metals and silver assay with accessory minerals will be taken during the course of geological mapping.

5.2.0 Geochemical Sampling

5.2.1 Surface Sampling (Bed Rock Sample / Soil Sample)

During the course of Geological mapping the Bed rock and Soil samples shall be collected from the out crops and soil covered area respectively. A total of 100 no's bed rock samples and 50 no's soil samples shall be collected, prepared and analyzed for (Cu, Pb-Zn, Co, Ni, Te & Se) and also for Au & Ag by fire assay.

5.2.2 Stream Sediment Sampling:

The stream sediment samples shall be collected from the entire study area of 105 sq. km. The samples shall be collected depending upon the forest cover and accessibility of the area. A total of 100 stream sediment samples shall be collected from the study area and will be analysed for Cu, Pb & Zn and for Ag also.

5.3.0. Surveying:

5.3.1. The block boundary will be surveyed by DGPS and total station in WGS-84 datum for determination of block boundary points, the reduced level and Co-ordinates of the boreholes will be determined. The block is nearly of 105 sq km area, hence after identifying the disposition of mineralised zones (ore bodies), the area surrounding mineralised zones will be contoured on 1:12,500 scale at 5.00 m contour interval and surveying of surface features within such sub-blocks will be undertaken.

5.4.0 Geophysical Survey:

5.4.1 The area of the block is nearly 105 sq. km and to assess the strike continuity of the sub-surface mineralised zones (ore body) need of Geophysical Survey is felt. Based on the results of Geological Mapping and Geochemical sampling (Bed rock sampling, soil sampling and stream sediment sampling) if required surface Geophysical Survey will be carried out. The Geophysical survey will be taken up in 20 line km split in section lines for Cu, Pb, Zn & Ag mineralization. The survey will be the combination of magnetic self potential, Resistivity & Induced potential surveys.

5.5.0 Exploratory Mining

5.5.1 Shallow Trenching / Pitting (Excavation)

Trenching and pitting shall be carried out in the potential zones identified based on the results of Geological Mapping & Geochemical sampling. A provision of shallow trenching of 100 cu. m. is kept. Pitting shall be done for correlation of mineralised zones on surface upto a depth of 1m after removal of soil/ weathered column in the area. Locations of the pits & trenches on ground will be decided by field geologist based on field observations. A provision of 100 number of primary trench / pit samples is kept for analysis of Cu, Pb, Zn, Co & Ni and 30 samples for Se Ni and also for Au & Ag by Fire assay).

The trench & pit walls will be mapped on 1:200 scale.

Thus a total of 100 cu m of shallow trenching & pitting work along with associated geological & laboratory studies has to be carried out.

5.6.0 Core Drilling:

5.6.1 GSI has drilled 8 boreholes in Mataji-ka-Khera and 25 boreholes in Baghera blocks involving 4735.25 m of drilling for basemetal & silver mineralization (1985-90, unpublished Report, WRO-23068), the summary of the results at present has not been given in synopsis. However based on the Remote Sensing studies, Geophysical surveys and Geological mapping, 5 nos of scout boreholes involving 600 m drilling will be taken for upper level intersections of the ore bodies emerging of surface and their extension along strike in a concealed mode.

5.7.0 Drill Core Logging:

5.7.1 The drill core will be logged for rock types, structural features, textures, intersection of ore zones, type of mineralization and occurrence of various ore minerals. The logging for determining the Rock Quality Designation will also be undertaken.

5.8.0 Drill Core Sampling:

During the geological logging of drill core, samples in mineralized zones will be marked based on concentration and lithological variations. 220 Nos of primary samples will be analyzed for Cu, Pb, Zn, Co & Ni assay & 100 Nos (primary) samples for Au & Ag by fire assay 10% of primary samples will be given as check samples for analysis of Cu, Pb & Zn. 15 nos of composite samples will be analyzed for 6 Radicals Cu, Pb, Zn, Co & Ni and also for Au & Ag by fire assay

5.9.0 Whole Rock Analysis

5.9.1 10 Nos of samples shall be subjected to whole rock analysis for SiO_2 , Al_2O_3 , Fe_2O_3 , TiO_2 , MnO , CaO , Na_2O , $\text{K}_2\text{O}+\text{H}_2\text{O}$, MgO , P_2O_5 , CO_2 , & S radicals to check the rock types, their variation in chemical composition.

5.10.0 XRD Studies

5.10.1 From the composite samples, 10 samples shall be subjected for XRD studies.

5.11.0 Trace Element Study by LA MC-ICPMS Method/ Spectroscopic studies:

5.11.1. 15 N0.samples for the study of trace elements (48 Radicals) by La MC- ICP-MS Method spectroscopic studies.

5.12.0 Petrological Studies:

5.12.1 During the course of core logging & mapping 30 samples from various lithounits intersected in boreholes will be studied for petrography and 30 samples from mineralized zones will be studied for the ore mineral assemblages and their distribution, alteration, enrichment etc. in polished sections.

5.13.0 Specific gravity Determination:

5.13.1 Specific gravity determination shall be subjected to 20 Nos samples from the mineralized zones intersected in the boreholes.

5.14.0 Quantum of Work Proposed:-

5.14.1 The details of Quantum of work proposed in the area is given below:-

TABLE: 5.1 Proposed Quantum of Work in Satdudhiya-Lakhola-Bharak Block, for Basemetals & Silver (Block ID Raj-06) in 105 Sq Km Area, District: Bhilwara, Rajsamand & Chittorgarh, (Rajasthan)			
Sl. No.	Item of work	Unit (m)	Proposed Quantum of Work
1	Geological Mapping (on 1:12,500 Scale)	Sq. Km	105 sq.km
	Topographical Survey (on 1:12,500 Scale)	Sq. Km	105 sq.km
	Bore Hole Fixation (Scout Boreholes)	Nos	5 Nos
	RL & Coordinate Determination	Nos	5 N0s
2	Geochemical Sampling		
	a) Bed Rock Sampling	N0s.	100Nos
	b) Soil Sampling	N0s.	50 N0s
	c) Stream Sediment Sampling	N0s.	100 N0s
3	Geophysical Survey		
	a) Gravity & Magnetic Survey	No of Sts	2040 N0s
	b) Self Potential	No of St.	2040 N0s
	c) Resistivity	Line Km	20 Line Km
	d) Induced Polarisation Survey (at 100X25 m interval)	Line Km	20 Line Km
4	Exploratory Mining		
	Excavation (Trenching /Pitting)	Cu. m.	100 Cu m
5	Drilling (coring)	m	600m (5 Bhs)
6	Geological work		
	a) Geological Core Logging	m	600m (5 Bhs.)
7	Laboratory Studies		
	Surface Sampling (Primary samples)		
	i) Bed Rock samples		
	a) For 5 radicals (Cu, Pb-Zn, Co & Ni,)	Nos	100 Nos
	b) for 2 radicals Te & Se	Nos.	20 Nos
	c) Ag & Ag by Fire Assay	Nos	100 Nos
	ii)) Soil Samples		
	a) for (Cu, Pb-Zn,)	Nos.	50 Nos.
	b) for Ag by Fire Assay	Nos	50 Nos
	iii) Stream Sediment Samples		
	a) For (Cu, Pb-Zn,)	Nos.	100 N0s
	b) for Au + Ag by Fire Assay	Nos	100Nos
	iv) Check Samples (Bed Rock / Soil/ Stream sediment)		
	a) For (Cu, Pb-Zn, Co & Ni)	Nos	10 N0
	b) for Au + Ag by Fire Assay	Nos	10 N0
	v) Trench & Pit Sampling		
	a) For 5 radicals (Cu, Pb-Zn, Co & Ni,)	Nos.	100 N0s
	b) For 2 radicals	Nos	30Nos
	c) for Ag by Fire Assay	Nos	30Nos
	v) Drill Core Primary & Check Samples		

	a) for 5 radicals (Cu, Pb , Zn, Co & Ni) b) For Au & Ag by Fire Assay	Nos Nos	220 Nos 100 Nos
	vi) Composite Samples for 5 radicals a) Cu, Pb , Zn, Co & Ni b) for 2 radicals Te & Se b) Au & Ag (By Fire Assay)	Nos Nos Nos	15 Nos 15 Nos 15 Nos
8	Physical Studies a) XRD – Studies on Composite samples	Nos.	10 Nos
	b) Spectroscopic Studies (12 elements Cd, Sn, W, Sb, Mo, Ce, Nb, Ba, La, Bi, Co & Ni)	Nos.	15 Nos
9	Petrological Samples (Surface & Bh Core Samples) a) Preparation of Thin Section b) Study of Thin Section	Nos. Nos.	30 Nos 30 Nos
	Mineragraphic Studies (Surface & Bh Core Samples) a) Preparation of Polished Section b) Study of Polished Section	Nos. Nos.	30 Nos 30 Nos
11	Whole Rock Analysis (SiO₂, Al₂O₃, Fe₂O₃, TiO₂, MnO, CaO, Na₂O, K₂O+H₂O, MgO, P₂O₅, CO₂, & S)	Nos.	10 Nos
12	Specific gravity Determination	Nos.	20 Nos
13	Report Preparation [As per Mineral (Evidence of Mineral Contents) Rule-2015]	Nos.	1

6.0.0 Time schedule and cost Estimate:

6.1.0 Time schedule

6.1.1 The area of proposed block is nearly 105 sq. km. There are various mineralized zones in the study area the details of the exploration programme execution are indicated in the bar chart given below.

Time schedule (in months) for Exploration Programme in Satdudhiya-Lakhola-Bharak Block, District: Bhilwara, Rajsamand & Chittaurgarh, (Rajasthan)												
Item of Work	1	2	3	4	5	6	7	8	9	10	11	12
Geological Mapping (2 Party)	←→											
Bed Rock Sampling/ Soil Sampling	←→											
Stream Sediment Samplings		←→										
Surveying (1 Party Days) for Sampling etc	←→											
Sample Preparation Soil/Bed Rock/Stream (2 Party)		←→										
Analytical Work			←→									
Geophysical Survey				←→								
Geophysical Report						←→						
Surveying in Geophysical Survey (2 Party's)				←→								
Trenching & Pitting						←→						
Trench & Pit Sampling							←→					
Drilling (600 m)						←→						

Cost Estimate for G-4 Level of Exploration for Base Metals in Iswal-Selu-Kathar-Tula (Thala) Area (Block ID-WR-RAJ-14) , Block Area-95 Sq. Km. , District: Udaipur, Rajsamand, Rajasthan.					
Sl. No.	Item of Work	Unit	Rates (2016-17)	Qty.	Amount
A	REMOTE SENSING & REPORT (1 BLOCK)	Nos	2,000,000.00	1	2000000.00
B	GEOLOGICAL WORK				
1	Survey Party days				
	a) Survey Party days (1party) For Sampling etc	days	6,146.00	90	553140.00
	b) Survey Party days (2 party) For Geophysical Survey etc	days	6,146.00	120	737520.00
	b) Survey Party days (2 party) For Drilling	days	6,146.00	180	1106280.00
2	Geologist Party days				
	a) Geological Party days (2 Party) For Geological Mapping etc	days	8,021.00	180	1443780.00
	b) Geological Party days (1 Party) For Drilling, Core Sampling	days	8,021.00	90	721890.00
3	Sampling Party days	day			
	a) Sample Preparation for Bed Rock, Soil , Stream samples (2 Partys)	days	2,945.00	180	530100.00
	b) Sample Preparation Drill Cores (1 Party)	days	2,945.00	60	176700.00
4	Transportation (Light Vehicles, 2 nos)	day	1,500.00	480	720000.00
	Sub-Total B				5989410.00
C	GEOPHYSICAL SURVEY & REPORT				
	Magnetic Stations	Nos.	482.00	1020	491640.00
	Self Potential Stations	Nos.	2,997.00	1020	3056940.00
	Resistivity	L. km	18,710.00	20	374200.00
	Induced Potential	L. km	217,505.00	20	4350100.00
4	Transportation (Light Vehicles, 2 nos)	day	1,500.00	120	180000.00
	Sub-Total C				8452880.00
D	CORE DRILLING (5 BH)				
1	Surface Drilling (2 rigs)	m	7,268.00	600	4360800.00
2	Transportations (2 Rigs)	Km	34.00	4000	136000.00
3	Accommodation (One time/ Drill)	Nos	728,250.00	2	1456500.00
4	Camp Setting / Winding	Nos	268,723.00	2	537446.00
5	Road Making (Flat Terrain)	Km	20,368.00	10	203680.00
6	GI Core Boxes	Nos	2,000.00	150	300000.00
7	Transportation Charges of Core Boxes	Km	34.00	300	10200.00
	Sub Total D				7004626.00
E	LABORATORY STUDIES				
1	Chemical Analysis				
	<i>i) Surface sampling (Bed Rock Samples)</i>				
	a) Cu, Pb, Zn & Ag by fire assay	Nos.	2,281.00	100	228100.00
	ii) Soil Samples				
	b) Cu, Pb, Zn & Ag by fire assay	No	2,281.00	50	114050.00
	iii) Stream Sediment Samples				
	c) Cu, Pb, Zn & Ag by fire assay	No	2,281.00	100	228100.00
	d) Check Samples (Bed rock/ soil/ stream)	No	1,443.00	*	
	<i>ii) BH Core Sampling, Primary & Check samples</i>				
	a) Cu, Pb & Zn,	Nos.	1,443.00	220	317460.00
	iii) Composite Samples for 5 radicals				
	a) Cu, Pb & Zn	Nos	1,443.00	15	21645.00
	b) Au & Ag (Fire assay)	Nos	1,460.00	15	21900.00
2	Physical Analysis				
	<i>i) Petrographic Studies (BH core + Surface Samples)</i>				
	a) Preparation of thin section	Nos	545.00	60	32700.00
	b) Study of thin section	Nos	1,495.00	60	89700.00
	<i>ii) Mineragraphic Studies (BH core + Surface Samples)</i>				
	a) Preparation of polished section	Nos	583.00	30	17490.00
	b) Study of polished section	Nos	2,118.00	30	63540.00
	iii) Whole rock analysis	Nos	6,386.00	10	63860.00
	iv) Specific Gravity Determination (BH)	Nos	198.00	20	3960.00
	v) XRD & Spectroscopic Studies				
	a) X-RD Studies on composite	Nos	5,900.00	10	59000.00
	b) Spectroscopic studies (12 elements- Cd,Sn,W,Sb,Mo,Ce,Nb,Ba,La,Bi,Co & Ni)	Nos	6,274.00	15	94110.00
	Sub-Total E				1355615.00
	Total (A+B+C+D+E)				24802531.00
F	EXPLORATION REPORT - 1% of (A+B+C+D+E)				248025.00
	GRAND TOTAL (A+B+C+D+E+F)				25050556.00
				Say Rs. 2.50 crore	
Note	Rates of Goel Committee based on actual escalation as per RBI indices as on 31.3.16 and provisional escalation of @15% points for drilling and 25% points for Geological & Laboratory Studies for subsequent year.				