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(Part- I)

61st Edition

STATE REVIEWS (Rajasthan)

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GOVERNMENT OF INDIA
MINISTRY OF MINES
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RAJASTHAN

Mineral Resources

Rajasthan is the richest state in terms of availability and variety of minerals in the country and produces about 50 different minerals along with minor minerals during 2020-21. Rajasthan is the sole producer of lead & zinc ores, selenite and wollastonite. Rajasthan was the sole producer of garnet (gem) till 2004-05. Almost entire production of silver in the country comes from Rajasthan. The State is a major producer of copper ore/conc., limestone, ochre, phosphorite/rock phosphate and talc/soapstone/steatite. The State is also an important producer of marble of various shades. Makrana area is the world famous centre for marble mining.

The State possesses substantial share of the total resources of potash (94%), lead & zinc ore (89%), wollastonite (88%), silver ore (88%), gypsum (82%), ochre (81%), bentonite (75%), fuller's earth (74%), diatomite (72%), felspar (66%), marble (63%), asbestos (61%), copper ore (54%), calcite (50%), talc/steatite/soapstone (49%), ball clay (38%), rock phosphate (31%), fluorite (29%), and tungsten (27%).

Important minerals that are found to occur in the State are: **asbestos (amphibole)** in Ajmer, Bhilwara, Dungarpur, Pali, Rajsamand & Udaipur districts; **ball clay** in Bikaner, Nagaur & Pali districts; **barytes** in Alwar, Bharatpur, Bhilwara, Bundi, Chittorgarh, Jalore, Pali, Rajsamand, Sikar & Udaipur districts; **calcite** in Ajmer, Alwar, Bhilwara, Jaipur, Jhunjhunu, Pali, Sikar, Sirohi & Udaipur districts; **china clay** in Ajmer, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Dausa, Jaipur, Jaisalmer, Jhunjhunu, Kota, Nagaur, Pali, Sawai Madhopur & Udaipur districts; and **copper** in Khetri belt in Jhunjhunu district & Dariba in Alwar district. Deposits of copper are also reported at Ajmer, Bharatpur, Bhilwara, Bundi, Chittorgarh, Dausa, Dungarpur, Jaipur, Jhunjhunu, Pali, Rajsamand, Sikar, Sirohi and Udaipur districts. Occurrence of other minerals, namely, **Dolomite** in Ajmer, Alwar, Bhilwara, Chittorgarh, Dausa, Jaipur, Jaisalmer, Jhunjhunu, Jodhpur, Sikar & Udaipur districts; **felspar** in Ajmer, Alwar, Bhilwara, Jaipur, Pali, Rajsamand, Sikar, Tonk & Udaipur districts; **fireclay** in Alwar, Barmer, Bharatpur, Bhilwara, Bikaner, Dausa, Jaisalmer, Jhunjhunu & Sawai Madhopur districts; **fluorspar** in Ajmer, Dungarpur, Jalore, Jhunjhunu, Sikar, Sirohi & Udaipur districts; **garnet** in Ajmer, Bhilwara, Jhunjhunu, Sikar & Tonk districts; **gypsum** in Barmer, Bikaner, Churu, Sri Ganganagar, Hanumangarh, Jaisalmer, Jalore, Nagaur & Pali districts; **iron ore (haematite)** in Alwar, Dausa, Jaipur, Jhunjhunu, Sikar & Udaipur districts; **iron ore (magnetite)** in Bhilwara, Jhunjhunu & Sikar districts; and **lead-zinc** in Zawar in Udaipur district, Bamnia Kalan, Rajpura-Dariba in Rajsamand & Rampura/Agucha in Bhilwara district. Lead-zinc occurrences have also been reported from Ajmer, Chittorgarh, Pali and Sirohi districts. **Lignite** deposits are found to occur in Barmer, Bikaner, Jaisalmer, Jalore, Nagaur and Pali districts. Flux grade **limestone** occurs in Jodhpur and Nagaur districts and Chemical-grade limestone in Jodhpur, Nagaur and Alwar districts. Cement grade deposits of limestone are widespread in Ajmer, Alwar, Banswara, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Jaipur, Jaisalmer, Jodhpur, Jhunjhunu, Kota, Nagaur, Pali, Sawai Madhopur, Sikar, Sirohi and Udaipur districts. **Magnesite** in Ajmer, Dungarpur, Pali & Udaipur districts; **marble** in Ajmer, Alwar, Banswara, Bhilwara, Bundi, Chittorgarh, Dungarpur, Jaipur, Nagaur, Sikar, Sirohi & Udaipur districts; **mica** in Ajmer & Bhilwara districts; **ochre** in Baran, Bharatpur, Bhilwara, Bikaner, Chittorgarh, Jaipur, Sawai Madhopur & Udaipur districts; **pyrite** in Sikar district; **pyrophyllite** in Alwar, Bhilwara, Jhunjhunu, Rajsamand & Udaipur districts; **quartz/silica sand** in Ajmer, Alwar, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Dausa, Jaipur, Jaisalmer, Jhunjhunu, Jodhpur, Kota, Pali, Rajsamand, Sawai Madhopur, Sikar, Sirohi, Tonk & Udaipur districts; **quartzite** in Ajmer, Alwar, Jhunjhunu & Sawai Madhopur districts; **rock phosphate** in Alwar, Banswara, Jaipur, Jaisalmer & Udaipur districts; **talc/steatite/soapstone** in Ajmer, Alwar, Banswara, Bharatpur, Bhilwara, Chittorgarh, Dausa, Dungarpur, Jaipur, Jhunjhunu,

Table – 1 : Reserves/Resources of Minerals as on 1.4.2020: Rajasthan

Mineral	Unit	Reserves				Remaining Resources								Total resources (A+B)
		Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)	
			STD121	STD122			STD221	STD222						
Apatite	tonne	-	-	-	-	-	-	-	51521	1016000	-	-	1067521	1067521
Asbestos	tonne	-	-	-	-	1803183	3070449	4027514	87802	42101	4526861	57800	13615710	13615710
Bauxite	'000 tonnes	-	-	-	-	-	-	-	-	-	528	-	528	528
Copper														
Ore	'000 tonnes	14344	20045	-	34388	13314	1148	24304	18603	197078	573814	5200	833461	867849
Metal	'000 tonnes	169.44	313.64	-	483.08	33.87	12.2	136.32	338.66	1385.88	2214.46	31.13	4152.52	4635.6
Diatomite#	'000 tonnes	-	-	-	-	634	-	-	-	-	1440	-	2074	2074
Fluorite	tonne	6111	-	11988	18099	644667	618802	759285	1542460	510656	1350059	161575	5587504	5605603
Garnet	tonne	156938	50946	4	207888	310712	191094	33115	2013	17606	215120	73263	842923	1050811
Gold														
Ore (Primary)	tonne	-	-	-	-	-	-	-	4600000	51743000	69507720	63000	125913720	125913720
Metal (Primary)	tonne	-	-	-	-	-	-	-	6.67	104.97	122.85	0.07	234.56	234.56
Graphite	tonne	-	-	-	-	47600	-	165920	-	250000	1450034	-	1913554	1913554
Iron ore (Haematite)	'000 tonnes	4555	2280	479	7314	3775	3962	1132	-	11510	7776	13	28166	35480
Iron ore (Magnetite)	'000 tonnes	37631	136	83294	121060	1131	1023	85	-	3566	588463	79598	673866	794926
Kyanite	tonne	-	-	-	-	13097	-	10606	-	-	-	-	23703	23703
Lead-Zinc														
Ore	'000 tonnes	28791	63331	11153	103275	2485	19779	12632	43337	172985	328784	1380	581381	684656
Lead metal	'000 tonnes	503.7	1188.47	208.02	1900.19	58.48	405041	245.68	917.5	1972.47	5832.19	-	9431.73	11331.92
Zinc metal	'000 tonnes	2356.56	4592.03	489.46	7438.05	331.22	992.09	559.35	3112.59	5052.47	1377.72	0.53	23827.97	31266.02
Lead-Zinc metal	'000 tonnes	-	-	-	-	-	-	-	-	-	119.86	22.37	142.23	142.23
Limestone	'000 tonnes	3299838	220062	1284254	4804154	454148	1838217	4541298	441902	2261727	12946106	1673697	24157095	28961249
Magnesite	'000 tonnes	-	-	-	-	1030	1574	2045	-	149	49293	-	54091	54091
Manganese ore	'000 tonnes	568	-	-	568	-	100	-	-	-	1690	-	1790	2359

(Contd.)

Table - 1 (Concld.)

Mineral	Unit	Reserves				Remaining Resources								Total resources (A+B)
		Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)	
			STD121	STD122			STD221	STD222						
Potash	million tonnes	-	-	-		-	-	-	-	16936	3509	127	20572	20572
Pyrite	'000 tonnes	-	-	-		-	13667	-	22917	9590	26310	18392	-	90876	90876
Rock Phosphate	tonne	21845000	-	-	21845000	4144961	13675437	157933355	119833	69750	28942783	9257650	72003769	93848769
Sillimanite	tonne	-	-	-	-	300	-	519	-	-	-	-	819	819
Silver														
Ore	tonne	44124192	63331000	40870828	148326020	2330000	17049200	36712218	39420000	64730000	182142579	-	342383997	490710017
Metal	tonne	2150.87	4980.73	570.04	7701.64	172.2	781.85	531.62	3720.28	4384.86	12349.76	-	21940.57	29642.21
Tungsten														
Ore	tonne	-	-	-	-	-	-	-	-	963666	17000628	5964000	23928294	23928294
Contained WO_3	tonne	-	-	-	-	-	-	-	-	1421.44	90171.5	2115	93707.94	93707.94
Vermiculite	tonne	-	-	-	-	41354	19960	4540	-	13000	16555	8716	104125	104125
Wollastonite	tonne	2388641	190739	101598	2680978	4563016	1245009	8559760	-	3325042	2603667	137461	20433955	23114933

Figures rounded off

Note: The proved and indicated balance recoverable reserves of crude oil and natural gas as on 1.4.2016 are 31.72 million tonnes and 35.66 billion cu.m. respectively.

Karauli, Pali, Rajsamand, Sawai Madhopur, Sirohi, Tonk & Udaipur districts; **vermiculite** in Ajmer & Barmer districts; and **wollastonite** in Ajmer, Dungarpur, Pali, Sirohi & Udaipur districts.

Other important minerals that occur in the State are: **apatite** in Udaipur & Sikar districts; **bauxite** in Kota district; **bentonite** in Barmer, Jaisalmer & Jhalawar districts; **corundum** in Tonk district; **diatomite** in Barmer & Jaisalmer districts; **emerald** in Ajmer & Rajsamand districts; **fuller's earth** in Barmer, Bikaner & Jodhpur districts; **gold** in Banswara, Bhilwara, Dausa, Sirohi & Udaipur districts; **granite** in Ajmer, Alwar, Banswara, Barmer, Bhilwara, Chittorgarh, Jaipur, Jaisalmer, Jalore, Jhunjhunu, Jodhpur, Pali, Rajsamand, Sawai Madhopur, Sikar, Sirohi, Tonk & Udaipur districts; **graphite** in Ajmer, Alwar & Banswara districts; **kyanite** & **sillimanite** in Udaipur district; **manganese ore** in Banswara, Jaipur & Pali districts; **potash** in Jaisalmer & Nagaur districts; **silver** in Ajmer, Bhilwara, Jhunjhunu, Rajsamand, Sikar & Udaipur districts; and **tungsten** in Nagaur & Sirohi districts (Table -1). District-wise reserves/resources of lignite in the State are provided in Table-2.

Deposits of **petroleum** are located in the Bikaner-Nagaur and Barmer-Sanchore basin and those of **natural gas** in Jodhpur and Jaisalmer basins in the State.

Exploration & Development

The details of exploration activities conducted by GSI for Gold, Emerald, Limestone, Manganese ore, base metals (Cu,Pb & Zn), Rare Earth Elements, Tungsten, Rare Metal and other minerals during the year 2021-22 are furnished in Table - 3.

Production

Production of different type of of minerals have been reported from the state of Rajasthan. The value of minor minerals' production was estimated at ₹11780 crore for the year 2021-22**.** The number of reporting mines in Rajasthan was 91 in the year 2021-22 in case of MCDR minerals (Table-4).

Table – 2 : Reserves/resources of Lignite as on 1.4.2023 : Rajasthan

(In million tonnes)

District	Proved	Indicated	Inferred	Total
Total	**1203.85**	**3108.55**	**2273.84**	**6586.24**
Bikaner	560.30	230.33	309.19	1099.82
Barmer	495.23	2509.46	1555	4559.69
Jaisalmer & Bikaner	–	–	11.47	11.47
Jaisalmer	–	–	70.44	70.44
Jaisalmer & Barmer	–	–	13.80	13.80
Jalore	–	–	76.08	76.08
Nagaur	148.32	368.26	219.17	735.75
Nagaur & Pali	–	0.50	18.69	19.19

Source: *Coal Directory of India, 2022-23.*

Table –3 : Details of Exploration Activities in Rajasthan, 2021-22

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Manganese							
Rajsamand	Negariya block	-	-	19	710.54	-	Negariya block is located in Survey of India T.S. nos. 45H/9&13 Rajsamand district, Rajasthan. The study area comprises rocks of Delwara Group of Aravalli Supergroup of Palaeoproterozoic age and Granite Gneiss of Bhilwara Supergroup of Archean age. Lithologies exposed are brecciated ferruginised quartzite with or without manganese, quartzite, calcareous quartzite and intercalated phyllite with minor dolomite and granite gneiss exposed as basement rock. The rocks of this area have undergone at least four phases of deformation as evident by the formation of cleavage planes in different lithounits and later affected by ductile and brittle deformation in the form of shearing and fault. Dome and basin structure have been developed in the study area due to intersection of third and fourth phase of deformation. In the mapped area, manganese bearing horizons are exposed in 3 linear hills trending NS to N10°E in western, central and NE part. Manganese is associated with brecciated ferruginised quartzite. The manganese exposure on western hill extends discontinuously for a strike length of 900m, on central hill for a strike length of 650m and northeasterly hill for a strike length of 650m. Total 7 nos. of trench were excavated in all the three bands. Chemical analysis of trench -T1 has analysed 13.82 % MnO over 4m, trench T2 indicated 30.34 % MnO over 9 m, trench no. T3 indicated 20.8 % MnO over 10 m, trench no. T4 indicated 12.51 % MnO over 6 m and trench T 7 indicated MnO values of 13.95 % and 10. 17 % MnO over 4m width. Total 19 boreholes (2 inclined and 17 vertical) have been drilled with total meterage of 710.54 m and the exploration has been completed in this block. Maximum width of manganese mineralised zone exposed on the surface is 35 m with

(contd)

Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							average width of around 20m. The maximum thickness of manganiferous horizon intersected in the borehole is 17m in borehole RJRN-04 and average thickness of manganiferous horizon is about 10 m. The maximum depth of manganiferous horizon is up to 28.5 m in borehole RJRJ-09. The analytical results of borehole samples are yet to be received.
Gold							
Udaipur	Rathri-Harmatiya Khurd area	1:12500	50	-	-	175	During FS 2021-2022, reconnaissance survey for gold and basemetal mineralisation in Rathri-HarmatiyaKhurd area of Udaipur district, Rajasthan (G-4 Stage) was taken up in parts of toposheet no. 46I/1 and 46 I/5. It is covered by large scale geological mapping of 50sq km area on 1:12,500 scale and sampling. The main objective was to assess the nature and potentiality of gold and base metal mineralisation. Bedrock and pit & trench sampling have been done. Geologically, the study area exposes the rocks of Mangalwar complex and Aravalli Supergroup. Different rock types observed during mapping are granite gneiss of Mangalwar complex and the rocks belong to Aravalli Supergroup include dolomitic marble, garnet-biotite-schist, calc-silicate, amphibolite, metavolcanics intruded by quartzo-feldspathic veins. The general trend of the rocks in this area is NNE-SSW to NW-SE with moderate dips on NNW and SW. The basement rocks have undergone four phases and Aravalli rocks have undergone three phases of deformation. The rocks have undergone up to amphibolite facies of metamorphism. Evidences of mineralisation in the area occur in the form of small old workings/ pits, gossanisation, ferruginisation, malachite staining, silicification, dissemination of pyrite grains. 100 nos. of Bedrock samples, 25 nos. of petrochemical samples and 50 nos. of trench samples were submitted in the chemical division for Au,

(contd)

Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							basemetal, REE and trace elemental analysis. Chemical analysis of samples is yet to be received for further studies and to conclude the presence of any valuable mineralisation in the study area for further course of action.
Udaipur and Dungarpur	Bara Talav-Jharap-Bori area	1:12500	50	-	-	190	A large scale mapping (1:12500 scales) was carried out and covered 50 sq km area around Bara-Talav, Jharap, Bori, Manpur, Matasula, HarmatiyaKhurd, Bhabharanaetc area of Salumber tehsil of Udaipur and Aspur tehsil of Dungarpur district in parts of T.S. No. 45L/04. LSM work along with sampling was carried out with an objective to assess the nature and potentiality of gold and basemetal mineralisation. Geologically, study area is occupied by the rocks of Mangalwar complex of Archaean age and Aravalli Supergroup of paleo-proterozoic age. Mangalwar complex is represented by the banded biotite granite gneiss. The banded biotite granite gneiss is medium to coarse grains, dark greyish to white gray in colour. The banding in the gneisses is marked by dark bands rich in ferromagnesian minerals mainly biotite and light-coloured band rich in quartzo-felspathic material. Aravalli Supergroup is represented by the garnetiferous mica schist of Delwara group and dolomitic marble of Debari group. Garnetiferous mica schist is fine to medium grain, greenish grey to dark grey colour rock with well-developed schistosity planes. Porphyroclast of garnet crystal are well developed in this rock. Dolomitic marble of Debari group is light to dark brown coloured, medium to coarse grained rock. It is crystalline in nature at number of places. During mapping a gossan zone is also identified. It is associated near to the contact of dolomitic marble and garnetiferous mica schist around Bara-Talav area. The zone has a dimension of approximately 400 m length and 40-50m in thickness. Gossanised material is

(contd)

Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							exposed along the NW-SE trending shear zone developed at the contact of dolomitic marble and garnetiferous mica schist around Bara-Talav area. During the course of mapping 50 cu m trenching work has been carried out through 6 numbers of trenches. During field work 100 Nos. of BRS, 30 trench samples, 25 Nos. Of PCS, 30 No. of petrological and 5 number of XRD sample also has been collected.
Banswara	Ghatiyana Block	-	-	11	1249.00	242	Ghatiyana block is located in Survey of India T.S. 46 I/05 in Banswara District, Rajasthan. The main objective was to assess the nature and potentiality of gold and base metal mineralisation. The rock types exposed in the study area belongs to Delwara Group of Aravalli Supergroup. The main lithounits are phyllite, quartz albite epidote rock, impure marble and quartz veins. Phyllite is the most dominant lithounits having well-developed foliation. Central part of the area is occupied by thin impure marble bands and quartz albite epidote rock. All the lithounits are disposed in the form of NNW – SSE trending linear bands with steep to sub vertical dips towards WSW. The most penetrative and pervasive foliation is S1 oriented parallel to litho-contacts represents the planar fabric formed during the first phase of deformation. The surface mineralisation in the area is manifested by malachite / azurite stain, hydrothermal alterations, gossans, ore grinding implements and presence of fresh sulphides like pyrite, pyrrhotite, chalcopyrite and bornite. A number of small old workings and dump sites are present in the area. During FS 2021-22, based on the detail geological mapping and channel sampling at a regular interval of nearly 100 m along strike, trench sampling and bed rock sampling of one surface mineralisation zone (MZ-I) has been delineated having the dimension of nearly 1.3 km strike length and

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Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							6- 10 m width. Total thirteen channels of the various lengths were laid along the strike and a total of 161 channel samples, 31 trench samples and 50 bed rock samples were also collected. Channels are showing encouraging value of copper. Chemical result of channels shows copper (Cu) in the range of 170 ppm to 2.00 % with an average value of 0.23 %, while gold (Au) varies from <0.05 ppm to 0.23 ppm with an average of 0.07 ppm. A total of eleven first level boreholes (RJBGN-01 to RJBGN-11) were planned at about 100m spacing to intersect mineralised zones at 60 m vertical depth. All boreholes were planned at 45°- 50° dip and S 70°W azimuth. To avoid the forest issues, borehole has been planned along the dip from the footwall. Total 1249.00 m drilling has been completed in eleven nos. of boreholes. All boreholes are intersected significant sulphide mineralisation in the form of chalcopyrite, bornite, and covellite (VE= 1% to 2%). Few native copper grains are also present in core samples. The thickness of the zones in various boreholes varies from 6 m to 12 m. Sulphide minerals are mainly noticed in the core samples of quartz albite epidote and dolomitic marble rock and mineralisation is mainly structurally controlled.
Emerald							
Rajsamand	Kalaguman-Dhaneen-Nathela areas	1:12500	100 100	- -	- -	312 255	During FS 2021-2022, reconnaissance survey for Emerald was taken up in Kalaguman-Dhaneen-Nathelaarea of Rajsamand district, Rajasthan (G4 Stage) and in parts of toposheetno. 46H/12. As per the objective of the item, large-scale geological mapping (LSM) on a 1:12,500 scale was carried out in 100 sq.km. area along with pitting and trenching and collection of bedrock samples (BRS) and soil samples. A total of 200 numbers of bedrock samples, 37 numbers of petrographic samples

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Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							(PS), 20 petrochemical samples (PCS), and 55 numbers of pitting/ trenching samples (PTS) have been collected to evaluate the emerald mineralisation potentiality of the area. Besides these, an area of 700 sq km was studied by Photogeology & Remote Sensing (PGRS) studies which include ASTER data processing and alteration zone mapping. The study area encompasses Archaean (BGC) to Proterozoic (Aravalli and Delhi fold belts) rocks covered at places by recent soil and alluvium sediments. The Kalaguman prospect is situated near the eastern margin of the South Delhi Fold Belt within the basement rocks belonging to the banded gneissic complex (BGC) of Heron (1953). However, Naha, Gupta, et al. (1980, 1997) included these rocks within the Aravalli Supergroup. The Bhilwara Supergroup in the study area is represented by the Sandmata Group, Sambhugarh Formation constituting the sequence of the high-grade rock, defined by Augen gneiss & migmatite gneiss followed by the amphibolites of the Badnor Formation having Archaean age. Aravalli Supergroup in the area is represented by Devathri Formation of Dovda Group constituting of calc-silicate rocks of Paleoproterozoic age. Delhi Supergroup in the area is represented by quartzites of Antalia Formation, Gogunda Group having Paleoproterozoic to Mesoproterozoic age. Mafic dykes/ Meta basics, pegmatites, and leucogranites are classified as later intrusive having Mesoproterozoic to Paleoproterozoic age. Major rock types exposed in the area are Augen gneiss/migmatite/banded gneiss and mica schist. Apart from these many small bodies of altered mafic/ ultramafic (tremolite-actinolite schist, biotite-actinolite schist) and hornblende schist/amphibolite are also observed in the area. All these rocks are profusely injected by pegmatite veins. The emerald

(contd)

Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							deposits in Rajasthan, northwest India, are situated in a narrow NE–SW belt in the Aravalli Mountains. The studied deposits were formed by the metasomatic reaction between muscovite (± garnet ± tourmaline) pegmatites and lenticular bodies of altered ultramafic rocks that are hosted by the Bhilwara Supergroup gneisses (BGC). This reaction produced phlogopite schists containing the exometasomatic emeralds, as in all other granite-related emerald deposits. The concentration and distribution of chromium in the host rock and beryllium content of the hydrothermal fluids, derived from the pegmatites, seem to be the most significant factor for the development of emeralds. Field studies confirmed that a lithological association i.e., schistose, mafic/ ultramafic intruded by beryllium bearing pegmatites is a must for the mineralisation of emerald, apart from the lithological control and structural control. So far, 200 BRS samples and 55 P/T samples have been submitted and 100 sq. km. mapping has been successfully completed.
Basemetal							
Sikar	SE Block of Ravji Ki Dhani, NimKa Thana Belt	1:2000	-	-	-	-	A G3 stage exploration in SE Ravji Ki Dhani area was taken up to delineate the zones of basemetal mineralisation. The area is located about 16 km southeast of Nim Ka Thana, Sikar district, Rajasthan. Detailed geological mapping has been completed on 1: 2,000 scale along with different types of sampling. The dominant lithologies are meta-sediments belonging to the Kushalgarh Formation of the Ajabgarh Group and the Pratapgarh Formation of the Alwar Group of the Delhi Supergroup. The Kushalgarh Formation is represented by impure marble, mica schist and quartzite. There are two variants of impure marble, namely micaceous marble and amphibole marble. The rocks have undergone

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Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							three phases of deformation. Copper mineralisation is observed in the form of malachite stains and disseminations of chalcopyrite, bornite and chalcocite. At some places quartz veins intruded into amphibole marble along and across the strike also carry disseminated bornite and chalcocite. The lithologies intersected along the boreholes are amphibole + biotite marble, biotite + amphibole marble, mica schist and amphibolite. The investigation has established occurrence of subsurface copper mineralisation, hosted by amphibole marble and quartz biotite schist of the Kushalgarh Formation of the Ajabgarh Group. Sulphide mineralisation in the drilled boreholes is manifested in the form of fine disseminations, specks with occasional stringers, vein fillings and fracture fillings of the copper ore minerals, namely chalcocite, bornite, chalcopyrite and occasionally covellite associated with pyrite. Mineralisation shows either foliation parallel or cross cutting relationship with the host rock.
Alwar	Raipur-Mundawar area	1:12500	50	-	-	150	Reconnaissance survey for base metal and gold mineralisation in Raipur-Mundawar area, Alwar district, Rajasthan was carried out covering an area 50 Sq. Km. in toposheet no 54A/09. The area exposes the rocks belonging to Delhi Supergroup and located in North Delhi Fold Belt (NDFB) of Proterozoic age which hosts many occurrences of base metal mineralisation. Large scale geological mapping of 50.0 sq. km area was carried out on 1:12,500 scale. The lithounits exposed in the study area belongs to the Delhi Supergroup of rocks comprising of Alwar and Ajabgarh Groups. Major lithounits observed are micaceous quartzite with amphibolite band, mica schist, calc-biotite quartzite of Kankwari formation and orthoquartzite and biotite sericite schist of Pratapgrah Formation of

(contd)

Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							Alwar Group. The other major lithounits observed are mainly of impure marble of Kushalgarh Formation and tremolite marble of Thanagazi Formation of Ajabgarh Group. During the course of large-scale geological mapping, copper mineralisation was recorded in the tremolite marble of the Thanagazi Formation and Impure Marble of Kushalgarh formation in the form sulphides mainly chalcopyrite, bornite with malachite staining occurring as disseminations and occasionally as thin stringers. The copper mineralisation in the area is litho controlled. Towards south of Pehal, an old working pit (strike length: 30 m, width: 20 m and depth: 10 m) is demarcated in tremolite marble. It shows malachite staining and oxidised specks of chalcopyrite. A total of 150 nos. of samples (BRS and Channel samples) were collected from 6 channels and 2 Trench lay in area. The analytical result of the bed rock samples indicates the occurrences of different mineral are in the range of Cu (<10 to 33000 ppm), Co (<15 to 40 ppm), Ni (<15 to 70 ppm), Pb (<25 to 30 ppm), Zn (<5 to 10 ppm), Ag (<5 ppm) Cd (<5 ppm) and Au (<0.05 to 0.17 ppm). Two mineralised zones (MZ-I and MZ-II) have been delineated on the basis of surface indications. The mineralisation in these zones is observed as zones of malachite staining with minor occurrence of specks of chalcopyrite, pyrite, bornite and old working. MZ-I is observed just south of Pahel area. It is demarcated in impure marble and tremolite marble. This zone has an approximate length of 500 m and a width of 25 m. Total 2 channels were laid in the Impure marble and tremolite marble namely RM/CH/ 01 and RM/CH/02 of 10 m each. MZ-II is observed in the eastern side of Kali Pahadi area, near Ranoth village marked by malachite staining in calc-biotite quartzite. This zone has an approximate length of 650 m and a width of 15 m. Total 4

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Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							Channel were laid in the calc-biotite quartzite namely RM/CH/3 to RM/CH/6 of 15m,10m,10m and 10m respectively. The analytical results of the channel RM/CH1 and RM/CH/2 from MZ-I are encouraging. The Channel RM/CH/1, analysed a maximum of 0.45% and minimum of 20 ppm Cu. and the Channel RM/CH/2, analysed a maximum of 2% and minimum of 20 ppm Cu. The analytical results of the channel RM/CH4 and RM/CH/5 from MZ-II are encouraging. The Channel RM/CH/4, analysed a maximum of 1.10% and minimum of 30 ppm Cu. and the Channel RM/CH/5, analysed a maximum of 0.10% and minimum of 165 ppm Cu.
Sikar	West of Narda	1:2000	1.5	6	1000	-	The west of Narda block is located about 25 km east of Neem Ka Thana tehsil, Sikar district, Rajasthan. The area falls in toposheet No. 45M/14. Geologically, the area exposes rocks of the Ajabgarh Group of the Delhi Supergroup. The exposed lithounits are scapolite-bearing banded impure marble of the Thanaghazi Formation with tremolite and actinolite and the sheared quartzite of the Seriska Formation along with interbanded garnetiferous quart biotite schist. Apart from this, numerous intrusive pegmatite, quartz and calcite veins are also present in the block area. Structurally, the area has undergone three phases of ductile deformation with the second phase of deformation controlling the regional topography of the area. During the FS: 2021-22, an area of 1.50 sq. km. area was mapped on 1:2000 scale. A total of 06 nos. of channels have been laid across the scapolite-bearing banded impure marble over 1000m strike length and 11m to 20 m width based on the presence of malachite stains and fresh specks of pyrite and chalcopyrite. On the basis of surface anomalous values for Cu, a total 06 nos. of first level boreholes RJSWN-01 to RJSWN-06 and 01 no. second

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Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							level borehole RJSWN-07 were drilled to evaluate the subsurface potentiality of basemetal and other precious metals in west of Narda block. All the boreholes intersected scapolite-bearing banded impure marble along with partings of biotite and amphibole rich marble along with quartz and calcite veins. In borehole no. RJSWN-07, apart from scapolite-bearing banded impure marble, quartzite with bands of garnetiferous quartz biotite schist has also been intersected at a deeper level (approx. 193m to 230m). Fine disseminated pyrite, pyrrohtite, chalcopyrite and bornite along with fracture and vein filled pyrite and chalcopyrite have been reported in the boreholes. The analytical results of channels WNRDCH-1 (1m x 0.35% Cu), WNRDCH-2 (2m x 0.10% Cu) and WNRDCH-4 (7m x 0.85% Cu) indicated anomalous values for Cu. The analytical results of channel nos. WNRDCH-3, WNRDCH-5, WNRDCH-6, WNRDCH-7 and WNRDCH-8 didn't show any encouraging basemetal values. The complete analytical results of the core samples are awaited.
Jhunjhunu	Pratappura block	1:2000	-	-	-	-	During FS 2021-22, detailed mapping on 1:2000 scale along with surface sampling work and ground geophysical survey was carried out at East of Pratappura block. The block exposes thick pile of meta-sediments of Delhi Supergroup and intrusive rocks. The garnet-biotite schist, dolomite, quartzite of Kushalgarh Formation of Ajabgarh Group of Delhi Supergroup are the dominant litho-units. The Ajabgarh Group is represented by combination of alternating arenaceous, argillaceous and calcareous facies rocks, among which argillaceous and calcareous components are dominant. Garnet biotite schist exposes in the maximum part of the study area and comprising of large garnet (diameter ~4.2cm to 1cm) with biotite, plagioclase, and quartz. Dolomite

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Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							is impure in nature, consists of quartz, dolomite, calcite and ankerite, exposes eastern margin of the study area, shows elephant skin weathering. Quartzite mainly occurs at higher elevation in the study area and characteristics of yellowish white in colour, medium grain, shows well developed foliation planes. Amphibolite and granite occur as intrusive rocks in the area. Amphibolite dyke is melanocratic in nature, consists of mainly plagioclase and pyroxene, and shows typical salt-pepper texture. Evidences of at least three generations of deformations are observed within the lithounits. The surface evidences of mineralisation are well preserved in the form of malachite stain, box-work structure, gaussan zone, slag, old workings, and occurrences of Ocimum centraliafricanum as copper plant. Occurrence of old working is present mainly in the contact of quartzite and garnet-biotite-schist along F2 fold hinges. The ground Geophysical survey was also carried out, covering 10L Km. in which magnetic anomaly, self-potential, IP chargeability and IP resistivity were measured. Four low SP zones were marked mostly concentrated on the east and north part of the block, magnetic high on the east and west part of the block, four zones having high IP chargeability mainly on the east and central part of the block and low IP resistivity at the eastern part of the block were noticed. A total 10 nos. of channel laid mainly targeting the garnet-biotite schist and impure dolomite, on which EPCH-1, 2 and 9 on garnet- biotite schist and EPCH-4, 6 and 8 on impure dolomite have indicated positive results. The maximum copper zone identified on the channel at EPCH-2 having 0.56% Cu with a thickness of 15.0m. The maximum Pb concentration delineated at EPCH-4 having 5.0m thick with an average grade of 0.44%. The Maximum Zn observed at EPCH-4 having 7.0m thickness with an average grade of 0.47%.

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Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Alwar	Suratgarh block, Thanagazi tehsil	1:2000	-	-	1251.30	310	The field work includes detailed geological mapping of an area of 1.00 sq km on 1:2000 scale followed by 1251.30m drilling in ten boreholes during FS 2021-22. A total of 180 nos. of core samples have been prepared and submitted in the Chemical laboratory, WR for analysis. Apart from this, in order to assess the potentiality of mineralised zones in respect of copper and associated precious metals, 33 cubic m pitting/ trenching were carried out and a total of 20 nos. of PTS samples, 90 BRS/ channel samples, 10 nos. of petrological samples and 10 nos. of ore mineral samples have been collected and submitted in the respective laboratory of GSI, WR. The lithologies intersected in the boreholes drilled in Suratgarh block are brecciated quartzite, dolomitic marble intercalated with thin bands of quartzite, banded dolomitic marble and thin veins and veinlets of quartz and carbonate. Sulphide mineralisation has been intersected in the form of specks, dissemination, vein and fracture filled bornite, chalcopyrite and pyrrhotite. Borehole RJAS-1 has intersected 1m thick lean mineralised zone of 0.12% Cu. Borehole RJAS-2 has intersected two lean mineralised zone of 1m thick with 0.11% and 0.13% Cu. The analytical results are awaited to estimate the resource of the block.
	Around the Baraud-Dooghera	1:12500	100	-	-	284	Exploration for copper and associated precious metals in Dooghera-Baraud block, Alwar, Rajasthan has been taken up involving large scale geological mapping. An area of 100 sq. km was mapped on 1:12,500 scale, 700 sq. km ASTER image processing and a total of 150 bed rock/channel samples and 50 trench samples were collected. Apart from this, 20 samples for petrography, 10 samples for ore microscopy, 10 samples for petrochemical analysis and 25 nos. of water samples have been

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Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							collected from the study area. The main rocks exposed in the area includes impure dolomitic marble of Kushalgarh Formation, brecciated quartzite of Seriska Formation, graphite bearing mica schist, garnet bearing mica schist, chlorite mica schist and carbon phyllite/ pyritiferous quartzite of Bharkol Formation. Apart from this numerous intrusive bodies are present in the study area as, quartz reef, quartz veins and calcite veins. Alterations occurs in the form of limonitisation and chloritisation. The rocks of the study area had undergone three stages of deformation and the general trend of rocks is NNE to SSW and moderately dipping towards NW or SE. The surface indications of base metal mineralisation are present in the form of malachite stains and fresh sulphides i.e., chalcopyrite, covellite, bornite, pyrrhotite and pyrite within impure dolomitic marble, carbon phyllite and brecciated quartzite as well as in quartz veins. A mineralisation zone MZ-I has been delineated on the basis of surface indications of mineralisation within impure dolomitic marbles of Kushalgarh Formation. Apart from this, surface indication of graphite mineralisation was also observed. Graphite present in the study area is thinly laminated/ bedded and having flaky to crystalline in morphology. It is hosted by graphite bearing mica schist, carbon phyllite and garnet bearing mica schist. Copper mineralisation is in the study area were manifested by presence of gossan zone in ferruginous brecciated quartzite of Sariska Fm. Based on these surface indications for copper mineralisation, one mineralised zone (MZ-I) has been demarcated. The MZ-I, is lying within impure dolomitic marble of the Kushlagarh Formation and situated east of Baraud village. The strike length of mineralised zone was trending in NNE-SSW direction

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Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							having strike extension of 350 m and width varying from 3m to 6m. Channel samples from copper mineralised zone were collected and submitted for analysis. The chemical result of 03 number of channel samples (DBCH-2, 3 and 4) shows Cu, Mn, and Fe content from 10 ppm to 0.72%, 80 ppm to 0.17% and 0.70% ppm to 12.50% respectively. The channel samples (DBCH-4) analysed amaximum of 0.72% Cu, with 6m x 0.28% Cu, 2m x 0.21%, 4m x 0.1% and 3m x 0.1%. The chemical result of 50 nos. of pitting trenching cum channel samples indicates insignificant amount of copper content (10 ppm to 160 ppm). Petrochemical sampling was carried out in the study area to know the whole rock geochemistry of all the litho-units present in the study area. Most of the analytical results are awaited with Chemical Division, GSI, WR. Graphite mineralisation was also observed within graphite mica schist, carbonaceous phyllite and garnet bearing mica schist of Bharkol Formation of Ajabgarh group. A mineralised zone (MZ-II) is delineated over a strike length of 5.25 Km and width up to 20m. 02 nos. of channel and 17 nos. grab bed rock samples were collected to check the fixed carbon analysis and vanadium, Mo and REE.
REE & RM							
Sirohi	Mungthala-Mawal-Bhaisasing area	1:12500	100	-	-	-	The work includes large scale mapping of an area of 100 sqkm on 1:12,500 scale. A total of 167 bedrock samples, 30 pit/trench samples, 26 petro-chemical samples, 40 soil samples, 40 stream sediment samples and 20 heavy mineral samples were collected during field work. All the samples have been submitted to Chemical Division, GSI, WR for chemical analysis. Apart from this, 24 petrological samples, 20 ore microscopy samples, 5 XRD and 5 EPMA samples were also submitted in the respective laboratories of GSI.

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Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							The litho-units observed during mapping were calc-silicate rock, impure marble, skarn, biotite granitoid, medium and coarse grained granitoid, gabbro, and sheared/brecciated cherty quartzo-feldspathic rock. Several skarn zones were observed in the area by presence of garnet and pyroxene. The granitoid are brecciated and sheared at places. Most of the area is covered by Quaternary sediments of Holocene age comprising of Thar Desert Formation. Structural features recorded in the area are represented by bedding, lineation, foliation, joint, fold and shear zone. Granites are jointed and sheared. The surface indication of mineralisation in the area is manifested by the presence of chalcopyrite within quartz vein, malachite staining, limonitic vein, sulfides within skarn and brecciated/sheared quartzo-feldspathic rock/silicified breccia, pyrrhotite, epidote vein, iron staining on skarn rock.Veinlets of magnetite in gabbroic rock/mafic rock, magnetite associated with quartz veins intruding granite and sediments near skarn zone has been recorded at several places. Rutile, Ilmenite, and sulphide bearing quartz vein, tourmaline bearing micro-pegmatite, epidotisation, goethite development at fracture and joint surfaces of brecciated quartz vein and veins of iron-carbonate, iron box-work, ferrugenisation and limonitisation inbrecciated/ sheared quartzo-feldspathic rock/ silicified breccias is also present in the area. The samples collected from the study area were submitted in the respective laboratories of GSI WR, Jaipur for Chemical analysis. The analytical results of submitted samples are awaited.

(contd)

Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Barmer	Sainji Ki Beri-Meli area	1:12500	108	-	-	-	A G4 stage exploration in Sainji Ki Beri-Meli area in toposheet no. 45C/06 was taken up to delineate zones of REE & associated RM mineralisation and to demarcate younger intrusive phases. Large scale geological mapping has been carried out over an area of 108 sq. km on 1:12,500 scale along with collection of various sample media. During mapping, a total of 29 nos. of different flows of rhyolites were marked on the basis of the characteristics of groundmass colour, mineral composition of phenocrysts (viz. globular quartz, K-feldspar, Na-feldspar etc.), size and shape of the phenocrysts (viz. tabular, lath etc.) the ratio between ground mass and phenocrysts as well as presence of vesicles. The rhyolitic flows are well jointed and the joint planes are intruded by basic and felsic dykes. Felsic dykes are comparatively thicker than basic ones. Felsic dykes are showing coarse grained texture primarily composed of K-feldspar, Na-feldspar and quartz. Often K-feldspars are rimmed by Na-feldspar. All basicdykes are fine grained and highly weathered. Complete analysis of submitted samples is awaited.
Sikar	South East of Nanagwas	1:1000	1	9	-	-	The Southeast of Nanagwas area is located about 20 kms east of Neem ka Thana tehsil, Sikar district, Rajasthan. The area falls in toposheet No. 45M/14. Geologically, the area exposes the rocks of the Ajabgarh Group of the Delhi Supergroup. The exposed lithounits are quartz biotite schist with magnetite band and banded impure marble of the Kushalgarh Formation, quartzite of the Seriska Formation and Jaitpura granite. Apart from this, numerous intrusive bodies' viz. pegmatite veins, quartz veins, calcite veins, albitite veins are present in the study area. General strike of rocks is NE to SW and dip varies from 55° to 85° towards west. The area has undergone three phases of deformation. The second-

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Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							generation deformation is more prominent which controls the topography of the area. During the period, an area of 1.00 sq km was mapped on 1:1000 scale along with delineation of host of REE mineralisation (quartz biotite schist with magnetite band/partings). A total of 09 nos. of geochemical profiles has been led across the quartz biotite schist with magnetite band/partings over 1500m strike length and 0.50 to 03 m width. Occurrence of base metal mineralisation was also demarcated over 250 m strike length with very restricted width of about 1m in the form of fresh copper sulphides i.e. chalcocite, bornite and chalcopyrite along with pyrite and malachite stains. The analytical results of channels SENCH-01 (2m x 0.26% tREE), SENCH-02 (0.50m x 0.24% tREE), SENCH-03 (0.50m x 0.11% tREE), SENCH-04 (1.5m x 0.17% tREE), SENCH-05 (3.0m x 0.68% tREE), SENCH-06 (1m x 0.19% total REE and 2m x 0.24% tREE), SENCH-07 (3m x 0.21% tREE) and SENCH-08 (2.5m x 0.14% tREE) indicated anomalous values of tREE on surface. On the basis of surface anomalous values of tREE, a total 09 nos. of first level boreholes RJSSN-01 to RJSSN-09 were drilled to evaluate the subsurface potentiality of REE and Rare Metals in SE of Nanagwas area. All the borehole intersected quartzite, quartz biotite schist with magnetite band/partings (host lithology of REE mineralisation in the area), amphibole bearing dolomitic marble and albitite-quartz-calcite veins. The subsurface feeble and sporadic occurrence of copper mineralisation was also reported in the form of vein filled bornite and chalcopyrite in few boreholes. All the boreholes RJSSN-01 to RJSSN-09 intersected iron (magnetite-hematite) in the form of thick bands, thin partings, small laths and crystals hosted within quartz biotite schist and are mostly associated with calcite and albitite veins. Chemical analytical results of core samples are awaited.

(contd)

Table – 3 (contd)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Tungsten, Lithium and associated mineralisation							
Pali	Mohangarh (Motiya) Block	1:2000	2	-	-	-	During field season 2021-22, the area around Mohangarh (Motiya) is taken up for G3-investigation with an objective 1) To assess the potentiality of tungsten, lithium and associated mineralisation. 2) Genetic and metallogenic correlation with Degana Tungsten prospect, if any. During FS 2021-22, detailed geological mapping on 1:2000 scale of 2 sq. km area was carried out and two major litho units were identified and demarcated viz. mica schist/phyllite and granite gneiss. Mica schist is fine grained rock with quartz, mica as essential mineral composition. Granite Gneiss is coarse to medium grained leucocratic rock with Quartz (55-60%), feldspar (35-40%), mica (3-4%), tourmaline (1-2%) as major mineral phases. Contact of mica schist and Granite Gneiss is sheared which is evident by development of mineral lineation and s-c fabric and sub-grain formation in granite gneiss near the contact. Two sets of foliations are well developed and preserved in mica schist and granite gneiss (near the contact). Disseminated wolframite grains are observed in quartz and quartz-tourmaline veins intruded in granite gneiss near the contact. Total five numbers of major mineralised quartz and quartz tourmaline veins with visible wolfram grains of varying size from 1 mm to 6 cm are identified and recorded. These veins are varying in thickness from 5 cm to 2m and exposed strike length is about 700m. The general trend of quartz and quartz tourmaline veins is NS, NNE-SSW with sub vertical dip. These veins are branched, swirling in nature and dipping either side at places. Total 50 nos. of Channel samples, 100 nos. of bed rock samples, 50nos of polished sections, 30 nos. of petrochemical samples and 25 nos. of soil samples had been collected and submitted to respective laboratories. The analytical results 21 bed rock

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Table – 3 (concld)

Agency/ Mineral/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							samples have been received from the Chemical laboratory on which 1 sample is having 28000 ppm and one more sample having upto 6000 ppm tungsten, 50 channel sample result also received from the Chemical laboratory out of which 1 sample of MCH-7 is showing 3273 ppm W value, 6 PCS samples result also received on which 2 samples are giving more than 6000 ppm tungsten value. 15 L Km of ground geophysical survey SP, IP, Gravity, Magnetic & Resistivity was carried out. Drilling is being taken up during FS 2022-23 to establish strike extension and depth continuity of W-mineralised zones intersected in the earlier drilled boreholes.
Limestone							
Sikar	Maonda area	1:2000	1.63	8	434.20	7	The item comprised of detailed geological mapping of 1.63 sq km area on 1:2000 scale and a total core drilling of 400 m involving 08 nos. of boreholes each having a depth of 50m with having borehole spacing of 400m. A total of 8 boreholes (RJNN-1 to RJNN-8) were drilled in the area, which involved 434.20 m of drilling. The rock types exposed in the block are micaceous quartzite, dolomitic marble, mica schist, quartz-feldspar vein and impure marble of the Kushalgarh Formation of the Ajabgarh group. During the investigation, 07 nos. bed rock samples were collected and analysed. The chemical analysis of 07 nos. of bed rock samples from impure marble indicated weighted average grade of CaO-48.97%, SiO2-5.71%, MgO-4.32%, Al2O3-0.56% and Fe2O3-0.57%. 03 nos. of samples out of 07 nos. have more the 5% MgO. Analytical results of bed rock samples indicate that impure marble unit (high CaO and low SiO2 except high MgO) is suitable for cement grade. Impure marble has been intersected in 05 nos. boreholes out of 08nos. of boreholes. Borehole nos. RJNN-2, RJNN-6 and RJNN-7 has been intersected thick micaceous quartzite.

Table – 4 : Mineral Production in Rajasthan, 2019-20 to 2021-22
(Excluding Atomic Minerals)

(Value in ₹ '000)

Mineral	Unit	2019-20			2020-21			2021-22 (p)		
		No. of mines	Qty	Value	No. of mines	Qty	Value	No. of mines	Qty	Value
All Minerals		**85**		**257025185**	**88**		**308261370**	**91**		**305036202**
Lignite	'000t	-	8223	-	-	9056	-	-	10526	-
Natural Gas (ut.)	m c m	-	1883	-	-	2040	-	-	2619	-
Petroleum(crude)	'000t	-	6653	-	-	5891	-	-	5887	-
Copper Ore	t	-	1119523	-	-	991991	-	-	1101339	-
Copper Conc.	t	2	51832	3094145	2	42590	3371952	2	49399	5463975
Iron Ore	'000t	10	1012	3677013	9	1088	5106818	10	1235	5574588
Lead & Zinc Ore	t	-	14479032	-	-	15455342	-	-	16338461	-
Lead Conc.	t	10	351746	18260832	10	376923	18810483	10	368040	22366174
Zinc Conc.	t	*	1446824	60438504	*	1513996	63127101	*	1594086	81815818
Manganese Ore	t	1	9937	29811	1	6940	20820	1	8008	25626
Silver **	kg	-	609153	25608038	-	705676	42657180	-	647013	42115418
Phosphorite	t	1	1300229	4637009	1	1357949	4602518	1	1281349	7505078
Garnet (abrasive)	t	5	568	1775	7	7114	26378	5	8182	29880
Limestone	'000t	38	72390	19094468	39	74266	19449722	41	87679	22220563
Magnesite	t	-	-	-	-	-	-	1	-	-
Selenite	t	2	2154	4206	3	402	602	4	756	1022
Siliceous Earth	y	12	19367	11710	12	23823	14686	13	31783	21209
Wollastonite	t	4	124757	139695	4	103902	122210	3	108383	99265
Minor Minerals		-	-	122027979	-	-	150950900	-	-	117797586

Note : *The number of mines excludes Fuel and Minor minerals.*

$ Excludes the value of Fuel minerals.

** Number of mines covered under lead concentrates.*

*** Recovered at Chanderiya Lead-Zinc Smelter of HZL (as by product) from lead concentrates produced in Rajasthan.*

Mineral-based Industry

The present status of each mineral-based industry is not readily available. However, the important mineral-based industries in the organised sector in the State are given in Table - 5.

Table – 5 : Principal Mineral-based Industries

Industry/plant	Capacity ('000 tpy)
Cement	
ACC Ltd, Lakheri, Distt. Bundi	1500
Ambuja Cements Ltd, Rabriyawas, Distt. Pali	3600
Binani Cement, Binanipuram, Distt. Sirohi	4850
Binani Cement, Neem Ka Thana, Distt. Sikar (G)	1400
Birla Corporation Ltd, (Birla Cement Works & Chanderia Cement Works), Distt. Chittorgarh	4000
India Cements Ltd, Jhalo ka garha Garhi	1800
J.K. Cement, Nimbahera, Distt. Chittorgarh	3250
J.K. Cement, Mangrol, Distt. Chittorgarh	2500
J.K. Cement, Gotan, Distt. Nagaur	500
J.K. White Cement Works, Gotan, Merta, Distt. Nagaur	610 (white Cement) 500 (white Putty)
J.K. Laxmi Cement, Banas, Distt. Sirohi	8700
NUVOCO Vistas(Lafarge) India Ltd, Nimbahera, Distt. Chittorgarh	2600
Mangalam Cement (Mangalam Cement & Neer Shree Cement), Morak, Distt. Kota	3250
Nirma Limited, Nimbol, Jaitaran	2280
Shree Cement Ltd, Beawar, Distt. Ajmer	3000
Shree Cement Ltd, Andherideori, , Masuda, Ajmer	3600
Shree Cement Ltd, Ras, Distt. Pali	3000
Shree Cement Ltd, Ras ,Jaitaran, Distt. Pali	4000
Shree Cement Ltd, Kushkhera, Distt. Alwar (G)	3500
Shree Cement Ltd, Suratgarh, Distt. Sri Ganganagar (G)	1800
Shree Cement Ltd, Suratgarh, Rohi, Udaipur-Udasar Distt. Sri Ganganagar (G)	3600
Shree Cement Ltd, Jobner, Distt. Jaipur (G)	1500
Shriram Cement Works, Kota	400
Trinetra Cement (Subsidiary of India Cement), Nokhala, Distt. Banswara	1800
Udaipur Cement Works (Subsidiary of JKCL), Udyog Ltd,), Distt. Udaipur	1240
Ultra Tech Cement (Birla White Cement Division), Kharia Khangar, Bhopalgarh	680 (white cement) 400 (putty)
Ultra Tech Cement Nathdwara Binnani Cement Ltd,Amli,Pindwara	4850 (cement)

(contd)

Table - 5 (contd)

Industry/plant	Capacity ('000 tpy)
UltraTech Cement (Aditya I & II), Shambhupura, Distt. Chittorgarh	8000
UltraTech Cement, Kotputali, Distt. Jaipur	4000
Wonder Cement, Nimbahera, Distt. Chittorgarh	8000
Chemical	
DCM Shriram Industries Ltd, Distt.Kota	9 (rayon/yarn) 7.7 (sodium sulphate)
Modi Alkalies & Chemicals Ltd, Distt. Alwar	84.2 (caustic soda) 50.3 (Cl), 39.6 (HCl)
Ceramics/Chemicals	
Bikaner Ceramics Pvt. Ltd, Distt. Bikaner	9 (insulators)
Kajaria Ceramics Ltd, Gailpur	6.5 (mill. sq m)
Kajaria Ceramics Ltd, Malootana	24.5 (mill. sq m)
Bhalla Chemical Works Pvt Ltd	10 (zirconium oxychloride & special zirconia)
Roca Bathroom Product Pvt Ltd, Distt. Alwar	12.9
Roca Bathroom Product Pvt Ltd, Distt. Alwar	2 mill. pc.
Fertilizer	
Adheeshaa Phosphate, Umarada, Distt. Udaipur	132 (SSP)
Arawali Phosphate Ltd, Umra, Distt. Udaipur	40 (SSP)
Arihant Phosphate & Fertlizers Ltd, Nimbaheda, Distt. Chittorgarh	66 (SSP)
Bohra Industries Ltd, Umra, Distt. Udaipur	200 (SSP)
Chambal Fertilizers & Chemicals Ltd, Gadepan, Distt. Kota	180 (SSP)
Coromandel International Ltd, (Formerly) Liberty Phosphate Ltd), Jagpura, Distt. Kota	132 (SSP)
Devyani Phosphate Pvt. Ltd, Distt. Udaipur	60 (SSP)
Dharamsi Morarji Chemical Co. Ltd, Khemli, Distt. Udaipur	66 (SSP)
Gayatri Spinners Ltd, Hamirgarh, Distt. Bhilwara	30 (SSP)
Indian Phosphate Ltd, Umrada, Distt. Udaipur	130 (SSP)
Jagdamba Phosphate,Distt. Kota	132 (SSP)
Jubilant Agri and Consumer Products Ltd, Singhpur, Kapasan, Distt. Chittorgarh	264 (SSP)
Khaitan Chemical & Fertilizers Ltd, Dhinwa, Distt. Chittorgarh	198 (SSP)
Mangalam Phosphates Ltd, Hamirgarh, Distt. Bhilwara	72 (SSP)
Ostwal Phoschem (India) Ltd, Hamirgarh, Distt. Bhilwara	132 (SSP)
Patel Phoschem (P) Ltd, Umarda, Distt. Udaipur	100 (SSP)
Prem Sakhi Fertx. Ltd, Lakadwas, Distt. Udaipur	66 (SSP)

(contd)

Table - 5 (contd)

Industry/plant	Capacity ('000 tpy)
Rama Phosphates Ltd, Umra, Distt. Udaipur	181 (SSP)
Sadhana Phosphates & Chems Ltd, Gudli, Distt. Udaipur	120 (SSP)
Shriram Fertilizers & Chemicals Ltd,	379.5 (Urea)
Shriramnagar, Distt. Kota	113.8 (caustic soda) 13.2 (bleaching powder) 61.2 (HCl) 61.2 (Cl)
Shri Ganapati Fertilizers Ltd, Kapasan, Distt. Chittorgarh	99 (SSP)
Shurvi Colour Chem Ltd, Madri, Distt. Udaipur	12 (SSP)
Plaster of Paris	
Abhishek Plaster Industries, Baramsar, Distt. Hanumangarh	6.1
Agrawal Industries, Nohar, Distt. Hanumangarh	6.3
Balaji Plaster Industries, Taranagar, Distt. Churu	6
Balaji Industries, Taranagar, Distt. Churu	6.5
Ganesh Plaster Industries, Taranagar, Distt. Churu	6
Gil Brothers, Taranagar, Distt. Churu	7.1
Hind Plaster Industries, Taranagar, Distt. Churu	6
Jaishri Plaster Industries, Taranagar, Distt. Churu	6.3
Jagdamba Plaster Industries, Rawatsav, Distt. Hanumangarh	7
Coromandel International Ltd, (Formerly Liberty Phosphate Ltd), Jagpura, Distt. Kota	132 (SSP)
Devyani Phosphate Pvt. Ltd, Distt. Udaipur	60 (SSP)
Dharamsi Morarji Chemical Co. Ltd, Khemli, Distt. Udaipur	66 (SSP)
Jai Bhavani Plaster Industries, Baramsar, Distt. Hanumangarh	6
Jai Sriram Plaster Industries, Taranagar, Distt. Churu	7.1
M.G. Plaster Pvt Ltd, Taranagar, Distt. Churu	6.2
Mahabir Plaster Industries, Taranagar, Distt. Churu	6
Multani Industries, Nohar, Distt. Hanumangarh	8.4

(contd)

Table - 5 (concld)

Industry/plant	Capacity ('000 tpy)
R.D. Plaster Industries, Nohar, Distt. Hanumangarh.	8.4
R.N. Industries, Bikaner, Distt. Bikaner	18
Shalimar Plaster & Chemical Industries, Sardarshahar, Distt. Churu	14
Shri Lakshmi Gypsum, Chak, Distt. Hanumangarh	6
Shriram Plaster, Taranagar, Distt. Churu	6.3
SS Plaster Industries, Taranagar, Distt. Churu	6
Shiv Bhakti Industries, Nohar, Distt.. Hanumangarh	8.4
Tiger Plaster, Sardarshahar, Distt. Churu	11
The Sardarshahar Plaster & Minerals, Sardarshahar, Distt. Churu	19.4
Updesh Industries Ltd, Chak, Distt. Hanumangarh	9
Pellet	
Jindal Saw Limited, Pur, Bilwara	*1500*
Power generation	
JSW Energy Barmer Ltd, Bhadresh.	1080 MW
Copper Smelters	
HCL, KCC, Distt. Jhunjhunu.	31 (Cu cathode)
Rajpura Dariba Lead & Zinc Mine	76.827(Zinc Conc.)
Dariba, Distt. Rajsamand	17.506(lead Conc.)
Lead & Zinc Smelters	
HZL Zinc Smelter, Debari, Distt. Udaipur.	88 (Zn)
HZL Lead-zinc Smelter, Chanderiya, Distt. Chittorgarh.	85 (Pb) 525 (Zn) 0.833 (Cd)* 168 tonnes (Ag)
HZL, Dariba Smelting Complex, Dariba Distt. Rajsamand.	100 (Pb) 210 (Zn)

** Total for all smelters of HZL*

(G); Grinding Units

Note: *Data sourced from Indian Fertilizer Scenario, FAI Statistics and Survey of Cement Industry & Directory respectively.*