BABA KHEL MINING (SMC-PRIVATE) LIMITED, AL HAAJ GARDEN, NORTHER BY PASS PESHAWAR

GEOLOGICAL ASSESSMENT OF BARJOKNAI LOW GRADE CHROMITE DEPOSITS FOR UPGRADATION.

SUBMITTED BY

Muhammad Nawaz Khan Consultant Geologist

JUNE, 2026

INTRODUCTION

I along with Professor Saddique Akbar and Akram khan representative of **BABA KHEL MINING (SMC-PRIVATE) LIMITED, PESHAWAR** visited Barjokani low grade chromite deposits (Heroshah) on 18-5-2026. The main purpose of the visit was to geologically assess the low grade chromite deposits fall in the leased area of company in terms of its grade & reserves for its upgradation. This area is previously investigated and explored by Pakistan Mineral Development Corporation PMDC (1976-78) and subsequently by Sarhad Development Authority (SDA) during the year 1982-2093. The company is presently working in development cum mining activities of low grade chromite in the area. During the visit, the following mines/working sites fall in the premises of the company lease are checked and studied in detail.

- Mine-1 (Northern part of Barjokani)
- Mine-2 (Northern part of Barjokani)
- 1st body/zone with MB-1 (Southern part of Barjokani)
- 2nd body / zone (Southern part of Barjokani)
- 3rd body/zone with MA-1 (Southern part of Barjokani)
- Javid mine (Southern part of Barjokani)
- Ansar Mine-1 (Eastern part of Barjokani)
- Ansar Mine-2 (Eastern part of Barjokani)

PREVIOUS WORK

During the area 1976-78, PMDC has conducted survey & exploration at Barjokani site and calculated a total reserve of 583070mt which include 292042mt of probable and 291028mt of possible reserves. They have driven 5 exploratory adits to intersect the ore bodies at depth and give a figure of 80,000mt of proved reserves.

Later on, SDA has also conducted survey & exploration work (1982 to 1993) to know the potential of Malakand chromite deposits including Heroshah, Barjokani, Landi Raud, Badasar and Qila areas under different Pc-11 schemes. In all these areas, SDA identified 0.751 million tons of chromite, which consist of 0.325mt proved, 0.044mt indicated and 0.381mt in inferred categories. On the 0.102 proved reserves of Heroshah Pc-1 scheme was got approved. To enhance the reaming estimated reserves of 0.62 million tons, another scheme (Phase-iv) regarding core drilling was prepared, but not materialized at time.

SDA had reported 3-chromite veins on northern part of Barjokani site. The first vein is 45 m long and 0.3 m to 1 m thick, while the other 2 veins containing disseminated chromite having an average of 21.2 m thickness and 197 m length respectively. On the southern part of the Barjokani locality, SDA identified economically significant 4–sub parallel chromite zones with following dimension.

S.No	Length	Thickness	Dip/Angle
I-Zone	220m	3m	30-40 Degree NE
II-Zone	190m	2m	Do
III-Zone	220m	0.3m	46 – 52 Degree SW
IV-Zone	270m	0.5m	----------

There are many other chromite bearing zones found in this block with variable dimension. SDA established total reserve in this block to the tune of 170940 million tons which consist of 108558mt of proved, 20520 indicated and 41882mt inferred. The chromite contents ranges in Cr2o3 contents from 12 % 27%.

GEOLOGY OF THE AREA

Geologically, the area falls within the Dargai ophiolite complex which is 3-km thick and 40-km long extending from Skhakot in the east to Qila area in the west. it is abducted along Main Mantle Thrust (MMT), tectonically emplaced on meta-sedimentary rocks of Indian plate, and also called "**Dargai cliffee**. The Dargai ophiolite complex is comprises of huzburgite, dunite, peridotite, serpentinite, gabbro, quartz veins & magnesite veins,

The study area mainly comprised of

- Huzburgite
- Dunite
- Magnesite veins

DESCRIPTION OF THE CHROMITE MINERALIZATION.

Generally, within ophiolite belt, chromite deposits are found in lensoid shapes, but locally the chromite mineralization in Dargai ophiolite complex are divided in to the following types

- Lenses/pod type
- Layered
- Veins
- Disseminated

In the study area, we observed that the chromite mineralization is mostly in the form of layers, dissemination & veins with subordinate lensoid/pocket type.

GEOLOGICAL DESCRIPTION & POTENTIAL OF THE VISITED SITES

A-Northern side

Mine-1: This mine is located at 34, 26, 52.3^0 N, 71,48,59.7^0 E with elevation of 428 meter below the china mine. Here, extensive mining has been done in the recent past and weak to medium grade chromite is extracted. As per statement of the local miner, the mineralization was found mostly in dissemination and layered form. At some places patches of medium grade chromite were also found. The mineralization is not continuous but found irregular along strike. This mine is driven for about 100 feet in south direction. At one spot, it is followed along dip for 50 feet. At present, the mine is filled with water and there is no access to visit it inside.

Mine-2: This mine is also located on the northern side of the Barjokani locality at 34, 26, 50.7^0 N &71, 48, 59^0 E with 463-meter elevation. Here, one-meter thick lean chromite zone (disseminated+ layered type) is found, and followed for about 10 meter along strike. Onward, this mine is collapsed. As per statement of the local miner, more low grade chromite has been extracted from this mine. Host rock is dunite. **BS-1** Chip sample is collected from this zone.

B-Southern Side

1st chromite body/zone: This body is located at 34.44647^0 N & 71.81661^0 E with elevation of 463 meter (west end) and extended in east direction for 170-meter. MB-1 mine located at 34.44641^0 N and 71.81805^0 E with 451-meter elevation is driven in this zone. At start, the outcrop of the chromite zone is mined out for about 15 meter along strike and up to few meter at depth. These underground working are now collapsed. The exposed outcrop of chromite is about 3-meter thick. The chromite mineralization is lean /low grade & is found in disseminated and layered form. As per statement of the local, MB-1 mine is driven along dip of the chromite zone for about 9-meter. Onward the mineralization is squeeze up to 2-feet. The 2-feet zone with little good grade is continued along dip for 15-meter. It is observed that they may have missed the dip angle of the chromite zone at 9-meter drivage point, where it may be present below the floor of the mine. **BS-2** representative sample collected from the out crop of the chromite zone while **BS-3** representative sample is collected from the dumped chromite at portal of M-B1 mine.

2nd chromite body/Horizon: Above body-1, there is another zone of low grade chromite located at 34.44427^0 N & 71.81702^0 E with elevation of 496 meter (west end). This zone is about 3-meter thick and extended in east direction for about 140-meter. Outcrop of this zone is exposed through trenches at places. M-A1 mine located at 34.44672^0 N, 71.81780^0 E with 490-meter elevation is driven in this zone. As per statement of the local miner, Low grade chromite is extracted from this mine in the recent past, but now it is collapsed and water filled. At present there is no access to visit this mine underground.

BS-5 & BS-6 representative chip samples are collected from this body. BS-5 sample collected from out crop while BS-6 sample collected from the M-A1 mine dumped material.

3rd Chromite body/Horizon: This body is located at 34.44727^0 N and 71.81975^0 E with elevation of 495 meters. The outcrop of this body/zone was exposed at places through trenches. This body/zone was followed along strike for about 190 meter, and terminated at 34.44725^0 N, 71.81802^0 E with elevation of 512 meter (west end). Onward, it may join M-1 chromite zone of northern part. Here mineralization is lean, and mixture of dissemination and layer type. **BS-4** representative chip sample is collected from the outcrop of this body. Thickness of this zone is variable ranges from 0.5 meter to 3 meter at places with an average of about 2 meter.

Fig-1 shows All the above mentioned 3 –bodies /zones.

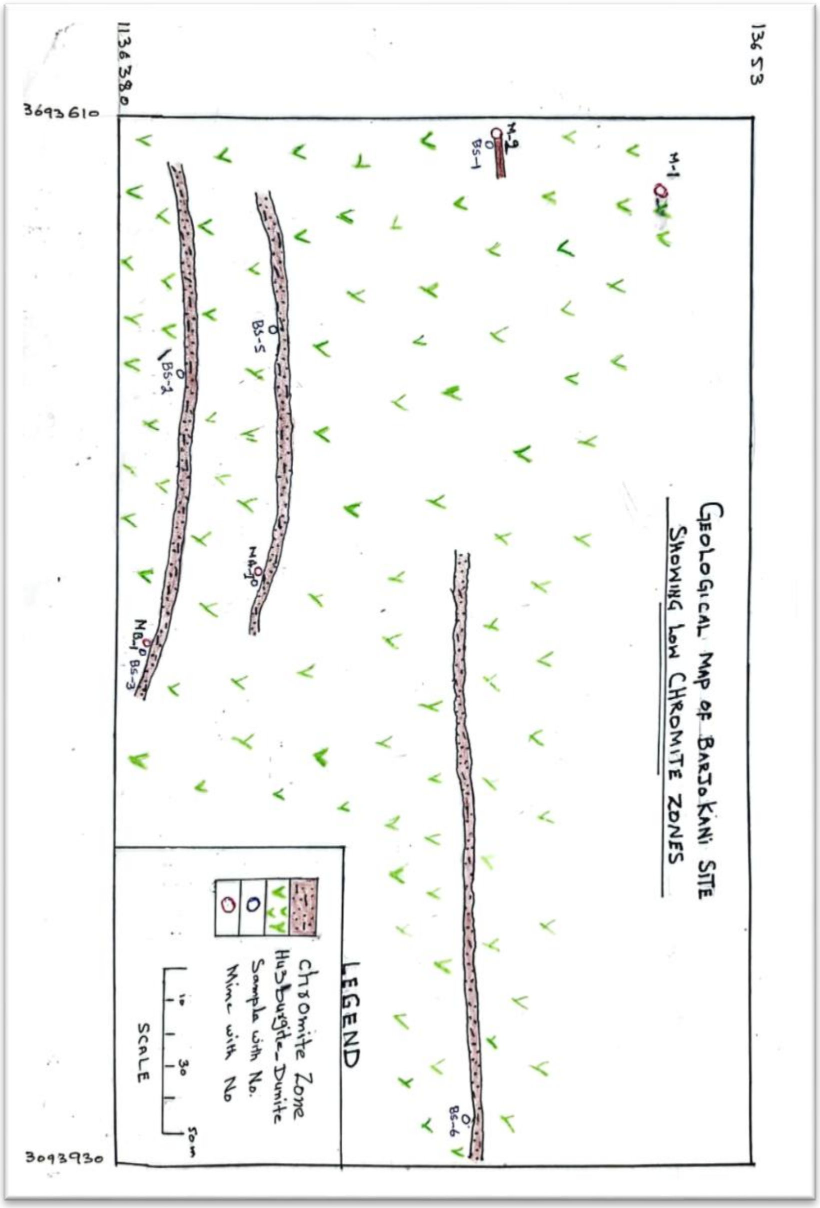
GEOLOGICAL MAP OF BARJOKANI SITE
SHOWING LOW CHROMITE ZONES
LEGEND
Chromite Zone
Harzburgite_Dunite
Sample with No.
Mine with No
SCALE
3093610
3093930
1136380
M-1
M-2
BS-1
BS-2
BS-3
BS-5
BS-6

Fig-1

Javid-Mine: This mine is located to the east of MB-1 below the 3rd chromite zone at 34.44786^0 N, 71.81655^0 E with elevation of 437 meters. At present this mine is filled with water & no information is available about it.

Ansar Mine-2: This mine is located to the east of Javid mine at 334.44672^0 N, 71.81780^0 E with elevation of 459 meters. Here low to medium grade mineralization of about 1-foot-thick and 10 -meter in length is found. At this site mining activities was conducted in the recent past and a few tons' chromite was extracted. At present there is no mining activities at this site.

Ansar Mine-1: This mine is further located east of Ansar Mine-2 at 34.44786^0 N & 71.81658^0 E with elevation of 414 meters. At present, mining for chromite is in progress through underground working. As per statement of the local miner, one lens with 3-meter thick and 15-20-meter in length found on roof of the mine is already extracted. This lens was followed further for about 20 meter but in vain. At present they exposed another lens with 1.5 feet by 3- feet on the floor of the mine at about 10-meter distance from the portal. The grade of this mine is good with 26% Cr2o3.

SAMPLING & ANALYSIS

During the field visit, one- representative chip sample is collected from Mine-2 (northern side) and 5-representative chip samples from the 3-Chromite bodies/zones located on the southern side of Barjokani locality. These samples are analyzed for Cr2o3, Fe2o3, Al2o3 and Sio2 in Mineral Testing Laboratory of DGMM at Hayatabad, Peshawar. The chromite content ranges from 1.2% Cr2o3 to 11.4% Cr2o3 &found on low side. The analysis report shows that the chromite contents are low on the surface and increases at depth level. In this case sample No SB-2, SB-4 & SB-5 is collected from the weathered surface/outcrop of the chromite zone, while SB-1, SB-3 &SB-6 is collected from fresh chromite body in mines. These are the representative samples of chromite zone, not selective one. Therefore, the chromite materials after sorting (selective one) will give better result. For verification of these results, the duplicates of 2 -sample may be analyzed in SGS laboratory as check samples. A copy of the analysis report is attached.

ESTIMATED RESERVES

There are 3-categories of the ore reserves i.e. inferred, indicated and proved. In this case we can easily calculated the inferred & indicated reserves for which one and 2–dimensions are known. But at this stage, we could not calculate the proved reserves as 3rd dimension of the ore (depth) is not cleared. However, based on the limited data gathered during the present one-day trip, the estimated reserves of the 3–chromite zones located on the southern side of Barjokani locality is calculated as per table below.

Table showing the estimated reserves of chromite on Southern side

Name of body/zone	Proved reserves (Metric tons)	Indicated Metric tons)	Inferred Metric tons)	Grade
1st body/zone	L x W x D x SP. G 170x3x15x4= 30,600 tons	L x W x D x SP. G	L x W x D x SP. G 200 x3 x25x 4= 60,000	**5.3-9.8% Cr2o3**
2nd body/zone	L x W x D x SP. G 140x 3x15x4 = 25,200 tons	L x W x D x SP.G	L x W x D x SP. G 160 x3 x25 x4 = 48,000 tons	**3.5-10.4% Cr2o3**
3rd body/zone	L x W x D x SP. G 190x2x1x4= 1520 tons	L x W x D x SP.G	L x W x D x SP. G 220x2x25x4= 44,000 tons	**1.2% Cr2o3**
Total	**57320 MT**		**152,000 MT**	

In addition to southern side deposits, some reserves are also expected on the northern side i.e. Mine-1 and in Mine- 2 area (near camp site). But these mines are collapsed, filled with water and there is no access to visit these inside for detail checking and possible reserves estimation. At present, the only chromite zone found in Mine-2 is 1-meter-thick and 10-meters in length having an inferred reserve of few hundred tons.

The reserves estimation of PMDC and SDA are on higher side, but these may need verification on ground by getting their exploration work data/geological reports.

CONCLUSION/FINDINGS

On the basis of limited data collected during a single day field trip & subsequent discussion with local miners and representative of the company, the following conclusion are made.

- During the visit, I have checked only about 30% of the company leased area.
- The area contained low grade chromite at places in the form of dissemination, layers, veins, small patches, and pockets. The host rocks are huzbergite & dunite.
- The mineralization on the working sites is not continue but irregular along strike and dip. On the surface, it is 2-3-meter-thick, but as per statement of the local miner its thickness decreases at depth with increase in chromite grade.
- At present, the 3-chromite sub parallel zones of the southern side are found significant for low grade deposits, while the remaining sites need further detail study.

- Six-chip samples collected from the above mentioned chromite bodies/zones show Chromite contents in the range of 1.2-10.4% Cr2o3. This is the result of representative samples not selective one, indicating that chromite contents increases at depth level. Check analysis of these samples through SGS laboratory is necessary for verification.
- To get chromite material above 15% Cr2o3 content, then the extracted material will need sorting, for which the per ton production cost will be increased accordingly.
- These zones of chromite are not systemically explored for calculation of the proved reserves. The width and length of these bodies are known but their actual depth position is not clear. Therefore, at present we are unable to calculate the estimate of proved reserves in the study area. However, as per limited field data collected, the total inferred and indicted reserves of these zones come to 152,000 & 57320 metric tons respectively.
- No reports of SDA & PMDC workings are available to verify their reported chromite zones on the ground. I checked only those zones showed by the company representative.
- Hopefully, the present estimated reserves may be enhanced after interpretation of PMDC &SDA workings data, and as well as through an additional detail survey + exploration work in the leased area of the company.

RECOMMENDATION

On the basis of the above findings, the following are recommended

i. Total leased area need detail geological survey/prospection & exploration for finding new more chromite bodies of interest.
ii. In the area of the known 3-chromite zones, core drilling is recommended at appropriate location for knowing their actual depth. Initially each drill hole may not exceed 30-meter. However, if the output is promising, then plan for further deep drilling should be chalked out accordingly. This will enable the company to know about the total proved reserves in these zones.
iii. The geophysical survey already conducted by SDA in this area may also be checked for any subsurface significant anomalies found in the leased are of the company.
iv. The underground geological maps of Mine-1 & Mine-2 located on the northern side may be prepared for knowing their actual subsurface status, and for future planning.
v. Similarly, the unground maps of M-AI & M-B1 mines of southern side may also be prepared for knowing the actual status of chromite zones in these mines.
vi. To verify the chromite result of 6-reprentative samples of MTL Peshawar, 2-duplicate samples may be analyzed in SGS lab as check samples.
vii. Laboratory and pilot scale study of the known workable deposits (mixed and sorted chromite materials) should be done before installation of large scale beneficiation

plant. This will help the company for knowing per ton processing cost and level of upgradation of the chromite contents. The extraction of magnetite as product through magnet separator may also be checked.

viii. In case of sorting of the extracted material for chromite with above 15% Cr2o3, then per ton production cost need to be established.

ix. Prefeasibility study is necessary before installation of large scale processing plant on the basis of available total estimated reserves.

x. Company may approach PMDC &SDA for getting geological report of Malakand chromite for knowing the actual picture of these deposits before prefeasibility study for installation of the proposed plant.

GOVERNMENT OF KHYBER PAKHTUNKHWA
MINERAL TESTING LABORATORY
Minerals Development Department
164-C Industrial Estate Jamrud Road, Hayatabad, Peshawar
Phone: 091-5890902- 5891341 mtlpeshawar@gmail.com Mineral Testing Lab Hayatabad-Peshawar 0333-8684568

No. MTL/Chem/ 2231 Dated: 2 / 6 /2026

TEST REPORT

Demanded by/Through:
M/S Baba Khel Mining (SMC-Private) Ltd.

Phone: 0346-9399459

Type & locality
Samples from Malakand

Vide MTL SSF No.1257/2025-26 dated: -19-05-2026

Report No.1288/2025-26

Date Sample Received: - 19-05-2026
Date Analysis Completed: - 02-06-2026

METHOD: -

ASTM /Robertson Research Labs, UK.

PROCEDURE: -

i) Determination of Fe and Cr_2O_3 by Titration method.
ii) Determination of SiO_2 by Gravimetric method.
iii) Determination of Al_2O_3 by Colorimetric method.

NATURE OF WORK REQUIRED: -

S. No	Sample No.	Fe_2O_3 %	Cr_2O_3 %	SiO_2 %	Al_2O_3 %
1	BS-1	9.8	11.4	39.8	6.53
2	BS-2	9.43	5.3	45.4	5.52
3	BS-3	10.0	9.8	43.6	6.94
4	BS-4	9.9	1.2	49.5	4.7
5	BS-5	9.3	3.5	41.4	4.9
6	BS-6	10.4	10.4	40.3	6.0

(Assistant Gemologist)
MTL

(Chief Geochemist)
Mineral Testing Laboratory

(Senior Mineralogist)
MTL

Copy forwarded to: -

1) Report File

Note: This analytical/test report is based solely on the particular sample(s) supplied by the customer/AD concerned and cannot be used for publicity or advertisement.
If you have any objection regarding test report, please submit written quarry to CGC within 15 working days after the issuance of result otherwise sample will be discarded after that and no complaint will be entertained.

This report shall not be reproduced in part. The party/parties utilizing it in any way shall be fully responsible for its ethical use and proper technical application. They shall be liable for all losses or claims that may arise from its use, and MTL shall be held indemnified, harmless, and free from any and all claims.

While every possible precaution was exercised to ensure the accuracy of the results, MTL does not assume any responsibility for the accuracy of results beyond the limits and scope of the available methods employed.