

**PEER REVIEW COMMENTS ON “GEOLOGICAL REPORT ON
RECONNAISSANCE SURVEY (G-4 STAGE) FOR GLAUCONITIC SANDSTONE IN
PARSADA-NAWAPARA-GURUR BLOCK (144 Sq Km) DISTRICT-BALOD,
CHHATTISGARH”**

Sl. No.	Peer Review Comments	MECL Response
1	Executive Summary, Section 1.4.1 Line 6 at Page 8: Glauconite content is stated to be between 1-8% in enriched layers (see also lines 6-7 at Page 63). The highest K ₂ O content in mature glauconite mineral is ~9% , It translates < 1%K ₂ O contribution by glauconite mineral in the glauconitic sandstone. The higher K ₂ O values between 4% to 6.44% in the analytical reports, therefore, need to be explained.	<p>i) This may indicate that, apart from glauconite, additional potassium-bearing phases such as feldspar (orthoclase/microcline), illite/mica, and diagenetically altered detrital minerals are contributing to the overall K₂O content.</p> <p>ii) The higher K₂O, therefore, may not be solely attributed to glauconite but rather to the combined presence of multiple K-bearing minerals within the glauconitic sandstone.</p>
2	There is a distinct disparity in the K ₂ O content of surface and core samples of glauconitic sandstone. Average K ₂ O content of 22 pit samples is 1.08% (computed from Table-10.1 at Page 75) while the weighted average of K ₂ O content of five boreholes varies & from 5.36 % to 6.21% (computed from Table 19.1 at Page 12). A plausible explanation is required.	<p>This difference may be attributed to</p> <p>(i) Surface weathering and leaching, which reduces K₂O in surface and pit samples</p> <p>(ii) Better preservation and enrichment of K-bearing minerals at depth. Consequently, higher K₂O values in core samples represent the true sub-surface potential of glauconitic sandstone, while surface samples are depleted and less representative.</p>
3	Primary analyses of pit samples, ANNEXURE IIB/1 : Glauconite is an iron-rich mineral (containing 21% to 23% Fe ₂ O ₃), however, in the analytical results of Balod glauconitic sandstone, the high iron content of pit samples is associated with very low K ₂ O content (mean 0.91% K ₂ O) as evident from seven samples that have analysed more than 20% Fe ₂ O ₃ .	Agreed.
4	<p>Section 12.2, P. 85-87, Table-12.1, ANNEXURE-IIC/1, Primary and check sample analyses:</p> <p>MECL chemical laboratory is reporting 43% higher K₂O content than the check samples analysed at Jawaharlal Nehru Aluminum Research Development and Design Centre</p>	<p>i. Accepted, but, the Correlation Coefficient (r) is 0.993 which is near to 1, which suggest strong positive linear relationship.</p> <p>ii. In connection with the observations regarding variance in analytical results of K₂O, Fe₂O₃, SiO₂ and</p>

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	<p>(JNARDDC), Nagpur. The arithmetic mean of K₂O content of 15 bedrock and pit samples by MECL Lab is 1.588% while it is 1.11% by the JNARDDC lab. The variance of about 43% is much beyond the acceptable limit of 5%. High analytical variance is also observed in respect of Fe₂O₃, SiO₂ and Al₂O₃. Analytical values of the certified reference material (CRM) during chemical analyses could have been useful in resolving this issue.</p>	<p>Al₂O₃ between MECL Chemical Laboratory and JNARDDC, it is submitted that Certified Reference Materials (CRMs) were duly used during the course of analysis. The CRM results obtained were found within the permissible tolerance limits, thereby supporting the reliability of the MECL laboratory data.</p> <p>iii. With respect to K₂O values, the arithmetic mean reported by MECL is 1.588% compared to 1.11% by JNARDDC, which corresponds to a value-wise difference of 0.47%, though expressed in relative terms it appears as ~43%. The apparent variation may thus be attributable to factors such as sample preparation protocols or matrix effects, rather than non-compliance in quality control procedures.</p>
5	<p>Average K₂O content of 24 m shale zone in the borehole MPN-04 is 5.97% which is higher than 5.03% in the glauconitic sandstone. In view of shale being part K₂O zones for reserve estimation (see Plate-IV), the geological details in terms of its petrography and XRD studies are lacking in the report.</p>	<p>i) Petrography report of the glauconitic shale encountered in borehole MPN-02 and MPN-05 has been discussed in para 7.5.4.2. While it is also included in Annexure-V and in Table 7.3.</p> <p>ii) Interpretation of XRD studies has been discussed already in para 8.7.0 and results have been also furnished in Annexure-VI.</p>
6	<p>Annexure VI/1, Statement showing XRD analytical results require a thoughtful consideration:</p> <p>The K₂O, contained in the mineral glauconite is the central theme of the present reconnaissance survey and this report. Following points emerge from the XRD analytical results:</p> <p>i) Glauconite the potash bearing mineral (containing 5% to ~9% K₂O in its mineral composition) is always in traces in XRD analyses,</p> <p>ii) Microcline (16.9% K₂O with no iron) and muscovite (11.8% K₂O with no iron), both</p>	<p>i. It may be possible that K₂O value of the borehole sample may be elevated due to the other potash bearing minerals. But, this does not negate the occurrence of glauconitic sandstone in the area. The Kansapathar Formation of the Chhattisgarh Basin is regionally well-documented for the presence of glauconite. Therefore, even though the precise contribution of glauconite to the observed K₂O values may vary due to the presence of other potassium-bearing phases, the geological context strongly supports the inference that glauconitic sandstone is indeed present within the</p>

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	<p>are potassic mineral that occur as major phases in XRD analyses,</p> <p>Orthoclase, phengite, dark micas, are all K₂O bearing minerals which occur as minor phases ($\leq 5\%$ to 1%),</p> <p>In view of glauconite occurring in traces in all the 5 XRD results, the minerals listed at ii) and iii) are the major contributors of K₂O content in the chemical analytical results of sandstones. The assumption and or assignment of entire K₂O contributed by the glauconite is invalid on scientific ground as evident from the above considerations.</p>	<p>explored sequence.</p> <p>ii. However, detailed petrographic studies indicate that glauconite occurrence is more inclined in fine-grained sandstones and is even prominently developed within associated shale units. The finer grain size of these sediments might be providing favorable conditions for the authigenic growth and preservation of glauconite, as the relatively low-energy depositional environment promotes slow sedimentation rates and extended residence time of detrital material on the sea floor—factors considered essential for glauconitization. Consequently, glauconite tends to be better concentrated in finer clastic facies rather than in coarser sandstones.</p> <p>iii. Further SEM-EDS studies have been recommended in the recommendation to validate glauconite vs feldspar/mica</p>
7.	<p>Comment on the margins are made in text part of the report. Executive summary in Hindi is missing at page 'a' in the report. Please also see and attend to the typo- and marginal comments made on body of the text at Pages 1, 2, 3, 5, 8, 11, 14, 16, 19, 21, 22, 29, 30, 36, 38, 41, 48, 50, 52 to 64, 66, 68, 70, 74, 77, 84, 87, 93, 98, 101, 113 to 119, 122.</p>	<p>The required typographical corrections in the page numbers and the Hindi translation of the Executive Summary have been incorporated as per the corrections and suggestions of the peer reviewer</p>
8.	<p>Text Figures and Plates: Text Figures 4.1 (Page 18), 7.3 (Page 49), 20.1 (Page 119) are not legible. Plate-II: Index shows granite within the sedimentary sequence, while in text it is mentioned as basement of the Chhattisgarh Supergroup, index may be corrected accordingly, Plate-III: Dark grey colour is missing in the index, Plate-IV: Please write 6.21% and K₂O together in the index and Plate-V: Please correct overwriting of the scale in the plate.</p>	<p>Text figure will be replaced with high resolution images. Correction in plates has been attended as per the suggestions.</p>
9.	<p>References: There are several references which are cited in the text of the report but are not in the list of references. They include</p>	<p>All the references has been updated as per the suggestion</p>

Sl. No.	Peer Review Comments	MECL Response
	<p>the works of Anderson, 1985; The New York Times Editorial Board, 2013; Rawashdeh & Maxwell, 2014; Manning 2010 and 2012; Ciceri et. al., 2015; Rawashdeh et al. 2016; Everest, 1964; Kumar and Bakliwal, 2005; Dutt, 1963; Mukherjee et al., 2014; Das et al., 1992; Murthy and Radhakrishna, 1961; Dutt, 1964; Schnitzer, 1971; Deb, 2004; Bose, 1898-99; Sen, 1963-64; Sen and Satyanarayan, 1964-65 and Satyanarayan, 1965-67 which should be mentioned in the list of references.</p>	