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Proposal for engaging a Technical Supervision and Quality Control (TS-QC) consultant for Monitoring of Quality Assurance / Quality Control (QA/QC) of the Multi-sensor Aerogeophysical Surveys over Blocks 13 to 16 under National Airborne Geophysical Mapping Programme (NAGMP)

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Proposal for engaging a Technical Supervision and Quality Control (TS-QC) consultant for Monitoring of Quality Assurance / Quality Control (QA/QC) of the Multi-sensor Aerogeophysical Surveys over Blocks 13 to 16 under Phase-II of National Airborne Geophysical Mapping Programme (NAGMP)

1.0 Introduction:

GSI has been carrying out regional to semi-regional aerogeophysical surveys over selected prioritised blocks using its fixed wing Twin Otter Airborne Survey System (TOASS). However, it is being realised since many years that India's national aerogeophysical coverage is severely lagging compared to many developed and numerous developing countries viz., Australia, Canada, United Kingdom, Ireland, Finland, Kosovo, Tanzania, Malawi, Nigeria, etc. where programmes for regional and detailed (follow-up) aerogeophysical surveys have been executed for systematic mineral prognostication.

The conventional geological methods for mineral exploration in hard rock areas are not supplementing the expected results and hence the aerogeophysical surveys are being considered as the only tool to scan large areas to tap the hidden or concealed mineral resources. Mineral deposits which have surficial manifestations have been explored and exploited, sustaining human civilization over several millenniums. Therefore, it has now become imperative world over to look for subsurface and deep seated mineral resources and also intensifying exploration activities to meet the ever growing need of the industry.

National Aerogeophysical Mapping Programme (NAGMP) has been planned to acquire uniform aerogeophysical data initially over Obvious Geological Potential (OGP) and its adjoining areas followed by the coverage of whole country in fixed time frame and to prognosticate suitable areas for mineral targeting. This will ultimately enhance the exploration activities in the country and attract foreign investments in the mineral sector.

Thus, GSI has started multi-phase national programme i.e. "Multi-sensor Aerogeophysical Surveys over Obvious Geological Potential (OGP) and adjoining areas" in 2017 under the national level programme "National Airborne Geophysical Mapping Programme (NAGMP)" which is funded by National Mineral Exploration Trust (NMET). In Phase-I of NAGMP program, the aerogeophysical surveys over OGP Blocks 1 to 12 covering approximately 8,13,000 Sq. Km through outsourcing is presently under execution. The surveys will be carried out with magnetic (Total Field) and spectrometric sensors using fixed wing aircrafts at an altitude of 80 m above ground level (AGL) with a survey linespacing of 300 m and tie line spacing of 3000 m (3 Km). Similar surveys are planned in the adjoining areas of OGP Blocks over survey Blocks 13 to 22 in coming years, in order to prepare a uniform composite aerogeophysical (magnetic and spectrometric) maps of the entire country, to make it on par with other major countries, achieving the objective of the NAGMP project.

Follow-up surveys over highest potential areas, chosen on the basis of available geological, geochemical and geomorphological data and information on mineral forming environments, engaging more detailed magnetic/radiometric, time-domain and frequency-domain electromagnetic, gravity and gravity gradiometry deployed preferably on Heliborne platform. The survey parameters are optimized based on the terrain condition, geology, overburden and target. The survey parameters generally adopted for follow-up surveys are 150 m line spacing, control line spacing of 1500 m and the survey heights at 90 m AGL with the towed birds placed at 30 m AGL.

The NAGMP project was taken up with an initial pilot project flagged up on 7th April, 2017 for surveys over OGP Blocks 1 to 4. A programme has been designed to acquire magnetic (horizontal gradiometer) and gamma-ray spectrometer data over selected areas (12 Blocks) of Obvious Geological Potential (OGP). The aerogeophysical surveys over OGP Blocks 1 to 4 and 11 were completed successfully during 2019, 2020 & 2021 with the identified 150 mineral potential target areas for the follow-up survey. Remaining Blocks of Phase-I survey is in various stages of execution.

During 24th TCC meeting of NMET, the GSI's proposal regarding Multi-sensor aerogeophysical surveys over Blocks 13 to 22 in adjoining areas of OGP Blocks 1 to 12 under Phase-II of project NAGMP was discussed & in 26th TCC meeting the proposal was approved and sent to Executive Committee meeting of NMET. During the 21st Executive Committee meeting of NMET which was held on 19.07.2021, the project proposal was approved and sent to Development Investment Board for necessary approval.

During 2nd Development Investment Board (DIB) meeting which was held on 28.07.2021 in virtual mode in connection with GSI's proposal of Phase-II of National Airborne Geophysical Mapping Programme (NAGMP) project for carrying out aerogeophysical surveys over Blocks 13 to 22 in the areas adjoining to Obvious Geological Province (OGP) areas of Blocks 1-12 chaired by Secretary, Ministry of Mines, New Delhi, the proposal was approved. In this regard, an Office Memorandum was issued by NMET vide OM No.F.No.6/2/2015-NMET/130 dated 8th September 2021 and approved the project "Multi-sensor Aero-geophysical surveys over Blocks 13 to 22 in adjoining Obvious Geological Potential (OGP) areas under National Airborne Geophysical Mapping Programme (NAGMP)" with an estimated cost of Rs.243.98 crore including GST subject to review of progress of project by Executive Committee at the end of first year before tenders for subsequent years are floated by GSI.

After receiving the project approval for Phase-II of project NAGMP from NMET in September 2021, the tendering process for NAGMP Blocks 13 to 22, the area of survey is adjoining to present OGP Blocks 1 to 12, has been initiated by floating four individual domestic tenders for Blocks 13, 14, 15 & 16 in GeM Portal on 18.11.2021 by RSAS, GSI, Bangalore after obtaining the necessary approvals from the competent authority.

At every stage, the quality of data acquired by each Project Implementing Agency (PIA) is to be validated by an experienced Technical Supervision and Quality Control (TS-QC) team to be identified for this sole purpose for ensuring data sanity, reliability and quality. The total responsibility of validating the final deliverables submitted by the PIAs and identifying potential areas in each block for subsequent detailed survey is vested on the TS-QC consultant. Due to complex and multi-disciplinary nature of the work program, there is a need to identify and appoint an external consultant to act as Technical Supervisor ensuring the data integrity and consistency of the mega data sets which will be produced during the project. The primary role of the consultant will be to overall supervision and quality control throughout all phases of the program, from pre-survey planning till handing over of final deliverables. Such a consultant by necessity will need to be highly experienced with a strong background and successful recent track record in the Technical Supervision and Quality Control of multi-sensor airborne geophysical surveys. Thus the appointment of TS-QC consultant is very much essential for the successful completion of the project.

During the execution of the project a large amount of data will be collected in a short time span with multiple aircrafts carrying out surveys from different operational bases simultaneously. It will be difficult to coordinate the surveys and monitor the quality of the data, processing and interpretation with the existing experienced manpower of GSI.

For successful completion of such a huge and prestigious project, a highly experienced and internationally recognized external Technical Supervision and Quality Control (TS-QC) consultant from a well-established airborne geophysical survey organization is very much essential to initiate and organize the entire project within the stipulated time schedule.

2.0 Objective of proposed Technical Supervision and Quality Control Consultant:

The objective of employing the services of TS-QC consultant is to ensure high quality in acquisition of purpose oriented geoscientific data over NAGMP Blocks 13 to 16 (Fig.1), which will augment the understanding of the geology and mineral potential of India, compilation, interpretation and integration of data with existing available legacy data of GSI. This is aimed to assist in identifying the

priority areas for mineral resource potential in order to promote and sustain growth in the sector, and increase the contribution of the mining sector in India.

Table-1: Details of NAGMP survey Blocks, Area / Line Km coverage in Blocks 13 to 16:

Sl. No.	Survey Block Number	Area (Sq. Km)	Line Km
1	NAGMP Block-13	53,583	1,96,473
2	NAGMP Block-14	65,537	2,40,305
3	NAGMP Block-15	54,494	1,99,813
4	NAGMP Block-16	41,272	1,51,332
Total	4 Blocks	2,14,886	7,87,923

2.1 TS-QC Consultant will look into:

- Overall management of the multi-sensor aerogeophysical program over Blocks 13 to 16 and adjoining areas
- Co-ordination among the Project Implementing Agencies (PIAs)
- Liaison with GSI
- Integration of existing legacy data with present survey data
- Merging of the grids and interpretation
- Training to GSI personnel

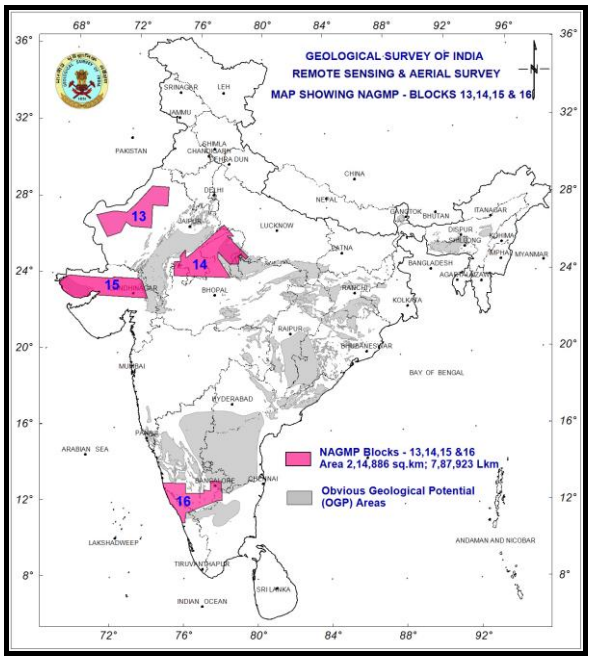

Fig.1. Map showing proposed aerogeophysical survey Blocks from 13 to 16 under Phase-II of Project NAGMP.

3.0 Scope of work of proposed TS-QC consultant:

The basic aim of appointing the TS-QC consultant for this project is to ensure the compliance of the work agreement between GSI and the PIAs, and technical consistency among the PIAs. The TS-QC consultant has to form a working professional relationship with the PIAs for the project from initiation.

All the works by the PIAs has to be performed to the satisfaction and subject to the acceptance of the TS-QC consultant with the help of a team of qualified personnel employed by the consultant. The geophysicists/geologists employed by the TS-QC consultant will visit to the survey site to monitor field operations especially before the commencement of survey in each survey Block. The TS-QC

consultant will inspect the equipment's and calibration results in the beginning and prior to demobilization, to observe whether operations are being carried out in accordance with the contract specifications. Most of the Quality Assurance and Quality Control (QA/QC) function will be carried out in Bangalore, where the consultant's QC geophysicists will be stationed in the same GSI complex as the processors and interpreters employed by the PIAs. This will facilitate interaction between these groups, as well as with the GSI's personnel.

The TS-QC consultant for supervising and monitoring the following works over survey Blocks 13 to 16:

- Plan and discuss with the PIAs regarding the survey operation modalities, survey bases, achievable targets, base magnetic stations and calibration of sensors.
- Quality Assurance and Quality Control (QA/QC) of the acquired data in the field and at the Bangalore centre on a day-to-day basis; interaction and co-ordination with the PIAs for transmitting the airborne geophysical data to Bangalore under the security of GSI for further processing.
- Supervision, co-ordination and QA/QC of compilation, processing, integration and interpretation by the respective PIAs at Bangalore.
- Scrutiny of the project reports submitted by the PIAs.
- Compilation of acquired aerogeophysical data of this project, with the existing airborne geophysical data available with GSI, with an objective to generate composite magnetic and spectrometric maps of India and identify target blocks of high mineral potential zones for follow-up.
- Prepare a comprehensive manual on the procedures of the QA/QC of the airborne geophysical data acquisition, data processing, data integration and data interpretation.

4.0 Deliverables:

After each inspection of the calibration and test data, field data, compiled data and deliverables, the TS-QC consultant will submit reports both in hard and soft copies to GSI with a detailed review and check list. During the data compilation, processing and interpretation phases, the consultant will continue to review the products prepared by the survey PIAs until all final deliverables meet the contract specifications.

Number of reports required, at the following stages are:

1. Pre-survey planning, calibration and acquisition start-up
2. Data acquisition at approximately monthly intervals
3. Final data acquisition at completion of block
4. Interim products
5. Processing
6. Compilation of data of this project with the legacy data available in adjacent areas of the 10 Blocks
7. Interpretation
8. Identification of suitable blocks for the follow up surveys
9. Final deliverables
10 Submit a manual with details of QA/QC of data acquisition, data processing, data integration and data interpretation.

The consultant will manage (scrutinise and ensure the quality) the following deliverables from the survey PIAs:

- Databases: Magnetic and radiometric compiled databases
- Grids: Magnetic and radiometric grids
- Digital maps: Digital maps will be prepared at 50K and 500K/400K scales
- Interpretation product will be prepared in ArcGIS/Geosoft format

5.0 Data Archiving:

The raw, processed and interpreted survey data in digital form and soft copies of all the maps generated along with gridded data will be archived over survey Blocks 13 to 16 for future use. All types of data will be stored in the National Geophysical Data Repository for easy archival and utilisation as and when required.

6.0 Geological Domains of the NAGMP Survey Blocks 13 to 16:

Details of proposed survey Blocks 13 to 16 in the extended areas adjoining to Obvious Geological Potential (OGP) region is mentioned in Table-2.

Table-2:

Block No.	Location	Area (Sq. Km)	Line km	Geological domain
13	NW Rajasthan	53,583	1,96,473	Thar Desert
14	Parts of Rajasthan, Uttar Pradesh and Madhya Pradesh	65,537	2,40,305	Vindhyan and Deccan Trap
15	Kachchh, Gujarat	54,494	1,99,813	Mesozoics and Tertiaries of Kachchh
16	Southern Karnataka and northern Kerala	41,272	1,51,332	Peninsular Gneissic Complex and Southern Granulite Terrain
	Total	2,14,886	7,87,923	

7.0 Budget Estimate of proposed TS-QC consultant work for survey Blocks 13 to 16:

(a) Quoted Rate per Line Km for OGP Blocks 1 to 4 = **Rs.116.20 ps.**

(b) Quoted Rate per Line Km for OGP Blocks 5 to 12 = Varies from **Rs.70.26 ps. to Rs.77.36 ps.**

Table-3:

Sl. No.	OGP Block No.	Rate per Line Km (Rs.)	Area (Sq. Km)	Coverage Line Km	Cost (Rs.)	Remarks
[1[	**[2]**	**[3]**	**[4]**	**[5]**	**[6 = 3 * 5]**	**[7 = Total of 6/ Total of 5]**
1	1	116.20	59,067	2,16,579	2,51,66,479.80	Average quoted Rate per Line Km in OGP Blocks 1 to 12 under Phase-I is Rs.83.32 ps.
2	2	116.20	59,409	2,17,833	2,53,12,194.60	
3	3	116.20	39,452	1,44,657	1,68,09,143.40	
4	4	116.20	48,052	1,76,191	2,04,73,394.20	
5	5	70.26	91,219	3,34,470	2,34,99,862.20	
6	6	72.39	76,049	2,78,846	2,01,85,661.94	
7	7	75.23	56,664	2,07,768	1,56,30,386.64	
8	8	70.26	87,914	3,22,351	2,26,48,381.26	
9	9	75.23	71,132	2,60,817	1,96,21,262.91	
10	10	70.26	91,801	3,36,604	2,36,49,797.04	
11	11	70.26	89,583	3,28,471	2,30,78,372.46	
12	12	77.36	33,752	1,23,757	95,73,841.52	
Total			4,88,391	29,48,344	24,56,48,777.97	

(c) Average quoted Rate per Line Km for OGP Blocks 1 to 12 = **Rs.83.32 ps. taken for reference (Table-3)**

(d) Rate per line km after adding appreciation @20% to the reference rate = **Rs.99.98 ps. (Rounded off to Rs. 100/-)** (**Table-4**)

Table-4:

Sl. No.	NAGMP Block No.	Rate per Line Km (Rs.)	Area Sq. Km	Coverage Line Km	Cost (Rs.)	GST @ 18% (Rs.)	Total Cost (Rs.)
[1]	**[2]**	**[3]**	**[4]**	**[5]**	**[6 = 3 * 5]**	**[7 = 6 * (0.18)]**	**[8 = 6 +7]**
1	Block-13	100	53,583	1,96,473	1,96,47,300	35,36,514	2,31,83,814
2	Block-14	100	65,537	2,40,305	2,40,30,500	43,25,490	2,83,55,990
3	Block-15	100	54,494	1,99,813	1,99,81,300	35,96,634	2,35,77,934
4	Block-16	100	41,272	1,51,332	1,51,33,200	27,23,976	1,78,57,176
		Total	2,14,886	7,87,923	7,87,92,300	1,41,82,614	9,29,74,914

Note: Approximate cost for engaging a TS-QC consultant for survey Blocks 13 to 16 inclusive of GST is **Rs.9,29,74,914/-.**

During the Phase-II of NAGMP, the aerogeophysical surveys over adjoining areas of OGP Blocks, it is proposed to engage a Technical Supervision and Quality Control (TS-QC) consultant to carry out the Quality Control and Quality Assurance (QA/QC) of the data, reports, etc. over survey Blocks 13 to 16 covering an area of 4,88,391 Sq. Km along 17,90,783 Line Km at an estimated approximate cost of about **Rs.9,29,74,914/-** (approximately Rupees nine crore twenty nine lakh seventy four thousand nine hundred and fourteen only) inclusive of GST. However the exact cost will depend on bidders quoted price for the project.

It is proposed to award Contract to a **single firm in a rate contract mode i.e. Rate per Line Km in INR to carry out the entire TS-QC job pertaining to NAGMP Blocks 13 to 16** with a validity of the rate contract for a period up to **two years (24 months)** from the date of signing of MoA.

Also, if required the validity of rate contract should be extendable as per the requirement of RSAS, GSI for further period on mutual agreement between buyer and seller at the same terms, conditions and price of the MoA.

In addition to the above, the selected firm should, if desired by GSI, carry out the TS-QC job for any additional Blocks (OGP Blocks 5, 7, 9, 10 & 12 with a coverage of 12,63,416 Line Km), within the rate contract period i.e. up to two years from the date of signing of MoA at the same terms, conditions and price.

It is proposed to issue Block-wise Work Orders to the selected TS-QC Consultant firm at the same terms, conditions and price of the MoA.

The project is to be executed by outsourced agencies selected through domestic tendering process in GeM portal as per the Govt. norms.

Approval sought from NMET:

1. Project approval for engaging TS-QC Consultant for NAGMP Blocks 13 to 16 with an estimated approximate project cost Rs.9,29,74,914/- (approximately Rupees nine crore twenty nine lakh seventy four thousand nine hundred and fourteen only) inclusive of GST on the basis of rate contract, with a validity of the rate contract for a period two years from the date of signing of MoA. This is in tune with the approval of engaging the Project Implementation Agency (PIA) vide OM No. F.No.6/2/2015-NMET/130 dated 8th September 2021. However the exact cost for TS-QC work component for NAGMP Blocks 13 to 16 will depend on bidders quoted price for the project.