



**NATURAL RESOURCES ASSESSMENT**

Geological Survey of India  
GSI Complex, 2nd Floor, C-Block  
Seminary Hills, NAGPUR-440 006

Additional Director General & Head, NM-II

Dated: 07/08/2019

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No. /M-II/FSP Guidelines/GSI/FS 20-21/2019

To,

**The Additional Director General & HoD,  
Geological Survey of India  
SR/ WR/ ER/ CR/ NR/ NER  
Hyderabad/ Jaipur /Kolkata /Nagpur /Lucknow /Shillong**

**Sub: REVISED MODALITIES: Formulation Mission-II, Annual Programme for the FS 2020 -21**

Sir,

I have been directed by the Additional Director General, Policy Support System, CHQ., GSI, Kolkata to convey the modified guidelines for making Annual Programme for 2020-21 through letter nos., 1/1/FSP/Geol./2020-21/46F dated 5<sup>th</sup> Aug 2019 and 1/1/FSP/Geol/2020-21/45F dated 31<sup>st</sup> July 2019. The previous guidelines on the same subject dated 29<sup>th</sup> July 2019 stands null and void. The points of previous modified guideline were,

*i. Formulation and mandatory approval through OCBIS – may be done after IPR ii. LSM and DM will remain same for variety of deposit styles for Limestone, Bauxite, Potash, Gold, PGE, Basemetal, Tin, Tungsten, Molybdenum, Graphite, Iron, Manganese, Chromite, REE etc., (Himalaya & NER – 25 sq. km/ Geologist, Rest of India- 50 sq. km/ Geologist) except diamond, coal & lignite as per the previously approved norms of GSI vide., /1/1/FSP/Genl./2013-14/46F dated 17th Oct 2012 needs to be followed. iii. Instead of submission of proposals by 30<sup>th</sup> Aug 2019 to this office, a convenient date before the IPR is fine. iv. Review of proposals through videoconference is dropped as these may overlap IPR period and direct discussions at the later stage on the FSP proposals at Nagpur. v. Flow of background information as stated in the previous document in 4000 characters is flexible. vi. It is not mandatory to make any presentations justifying the proposal by the concerned DDG or Director with the O/o. Mission-II, Nagpur.*

**Guidelines for Adherence:**

1. Field visits should be taken by the Geoscientist/s before proposing the mineral exploration item to assess the mineral potentiality and workability of the project in case the proposing Geoscientist is not conversant with the area of G4-stage proposal. This may please be followed mandatorily for G2- and G3-stage proposals.
2. All the FSP programmes of Mission-II (excluding drilling) are to be formulated as per the target norm given in the table (for two geologists) below. However, for drilling items the target has to be fixed as per revised drilling target norm for in-house rigs of GSI.
3. In case of mineral exploration for gold, PGE, REE, an average of 1 km strike length with 100m borehole separation along strike for G3 and a borehole spacing of 200m along strike for basemetal, graphite, tin-tungsten-molybdenum should be considered for the NQT. A wider area must be proposed for LSM & DM for bauxite, limestone, glauconite etc., for acquiring geological continuity of larger area and balancing the work quantum to the field party.
4. To avoid large quantum of exploratory drilling in G3 stage exploration with 100m spacing for gold, PGE, REE at one go without ascertaining the chemical results, it has been suggested initially to carryout 200m spacing of boreholes and after confirming the mineralization with chemical results, infill boreholes with 100m spacing and few second level boreholes are suggested. The ADG & HoD, DDG & RMH-II of the concerned Region and Mission-II HQ., will follow up the matter for speedy chemical analysis to keep the drilling momentum at the site. However, field party is directed to submit the samples regularly and obtain the permission from Mission-II HQ., for close spaced boreholes (infill boreholes of 100m spacing) and second level drilling.

5. The ADG & HoD of a Region along with DDG & RMH-IIs are requested to decide the LSM, DM and Drilling for the remaining commodities like, Sillimanite, Kyanite, Andalusite, Pyrophyllite, Diaspore, Dimension stone, Dolomite, Dunite, Clay etc., ensuring full engagement of a Geoscientific & Drilling team for a period on one year.
  6. In G3 stage investigations, Phase - I, drilling of boreholes should be undertaken by the Region with a wide separation (e.g., 200m separation, G3 stage, gold, PGE, REE investigation) of boreholes along the strike as written against the commodity. After ensuring the existence of mineralization in these boreholes, the 100m infill boreholes and few second level boreholes needs to be justified and appropriate approvals is essentially required from NMH-II.
  7. Mission-II and HoDs of the Regions will ensure the chemical analysis of sparsely spaced boreholes for taking appropriate decisions on close spaced and second level drilling in G3 stage investigations for gold, PGE, REE exploration.
  8. Approval of boreholes for G2 stage will continue as per current practice for all the mineral commodities.
- Suggested NQT for LSM, DM and drilling for the FS 2020-21 onwards:

**Phasing of G3 and G2 Stage Investigations for the FS 2020-21 (Other than NER and Himalayan Areas)**

Commodity	Geological Environment	Drilling in meters		
		G3 Stage		G2 Stage
		Phase - I	Phase - II	
Gold	Primary Au mineralization	First level BHs (60 m vertical depth) to be planned at 200m spacing.	Infilling first level BHs (60 m vertical depth) to be planned at 100m spacing. Two to three second level BHs (120 m vertical depth) along positive profile.	First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth).
	Placer Au	400m x 400m grid, depth till bedrock.	Infills for making 200m x 200m grid	On 100m x 100m grid.
Ni-PGE	Primary Greenstone / Primary Mafic-Ultramafic	First level BHs (60 m vertical depth) to be planned at 200m spacing. In rare case based on the disposition of MZ, 30m vertical depth may be considered for first level intersection.	Infilling first level BHs (60 m vertical depth) to be planned at 100 m spacing. Two to three second level BHs (120 m vertical depth) along positive profile. In rare case based on the disposition of MZ, 60 m vertical depth may be considered for second level intersection.	First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth).
	Supergene Type	400m x 400m grid, depth till bedrock.	Infills for making 200m x 200m grid	On 100m x 100m grid.
REE	Primary, Igneous	First level BHs (60 m vertical depth) to be planned at 200m spacing.	Infilling first level BHs (60 m vertical depth) to be planned at 100 m spacing. Two to three second level BHs (120 m vertical depth) along positive profile.	First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth).
	Secondary Mineralization	400m x 400m grid, depth till bedrock.	Infills for making 200m x 200m grid	On 100m x 100m grid.
Basemetal	Primary Deposits (Proterozoic)	First level BHs (60 m vertical depth) to be planned at 200m spacing.		First & second level infill boreholes with 100m strike separation and few third level boreholes (180 m vertical depth).
Graphite	Primary Deposits (Archaean)			
Tin, Tungsten, Molybdenum	Regular & Irregular Primary mineralization			
	Secondary deposits (Tin)	400m x 400m grid, depth till bedrock.	Infills for making 200m x 200m grid	On 100m x 100m grid.
Iron	Meta-sedimentary & meta igneous terrain	First level (30 m vertical depth) boreholes with 200m separation and 3 second level (60m vertical depth) boreholes. The separation may be closer for smaller bands based on the field observations and disposition of the bands.		First & second level infill boreholes with 100m strike separation and few third level boreholes (90 m vertical depth).
Manganese	Meta-sedimentary or Supergene	First level (30 m vertical depth) boreholes with 200m separation and 3 second level (60m vertical depth) boreholes. The separation may be closer for smaller bands based on the field observations and disposition of the bands.		First & second level infill boreholes with 100m strike separation and few third level boreholes (90 m vertical depth).
Chromite	Meta-sedimentary, meta-igneous			
Limestone	Irregular habit		On 400m grid	On 200m grid
	Regular habit		On 800m grid	On 400m grid
	Irregular habit		On 400m grid	On 200m grid

<b>Potash / Glaucanite</b>	Regular habit	On 800m grid	On 400m grid
<b>Bauxite</b>	Irregular	On 400m grid	On 200m grid
	Regular	On 800m grid	On 400m grid

**Phasing of G3 and G2 Stage Investigations for North Eastern Regions (NER) and Himalayan Areas.**

Commodity	Geological Environment	Drilling in meters		
		G3 Stage		G2 Stage
		Phase - I	Phase - II	
<b>Gold</b>	Primary Au mineralization	First level BHs (60 m vertical depth) to be planned at 150m - 200m spacing.	Infilling first level BHs (60 m vertical depth) to be planned at 75m - 100m spacing. Two to three second level BHs (120 m vertical depth) along positive profile.	First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth).
	Placer Au	400m x 400m grid, depth till bedrock.	Infills for making 200m x 200m grid	On 100m x 100m grid.
<b>Ni-PGE</b>	Primary Greenstone / Primary Mafic-Ultramafic	First level BHs (60 m vertical depth) to be planned at 150m -200m spacing. In rare case based on the disposition of MZ, 30m vertical depth may be considered for first level intersection.	Infilling first level BHs (60 m vertical depth) to be planned at 75m - 100 m spacing. Two to three second level BHs (120 m vertical depth) along positive profile. In rare case based on the disposition of MZ, 60 m vertical depth may be considered for second level intersection.	First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth). In rare case based on the disposition of MZ, 90 m vertical depth may be considered for third level intersection.
	Supergene Type	400m x 400m grid, depth till bedrock.	Infills for making 200m x 200m grid	On 100m x 100m grid.
<b>REE</b>	Primary, Igneous	First level BHs (60 m vertical depth) to be planned at 150m - 200m spacing.	Infilling first level BHs (60 m vertical depth) to be planned at 75m - 100m spacing. Two to three second level BHs (120 m vertical depth) along positive profile.	First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth).
	Secondary Mineralization	400m x 400m grid, depth till bedrock.	Infills for making 200m x 200m grid	On 100m x 100m grid.
<b>Basemetal</b>	Primary Deposits (Proterozoic)	First level BHs (60 m vertical depth) to be planned at 200m spacing.		First & second level infill boreholes with 100m strike separation and few third level boreholes (180 m vertical depth).
	Primary Deposits (Archaean)			
<b>Graphite</b>	Regular & Irregular			
<b>Tin, Tungsten, Molybdenum</b>	Primary mineralization			
	Secondary deposits (Tin)	400m x 400m grid, depth till bedrock.	Infills for making 200m x 200m grid	On 100m x 100m grid.
<b>Iron</b>	Meta-sedimentary & meta igneous terrain	First level (30 m vertical depth) boreholes with 200m separation and 3 second level (60m vertical depth) boreholes. The separation may be closer for smaller bands based on the field observations and disposition of the bands.		First & second level infill boreholes with 100m strike separation and few third level boreholes (90 m vertical depth).
<b>Manganese</b>	Meta-sedimentary or Supergene			
<b>Chromite</b>	Meta-sedimentary, meta-igneous			
<b>Limestone</b>	Irregular habit	On 200m grid		On 100m grid
	Regular habit	On 400m grid		On 200m grid
<b>Bauxite</b>	Irregular	On 150m - 200m grid		On 100m grid
	Regular	On 400m grid		On 200m grid

9. Project formulation is to be initiated from the level of Projects / State Units / Divisions and the programmes are to be scrutinized by respective Regional Mission Head-II. The HoD's of the Region shall evaluate all the programmes in terms of the technical content, availability of man power, budget and

logistic requirement and submit the draft FSP to National Mission Head - II for scrutiny and recommendations for approval.

10. Leasehold areas are to be excluded. Proposals falling forest areas may also be proposed for starting the forest approval process by the Region as the approval from GSI is essentially required for obtaining the forest permission. However, these proposals may have be considered for the next FS after obtaining all the clearances.
11. A number of requests were received for block modification, change in the co-ordinates, change in title, NQT etc during the previous FSPs mainly due to incomplete understanding of the target site. Hence it is advised to ensure the exploration suitability of the area by field visits if not seen by the proposing Geoscientist.
12. Please keep scope for additional 10% of the samples of each project in the NQT to be submitted to the chemical laboratories. The PSS of Regions were to identify the suitable chemical lab for check analysis by interacting with the concerned Lab heads.
13. The Mission-II target assigned to each Region for FS 2020-21, should commensurate with commitments of GSI, which is given by the office of the DDG, PSS, P&M. It's a request from this office that during IPR every Region must come with 10 % additional number of proposals (which will contain G2, G3 and G4 stages programmes) after scrutiny and justifications, so that if any proposal is dropped during IPR, a substitute can be discussed from the list of additional proposals.
14. Emphasis should be given to critical minerals viz., copper, gold, diamond, nickel, REE & RM, PGE, Lead & Zinc & so on., and the strategic minerals viz., tungsten, tin, molybdenum, cobalt, bismuth, lithium, antimony, cadmium, fluorite, germanium, gallium, vanadium etc., while proposing the mineral exploration projects.
15. Possibility of targeting Ga, REE etc in bauxite and gold, vanadium, titanium in BIF as per genetic association should be considered. In addition, new target regions of REE in sediments, peat beds, zones of saprolite etc., and for nickel in ochres formed at basal portions of mafic ultramafic derived laterites should be looked for proposing the projects.
16. While proposing the new items, it should be ensured that there is no overlapping of the mapping area (LSM & DM) to be demarcated even for different commodity. However, mineral exploration to a next stage (G4 to G3 or G3 to G2) for a similar or different commodity can be taken up without duplicating the mapping target on similar scale.
17. The geophysical component has to be incorporated in the NQT with appropriate methodologies for almost all G3 stage exploration. The limestone, bauxite and other bulk minerals are excluded from the approach.
18. Regolith samples & hydrogeochemical samples are to be included in the NQT. These samples are to be collected where alterations are observed in the surface and the number of samples may be fixed depending upon the mineral commodity.
19. Pitting & Trenching: The separation of trenches and pits should be based on the local geological set up, disposition of the mineralised zones and its potentiality. An exercise of coinciding the trenches and pits with the expected borehole profile to be made as it makes the borehole cross-section profiles clearer during resource estimation in addition to planning the boreholes by understanding surface manifestation of mineralization. Close spaced PT may be taken up in the case of highly erratic mineralisation. The planned BH profiles should have the significant surface value (PT or systematic channel / groove samples).
20. Bed Rock Samples (BRS): It includes, channel sample, chip sample, grab sample, groove sample etc collected from the site lithology. The fresh bed rock samples should represent the geological domain of the target Region. The analysis is targeted to geochemical classification of rocks, comparing with the already established fertile lithology, tectonic discriminations, petrogenesis, mineral potentiality etc. Accordingly, specific selection of oxide and trace elements is to be done as per the need. All the targeted elemental/ oxides should be mentioned in the proposal.
21. Mentioning of specific chemical elements for Whole Rock Analysis, BRS, Stream Sediment, Soil etc., is to be made judiciously to optimise the analytical workload. Again, the core samples may be requested for a target element/s in order to enable the Chemical team to give the results within a week for planning subsequent bore hole. Later, the targeted paragenetic assemblage may be obtained from the Lab for further interpretations.

<b>Whole Rock Analysis</b>	<b>Acidic Rocks</b> Major oxides: SiO <sub>2</sub> , TiO <sub>2</sub> , Al <sub>2</sub> O <sub>3</sub> , MgO, MnO, CaO, Na <sub>2</sub> O, K <sub>2</sub> O, FeO (t), P <sub>2</sub> O <sub>5</sub> , LOI Trace Elements: Cr, S, Ni, Ba, Rb, Sr, Ga, Zr, Nb, Ta REEs: La, Ce, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Yb, Lu
	<b>Intermediate Rocks</b> Major oxides: SiO <sub>2</sub> , TiO <sub>2</sub> , Al <sub>2</sub> O <sub>3</sub> , MgO, MnO, CaO, Na <sub>2</sub> O, K <sub>2</sub> O, FeO (t), P <sub>2</sub> O <sub>5</sub> , LOI Trace Elements: Cr, S, Ni, Ba, Rb, Sr, Ga, Zr, Nb, Ta REEs: La, Ce, Nd, Sm, Eu, Gd, Tb, DY, Ho, Er, Yb, Lu
	<b>Basic Rocks</b> Major oxides: SiO <sub>2</sub> , TiO <sub>2</sub> , Al <sub>2</sub> O <sub>3</sub> , MgO, MnO, CaO, Na <sub>2</sub> O, K <sub>2</sub> O, FeO (t), FeO, P <sub>2</sub> O <sub>5</sub> , LOI Trace Elements: S, Cr, Ni, Sc, V, Cu, Zn, Ga, As, Rb, Sr, Y, Zr, Nb, Ba, Ce, Pb, Th, U, Y, Zr, Nb, Ba REEs: La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb
	<b>Ultrabasic Rocks</b> Major oxides: SiO <sub>2</sub> , TiO <sub>2</sub> , Al <sub>2</sub> O <sub>3</sub> , MgO, MnO, CaO, Na <sub>2</sub> O, K <sub>2</sub> O, FeO (t), FeO, P <sub>2</sub> O <sub>5</sub> , LOI Trace Elements: S, As, Ba, Rb, Sr, Th, Zr, Nb, Y, V, Cr, Ni, Cu, Pb, Zn, Ga, Sc REEs: La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu
<b>BRS (Multi-elemental analysis) &amp; Placer</b>	Lead-zinc: Zn, Pb, Cu, Ag, As, Co, Sb, S, As, Ba, Ni, Ca, Hg, K, Na
	Tungsten: W, Mo, Zn, Pb, u, Ba, Sb, B, K, S
	Gold: Au, As, S, As, Ag, Bi, Co, Cu, Pb, Sb, Be, Mo, Co, Zn, Fe
	Copper: Cu, Au, Ag, Pb, Zn, Co, Mo, S, As, Sb, Ca, K, Na, Bi, Ba, Te, Hg, Mn
	Molybdenum: Mo, Pb, Cu, U, Zn, Ag, Mo
	Manganese: Co, Ni, Mo, Zn, W, As, Ba, V
	Laterite/ Bauxite (Mafic-ultramafic protolith): Ni, Co, Fe, Cr, V
	Laterite/ Bauxite (acidic protolith): Al, Nb, Ti, Ga, Be
	Tin: Sn, W, Ag, Zn, Pb, S, Cu, Mo, Ag
	Granite rocks: Ba, Li, W, Mo, Sn, Zr, U, Th, Ti
	Carbonatites: Ti, Nb, Ta, P, F, REE
	Alkaline rocks: Ti, Nb, Ta, Zr, REE, F, P
	Mafic rock: Ti, V, Sc
	Ultramafic rock: Cr, Co, Ni, Cu
	Pegmatites: Li, Rb, Cs, Be, REE, Nb, Ta, U, Th, Zr, Hf, Sc
Phosphorites: P <sub>2</sub> O <sub>5</sub> , U, V, Mo, Ni, Ag, Pb, F	
Sedimentary associated with Black shales: U, Cu, Pb, Zn, Cd, Ag, Au, B, Mo, Ni, As, Bi, Sb, V	
<b>Secondary Dispersion Media (Multi-elemental) Soil/SS/Groundwater</b>	The paragenetic group including pathfinders in these respective media related to the target mineralization.
	Placers (Gold, Tin): Au, Cu, Sn, W


All the Geoscientists are advised to carefully go through the guidelines stated above before formulating the programmes.


Copy for information to:

The ADG, PSS, P & M, CHQ., Kolkata

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