



Mineral Exploration Guidelines 2023

Department of Geology and Mines
Ministry of Energy and Natural Resources
Royal Government of Bhutan

- R. N. 7.1

Acronyms

DEM	Digital Elevation Model
DGM	Department of Geology and Mines
EDP	Economic Development Policy 2016
FYP	Five Year Plan
GIS	Geographical Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
LiDAR	Light Detection and Ranging
MDP	Mineral Development Policy 2017
MRDP	Mineral Resources Development Plan
MMMA	Mines and Minerals Management Act 1995
MMMR	Mines and Minerals Management Regulations 2022
MoHA	Ministry of Home Affairs
MoIT	Ministry of Infrastructure and Transport
NLC	National Land Commission
OHS	Operational Health and Safety
PPE	Personal Protective Equipment
RGoB	Royal Government of Bhutan
RS	Remote Sensing
SRF	State Reserve Forest
UAV	Unmanned Aerial Vehicle
WGS	World Geodetic System

Definitions

1. **“Drilling”** means digging a hole into the earth using either handheld drilling tools or machines.
2. **“Core”** shall refer to the drill core of rocks and minerals obtained using drilling tools and machines.
3. **“Environment”** means the physical features (both biotic and abiotic) surrounding human beings. The biotic components are animals and plants while the earth, soil, water, atmosphere, climate, sound, odors, tastes form abiotic components. The complex web of interrelationships between the abiotic and biotic components sustain life on earth.
4. **“Geochemical”** shall refer to the chemical composition of the rocks, minerals, and soil.
5. **“Geological Mapping”** is a mapping process to produce a special-purpose or thematic map showing the distribution of geological features such as rock types, mineralization, faults, folds, foliations, lineation, joints, etc.
6. **“Geophysical”** shall refer to recording or mapping of physical properties of rocks and minerals through an application of physics.
7. **“Grid System”** is a simplified grid used for systematic planning of prospecting and exploration works.
8. **“Inspector”** means a person employed by the DGM to monitor all activities pertaining to mineral prospecting and exploration.
9. **“Mineral”** means any substance occurring naturally in or on the earth and having definite chemical formula or rocks with an economic significance formed through a geological process(s) that can be obtained from the earth by digging, drilling, dredging, quarrying, hydraulicking, sluicing or other mining methods.
10. **“Mineral Deposit”** is any occurrence of a valuable commodity or mineral that is of sufficient size and grade (concentration) that has potential for economic development under past, present, or future favorable conditions.
11. **“Mineral Exploration or Exploration”** refers to an exploration of geological resources such as minerals, rocks, fuels, gemstones, alluvial, glacial, colluvial and residual deposits for various uses in construction, industry, metal extraction, tourism, decoration, and energy. It is a process of determining the grade and reserve of identified potential geological resources for economic extraction.

12. **“Exploration Permit”** is a permit that provides the right to explore or study the permitted mineral(s) within the permitted area to determine the geology, grade and reserve of the permitted mineral(s) for economic extraction.
13. **“Mineral Resource”** means a concentration or occurrence of minerals in or on the earth’s crust in such form, quality, and quantity that are reasonable prospects for eventual economic extraction.
14. **“Mineralogical Study”** is a scientific study of chemistry, crystal structure, and physical (including optical) properties of minerals and mineralized artifacts for identification purposes.
15. **“Officer”** means an officer of the DGM authorized in writing by DGM to exercise powers conferred by the MMMA 1995, MMR 2022 and this Guidelines.
16. **“Permit”** means an approval granted for exploration issued under MMR 2022 and this Guidelines.
17. **“Permit Area”** shall mean the delineated or demarcated area by DGM, as reflected in the permit inside which prospecting or exploration activity shall be carried out.
18. **“Exploration Permit Holder”** shall refer to an individual or company, whose name is reflected in the permit and has the right to carry out prospecting or exploration.
19. **“Petrological Study”** is a scientific study of chemistry, crystal structure, and physical (including optical) properties of minerals for identification purposes.
20. **“Pitting”** is digging of shallow depth holes in the earth’s surface within permit area for determination of mineralization continuity, size and shape and sampling purpose.
21. **“Prospecting”** means the systematic process of searching for a mineral deposit by narrowing down areas of promising mineral deposits.
22. **“Provision”** shall mean a condition or requirement in a legal document.
23. **“Reserve”** is that subgroup of a mineral resource that has been discovered, has a known size or extent that can be extracted at a profit at a given point of time.
24. **“Sampling”** is the process of taking a small portion of the target mineral such that it is representative of the entire property under assessment.
25. **“Topographical Survey”** is defined as collecting spatial data or information of the features on the surface of the land both natural and man-made using standard tools and technologies.

26. **“Trenching”** is digging of shallow depth trenches on the earth surface within permit area for determination of mineralization continuity, size and shape and sampling purpose

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Introduction

Mineral resources and its development are one of the key drivers of economic growth. Mineral resources of Bhutan include dolomite, limestone, quartzite, gypsum, talc, marble, graphite, coal, construction stones and aggregates. These resources form raw materials to mineral-based industries of Bhutan and are also exported to India, Bangladesh and Nepal. Metallic mineral resources such as copper, lead, zinc, tungsten, gold, rare earth elements (REE) and iron are also known. Regional geological mapping on a 1:50,000 scale is underway to map the remaining 50 percent of the country's areas, which will help understand mineral resource endowment and drive new discoveries.

The RGoB identified mining as one of the key sectors for economic development of Bhutan. To enhance the contribution of the mining sector to the economy, mineral exploration is fundamental in determining geological characteristics, reserve, grade, mining and economic feasibility of mineral deposits. Thus, in exercise of the power conferred by MMMA 1995 and MMMR 2022, DGM hereby adopts this guidelines hereafter known as **“Mineral Exploration Guidelines 2023”**.

The Guidelines shall provide details on requirements, procedures, specifications and standards for mineral exploration works in the Kingdom of Bhutan. The guidelines for obtaining Exploration Permit, Rights and Obligations of Permit Holder, and Monitoring of the Exploration Works are provided as Part-I. Part-II provides guidelines for exploration under RGoB funding. Part-III provides guidelines for both Permit Holder and exploration under RGoB funding.

PART I: MINERAL EXPLORATION BY PERMIT HOLDER

Chapter 1. Exploration by Permit Holder

Mineral Resources covered by the Exploration Permit

1. The Exploration Permit shall be issued for minerals in accordance with MMMR 2022.
2. Any other mineral not specified in the Exploration permit, fossil, and gemstone discovered during exploration must be reported to DGM within 30 days from the date of discovery. The report shall comprise brief description of the following:
 - (1) location (with highest possible accurate location coordinates);
 - (2) geology and mineralization including reserve and grade; and
 - (3) conclusions and recommendations.
3. The mineral reported in section 1 of this Guidelines shall be permitted for exploration, subject to expression of interest and eligibility.

Exploration Permit Area

4. Exploration shall be permitted in both the SRF and private registered land.
5. Exploration within the private registered land shall be permitted upon submission of a written consent from the private registered landowner or any person in custody of such land by the applicant.
6. The maximum area permissible for exploration shall be up to 3 km².
7. Proposals for any change in the demarcation of the permitted area must be submitted to DGM with reasons for approval.

Exploration Permit Validity and Renewal

8. The Exploration Permit shall be valid for a period of 3 years.

9. The Exploration Permit may be renewed up to 3 years based on the need and valid justification.

Surrender of the Exploration Permit

10. The Exploration Permit Holder may submit a written application for surrender of a part or whole of the Exploration Permit Area to DGM.
11. The DGM shall accept the application for surrender of a part or whole of the Exploration Permit Area upon fulfillment of the environmental restoration and other Terms and Conditions of this Guidelines by the Exploration Permit Holder.

Suspension of the Exploration Permit

12. The DGM shall suspend the part or whole of the Exploration Permit Area on the following grounds:
 - (1) in case of serious and imminent threat to human health or the environment caused by non-compliance to the Terms and Conditions of Exploration Permit;
 - (2) if the Exploration Permit Holder fails to comply with the notices issued by the DGM; or
 - (3) if the Exploration Permit Holder fails to submit a report as per section 33(9) and (10) of this Guidelines.
13. The DGM may lift the suspension upon necessary rectification of the compliance requirements.

Termination of the Exploration Permit

14. The DGM shall terminate the part or whole of the Exploration Permit Area on the following grounds:
 - (1) breach of the Terms and Conditions of the Exploration Permit or the provision(s) of MMMA 1995 and MMMR 2022 and other relevant laws of the Kingdom of Bhutan;
 - (2) withdrawal of the Exploration Permit in the interest of RGoB.
15. Upon termination, the Exploration Permit Holder shall be required to fulfill the environmental restoration and other Terms and Conditions of this Guidelines, where relevant.

Compensation

16. The RGoB shall pay reasonable compensation to the Exploration Permit Holder if the Exploration Permit is terminated in line with section 14(2) of this Guidelines.
17. The Exploration Permit Holder shall compensate for any accident resulting in the injury or death as per existing laws of the Kingdom.

Chapter 2. Application Procedures for Exploration Permit

To obtain an Exploration Permit for mineral exploration, the following procedures and requirements shall be followed and fulfilled by the applicant:

Eligibility Criteria

18. Any Bhutanese citizen, proprietor of licensed firm or company shall be eligible to apply for the Exploration Permit.
19. The DGM shall issue an Exploration Permit based on eligibility and requirements of MMR 2022 and this Guidelines.

Procedure for obtaining Exploration Permit

20. The applicant shall submit the application in Form EP-1 in Annexure 4 of this Guidelines to the DGM;
21. The DGM shall convene a technical committee meeting, where necessary, to assess the eligibility and capability of the applicant and communicate the decision on acceptance or rejection.
22. The use of airborne or UAV for exploration shall require approval from MoIT.
23. The use of explosives for exploration shall require approval from MoHA. However, DGM discourages the use of explosives during mineral exploration.
24. DGM shall approve and issue Exploration Permit in Form EP-2 in Annexure 5 of this Guidelines upon fulfillment of the requirements as per this Guidelines.
25. Any changes in the Exploration Permit Area(s) would require the approval of DGM upon which the new Exploration Permit shall be issued.

Renewal of Exploration Permit

26. The Exploration Permit Holder shall submit a written application to the DGM for renewal of the Exploration Permit at least 6 months prior to the expiry of the Exploration Permit.
27. The DGM shall renew and issue the Exploration Permit in Form EP-2 in Annexure 5 of this Guidelines based on feasibility and completion of more than half of the work under initial Exploration Permit and submission of reports as per sections 33 (9) and (10) of this Guidelines.

Chapter 3. Inspection and Compliance Monitoring

28. The DGM shall regulate and monitor the exploration activities in approved areas in line with MMMA 1995, MMR 2022 and this Guidelines to ensure compliance by the Exploration Permit Holder.
29. The Officer(s) or Mines Inspector(s) shall:
 - (1) carry out inspection and monitoring of the exploration activities;
 - (2) produce proof of identification issued by the DGM;
 - (3) call for and examine all reports, registers and records required to be maintained by the Exploration Permit Holder;
 - (4) have access to the permit area and all facilities related to exploration, with or without prior notice, at any time for inspection and monitoring;
 - (5) take samples of minerals for verification and validation purposes;
 - (6) issue order(s) or levy fines and penalties to the permit Holder for any non-compliance or infringement of terms and conditions of the permit, MMMA 1995 and MMR 2022; and
 - (7) submit a report to the Head Office after completion of the inspection and compliance monitoring of such activities.
30. The DGM shall:
 - (1) maintain the confidentiality of the reports and data submitted until an appropriate time for disclosure or sharing is determined;

- (2) disclose or share the confidential material or document only through a written consent of the Exploration Permit Holder. The Exploration Permit Holder shall not withhold such consent without strong basis; and
- (3) use (including publication) reports or data if DGM deems it as a public or national interest and the DGM may request additional information on the reports.

31. The Exploration Permit Holder shall:

- (1) undertake exploration work in accordance with Chapter V of this Guidelines;
- (2) inform in writing to the Divisional Office of DoFPS, Local Government and other relevant agencies prior to the commencement of the mineral exploration works;
- (3) cooperate with the officer(s) or inspector(s) at all times when they are on inspection and monitoring;
- (4) produce Exploration Permit and other relevant records/documents;
- (5) keep accurate records of exploration activities including financial records carried out as may be prescribed under this Guidelines;
- (6) carry out exploration in accordance with Terms and Conditions of the Exploration Permit;
- (7) abide by all regulations, orders and standards as may be issued by the DGM;
- (8) ship samples to other countries for analysis with prior approval from DGM;
- (9) submit half yearly progress report to DGM including the findings on geology and mineralization and expenditure made for the exploration work on or before 15th day of the following month;
- (10) submit Final Report to DGM within 6 months from the date of expiry of permit fulfilling the standards as per Annexure 3 of this Guidelines;
- (11) submit survey or raw field data to Geological Survey Division of DGM for archival in the system maintained by DGM;

- (12) submit all the digital data of GIS (in shapefile) and images (in JPEG or TIFF, GeoTIFF or PNG) to the Geological Survey Division of DGM; and
- (13) keep all data, drill cores and other samples for at least one year after the expiry of the permit. After this period, all data, drill cores and other samples shall be submitted to DGM before its discard and destruction.

PART II: MINERAL EXPLORATION UNDER RGOB FUNDING

Chapter 4. Exploration by DGM

34. The Exploration Program under RGoB funding shall be guided by the MRDP, FYP, EDP, MDP and available geological and mineral resources information of the country.
35. The DGM shall carry out the planned exploration activity on its own or outsource to a qualified exploration firm where DGM has capacity constraints.
36. The DGM shall hire the qualified exploration firm for execution of the planned exploration activity using appropriate method of selection, in accordance with the provisions of the Procurement Rules and Regulations.
37. The DGM shall inform in writing to the Divisional Office of DoFPS, Local Government and other relevant agencies prior to the commencement of the mineral exploration work.
38. The DGM shall seek consent from the private registered landowner or a person in custody of such land prior to commencement of the exploration works.
39. The RGoB shall pay fair compensation to the land and property owner if any damages are caused during exploration.
40. The exploration work under RGoB funding shall be undertaken in accordance with Chapter V of this Guidelines.
41. The exploration team of DGM or exploration firm shall remove all the installation and restore any environmental damages in the area on completion of the exploration activity.
42. The exploration team of DGM shall report on the progress and way forward to the DGM on a monthly basis.
43. The exploration firm undertaking exploration works on behalf of DGM shall report on the progress and way forward to the DGM as per the contractual term.
44. The DGM shall prepare the exploration report in accordance with Annexure 3 of this Guidelines and submit it as per the department target.

45. The exploration firm undertaking exploration works on behalf of DGM shall prepare the exploration reports in accordance with Annexure 3 of this Guidelines and submit to the DGM as per the contractual term.
46. The exploration team of DGM or exploration firm undertaking exploration works on behalf of DGM shall present the findings of the exploration to the DGM for further directive or action.

PART III: GENERAL PROVISIONS

Chapter 5. Code of Exploration Practices

This Chapter shall provide standards and specifications to be fulfilled for Exploration in the Kingdom by both Exploration Permit Holder and exploration under RGoB funding.

General Code of Practices

47. The Exploration work in the country shall ensure the following:
- (1) abide by the provisions of MMMA 1995, MMR 2022, this Guidelines and Terms and Conditions of the Exploration Permit, where relevant;
 - (2) abide by the methods, specifications, and standards mentioned under this Guidelines;
 - (3) carry out the activities without disturbing or damaging cultural and heritage sites, properties of government, private and corporate, with exception to possession of prior approval or permission;
 - (4) carry out with minimal interference to locals, other lawful activities and not expose a person or third-party property to danger;
 - (5) carry out the exploration activities with minimal impacts to forests and the natural environment. In unavoidable circumstances, the permit holder shall adhere to the provisions of the environmental and forestry legislations of the Kingdom of Bhutan.
 - (6) provide adequate first aid kits with proper signs maintained; and
 - (7) use adequate PPE and abide by the OHS standards.

Stages of Exploration

49. In this Guidelines, exploration shall comprise of (1) Prospecting, (2) General Exploration and (3) Detailed Exploration.
50. The detailed standards and specifications for each stage of exploration are provided in Annexure 1 of this Guidelines.

Social and Environment Management

51. The exploration activities shall be carried out:
- (1) in accordance with the provisions of the environmental legislations and standards of the Kingdom of Bhutan; and
 - (2) with minimal social and environmental impact by implementing the mitigation and management measures provided in Annexure 2 of this Guidelines.

Annexure 1. Stages of Exploration

a. Prospecting Stage

The objective of prospecting is to identify a deposit for further exploration. Estimates of quantities and grades are inferred, based on interpretation of geological, geophysical and geochemical results. This stage of exploration may include geological mapping, sampling, pitting, trenching, drilling, Petrological and Mineralogical Studies, sample analysis and reserve estimation. The details of the standards for each work item are provided below:

1. Geological mapping

The following are the standards for geological mapping during the prospecting stage:

- (1) geological mapping on 1:25,000 or larger scale using Toposheet Map of NLC or DEM and geological tools;
- (2) location of data must be collected using GPS with coordinates in decimal degree and WGS 1984; and
- (3) qualitative and quantitative data must be collected and recorded based on a scale of mapping.

2. Sampling

The following sampling standards shall be required to fulfill:

- (1) sampling method recommended are Grab or Chip and Soil Sampling;
- (2) the samples collected shall be used only for analysis purposes; and
- (3) samples must be collected:
 - a. using handheld tools only;
 - b. with wide space ranging from 50-100 meters;
 - c. to represent the area of interest;
 - d. free of weathering and contamination;
 - e. with locations (geo coordinates using WGS 1984 datum);

- f. with each sample weighing 1-2 kg for petrological or mineralogical studies, and geochemical tests for non-metallic minerals and 5-100 kg for metallic minerals and geotechnical tests; and
 - g. with proper packaging and labeling.
- (4) The total allowable weight of samples collected shall be determined by DGM based on the type of mineral and purpose of analysis.

3. Pitting and Trenching

The pitting and trenching for sampling and determination of extent, size and shape of mineral of interest shall be carried out fulfilling the following:

a. Pitting

- (1) limited number(s) of pits may be carried out. The number(s) and spacing may differ depending on the nature of mineral occurrence or deposit. Spacing may range from 50-100m;
- (2) excavating about 1 x 1 m² or 1 m radius pits using handheld tools only;
- (3) the depth of the pits varies depending on the extent of weathering and location of mineral(s) of interest;
- (4) the representative material recovered from each meter of the pit must be stacked separately to collect samples for analysis to determine the variations across the mineralization; and
- (5) other materials excavated from the pit must be stacked properly for backfilling purposes.

b. Trenching

- (1) limited number of trenches with appropriate dimensions may be carried out using handheld tools only;
- (2) the number and spacing may differ depending on the nature of mineral occurrence or deposit. Spacing may range from 50-100m;
- (3) the representative material recovered from each meter of the trench must be stacked separately to collect samples for analysis to determine the variations across the mineralization; and

- (4) other materials excavated from the trench must be stacked properly for backfilling purposes.

4. Drilling

- (1) limited or few, wide spaced (200-2,000 m) drilling using handheld drilling tools may be used;
- (2) the number and spacing of drilling will depend on the type and nature of the mineral deposit;
- (3) all drill hole location(s) must be maintained on the base map of 1:25,000 or larger scale with proper geo-coordinates;
- (4) drilling must be planned and executed to ensure maximum core recovery;
- (5) drill cores must be systematically preserved and properly labeled in the core boxes for core logging purposes.

5. Petrological and Mineralogical Studies, Sample Analysis

- (1) samples collected must be tested or analyzed in a standard licensed or certified laboratory.

6. Reserve Estimation

This Guidelines shall follow Indian Classification System of Reserve. The Reserve shall include both quality (grade) and quantity (tonnes) aspects.

- (1) reserve estimates must be at least in the “Possible” category;
- (2) reserve must be estimated using an appropriate method depending on type and nature of topography and mineral deposits. Recommended methods are provided in Table 1;
- (3) the error of the estimated reserve shall not exceed 50%;
- (4) the reserve estimate is based on limited geological, geochemical and/or geophysical information; and
- (5) the level of geological confidence on the reserve is low.

Table 1. Conventional Methods of Reserve Estimation

Sl. No.	Geological Condition	Reserve Estimation Method
1	Moderately to Steeply dipping ore/mineral deposits	-Cross Section method -Longitudinal Section method -Level plan method
2	Horizontal to low dipping ore/mineral deposits	-Polygon method (triangular, square and rectangle) -Method of isograd/isopach

b. General Exploration Stage

Based on the findings and recommendations of Prospecting and/or Preliminary Socio-Economic and environmental considerations, General Exploration may be undertaken. The objective of general exploration is to establish the main geological features of a deposit, giving a reasonable indication of continuity and providing an initial estimate of extent, shape, structure, and grade. The degree of accuracy should be sufficient for deciding whether a Detailed Exploration is warranted. Estimates of quantities and grades are indicated, based on interpretation of geological, geophysical and geochemical results. The details of the standards for each item are as follows:

1. Topographical Surveying

The following are the standards for topographical surveying during the General Exploration stage:

- (1) prior to undertaking the topographical survey, carry out proper desktop study with field reconnaissance of the proposed site to assess the topography for proper mobilization of resources;
- (2) the topographical survey shall be carried out using appropriate technology and instruments to generate accurate base maps, geological maps and cross sections. Some of the available technologies or equipment are Total Station, UAV based LiDAR, photogrammetry, GNSS and RS techniques;
- (3) the topographical survey must be carried out on large scale considering nature and type of deposits;
- (4) the contour interval must be in consistent with the map scale or should be adequate enough to represent the topography;
- (5) the topographical survey or any kind of data collection must be carried out on Standard Spatial Reference Coordinate System (Preferably National Coordinate Reference System - DRUKREF-03);
- (6) in the process of map production and construction of cross sections, state of art technology in data input, spatial database management, GIS techniques, and relevant software shall be used;
- (7) the GIS layers should contain required attribute information;
- (8) the final maps should contain, inset of location Map, title, scale bar, contour interval, field data collection period, name of surveyor, name of the reference

coordinate system, orientation, legend, projected grid and all other map elements;

- (9) base Map/Fundamental Datasets may include but not limited to the following layers/features:
- Contour;
 - Drainage;
 - Infrastructures; and
 - Land Use and Land cover.
- (10) the number of cross sections should be representative of the scale of mapping and type and nature of deposits and topography;
- (11) the cross section should be oriented normal to the strike of the lithology and should represent all the lithological units. Where orientation deviates from normal to the strike, apparent dip amount must be used for sub-surface projection; and
- (12) the cross section should contain title, scale bar, orientation of the section line, legend and grid.

2. Geological Mapping

The following are the standards for geological mapping during the General Exploration stage:

- (1) geological mapping should be on a same or smaller scale topographic map;
- (2) location of data must be collected using an instrument that has the capability to collect the locational data consistent with the accuracy level of the topographic base map and in the coordinates system consistent with base data; and
- (3) qualitative and quantitative data must be collected and recorded based on a scale of mapping.

3. Sampling

The following sampling standards shall be required to fulfill:

- (1) sampling methods recommended are Groove or Channel, Core sampling, and Soil Sampling with sample spacing ranging from 25-50m; and
- (2) other requirements and standards of the samples collected shall be as per provisions of the Prospecting Stage of this Guidelines.

4. Pitting and Trenching

The pitting and trenching for sampling and determination of extent, size and shape of mineral of interest shall be carried out fulfilling the following:

a. Pitting

- (1) limited number(s) of pits may be carried out. The number(s) and spacing may differ depending on the nature of mineral occurrence or deposit.
- (2) spacing may range from 25- 50m; and
- (3) other requirements and standards shall be as per provisions of the Prospecting Stage of this Guidelines.

b. Trenching

- (1) systematic trenching may be carried out by excavating appropriate dimensions;
- (2) the numbers and spacing may depend on the nature of the mineral occurrence or deposit. Spacing may range from 25-50m; and
- (3) other requirements and standards shall be as per provisions of the Prospecting Stage of this Guidelines.

5. Drilling

- (1) diamond drilling or other drilling methods may be used;
- (2) grid or other appropriate drilling plans may be used;
- (3) boreholes must be moderately spaced (400 - 1000 m);
- (4) the number of boreholes will depend on type, and nature of the mineral deposit;
- (5) the borehole locations must be shown on a final geological map;

- (6) the width of the approach track must be not more than 2m;
- (7) clearances from concerned authority(s) for approach road, if deemed necessary, must be obtained;
- (8) drilling must be planned and executed to ensure maximum core recovery;
- (9) quality control or assurance of drilling operations and cores must be maintained;
- (10) drill cores must be systematically preserved and properly labeled in the core boxes for core logging purpose; and
- (11) systematic drill logs must be maintained by the concerned drilling professional and systematic core logs must be maintained by the geologist.

6. Petrological and Mineralogical Studies, Sample Analysis

- (1) samples collected must be tested or analyzed in a standard licensed or certified laboratory.

7. Reserve Estimation

- (1) reserve estimates must be at least in “Probable” Category;
- (2) reserve must be estimated using an appropriate method, which will depend on the type and nature of topography and mineral deposits. Recommended methods are provided in Table 1;
- (3) the error of the estimated reserve shall not exceed 30%;
- (4) the reserve estimate is based on moderate geological, geochemical and/or geophysical information; and
- (5) the level of geological confidence on reserve is moderate.

c. Detailed Exploration Stage

Detailed Exploration involves clear three-dimensional delineation of a known deposit extent, shape, structure, grade, and other characteristics of the deposit with a high degree of accuracy. A decision whether to conduct a Feasibility Study can be made from the information provided by Detailed Exploration. Estimates of quantities and grades are measured, based on interpretation of geological, geophysical and geochemical results. The work items and standards for detailed exploration are as follows:

1. Topographical Surveying

The following are the standards for topographical surveying during the Detailed Exploration stage:

- (1) the requirements and standards shall be as per the provisions of the General Exploration Stage of this Guidelines.

2. Geological Mapping

The following are the standards for geological mapping during the Detailed Exploration stage:

- (1) the requirements and standards shall be as per the provisions of the General Exploration Stage of this Guidelines.

3. Sampling

The following sampling standards shall be required to fulfill:

- (1) sampling methods recommended are Groove or Channel, Core sampling, and Soil Sampling with the sample spacing ranging 5 to 50 meters; and
- (2) other requirements and standards shall be as per the provisions of the General Exploration Stage of this Guidelines.

4. Pitting and Trenching

The pitting and trenching for sampling and determination of extent, size and shape of mineral of interest shall be carried out fulfilling the following:

a. Pitting

- (1) the number(s) and spacing of pits may differ depending on the nature of mineral occurrence or deposit. Spacing may range from 5- 50m;

- (2) other requirements and standards shall be as per the provisions of the General Exploration Stage of this Guidelines.

d. Trenching

- (1) the numbers and spacing may depend on the nature of mineral occurrence or deposit. Spacing may range from 5-50m;
- (2) other requirements and standards shall be as per the provisions of the General Exploration Stage of this Guidelines.

5. Drilling

The following are the standards for drilling during the Detailed Exploration stage:

- (1) boreholes must be closely spaced (less than 400m);
- (2) other requirements and standards shall be as per the provisions of the General Exploration Stage of this Guidelines.

6. Petrological and Mineralogical Studies, Sample Analysis

Samples collected must be tested or analyzed in a standard licensed or certified laboratory.

7. Reserve Estimation

- (1) reserve estimates must be at least in “Proven” Category;
- (2) reserve must be estimated using an appropriate method, which will depend on the type and nature of topography and mineral deposits. Reserve estimation based on 3-D modeling and geo-statistical techniques using standards software may be used;
- (3) the error of the estimated reserve shall not exceed 20%;
- (4) the reserve estimate is based on detailed geological, geochemical and/or geophysical information; and
- (5) the level of geological confidence on the reserve is high.

Annexure 2. Social and Environmental Management in Exploration projects

TYPE	ACTIVITIES	POTENTIAL IMPACT	MITIGATION MEASURES	MANAGEMENT PLAN
LAND	1. Camping, surveying, mapping. 2. Drilling activities 3. Pitting and trenching. 4. Construction of approach tracks and roads.	Damages to topography and physiography, removal of vegetation, waste generations, soil pollution from oil spillages	1. Minimize the vegetation clearance, confined to wherever necessary only. 2. Select the ideal camping location (appropriate distance from villages, safe and stable) avoiding ecologically sensitive areas. 3. Carry out Drilling, pitting and trenching, construction of tracks within standards of this Guidelines. 4. Carry out proper segregation and disposal of waste. 5. Install Trays/thick plastic mats beneath stationary machinery and oil drums to prevent oil spills.	1. Undertake Re-plantation works. 2. Carryout landscaping, if necessary 3. Backfill and seal any dug land, holes, pits and trenches. 4. Construct proper drainages. 5. Implement the terms and conditions of the permit. 6. Dispose waste in a safe or designated area. 7. Adopt precautionary measures to prevent wildfires. 8. Carry out proper closure of the sites with necessary reclamation/restoration works. 9. Stock the oil absorbent materials for any potential oil spill.

AIR	1. Drilling activities 2. Vehicles and machine exhaust fumes	Air pollution/Dust emission	1. Transport material in closed vehicles to reduce dust emission. 2. Carry out regular maintenance of vehicles and machines. 3. Use dust suppression and air pollution control systems to meet the desired standard. 4. Implement drilling control standards.	1. Wear personal protection equipment. 2. Regulate the driving speeds on-site. 3. Use dust suppression and air pollution control systems to meet the desired standard.
WATER	1. Camping, surveying, mapping. 2. Drilling activities 3. Pitting and trenching. 4. Construction of approach tracks and roads.	Induced pressure on local water resources, decrease in groundwater recharge potential, contamination of nearby water bodies.	1. Maintain a natural drainage system. 2. Minimal spillage of fuels and lubricants used for drilling. 3. Inspect leakages of the fuels and lubricants containers and machines. 4. Select the ideal location of the drilling pump away from the water bodies. 5. Ensure responsible sharing and use of water resources with the local community. 6. Proper maintenance of sanitation and drinking water in the camp and field sites.	1. Clean any spillage of fuels and lubricants from drilling. 2. Rectify any leakages of fuels and lubricant containers and machines. 3. Rectify damages caused to community water sources. 4. Dismantle and seal properly, the toilets and degradable waste pits. 5. Construct and maintain a garland drain and siltation pond.

WILD LIFE	1. Camping, surveying, mapping. 2. Drilling activities 3. Pitting and trenching. 4. Construction of approach tracks and roads.	Fragmentation and loss of wildlife habitat, Increased risk of poaching and hunting of animals, stress on local resources.	1. Prohibit encroachment of established habitat and corridor. 2. Provide proper advocacy to the prospecting/exploration team. 3. Avoid poaching or hunting of wild animals including malicious scarring, harassing, attracting or chasing of wild animals. 4. Avoid picking up the remains (part or whole) of the wild animal.	1. Backfill all excavations resulted from prospecting/exploration activities. 2. Carry out replantation and reclamation works.
SOCIAL & ECONOMIC	1. Camping, surveying, mapping. 2. Drilling activities 3. Pitting and trenching. 4. Construction of approach tracks and roads.	Impact on social and economy Influx of people.	1. Provide part time employment to local inhabitants. 2. Maintain harmony with the community. 3. Ensure no damages to the infrastructures, cultural and heritage sites and properties.	1. Rectify any damages to the infrastructures, cultural and heritage, and properties must be carried out on a common understanding of all parties involved. 2. Resolve any pending social issues before leaving the camp.

OTHERS	1. Aerial survey 2. Camping, surveying, mapping. 3. Drilling activities 4. Pitting and trenching. 5. Construction of approach tracks and roads.	Noise and vibration	1. Serve prior notice to the local government authority. 2. Ensure that the activities be carried out between 6 AM and 10 PM, if near settlements.	1. Rectify any damages caused. 2. Provide appropriate personal protective equipment.
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Annexure 3. Report Standards and Format

The Exploration Report must be submitted to DGM in following standards or format:

- (1) Font size 14-16 for headings, 12 for others;
- (2) Font style must be “Times New Roman”;
- (3) Paper size must be A4 for text and appropriate size for maps and cross-sections (not less than A3);
- (4) softcopy (PDF) and one hard copy;
- (5) Units used must be in SI unit system;
- (6) pictures or photographs must be in color with proper annotations;
- (7) Proper captions for tables, figures, annexures, appendices etc;
- (8) All the maps, cross-sections, annexure, and appendix and other supporting documents must be enclosed with reports in proper sequence; and
- (9) the survey or base data (in softcopy) to determine the consistency of the map and data.

The following layout or outline should be included in the Mineral Exploration Report:

Cover page

The title, author, submission date (dd/mm/yy), representative photo, company or firm logo (if relevant), permit number.

Abstract or Executive Summary

A brief description of background, objectives, study area, methodology, results, conclusion, and recommendations not more than 350-700 words.

Table of Content

With proper categorization of headings and page number, list of figures, tables, pictures, plates, and annexure etc.

1. Introduction

Should include: (1) Concise and appropriate background scope, and limits of the work; (2) aims and objectives of the study; (3) Detailed description on study area including locations, accessibility, topography, drainage, climate, flora and fauna; and (4) Outline what has been done before by citing truly pertinent literature, but do not include a general survey of semi-relevant literature.

2. Regional Geological Setting

A brief description of regional geology of the study area using existing information.

3. Materials and Methods or Techniques Applied

This section should succinctly describe what was done. It should include a description of the techniques used including the scale of mapping, sampling methods, analytical techniques, geophysical methods, statistical procedures, drilling methods, surveying methods, data analysis, software used, etc.

4. Results and Discussion

This section should present the findings/results with respect to methods or techniques used in 3. The findings should include but not limited to:

- (1) discuss analytical results on geology, structures, petrological & mineralogical studies;
- (2) laboratory analysis results;
- (3) geological reserve estimation; and
- (4) other graphical results or maps.

5. Conclusions and Recommendations

- (1) include summarized key findings or result;
- (2) key findings should be based on the evidence presented in the report and validated against the studies or methodology of similar kind; and
- (3) based on conclusive evidence, the recommendation can be made for decision making.

6. Acknowledgement

A brief acknowledgement to an individual and/or organization.

7. References

- (1) the purpose of the reference is for the credibility of the report and to help readers;
- (2) find the literature easily;
- (3) the references shall be in the Standard Referencing System (e.g. Harvard, Chicago, APA etc); and
- (4) in-text citation for all the references listed under this section shall be provided in the report.

8. Annexures

Annexures shall include but not limited to:

- (1) maps, cross-sections, models, core and sample logs, and laboratory results.

ANNEX I

N ↑ <North Arrow>	<Title of the Map with theme and subject of a Map> <Sub-title: name of location, administration, geog,Dzongkhag> <Map Scale, Representative Factor(RF)>			27°42'N 27°40'N
27°42'N 27°40'N	90°38'30"E 90°38'00"E	90°41'30"E 90°41'00"E	90°47'0"E 90°46'30"E	
Body of Map Text				
Note: Font and Symbols Size Guidelines https://www.esri.com/arcgis-blog/products/product/mapping/guidelines-for-minimum-size-for-text-and-symbols-on-maps/ Dimensions of A3-A1 size paper				

<Logo and Name of the organization or Firm>			
<Legend>	<Name of the Geologist/Surveyor>	<Name and Signature of Approving Authority>	<Location Map>



For Official Use	
Application ID No.	
Date received	
Receiving Officer	
ANNEXURE 4. FORM EP-1 (APPLICATION FOR EXPLORATION PERMIT)	

APPLICANT DETAILS												
a. INDIVIDUALS												
Title (tick)*	Mr.		Mrs.		Ms.		Dasho		Dr.		Others	
Name*												
Postal Address												
Telephone No.						Mobile No.*						
CID No.*						Email ID*						
b. LICENSED FIRMS OR COMPANY												
Name*												
Postal Address*												
Telephone No.						Mobile No.*						
License No.*						Email ID*						
SHORT DESCRIPTION OF THE PROPOSED EXPLORATION ACTIVITY												
Mineral(s) of interest*												
Proposed duration*												
Source of Finance*	Loan						Equity					

Technical competence & experience						
Workforce requirement & recruitment*						
Land ownership*	SRF (acres)		Private (acres)		Total area (acres)	

LOCATION OF THE PROPOSED EXPLORATION ACTIVITY					
Place*			Nearest village*		
Gewog*			Dungkhag/Dzongkhag*		
Geographical Coordinates*	Latitude	° ' " N	Longitude	° ' " E	

DECLARATION
<i>I hereby declare that the information provided herewith are true to the best of my knowledge and in the event of false or misleading information, I shall be liable for any action under the Mines and Minerals Management Act and Regulations thereof.</i>

SIGNATURE*			
Signature*	Applicant	Witness	
	Affix legal stamp		
		Name*	
		CID No. *	
	Contact no. *		
Date:			
Place:			

Required documents to be attached:

<i>Sl. No.</i>	<i>Appendices</i>	<i>Appendix No.</i>	<i>Tick (✓) mark if enclosed</i>
1	Description of exploration activity (<i>description of area, exploration plan and value addition proposal</i>) Description of area - a written description of the area such as location, type of land, land use, cultural and heritage, accessibility, topography, vegetation, drainage, flora and fauna, the potential of mineral(s) of interest, settlements, demography, infrastructures, objective of the proposal, and likely environmental impacts. Exploration Plan - Exploration Plan containing work items, equipment, methodology, timeline, deliverables and cost estimates, which may be supported by maps, figures, etc. Project Proposal - proposal for use of mineral and value additions to process mineral deposit as captive mines.	A	
2	Location map with proposed boundary (<i>a map in the scale of 1:25,000 or larger with clearly delineated proposed exploration area boundaries and geo-coordinates showing important infrastructure, settlements, cultural and heritage sites, natural drainage system, roads and footpaths, etc. in the surrounding area</i>)	B	
3	Curriculum Vitae (CV) along with certificates of the qualified professionals with a minimum of Bachelor's Degree in Geology, and other relevant disciplines OR persons with a minimum of at least five years of field experience in mineral exploration validated by relevant authority, to be engaged in the exploration activity.	C	
4	Copy of CID in case of individual/license/company registration certificate.	D	
5	A copy of Household Information (family tree) issued by MoHCA for an individual or proprietor of a licensed firm.	E	
6	Written consent letter from the private landowner if the proposed area falls within private registered land.	F	

ANNEXURE 5. FORM EP-2 (EXPLORATION PERMIT)**Permit No:****Date:**

The Department of Geology and Mines (DGM) under Ministry of Energy and Natural Resources, hereby issue this Exploration Permit as under:

i. Detail of the Exploration Permit Holder

a. Name: _____

b. CID/License number: _____

c. Postal address: _____

d. Email ID: _____

e. Mobile number: _____

ii. Details of the permit

a. Mineral(s):

b. Location:

Place/Village(s): _____; Nearest Village: _____;

Gewog: _____; Dungkhag/Dzongkhag: _____;

c. Area (acres): SRF: _____ Private: _____ Total: _____

d. Validity Period: from _____ to _____

Terms and Conditions

1. The Exploration Permit Holder shall carry out the exploration:

- (1) for the approved mineral(s) only;
- (2) within the validity period only;
- (3) by consulting geologist and relevant professionals; and

- (4) in accordance with the relevant provisions of MMMA 1995, MMMR 2022, Mineral Exploration Guidelines 2023, Terms and Conditions of this Exploration Permit and other relevant laws of the Kingdom.
2. The Exploration Permit holder shall:
 - (1) report discovery of any other mineral not specified in the permit, fossil, and gemstone discovered during exploration to the DGM within 30 days from the date of discovery;
 - (2) obtain approval from the DGM to carry out exploration of mineral(s) reported in 2 (1), subject to expression of interest and eligibility;
 - (3) not transfer or sublet the Exploration Permit to any third party;
 - (4) pay fair compensation to the land and property owner if any damages are caused during exploration;
 - (5) carry out the social and environmental mitigation and management measures in line with the Annexure 2 of the Mineral Exploration Guidelines 2023 to minimize social and environmental impacts.
 - (6) submit half yearly progress report to the DGM on or before the 15th day the following month as per section 33(9) of this Guidelines;
 - (7) submit the Final Report to the DGM within 6 months from the date of expiry of permit as per section 33(10) of this Guidelines; and
 - (8) remove all the installation and restore any environmental damages in the area within a year of expiry, withdrawal, surrender or termination of the permit to the satisfaction of the DGM;
3. The Exploration Permit Holder shall be debarred for future exploration permits in the event of failure to remove all the installations and restore any environmental damages in the area after the expiry, withdrawal, surrender or termination of the Exploration Permit.
4. The Exploration Permit Holder may submit a written application for surrender of a part or whole of the Exploration Permit Area to DGM.
5. This Exploration Permit does not guarantee automatic grant of mining lease to the Exploration Permit Holder. The mining leasing process shall entail the fulfillment of a separate set of procedures and clearance requirements in line with the provisions of MMMA 1995 and MMMR 2022.

6. Failure to abide by the provisions of MMMA 1995, MMR 2022, Mineral Exploration Guidelines 2023 and the Terms and Conditions of this Permit may lead to suspension or termination of the Exploration Permit.

(Chief Geologist)
Geological Survey Division
Department of Geology & Mines

Copy to:

1. Director, DGM, Thimphu for kind information
2. Dasho Dzongdag, Dzongkhag Administration, for kind information
3. Gup, Gewog Administration,for kind information.
4. Chief Engineer, Mining Division, DGM, Thimphu for information.
5. Chief Engineer, Mineral Policy and Cadastre Division, DGM, Thimphu for information.
6. Chief Forest Officer Divisional office, DoFPS for information
7. Chief Environmental Officer, EACD, DoECC, MoENR, Thimphu for information
8. Regional Director, RRCO, for information
9. Regional Coordinator, DGM, for information and necessary compliance monitoring.

Attachment:

1. Topographical Map of the approved area showing the boundaries and coordinates of approved mineral exploration areas on 1:25,000 scale or larger, and the surrounding area showing important infrastructure, settlements, cultural and heritage sites, natural drainage system, roads and footpaths, etc.