



## mineral resources

Department:  
Mineral Resources  
REPUBLIC OF SOUTH AFRICA

**NAME OF APPLICANT:** SEDEX MINERALS (PTY) LTD.

**REFERENCE NUMBER:**

# **PROSPECTING WORK PROGRAMME**

## **SUBMITTED FOR A PROSPECTING RIGHT APPLICATION WITHOUT BULK SAMPLING**

**AS REQUIRED IN TERMS OF SECTION 16 READ TOGETHER WITH REGULATION  
7(1) OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT  
28 of 2002)**

### **STANDARD DIRECTIVE**

All applicants for mining rights are herewith, in terms of the provisions of Section 16 and in terms of Regulation 7(1) of the Mineral and Petroleum Resources Development Act, directed to submit a Prospecting Work Programme, strictly under the following headings and in the following format together with the application for a prospecting right.

## 1. REGULATION 7.1.(a): FULL PARTICULARS OF THE APPLICANT

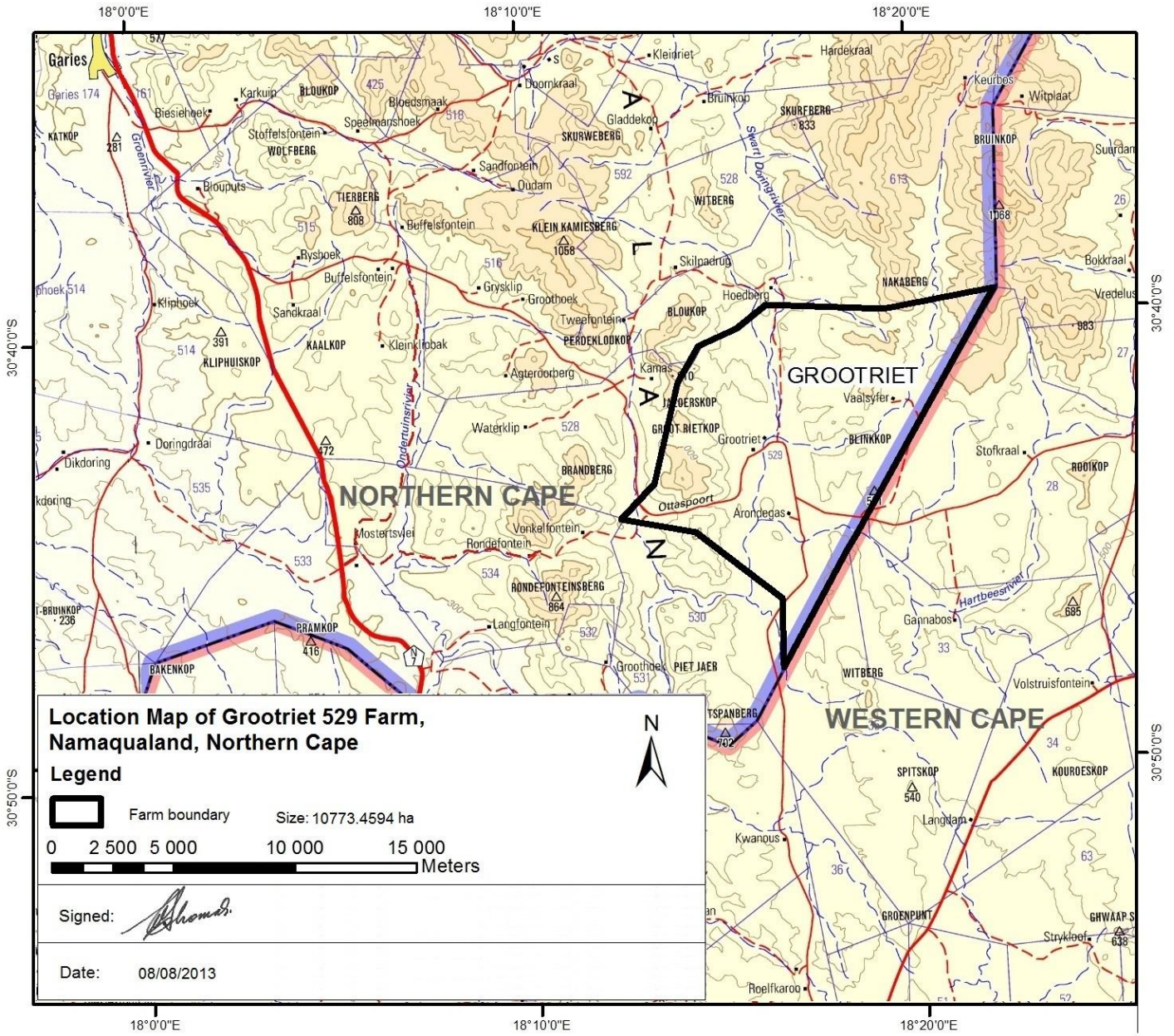
**Table 1: Applicant's Contact Details**

ITEM	COMPANY CONTACT DETAILS
Name	Cyril Thomas
Tel no	021 446 6040
Fax no:	021 446 6050
Cellular no	083 626 1318
E-mail address	cthomas@frontierrareearths.co.za
Postal address	P. O. Box 8399 Foreshore, Cape Town 8012

**Table 2: Consultant's Details**

ITEM	CONSULTANT CONTACT DETAILS (If applicable)
Name	Not applicable
Tel no	
Fax no:	
Cellular no	
E-mail address	
Postal address	

2. REGULATION 7(1)(b): PLAN CONTEMPLATED IN REGULATION 2(2) SHOWING THE LAND TO WHICH THE APPLICATION RELATES



### 3. REGULATION 7(1)(c): THE REGISTERED DESCRIPTION OF THE LAND TO WHICH THE APPLICATION RELATES

The farm Grootriet No. 529, is situated in Namaqualand District, Northern Cape Province.

### 4. REGULATION 7(1)(d) and (e): THE MINERAL OR MINERALS TO BE PROSPECTED FOR

**Table 4.1: Minerals to be prospected for**

ITEM	DETAIL
Type of mineral(s)	Limestone
Type of minerals continued	Calcite
Type of minerals continued	Dolomite
Type of minerals continued	Sulphur (in Pyrite)
Locality (Direction and distance from nearest town)	The nearest town to the north west is Garies (approx. 30kms) and Bitterfontein (approx. 35kms) to the south west.
Extent of the area required for prospecting	10 773.4594 hectares
Geological formation	Grootriet Formation of the Vanrhynsdorp Group

#### 4.2 Description why the Geological formation substantiates the minerals to be

**prospected for** (provide a justification as to why the geological formation supports the possibility that the minerals applied for could be found therein)

A simplified geological map of the Grootriet farm is shown in Figure 4.3 below. Here the Vanrhynsdorp Group rocks outcrop in a north-south trending half graben where the western side is bounded by a fault and the eastern side lies unconformably on the Namaqualand Metamorphic Province basement gneiss.

The stratigraphy of the Vanrhynsdorp Group in this area consists of the basal unit of immature quartz arenites and conglomerates of the Flaminkberg Formation overlain by the Grootriet Formation consisting of the blue-black limestone. This in turn is overlain by the Hoedberg Formation greenish laminated carbonaceous shale. These are the important units for defining the limestone horizon as the upper hanging wall consists of shale while the lower foot wall consists of quartzite and conglomerates.

The Grootriet Formation crops out along a strike length of 10km (with a further 2.5km occurring in the Western Cape) and while it is not continually exposed along this length, as the underlying and overlying units are better exposed, it is suspected that the Grootriet Formation will also be continuous along the 12.5km strike length albeit covered by alluvium in places.

Martini (1987) compiled a handbook on the limestone and dolomite resources of South Africa and describes the Grootriet Formation on the Grootriet farm as a bed 10km long by 500m wide in outcrop, dipping to the west at 30° and partly covered by an alluvial blanket. He further notes that the limestone succession is about 150m thick and includes ~40% of intercalated shale. He collected a series of samples from the base (sample 1) across the stratigraphy to the top (sample 10). The partial analyses carried out by MINTEK are listed in Table 1.

**Table 1: Chemical analyses (in Wt%) of limestone from Grootriet**

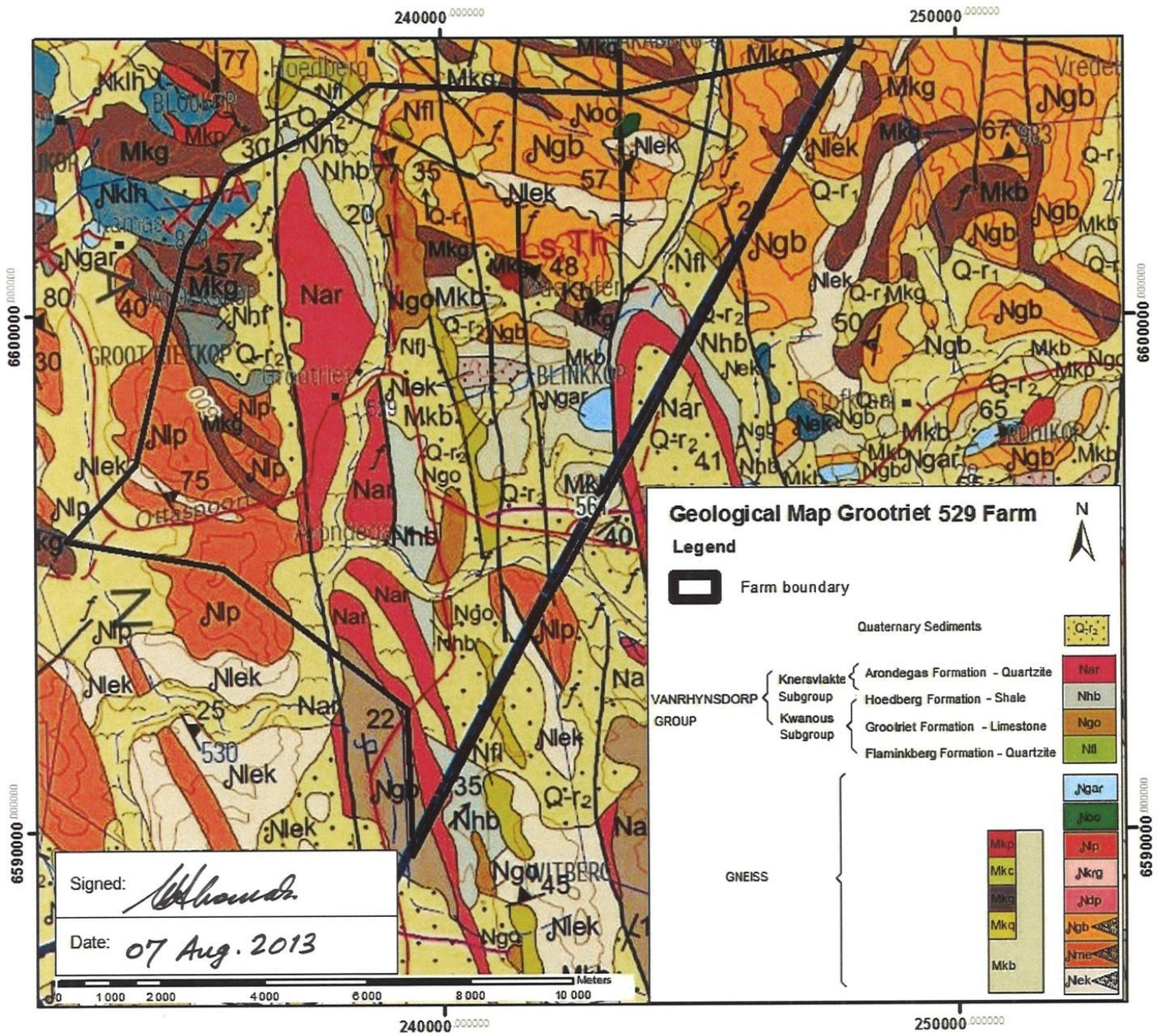
Sample	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MgO	CaO	CaCO <sub>3</sub> *
1	0.14	0.24	0.07	0.04	55.80	99.7
2	0.35	0.10	0.11	0.43	55.32	98.7
3	0.37	0.10	0.13	0.39	55.39	98.8
4	2.89	0.83	0.34	0.12	53.33	95.1
5	0.48	0.10	0.11	0.20	55.24	98.6
6	1.65	0.45	0.25	0.28	54.12	96.7
7	1.21	0.37	0.17	0.24	54.68	97.7
8	1.28	0.30	0.14	0.54	54.06	96.5
9	0.87	0.25	0.12	0.35	54.99	98.2
10	3.52	0.25	0.12	0.43	53.00	94.6
<b>Average</b>	<b>1.28</b>	<b>0.30</b>	<b>0.16</b>	<b>0.30</b>	<b>54.59</b>	<b>97.46</b>

\* Carbonate content calculated from CaO values.

Martini (1987) noted the high quality of the limestone material and provided a conservative estimate of the resource of >30 million tonnes.

#### **4.3 Attach a geological map that justifies the description why there is a possibility that the minerals applied for could occur on the land concerned.**

See geological map on next page.



**5. REGULATION 7(1)(f): A DESCRIPTION OF HOW THE MINERAL RESOURCE AND MINERAL DISTRIBUTION OF THE PROSPECTING AREA WILL BE DETERMINED**

**AND**

**REGULATION 7(1)(h): ALL PLANNED PROSPECTING ACTIVITIES MUST BE CONDUCTED IN PHASES AND WITHIN SPECIFIC TIMEFRAMES**

**AND**

**REGULATION 7(1)(i): TECHNICAL DATA DETAILING THE PROSPECTING METHOD OR METHODS TO BE IMPLEMENTED AND THE TIME REQUIRED FOR EACH PHASE OF THE PROPOSED PROSPECTING OPERATION**

Refer to Table 5.1 for details.

The table below incorporates the information required in respect of Regulations 7(1)(f), 7(1)(h) and 7(1)(i):

Table 5.1

Phase	Activity	Skill(s) required	Timeframe	Outcome	Timeframe for outcome	What technical expert will sign off on the outcome?
1	<b>Non-Invasive Prospecting</b> Investigation and compilation of the historical data, mapping and magnetic survey	Geologist	Months 0-6	Report and map showing limestone distribution	Month 6	Geologist
2	<b>Invasive Prospecting</b> Grid rock sampling, pitting and analysis	Geotechnical team	Months 7-12	Report and maps emphasising most prospective areas	Month 12	Geologist
3	<b>Invasive Prospecting</b> RC Percussion and diamond drilling to 100m, analysis and resource modelling	Geologist, field assistants and drilling company	Months 13-24	Code compliant resource estimate	Month 24	Independent Resource Consultant
4	<b>Invasive Prospecting</b> Infill drilling as required, analysis and resource modelling	Geologist, field assistants and drilling company	Months 25-36	Measured, Indicated and Inferred resource estimate	Month 36	Independent Resource Consultant
5	<b>Non-Invasive Prospecting</b> Composite high grade drill samples	Metallurgist	Months 36-42	Limestone grinding curves and reactivity tests	Month 42	Independent Metallurgical Group
6	<b>Non-Invasive Prospecting</b> Mine and plant design, mining right application	Mining engineers, metallurgists, environmental.	Month 43-60	Preliminary Economic Assessment technical report	Month 60	Independent Mining Consultants



## 6. REGULATION 7(1)(g): A DESCRIPTION OF THE PROSPECTING METHOD OR METHODS TO BE IMPLEMENTED

### (i) DESCRIPTION OF PLANNED NON-INVASIVE ACTIVITIES:

(These activities do not disturb the land where prospecting will take place e.g. aerial photography, desktop studies, aeromagnetic surveys, etc)

The area under application has already been mapped by the Council of Geoscience at a scale of 1:250 000 (see: The geology of the Loeriesfontein Area Sheet 3018) where a limestone unit of the Grootriet Formation has been clearly identified over a 7km strike length.

**Phase 1** of the non-invasive prospecting work will take approximately four months and will compile the relevant data and observations from the historical survey work coupled with detailed mapping and ground magnetometer survey of the limestone units. The deliverables will be a detailed report and maps highlighting areas with the best potential for high grade limestone deposits.

**Phase 5** of the non-invasive prospecting will consist of off-site metallurgical test work, at MINTEK or similar facility. This work will investigate the crushing and grinding equipment required to produce a pulp of 80% less than 45µm. The reactivity of the pulp with sulphuric acid will also be tested to ascertain the suitability of the material for acid neutralisation. A suitably sized and representative sample for the metallurgical test work will be obtained from compositing all the borehole intersections.

**Phase 6** of the non-invasive prospecting will be developing a preliminary economic assessment further discussed in Section 6 (iii).

### (ii) DESCRIPTION OF PLANNED INVASIVE ACTIVITIES:

(These activities result in land disturbances e.g. sampling, drilling, bulk sampling, etc)

**Phase 2** of the invasive prospecting will initially consist of surface limestone sampling on a regular grid over areas that have been defined as limestone bearing outcrop at the surface. The samples will have to be taken from the surface and in some instances pitting to penetrate the wind-blown sand that is common in this area. This may involve digging a small shallow hole (<2m deep) to sample the limestone bedrock. The hole will be rehabilitated immediately after the sample is taken. The sample lines will be traversed by foot so no new tracks will be formed by the field vehicles. The samples will be analysed for their calcium carbonate content. The data will be interpreted and an anomaly map developed of the most prospective areas.

It should be clearly noted that each step or phase of the prospecting activities depends on encouraging results from the previous step.

**Phase 3** of the invasive prospecting will be to drill the most promising areas on a coarse grid (~100m x 100m). The drilling method will be Reverse Circulation (RC) to eliminate sample contamination as far as possible. The drill rig will be truck-mounted with a compressor and will be positioned on the drill site using GPS techniques. The holes will be drilled to penetrate the limestone bedrock to a maximum of 100m. RC is a dry drilling technique and no water will be required at the drill site. Once the holes have been drilled the collar positions will be surveyed by a professional surveyor. The holes will be logged and sampled every metre by a geologist and geotechnical team.

As per the Company's standard operating procedures the drill site will be photographed before, during and after drilling and after rehabilitation of the site. A permanent record will be kept on file of these activities.

The samples will be analysed in an appropriate certified laboratory for their calcium carbonate content. The results will be interpreted and an ore-body map developed. If the grades and volumes are encouraging the data will be provided to an independent Consultant to estimate the overall grade and resource tonnages using code compliant (Canadian National Instrument 43-101) resource calculation techniques. This will provide a reliable estimate of what the deposit contains and should enable a clear decision as to the future work required on the programme.

**Phase 4** of the invasive prospecting activities will be to carry out infill drilling to further constrain and define the ore-body. The same procedures as for Phase 3 will be followed except the drill spacing will be closer (50m x 50m) grid. The data consisting of borehole logs, geochemistry and mineralogy at 1 metre intervals, collar position and other pertinent information will be provided to the independent Consultant to upgrade the resource and tonnages estimates of the ore body. If, at this time, the resource is considered attractive to the company then Phase 6 will be implemented to develop the mining operation plan.

**(iii) DESCRIPTION OF PRE-FEASIBILITY STUDIES**

(Activities in this section includes but are not limited to: initial, geological modelling, resource determination, possible future funding models, etc)

**Phase 6** of the non-invasive prospecting activities will consist of a Preliminary Economic Assessment (PEA) of the limestone deposit. In this study the mine plan for a 30 year life-of-mine will be developed including the crushing and transport of the product to the end users in the area. If this assessment is positive the Company will apply for a Mining Right.

**Commitment to provide addendums in respect of  
additional prospecting activities**

I herewith commit to provide the Department of Mineral Resources with an addendum in respect of both the EM Plan and Prospecting Work Programme regarding any future in-fill prospecting required but not described above, prior to undertaking such activities. The addendum will cover all the Regulations as per the Prospecting Work Programme.

I agree that the addendums will provide for similar activities only and if the scope changes I would be required to apply in terms of Section 102 of the MPRDA for an amendment of the Prospecting Work Programme

Mark with X

<b>ACCEPT</b>	<b>X</b>
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**7. REGULATION 7(1)(j)(i):DETAILS WITH DOCUMENTARY PROOF OF THE APPLICANT'S TECHNICAL ABILITY OR ACCESS THERETO TO CONDUCT THE PROPOSED PROSPECTING OPERATION**

**7.1 Competencies to be employed in terms of the Mine Health and Safety Act**

**COMPETENCIES TO BE EMPLOYED** (List the legal appointments that will be made in terms of the Mine Health and Safety Act, appropriate for the type of operation)

The prospecting activities will not require more than 20 workers, hence no legal appointments will be required.

However, Sedex Minerals will appoint its Exploration Manager to ensure compliance to the relevant Mine Health and Safety Act sections applicable to exploration activities.

**I herewith confirm that I, in Table 9.1 have budgeted and financially provided for the required skills listed above.**

<b>CONFIRMED</b> (Mark with an X)	<b>X</b>
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## 7.2 List of Appropriate equipment at your disposal (If Applicable)

**Table D: Appropriate Equipment Available**

Scintillometers (RadEye PRD units)
Magnetometers (Geotron)
Niton hand held X-Ray fluorescence units for analytical purposes
Binocular Microscopes
Suitable field vehicles
GPS's positioning equipment and Geological software
Personal safety equipment

### 7.3 Technical skills provided Free of Charge

**7.3.1** Information (CV's) in respect of skills already acquired (append)

**7.3.2** Copy of the relevant contractual agreements between the service provider and the applicant relative to the duration of the planned prospecting period, where applicable.(append)

**7.3.3** ALL other evidence of Technical Ability (append)

## TECHNICAL CAPABILITY

### Geological Staff

The Company's technical ability is based on the accumulated exploration knowledge and experience which is available to it through Sedex's parent company, Frontier Rare Earths' Vice President Exploration, Dr Stuart Smith, who is responsible for the development and management of detailed exploration programmes for the company's projects. Dr. Smith is a graduate in geochemistry (Ph. D.) from the University of Cape Town. He was a research scientist at the University of Cape Town for 13 years and published 18 papers in the fields of Archaean geology, stable isotope geochemistry and mineralization processes. The next 10 years were spent as exploration manager on alluvial and marine diamond deposits in South Africa and Namibia. He joined Frontier in 2007 as exploration manager. A copy of Dr. Smith's CV is attached under Annexure A.

Sedex Minerals also has access to the exploration knowledge and expertise of Frontier's Senior Exploration Geologist, Mr. Grant Hayward, who joined Frontier in 2011. Grant obtained his BSc geology degree from the University of Cape Town in 1986 and has twenty four years of exploration experience in Africa covering a wide range of deposit types and commodities. Acting as a Senior Consulting Geologist for the past twelve years he has been involved in the evaluation and resource definition of a number of ore bodies and deposit types. Grant is a team leader with extensive experience in the designing,

implementing (including staff training) and management of multidisciplinary exploration programmes utilising internationally acceptable and accountable practices. Grant has extensive experience in dealing with working conditions in Africa with a wide range of mechanical and practical skills for on-site problem solving. A copy of Grant's CV is also attached under Annexure A.

### **Field Staff**

Frontier's geological staff is supported on the ground by a highly experienced team of field staff, which is probably one of the most experienced in Namaqualand. Most of the members of the field staff are HDSA's who have been long-time residents of the Springbok area in Namaqualand and whose working lives have been exclusively spent in mineral exploration and mining.

Frontier will have three independent field exploration teams based at its Springbok office to carry out exploration at the company's exploration projects in the region. These teams will be led by three very experienced field exploration team managers - Rudolph Steyn, Thomas Malgas and Avril Van Den Heever. These personnel have been widely trained in exploration techniques and procedures over many years of working closely with a succession of highly competent exploration geologists. In addition to their field skills they all have considerable experience of drilling and exploration plant operations. The field staff's combined years of experience makes it possible for the company to conduct exploration rapidly and effectively. All members of the team have been trained in modern exploration technologies.

### ***Rudolph Steyn***

Rudolph Steyn is a highly experienced field geological and exploration team manager. He has extensive experience in all phases of geological field mapping, stream, outcrop and trench sampling and compiling and interpreting data and rock samples. He has the requisite experience to work unsupervised over periods of weeks in remote areas of the Northern Cape, exploring for and mapping mineral occurrences.

### ***Thomas Malgas***

Thomas Malgas also has extensive field geological and exploration experience. He has extensive experience in field mapping and reconnaissance exploration techniques, including stream sampling and sample identification and is fully conversant with all the requirements for working in tandem with exploration geologists and supervising junior field staff, who will be trained into higher skill and knowledge levels. He has extensive experience operating and managing exploration drilling projects using both percussion and diamond core drilling rigs.

### ***Avril Van Den Heever***

Avril Van Den Heever has broad overall experience in geometric surveys, sampling techniques and analysis of samples. She has, like the other staff, received prolonged field training by working with highly experienced exploration geologists.

Wherever possible, additional staff required for the field exploration teams will be employed from the local area.

### **Offices and equipment**

All of Frontier's exploration field staff are highly mobile and have been provided with field vehicles, GPS's, scintillometers and sampling and prospecting equipment which include magnetometers for geophysical surveying and a Niton X-Ray fluorescence unit for analysing various chemical elements. This specialized equipment provides a very efficient means for the field staff to explore the Company's prospecting permit areas. They have an operating base at the company's Springbok office and workshop, from which they can source supplies, equipment, fuel and obtain maintenance and repair services.

**Contractors and consultants**

To the extent that additional specialised geological, exploration or resource evaluation expertise is required, this will be provided either by “The MSA Group”, 20B Rothesay Avenue, Craighall Park, Johannesburg 2196 (Tel: 011 880-2184) or similar consulting group such as The Snowden Group.

The MSA Group may also be used to undertake Environmental Impact Studies, Scoping Studies and to compile EMP’s as and when required.

Drilling operations will be outsourced to an experienced exploration drilling contractor, under the supervision of the Company’s geological and field exploration staff. The preferred contractor would be either “Blue Chip Mining and Drilling”, P.O. Box 818, Kuruman, 8460 (tel. 053 712 2858) or Aarboor Drilling Contractors in Springbok (Tel. 027 712 1964).

Geochemical analysis of material recovered from field sampling, trenching and drilling will be carried out by Scientific Services cc of Unit 3, Technosquare, 42 Morningside Road, Ndabeni 7405 (Tel: 021 531-7166).

Geophysical interpretations will be carried out as required by Remote Exploration Services, from geophysical data generated from surveys done by Frontier's field staff.

Attached under “Annexure A” are company profiles of the various contractors and consultants which the Company may be using.

**8. REGULATION 7(1)(j)(ii):DETAILS WITH DOCUMENTARY PROOF OF A BUDGET AND DOCUMENTARY PROOF OF THE APPLICANT’S FINANCIAL ABILITY OR ACCESS THERETO****AND****9. REGULATION 7(1)(k) A COST ESTIMATE OF THE EXPENDITURE TO BE INCURRED FOR EACH PHASE OF THE PROPOSED PROSPECTING OPERATION (remember to also include prospecting fee)**

**Table 9.1**

ACTIVITY	YEAR 1 Expenditure (R')	YEAR 2 Expenditure (R')	YEAR 3 Expenditure (R')	YEAR 4 Expenditure (R')	YEAR 5 Expenditure (R')
<b>REHABILITATION FEES</b>	30 000				
<b>PROSPECTING FEES</b>	10 780	16 170	21 560	26 950	32 340
<b>PHASE 1 (6 months)</b>					
Desktop study and compilation of historical data, survey and mapping	50 000				
<b>PHASE 2 (6 months)</b>					
Rock sampling and rehabilitation-field teams	100 000				
Laboratory assay	20 000	-			
Interpretation and report	Included above				
<b>PHASE 3 (12 months)</b>					
Initial RC drilling (100m x100m) grid, 50 holes to average 50m		500 000			
Site establishment/de-establishment		Included above			
Assay		10 000			
Resource modelling		100 000			
<b>PHASE 4 (12 months)</b>					
Infill RC drilling, (50mx50m grid), 50 holes to average 50m			500 000		
Assay			10 000		
Resource modelling			100 000		
<b>PHASE 5 (6 months)</b>					
Metallurgical work and reactivity tests				100 000	
<b>PHASE 6 (18 months)</b>					
Commencement/completion of PEA study and Mining Right application				500 000	1 000 000
<b>Annual Total</b>	<b>210 780</b>	<b>626 170</b>	<b>631 560</b>	<b>626 950</b>	<b>1 032 340</b>
				<b>Total Budget</b>	<b>3 127 800</b>

**NOTE! If any person (including the applicant) provides services in any job or skills category at a reduced rate or free of charge, then such person's Curriculum Vitae (CV) must be attached as documentary proof of the technical ability available to the applicant.**

## **10. FINANCIAL ABILITY TO GIVE EFFECT TO THE WORK PROGRAMME**

### **10.1 The amount required to finance the Work Programme.**

(State the amount required to complete the work)

**R 3 127 800.00**

### **10.2 Detail regarding the financing arrangements**

(Elaborate on the financing arrangements, in terms of where the finance will be sourced, extent to which the financing has been finalized and on the level of certainty that such financing can be secured.)

## **FINANCIAL CAPABILITY**

The funding required for Sedex Minerals' prospecting project will be financed by its parent company, Frontier Rare Earths Ltd. Frontier listed on the Toronto Stock Exchange in November 2010 and at the time of listing raised approximately \$62m in new equity funds, mainly from Canadian and US financial institutions and approximately 500 private investors to evaluate and develop the Zandkopsdrift rare earth project as well as to invest in other mineral projects in South Africa.

Attached under "Annexure B" is a copy of Frontier's latest financial accounts for the second quarter of 2013, which show sufficient cash on hand in the order of \$41m (approx. R400m) on pages 4 and 11.

The cost estimates for all proposed work programmes in respect of all the other prospecting rights and prospecting right applications submitted by Frontier and its associated companies amount to approximately R19 million for the next 3 years. It is expected that after three years, further finance will be introduced through the introduction of new shareholders, however, should this not take place, Frontier would very comfortably be able to finance the exploration projects for its associated companies.

### **10.3 Confirmation of supporting evidence appended**

(Attach evidence of available funding and or financing arrangements such as balance sheets, agreements with financial institutions, underwriting agreements, etc. and **specifically confirm** in this regard what documentation has been attached as appendices).

Attached under "Annexure B" is a copy of Sedex Minerals' parent company, Frontier Rare Earths Ltd's, latest financial accounts as at the 30 June 2013.



**11 Confirmation of the availability of funds to implement the proposed project.**

Refer to clauses 10.2 and 10.3 above.

**12 I herewith confirm that I have budgeted and financially provided for the total budget as identified in Regulation 7(1)(k).**

<b>Confirmed (Mark with an X)</b>	<b>X</b>
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**13 REGULATION 7(1) (m): UNDERTAKING, SIGNED BY THE APPLICANT, TO ADHERE TO THE PROPOSALS AS SET OUT IN THE PROSPECTING WORK PROGRAMME**

Table: 13.1

<b>Herewith I, the person whose name and identity number is stated below, confirm that I am the Applicant or the person authorised to act as representative of the Applicant in terms of the resolution submitted with the application, and undertake to implement this prospecting work programme and adhere to the proposals set out herein.</b>	
<b>Full Names and Surname</b>	Cyril Victor Thomas
<b>Identity Number</b>	610129 5085 08 8

**END**