



**mineral resources**

Department:  
Mineral Resources  
**REPUBLIC OF SOUTH AFRICA**

**NAME OF APPLICANT:** Imerys Refractory Minerals South Africa - Cape Bentonite Mine

## **PROSPECTING WORK PROGRAMME**

**SUBMITTED FOR A PROSPECTING RIGHT  
APPLICATION WITH NO BULK SAMPLING**

**ON**

Erf 2224

Heidelberg, Western Cape

**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**

<b>ITEM</b>	<b>COMPANY CONTACT DETAILS</b>
Name	Imerys Refractory Minerals South Africa (Pty) Ltd trading as Cape Bentonite Mine
Tel no	012 643 5880
Fax no:	012 643 1966
Cellular no	-
E-mail address	<a href="mailto:Julien.conte@imerys.com">Julien.conte@imerys.com</a> & <a href="mailto:yoann.hoibian@samrec.com">yoann.hoibian@samrec.com</a>
Postal address	P.O Box 8118, Centurion 0046 & Cape Bentonite Mine, Princess Farm, PO Box 242, Heidelberg, Western Province 6665

**Table 2: Consultant's Details**

ITEM	CONSULTANT CONTACT DETAILS (If applicable)
Name	N/A
Tel no	N/A
Fax no:	N/A
Cellular no	N/A
E-mail address	N/A
Postal address	N/A

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

Refer to Appendix 1: Regulation 2(2) Layout Plan

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

The property is situated approximately 2km northeast of the town Heidelberg and can be accessed via gravel roads leading from Heidelberg off Van Riebeeck street towards the N2. Moreover, the study area falls within the Hessequa Municipality as part of the Eden District Municipality.

**Table 3: Property Details**

FARM NAME	FARM NUMBER	REGISTRATION DIVISION	PORTIONS	SG 21-Digit Code
Erf	2224	Swellendam RD	NA	C07300030000222400000

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

**Table 4: Minerals to be Prospected For**

ITEM	DETAIL
Type of mineral(s)	Bentonite (CB)
Type of minerals continued	Zeolite (Zs)
<b>Locality</b> (Direction and distance from nearest town)	The property is situated approximately 2km northeast of the town Heidelberg and can be accessed via gravel roads leading from Heidelberg off Van Riebeek street towards the N2.
<b>Extent of the area required for prospecting</b>	Erf 2224  Total property size – 101.15804Ha
<b>Geological formation</b>	Kirkwood Formation of the Uitenhage Group

**4.1 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)**

The Bentonite is a clay part of the smectite family one of the seven clay family. This deposit is situated in the Cape basin, more precisely in one of its subsidiary the Heidelberg-Riversdale Basin.

From a global point of view, the Cape Basin was first formed during the Cape Fold Belt orogeny (Permian-Triassic) as a foreland basin. Thereafter it continued to subside during the fragmentation of the Gondwana due to the opening of the South-Atlantic. This second phase was controlled by Normal faulting such as the Worcester Fault governing the Heidelberg-Riversdale Basin. These faults divides the area in two structural blocks:

- Highly deformed rocks of the Cape Fold Belt

-Sediments post orogeny slightly folded but an average dipping of 25 degrees towards the North

During the formation of the Heidelberg-Riversdale basin, Alkaline volcanic episodes took place, leading to the deposition of ashes in salted Lacustrine environment where they were subjected to hydrothermal variations.

The glass components of the ashes were chemically altered in this low energy environment and consolidated into distinct clay layers. These clay layers currently forms the Heidelberg-Riversdale Bentonite Deposits.

These deposits are also outstanding due to the salted environment in which the ashes were deposited. Indeed, this parameter will lead to the formation of Sodium Bentonite. Heidelberg-Riversdale Bentonite deposits are the only, currently mined, Sodium Bentonite deposit in South-Africa.

There are two main kinds of Bentonite:

- Sodium
- Calcium

Both of these clays have Green compressive strength and Dry compressive strength properties, used in the Foundry's industry mainly. However, calcium bentonite needs heavy processing in order to get the sodium bentonite physical properties (High viscosity/Free swell/Base exchange Capacity/Sinter Plate Absorption etc.). As a consequence, Sodium Bentonite requires a minimum energy to be processed in comparison with calcium bentonite which makes its use a lot more sustainable for the environment.

Geological work in this area has indicated that bentonite occurs as several layers in the Kirkwood Formation, overlain by conglomerate and sandstone of the Buffelskloof Formation. Zeolite is found interbedded within the bentonite in places.

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

Refer to Appendix 2: Geological Map

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

Field Mapping

Field exploration will be conducted on the farm in order to locate a hint and/or possible outcrops of Bentonite or Zeolite. Geological measurements (dip, direction, etc.) and sampling will be done on the visible outcrops. This process will enable the prospecting company to determine the approximate extension, volume and quality of the layers discovered on the Erf 2224.

Direct push sampler drilling

The direct push sampler drilling campaign will then be planned and conducted on the expected outcrop area. The sampler holes will have the following maximum temporary footprints – Diameter 60mm; depth 6m = 67.5m<sup>3</sup> overburden material produced by drilling to be backfilled immediately after sample has been taken. Samples would be collected according to the geology.

Borehole Results

Boreholes will be drilled. The drilled boreholes will have the following maximum temporary footprints - diameter 0.2m by 0.2m; depth 30m = 12 m<sup>3</sup> maximum overburden material produced per borehole to be replaced immediately after sample has been taken. Samples would be collected according to the geology.

Sampling Analysis

<1kg of sample material is collected by the geologist from each trench and borehole for testing. The samples collected are sent to the laboratory at the Cape Bentonite Mine processing plant near Heidelberg and tested for specific properties

to establish the quality of ore as well as determine approximate extension and volume of the available ore body.

#### Maps

Maps will be produced showing the location, depth and extent of physical prospecting work, together with, sampling points and the lithology, mineral content and mineral distribution identified, relative to the prospecting area.

#### Geological Modeling or Reports and Results Statements

Following the results of sample analysis conducted the geological reserve modelling is done by using SURPAC and AUTOCAD geological software to determine the grades and quantities of available bentonite and zeolite resources and produce the feasibility reports for the property as investigated/surveyed.

#### Feasibility Reports or Pre-feasibility Reports

Following the results of sample analysis conducted the geological reserve modelling is done by using SURPAC and AUTOCAD geological software to determine the grades and quantities of available bentonite and zeolite resources and produce the feasibility reports for the property as investigated/surveyed.

**AND**

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

**Table 5.1: Planned Prospecting Phases and Timeframes**

<b>PHASE</b>	<b>ACTIVITY</b>	<b>TIMEFRAME</b>
1	Field Mapping and Surveying	16 months
2	Literature Review	8 months
3	Drilling and Sampling	24 months
4	Sample Analysis/ Laboratory Work	6months
5	Reserve and Resource Modeling	6 months

**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**

**Table 5.2: Planned Prospecting Phases and Responsible Parties**

<b>PHASE</b>	<b>ACTIVITY</b>	<b>RESPONSIBLE PARTY/IES</b>
1	Field Mapping and Surveying	Geologist Surveyor
2	Literature Review	Geologist
3	Drilling  Sampling	Mining/prospecting company Drilling contractor/geologist Geologist/field assistant
4	Sample Analysis	Laboratory
5	Reserve and Resource Modeling	Geologist



**Table 5.3: Information required in respect of Regulations 7(1)(f), 7(1)(h) and 7(1)(i):**

<b>Phase</b>	<b>Activity</b>	<b>Skill(s) required</b>	<b>Timeframe</b>	<b>Outcome</b>	<b>Timeframe for outcome</b>	<b>What technical expert will sign off on the outcome?</b>
<b>Phase 1</b>	<b>Non-invasive Prospecting</b>					
	Field Mapping and Surveying	Geologist Surveyor	Month 1 - 16	Identifying suitable prospecting localities	Month 16	Geologist
<b>Phase 2</b>	<b>Non-invasive Prospecting</b>					
	Literature Survey	Geologist	Month 16-24	Digital data gathering	Month 24	Geologist
<b>Phase 3</b>	<b>Invasive Prospecting</b>					
	Drilling and Sampling	Drilling contractors Geologist	Month 24-48	Physical data/samples collection	Month 48	Geologist
<b>Phase 4</b>	<b>Non-Invasive Prospecting</b>					
	Sample Analysis	Laboratory Geologist	Month 48-54	Sample quality and quantity analysis	Month 54	Geologist
<b>Phase 5</b>	<b>Non-Invasive Prospecting</b>					
	Reserve and Resource Modeling	Geologist	Month 54-60	Orebody and resource definition and feasibility reports	Month 60	Geologist

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

The *proposed prospecting activities* will entail the following phases:

- **Phase 1 – Field Mapping and Surveying**

A qualified geologist will survey/explore the transformed cultivated areas on the proposed prospecting property by foot and map potential visible bentonite and zeolite outcrops. If such visible outcrops are found on the transformed cultivated areas of property the geologist will map these areas for potential sampling during phase 3.

- **Phase 2 – Literature Review**

A qualified geologist will research known geological literature of the property and surrounds to assist in determining approximate location of viable bentonite and zeolite deposits on the transformed cultivated areas of the property.

After the completion of phases 1 and 2 the geologist will produce potential bentonite and zeolite deposits maps for the property which will serve as guidelines for the next phase which will entail drilling and sampling.

- **Phase 3 – Drilling and Sampling**

*Direct push sampler drilling and sampling* – using the maps as produced by the geologist during phases 1 and 2 the geologist will determine which orebodies must be investigated further by direct push sampler drilling. This is conducted by the mining company itself and involves the use of a direct push sampler drill rig. The drill rig will push a stainless steel tube of 50-60cm long into the ground, once full it will bring it up and the sample will be taken out. This process will be carried out until bentonite is found or reaching the depth of around 6m. The hole will then immediately be rehabilitated by backfilling and a month later the site is revisited to determine if any the holes re-opened due to decompaction. The sampler holes will have the following maximum temporary footprints – Diameter 60mm; depth 6m = 3.6m<sup>3</sup> overburden material produced by drilling to be backfilled immediately after sample has been taken. Samples would be collected according to the geology. Approximately 1000 sampler holes are proposed for the property, but final proposed direct sampler holes's amount will be determined during the completion of phases 1 and 2 therefore proposed direct sampler holes amount might increase or decrease.

*Boreholes and sampling* - following the results of the samples collected during the direct push sampler drilling, a qualified drilling contractor will be appointed by the mining company and under the guidance and supervision of the qualified geologist conduct the following drilling activities on the areas as identified by the geologist. Drilling involves using a rotary percussion drilling rig bringing samples to the surface in the form of chips. The drilled boreholes will have the following maximum temporary footprints - diameter 0.2m by 0.2m; depth 30m = 12 m<sup>3</sup> maximum overburden material produced per borehole to be replaced immediately after sample has been taken. <1kg of sample material is collected by the geologist from each borehole for testing. The drilling samples collected

are sent to the laboratory at the cape bentonite mine processing plant near Heidelberg and tested for specific properties to establish the quality of ore as well as determine approximate extension and volume of the available ore body. Approximately 60 drilling sections/lines with 3 boreholes each are proposed for the property = approximately 180 boreholes in total for the property, but final proposed boreholes amount will be determined during the completion of phases 1 and 2 and direct push sampler drilling results and the number of proposed drilling boreholes therefore might increase or decrease.

*Rehabilitation* – immediately (same day) following samples taken during drilling as described above the excavated material will be replaced and existing agricultural land contour structures will be reinstated. The disturbed prospecting areas will be monitored for signs of erosion for at least six months after sampling and erosion rectification and prevention measures will be implemented as and if required. Alien invasive and weed vegetation monitoring and removal will be undertaken for at least a year after sampling on disturbed prospecting areas or until the landowner starts with the annual cultivation activities on the affected land. This must be done by the applicant, landowner or their appointed contractor, using CapeNature approved methodology depending on the contract agreement that the applicant has with the landowner.

- **Phase 4 – Sample Analysis**

<1kg of sample material is collected by the geologist from each borehole for testing. The samples collected are sent to the laboratory at the cape bentonite mine processing plant near Heidelberg and tested for specific properties to establish the quality of ore as well as determine approximate extension and volume of the available ore body.

- **Phase 5 – Maps, Reserve and Resource Modelling**

Maps will be produced showing the location, depth and extent of physical prospecting work, together with, sampling points and the lithology, mineral content and mineral distribution identified, relative to the prospecting area. Following the results of sample analysis conducted the geological reserve modelling is done by using SURPAC and AUTOCAD geological software to determine the grades and quantities of available bentonite and zeolite resources and produce the feasibility reports for the property as investigated/surveyed.

**(i) DESCRIPTION OF PLANNED NON-INVASIVE PROSPECTING ACTIVITIES:  
(These activities do not disturb the land where prospecting will take place  
e.g. aerial photography, desktop studies, aeromagnetic surveys, etc)**

- Aerial photography and reconnaissance geological mapping
- Desktop studies
- Research and target identification
- Surveys of prospecting target to classify them in regards of their extension
- Environmental studies

- Literature survey

**(ii) DESCRIPTION OF PLANNED INVASIVE PROSPECTING ACTIVITIES:  
(These activities result in land disturbances e.g. sampling, trenching,  
drilling, bulk sampling, etc.)**

- Rotary percussion borehole drilling
- Direct push sampler drilling
- Boreholes
- Sampling

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

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

- Geological modeling
- Resource determination
- Possible future models

**(iv) DESCRIPTION OF BULK SAMPLING ACTIVITIES**

This activity requires that an application IN TERMS OF Section 20 of the Act is specifically included in your application for a prospecting Right and cannot be proceeded with if such permission is not specifically granted.

(Bulk sampling is a sampling technique ONLY- it cannot be used to conduct mining operations. The following table must be completed for Bulk Sampling)

**Table 6: Bulk Sampling Activities**

<b>ACTIVITY</b>	<b>DETAILS</b>		
<b>Number of pits/trenches planned</b>	NA		
<b>Dimensions of pits/trenches, per pit/trench</b>	<b>Length</b>	<b>Breadth</b>	<b>Depth</b>
	NA		
<b>Locality</b>	NA		
<b>Volume Overburden (Waste)</b>	NA		
<b>Volume Ore</b>	N/A		
<b>Density Overburden</b>	N/A		
<b>Density Ore</b>	N/A		
<b>Phase(s) when bulk sampling will be required</b>	NA		
<b>Timeframe(s)</b>	NA		
<b>Note</b>	Refer to point 6 above for a description of the proposed sampling methods.		

**NOTE: Detailed description of the required costs MUST be indicated in the cost estimate as per Regulation 7(1) (k)**

**Commitment to provide for an addendum in respect of  
additional bulk sampling activities**

I herewith commit to provide the Department of Mineral Resources with an addendum to the Prospecting Work Programme, and an Environmental Management programme for approval prior to undertaking any future bulk-sampling activities not described above.

**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)**

Assistant Manager (2.6.1)

Mine Engineer (2.13.1)

**I herewith confirm that I, in Table 8 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 7: Appropriate Equipment Available**

1 x Direct push sampler drill rig
1 x Percussion drilling rig

**7.3 Technical skills provided Free of Charge**

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

- Geologist (Field Work / Drilling / Trenching / Modelling): Appendix 3
- Laboratory Analyst (Sample Analysis): Appendix 4

**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)**  
N/A

**7.3.3 All other evidence of Technical Ability (append)**  
N/A

**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 fees)**

**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.**

**Table 8: Budget and Cost Estimate of the Expenditure to be Incurred for Each Phase of the Proposed Prospecting Operation**

	1ST YEAR				2nd YEAR				3rd YEAR				4th YEAR				5th YEAR				Total				
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th					
<b>3 MONTH PERIOD</b>																									
<b>Field mapping</b>	Geologist		100hours= R17 000																				R17,000		
<b>Field Outcrop Sample Analysis</b>	Analysis of 20 samples				20hours Lab Analyst= R740																				R 740
<b>Literature survey</b>	Geologist				50hours = R8 500																				R8,500
<b>Drilling and sampling</b>	Drilling contractor						30 sections @ 40m per sections = 1200m @ R450/m and 3L/m Diesel @ R13/L <=> R586,800				30 sections @ 40m per sections = 1200m @ R450/m and 3L/m Diesel @ R13/L <=> R586,800								R1,173,600						
<b>Rehabilitation</b>	Close down holes						30 sections @ 67.5 m3 to be rehabilitated @ R10 per m3 = R20,250				10 sections @ 67.5 m3 to be rehabilitated @ R8 per m3 = R20,250								R40,500						
<b>Sample analysis</b>	Analysis of 100 samples																		100 Samples = R3,700	R3,700					
<b>Reserve/ resource modeling</b>																						R1,244,040			
<b>TOTAL</b>	R17,000				R9,240				607,050				607,050				R3,700								



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

### **10.1 The amount required to finance the Prospecting Work Programme. (State the amount required to complete the work)**

During the prospecting work 1000 holes will be done with the direct push auger and 180 percussion drill holes. This correspond respectively to 36000m<sup>3</sup> and 2160m<sup>3</sup> which in total gives us around 40 000m<sup>3</sup> of material which will be temporarily removed per drill and borehole site and immediately replaced after sampling.

#### *Operational costs:*

For the direct push auger drill, the rate is R15/hole and 3L/hole at R14/L, so for a 1000 boreholes the total cost will be R192 000.00.

For percussion drilling, at a rate of R500/m and 3L/m (R14/L) of Diesel per meter (on average we do 12m/hole) it is foreseen that the operational amount required to finance this project is approximately R1 170 720.00.

#### *Rehabilitation costs:*

At a rate if R10/cubic metre to rehabilitate it is foreseen that the rehabilitation amount required to finance this project is approximately R 400 000.00.

### **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.)**

All exploration will be financed in-house as part of working capital. No capital investment is envisaged / planned.

### **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).**

Refer to 10.2 above

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


Refer to 10.2 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 9: Applicant Confirmation**

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.	
Full Names and Surname	XOLISA MVINJELWA : 
Identity Number	6907055952089

**END**