MULTIVERSE MINERAÇÃO

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MULTIVERSE MINERAÇÃO | RARE EARTHS BAHIA

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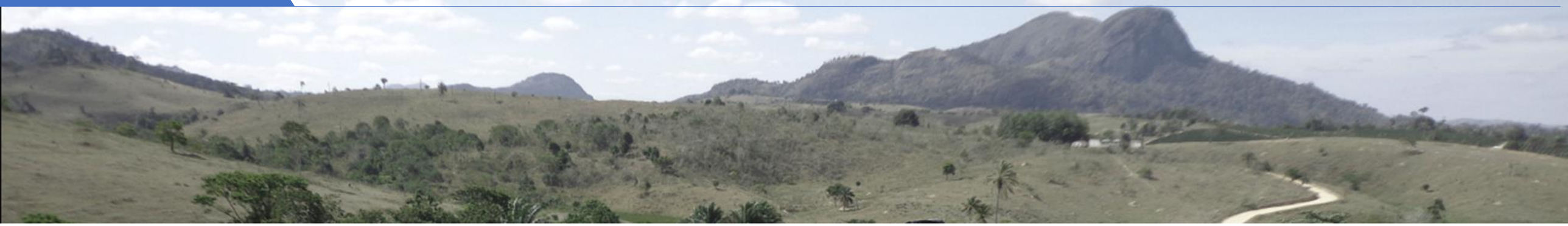
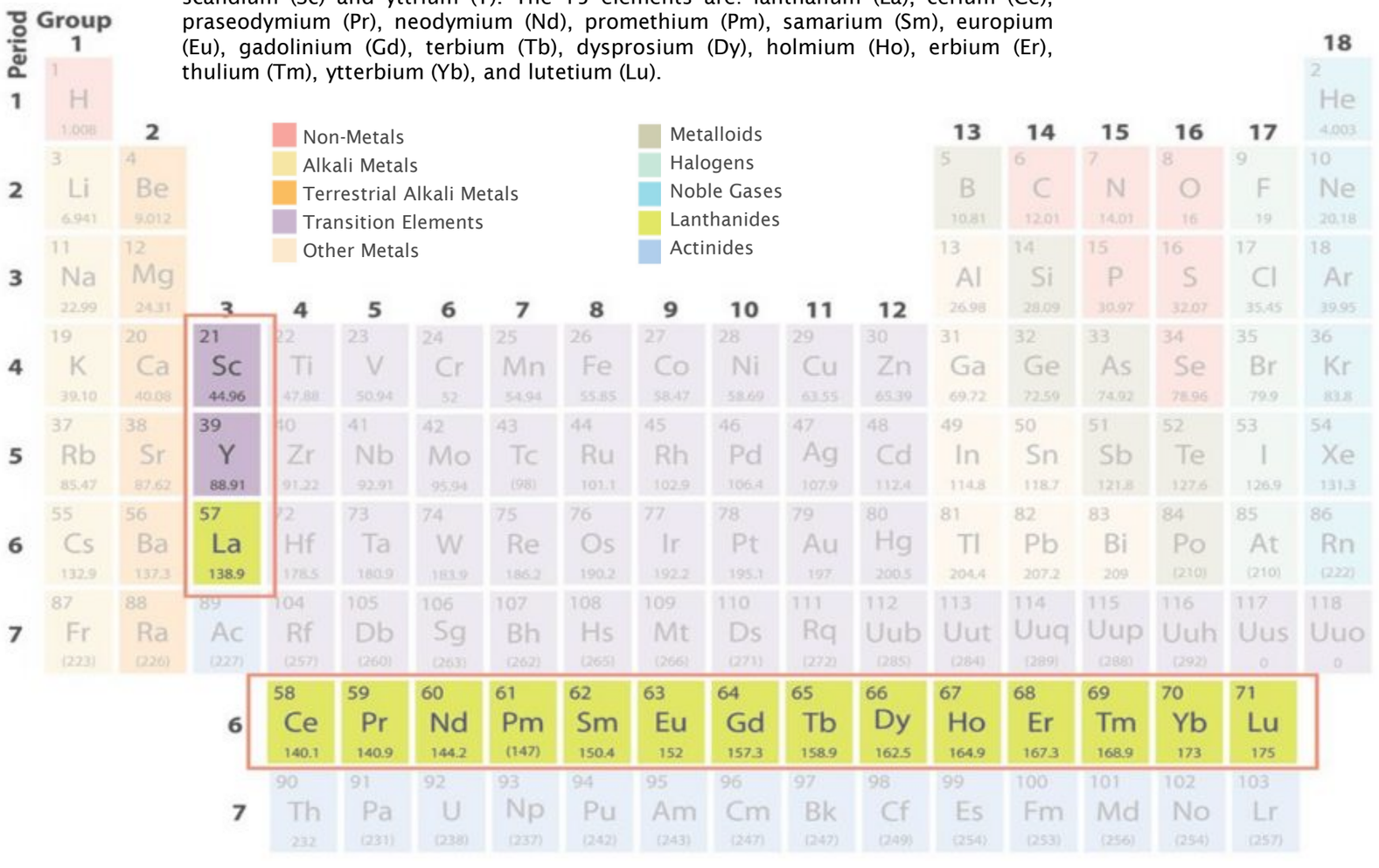
01| concepts



In the face of the discovery of RARE EARTHS, MULTIVERSE MINERAÇÃO began to face a new challenge, because the mineral is of extreme importance in several industrial segments and of very high importance in the technological industry.

The rare earths group consists of 17 Chemical Elements, 15 lanthanides plus scandium (Sc) and yttrium (Y). The 15 elements are: lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), promethium (Pm), samarium (Sm), europium (Eu), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb), and lutetium (Lu).







Catalysts

- La, Ce, Nd, Pr
- Petroleum Refinery
- Catalytic Converters
- Fuel Additives
- Chemical Processing
- Atmospheric Pollution Control

Defense

- La, Nd, Pr
- Nd, Eu, Tb, Dy, Lu, Sm, Y
- Satellite Communication
- Localization Systems
- Aircraft Structures

Batteries

- La, Ce, Nd, Pr
- Y
- Fuel Cells
- Steel
- Super Alloys
- Aluminum / Magnesium

Light Rare Earths
Heavy Rare Earths





Phosphorescents

- Ce, Pr
- Er, Gd, Eu, Tb, Y
- Phosphorescent Display – CRT, LPD and LCD
- Phosphorescent Lamps
- Medical Images
- Laser
- Fibre Optics

Ceramics

- La, Ce, Nd, Pr
- Gd, Lu, Dy, Eu, Y
- Capacitors
- Sensors
- Dyes
- Flickers
- Refractaries

Magnets

- Nd, Pr
- Tb, Gd, Dy
- HD Computers
- Automotive Parts
- Microwave Tubes
- Power Generation
- Microphones
- Magnetic Resonance Imaging

Glass and Polishing

- La, Ce, Nd, Pr
- Gd, Er, Ho
- Compounds for Polishes
- Pigments and Coatings
- UV Resident Glass
- Optical Glasses
- X-Ray Images

02| history

MULTIVERSE MINERAÇÃO is a company that has come up with the purpose of researching GRANITE. However, after several researches with technicians and geologists, the company ended up finding IRON, ALUMINIUM, NIOBIUM and especially RARE EARTHS revealed in CHEMICAL ANALYSES, giving rise to the RARE EARTHS BAHIA PROJECT.

Indeed, WHITE IVORY GRANITE was found, as noted by the research report, carried out by the company ASA EMPRESARIAL, through its geologist ATAILSON ARAUJO in which A RESEARCH REPORT WAS MADE, in the year 2010.

In continuity with field research, with GEOLOGIST LILIAN MERCES, the MINERAL MOLYBDENITE was found, AS RECORDED IN THE 2012 RESEARCH REPORT, without having performed chemical analysis, though.

In the field campaign carried out by the GR -CONSULTORIA E PESQUISA MINERAL LTD. in the year 2013, the geologist CESAR GALVÃO, and for the work carried out and the chemical analyses made by LABORATÓRIO NOMOS, for the FIRST TIME IN THE FIELD STUDIES, it was proved that the existence of the **RARE EARTHS, with surprising results from the ResearchReport**, with significant yields of La (lanthanum), Nd (Neodymium) Yb (Ytterbium), Dy, Gd, Tb, Eu. Geologist Cesar Galvão recorded his data in a RESEARCH REPORT in 2014. Geologist **EDMAR SILVA**, **in 2014**, in field research **also found RARE EARTHS**, whose chemical analyses were carried out at the company SGS - GEOSOL. He also wrote the research report and in his conclusion, states that in his modest estimate there is 20 to 30MT of rare earths, with emphasis on Ce, Yb, Nd.

In a new campaign carried out by ASA EMPRESARIAL, geologist ATAILSON ARAUJO confirmed the existence of Rare Earths, through a large amount of chemical analyses, also carried out in the SGS – GEOSOL laboratory, and that the anomalies remained proven in expressive percentage. Also, through the company ASAS EMPRESARIAL was protocol the FINAL RESEARCH REPORTS were protocoled, with 04 Final Reports being submitted, and then other 06 Final Reports. IN JANUARY 2015, AT DNPM, BY PETITION, THE EXISTENCE OF THE NEW SUBSTANCE WAS OFFICIALLY INFORMED.

In 2016, MULTIVERSE MINERAÇÃO brings to Brazil **LUISA MORENO and William H. BIRD**, geologists and rare earths specialists to reaffirm the presence and potential of the field.

It should also be noted that the work carried out so far includes the aerial geophysical survey of CBPM (which appears in the processes), and some occurrences catalogued by CPRM. There is also excavation, trenches and shallow surveys made by the process holder.

Thus, THERE ARE 10 PROCESSES WITH FINAL POSITIVE RESEARCH REPORT OF RARE EARTHS PRESENTED AT DNPM. As a result, a new field campaign is being carried out by GEOLOGIST ATAILSON SACRAMENTO, a survey performed in order to make the re-evaluation of the reserves, in order to scale more accurately. Therefore, all 10 areas are regular with the National Department of Mineral production (DNPM, acronym in Portuguese).

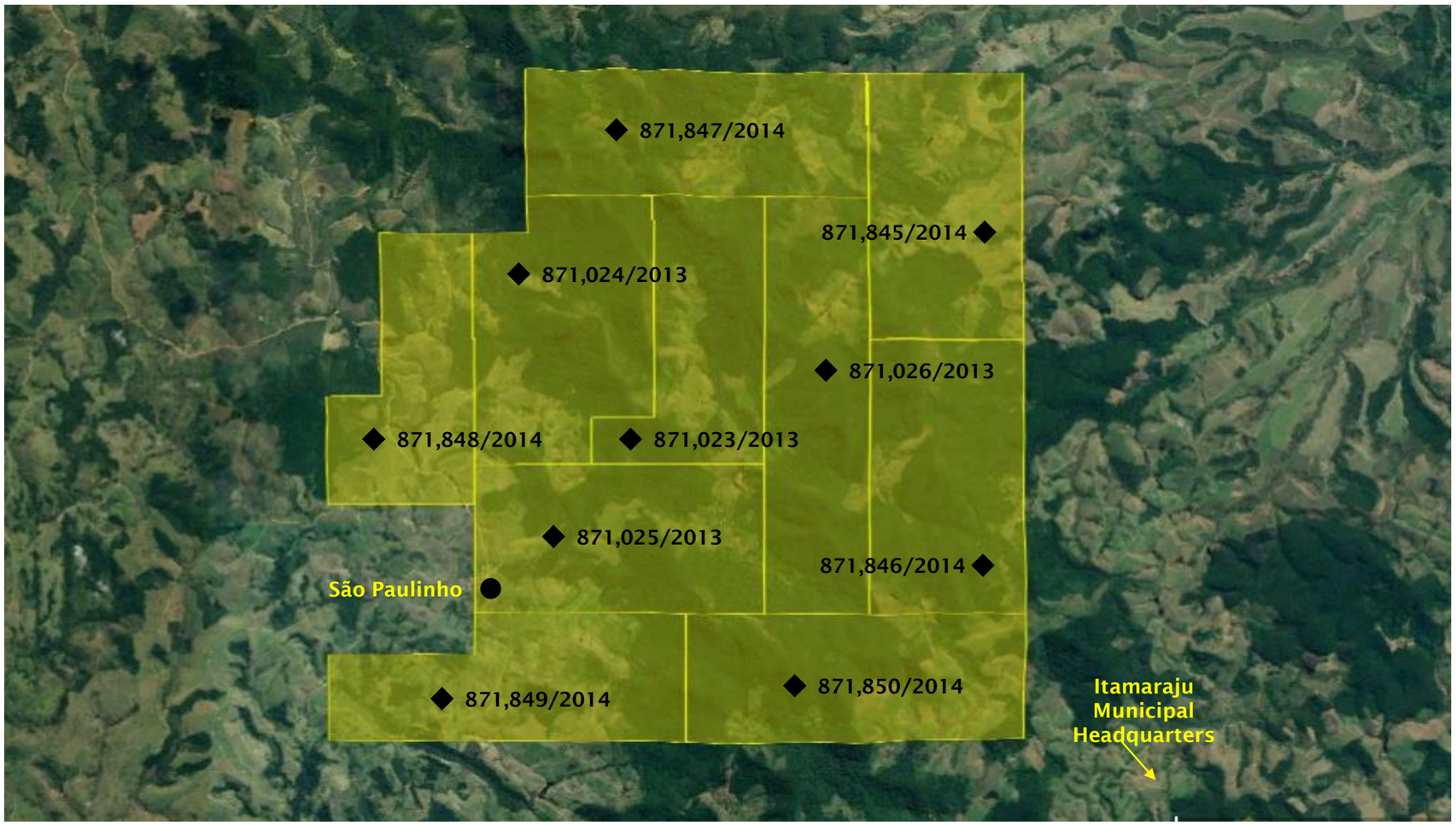
03| location

In the extreme southern part of the state of Bahia, the occurrence of anomalous values for rare earths elements (REE) identified in lithotypes of the jequitinhonha complex in the mid-2000s, through geological surveys carried out by Companhia Baiana de Pesquisa Mineral (CBPM) and the Federal University of Bahia (Celino & Botelho, 2002).

The study area is located in the extreme south of the state of Bahia, in the vicinity of the town of São Paulinho, municipality of Itamaraju. The city is 621 km away from the capital, the journey can be done by ferryboat, and next getting on the road BA-001, and going through all the cities of Nazaré, Valença, Camamu, following by BR-101 and by the municipalities of Ubaitataba, Itabuna, Itagimirim, Eunápolis, until you get to Itamaraju, from where you follow the unpaved road for 36 km to the town of São Paulinho.

MULTIVERSE MINERAÇÃO is the holder of the mineral rights set out in the Unit Areas São Paulinho, is comprised of ten processes in DNPM, namely: **871,023/2013, 871,024/2013, 871,025/2013, 871,026/2013, 871,845/2014, 871,846/2014, 871,847/2014, 871,848/2014, 871,849/2014, 871,850/2014,** in the Bahia municipalities of Itamaraju, Itabela and Guaratinga.

The study of rare earths by MULTIVERSE MINERAÇÃO, awarded with a research permit, covers an area equivalent to about 8.780 ha.



Id	Nº. Process	Area (ha)	Exploration Autorization	Status	Publication Date
1	871023/2013	701.01	Business License Research	Granted	09/10/2013
2	871024/2013	942.64	Business License Research	Granted	09/10/2013
3	871025/2013	941.39	Business License Research	Granted	09/10/2013
4	871026/2013	945.03	Business License Research	Granted	09/10/2013
5	871845/2014	906.96	Business License Research	Granted	12/30/2014
6	871846/2014	927.45	Business License Research	Granted	12/30/2014
7	871847/2014	924.58	Business License Research	Granted	12/30/2014
8	871848/2014	674.87	Business License Research	Granted	12/30/2014
9	871849/2014	870.8	Business License Research	Granted	12/30/2014
10	871850/2014	942.69	Business License Research	Granted	12/30/2014

From a strategic point of view, the site of the rare earths deposit is located between two large sea transport terminal, possible runoff centres, the southern port in Ilhéus – Bahia, which is approximately 347 km from the site and Port Vitória located in the capital of Espírito Santo, about 427 km away.

PORT IN ILHÉUS - BA

PORT IN VITÓRIA - ES

04| events

In the process of prospecting information concerning Rare Earths deposits, Multiverse Mineração has participated in several national and international events to learn more about the exploitation of rare earths, improve the knowledge acquired in the geological study in the area, connect with the world market of REE and establish a network of contacts with a sector expert. Multiverse Mineração was represented at the following events:

SIMEXMIN VII - Brazilian Mineral Exploration Symposium. Held from May 15 to 18, 2016. Ouro Preto, Minas Gerais.

CIME 2016 - International Mining Expo. Held from May 15 to 18, 2016. Beijing, China.

Argus Americas Rare Earths Summit. Held from June 13 to 16, 2016. Denver, Colorado, USA.

Expomin 2016 - World Mining Exhibition. Held from April 25 to 29, 2016. Santiago, Chile.

Iranian Base Metals Conference. Held on September 6 and 7, 2016. Tehran, Iran.

MMTA's International Minor Metals Conference - Held from April 17 to 19, 2016. Amsterdam, Holland.

PDAC - The World's Premier Mineral Exploration & Mining Convention held from March 04 to March 7, 2018. Toronto, Canada.

05| research



In mid-2014, geological surveys were carried out in the vicinity of the municipality of Itamaraju, where by means of chemical analysis of lithotypes in the near surface era, where significant occurrences of REE anomalies associated with Kinzigite Paragneisses belonging to the Jequitinhonha complex were identified. New field approaches were subsequently developed to characterize these occurrences from a geological and geochemical point of view.

The preliminary evaluation and geological contextualization of the Block of São Paulinho were carried out through classical methods of geological prospecting. In the field work, the researches of topography were carried out, detail geology, sampling and Geophysics, in addition to those that were already done during the preliminary phase, that is, in the preliminary geological recognition, which consisted in the opening of accesses to the main outcrops, and to the place where the precursor camp was installed. In Figure 1 it is possible to observe the sequence of the main activities carried out for geological evaluation.

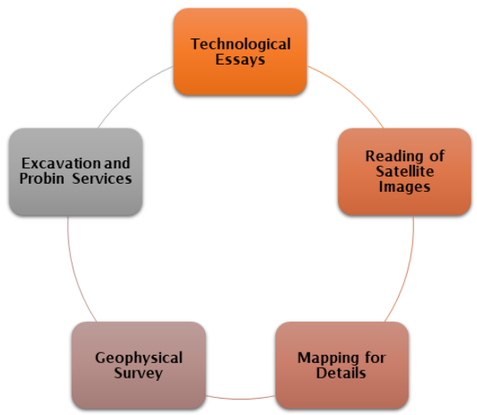


Figure 1 – sequence of main activities carried out for geological research

For confirmation of the existence of the REE, a systematic sampling was foreseen, characterized by the type of collection and sample. In this way, it was performed the **sampling of channel - rock**, initially 1 m deep; **sampling of rocks** for geochemical purposes carried out extensively to cover most of the area studied and **sampling of active sediment**, whose prospecting with average density of 1 sample to 1km2, with collection in the longitudinal direction of the drainage chute (Figure 2).

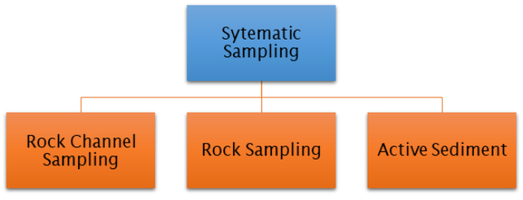


Figure 2 - types of systematic sampling at work

The samples were forwarded to the SGS-Geosol laboratory, with determination for chemical analysis, to verify the percentage of REE (REE content) and the associated elements by the following analytical methods: determination by Fusion with Lithium Methaborate – ICP OES and determination by Fusion with Lithium Methaborate – ICP MS.

SGS GEOSOL LABORATÓRIOS LTDA.

Seven campaigns were carried out in the area under study resulting in systematic sampling and consequent chemical analysis. During the field campaigns, 86 rock samples were collected at strategic points, in addition to the description and collection of structural data at 45 points.

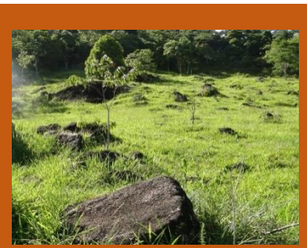
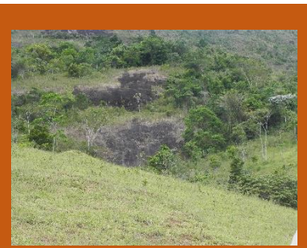
Number	Laboratory	Code Of Analysis	Date
1	Nomos	ES0053-13	03/22/2013
2	SGS Geosol	GQ1405407	09/03/2014
3	SGS Geosol	GQ1407474	11/26/2014
4	SGS Geosol	GQ1505481	12/11/2015
5	SGS Geosol	GQ1505482	12/11/2015
6	SGS Geosol	GQ1505483	12/11/2015
7	SGS Geosol	GQ1600926	02/23/2016

With regard to mineral exploration, on the basis of the work of geological mapping accompanied by gamma spectrometry, as well as the geophysical survey carried out (Gamma ray spectrometry) along the object of the picketing, as well as the study of the sampled trench, and the chemical results obtained, it was possible to determine two different types of mineralizations in the area, including: **(i) deposits in granitoids; and (ii) deposits in the soil, and saprolite, both of which correlate with the areas of failure.**

The bibliographical indications on the existence of thorium anomalies in association with elements of the rare earths group (REE) identified in earlier regional works carried out by CPRM in the area and its surroundings were then proven by means of preliminary geological recognition.





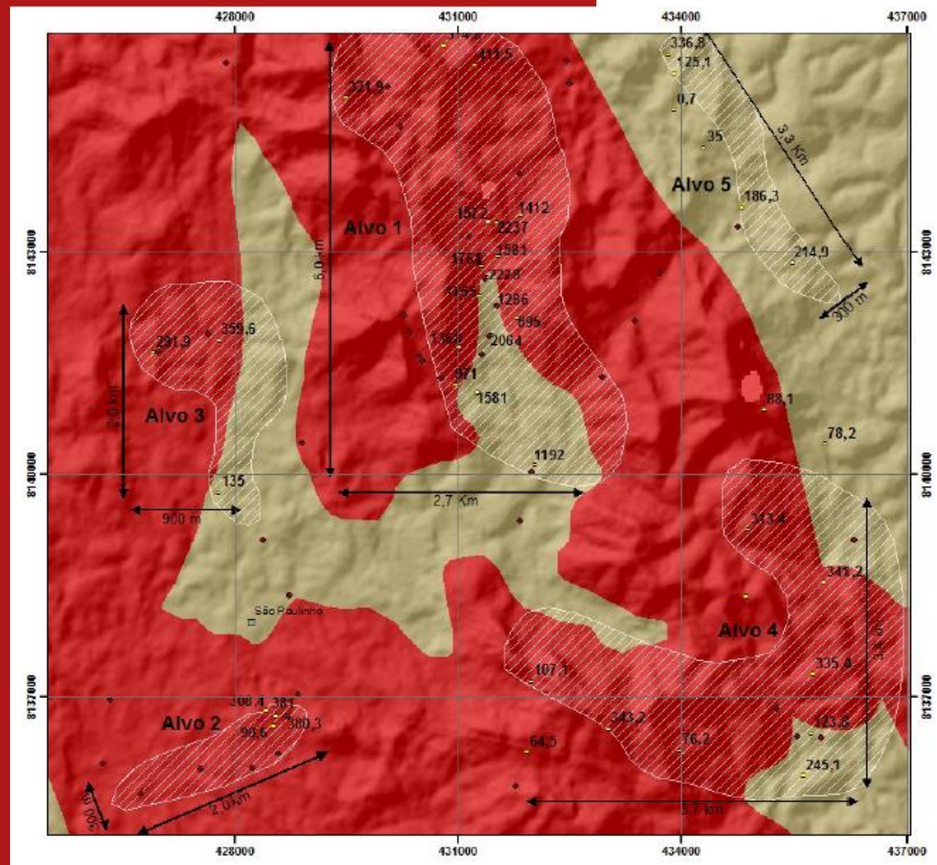

06| potential

During the work it was possible to select areas of interest through detailed field observations, associated with a significant amount of geochemical analyses performed at significant points.

Based on the criteria indicated by Boyle & Gosselin (2012), 05 (five) zones in the area studied, with high potential for economically viable occurrence of REE mineralizations have been delimited, (with emphasis on the occurrence of La, Ce and Yb).

Targets 1 and 2 will be detailed, due to the better disposition of representative outcrops, and it is possible to perform a more accurate characterization of the mineralized range in REE. For the other targets, anomalous values were observed in La, Ce and Yb in geological situations similar to those observed in Target 1.

It is important to note that in the work area a ductile deformation front has been observed that advances from south to north, reaching its highest intensity in the Kinzigite Gneiss 2 domains.



TARGET 1:

Target 1 occurs in the central portion of the study area, mainly covering process 871,023/2013. In this zone, it could be observed intense deformation levels and relevant structures and lithotypes typical of areas with notable remobilization of fluids, evidenced by the occurrence of granite potassium dikes with thicknesses of up to 4 m, in addition to Granite pegmatitic dikes and pegmatitic veins with thicknesses ranging from 20 cm to 50 cm, filling fractures that truncate the gneiss bandage in different directions. This zone extends over an area of approximately 6 km in length by 2.7 km in width. Not by chance, in the field campaigns conducted previously, the higher values of REE were found in this portion of the Prospectus São Paulinho.

Photo 1 - Kinzigite Gneiss, featuring mineralized band in REE (La, Ce and Yb). Coordinates: X 431311 / Y 8141610 (SD24).

In the samples collected and analyzed in Target 1, it can be seen that the mineralized interval in the REE is related to kinzigite gneiss to a mid-to-high degree of ductile deformation, that is truncated by pegmatític dikes and, more specifically, in the máfic bands, with predominantly gray to light gray to dark colors, composed mainly of biotite, quartz, and garnet, K-feldspar widespread, occurring to a lesser extent (Photo 1).

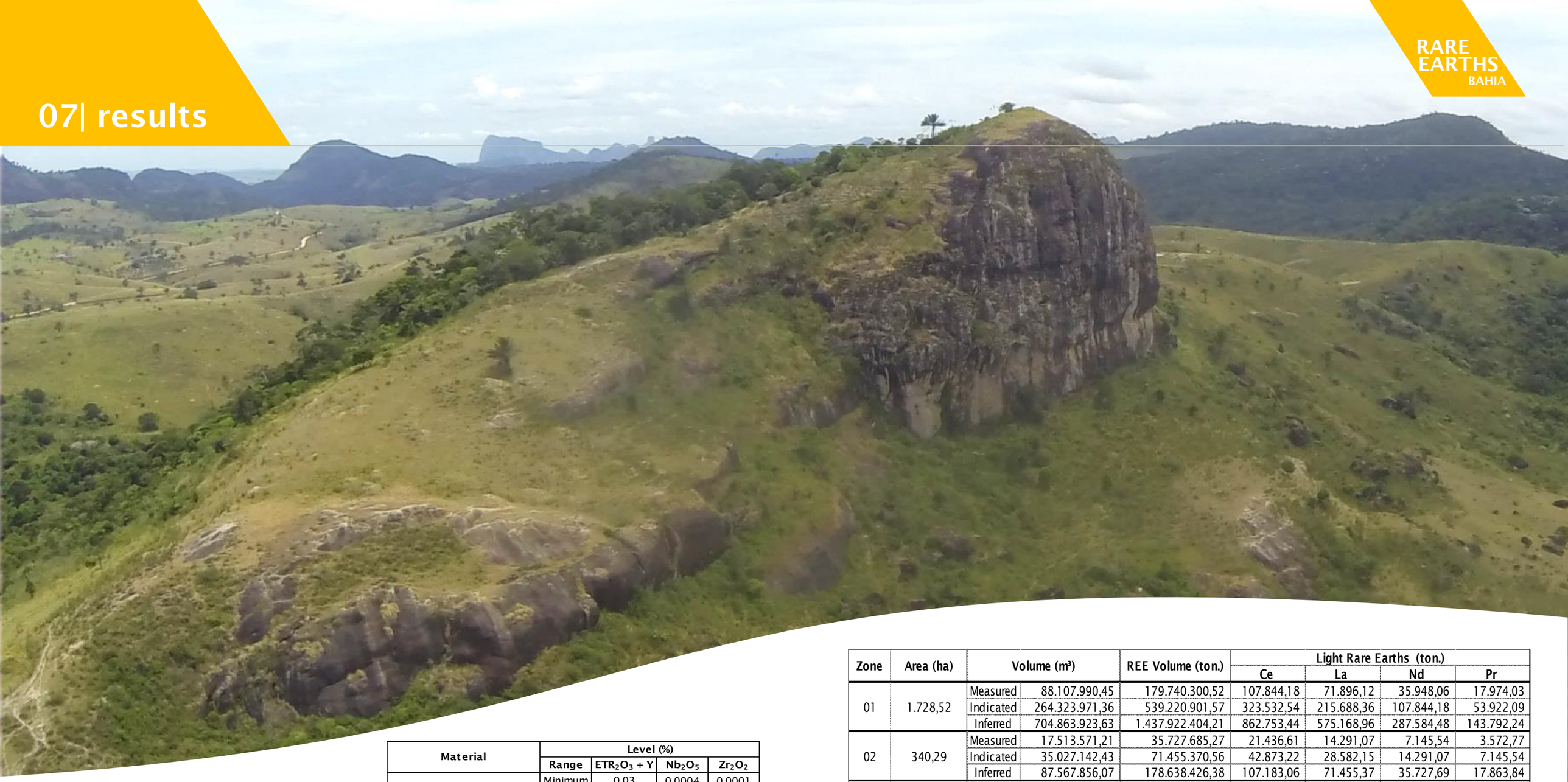
TARGET 2:

Target 2 occurs in the SW portion of the study area, covering portions of process 871,849/2014. It is marked by contact between the intrusive granitoids of the São Paulinho Suite, with the Kinzigite Gneisses 1 and 2, of the Jequitinhonha complex.

Anomalous values were observed in Kinzigite Gneiss 1 (Photo 2), with yellowish beige coloration, medium grain size, predominantly composed of biotite, quartz and feldspar, this rock has an incipient foliation marked by the orientation of the biotite, as well as in Granites moved, truncated by various veins and pegmatitic seams (Photo 3).

Photo 2 - Kinzigite gneiss 1, item ES-22. Coordinates: X 428234 / Y 8136024 (SD24).

Photo 3 - Granite with high Ce and La values, rising in contact zone with Kinzigite Gneisses 1. Coordinates: X 428695 / Y 8136741 (SD24) and X 428846 / Y 8137025 (SD24).



To the result of the chemical analyses were converted into Rare Earths equivalent oxides (ETR_2O_3) for evaluation and comparison with known rare earths deposits and other parts of the world. These oxide contents are listed in the table.

It can be observed that in Quartz shafts and segregations, the average rare earths contents + yttrium vary from 0.08% to 13.08%, with an average of 2.26%. In saprolites, the levels range from 0.003% to 0.266%, on average 0.11%. Finally, in soils, the levels of REE + Y range from 0.009% to 3,61%, averaging 0.4406%.

Material	Level (%)			
	Range	ETR_2O_3 + Y	Nb_2O_5	Zr_2O_2
Sreams And Partially Sapolitized Sreams	Minimum	0,03	0,0004	0,0001
	Maximum	13,2	0,51	0,07
	Medium	2,26	0,05	0,1
Sreams And Partially Sapolitized Sreams Saprolites	Minimum	0,003	0,0009	0,012
	Maximum	0,662	0,0044	0,294
	Medium	0,106	0,0045	0,088
Soils	Minimum	0,009	0,002	0,009
	Maximum	3,618	0,073	0,175
	Medium	0,44	0,009	0,101

The results are satisfactory. Although famous deposits of Rare Earths such as Bayan Obo (4.1%) and Mountain Pass (8.9%) have higher levels, there are production deposits with lower levels such as Maniouping, where the average level is about 2% (Wu et al., 1996) And De Mineville, USA, where REE has already been mined with an average content of 1.04% RE2O3 (Jackson and Christiansen, 1993).

Zone	Area (ha)	Volume (m³)		REE Volume (ton.)	Light Rare Earths (ton.)			
					Ce	La	Nd	Pr
01	1.728,52	Measured	88.107.990,45	179.740.300,52	107.844,18	71.896,12	35.948,06	17.974,03
		Indicated	264.323.971,36	539.220.901,57	323.532,54	215.688,36	107.844,18	53.922,09
		Inferred	704.863.923,63	1.437.922.404,21	862.753,44	575.168,96	287.584,48	143.792,24
02	340,29	Measured	17.513.571,21	35.727.685,27	21.436,61	14.291,07	7.145,54	3.572,77
		Indicated	35.027.142,43	71.455.370,56	42.873,22	28.582,15	14.291,07	7.145,54
		Inferred	87.567.856,07	178.638.426,38	107.183,06	71.455,37	35.727,69	17.863,84
03	80,52	Measured	4.092.001,24	8.347.682,53	5.008,61	3.339,07	1.669,54	834,77
		Indicated	8.184.002,49	16.695.365,08	10.017,22	6.678,15	3.339,07	1.669,54
		Inferred	20.460.006,22	41.738.412,69	25.043,05	16.695,37	8.347,68	4.173,84
04	283,47	Measured	14.501.599,67	29.583.263,33	17.749,96	11.833,31	5.916,65	2.958,33
		Indicated	29.003.199,35	59.166.526,67	35.499,92	23.666,61	11.833,31	5.916,65
		Inferred	72.507.998,37	147.916.316,67	88.749,79	59.166,53	29.583,26	14.791,63
05	21,81	Measured	1.112.316,13	2.269.124,91	1.361,47	907,65	453,82	226,91
		Indicated	2.224.632,27	4.538.249,83	2.722,95	1.815,30	907,65	453,82
		Inferred	5.561.580,68	11.345.624,59	6.807,37	4.538,25	2.269,12	1.134,56
06	391,51	Measured	20.013.012,02	40.826.544,52	24.495,93	16.330,62	8.165,31	4.082,65
		Indicated	40.026.024,04	81.653.089,04	48.991,85	32.661,24	16.330,62	8.165,31
		Inferred	100.065.060,10	204.132.722,60	122.479,63	81.653,09	40.826,54	20.413,27
07	282,6	Measured	14.485.997,98	29.551.435,88	17.730,86	11.820,57	5.910,29	2.955,14
		Indicated	28.971.995,96	59.102.871,76	35.461,72	23.641,15	11.820,57	5.910,29
		Inferred	72.429.989,89	147.757.179,38	88.654,31	59.102,87	29.551,44	14.775,72
08	75,9	Measured	3.877.782,32	7.910.675,93	4.746,41	3.164,27	1.582,14	791,07
		Indicated	7.755.564,64	15.821.351,87	9.492,81	6.328,54	3.164,27	1.582,14
		Inferred	19.388.911,60	39.553.379,66	23.732,03	15.821,35	7.910,68	3.955,34

Note: Mineral Reserves classified according Brazilian Mining law (date February 28th, 1967)

08| conclusion

During the early years of the survey, by means of the classical methods of mineral prospecting, the collection samples of rock has been carried out at strategic points, in addition to a description and a collection of structural data at various points in the geological distribution in the study area, with the objective to characterize the mineralization in the REE (Rare Earths Elements), in the context of the occurrence of the anomalous values from the point of view of geology, in addition to the evaluation of the mineral potential of the block areas, and other substances of interest, such as gold (Au), niobium (Nb) and manganese (Mn). The results obtained were satisfactory, ratifying the occurrence of anomalous values of REE in the block of São Paulinho.

In Brazil, the existence of a new project for the exploitation of the minerals of rare earths, as a result of the existing Araxás - MG, which has as its main product the oxide of lanthanum, can encourage the establishment of an industry chain in this country for the use of each of these minerals both on the domestic market, as well as re-position the country strategically in the global scenario, in the face of the sovereignty of China on the export of these resources.

From the perspective of commercial exploitation of the REE ores, important aspects are highlighted to be observed by investors in the potential of the resources found in the areas studied by the Multiverse Mineração Ltd. The areas **in mineral rights make up a total of approximately 10,000 ha, where eight potential zones were found**, equivalent to about 3,200 ha (over 30% of the mineral Law area). By way of comparison, the area currently in operation in the Araxás project amounts to 220 ha.

According to 59 reports of REE deposits in the world, the quantity of these resources is expected to be 276 Mt REO, and the Ce presents itself as the most abundant with approximately 130mt, followed by La (68 Mt), Nd (43 Mt), Pr (13 Mt) and Y (9 Mt) (ZHOU, B.; LI, Z.; CHEN, C.; 2017). It is observed that it is **precisely the chemical elements that predominate in the areas studied by Multiverse Mineração.**

In another aspect, according to Zhou *et al,* although fossil fuels remain a source of energy, the growth of primary energy from alternative and clean sources is expected to grow by the middle of 2035 and continue to grow throughout this century. Thus, over the years an increase in demand for cleaner energy generation technologies and energy-saving technologies, whose REEs are present, must be observed. For example, about 120 kg of Nd is needed for wind turbine production. In this scenario, due to the advances of technology and the consumption by products of high technology **generates an increase of the world demand of the main elements existing in these studied areas.**

In 2016, according to the Chinese price market, the market value of light and heavy REEs constitutes respectively 62,5% and 37,5% of total REE. Considering the light REE resources, Pr and Nd are the two most valuable, whose values represent 77% of the market value of light REE. To get an idea, the price of Nd oxide exported by China in 2017 ranged from 80 to 100 US$ per kilo. For heavy RTE resources, Dy, Yb and Y prevail with 96.7% of the total market value of heavy REE, while Y contributes 23.4% of this value. Among the most valuable REEs found in the area of scope of mineral research, **Nd presented very expressive quantitative values, with inferred values in the order of 280,000 tons, in zone 01 alone.**

Finally, the REEs present in southern Bahia are extremely important for the development of a new economic activity in the state with high financial potential, encouraging the creation of a new industrial hub, generating jobs, wealth and development.