DANF Santiago Project, Tocantins, Brazil

Independent Technical Report - Preliminary Economic Assessment

Developed by GE21 Ltda on behalf of:

DuSolo Fertilizers Inc.

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Effective Date: September 1, 2016

Delivery Date:

GE21 Project N°: GE21_160823

Version: Initial issue

Work Directory: S:\Projetos\DuSolo\GE21-160803_Plano_Lavra_Santiago\15_Relatório

Print Date: May 8, 2017

Copies:

Du Solo Fertilizers (1)

GE21 – Belo Horizonte (1)

Document Change Control

Version	Description	Author(s)	Date

Date and Signature Page

This report, entitled "DANF Santiago Project, Tocantins, Brazil - Independent Technical Report - Preliminary Economic Assessment", having an effective date of 01 September 2016, was prepared on behalf of DuSolo Fertilizers by Porfirio Cabaleiro Rodriguez, Mario Conrado Reinhardt, Bernardo Horta Cerqueira Viana, Fabio Valerio Xavier, and signed:

Dated at Belo Horizonte, Brazil, this May 8, 2017.

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APPENDICES

Appendix A – Certificates of Competent Persons

UNITS, SYMBOLS AND ABBREVIATIONS

This report uses metric units, the common name for those defined in the International System of Units (SI). All references to dollars are in US Dollars unless otherwise indicated. Other currencies are specified when used in the report.

Abreviations		
Long Form	**Short**	**Notes**
Direct Application Natural Fertilizer	DANF	
National Department of Mineral Production	DNPM	
Guia de Utilização - Mineral Rights Limitations	GUIA / UG	
Phosphorus	P	
Phosphorus pentoxide	P_2O_5	
Phosphate	(PO_4) -2	
parts per billion by weight	ppb	
parts per million by weight	ppm	
Former Mining agency of Goiás	Metago	
Phosphorite Zone East	PZE	
Phosphate Zone West	PZW	
Preliminary Economic Assessment	PEA	
Mineralized Silexite Zone	MSZ	
Measured and Indicated	M&I	
Instituto Natureza do Tocantns	NATURATINS	
Centro de Estudos Avançados em Economia Aplicada (Centre for Advanced Studies in Applied Economics)	CEPEA	
University of São Paulo	USP	
Empresa Brasileira de Pesquisa Agropecuária (Brazilian Agriculture and Livestock Research Corporation)	EMBRAPA	
Ministério da Agricultura, Pecuária e Abastecimento (Ministry of Agriculture, Livestock and Food Supply)	MAPA	
Secretaria do Estado do Meio Ambiente e dos Recursos Hídricos (State Secretariat of the Environment and Water Resources)	SEMARH	

Units		
Long Form	**Short**	**Notes**
litre	**L**	
m	**Metres**	
Kt	**Thousand tonnes**	
Mt	**Million tonnes**	
parts per billion by weight	**ppb**	
parts per million by weight	**ppm**	
tonnes	**t**	**1,000 kg, metric tonne**

Conversion Factors		
From	**To**	**Multiply by**
Phosphorus (P)	**Phosphate (PO_4) -2**	**3.0645**
Phosphorus (P)	**P_2O_5**	**2.2914**

1 EXECUTIVE SUMMARY

1.1 Introduction

GE21 Consultoria Mineral Ltda. (GE21) was engaged by the company DuSolo Fertilizers (DuSolo) to develop a technical study, in the form of a Preliminary Economic Assessment (PEA), with respect to the Santiago phosphate deposit (DANF Santiago Project), which was previously covered in a Technical Report as part of the Bomfim project and located in the municipalities of Campos Belos – Goiás (GO) and Arraias – Tocantins (TO), Brazil, in accordance with the directives of CIM National Instrument 43-101 (NI 43-101).

The principal Qualified Person with respect to the objectives of this report is Mining Engineer Porfírio Cabaleiro Rodriguez. Geologist Fábio Valério Câmara Xavier was responsible for developing the project's geological interpretations and modelling, in addition to activities related to QAQC procedures and the mineral resource estimate. Geologist Mário Conrado Reinhardt participated in the site visit and discussions regarding the prospective model of the deposit with DuSolo staff. Geologist Bernardo de Cerqueira Viana supported the coordination of the activities and participated in the discussions with respect to the geological model and mineral resource estimate. Regarding mining studies, Mr. Rodriguez received support from engineers Rooniel Hirose and Poliana Auxiliadora Freitas.

With the respect to this Preliminary Economic Assessment, September 01, 2016 was considered the *Effective Date* for the resource estimate, based on the date when the topographical survey was completed on the mineral exploration area. GE21 believes that no relevant data with respect to the mineral resource estimate were produced after this date.

1.2 Location and Access

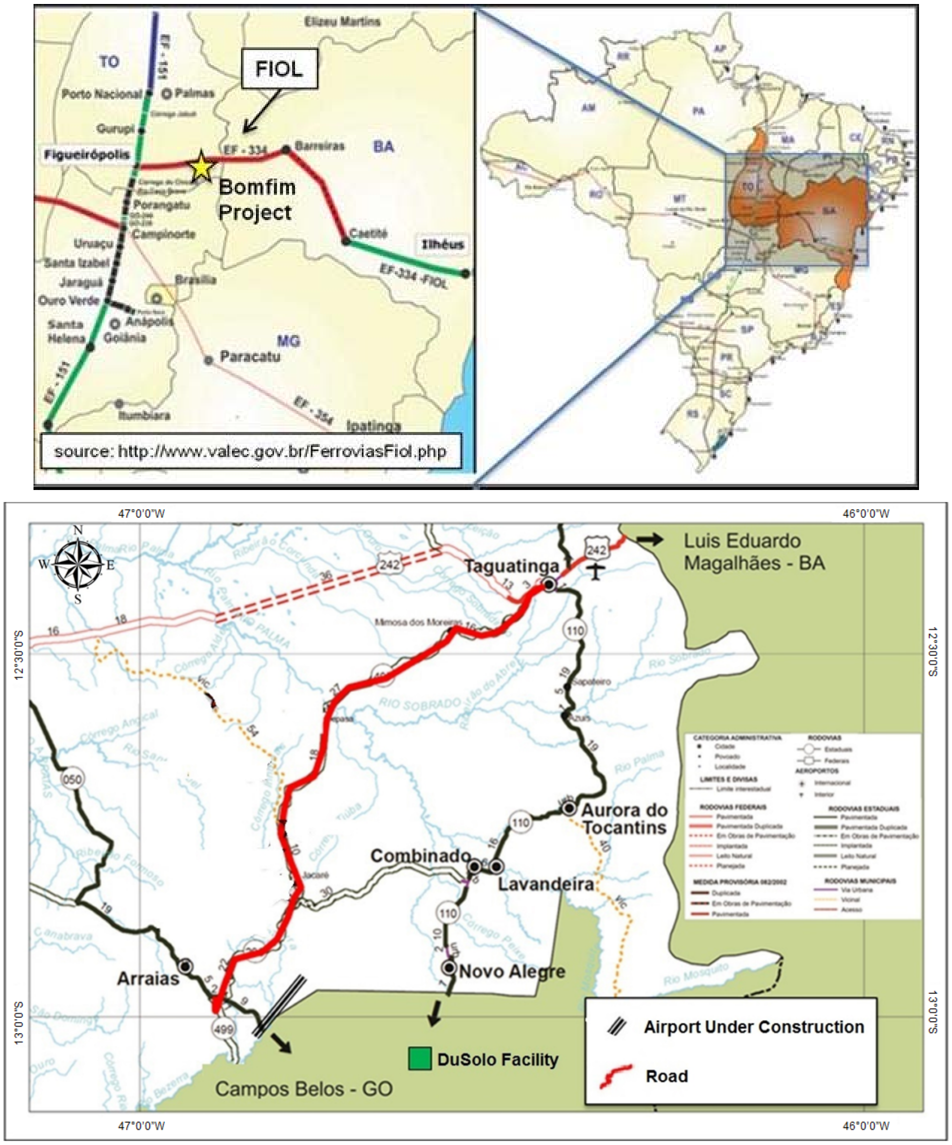
The project is located within the frontier region of the states of Goiás and Tocantins, close to the city of Campos Belos, Goiás, which is located 400km to the north of Brasília and 400km south of the city of Palmas. The processing plant is 5 km away from the city of Campos Belos and 25 km away from the DANF Santiago Project (Figure ES_01).

The Property can be easily accessed in 4-5 hours drive from Brasilia, the capital of Brazil and the closest major international airport. Access from Brasilia is 425 km via paved highways (BR-020 and GO-118) to the town of Campos Belos and from there for a few km by a network of unpaved provincial roads and smaller farm roads. Campos Belos has an airstrip with a 1,400m paved runway that can be utilized by small aircraft.

The following infrastructure can be found close to the DANF Santiago Project: roads, dams, electrical transmission lines and a local airport that is being built to provide domestic flights. Recently the Brazilian government approved the FIOL (Ferrovia Integração Oeste-Leste, or West-East Integration Railroad), a new railroad that will be located 100km to the north of the Project Area (Figure 4.1.1_1).

Figure ES_01

Project Location



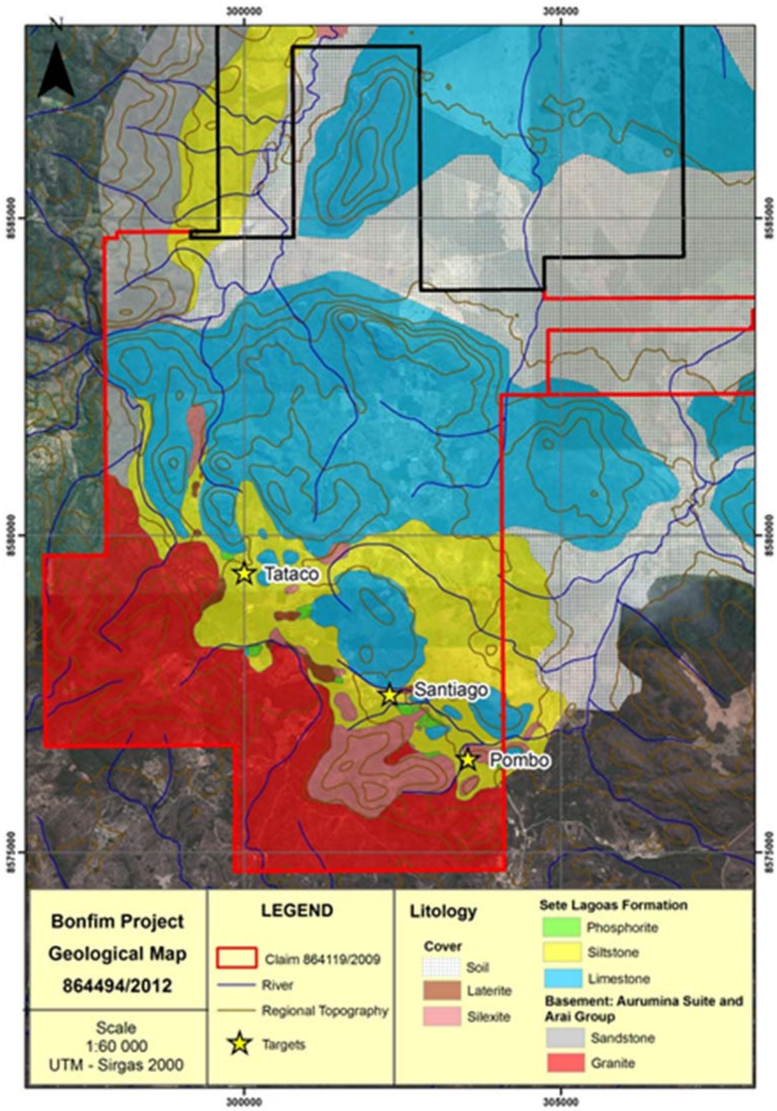
1.3 Geology and Exploration

The larger Bomfim Project, within which the Santiago DANF Project lies, is within a large package of rocks along the western edge of the São Francisco craton and immediately east of the Brasilia fold belt in central Brazil (Mendonça and Campos, 2012; Da Rocha Araujo et al., 1992).

DuSolo holds the mineral exploration rights to seven exploration licences within the region (Bomfim Project), however, this report deals with the information that was acquired during the work that was undertaken with respect to DNPM administrative instrument 864.494/2012, which corresponds to the Santiago, Tataco and Pombo targets (Figure ES_02). These targets compose the Santiago DANF Project. As such, the lithotypes that are found within the limits of this exploration licence, which covers an area of 6947.39 hectares, are described herein.

Figure ES_02

Geological map of the claim from this report



Within this area, rocks of the base of the Bambuí Group can be found that are associated with the Sete Lagoas Formation, which is host to the phosphate mineralization. It includes the pelitic, carbonatic and phosphatic rocks that overlie the granitic rocks of the Aurumina Suite. The Sete Lagoas Formation can be found in the majority of the area and is distributed to the east of the granitic basement.

Mineral exploration work and exploratory drilling was intensified since the last report (the "Bonfim Agro-Mineral Phosphate Project, Technical Report and Initial Resource Estimate" issued March 5, 2014). Geological interpretations were undertaken and, because of the various types of mineralization present, which display a large range of phosphate concentrations, the mineralization was separated into two principal groups: high grade (HG) and low grade (LG).

A value of ≥10% P_2O_5 was adopted for the Santiago DANF Project in order to designate the HG mineralization, which was referred to as the phosphorites group. Although the literature defines phosphorite as having grades that are quite higher than those that were adopted by the company, the limit of 10% that was applied herein sought to provide an objective basis to define the HG and LG mineralization, and to be compatible with the processing routes that were evaluated – crushing and screening of the ore results in a high grade coarse fraction, and lower grade medium and fine fractions. Milling of the coarse material and blending allows DuSolo to produce its products of 12% and 15% DANF.

Rocks that contained concentrations below that value, but above 3% P_2O_5, are referred to herein as LG mineralization, which are simply referred to as phosphatic rocks.

From analyses of the satellite images, the definition of regional lineaments was undertaken (smaller, larger and intermediate) with respect to all of DuSolo's exploration licences. In addition to the geological map that was produced and Sn (flat) data that were collected in the field by the team of geologists, a structural interpretation was developed for the Great Bomfim Project site. The Figure ES_03 shows the cross-referencing of the regional structural analyses and the geological mapping of the area where Dusolo's mineral claims are located.

Among several types of phosphate deposits ranging from 1) modern bioaccumulation of guano, 2) igneous sources in carbonatites and alkaline igneous complexes and 3) marine chemical sedimentary deposits.(Simandl et al., 2012; Guilbert and Park, 1986); mineralization at Bomfim is classified as a marine chemical sedimentary deposit of a shallow nature, restricted to nearshore environments, generally formed in distal shelf environments in association with coastal upwelling (Pufahl 2010).

DuSolo has pursued a continuous exploration program within which mineralized material of potentially economic significance were at or very close to surface. While the exploration model is able to predict where substantial phosphate mineralization is likely to occur at depth, only mineralization at or near surface has been given priority.

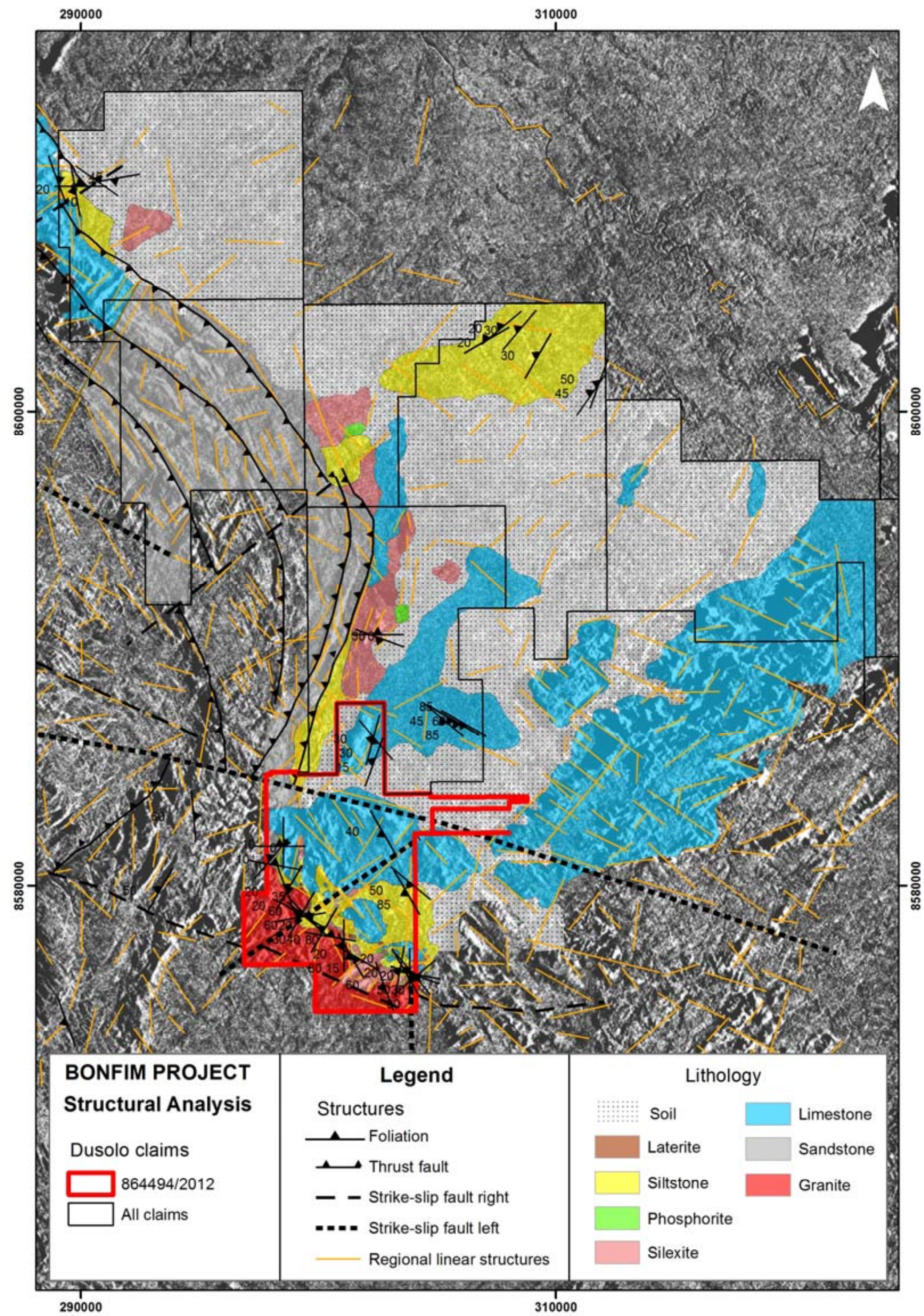
Field methods for detecting phosphate have been used to confirm significant mineralization. Two methods were used to detect phosphate:

- an Ammonium Molybdate test that showed a bright yellow reaction to phosphated sediments with a minimum 1-2% P_2O_5, and;
- a handheld XRF spectrometer which could be used on rock surfaces or soils in the field and with crushed rocks in a more controlled environment in the field office.

The on site or same day turnaround made possible by these methods was particularly effective in directing exploration priorities prior to receiving confirmation through lab results.

Figure ES_03

Structural Map of the DuSolo Claims



During the mineral exploration work three mappings were executed, each with different purposes, 1) Regional mapping at 1:50,000; 2) Detailed mapping at 1:25,000 and 1:10,000; 3) Detailed mapping at 1:5,000 and 1,1000. The mapping work generated data from detailed outcropping mineralization and positions of future drillholes to the overall direction of the contact between the sediments of the Sete Lagoas Formation and the granitic basement.

Chip and grab samples were collected during both prospecting and mapping phases and were focused on identifying the presence of phosphorite at surface, particularly in locations where the exploration model predicted mineralization. Besides that, a total of 15 test pits were opened at the Santiago and Tataco targets. The deepest test pit reached 7m in depth, while the shallowest pit reached 2,2m.

The topographic survey for the area considered in this report was executed by CCM Engenharia and covered approximately 15 hectares. Besides that, a survey on the mining area with a drone using a Canon s100 camera with a 1/1.7 sensor, which generated an aerial image of the region, also conducted by CCM Engenharia.

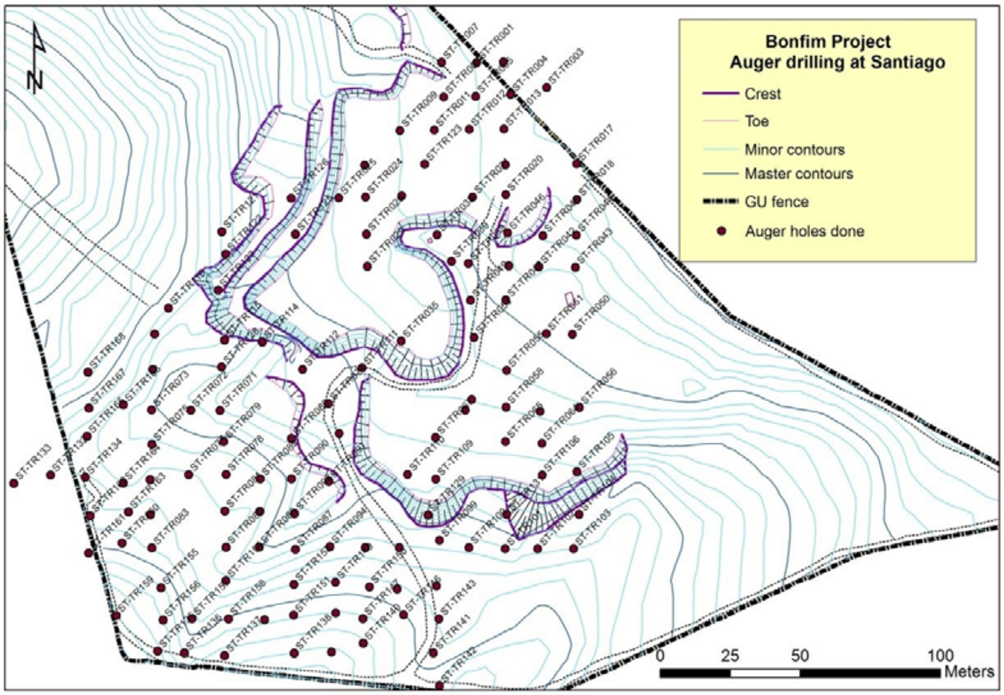
The dry bulk density that was adopted for the phosphate resource estimate was established from results with seventy-six grab samples of different sizes, that were collected from the ground and walls at the original excavation site. The samples were selected and fragmented into different sizes with the aim of reducing bias. After being collected and prepared, the samples were labelled and transported to the laboratory located within DuSolo's premises at Campos Belos

The results that were obtained varied from 1.03 to 2.54 g/cm³ and had an overall average of 1.68g/cm³, for the samples taken from the mining front, and 1.63g/cm³ for the samples produced from drill core samples. Using only the samples that were within the limit of one standard deviation, one obtains an average density of 1.67g/cm³.

At the Santiago Target, two rotary diamond drill holes and 155 reverse circulation (RC) rotary-percussive drill holes were executed by the company Geomina. All of the holes were drilled vertically due to the horizontal nature of the mineralization and the fact that the thicknesses of the layers were considered to be true. The holes reached a maximum depth of 48 meters.

In the area of the Santiago target, 168 auger drill holes were executed in accordance with a 12.5m x 12.5m grid with the aim of following the lateral continuity of the mineralization at depths of up to 10m (Figure ES_04).The purpose of this was to help direct extraction campaigns and act as a basic tool in the grade control program. In total, 973.05m were drilled with the auger, which generated a total of 1001 samples. The same procedures of preparation and analysis were executed for the reverse circulation drilling and auger samples.

Figure ES_04
Auger drilling grid that was adopted at the Santiago Target



1.4 QAQC and Data Verification

Intertek Minerals Laboratory ("Intertek") in Cotia, São Paulo was the primary laboratory used for the Santiago DANF Project. Two other laboratories, SGS Geosol Laboratórios Ltda ("SGS") and a laboratory in the geological engineering department of Escola Politécnica da Universidade de São Paulo ("USP") were used earlier in the program for limited batches of samples. Acme Analytical Laboratories Ltd ("Acme") prep facility in Itaituba, Brazil, with analysis conducted in Vancouver, Canada, was used for check samples during the delineation-drilling phase.

An internal QA/QC program was implemented at the Santiago DANF Project that made it possible to validate the quality of the results that were produced by the chemical analysis laboratory. This program was restricted to the RC drilling campaign and included laboratory contamination, accuracy and precision control tools through the insertion of "blank", "standard" and field duplicate samples.

A total of 53 standard samples were inserted in the batches; 29 of them were high-grade and 24 low-grade, which corresponded to 1.6% of the total amount of samples. Also, 59 field duplicate samples were inserted into the sequence of drill core samples, which corresponded to 1.8% of the total amount of samples.

Additionally, a batch of 34 auger samples were selected by GE21 to be sent to SGS-Geosol's laboratory in Vespasiano, Minas Gerais, with the aim of comparing the results of the analyses obtained via portable X-ray device with the results of the certified laboratory.

GE21 concluded that the sampling methods, safety procedures and analytical techniques that were employed are compatible with industry best practices, and therefore may be used for this mineral resource estimate.

The nature of the auger holes and resulting samples is such that they are considerably shorter and variable in length than the RC drill holes, and are more affected by mixing of the intervals. As such GE21 decided that whilst the auger samples provided relevant information for short-term mine planning, it was not sufficient to be used for the grade estimation of the resource model.

GE21 staff undertook field visits to the project site with the aim of improving the knowledge of the geology there, confirming the existence of the information required for the resource estimate, and to verify the procedures that were adopted during the exploration, drilling and mining phases. Mining Engineer Porfírio Rodriguez and Geologist Mário Reinhardt completed the last field visit in September 2016.

GE21 visited and verified RC drilling benchmarks and recorded their coordinates with a navigational GPS in order to be compared later with the project database. No differences were found to be greater than the differences that could possibly be related to the imprecision of the methods of measurement used in the verification.

GE21 concluded that DuSolo's installations and procedures were in accordance with industry best practices.

1.5 Mineral Processing and Metallurgical Testing

DANF is an environmentally friendly, natural fertilizer derived from phosphate-rich rock types that display sufficient agronomic solubility. DANF is applied directly to the soil and yields excellent solubility values, that render the phosphorous more available for the plant's consumption over longer periods of time, and in accordance with the plant's life cycle. DANF does not leach from the soil and is suitable for both organic and conventional farming.

Regarding the legislation surrounding fertilizer products in Brazil, DANF may be associated with Natural Phosphate, having an anomalous concentration of P_2O_5 and a minimum grade of 4% P_2O_5 that is soluble in 2% citric acid at a proportion of 1:100 in terms of particle size. The particles must be 85% passing (in a 0.075mm screen).

Because it is a natural product and no processing other than crushing and screening is required, no metallurgical process testing was completed, and the agronomical quality can be ascertained from the market that the product has generated within local agribusiness. This was attained during the previous "trial mining" phase with mining activities permitted by the mineral exploration, known as the GUIA. (refer to Section 15).

The *Guia de Utilização* - GUIA, roughly translated to English as Utilization Guide, is an instrument of the Brazilian mining legislation whose provisions are specified within Directive No. 144, from May 3, 2007, which was modified by the National Department of Mineral Production. This directive allows the prospector the extraction of mineral substances from a mining tenement before the issuance of a mining concession when the extraction is based on a proper analysis of technical, environmental and market conditions.

1.6 Mineral Resource Estimate

The definitions of resources established by CIM states that a Mineral Resource is a concentration or occurrence of diamonds, natural solid inorganic material, or natural solid fossilized organic material, including base and precious metals, coal, and industrial minerals in or on the Earth's crust in such form and quantity and of such a grade or quality that it has reasonable prospects for economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge.

GE21 executed the geological modeling, the grade estimation and the classification of the mineral resources of the Santiago target. In doing so, the following set of factors was taken into consideration: the quantity and spacing of the available data, the interpretation of the mineralization controls, the type of mineralization, and the quality of the data that was utilized, and a Lersch-Grossman pit as economic limit . The resource estimate was calculated in areas that were limited by the geological interpretations and by the borders of the mining rights. The database that was used by GE21 contains the results of the overall grade analyses for P_2O_5, Fe_2O_3, MnO TiO_2, CaO, Al_2O_3, MgO, K_2O, Na_2O, SiO_2, ZrO_2, SrO and LOI.

Table ES_01 shows a summary of the project's database.

Table ES_01
Database Summary

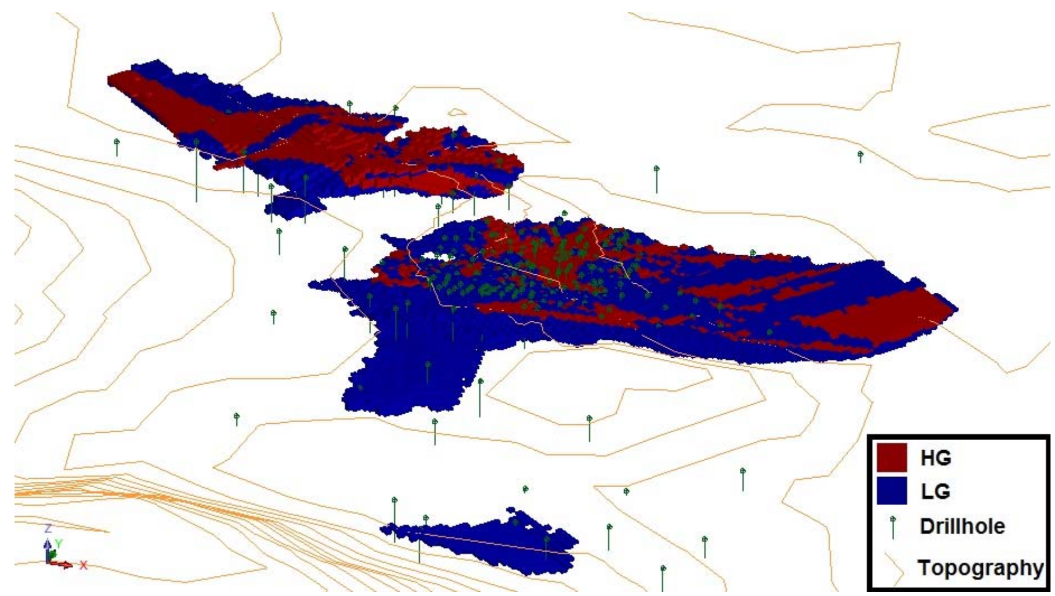
Type	Total Drillholes	Total Meters (m)	Number of Samples
AUGER	128	734.85	757
DD	2	38.4	0
RC	155	3,198.8	3,231
Total	**285**	**3,972.05**	**3,988**

GE21 executed multi-variable grouping that was based on the Cluster Analysis technique, which sought to distinguish the geological domains that exist at the targets. To do so, the lithological descriptions that had been previously prepared by the field geologists, and the results of the chemical analyses of the RC drillholes, were utilized. The grouped analysis took into account the following variables: P_2O_5, K_2O, Al_2O_3, SiO_2, CaO, MgO and LOI.

The modelling was executed taking into account the following domains: non-mineralized siltite/argillite, carbonatic rock, silexite and two domains that are mineralized in siltite/phosphorite, which were classified as: "High-Grade" and "Low-Grade" zones. Soil and secondary phosphate domains, originating from weathering processes, were not modelled because, in the study area, they occur in volumes that are insignificant.

The 3D model was developed based on the connection of the polygons and section lines, generating solids and 3D surfaces that, when combined, generated the geological model onto the block model (Figure ES_05).

Figure ES_05
Geological model - Mineralized Domains - 3D view towards the NE



The Santiago DANF Project has samples that were obtained via RC drilling, which was executed along the entire extension of the deposit, in addition to auger drilling, which was executed within the mining area that is related to the GUIA. GE21 completed the estimate of the resource model using exclusively the RC samples. The estimate of the area that will be mined in the short term was executed using RC and auger samples because of the more detailed drilling grid and the relevance of the auger samples when considering the mining bench height and methods.

Considering the statistics of the sample support and the characteristics of the mineralization, GE21 opted to generate one metre composites, and only composites of at least 75 centimetres were considered valid.

An exploratory analysis of the RC drilling sample composites and the RC+auger samples taken together was conducted. The analysis took into account the variables P_2O_5, CaO, MgO, Al_2O_3, Fe_2O_3, SiO_2, K_2O and LOI from the HG and LG domains.

Table ES_02 shows a summary of the descriptive statistical analysis that was developed for the RC and RC+auger composites, respectively.

Table ES_02 Summary of the Composite Statistics									
Composite	**Variable**	**Lithology**	**Average %**	**Variance %²**	**Standard Deviation %**	**CV**	**No. of Samples**	**Lower Limit %**	**Upper Limit %**
RC	**P_2O_5**	**HG**	15.41	32.35	5.69	0.37	395	1.49	33.36
		LG	5.77	10.77	3.28	0.57	863	0.01	35.57
	CaO	**HG**	21.37	71.09	8.43	0.39	395	1.99	48.20
		LG	7.55	25.11	5.01	0.66	863	0.14	50.00
	MgO	**HG**	1.04	0.16	0.39	0.38	395	0.06	4.36
		LG	1.36	0.63	0.79	0.58	863	0.19	17.80
	Al_2O_3	**HG**	8.47	6.45	2.54	0.30	395	1.31	15.98
		LG	10.64	7.94	2.82	0.26	863	0.01	20.00
	Fe_2O_3	**HG**	5.37	7.70	2.78	0.52	395	0.55	19.60
		LG	7.22	24.77	4.98	0.69	863	0.12	41.80
	SiO_2	**HG**	39.97	148.90	12.20	0.31	395	6.40	92.42
		LG	58.97	105.49	10.27	0.17	863	3.09	81.80
	K_2O	**HG**	2.29	0.50	0.71	0.31	395	0.20	4.54
		LG	2.98	0.65	0.80	0.27	863	0.01	5.24
	LOI	**HG**	4.27	1.03	1.02	0.24	395	0.63	10.20
		LG	4.14	4.60	2.14	0.52	863	1.03	37.75
RC+ Auger	**P_2O_5**	**HG**	15.41	29.47	5.43	0.35	642	0.64	33.36
		LG	5.72	9.43	3.07	0.54	1 138	0.01	35.57

The variographic analysis was executed on the HG and LG mineralized domains with respect to the following grade variables: P_2O_5, CaO, MgO, Al_2O_3, Fe_2O_3, SiO_2, K_2O and LOI. Only RC composites were used in this analysis. The variograms that were obtained were normalized and applied in the estimate of the short-term area using the composited samples from the RC+Auger samples. The Table ES_03 presents the summary of the variographic analysis.

Table ES_03 Summary of the variographic analysis										
Variable	**c0 %²**	**c1 %²**	**a1 m**	**c2 %²**	**a2 m**	**Bearing**	**Plunge**	**Dip**	**RSM**	**RM**
P_2O_5	0.19	0.05	30	0.76	117	195º	8.65º	0º	1	4.5
CaO	0.19	0.05	30	0.76	61.00	195º	8.65º	0º	1	4.52
MgO	0.18	0.06	20	0.76	69.00	195º	8.65º	0º	1	4.5
Al_2O_3	0.22	0.01	25	0.76	77.00	195º	8.65º	0º	1	8.23
Fe_2O_3	0.10	0.35	11	0.55	85.00	195º	8.65º	0º	1	2.83
SiO_2	0.07	0.16	20	0.77	93.00	195º	8.65º	0º	1	4.5
K_2O	0.12	0.38	15	0.50	101.00	195º	8.65º	0º	1	4.87
LOI	0.11	0.21	25	0.68	109.00	195º	8.65º	0º	1	4.5

GE21 made use of two block models for the Santiago target deposit estimate. One was a model covering the entire area of the deposit (Long Term Model - LT), having block dimensions that were compatible not only with the spacing of the RC drilling grid but also with the height of the mining benches (Table ES_04). The second model had dimensions that were restricted to the short-term area (Short-term Model - ST) and a block spacing that was compatible with the spacing of the auger holes (Table ES_05).

Table ES_04 Dimensions of the block model - LT Model			
Type	**Y**	**X**	**Z**
Minimum Coordinates (UTM)	8575068.219	303328.175	562m
Maximum Coordinates (UTM)	8580955.719	305078.175	790m
User Block Size(m)	12.5	12.5	4
Min. Block Size (m)	6.25	6.25	2
Rotation	-50º	0º	0º

Table ES_05 Dimensions of the block model - ST Model			
Type	**Y**	**X**	**Z**
Minimum Coordinates (UTM)	8574635	303650	550m
Maximum Coordinates (UTM)	8582635	306650	950m
User Block Size (m)	6.25	6.25	2
Rotation	-50	0	0

The Ordinary Kriging method (OK) was used on the variables P_2O_5, CaO, MgO, Al_2O_3, SiO_2, Fe_2O_3, K_2O and LOI (%) for the estimation of the block model grades. An estimate was performed for the HG and LG mineralized domains and for the two block models.

The estimation strategy that was adopted considered criteria such as the type and continuity of the mineralization and the spacing of the drilling grid. The plan that was established considered up to 4 estimation steps, as shown in Table ES_06.

Table ES_06 Estimation Strategy						
Type	**Step**	**Horizontal Exploration Distance (m)**	**Search**	**Minimum Nº of Samples**	**Maximum Nº of Samples**	**Maximum Nº of samples per hole**
HG and LG	1	20	Ellipsoid	4	12	2
	2	40		4	12	2
	3	60		4	12	2
	4	> 60		1	12	2

GE21 used the long-term model, which was estimated only with the RC samples, in order to declare the mineral resources. The HG and LG mineralized domains were considered for the classification of mineral resources. The mineral resources are limited to: a cut-off of 3% P_2O_5 based on the economic parameters of similar deposits, the limits of the mining rights and the mathematical pit that was generated to guarantee "Reasonable Prospects for Eventual

Economic Extraction" (RPEEE). GE21 also states that mineral resources that are not mineral reserves do not have demonstrated economic viability.

Considering the quality of the data that was utilized in the estimate, the mineral resource was classified as:

- Indicated - where the RC drilling grid had a density of approximately 40x40m;
- Inferred - where the drilling grid had a spacing of more than 40m.

The mineral resources that were estimated are shown in Table ES_07.

All resources are presented in dry tonnes.

Table ES_07
Mineral Resource Table - Phosphate
Indicated and Inferred Resources

Resource	Type	Tonnes (Mt)	P_2O_5%	CaO%	MgO%	SiO_2%	Al_2O_3%	LOI%
Indicated	HG*	0.29	14.78	20.49	1.02	41.53	8.44	4.08
	LG*	0.87	6.08	7.92	1.22	58.79	9.96	3.90
Total Indicated		**1.16**	**8.23**	**11.03**	**1.17**	**54.52**	**9.59**	**3.94**
Inferred	HG*	0.82	14.72	20.92	0.97	42.62	7.95	4.22
	LG*	1.88	5.89	7.83	1.48	58.39	10.73	4.43
Total Inferred		**2.70**	**8.58**	**11.82**	**1.32**	**53.59**	**9.88**	**4.37**

* High Grade Mineralization (HG): $P_2O_5 \geq 10\%$, Low Grade Mineralization (LG): $P_2O_5 \geq 3\%$ and <10%;
Block Model X=12.5; Y=12.5; Z=4 (Sub-block: X=6.25; Y=6.25; Z=2)
Effective date: 01/09/2016
Density: 1.67g/cm3

The Nearest Neighbour validation method made it possible to check for the occurrence of estimate smoothing due to Kriging, within what is expected for the type of deposit and the dimensions of the block model. The comparison showed that the Kriging respected the average of the grades.

GE21 considered that the result that was obtained for the estimate via Ordinary Kriging was acceptable, and noted that no overall or local bias existed.

1.7 GUIA – Mineral Rights Limitations

The *Guia de Utilização* - GUIA, roughly translated to English as Utilization Guide, is an instrument of the Brazilian mining legislation whose provisions are specified within Directive No. 144, from May 3, 2007, which was modified by the National Department of Mineral Production. This directive allows the extraction of mineral substances from a mining tenement during the exploration phase and before the issuance of a mining concession with the associated permanent mining and environmental licences. The GUIA approval of extraction allows a proper analysis of technical, environmental factors and to assess market conditions and prices.

For the issuance of a GUIA, the following situations shall be considered as justification for extraction prior to receiving a mining concession approval:

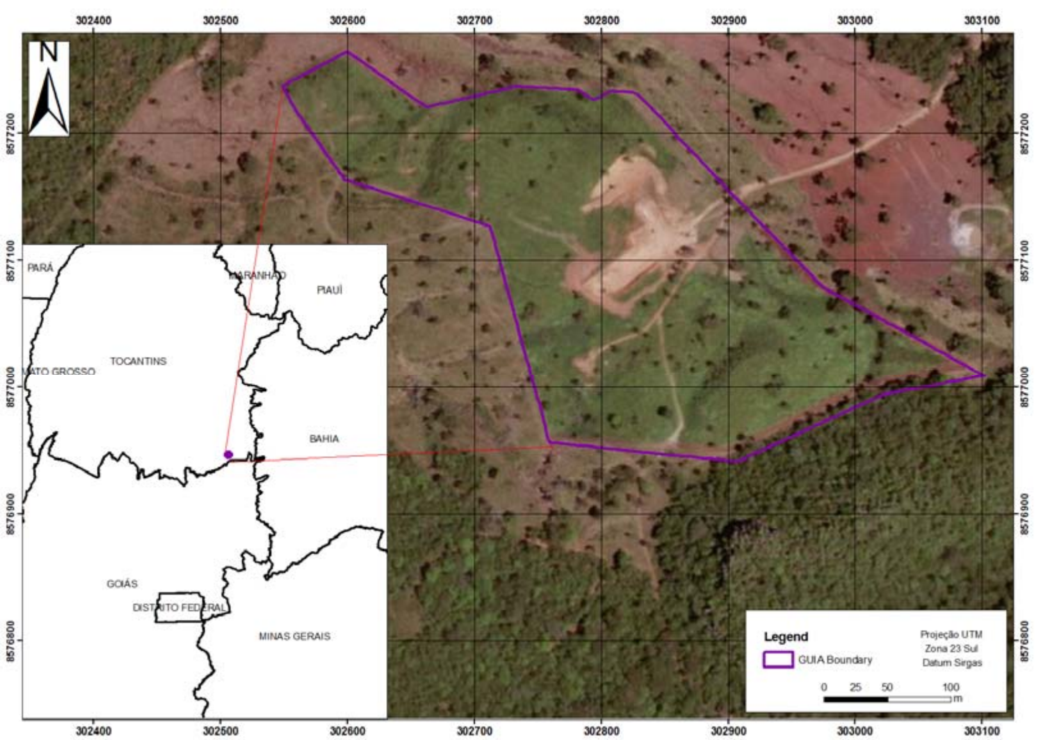
- Verification of the technical-economic feasibility of the mining of mineral substances within domestic and/or foreign markets;
- The extraction of mineral substances for the execution of industrial analyses and testing before the mining concession is granted;
- The commercialization of mineral substances, at the discretion of the DNPM, in accordance with public policies, to support the exploration and development phase of a project.

The development of mining activities, under the conditions that are established by the GUIA, is considered to be an integral part of the mineral exploration phase.

DuSolo, through its subsidiary P-TEC Agro Mineração, applied for and received a GUIA from the DNPM with the objective of undertaking experimental mining so that the results that would be obtained could offer technical insights that could prove the technical-economic feasibility of the Project. As such, the company could more adequately verify the market's acceptance of the product and the future demand of this consumer market.

Figure ES_06 shows the polygon that is associated with the GUIA.

Figure ES_06
Extents of the GUIA



The current GUIA (039/2014) was granted on September 23, 2014 and has allowed the mining and commercial sale of up to 100,000 tons per year of phosphatic rock. DuSolo intends to make use of the GUIA for the next 3 years.

1.8 Mining Methods

GE21, based on the Mineral Resource declared in this report prepared a Preliminary Economic Assessment (“PEA”) aiming to assess the potential economic viability of the Santiago DANF Project.

A PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.

The economic analysis was based on potentially recoverable resources and is defined as a mineral inventory.

The study was prepared in two phases,

- Short Term Mining Plan – First three years, a detailed mine plan to support GUIA mining activities;
- Long Term Mining Plan – Continuous yearly mining plan, from the fourth year, to complete the Life of Mine Plan.

According to DuSolo, after the third year the company plans to implement an Acid Granulation plant, in order to create added value to the product, but it will need to be justified economically in a future PEA. The current PEA is considering only the production of 12% and 15% P_2O_5 DANF for the current Life of Mine.

The economic and geometric parameters were defined based on GE21's database in accordance with projects of similar scale and characteristics. The determination of the geometry of the optimal pits, based on the economic parameters, was executed with Whittle software.

The sequence of optimal pits was obtained by varying the revenue factor from 30% to 200% with respect to the estimated product's selling price. In order to determine the evolution of the pits over time, an annual production scale of 100ktpa of ROM was established, at an annual discount rate of 10%. The optimal pit that had a quantity of mineralized material that could supply a production of 100ktpa, over 3 years, was adopted for Short Term Plan, and the optimal pit for the LOM was selected based on the maximum NPV.

Table ES_08 presents the geotechnical and geometric parameters that were adopted to develop the final operational pits for each period of mining.

Table ES_08

Operational Parameters for the Quarterly Mining Plan

Overall Slope Angle	33°
Face Angle	90°
Minimum Bench	6m
Minimum lot size	20m
Bench Height	4m
Ramp Width	10m
Ramp Slope	10%

The Table ES_09 summarizes the Resources and production results for the 12 and a half years of mining scheduled in this PEA.

Table ES_09

Summary of Resouce and Production

Material			**Mass wet basis (Kt)**	**P_2O_5 (%)**
Resource	**Class**	**Indicated**	1 296	7.82
		Inferred	3 022	8.15
ROM	**Type**	**Stockpile 1**	582	12.50
		Stockpile 2	669	16.03
	Total		1 251	14.38
Very Low Grade Material			1 080	7.15
Waste Rock			865	n/a
Mining product Diluted	**Type**	**P_2O_5 12%**	543	11.90
		P_2O_5 15%	635	15.24
	Total		1 178	13.70
Strip Ratio[1]	1.56	**Strip Ratio**[2]	0.37	

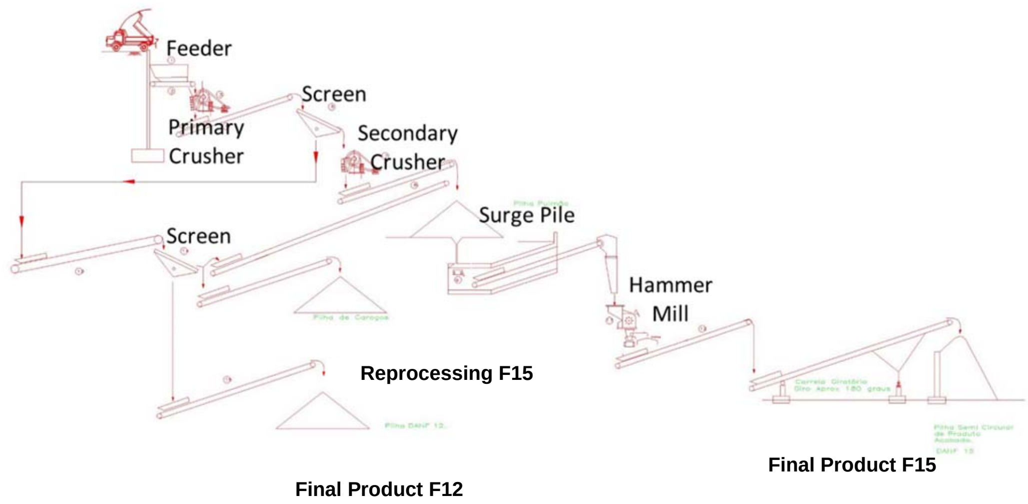
1.9 Recovery Methods

The material is placed in the ROM patio area, stockpiled and blended in such a way so as to guarantee a constant feed grade for the beneficiation process.

The processing route consists of a sizing process via crushing, screening and grinding, as shown in figure ES_07. No beneficiation or concentration type processing is undertaken.

Figure ES_07

Natural Phosphate Processing Flowchart



All of the material that is obtained from mining is transformed into the final product, which generates products that have greater or lesser value, depending on the phosphate concentration (P_2O_5). Therefore, tailings are not produced during ore processing, and the recovery of material during the process is 100%.

However, a fraction of the material is lost, not for reasons of the method of processing, but for operational reasons, such as when wheel loaders transport the material, or when it is loaded or unloaded from trucks within the lot, or when boulders are generated. Material is also lost through holes and leaks during the processing stages, by wind or rain removal when it is stockpiled in an open area in the lot, among other causes. In accordance with background data, this loss is estimated at 7% of the mass of the run of mine that is fed to the crusher.

For internal quality control purposes, the company maintains its own laboratory, with equipment that serves to analyze certain characteristics of the product such as particle size, comminution, sample preparation and a spectrophotometer for determining the concentration of P_2O_5 (phosphorus pentoxide - apatite mineral). The company also maintains a chemical technician on site that can run analyses.

1.10 Market Studies

According with data from CEPEA-USP, agribusiness sector represents 23% of Brazilian GDP (2015). Additionally, MAPA data shows that in 2015, agribusiness generated a US$ 75.0 billion surplus compared to a $20.0 billion trade surplus registered in Brazil as a whole. Therefore, this activity allows the country to sustain its positive outcomes in the balance of trade.

From 2015 to 2025, 16.6 million ha of planted area should be added to Brazilian agriculture industry, but increases in production will be mainly achieved by improvements in productivity. This means that Brazilian agricultural growth will continue to be led by technology and improved use of fertilzers and nutrients, and the planted area expansion will be concentrated mainly in the Cerrado region.

In the past ten years, the fertilizer market in Brazil grew at an annual rate of 4.1%. For the coming years, the market will keep growing, but at a lower pace (3.0% y-o-y). By 2025, more than 10.6 million additional tons of fertilizer supply will be required in the Brazilian market above current demand levels. During 2016, farmers demanded 32.6 million tons of fertilizers. In 2025 market demand will be close to 43.2 million tons. Over the next 10 years, fertilizer consumption in Center-West will increase more than 50%. And the region will account for 51% of the additional demand in the whole country. The three most important regions for the fertilizer market (Center-West, South and Southeast) represents 86% of the total fertilizer consumption in Brazil. In 2025 this main predominance will continue with 84% share. Phosphate fertilizer always represents about 42% of the Brazilian fertilizer market and will growth at a ratio of 2.9% y-o-y.

Brazil has a local industry to provide fertilizers, but the country needs to import all raw materials (except SSP) to meet its total demand. The country's dependence on imports differs among nutrients, reflecting the availability of natural resources. Currently, 77% of nutrient consumption is supplied by imports. This share achieves 95% for K_2O, 78% for N and 57% for P_2O_5.

The market potential, in the case of straight sales, would be 135.9 thousand tons with prices (FOB Campos Belos) at US$ 51.5 per metric ton for a 12% P_2O_5 Rock and 108.7 thousand tons at US$ 62.6 per metric ton for a 15% P_2O_5 Rock. In both cases the estimate potential focus on pasture, forest and sugarcane demand in the states of MT, GO, and TO. These results are shown on the figures ES_08 and ES_09.

Figure ES_08

Sensitivity Analysis – 12% P_2O_5

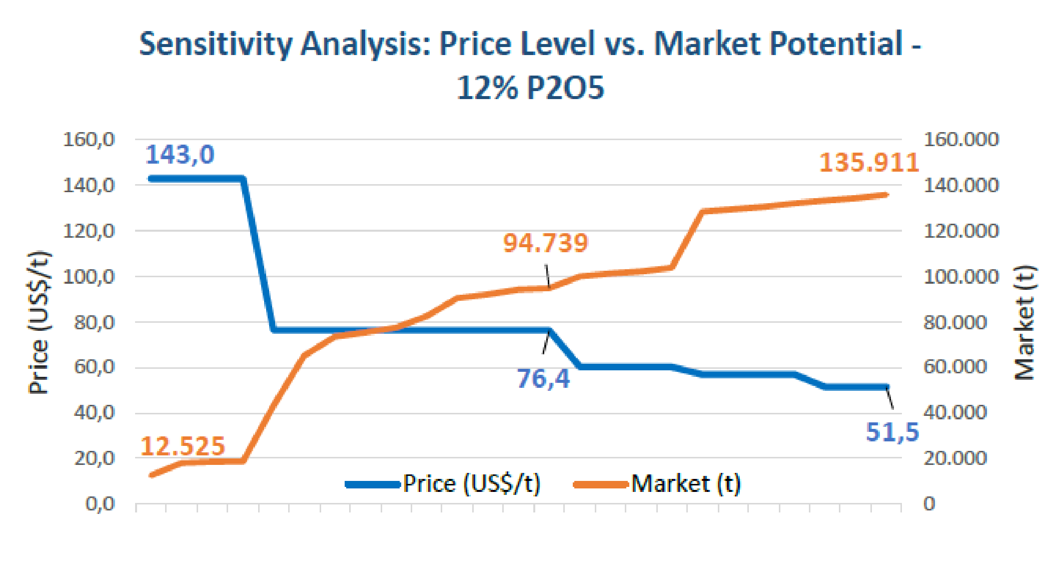
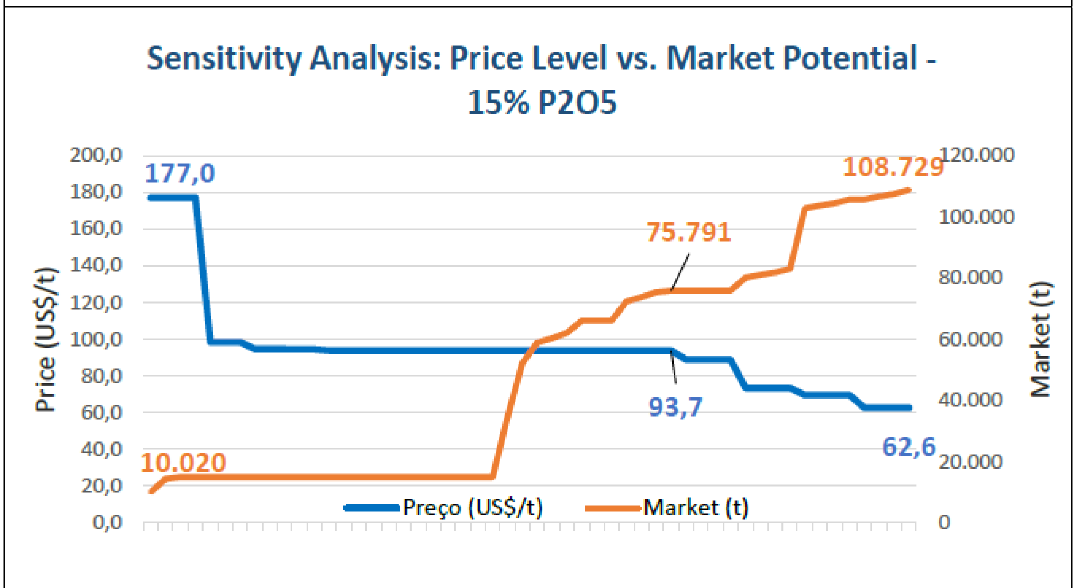


Figure ES_09

Sensitivity Analysis – 15% P_2O_5



1.11 Environmental Studies

The environmental licensing of any economic activity that may impact the environment within the State of Tocantins, must follow the provisions of the Instituto Natureza do Tocantins (NATURATINS) (Tocantins Nature Institute), and, within the State of Goiás, such licensing must adhere to the directives of the Secretaria de Meio Ambiente e Recursos Hídricos, Infraestrutura, Cidades e Assuntos Metropolitanos (SECIMA) (State Secretariat of the Environment and Water

Resources, Infrastructure, Cities and Metropolitan Issues), which was previously known as SEMARH.

Each agency is responsible for executing each state's environmental policies, environmental monitoring activities and environmental control activities. These agencies are also responsible for the enforcement of environmental laws and the provision of related services that are attributed to them as a result of mutually beneficial agreements and contracts.

Negative environmental impacts always arise as a result of mining activities (extraction and processing), because they are inherent to these undertakings, even during the mineral exploration phase. As a result, among other issues, it is with the aim of minimizing such impacts that environmental studies are developed, and required by the local environmental regulatory agency within the environmental licensing process. Within this process, the company must submit an environmental evaluation of the project site, and of the technical and structural implementation aspects of the project, in order to evaluate the impact of the venture on the site that was established for its implementation (in observance of the technical requirements that are imposed by the local environmental regulatory agency through its Terms of Reference and document lists).

Irrespective of the impacts that are associated with this activity, the requirement that it be submitted to environmental licensing procedures in the both the States of Tocantins and Goiás classifies the venture as an "Exploration Activity with a *Guia de Utilização* (GUIA)" and as the "Processing of Non-Metallic Minerals" (in accordance with the characteristics of the P-TEC - DuSolo Installations). The Project is classified as a Small Scale Activity by both environmental agencies.

Regarding the above, both NATURATINS and SECIMA make a list of the basic required documents available, as well as the Term of Reference (within which the technical aspects that are required of the project are listed) for the development of the required environmental studies. In the case of this Venture, an Environmental Project (EP) is required.

The EP is a technical-scientific document whose purpose is to evaluate the environmental impacts that arise from the activities and/or ventures that are potentially pollutant or that may engender environmental degradation. This document sets forth the mitigation measures and Environmental Control Plans (ECP) that are required, thereby guaranteeing the sustainable extraction of natural resources.

When it comes to environmental and community works, DuSolo regularly uses water trucks to irrigate the surrounding roads, in order to mitigate the dust generated by the vehicles on the communities next to the company’s work area.

As the mining activity has been undertaken on private property, and the mineral processing is executed within a plant that has already been installed and permitted, it is not necessary to negotiate or sign contracts with local communities.

The proposal of mitigation and potentializing measures should be undertaken for each impact on the environment that arises from each of the activities and processes that are expected to cause impacts, even though some measures that shall be adopted for a certain activity may have positive effects on another.

All of the licences that were obtained for the Santiago Target are shown in Table ES_10.

Table ES_10

Summary of the Santiago Target environmental licences

Description	Licence No.	Licensing Agency	Expiration Date	Status
Santiago Target Preliminary Licence (PL)	7506/14	NATURATINS	08/08/16	Expired
Santiago Target Installation Licence (IL)	7507/14	NATURATINS	08/08/16	Expired
Santiago Target Operation Licence (OL)	7825/14	NATURATINS	20/08/18	Active
Santiago Target *Guia de Utilização* (GUIA)	039/14	DNPM	01/04/16*	Active
Processing Plant Functioning Licence (FL)	1089/14	SEMARH	15/05/20	Active
Forest Exploitation Permit (FEP) - Bananal Farm	2221/11	NATURATINS	06/06/15	Expired

1.12 Capital and Operating Costs

As the Santiago DANF Project and the Campos Belos plant are already extracting and processing phosphate rock, there is no additional capital requirement for the Project. Sustaining capital over the LOM is minimal and included in the maintenance costs. The Company estimates the existing capital equipment (primary crusher, hammer mills etc) have a capacity of c.280,000 tonnes per annum and the projected DANF PEA production of 100,000 tonnes per annum is approximately 35% of the actual installed capacity, resulting in reduced operating hours and general wear. Mobile equipment such as trucks, water trucks and front-end loader and excavator are all supplied on a contract basis. The Company maintains insurance for its assets which includes the Campos Belos Plant.

DuSolo has already been maintaining an up-to-date operating and administrative cost tracking system regarding the mining operations in accordance with the licence that was granted by the GUIA.

GE21 summarized the operating and administrative costs, based on actual costs that are regularly incurred by DuSolo, and fixed for a forecasted production of 100,000tpa.

Table ES_11 shows the operational costs that were taken into account for the DANF Santiago Project.

Table ES_11

Operating Costs

Item		Cost	Unit
Mine	Ore	9.06	US$/t mined
	Waste Rock	1.34	
Plant		4.36	
G&A		4.00	

1.13 Cash Flow Model

An after-tax cash flow scenario was developed to evaluate the project based on economic-financial parameters, on the results of the mine scheduling and on the OPEX estimate that was presented above. Table ES_12 shows the selling prices and taxes that were taken into account in the cash flow scenario mentioned above.

Table ES_12
Cash Flow

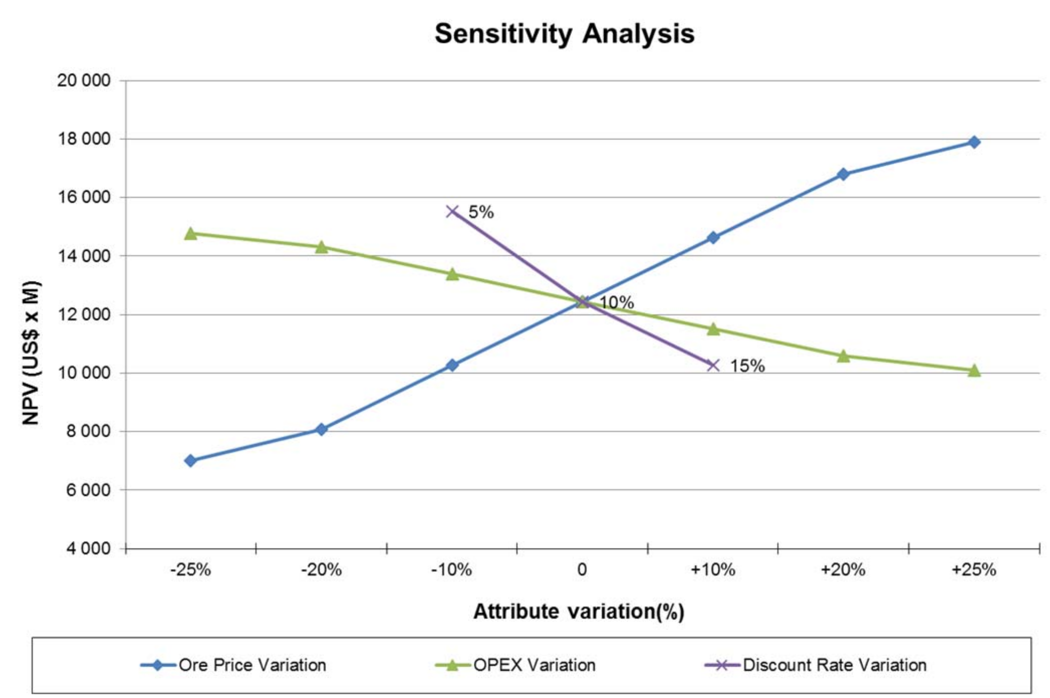
Period	1	2	3	4	5	6	7	8	9	10	11	12	13
Mined ore (Kt)	100	102	85	97	103	100	102	93	102	90	111	109	58
Mined waste rock (Kt)	43	100	30	84	87	93	75	99	69	41	12	115	61
Total mined material (Kt)	**143**	**202**	**115**	**181**	**190**	**193**	**176**	**192**	**171**	**130**	**123**	**224**	**119**
Mine OPEX (US$ x 1000)	(963)	(1 056)	(810)	(993)	(1 045)	(1 027)	(1 020)	(975)	(1 017)	(865)	(1 017)	(1 137)	(605)
Plant OPEX (US$ x 1000)	(511)	(520)	(435)	(497)	(524)	(510)	(519)	(476)	(522)	(458)	(565)	(555)	(295)
G&A (US$ x 1000)	(335)	(341)	(285)	(325)	(343)	(334)	(340)	(312)	(342)	(299)	(370)	(363)	(193)
Total OPEX (US$ x 1000)	**(1 809)**	**(1 916)**	**(1 530)**	**(1 815)**	**(1 911)**	**(1 871)**	**(1 880)**	**(1 763)**	**(1 882)**	**(1 622)**	**(1 952)**	**(2 055)**	**(1 093)**
Surface Royalties (US$ x 1000)	(54)	(56)	(47)	(50)	(51)	(48)	(45)	(36)	(42)	(33)	(36)	(31)	(16)
Operating costs	**(1 862)**	**(1 973)**	**(1 578)**	**(1 865)**	**(1 962)**	**(1 919)**	**(1 924)**	**(1 799)**	**(1 923)**	**(1 655)**	**(1 987)**	**(2 086)**	**(1 110)**
Operating cost per t produced	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(18)	(18)	(21)	(21)
Mine Closure Costs	(11)	(11)	(9)	(10)	(10)	(10)	(9)	(7)	(8)	(7)	(7)	(6)	(3)
Total Cost	**(1 873)**	**(1 984)**	**(1 587)**	**(1 875)**	**(1 972)**	**(1 929)**	**(1 933)**	**(1 806)**	**(1 932)**	**(1 662)**	**(1 994)**	**(2 092)**	**(1 113)**
Product @12% P_2O_5 (Kt)	8	2	-	16	25	29	47	63	60	68	103	100	53
Product @15% P_2O_5 (Kt)	92	100	85	82	78	71	55	30	43	22	7	-	-
Gross Revenue (US$ x 1000)	5 361	5 609	4 733	5 012	5 074	4 825	4 470	3 601	4 192	3 285	3 566	3 071	1 634
EBIT (zero depreciation)	**3 488**	**3 625**	**3 146**	**3 137**	**3 102**	**2 896**	**2 537**	**1 795**	**2 260**	**1 623**	**1 572**	**979**	**521**
Total taxes (29.8%)	(1 039)	(1 080)	(937)	(935)	(924)	(863)	(756)	(535)	(674)	(484)	(468)	(292)	(155)
Net Revenue (P/IPPJ)	**2 448**	**2 545**	**2 208**	**2 202**	**2 177**	**2 033**	**1 781**	**1 260**	**1 587**	**1 140**	**1 103**	**687**	**366**
CFEM (US$ x 1000)	(49)	(51)	(44)	(44)	(44)	(41)	(36)	(25)	(32)	(23)	(22)	(14)	(7)
Working Capital	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Profit	**2 399**	**2 494**	**2 164**	**2 158**	**2 134**	**1 993**	**1 745**	**1 235**	**1 555**	**1 117**	**1 081**	**673**	**358**
Cash Flow	2 399	2 494	2 164	2 158	2 134	1 993	1 745	1 235	1 555	1 117	1 081	673	358
NPV (US$ x 1000)	**13 051**	-	-	-	-	-	-	-	-	-	-	-	-

1.14 Economic Analysis

The sensitivity analysis was undertaken to evaluate the impact of the resulting economic indicators for the following attributes, within the cash flow: WACC (Weighted Average Cost of Capital); Product price; Total OPEX.

The WACC was evaluated by varying its value from 5% to 15%, in addition to the base value of 10%. The WACC and the OPEX were evaluated by varying their base values above and below 10%, 20% and 25%. The Figure ES_10 shows the sensitivity analysis developed by GE21.

Figure ES_10
Sensitivity Analysis



1.15 Conclusion

The Santiago DANF Project was developed to produce DANF, using its high grade phosphate mineralization, has been able to produce, economically, a 15% P_2O_5 and a 12% P_2O_5 products, saleable for the local agro-industries.

DANF has been produced and sold to local farmers surroundings of Itafós mine for the past 8 years. DANF production within the “Cerrado” region of Brazil is a simple and straight forward operation that requires the mining of a surficial high-grade phosphate mineralization, crushing, milling and then shipping to the farms within close vicinity to the project area.

This Resource Estimate of 0,29Mt@14.78% P_2O_5 Indicated and 0.82Mt@14.72% Inferred Resource categories supports DuSolo’s intention to produce DANF as a mean to create value for the project, and also allows DuSolo to raise capital to start the studies on more complex and higher value products.

The resource estimates were completed using ordinary kriging interpolation after data validation, statistical analysis and a variography study. One meter composite samples were used in conjunction with the resource estimation. An average dry specific gravity (SG) of 1.67g/cm³ was used for the resource estimate. The average SG value is based on SG testing (93 samples) of representative ore types collected in situ. The water displacement method (Arquimedes Principle) was used to perform the density measurements. The reverse circulation drilling procedures are to high quality with >85% recovery. A total of 150 control tool samples (59 duplicates, 53 high and low-grade standards, 38 blanks) were inserted in the sample sequences of the reverse circulation drill holes.

No Reserve was declared, but the preliminary economic assessment concludes that the Santiago DANF Project is a potentially viable project, at a production rate of 100,000tpy of DANF, for 12.5 years, producing 543kt @12%P_2O_5 and 635kt @15%P_2O_5 products, with no CAPEX, due to the facility already being installed and in production at a estimated OPEX of US$17.50/t mined, and selling for an average price around US$42/t (US$56/t @15% P_2O_5, US$31/t @12% P_2O_5 product), yielding a NPV of US$13M.

1.16 Recommendations

1.16.1 Exploration Work and Resource

GE21 recommends DuSolo to advance in the research of the relationship between the phosphorite outcropping and the silexite ocurrences, leading to a model which discover and expand the high grade mineralization zones.

Is recommended that DuSolo's Lab restart the CaO analysis, and a certification process, including a umpire assay program, to be ready to support futher exploration campaigns.

GE21 suggests DuSolo to prepare a confirmation campaign to shift the resource classification from Indicate to Measured, and from Inferred to Indicated, at least, using RC drilling for infill and diamond drilling twin holes for certification of RC quality.

1.16.2 Quality Control and Quality Assurance

It is desirable for Dusolo to acquire a commercial standard with a P_2O_5 grade in the range of high quality material, from 10% to 20% P_2O_5, to better qualify the QA / QC program and determination of accuracy.

1.16.3 General Advance of the Project

To provide some idea of the potential improvement in NPV that a relocation of DuSolo's processing plant to a closer location could generate, we have prepared a Plant Relocation Case assuming that haulage costs are significantly decreased, reducing the Mining Cost to US$1.40/t. This results in an increase to the NPV of approximately US$3.3M. GE21 has not made any assumption regarding a capital investment required for the move, and simply note that there is a reasonable increase NPV which could justify moderate expenditure of, for example US$0.8-1.1M, in addition to the other benefits mentioned above.

Agroconsult provided a market study for the DANF products that DuSolo intends to produce. Assuming an average LOM production of 50,000t per year for each product, Agroconsult's analysis suggests the prices on Table ES_13. (Refer to Section 19)

Table ES_13
Agroconsult Prices

Product DANF	Price (US$/t)
12%	76,4
15%	93,6

These prices are higher than currently achieved, but Agroconsult notes that with the correct strategy of market and price development, branding etc these higher prices could be achieved.

Accordingly, GE21 have prepared an Upside Case Model using the higher Agroconsult prices, resulting in an increase of the NPV to US$30M. GE21 recommends that management maintain its focus on marketing and sales prices, as this could provide significant improvements in the Santiago Project returns for limited increases in operating costs.

GE21 belives that the GUIA phase creates an excellent opportunity to implenet a reconciliation program, it could validate the use of auger drilling as a tool for grade control. This program should consider the reconciliation with the resource model as well.

2 INTRODUCTION

GE21 Consultoria Mineral Ltda. (GE21) was engaged by the company DuSolo Fertilizers (DuSolo) to develop a technical study, in the form of a Preliminary Economic Assessment (PEA), with respect to the Santiago phosphate deposit (DANF Santiago Project), which was previously addressed within the Bomfim project and located in the municipalities of Campos Belos – Goiás (GO) and Arraias – Tocantins (TO), Brazil, in accordance with the directives of CIM National Instrument 43-101 (NI 43-101).

The NI 43-101, which was developed by the Canadian Institute of Mining, is used to report mineral exploration results, mineral resources and mineral reserves. The code is a:

- Code of Mineral Ethics;
- Code of Technical Concepts and Procedures;
- Manual (containing Guidelines) and a Check List;
- Tool for guaranteeing real confidence levels and clarity in the mineral resource and reserve reports (for transparency);
- Tool for guaranteeing budgets, safe production plans and robust strategic planning that is devoid of "surprises".

The principles that dictate the functioning and application of the CIM NI 43-101 are Transparency, Materiality and Competence. Universal standardization stands out as a clear tendency within the NI 43-101 (currently only slightly different from the UK and Australian mineral codes). The NI 43-101 requires that a universal language be adopted by the mining industry in terms of the classification of resources and reserves: Clarity and transparency, for use in conferences and worldwide congresses, such as, for example, PDAC in Canada.

The Bomfim Project, within which the DANF Santiago Project is found, was founded in 2012 through the partnership between Eagle Star Petróleo e Mineração, a Canadian company that is active in Brazil in the exploration and development of mineral assets, and Quantum Fertilizantes do Tocantins, a Brazilian geological exploration company.

Through the development of the project, Eagle Star acquired Quantum's shares and changed its corporate name to DuSolo Fertilizantes, after which the company began to focus on the development and production of phosphatic fertilizers within Brazil under the name PTEC. P-TEC Agro Mineração is a subsidiary in Brazil of DuSolo Fertilizers, a Canadian publicly traded corporation that is headquartered in Vancouver. DuSolo now owns 100% of the Bonfim Project.

2.1 Qualifications, Experience and Independence

GE21 is a specialized, independent mineral consulting company. The mineral resource estimate and the conceptual economic study were developed by GE21 staff members, who are accredited by the Australian Institute of Geoscientists (AIG) as "Competent Persons" for the declaration of Mineral Resources and Reserves in accordance with international codes, such as NI43-101.

GE21 is the successor of Coffey Consultoria e Serviços in terms of the coordination and execution of the services that aim to certify the resources that pertain to DuSolo. Tetra Tech acquired Coffey in 2015.

Each of the authors of this report has the required qualifications, experience, competence and independence to be considered a "Qualified Person", as defined by NI 43-101.

Neither GE21, nor the Qualified Persons of this report, have, or have had, any material interest vested in DuSolo or any of its related entities. GE21's relationship with DuSolo is strictly professional, consistent with that held between a client and an independent consultant. This report was prepared in exchange for payment based on fees that were stipulated in a commercial agreement. Payment of these fees is not dependent on the results of this report.

2.2 Qualified Persons

The principal Qualified Person with respect to the objectives of this report is Mining Engineer Porfírio Cabaleiro Rodriguez. Mr. Rodriguez is a mine engineer that has 36 years of experience in the field of mineral resource and reserve estimation. He possesses considerable experience dealing with various commodities, such as phosphate, iron, uranium, gold and nickel ore, in addition to rare earth elements, among others. Mr. Rodriguez is a member of the Australian Institute of Geoscientists (MAIG).

Geologist Fábio Valério Câmara Xavier was responsible for developing the project's geological interpretations and modelling, in addition to activities related to QAQC procedures and the mineral resource estimate. Mr. Xavier is also a member of the Australian Institute of Geoscientists and has more than 13 years experience in working with mining projects.

Geologist Mário Conrado Reinhardt participated in the site visit that was undertaken over 3 days in August, 2016 and participated in discussions regarding the prospective model of the deposit with DuSolo staff. Mr. Reinhardt has more than 36 years of experience in mining projects, most notably with respect to providing geological interpretations and conducting mineral exploration activities.

Geologist Bernardo de Cerqueira Viana supported the coordination of the activities and participated in the discussions with respect to the geological model and mineral resource estimate. Mr. Viana is also a member of the Australian Institute of Geoscientists (MAIG) and has more than 15 years experience in mining projects.

2.3 Effective Date and Sources of Information

The effective date for the resource estimate, "Effective Date" of September 01, 2016, is based on the date when the topographical survey was completed on the mineral exploration area. GE21 believes that no relevant data with respect to the mineral resource estimate were produced after this date.

DuSolo and its consultants provided GE21 with the information that was used to develop this report, specifically during the execution of the work that is described herein. This work reflects the technical and economic conditions at the time that it was executed. GE21 executed, whenever possible, an independent verification of the data that it received, in addition to field visits in order to corroborate said data. This information was supplied in the form of an exploratory drilling database, certifications, maps, technical reports and a topographical survey. The data is a combination of historical and newly generated information.

2.4 Units of Measure

Unless stated otherwise, the units of measurement used in this report are all metric, in accordance with the International System of Units (SI). Unless indicated otherwise, all monetary units are expressed in Brazilian Reais (R$) or United States Dollars (US$). Although some cost figures have been taken from local sources in Brazil, each of these figures were converted to US$ for the compilation and presentation of the financial analysis. An exchange rate of R$ 3.6 = 1US$ was applied throughout.

The UTM Zone 23 South projection, datum SIRGAS2000, was chosen as the spatial point of reference of the project.

3 RELIANCE ON OTHER EXPERTS

The authors of this report, although once Coffey employees, now work for GE21 Consultoria Mineral, a company that has the same professional traits as Coffey, in terms of consulting activities, in the field of mineral resource and reserve estimation.

The information presented herein with respect to the mining rights associated with the Project is based on information that was submitted to, and published by, the National Department of Mineral Production (DNPM).

Information regarding the status of environmental licensing procedures, market conditions, contracts and the phosphatic rock processing plant were based on information that were described by, or obtained from, Du Solo and its consultants.

4 PROPERTY DESCRIPTION AND LOCATION

4.1 Property Description

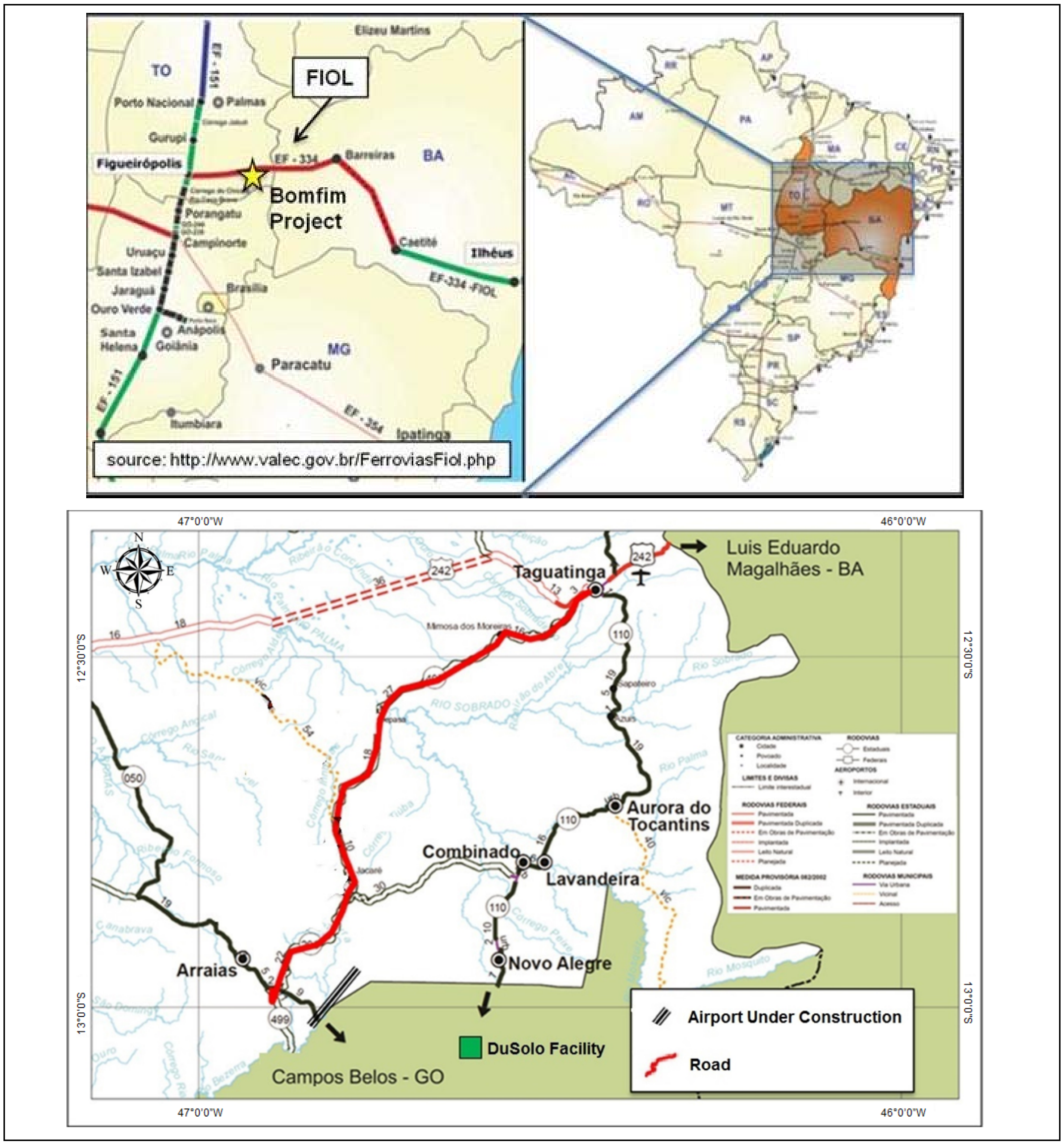
The Santiago DANF Project consists of an exploration target which is currently in its exploration authorization phase under licence number 864494/2012 (Centre located at 46°50'26.943"W, 12°51'32.742"S). This licence is part of the Bomfim Project, which itself consists of seven exploration authorizations that are held by PTEC Agro Mineração Spe Ltda and located in the region that is known as the phosphate belt in the southern region of the state of Tocantins and northern region of the state of Goiás.

The project is located within the frontier region of the states of Goiás and Tocantins, close to the city of Campos Belos, Goiás, which is located 400km to the north of Brasília and 400km south of the city of Palmas. The processing plant is 5 km away from the city of Campos Belos and 25 km away from the mine site (Figure 4.1_1).

The following infrastructure can be found close to the Bomfim project: roads, dams, electrical transmission lines and a local airport that is being built to provide domestic flights. However, recently, the Brazilian government approved the FIOL (Ferrovia Integração Oeste-Leste, or West-East Integration Railroad), a new railroad that will be located 100km to the north of the Project Area (Figure 4.1.1_1).

Figure 4.1.1_1

Project Location



4.2 Mineral Title in Brazil

Mining legislation in Brazil has been under review for several years and it is the intention of the government to introduce new legislation through Congress with some urgency. Debate within Brazil regarding the new mining legislation has extended what was intended to be an expedited process. The following description covers existing mining legislation under which the Company has been operating. Changes to the code are expected to include increased royalties, changes to methods for mineral right allocation/acquisition, changes to investment/work commitments per licence, changes to annual fees and the transition process from exploration to mining licences. Although many mining commentators (excluding NGOs critiquing the changes) feel that the new law will bring stability to the mining sector in Brazil, the authors notify that by the date of this Report, the final version of the new legislation is unknown and has not yet been published or enacted. Fertilizer production is incentivized by government because it is a strategically important commodity for Brazil.

4.3 Mining Legislation, Administration and Rights

The primary mining legislations in Brazil are the 1967 Federal Mining Code (Law No. 227), updated in 1995 (Law No. 9314) and parts of the 1988 Federal Constitution. Mining rights are under the jurisdiction of the Federal Union and mining legislation is enacted at the federal level though the General Assembly. Mining laws are administered through the National Department of Mineral Production (DNPM), which maintains offices in each state capital. Brazilian citizens and legal entities incorporated in Brazil may carry out mineral exploration under authorization of the federal government. There are no restrictions on foreign participation in these entities.

Landowners and governments (municipal, state and federal) are entitled to royalties ranging from 1 to 3% Gross Overriding Royalty (GOR) depending on the state and mineral being extracted. Mining activities are subject to both federal and state level environmental licencing. Phosphate royalty is currently 2%.

Licence holders are entitled to access their licence area and work on it whether surface rights are public or privately held, but must compensate the holder of surface rights for occupation or loss caused by work. Compensation is dealt with on a case-by-case basis and any disputes are settled by court.

4.4 Exploration Licences

Exploration licences are granted up to 3 years for an initial period and may be renewed once up to another 3 years on the approval of a DNPM inspector. The size of a licence ranges from 50 ha to 10,000 ha depending on the state. Tocantins has a maximum of 10,000 ha and Goiás a maximum of 2,000 ha per licence. The application should state the minerals or commodities sought and if commodities not stated are identified during exploration the DNPM should be notified to modify the title.

4.5 Annual Fees and Reporting Requirements

Annual licence fees are based on size and are calculated at US$0.56 per ha for the first licence term and US$0.85 per ha in the second term. Each licence holder should submit an exploration plan, budget and timeline – although there is no work or expenditure requirement. Licences require annual reports two months before the licence expires, describing exploration results, interpretation and expenditures. The renewal of a licence requires that holder has met reporting requirements during the years of the first licence term. A final report is due at the end of the term or on relinquishment of the licence.

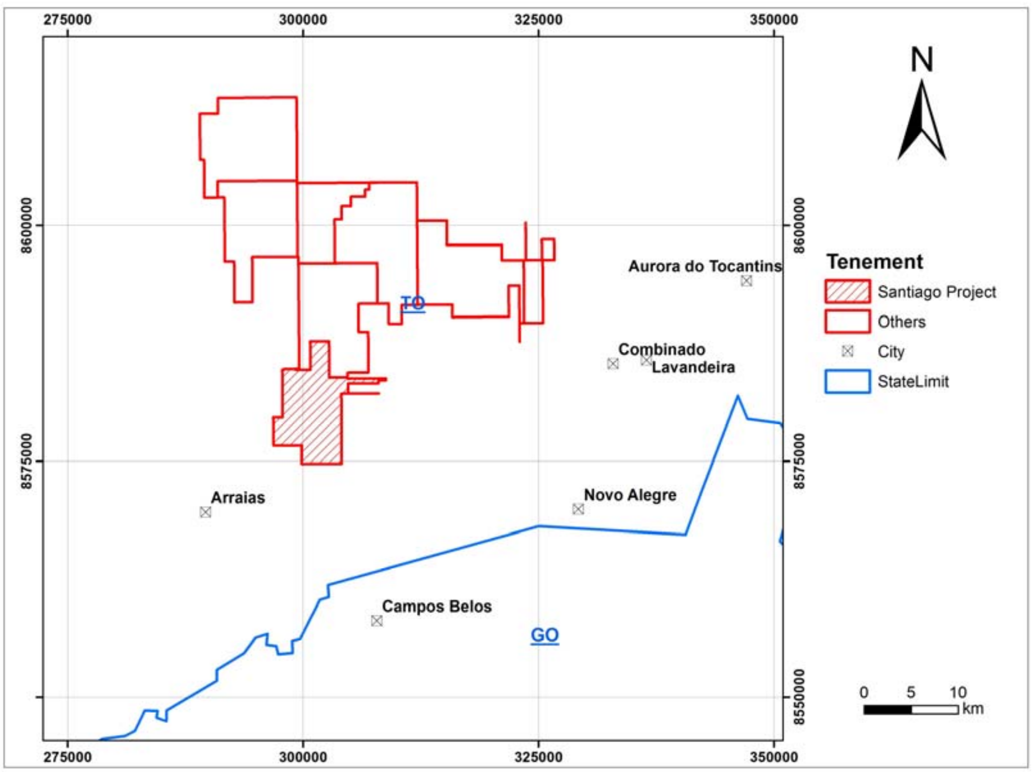
4.6 Mineral Tenure and Permits

Santiago Project is part of Bomfim Project under the exploration licence 864494/2012 (Table 4.6_1 and Figure 4.6_1).

Table 4.6_1 Mining Rights - Greater Bomfim Project			
Number	**Year**	**Area (ha)**	**Phase**
864055	2010	8832.38	EXPLORATION AUTHORIZATION
864236	2010	7328.55	EXPLORATION AUTHORIZATION
864237	2010	8875.5	EXPLORATION AUTHORIZATION
864119	2009	8046.69	EXPLORATION AUTHORIZATION
864605	2010	5812.55	EXPLORATION AUTHORIZATION
864067	2010	8230.51	EXPLORATION AUTHORIZATION
864494	2012	6947.39	EXPLORATION AUTHORIZATION

Figure 4.6_1

Location of the Mining Rights



4.7 Underlying Agreements

In order to acquire an interest in the Property, DuSolo entered into an agreement (the "Agreement") through its wholly owned Brazilian subsidiary, Eaglestar Petróleo E Mineração Do Brasil Ltda ("EPMD") and a Brazilian private company Quantum Mineração Ltda ("Quantum"). This subsection will use DuSolo to refer to either the Company or its Brazilian subsidiary as the context requires (and any such predecessor company).

DuSolo and Quantum (the "Parties") have entered into various agreements during the term of their relationship, governing the exploration and acquisition of the various concessions in Goias and Tocantins States in Brazil. The agreements are as follows and include amendments between Dusolo Mineracao Ltda. and Cesar Augusto de Sousa Sena (original owner of Quantum),:

A. The Parties entered into an "Investment Agreement" on June 14, 2012, in order to jointly develop mineral research in certain areas through the incorporation of a specific purpose entity ("Investment Agreement") which was amended on November 1st, 2012 and July 11, 2013;

B. DuSolo and Cesar entered into an agreement in order to formalize the relationship among them after the specific purpose entity was incorporated ("Cesar Agreement"), which was amended on November 1st, 2012;

C. As agreed upon by the Parties on the Investment Agreement, P-Tec was incorporated on October 11, 2012 and the Parties entered into a "Shareholders Agreement" on October 12, 2012 ("Shareholders Agreement");

D. On November 6, 2013, the Parties entered into a "Shareholders and Call Option Agreement" whereby Quantum stated its desire to sell its share of P-Tec ("Call Option");

E. On August 26, 2014, DuSolo and Cesar signed the "Termination of Cesar Agreement and Purchase of Shares" ("Termination of Cesar Agreement") whereby the parties agreed upon (x) the termination of the Investment Agreement and the Cesar Agreement, as amended, as well as of the Shareholders Agreement and the Call Option previously entered by the parties; and (y) payment of residual amounts due to Cesar regarding the services rendered to DuSolo;

F. Also on August 26, 2014, the Parties entered into the "Termination of the Investment Agreement and Purchase of Rights" ("Share Purchase Agreement") whereby the Parties agreed upon (x) the termination of the Investment Agreement; and (y) the acquisition, by DuSolo, of all shares issued by P-Tec and owned by Quantum, and the payment of the consideration amount set on US$1,389,000.00 (five million *Reais*) ("Purchase Price") of which US$611,111.00 has been paid;

G. On December 1st, 2015 the Parties decided to amend the Share Purchase Agreement in order to change the Purchase Price, agreeing on a new payment stream with the final payment due in January 2017;

H. On January 20th, 2017, the Parties executed the Second Amendment, with the final payments now due by June 1st 2017. The outstanding amount is US$611,111.00.

The effect of these two agreements were for DuSolo to acquire Quantum's 25% of P-Tec, in return for amongst other things, a revised payment schedule. In December 2015 the payment schedule was revised again, given the Company's financial situation.

GE21 understands that the Company is currently in good standing regarding its agreements with Quantum.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

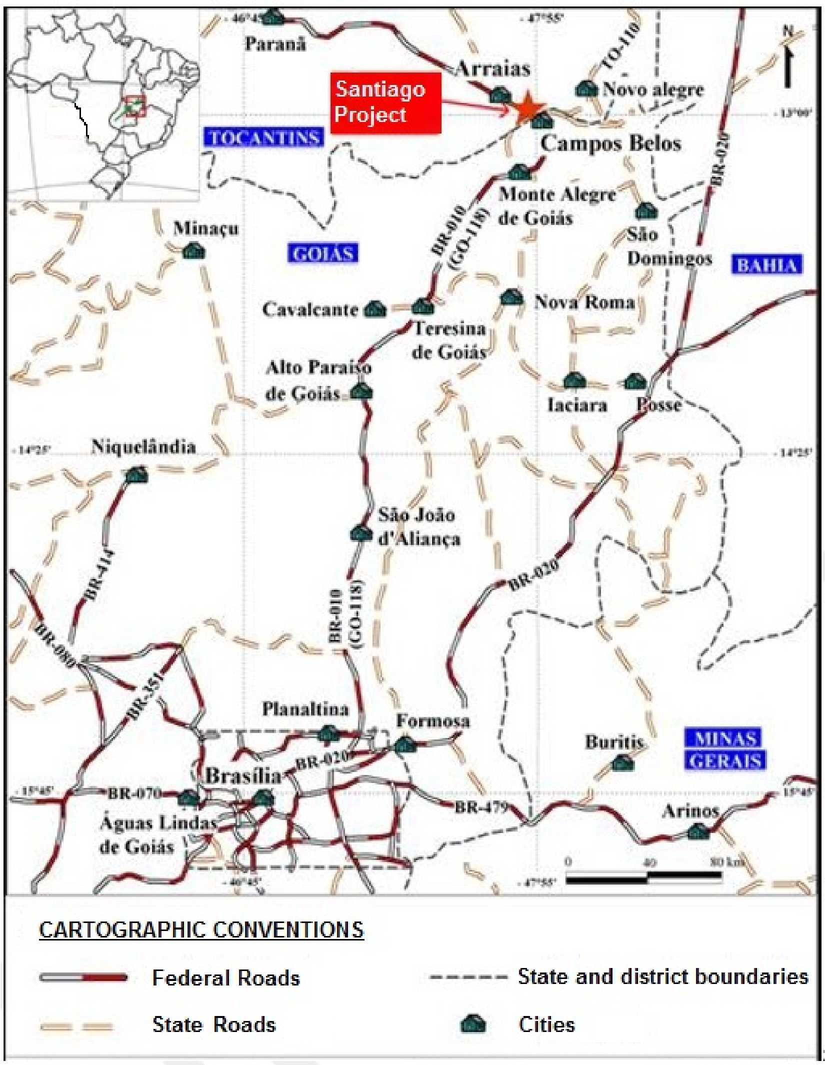
5.1 Accessibility

The Property can be easily accessed in 4-5 hours drive from Brasilia, the capital of Brazil and the closest major international airport. Access from Brasilia is 425 km via paved highways (BR-020 and GO-118) to the town of Campos Belos and from there for a few km by a network of unpaved provincial roads and smaller farm roads. The local roads are generally in good condition except for a few days during the peak of the rainy season. Campos Belos has an airstrip with a 1,400m paved runway that can be utilized by small aircrafts.

To get to DuSolo's processing plant (Figure 5.1_1), one must take the east exit from the city of Campos Belos and drive five kilometres in the direction of Taguatinga, Tocantins, via State road GO-110/TO-110.

Figure 5.1_1

Access routes modified from Monteiro et al. 2009



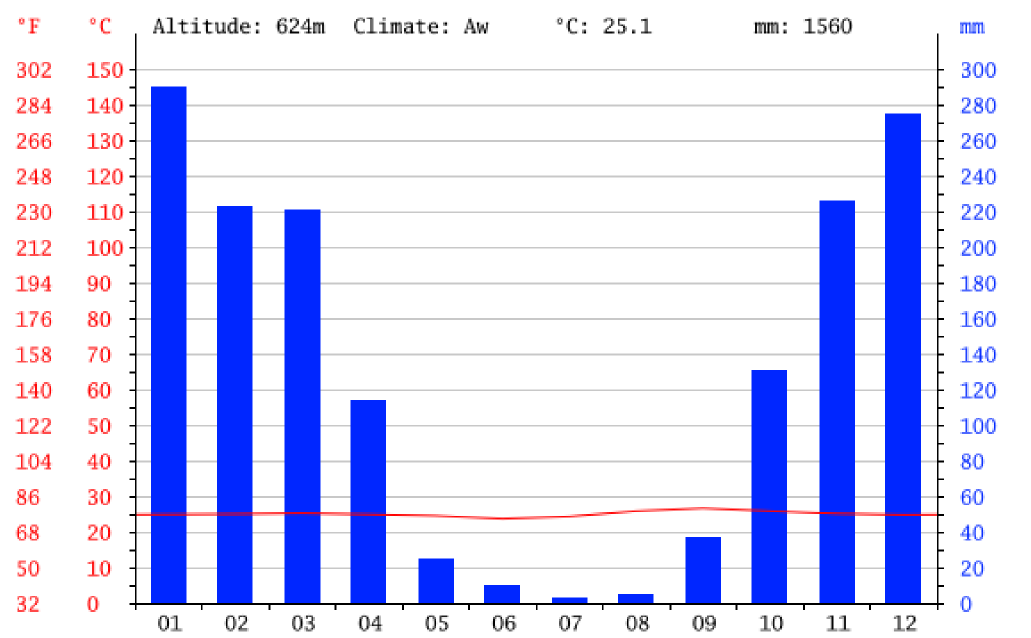
5.2 Climate and Length of Operating Season

The climate in the project area, which has an Aw classification in accordance with the Koëppen (1948) system, is tropical with a well-defined dry season, or winter (May to August) followed by a wet season, or summer (September to April). Average annual temperatures are 22 to 27 degrees Celsius (ºC) with rainfall typically between 1,000 and 1,500 millimeters (mm) during the summer. The Property is located in the Cerrado, a large tropical savannah ecoregion located in the central plateau region of Brazil. Vegetation across this region of Brazil is typical of savannah regions of the world, much of which has now been converted to crop farming or cattle pasture; the local agricultural economy depends largely on cattle grazing and generates on-going local demand for fertilizers.

Figure 5.2_1 shows annual precipitation data for the municipality of Campos Belos, Goiás, taken from the website climate-data.org on December 13, 2016.

Figure 5.2_1

Annual precipitation in Campos Belos, Goiás.



5.3 Physiography

The project is located in an area known as the Central Brazilian Highlands with an average elevation of 750 m above sea level. The local topography is usually flat to gently sloping underlain by siltstones and limestones with a few higher elevations composed of granite and quartzite basement. Dolomite bodies form remnant hills with typical karstic dissection.

The municipality of Campos Belos is situated in the Northeast of Goiás, and is found in the micro-region of the Chapada dos Veadeiros (Veadeiros Plateau). To the east, this municipality borders the state of Bahia and has, as its geographical limit, the Serra Geral de Goiás Mountains. To the north, the municipality borders the State of Tocantins at the Bezerra River, a tributary of on the right bank of the Paranã River, which is in the Tocantins catchment basin. Geomorphologically speaking, Campos Belos is located within the Brazilian Central

Plateau. The city lies at an altitude of 700m and was built on polymictic metaconglomerates and meta-arkoses of the Araí Group, which form a small basin that lies between mountain ranges that consist of Paleoproterozoic granites.

Arraias is situated within the southeastern portion of the State of Tocantins, in the micro-region of Dianópolis. The municipality is situated at an altitude of 682m, and also lies within the Tocantins Catchment Basin and the Brazilian Central Plateau, which is encircled by the mountains of the Arraias Formation, belonging to the Araí Group.

5.4 Local Resources and Infrastructure

Arraias, is the closest major settlement to the Santiago DANF Project with a population of 10,643 (2010 census) of which 31% is described as rural population. Arraias is a municipality within Tocantins state.

Campos Belos is a municipality in Goiás state, with approximately 18,395 (2010 census) inhabitants, of which only 12% are described as rural. It is south of the BF-1 group and north of the BF-2 group making it central to the Property. The town has a technical college, hotels and supporting services making it a reasonable infrastructure base for the DuSolo workforce and day-to-day operations.

Smaller communities of a few hundred or less inhabitants (such as Cana Brava) are located on the Property. These communities consist largely of small farmer landholders. Limited facilities and labour are available through these communities.

The mining activities that have been undertaken in the last 10 years by Itafós, and the development that has been implemented by the State and Federal Governments have generated significant growth of the region's infrastructure, which includes:

- The government implementation of electrical transmission lines in order to supply energy to Itafós's processing plant, which is 10km away from the Santiago target;
- The repaving by the government of 80km of road that runs close to the Santiago target;
- An airport located between Arraias and Campos Belos that is under construction;
- The government planned construction of a new railway (Ferrovia Integração Oeste Leste-FIOL) that will pass 100km to the north of the project area;
- The repavement works of the highway that connects Brasília, DF, to Campos Belos (400km).

6 HISTORY

6.1 History of Exploration

The Bomfim Project is located in what is recognized as an emerging Brazilian phosphate belt where several major companies including Itafos Fertilizers, Vale, and Votorantim have mineral claims. Exploration for phosphate mineralization in the region dates back to 1960s when METAGO, the Goiás State Mining Company, was active in the area. There is no available record of further exploration until 2004 when Itafós Mineração Ltda ("Itafós"), a local company, began exploration and subsequently developed a small-scale phosphate operation of Direct Application Natural Fertilizer ("DANF") in the Campos Belos area, 10 km south of the Property. Itafós held some of the ground that now comprises the Bomfim concessions, prior to their acquisition by Quantum. In addition, Vale held the ground comprising the Santiago DANF Project in BF-1. Very little record is available of exploration work that may have been conducted by Itafos or Vale when they held licences for areas now within the Property.

The authors are not aware of any previous drilling or trenching on the Property other than what may have taken place during prospecting by Itafós, or Vale. The authors are not aware of any production history or historical mineral resource or reserve estimates for the Property.

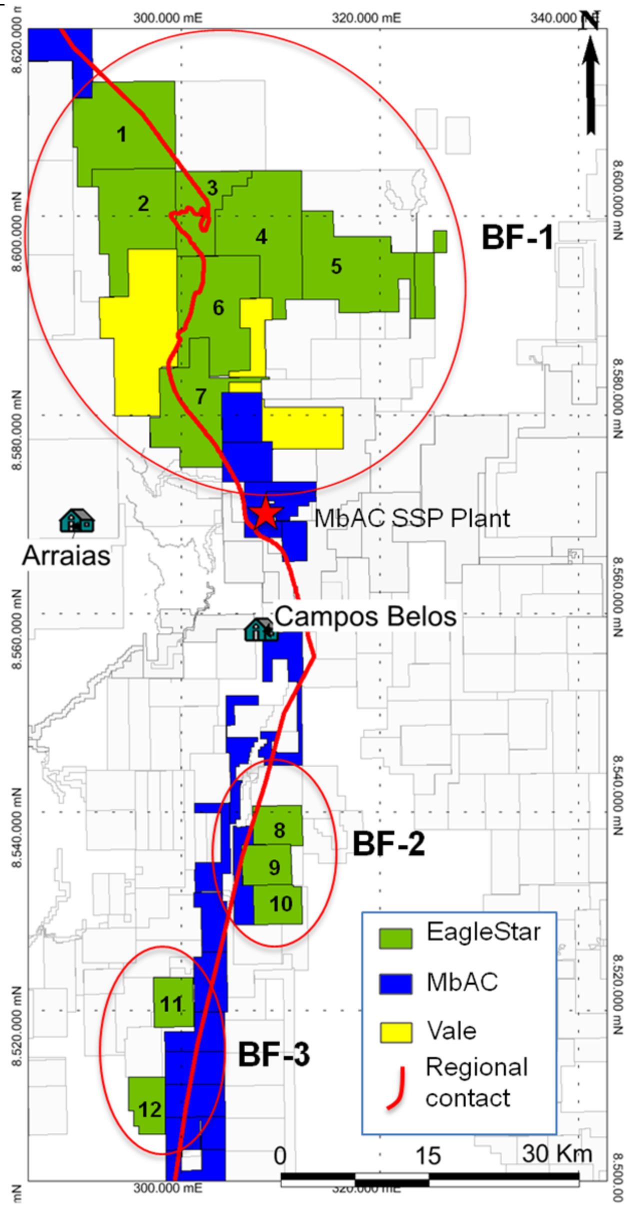
Additional discussion on the development of adjacent properties may be found in Section 23 (Adjacent Properties).

6.2 History of Mineral Tenure

The Bomfim project originally comprised 12 exploration licences totalling 62,465 hectares. The licences formed three groups; BF-1 in the north is entirely within Tocantins state, while BF-2 and BF-3 in the southern part of the property fall entirely within Goiás state. Currently, Bomfim Project comprises seven (7) exploration licences locates on BF-1 group (Figure 6.2_1). The Santiago Project is part of Bomfim Project under the exploration licence 864494/2012.

Figure 6.2_1

Claim Map – Bomfim project decribed as BF-1.



DuSolo initially acquired interest in 4 licences totalling 30,922 ha from Quantum in June 2012. These claims formed the core of what later became known as the BF-1 group. Then in December 2012, additional claims were added south of MbAC's Itafós Project, which formed what became identified as the BF-2 and BF-3 groups. These consisted of 11 claims totalling 37,036 ha through an agreement with Quantum and 13 claims totalling 22,618 ha by DuSolo by direct application to DNPM. This brought the Property total to 28 claims totalling 90,577 ha. All of the newly added claims came under the previous Quantum Agreement. Finally, in July 2013, one more claim, consisting of 6,947 ha, was acquired in the BF-1 area and added to the Property under existing agreements (Figure 6.2_1).

By the time of the acquisition of the last claim, DuSolo had already completed sufficient due diligence and exploration work on the 28 licences to determine which ones were not prospective and had released several of them to reduce administrative and holding costs. This brought the total area of the Property by July 2013 down to 70,531 ha. By the effective date of this Report, further reduction had taken place as the geology and prospectivity became better known, leaving the 7 subject claims totalling 54,073 ha. The BF-2 and BF-3 areas have been relinquished by Eagle Star, and on 13th January 2017 the Company relinquished the Kalunga I&II, Depasa and Amaralina concessions (1, 2, 4 & 5 in figure 6.2_1). The Property now consists of 3 subject claims totaling 20,807ha.

6.3 History of Resource Estimation

DuSolo issued on March 7th, 2014 a Technical Report CIM NI43-101 compliant, presenting the results for Mineral Resources of Bomfim, Amaury and Santiago Targets. The report was assembled by Coast Mountain Geological Ltd, with effective date of December 21st, 2013.

Signed as Qualified Persons:

- Geologist John Harop, Coast Mountain Geological Ltd – responsible for exploration and drilling phases;
- Geologist Fábio Xavier and Mining Engineering Porfírio Rodriguez, Coffey Consultoria e Serviços Ltda. – responsible for database verification, QAQC and Mineral Resources Estimation.

The mineral resource of Santiago Target was classified as Inferred due to the low density of drilling information. The deposit's continuity was recommended as Exploratory Potential, suggesting further exploratory works.

7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The larger Bomfim Project, within which the Santiago DANF Project lies, is within a large package of rocks along the western edge of the São Francisco craton and immediately east of the Brasilia fold belt in central Brazil (Mendonça and Campos, 2012; Da Rocha Araujo et al., 1992). The Bambuí Group, which hosts phosphate sediments, is a sequence of Neoproterozoic marine sedimentary rocks. The group rests unconformably on the Paleoproterozoic metasedimentary Araí and Paranoá Groups and granitic Aurumina Suite.

The western limits of the Bambuí basin along the Proterozoic crystalline basement are marked by a N-S trending erosional discontinuity due to glaciations (Ackroyd, 2013; Mendonça and Campos, 2012).

The sedimentary Araí group was deposited during a failed rift event between 1.7-1.5 Ga (Cordani et al., 2000; Da Rocha Araujo et al., 1992). The Arai Group is a 1500m thick sequence comprising two formations: the basal Arraias Formation, which consists of quartzites with intraformational conglomerate units intercalated with siltstones, and the younger Trairas

Formation which is comprised of pelitic sediments with thick quartzite layers and some carbonate layers (Cordani et al., 2000).

The Paranoá Group is part of a slightly younger transgressive sequence on the São Francisco craton and is comprised of quartzites, siltstones and schists with minor amounts of stromatolitic carbonates (Da Rocha Araujo et al., 1992). The Paranoá Group is dated at 1.75-1.1 Ga (Da Rocha Araujo et al., 1992). The Aurumina Granite Suite is the local expression of the Archean granite-greenstone/gneiss terrane and is comprised of syeno-granites with muscovite and biotite, with minor amounts of tonalite. The suite has been deformed during the regional deformation event and contains shears zones with mylonitic textures. The Aurumina Suite also has potential for economic Au, Sn and tantalum deposits in the region (AMEC, 2010).

Sedimentary rocks of the Bambuí were deposited during regressive and transgressive cycles after a major regional to global glaciation and end with deeper water, storm dominated conditions. The stratigraphy of Bambuí is well described and divided into six formations: Jequitaí, Sete Lagoas, Serra de Santa Helena, Lagoa do Jacaré, Serra da Saudade and Três Marias. This lithostratigraphic sequence has been recognized over the states of Goiás, Minas Gerais and Bahia. The group covers unconformably the granite-gneissic basement, the Araí and Paranoá metasediments.

Diamictites of the Jequitaí locally overlie glacially striated São Francisco craton. Several regional and worldwide glacial events are known within the Neoproterozoic and many authors suggest a mid-Cryogenian (post-Sturtian glaciation) date for the Jequitaí. The Sturtian glaciation was the longest of the Cryogenian glaciations lasting approximately 60 million years. A later date for the Jequitaí has also been suggested (Caxito et al, 2012) that associates the diamictites with the end of the Marinoan glaciation and that the Lagoas Formation represents a basal Ediacaran cap carbonate sequence (~635–610 Ma). This date also appears to be more consistent with the date of the global phosphogenic event that generated the mineralization at Bomfim.

The Marinoan glaciation was the last of several worldwide glaciation events that took place in the Cryogenian Period, the middle and longest period of the Neoproterozoic Era. These worldwide glaciations were the most extreme known and are collectively called Snowball Earth. During these time landmasses were connected as supercontinent Rodinia with the São Francisco craton connected to the Congo craton now in Africa. The breakup of Rodinia resulted in rifting between these two cratons, which initially formed a shallow, narrow, epicontinental sea and depositional environment for the Bambuí.

The sedimentary sequence that follows the Marinoan glaciation is recorded by three megacycles. Each megacycles begins with a rapid marine transgression of regional amplitude, associated with a sudden subsidence of the basin evidenced by deep pelitic marine facies, followed by shallow platform facies and tidal to supratidal facies.

From the Jequitaí base upwards, the megacycles are distributed in the following manner:

Megacycle I: The pelitic-carbonatic, Sete Lagoas Formation comprises of a coarsening upward sequence deposited in a sub-coastal environment with dark grey to black calcilutites (a limestone composed of silt and clay sized detrital particles) and marls transitioning to limestones and dolomites at the top. The phosphate mineralization is found restricted to the Sete Lagoas Formation of the Bambuí Group.

Megacycle II: The pelitic-carbonatic, Serra de Santa Helena Formation is part of a transgression cycle indicating a sudden and generalized subsidence of the basin with a change in sediments reflecting calm deep water. It is characterized by argillaceous and laminate siltstones and fine rhythmites with massive siltstone and very fine sandstone intercalations. The Lagoa do Jacaré Formation is characterized by a regression cycle immediately following the transgression of the Serra de Santa Helena Formation. The formation consists of dark grey platformal limestones, marls and siltstones deposited in an environment dominated by storms and tidal currents.

Megacycle III: The pelitic-sandy, Serra da Saudade Formation was deposited in deep platform environment with the episodic influence of storms. Also contains the predominantly arkosic Três Marias Formation, deposited in a shallow platform environment dominated by storm currents with episodic changes tidal to supratidal facies (Chiavegatto, 1992).

The entire region including the Bambuí Group and granite-greenstone basement were subsequently affected by asymmetrical folding, with eastward convergence, formed under compressive ductile-brittle conditions as part of a thin skinned crust and fold belt along the eastern edge of the São Francisco craton.

The Inhumas Fault system is an important structural control at Bomfim Hill that forms geological compartments, which influence the weathering process, topographic level of the mineralization, geomorphology, and overburden. The fault system trends N-S and appears to be causing rocks to dip 25 degrees to the east.

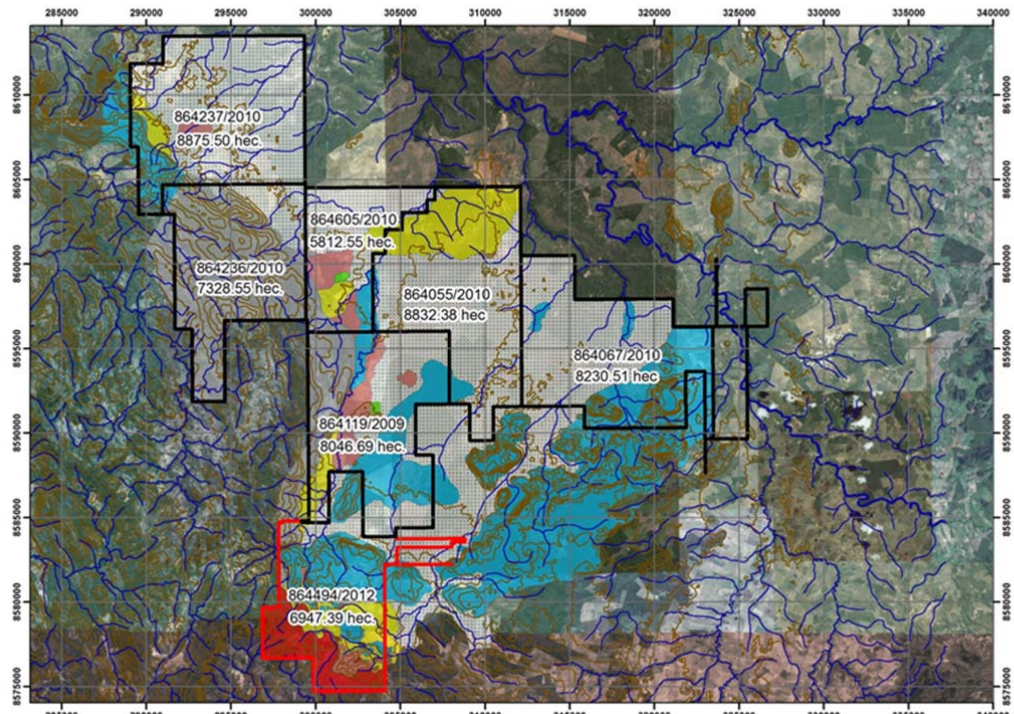
7.2 Property Geology

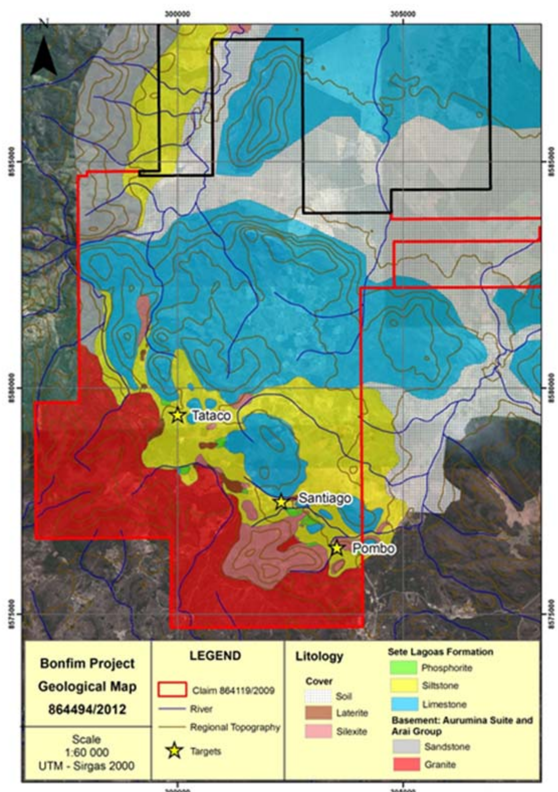
DuSolo holds the mineral exploration rights to seven exploration licences within the region. Together, these licences compose the Greater Bomfim Project; however, this report deals with the information that was acquired during the work that was undertaken with respect to DNPM administrative instrument 864.494/2012, which corresponds to the Santiago, Tataco and Pombo targets. These targets compose the DANF Santiago Project. As such, the lithotypes that are found within the limits of this exploration licence, which covers an area of 6947.39 hectares, will be described herein.

Within this area, rocks of the base of the Bambuí Group can be found that are associated with the Sete Lagoas Formation, which is host to the phosphate mineralization. It includes the pelitic, carbonatic and phosphatic rocks that overlie the granitic rocks of the Aurumina Suite. The Sete Lagoas Formation can be found in the majority of the area and is distributed to the east of the granitic basement.

Figure 7.2_1

Overview of Santiago Project with all DuSolo claims. Geological map of the claim from this report



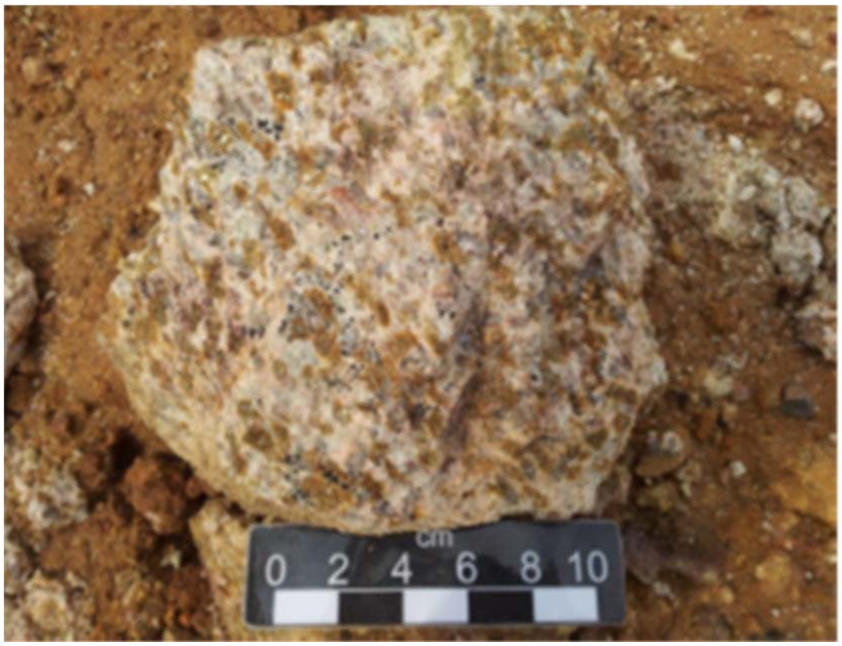


7.2.1 Suite Aurumina

The basement of the mineralized sequence occurs within the southeastern portion of DNPM administrative instrument 864.494/2012, and consists of granites of the Aurumina Suite (Botelho et al., 1999), which have been dated to between 2.0 and 2.2 Ga. Biotite-granite is predominant in the region. Its particle sizes range from medium to coarse and its foliation has developed recently, having a dip to the south-southeast whose angle is quite pronounced (125/75). In general, this biotite-granite is quite weathered, and is of a white to yellowish colour (Figure 7.2.1_1). These rocks are intersected by long quartz veins that are centimetric in width (up to 20cm) as well as concordant and discordant.

Figure 7.2.1_1

Aurumina Suite Biotite-Granite



7.2.2 Sete Lagoas Formation

The rocks of the Sete Lagoas Formation represent the geological unit that contains the phosphatic sequence. Its sedimentary record corresponds to a post-glacial transgression that flooded the San Francisco Craton during the Neoproterozoic Era (Sial et al., 2009). The formation consists of a pelitic-carbonatic sequence that itself is composed of siltites, limestones and dolomites.

The pelitic rocks, most notably the siltites, are the most abundant lithotypes. The sedimentary bedding dips towards the northeast at a low angle (15º), and the characteristic outcroppings can be seen not only in cuts in the slopes and channels that were cut along local roads, but also in the embankments and beds of the small rivers that transverse the area.

A yellowish clayey siltite occurs in the area. It has a silky texture and it has plane-parallel laminations of 1 to 3mm, which is indicative of lower energy deposition process (Figure 7.2.2_1a). The siltite contains layers of kaolinite that are parallel to the sedimentary bedding and have low grades of P_2O_5, of between 2% and 4% P_2O_5.

Another more finely grained Siltite occurs in the study area. It is generally white, having a few variations in colour to purple, has parallel laminations and is has been extremely hardened due to its silicification (Figure 7.2.2_1b). The occurrence of apatite in micro-fissures has also been detected. Planes that are filled with manganese are also common. This lithotype has high concentrations of P_2O_5, from between 16% and 22% P_2O_5.

Figure 7.2.2_1

Sete Lagoas Formation Siltites

a) Clayey yellowish siltite.

b) Sandy purple siltite with micro-fissures that contain apatite.

Intraformational sedimentary breccia occur in association with the siltites. Their occurrence varies from centimetric to metric levels. The breccia is indicative of moments when there was significant energy in the environment; storm cycles that generated the reworking of the sediments that were deposited previously.

Such breccias are monomitic and have clasts that consist exclusively of siltite. The clasts range from milimetric to a few centimeters (up to four cm) in size, are angular to sub-rounded, and, at times, preserve the primary bedding configuration. The matrix is finely grained, consists of silt and clay, is either yellow or reddish and shows signs of weathering (Figure 7.2.2_2).

Polymitic breccia with supported clasts also occur, having a diverse range of clasts, from siltite, chert, carbonate, and recrystallized quartz that are, at times, kaolinizated (Figure 7.2.2_2). The particle sizes of the matrix are similar to that of finely grained sand, and it is always highly silicified. By the characteristics and texture of the clasts, the breccias are believed to be of tectonic origin.

Both types of breccia correspond to the higher grade (above 15%) lithotypes that are found in the area; the occurrence of apatite, which is found within the fracture planes and pores of the rock matrix, is also common.

Figure 7.2.2_2

Sete Lagoas Formation Breccias

a) Monomitic breccia with siltite clasts.

b) Polymitic breccia displaying various clasts.

Various prominent hillocks that feature in the terrain, which are resistant to weathering, are composed of a fine silicified rock, known as silexite. Such lithotypes present a close association with the mineralization. The silexite hillocks are located close to the mineralized outcroppings, and, as such, serve as a guide, so to speak, for the mineral exploration work. This lithotype outcrops throughout a vast area south of the exploration licence region that is referred to herein.

In addition, within the phosphatic sequence of the Sete Lagoas Formation, various carbonatic rock bodies occur, which form ranges of hills that are aligned in a northwest to southeast direction in a manner that follows the granitic basement in the form of towers that reach up to 50m in elevation. The occurrence of these towers is more evident in the northern portion of the exploration licence area at the target that is known as Tataco. However, isolated towers also occur in the central and eastern regions of the Santiago target (Figure 7.2.2_3).

Laboratory analysis results revealed that these towers are composed of calcitic carbonates. They occur in various different lithofacies, both in solid and in parallel laminations, and also have centimetric layers of intercalated clayey material.

The limestones are speculated to be the result of the abiotic precipitation of calcium carbonate that was facilitated by the evaporation of seawater that was supersaturated in $CaCO_3$ (Vieira et al., 2007).

Figure 7.2.2_3

Limestone tower having a ruiniform appearance.

7.3 Mineralization

Mineral exploration work and exploratory drilling was intensified since the last report. Re-interpretations were undertaken and, because of the various types of mineralization present, which display a large range of phosphate concentrations, the mineralization was separated into two principal groups: high grade (HG) and low grade (LG).

A value of ≥10% P_2O_5 was adopted for the DANF Santiago Project in order to designate the HG mineralization, which was referred to as the phosphorites group. Rocks that contained concentrations below that value, but above 3% P_2O_5, are referred to herein as LG mineralization, which are simply referred to as phosphatic rocks. The company has studied and continues to study processes for the separation and concentration of the low-grade material, which would increase the economic potential of the LG mineralization in the deposit. Although the literature defines phosphorite as having grades that are quite higher than those that were adopted by the company, the limit of 10% that was applied herein sought to provide objectivity and be compatible with the processing routes that were evaluated.

High grade (phosphorite): The rocks that are included in this group can be separated into brecciated, laminated and clayey phosphorite.

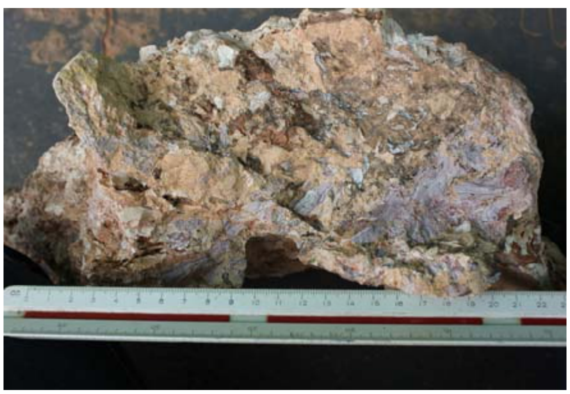
The brecciated phosphorite is believed to be the result of a re-working of siltites during the sedimentation process, or by later tectonic events.

It is believed that the re-working that was induced by storm waves within the paleochannels of the basin generating a re-concentrated brecciated phosphorite. This is, therefore, a supergenic mineralization that began from the siltic facies. In addition to this synsedimentary origin, a tectonic re-working mechanism and the circulation of mineralizing fluids can also be mentioned in this context of increasing the phosphate grade.

Polymitic and monomitic brecciated phosphorites can be distinguished among the lithotypes. The monomitic brecciated phosphorites display intraclasts that are exclusively composed of siltite that can reach up to four centimetres in size (Figure 7.3_1, left). In the polymitic brecciated phosphorites, the clasts are diverse, consisting of siltite, chert, carbonate and recrystallized quartz. Among these, submicrometric to milimetric clasts are predominant (Figure 7.3_1, right). The rock matrix varies from silt to fine sand that is rosy or yellowish in colour.

The high degree of permeability of these rocks may have contributed to the re-precipitation of the phosphatic mineral, most notably the apatite. In the rock matrix, one can notice small circular pores that contain apatite, which is also present in the fracture planes. This apatite occurs, at times, in acicular and prismatic form and is transparent, where needles are formed in the interior and grow out towards the opening of the cavity (Figure 7.3_2). At times the apatite is white and has a botryoidal aspect to it.

Figure 7.3_1
Phosphorite samples



A) Monomitic brecciated phosphorite displaying clasts that consist exclusively of siltite

B) Polymitic brecciated phosphorite displaying various clasts.

Figure 7.3_2

Pores filled with acicular apatite

The laminated phosphorite consists of highly hardened siltites that display submilimetric parallel lamination, have particle sizes similar to those of fine sand, and may also be solid. Weathering processes have caused this phosphorite to be white and purple in colour. The occurrence of this type of ore was recorded at the Pombo target at the south-southeastern region of the area that is the subject of this report (Figure 7.3_3). The occurrence of apatite in micro-fissures has also been detected. Planes that are filled with manganese are also common.

Textural characteristics and preserved sedimentary structures suggest that this should be interpreted as being low-energy sedimentation that occurred in an infratidal environment.

Figure 7.3_3

Laminated Phosphorite

The clayey phosphorite is notable for its absence of structure and high degree of weathering. Its alteration colour varies from dark brown to red. This phosphorite has very low hardness and displays a texture that is plastic in nature. The internal texture has been completely obliterated by the material's clay and moisture content. Acicular apatites that consist of small, colourless, milimetric needles, can be seen dispersed within the rock matrix. The clayey phosphorite is closely associated with the level of the water table, and it is believed that this is one of the re-concentration factors.

Low grade (phosphated rocks): Within the study area, this category of rock is the most abundant. These rocks include various kinds of siltites that vary from being solid to having either parallel or wavy lamination. They are friable, heavily weathered and have brown and yellow colorations (Figure 7.3_4). The presence of manganese is very common within the planes of micro-fissures, as well as along the laminae. It was shown that certain pores contained apatite. These rocks differ from the phosphorites in their friability and low densities.

The wavy lamination is not continuous, is of approximately 5mm, and suggests that microbial lamination occurred. The occurrence of microbial lamination suggests bacteria were intensely active within the intertidal zone, which could be interpreted as a mechanism of phosphogenesis for the precipitation of an authigenic francolite (Folmii, 1996; Pufahl, 2010). This francolite would later be re-worked and concentrated into economically exploitable grades such as those that are found in the region's phosphorites.

Phosphogenesis occurs when interstitial water becomes saturated with phosphate, which triggers the authigenic precipitation of the francolite (or carbonate-fluorapatite) within the sediment during the inicial phases of the diagenesis. The precipitation of the authigenic francolite is regulated mainly by the microbial activity along with the degradation of the buried organic matter and consequent liberation of phosphorus in the water within the pores. Precipitation is also influenced by the rate of sedimentation, presence of oxygen, availability of fluorine in the sediment and other physical and chemical properties of the sediment. This process occurs a few centimetres below the water-sediment interface due to the potential of diffusion of fluorine that is derived from the sea water (Jarvis et al., 1994).

Figure 7.3_4

Phosphate siltite with wavy laminae

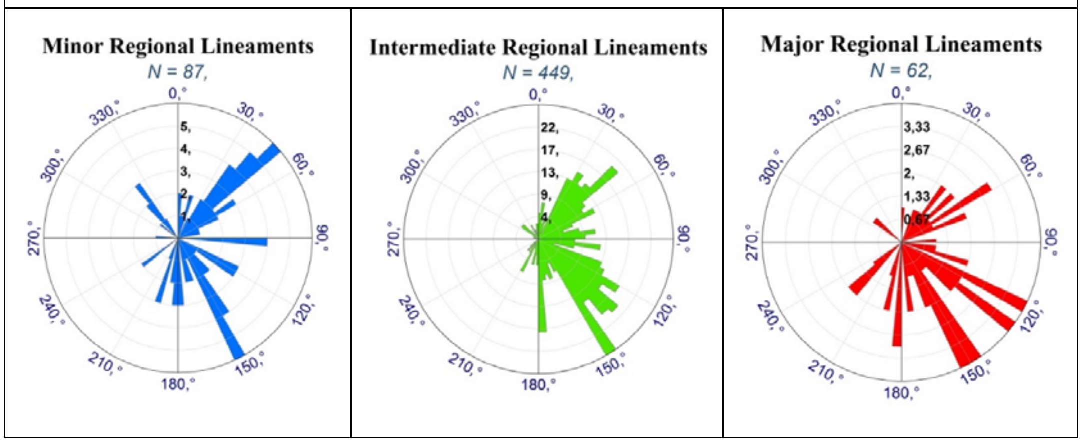
7.4 Structural Analysis

From analyses of the satellite images, the definition of regional lineaments was undertaken (smaller, larger and intermediate) with respect to all of DuSolo's exploration licences. In addition to the geological map that was produced and Sn (flat) data that were collected in the field by the team of geologists, a structural interpretation was developed for the Great Bomfim Project site.

The study of the regional lineaments was based on three different images - two SRTM images, which were processed with a directional filter, and the RADAM image. This regional analysis sought to highlight the most notable tendencies that were present, such as breaks in the terrain, which could pinpoint geological faults, or even changes in the lithology. Rosette diagrams were developed based on the lineaments. Each diagram corresponds to a group of identified lineaments: the smallest (< 1km), intermediate (>1km and <2km) and the largest (>3km), which can be seen in Figure 7.4_1.

Figure 7.4_1

Rosette Diagrams



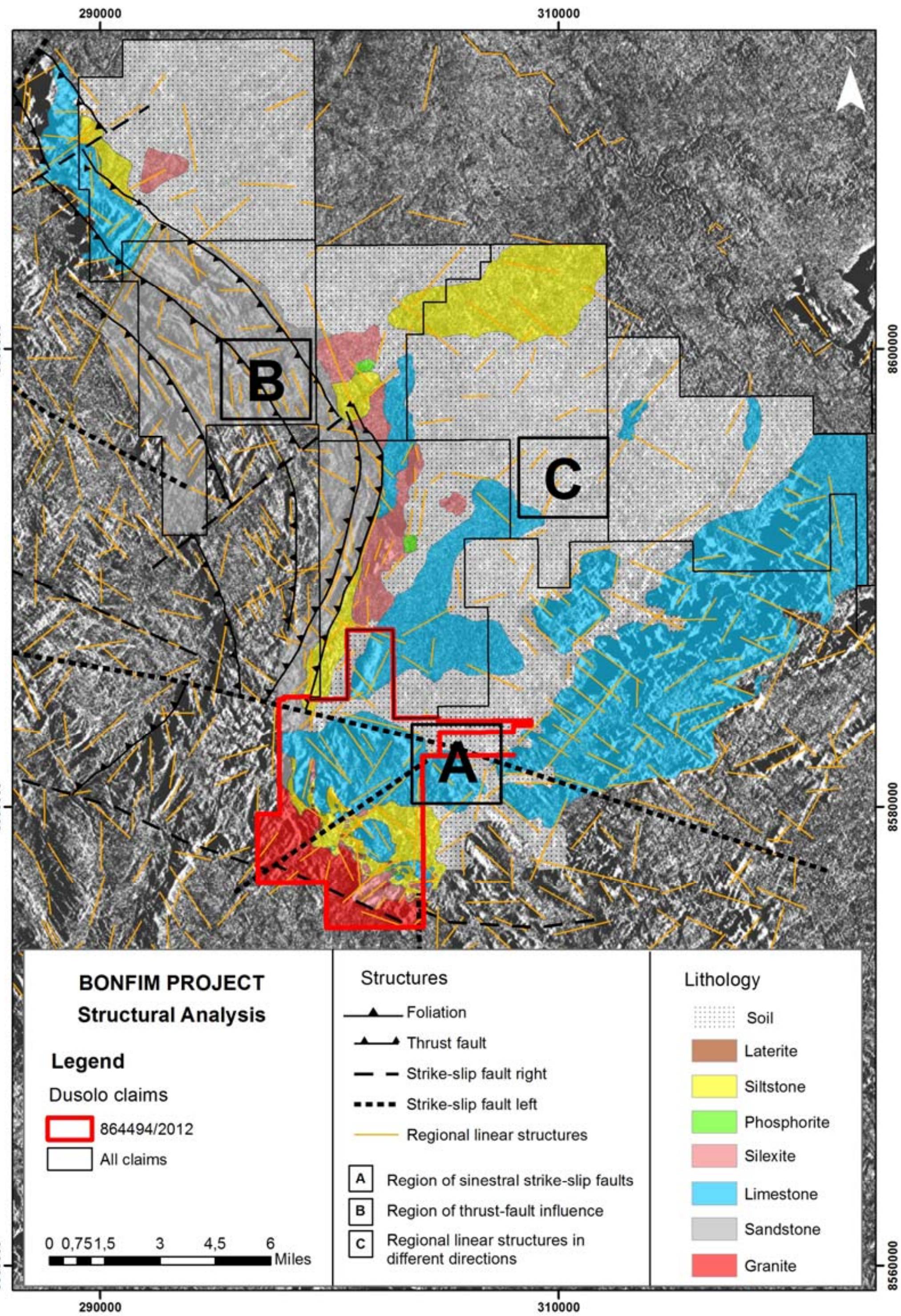
The lineaments of the three groups that were described present the same principal tendency - two principal directions: northeast/southeast. The southeast to northwest direction, which appears even more clearly among the largest lineaments, corresponds to the principal direction of the thrust in the area, with ramps that are oriented towards the west and a vergence that is oriented towards the east. The northeast direction is related to the tear faults of the thrust. Other directions may be tied to faults that post-dated the thrust in the northwest and southwest directions, which could have been generated during the same event or during different events.

The Figure 7.4_2 shows the cross-referencing of the regional structural analyses and the geological mapping of the area where Dusolo's mineral claims are located. The coincidence of certain lineaments with lithological borders should be noted in that it defines a robust structural control within the region. In the southern portion of the map, which is classified as region A, a large sinistral strike-slip fault (southeast direction) stands out in which the superior block was shifted to the east, which becomes visible in the drag deformation of the limestone. Region B is replete with thrust fronts and their tears towards the northeast that display sinistral and dextral directional shifts. In region C, lineaments that have northeast and southeast-northwest directions are predominant.

The thrust that occurs in the area, which has a vergence towards the east, did not affect the basement rock (thin skinned tectonic), i.e., the granite towards the south that was mapped for mining tenement 864.494/2012 served as an "obstacle" for the development of the thrust. This barrier increased the velocity in the central region compared to the southern area of the fault, and this difference in velocity eased the tears, shifting the central portion more towards the east. Within the granite, there are lineaments that have a north to south direction which are structures that arose from an event that occurred previous to the thrust that may have affected the sedimentary overburden.

Figure 7.4_2

Structural Map of the DuSolo Claims



The Sn (planar) data that were collected from the regional mapping were plotted in the form of poles in a stereogram, which totalled 57 measurements.

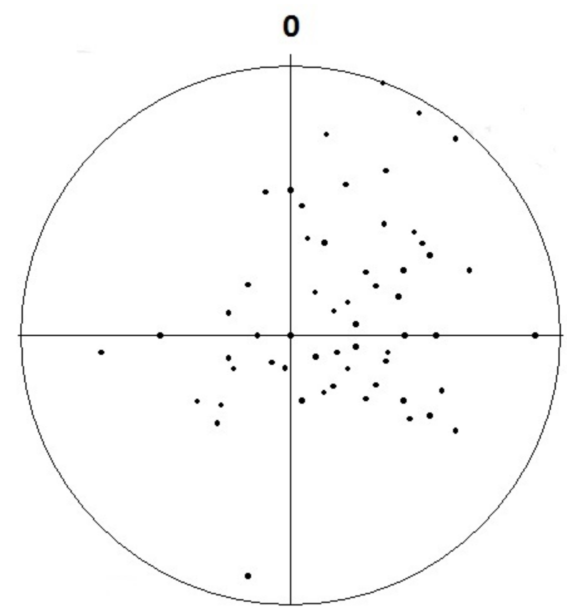
The mapping data corroborate the regional structural analyses. Data that was collected in the field indicate two main planes:

- One having a southeast to northwest direction and a dip towards the northeast; and,
- Another having a northeast to southwest direction and a dip towards the southeast.

The dips vary within two distinct intervals: one between 15°-35°, and the other between 40°-55°. The presence of folds was not explicit in regional terms; however, they were able to be detected in the stereogram that is shown in figure 7.4_3.

Figure 7.4_3

Stereogram Indicating Poles in the Foliation N=57



Although relationships between cuts and interference were not described, based on these data, staff members aimed to organize the planar structures that occur into phases and events. However, if such an interpretation had been undertaken beforehand, it would have aided the subsequent mapping phases in attempting to find proof in the field that would support them.

The main structure that is associated with the first event (E1) is the thrust, which itself consists of two phases. The main directions of the first phase are S1 240/20 and S3 60/30, which suggests a low amplitude fold that has a long and a short flank. The second phase presents the same directions, however with a more accentuated dip that has the following characteristics: S2 240/40 and S4 60/50, which suggests a progression of the previous phase.

The planes of the phase that is associated with the second event (E2) has the following characteristics: S5 300/30 and S6 160/45. It is believed that E2 was imposed on the E1 event because its δ1 is different. While the δ1 that is associated with E1 has a northeast to east direction, the δ1 that is associated with E2 has a southeast to south direction, i.e., E1 displays an east to west tendency, whereas E2 displays a north to south tendency.

Table 7.4_1 summarizes the structural organization that was proposed for the project:

Table 7.4_1

Structural organization that is proposed for the project

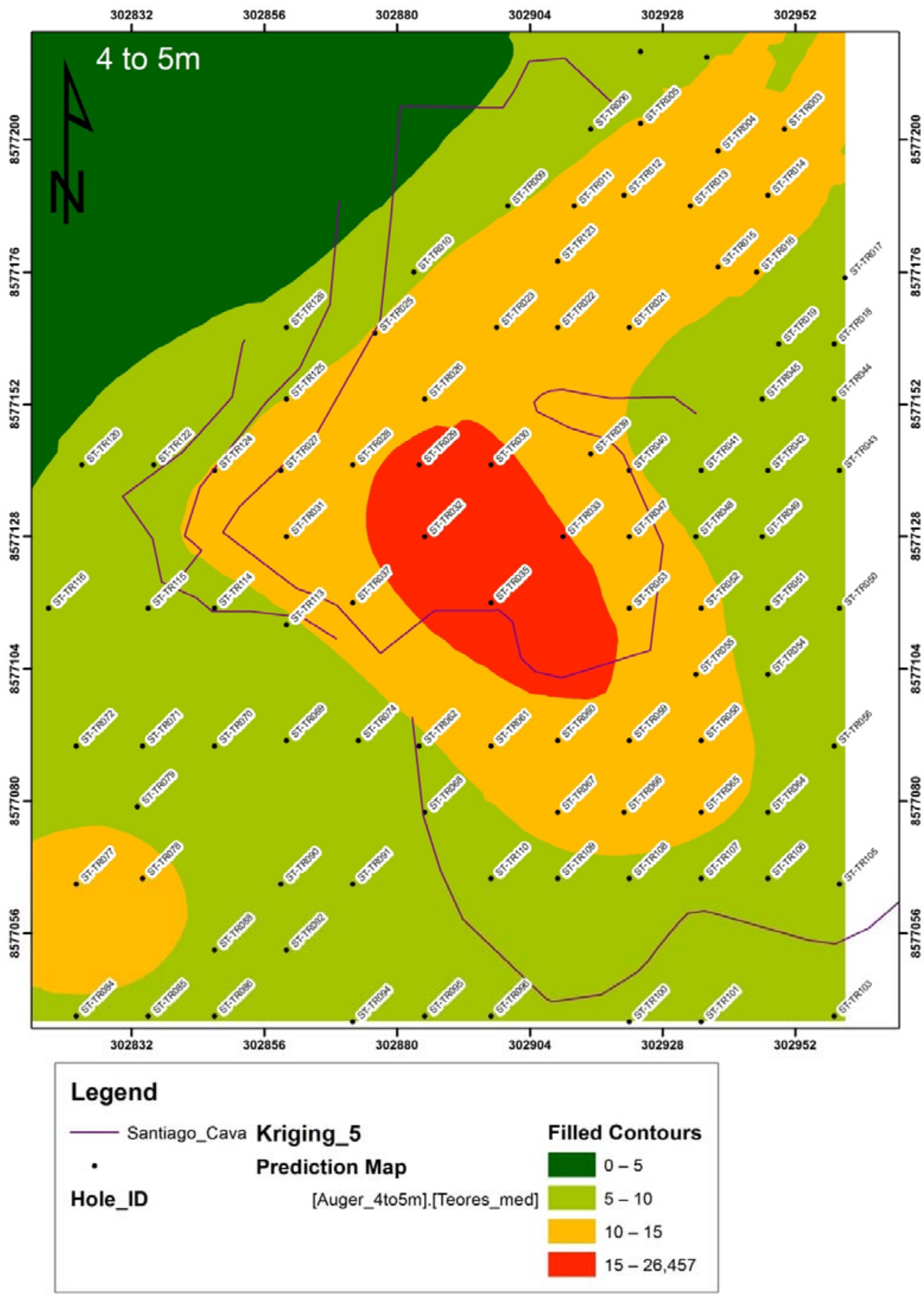
Event	Phase	Sn	DipDir/Dip	Principal structures of the phase/event
E1	F1	S1	240/20	Thrust and fold (E-W), tear faults from the thrust
	F2	S2	240/40	Thrust and fold (E-W), tear faults from the thrust
	F1	S3	60/30	Thrust and fold (E-W), tear faults from the thrust
	F2	S4	60/50	Thrust and fold (E-W), tear faults from the thrust
E2	F1	S5	300/30	Faults and fold (NW-SE)
	F1	S6	160/145	Faults and fold (NW-SE)

From the results of auger samples that were taken from the Santiago target, contour lines were generated as a function of grade intervals: from 0 to 5%, from 5 to 10%, from 10 to 15% and above 15% P_2O_5. This made it possible to identify a tendency that was compatible with the structural directions that were analysed, NE-SW and SE-NW, which control the mineralization (Figure 7.4_4). These directions can represent faults or fractures that facilitated the percolation of rainwater, which, in the evolution of the weathering and pedogenesis generated the anomalous concentrations of P_2O_5 that are being exploited today.

Figure 7.4_4 shows the exploratory contour lines that were produced with auger drilling data that had an intercept of 4 to 5m, indicating the range of the grades: 0-5%, 5-10%, 10-15% e >15% P_2O_5, presenting a "boomerang" style of intersection of the two principal directions that were observed in the structural analyses: NE-SW and SE-NW.

Figure 7.4_4

Contour Lines that were Established from the Auger Drilling Data



8 DEPOSIT TYPES

Phosphate deposits provide an important primary nutrient for fertilizer and agricultural industries worldwide in addition to feedstock for phosphate chemical processing plants. There are several types of phosphate deposits ranging from 1) modern bioaccumulation of guano, 2) igneous sources in carbonatites and alkalic igneous complexes and 3) marine chemical sedimentary deposits. Sedimentary phosphate deposits are the most productive currently producing 75-80% of the world's phosphate (Simandl et al., 2012; Guilbert and Park, 1986).

Phosphorus is often the limiting nutrient in ocean environments. It limits biological productivity in geologic timescales (Filippelli 2002). Its availability is controlled by the rate of P release during chemical weathering of the continents. Once P is dissolved it enters myriad abiotic and biotic pathways that ultimately deliver it to the oceans (Compton et al. 2000). Under favourable conditions P can accumulate on the seafloor in the form of pristine phosphorite, which precipitates through phosphogenesis (Jarvis et al. 1994; Pufahl 2010).

Litofacies stacking patterns of Sete Lagoas Formation around Bomfim deposit indicate deposition occurred during flooding of the São Francisco Craton. Deposition of phosphorite coccurred during a single seal-level cycle punctuated by higher-order fluctuations in base level that produced parasequences (Drummond 2014). Resultant decameter-scale parasequences generally consist of a basal flooding surface overlain by carbonate, mudstone and siltstones with phosphatic layers (Drummond 2014). Each aggradational cycle is interpreted to record progradation of phosphatic intertidal flats over shallow subtidal deposits as accommodation filled (Drummond 2014).

Mineralization at Bomfim is classified as of a shallow nature, restricted to nearshore environments. These giant phosphorites generally formed in distal shelf environments in association with coastal upwelling (Pufahl 2010). At Bomfim, storms waves and tidal currents swept the seafloor and flood channels, re-working the pristine phosphorite producing phosphatic intraclasts that can be concentrated into beds or lags. Depending on the degree of re-working granular phosphorite can be matrix or grain supported (Pufahl 2010). Later, uplift and erosion exposed the phosphatic sediments, tropical weathering leads to lateritization, which process removes some minerals and results in the concentration of residual elements, including phosphorus.

8.1 Deposit Model

The Bomfim phosphatic mineralization was formed during an important global phosphogenetic event at the end of the Neoproterozoic Era.

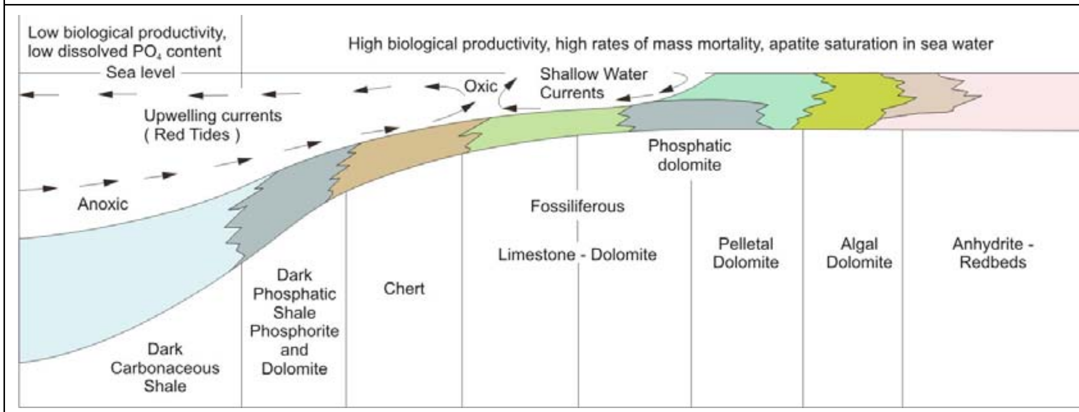
Throughout the history of the Earth, phosphorite accumulation events occurred at times of significant climatic, tectonic and oceanographic change. These changes directly affected the biogeochemical recycling of the phosphorus, the primary productivity and the oxygenation of the oceans. The first phosphogenetic event occurred during the Paleoproterozoic Era (~2.2-1.8 Ga; Pufahl 2010; Nelson et al. 2010; Papineau 2010), which coincided with the Great Oxidation Event (Nelson et al. 2010, Pufahl 2010). The second episode began after the Marinoan glaciation (~635Ma), which coincided with the second, more pronounced pulse of oxygenation, known as the Neoproterozoic Oxygenation Event (NOE). This last event allowed for increased oxygenation of deep waters, which definitively changed the phosphorus cycle.

The Neoproterozoic was an era of profound environmental and climatic change during the history of the Earth, which includes the following: the breakup of the continent known as Rodínia; large glaciation events (Snowball glaciation); great fluctuations in the level of the oceans; and, finally, the development of multicellular organisms. Interglacial melting periods set off an increase in the influx of material that was eroded from the continents and transported to the oceans, which increased the movement of dissolved phosphorus, making increases in organic production possible, in addition to the marine transgressions and the formation of great epicontinental oceans (Nelson et al., 2010; Papineau, 2010). Tectonic orogenic events caused changes in atmospheric circulation and the exposed vast areas of continent, which also brought about large scale weathering of rock (Nelson et al., 2010). This unusual and complex combination of geological events contributes to the genetic model of the Bomfim phosphate deposit.

The phosphorites accumulation occurs at the same environmental deposition site as banded iron formations and bedded manganese ores, along continental shelves and in shallow marginal marine settings such as lagoons and deltas, Figure 8.1_1. In an anoxic environment, deeper, colder and more acidic waters promote phosphate solubility. Whereas in an oxic environment, alkaline, warm-water conditions that apply to continental shelves promote apatite formation.

Figure 8.1_1

Deposit Model



Phosphorus Source

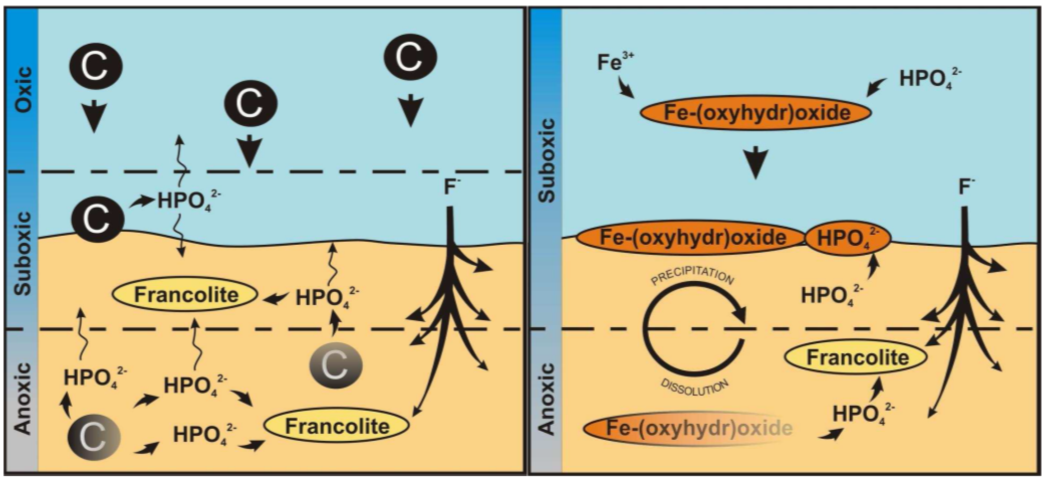
The availability of phosphorus in the environment is controlled by chemical weathering processes which liberate this element from the soils and rocks. Once liberated from its continental source, the phosphorus is transported by the rivers and winds to the oceans (Filippelli 2002; Pufahl 2010).

This transport may occur in the form of dissolved or particulate phosphorus. The dissolved phosphorus is quickly taken up by photosynthesizing organisms. On the other hand, the pulverized phosphorus, when it occurs in the form of detrital apatite grains, does not participate in this biogenetic cycle, since the organisms cannot absorb it. However, in addition to the detrital apatite grains, the phosphorus grains can get to the marine environment adsorbed onto the particles of iron oxides and hydroxides (Compton et al. 2000). In this case, the phosphorus is considered potentially available for the biosphere, requiring only certain changes in the oxidation conditions of the environment (Fe-redox pumping) (Compton et al., 2000).

Once the phosphorus is consumed by the organic matter or transported to the ocean on iron particles, it is rapidly buried in marine sediments. Chemical and biological processes may liberate this phosphorus and, afterwards, make it bioavailable again with the return of this element to the water column by means of resurgence cells. The other destination of this liberated phosphorus is its concentration within the interstices of the sediment, and, when it reaches a certain level of saturation, it precipitates as the phosphatic mineral francolite ($Ca_5(PO_4,CO_3)_3(F,O)$). Figure 8.1_2 summarizes the biogenetic cycle of phosphorus.

Figure 8.1_2

Biogenetic Cycle of Phosphorus



a) Microbial respiration of sedimentary organic matter. Organic matter (C) that accumulates in marine sediment is degraded by tiered microbial process. Organic matter degradation releases P to pore waters facilitating francolite precipitation. Francolite precipitation is limited to the shallow sediment by diffusion of fluorine (F) from overlying seawater. Modified after Pufahl (2010) in Drummond, 2014.

b) Fe-redox cycling. Due to protonation, dissolved P is readily adsorbed to Fe-(oxyhydr)oxide particles. These particles can be detrital, transported from the terrestrial realm by wind and rivers, precipitate within water column, or from in sediment. Once buried below Fe-redox interface where pore waters are anoxic Fe-(oxyhydr)oxides dissolve, releading and concentrating P within pore waters. Modified after Pufahl (2010) in Drummond, 2014.

Depositional Model

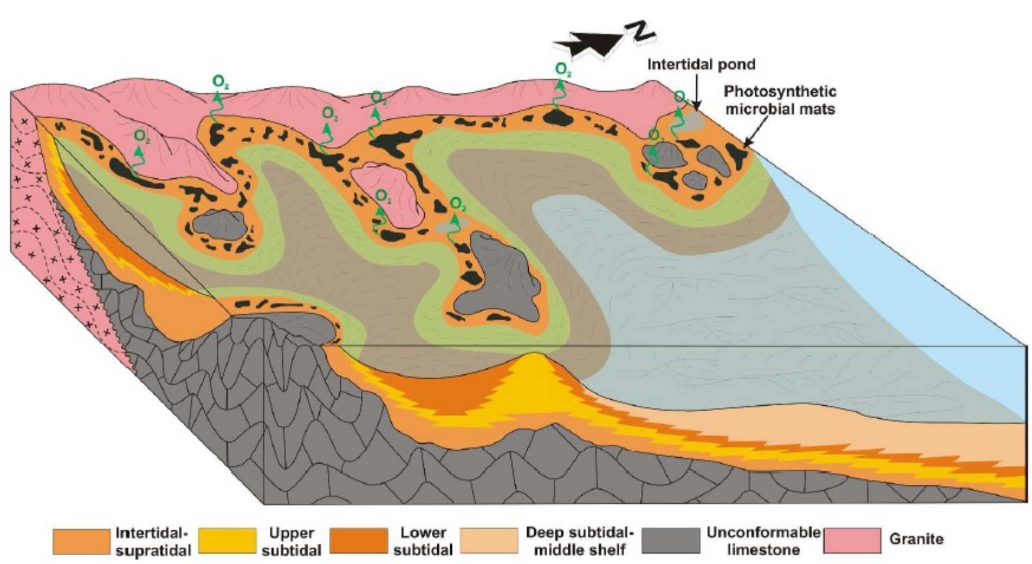
The Sete Lagoas Formation corresponds to the beginning of the post-glacial ocean flooding over the São Francisco Craton during the Neoproterozoic Era (Dardene et al., 1986; Sial et al., 2009; Vieira 2007; Alkmin & Martins-Neto, 2012), which began its depositional history associated with a vast epicontinental shelf that evolved into a foreland basin (Martins & Lemos, 2007; Zálan and Romeiro-Silva, 2007 apud Caxito et al., 2012).

Stratigraphic and sedimentological data suggest that the accumulation of phosphorites occurred within a peritidal shelf (Drummond, 2014). Vieira (2007) believes that the Sete Lagoas Formation represents a source of aeolian clastic sediments on a ramp shelf that was affected by storms in which the internal ramp is host to the clayey peritidal sediments. The absence of a shelf-slope break in regional seismic profiles supports this idea. (Martins-Neto 2009 in Drummond 2014). It is believed that topographic highpoints along the coast contributed to this low energy peritidal shelf environment where the phosphogenesis occurs.

Such muddy intertidal flats possess similar characteristics to that of the wave dominated, open-coast tidal flats of south-western Korca (Drummond 2014). However, unlike modern mud-dominated intertidal environments which are typically colonized by saltmarsh grasses, these Precambrian peritidal mudflats were colonized by benthic photosynthetic microbial mat communities (Drummond 2014). These cyanobacterial mats created nearshore oxygen oases that promoted phosphogenesis in coastal environments (Drummond 2014) The Figura 8.1_3 shows the depositional model for the accumulation of the phosphatic sequence within Sete Lagoas Formation.

Figure 8.1_3

Depositional model for the accumulation of the phosphatic sequence within the Sete Lagoas Formation (Drummond 2014).



Phosphogenesis at Bomfim Deposits

Phosphogenesis occurs when interstitial water becomes saturated with phosphate, which triggers the authigenic precipitation of the francolite (or carbonate-fluorapatite) within the sediment during the inicial phases of the diagenesis (Folmii, 1996; Pufahl, 2010). This precipitation is regulated by microbial processes that are affected by the environment's reduction potential, acidity and the chemical gradients of the interstitial waters and the ocean floor (Jarvis et al., 1994; Folmii, 1996).

The precipitation of the francolite generates laminar phosphatic layers that are not bioturbated and contain nodes and peloids of the in-situ francolite, which is known in the literature as primary phosphorite (pristine phosphorite) (Folmii, 1996; Pufahl, 2010). The rate of sedimentation is an important factor for the formation of continuous, thick layers of the pristine phosphate.

Studies on Phanerozoic phosphorites concluded that the most efficient process of P saturation in the interstices of the sediment is through sulfurous chemosynthetic bacteria (sulfide oxidizers and sulfate reducers) that concentrate a large quantity of polyphosphate in its cells and liberate it as a byproduct of their metabolic activity (Jarvis et al., 1994; Glenn et al., 1994; Pufahl, 2010; Hiatt et al., 2015). At the Bomfim deposit, it is believed that colonies of cyanobacteria had created oxygenated zones within a shallow environment that generated chemical gradients in the sediment for the activity of the chemosynthetizing bacteria. It is thought that these two mechanisms working together acted to concentrate phosphorus in the sediment and facilitated the precipitation of the francolite (Hiatt et al., 2015; Drummond et al., 2015). The presence of pyrite and iron oxyhydroxides in the rocks of the deposit suggests that these microorganisms were active in an anoxic environment.

Progressive storm events may blend layers and generate granular phosphatic levels of greater concentration than the laminar microbial facies. The presence of breccia at the Bomfim deposit suggests that that such high-energy events reworked the sediments that were deposited previously. The majority of the economically exploitable phosphatic deposits in the world are characterized by having granular phosphorites that were generated by the reworking of the pristine phosphorite facies (Glenn et al., 1994; Föllmi, 1996; Pufhal, 2010).

For the deposit to contain an economically exploitable concentration of phosphatic material, it is believed that, in addition to the synsedimentary reworking activity, tectonic activity of the Brazilian orogenesis functioned as a thermal motor for the percolation of low temperature fluids (<200C) and the remobilization of phosphorus through the reactivation of deep faults and zones of greater permeability. Such fluids may be related to the silicification that is observed in some mineralized lithotypes. This in addition to the presence of silexite hillocks that were always seen close to the mineralized zones. Such hillocks, as they are more resistant to weathering, stand out within the terrain and have been used as exploratory guides by the company's team of geologists.

Lastly, it is believed that recent supergenic events reconcentrated the mineralization. In Brazil, phosphate deposits can have a significant enrichment due to deep, tropical weathering, which leads to lateritization. Tropical climates provide long term exposure to warm weather and meteoric water can cause significant depth of weathering. The weathering process removes some minerals, which results in the concentration of residual elements including nickel, gold, phosphorus and niobium – potentially to ore grade levels. This process is currently occurring at Bomfim.

8.2 Exploration Model

Preliminary studies that were undertaken in the region by Professor Amorim in 2008 already indicated the siltites as the lithology having the greatest potential to host large mineralized zones of low grade (LG) material, and with the possibility of containing economically exploitable deposits of disseminated phosphates and others that are of supergenic origins. As such, the previous knowledge of the Bambuí stratigraphy made the lithology and the stratigraphy the primary prospecting criteria that were applied to the identification and confirmation of the resources, which currently are economically exploited.

With the increases in this knowledge, other criteria were developed and used together in order to locate other mineralized zones, such as:

- Structural analysis regional and local scale syn- and post-depositional lineaments. Identification of structural features associated with sedimentation gaps or erosional events.
- Areas to the east of the granitic basement, close to the limestone hills, where the low energy region is believed to have existed, having an environment that was conducive to the proliferation of the microorganisms within closed basins and paleochannels;
- The identification of silexite hillocks in the field, since it is believed that an event occurred that remobilized the phosphate through the percolation of low temperature fluids through the rocks' fractures and pores, which makes the formation of small high grade (HG) supergenic deposits possible, which might have been triggered by the tectonics of the Brazilian orogenesis. In addition, there is also the fact that some high-grade lithotypes also show high grades of silicification.

9 EXPLORATION

DuSolo has pursued a continuous exploration program. This was made possible by the exploration team using several characteristics of the project, that set it apart from many exploration programs, to effectively accelerate the program. Some of these characteristics are summarized below, with an explanation of how they have affected the project.

Mineralized material of potentially economic significance must be at or very close to surface. While the exploration model is able to predict where substantial phosphate mineralization is likely to occur at depth, only mineralization at or near surface has been given priority. Prospecting and detailed mapping are more effective at identifying mineralization and drill targets than conventional soil or stream sediment reconnaissance and grids. This is in large part due to the exploration model providing a narrow time-stratigraphic range that is prospective and which has been traced by fieldwork through mapping and interpretation of the sedimentary geology.

Field methods for detecting phosphate have been used to confirm significant mineralization. Two methods were used to detect phosphate:

- an Ammonium Molybdate test that showed a bright yellow reaction to phosphated sediments with a minimum 1-2% P_2O_5, and;
- a handheld XRF spectrometer which could be used on rock surfaces or soils in the field and with crushed rocks in a more controlled environment in the field office.

The on site or same day turnaround made possible by these methods was particularly effective in directing exploration priorities prior to receiving confirmation through lab results.

Following initial mapping, preliminary testing may be done by drilling short holes. Drilling then plays a more important role in early stage testing than is often the case in exploration and therefore is mentioned briefly in this section. Further details and discussion of drilling are in the Drilling section. Although the initial drilling may be preliminary in nature, if the results are positive then these prospecting holes could contribute to the database for eventual resource estimative. Moving immediately from mapping and prospecting to test pits, trenches and drilling enabled the Company to start building a three dimensional picture of the mineralization without the need of intermediate exploration stages to develop drill targets.

Proximity to a new operating phosphate mine and access to experienced staff has benefitted the Company as they have worked to compress the development timeline.

9.1 Mapping

Geological mapping was carried out at different scales and followed those steps:

- Regional mapping at a scale of 1:50.000 - Initially undertaken following the main existing access routes, following the overall direction of the contact between the sediments of the Sete Lagoas Formation and the granitic basement. The aim of this stage was to validate the previous interpretations of the remote sensing images; precisely map the contact between the granitic basement to the west and the sediments of the basin; identify the area where the siltites are located; and individualize the limestone bodies and the other lithotypes that were found.
- Detailed mapping at 1:25.000 and 1:10.000 scales - This stage aimed to map the areas in which the siltites are found that have a greater propensity for mineralization in the search for high grade ore outcroppings.
- Detailed mapping at 1:5000 and 1:1000 scales - This stage aimed to map, in greater detail, the outcropping mineralization that was found in the previous phase in order to define the positions of future drillholes.

With the mapping work that was executed, the contact relationships between the areas lithotypes was determined in addition to the stratigraphic layering, the characterization of the different siltite and limestone facies and the classification of the types of outcropping ore that were found.

The mapping revealed the presence of outcropping areas of 250 to 600m in length that corroborate the previous interpretations of the geological model of the areas that are potentially close to the basement, which also suggests a continuation of the deposit that belongs to the company MbAC.

The mapping also revealed a close relationship between the phosphorite outcroppings and the silexite occurrences. This brought out new interpretations that should be studied in greater detail; however, initially this may be interpreted as a late mineralizing event.

The geological mapping was accompanied by the collection of samples for the development of an internal lithoteque and database, in addition to XRF tests executed with a portable device for the certification of the grades.

After the results from phase 2, which included the identification of the mineralized high-grade bodies, three targets were established: Santiago, Tataco and Pombo, in order to facilitate internal communication and team planning.

9.2 Ammonium Molybdate Field Test

The ammonium molybdate test for phosphate after a nitric acid attack on rock or soil, is a qualitative test for phosphate and has been used by the Company to assist in directing exploration focus. This test is a powerful tool in the field to identify phosphate quickly in the initial prospecting stages. The test uses two bottles of reagent. The first is an acid attack to digest phosphate from the rock or soil. The second contains the reactive reagents that result in a bright yellow precipitate in the presence of phosphate. The effectiveness of the acid attack will depend on the matrix of the sample. Phosphate in silexites will be much more difficult to detect than those in a siltstone matrix.

Figure 9.2_1

Example of ammonium molybdate reaction to phosphate.

9.3 Chip Sampling

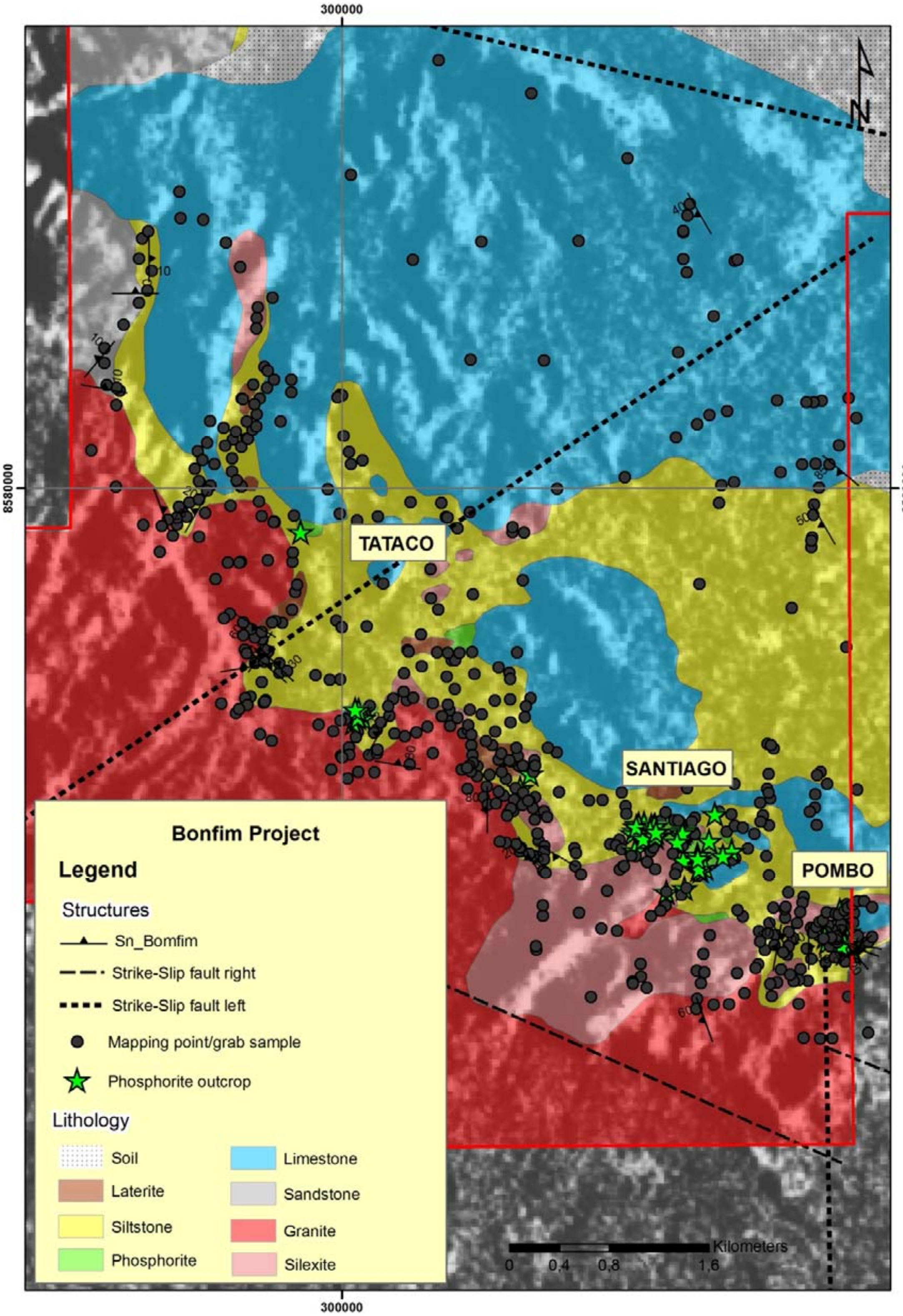
Chip and grab samples were collected during both prospecting and mapping phases. This phase focused on identifying the presence of phosphorite at surface, particularly in locations where the exploration model predicted mineralization. Senior Company technical management directed the execution of this in the field, to ensure correct application of the model and interpretation of observations.

The samples that were collected, mainly those that displayed a positive acid reaction, were sent to DuSolo's internal laboratory to have their grades verified with a portable XRF device. This guaranteed a rapid response from the field and the possible redirection of the exploration campaign for new targets.

The result of this phase, in conjunction with the geological mapping, can be observed in Figure 9.3_1, which emphasizes the following targets: Santiago, Tataco and Pombo.

Figure 9.3_1

Geological Mapping and Sampling



9.4 Test Pits

Test pits provided a three dimensional view of the mineralization and assisted in characterizing mineralization types, textures, weathering horizons and contact relationships.

A total of 15 pits were opened at the Santiago and Tataco targets. The deepest pit reached 7m in depth, while the shallowest pit reached 2,2m, upon which it intercepted a layer of limestone. In general terms, the pits reached down to siltites or friable soils. Not only high-grade hardened blocks were found (24.3% P_2O_5) which were dispersed within the friable rock matrix, but also laminated low-grade yellow siltites (3.5% P_2O_5). Figure 9.4_1 shows a test pit that is located in the Santiago target.

Figure 9.4_1

Example Test Pit at Santiago Target

9.5 Topographic Survey

The topographic survey for the area of the polygon that is referenced in the *Guia de Utilização* - GUIA (mineral rights limitations, see section 15.1) was executed by CCM Engenharia and covered approximately 15 hectares. Initially, two geo-referenced vertices were placed in the field, labelled MA-88 and MA-89, which were established as standard concrete IBGE benchmarks. Such benchmarks have the form of a pyramidal trunk and also have an anti-corrosive aluminum plaque containing the information regarding the vertex. Following that, a planimetric survey was completed on the area of the target with an RTK GPS that had a precision of 2mm.

In order to obtain the planimetric coordinates and the vertical component of the geodesic vertices that were positioned in the area, GNSS technology was used from the RBMC (Brazilian Network of Continuous Monitoring) that employed the cities of Brasília and Uruaçú as active stations. The processing of the GNSS triangle data and adjustment of the geodesic network were executed on the Trimble Business Center software. In order to transport the coordinates, the GNSS technique was adopted, which made use of two Trimble brand, model R4 geodesic receivers.

Table 9.5_1 Coordinates of the Vertices Plane Coordinates, UTM System, Datum: SIRGAS 2000, Mc= 45° W					
Vertex	**NORTH (m)**	**EAST (m)**	**Latitude**	**Longitude**	**H (m)**
MA-88	8.577.138,835	302.915,793	12°51'52,66108" S	46°48'58,21614" W	636,092
MA-89	8.577.143,988	302.748,226	12°51'52,45490" S	46°49'03,77196" W	662,274

Figure 9.5_1

Points Collected by the Topographic Team

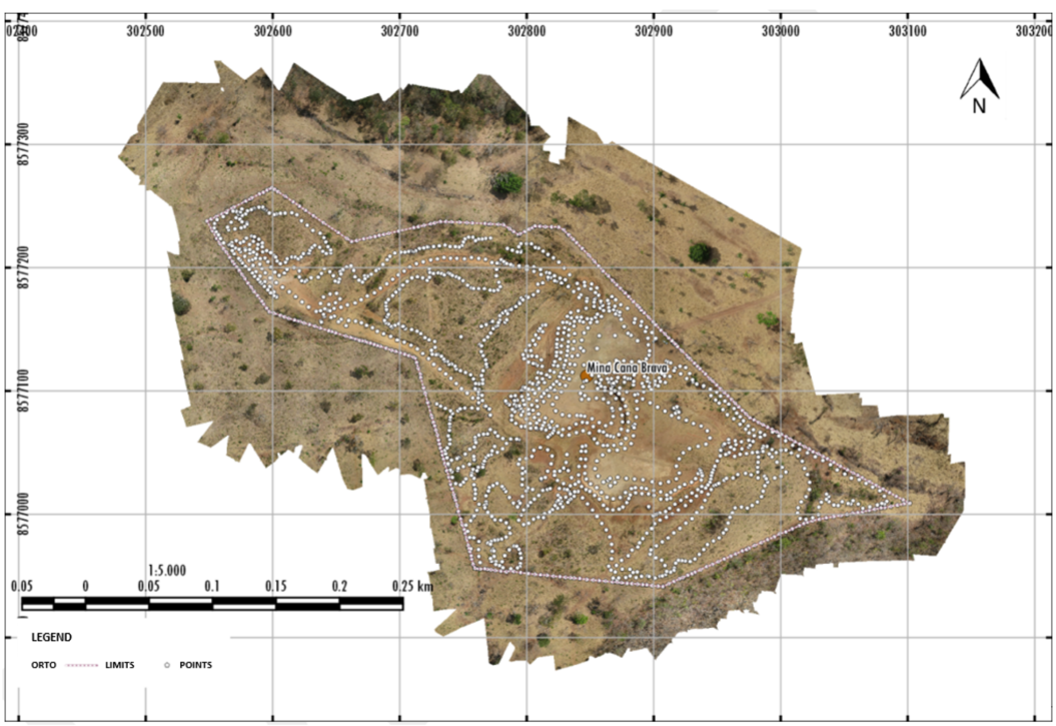
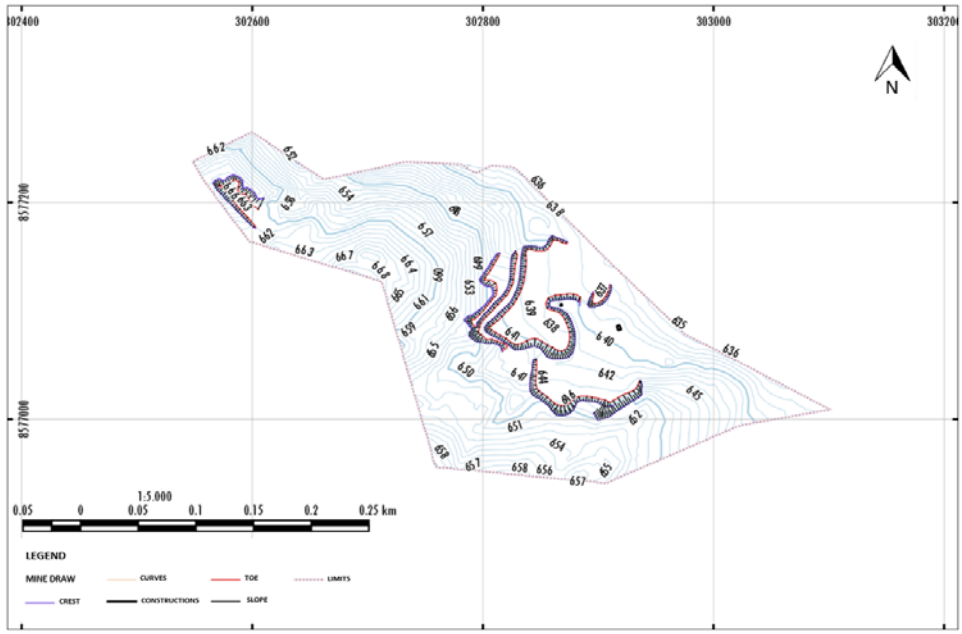


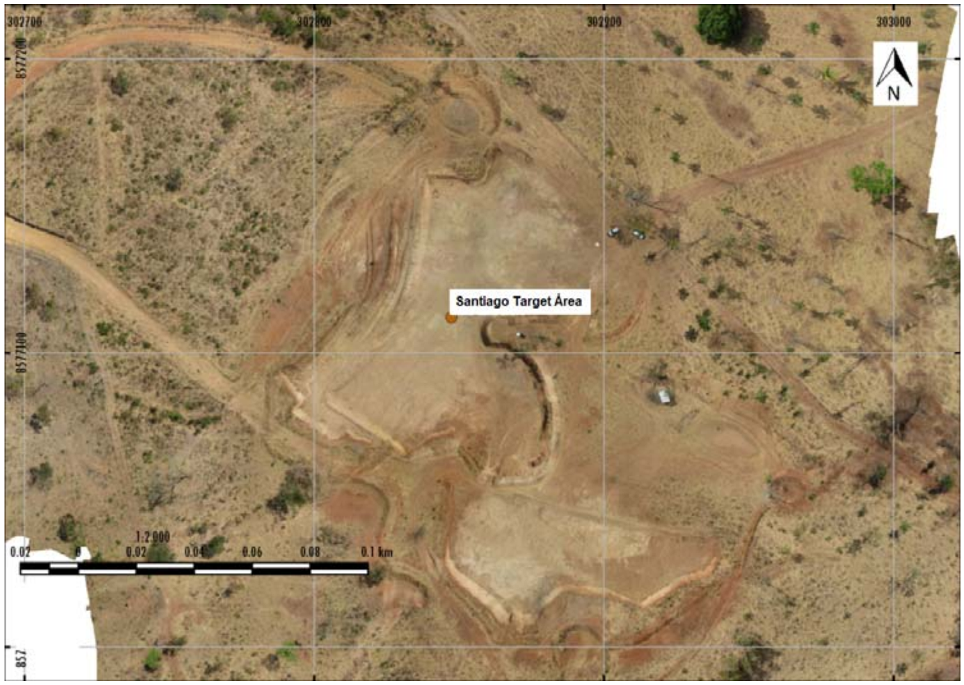
Figure 9.5_2

Drawing of the Area of the GUIA Obtained from the Planimetric Survey



CCM Engenharia also executed a survey on the mining area with a drone using a Canon s100 camera with a 1/1.7 sensor, which generated an aerial image of the region where the mine is located. The orthophoto that was generated has a resolution of 2 cm/pixel.

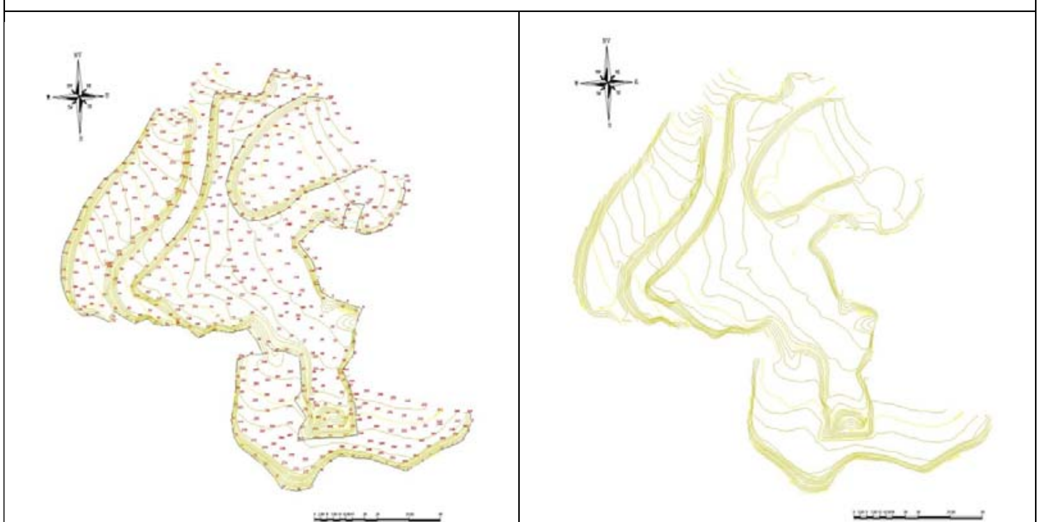
Figure 9.5_3

Orthophoto of the target taken with the drone


More recently, a new planimetric survey was executed, this time only of the area that will be mined. It was undertaken by the company Edno Guerreiro Topografia, which made use of a Leica TS-02 total station GPS having 2mm precision. The data obtained was treated with Topograph TG98 software. All of the openings of the RC drill holes and auger holes were georeferenced as well.

Figure 9.5_4

Topographic Points and Planimetric Survey



A) Points collected by the topographic team

B) Drawing obtained from the planimetric survey.

9.6 Density Measurements

The density that was adopted for the phosphate resource estimate was established with samples that were collected within the excavation area that corresponds to the GUIA.(Refer to Section 15)

Seventy-six grab samples of different sizes were collected from the ground and walls at the original excavation site. The samples were selected and fragmented into different sizes with the aim of reducing bias.

After the samples were collected and prepared, they were labelled and transported to the laboratory located within DuSolo's premises at Campos Belos. Each sample was dried for 24 hours at approximately 105°C. After they cooled, the samples were weighed, covered in paraffin and weighed again in air and submersed in water using a BALMAK scale that was certified to a precision of 2g (Figure 9.6_1).

The density calculations were performed with the following formula:

$$SG = A / (B - C - [(B - A) / \rho Wax])$$

Where:

A = Weight of the sample in air

B = Weight of the sample in air covered in paraffin

C = Weight of the sample covered in paraffin under water

ρWax = Density of the paraffin = 0.78g/cm³

The same process was executed on 15 drill core samples that were taken from drill hole STW-DD-01.

The results that were obtained varied from 1.03 to 2.54 g/cm³ and had an overall average of 1.68g/cm³, for the samples taken from the mining front, and 1.63g/cm³ for the samples produced from drill core samples (Table 9.6_1). Using only the samples that were within the limit of one standard deviation, one obtains an average density of 1.67g/cm³.

Figure 9.6_1
Density Testing Process

Table 9.6_1

Results of the Density Testing

Sample ID	Weight in air (g)	Weight in air with wax(g)	Weight in water (g)	Wax weight (g)	Wax density (measured)	Density
1	78	80	28	2	0.78	1.58
2	24	28	8	4	0.78	1.61
3	140	148	60	8	0.78	1.80
4	184	188	76	4	0.78	1.72
5	264	272	148	8	0.78	2.32
6	146	152	78	6	0.78	2.20
7	166	180	22	14	0.78	1.19
8	768	806	332	38	0.78	1.81
9	306	312	130	6	0.78	1.76
10	212	220	60	8	0.78	1.42
11	454	462	196	8	0.78	1.78
12	324	330	138	6	0.78	1.76
13	126	130	36	4	0.78	1.42
14	216	222	120	6	0.78	2.29
15	152	156	86	4	0.78	2.34
16	376	414	82	38	0.78	1.33
17	272	292	74	20	0.78	1.41
18	474	484	198	10	0.78	1.74
19	70	72	28	2	0.78	1.69
20	240	252	80	12	0.78	1.53
21	96	98	34	2	0.78	1.56
22	154	160	60	6	0.78	1.67
23	80	82	48	2	0.78	2.54
24	676	700	252	24	0.78	1.62
25	106	110	44	4	0.78	1.74
26	152	160	20	8	0.78	1.17
27	76	80	18	4	0.78	1.34
28	174	188	62	14	0.78	1.61
29	550	564	238	14	0.78	1.79
30	240	248	100	8	0.78	1.74
31	224	232	92	8	0.78	1.73
32	142	146	54	4	0.78	1.63
33	494	506	214	12	0.78	1.79
34	318	346	106	28	0.78	1.56
35	366	372	206	6	0.78	2.31
36	246	254	114	8	0.78	1.90
37	98	108	32	10	0.78	1.55
38	166	182	38	16	0.78	1.34
39	528	582	0	54	0.78	1.03
40	522	552	174	30	0.78	1.54
41	998	1048	316	50	0.78	1.49
42	380	412	134	32	0.78	1.60
43	234	250	72	16	0.78	1.49
44	210	224	72	14	0.78	1.57
45	172	184	62	12	0.78	1.61
46	874	892	360	18	0.78	1.72
47	550	558	230	8	0.78	1.73
48	1190	1224	478	34	0.78	1.69
49	1006	1056	550	50	0.78	2.28
50	290	322	18	32	0.78	1.10
51	732	802	116	70	0.78	1.23
52	1128	1140	636	12	0.78	2.31
53	704	738	72	34	0.78	1.13

Table 9.6_1 Results of the Density Testing						
Sample ID	**Weight in air (g)**	**Weight in air with wax(g)**	**Weight in water (g)**	**Wax weight (g)**	**Wax density (measured)**	**Density**
54	1726	1752	716	26	0.78	1.72
55	762	802	332	40	0.78	1.82
56	780	808	378	28	0.78	1.98
57	1174	1236	360	62	0.78	1.47
58	792	818	334	26	0.78	1.76
59	1092	1108	456	16	0.78	1.73
60	700	708	314	8	0.78	1.82
61	396	438	76	42	0.78	1.29
62	1532	1552	814	20	0.78	2.15
63	1554	1574	690	20	0.78	1.81
64	1016	1064	358	48	0.78	1.58
65	1782	1838	786	56	0.78	1.82
66	1430	1520	274	90	0.78	1.26
67	384	414	16	30	0.78	1.07
68	2454	2514	804	60	0.78	1.50
69	890	912	328	22	0.78	1.60
70	1664	1710	760	46	0.78	1.87
71	2790	2844	1534	54	0.78	2.25
72	860	876	362	16	0.78	1.74
73	854	888	156	34	0.78	1.24
74	1342	1380	482	38	0.78	1.58
75	1948	2016	1112	68	0.78	2.38
76	1954	2032	848	78	0.78	1.80
T1	384	400	156	16	0.78	1.72
T10	208	222	68	14	0.78	1.53
T11	350	372	142	22	0.78	1.73
T12	202	210	88	8	0.78	1.81
T13	338	360	140	22	0.78	1.76
T14	396	412	158	16	0.78	1.70
T15	240	250	92	10	0.78	1.65
T2	294	310	106	16	0.78	1.60
T3	390	408	138	18	0.78	1.58
T4	232	244	84	12	0.78	1.60
T5	368	382	120	14	0.78	1.51
T6	198	210	64	12	0.78	1.52
T7	274	288	118	14	0.78	1.80
T8	154	60	56	-94	0.78	1.24
T9	330	348	130	18	0.78	1.69

10 DRILLING

10.1 Reverse Circulation Drilling

At the Santiago DANF Project, two rotary diamond drill holes and 155 reverse circulation (RC) rotary-percussive drill holes were executed by the company Geomina (Figure 10.1_1).

All of the holes were drilled vertically due to the horizontal nature of the mineralization and the fact that the thicknesses of the layers were considered to be true. The holes reached a maximum depth of 48 meters; therefore, it was not considered necessary to measure their deviations.

The RC samples were collected at intervals of one meter, and were stored in a bag at the exit of the cyclone by a geological technician.

Small portions of each drilled interval were stored in chip boxes in order to be described geologically and logged.

The rest of the material was homogenized and quartered, which resulted in aliquots of 2kg to be sent to the chemical analysis laboratory. The remaining material was stored in a drill core warehouse located in Canabrava.

A geologist, the same that was responsible for the supervision of the drilling, performed the geological description. All of the data was compiled, integrated and stored in a database.

Figure 10.1_1 **Pictures of the drilling campaign**	
Rotary-percussive drilling	
	
Drill core boxes (Chip)	
	

Figure 10.1_1 Pictures of the drilling campaign	
Samples of material that was taken from the field and an aliquot of pulverized sample	
	

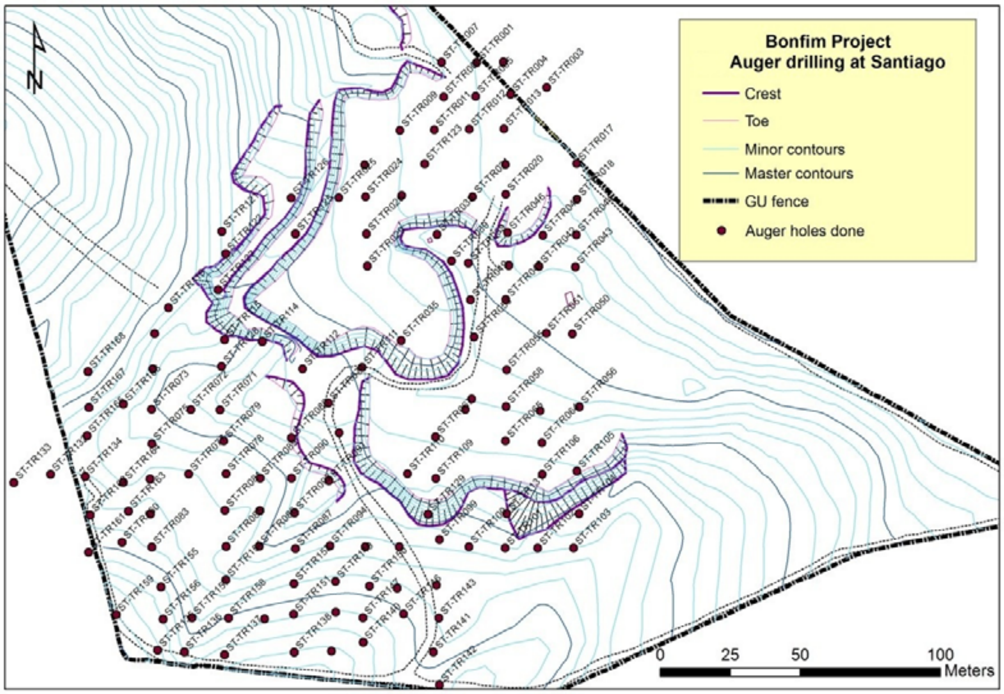
10.2 Auger Drilling

The mechanical auger is a piece of portable equipment that is easy to handle, can be disassembled and is low-cost in terms of operation and maintenance. It is widely used in mineral exploration work (Figure 10.2_1). In the area of the Santiago DANF Project, 168 auger drill holes were executed in accordance with a 12.5mx12.5m grid with the aim of following the lateral continuity of the mineralization at depths of up to 10m. The purpose of this was to help direct extraction campaigns and act as a basic tool in the grade control program (Figure 10.2_2). In all, 973.05m were drilled with the auger, which generated a total of 1001 samples.

Figure 10.2_1
Operation of the mechanical auger

The same procedures of preparation and analysis that were used with the reverse circulation drilling samples were adopted for the auger samples.

Figure 10.2_2
Auger drilling grid that was adopted at the Santiago target



Fragments with sizes ranging from 5 to 10cm were recovered from the auger samples. These fragments made it possible for geologists to develop the geological description of the area (Figure 10.2_3).

The samples were collected metre by metre, weighed, dried, logged, photographed and analised in DuSolo's internal laboratory, initially with a portable XRF device, in order to obtain a preliminary result. When the result surpassed 10% P_2O_5, colourimeter work was initiated.

Figure 10.2_3
Auger drill holes showing good recovery of centimetric fragments

11 SAMPLE PREPARATION, ANALYSIS AND SECURITY

After the core was recovered on site, the material was wrapped in plastic to avoid contamination and to preserve natural moisture content. The core was transported to the core logging facility located at the Arraias field office where logging and sampling were conducted. The procedure was as follows:

- Drilling intervals and recovery were examined in core boxes. Any other problems with the core were noted for review with the drilling company.
- Core boxes were benched on tables for logging and cut into equal half's (perpendicular to foliation when present). This permited a better inspection of the material and a rapid sampling of loose material.
- Core was logged by a geologist onto paper log sheets, and then transferred to electronic form. The collected data was stored in a Microsoft Excel spreadsheet.
- Half of the core was placed in plastic bags (one half was sent for analysis and the other half was retained in the core box). Multipart numbered sample were used with one part placed in the sample bag and a tag attached to the core box at the sample location.
- Remaining half of the core was put back into the core boxes and photographed.
- The sample submittal forms were prepared by a geologist and the samples were packaged for shipment to the analytical laboratory (currently Intertek in São Paulo).

Samples were generally taken over one metre intervals but do not cross-geological contacts. If the material was the same rock type, the samples may use larger intervals to avoid small sample lengths adjacent to contacts.

11.1 Reverse Circulation Drilling – Chips

Samples were collected directly into a bag from the cyclone by a geological technician. The geologist supervising the drill also supervised the sample collection. Samples were collected on a one-metre interval. The first cuttings of each run were discarded to minimize contamination. The sample was then homogenized and cuts were taken for the chip tray and a sample for the lab. The remainder of the sample was then sealed for storage in the Company storage facility in Canabrava. Logging was done on site by the geologist monitoring the drill, who was able to record drilling rate and other indications of the character of material through which the drill was progressing.

11.2 Sample Security

Core was stored in wooden trays in core racks at the Arraias field office. Samples were secured in a storage room at the field office until shipped by Company personnel to a commercial shipping or bus company for transport to the laboratory. Laboratories did not report any instances of damage to shipments or evidence of tampering on their arrival.

RC samples parts not sent to the laboratory for analysis were stored at the Canabrava field camp where they were secured in a house rented by the Company. Samples were taken at the drill site and transported by Company employees to the Arraias field office where they were secured before shipping.

11.3 Laboratory Sample Preparation and Analysis

11.3.1 Assay Laboratories

Intertek Minerals Laboratory (“Intertek”) in Cotia, São Paulo was the primary laboratory used for the DANF Santiago Project. Two other laboratories, SGS Geosol Laboratórios Ltda (“SGS”) and a laboratory in the geological engineering department of Escola Politécnica da Universidade de São Paulo (“USP”) were used earlier in the program for limited batches of samples. Acme Analytical Laboratories Ltd (“Acme”) prep facility in Itaituba, Brazil, with analysis conducted in Vancouver, Canada, was used for check samples during the delineation-drilling phase.

Sampling and analysis followed specific codes:

Preparation (code: PR01 at Intertek – equivalent in other labs) – Samples were dried, crushed to 2mm, homogenized and split into 4 equal parts. A cut of 250 to 300g was pulverized so that 95% of the material would pass through 150 mesh (200 mesh for Acme). The rest of the sample was stored as waste.

Intertek analysis followed the package code XR55L: Determination of metals/ oxides (Fe_2O_3, SiO_2, Al_2O_3, P_2O_5, MnO, TiO_2, CaO, MgO, K_2O, Na_2O, SrO and ZrO_2) by lithium tetraborate fusion followed by XRF analysis. LOI (Loss On Ignition) was determined separately.

SGS analysis followed package codes XRF79C, IMS95R and PHY01E: lithium tetraborate fusion followed by XRF for Fe_2O_3, SiO_2, Al_2O_3, P_2O_5, MnO, TiO_2, CaO, MgO, K_2O and Na_2O; lithium metaborate fusion followed by ICP-MS for Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sm, Tb, Th, Tm, U, Y and Yb. LOI (Loss On Ignition) was determined separately.

Acme analysis followed package code 4A02: $LiBO_2/LiB_4O_7$ fusion followed by ICP-ES for Fe_2O_3, SiO_2, Al_2O_3, P_2O_5, MnO, TiO_2, CaO, MgO, K_2O, Na_2O, Cr_2O_3 and Ba, Ni, Sr, Zr, Y, Nb, Sc ; LOI was determined separately.

USP analysis performed was lithium tetraborate fusion followed by XRF analysis for Fe_2O_3, SiO_2, Al_2O_3, P_2O_5, MnO, TiO_2, CaO, MgO, K_2O and Na_2O; LOI was determined separately.

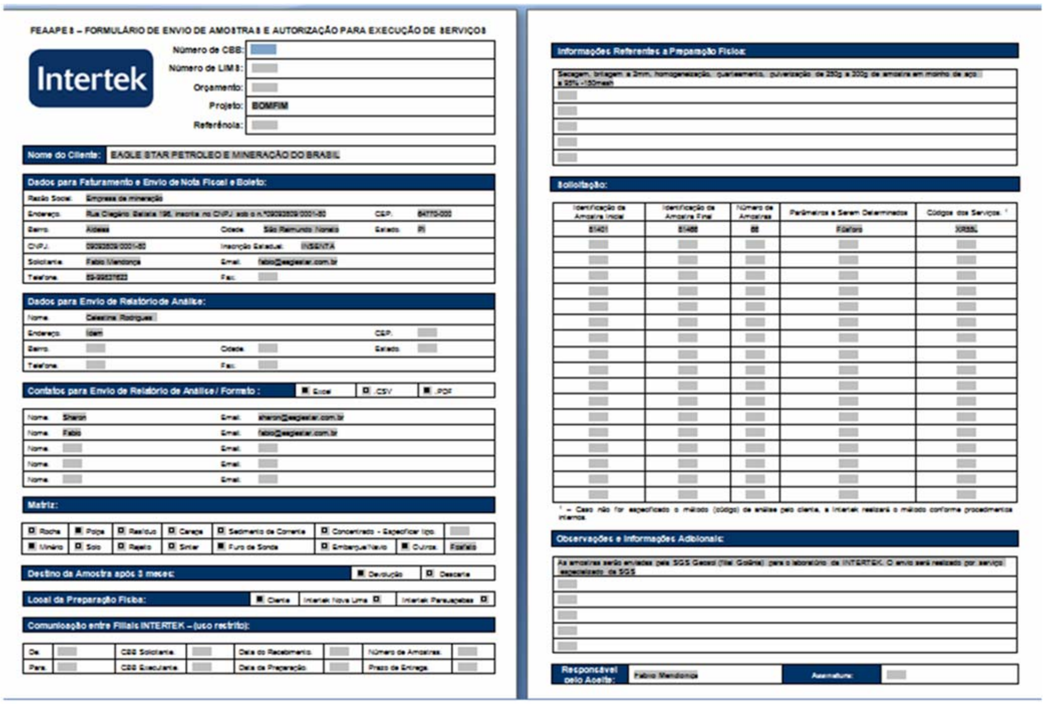
Intertek, SGS and Acme have ISO certification as ISO 9001:2008 (Intertek, SGS, Acme), ISO 17025:2005 (Acme) and ISO 14001:2004 (SGS). The ISO 9000 series of standards is used to define, establish, and maintain an effective quality assurance system. ISO 17025 standard overlaps with 9001 but specifically focuses on general requirements for the competence of testing and calibration laboratories. ISO 14000 is a family of standards related to environmental management and how an organization minimizes negative effects, complies with applicable laws and regulations and continues to improve in these areas.

Two sample submission form copies were prepared and signed by a geologist before sending to the lab. One submission form copy was sent to the lab and another kept at the field office. CMG recommends that a third copy with sample descriptions is summited to the Qualified Person for the project when the samples are shipped to the lab. The forms included the information listed below (Figure 11.3.1_1):

Date; Client name, address, phone and fax number and email; Sequence of samples; Total number of samples; Batch number; Shipping date; Geologist responsible for batch; Specification of the preparation and analysis package.

Any special instructions were written in the note field.

Figure 11.3.1_1
Intertek Laboratory Invoice



11.4 Quality Assurance and Quality Control (QA/QC)

An internal QA/QC program was implemented at the DANF Santiago Project that made it possible to validate the quality of the results that were produced by the chemical analysis laboratory. This program was restricted to the RC drilling campaign and included laboratory contamination, accuracy and precision control tools through the insertion of "blank", "standard" and field duplicate samples.

The QA/QC program consisted of:

- the control of contamination of P_2O_5 during the physical preparation process in the laboratory through the insertion of "blank" samples in the batches used in the analyses;
- the control of the accuracy of the laboratory through the insertion of "standard" samples in the batches used for analyses;
- the control of the precision of the laboratory through the insertion of field duplicates.

Additionally, a batch of 34 auger samples were selected by GE21 to be sent to SGS-Geosol's laboratory in Vespasiano, Minas Gerais, with the aim of comparing the results of the analyses obtained via portable X-ray device with the results of the certified laboratory.

Blank Samples

Limestone samples having very low concentrations of P_2O_5 were used as a contamination control for the samples during the physical preparation process that was undertaken at the chemical analysis laboratory.

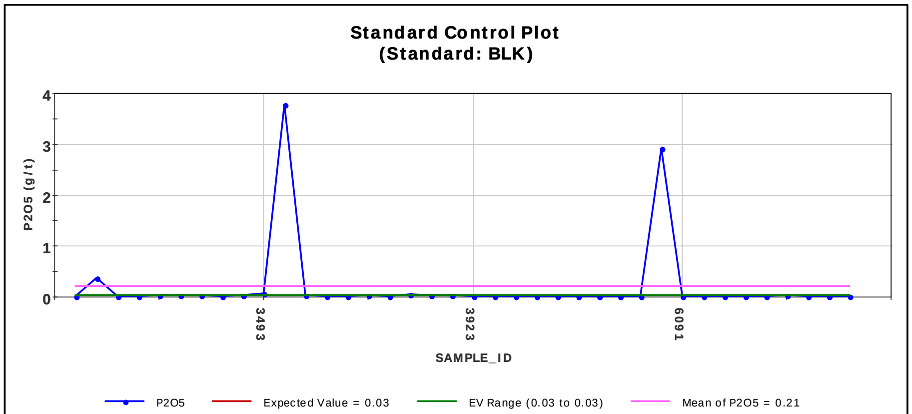
The blank samples were inserted in the analysis batches in the field at a rate of 2%.

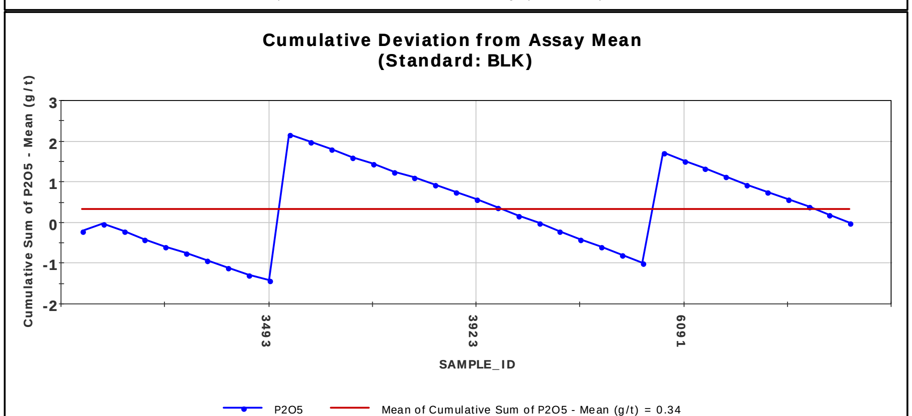
The analyses of the results showed that contamination problems were non-existent during the analysis of the batches. Two samples presented anomalous values, which was considered to be an outlier associated with the possible switching of samples.

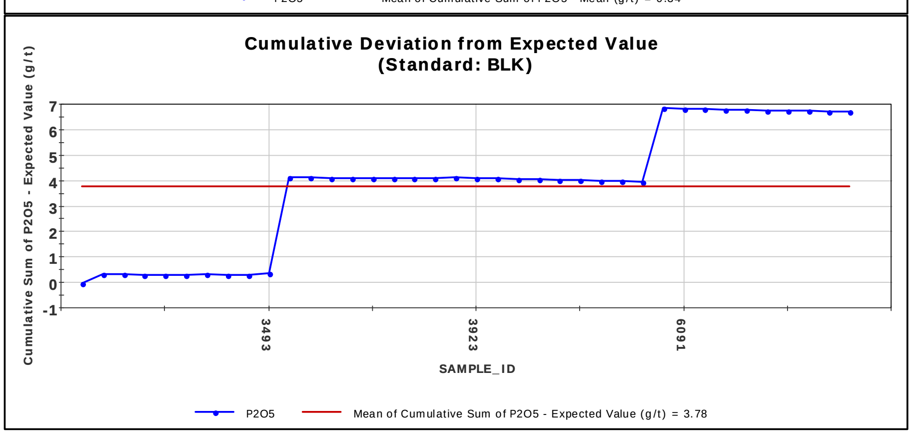
Figure 11.4_1
Analysis of the results obtained with the blank samples

Summary
(Standard: BLK)

Standard:	BLK		No of Analyses:	38
Element:	P2O5		Minimum:	0.01
Units:	%		Maximum:	3.79
Detection Limit:	-		Mean:	0.21
Expected Value (EV):	0.03		Std Deviation:	0.75
E.V. Range:	0.03 to 0.03		% in Tolerance	10.53 %
			% Bias	588.33 %
			% RSD	363.57 %



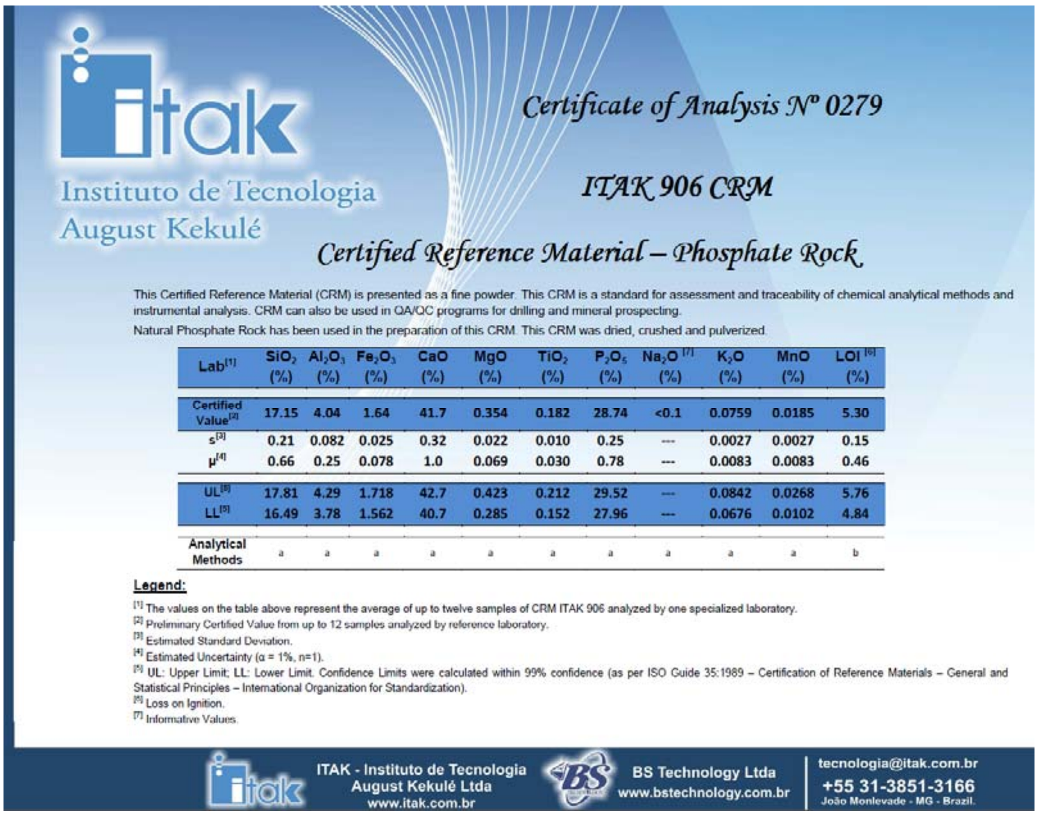




11.4.1 Analysis of Standards

The preparation and purchase of two standard samples, one of high and the other of low grade P_2O_5, was requested. These standards were produced from siltite/phosphorite outcroppings found in the area by ITAK - Instituto de Tecnologia August Kekulé (The August Kekulé Technical Institute). These samples had grades of 28.74 P_2O_5 (ITAK-906) and 0.592 P_2O_5 (ITAK-907). The certificates of the samples are shown in Figures 11.4.1_1 and 11.4.1_2.

Figure 11.4.1_1
Certificate ITAK-906.



itak
Instituto de Tecnologia August Kekulé

Certificate of Analysis Nº 0279

ITAK 906 CRM

Certified Reference Material – Phosphate Rock

This Certified Reference Material (CRM) is presented as a fine powder. This CRM is a standard for assessment and traceability of chemical analytical methods and instrumental analysis. CRM can also be used in QA/QC programs for drilling and mineral prospecting.

Natural Phosphate Rock has been used in the preparation of this CRM. This CRM was dried, crushed and pulverized.

Lab[1]	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	CaO (%)	MgO (%)	TiO_2 (%)	P_2O_5 (%)	Na_2O [7] (%)	K_2O (%)	MnO (%)	LOI [6] (%)
Certified Value[2]	17.15	4.04	1.64	41.7	0.354	0.182	28.74	<0.1	0.0759	0.0185	5.30
s[3]	0.21	0.082	0.025	0.32	0.022	0.010	0.25	---	0.0027	0.0027	0.15
μ[4]	0.66	0.25	0.078	1.0	0.069	0.030	0.78	---	0.0083	0.0083	0.46
UL[5]	17.81	4.29	1.718	42.7	0.423	0.212	29.52	---	0.0842	0.0268	5.76
LL[5]	16.49	3.78	1.562	40.7	0.285	0.152	27.96	---	0.0676	0.0102	4.84
Analytical Methods	a	a	a	a	a	a	a	a	a	a	b

Legend:

[1] The values on the table above represent the average of up to twelve samples of CRM ITAK 906 analyzed by one specialized laboratory.
[2] Preliminary Certified Value from up to 12 samples analyzed by reference laboratory.
[3] Estimated Standard Deviation.
[4] Estimated Uncertainty (α = 1%, n=1).
[5] UL: Upper Limit; LL: Lower Limit. Confidence Limits were calculated within 99% confidence (as per ISO Guide 35:1989 – Certification of Reference Materials – General and Statistical Principles – International Organization for Standardization).
[6] Loss on Ignition.
[7] Informative Values.

ITAK - Instituto de Tecnologia August Kekulé Ltda www.itak.com.br
BS Technology Ltda www.bstechnology.com.br
tecnologia@itak.com.br +55 31-3851-3166 João Monlevade - MG - Brazil.

Figure 11.4.1_1
Certificate ITAK-906.

Analytical Methods:

[a] X Ray Fluorescence (XRF).
[b] Gravimetric Method.

PLANNING. PREPARATION AND ANALYSIS

This CRM was crushed, pulverized and tested for homogeneity by the INSTITUTO DE TECNOLOGIA AUGUST KEKULÉ – ITAK.

The preparation of this CRM (including drying, comminution, homogenization and quartering) was coordinated by the Chemist Smarck de Jesus Lelis, B.Sc., *Technical Director*. The statistical evaluations were coordinated by the Chemist Bráulio de Freitas Pessoa B.Sc., *Innovation and Technology Director*, both being aided by the ITAK Certified Reference Materials Production Department Technical Team.

CRM registered in Technical Report: RT-018/13 STD.

This certificate may only be reproduced in its entirety and without change.

This certificate of this CRM is valid until: **April 16, 2023**.

João Monlevade. April 16, 2013.

Bráulio de Freitas Pessoa
Innovation and Technology Director
Instituto de Tecnologia August Kekulé
Chemist – CRQ 02.202.008

Smarck de Jesus Lelis
Technical Director
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Figure 11.4.1_2

Certificate ITAK 907.

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Certificate of Analysis Nº 0280

ITAK 907 CRM

Certified Reference Material – Phosphate Rock

This Certified Reference Material (CRM) is presented as a fine powder. This CRM is a standard for assessment and traceability of chemical analytical methods and instrumental analysis. CRM can also be used in QA/QC programs for drilling and mineral prospecting.

Natural Phosphate Rock has been used in the preparation of this CRM. This CRM was dried, crushed and pulverized.

Lab[1]	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	CaO (%)	MgO (%)	TiO_2 (%)	P_2O_5 (%)	Na_2O (%)	K_2O (%)	MnO (%)	LOI [6] (%)
Certified Value[2]	63.10	16.02	5.34	0.787	3.55	0.789	0.592	0.924	3.65	0.0214	5.15
s[3]	0.53	0.26	0.055	0.016	0.057	0.011	0.0086	0.030	0.044	0.0015	0.082
µ[4]	1.66	0.82	0.17	0.049	0.18	0.034	0.027	0.093	0.14	0.0047	0.25
UL[5]	64.75	16.84	5.51	0.836	3.73	0.823	0.618	1.016	3.79	0.0261	5.40
LL[5]	61.44	15.20	5.17	0.738	3.37	0.755	0.565	0.831	3.51	0.0167	4.89
Analytical Methods	a	a	a	a	a	a	a	a	a	a	b

Legend:

[1] The values on the table above represent the average of up to twelve samples of CRM ITAK 907 analyzed by one specialized laboratory.
[2] Preliminary Certified Value from up to 12 samples analyzed by reference laboratory.
[3] Estimated Standard Deviation.
[4] Estimated Uncertainty (α = 1%, n=1).
[5] UL: Upper Limit; LL: Lower Limit. Confidence Limits were calculated within 99% confidence (as per ISO Guide 35:1989 – Certification of Reference Materials – General and Statistical Principles – International Organization for Standardization).
[6] Loss on Ignition.

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Figure 11.4.1_2

Certificate ITAK 907.

Analytical Methods:

[a] X Ray Fluorescence (XRF).
[b] Gravimetric Method.

PLANNING. PREPARATION AND ANALYSIS

This CRM was crushed, pulverized and tested for homogeneity by the INSTITUTO DE TECNOLOGIA AUGUST KEKULÉ – ITAK.

The preparation of this CRM (including drying, comminution, homogenization and quartering) was coordinated by the Chemist Smarck de Jesus Lelis, B.Sc., *Technical Director*. The statistical evaluations were coordinated by the Chemist Bráulio de Freitas Pessoa B.Sc., *Innovation and Technology Director*, both being aided by the ITAK Certified Reference Materials Production Department Technical Team.

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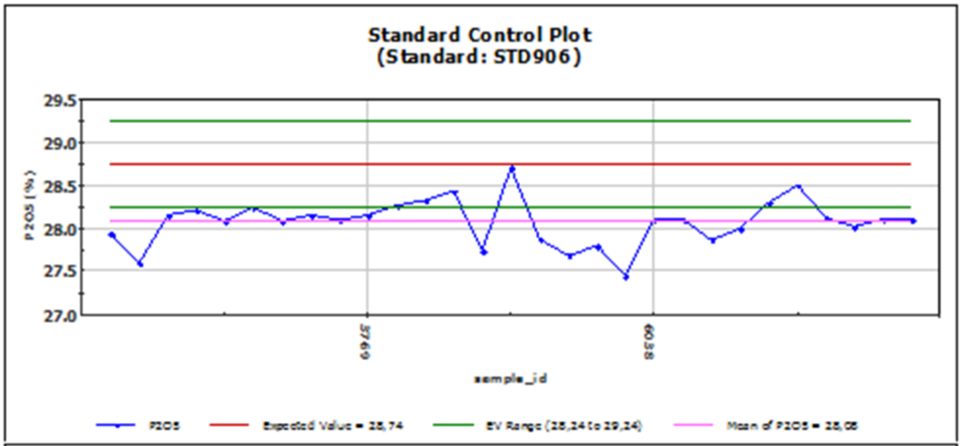
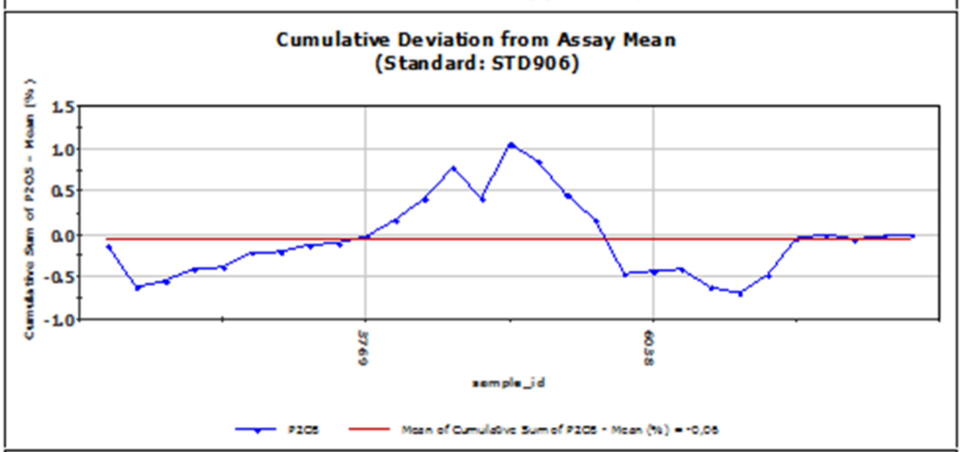
A total of 53 standard samples were inserted in the batches; 29 of them were high-grade and 24 low-grade, which corresponded to 1.6% of the total amount of samples.

The analysis of the accuracy of the samples made it possible to conclude that the analysis of the high-grade samples was biased, which underestimated the value of P_2O_5, at an absolute value of 0.66% and a relative value of 2.31%. It should be noted that the value that was expected for the high-grade standard was found to be higher than the average for the project and the absolute value did not show a significant value regarding the resource estimate for the project.

Figure 11.4.1_3
Analysis of standard samples – ITAK 906

Standard:	STD906	No of Analyses:	29
Element	P2O5	Minimum:	27,45
Units:	%	Maximum:	28,70
Detection Limit:		Mean:	28,08
Expected Value (EV):	28,74	Std Deviation:	0,26
E.V. Range:	28,24 to 29,24	% in Tolerance	24,14 %
		% Bias	-2,31 %
		% RSD	0,94 %





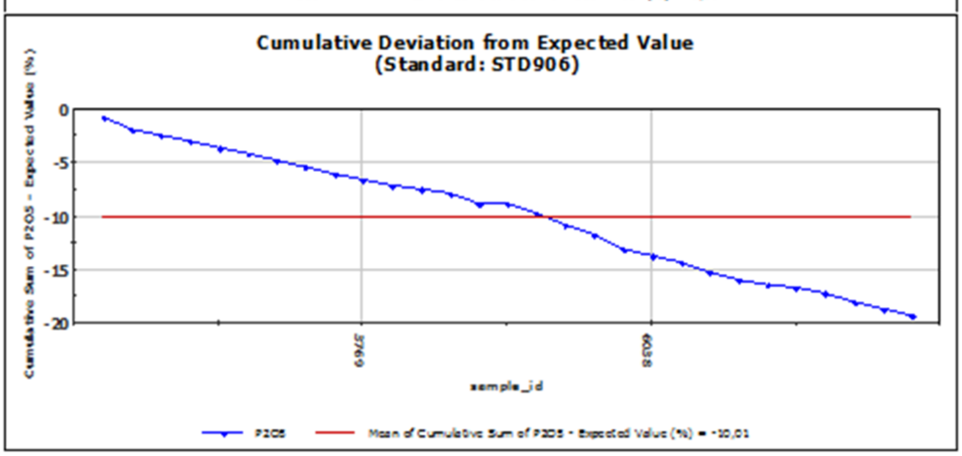
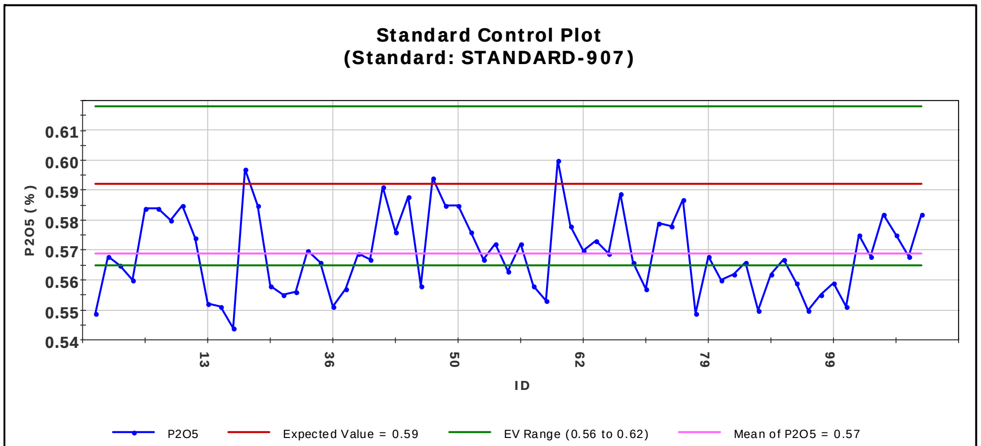
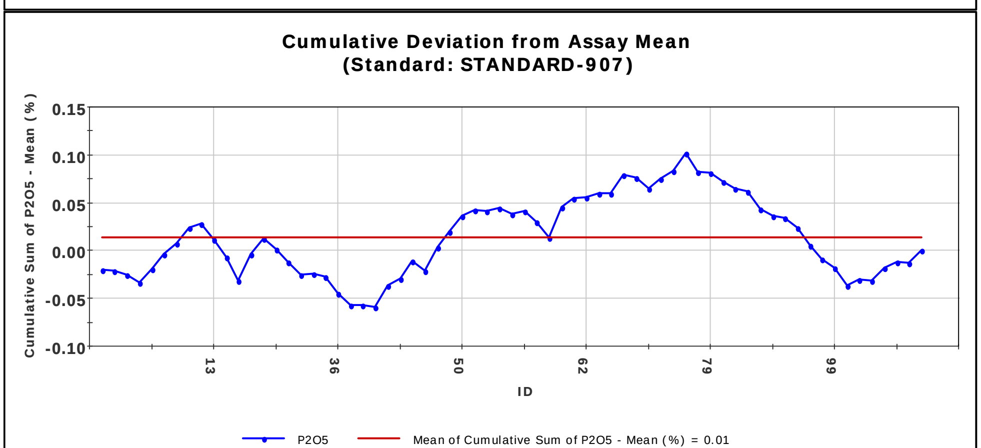
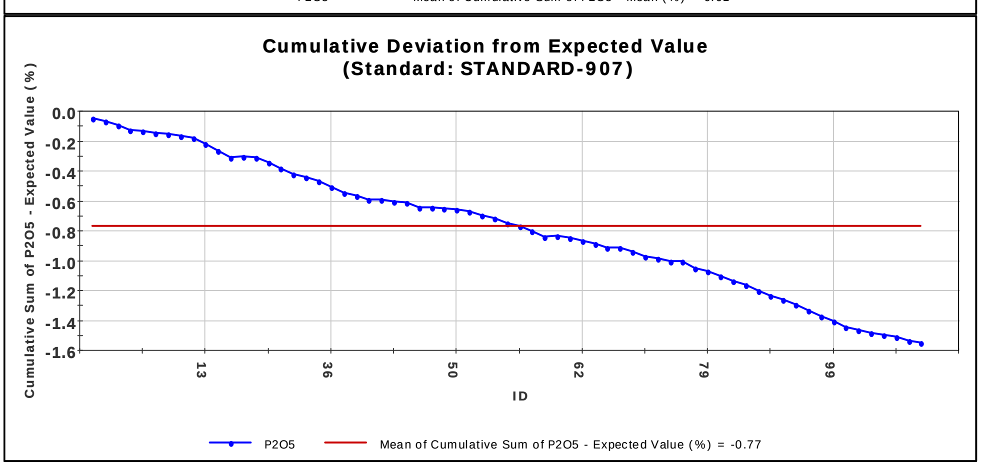


Figure 11.4.1_4
Analysis of standard samples – ITAK 907

Standard:	STANDARD-907		No of Analyses:	67
Element:	P2O5		Minimum:	0.54
Units:	%		Maximum:	0.60
Detection Limit:	0.01		Mean:	0.57
Expected Value (EV):	0.59		Std Deviation:	0.01
E.V. Range:	0.56 to 0.62		% in Tolerance	62.69 %
			% Bias	-3.90 %
			% RSD	2.33 %







11.4.2 Duplicate Analysis

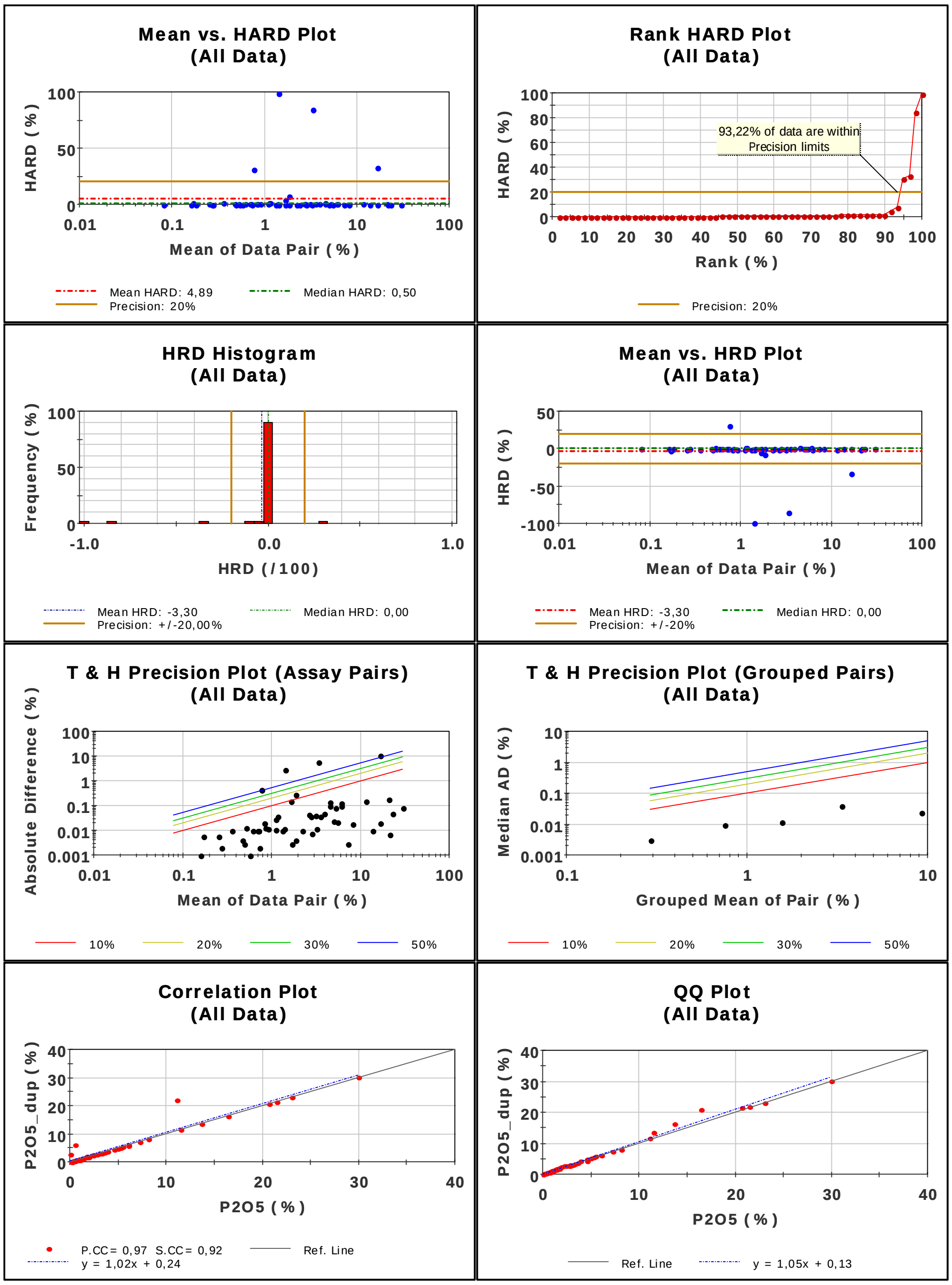
A total of 59 field duplicate samples were inserted into the sequence of drill core samples, which corresponded to 1.8% of the total amount of samples.

The duplicate samples were prepared with ¼ of the quartered sample, which is the same amount of material that was taken from the original sample.

One may verify, from the analysis of the results, that 93% of the pairs of duplicate samples showed a relative difference that was less than 20%, which guarantees a desirable control of precision.

Figure 11.4.2_1
Analysis of field duplicate samples

	P2O5	P2O5_dup	Units			Result
No. Pairs:	59	59			Pearson CC:	0,97
Minimum:	0,01	0,08	%		Spearman CC:	0,92
Maximum:	29,97	30,05	%		Mean HARD:	4,89
Mean:	4,26	4,59	%		Median HARD:	0,50
Median	1,57	1,83	%			
Std. Deviation:	6,34	6,66	%		Mean HRD:	-3,30
Coefficient of Variation:	1,49	1,45			Median HRD	0,00



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11.5 Chemical Analysis of Auger Drilling

DuSolo analysed the element P in the auger samples with a portable X-ray device. No control samples were inserted in the batches of auger drilling samples.

A batch of 34 auger drilling samples were selected by GE21 and analysed via portable X-ray device, and by DuSolo's internal laboratory through colourimetry. The aliquot of crushed material was sent to SGS-Geosol's laboratory in Vespasiano, Minas Gerais, with the aim of comparing the results of the analyses obtained via portable X-ray device and colourimetry with the results of the certified laboratory. The comparison of the results indicated a precision of approximately 20% for the portable X-ray device (Figure 11.5_1) and 10% for the internal laboratory (Figure 11.5_2).

Figure 11.5_1
Comparison of the Portable XRF x Laboratory

	P2O5_SGS	P2O5_XRF	Units			Result
No. Pairs:	34	34			Pearson CC:	0.99
Minimum:	5.28	6.44	%		Spearman CC:	0.99
Maximum:	33.20	29.95	%		Mean HARD:	5.76
Mean:	16.15	17.11	%		Median HARD:	3.94
Median	15.45	17.10	%			
Std. Deviation:	6.77	5.69	%		Mean HRD:	-4.69
Coefficient of Variation:	0.42	0.33			Median HRD	-2.47

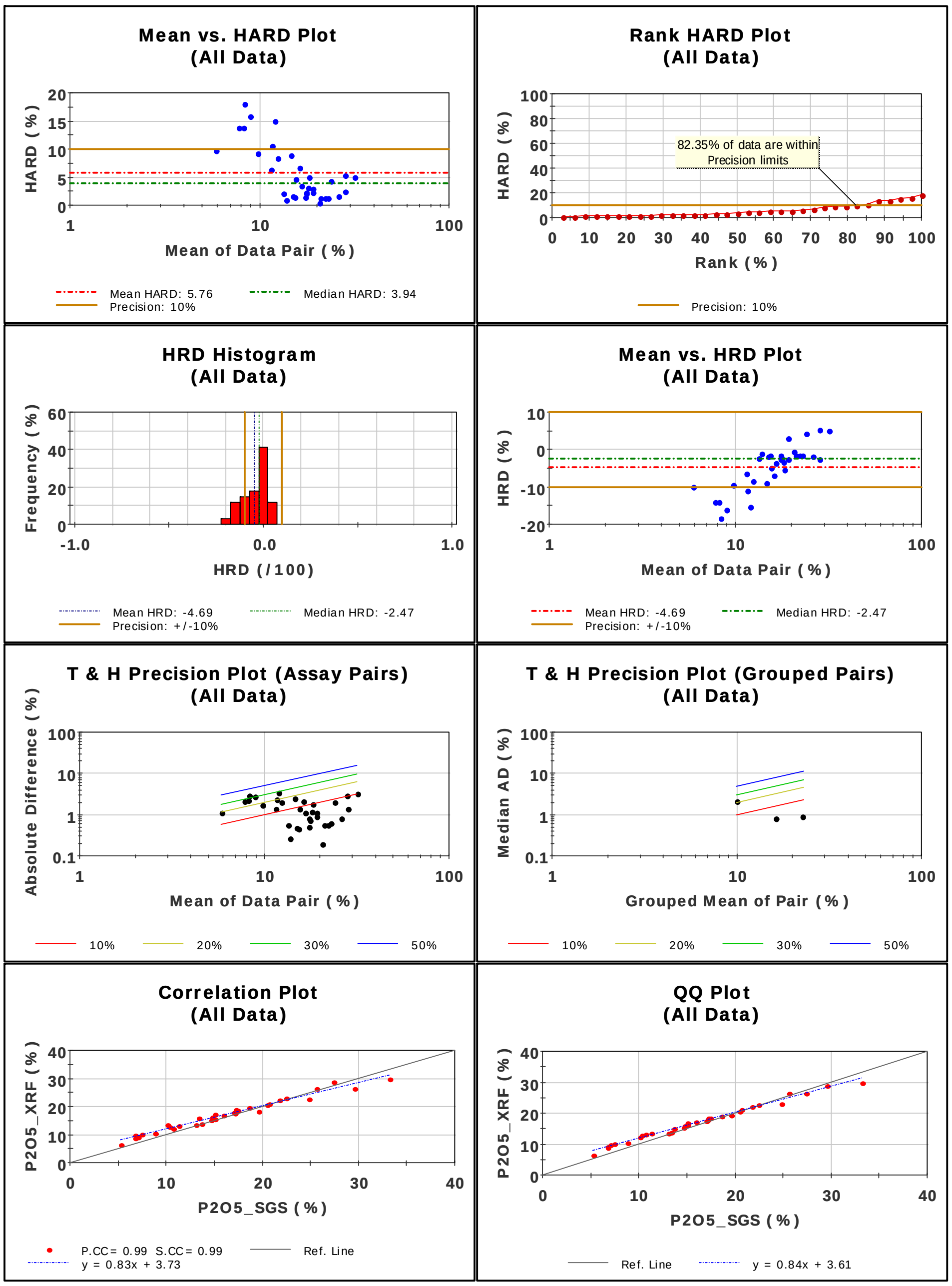
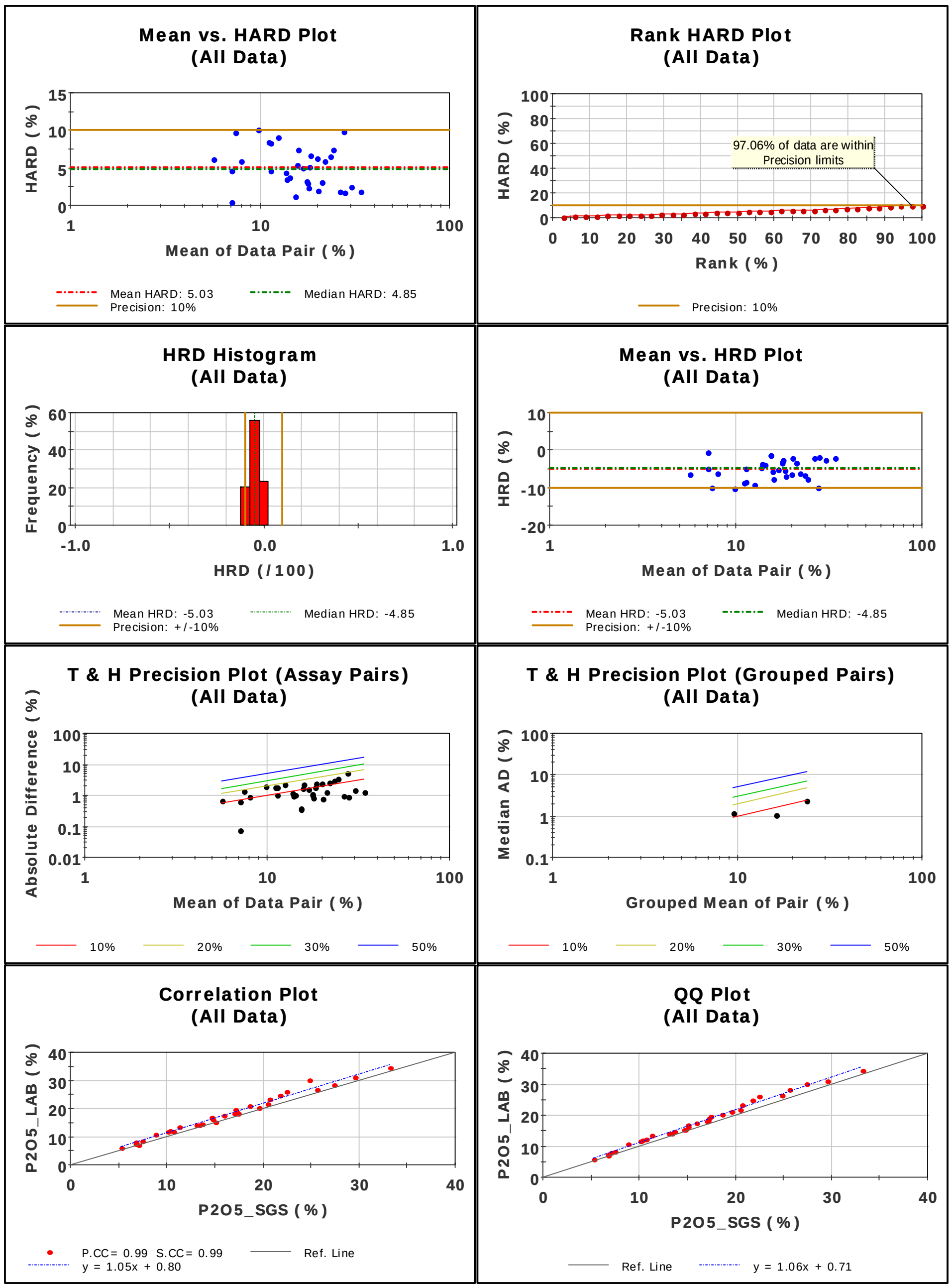


Figure 11.5_2
Comparison of the Colourimetry Analysis x Certified Laboratory

	P2O5_SGS	P2O5_LAB	Units			Result
No. Pairs:	34	34			Pearson CC:	0.99
Minimum:	5.28	5.99	%		Spearman CC:	0.99
Maximum:	33.20	34.51	%		Mean HARD:	5.03
Mean:	16.15	17.75	%		Median HARD:	4.85
Median	15.45	17.27	%			
Std. Deviation:	6.77	7.17	%		Mean HRD:	-5.03
Coefficient of Variation:	0.42	0.40			Median HRD	-4.85



11.6 Adequacy of Procedures

GE21 concluded that the sampling methods, safety procedures and analytical techniques that were employed are compatible with industry best practices, and therefore may be used for this mineral resource estimate.

Considering the quality of the analyses undertaken on the auger drilling samples, GE21 decided not to use these samples for the grade estimation of the resource model; however, GE21 believed they were appropriate for use with the short-term model.

12 DATA VERIFICATION

GE21 staff undertook field visits to the project site with the aim of improving the knowledge of the geology there, confirming the existence of the information required for the resource estimate, and to verify the procedures that were adopted during the exploration, drilling and mining phases. Mining Engineer Porfírio Rodriguez and Geologist Mário Reinhardt completed the last field visit in September 2016.

The itinerary of the field visit included, in addition to the Santiago DANF Project, the Bomfim and Amaury targets. It was possible to verify: the degree of geological understanding of the area, the level of detail of the geological surface mappings, and the materiality of the exploration work that was executed and made available for this resource estimate.

It was also possible to evaluate the pits and Itafos's concentration plant by means of the provincial roads that traverse the project site. Through satellite images and the Itafós Arraiais SSP Project Technical Report – dated March 27, 2013, it was possible to confirm that DuSolo's exploration areas are within the same regional geological context of the areas that are being exploited by Itafos.

GE21 visited and verified RC drilling benchmarks and recorded their coordinates with a navigational GPS in order to be compared later with the project database (Figure 12_1). No differences were found to be greater than the differences that could possibly be related to the imprecision of the methods of measurement used in the verification.

Figure 12_1 Pictures of wells, drill hole benchmarks and trenches


The coordinates of the RC drill holes were registered with geodesic GPS when they were executed. A comparison with the detailed topographical survey of the surface revealed a difference in the elevation of some RC drill hole collars. With the aim of measuring this difference and evaluate its impact on the resource model, a survey check was executed on the benchmarks of 38 holes by the company Edno Guerreiro Topografia. This new point survey used the geodesic benchmarks that were installed during the surface survey work as a basis to provide conciliation for both survey.

Four holes were discarded due to the difference in coordinates, which associated these differences to drill hole identification errors or errors in the data entry process for the coordinates. A shift in the elevation, equal to -0.22 metres, was observed. The distribuition of the errors is presented on Figure 12_2. GE21 believes that there was no overall impact, only significant individual differences and that therefore the expected precision was achieved and can be used in this resource estimate.

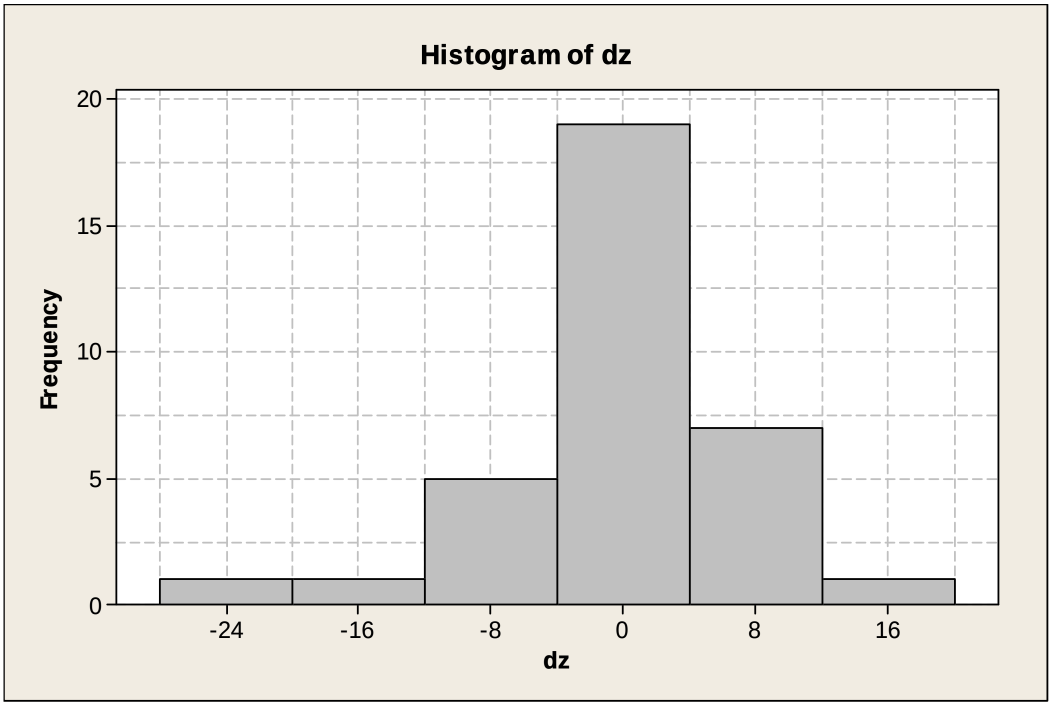
Table 12_1
RC drill hole coordinate validation

Original survey - Sirgas2000				Validation survey			Difference					
hole_id	X	Y	Z	X	Y	Z	dx	dy	dz	dxy	d_xyz
STW-RC-034	302757.9	8577059.0	657.4	302759.5	8577060.0	635.8	1.6	0.9	21.6	1.9	21.7
STW-RC-099	302695.5	8577258.4	655.9	302695.6	8577258.3	640.0	0.1	0.0	-15.9	0.1	15.9
STW-RC-095	302622.3	8577309.0	649.5	302622.2	8577308.6	638.9	-0.1	-0.3	-10.6	0.4	10.6
STW-RC-100	302747.6	8577240.8	648.4	302749.1	8577241.8	640.0	1.5	1.1	-8.4	1.8	8.6
STW-RC-094	302649.0	8577262.0	650.5	302649.1	8577261.8	643.4	0.0	-0.3	-7.1	0.3	7.1
STW-RC-109	303027.7	8577038.6	643.7	303028.0	8577039.5	637.6	0.3	0.9	-6.0	0.9	6.1
STW-RC-096	302575.6	8577313.3	645.9	302575.3	8577313.8	641.2	-0.4	0.4	-4.7	0.6	4.7
STW-RC-053	302941.0	8576999.4	656.6	302940.6	8576999.2	652.7	-0.5	-0.2	-3.9	0.5	3.9
STW-RC-110	303085.0	8577010.9	640.3	303083.9	8577010.2	636.8	-1.0	-0.7	-3.4	1.2	3.7

Table 12_1 RC drill hole coordinate validation											
Original survey - Sirgas2000				Validation survey			Difference				
hole_id	**X**	**Y**	**Z**	**X**	**Y**	**Z**	**dx**	**dy**	**dz**	**dxy**	**d_xyz**
STW-RC-097	302536.4	8577300.5	646.1	302536.7	8577299.9	643.8	0.3	-0.5	-2.3	0.6	2.4
STW-RC-009	302859.9	8576946.1	658.5	302859.5	8576945.4	656.2	-0.4	-0.7	-2.3	0.8	2.4
STW-RC-036	302785.4	8577057.1	651.2	302784.6	8577055.1	649.0	-0.8	-2.0	-2.1	2.2	3.0
STW-RC-054	302982.2	8577010.0	648.3	302982.6	8577010.2	646.2	0.5	0.2	-2.1	0.5	2.1
STW-RC-112	302957.7	8577028.6	647.5	302957.8	8577028.8	646.0	0.0	0.2	-1.5	0.2	1.5
STW-RC-078	302814.6	8576956.2	660.4	302813.8	8576955.4	659.2	-0.8	-0.8	-1.2	1.1	1.7
STW-RC-057	302935.7	8576976.4	653.0	302935.1	8576976.4	651.9	-0.6	0.0	-1.1	0.6	1.2
STW-RC-044	302810.1	8577030.6	650.1	302810.4	8577030.9	649.1	0.3	0.3	-1.0	0.4	1.1
STW-RC-079	302761.4	8576959.8	659.9	302760.9	8576958.7	659.4	-0.5	-1.1	-0.5	1.2	1.3
STW-RC-045	302738.0	8577012.9	656.3	302737.8	8577012.0	656.1	-0.2	-0.9	-0.2	0.9	0.9
STW-RC-006	302727.4	8577007.7	656.6	302726.5	8577006.4	658.2	-0.9	-1.3	1.6	1.6	2.3
STW-RC-084	302705.7	8576985.5	659.9	302705.9	8576986.2	662.2	0.2	0.7	2.4	0.7	2.5
STW-RC-090	302465.2	8577168.9	657.7	302464.4	8577168.6	660.2	-0.8	-0.3	2.5	0.9	2.6
STW-RC-089	302514.3	8577164.8	657.2	302514.8	8577163.0	659.7	0.5	-1.8	2.6	1.9	3.2
STW-RC-098	302473.7	8577248.0	651.9	302474.1	8577248.2	654.8	0.5	0.2	2.9	0.5	2.9
STW-RC-015	303005.5	8577018.9	641.0	303005.1	8577019.9	644.2	-0.4	1.0	3.2	1.1	3.4
STW-RC-088	302588.9	8577119.5	662.7	302589.3	8577119.3	666.2	0.4	-0.2	3.5	0.4	3.5
STW-RC-093	302597.4	8577260.2	648.6	302597.7	8577260.4	653.9	0.3	0.2	5.3	0.3	5.4
STW-RC-087	302563.5	8577174.8	656.4	302565.9	8577173.8	662.2	2.4	-1.0	5.8	2.6	6.4
STW-RC-003	302464.7	8577222.6	653.9	302465.0	8577222.7	660.1	0.3	0.1	6.2	0.3	6.2
STW-RC-092	302548.4	8577262.2	648.4	302548.0	8577261.4	657.0	-0.4	-0.8	8.6	0.9	8.7
STW-RC-091	302512.7	8577219.3	652.4	302512.1	8577218.2	661.7	-0.6	-1.1	9.3	1.3	9.4
STW-RC-060	302613.6	8577208.9	651.8	302613.3	8577208.7	662.1	-0.2	-0.2	10.4	0.3	10.4
STW-RC-102	302724.9	8577158.0	651.3	302725.1	8577157.8	663.1	0.2	-0.3	11.8	0.3	11.8
STW-RC-086	302553.5	8577209.4	652.8	302553.7	8577209.0	665.1	0.2	-0.4	12.3	0.4	12.4
Discarded holes											
STW-RC-062	302655.6	8577198.0	650.3	302703.2	8577152.4	667.5	47.6	-45.5	17.2	65.9	68.1
STW-RC-059	302884.7	8577054.5	645.5	302884.5	8576942.1	657.9	-0.3	-112.4	12.3	112.4	113.0
STW-RC-025	302829.6	8577106.7	647.0	303004.2	8577040.3	641.2	174.6	-66.3	-5.8	186.7	186.8
STW-RC-111	303037.4	8577007.3	640.8	302036.5	8577007.3	639.1	1000.8	0.0	-1.7	1000.8	1000.8

Figure 12_2

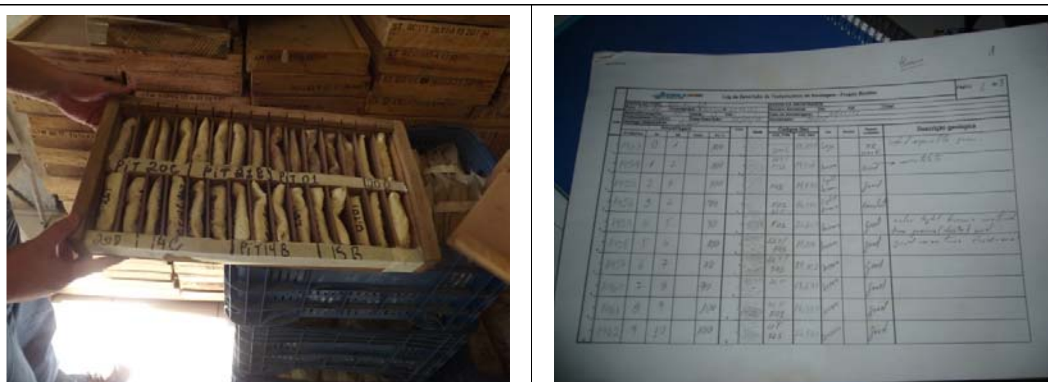
Histrogram of the absolute differences in the elevations of the RC drill holes



GE21 staff had access to DuSolo's installations, where the storage, logging and sampling of drill cores is undertaken. Such aspects as storage, quality of the drill cores, recovery, lithological descriptions and correspondence of the information with the database were verified (Figure 12_3). GE21 concluded that DuSolo's installations and procedures were in accordance with industry best practices.

Figure 12_3

Pictures of drill core samples and documents that were generated during the drilling campaign



The information that exists regarding drill hole recovery of the RC drill holes in the database indicated appropriate average recovery levels; however, it was not possible to verify the drill hole recovery of the RC drill holes.

The drilling data was stored and handled by DuSolo through the use of Microsoft Excel spreadsheets. The data that was received by GE21 was imported to a Microsoft Access format database for validation in order to guarantee the use of a solid database to be used in the resource estimate. Details regarding this validation database are described in section 14.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

DANF is an environmentally friendly, natural fertilizer derived from phosphate-rich rock types that display sufficient agronomic solubility. DANF is applied directly to the soil and yields excellent solubility values, that render the phosphorous more available for the plant's consumption over longer periods of time, and in accordance with the plant's life cycle. DANF does not leach from the soil and is suitable for both organic and conventional farming.

Regarding the legislation surrounding fertilizer products in Brazil, DANF may be associated with Natural Phosphate, having an anomalous concentration of P_2O_5 and a minimum of 4% that is soluble in 2% citric acid at a proportion of 1:100 in terms of particle size. The particles must be 85% passing (in a 0.075mm screen).

Because it is a natural product, no metallurgical process is required and hence no metallurgical testing was undertaken, and the agronomical quality can be ascertained from the market that the product has generated within local agribusiness. This was attained during the previous "trial mining" phase with mining activities permitted by the mineral exploration, known as the GUIA, refer to Section 15.

14 MINERAL RESOURCE ESTIMATE

14.1 Introduction

GE21 executed the geological modeling, the grade estimation and the classification of the mineral resources of the Santiago target. In doing so, the following set of factors was taken into consideration: the quantity and spacing of the available data, the interpretation of the mineralization controls, the type of mineralization, and the quality of the data that was utilized. The estimation was calculated in portions that were limited by the geological interpretations and by the borders of the mining rights.

The effective date of this estimation is the date on which GE21 received the last material information regarding the resource estimation, which was on September 1st, 2016.

14.2 Database

GE21 received the data regarding the drilling in XLS format, which was integrated into a MS-Access database in order to guarantee the integrity of the data and make it possible to connect the GIS and 3D geological modelling software.

The project's database consists of the collar, survey, lithology and assay tables containing the following data: X and Y coordinates, elevations, final drill hole depths, geological descriptions of the drilled intervals, thickness of the sampled interval and chemical analysis of the mineralized interval.

The following validations were performed after perusing the Access database and using the database auditing tool contained in the Gemcom Surpac software:

- Existence of the minimum information necessary for use in the Gemcom Surpac software;
- Final depth – Verifies if the final depth contained in the sampling, geology and drill hole profiling tables do not exceed the value defined in the collar and survey table;
- Overlapping – Verifies whether or not intervals within the same drillhole overlap;
- Collar – Verifies if each of the principal data, such as coordinates and final depths, are filled in.

The database that was used by GE21 contains the results of the overall grade analyses for P_2O_5, Fe_2O_3, MnO TiO_2, CaO, Al_2O_3, MgO, K_2O, Na_2O, SiO_2, ZrO_2, SrO and LOI.

Table 14.2_1 shows a summary of the project's database.

Table 14.2_1
Database Summary

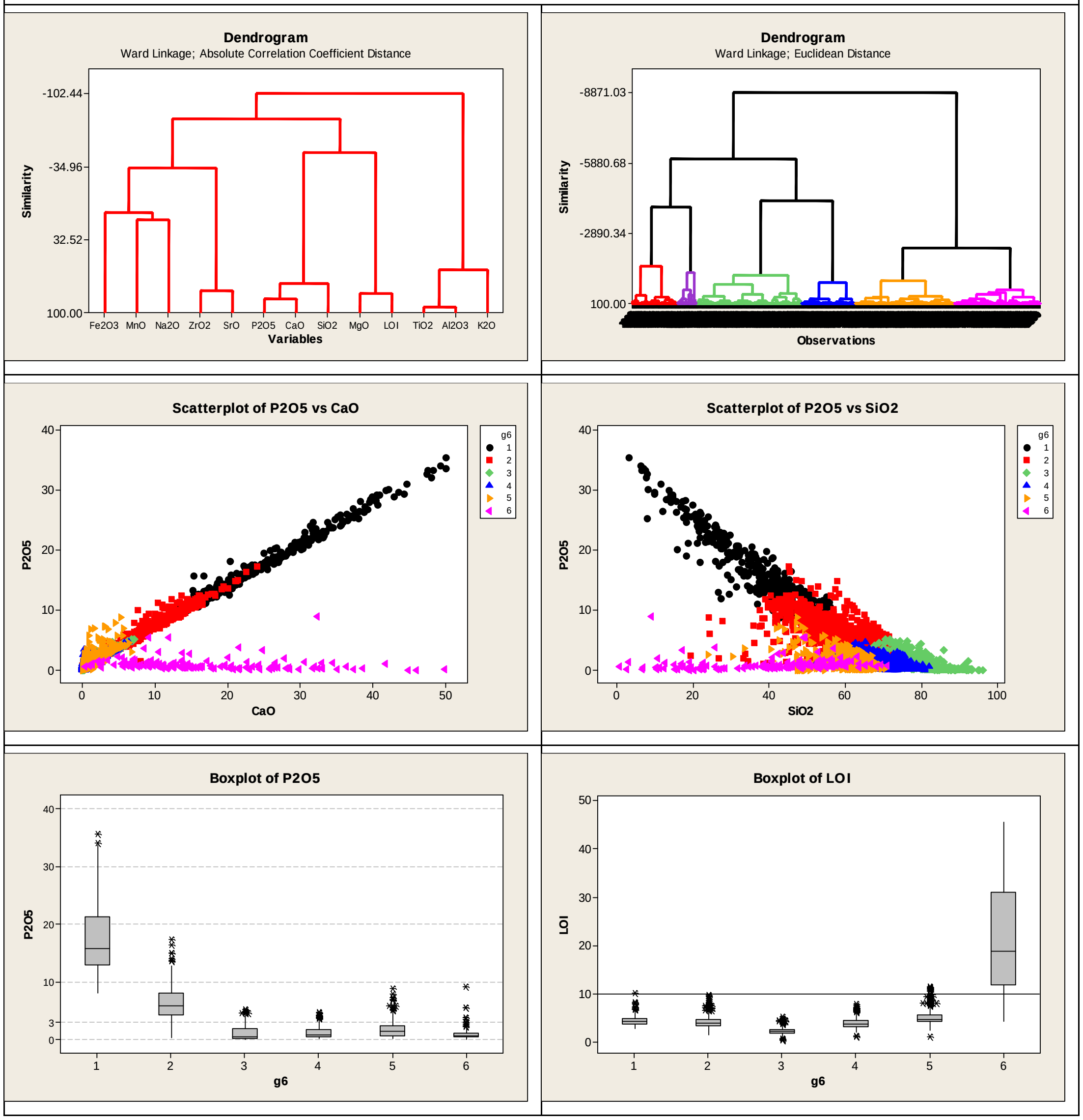
Type	Total Drillholes	Total Meters (m)	Number of Samples
AUGER	128	734.85	757
DD	2	38.4	0
RC	155	3,198.8	3,231
Total	**285**	**3,972.05**	**3,988**

14.3 Geological Model

GE21 executed multi-variable grouping that was based on the Cluster Analysis technique, which sought to distinguish the geological domains that exist at the targets. To do so, the lithological descriptions that had been previously prepared by the field geologists, and the results of the chemical analyses of the RC drillholes, were utilized. The grouped analysis took into account the following variables: P_2O_5, K_2O, Al_2O_3, SiO_2, CaO, MgO and LOI. Figure 14.3_1 presents the dendrograms, scatterplots and boxplots that were obtained from the analysis.

Figure 14.3_1

Dendrograms, Scatterplots and Boxplots of the Typological Phosphate Study



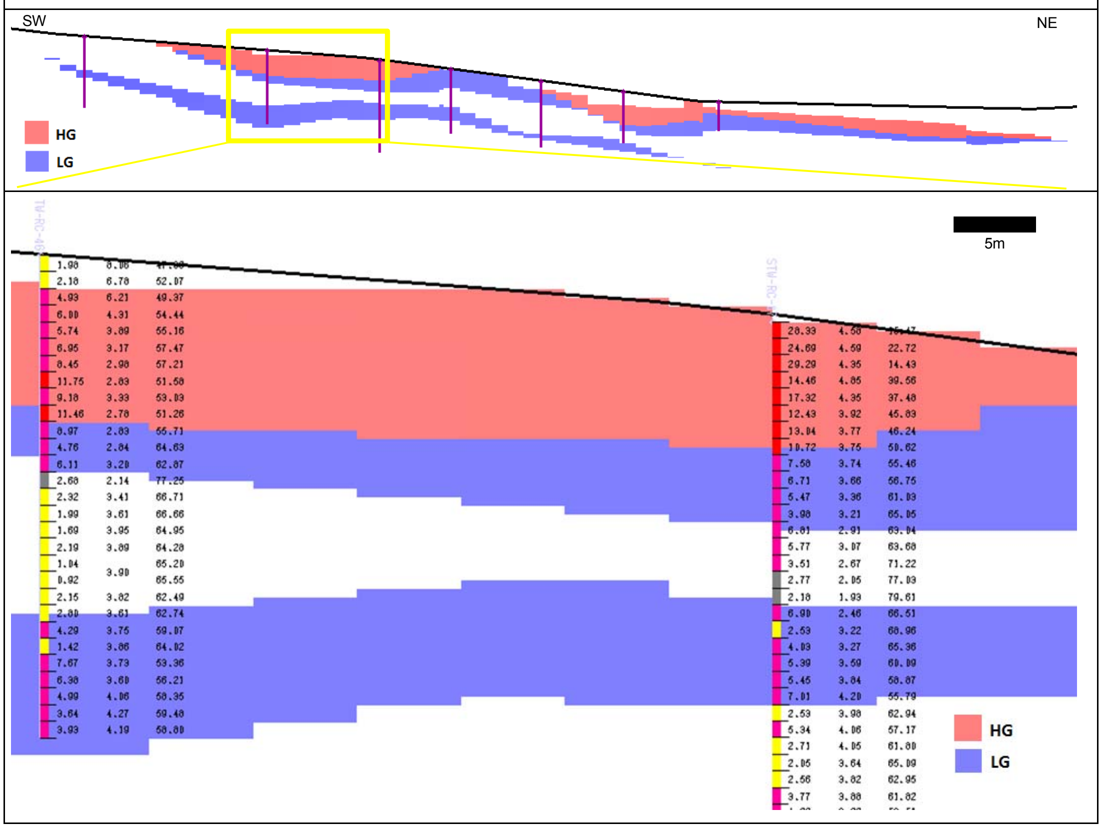
After completion of the spatial validation of the typologies, Types were determined based on the following parameters:

- Type 1: P_2O_5 ≥ 10% – High Grade Mineralization (HG);
- Type 2: P_2O_5 ≥ 3% and <10% – Low Grade Mineralization (LG);
- Types 3 and 4: SiO2 ≥ 70% – Silexite;
- Type 5: P_2O_5 < 3% and LOI < 10% - Siltite/non-mineralized sandstone;
- Type 6: LOI ≥ 10% – Carbonatic rock.

The modelling was executed taking into account the following domains: non-mineralized siltite/argillite, carbonatic rock, silexite and two domains that are mineralized in siltite/phosphorite, which were classified as: "High-Grade" and "Low-Grade" zones (Figure 14.3_2). Soil and secondary phosphate domains, originating from weathering processes, were not modelled because, in the study area, they occur in volumes that are insignificant. The secondary phosphate was characterized as having a CaO/P_2O_5 ratio that was smaller than 1.3, which is commonly associated with phosphates of the crandallite family. The samples that were collected at the domains that were not modelled were included in the non-mineralized siltite/sandstone domain.

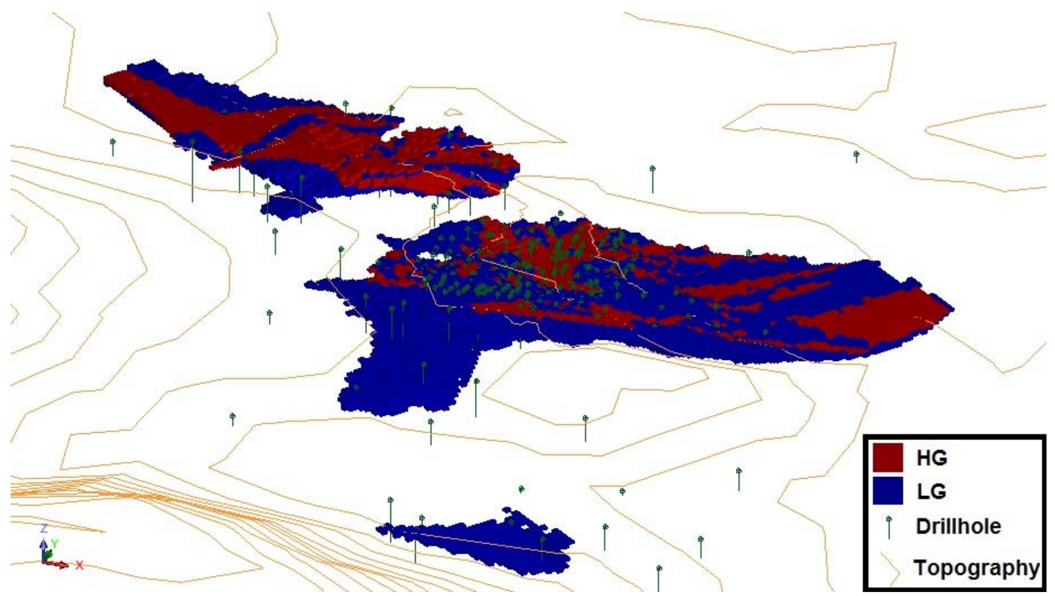
In its geological modelling, GE21 used RC and auger drillholes, in addition to information from the surface geological map and the topography. Eleven northeast-southwest and 29 east-west cross-sections were developed in accordance with the best adjustment of these sections to the geometry of the drillholes.

Figure 14.3_2
Typical section of the deposit - Modelling of the HG and LG domains



The 3D model was developed based on the connection of the polygons and section lines, generating solids and 3D surfaces that, when combined, generated the geological model onto the block model (Figure 14.3_3).

Figure 14.3_3
Geological model - Mineralized Domains - 3D view towards the NE



14.4 Structural Analysis

14.4.1 Compositing

The Santiago target has samples that were obtained via RC drilling, which was executed along the entire extension of the deposit, in addition to auger drilling, which was executed within the mining area that is related to the GUIA. GE21 completed the estimate of the resource model using exclusively the RC samples. The estimate of the area that will be mined in the short term was executed using RC and auger samples because of the more detailed drilling grid.

The RC and auger drilling obtained samples that had an average length of one metre, being that 3% of the samples had lengths that were less than the average and 1% of the samples had lengths that were greater than the average.

Considering the statistics of the sample support and the characteristics of the mineralization, GE21 opted to generate one metre composites, and only composites of at least 75 centimetres were considered valid.

14.4.2 EDA – Exploratory Data Analysis

Figures 14.4.2_1 to 14.4.2_4 show the statistics for the variable P_2O_5 from the HG and LG domains.

Table 14.4.2_1 Summary of the Composite Statistics									
Composite	**Variable**	**Lithology**	**Average**	**Variance**	**Standard Deviation**	**CV**	**No. of Samples**	**Lower Limit**	**Upper Limit**
RC	**P_2O_5**	**HG**	15.41	32.35	5.69	0.37	395	1.49	33.36
		LG	5.77	10.77	3.28	0.57	863	0.01	35.57
	CaO	**HG**	21.37	71.09	8.43	0.39	395	1.99	48.20
		LG	7.55	25.11	5.01	0.66	863	0.14	50.00
	MgO	**HG**	1.04	0.16	0.39	0.38	395	0.06	4.36
		LG	1.36	0.63	0.79	0.58	863	0.19	17.80
	Al_2O_3	**HG**	8.47	6.45	2.54	0.30	395	1.31	15.98
		LG	10.64	7.94	2.82	0.26	863	0.01	20.00
	Fe_2O_3	**HG**	5.37	7.70	2.78	0.52	395	0.55	19.60
		LG	7.22	24.77	4.98	0.69	863	0.12	41.80
	SiO_2	**HG**	39.97	148.90	12.20	0.31	395	6.40	92.42
		LG	58.97	105.49	10.27	0.17	863	3.09	81.80
	K_2O	**HG**	2.29	0.50	0.71	0.31	395	0.20	4.54
		LG	2.98	0.65	0.80	0.27	863	0.01	5.24
	LOI	**HG**	4.27	1.03	1.02	0.24	395	0.63	10.20
		LG	4.14	4.60	2.14	0.52	863	1.03	37.75
RC+ Auger	**P_2O_5**	**HG**	15.41	29.47	5.43	0.35	642	0.64	33.36
		LG	5.72	9.43	3.07	0.54	1 138	0.01	35.57

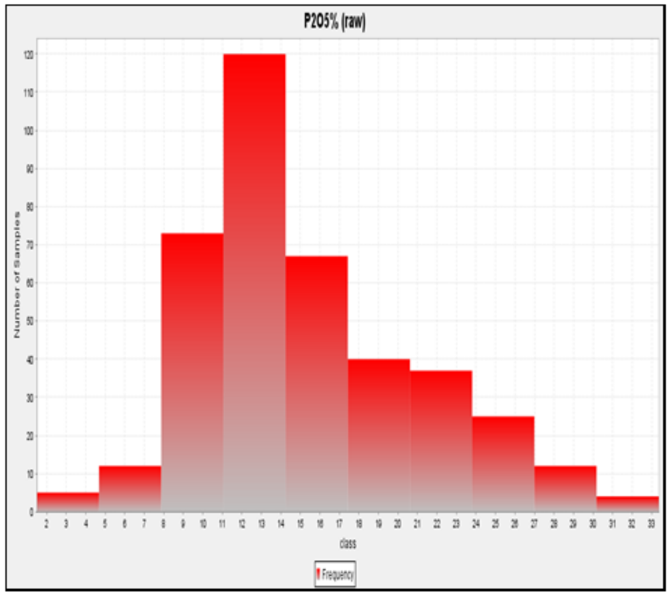
Figure 14.4.2_1
Descriptive statistics – HG Type - RC Composites – P_2O_5%

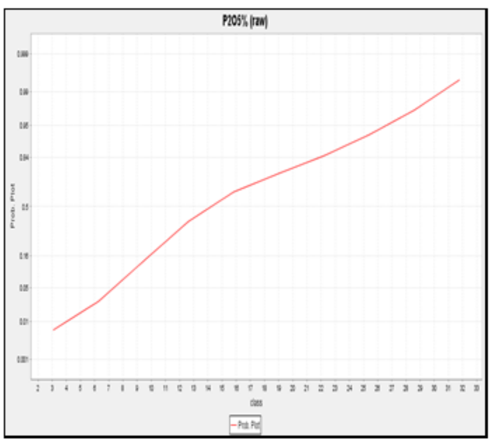
Target:	**Santiago**
Lithology:	HG
Variable:	**P2O5%**

Number of Samples	**395**
Min. Value	1.49
Max. Value	**33.36**
N° of Classes (Sturges):	10
Interval (Sturges):	**3.30**

Quantiles	
2.5%:	6.45
5.0%:	8.39
25.0%:	11.37
Median:	13.76
75.0%:	18.77
95.0%:	26.31
97.5%:	28.58

Average:	**15.41**
Variance:	32.35
Standard Deviation:	**5.69**
Variance coef.:	37%
Range interquartile:	**7.40**





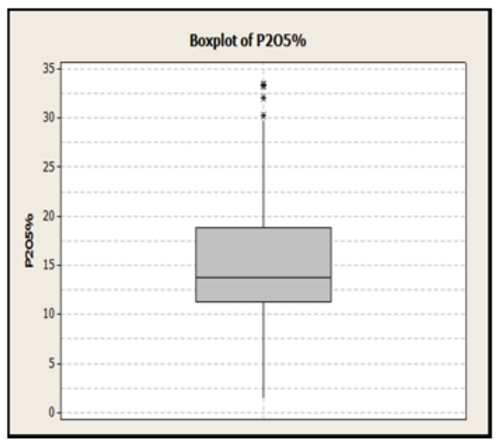


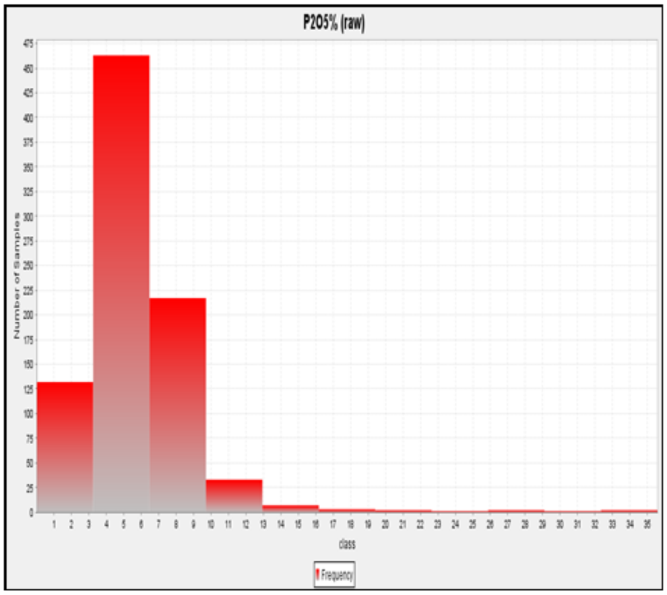
Figure 14.4.2_2
Descriptive statistics – LG Type - RC Composites – P_2O_5%

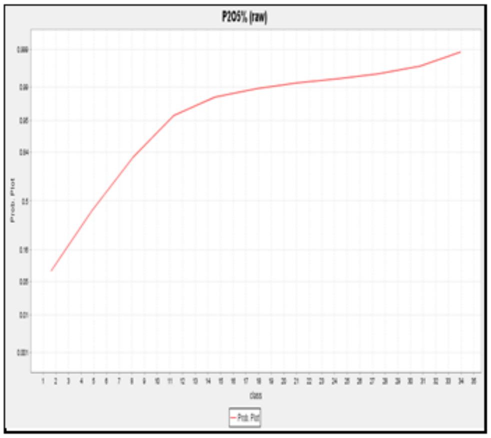
Target:	Santiago
Lithology:	LG
Variable:	P2O5%

Number of Samples	863
Min. Value	0.01
Max. Value	35.57
N° of Classes (Sturges):	11
Interval (Sturges):	3.30

Quantiles	
2.5%:	1.87
5.0%:	2.43
25.0%:	3.78
Median:	5.19
75.0%:	6.97
95.0%:	9.98
97.5%:	12.21

Average:	5.77
Variance:	10.77
Standard Deviation:	3.28
Variance coef.:	57%
Range interquartile:	3.19





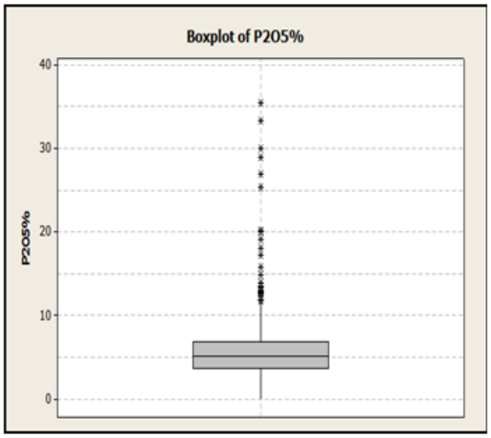


Figure 14.4.2_3

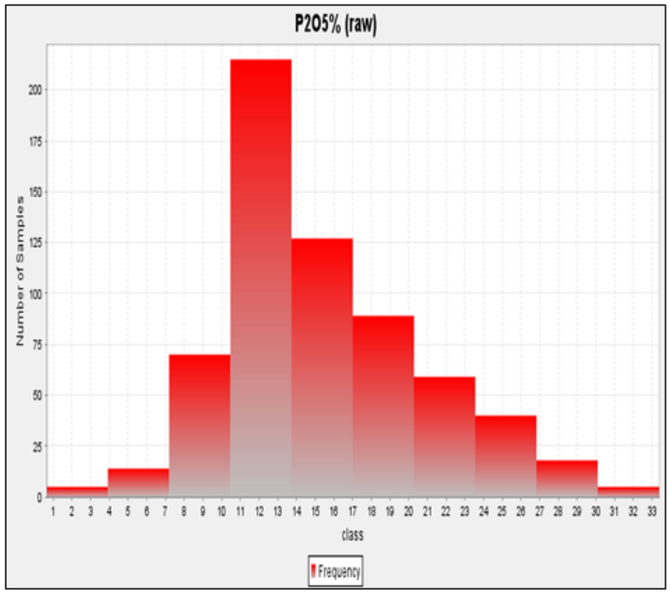
Descriptive statistics – HG Type - RC+Auger Composites – P_2O_5%

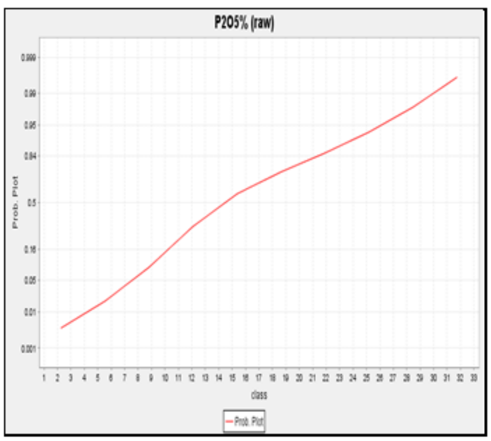
Target:	Santiago
Lithology:	HG
Variable:	P2O5%

Number of Samples:	642
Min. Value:	0.64
Max. Value:	33.36
N° of Classes (Sturges):	10
Interval (Sturges):	3.16

Quantiles	
2.5%:	6.74
5.0%:	8.62
25.0%:	11.46
Median:	14.02
75.0%:	18.68
95.0%:	25.82
97.5%:	28.18

Average:	15.41
Variance:	29.47
Standard Deviation:	5.43
Variance coef.:	35%
Range interquartile:	7.22





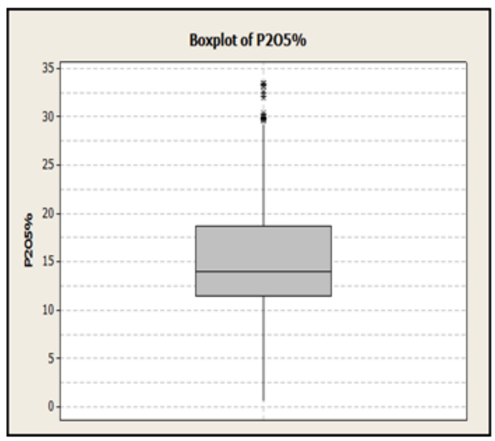


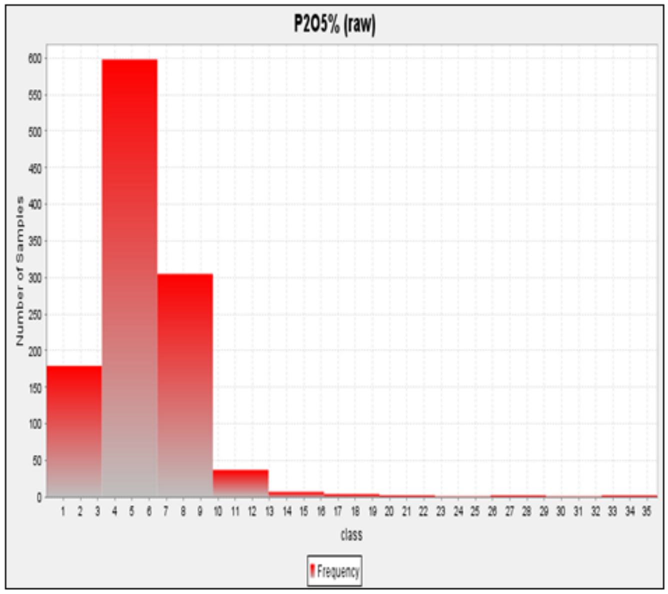
Figure 14.4.2_4
Descriptive statistics – LG Type - RC+Auger Composites – P_2O_5%

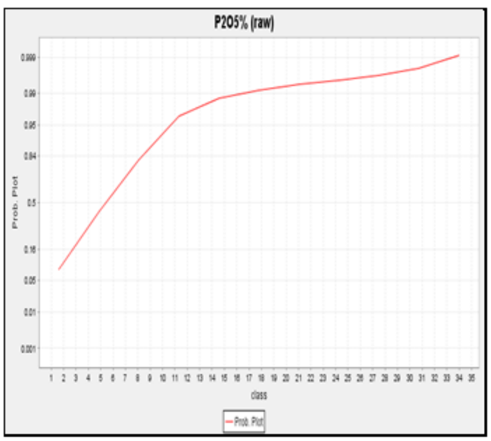
Target:	Santiago
Lithology:	HG
Variable:	P2O5%

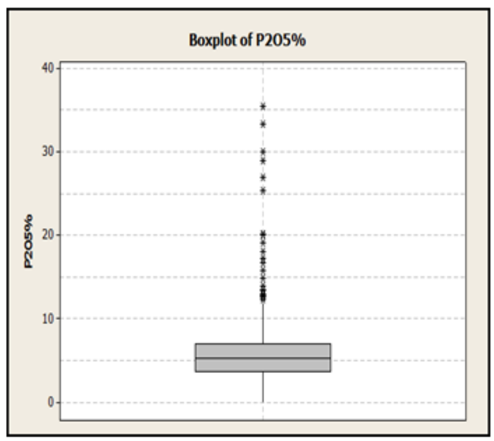
Number of Samples:	1 138
Min. Value:	0.01
Max. Value:	35.57
N° of Classes (Sturges):	11
Interval (Sturges):	3.18

Quantiles	
2.5%:	1.87
5.0%:	2.43
25.0%:	3.73
Median:	5.27
75.0%:	7.05
95.0%:	9.70
97.5%:	11.59

Average:	5.72
Variance:	9.43
Standard Deviation:	3.07
Variance coef.:	54%
Range interquartile:	3.32







14.4.3 Variographic Analysis

The subject of geostatistics has two main objectives:

- To mathematically structure the relationships of variability between two points in space, i.e., to measure the zone of influence and the degree and type of variability that is restricted to one homogenous field; and,
- To establish a spatial distribution model of a regionalized variable with the measure of precision of its estimate.

The variographic analysis was executed on the HG and LG mineralized domains with respect to the following variables: P_2O_5, CaO, MgO, Al_2O_3, Fe_2O_3, SiO_2, K_2O and LOI. Only RC composites were used in this analysis. The variograms that were obtained were normalized and applied in the estimate of the short-term area using the composited samples from the RC+Auger samples.

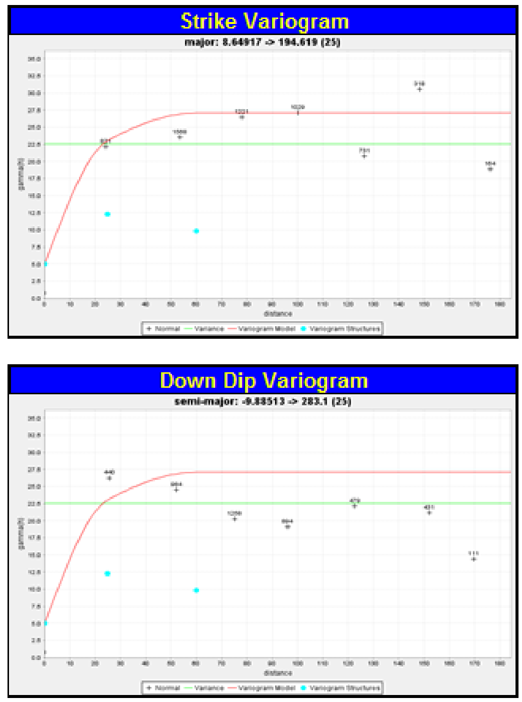
Figures 14.4.3_1 and 14.4.3_2 show the variograms of the HG and LG domains for the variable P_2O_5. GE21 built variograms of each of the variables that were analysed. Table 14.4.3 shows a summary of the variographic analysis.

Figure 14.4.3_1
P_2O_5 (%) – HG Variograms

Target	Santiago
Ore:	HG
Variable:	P2O5%

Variogram structures		
Model	Spherical	
Structure	Sill	Range
Nugget	5.000	-
1	1.40	30
2	20.00	60

Ellipse Orientation	
Bearing	195
Plunge	9
Dip	-10
Major/Semi-major	1.0
Major/Minor	4.5



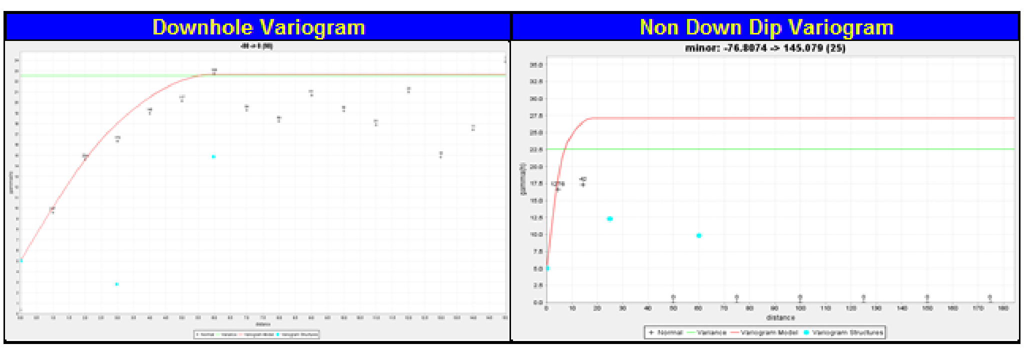
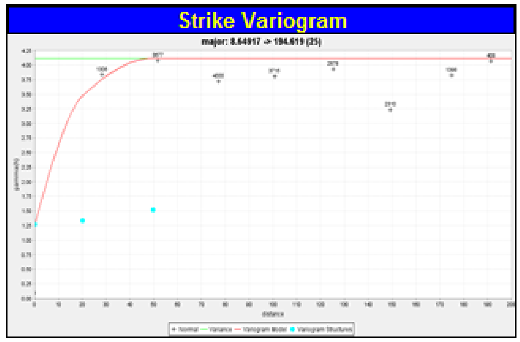
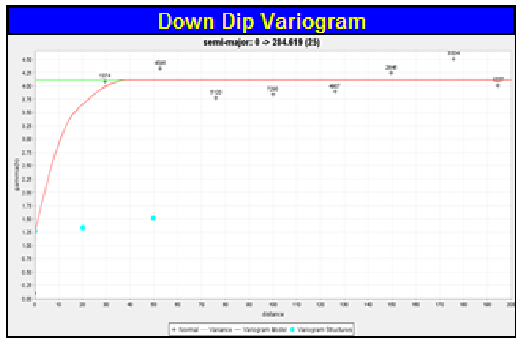


Figure 14.4.3_2
P_2O_5 (%) – LG Variograms

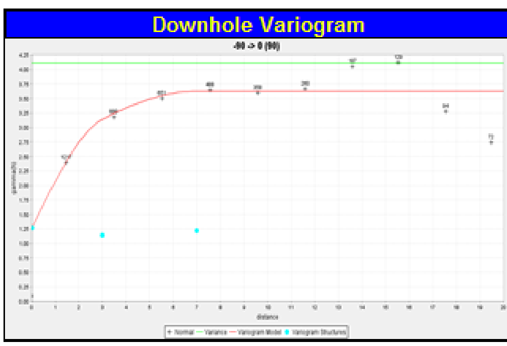
Target	Santiago
Ore:	LG
Variable:	P2O5%

Variogram structures		
Model	Spherical	
Structure	Sill	Range
Nugget	1.267	-
1	1.33	20
2	1.52	50





Ellipse Orientation	
Bearing	195
Plunge	9
Dip	0
Major/Semi-major	1.3
Major/Minor	3.2



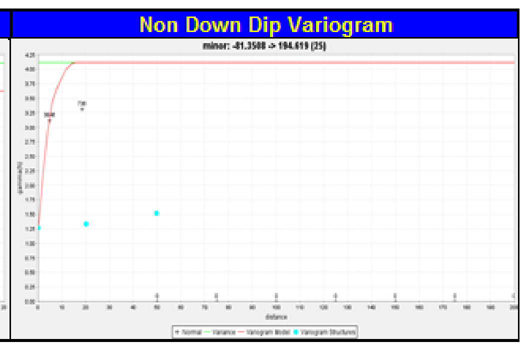


Table 14.4_1
Summary of the variographic analysis

Variable	c0	c1	a1	c2	a2	Bearing	Plunge	DIP	RSM	RM
P_2O_5	0.19	0.05	30	0.76	117	195	8.65	0	1	4.5
CaO	0.19	0.05	30	0.76	61.00	195	8.65	0	1	4.52
MgO	0.18	0.06	20	0.76	69.00	195	8.65	0	1	4.5
Al_2O_3	0.22	0.01	25	0.76	77.00	195	8.65	0	1	8.23
Fe_2O_3	0.10	0.35	11	0.55	85.00	195	8.65	0	1	2.83
SiO_2	0.07	0.16	20	0.77	93.00	195	8.65	0	1	4.5
K2O	0.12	0.38	15	0.50	101.00	195	8.65	0	1	4.87
LOI	0.11	0.21	25	0.68	109.00	195	8.65	0	1	4.5

14.5 Block Model

GE21 made use of two block models for the Santiago DANF Project deposit estimate. One was a model covering the entire area of the deposit (Long Term Model - LT), having block dimensions that were compatible not only with the spacing of the RC drilling grid but also with the height of the mining benches (Table 14.5_1). The second model had dimensions that were restricted to the short-term area (Short-term Model - ST) and a block spacing that was compatible with the spacing of the auger holes (Table 14.5_2).

The use of sub-blocks was adopted for the complete model of the deposit and had the same dimensions of the blocks of the short-term model in order to make the integration of the two models possible and to guarantee the adherence of the solids and the surfaces that were modelled.

Each block within the model was characterized by the series of attributes that are presented in Table 14.5_3. Figure 14.5_1 shows the resulting block model classified by lithotype.

The block models were created with Gemcom Surpac software version 6.1.4.

The attribute regarding the lithology of the block in the model was determined by utilizing the solids and surfaces of the modelled domains.

Table 14.5_1
Dimensions of the block model - LT Model

Type	Y	X	Z
Minimum Coordinates	8575068.219	303328.175	562
Maximum Coordinates	8580955.719	305078.175	790
User Block Size	12.5	12.5	4
Min. Block Size	6.25	6.25	2
Rotation	-50	0	0

Table 14.5_2
Dimensions of the block model - ST Model

Type	Y	X	Z
Minimum Coordinates	8574635	303650	550
Maximum Coordinates	8582635	306650	950
User Block Size	6.25	6.25	2
Rotation	-50	0	0

Table 14.5_3
Block model attributes

Attribute Name	Type	Decimals	Background	Description
density	Float	2	-99	Density in g/cm3
dn_ok_al2o3	Float	3	-99	Anisotropic distance to nearest sample
dn_ok_cao	Float	3	-99	Anisotropic distance to nearest sample
dn_ok_fe2o3	Float	3	-99	Anisotropic distance to nearest sample
dn_ok_k2o	Float	3	-99	Anisotropic distance to nearest sample
dn_ok_loi	Float	3	-99	Anisotropic distance to nearest sample

Table 14.5_3 Block model attributes				
Attribute Name	**Type**	**Decimals**	**Background**	**Description**
dn_ok_mgo	Float	3	-99	Anisotropic distance to nearest sample
dn_ok_p2o5lp	Float	3	-99	Anisotropic distance to nearest sample
dn_ok_sio2	Float	3	-99	Anisotropic distance to nearest sample
dnpm	Integer	-	0	0= outside; 1=inside
ds_ok_al2o3	Float	3	-99	Anisotropic average distance to samples
ds_ok_cao	Float	3	-99	Anisotropic average distance to samples
ds_ok_fe2o3	Float	3	-99	Anisotropic average distance to samples
ds_ok_k2o	Float	3	-99	Anisotropic average distance to samples
ds_ok_loi	Float	3	-99	Anisotropic average distance to samples
ds_ok_mgo	Float	3	-99	Anisotropic average distance to samples
ds_ok_p2o5lp	Float	3	-99	Anisotropic average distance to samples
ds_ok_sio2	Float	3	-99	Anisotropic average distance to samples
kv_ok_al2o3	Float	3	-99	Variance of krigage
kv_ok_cao	Float	3	-99	Kriging variance
kv_ok_fe2o3	Float	3	-99	Kriging variance
kv_ok_k2o	Float	3	-99	Kriging variance
kv_ok_loi	Float	3	-99	Kriging variance
kv_ok_mgo	Float	3	-99	Kriging variance
kv_ok_p2o5lp	Float	3	-99	Kriging variance
kv_ok_sio2	Float	3	-99	Kriging variance
litho	Integer	-	-99	0=air; 1=HG; 2=LG; 3=siltite; 4=dolomite; 5=silexite
model	Integer	-	0	1=Long Term; 2=Short Term
nn_al2o3	Float	3	-99	Grade estimated by nearest neighbour
nn_cao	Float	3	-99	Grade estimated by nearest neighbour
nn_fe2o3	Float	3	-99	Grade estimated by nearest neighbour
nn_k2o	Float	3	-99	Grade estimated by nearest neighbour
nn_loi	Float	3	-99	Grade estimated by nearest neighbour
nn_mgo	Float	3	-99	Grade estimated by nearest neighbour
nn_p2o5	Float	3	-99	Grade estimated by nearest neighbour
nn_sio2	Float	3	-99	Grade estimated by nearest neighbour
ns_ok_al2o3	Integer	-	-99	Number of samples used on kriging
ns_ok_cao	Integer	-	-99	Number of samples used on kriging
ns_ok_fe2o3	Integer	-	-99	Number of samples used on kriging
ns_ok_k2o	Integer	-	-99	Number of samples used on kriging
ns_ok_loi	Integer	-	-99	Number of samples used on kriging
ns_ok_mgo	Integer	-	-99	Number of samples used on kriging
ns_ok_p2o5lp	Integer	-	-99	Number of samples used on kriging
ns_ok_sio2	Integer	-	-99	Number of samples used on kriging
ok_al2o3	Float	3	-99	Grade estimated by ordinary kriging
ok_al2o3_pass	Integer	-	0	Kriging step
ok_cao	Float	3	-99	Grade estimated by ordinary kriging
ok_cao_pass	Integer	-	0	Kriging step

Table 14.5_3 Block model attributes				
Attribute Name	**Type**	**Decimals**	**Background**	**Description**
ok_fe2o3	Float	3	-99	Grade estimated by ordinary kriging
ok_fe2o3_pass	Integer	-	0	Kriging step
ok_k2o	Float	3	-99	Grade estimated by ordinary kriging
ok_k2o_pass	Integer	-	0	Kriging step
ok_loi	Float	3	-99	Grade estimated by ordinary kriging
ok_loi_pass	Integer	-	0	Kriging step
ok_mgo	Float	3	-99	Grade estimated by ordinary kriging
ok_mgo_pass	Integer	-	0	Kriging step
ok_p2o5cp	Float	3	-99	Grade estimated by ordinary kriging
ok_p2o5cp_pass	Integer	-	0	Kriging step
ok_p2o5lp	Float	3	-99	Grade estimated by ordinary kriging
ok_p2o5lp_pass	Integer	-	0	Kriging step
ok_sio2	Float	3	-99	Grade estimated by ordinary kriging
ok_sio2_pass	Integer	-	0	Kriging step
resource	Integer	-	0	1=measured; 2=indicated; 3=inferred

Figure 14.5_1
Block Model - 3D View Toward the West

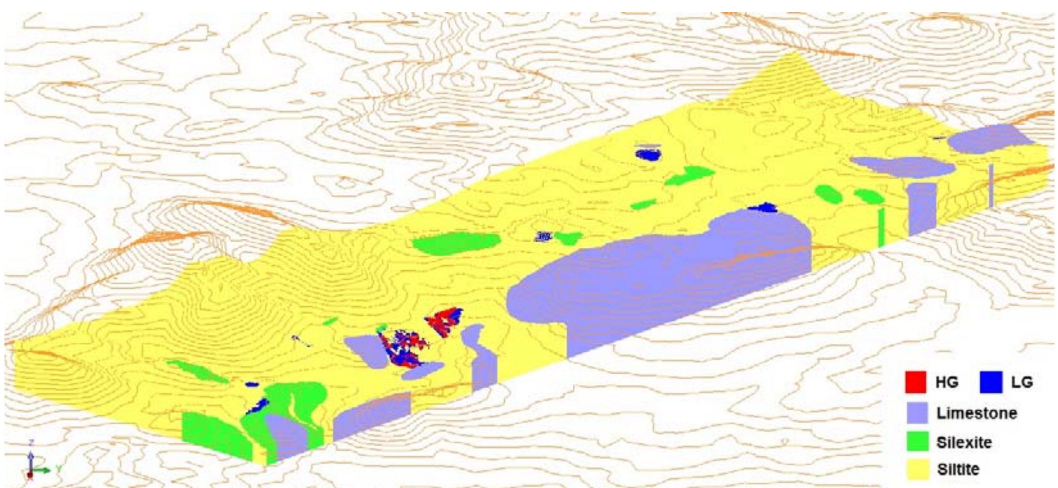


Table 14.5_3 presents a comparison between the volume of the mineralized type of the block model and the solids. This comparison aims to validate the adherence of the block model, which is defined by the sub-blocks and by the volume of the solids that were modelled, establishing the relationship between the size of the sub-blocks and the complexity of the geometry and dimensions of the geological formations. The volume shown here is not influenced by intersections between the surfaces and the topography and, for this reason, they should not be utilized for ends other than this validation. The validation of the adherence did not reveal a difference with respect to the mineralized domains.

Table 14.5.3_4 Validation of the adherence between the solids and the block model		
Volume of Solids (m³)	**Volume of Blocks (m³)**	**Difference**
3 344 606.89	3 356 718.75	0%

14.6 Resource Statement and Classification of Mineral Resources

14.6.1 Introduction

The Ordinary Kriging method (OK) was used on the variables P_2O_5, CaO, MgO, Al_2O_3, SiO_2, Fe_2O_3, K_2O and LOI (%) for the estimation of the block model grades. An estimate was performed for the HG and LG mineralized domains and for the two block models.

14.6.2 Ordinary Kriging

OK is one of the most common geostatistical methods used in estimating the mineral grade of a block. This interpolation technique identifies the contributing composite samples by means of an investigative process that originates from the centre of each block. The weights are determined so as to minimize the variance error, considering the spatial localization of the selected composites and the modelled variogram. Variography describes the correlation between composite samples as a function of their distance and direction. The weighted composite sample's grade is then combined in order to generate the block estimate and the variance.

The typical assumptions for the practical application of ordinary kriging are:

- Intrinsic stationarity or wide sense stationarity of the field;
- Enough observations to estimate the variogram.

The mathematical condition for applicability of ordinary kriging is:

- The mean E[Z(x)] = μ is unknown but constant;
- The variogram γ(x,y) = E[(Z(x) − Z(y))2] of Z(x) is known.

Ordinary Kriging Equation

The kriging weights of ordinary kriging fulfill the unbiasedness condition:

$$\sum_{i=1}^{n} \lambda_i = 1$$

and are given by the ordinary kriging equation system:

$$\begin{pmatrix} \lambda_1 \\ \vdots \\ \lambda_n \\ \mu \end{pmatrix} = \begin{pmatrix} \gamma(x_1, x_1) & \cdots & \gamma(x_1, x_n) & 1 \\ \vdots & \ddots & \vdots & \vdots \\ \gamma(x_n, x_1) & \cdots & \gamma(x_n, x_n) & 1 \\ 1 & \cdots & 1 & 0 \end{pmatrix}^{-1} \begin{pmatrix} \gamma(x_1, x^*) \\ \vdots \\ \gamma(x_n, x^*) \\ 1 \end{pmatrix}$$

The additional parameter μ is a Lagrange multiplier used in the minimization of the kriging error $\sigma_k^2(x)$ to honour the unbiasedness condition.

Ordinary Kriging Interpolation

The interpolation by ordinary kriging is given by:

$$\hat{Z}(x^*) = \begin{pmatrix} \lambda_1 \\ \vdots \\ \lambda_n \end{pmatrix}' \begin{pmatrix} Z(x_1) \\ \vdots \\ Z(x_n) \end{pmatrix}$$

Ordinary Kriging Error

The kriging error is given by:

$$var\left(\hat{Z}(x^*) - Z(x^*)\right) = \begin{pmatrix} \lambda_1 \\ \vdots \\ \lambda_n \\ \mu \end{pmatrix}' \begin{pmatrix} \gamma(x_1, x^*) \\ \vdots \\ \gamma(x_n, x^*) \\ 1 \end{pmatrix}$$

Properties Of Kriging

(Cressie 1993, Chiles & Delfiner 1999, Wackernagel 1995)

- The kriging estimation is unbiased: $E[\hat{Z}(x_i)] = E[Z(x_i)]$
- The kriging estimation honours the value that was actually observed: $\hat{Z}(x_i) = Z(x_i)$

The kriging estimation $\hat{Z}(x)$ is the best linear unbiased estimator of Z(x) if the assumptions hold. However (e.g. Cressie 1993), as with any method:

- If the assumptions do not hold, the kriging result might be inaccurate;
- There might be better nonlinear and/or biased methods;
- No properties are guaranteed when the wrong variogram is used. However, a 'good' interpolation is usually still achievable;
- Best is not necessarily good: e.g. in case of no spatial dependence the kriging interpolation is only as good as the arithmetic mean;
- Kriging provides σ_k^2 as a measure of precision. However, this measure relies on the correctness of the variogram.

14.6.3 Estimation Strategy

The estimation strategy that was adopted considered criteria such as the type and continuity of the mineralization and the spacing of the drilling grid. The plan that was established considered up to 4 estimation steps, as shown in Table 14.6.3_1.

An estimate of the variables P_2O_5, CaO, MgO, Al_2O_3, SiO_2, Fe_2O_3, K_2O and LOI (%) was completed for the block model of the area of the deposit (LT) using only the RC composites, in accordance with the results of the structural analysis that was undertaken for each one of these variables.

Regarding the model that is restricted to the short-term area (ST), an estimate was completed for the variable P_2O_5 that made use of the RC+Auger composites. The value of the variable that was estimated was imported to the sub-block of the long-term model (LT), making it possible to use it in future phases of mine planning.

Table 14.6.3_1
Estimation Strategy

Type	Step	Horizontal Exploration Distance (m)	Search	Minimum N° of Samples	Maximum N° of Samples	Maximum N° of samples per hole
HG and LG	1	20	Ellipsoid	4	12	2
	2	40		4	12	2
	3	60		4	12	2
	4	> 60		1	12	2

14.6.4 Resource Classification

GE21 used the long-term model, which was estimated only with the RC samples, in order to declare the mineral resources.

The resource classification was based on the HG and LG domains. The criteria with respect to the quality of the data that was utilized to calculate the estimate are summarized in Table 14.6.4_1.

Table 14.6.4_1 Table of Mineral Resource Classification Criteria		
Data	**Discussion**	**Classification**
Database	Digital and physical databases exist that contain all of the information, such as descriptions, chemical analysis reports and drill core samples, maps and methodologies.	High
Drilling Techniques	The rotary-percussive holes were executed within acceptable standards.	Moderate
Logging	The drill core logging was considered appropriate, although limited to the characteristics of the drill core sample.	Moderate
Drill hole Recovery	The RC sampling did not follow strict procedures involving the drying and weighing of the samples, which made it possible to execute the quantitative analysis and the drill hole recovery. The drilling and sampling procedures were found to have been executed within acceptable limits.	Moderate to low
Drilling Techniques	GE21's assessment is that the drilling procedures employed at the project were within industry standards.	High
QAQC	A QA/QC analysis was executed with data from the field and from the laboratory. The analysis shows that the laboratory did not have any significant influence on the results.	Moderate to High
Density	Many density tests were executed on the mineralized lithotypes and some on the non-mineralized lithotypes through procedures that were considered to be consistent with industry best practices.	High
Positioning of the Drillholes	The drillholes were surveyed with geodesic GPS; however, they presented a considerable difference in elevation with respect to the survey that was completed subsequently. A new survey was executed in order to quantify the difference and evaluate the impact on the resource model.	Moderate
Drillhole Profiling	No profiling was performed on the drillholes. The drillholes that were executed are shallow and the mineralized layers are horizontal. GE21 does not believe that the measurement of the deviation of the drillholes is relevant for this estimate.	High
Quantity and Distribution of the Data	The drilling grid was considered to be sufficient to guarantee the continuity of the mineralization within the dimensions of the mineralized body.	Moderate to High
Database Integrity	The database that was used for the estimate was validated and approved by GE21.	High
Geological Interpretation	The geological interpretation reflects the actual knowledge regarding the deposit, including the knowledge of the area that will be mined.	High
Modeling Techniques and Resource Estimation	GE21 employed the ordinary kriging method, an industry standard in the mineral sector.	High

The definitions of resources established by CIM are as follows:

- A Mineral Resource is a concentration or occurrence of diamonds, natural solid inorganic material, or natural solid fossilized organic material, including base and precious metals, coal, and industrial minerals in or on the Earth's crust in such form and quantity and of such a grade or quality that it has reasonable prospects for economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge.
- An "Inferred Mineral Resource" is that part of a Mineral Resource for which quantity and grade or quality can be estimated on the basis of geological

evidence and limited sampling and reasonably assumed, but not verified, geological and grade continuity. The estimate is based on limited information and sampling gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes.

- An "Indicated Mineral Resource" is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics, can be estimated with a level of confidence sufficient to allow the appropriate application of technical and economic parameters, to support mine planning and evaluation of the economic viability of the deposit. The estimate is based on detailed and reliable exploration and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes that are spaced closely enough for geological and grade continuity to be reasonably assumed.

- A "Measured Mineral Resource" is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are so well established that they can be estimated with confidence sufficient to allow the appropriate application of technical and economic parameters, to support production planning and evaluation of the economic viability of the deposit. The estimate is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes that are spaced closely enough to confirm both geological and grade continuity.

NI 43-101 defines a mineral resource as that portion of the mineral inventory that has reasonable prospects for economic extraction. From this can make the following observations:

- A portion of mineral resource is not simply a part of the mineral inventory above a given cut-off grade. The spatial distribution and geological and grade continuity must also be considered;
- Reasonable prospects means: not to be conservative or excessively liberal in choice of parameters of resource estimated;
- Economic extraction implies that the qualified person should determine the prospects for sufficient revenues from the deposit to cover capital costs, which can be estimated from similar operations.

The CIM Best Practice Guidelines for estimating mineral resources require the factors significant to project economics be current, reasonably developed and based on generally accepted industry practice and experience. In establishing the cut-off grade, it must realistically reflect the location, deposit scale, continuity, assumed mining method, metallurgical processes, costs and reasonable long-term metal prices appropriate for the deposit.

When it comest to deposits amenable to open-pit mining methods, a Lerchs-Grossman (LG) pit of measured, indicated and inferred confidence categories captures all of the required inputs under CIM Definition Standards for mineral resources. It is an efficient means by which to assess the reasonable prospects for economic extraction of material that can be mined by open pit methods, as long as the inputs of operating costs, metal prices and metallurgical recoveries are reasonable.

To accommodate the dynamics of the mining industry, the definition of mineral resources under the reporting codes was chosen to be principle-based and not prescriptive. This allows resource estimators the freedom to make appropriate, experienced-based decisions, but also imposes a responsibility to explain and justify their basis for determining reasonable economics.

The HG and LG mineralized domains were considered for the classification of mineral resources. The mineral resources are limited to: a cut-off of 3% P_2O_5 based on the economic parameters of similar deposits, the limits of the mining rights and the mathematical pit that was generated to guarantee "Reasonable Prospects for Eventual Economic Extraction" (RPEEE).

The main parameters used in the definition of the economic function, used to define the pit shell, are listed below:

- Block size for: x=12.5 m, y=12.5 m e z=4 m
- General slope angle:
  - Dolomite and Silexite: 32°;
  - Soil: 32°;
- Production costs:
  - Mining (Ore): US$ 0.83/t
  - Mining (Waste): US$ 1.11/t
  - Process: US$ 8.33/t ROM
  - Logistics: US$ 5.56/t ROM
- Selling price:
  - P_2O_5: US$ 25/t @8% P_2O_5
    - The selling price considered a nominal product of 8% P_2O_5 , which can be sold as a DANF, or as a raw material for a fertilizer plant. The price was obtained as a composition of the regression curve from the 50% of the selling price projection, considering Agroconsult report, for a product of 8% P_2O_5 ,
- Mass recovery (High Grade + Low Grade) = 92.5%
- Mine recovery = 95%
- Dilution = 5%

The geometric definition of the RPEEE pit and its respective economic function was performed using Whittle software.

The Table 14.6.4_1 shows the list of generated pits, the selected one was Pit 19, corresponding to Revenue Factor of 1. The graphical represention of the is shown in Figure 14.6.4_1, and the Figure 14.6.4_2 presents the perspective view of the final resource pit.

Table 14.6.4_2

Table of pits – Resource Pit

Pit	Revenue Factor	Total Mined	Material to Process	Waste Rock	Strip Ratio	P_2O_5	NPV
		(kt)			(t/t)	(%)	(M US$)
1	0.64	1 543	1 535	8	0.01	9.57	4.03
5	0.72	3 937	3 287	650	0.20	8.51	4.33
10	0.82	5 038	3 609	1 430	0.40	8.31	4.33
15	0.92	5 530	3 695	1 835	0.50	8.24	4.33
19	**1.00**	**6 677**	**3 848**	**2 830**	**0.74**	**8.12**	**4.33**
20	1.02	6 789	3 861	2 928	0.76	8.11	4.33
25	1.12	6 919	3 875	3 044	0.79	8.09	4.33
30	1.22	7 045	3 886	3 159	0.81	8.09	4.33
35	1.32	7 294	3 904	3 390	0.87	8.07	4.33
40	1.44	7 585	3 922	3 664	0.93	8.05	4.33
45	1.54	7 726	3 930	3 796	0.97	8.05	4.33
50	1.72	7 857	3 936	3 921	1.00	8.04	4.33
55	2.00	7 948	3 940	4 009	1.02	8.04	4.33

Figure 14.6.4_1

Pit by pit – Resource Pit

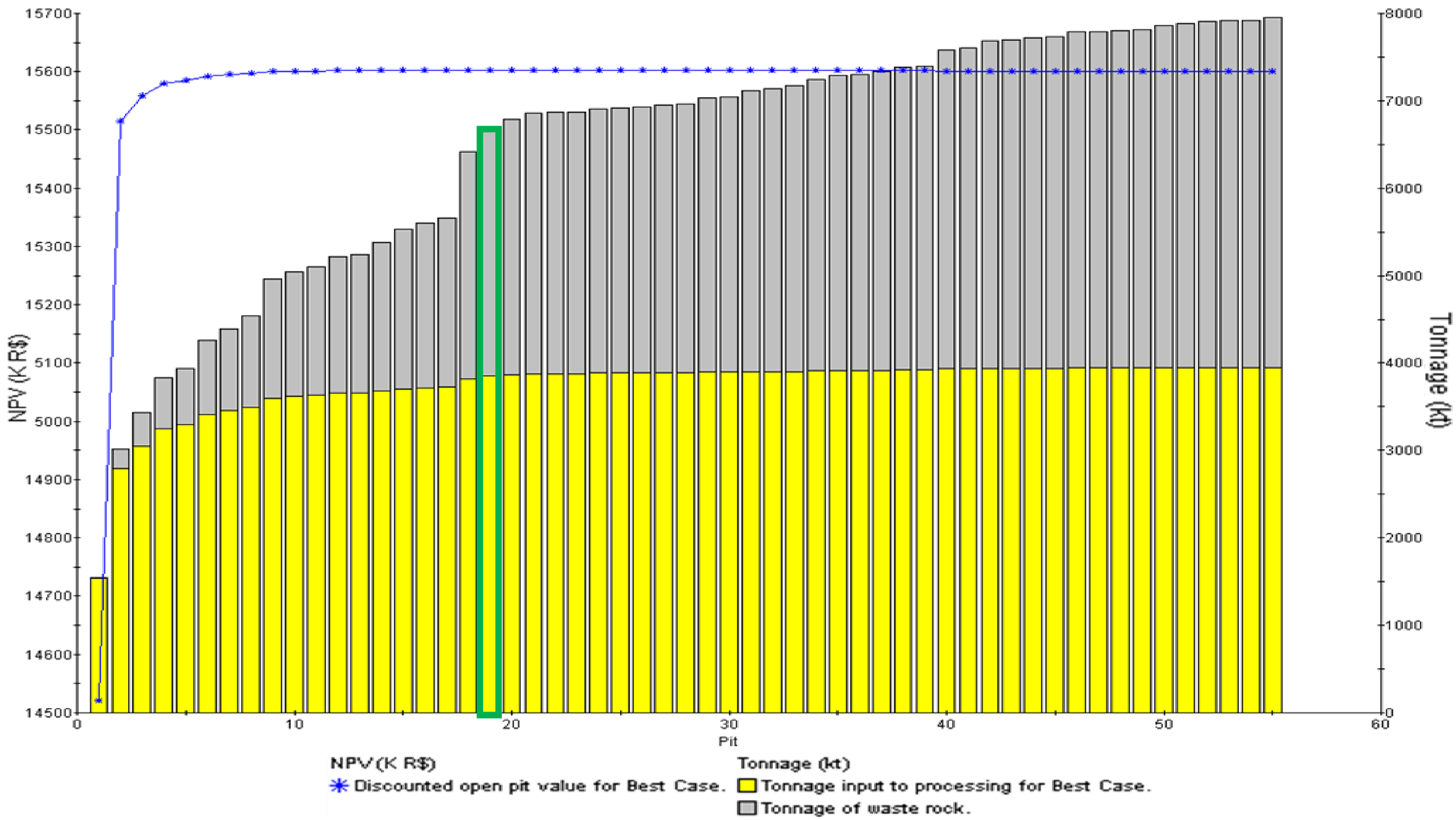
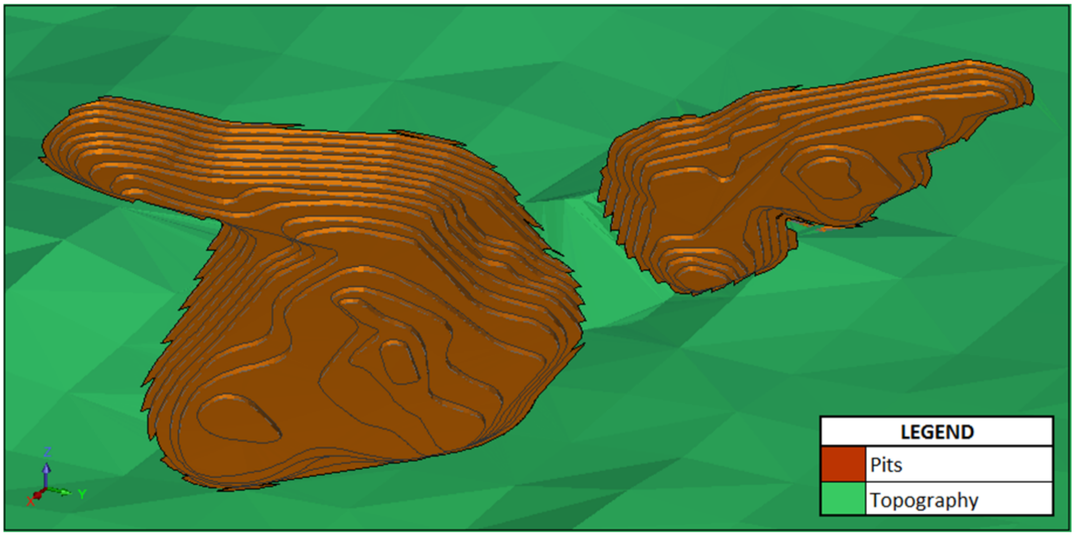


Figure 14.6.4_2

Perspective view of the final pit



Considering the quality of the data that was utilized in the estimate, the mineral resource was classified as:

- Indicated - where the RC drilling grid had a density of approximately 40x40m;
- Inferred - where the drilling grid had a spacing of more than 40m.

The mineral resources that were estimated are shown in Figure 14.6.4_1 and in Table 14.6.4_1. Figure 14.6.4_2 shows the tonnage x grade curve.

Figure 14.6.4_3
Block Model - Indicated and Inferred Resources - Plan View

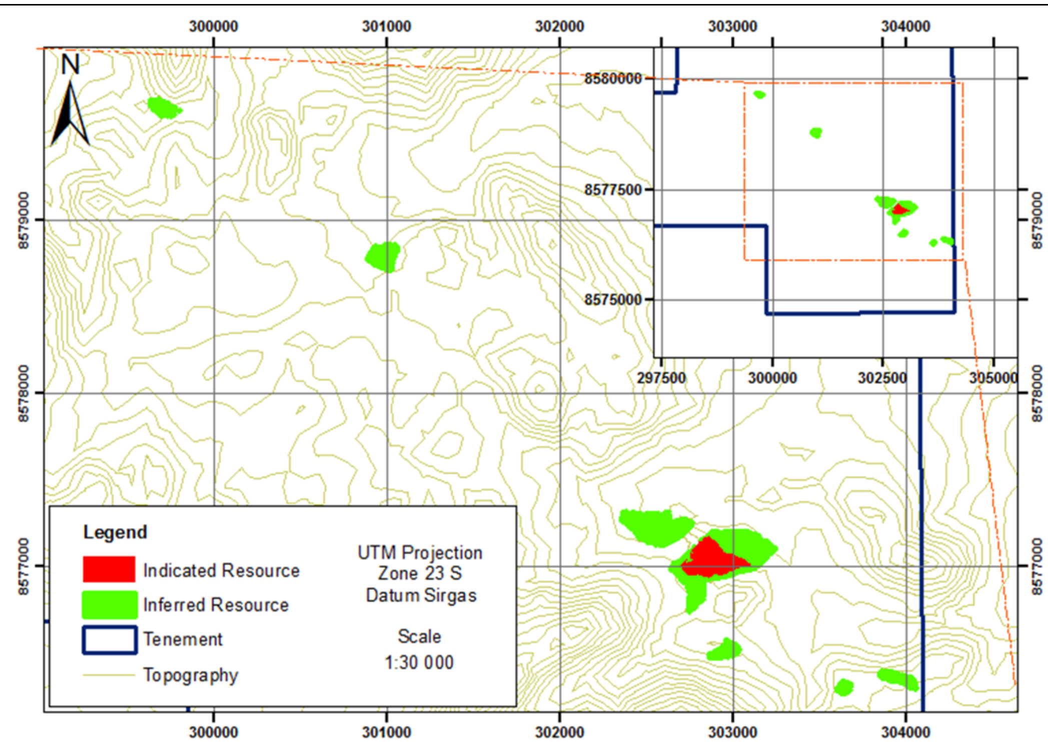


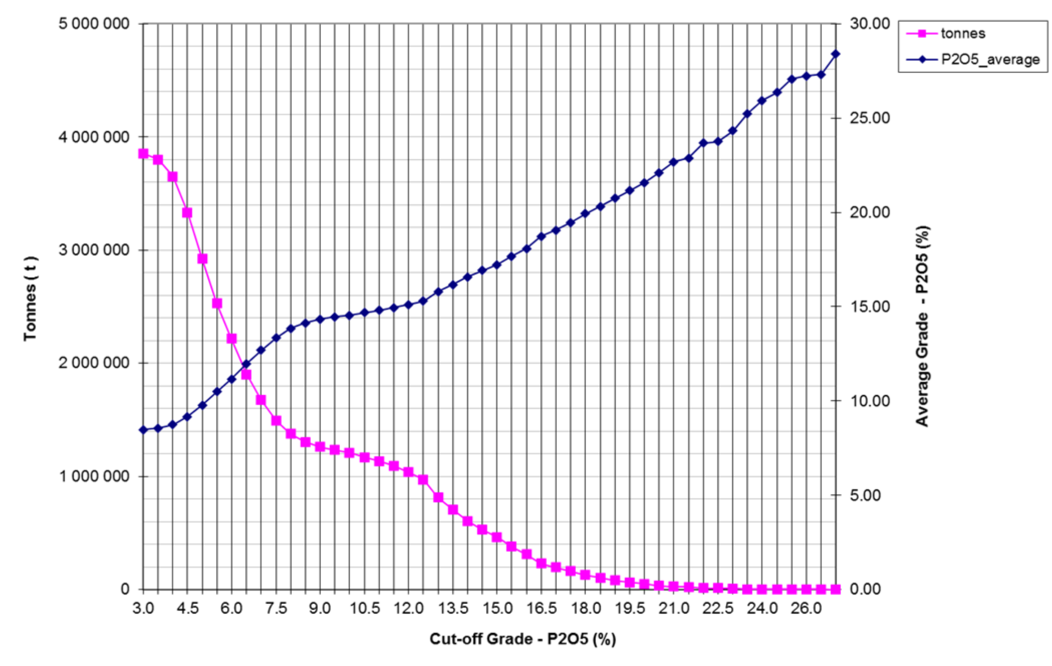
Table 14.6.4_3 Mineral Resource Table - Phosphate Indicated and Inferred Resources								
Resource	**Type**	**Tonnes (Mt)**	**P_2O_5%**	**CaO%**	**MgO%**	**SiO_2%**	**Al_2O_3%**	**LOI%**
Indicated	HG*	0.29	14.78	20.49	1.02	41.53	8.44	4.08
	LG*	0.87	6.08	7.92	1.22	58.79	9.96	3.90
Total Indicated		**1.16**	**8.23**	**11.03**	**1.17**	**54.52**	**9.59**	**3.94**
Inferred	HG*	0.82	14.72	20.92	0.97	42.62	7.95	4.22
	LG*	1.88	5.89	7.83	1.48	58.39	10.73	4.43
Total Inferred		**2.70**	**8.58**	**11.82**	**1.32**	**53.59**	**9.88**	**4.37**

* High Grade Mineralization (HG): $P_2O_5 \geq 10\%$, Low Grade Mineralization (LG): $P_2O_5 \geq 3\%$ and <10%;
Block Model X=12.5; Y=12.5; Z=4 (Sub-block: X=6.25; Y=6.25; Z=2)
Effective date: 01/09/2016
Density: 1.67g/cm3

Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Figure 14.6.4_4

Santiago Target - Grade X Tonnage Curve - Indicated and Inferred Resource



GE21 considered the extension of the HG and LG bodies to be exploration targets, at places where was not currently possible to execute drilling at a neighbouring farm. This farm, shares borders with the area that is referred to in the *Guia de Utilização* - GUIA (mineral rights limitations, see section 15.1), whose property registration numbers are 512 and 3413, together, cover approximately 1.94 Km². The company's study area is limited to a region that comprises approximately 550,000m² (area that is hatched on the Figure 14.6.4_3).

There are some 10 occurrences of outcropping phosphorite from which samples were taken that have concentrations of P_2O_5 that range from 7.5 to 23.3% (green stars on the Figure 14.6.4_3).

In addition, the drilling grid that borders the neighbouring farm contains positive drill holes that indicate the mineralization that is open towards the northwest (red triangles on the Figure 14.6.4_3).

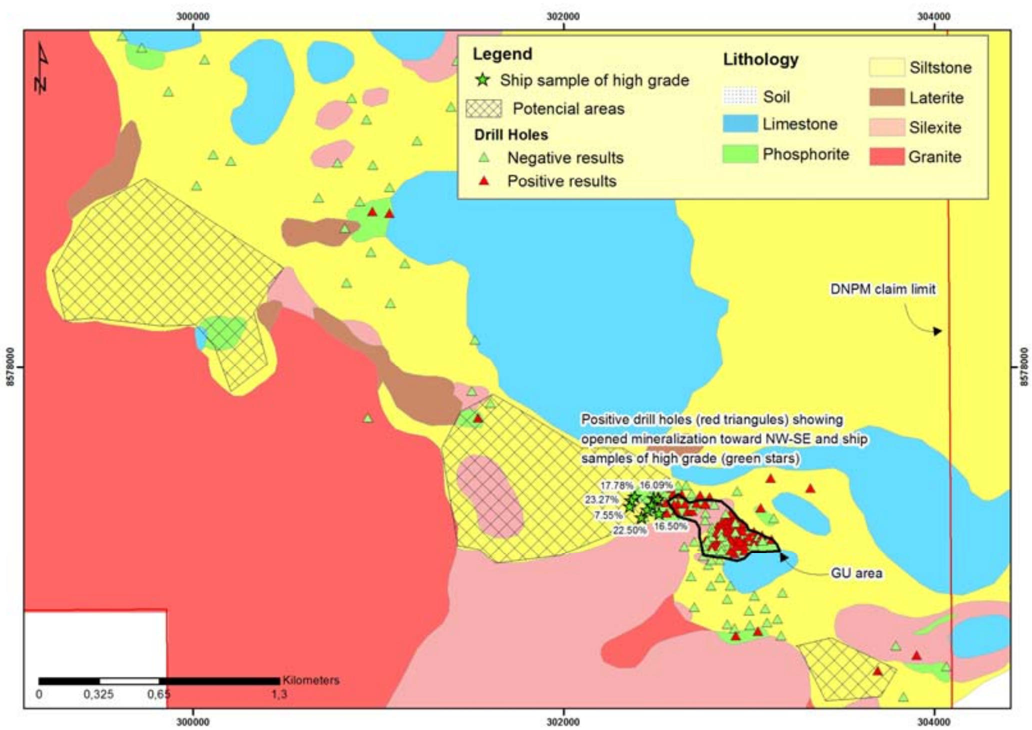
Regionally, a potential NW-SE trend has been shown to exist that extends from MbAC's deposit, which coincides with the direction of the mineralization within the area of the farm. This is in addition to the geological model that was proposed by the company's geologists, which suggests that the potential areas extend towards the granitic basement.

In light of these facts, the area of the neighbouring farm can be viewed as a potential target for mineral exploration.

When referred to exploration targets, should be noted that the exploratory potential is not considered as mineral resource; it is presented here as a reference for future exploration drilling campaigns.

In accordance with the mining industry best practices and Canadian National Instrument 43-101 Standards for Disclosure for Mineral Projects, the exploration potential was reported as a range of values. GE21 estimated an exploratory potential of 5Mt to 14Mt with the P_2O_5 grade varying between 4% and 18%.

Figure 14.6.4_5
Exploration Target



The independent qualified person responsible for the Mineral Resource estimated in this report is Fábio Xavier, a Geologist Engineer Bsc (Geo) with 13 years of geologist related experience ranging from execution, coordination of geological mining and exploration projects, to resource estimation in a variety of commodities. He is a member of the Australian Institute of Geoscientists (“MAIG”) and is independent of DuSolo, as that term is defined in Section 1.5 of the Instrument.

Mr. Xavier was supported and supervised by Mr. Porfirio Rodriguez, who is a mining engineer with 35 years of experience in Mineral Resource and Mineral Reserves estimation, and his experience covers among others commodities, more than 10 phosphate projects. Mr. Rodriguez is a member of the Australian Institute of Geoscientists (“MAIG”) and is independent of DuSolo, as that term is defined in Section 1.5 of the Instrument.

14.7 Estimate Validation

14.7.1 Global Bias – NN Check

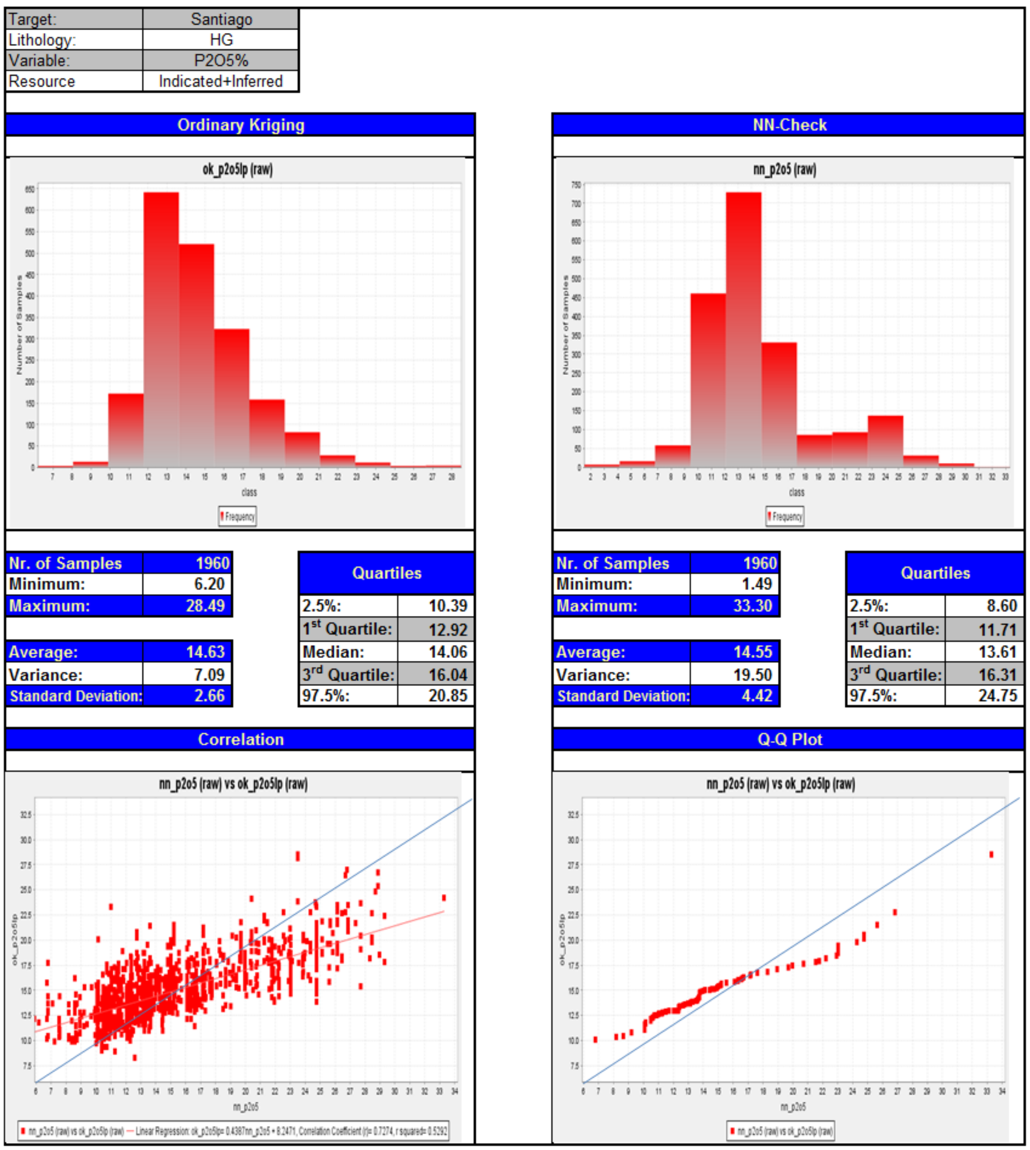
The method of validating an overall bias via the Nearest Neighbor method consists in arriving at an estimate through the use of only one step, where the block that is estimated is designated as having the same grade as the sample that is closest to it, within the parameters of anisotropy that are defined for the search ellipsoid, and the subsequent comparison of this grade with the grade that was estimated for the model.

The estimate validation was conducted with the aid of scatter plots and quantile-quantile plots that were used to check for the occurrence of bias and to smooth the estimate. Figures 14.7.1_1 and 14.7.1_2 show the results for the overall analysis of P_2O_5 for the HG and LG domains regarding the Indicated Resource.

The Nearest Neighbour validation method made it possible to check for the occurrence of estimate smoothing due to Kriging, within what is expected for the type of deposit and the dimensions of the block model. The comparison showed that the Kriging respected the average of the grades.

Figure 14.7.1_1

NN-Check - HG - P_2O_5 (%) analysis



Target:	Santiago
Lithology:	HG
Variable:	P2O5%
Resource	Indicated+Inferred

Ordinary Kriging

Nr. of Samples	1960
Minimum:	6.20
Maximum:	28.49
Average:	14.63
Variance:	7.09
Standard Deviation:	2.66

Quartiles	
2.5%:	10.39
1st Quartile:	12.92
Median:	14.06
3rd Quartile:	16.04
97.5%:	20.85

NN-Check

Nr. of Samples	1960
Minimum:	1.49
Maximum:	33.30
Average:	14.55
Variance:	19.50
Standard Deviation:	4.42

Quartiles	
2.5%:	8.60
1st Quartile:	11.71
Median:	13.61
3rd Quartile:	16.31
97.5%:	24.75

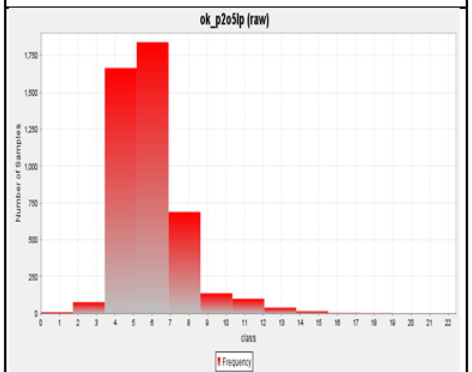
Correlation

Q-Q Plot

Figure 14.7.1_2
NN-Check - LG - P_2O_5 (%) analysis

Target:	Santiago
Lithology:	LG
Variable:	P2O5%
Resource	Indicated+Inferred

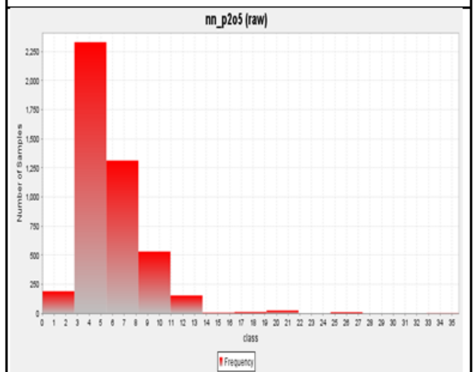
Ordinary Kriging



Nr. of Samples	4 575
Minimum:	0.00
Maximum:	22.40
Average:	5.92
Variance:	3.30
Standard Deviation:	1.82

Quartiles	
2.5%:	3.56
1st Quartile:	4.73
Median:	5.57
3rd Quartile:	6.67
97.5%:	11.16

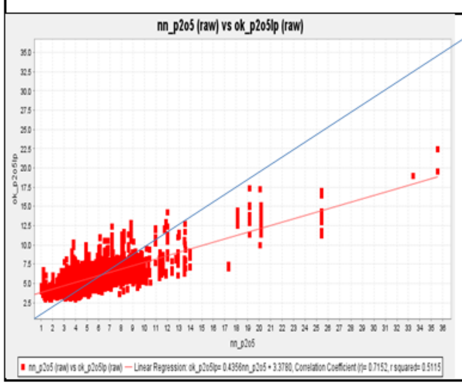
NN-Check



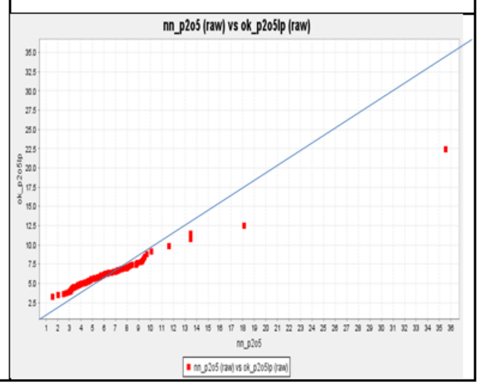
Nr. of Samples	4 575
Minimum:	0.00
Maximum:	35.57
Average:	5.84
Variance:	8.89
Standard Deviation:	2.98

Quartiles	
2.5%:	2.37
1st Quartile:	3.73
Median:	5.00
3rd Quartile:	7.21
97.5%:	13.50

Correlação



Q-Q Plot



14.7.2 Local Bias – Swath Plot

Local validation via the Swath Plot method aims to analyse the occurrence of a local bias by comparing the average estimated grades for the model, obtained via the Ordinary Kriging method, with the grades that were estimated via the Nearest Neighbor method for the same x, y or z coordinates. Grade scatter plots were developed for P_2O_5 (%) grades versus coordinates. Figures 14.7.2_1 through 14.7.2_3 show the results of the Indicated Resource validation.

GE21 considered that the result that was obtained for the estimate via Ordinary Kriging was acceptable, and noted that no overall or local bias existed.

Figure 14.7.2_1

Swath Plot – P_2O_5 (%) Analysis

X Axis - Inferred Resource.

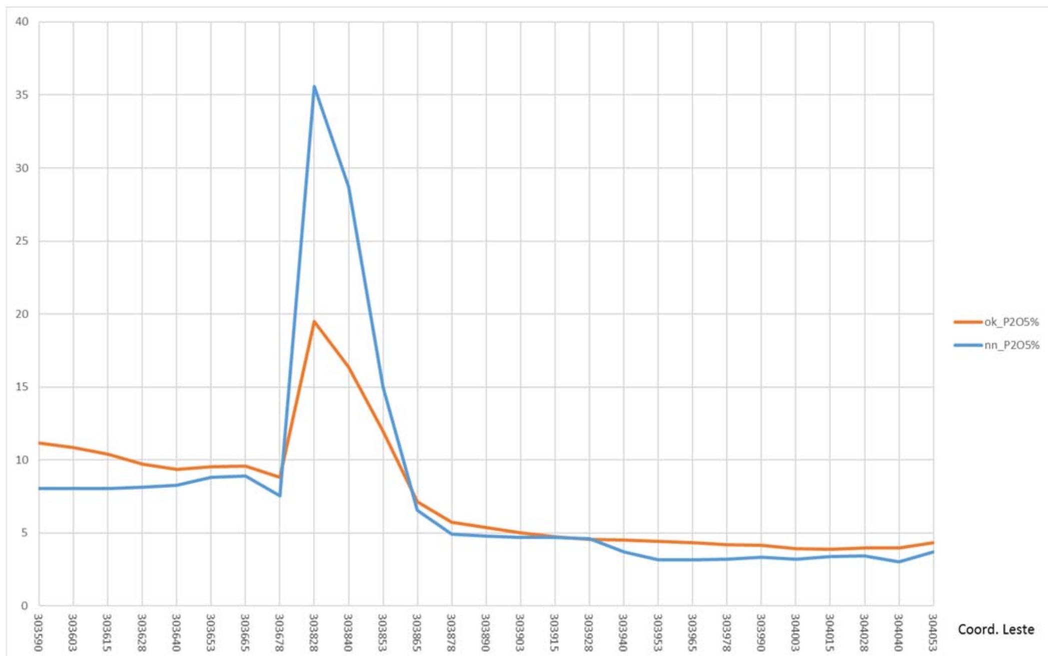


Figure 14.7.2_2

Swath Plot – P_2O_5 (%) Analysis

Y Axis - Inferred Resource.

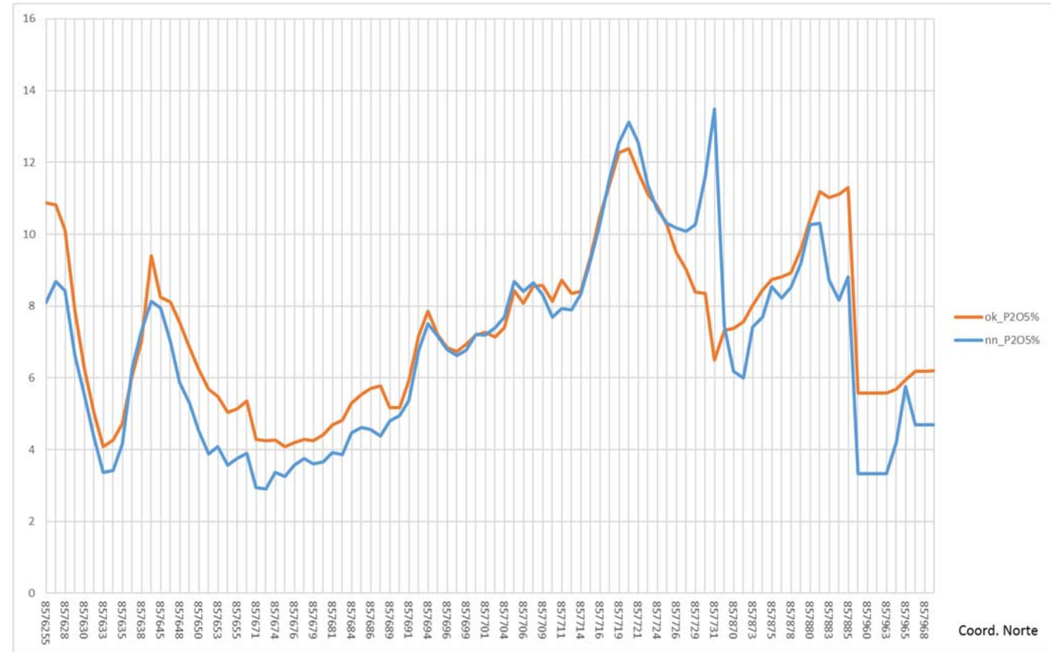
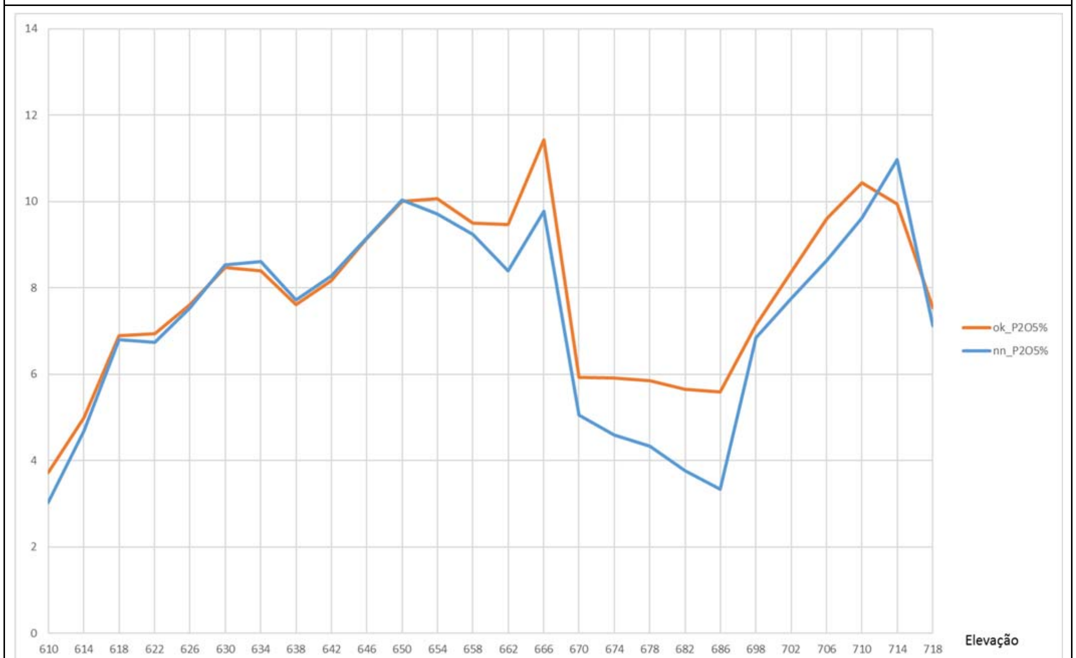


Figure 14.7.2_3

Swath Plot – P_2O_5 (%) Analysis

Z Axis - Inferred Resource.



15 MINERAL RESERVES ESTIMATES

The existing resources and the amount of current data do not allow for the conversion of the Mineral Resources into Mineral Reserves. As such, GE21, making use of its own methodology, has put forth herein an economic evaluation, in the form of a Preliminary Economic Assessment, in accordance with what is established by the CIM.

A "Preliminary Economic Assessment" means a study, other than a pre-feasibility or feasibility study, which includes economic analysis of the potential viability of Mineral Resources. A PEA level study is of insufficient accuracy to establish Mineral Reserves.

15.1 GUIA - Mineral Rights Limitations

The *Guia de Utilização* - GUIA, roughly translated to English as Utilization Guide, is an instrument of the Brazilian mining legislation whose provisions are specified within Directive No. 144, from May 3, 2007, which was modified by the National Department of Mineral Production. This directive allows the prospector the extraction of mineral substances from a mining tenement before the issuance of a mining concession when the extraction is based on a proper analysis of technical, environmental and market conditions.

For the issuance of a GUIA, the following situations shall be considered as justification for extraction prior to receiving a mining concession approval:

- Verification of the technical-economic feasibility of the mining of mineral substances within domestic and/or foreign markets;
- The extraction of mineral substances for the execution of industrial analyses and testing before the mining concession is granted;
- The commercialization of mineral substances, at the discretion of the DNPM, in accordance with public policies, to support the exploration and development phase of a project.

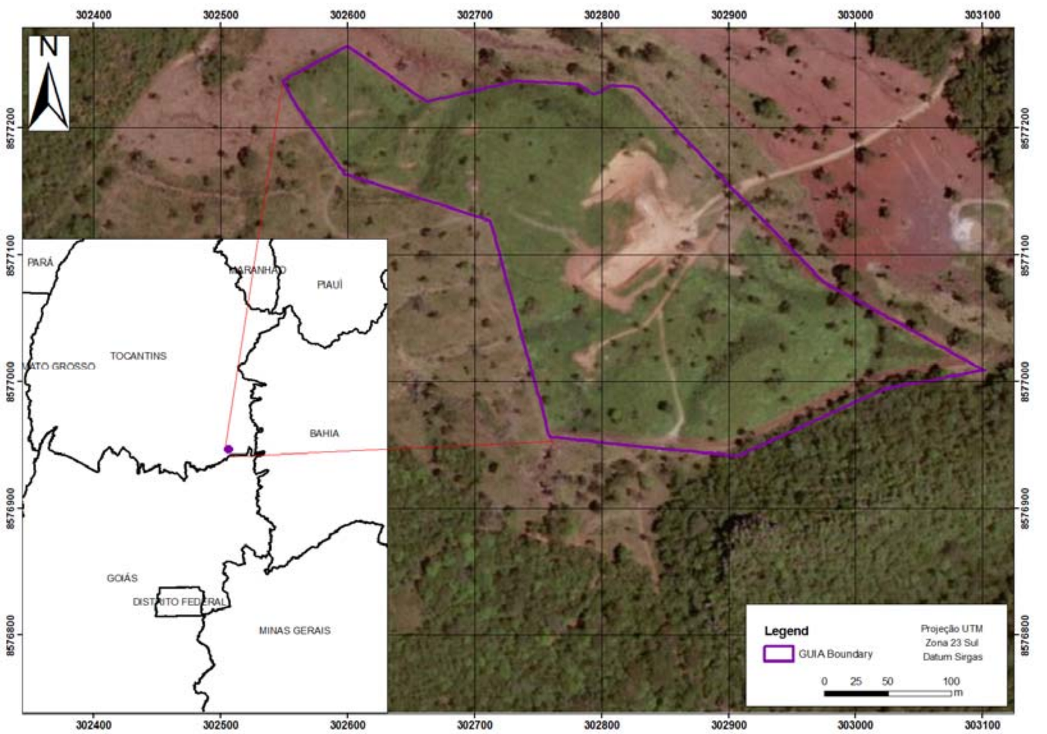
The development of mining activities, under the conditions that are established by the GUIA, is considered to be an integral part of the mineral exploration phase.

DuSolo, through its subsidiary P-TEC Agro Mineração, applied for and received a GUIA from the DNPM with the objective of undertaking experimental mining so that the results that would be obtained could offer technical insights that could prove the technical-economic feasibility of the Project. As such, the company could more adequately verify the market's acceptance of the product and the future demand of this consumer market.

Figure 15.1_1 shows the polygon that is associated with the GUIA.

Figure 15.1_1

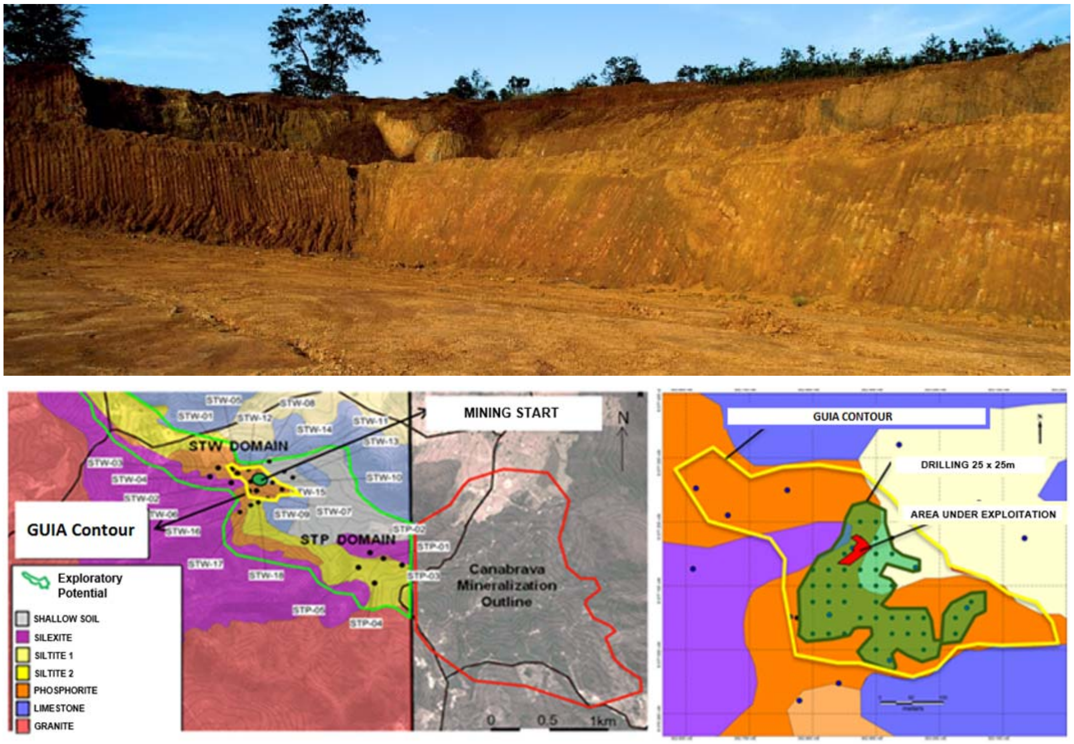
Extents of the GUIA



The current GUIA (039/2014) was granted on September 23, 2014 and has allowed the mining and commercialization of up to 100,000 tons per year of phosphatic rock. DuSolo intends to make use of the GUIA for the next 3 years.

Figure 15.1_2 shows the GUIA polygon and the site where the experimental mining activities were initiated.

Figure 15.1_2 Location of the GUIA Mining Area



Experimental mining began in October of 2014 and the product was sold within the local market. In 2015 and 2016 sales have increased and the market expanded, with over 32,000t of DANF delivered in 2016. In January 2016 Dusolo applied for a new GUIA, to allow extraction to continue from April 2017 into 2018. The Company is currently awaiting approval of the new GUIA, expected in March 2017. The GUIA will allow the Company to continue to develop the market for DANF and new products, as well as supporting the development of the project, and thereby evaluate more broadly the consumer market during the period of several complete agricultural cycles: preparation of the soil, planting and harvest.

DuSolo purchased and installed three new hammer mills, in addition to the expansion of its storage lot and other improvements at the Campos Belos processing plant to expand its capacity to 200kt/year. Currently management estimate that the existing plant is capable of 280kt/year without further capital equipment investment.

16 MINING METHODS

GE21, based on the Mineral Resource declared in this report prepared a Preliminary Economic Assessment ("PEA") aiming to assess the economic viability of the DANF Santiago Project.

A PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.

The economic analysis was based on potentially recoverable resources and is defined as a mineral inventory.

The study was prepared in two phases,

- Short Term Mining Plan – First three years, a detailed mine plan to support GUIA mining activities;
- Long Term Mining Plan – Continuous yearly mining plan, from the fourth year, to complete the Life of Mine Plan.

According to DuSolo, after the third year the company is considering whether to implement an Acid Granulation plant, in order to create added value to the product, but it will need to be justified economically in a future PEA. The current PEA is considering only the 12% and 15% P_2O_5 DANF production to the complete Life of Mine.

The mining operations at the DANF Santiago Project will be executed via a conventional mining fleet, making use of wheel loaders, dump trucks and bulldozers. The mining operation will be contracted, to reduce capital costs and allow flexibility in the timing of extraction during the year.

The phosphate and waste rock material shall be loaded directly onto trucks with excavators or front loaders. The transport of phosphate rock to the plant located in Campos Belos, 28 km away from Santiago mining site, will be performed with road-legal trucks that have a nominal capacity of 20t. The transport of the waste rock material, to the waste dump, close to the mine face, will be performed with the same trucks.

It is projected that the LG mineralized material, which have a P_2O_5 grade above 3% and below 10%, will be stockpiled in the mine area, avoiding major transport distances, and allowing easy recovery in the future, in case this LG material becomes suitable for concentration or other final uses.

The disposal of waste rock, and LG mineralized material will be executed on an area close to, or inside, the pit. The site shall be adequately prepared to include a drain at its base and channels to direct the flow of water with the aim of aiding geotechnical stability and mitigating the erosion of the stockpiled material.

The operation of this phase, in accordance with the ascending method, shall begin during the construction of the waste pile at the base of this area. Waste rock will be disposed by truck, which will then be uniformly distributed and leveled by an operator using a dozer. The aforementioned procedure is then repeated, stacking another layer above the original one, while maintaining a ramp for the trucks to be able to access the area.

16.1 Pit Optimization

The selection of the optimal pit was based on:

- The determination of the economic and geometric parameters in order to define the economic function, cut-off grade and legal and proprietary restrictions;
- A calculation of the interlocking of optimal pits using Geovia Whittle 4.3 software;

- The selection of the minimum optimal pit with sufficient mineralized material to supply a production of 100ktpa during LOM.
- A separate pushback, representing the Short Term phase, was selected to delimitate this period.

The economic and geometric parameters were defined based on GE21's database in accordance with projects of similar scale and characteristics.

The determination of the geometry of the mathematical pits was executed through the generation of an optimal sequence of *pushbacks*, which correspond to increments in the geometry of the pit resulting from the repeated use of the three-dimensional Lerchs & Grossman algorithm for different values of blocks that are obtained by varying the price of the product through the use of a revenue factor.

This sequence of pit expansions, or pushbacks, is the basis of open pit mine planning when using *Whittle software*, which projects the evolution of the geometry of the pit over time. The evolution of the mining process over time can be simulated with two criteria: the maximizing NPV approach or the maintaining production approach. The first attempts to maximize the operation's financial returns based on a sequence of pushbacks that optimize the cash flow; the latter aims to maintain the processing plant feed material parameters constant. In the case of the DANF Santiago Project, the maximizing NPV approach was selected.

The sequence of optimal pits was obtained by varying the revenue factor from 30% to 200% with respect to the estimated product's selling price. In order to determine the evolution of the pits over time, an annual production scale of 100ktpa of ROM was established, at an annual discount rate of 10%. The optimal pit that had a quantity of mineralized material that could supply a production of 100ktpa, over 3 years, was adopted for Short Term Plan, and the optimal pit for the LOM was selected based on the maximum NPV. Figure 16.1_1 presents a graph of the result of the evolution of optimization pushbacks. Figure 16.1_2 shows a 3D representation of Pit 5, which was selected as the final mining limit.

It is important to remark that the pit NPV reported from Whitlle/Lershs-Grossman exercice is, sometime, a semi-quantitative approach, not comparable to the final project NPV which resulted from an economic model, as a number of the costs which influence the final project NPV, are not fully used in pit optimization.

Figure 16.1_1

Results of the Pit Optimization

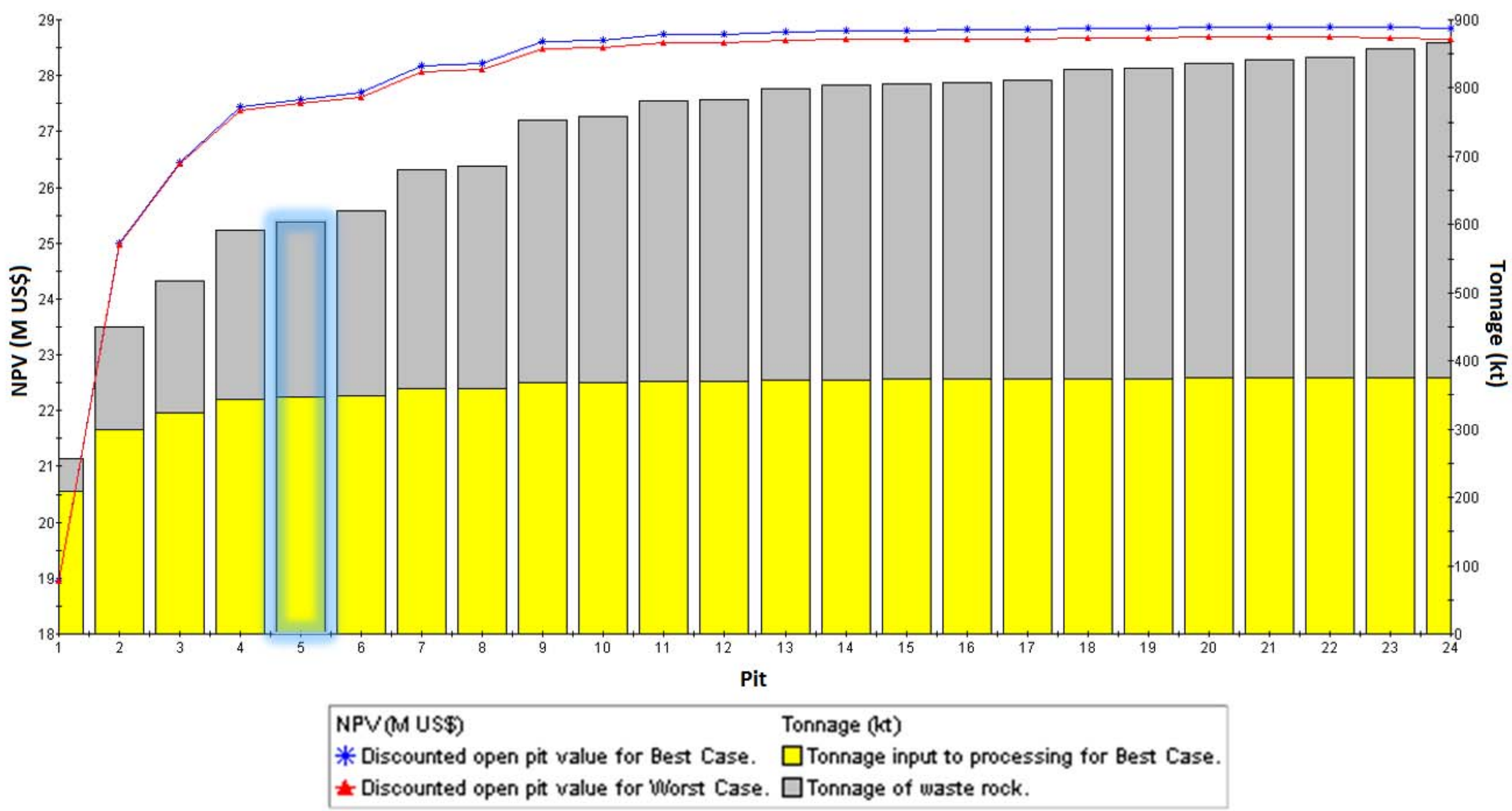
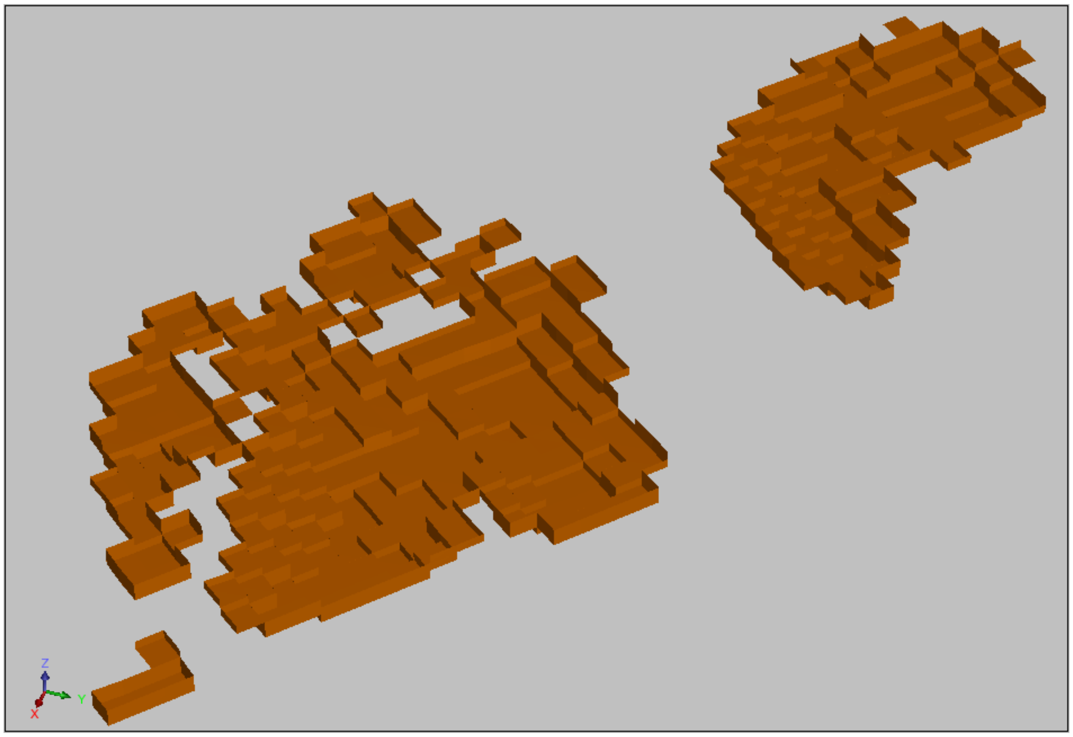


Figure 16.1_2

Perspective view of the optimal pit



The optimal pits were design with operational criteria for the Short Term Plan, aiming to be useful for the mining activities during the GUIA period.

16.2 Pit Design

The design of the pit consists of projecting, based on an optimal pit model, an operational pit that allows for the safe and efficient development of mining operations.

The methodology consists of establishing an outline of the toes and crests of the benches, safety berms, work sites and mining site access ramps while adhering to the geometric and geotechnical parameters that were defined. The assumptions that were adopted for the design of the final pit shells for each period of mining were:

- Minimize the ore mass loss;
- Define the access routes so as to attain shorter average transport distances.

Table 16.2_1 presents the geotechnical and geometric parameters that were adopted to develop the final operational pits for each period of mining.

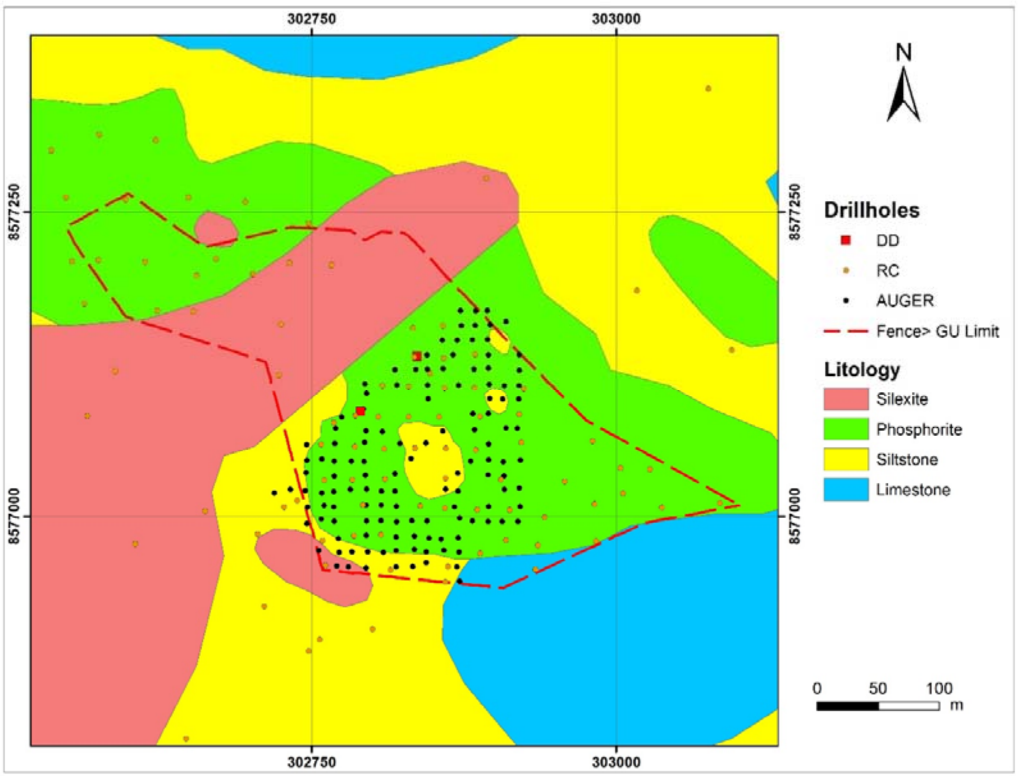
The operational parameters were defined based on similar mining operations and on the sizing of the loading and transport equipment that will be used during mining operations.

Table 16.2_1 Operational Parameters for the Quarterly Mining Plan	
Overall Slope Angle	33°
Face Angle	90°
Minimum Bench	6m
Minimum lot size	20m
Bench Height	4m
Ramp Width	10m
Ramp Slope	10%

16.3 Short-Term Plan

In order to develop the three-year plan, which was defined as the Short-Term Plan, an auxiliary block model was created for the area that contains the auger holes, in accordance with figure 16.3_1.

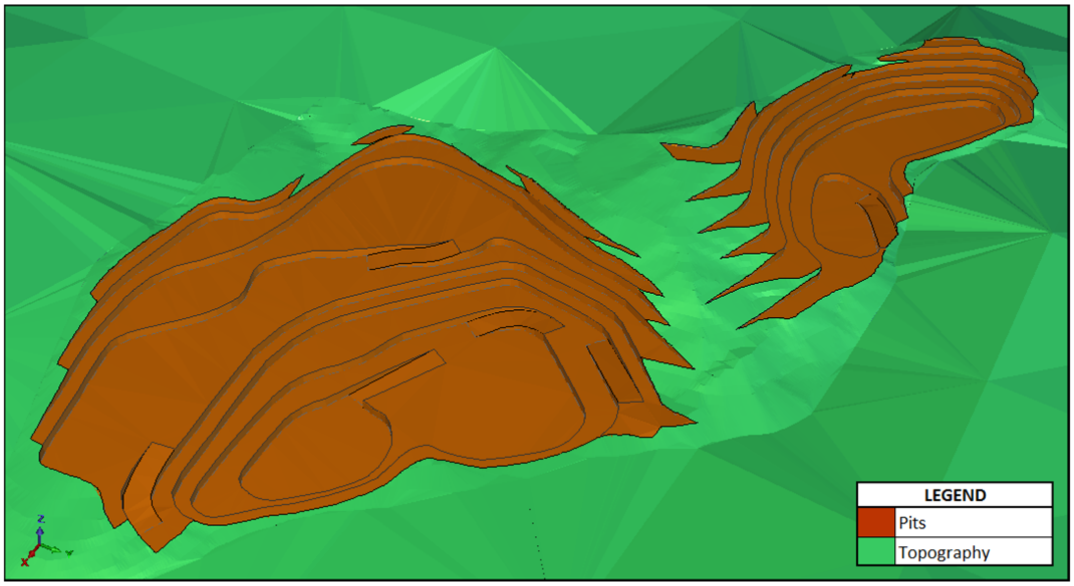
Figure 16.3_1
Auger Holes



The auxiliary block model and the resource block model, both having orientations and dimensions that are compatible and both having a discretization of blocks within the ST model that have dimensions that are the same as the sub-block of the resource model, were merged in order to allow for the joint use of the aforementioned data.

GE21 used the three-year plan as the limiting surface for the sequential short-term mining plan, in accordance with operational parameters that allow for its execution. Figure 16.3_2 shows the perspective view of the three-year pit.

Figure 16.3_2
Perspective View of Pit Design – Year 3



The mine scheduling was developed for the following periods:

- 1st Quarter 1st Year 25 000t @12% natural moisture content;
- 2nd Quarter 1st Year 25 000t @12% natural moisture content;
- 3rd Quarter 1st Year 25 000t @12% natural moisture content;
- 4th Quarter 1st Year 25 000t @12% natural moisture content;
- 1st Half 2nd Year 50 000t @12% natural moisture content;
- 2nd Half 2nd Year 50 000t @12% natural moisture content;
- 3rd Year 100 000t @12% natural moisture content.

A grade parameterization of the ROM in Short-Term Plan was performed to define the destination of each block from the P_2O_5 contents. It was defined that:

- Ore blocks ≥ 8% P_2O_5 and < 10.5: will be sent to the Stockpile 1, resulting 12% P_2O_5 product stockpile when screened and blended;
- Ore blocks ≥ 10.5% P_2O_5: will be sent to the Stockpile 2, resulting 15% P_2O_5 product stockpile;

However, it was not possible to obtain a mining sequence that would guarantee the supply of the stockpiles with grades of 12% and 15% P_2O_5. There was periods when Stockpile 1 was formed containing less than 12% P_2O_5 and Stockpile 2 containing ≥15% P_2O_5 . Thus, a portion of the Stockpile 2 was used to blend with material from Stockpile 1 and to fix that grade, and obtain a product having 12% P_2O_5.

The moisture content of the product was set at 12.0%. A composition among these stockpiles was then promoted in order to always obtain two products that can be physically stored at the specifications that are required for sale.

The NPV maximizing method was adopted as the scheduling strategy in which the block with the highest grade was mined first, which was associated with the lowest strip ratio.

Table 16.3_1 summarizes the results that were obtained for the scheduling of the three first years of operational mining, within the period that is covered by the GUIA, in addition to the end of year plans, which are presented in Figures 16.3_3 to 16.3_22.

Table 16.3_1
Scheduling of the Three First Years of Mining

Period		ROM					Very Low Grade Material			Waste Rock		Strip Ratio[1]	Strip Ratio[2]	Mining product		
		Type	Volume (m^3)	Mass dry basis (t)	Mass wet basis (t)	P_2O_5 (%)	Volume (m^3)	Mass wet basis (t)	P_2O_5 (%)	Volume (m^3)	Mass wet basis (t			Type	Product (t)	P_2O_5 (%)
Year 01	Quarter 1	Stockpile 1	781	1 305	1 462	9.6								P_2O_5 12%	2 617	12.0
		Stockpile 2	12 422	20 745	23 234	15.1	3 359	6 283	5.83	1 875	3 507	0.40	0.11	P_2O_5 15%	22 079	15.1
		Total	13 203	22 050	24 696	14.7								Total	24 696	14.7
	Quarter 2	Stockpile 1	547	913	1 023	9.3								P_2O_5 12%	2 269	12.0
		Stockpile 2	12 734	21 266	23 818	14.3	10 234	19 142	5.42	1 875	3 507	0.91	0.08	P_2O_5 15%	22 572	14.3
		Total	13 281	22 179	24 840	14.0								Total	24 840	14.0
	Quarter 3	Stockpile 1	469	783	877	8.6								P_2O_5 12%	1 642	12.0
		Stockpile 2	13 359	22 310	24 987	15.9	12 578	23 526	5.58	8 672	16 220	1.54	0.33	P_2O_5 15%	24 222	15.9
		Total	13 828	23 093	25 864	15.7								Total	25 864	15.7
	Quarter 4	Stockpile 1	391	652	730	9.1								P_2O_5 12%	1 470	12.0
		Stockpile 2	12 813	21 397	23 965	14.9	11 563	21 626	5.57	10 469	19 581	1.67	0.42	P_2O_5 15%	23 225	14.9
		Total	13 204	22 049	24 695	14.7								Total	24 695	14.7
	Sub Total	Stockpile 1	2 188	3 653	4 091	9.2								P_2O_5 12%	7 997	12.0
		Stockpile 2	51 328	85 718	96 004	15.0	37 734	70 577	5.56	22 891	42 814	1.13	0.25	P_2O_5 15%	92 099	15.0
		Total	53 516	89 371	100 096	14.8								Total	100 096	14.8
Year 02	Sem. 1	Stockpile 1	625	1 044	1 169	9.6								P_2O_5 12%	2 052	12.0
		Stockpile 2	26 172	43 707	48 952	15.2	31 797	59 473	5.64	16 875	31 563	1.82	0.29	P_2O_5 15%	48 069	15.2
		Total	26 797	44 751	50 121	15.0								Total	50 121	15.0
	Sem. 2	Stockpile 1	-	-	-	-								P_2O_5 12%	-	-
		Stockpile 2	27 656	46 186	51 728	15.7	30 547	57 135	5.57	36 406	68 815	2.43	0.63	P_2O_5 15%	51 728	15.7
		Total	27 656	46 186	51 728	15.7								Total	51 728	15.7
	Sub Total	Stockpile 1	625	1 044	1 169	9.6								P_2O_5 12%	1 979	12.0
		Stockpile 2	53 828	89 893	100 680	15.5	62 344	116 608	5.61	53 281	100 378	2.13	0.46	P_2O_5 15%	99 870	15.5
		Total	54 453	90 937	101 849	15.4								Total	101 849	15.4
Year 03		Stockpile 1	-	-	-	-								P_2O_5 12%	-	-
		Stockpile 2	45 547	76 063	85 191	16.5	11 250	21 041	5.27	14 297	29 625	0.59	0.28	P_2O_5 15%	85 191	16.5
		Total	45 547	76 063	85 191	16.5								Total	85 191	16.5
Total		Stockpile 1	2 813	4 697	5 261	9.3								P_2O_5 12%	9 976	12.0
		Stockpile 2	150 703	251 674	281 875	15.6	111 328	208 226	5.56	67 578	130 003	1.18	0.26	P_2O_5 15%	277 160	15.6
		Total	153 516	256 371	287 136	15.5								Total	287 136	15.5

Remarks:

- Stockpile 1: ore that will be sent to the 12% P_2O_5 product stockpile;
- Stockpile 2: ore that will be sent to the 15% P_2O_5 product stockpile;
- Strip Ratio[1]: considers the very low grade material to be waste rock;
- Strip Ratio[2]: considers the very low grade material to be ore;
- Moisture content: 12%;
- Mine recovery: 95%;
- Dilution: 5%.

Figure 16.3_3

Perspective View of Pit Design showing ore block model – Year 1

Figure 16.3_4

Perspective View of Pit Design showing ore block model – Year 2

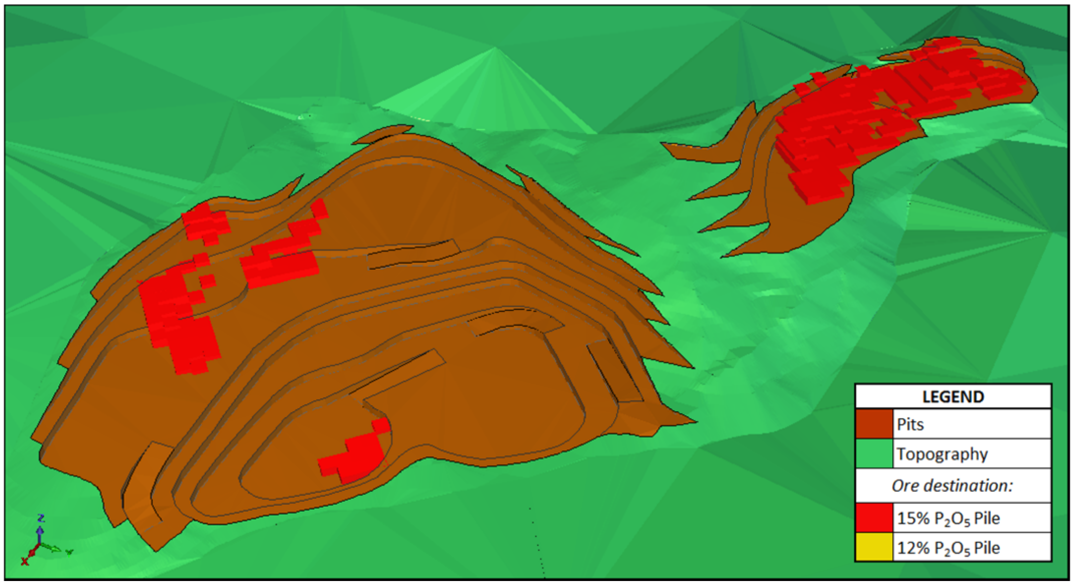
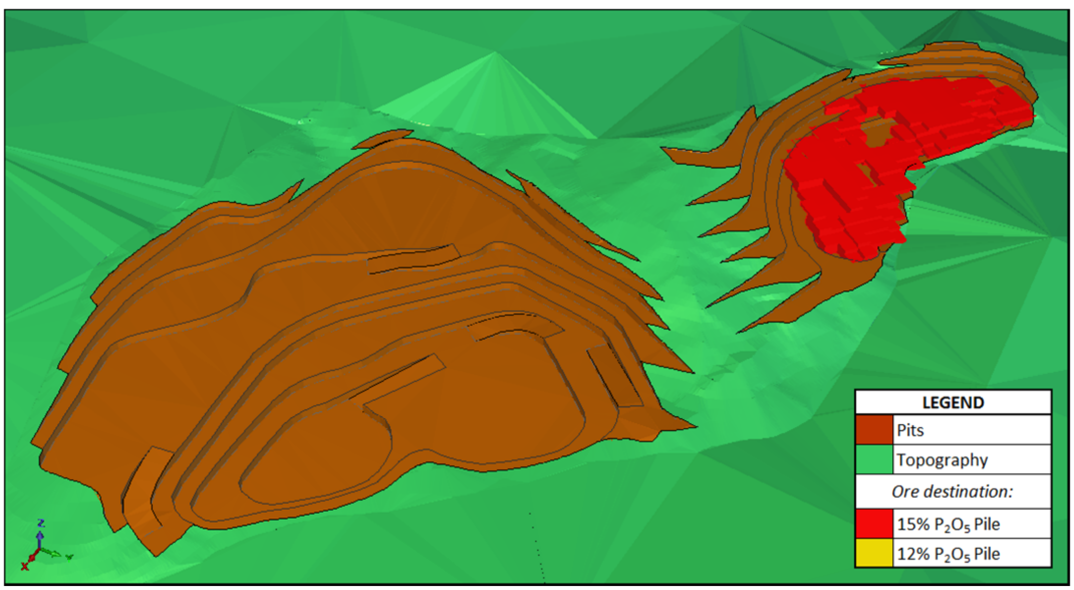


Figure 16.3_5

Perspective View of Pit Design showing ore block model – Year 3



16.4 Long Term Plan

The production strategy for the creation of the stockpiles of commercial quality products, in addition to the adoption of the maximizing route with respect to scheduling, was maintained for the periods after the third year, at the same production rate of 100 000 tpa.

GE21 presents the scheduling as it was obtained during the computer exercise, while not adhering to operational details, since this mining phase is considered to merely have the purpose of creating cash flow that is more comprehensive because DuSolo has already decided to study new mining parameters and products for this phase.

The additional years 4 to 12.5 in the Life of Mine Plan are summarized in Table 16.4_1.

A grade parameterization of the ROM in Long-Term Plan was performed to define the destination of each block from the P_2O_5 contents. It was defined that:

- Ore blocks ≥ 8% P_2O_5 and < 14%: that will be sent to the Stockpile 1, resulting 12% P_2O_5 product stockpile;
- Ore blocks ≥ 14% P_2O_5: that will be sent to the Stockpile 2, resulting 15% P_2O_5 product stockpile;

However, it was not possible to obtain a mining sequence that would guarantee the supply of the stockpiles with contents of 12 and 15% P_2O_5. In most periods Stockpile 1 was formed containing less than 12% P_2O_5 and Stockpile 2 containing ≥15% P_2O_5. Thus, a portion of the Stockpile 2 was used to blend with material from Stockpile 1 and resulting in a product having a grade of 12% P_2O_5.

Starting at year 12 a new grade definition was made necessary:

- Ore blocks ≥ 10.5% P_2O_5: will be sent to the Stockpile 1, resulting 12% P_2O_5 product stockpile;
- Ore blocks ≥ 8% P_2O_5 and < 10.5%: will be considered as Very Low Grade Material.

Table 16.4_1
Scheduling Supplementation

Year	ROM			Very Low Grade Material			Waste Rock		REM[1]	REM[2]	Mining product		
	Type	Mass wet basis (t)	P_2O_5 (%)	Volume (m^3)	Mass wet basis (t))	P_2O_5 (%)	Volume (m^3)	Mass wet basis (t)			Type	Product (t)	P_2O_5 (%)
4	Stockpile 1	15 782	12.2	24 766	46 322	5.92	44 844	83 876	1.34	0.58	P_2O_5 12%	14 598	12.2
	Stockpile 2	81 538	14.9								P_2O_5 15%	75 423	14.9
	Total	97 320	14.5								Total	90 021	14.5
5	Stockpile 1	24 987	12.4	40 547	75 839	5.12	46 563	87 090	1.59	0.49	P_2O_5 12%	23 113	12.4
	Stockpile 2	77 592	14.9								P_2O_5 15%	71 773	14.9
	Total	102 580	14.3								Total	94 886	14.3
6	Stockpile 1	28 786	12.4	47 969	89 721	5.36	49 531	92 914	1.83	0.49	P_2O_5 12%	26 627	12.4
	Stockpile 2	71 017	15.0								P_2O_5 15%	65 691	15.0
	Total	99 803	14.3								Total	92 318	14.3
7	Stockpile 1	47 198	11.7	54 766	102 434	4.74	38 906	74 663	1.74	0.37	P_2O_5 12%	43 658	11.7
	Stockpile 2	54 505	15.3								P_2O_5 15%	50 417	15.3
	Total	101 703	13.6								Total	94 075	13.6
8	Stockpile 1	63 125	12.3	35 469	66 341	6.19	52 734	98 634	1.77	0.62	P_2O_5 12%	58 391	12.3
	Stockpile 2	30 102	14.5								P_2O_5 15%	27 845	14.5
	Total	93 228	13.0								Total	86 236	13.0
9	Stockpile 1	59 619	11.3	31 094	58 158	5.61	36 641	68 533	1.24	0.43	P_2O_5 12%	55 147	11.3
	Stockpile 2	42 669	14.8								P_2O_5 15%	39 468	14.8
	Total	102 287	12.7								Total	94 616	12.7
10	Stockpile 1	67 656	11.8	28 438	53 190	5.56	21 875	40 915	1.05	0.29	P_2O_5 12%	62 582	11.8
	Stockpile 2	21 918	14.6								P_2O_5 15%	20 275	14.6
	Total	89 574	12.5								Total	82 856	12.5

Table 16.4_1
Scheduling Supplementation

Year	ROM			Very Low Grade Material			Waste Rock		REM[1]	REM[2]	Mining product		
	Type	Mass wet basis (t)	P_2O_5 (%)	Volume (m^3)	Mass wet basis (t)	P_2O_5 (%)	Volume (m^3)	Mass wet basis (t)			Type	Product (t)	P_2O_5 (%)
11	Stockpile 1	103 164	11.9	33 125	61 957	5.25	6 406	11 982	0.67	0.07	P_2O_5 12%	95 427	11.9
	Stockpile 2	7 452	14.7								P_2O_5 15%	6 894	14.7
	Total	110 617	12.1								Total	102 321	12.1
12	Stockpile 1	108 640	11.9	111 017	207 646	10.03	61 400	115 016	2.97	0.36	P_2O_5 12%	100 492	11.9
	Stockpile 2	-	-								P_2O_5 15%	-	-
	Total	108 640	11.9								Total	100 492	11.9
13	Stockpile 1	57 796	11.9	59 061	110 468	10.03	32 664	61 189	2.97	0.36	P_2O_5 12%	53 462	11.9
	Stockpile 2	-	-								P_2O_5 15%	-	-
	Total	57 796	11.9								Total	53 462	11.9
Total	Stockpile 1	576 754	11.9	466 252	872 076	7.08	391 564	734 810	1.67	0.40	P_2O_5 12%	533 498	11.9
	Stockpile 2	386 794	14.9								P_2O_5 15%	357 785	14.9
	Total	963 548	13.1								Total	891 282	13.1

The Table 16.3_2 summarizes the Resources and production results for this PEA.

Table 16.3_2
Summary of Resouce and Production

Material			Mass wet basis (Kt)	P_2O_5 (%)
Resource	Class	Indicated	1 296	7.82
		Inferred	3 022	8.15
ROM	Type	Stockpile 1	582	12.50
		Stockpile 2	669	16.03
	Total		1 251	14.38
Very Low Grade Material			1 080	7.15
Waste Rock			865	n/a
Mining product Diluted	Type	P_2O_5 12%	543	11.90
		P_2O_5 15%	635	15.24
	Total		1 178	13.70
Strip Ratio[1]	1.56	Strip Ratio[2]	0.37	

Remarks in Table 16.3_1 and Table 16.3_2:

- Stockpile 1: ore that will be sent to the 12% P_2O_5 product stockpile;
- Stockpile 2: ore that will be sent to the 15% P_2O_5 product stockpile;
- Strip Ratio[1]: considers the very low grade material as waste rock;
- Strip Ratio[2]: considers the very low grade material as product;
- Moisture content: 12%;
- Mine recovery: 95%;
- Dilution: 5%.

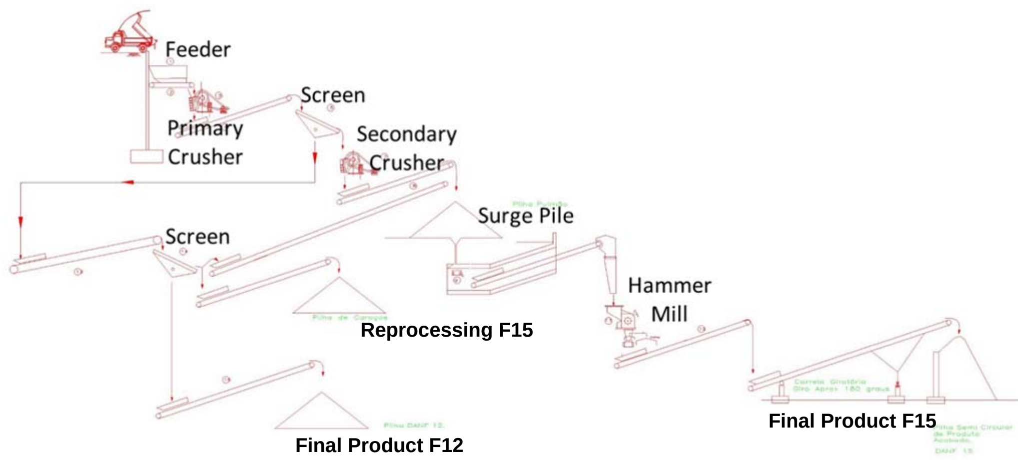
17 RECOVERY METHODS

The material is placed in the ROM patio area and arranged in piles in accordance with their grades. The feed material from the stockpiles is blended in such a way so as to guarantee a constant feed grade for the sizing process.

The current processing flowchart consists of crushing, screening and grinding, as shown in figure 17_1.

Figure 17_1

Natural Phosphate Processing Flowchart



The main processing equipment currently installed at site include:

- Vibrating Feeder;
- Primary crusher, model SIMPLEX SXBM 8050 H, with a 75 hp motor;
- Vibrating grizzly 1, manufactured by Nordberg, 300x100, with a 15 hp motor;
- Secondary crusher, manufactured by Rosenveig, model 9040, with a 50 hp motor;
- Vibrating grizzly 2, size 500x150, with a 15 hp motor;
- 4 hammer mills, manufactured by Piacentini, model 305DS, with a 200 hp motor;
- Belt Conveyor;
- Electrical transformer exclusively for the processing plant, having a 500kVA capacity;

Figure 17_2 shows the structure of the processing plant.

Figure 17_2

Mineral Processing Plant

Figure 17_3 shows the hammer mills.

Figure 17_3

Hammer Mills

In order to handle the run of mine feed and the finished products in the ROM patio and the product storage shed, the company makes use of the following mobile equipment:

- A wheel loader, model CAT 938, having a $2.5m^3$ capacity bucket. The number of wheel loaders depends on the volume of production and product shipping. In general terms these pieces of equipment are rented as needed;

- A dump truck, having a double axle in its chassis, with an average capacity of 15 tonnes.

In general, the monthly volume of sales varies as a function of demand from customers, which is primarily driven by the agricultural cycle and the weather; the volume of demand is greater in the dry season, which in the region includes, in general, the months between April and December. This is the time when the producers prepare the soil and the pastures for agriculture and are using the maximum amount of phosphate.

As such, the Company's productive activity grows during the dry months when, in addition, it is easier to do your mining work and the demand for the final product is even higher. As a result, the plant works longer hours, including a night shift whenever necessary.

Sizing and screening is the technique that is used in processing the material. In light of the characteristics of the mineralization, the highest concentrations occur in harder material and, during the screening stage, these larger fragments are retained in the screen, whereas the ore matrix, which presents lower grades, passes through and follows a separate pathway.

This method of physical processing has the advantage of being one of the simplest and most inexpensive methods among those that are generally used in mining. The final grades that are obtained depend on the intrinsic characteristics of the ROM that is produced from a certain mining block, such as grade, hardness, size and shape.

Historically, the final products of the plant are:

- D12, a product consisting of 12% P_2O_5, and represents approximately 45% of the volume that is produced;

- D15, a product consisting of 15% P_2O_5, and represents approximately 45% of the volume that is produced;

- D18, a product consisting of 18% P_2O_5, and represents approximately 10% of the volume that is produced;

Currently, the company processes material that has approximately 12% moisture content, which has the principal aim of reducing the production of dust during the beneficiation process. The reduction of dust has two main advantages: first, it improves the working conditions at the plant, in accordance with Labour Ministry Regulatory Standard No. 15. And second, it reduced the loss of material in the form of dust that is swept away by the wind, which represents a quantity of material that cannot be disregarded.

This moisture content may be the result of using fresh ROM material, or it can be added during the beneficiation process, as needed.

All of the material that is obtained from mining is transformed into the final product, which generates products that have greater or lesser value, depending on the phosphate concentration (P_2O_5). Therefore, tailings are not produced during ore processing, and the recovery of material during the process is theoretically 100%.

However, a fraction of the feed material is lost, not for reasons of the method of processing, but for operational reasons, such as when wheel loaders transport the material, or when it is loaded or unloaded from trucks within the lot, or when boulders are generated. Material is also lost through holes and leaks during the processing stages, by wind or rain removal when it is stockpiled in an open area in the lot, among other causes. In accordance with background data, this loss is estimated at 7% of the mass of the run of mine that is fed to the crusher.

For internal quality control purposes, the company maintains its own laboratory, with equipment that serves to analyze certain characteristics of the product such as particle size, comminution, sample preparation and a spectrophotometer for determining the concentration of P_2O_5 (phosphorus pentoxide - apatite mineral). The company also maintains a chemical technician on site that can run analyses.

In terms of infrastructure that serves to provide production support, in addition to the items mentioned above, the company also maintains:

- An office, which serves to provide support for the administrative, technical and shipping activities;
- An 80 ton capacity highway scale, with the capacity for weighing road trains;
- A store room, for the storage of the items that are most readily consumed at the processing plant, such as V belts, grease and ball bearings, among others;
- An indoor workshop for the maintenance of diesel equipment that has a containment system to prevent the leakage of contaminated oil and water, with a water-oil separation chamber for the proper disposal of potential wastes;
- A 15,000 litre diesel fuel storage tank that contains a separation chamber in order to guarantee the control of potential waste effluents;
- A warehouse for the storage of drill core samples;
- A water intake well;
- An electric transformer and low-tension power network that exclusively provide power for the company's support infrastructure.

18 PROJECT INFRASTRUCTURE

18.1 Master Plan

Figure 18.1_1 outlines the Master Plan of the Mining Plan that is set forth in the GUIA.

Figure 18.1_2 shows the extension of the process route, including the relative location of the mining site associated with the GUIA phase and the location of the processing plant and the stockpiles in the municipality of Campos Belos, Goiás.

The mining infrastructure includes the mining sites and the primary drainage system, which consists of drainage protection channels that drain the rainwater to a fines settling basin. This basin promotes the discharge of decanted water to the surrounding watercourses.

The waste rock pile was not fully designed within the restrictions of the GUIA licence; however, the pile may be established in an external area, provided it be positioned at least 250m from the karstic zones where caves are located.

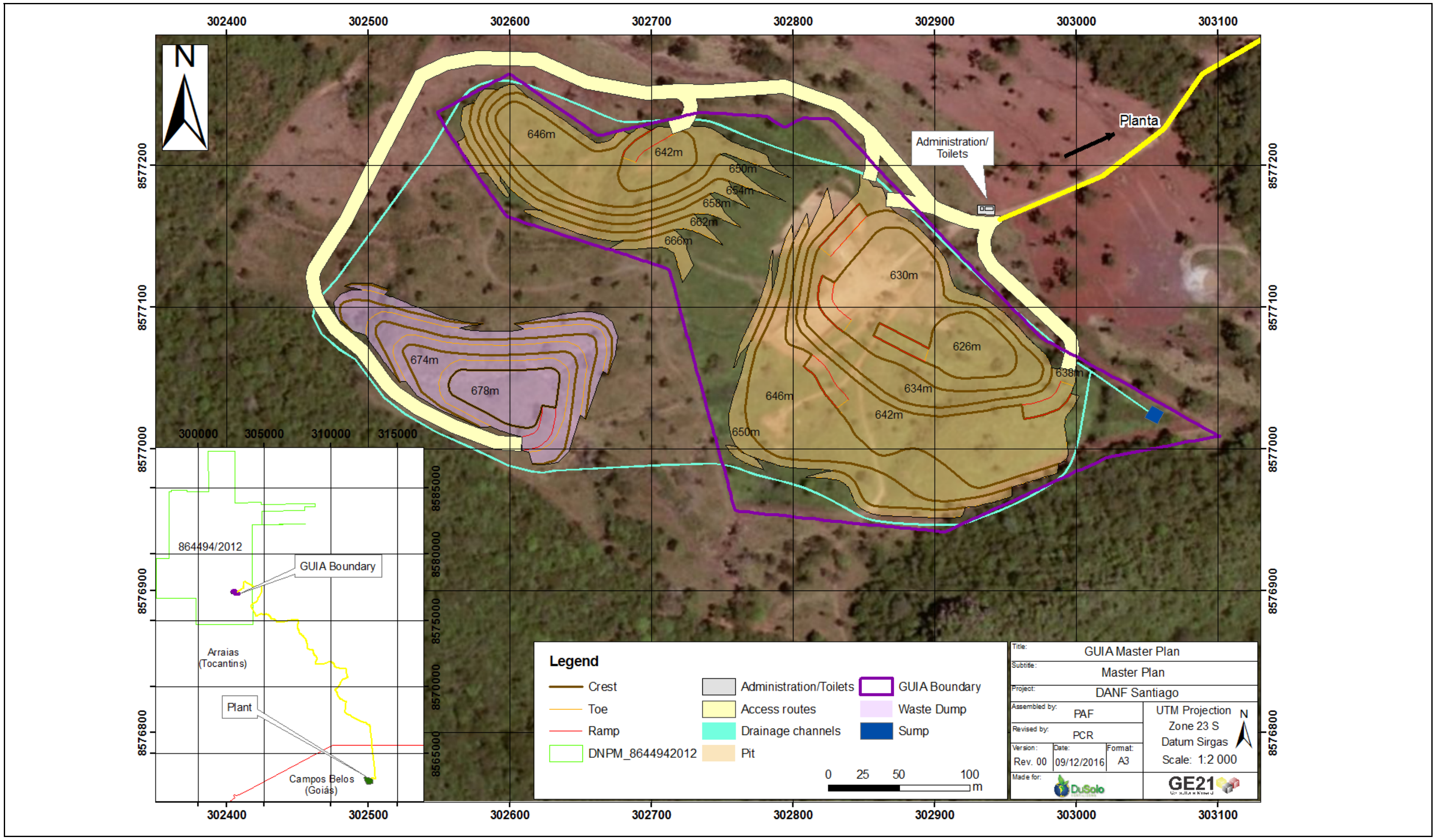
The phosphatic rock shall be transported to the processing plant via municipal road that is maintained operational year-round.

DuSolo has been considering moving the processing plant closer to where mine operations occur. GE21 considers the haulage cost very important in the final cash flow.

Currently the Campos Belos plant is some 29km from the Santiago Project, and haulage represents a significant part of the mining costs. GE21 understands that the Company is engaged in a trade-off study to determine whether relocation of the plant close to the Santiago Project is an economically viable option. GE21 recommends that management completes such a study, as in addition to economic concerns there are likely to be numerous operational, safety, social and environmental benefits to eliminating the longer haulage.

Figure 18.1_1

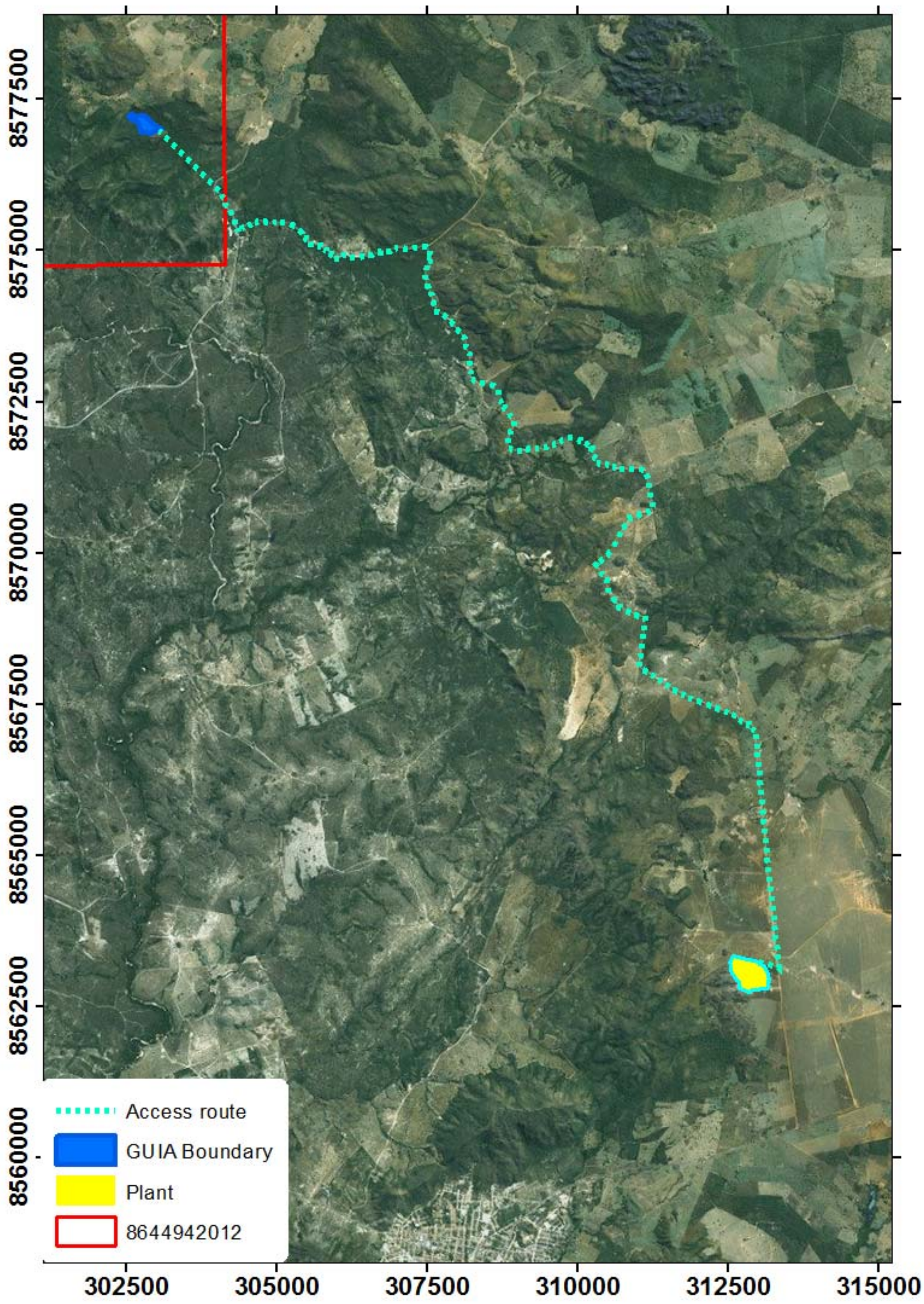
Master Plan of the Mining Plan that is set forth in the GUIA



Planta
Administration/ Toilets
646m
642m
650m
654m
658m
662m
666m
630m
626m
638m
634m
642m
646m
650m
674m
678m
864494/2012
GUIA Boundary
Arraias (Tocantins)
Plant
Campos Belos (Goiás)
Legend
Crest
Toe
Ramp
DNPM_8644942012
Administration/Toilets
Access routes
Drainage channels
Pit
GUIA Boundary
Waste Dump
Sump
GUIA Master Plan
Master Plan
DANF Santiago
Assembled by: PAF
Revised by: PCR
Version: Rev. 00
Date: 09/12/2016
Format: A3
UTM Projection
Zone 23 S
Datum Sirgas
Scale: 1:2 000

Figure 18.1_2

Master Plan - Continuation of the Process Route



18.2 Waste Rock Disposal

Table 18.2_1 presents the principal parameters that were adopted in the design of the waste rock disposal pile.

Table 18.2_1
Waste Rock Pile Operational Parameters

Parameter	Value
Overall Slope Angle	20°
Face Angle	30°
Minimum Bench	4m
Lift Height	4m
Ramp Width	10m
Ramp Slope	10%

Figure 18.2_1 shows a perspective view of the waste rock heap.

Figure 18.2_1
Waste Rock Heap

18.3 Local Infrastructure

The infrastructure that is necessary to bring the project online is already in place, since, after all, the company is already operational, working in accordance with DNPM directives as they are set forth in the *Guia de Utilização* (GUIA) number 39/2014, which was issued on September 19, 2014.

Regarding mining operations, to improve access to the mine, the company refurbished the pre-existing access routes to the Santiago Project. It was therefore unnecessary to open new access routes to the deposit.

To transport the ore from the mining area to the processing plant, an unpaved municipal road is used that the company maintains and improves constantly in order to maintain conditions that are ideal for transport. In addition, a water truck constantly irrigates the road in order to control the proliferation of dust and thereby maintain the safety of local traffic and not disturb the communities that reside on the borders of the road. Figure 18.3_1 shows DuSolo personnel undertaking maintenance work and the installation of signage on the access roads.

Figure 18.3_1

Maintenance Work and the Installation of Signage on the Access Routes

Within the area of the processing plant, the company is provided access to the high-tension power network that supplies the current electrical requirements of the equipment. The electrical utility company that supplies the region is known as CELG - Companhia Energética de Goiás (Goiás Power Company), which maintains the three-phase power network. This network has a nominal capacity of 34kVA, which is connected to the company's substation. Figure 18.3_2 shows the office installations at the processing plant.

Figure 18.3_2

Office Installations at the Processing Plant

Regarding moisture content, practically all of the moisture content that is necessary to control the proliferation of dust is contained within the ROM itself. On certain occasions, especially during the last months of the dry season, it is necessary to sometimes add water to the material. This is achieved with a water truck, which sprays water directly onto the stockpiled materal that is spread over the storage area. When this happens, the consumption of water can be estimated to be 5% of the mass of ore that is irrigated; this therefore represents a small annual volume of water that is required to execute the processing of the ore.

Figure 18.3_3

Run Of Mine Material Stored on the Lot of the Processing Plant

The sizing process does not require other reagents, such as acids, or any other chemical compounds.

19 MARKET STUDIES AND CONTRACTS

19.1 Introduction

Agroconsult Consultoria e Projetos (Agroconsult), a consulting company specialized in Brazilian agribusiness, was commissioned by DuSolo to develop a market research report aiming to estimate market potential and competitive prices for some of its phosrock products. The report was prepared and delivered in December, 2016.

Brazilian agribusiness is one of the country's major industries and has made a substantial contribution to national development by fostering national production, generating foreign trade surplus and increasing national financial reserves.

According with data from CEPEA-USP, agribusiness sector represents 23% of Brazilian GDP (2015). Additionally, MAPA data shows that in 2015, agribusiness generated a US$ 75.0 billion surplus compared to a $20.0 billion trade surplus registered in Brazil as a whole. Therefore, this activity allows the country to sustain its positive outcomes in the balance of trade.

The relevance of agribusiness is based on the fact that Brazil is one of the world's largest agricultural producers, especially in meat, soybeans, sugar, ethanol, orange juice, coffee and cotton. The consistent growth in agricultural production underlying this performance is explained, in part, by massive productivity gains following the adoption of technologies that involve, among other measures, more intensive fertilizer usage. Currently, grains, sugarcane, forest and coffee are the main crops cultivated in the country.

Agroconsult reported that the current rise in demand for foodstuffs, driven by global growth, especially in developing countries, as well as the incentives for biofuels in the Brazilian energy grid are a source of many opportunities for the Brazilian farming industry.

From 2015 to 2025, 16.6 million ha of planted area should be added to the Brazilian agriculture, but increase in production will be mainly achieved by improvements in productivity. This means that Brazilian agricultural growth will continue to be led by technology, and the area expansion will be concentrated mainly in the Cerrado region.

Agroconsult estimates that grain production could reach about 301 million tons until 2025. While this performance is dependent on improvements in crop yields, some area expansion may also be required (for both new areas and second harvest area).

For sugarcane, Agroconsult estimates that production will reach to 884 million tons by 2025, with an average growth of 2.9% y-o-y. Part of this expansion will be explained by productivity, which tends to grow at an average rate of 0.9% y-o-y, while planted area is expected to reach 12.1 million hectares in the same period (average growth of 1.9% y-o-y).

Even considering the restrictions set by Brazilian environmental legislation, a study from Embrapa (Brazilian Company for Agricultural Research) about land use in Brazil, asserts that the availability of arable land is around of 34 million hectares. However, despite the availability of area, it must be considered that the Brazilian soils have strong restrictions. There is in Brazil a predomination of low fertility soil, classified as restricted or very restricted to agricultural production. Besides the low availability of primary macronutrients (N, P and K), secondary (Ca, Mg and S) and micronutrients (Zn and Cu, among others), there are also large areas of acid soils with low CEC (cation exchange capacity), strong power to fix phosphorus besides the high exchangeable acidity (Al^{3+}).

Therefore, fertilizer application is vital for the performance of the farming industry and is likely to remain so for the foreseeable future. This means that increasing farmland acreage and attempts to improve productivity will be accompanied by an increase in fertilizer consumption, which clearly shows the growth potential for this market in Brazil.

19.2 Brazilian Fertilizer Market

Due to predominance of very poor soils in Brazil, there is a need to use large amounts of fertilizers per area to make agricultural production possible and feasible.

Because of its agricultural profile and the relevant share of soybean in this activity, Brazil has a balanced nutrient consumption of nitrogen, phosphorus and potash, unlike other important markets such as China and India where nitrogen predominates.

In the past ten years, fertilizer market in Brazil grew at an annual rate of 4.1%. For the coming years, market will keep growing, but at a lower pace (3.0% y-o-y). By 2025, more than 10.6 million tons of fertilizer will be added to the Brazilian market regarding current demand levels. During 2016, farmers demanded 32.6 million tons of fertilizers. In 2025 market demand will be close to 43.2 million tons. Over the next 10 years, fertilizer consumption in Center-West will increase more than 50%. And the region will account for 51% of the additional demand in the whole country. The three most important regions for the fertilizer market (Center-West, South and Southeast) represents 86% of the total fertilizer consumption in Brazil. In 2025 this main predominance will continue with 84% share. Phosphate fertilizer always represents about 42% of the Brazilian fertilizer market and will growth at a ratio of 2.9% y-o-y.

As a result of its soil characteristics and agricultural profile, Brazil is the world's fourth-largest consumer of fertilizers but it accounts only for 2% of the fertilizer world production and depends on imports to supply the market.

Brazil has a local industry to provide fertilizers, but the country needs to import all raw materials (except SSP) to meet its total demand. The country’s dependence on imports differs among nutrients, reflecting the availability of natural resources. Currently, 77% of nutrient consumption is supplied by imports. This share achieves 95% for K_2O, 78% for N and 57% for P_2O_5.

Since 2000, Brazilian fertilizer production fluctuates around 8.0 to 10.0 million tons. In the past five years, though, production has been decreasing despite the upward trend in demand. Currently, phosphate fertilizers represent about 80% of total national production.

Considering the Brazilian Fertilizer Industry opportunities, Agroconsult expects an improvement in its capacity with the start-up of new facilities. Nevertheless, domestic production will be far from reaching domestic consumption.

19.3 The Product, Rock Phosphate Consumption in Center-West and Pricing

As previously addressed, the fertilizer market is expected to grow over the next years, especially in Cerrado Region. Considering this particular area, three key states deserve to be highlighted: Mato Grosso (MT), Tocantins (TO) and Goiás (GO).

In 2016, both states may consume more than 11 million fertilizer tons, of which 4.5 million refers to phosphate fertilizer, responding to 1.8 million tons of P_2O_5. Part of this volume is effectively consumed by perennial crop as well as semi-perennial, such as grasslands, commercial reforestations and sugarcane. Additionally to this market, the phosphating procedure is also considered, being used in order to correct the phosphorus levels presented in new first planting areas.

Several sources of phosphorus have been used to supply this nutrient. Currently, the most popular sources are: rock reactive phosphates, triple superphosphate, monoammonic phosphate and simple superphosphate. Common to all of them is the fact that they all are rapidly solubilized. However, while this feature is extremely important for the short cycle crops, which require immediate supply of phosphorus, it is in fact a problem for the long cycle crops such as perennials and semi-perennials.

The Brazilian soils are acids and present unavailable phosphorus due to a particular natural phenomenon called fixation. Because of that, currently these crops have been supplied with both soluble products and by-products of the phosphate industry. In terms of solubility, it is seen that sources easily solubilized are desirable for long cycle crops. Thus, it is possible to understand that there is an opportunity for products with more appropriate behavior to the perennial crops and the correction of phosphorus in the soil, which is a rock phosphate.

For while, to estimate price and market potential, Agroconsult is considering that the DuSolo's Phosphate Rock provides 12% and 15% of P_2O_5 as a reference. Due to its features, DuSolo's Phosrock is naturally applied in perennial crops or in new areas that will receive an annual crop for the first time. As both products herein analyzed offer the same nutrient (P_2O_5) and have the same behavior when applied to the soil, the choice between them will be a matter of price and handled volume. Generally speaking, market gives priority to more concentrated products.

When compared to other phosphate sources, the rocks to be worked by DuSolo differ from the soluble sources because they have non-acidified gradual solubility behavior, therefore being slightly affected by pH effects such as nutrient losses in the soil (which means they are suitable for long cycle crops). Moreover, compared to some byproducts originated from rock mined to fertilize production purposes and that are sold in the market, DuSolo rocks are favorable because they are dry and offer greater phosphorus concentration, thereby facilitating the handling by the final user. Nevertheless, the price will be the main decision factor to be considered by the user. In this case, the value charged for each percentage unit of phosphorus (P_2O_5) is going to be used as comparison by farmers.

Therefore, to estimate DuSolo's competitive price in each market – Mato Grosso, Goiás and Tocantins – Agroconsult has considered competition with SSP, MAP, STP and PhosRock regarding the cost per point (%) of P_2O_5. Then, net-back prices were calculated discounting freight value and taxes (ICMS of 8.4% for Mato Grosso and 0% for Goiás and Tocantins) considering that the products will be originated from Campos Belos/GO.

In the first moment, Agroconsult understand that perennial crops (sugarcane, forest and pasture) are among those ones immediately able to receive the kind of product sold by DuSolo with a positive response. So, market potential has been estimated by the equivalent volume of the New Product required to supply the same amount of P_2O_5 provided through other sources currently applied as single element in pasture, sugarcane and commercial forest in the following regions: Tocantins, Goiás (East, Southeast and North) and Mato Grosso (South and East).

Both price and market potential analysis consider that the DuSolo will operate in the Single Element market with no intermediaries, in other words, the company will sell and deliver their products straight to farmers. Currently, single element market totalizes 1,600,000 tons in selected states. It is estimated that single element market for phosphates in Mato Grosso, Tocantins and Goiás reaches 689,893 tons of P_2O_5.

It is important to take into account that the product to be sold by DuSolo, no matter the one to be chosen between the two options herein analyzed – has a low P_2O_5 concentration. Even if it presents a good efficiency, the dosage must be higher than any other P sources commonly used in Brazil. This brings more effort to transport the product from its origin to the farm and to apply it into the soil.

The market potential, in the case of straight sales, would be 135.9 thousand tons with prices (FOB Campos Belos) at US$ 51.5 per metric ton for a 12% P_2O_5 Rock and 108.7 thousand tons at US$ 62.6 per metric ton for a 15% P_2O_5 Rock. In both cases the estimate potential focus on pasture, forest and sugarcane demand in the states of MT, GO, and TO. These results are shown on the figures 19.3_1 and 19.3_2.

Figure 19.3_1

Sensitivity Analysis – 12% P_2O_5

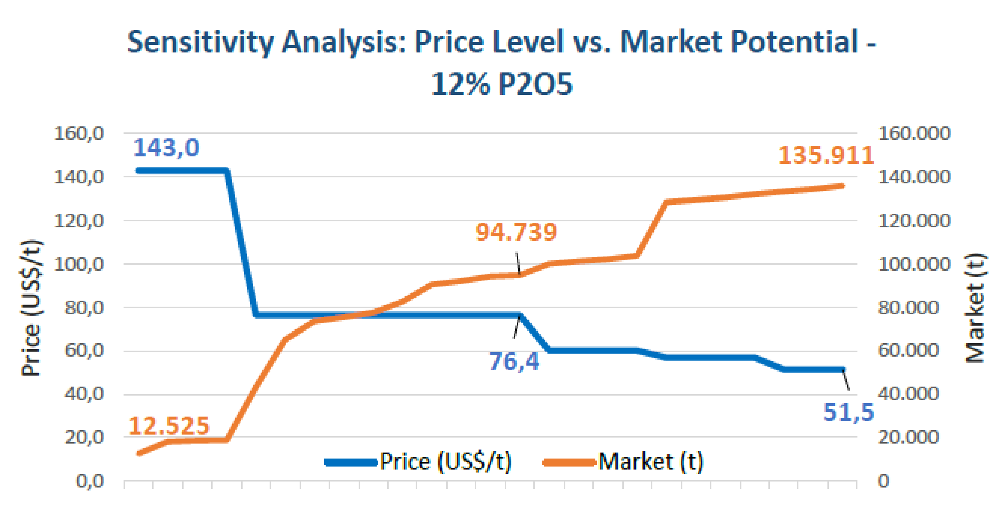
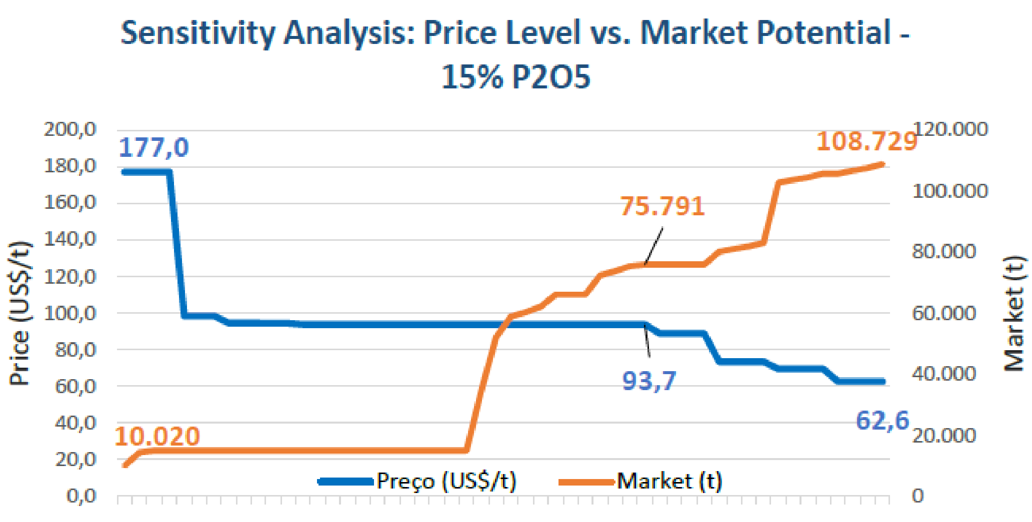


Figure 19.3_2

Sensitivity Analysis – 15% P_2O_5



Agroconsult recommends that DuSolo put an effort to sell straight to farmers. Sales occur through a direct contact of the company's commercial team or sales agent (i.e.: agricultural inputs retailers or sales person) with the end user. The sales team or agent will be responsible for providing agronomic and technical support to farmers as well as negotiating payment and financial conditions (i.e.: prices with CIF or FOB model, credit, discounts). DuSolo should be prepared to provide not just the fertilizer, but also the funding for farmers.

DuSolo has a disadvantage in being new in the fertilizer market, and the company should charge a lower price than its competitors to get market share and establish itself in the market. The sales team will be an important link with farmers, as important as price and product, and must be managed under a strong relationship strategy.

Another point of attention is that DuSolo's competitors have a high bargaining power (since they operate with a capacity superior to the growth of the market). DuSolo entry into the Brazilian market may bother its competitors, allowing them to adopt strategies to avoid losing market share, such as lowering the raw material price.

Thus, what will decisively affect DuSolo competitiveness in the Brazilian market is its cost structure and sales team skills. The advantage of DuSolo lies on the faster delivering of the product, given its proximity to consumers when compared to its international competitors.

20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

Currently, DuSolo Fertilizantes undertakes mineral exploration work for phosphate in seven (7) areas where the company holds exploration licences in the rural area of the municipality of Arraias, in the State of Tocantins. This work is executed by DuSolo's subsidiary company, P-TEC Agro Mineração SPE LTDA.

In light of the fact that P-TEC is still working within the mineral exploration phase, i.e., it has not yet been granted a Mining Concession from the National Department of Mineral Production (DNPM), the Mining Code (Law 227/67), in such cases, allows for the extraction of ore by means of the *Guia de Utilização* (GUIA).

20.1 GUIA - Mineral Rights Limitations

The GUIA, as decribed on Item 15, is a permit that is issued by the DNPM, under defined circumstances, that authorizes the extraction of minerals during the mineral exploration phase of mining until the mining concession is granted. This is provided for in Article 22, § 2 of the Mining Code. The situations in which the GUIA may be issued are the following: 1) Verification of the technical-economic feasibility of the mining of mineral substances within domestic and/or foreign markets;; 2) The extraction of mineral substances for the execution of industrial analyses and testing before the mining concession is granted; and 3) The commercialization of mineral substances, at the discretion of the DNPM, in accordance with public policies, to support the exploration and development phase of a project

As such, at the Santiago Target, mineral exploration work is executed in accordance with the Guia de Utilização (GUIA) - No. 039/2014, within a 10.00 hectare area that is found within DNPM Decree 864.494/2012. This work is undertaken within the premises of the Bananal Farm (registration No. 1770 or 3182 - Updated).

20.2 Environmental Studies

The environmental licensing of any economic activity that may impact the environment within the State of Tocantins, must follow the provisions of the Instituto Natureza do Tocantins (NATURATINS) (Tocantins Nature Institute), and, within the State of Goiás, such licensing must adhere to the directives of the Secretaria de Meio Ambiente e Recursos Hídricos, Infraestrutura, Cidades e Assuntos Metropolitanos (SECIMA) (State Secretariat of the Environment and Water Resources, Infrastructure, Cities and Metropolitan Issues), which was previously known as SEMARH.

Each agency is responsible for executing each state's environmental policies, environmental monitoring activities and environmental control activities. These agencies are also responsible for the enforcement of environmental laws and the provision of related services that are attributed to them as a result of mutually beneficial agreements and contracts.

With respect to cases of mineral extraction and processing that is authorized by a GUIA, the environmental agencies must follow what is set forth in CONAMA Resolution No. 237/97, which lists the types of business ventures and economic activities that are subject to environmental licensing procedures.

Negative environmental impacts always arise as a result of mining activities (extraction and processing), because they are inherent to these undertakings, even during the mineral exploration phase. As a result, among other issues, it is with the aim of minimizing such impacts that environmental studies are developed, and required by the local environmental regulatory agency within the environmental licensing process. Within this process, the company must submit an environmental evaluation of the project site, and of the technical and structural implementation aspects of the project, in order to evaluate the impact of the venture on the site that was established for its implementation (in observance of the technical requirements that are imposed by the local environmental regulatory agency through its Terms of Reference and document lists).

Irrespective of the impacts that are associated with this activity, the requirement that it be submitted to environmental licensing procedures in the both the States of Tocantins and Goiás classifies the venture as an "Exploration Activity with a *Guia de Utilização* (GUIA)" and as the "Processing of Non-Metallic Minerals" (in accordance with the characteristics of the P-TEC - DuSolo Installations). The Project is classified as a Small Scale Activity by both environmental agencies.

Regarding the above, both NATURATINS and SECIMA make a list of the basic required documents available, as well as the Term of Reference (within which the technical aspects that are required of the project are listed) for the development of the required environmental studies. In the case of this Venture, an Environmental Project (EP) is required.

The EP is a technical-scientific document whose purpose is to evaluate the environmental impacts that arise from the activities and/or ventures that are potentially pollutant or that may engender environmental degradation. This document sets forth the mitigation measures and Environmental Control Plans (ECP) that are required, thereby guaranteeing the sustainable extraction of natural resources.

In adhering to the procedural requirements of the local environmental regulatory agencies, which are enforced through the execution of technical inspections by staff members from these very agencies in order to verify the data that are submitted. These agencies may, thereby, authorize the localization, installation, expansion, modification and operation of ventures and economic activities that make use of environmental resources, which may be considered to cause, or do cause, pollution. This is in addition to the ventures that are capable of, under any circumstances, causing environmental degradation.

20.3 Project Permits

P-TEC – DuSolo applied, in 2014, for the *Guia de Utilização* - GUIA at the National Department of Mineral Production (DNPM administrative instrument No. 864.494/2012). It also submitted applications for the necessary environmental licences (Preliminary Licence - PL, Installation Licence - IL and Operation Licence - OL) to NATURATINS (Case No. 1361-2014-M), and, in doing so, submitted all of the documents that are required by these proceedings. This culminated in the issuance of PL No. 7506/2014 and IL No. 7507/2014.

Once the installation of the licensed structures had been established, the agency issued OL No. 7825/2014 within the Technical Memorandum No. 5109/2014. This latter document stated that mineral extraction could only commence after the issuance of the GUIA by the DNPM to PTEC – DuSolo, in addition to the submission of the document within 90 days.

The process of obtaining the GUIA from the DNPM also began at the same time as the environmental licensing process associated with the mine since, as was mentioned earlier, the two processes are complementary. As such, after being granted OL No. 7825/2014, this document was presented to the DNPM, which finalized the analysis procedure and issued GUIA No. 039/2014. The latter document authorized P-TEC's extraction and commercialization of 100,000 tons/year of product. It should be noted that the GUIA was submitted to NATURATINS after it was issued.

The processing of the material that is extracted from the Santiago Project is executed in a plant that is outside of the area that is governed by the GUIA, at the Mineral Processing Plant that is located in Campos Belos, Goiás. In light of this fact, P-TEC, at the same time it was licensing its ventures with the DNPM and NATURATINS, submitted its Functioning Licence (FL) for its mineral processing plant to the Secretariat for the Environment and Water Resources of the State of Goiás (currently known as SECIMA) through submission of document No. 6249/2014. This was possible because the plant had already been installed, and all of the studies and documents that are required by the agency had already been submitted, thereby making it possible to issue LF No. 1089/2014 for the processing of the material that is extracted at the Bananal Farm.

It should also be noted that a Forest Exploitation Permit (vegetation suppression licence), having No. 221/2011 had already been granted to the Bananal Farm. The polygon that delineates the area of this licence includes the entire extraction area that corresponds to the Santiago Target GUIA. The vegetation within this area was completely removed during the period for which the Exploration Permit was valid.

All of the licences that were obtained for the Santiago Target are shown in Table 20.3_1.

Table 20.3_1

Summary of the Santiago Target environmental licences

Description	Licence No.	Licensing Agency	Expiration Date	Status
Santiago Target Preliminary Licence (PL)	7506/14	NATURATINS	08/08/16	Expired
Santiago Target Installation Licence (IL)	7507/14	NATURATINS	08/08/16	Expired
Santiago Target Operation Licence (OL)	7825/14	NATURATINS	20/08/18	Active
Santiago Target *Guia de Utilização* (GUIA)	039/14	DNPM	01/04/16*	Active
Processing Plant Functioning Licence (FL)	1089/14	SEMARH	15/05/20	Active
Forest Exploitation Permit (FEP) - Bananal Farm	2221/11	NATURATINS	06/06/15	Expired

Even though it is not required by the licensing agency (NATURATINS), during the environmental licensing process, a "Speleological Inventory" was developed, which made it possible to identify some caves within the area of influence of the Santiago Target. These caves were classified by NATURATINS as having low relevance, considering that they are not under direct influence of the activities that are being undertaken by P-TEC - DuSolo.

Regarding archaeological aspects, up until the month of March 2015, the submission of archaeological studies was only required for large scale projects. Beginning in March 2015, with the publication of Normative Instrument No. 01/2015 by the Instituto do Patrimônio Histórico e Artístico Nacional (IPHAN) (National Historic and Artistic Heritage Institute), the administrative procedures that should be observed within environmental licensing processes for all projects were established, irrespective of the scale of the project.

The study that was executed at the Bananal Farm began in 2014 with the issuance, by NATURATINS, of Operation Licence No. 7825-2014, with the issuance of GUIA No. 039-2014 by the DNPM and the issuance of Functioning Licence No. 1089/14 by SEMARH. However, each of the permits that were granted was issued prior to IPHAN Normative Instrument No. 01/2015. During the environmental licensing process, nothing was requested by IPHAN for this level of licensing (small scale project).

The next step in the mining venture will include the mining phase itself. DuSolo has already applied for a mining concession for the target minerals at the DNPM, in addition to the environmental licensing procedures, which will have to proceed in accordance with IPHAN Normative Instrument No. 01/2015, for this new phase of the project that will be undertaken by DuSolo.

20.4 Social Overview

DuSolo has worked, for more than 4 years, on Arraias (TO) and Campos Belos (GO) regions, mainly focused on the task of mineral exploration (phosphate), having an important social influence on the location where the projects take place. The company prioritizes employing local people, with 74% of its staff being composed of residents from the cities mentioned. State wise, 91% of DuSolo's total staff are born on the states of Goiás (GO) and Tocantins (TO).

Another social benefit provided by DuSolo, is the development of local suppliers for the general operation needs and company maintenance. Some of the services and products hired locally by DuSolo are:

- Mechanical and eletrical maintenance;
- Smelting and metalworking services;
- Equipment rental;
- Topographic survey;
- Food supply and catering;
- Fuel supply;
- Occupational medicine;
- Banking and administrative services;
- IT services;
- Hotel services;

When it comes to environmental and community works, DuSolo regularly uses water trucks to irrigate the surrounding roads, in order to mitigate the dust generated by the vehicles on the communities next to the company's work area.

As the mining activity has been undertaken on private property, and the mineral processing is executed within a plant that has already been installed and permitted, it is not necessary to negotiate or sign contracts with local communities.

The proposal of mitigation and potentializing measures should be undertaken for each impact on the environment that arises from each of the activities and processes that are expected to cause impacts, even though some measures that shall be adopted for a certain activity may have positive effects on another.

Within this context, beginning with the identification and classification of the probable environmental impacts that may arise from the activities and processes during the planning, installation and operation phases of the GUIA at the Santiago Target and at the Processing Plant that were addressed during the environmental licensing process, that was completed and submitted to NATURATINS and SEMARH, the Environmental Control Plans (ECP) that are associated with the various phases of the project were approved. These plans set forth the measures that are necessary for the control, mitigation, monitoring and management of the structures that control erosion processes, the management of soils, the management of solid and liquid wastes, environmental education, conservation of the fauna and flora, conservation of water resources and the recovery of degraded areas.

These measures, which are set forth in the ECP, are being executed and/or monitored by P-TEC – DuSolo staff in accordance with the extraction and processing activities timetable.

20.5 Mine Closure

The total area that will have to be recovered, within the GUIA area, once the mineral exploration work at the Santiago Target has ceased, is approximately 10.00 hectares.

Currently, regarding the environmental rehabilitation work, a topographic reworking of the land (earthworks) would be required, after which the planting of grasses and trees would have to be undertaken through the sowing of seedlings that are native to the region.

The cost of the tractor (Caterpillar D8 or similar) that is required for the reworking of the terrain is US$ 56.00/hour. It is estimated that 16 hours of work is required to rehabilitate each hectare of land, taking into account the low volume of material that will be moved.

In addition, the cost of environmental rehabilitation, including the revegetation of grasses and trees, equipment, raw materials, manpower, laboratory analyses and the supervision of this work, is estimated at US$ 3,333.00/ha.

As such, the total cost of recovering the areas that will be degraded at the Santiago Target is US$ 42,200.00 (one hundred and fifty-two thousand Reais), as outlined in Table 20_1.

Table 20_1 Cost estimate for the recovery of degraded areas				
Description	**Area (ha)**	**Earthworks**	**Revegetation**	**Total Cost**
Santiago Target	10.00	US$ 8,890.00	US$ 33,330.00	US$ 42,200.00
TOTAL	**10.00**	**US$ 8,890.00**	**US$ 33,330.00**	**US$ 42,200.00**

21 CAPITAL AND OPERATING COSTS

21.1 CAPEX

As the Santiago DANF Project and the Campos Belos plant are already extracting and processing phosphate rock, there is no additional capital requirement for the Project. Sustaining capital over the LOM is minimal and included in the maintenance costs. The Company estimates the existing capital equipment (primary crusher, hammer mills etc) have a capacity of c.280,000 tonnes per annum and the projected DANF PEA production of 100,000 tonnes per annum is approximately 35% of the actual installed capacity, resulting in reduced operating hours and general wear. Mobile equipment such as trucks, water trucks and front-end loader and excavator are all supplied on a contract basis. The Company maintains insurance for its assets which includes the Campos Belos Plant.

21.2 Operating Costs

DuSolo has already been maintaining an up-to-date operating and administrative cost tracking system regarding the mining operations in accordance with the licence that was granted by the GUIA.

GE21 summarized the operating and administrative costs, based on real costs that are regularly incurred by DuSolo. GE21 considered that these costs have been overestimated due to the low levels of production associated with the period that was studied, when the fixed costs had more heigth in the total cost than the variable cost, creating a bias on the real cost.

Table 21.2_1 shows the breakdown operating costs that are currently executed by DuSolo at a production rate of 60,000tpa.

Table 21.2_1 Breakdown Operating Costs @ 60,000tpa					
Cost Breakdown	**Costs (US$)**			**Unit Cost (US$/t mined)**	
	Fixed	**Variable**	**Total**	**Variable**	**Total**
Mining Cost	**581 412**	**1 605 511**	**2 186 923**	**26.8**	**36.4**
Ore Transport (30 km distance)		1 200 000	1 200 000	20.0	20.0
Mining Cost + Water Trucks	391 004	288 600	679 604	4.8	11.3
Road Maintenance	128 620	55 123	183 743	0.9	3.1
Mine Development	61 788	61 788	123 576	1.0	2.1
Plant Cost	**503 297**	**801 288**	**1 304 585**	**13.4**	**21.7**

Table 21.2_1 Breakdown Operating Costs @ 60,000tpa					
Mobile Equipments (FEL+Truck)	284 585	324 475	609 060	5.4	10.2
Maintenance	60 000	273 365	333 365	4.6	5.6
Electricity	122 712	203 449	326 160	3.4	5.4
Other Plant Costs	36 000		36 000	0.0	0.6
General Costs	**1 074 162**	**77 667**	**1 151 828**	**1.3**	**19.2**
Payroll - Campos Belos	534 302	59 367	593 668	1.0	9.9
Employee Lunch	110 700	12 300	123 000	0.2	2.1
Employee Transport	54 000	6 000	60 000	0.1	1.0
Land and Facilities Rental	295 960		295 960	0.0	4.9
Other	79 200		79 200	0.0	1.3
Total Cost	**2 158 870**	**2 484 466**	**4 643 336**	**41.4**	**77.4**

Considering the values presented at a 60,000tpa production, the Table 21.2_2 presents the recalculated breakdown operating costs that are taken into account for the DANF Santiago Project at a production rate of 100,000tpa.

Table 21.2_2
Breakdown Operatingl Costs @ 100,000tpa

Cost Breakdown	Costs (US$)			Unit Cost (US$/t mined)	
	Fixed	Variable	Total	Variable	Total
Mining Cost	**161 503**	**743 292**	**904 795**	**7.4**	**9.05**
Ore Transport (30 km distance)	-	555 556	555 556	5.6	5.56
Mining Cost + Water Trucks	108 612	133 611	242 223	1.3	2.42
Road Maintenance	35 728	25 520	61 248	0.3	0.61
Mine Development	17 163	28 606	45 769	0.3	0.46
Plant Cost	**139 805**	**370 967**	**510 771**	**3.7**	**5.11**
Mobile Equipments (FEL+Truck)	79 051	150 220	229 271	1.5	2.29
Maintenance	16 667	126 558	143 224	1.3	1.43
Electricity	34 087	94 189	128 276	0.9	1.28
Other Plant Costs	10 000	-	10 000	0.0	0.10
General Costs	**298 378**	**35 957**	**334 335**	**0.4**	**3.34**
Payroll - Campos Belos	148 417	27 485	175 902	0.3	1.76
Employee Lunch	30 750	5 694	36 444	0.1	0.36
Employee Transport	15 000	2 778	17 778	0.0	0.18
Land and Facilities Rental	82 211	-	82 211	0.0	0.82
Other	22 000	-	22 000	0.0	0.22
Total Cost	**599 686**	**1 150 216**	**1 749 902**	**11.5**	**17.50**

Table 21.2_3 summarizes the operating costs at Santiago DANF Project.

Table 21.2_3
Operating Costs

Item	Cost	Unit

Mine	Ore	9.05	US$/t mined
	Waste Rock	1.34	
Plant		5.11	
G&A		3.34	

21.3 Cash Flow

A cash flow scenario was developed to evaluate the project based on economic-financial parameters, on the results of the mine scheduling and on the OPEX estimate that was presented above. Table 21.3_1 shows the selling prices and taxes that were taken into account in the cash flow scenario mentioned above.

Table 21.3_1 **Selling Prices and Taxes**	
Selling price	
Product	Price (US$/t)
Product @12% P_2O_5	31
Product @15% P_2O_5	56
Taxes	
CFEM	2%
Surface Royalties	1%
Mine Closure Cost	0.2%
WACC	10%

According to subsection I in Article 1 of Decree 5.630/2005, the rates of the PIS and COFINS taxes are reduced to zero for the importation and internal commercialization of fertilizers. Regarding the ICMS tax, DuSolo has been granted a 60% reduction, which results in a rate of 4.8%. A total rate of 25% was taken into account for the remaining taxes.

With the aim of simplifying the tax issue, the taxes that apply to the EBIT were added, and the total value equaled 29.8%. Table 21.3_2 presents the Cash Flow of the DuSolo Santiago Phosphate Target PEA.

Table 21.3_2
Cash Flow

Period	1	2	3	4	5	6	7	8	9	10	11	12	13
Mined ore (Kt)	100	102	85	97	103	100	102	93	102	90	111	109	58
Mined waste rock (Kt)	43	100	30	84	87	93	75	99	69	41	12	115	61
Total mined material (Kt)	**143**	**202**	**115**	**181**	**190**	**193**	**176**	**192**	**171**	**130**	**123**	**224**	**119**
Mine OPEX (US$ x 1000)	(963)	(1 056)	(810)	(993)	(1 045)	(1 027)	(1 020)	(975)	(1 017)	(865)	(1 017)	(1 137)	(605)
Plant OPEX (US$ x 1000)	(511)	(520)	(435)	(497)	(524)	(510)	(519)	(476)	(522)	(458)	(565)	(555)	(295)
G&A (US$ x 1000)	(335)	(341)	(285)	(325)	(343)	(334)	(340)	(312)	(342)	(299)	(370)	(363)	(193)
Total OPEX (US$ x 1000)	**(1 809)**	**(1 916)**	**(1 530)**	**(1 815)**	**(1 911)**	**(1 871)**	**(1 880)**	**(1 763)**	**(1 882)**	**(1 622)**	**(1 952)**	**(2 055)**	**(1 093)**
Surface Royalties (US$ x 1000)	(54)	(56)	(47)	(50)	(51)	(48)	(45)	(36)	(42)	(33)	(36)	(31)	(16)
Operating costs	**(1 862)**	**(1 973)**	**(1 578)**	**(1 865)**	**(1 962)**	**(1 919)**	**(1 924)**	**(1 799)**	**(1 923)**	**(1 655)**	**(1 987)**	**(2 086)**	**(1 110)**
Operating cost per t produced	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(18)	(18)	(21)	(21)
Mine Closure Costs	(11)	(11)	(9)	(10)	(10)	(10)	(9)	(7)	(8)	(7)	(7)	(6)	(3)
Total Cost	**(1 873)**	**(1 984)**	**(1 587)**	**(1 875)**	**(1 972)**	**(1 929)**	**(1 933)**	**(1 806)**	**(1 932)**	**(1 662)**	**(1 994)**	**(2 092)**	**(1 113)**
Product @12% P_2O_5 (Kt)	8	2	-	16	25	29	47	63	60	68	103	100	53
Product @15% P_2O_5 (Kt)	92	100	85	82	78	71	55	30	43	22	7	-	-
Gross Revenue (US$ x 1000)	5 361	5 609	4 733	5 012	5 074	4 825	4 470	3 601	4 192	3 285	3 566	3 071	1 634
EBIT (zero depreciation)	**3 488**	**3 625**	**3 146**	**3 137**	**3 102**	**2 896**	**2 537**	**1 795**	**2 260**	**1 623**	**1 572**	**979**	**521**
Total taxes (29.8%)	(1 039)	(1 080)	(937)	(935)	(924)	(863)	(756)	(535)	(674)	(484)	(468)	(292)	(155)
Net Revenue (P/IPPJ)	**2 448**	**2 545**	**2 208**	**2 202**	**2 177**	**2 033**	**1 781**	**1 260**	**1 587**	**1 140**	**1 103**	**687**	**366**
CFEM (US$ x 1000)	(49)	(51)	(44)	(44)	(44)	(41)	(36)	(25)	(32)	(23)	(22)	(14)	(7)
Working Capital	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Profit	**2 399**	**2 494**	**2 164**	**2 158**	**2 134**	**1 993**	**1 745**	**1 235**	**1 555**	**1 117**	**1 081**	**673**	**358**
Cash Flow	2 399	2 494	2 164	2 158	2 134	1 993	1 745	1 235	1 555	1 117	1 081	673	358
NPV (US$ x 1000)	**13 051**	-	-	-	-	-	-	-	-	-	-	-	-

22 ECONOMIC ANALYSIS

22.1 Sensitivity Analysis

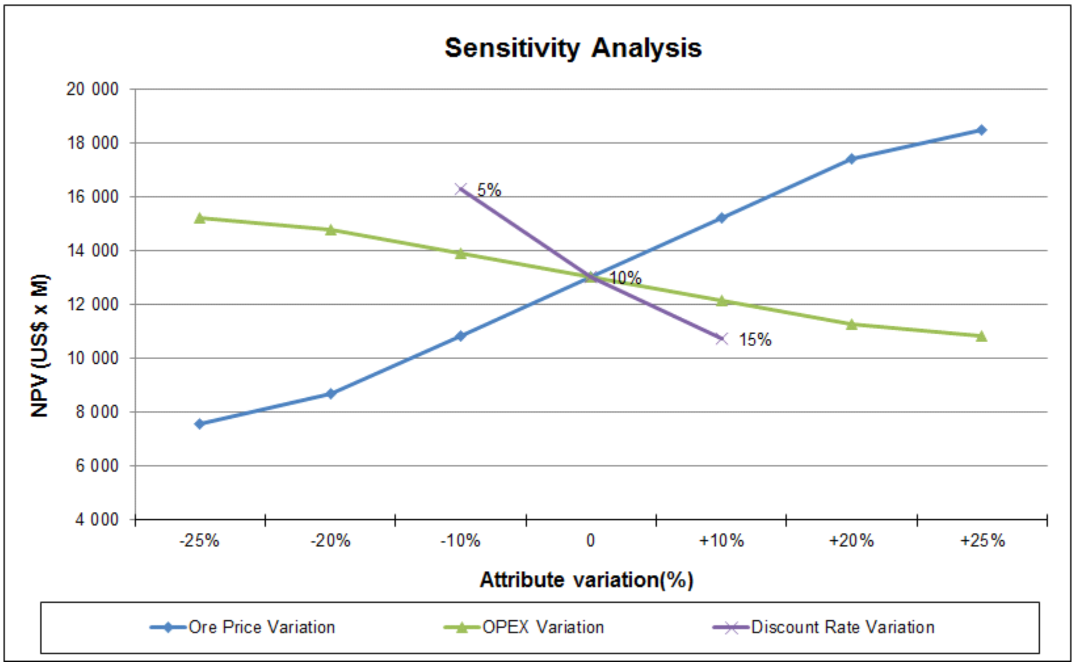
The sensitivity analysis was undertaken to evaluate the impact of the resulting economic indicators for the following attributes, within the cash flow:

- WACC;
- Product price;
- Total OPEX.

The WACC was evaluated by varying its value from 5% to 15%, in addition to the base value of 10%. The WACC and the OPEX were evaluated by varying their base values above and below 10%, 20% and 25%. The Figure 22.1_1 shows the sensitivity analysis developed by GE21.

Figure 22.1_1

Sensitivity Analysis



23 ADJACENT PROPERTIES

The majority of the mineral properties in the area are being explored for industrial minerals or fertilizer. MbAC and its wholly owned subsidiary Itafós Mineração Ltda, is the largest claim holder in the area with the Itafós Mine located 16km south of the Property in Goiás State. MbAC and its predecessors have been active in the area since 2004 and have acquired over 69,000 hectares of claims in both Tocantins and Goiás states. The authors has not been able to verify the adjacent property information and the information presented here is not necessarily indicative of the mineralization on the property that is the subject of this report.

23.1 Phosphates

The Property is located in an emerging phosphate belt of Brazil. The presence of phosphate was first discovered in 1960 by Metago, a state owned company. Little activity is documented over the next four decades. In 2004 Itafós Mineração Ltda ("Itafós"), a local company began exploration work and subsequently developed a small-scale phosphate operation in the Campos Belos area, 10 km south of the Property. Itafós held the claims that now comprise the Bomfim concessions, prior to their being acquired by Quantum Mineração.

DuSolo considers the larger Bomfim Project as a Brownfield regarding the close proximity of the MbAC SSP beneficiation plant. In 2008 MbAC Opportunities and Financing Inc. (MBAC O&F), a private company, acquired 100% of Itafós. The project was called the Arraias-Campos Belos Phosphate Project (Arraias Project). MbAC continued to drill and explore the property while keeping the production going.

In 2011 MbAC retained Andes Mining Services ("AMS") to update the resource model at Itafós. An updated resource was released in December 2011 (see Table 23.1_1) (Delboni Jr and Guzmán, 2013).

Table 23.1_1
Total of Mineral Resource

Category	Tonnage (Mt)	P_2O_5 (%)
Total M&I	79	4.94
Total Inferred	12.7	3.85

24 OTHER RELEVANT DATA AND INFORMATION

None relevant data was found.

25 INTERPRETATION AND CONCLUSIONS

The Santiago DANF Project was developed to produce DANF, using its high grade mineralization on phosphate, and has proved to be able to produce, economically, a 15% P_2O_5 and a 12% P_2O_5 products, saleable for the local agro-industries.

DANF has been produced and sold to local farmers at the surroundings of Itafós mine for the past 8 years. DANF production within the "Cerrado" region of Brazil is a simple and straight forward operation that requires the mining of a surficial high-grade phosphate mineralization, crushing, milling and then shipping to the farms within close vicinity to the project area.

This Mineral Resource Estimate of 0,29Mt@14.78% P_2O_5 Indicated and 0.82Mt@14.72% P_2O_5 Inferred Resource categories supports DuSolo's intention to produce DANF as a mean to create value for the project, and also allows DuSolo to arise capital to start the studies on more complex products.

The resource estimates were conducted using ordinary kriging interpolation after data validation, statistical analysis and a variography study. One meter composite samples were used in conjunction with the resource estimation. An average specific gravity (SG) of 1.67g/cm³.was used for the resource estimate. The average SG value is based on SG testing (93 samples) of representative ore types collected in situ. The water displacement method (Arquimedes Principle) was used to perform the density measurements. The reverse circulation drilling procedures are to high quality with >85% recovery. A total of 150 control tool samples (59 duplicates, 53 high and low-grade standards, 38 blanks) were inserted in the sample sequences of the reverse circulation drill holes.

No Mineral Reserve was declared, but the preliminary economic assessment concludes for a potentially viable project, considering a production rate of 100,000 tpy of DANF, for 12.5 years, producing 543kt @ 12%P_2O_5 and 635kt @15%P_2O_5 products, with no CAPEX, due to a facility already installed and in conditions for production at a estimated OPEX of US$17.50/t mined, and selling for an average price around US$42/t (US$56/t @15% P_2O_5, US$31/t @12% P_2O_5 product), reaching a NPV of US$13M.

26 RECOMMENDATIONS

26.1 Exploration Work and Resource

GE21 recommends DuSolo to advance in the research of the relationship between the phosphorite outcropping and the silexite ocurrences, leading to a model which discover and expand the high grade mineralization zones.

Also, is recommended to manage the start of exploratory work in the exploration potential area, in order to increase the resources for the project.

Is recommended that DuSolo's Lab restart the CaO analysis, and a certification process, including a umpire assay program, to be ready to support futher exploration campaigns.

GE21 suggests DuSolo to prepare a confirmation campaign to shift the resource classification from Indicate to Measured, and from Inferred to Indicated, at least, using RC drilling for infill and diamond drilling twin holes for certification of RC quality.

26.2 Quality Control and Quality Assurance

It is desirable for Dusolo to acquire a commercial standard with a P_2O_5 grade in the range of high quality material, from 10% to 20%, to better qualify the QA / QC program and determination of accuracy.

26.3 General Advance of the Project

To provide some idea of the potential improvement in NPV that a relocation of DuSolo's processing plant to a closer location could generate, GE21 have prepared a Plant Relocation Case assuming that haulage costs are significantly decreased, reducing the Mining Cost to US$1.39/t. This results in an increase to the NPV of approximately US$3.3m. GE21 has not made any assumption regarding a capital investment required for the move, and simply note that there is a reasonable increase NPV which could justify moderate expenditure of, for example USS$0,83-1,11m, in addition to the other benefits mentioned above.

Agroconsult provided a market study for the DANF products that DuSolo intends to produce. Assuming an average LOM production of 50,000t per year for each product, Agroconsults analysis suggests prices on Table 26.3_1.(Refer to Section 19)

Table 26.3_1
Agroconsult Prices

Product DANF	Price (US$/t)
12%	76,4
15%	93,7

These prices are higher than currently achieved, but Agroconsult notes that with the correct strategy of market and price development, branding etc these higher prices could be achieved.

Accordingly, GE21 have prepared an Upside Case Model using the higher Agroconsult prices, and assuming an increase in marketing and selling costs of US$1,11/t (approximately 50% increase in G&A). This results in an increase of the NPV to US$30,28m. GE21 recommends that management maintain its focus on marketing and sales prices, as this could provide significant improvements in the Santiago Project returns for limited increases in operating costs.

GE21 belives that the GUIA phase creates an excellent opportunity to implement a reconciliation program, It could validate the use of auger drilling as a tool for grade control. This program should consifder the reconciliation with the resource model as well.

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Appendix A

Certificates of Qualified Persons

Certificate of Qualified Person – Porfírio Cabaleiro Rodriguez

I, Mine Engineer Porfirio Cabaleiro Rodriguez, acted primary author of the report entitled "**DANF Santiago Project, Independent Technical Report - Preliminary Economic Assessment**", With respect to the DANF Santiago Project Project, which was prepared for DuSolo Fertilizers, and has an effective date of 2016, September 1st, I do hereby certify that:

I am a mining engineer and Associate Consultant for GE21 Consultoria Mineral, which is located on Avenida Afonso Pena, 3924, SL,207, Cruzeiro, Belo Horizonte, MG, Brazil - CEP 30130-009;

1. I am a graduate of the Federal University of Minas Gerais, located in Belo Horizonte, Brazil, and hold a Bachelor of Science Degree in Mine Engineering (1978). I have practised my profession continuously since 1979.
2. I am a professional mining engineer, with more than 36 years relevant experience in ore resource and reserves estimation, which includes numerous iron ore properties in Brazil, in addition to phosphate ore.
3. I am a member of the Australian Institute of Geoscientists ("AIG") - ("MAIG") #3708.
4. I am a "competent person", as that term is defined in the JORC Code (the "Instrument").
5. I supervised and am jointly responsible for all sections of this report.
6. I visited the DANF Santiago Project in August 2016.
7. I am independent of DuSolo Fertilizers, pursuant to section 1.5 of the Instrument.
8. I have had no prior involvement with the property that is the object of this Technical Report.
9. I do not have, nor do I expect to receive, direct or indirect participation in DuSolo Fertilizers, or DANF Santiago Project, and I do not benefit directly or indirectly from any stock associated with the DANF Santiago Project or any associate or affiliate of such company.
10. On the effective date of this Technical Report, to the best of my knowledge, information, and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to ensure that the Technical report is accurate in all respects.

Belo Horizonte, Brazil, 2017, , 2017, May 5.

Porfirio Cabaleiro Rodriguez
MAIG 3708

Porfirio Cabaleiro Rodriguez
BSc. (MEng), MAIG #3708

AUSTRALIAN INSTITUTE OF GEOSCIENTISTS
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Annual Membership Certificate 2016/2017

The Council of the Australian Institute of Geoscientists hereby certifies that

Mr Porfirio Cabaleiro Rodriguez MAIG

(# 3708)

is a current, financial member of the Institute, as stipulated in the Articles of Association, has agreed to be bound by the Institute's Code of Ethics, and holds the membership level of Member.

Mike Erceg	Anne Tomlinson
President	Councillor for Membership

Current to 30th June 2017

Joining date: 13th February 2008

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Certificate of Qualified Person – Fábio Valério Câmara Xavier

I, Geologist Fábio Valério Câmara Xavier, acted secondary author of the report entitled "**DANF Santiago Project, Independent Technical Report - Preliminary Economic Assessment**", With respect to the DANF Santiago Project Project, which was prepared for DuSolo Fertilizers, and has an effective date of 2016, September 1st, I do hereby certify that:

I am a geologist and Associate Consultant for GE21 Consultoria Mineral, which is located on Avenida Afonso Pena, 3924, SL,207, Cruzeiro, Belo Horizonte, MG, Brazil - CEP 30130-009;

1. I am a graduate of the Federal University of Rio Grande do Norte, located in Natal, Brazil, and hold a Bachelor of Science Degree in Geology (2003). I have practised my profession continuously since 2003.
2. I am a professional geologist, with more than 12 years relevant experience in ore resource estimation and geology exploration, which includes numerous iron ore properties in Brazil, in addition to phosphate ore.
3. I am a member of the Australian Institute of Geoscientists ("AIG") - ("MAIG") #5179.
4. I am a "competent person", as that term is defined in the JORC Code (the "Instrument").
5. I participated and I am jointly responsible for geological and estimative sections of this report.
6. I visited the DANF Santiago Project in August 2016.
7. I am independent of DuSolo Fertilizers, pursuant to section 1.5 of the Instrument.
8. I have had no prior involvement with the property that is the object of this Technical Report.
9. I do not have, nor do I expect to receive, direct or indirect participation in DuSolo Fertilizers, or DANF Santiago Project, and I do not benefit directly or indirectly from any stock associated with the DANF Santiago Project or any associate or affiliate of such company.
10. On the effective date of this Technical Report, to the best of my knowledge, information, and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to ensure that the Technical report is accurate in all respects.

Belo Horizonte, Brazil, 2017, , 2017, May 5.

Fábio Valério Câmara Xavier
MAIG 5179

Fábio Valério Câmara Xavier
Geologist BSc. MAIG #5179

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Mike Erceg
President

Anne Tomlinson
Councillor for Membership

Current to 30th June 2017

Joining date: 11st July 2012

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Certificate of Qualified Person – Mário Conrado Reinhardt

I, Geologist Mário Conrado Reinhardt, acted secondary author of the report entitled "**DANF Santiago Project, Independent Technical Report - Preliminary Economic Assessment**", With respect to the DANF Santiago Project Project, which was prepared for DuSolo Fertilizers, and has an effective date of 2016, September 1st, I do hereby certify that:

I am a geologist and director for GE21 Consultoria Mineral, which is located on Avenida Afonso Pena, 3924, SL,207, Cruzeiro, Belo Horizonte, MG, Brazil - CEP 30130-009;

1. I am a graduate of the Federal University of Bahia, located in Salvador, Brazil, and hold a Bachelor of Science Degree in Geology (1979). I have practised my profession continuously since 1979.
2. I am a professional geologist, with more than 36 years relevant experience in ore resource estimation and geology exploration, which includes numerous iron ore properties in Brazil, in addition to phosphate ore.
3. I am a member of the Australian Institute of Geoscientists ("AIG") - ("MAIG") #3707.
4. I am a "competent person", as that term is defined in the JORC Code (the "Instrument").
5. I participated and I am jointly responsible for geological and estimative sections of this report.
6. I visited the DANF Santiago Project in August 2016.
7. I am independent of DuSolo Fertilizers, pursuant to section 1.5 of the Instrument.
8. I have had no prior involvement with the property that is the object of this Technical Report.
9. I do not have, nor do I expect to receive, direct or indirect participation in DuSolo Fertilizers, or DANF Santiago Project, and I do not benefit directly or indirectly from any stock associated with the DANF Santiago Project or any associate or affiliate of such company.
10. On the effective date of this Technical Report, to the best of my knowledge, information, and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to ensure that the Technical report is accurate in all respects.

Belo Horizonte, Brazil, 2017, , 2017, May 5.

Mário Conrado Reinhardt
MAIG 3707

Mário Conrado Reinhardt
Geologist BSc. MSc MAIG #3707

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Mr Mario Conrado Reinhardt MAIG

(# 3707)

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Mike Erceg President	Anne Tomlinson Councillor for Membership

Current to 30th June 2017

Joining date: 14th February 2008

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Certificate of Qualified Person – Bernardo Horta de Cerqueira Viana

I, Geologist Bernardo Horta de Cerqueira Viana, acted secondary author of the report entitled "**DANF Santiago Project, Independent Technical Report - Preliminary Economic Assessment**", With respect to the DANF Santiago Project Project, which was prepared for DuSolo Fertilizers, and has an effective date of 2016, September 1st, I do hereby certify that:

I am a geologist and director for GE21 Consultoria Mineral, which is located on Avenida Afonso Pena, 3924, SL,207, Cruzeiro, Belo Horizonte, MG, Brazil - CEP 30130-009;

1. I am a graduate of the Federal University of Minas Gerais, located in Belo Horizonte, Brazil, and hold a Bachelor of Science Degree in Geology (2002). I have practised my profession continuously since 2002.
2. I am a professional geologist, with more than 14 years relevant experience in ore resource estimation and geology exploration, which includes numerous iron ore properties in Brazil, in addition to phosphate ore.
3. I am a member of the Australian Institute of Geoscientists ("AIG") - ("MAIG") #3709.
4. I am a "competent person", as that term is defined in the JORC Code (the "Instrument").
5. I participated and I am jointly responsible for geological and estimative sections of this report.
6. I visited the DANF Santiago Project in August 2016.
7. I am independent of DuSolo Fertilizers, pursuant to section 1.5 of the Instrument.
8. I have had no prior involvement with the property that is the object of this Technical Report.
9. I do not have, nor do I expect to receive, direct or indirect participation in DuSolo Fertilizers, or DANF Santiago Project, and I do not benefit directly or indirectly from any stock associated with the DANF Santiago Project or any associate or affiliate of such company.
10. On the effective date of this Technical Report, to the best of my knowledge, information, and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to ensure that the Technical report is accurate in all respects.

Belo Horizonte, Brazil, 2017, May 5.

Bernardo H. C. Viana
MAIG 3709

Bernardo H C Viana
Geologist BSc. MBA MAIG #3709

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The Council of the Australian Institute of Geoscientists hereby certifies that

Mr Bernardo Horta De Cerqueira Viana MAIG

(# 3709)

is a current, financial member of the Institute, as stipulated in the Articles of Association, has agreed to be bound by the Institute's Code of Ethics, and holds the membership level of Member.

Mike Erceg
President

Anne Tomlinson
Councillor for Membership

Current to 30th June 2017

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