NO.

REPORT
ON
THE MINERAL EXPLORATION
IN
THE ALTA · FLORESTA AREA
FEDERATIVE REPUBLIC OF BRAZIL

(PHASE Ⅱ)

MARCH 2000

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

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PREFACE

In response to the request of the Government of the Federative Republic of Brazil, the Japanese Government decided to conduct a Mineral Exploration Project in the Alta Floresta Area and entrusted the project to the Japan International Cooperation Agency (JICA) and the Metal Mining Agency of Japan (MMAJ).

JICA and MMAJ sent to Brazil a survey team composed by 5 menbers from July 12, 1999 to November 28, 1999.

The team exchanged views with the officials concerned of the Government of Brazil and conducted a field survey in the Alta Floresta area. After the team returned to Japan, further studies were made and the present report has been prepared. This report includes the survey results of geological, geochemical and drilling surveys carried out during Phase II.

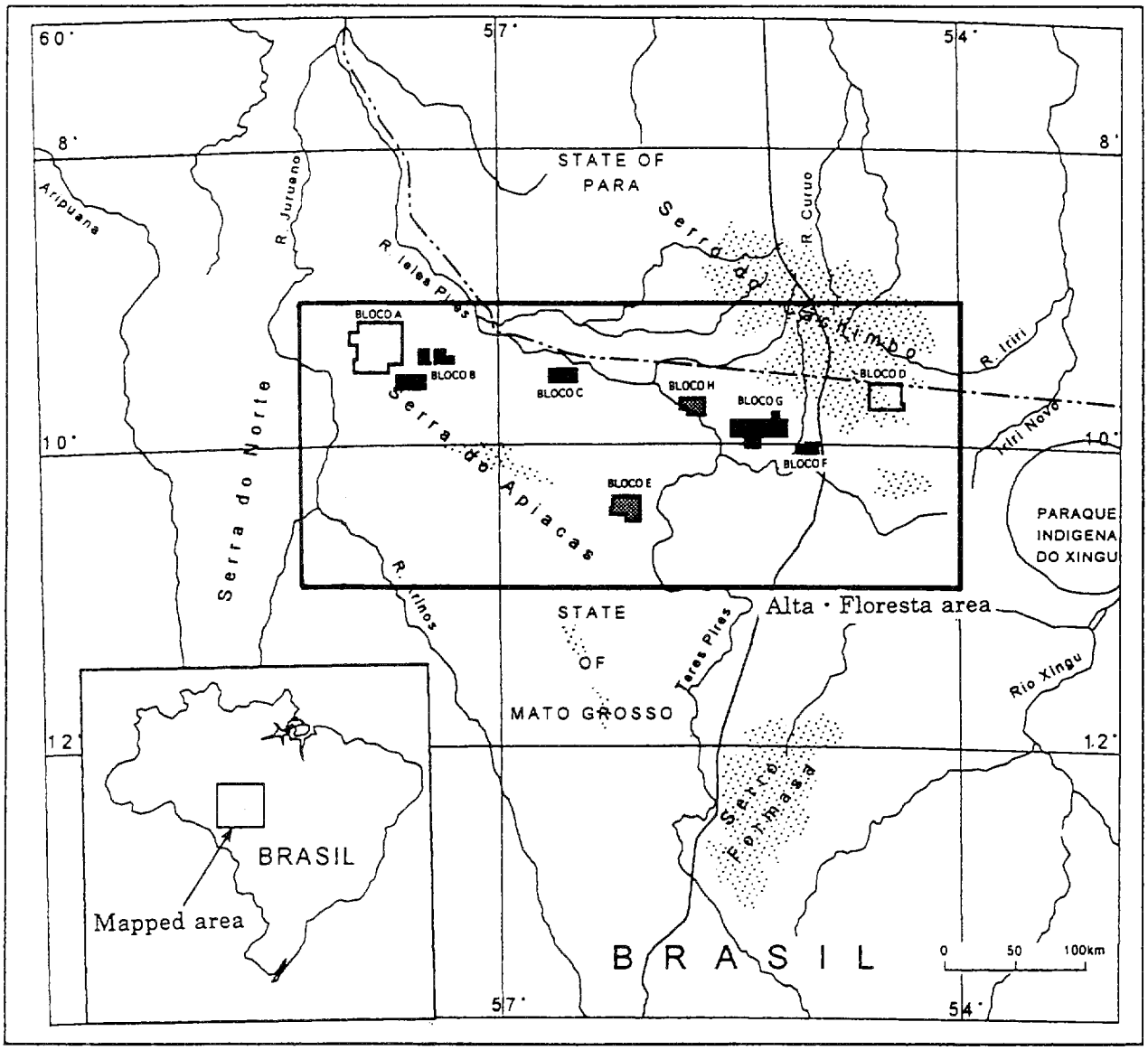
We hope that this report will be useful for the development of the mineral resources in Brazil and contribute to the promotion of friendly relations between Japan and Brazil.

We wish to express our deep appreciation to the officials concerned of the Government of Brazil for their close cooperation extended to the team.

March, 2000

Kimio Fujita
President
Japan International Cooperation Agency

Naohiro Tashiro
President
Metal Mining Agency of Japan



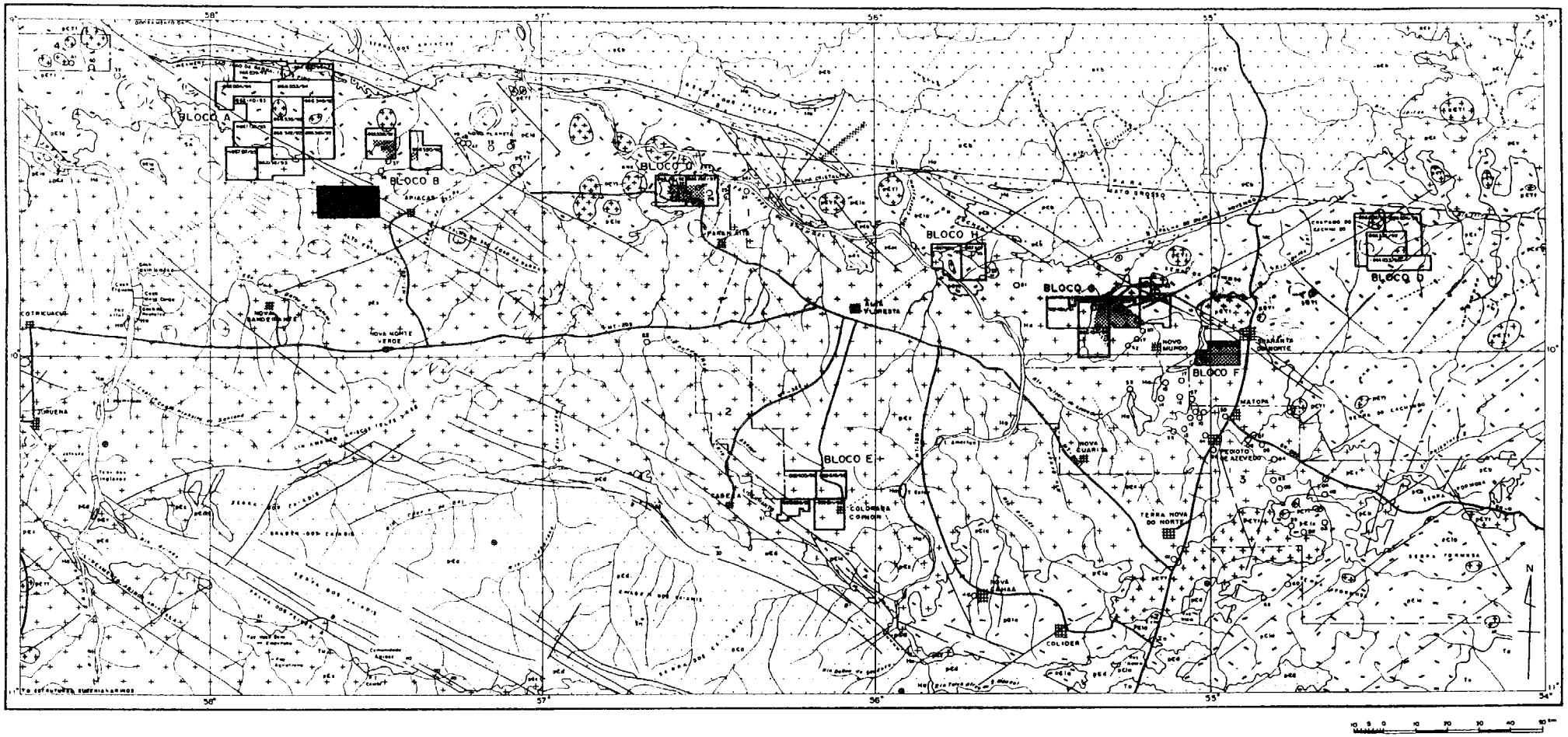
Alta · Floresta area

Mining claim area

Phase I Survey Areas

Phase II Survey Area

Fig. 1 Location map of the project area in Brazil



▒ Geochemical Survey area

▬ Geological Survey area

Drilling survey will be carried out in Block B, C and F.

Fig. 2 Location map of the survey areas in Alta Floresta area

ABSTRACT

In accordance with the Scope of Work signed on 6th July 1998 between the Governments of Japan and the Federative Republic of Brazil, a mineral exploration project was carried out in Alta Floresta, Brazil in order to discover a new ore deposits in the survey area.

This project started in 1998, with duration of three years, and the present report describe the survey results of the second year (Phase II).

Survey results from first year, indicated a high gold potentiality in B and C blocks and a high gold and copper potentiality in F and G blocks and these areas were recommended as survey areas for the Phase II.

During Phase II of the present project and based on the recommendations of the Phase I results, it was decided to carry out a semidetailed soil geochemical survey, auger geochemical survey and drilling survey in B and C block. A geological survey, soil geochemical survey, auger survey and a drilling survey was carried out in F block. A regional soil geochemical survey was carried out in G block.

The survey results confirmed a very close association between gold mineralization and shearing structure in the Alta Floresta region.

The soil geochemical survey carried out in B block confirmed three large gold anomaly zones, named Northwest zone, Southeast zone and Northeast zone. These anomalies presented an elongated pattern trending along the direction NW-SE, which suggest the existence of a shearing structure in this direction. Gold garimpo survey within B block presented high gold contents with maximum values of 379.36 g/t of Au and a 6m wide channel sampling presented an average grade of 70.52g/t Au and 6.05g/t Ag. Preliminary auger survey confirmed that the gold anomaly in saprolite is narrower than in soil. 7 boreholes with a total length of 403.05m were performed in B block and the best intercepts were obtained in 4 boreholes, i.e., MJBA-8, MJBA-11, MJBA-12 and MJBA-13. Gold mineralization in borehole MJBA-8 was closely related to sub-vertical shearing zones. The most sheared section in the borehole MJBA-8 were between 43.00m and 69.00m, for which the analytical gold results within this 26m interval presented an average of 0.21g/t Au and a maximum gold value of 0.73g/t. Others boreholes such as, MJBA-11, MJBA-12 and MJBA-13, also presented gold mineralization probably related to sub-vertical shear zones.

The main shearing direction in C block is NW-SE direction, well represented by the distribution of gold anomaly detected by soil geochemical survey. Others direction are the ENE-WSW and NNW-SSE directions. Gold garimpo (C8401700), located inside a shearing with NNW-SSE direction, presented samples with high gold and silver values. Results of auger geochemical survey in C block bears a similarity with the results of B block presenting narrow gold anomalies within saprolite. 4 boreholes with a total length of 202.10m performed within C block confirmed that the gold mineralizations are strongly controlled by the shearing structure. The evidence of a relationship between shearing structure and gold mineralization open a good perspective for finding a major gold deposits related to shearing structures in the C block, as well as in B

block.

Serrinha do Guaranta garimpo and Aluizio garimpo are two gold primary garimpos in F block. Geological survey in Serrinha do Guaranta confirmed that gold mineralization is related to sulphide rich quartz veins filling a NW direction subvertical ductile shearing in talc-chlorite schist. Previous survey had indicated evidence of copper dissemination in Serrinha do Guaranta area, as exemplified by the analytical results from 32 meters of channel sampling in weathered talc chlorite schist that showed a lateral average grade of 0.43% Cu. Gold results in the same 32 meters presented low-grade gold values and the best values for 2m wide sample were 2.33 ppm, 0.52 ppm and 0.13 ppm. The geological survey in Aluizio Garimpo confirmed that the gold mineralization in Aluizio is confined in sulphide rich quartz veins that fills a N80W direction-shearing zone. The quartz vein is pyrite rich and it is inserted in a shear zone that averages 8 meters width and a confirmed length of more than 500 meters. The regional geochemical survey and the auger survey in Serrinha do Guaranta confirmed that the Serrinha do Guaranta gold anomaly extends toward north. The auger survey also showed that the gold mineralization of Serrinha do Guaranta is not continuous and probably present an orebody with boudin form. The borehole MJBA-1 in Serrinha do Guaranta garimpo confirmed that gold bearing sulphide rich quartz vein fills the NW direction subvertical ductile shearing in talc-chlorite schist. It also confirmed copper mineralization in schist with average copper grade in 10m coring of 1.41%. The borehole MJBA-2 in Aluizio Garimpo confirmed that gold mineralization is associated to quartz veins and the maximum gold grade obtained was 1.5g/t Au in 1m coring.

The soil geochemical survey carried out in G block showed a broad gold anomaly in soil at the southwestern part of the survey area. During fieldwork were surveyed 4 gold garimpos with the following results. The quartz veins in Zanete garimpo returned gold results between 28.73g/t and 45.06g/t. The sulfide rich silicified rock of Pezao garimpo presented gold values between 0.65g/t and 35.71g/t. The Edmar garimpo showed gold results between 0.01g/t and 60.45g/t in py rich altered granite. The sulfide rich altered granite from Luizao garimpo presented 6.49g/t Au. The above sampling results are a strong indication that G block holds high-grade gold mineralization and it open a good perspective of finding a major gold deposit in the area.

Phase II soil geochemical survey in B, C, F and G blocks confirmed innumerous large gold anomalies zones and the results of the auger geochemical survey in B, C and F blocks confirmed the utility of the auger method for detailing gold anomalies. For Phase III, it is recommended a further detailing of the gold anomalies by soil geochemical and auger geochemical survey and later a grid drilling survey to evaluate the gold orebodies at depth.

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PART II SURVEY RESULTS

PART I GENERALITIES

CHAPTER 1 INTRODUCTION

1-1 Background

In accordance with the Scope of Work signed on 6th July 1998 between the Governments of Japan and the Federative Republic of Brazil, a mineral exploration project was carried out in Alta Floresta, Brazil.

This project started in 1998 with duration of three years and it aimed at discovering new mineral deposits in the survey area.

Survey results from first year, indicated a high gold potentiality in the blocks B and C and a high gold and copper potentiality in the block F and G and these areas were recommended as survey areas for the Phase II. The present report describes the survey results of the second year (Phase II).

1-2 Conclusions and recommendations from Phase I

1-2-1 Conclusions from Phase I

The geology of B block is represented by early Proterozoic pre-Uatuma Granite, middle Proterozoic Iriri Formation and Teles Pires Granite and Basic dykes. The regional scale WNW-ESE shearing zone is the main geological structure and it embodies most of the primary gold garimpo in the B block area. Sampling in sulfide rich quartz veins within primary gold garimpo indicated gold values of 100.00 g/t, silver grades of 127.2 g/t and copper of 3.86 %, showing a potentiality of the survey area in holding high grade gold mineralization. The soil geochemical survey showed a NW-SE oriented large gold anomaly zone in the central south part of the B block.

The geology of C block is represented by early Proterozoic pre-Uatuma Granite, middle Proterozoic Iriri Formation and Teles Pires Granite and Basic dykes. A shearing structure with NW-SE direction is the most important geological structure in C block area. Sampling within primary gold garimpo, indicated a gold values in sulphide rich quartz vein of 130 g/t, and in silicified granite of 11.20 g/t, showing a potentiality of the survey area in holding high grade gold mineralization. The soil geochemical survey showed a large gold anomaly in the central part of the C block.

The geology of F block is represented by Archean to Lower Proterozoic Xingu Complex and Basic dykes. The shearing structures in the F block is WNW-ESE oriented and gold garimpo as Aluizio garimpo and Serrinha do Guaranta garimpo are embodied within these shearing structure. Results from channel samples in Serrinha do Guaranta garimpo showed a wide copper dissemination in talc chlorite schist, with average grade of 0.43% Cu in 32 meters. The talc chlorite schist also holds gold

mineralizations as proved by the average gold grade in 2m channel samples with 2.33g/t, 0.52g/t and 0.13g/t Au. The Phase I survey indicated that Serrinha do Guaranta and Aluizio garimpo areas have the most favorable geological and tectonical conditions to host a major gold and copper deposit in the block F area.

The geology of G block is represented by Archean to lower Proterozoic Xingu Complex, early Proterozoic pre-Uatuma Granite, middle Proterozoic Iriri Formation, Teles Pires Granite and Beneficiente sediments and Basic dykes. Results of Phase 1 survey showed a large shear zone with several kilometers wide and NW trending that connects two biggest primary garimpos in the region of G block, named Luizao garimpo and Pezao garimpo. The Phase 1 survey results also indicated that the most favorable area to find a major gold deposit within G block is inside the wide shear zone.

1-2-2 Recommendations for the Phase II Survey

Survey results from first year, indicated a high gold potentiality in the B and C blocks and a high gold and copper potentiality in the F and G blocks, and these areas were recommended as survey areas for the Phase II.

At first stage, it was recommended a detailed geological survey, a detailed soil geochemical survey and trench survey. At second stage, it was considered a geophysical survey (IP and magnetometry) and trench. In the last stage, drilling survey was proposed to confirm the gold mineralization at depth.

1-3 Generalities of the Phase II Survey

1-3-1 Survey area

The Phase II survey was carried out in the B, B south, C, F and G block, as shown on Fig. 2. The B block and B south block is located at northern and western part, respectively from Apiacas City. The C block is located at northwestern part from Paranaita City. The F block is located at northern part from Matupa City, and the G block is located at northwest from Novo Mundo City.

1-3-2 Objectives of the survey

The survey aimed at discovering new mineral deposits in the Alta Floresta by clarifying the geological setting and characteristics of mineral deposits.

The geochemical survey carried out in the B, C, F and G block aimed at first, to identify gold and copper anomalies in soil and later, by detailing the soil anomaly with auger, detect gold and copper anomalies within saprolite. The auger geochemical survey was carried out in B, C and F blocks.

The drilling survey aimed to confirm gold and copper anomalies in depth and clarifies the tectonics

and alteration related to these mineralizations. The drilling survey was carried out in B, C and F block.

Geological survey was carried out in the B south block and in the surrounding areas of Serrinha do Guaranta and Aluizio garimpos, in F block. The geological survey in the garimpo areas aimed to check the relationship between geology, geological structure and mineralization while the geological survey in the B south block aimed to investigate the gold and copper potentiality of the surveyed area.

1-3-3 Content and amount of work

The Phase II survey consisted from geochemical survey, drilling survey and geological survey. For this survey, both the soil geochemical survey and the hand auger survey were considered as parts of the geochemical survey.

Table I-1-1 Content and Amount of Work

Survey Content	Amount of work			
Geochemical Survey (by Soil)	Survey Block	B, C, F and G		
	Survey line length	479.5 km		
	Survey sites	4,899 points		
	No. of soil samples	4,899 samples		
(by Auger)	Survey Block	B, C and F		
	Survey line length	17.05 km		
	Auger survey sites	364 points		
	Auger dig length	2,134 m		
	No. of auger samples	2,134 samples		
Drilling Survey	Survey Block	Hole Name	Inclination (Direction)	Length
	Block F	MJBA-1	-60 degrees (S45W)	100.15 m
	Block F	MJBA-2	-60 degrees (N20E)	100.55 m
	Block C	MJBA-3	-90 degrees	50.30 m
	Block C	MJBA-4	-90 degrees	50.45 m
	Block C	MJBA-5	-90 degrees	50.70 m
	Block C	MJBA-6	-90 degrees	50.65 m
	Block B	MJBA-7	-90 degrees	50.80 m
	Block B	MJBA-8	-90 degrees	100.15 m
	Block B	MJBA-9	-90 degrees	50.05 m
	Block B	MJBA-10	-90 degrees	50.55 m
	Block B	MJBA-11	-90 degrees	50.15 m
	Block B	MJBA-12	-90 degrees	50.65 m
	Block B	MJBA-13	-90 degrees	50.70 m
	Total	13 holes		805.85 m
Geological Survey	Survey Block	F Block		
	Survey Area	3.0 km^2		
	Survey route	15.0 km		

Table I-1-2 Laboratory Work

Survey Contents	Laboratory work	
Geochemical Survey	①Chemical analysis (18 elements)	6,981 samples
	②Chemical analysis (Au)	152 samples
Geological Survey	①Thin section	32 samples
	②Polished section	39 samples
	③X-ray diffraction analysis	36 samples
	④Chemical analysis for ore assay	204 samples
	⑤Fluid inclusion	20 samples
	⑥Dating (U/Pb method)	9 samples
	(Pb/Pb method)	1 sample
Drilling Survey	①Thin section	58 samples
	②Polished section	44 samples
	③X-ray diffraction analysis	46 samples
	④Chemical analysis for ore assay	838 samples
	⑤Fluid inclusion	5 samples

Analyzed element (18): Au, Ag, Cu, Pb, Zn, Fe, As, Sb, Hg, Bi, Cd, Co, Ni, V, Mn, Mo, K, W

Geochemical survey samples consist of soil samples (4,897), auger samples (2.134) and Check analysis samples (100).

1-3-4 Survey Members of the Project

The following members participated in the project:

(1) Field work

Japanese counterpart		Brazilian counterpart	
Motomu Goto	Team Leader	Nilson Batista de Souza Principal geologist	(DNPM/MT)
Junichi Yamagata	Geochemist	Amóss de Melo Oliveira Geologist	(DNPM/MT)
Hisashi Matsuba	Geochemist	Jair de Freitas Geologist	(DNPM/MT)
Yoshimitsu Negishi	Geochemist	Jocy Gonçalo de Miranda Geologist	(DNPM/MT)
Masaharu Kaedei	Geochemist	Claudio Recht Geologist	(DNPM/BRS)
		Jose Raimundo dos Anjos Geologist Assistant	(DNPM/BRS)
		Emanuel Teixeira de Queiroz Director	(DNPM/BRS)
		Carlos Schobbenhaus DivisionChief	(DNPM/BRS)
		Jose da Silva Luz Regional Chief	(DNPM/MT)
		Gercino Domingos da Silva Geologist	(METAMAT)
		Isaias Mamore de Souza Geologist	(METAMAT)
		Antonio João Paes de Barros Geologist	(METAMAT)
		Jesue Antonio da Silva Geologist	(METAMAT)
		Wanderlei Magalhães de Resende Director	(METAMAT)

DNPM: Departamento Nacional de Produção Mineral

METAMAT: Companhia Matogrossense de Mineração

(2) Field Inspection

Japanese counterpart	
Yoshiaki Igarashi	(MMAJ Santiago office)
Takeshi Harada	(MMAJ)

MMAJ: Metal Mining Agency of Japan

1-3-5 Survey Period

The Phase II survey were conducted in Brazil during the following period:

Project planning and negotiation:	25th August to 4th September 1999
	21st to 27th November 1999
Geochemical survey:	12th July to 28th November 1999
Drilling survey:	1st September to 11th November 1999
Geological survey:	2nd August to 17th August 1999

CHAPTER 2 GEOGRAPHY OF THE SURVEY AREA

2-1 Location and Access

The Federative Republic of Brazil, accounting as the biggest country in South America, has an area of approximately 8.540.000 km^2. The population is about 157 million and its capital city is Brasilia.

Alta Floresta area is located in the northern part of the Mato Grosso State at about 800 km north from capital Cuiaba (Fig.1).

The main road that accesses the survey area is the BR163, which connects the capital Cuiaba with Santarem City in the Para State. The BR163 crosses the eastern part of the survey area at the city of Matupa. It takes about 12 hours by vehicle for 790 km from Capital Cuiaba to Alta Floresta City. From Alta Floresta City to Apiacas City it take about 6 hours by vehicle for about 180 km of gravel road.

2-2 Topography and Drainage System

The Alta Floresta region, including all the survey areas, is located in a residual plateau known as Depressoes da Amazonia Meridional (Fig. I-2-1). The topography of the region is almost flat but present at northern and southern portion a continuous range of high topographic relief. The high topography is related to two graben structures that run along WNW-ESE direction. The altitude at the central part of the area has an elevation of 150 m to 350 m and it forms gentle hills within the area. The elevations at the northern and southern portion are higher than 500 m.

The main river that runs in Alta Floresta region is the Rio Teles Pires with many tributaries as Rio Apiacas and Rio Paranaita.

2-3 Climate and Vegetation

The survey area belongs to Amazon tropical rain forest that presents high temperature and high humidity. Original forest is still present at the northern part of the Alta Floresta region. But at the southern part, cattle farms and large plantations are widely distributed.

In the survey area there are two well-defined seasons i.e., dry season from April to October and rainy season from November to March.

CHAPTER 3 EXISTING GEOLOGICAL DATA

3-1 General Geology of the Surrounding Area

The Fig I-3-1 that shows the study area is an interpretation map from Landsat TM Imagery and its generalized stratigraphic column is shown in the Fig I-3-2.

In the survey area, the basement is built up by high to medium-grade metamorphic rocks including granitoids. These rocks are overlain by a slightly to nonmetamorphic and widely distributed platform cover, deposited between about 1.9 Ga to 1.0 Ga, which was in turn intruded by anorogenic granitoids and, locally, by basic and alkaline rocks.

The oldest unit present in the Alta Floresta area is represented by a granite-gneiss-migmatite terrain referred by Silva et al. (1974) to as the Xingu Complex of archean to paleoproterozoic age.

During the Mesoproterozoic, the Amazonian Craton was a scenario of a widespread granitic and volcanic event, called the Uatuma Magmatism (Uatuma Supergroup).

After Uatuma Magmatism, the rocks of the Xingu Complex and the Uatuma Supergroup are overlain by Mesoproterozoic platform sediments of the Beneficente and Dardanelos groups that are interpreted as deposited within graben system named Caiabis and Cachimbo.

(a) Xingu Complex

The Xingu Complex is composed mostly by gneiss, schist, granodiorite, quartz-diorite, tonalite, migmatite, BIF and intrusives granitoids. The granitoids are widely intruded in the Xingu Complex and clearly present distinctive characteristics between intrusive ages and genesis.

(b) Pre Uatuma Granites

As shown on Fig. I-3-2, the pre-Uatuma granites were divided into three types, as follows:

(1) Type I

Based in certain similarity observed in field, the type I was associated with Juruena types granitoid. The type I granitoid shows a variety of lithologic types: tonalitic granite, granodiorite, adamelitic monzonite, quartz-monzodiorite, quartz-diorite and quartz-syenite, with predominance of adamellite or granodiorite. The type I granitoid consists of a granodioritic mass with basement composition and without intrusive features. They form large batholiths, which are dominantly isotropic, but also foliated and banded with their main composition going from monzogranitic to granodioritic. It was defined as a massif composed of porphyritic rocks, generally gneissic rocks, and coeval with the Transamazonian

Orogeny. Dating analysis by Rb/Sr resulted in 1947 Ma. (Santos & Reis Neto, 1982).

(2) Type 2

The type 2 was associated with hydrothermally altered granite as exemplified by Matupa type granitoid.

The Matupa granite, as the Juruena granodiorite, has been poorly studied, however, it is not seen correlated with the anorogenic magmatism of the central Amazonian Province. As dated as 1872 Ma by the Rb/Sr method, it has been defined as a type I undeformed and homogenous biotite monzogranite (Botelho et al, 1997). Geochemical data indicate that either a volcanic arc or post-collisional emplacement took place soon after the Transamazonian Orogeny (Moura et al, 1995). It strength the interpretation given by Teixeira et al. (1989) for this area, i.e., the zone of collision between the Rio Negro-Juruena magmatic arch with the Central Amazonian continental mass.

(3) Type 3

As the type 3, it was included the alkaline granite and syenitic biotite granite described in the Alta Floresta region.

(c) Uatuma Group

The Uatuma magmatism is represented in the Alta Floresta area by low metamorphosed acid to intermediate volcanics of the Iriri Formation (~1650 Ma by Rb/Sr), also called Teles Pires volcanic, and Teles Pires granitic intrusive (~1600 Ma by Rb/Sr).

The volcanic rocks, which show an calc-alkaline tendency, were genetically generated in the mantle or lower crust by partial fusion giving an initial basaltic magma. The differentiation to rocks of felsic composition, like dacite, rhyodacite and rhyolite are interpreted to be generated by gradual fractioning during crystallization (Montalvao, 1982).

The granitic intrusions are in general related with circular morphologic features, in association with rocks of subvolcanic characteristics with alaskitic tendency.

The most common Teles Pires granitic lithotypes are porphyry granite, microgranite, rapakivi granite and granite, mainly of calc-alkaline composition (Silva et. al., 1980).

(d) Beneficente Group

More than 1,000 m in thickness of the Beneficente Group was deposited between 1.6-1.4 Ga. in a SE-NW direction oriented continental rift. Morphologically, this unit of very large and uniform regional expression is represented by the Chapada do Cachimbo that occurs in the northern/northwestern sector

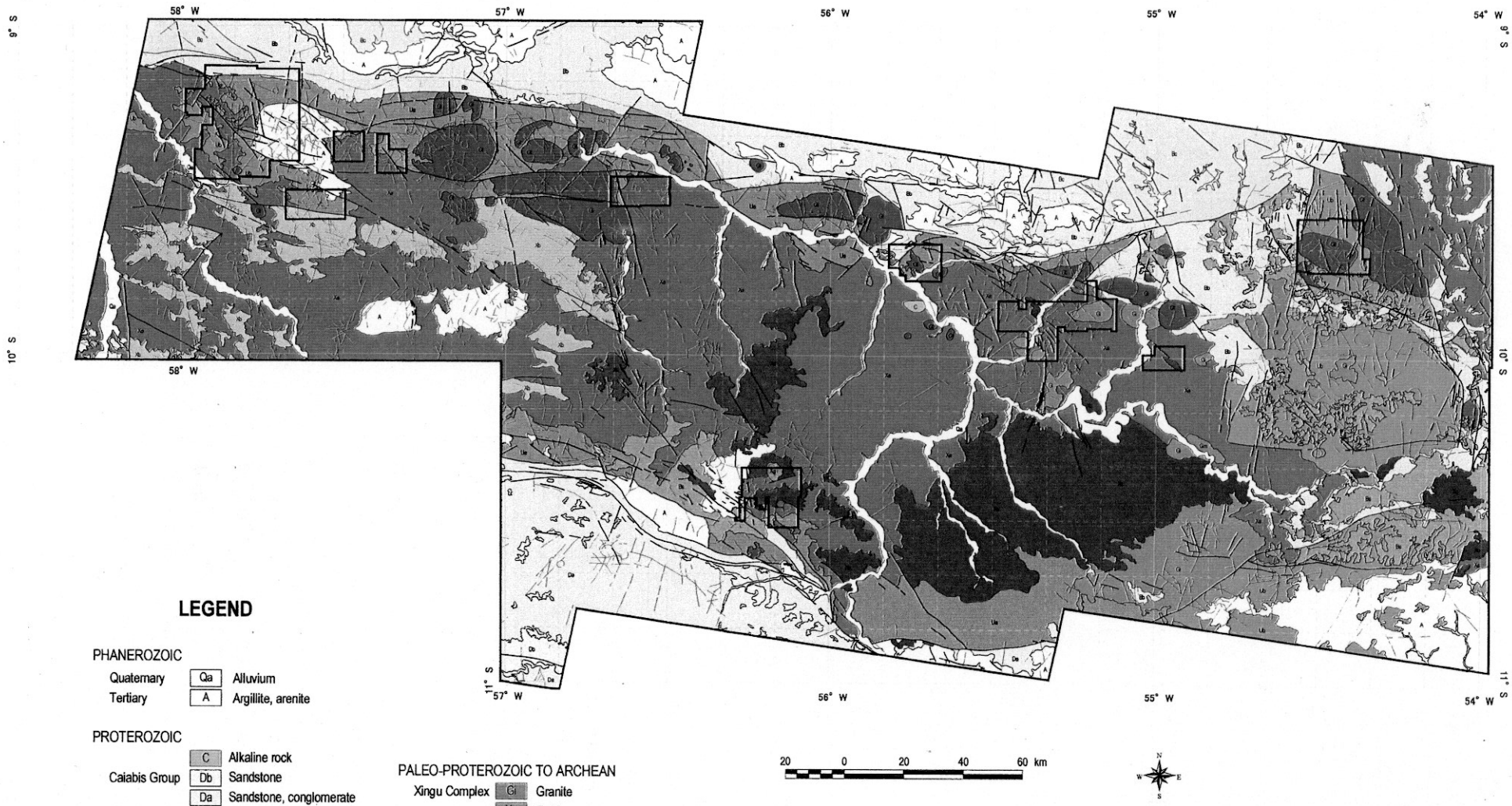
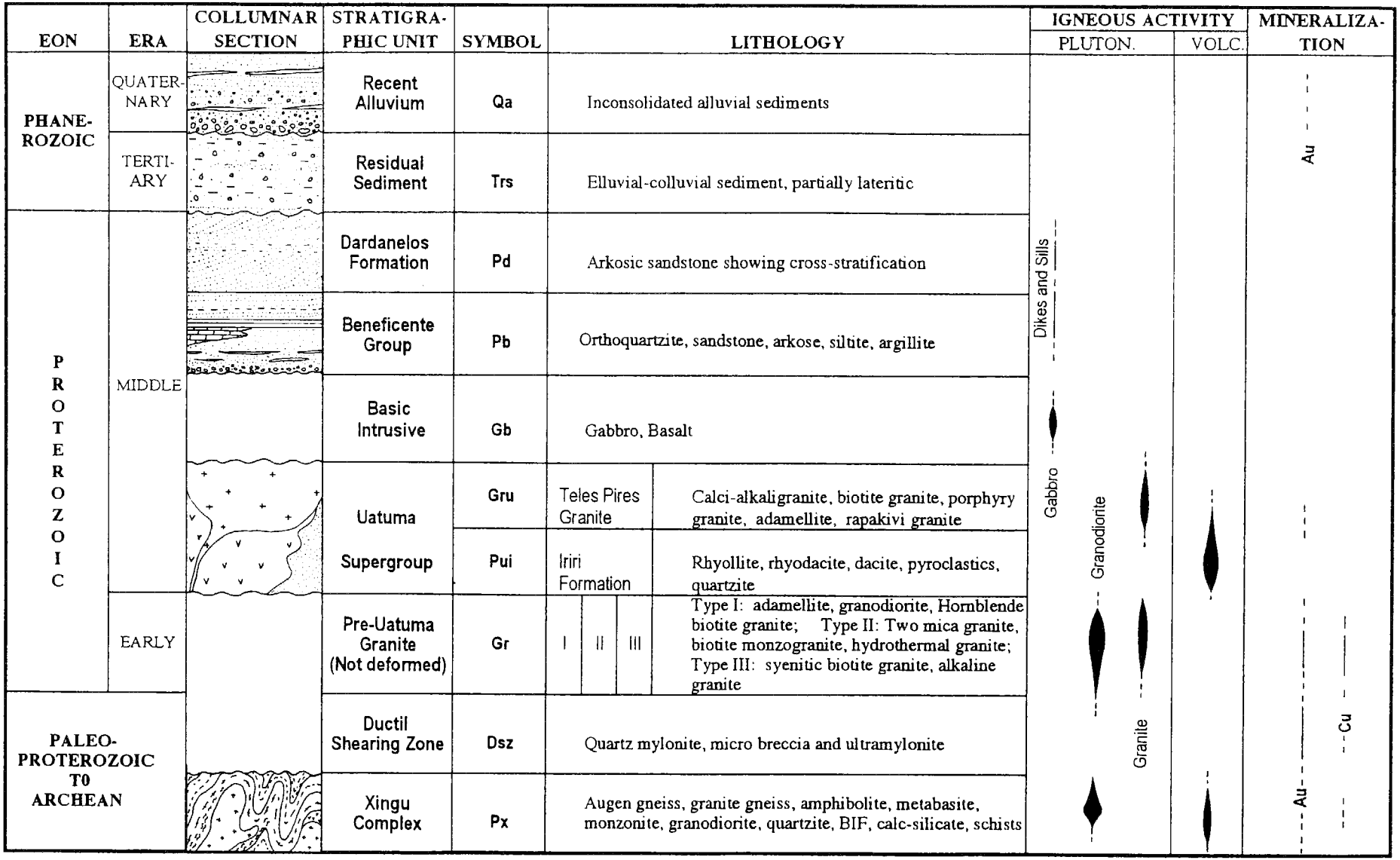


Fig. I-3-1 Geological interpretation map of the Alta Floresta area by Landsat images



Stratigraphy in accordance with: Schobbenhauss et al., 1981 and Antonio Joao P. Barros, 1994; modified.

Fig. I-3-2 Generalized stratigraphic columnar section of the project area

of the Alta Floresta area.

The continental and shallow marine clastic and carbonatic sediments of this group overlay the Iriri volcanics and the Teles Pires granites. The poorly deformed and unmetamorphosed sedimentary sequence is composed by orthoquartzite, sandstone, arkose, siltite, argillite and carbonate rocks. Dating of the diagenesis of Beneficente sediments by the Rb/Sr method resulted in 1.4 Ga (Tassinari et al., 1978).

(e) Dardanelos Group

This unit occurs in the southern part of the Alta Floresta area and is also represented, like the Beneficente Group, by a very uniform regional morphology known as Serra dos Caiabis. The undeformed sediments deposited in the Caiabis graben represent the Dardanelos Group, composed mostly by arkosic sandstone showing cross-stratification and horizontal bedding. Two different basaltic flows occur intercalated in the Dardanelos sediments, being the lower flow dated 1.4 Ga and the upper one, 1.2 Ga by the Rb/Sr method (Tassinari, 1981).

(f) Basic dikes and sills and alkaline intrusions

The Central Amazonian Province was affected by several magmatic episodes of basic nature, which occurred in the time interval of 1.55 Ga and 1.0 Ga and associated to lineaments like the Tapajos (NE-SW) and the Abacaxis and Canama (NW-SE). Quite in the same time interval (1.45 Ga-1.2 Ga), the region was also affected by an alkaline magmatism (mainly syenites) of cratogenic origin, like the Canama alkaline complex (Tassinari, 1981).

The basic magmatism is represented by diabase dikes and sills of olivine-gabbro composition, which cut all the above described units.

The Alta Floresta area is located at the southwestern margin of the Central Amazonian Province. Its basement is built up by high to medium-grade metamorphic rocks including granitoids. These rocks are overlain by a nonmetamorphic and widely distributed platform cover, deposited between about 1.9 Ga. to 1.0 Ga., which was in turn intruded by anorogenic granitoids and, locally, by basic and alkaline rocks.

The granites of the Amazonian craton have been tentatively grouped, and the most complete classification of granites has been summarized by Dall`Agnol et al. (1987) as:

①Archean granites (>2.5Ga);

②Paleoproterozoic (Transamazonian age) granitoids (2.1-1.9Ga);

③Mesoproterozoic (1.8-1.4Ga) anorogenic granites of the Central Amazonian Province;

④Mesoproterozoic (1.7-1.4 or 1.2Ga) granites of the Rio Negro-Juruena Province; and

⑤Meso- to Neoproterozoic (1.4-0.9Ga) anorogenic granites of the Rio Negro - Juruena,

Rondonian and Sunsas Provinces.

A datation of rocks by K/Ar method was carried out during the Phase I survey, and its objective was to confirm the above classification summarized by Dall`Agnol et al.

Further datation by U/Pb and Pb/Pb methods was carried out during the Phase II survey and the datation results are shown on Table 1-3-1.

3-2 Mineralization and Mining Activities

3-2-1 Mineralization

The gold mineralization in the survey area is composed from placer deposits, residual gold deposits in soil and primary gold mineralization in hard rock and saprolitic rock.

Primary Gold Mineralizations exist in many tectonic environments through the Amazonian craton. For instance, in the Alta Floresta area were identified mainly three Gold Mineralization types, as follow:

(1) Porphyry Gold type

Botelho et al. (1998) associate the gold mineralization of the Alta Floresta region with oxidized type I calc-alkaline plutons, with characteristic either of volcanic arc or post-collision granites. The gold either occurs in small high-grade vein-type deposits or is disseminated in widespread hydrothermal zones with alteration such as sericitization, feldspathization and pyritization.

This granitic massif is a homogeneous, undeformed, equigranular to porphyritic monzogranite, with geochemical characteristics either of volcanic arc granites or of post-collisional granites generated in the presence of an oceanic lithosphere (Moura et al. 1997a).

The presence of hydrothermal magnetite in association with pyrite, sulphur isotope data and the petrological data for the Matupa Monzogranite in the Serrinha deposit are also characteristics of porphyry copper-molybdenum and copper-gold deposits (Sillitoe, 1997). Nevertheless, the Serrinha deposit presents low levels of Cu and Mo, which precludes its classification as base metal rich in porphyry. In spite of this fact. Sillitoe (1979) predicted the existence of copper-poor porphyry gold deposits and classified the characteristics presented for the Matupa Monzogranite and Serrinha Gold Deposit, allowing its classification as a porphyry gold deposit.

(2) Shear zone hosted quartz veins type

A regional NW-SE direction ductile shear zone crosses the Alta Floresta region. This shear zone has a width of several kilometers and 36 majors gold lodes and hundred of minor gold quartz veinlets zones were recognized inside of the shear zone (Abreu Filho et al., 1992; Barros, 1993).

Table I-3-1 Correlation for dating results in Alta Floresta area

		Existing Data	MMAJ (1999)	Phase II Survey
Dardanelos Formation		1.4 Ga (Rb/St method)		
Beneficente Group		1.6 to 1.4 Ga		
Basic Intrusive				
Uatuma Group				
	Teles Pires Granite	1.6 Ga	1.104 to 1.341 Ga (K/Ar method)	
	Iriri Formation	1.65 Ga (Rb/Sr method)	1.414 to 1.538 Ga (K/Ar method)	1.786 Ga (U/Pb method)
Pre-Uatuma Granite				
	GrillB (Block C)			1.801 to 1.803 Ga (U/Pb method)
	GrillB (Block B)			1.816 Ga (U/Pb method)
	GrillA (Block B)			1.820 Ga (U/Pb method)
	GrillI			1.823 Ga (Pb/Pb method)
	GrillI			1.848 Ga (U/Pb method)
	(Gru, Block F)			1.894 Ga (U/Pb method)
	(Xing, Block F)			1.937 Ga (U/Pb method)
	(Xing, Block G)			1.817 Ga (U/Pb method)
	Matupa Granite	1.872 Ga		
	Juruena Granite	1.947 Ga		
Xingu Complex				
	Granite			

These quartz veinlets zones and lodes display preferential directions along N20-60E, NNE, N30-60W and E-W.

The Paraiba gold mine is the only known lode deposit and it has been considered as the most important shear zone hosting lodes in the Alta Floresta area. The Paraiba lode presents gold and copper bearing quartz veins network, showing parallel bands with different amount of sulphides.

(3) Stockwork type

The stockwork type gold mineralization generally is related and controlled by regional lineaments or local shearing structure.

The Novo Planeta garimpo is the most studied stockwork type gold mineralization in the Alta Floresta area. The gold mineralization in Novo Planeta garimpo is related to Teles Pires type granite. In Novo Planeta, the Teles Pires granite is intruded in granitoids of the Xingu Complex and the gold mineralization is positioned along the border of the Teles Pires granite.

3-2-2 Outlines of the Mining Activities

The mining activities in the region started in 1966 with gold discovery by garimpeiros in the Juruena River. Only in 1978, due to the opening of the road BR-163 that connects the state capital Cuiaba and the Santarem city of Para state, that the garimpo activity spread to Peixoto de Azevedo and Alta Floresta areas. The garimpo activities increased sharply after 1978, with the discoveries of Novo Planeta, Novo Satelite and Novo Astro alluvial garimpos and in 1979, with the discoveries of Jau, Ze Vermelho and Ze da Onca alluvial garimpos.

The garimpo gold production in the period between 1982 and 1995 was officially reported in 53.0 ton in the Peixoto de Azevedo area and 58.8 ton in the Alta Floresta area, totaling 111.8 ton of gold in the garimpos of the Alta Floresta Region.

The primary vein of the Paraiba gold garimpo was discovered by garimpeiros in 1980, and it was manually mined down to a depth of about 20 to 30 m. In 1990, the first shaft of 60m depth was open and Mineracao Mivale in association with garimpeiros drilled 8 holes

TP Mineracao S.A., mining company, shared by BUMBRAS of Canada and CMP, surveyed the Teles Pires main river during 1983 and developed a mining operation from 1984 until 1989.

Jaruana Mineracao Ind. e Com. S.A. carried out an exploration survey in the Juruena area alluvial deposit from 1981 to 1982 with successful results.

Grupo Eluma S.A. Ind. e Comercio surveyed the Braco Norte and Terra Nova areas during 1981 and 1984 aiming alluvial and elluvial-colluvial deposits with good results.

CHAPTER 4 SUMMARY OF THE PHASE II SURVEY RESULTS

4-1 Correlation between Mineralization and Geological Setting

Teixeira et al. (1989) divided the Amazonian Craton in several provinces showing similar geochronologic ages complemented by structural, petrological and geochemical informations. Following the schema proposed by these authors, an old archean core is distinguished in the central part of the Amazonian Craton (Central Amazonian Province). This archean core growed up during the Transamazonian Cycle with the development of the Maroni-Itacaiunas mobile-belt on its notheastern and northern margins, during the Paleoproterozoic (Maroni-Itacaiunas Province, 2.25-1.9 Ga). Afterwards, the western and southern margins of the Archean core are bordered by three tectonic provinces: the Rio Negro-Juruena mobile belt (1.75-1.5 Ga), the Rondonia mobile belt (1.45-1.25 Ga), and the Sunsas mobile belt (1.1- 0.9 Ga).

The Alta Floresta area is located at the southwestern margin of the Central Amazonian Province, at the limit with the Rio Negro-Juruena Province. Teixeira et al. (1989) suggests a mantle-derived magmatic arch evolution, which collided with the Central Amazonian Province, as the result of an eastward-directed subduction. This subduction modeling explain the existence of innumerous granitic intrusions and regional scale shearing structure in the survey area.

The subduction model also explains the distribution pattern of alluvial gold garimpo and the existence of several primary gold garimpos aligned in WNW-ESE direction trend. Most of primary gold garimpo in the Alta Floresta region is embodied within shearing zones indicating the close relationship between gold mineralization and shearing zones.

4-2 Preliminary Evaluation of Mineral Potentiality

The mineralization characteristic for gold mineralization in B, C, F and G block are described below and a compilation of mineralization characteristic for each block is shown on Fig.I-4-1.

(1) B Block

The shearing zones are the most important geological structure observed in the survey area and some of the primary gold garimpo are located inside these shearing structures. Examples of gold garimpo related to shearing structure in the B block are the Jacare garimpo, Satelite garimpo and Paulao garimpo and all of them present a WNW-ESE shearing trend. Jacare garimpo with a gold mineralization related to quartz veinlets and shearing planes presented high gold contents with a maximum value of 379.36 g/t of Au. Also, a 6m wide channel sampling presented an average grade of 70.52g/t Au and 6.05g/t Ag.

Table I-4-1 Characteristics of mineralization for the each block

Area	Country rocks	Intrusion composition	Structure	Alteration	Fluid Inclusion	Gold occurrence	Ore assay
Block B	Pre-Uatuma Granite	Horn-biotite-granite	Shearing zones	Epi-chl-ser-alb-kf-sil in silicified rock	218℃ to 232℃ 7% to 9 % NaCl	Placer deposits	Jacare garimpo: 6m wide channel sample: Au 70.5 g/t
	Teles Pires Granite	Biotite granodiorite	Mainly WNW - ESE and NW -SE	Sil-kf-alb-ser-chl-cal-py in sheared granite	335℃ to 356℃ 21% to 24 % NaCl	Gold in sulphide rich quartz vein and veinlets	Satelite garimpo: 20cm wide chip sample: Au 4.3 g/t
	Iriri Formation (Volcanics and sediments)	Biotite granite porphyry		Magn and hm in brecciated rock	230℃ to 294℃ 3 % to 9 % NaCl	Gold in sheared zone with disseminated py	Paulao garimpo: grab sample of qz vein: Au 100.0 g/t, Ag 127.2 g/t
	Basic dykes	Pink porphyritic granite		Sil-kf-alb-ser-chl-do in silicified granite		Gold associated with bismuthinite	MJBA-8: 26m core length: average Au: 0.21 g/t
		Aplite		Sil-kf-alb-bi-chl-py-ru in sheared granite Blue quartz		Gold associated to hem-py-spha-magn-ccp in qz veins and altered granite	MJBA-11: 3m core length: average Au: 0.79 g/t
		Diabase		Py dissemination in qz veins			MJBA-13: 3 m core length: average Au 2.72 g/t
Block C	Pre-Uatuma Granite	Coarse grained biotite granite with porphyritic potassic feldspar	Shearing zones	Sil-kf-alb-ser in sheared granite	160℃ to 181℃ 11% to 19 % NaCl	Placer deposits	Anta garimpo: 0.1m wide chip sample: Au 130.0g/t
	Teles Pires Granite		Mainly WNW - ESE and NW -SE	Sil-kf-alb-bi-ser-ru in silicified granite	278℃ to 314℃ 12% to 24% NaCl	Gold in sulphide rich quartz vein and veinlets	Waldemar garimpo: grab sample of qz vein: Au 174.0g/t
	Iriri Formation (Volcanics and sediments)	Aplite		Py dissemination in qz veins		Gold in sheared zone with disseminated py	New garimpo work: grab sample of qz vein: Au 113.44g/t, Ag 194.3g/t
	Basic dykes	Diabase		Sil-kf-alb-ser-chl-cal in silicified granite		Gold associated with bismuthinite	C11201850 Auger result: 3m core length in saprolite: average Au 5.51 g/t
				Sil-epi-kf-magn-py diss and films in silicified aplite and brecciated granite		Gold associated to hem-py-spha-magn-ccp in qz veins and altered granite	
				Blue quartz			
Block F	Xingu Complex	Horn-biotite-granite porphyry	Shearing zones	Kf-alb-chl-talc-cal-py in sheared schist	155℃ to 186℃ 7% to 19% NaCl	Placer deposits	Serrinha do Guaranta garimpo:
	(Volcanic, granite, gneiss,	Biotite granite gneiss	Mainly WNW - ESE and NW -SE	Chl-talc-verm-trem-do in altered rock	217℃ to 276℃ 7% to 19% NaCl	Gold in sulphide rich quartz vein and veinlets	32m wide channel sample: average Cu: 0.43%, 12m wide channel sample: average Au: 7.7 g/t, Ag max 51.4 g/t,
	and schist)	Diabase		Ser-qz in altered rock	320℃ 9% NaCl	Gold associated to ccp-mala-hm-ru in qz veins of Serrinha do Guaranta garimpo	MJBA-1: 3m core length: average Au: 3.34g/t; 10m core length: average Au: 0.27g/t, Cu: 1.41%
	Basic dykes	Rhyolite		Sil-kf-alb-chl-tre in silicified granite gneiss		Gold associated with bismuthinite	Aluizio garimpo:
				Qz-alb-ser-py-spha in quartz vein Sil-kf-alb-chl-cal in pink granite		Gold associated to hem-py-cv-ccp-cc-ru in qz veins of Aluizio garimpo	MJBA-2: 2m core length: average Au: 0.87g/t; 3m core length: average Au: 0.61g/t
				Py dissemination in qz veins			0.2m wide chip sample in qz vein: Au 25.4 g/t
Block G	Xingu Complex	Pink porphyritic biotite granite	Shearing zones	Ser-qz in altered granite	169℃ 11% NaCl	Placer deposits	Janete garimpo: 0.3m wide chip sample in quartz vein: Au 32.07g/t
	(Volcanic, granitic and	Gneissose biotite granite	Mainly WNW - ESE and NW -SE	Sil-ser-py-spha in silicified granite	224℃ to 260℃ 2% to 10% NaCl	Gold in sulphide rich quartz vein and veinlets	Pezao garimpo: grab sample of qz vein: Au 35.71g/t, Cu 0.86%
	gneissic rocks)	Biotite gneiss		Py dissemination in qz veins		Gold associated to hem-py-cv-ccp-cc in qz veins	Edmar garimpo: 1m wide channel sample in quartz veinlets zone: Au 60.45g/t
	Teles Pires Granite	Diabase		Qz-ser-kao in argillized granite		Gold associated with bismuthinite	
	Basic dykes						

Alteration: Epi(epidote), chl(chlorite), ser(sericite), alb(albite), Kf(potassic feldspar), sil(silicification), cal(calcite), py(pyrite), magn(magnetite), hm(hematite), do(dolomite), bi(biotite), ru(rutile), verm(vermiculite), trem(tremollite), spha(sphalerite), kao(kaolin)

Mineralization: py(pyrite), magn(magnetite), hm(hematite), spha(sphalerite), ccp(chalcopyrite), mala(malachite), cv(covelite), cc(calcocite)

Satelite garimpo and Paulao garimpo also show gold mineralization in quartz vein filling shearing zone and the results of analysis in quartz vein of Paulao garimpo presented 100g/tAu, 127.2g/tAg and 3.86%Cu.

The above sampling results are a strong indication that B block hold high grade gold mineralization and open a good perspective of finding a major gold deposit related to shearing structure in the area.

(2) C Block

The shearing zone is the most important geological structure within C block. The main shearing trend is NW-SE, observed in some of the primary gold garimpo. Shear zones with NNW-SSE trend was confirmed in the C7 gold garimpo (Fig.II-2-3). The gold mineralization in C7 garimpo is related to quartz vein with a width of 30cm that fill a 30-degree dip-shearing zone. The results of ore analysis showed 113.44g/t of Au, 194.3g/t of Ag and a high content of Bismuth. Also were confirmed anomalous values of Cu, Pb and Zn.

Widespread gold alluvial garimpo in the survey area also confirms the presence of primary source in the proximity. The source of alluvial gold is thought to be a disseminated type or vein / veinlets type gold mineralization embodied in shearing structure.

The above sampling results are a strong indication that C block holds high-grade gold mineralization related to shearing structure in the area.

(3) F Block

A detailed geological survey carried out in Serrinha do Guaranta garimpo confirmed that gold bearing sulfide rich quartz vein fills a NW direction subvertical ductile shearing in talc-chlorite schist. Previous survey had indicated the presence of a large copper dissemination within talc chlorite schist of Serrinha do Guaranta area. Analytical results from 32 meters of channel sampling in weathered talc chlorite schist showed a lateral average grade of 0.43% Cu. Gold results in the same 32 meters presented low grade gold values and the best values in 2m average were 2.33 ppm, 0.52 ppm and 0.13 ppm.

A detailed geological survey in Aluizio Garimpo confirmed gold mineralization in parallel, sulfide rich quartz veins that fill a N80W direction-shearing zone. The parallel quartz veins with strong dissemination of pyrite are inserted in a shear zone that averages 8 meters width and a confirmed length of more than 500 meters. Most of quartz veins were low gold grade, however results, as 25.40 ppm Au is also present.

The above survey results indicated that F block present several high gold grade quartz vein filling shearing structure and it open a good perspective of finding a major gold deposit embodied in shearing structure.

(4) G Block

The Zanete garimpo and Pezao garimpo are two of the principal gold primary garimpo found in G block. Edmar garimpo and Luizao garimpo are two others big garimpo located outside at the vicinities of the survey area.

Evaluation survey made in these 4 garimpo, presented the following results. In the Zanete garimpo, gold results between 28.73g/t and 45.06g/t were obtained in quartz veins. The sulfide rich silicified rock of the Pezao garimpo presented gold values between 0.65g/t and 35.71g/t.

The Edmar garimpo presented gold results between 0.01g/t and 60.45g/t in py rich altered granite. The sulfide rich altered granite from Luizao garimpo presented 6.49g/t Au.

The above sampling results are a strong indication that G block hold high grade gold mineralization and open a good perspective of finding a major gold deposit in the area.

4-3 Correlation between Geochemical Anomaly and Mineralization

At the Table I-4-2 are shown the results of geochemical survey and drilling survey.

(1) B Block

Survey results confirmed that most of the gold mineralization in Block B is strongly controlled by a shearing structure. The three large gold anomaly zones detected during the soil geochemical survey present elongation patterns trending along the direction W-SE which suggest the existence of a shearing structure along this direction. The geochemical data treatment indicated a weak relation between Au and Cu and the factor analysis showed the following metal signatures: The Factor 1 showed a relation between Pb-Zn-Fe and reflecting probably a gold mineralization distant from the intrusive center. The Factor 2 showed a relation between As-Fe-Cu, while Factor 5 showed a relation between Au-Cu. It is likely that association such as, Arsenium and Copper or Gold and Copper reflect gold mineralization adjacent to intrusive center.

Auger survey performed within the above gold anomaly zones indicated that even though the gold anomaly in soil has a relative great size, the gold distribution in the saprolite is narrow with spots of high gold grade. The difference in the gold distribution pattern confirms the high mobility of gold detritus in soil as compared to the low mobility within saprolite. Field observation suggested that the gold mobility within saprolite is mostly vertical with a very low lateral mobility. Therefore, the auger sites containing high gold content within saprolite indicate that gold mineralization probably exists in the vicinities.

Drilling core confirmed that the gold mineralization is strongly controlled by sub-vertical shearing structure.

Table I-4-2 Summary of survey results for the each block

Area	Soil Geochemistry					Results of auger survey	Results of drilling survey	
	Anomalous zone	Geology	Size of soil anomaly	Anomalous elements	Gold mineralization type		Hole No.	Au grade
Block B	Northwest area	Grillb	1.8 km x 0.8 km	Au, Pb, Zn	Alluvial Garimpos	High gold value existing in saprolite	MJBA-11 MJBA-13	Au: maximum 5.09 g/t Au: maximum 1.36 g/t
	Southeast area	Grillb, Grugp	2.0 km x 0.6 km	Au, Cu, Pb, Zn, Mo, W	Alluvial Garimpos	High gold value existing in saprolite	MJBA-8	Au: average in sheared zone (26m) : 0.21 g/t
	Northeast area	Grillb	0.8 km x 0.4 km	Au, Pb, Zn	Alluvial Garimpos, Primary Garimpo			
Block C	Central area	Grillb	1.2 km x 1.2 km	Au, Ag, Pb, Fe	Alluvial Garimpos, Primary Garimpo	High gold value existing in saprolite	MJBA-3 MJBA-4	Au: low grade and wide Au: maximum 1.09 g/t
	East area	Grillb	1.8 km x 0.5 km	Au, Fe	Alluvial Garimpos, Primary Garimpo	High gold value existing in saprolite		
	Northeast area	Grillb	1.0 km x 0.3 km	Au, Pb, Fe	Alluvial Garimpos			
	West area	Grillb, Ap	1.2 km x 0.2 km	Au, Ag, Pb, Fe	Alluvial Garimpos			
	Southwest area	Grillb, Ap	0.5 km x 0.3 km	Au, Ag	Alluvial Garimpos, Primary Garimpo			
Block F	Serrinha do Guaranta area	Pxsch, Pxgg, Di	3.5 km x 1.5 km	Au, Pb, Zn, V etc.	Alluvial Garimpos, Primary Garimpo	High gold value existing continuously in saprolite	MJBA-1	Au: maximum 7.67 g/t, Cu: average in 10m: 1.41 %
	Aluizio area	Pxmg, Di	3.5 km x 0.1 km	Au, As	Primary Garimpo		MJBA-2	Au: maximum 1.50 g/t in granite
	Central area	Pxmg, Pxv, Di		Au, Cu, As etc.				
Block G	Southwest area	Pxgg	6.0 km x 4.0 km	Au, Ag, Cu, Pb, Zn, V, etc.	Primary Garimpo			

(2) C Block

Although the main shearing direction in the survey area is supposed to be along NW-SE direction, shearing zones along ENE-WSW and NNW-SSE directions were also observed. The NW-SE direction shear zone is well represented by the elongated distribution along NW-SE direction of gold anomaly in soil. Results of factor analysis indicated the following metal signature: the factor 1 related with Pb-Zn-Fe-Cu is largely distributed in all survey area. The factor 3 related to Cu-Fe-Au is mostly distributed along the Rica and Buriti rivers that are the most important alluvial garimpo in the whole area. It is likely that metal associations such as, Copper, Gold and Iron reflect a gold mineralization adjacent to the intrusive center.

Results of auger geochemical survey in C block bears a similarity with the results of B block. The gold anomalies within saprolite were also narrow with localized distributions containing some high gold values.

Gold mineralization strongly controlled by shearing structure was found in hard cores as well as in saprolite of boreholes MJBA-3, MJBA-4 and MJBA-5.

(3) F Block

The regional geochemical survey showed a wide gold anomaly in soil at the southwestern part of the F block and it embodies the Serrinha do Guaranta garimpo area. The auger survey in Serrinha do Guaranta confirmed that the gold anomaly in soil and in saprolite extends toward north and its results confirmed the wide gold anomaly in soil obtained by the regional geochemical survey. The auger survey showed that the gold mineralization of Serrinha do Guaranta is not continuous and probably present a boudin like orebody.

The borehole MJBA-1, confirmed that gold bearing sulfide rich quartz vein fills the NW direction subvertical ductile shearing in talc-chlorite schist. It also confirmed copper mineralization within schist and a maximum average grade of 1.41% Cu in 10m coring was obtained.

A detailed geological survey in Aluizio Garimpo had confirmed sulfide rich quartz veins filling a N80W direction-shearing zone. The borehole MJBA-2 confirmed that gold was associated to quartz veins and a maximum gold grade of 1.5g/t Au was obtained in 1m coring.

(4) G Block

A large gold anomaly was confirmed in the southwestern part of the G block by the soil geochemical survey. The geochemical data treatment indicated a relation between Au and Cu.

The Zanete garimpo is the biggest gold garimpo within the large gold anomaly in soil and the analytical results of quartz veins from Zanete garimpo presented gold grades between 28.73g/t and 45.06g/t.

The above sampling results are a strong indication that G block hold a high-grade gold mineralization and open a good perspective of finding a major gold deposit in the area.

CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS

5-1 Conclusions

The survey results can be summarized per area as follows:

(1) B Block

The geology of block B is composed of Lower Proterozoic Pre-Uatuma Granite, Middle Proterozoic Uatuma Group, Dykes and Quaternary sediments (Fig II-1-2).

The shearing zones are the most important geological structure in the survey area, being some of the primary gold garimpo located inside these zones. Some of them are the Satelite garimpo and Jacare garimpo with gold mineralization related to quartz veinlets and veins filling shearing planes. From the gold analysis of garimpo Jacare samples, it was found that innumerable samples presented high gold contents with maximum values of 379.36 g/t of Au. Also, a 6m wide channel sampling presented an average grade of 70.52g/t Au and 6.05g/t Ag.

The single element analysis carried out during the Phase II for the soil geochemical data, indicated the existence of three large gold anomaly zones in the Block B, namely, Northwest zone, Southeast zone and Northeast zone (Fig II-1-9).

The multi element analysis applied to the soil geochemical data indicated a weak relation between Au and Cu. The factor analysis indicated the following metal signatures: The Factor 1 shows a relation between Pb-Zn-Fe and reflecting probably a gold mineralization distant from the intrusive center. The Factor 2 shows a relation between As-Fe-Cu, while Factor 5 shows a relation between Au-Cu. It is likely that association such as, Arsenium and Copper or Gold and Copper reflect gold mineralization adjacent to intrusive center (Fig II-1-12).

From the auger geochemical survey it was found out that within the survey area, the gold distribution pattern in saprolite in different than the gold distribution in soil. In this respect, the gold anomaly in soil presents a large distribution and a low gold grade, however the gold anomalies in saprolite are narrow and locally presenting high gold anomalies (Fig II-1-14). The auger geochemical results proved that this method is very useful to narrow considerably the gold anomaly and giving a more coherent anomalous halo than the broad gold anomaly resulted from soil geochemical survey.

The drilling survey confirmed that gold is present in hard core and in saprolite, but the best intercepts were obtained in 4 boreholes, i.e., MJBA-8, MJBA-11, MJBA-12 and MJBA-13. Gold mineralization in borehole MJBA-8 is closely related to sub-vertical shearing zones. The most sheared section was detected in the borehole MJBA-8 between 43.00m and 69.00m, for which the analytical gold results within this 26m interval presented an average of 0.21g/tAu and a maximum gold value of 0.73g/t.

Others boreholes such as, MJBA-11, MJBA-12 and MJBA-13, also presented gold mineralization related probably to sub-vertical shear zones. MJBA-11 presented a gold average of 0.78g/t between 11.00m and 14.00m, MJBA-12 with 0.32g/t between 26.00m and 30.00m and MJBA-13 with 2.71g/t between 22.00m and 25.00m.

The geology of the area to the south of B block is composed from Lower Proterozoic Pre-Uatuma granite, Middle Proterozoic Uatuma Group granite, Dykes and Quaternary sediments.

Three major shearing zones are observed along the directions WNW-ESE, NW-SE and NE-SW and gold barren quartz vein frequently fills these structures.

Gold alluvial garimpo are widespread in the survey area, indicating the existence of primary gold source within the survey area, however, during the geological survey, no primary gold garimpo were found in the survey area. Besides, some mylonitic rock samples and quartz veins samples taken within of the shearing zone presented only a weak gold mineralization.

(2) C Block

The geology of block C is composed of Lower Proterozoic Pre-Uatuma Granite, Middle Proterozoic Uatuma Group, Dykes and Quaternary sediments (Fig. II-2-2).

The shearing zones are the most important geological structure in the survey area because the gold mineralization is related to this shearing structure, as confirmed during the drilling survey.

Although the main shearing direction in the survey area is supposed to be along NW-SE direction, shearing zones along ENE-WSW and NNW-SSE directions were also observed. Gold garimpo (C8401700), located inside a shearing of NNW-SSE direction, presented samples with high gold and silver values. The soil gold anomaly represented by gold values of 25 ppb and 10 ppb presents an elongated pattern along NW-SE direction that suggests that a shearing structure exist in this direction.

Results of factor analysis indicated the following metal signature: the factor 1 related with Pb-Zn-Fe-Cu is largely distributed in all survey area. The factor 3 related to Cu-Fe-Au is mostly distributed along the Rica and Buriti rivers that are the most important alluvial garimpo in the whole area. It is likely that metal associations such as, Copper, Gold and Iron reflect a gold mineralization adjacent to the intrusive center.

Results of auger geochemical survey in C block bears a similarity with the results of B block. The gold anomalies within saprolite were also narrow with localized distributions containing some high gold values, as exemplified by the 14.8ppm Au on sample C112018504 (Fig II-2-10).

Gold mineralization related to shearing zones of varied inclination was found in hard cores as well as in saprolite in the boreholes MJBA-3, MJBA-4 and MJBA-5 (Fig II-2-13). The evidence of a relationship between shearing structure and gold mineralization open a good perspective for finding major gold deposits related to shearing structures in the survey area.

(3) F Block

Archean to Lower Proterozoic Xingu Complex (Px), Dykes and Quaternary sediment compose the geology of F block (Fig II-3-3). Shearing zones along WNW-ESE direction is the main geological structure of F block and inside these shearing structures are observed some primary gold garimpo as exemplified by the Aluizio garimpo.

Result of soil geochemical survey confirmed the presence of two major trends for the gold anomalies in the F block, as observed in the compiled map on the Fig. II-3-8. NW-SE gold anomalies trend was observed in the southwestern part and WNW-ESE trend were observed in the central part and central north part of F block. These gold anomaly trends were interpreted as reflecting gold mineralization strongly controlled by shearing structures. The gold anomaly at the central north part of F block embodies the Aluizio garimpo that show the same shearing direction. The southwest gold soil anomaly that embodies the Serrinha do Guaranta garimpo area was interpreted as controlled by both, shearing structures and lithology. In Serrinha do Guaranta, the shearing structures and the outcrop of talc-chlorite-schist present the same NW-SE direction.

The multi element analysis indicated an association between Au and Cu in the southwestern gold soil anomaly and this metal signature possibly is reflecting gold mineralization adjacent to the intrusive center.

The auger survey confirmed that the gold anomaly in soil and in saprolite extends toward north and its results confirmed the wide gold anomaly in soil obtained by the regional geochemical survey. The auger survey also showed that the gold mineralization of Serrinha do Guaranta is not continuous and probably present a form of boudinage structure.

The borehole MJBA-1 (Fig. II-3-19) confirmed that gold bearing sulfide rich quartz vein fills the NW direction subvertical ductile shearing in talc chlorite schist. It also confirmed copper mineralization within schist and a maximum average grade of 1.41% Cu in 10m coring was obtained.

Gold mineralization in Aluizio Garimpo is related to parallel and sulfide rich quartz veins that fill a N80W direction-shearing zone. The parallel quartz veins are inserted in a shear zone that locally present 8 meters width and a confirmed length of more than 500 meters. The borehole MJBA-2 (Fig. II-3-21) confirmed that gold mineralization is associated to quartz veins and the core analysis results presented an average gold grade of 0.87g/t between 9.00m and 11.00m and 0.61g/t between 30.00m and 33.00m. The drilling results confirmed a low grade and narrow gold mineralization in the Aluizio garimpo.

(4) G Block

The geology of G block is represented by Archean to lower Proterozoic Xingu Complex, middle Proterozoic Teles Pires Granite and Basic dykes (Fig II-4-2).

The WNW-ESE direction shearing zones are widespread in the survey area, being some of the primary gold garimpo located inside these zones as are Zanete garimpo and Pezao garimpo.

Edmar garimpo and Luizao garimpo are others two big garimpos located outside at the vicinities of the G block.

Evaluation survey made in these 4 garimpo, presented the following results. In the Zanete garimpo, gold results from 28.73g/t to 45.06g/t were obtained from quartz veins. The sulfide rich silicified rock of the Pezao garimpo presented gold values between 0.65g/t and 35.71g/t.

The Edmar garimpo presented gold results between 0.01g/t and 60.45g/t in py rich altered granite. The sulfide rich altered granite from Luizao garimpo presented 6.49g/t Au.

The above sampling results are a strong indication that G block hold high-grade gold mineralization and open a good perspective of finding a major gold deposit in the area.

The single element analysis of soil geochemical data indicated a large gold anomaly zone in the southwestern portion of G Block (Fig II-4-7). The multi element analysis showed that Au is associated to Cu within gold anomaly zone. The distribution form of soil gold anomalies is broadly concordant with the direction of regional shearing and that suggests a shearing structure control for the gold mineralization of G block.

5-2 Recommendations for the Phase III Survey

The following surveys are recommended for B, C, F and G blocks in the Alta Floresta region during the Phase III survey.

(1) B Block

It is recommended at first, further grid auger geochemical survey to narrow the broad gold anomaly detected in soil during Phase II. A grid RC drilling is recommended in the narrowed gold anomalies to confirm the continuity of the gold mineralization in depth. At last, a DD drilling targeting the gold orebody is recommended.

In the southern area from B block is recommended a geochemical survey in the central part of the area, aiming to detect the source of the alluvial gold mineralization.

(2) C Block

It is recommended the same types of survey and sequence of survey as in B block.

(3) F Block

Further grid soil geochemical survey and auger geochemical survey is recommended in the vicinities

of Serrinha do Guaranta garimpo, to detail the gold anomaly in soil. Later, a RC drilling is recommended to confirm the continuity of the gold mineralization in depth.

(4) G Block

Further grid soil geochemical survey and auger geochemical survey is recommended at southwest area from G Block, within of the large gold anomaly zone. Later, a RC drilling is recommended to confirm the continuity of the gold mineralization in depth.