**BUSINESS OPPORTUNITIES PORTFOLIO FOR THE FIELD OF GEOLOGY AND MINING IN CUBA.**

**Geominera, S.A.**

1. **INTRODUCtIoN**

The Cuban Government recognizes the potential role of foreign investment flows to contribute to sustainable economic development. In this regard, it has defined a new policy to attract foreign investment comprising general and sectorial principles. The definition of this Policy is one of the actions of greatest strategic implication in the process of implementing the Guidelines of the Economic and Social Policy of the Party and the Revolution, approved by the Sixth Congress of the Communist Party of Cuba and legitimized by the National Assembly.

The new Law on Foreign Investment aims to provide greater incentives to foreign investment and ensure that the attraction of foreign capital effectively contribute to the objectives of sustainable economic development. It supports the decision to conceive foreign investment as an active and crucial element in certain sectors and economic activities.

Business opportunities in Cuba for the field of Geology and Mining, seek to achieve the interest of foreign investors to develop projects in the phases of Geological Reconnaissance, Prospection, Exploration, Exploitation and trading for precious metals (gold and silver), base metals (copper, lead, zinc), and other minerals. Business opportunities cover the four following regions and the Island of Youth.

* Pinar del Río Region: “Hierro Mantua” copper deposit.
* Central Cuba Region: ten prospects and perspective areas for gold, silver, copper, lead and zinc.
* Ciego – Camagüey – Tunas Region: thirteen prospects and perspective areas for gold, silver, copper, lead and zinc.
* Holguín and Macizo Sagua – Baracoa Region: twelve prospects and perspective areas for gold, silver, copper, lead and zinc.
* Sierra Maestra Region: ten prospects and perspective areas for gold, silver, copper, lead, zinc and chromiun.
* Especial Municipality Island of Youth: eight prospects and perspective areas for micas, kaolin and tungsten.

For the development of geological and mining activities with foreign investment, highly qualified personnel is available to work on the fields of geology, geophysics, mining, metallurgy and other related areas. There are excellent professionals with technical and university level, gathered by Geominsal Business Group, which can be put together for the service of the projects. Geominsal Business Group has various companies located throughout the country, which have a high degree of experience in the field of geology and mining, they are:

* Geominera Pinar del Río Company.
* Geominera Isla de la Juventud Company.
* Geominera Center Company.
* Geominera Camagüey Company.
* Geominera East Company.
* Western Mining Company.
* Research Centre for Metallurgical Mining Industry (CIPIMM)
* Engineering, Construction and Maintenance Company (EMCODI)
* Central Laboratory Company "Joseph Isaac del Corral"
* Construction and Maintenance Company (ECOM).
* Salt National Company (ENSAL).

1. **BUSINESS OPPORTUNITIES PORTFOLIO FOR THE FIELD OF GEOLOGY AND MINING IN CUBA.**

**II.I. DESCRIPTION.**

This Business Opportunities Portfolio for the field of geology and mining in Cuba is updated annually, aiming to capture the interest of foreign investors to develop projects in the phases of Geological Reconnaissance, Prospection, Exploration, Exploitation and trading for precious metals (gold and silver), base metals (copper, lead, zinc), and other minerals of interest.

Business opportunities promoted by GeoMinera S.A. cover four regions and the Island of Youth.

GeoMinera, S.A., is a Cuban private trading company, created in August 1993. Its main objectives are:

1. To establish and to participate in international economic associations, both in national and foreign territories, to perform geological reconnaissance, prospection, exploration, exploitation and processing of solid mineral and saline deposits.
2. To provide technical services for Geology, Mining and Salt Industries, both in national and foreign territories.

c) To export technical and professional services in the Geology and Mining sectors.

GeoMinera S.A. has twenty-one years of experience in the geological-mining sector. It has implemented a Quality Management System that meets the requirements of NC-ISO 9001:2008, supported by a certificate issued by the National Bureau of Standards of Cuba on July 10, 2013.

At present, GeoMinera, S.A develops interests in:

* Three Cuban trading associations: General Nickel S.A. (20% of shares), Gold Caribbean Mining S.A. (50%), and MITSA (50%).
* Two Joint Ventures: Minera del Caribe S.A. (51% of shares), for lead and zinc exploitation and trading; and Isla Dorada S.A. (51% of shares) for gold exploitation and trading of final production.
* An International Economic Association contract: CUBANEX, for mineral drilling services.

**II.III. BUSINESS OPPORTUNITIES**

* **PINAR DEL RIO REGION.**

The Cordillera de Guaniguanico mountain chain (Guaniguanico Terrain) is the most highlighting feature of the Pinar del Río region. From the geological point of view it is composed mainly of terrigenous and carbonatic rocks, representative of a continental margin, whose age goes back to Lower Jurassic (San Cayetano Formation), which are overlain by other magmatic rocks belonging to different stages of development of the Caribbean region, basically to the Ophiolitic association and a Cretacic Island Arc.

From metallogenic point of view several genetic types of ore deposits are known in this region, mainly massive sulfides (Sedex, Beshi and Cyprus type). Well known examples in the Cuban geological literature are Matahambre, Santa Lucia, Castellanos, Mantua, Júcaro and other lesser known deposits. Most of them have been partially or completely exploited (Dora, Francisco, Candida, Buena Vista, etc.). Copper and polymetallic mineralization with more or less gold are the most outstanding; gold is generally concentrated in iron caps. Nickel mineralization is limited to weathering crusts of ophiolitic rocks (laterites).

**DESCRIPTION**

* **Title (general):** Project for the exploitation of “Hierro Mantua” copper deposit.
* **Project description:** The project objective is to implement a mining operation and the corresponding metallurgical plant at the site, to produce 18 000 t of copper annually (40 million pounds) as cathode copper grade A (LME) during 12 years of operations.
* **Investment capital:** The total investment must be defined during the Feasibility Study that is to be done. However, complementary works needed will require about 11-12 million USD.
* **Modality of foreign investment:** Joint Venture
* **Cuban Party:** Geominera SA
* **Market:** Products to be obtained in the future plant (for any of the found minerals) would be exported to the foreign market; however Cuban enterprises will always have priority for purchasing any product.

**CHARACTERISTICS OF THE PROPOSED AREA**

**HIERRO MANTUA (No 36)**

Mineral deposit is located a few kilometers north of Mantua town, Pinar del Rio province, in western Cuba. Distance from de site to Santa Lucía, a mining town located on the north coast of the same province, is about 45 km; and to Mariel port and Havana city toward east distances are 270 and 320 km respectively.

Local Topography of the area of interest is from flat to slightly hilly, with plenty of well-preserved mining and forest roads. The project area can be accessed from Santa Lucía or from Mantua town using the same rustic road. Both towns can be reached by paved road. The Central Railroad is available at the town of Guane, distant about 40 km south from Mantua (Fig. 3).

"Hierro Mantua" cooper deposit is placed like a small hill NE - SW, 60-70 m high and parallel to the north coast. It is a massive sulfide deposit hosted between two lithological sequences, one is basic magmatic and the second one is terrigenous in composition (VMS Beshi type). Main ore body is a lens shape of 1 200 m long x 50- 150 m wide and just over 100 m to depth; dipping ranges between 60 ° and 70 ° NW.

The iron cap covering the upper part of the copper deposit has economical free gold. It was estimated around 90 000 ounces in the 90s were, of which only 32,000 ounces were mined.

From a mineralogical point of view the reservoir is divided into three distinct areas:

* **Oxidation Zone (Iron Cap):** It is represented by a limonitic sandy-clay sequence with abundant iron oxides and hydroxides, with varying vertical thickness (20 - 40 m), but reaching greater depths in fracture zones. Copper has been almost completely leached here; only traces have been reported as oxides.
* **Secondary enrichment Zone:** Located immediately below the Iron Cap and reaching up to 150 m depth; it constitutes the core of the mineral deposit and encompasses almost all its economic value. Main minerals present are: sulfides (chalcocite and covellite), sulfates (chalcanthite), oxides (cuprite and delafosite), native copper, and to a lesser amount carbonates (azurite and malachite). Iron sulfides locally can be up to 73% of the total mass in the form of pyrite, marcasite and melnicovite. Zinc ores may be as oxides or sulphides.
* **Primary Sulfides Zone**: It appears as small isolated bodies below 100 m to beyond 180 m depth. Pyrites with some chalcopyrite are predominant; copper contents do not exceed 0.7 % in this zone.

About 90 % of resources have been estimated in Measured category; 324 drill holes, 4 pits and 6 mine galleries were made in different researching faces, They provided 25 800 m of rock cores which were analyzed by different analytical methods. Geotechnical and hydrogeological conditions are known and also technological performance has been studied.

In accordance with the Feasibility Study prepared by Davy International in 1995, mineable resources are as follows:

Ore ≥ 0.7 % Cu: 9.3 million t, with an average grade of Cu = 2.84 %

Ore from 0.1 to 0.7 % Cu: 3.4 million tons, with an average grade of Cu = 0.46 %

Total = 12.7 million t, with an average grade of Cu = 2.2 %

Technologies proven by different institutions gave copper recovery over 85 % for rich ores and 30 % for low grade ores.

The copper mineralization is partially open by the pit from which part of the gold mineralization was mined.

This project should solve the following problems before passing to exploitation:

* + Checking of previous work (some holes).
  + A technological test, including cobalt recovery.
  + A new evaluation of environmental conditions.
  + To precise the energy consumption of the metallurgical plant.
  + The estimation of gold resources remaining in the partially mined Iron Cap.
  + The optimization of the Feasibility Study
* **CUBA CENTRAL REGION**

A clear geotectonic zoning is an outstanding feature of this region; the following sequences are distinguished from south to north: The Escambray Terrain, composed of metamorphosed continental margin sequences; Two Volcanic Arc sequences (from Lower and Upper Cretaceous); as well as a belt of mafic and ultramafic rocks of oceanic nature, emplaced in allochthonous position as a result of the collision of island arc volcanic sequences against continental margin of the Bahamas – Florida block.

From metallogenic point of view this region exhibits a wide variety of mineral deposit types: Massive sulfides hosted in carbonate rocks (Irish type) at Escambray Terrain; felsic VMS (Kuroko type) and Porphyry type in island arc volcanic sequences. Orogenic gold and mafic – ultramafic VMS associated to ophiolites.

**DESCRIPTION**

* **Title (general):** Reconnaissance or Geological Researches (Prospection - Exploration) at risk for precious metals (gold and silver), base metals (copper, lead and zinc) and other minerals in prospects and interesting areas in Cuba Central Region.
* **Project Description:** To carry out Reconnaissance and Geological Researches (Prospection - Exploration) for precious metals (gold and silver), base metals (copper, lead, zinc) and other minerals of interest in Cuba Central Region, in order to find and evaluate mineral deposits that could be economically attractive, and which will enable the creation of a Joint Venture for the exploitation, processing, and trading of minerals discovered.
* **Investment capital:** It should be defined depending on each project magnitude (how big it will be, works to do, etc.) and the investigation phase to work in (Reconnaissance, Prospection or Exploration).
* **Modality of foreign investment:** International Economic Association contract (AEI) at Risk for Reconnaissance and Geological Research (Prospection and Exploration). Those prospects with sufficient progress in their degree of study (prior or reached during the AEI contract) could be assessed to establish a future Joint Venture.
* **Market:** In the context of these AEI contract it will only be carried out geological investigations for a period of up to five years, so no final products will be obtained; information gotten will help to take the decision of passing to a Joint Venture or not. Final products to be obtained by the future Joint Venture (for any of the minerals to be found) would basically be focused to the foreign market, however Cuban enterprises will always have priority for purchasing these products.

**MAIN FEATURES OF THE PROPOUSED AREAS**

**carlota - VICTORIA - guachinango (No 1)**

* **Location:** Located in the northern part of the Trinidad Mountain, at altitude between 500 and 750 m above sea level. Area is 40 km SSW of Santa Clara city and 40 km east of Cienfuegos harbor. Topography is rather hilly and access is possible through the road Cienfuegos - Cumanayagua - Manicaragua. The nearest railway line is 15 km away, which connect the area of interest with Cienfuegos port facilities. The mineral prospect can be also accessed through the Crucecitas road.
* **Área:** 117.18 km2.
* **Metals:** Cu, Zn, Au and Co.
* **Genetic type of mineralization:** Massive Sulfide carbonates hosted Cu - Pb - Zn ± Co, Au and Ag (Irish type).
* **Current degree of study:** Exploration - Prospection in "Carlota", "Victoria" and "Guachinango". Reconnaissance in "Siguanea" and "San Narciso". Other mineral occurrences ("Guachinango Este", "Furnia I and II", "Guamo", "La Batea", etc.) remain untouched.
* **Researching proposal:** Exploration in known deposits ("Carlota", "Victoria" and "Guachinango"), Prospection in "Siguanea" and "San Narciso" as well as in the rest of mineral occurrences.
* **Data on mineralization:** The Mineral District Carlota - Guachinango consists of several massive sulfide deposits carriers of S, Cu, Zn + Co, Au, Ag; more than 20 unstudied gossans hosted in carbonate rocks have been reported. The largest known deposits in the region so far are "Guachinango", "Carlota" and "Victoria". Ores shows massive and banded texture being composed for cobalt bearing massive pyrite and sulfides with Cu and Zn. The main gangue minerals are dolomite, ankerite, chlorite and quartz. Ore bodies’ length varies between 100 and 800 m, and their extension toward depth range between 100 and 300 m. Average thickness is from 5 to 20 m, but reaching up to 31 m. The oxidation zone is of varying thickness (mainly 5 m - 55 m).
* **Reported grades:**  Primary ores: 0.64 - 1.86 % Cu; 0.45 - 3.2 % Zn; 0.01 - 0.1 % Co; 0.21- 1.475 g / t Au; 23.0 - 38.7 % S. Oxidized Ores: 0.1 - 0.9 g / t Au and 1-7 g / t Ag.
* **Mining activity:** Underground Mining in "Carlota" where 10,000 t of ore were mined between 1919 and 1921, as well as more than 100 m of mine shafts and 1066 m of galleries at the upper part of mineral body in zone No 1. No mining nowadays. Two ancient adits were made in "Victoria", which cut the ore at 6.5 m deep.

**Arimao - LAS BREÑAS (No 2)**

* **Location:** The area is located in the northeastern part of the Cienfuegos province, 7 - 28 km away from the provincial capital and port facilitations of Cienfuegos. Access from Cienfuegos is by the road Cumanayagua - Manicaragua. There is also a railway line that communicates with port facilities. The terrain is hilly.
* **Area:** 158.4 km2.
* **Metals:** Cu, Mo, Au and Ag.
* **Genetic type** of **mineralization**:Meso - Epithermal of low to medium sulfidation; Porphyry (Cu - Mo ± Au) and Skarn (Cu).
* **Current degree of study:** Exploration at "Arimao", but the extension of the silicified area and those rich in magnetite associated with high Cu and Au values are still undetermined. Prospection at "Macagua", where ore zone is not delimited and IP anomalies have not been drilled. Reconnaissance on "Las Breñas" and "La Vega". The remaining occurrences and points of mineralization remain lack of studies.
* **Researching proposal:** Further Exploration in "Arimao" and other occurrences. Prospection in the remaining areas.
* **Data on mineralization:** There are 18 deposits and occurrences of meso - epithermal mineralization, being "La Vega", "Las Breñas" the main. Malachite, azurite, pyrite, native gold in quartz and calcite veins, in silicified, chloritized and carbonated rocks are quite common. There are strong geochemical anomalies of Cu, Au, Ag and Hg.

Porphyry mineralization: There are two prospects and 29 occurrences:

"Arimao" prospect: This deposit consists of disseminated and veinlet type pyrite and chalcopyrite in a well developed stockwork of quartz in an area of 500 x 500m. The mineralization extends between surface and 245 m deep, being basically pyrite, chalcopyrite, magnetite, bornite, Azurite, chalcocite, covellite, malachite, sphalerite, molybdenite; also quartz, chlorite, K feldspar and sericite.

"Macagua" prospect: The mineralized zone forms a linear stockwork of quartz veins with chalcopyrite and molybdenite. The best studied ore body is 750 m long x 100 m wide, ranging in thickness between 86 m and 122 m, with a length of 260 - 280 m down dip; mineralization has been detected between 18 and 300 m depth. The main minerals are pyrite, chalcopyrite and molybdenite, quartz, chlorite, K feldspar and sericite.

"Paso Bonito" is a zone with quartz veins 3-10 m wide and 1 000 m in length, located within altered banded amphibolites with marked foliation near the contact with granodiorite. Pyrite and some chalcopyrite disseminated with malachite and limonite are abundant.

Other occurrences present in the area consist of veinlet outcrops with malachite, azurite and quartz in felsic intrusive, in which has been reported 0.21 - 1.44 % Cu; 0.002 - 0.122 % Mo (up to 1% in some samples); 0.19 g / t Au and 25.5 g / t Ag. Grains of Au are present in geochemical samples.

* **Reported grades:** Possibly Meso - Epithermal deposits of low and / or medium sulfidation and skarn: 0.1 - 4.16 % Cu; 0.5 - 1.7 % Zn; 0.1 - 6.27 g / t Au; 1.0 - 33 g / t Ag (up to 199 g / t). Presence of Au grains in geochemical samples. "Arimao": 0.36 % Cu; 001 – 0-0096 % Mo; 0.1 - 2.738 g / t Au; 1.0 – 7.0 g / t Ag. "Macagua": 0.19 - 0.203 (up to 1.21) % Cu; 0,025 (up 0.4) % Mo. "Paso Bonito": 0.50 - 1.21 (average 0.73) % Cu; 0.3 - 1.2 g / t Ag.
* **Mining activity:** It has not been reported any kind of mining operations.

**SAN FERNANDO - ANTONIO (No 3).**

* **Location**: It encompasses part of the Villa Clara and the eastern end of the Cienfuegos province. It is located 35 kilometers south of Santa Clara city and 40 km east of Cienfuegos port facilities, with which it communicates through the Cienfuegos - Cumanayagua - Manicaragua – Fomento road. From Santa Clara access is by the Santa Clara - Manicaragua road. A railway allows communication with the port facilities at Cienfuegos.
* **Area:** 237.7 km2.
* **Metals:** Cu, Zn, Au and Ag
* **Genetic type of mineralization:** VMS bimodal mafic.
* **Current degree of study:** Exploration at "San Fernando" and "Antonio". Reconnaissance in "Independencia", "San Fernando Sur", "Santa Rosa Sector Central " and "Zambumbia Este".
* **Researching proposal:** Exploration in "San Fernando" and its flanks, as well as in "Antonio". Prospection in "San Fernando Sur", "Santa Rosa Sector Central " and "Zambumbia Este". Reconnaissance in the remaining areas.
* **Data on mineralization:** "San Fernando" prospect: Massive and veinlet disseminated ores. Pockets like and lenses mineral bodies. Mineralization extends from surface up to 147 m depth; there are oxidized ores, secondary enrichment and primary ores. The mineralized zone has been explored 700 m long and 200 m wide, it extends beyond the explored area about 650 m to the west and 850 m eastwards. Gossans with 0.1 - 3.99 g / t Au are known. Kaolinitic clay deposit with semi refractory properties reaching an average depth of 25 m have been defined in this zone. Minerals reported are pyrite, chalcopyrite and sphalerite, as well as other sulfides such as arsenopyrite, bornite, galena, tetrahedrite, argentita and pyrrhotite; gangue consists of quartz, chlorite, actinolite and sericite.

The "Antonio” prospect has a mineralized zone of 350 m along trend, 250 m down dip and average thickness of 11 m (up to 30 m). Pyritic polymetallic ore can be massive, disseminated, stockwork type and stratiform. Massive pyrite mineralization sectors enriched in chalcopyrite and sphalerite, with minor amounts of tennantite, galena and small inclusions of electrum, hessite, etc. has been defined. There are also quartz, carbonate and barite.

Other occurrences: "Independencia": gossans with 0.2 - 0.6 g / t Au (up to 1.6) and 7 - 51 g / t Ag (up to 131 g / t). "Santa Rosa": mineralized area of 1100 m long and 350 m wide. "San Joaquin": The mineralized zone is 1400 m long and 600 m wide. "San Fernando Sur": Estimated mineralized zone of 700 m long and 400 m wide. "Boca del Toro": An area of 800 m long and 400 m wide, with malachite, azurite and barite at surface, and with mineral intersections of 7.55 m - 44 m deep. "Sector Central": primary ores of Cu - Zn at 11 - 90 m deep, with minerals such as pyrite, sphalerite and chalcopyrite, accompanied by vetitic - disseminated and semi massive pyritic ores intercepted by drilling up to 160 m deep.

* **Reported grades:** "San Fernando" prospect: 1.44 - 2.19 % Cu (up 8.93 %); 1.94 - 4.59% Zn (up to 18.06 %); 115 g / t Ag (up to 298 g / t) and 0.005 - 3.59 g / t Au. "Antonio" prospect: 1.64 % Cu; 1.87 % Zn; 33.64 % S and 19.18 g / t Ag. Ten important occurrences ("Santa Rosa", "San Joaquin", "San Fernando Sur", "Zambumbia", "Zambumbia Este", "El Sol" "Vaquería", "Independencia", "Boca del Toro Sector Central") have reported 0.20 - 6.15 % Cu (up 26.97 %); 0.1 - 8.0 % Zn; up to 0.65 % Pb; 4.0 - 186 g / t Ag (up - 445 g / t) and 0.1 – 3-0 g / t Au (up to 10.72 g / t).
* **Mining activity**: Old mining mainly was concentrated in "San Fernando" and "Antonio". Details are as follow:

"San Fernando": Six mine shafts with several levels of galleries and rises. Mining operations began in 1827 and continued sporadically until its closure in 1960. Ore mined at Los Mangos shaft is estimated between 100 000 and 200 000 t, with 3.4% Cu and 6.0 % Zn. San Fernando shaft was sunk in the XIX century, but nowadays it is clogged. Other shafts like Los Mangos, Santa Isabel and Ceiba, Ceiba I and Ceiba II were made in subsequent periods. Los Mangos shaft was still preserved in 1997, with a depth of 171 m and 9 levels of galleries. Between 1950 and 1960 there was produced Cu concentrate with about 22 % and 57.70 % Zn.

“Antonio”: This deposit was exploited only in its upper part through a pit and some small adits. It was mined about 50 000 t of ore.

**la moza - YAGRUMAL (No 4)**.

* **Location:** The area is located in the southern part of Villa Clara province, about 45-60 km away to the east of Cienfuegos city and 35 km south of Santa Clara city. Main access is using the roads Cumanayagua - Manicaragua - Fomento and Santa Clara - Manicaragua. Manicaragua is the main urban center inside the polygon.
* **Area:** 221.1 km2.
* **Metals:** Cu, Au and Ag.
* **Genetic type of mineralization:** Porphyry (Cu - Mo ± Au) and Mesothermal (Cu - Au).
* **Current degree of study:** Geological Survey.
* **Researching proposal:** Reconnaissance throughout the area.
* **Data on mineralization**: A total of 31 mineral occurrences are known; only three of them have reported analytical results. Mineralization consists of malachite and chalcopyrite; sometimes with pyrite, magnetite, haematite and limonite in quartz veins within the amphibole or felsic intrusive. Iron caps and oxidized zones are present at "Lagunal 1, Laguna 2" and "Guinea".
* **Reported grades:** "La Moza": 0.32 - 5.54 % Cu and 1.2 - 7.5 g / t Ag "La Arena". 1.38 - 7.67 % Cu; 0.125 - 0.978 g / t Au and 16.4 - 57 g / t Ag "Yagrumal": 0.03 - 1.87 g / t Au and 8.14 - 11.2 g / t Ag. "La Magura": 0.29 % Cu; up to 1.14 g / t Au and 0.4 - 35.6 g / t Ag. "La Guinea": 0.1 – 1.0% Cu. There are other 26 mineral occurrences without analytical results.
* **Mining activity:** Only one old excavation at "Lagunal 1".

**Tuinicú - FORTUNA (No 5)***.*

* **Location:** The selected area is located in the central part of the Sancti Spíritus province, 1 – 14 km to NNW of the Sancti Spíritus city. Access is good, since it is crossed by the National Highway and the Central Railway, having a wide network of roads and paths. The villages of Cabaiguán, Guayos and others are located within the area.
* **Area:** 559.6 km2.
* **Metals:** Cu, Zn, Au and Ag.
* **Genetic type of mineralization**: VMS in felsic rocks (Kuroko type) and Porphyry (Cu - Mo ± Au).
* **Current degree of study:** Reconnaissance.
* **Researching proposal:** Reconnaissance throughout the area.
* **Mining activity: "**Los Cerros": Several mine workings in an area of 200 x 200 m, where three shaft, two adits and four open cast workings are still distinguished. There were mined 5 ore bodies. The main mine shaft reached 60 m depth. Ore body No 1 was exploited up to 90 m deep and the No 2 up to 40 m. The processing plant capacity was about 55 t ore / day by collective flotation method. The average head grade was 1.77 % Cu and 4.92 % Zn. Up to 1953 there were mined 25 160 t ore, with average grade of 3.5 % Cu; 1.2 % Zn; 19.9 % S and 0.05 % Pb. Up to 14.2 g / t Au and 28.3 g / t Ag were reported in some documents.

"Fortuna - Casualidad": Small pit 30 m long, 12 m wide and 8 m deep. Five mine shaft are distributed over 1200 m; one in the NW end of the mineralized zone ("Fortuna"), with 155 m of galleries; other two shafts towards the central part ("Casualidad") with 100 m of excavations (probable adits). The remaining two are at the end SSE ("Chiripazo ") with 125 m of galleries. This deposit is known since 1927; between 1929 and 1931 there were mined 6 600 t of cupriferous carbonatic ore. Operations stopped in late 1931 and they were reactivated in 1955. About 900 t ore with 3.0 % Cu were mined in 1956, which were trated in a plant located at "Los Cerros".

"Aguadita": An old shallow shaft with only one gallery.

"La Yaya 2": An old rustic shaft already collapsed.

**PLACETAS (No 6)**

* **Location:** It is placed in the north and northeast portions of the Villa Clara province, distant 5 - 25 km from the Santa Clara city. Placetas is the main town in the area. The territory has a good network of roads and is crossed by the Central Railway. Topography is hilly, with heights lower than 350 m.
* **Área:** 950.6 km2.
* **Metals:** Au, Ag, Cu, Zn.
* **Genetic type of mineralization:** Orogenic (Au – Ag) and small gold placers. Possibly mafic - ultramafic VMS (Cyprus type).
* **Current degree of study:** Exploration at "Descanso" and "Meloneras" deposits, as well as at "Loma Gobernadora" placers. Reconnaissance in the remaining area.
* **Researching proposal:** Further Exploration ay “Descanso” and "Meloneras". Prospection in "San Jose de Malezas" and Reconnaissance in the remaining areas.
* **Data on mineralization:** "Descanso" deposit: Fine disseminated arsenopyrite and free Au, accompanied by pyrrhotite, pyrite, chalcopyrite, Millerite, petlandita, bornite, covellite, Ag sulfosalts and other metallic minerals; all them rather scarce. Mineralization is known up to 80 m deep.

"Melonera" deposit: Scheelite, arsenopyrite, pyrrhotite, pyrite, chalcopyrite, Millerite, petlandita, bornite, covellite have been reported up to 185 m depth.

"San José de Malezas" occurrence: Au in gabbro and quartz veins and secondary enriched copper ores. Free Au and Ag, pyrite, chalcopyrite, pyrrhotite, sphalerite, native copper, malachite and azurite have been also reported.

"Ayuso" occurrence: Several veinlets within serpentines, secondary enrichment (malachite, azurite and Cu oxides) and primary (chalcopyrite, chalcocite, bornite).

"Gobernadora - Cerro El Jibaro": Small grains of free gold in placers (0.30 - 2.00 mm), and sporadically up to 4 - 5 mm. Also isolated grains of Platinum Group Elements (EGP) are reported.

* **Reported grades:** "Descanso": 50.7 g / t Au average (up to 1862.2 g / t Au); 16.5 g / t Ag average (up to 416 g / t); 0.1 - 3.0 % As. "Meloneras": Up to 538.3 g / t Au (average 22.5 g / t); up to 55.7 g / t Ag (average 6.2 g / t); 0 - 0.9 % of As; 0.20 - 0.61 % Cu. "San José de Malezas": Up to 20 g / t Au (average 3.68 g / t); 3.03 g / t Ag (up to 7.6 g / t); 0.12 % As; 0.295 - 3.57 % Cu (secondary enrichment ore). "Ayuso": 5.09 - 9.22 % Cu; Up to 1.5 % of W. Other occurrences with reports of 0.3 - 1.2 g / t Au.
* **Mining activity:** "Descanso": Under reactivation nowadays. Mine shaft of 67 m depth and 9 galleries (200 m long) in 5 levels, and several rises and stopes. "Meloneras": Known since 1868. Thera are a small pit 15.2 m depth, up to 9 trenches and one small mine shaft 32 m deep with three galleries, connected to a 40 m length adit made in 1955. In accordance with a 1957 report, between 1.25 and 3.44 g / t Au are in tailings. "Ayuso": A small pit (prior to 1951) 12.2 m deep, with a gallery. "San José de Malezas": Several rustic pits and horizontal workings dating back to 1867. "Loma Gobernadora": There is an old open pit 101 m long, excavated lucking for endogenous mineralization.

**SANCTI SPÍRITUS norte (No 7)**

* **Location:** Located in the northern part of Sancti Spiritus province, about 5 km north and northeast of Cabaiguán. Topography is hilly and access is good, mainly by the road Sancti Spiritus - Yaguajay and other secondary road and rail, is good. Several population centers such as Iguará, Meneses, Jarahueca and Zulueta are within the selected area.
* **Area:** 541.1 km2.
* **Metals:** Au, Ag and Cu.
* **Genetic type of mineralization:** Orogenic (Au - Ag quartz veins).
* **Current degree of study:** Exploration at "Lote Grande". Other occurrences have not been studied .
* **Researching proposal:** Further Exploration at "Lote Grande". Reconnaissance in the remaining areas.
* **Data on mineralization:**  "Lote Grande": Mineralization in quartz veins within gabbros, cut by diabase dike swarms. The ore zone has a minimum length of 650 m, 15 - 50 m down deep (locally up to 90 m). The most common minerals are pyrite, pyrrhotite, arsenopyrite; In lower amount are also present chalcopyrite, covellite, cubanite, bornite, sphalerite, native gold and limonite. "El Cortijo" mineralized zone of more than 500 m in length and up to 90 m depth.
* **Reported grades:** "Lote Grande" prospect: 7.5 g / t Au (up to 53, 6 g / t) and 1-8 g / t Ag. "Pedro Barba" occurrence: 0.11 - 0.75 % Cu; 0.3 - 2.9 g / t Au and 1 - 3.4 g / t Ag. "El Cortijo": Up 4.70 % Cu and up to 1.4 g / t Au. Other occurrences: 0.1 - 1% Cu and up to 0.6 g / t Au.
* **Mining activity:** None.

**Venegas (No 8)**

* **Location** Located in the northeastern part of the Sancti Spirits province and the western portion of the Ciego de Avila province. It has good access by road and railway. Several small villages are within the area. The relief is flat to hilly.
* **Area**: 410.0 km2.
* **Metals**: Au, Ag and Cu
* **Genetic type of mineralization**: Orogenic (Au - Ag veins). Possible VMS (Cu and Au) in mafic - ultramafic (Cyprus type).
* **Current degree of study**: Reconnaissance in some mineral occurrences.
* **Researching proposal**: Exploration at "La más Buena". Reconnaissance in the remaining areas.
* **Data on mineralization**: "Maria Antonieta": Mineralization in discontinuous pockets along about 150 meters into a fault zone within crushed diabase sequence. Most common minerals: pyrite, chalcopyrite, malachite and azurite. "La más Buena": Disseminated mineralization and filling cracks, occasionally massive, related to oceanic basalts. Most common minerals: pyrite, chalcopyrite, pyrrhotite, and magnetite cubanite. Mineralization has been followed up to 90 m deep, but remains open along the trend and downward. "Jobosí": vetitic – disseminated mineralization. Common minerals are malachite, cuprite, chalcocite, limonite, covellite, magnetite and pyrite. "Trillion": There are three mineral zones, where mineralization is very irregular.
* **Reported grades**: "Maria Antonieta": 1.12 - 5.6 % Cu and 3.4 - 5.2 g / t Ag "La más Buena". 0.2 - 4.28 g / t Au (0.5 g / t average) and 0.38 - 7.15 % of Cu (average 1.20 %). "La Cadena": 0.12 - 0.63 % Cu; 0.06 - 6 g / t Au and 3 g / t Ag "Jobosí": 1 - 8.3 g / t Au; up - 1% Cu. "Trillion": 0.1 - 23.7 g / t Au and 1.0 - 1.8 g / t Ag. Other occurrences: 0.1 - 2 g / t Au.
* **Mining activity**: There are many old mine workings, all of them of very low magnitude.

**CORRALILLO - CIFUENTES (No 9a, 9b)**

* **Location:** These sectors are located in the NW part of the Villa Clara province, about 20-80 km NNW of Santa Clara city and about 60-100 km ENE of Matanzas city, where large deepwater port facilities are available. The territory is crossed by several roads, railway track and a dense network of roads. The region is characterized by a flat and hilly relief that do not exceed 200 m.
* **Area:** 1698 km2 (Corralillo 1 142 km2 and Cifuentes 556 km2).
* **Metals:** Au, Ag. Possibly Cu, Zn and Pb.
* **Genetic type of** **mineralization**: Orogenic (Au in quartz veins and carbonates). It is also possible the presence of mafic - ultramafic VMS (Cyprus type).
* **Current degree of study:** Regional geochemical studies in the framework of the Geological Survey at 1: 50,000 scale, as well as a geochemical sampling campaign conducted by a junior company in 1996 -1997.
* **Researching proposal**: Reconnaissance throughout both areas.
* **Data on mineralization**: Major possibilities seem to be related to the mafic ultramafic belt, where visible Au grains have been reported in geochemical samples. Additionally, the presence of some interesting geochemical anomalies (Cu, Pb, Zn, Ag, Au, Co, Ba and Cd) associated to sequences belonging to the continental margin often associated to Mn exhalatites at the contact between Fm Carmita (carbonated ) and Fm Santa Teresa ( jasperoids), as well as Cu and Mo in Fm. Cabaiguán (volcanic islandarc).
* **Reported grades**: "Zona Norte Cascajal": Visible grains of gold in geochemical samples; Au anomalies up to 2.59 g / t, up to 0.35 % Cu. "Punto 1252”: Tectonic breccias with malachite in granitoids. "Israel Diaz Zone": Geochemical anomalies of up to 925 ppm Cu; 303 ppm Co; up to 1.5 g / t Ag and 015 - 1% Mn. Several occurrences of Mn in silicic rocks belonging to Santa Teresa Formation.
* **Mining activity**: No reported.
* **CIEGO – CAMAGÜEY – TUNAS REGION**

This vast region encompasses the most of the three provinces referred. The most outstanding geological structures in the region are the Cretacic Volcanic Arc sequences and the Ophiolitic belt (Fig. 5).

Calcium-Alkaline and alkaline magmatic rocks are widely developed at both sides of de core a oriented E – W and expressed mainly by polyphasic intrusive centers (granodiorite, gabbro - syenite and gabbro - plagiogranite) like for instances “Gaspar”, “Las Parras” and “Sibanicú - Las Tunas”. In accordance with its petrochemical characteristics, these plutonic rocks can be divided into three series: 1) calcium - alkaline standard, 2) calcium - alkaline sodium and 3) alkaline.

Volcanic activity seem to be occurred al different depths, from deep underwater volcanism in Lower Cretaceous (Albian - Santonian) island arc to subaerial and explosive volcanism in the Upper Cretaceous (Campanian) island arc. Vulcanógeno-sedimentary sequences are placed on both sides of the magmatic axis. The most important areas for Prospection are related to the southern flank sequence; nevertheless very interesting areas as "Loma Jacinto" are located in the North flank.

Mineralization at Loma Jacinto appears to be linked to acid and alkaline intrusive bodies. However, at other points like "Golden Hill", located south of magmatic axis mineralization is associated with vulcano - tectonic structures apparently linked to another not outcropping secondary magmatic axis.

The most important genetic types of mineral deposits identified in this region are the Epithermal of high and low sulfidation, and Porphyry Cu - Mo ± Au. There are also Skarn Cu type deposits (ex. Tamarindo). Other models could appear, like for instances: Skarn of Fe, Porphyry Fe and Thorium - Rare Earth veins.

A mafic and ultramafic rocks belt is placed north of the volcanic island arc sequences, highlighting the San Felipe ophiolitic massif. These basic – ultrabasic rocks, like in the Cuba Central Region, are in allochthonous position. Here appear laterites deposits of Fe - Ni – Co, as well as Cyprus type VMS.

Many small deposits of gold and iron were mined over there in the early twentieth century.

**DESCRIPTION**

* **Title (general):** Reconnaissance or Geological Researches (Prospection - Exploration) at risk for precious metals (gold and silver), base metals (copper, lead and zinc) and other minerals in prospects and interesting areas in the Ciego Region- Camagüey-Tunas Region.
* **Project Description:** To carry out Reconnaissance and Geological Researches (Prospection - Exploration) for precious metals (gold and silver), base metals (copper, lead, zinc) and other minerals of interest in the Ciego Region- Camagüey-Tunas Region, in order to find and evaluate mineral deposits that could be economically attractive, and which will enable the creation of a Joint Venture for the exploitation, processing, and trading of minerals discovered.
* **Investment capital:** It should be defined depending on each project magnitude (how big it will be, works to do, etc.) and the investigation phase to work in (Reconnaissance, Prospection or Exploration).
* **Modality of foreign investment:** International Economic Association contract (AEI) at Risk for Reconnaissance and Geological Research (Prospection and Exploration). Those prospects with sufficient progress in their degree of study (prior or reached during the AEI contract) could be assessed to establish a future Joint Venture.
* **Market:** In the context of these AEI contract it will only be carried out geological investigations for a period of up to five years, so no final products will be obtained; information gotten will help to take the decision of passing to a Joint Venture or not. Final products to be obtained by the future Joint Venture (for any of the minerals to be found) would basically be focused to the foreign market, however Cuban enterprises will always have priority for purchasing these products.

**MAIN FEATURES OF THE PROPOUSED AREAS**

**EL PILAR (No10)**

* **Location:** This polygon is located 25 km east of Ciego de Ávila city and 3.5 km ENE of Gaspar town. Terrain is flat and accessibility is good; the Central Highway crosses 1 km south and Central Railway passes 2.5 km in the same direction. Other nearby towns are Céspedes and Piedrecitas.
* **Area:** 180 km2.
* **Metals:** Au
* **Genetic type of mineralization**: Epithermal of high sulfidation.
* **Current degree of study:** Prospection.
* **Researching proposal:** Exploration at the deposit itself. Prospection in the surrounding areas.
* **Data on mineralization**: At "El Pilar" there are ten ore bodies of irregular morphology, with also an irregular gold distribution; plus pyrite, chalcopyrite, chalcocite, covellite, enargite, native gold,some malachite, azurite and rare bornite, limonite, goethite and haematite.
* **Reported grades:** "El Pilar" Prospect: 1.77 - 1.95 g / t Au average (maximum 284.7 g / t); Cu 0.8 % average (up 16.8 %); "San Nicolás": 0.02 - 8.94 g / t Au; 0.03 - 4.85% Cu.
* **Mining activity:** None

**Caonao (No11)**

* **Location:** Located 20 km NE of Florida town, with a hilly topography. Access from Florida town is through a network of embankments and paths.
* **Area:** 723.0 km2.
* **Metals:** Au and Ag
* **Genetic type of mineralization:** Epithermal.
* **Current degree of study:** Geological Survey at 1:50 000 scale.
* **Researching proposal:** Reconnaissance throughout the area.
* **Data on mineralization:** Several occurrences of Skarn Fe are known in the area, most of them exploited before 1959. Hydrothermal alteration zones and geochemical anomalies of Cu, Zn and Au are also reported. Minerals reported are: magnetite, hematite, quartz, garnet and pyroxene. The most common rock alterations are: propylitization, argílitización, sericitization and silicification.
* **Reported grades:** "Caobilla": 60 % Fe; "La Unión": 42.25 % Fe; "La Candelaria": 46, 9% Fe.
* **Mining activity:** "Caobilla" and "Magarabomba" were exploited before 1959 by open pit, being mined about 10 000 t of magnetite ore. Kaolinitic clay for ceramic has been exploited at "Pontezuela". Pit was in operation until the last decade of the last century.

**CORRAL DE ROJAS (No 11a)**

* **Location:** Placed 18 km SW of Camagüey city; its topography is hilly and direct access from Camagüey is possible trough a good road.
* **Area:** 375.59 km2.
* **Metals:** Au and Ag.
* **Genetic type of mineralization:** Epithermal.
* **Current degree of study:** Reconnaissance.
* **Researching proposal:** Reconnaissance throughout the area.
* **Data on mineralization:** In "Corral de Rojas" are known subvertical veins   
  1-12 m thick within propylitic and silicified phreatic breccias. Dacitic - andesitic rocks with quartz-sericite and propylitic alteration are present in "Clarita".
* **Reported grades:** "Corral de Rojas": 0.235 - 11.83 g / t Au. "Las Claritas": 0.1 - 5.19 g / t Au.
* **Mining activity:** None.

**CAMAGUEY OESTE (No 11b)**

* **Location:** Located just west of Camaguey city; its topography is from flat to hilly. Access from Camagüey is through the Central Highway and embankments in good condition.
* **Area:** 740.73 km2.
* **Metals:** Au and Ag.
* **Genetic type of mineralization:** Epithermal (Au - Ag).
* **Current degree of study:** Geological Survey 1:50 000 scale.
* **Researching proposal:** Reconnaissance throughout the area.
* **Data on mineralization:** It is supposed that the same kind of mineralization found in adjacent prospects (mainly epithermal Au) could be present here.
* **Reported grades:** This is an unexplored area where only hydrothermal alteration zones have been mapped, like "Algarrobo", "The Vallita" and "Larga"; but the geological and structural setting seem to worth at least Reconnaissance works to determine its potential.
* **Mining activity:** None.

**Jagüey- Sibanicú (No 12)**

* **Location:** This zone can be accessed by the Central Highway, which crosses the NE end of the sector, as well as the road Camagüey - Santa Cruz del Sur, which crosses through its central part. The sector is also crossed by the Central Railway. The territory is a rolling plain with only some isolated elevations. The nearest city is Camagüey distant 15 - 40 km away.
* **Area:** 500.47 km2.
* **Metals:** Au – Ag, and possibly Cu, Zn, Th and REE.
* **Genetic type of mineralization:** Epithermal (Au - Ag), Skarn (Au). Possible Th veins.
* **Current degree of study:** Reconnaissance at "Jagiiey" "Caridad", "La Mina","Catuca" and "Vista Principe".
* **Researching proposal:** Prospection in “El Jagüey" and "Loma  
  Caridad"; Reconnaissance in the rest of the polygon.
* **Data on mineralization**: Five important occurrences are highlighted:  
  "Jaguey": Polymetallic mineralization up to 6 m thick associated with a barite body; gold mineralization in quartz breccias zones of tectonic deformation in felsic volcanic rocks. The known extent of mineralization is about 200 m, where sphalerite, galena, chalcopyrite, pyrite, barite, quartz, sericite, garnets have been identified:

“La Catuca" (Tres Antenas): Skarn (Au) and possibly Th - Rare Earths mineralization ± Au in rhyolitic lavas, syenites and tuffs. Two intense gamma - spectrometric (Th) anomalies associated with syenitic intrusive contacting with volcanic rocks within a wide hydrothermal alteration zone. Anomalies are 1200 m and 900 m long respectively and coincide with tectonic zones. Important interceptions have been gotten in some holes, for instance: 29.3 m of skarn (Au), a vein of auriferous quartz of 2.3 m in thickness and other mineralized intervals with gold, pyrite, sphalerite, galena, magnetite and quartz.

“La Caridad": Mineral zone with veins 3-10 m thick and 100 m long in altered syenites contacting with rhyolitic - dacitic tuffs. Some native gold, pyrite and quartz found in trenches and drill holes.

"La Mina": An extension of more than 1 km long with anomalous Au values in rock, sediments and soil samples within a probable remnant central volcanic structure. Native gold and pyrite have been found.

"Vista Principe": Gold mineralization detected in trenches, oxidized quartz veins 10-15 cm thick; visible gold, pyrite and chalcopyrite in dacites and andesites affected by propilitization.

* **Reported grades:** At "Jagiiey" occurrence: 0.015 - 18.425 g / t  
   Au; 0.37 - 130.0 g / t Ag; 0.02 - 13.50 % Zn; 0.01 - 1.72 % Cu; 0.01 - 5.91 % Pb. In "La Caridad": 0.8 - 15.29 g / t Au. "The Catuca": 0.4 - 6 g / t Au, up to 23.3 g / t Ag. "La Mina": 0.1 - 0.7 g / t Au. "Vista Principe": 0.1 - 108.6 g / t Au; 3-950 ppm Cu; 1.6 ppm Ag, 4830 ppm Zn and 2480 ppm Pb.
* **Mining Activity**: At "El Jagüey" overburden was removed and mineralized zone came uncovered.

**LA PURÍSIMA (No 12a)**

* **Location:** Located 18 - 30 km south of Camagüey city; it shows a flat topography interrupted by isolated residual hills. Access from Camagüey is by the road to Santa Cruz del Sur and local embankments in good condition.
* **Area:** 697.86 km2.
* **Metals:** Au, Ag, Cu, Pb, Zn.
* **Genetic type of mineralization:** Porphyry (Cu-Au); Skarn (Au-Ag-Pb-Zn)  
  and Epithermal (Au-Ag).
* **Current degree of study:** Reconnaissance in the occurrence "La Purisima"; very poor in the surrounding areas.
* **Researching proposal:** Prospection in "La Purisima" and  
  Reconnaissance in the remaining areas.
* **Data on mineralization:** The mineral occurrence "La Purisima" consists of a porphyry (Cu) zone in a granodiorite stock with potassic alteration, and a polymetallic skarn (Au) zone at the northern contact of an intrusive stock with felsic volcanic rocks and limestone lenses. Geochemical anomalies of Au, Ag, Pb and Zn in soils over the contact area are greater than 2 km long. Copper anomalies on mineralized stockwork are wider than 1.5 km2.
* **Reported grades:** 0.5 g / t Au and 0.1 - 0.2 % Cu in stockwork; 22 g / t Ag, 0.153 - 1.34 g / t Au and up to 4.0 % Zn in skarn zones.
* **Mining activity**: None.

**LA UNION (No 12b)**

* **Location:** This selected area is defined 25 - 50 km SE of Camagüey city; its topography is flat, only interrupted by isolated residual hills. The best access can be achieved from Camagüey city by the Central Highway to Guáimaro, then turning to the south toward the Colombia sugar factory, and then to the west by embankments in good condition.
* **Area:** 557.16 km2.
* **Metals:** Au, Cu.
* **Genetic type of mineralization:** Porphyry (Cu-Au).
* **Current degree of study:** Reconnaissance in the mineral occurrence “La Union"; very poor in the surrounding areas.
* **Researching proposal:** Prospection at "La Union" and Reconnaissance in the remaining areas.
* **Data on mineralization:** Porphyry (Cu – Au) at the granodiorite stock contact with andesitic tuffs.
* **Reported grades:** “La Union": 0.1 - 28.7 g / t Au and 0.025 -  
  0.39 % Cu (in trenches, outcrops and holes up to 40 m depth).
* **Mining activity:** None

**CAMAGUEY SUR (No 12c)**

* **Location:** Located in the southernmost part of the Camagüey province, 35-50 km away from the capital city. Its topography is flat and can be accessed by the road to Santa Cruz del Sur (up to km No 41) and then by embankments and roads in good condition, both toward east and west. Also accessed from the Sibanicú village, moving west to Cuatro Caminos village once in Najasa town.
* **Area:** 950.28 km2.
* **Metals:** Possibly Au, Ag and base metals.
* **Genetic type of mineralization:** Epithermal of high and low sulfidation, and / or Meso – Epithermal of intermediate sulfidation. There are not excluded other types of mineralization typical of island arcs.
* **Current degree of study:** Geological Survey at 1: 250 000 scale.
* **Researching proposal:** Regional reconnaissance throughout the area.
* **Data on mineralization:** Despite it has not been discovered, several indications should be considered in order to appreciate the real possibilities of this region; they are:
  + Geological setting is good (alkaline intrusive and medium to felsic volcanic).
  + Buried or partially buried structures identified by satellite images, what mean that may be potential mineral deposits have been better preserved.
  + The spatial location of "Golden Hill" and "Jacinto" deposits, relatively distant from the main magmatic axis, suggests that the farther from the main axis of the volcanic arc, the better and greater may be the existing epithermal mineralization.
* **Reported grades:** Unknown, because lacking of studies.
* **Mining activity:** None.

**JACINTO - LA DESEADA (No 13).**

* **Location:** Distant 10 - 20 km north from Guáimaro town. It has a flat topography with only some witness hills like Jacinto and La Deseada; the area tends to be flooded during the rainy season. The most direct access can be achieved by Guáimaro - San Miguel de Bagá road.
* **Area:** 417.02 km2.
* **Metals:** Au and Ag.
* **Genetic type of mineralization:** alkaline epithermal of low sulfidation and possible Porphyry (Cu - Mo ± Au) and alkaline Porphyry (Cu - Au).
* **Current degree of study:** Exploration at Jacinto and very poorly studied the remaining areas.
* **Researching proposal:** Further Exploration at "Jacinto" and its flanks. Reconnaissance in the remaining areas.
* **Data on mineralization:** Five auriferous quartz veins are known so far, with length between 200 and 1500 m, and thicknesses between 1 and 9 m, but in areas of stockwork mineralization even reaches up to 42 m.

The vertical extent of ore bodies (down deep) is about 50 - 100 m. The detected minerals are electrum, few pyrite, chalcopyrite, sphalerite, galena, hessite, petzite and sylvanita; also abundant quartz, calcite, adularia and plaster. There are geophysical and geochemical anomalies (Au) in sediments, which is an indication of potentiality for the discovery of more mineralized veins.

* **Reported grades:** Jacinto: 1-14 g / t (maximum 200 g / t) Au.
* **Mining activity:** None

**Guáimaro - Jobabo (No 14)**

* **Location:** At the SE portion of the Camagüey province and the southwestern part of Las Tunas province. The land is flat with some small hills and easy access. The main access roads to this area are the Central Road and the Central Railway, from which leave other secondary roads leading into the area. The major urban centers are Guáimaro and Jobabo towns.
* **Area:** 942.68 km2.
* **Metals:** Cu, Mo, Au and Ag. Possibly Fe.
* **Genetic type of mineralization:** Epithermal of high sulfidation, low sulfidation and alkaline low sulfidation; Porphyry Cu - Mo ± Au and Cu - Au alkaline. It is possible the existence of other types of deposits.
* **Current degree of study:** Exploration in "Florencia" and "Maclama".  
  Prospection in the "Jobabo" district; Reconnaissance on "Guáimaro", "Palo Seco" and "Tres Casas I".
* **Researching proposal:** Exploration at the "Golden Hill" flanks. Further Exploration in "Maclama" "Florencia" and their flanks. Prospection in "Guáimaro", "Palo Seco" and "Tres Casas I". Reconnaissance in the remaining area.
* Mining activity: "Iron Hill": A trench like mining working of 15 m depth was excavated; Up to 10 g / t Au was found in it. "Maclama": Mining was performed by rustic shafts, adits and galleries; the main access is a ramp with two levels of galleries. "Georgina": At least two rustic shafts were made. All these extractions were made between 1932 and 1945 and ore was treated in a mill with a small cyanidation plant.

In "Florencia" there are two mine shafts, the first one is 80 m deep with 1200 m of galleries, and the second one is 30 m with 60 m of galleries. There are also many shallow deep mining workings.

**LAS TUNAS (No 15).**

* **Location:** It encompasses the central part of Las Tunas province, surrounding Las Tunas city from its south, southeast and west flanks. The main access is the Central Highway, from which leave other secondary highways and major roads toward north and south. The land is rather flat with some small hills.
* **Area:** 494.96 km2.
* **Metals:** Cu, Au and Ag. Possibly Mo and Zn.
* **Genetic type of mineralization:** Skarn (Cu - Au). Possibly Epithermal (Au- Ag) and Porphyry (Cu - Mo ± Au).
* **Current degree of study**: Geological Survey at 1: 100 000 scale throughout the area, and isolated Reconnaissance works in "Manicaragua", "La Botija", "Tunas Sureste" and other sectors.
* **Researching proposal:** Reconnaissance throughout the area.
* **Data on mineralization:** Here are described contacts between granodiorite intrusions and quartz diorites with effusive rocks. Vein like and disseminated sulfide mineralization spatially and genetically related to favorable structures. The most common alterations are hydrothermal, skarnitización and cornification; quartz veins with sulfides and Au are also known.
* **Reported grades:** "Manicaragua": 1-4 g / t Au (maximum 25 g / t)  
  and up to 4 % Cu. “La Botija": 0.1 - 0.99 g / t Au.
* **Mining activity:** None.

**TAMARINDO – EL MIJIAL (No 16)**

* **Location:** Located in the western and southern portions of Las Tunas province, just on the border with Holguin the province; distances from the provincial capital not exceed 40 km. This territory is mostly flat with some small hills. Access is good, being the Central Highway the main path to the area, from which leave other secondary highways and major roads toward north and south points of the province.
* **Area:** 448.88 km2.
* **Metals:** Cu, Au and Ag. Possibly Mo and Zn.
* **Genetic type of mineralization:** Skarn (Cu - Au). Possible Epithermal (Au-Ag) and Porphyry (Cu - Mo ± Au).
* **Current degree of study:** Reconnaissance in "Cañada Honda", "Asientos de Tamarindo" and "Tamarindo 5" occurrences. Geological Survey in the remaining areas.
* **Researching proposal:** Prospection in "Cañada Honda", "Asientos de Tamarindo " and "Tamarindo 5". Reconnaissance in the remaining areas.
* **Data on mineralization:** "Cañada Honda": A skarn zone with precious an copper mineralization, close related to the contact zone between limestones and tuffs, is reported; malaquite, garnet, quartz and calcite are abundant here. “Asientos de Tamarindo”: Copper and precious mineralization in skarn; malachite, azurite, epidote, quartz, garnet, calcite are abundant.
* **Reported grades:** "Cañada Honda": 0.96 - 7.35 % Cu; 0.75 - 3.67 g / t Au and 2.2 - 68 g / t Ag. "Asientos de Tamarindo": Up to 14.2 % Cu; 2.2 g / t Au and up to 100 g / t Ag. "Tamarindo": up to 16.2 % Cu; 0.52 % Zn; up to 6.1 g / t Au; 21 - 466 g / t Ag. "Tamarindo B y C": 0.67 - 20.70 % Cu; 0.5 - 5.49 % Zn; 0.6 g / t Au; 1.2 - 411 g / t Ag. "Tamarindo 5": 2.74 - 4.45 % Cu. "Tamarindo 2": 1.20 - 1.35 % Cu. In other occurrences: 0.5 – 4 % Cu (16.2 % maximum), 0.2 - 1 g / t Au (up to 10 g / t); 0.8 - 25 g / t Ag and 0.61 - 1.82 % Zn.
* **Mining activity:** Some mineral occurrences like "Asientos de Tamarindo", "Tamarindo 5" and others were partially exploited for copper by rustic miners during the first half of the twentieth century.

**FERROLANA – CARIDAD (No 16a)**

* **Location:** The polygon is located 18 - 30 km NE of the Camagüey city. The territory is flat and the most direct access from Camagüey is by the road to Nuevitas and local embankments in good condition.
* **Area:** 126.16 km2.
* **Metals:** Au and Ag.
* **Genetic type of mineralization:** Au in Listvenites.
* **Current degree of study:** Reconnaissance at "Ferrolana" and "Caridad".
* **Researching proposal**: Further Reconnaissance throughout the area to clarify its potential.
* **Data on mineralization:** The area is characterized by the presence of bodies of refractory chromite with inside ultramafic rocks belonging to the ophiolitic association. Sulfides in listvenitic alteration have been found. This setting is thought to be potentially favorable for gold mineralization, fallowing the model prevailing in Cuba Central Region ("Descanso" and "Melonera").
* **Reported grades:** Only the presence of sulfides in listvenites is known so far.
* **Mining activity:** Exploitation of refractory chromites during the 40s and 50s of the last century.
* **HOLGUIN and SAGUA - BARACOA massif REGION**

1. **HOLGUÍN REGION**  
     
   This region consists of a packed allochthonous sequence of volcano - sedimentary and ophiolitic rocks (known as "Auras Zone "), placed in a narrow and imbricated tectonic contact because of overthrustings and transcurrentes faults. This sequence, strongly overlapped and folded, is resting on top of the northamerican continental margin (Fig. 6).

The main mineral deposits models present in the area are: Mother Lode type (gold), Orogenic (copper - gold – silver) and VMS Cyprus type.

Places where overthrsts and transcurrents faults are cut by N and NE trending faults offer the best possibilities for finding mineral deposits. Also those points where the overthusted sequence is cut by subvolcanic bodies (from basic t acidic in composition) could be perspective.

Metallic mineralization is spatially and genetically related with subvolcanic bodies and tectonic zones in the Holguín region; a clear tectono- magmatic control is shown. Two set of hydrothermal alterations in close relationship with mineralization are distinguished; the first one is associated to subvolcanic bodies and the other in related to ophiolites and tectonics zones.

The “Aguas Claras” gold deposit is the most representative example of mineralization in the region; it was partially exploited in the past century, but some resources are still at depth.

1. **THE SAGUA – BARACOA MASSIF REGION**

As such are identified the ophiolitic massifs Pinares de Mayarí and Moa – Baracoa, as well as the metamorphic sequence of rocks named “Sierra del Purial”; each one has its own metallogeny. In the ophiolitic massif are located long residual nickel deposits, but also a lot of chromium deposits, mineral occurrences and mineralization points; while in the “Sierra del Purial” area copper mineralization is the most outstanding (Fig.).

Among the best known chromium deposits are "Merceditas", "Amores", "Los Naranjos", "Cayo Guam" and others (in Moa – Baracoa massif); Caledonia and Albertina (Mayari – Sagua region). The most relevant mineralization point in the Sierra del Purial area is the “Elección” copper deposit.

**DESCRIPTION  
  
A) The “Holguín Region” Project**

* **Title (general)**: Reconnaissance and Geological Researches (Prospection - Exploration) at risk, for precious metals (gold and silver), base metals (copper, lead, zinc) and other metals of interest in prospects and areas of interest in the Holguín Region.
* **Project Description**: To carry out Reconnaissance works and Geological Researches (Prospection - Exploration) for precious metals (gold and silver), base metals (copper, lead, zinc) and other minerals of interest (chromium, platinoids, etc.) in the Holguin region, looking for economically attractive mineral deposits, which could support the creation of a Joint Venture for the exploitation, processing and marketing of minerals discovered.
* **Investment capital**: It will be defined depending on each project magnitude (how big it will be, works to do, etc.) and the investigation phase to work in (Reconnaissance, Prospection or Exploration).
* **Modality of foreign investment**: International Economic Association contract (AEI) at Risk for Reconnaissance and Geological Research (Prospection and Exploration). Those prospects with sufficient progress in their degree of study (prior or reached during the AEI contract) could be assessed to establish a future Joint Venture.
* **Market**: In the context of this AEI contract it will only be carried out geological investigations for a period of up to five years, so no final products will be obtained; information gotten will help to take the decision of passing to a Joint Venture or not. Final products to be obtained by the future Joint Venture (for any of the minerals to be found) would basically be focused to the foreign market, however Cuban enterprises will always have priority for purchasing these products.

1. **The Sagua – Baracoa Massif Project**

* **Title (general)**: Reconnaissance and Geological Researches (Prospection - Exploration) at risk, for chromium and other metals in the Sagua - Baracoa Massif, and base and precious metals in the Sierra del Purial area.
* **Project Description**: To carry out Reconnaissance works and Geological Researches (Prospection - Exploration)

• For chromium and other metals (platinoids, etc.) in the ophiolitic rocks of Sagua – Baracoa massif, in order to find new deposits of this metal and increase the degree of study of several known mineral showing.

• For base and precious metals in the “Sierra del Purial” area.

Concentrations of these minerals that reach the economically attractive classification would be the argument for the creation of a future Joint Venture for the exploitation, processing and marketing of mineral such minerals.

* **Investment capital**: It will be defined depending on each project magnitude (how big it will be, works to do, etc.) and the investigation phase to work in (Reconnaissance, Prospection or Exploration).
* **Modality of foreign investment**: International Economic Association contract (AEI) at Risk for Reconnaissance and Geological Research (Prospection and Exploration). Those prospects with sufficient progress in their degree of study (prior or reached during the AEI contract) could be assessed to establish a future Joint Venture.
* **Market**: In the context of these AEI contract it will only be carried out geological investigations for a period of up to five years, so no final products will be obtained; information gotten will help to take the decision of passing to a Joint Venture or not. Final products to be obtained by the future Joint Venture (for any of the minerals to be found) would basically be focused to the foreign market, however Cuban enterprises will always have priority for purchasing these products.

**MAIN FEATURES OF THE PROPOUSED AREAS (FOR BOTH PROJECTS)**

**Project for Holguín Region**

**HOLGUÍN OESTE (No 17)**

* **Location**: At the western part of the Holguín province, about 10-15 km northwest from the city of the same name. Another nearby village is Gibara. The topography is from rather flat to hilly and it is easily accessible by highways and local roads.
* **Area**: 428.0 km2.
* **Metals**: Au, Ag, Cu.
* **Genetic type of mineralization**: Orogenic of Au - Ag (Mother Lode type) and VMS. Also would be possible to find orogenic mineralization in continental margin sequences.
* **Current degree of study**: Reconnaissance in "Monte Rojo" and "Las Cuevas" prospects, and Geological Survey in the remaining area. In general sense the level of study for mineral occurrences and point of mineralization (around 30) is rather low; so that this area can be considered virtually untouched.

**Fig. 6: Investment opportunities in the Holguín Region and the Sagua - Baracoa Massif.**

* **Researching proposal:** Geological Prospection in "Monte Rojo" and "Las Cuevas", and Reconnaissance in the remaining area.
* **Data on mineralization:** Two prospects and 30 mineral occurrences, plus several points of mineralization.
* **Reported grades:** "Monte Rojo": 0.4 to 11.9 % Cu and up to 7.2 g / t Au. "The Cave": 0.2 - more than 1% Cu; 0.2 - 2 g / t Au and 0.2 g / t Ag. "Floro Perez": 0.1 - 1% Cu: 0.3 - 1.5 g / t Au and 1.4 - 2.3 g / t Ag. Other mineral occurrences: 0.2 – 1.0% Pb; up to 0.2 % Cu; up to 4 g / t Ag; Au indeterminate and over 1.0 % Ti.
* **Mining activity:** There are no reports of any mining activities for metallic minerals.

**AGUAS CLARAS - GUAJABALES (NO 18)**

* **Location**: At the NW part of the Holguín province. Holguín city is less than 15 km away. It is possible to access the zone by two main roads and secondary roads in good condition. The topography is slightly undulated.
* **Area**: 23.3 km2.
* **Metals**: Au and Ag.
* **Genetic type of mineralization**: Orogenic gold.
* **Current degree of study**: Prospection and Exploration.
* **Researching proposal**: Exploration in "Reina Victoria", "Nuevo Potosí", "Agrupada" and "Holguinera" prospects. Prospection for the remaining mineral occurrences.
* **Data on mineralization**: The mineralization is associated with extensive and intense hydrothermal alteration zones, affecting both the ophiolites and intrusive bodies; alterations are later than the location of ophiolites, which is corroborated by xenoliths within intrusive "New Potosí". Despite lenses and pockets of high grade Au are present, the bulk of mineralization is mainly disseminated and rather poor. There are no clear differences between host and wall rocks. Gold occurs mainly as native, but also appears in the form of electrum and amalgam, as well as associated with arsenopyrite.
* **Reported grades**: "Reina Victoria": 1.69 - 6.9 g / t Au (up to 40 g / t in richer areas). "Holguinera": 0.5 - 4.8 g / t Au (up to 14.4 g / t). "Nuevo Potosí": 1 - 2 g / t Au (up to 124.6 g / t in bonanzas). "Agrupada": 1 - 1.8 g / t Au (up to 200 g / t in bonanzas). "Santiago": 0.5 - 1 g / t Au.
* **Mining activity**: There are ancient mines since before the nineteenth century.  
  "Reina Victoria": A long pit of about 300 m in length and two benchs. According to ancient documents there are 190 m of mine shafts and 1174 m of old galleries. Mining before 1942 was around 500 kg of free gold. "Nuevo Potosí": Discovered in 1888; between 1900 and 1940 were dug 195.2 m of mine shaft and 1525 m of mine galleries. A processing plant with capacity to 50t / day was in operation there. Pit of about 200 m long and 50-70m wide is flooded.  
  "Santiago": Mining workings reached 75 m depth, extracting approximately 512.7 kg of Au between 1900 and 1930. It is known that between 1905 and 1920 bonanzas with gold content between 8.9 and 26780 g / t were extracted.

**SANTA MARIA - CHARCO PRIETO (NO 19)**

* **Location**: Located in the NW of the Holguín province, no more than 8-10 km E of the Holguín city. Topography is flat and slightly hilly, with easy access through highways and local roads.
* **Area**: 341.59 km2.
* **Metals**: Cu, Zn, Au and Ag. Possibly platinoids.
* **Genetic type of mineralization**: VMS Cu - Zn - Au - Ag.
* **Current degree of study**: Reconnaissance.
* **Researching proposal**: Reconnaissance throughout the area.
* **Data on mineralization**: Mineral bodies are composed of massive and disseminated sulphides, with primary ores, secondary enrichments and oxidized. They are aligned in a mineralized belt of about 34 km in length.
* **Reported grades**: "Mayabe": 1.0 % Zn and 1.0 -28.0 g / t Au. "Santa María": 0.1 - 6.7 % Cu; 0.3 - 1.5 % Zn; 1.0 -32.0 g / t Au, 10 -15.0 g / t Ag "Charco Prieto": 0.4 – 1.0 % Cu; 0.1 – 2.0 g / t Au and up to 1.0 % Ti. "Las Margaritas": 0.25 – 1.0% Cu; 0.2 - 2 g / t Au and up over 1.0 % Ti. Other mineral occurrences: 0.2 – 3.0 % Cu and 0.5 - 2 g / t Au.
* **Mining activity**: "Santa María": Ancient mining workings up to 12 m deep. "Las Margaritas": Trenches made in 1933. Also at "Santa Rita" there are some old excavations with traces of ore.

**CUATRO PALMAS (NO 20)**

* **Location:** About 45 km NE of the Holguin city and 3-10 km from the northern coast. Good access through the road Holguín – Banes town and several good local roads. The terrain is from undulating to flat, with only a few hills.
* **Area:** 144.00 km2.
* **Metals:** Au and Ag**.**
* **Genetic type of mineralization**: Orogenic with Au - Ag (type Mother Lode).
* **Current degree of study**: Reconnaissance.
* **Researching proposal**: Prospection in "Cuatro Palmas" prospect and Reconnaissance for the remaining areas.
* **Data on mineralization**: Not available.
* **Reported grades**: "Cuatro Palmas": 0.5 – 5.0 g / t Au and 1.0 to 1.7 g / t Ag in endogenous ores and up to 4.6 g / t Au in small placers. "Cambute": 0.1 – 1.0% Cu and 51-100 mg / m3 Au in Geochemical samples. "Holguin 29": 0.1 - 0.5 g / t Ag and up to 1.0% Ti.
* **Mining activity**: Rustic mining workings in placers made by local inhabitants.

**Project for Sagua – Baracoa Region**

**SIERRA DEL PURIAL OESTE (NO 21)**

* **Location**: It encompasses the western part of the Sierra del Purial metamorphic massif, in Guantánamo province; It is between 25 and 45 km from the Guantánamo city. The territory is mountainous and very rugged. Access is really tough.
* **Area**: 152.20 km2.
* **Metals**: Cu, Au and Ag. Possibly Zn, Ni and Co.
* **Genetic type of mineralization**: Orogenic sulphides (Cu – Ni) and possibly felsic VMS (Kuroko type) more or less modified by the regional metamorphism.
* **Current degree of study**: Prospection in "Elección" and “Jobito" prospects. Reconnaissance in the remaining mineral occurrences.
* **Researching proposal**: To complete Prospection and to carry out Exploration at the "Elección" and "Jobito" prospects. Reconnaissance in the remaining area.
* **Data on mineralization**: At surface, both in "Elección" and "Jobito" prospects, copper mineralization is represented basically by malachite and azurite; it is associated with diorite bodies which are lying conformably with the metamorphic foliation. The mineralized zones tend to deep abruptly towards the W and are identified by high silicification and oxidation processes.
* **Reported grades**: "Elección": 0.7 – 15 % Cu (average 2.15 %); 0.1 - 0.8 % Ni; 0.05 - 0.1 % Co; up to 8 g / t Au and 10 to 85 g / t Ag. "Jobito": In the oxidized ore 0.5 - 9.58 % Cu; 0.1 - 15.2 g / t Au and 1.0 - 114 g / t Ag. In the primary ore 0.87 - 12.69 % Cu; 0.5 – 1.0 % Zn; 0.1 - 3.5 g / t Au and 1.0 to 31.2 g / t Ag. "La Cruzada": 0.4 - 1 0.1 % Cu and 0.2 % Ni. "Los Asientos": 0.3 – 3 % Cu and up to 1.2 g / t Au. "Aníbal": 0.1 – 10 % Cu and up to 1.0 % Zn. "Miguel": up to 3.32 % Cu. "Quibiján": 0.16 % Cu and 0.71 % Zn. "Yacabo Arriba": 0.2 - 0.3 % Cu, up to 0.7 % Pb and up to 0.3 % Zn. "Maya": up to 0.1% Cu. "La Criolla" 0.1 % Cu. "Lajas": up to 0.3 % Cu.
* **Mining activity**: Several adits were caved between 1920 and 1950.

**SIERRA DEL PURIAL ESTE (NO 22)**

* **Location**: It encompasses the eastern part of Sierra del Purial metamorphic massif, Guantánamo province, at about 50-80 km away to the east of the Guantánamo city. The main access to the area is through the road named La Farola, which links the aforementioned city with Baracoa town. The accessibility inside the property is bad, because of the highly dissected mountainous relief.
* **Area**: 355.44 km2.
* **Metals**: Cu, Zn, Au and Ag.
* **Genetic type of mineralization**: Mafic - ultramafic VMS (Cyprus type); Au - Ag Epithermal and mesothermal, modified by regional metamorphism.
* **Current degree of study**: Geological Survey.
* **Researching proposal**: Recognition throughout the area.
* **Data on mineralization**: Not available.
* **Reported grades**: "El Ñame": 0.1 – 10.0 % Cu and 0.2 g / t Au. "La Ventura I": 0.4 % Cu and 0.1 - 1 g / t Au. "Jaguey": 1.0 - 8.16 % Cu. "El Hoyo": 0.5 - 7.12 % Cu and 0.1 - 11.75 % Zn. "La Jalda": 1.0 % Cu and 200 g / t Ag. "El Hoyo": 0.1 - 12.59 % Cu and 0.1 - 1.14 % Zn.
* **Mining activity**: Several small adits at "El Hoyo" area.

**MERCEDITAS (NO 22a)**

* Location: It is located about 35 km south of Moa city, at the eastern end of the Holguín province. The relief is mountainous and rugged, but access is good, using a mountain road that leads to the old mining facilities. Access to any other place is extremely difficult.
* **Area**: 60 km2.
* **Metals**: Cr.
* **Genetic type of mineralization**: Podiform chromites.
* **Current degree of study**: Exploration at Merceditas", where there are substantial volumes of mineral prepared for extraction and resources estimated in the Measured, Indicated and Inferred categories. Prospection at "La Melba" and "Pilotos I, II, III and IV", "Loro", "Yarey", etc.
* **Researching proposal**: Additional Exploration at "Merceditas". To complete Prospection and undertaking Exploration at "La Melba", "Pilotos I, II, III and IV" and "Yarey". Reconnaissance in the remaining areas.
* **Data on mineralization:** "Merceditas": Several bodies of massive podiform chromites, refractory type and high grade chrome, usually associated with more or less serpentinized dunite. In other prospects and mineral occurrences mineralization may be both type, massive than disseminated.
* **Reported grades**: "Merceditas": Cr2O3 = 31.3 %; SiO2 = 5.5 %.
* **Mining activity**: The "Merceditas" deposit was exploited until 2008 by the Cuban enterprise Cromo Moa. Access is through a main adit and even entire inner mine infrastructure is preserved. "The Melba" deposit was also partially exploited.

**CAYO GUAM- CROMITA - POTOSÍ (NO 22b)**

* **Location**: The area is located to the SW of Moa city, 10 - 35 km away, at the eastern end of the Holguín province. The terrain is mountainous and rugged, but access is good, using a good mountain road that leads to the former mining site or its immediate surroundings.
* **Area**: 45 km2.
* **Metals**: Cr.
* **Genetic type of mineralization**: Podiform chromites.
* **Current degree of study**: "Chromite": Exploration; resources are evaluated in the Measured and Indicated categories. "Cayo Guam": Exploration; resources are evaluated in the Measured and Indicated categories. "Potosí": Exploration; resources are evaluated in the Measured and Indicated categories. Prospection in other surrounding mineral occurrences.
* **Researching proposal**: Additional Exploration in the three main deposits ("Chromite" Cayo Guam "and" Potosí "). Exploration toward the depths and in other small mineral occurrences located nearby.
* **Data on mineralization**: Bodies of podiform chromites usually associated with dunites. Disseminated mineralization is predominant, although massive bodies usually appear. Potential increases toward deepest levels.
* **Reported grades**: "Chromite": Cr2O3 = 35.23 %; SiO2 = 4.16 %. "Cayo Guam": Cr2O3 = 36.15 %; SiO2 = 2.95 %. "Potosí": Cr2O3 = 33.88 %; SiO2 = 5.96 %; = 20.77 % Al2O3.
* **Mining activity**: The three main deposits were exploited first by the Americans during the 40`s, and later by the Cuban enterprise Cromo Moa until the 90`s. All these deposits were initially open pit mined and then by tunnels (adits). The tunnels are still perfectly preserved. Smaller points of mineralization were also partially exploited.

**AMORES – LOS NARANJOS (NO 22c)**

* **Location**: Located in the Guantánamo province, about 20 km SW of Baracoa city and 70 km SE of Moa city. The terrain is mountainous and rugged, but access is good through a main road well preserved, which leads to both mining facilities.
* **Area**: 60 km2.
* **Metals**: Cr.
* **Genetic type of mineralization**: Podiform chromites.
* **Current degree of study**: Exploration in "Amores" and "Los Naranjos". In both deposits resources are estimated in categories of Measured, Indicated and Inferred. Prospection in other mineral occurrences ("Nibujón I and II", "Juraguá", etc.).
* **Researching proposal**: Further Exploration "Amores" and "Los Naranjos". Prospecting to the flanks and the depths of both as well as in "Nibujón I and II", "Juraguá" and others.
* **Data on mineralization**: Bodies of podiform chromites of refractory type. Both reservoirs are highly perspectives on its flanks and toward depth.
* **Reported grades**: "Amores": Cr2O3 =27.32 %; = 9.64 % SiO2, Al2O3 = 21.3 %. "Los Naranjos": Cr2O3 = 33.16 %; SiO2 = 6.81 %.
* **Mining activity**: Both deposits were exploited until 2008 by the Cromo Moa Company. "Amores" was partially operated by tunnels. "Los Naranjos": Partially exploited by open pit.

**ALBERTINA - RUPERTINA (NO 22d)**

* **Location**: The polygon is located in the northern foothills of Sierra Cristal, about 10 km from Sagua de Tánamo town. The terrain is hilly and some dissected. Access should be from the road Holguin - Sagua de Tánamo and then turning south through intricate and pretty bad preserved paths.
* **Area**: 6 km2.
* **Metals**: Cr and possibly platinoids.
* **Genetic type of mineralization**: Podiform chromites.
* **Current degree of study**: Exploration at "Albertina"; where resources are estimated in the Measured and Indicated categories. Prospection at "Rupertina", "Tibera", "Elizabeth" and other mineral occurrences.
* **Researching proposal**: Additional Exploration at “Albertina”, and Prospection - Exploration at "Rupertina", "Tibera" and other mineral occurrences.
* **Data on mineralization**: Overall prevail bodies of podiform chromites (mainly metallurgical type and occasionally refractory type), with variable attitude and lenses or pockets shaped basically associated with dunites and harzburgites. The most representative mineral is chromiumspinel (magnochromite and chromiumpicotite), which usually occurs in disseminated way.
* **Reported grades**: "Albertina": Cr2O3 = 27.34 %; SiO2 = 17.49 % Al2O3. = 11.58 %.
* **Mining activity**: "Rupertina" was exploited by adits; "Isabel" was operated by a mine shaft and two adits; Both deposits were partially exploited until the 90`s by the opencast method. Nearby mineral occurrences were also partially exploited until the 50`s.

**CASIMBA – LA SIN NOMBRE (NO 22e)**

* **Location**: Located in the SW portion of the Pinares de Mayarí plateau, 20 km away from the Mayarí town, Holguin province. The terrain is flat (only on top of the plateau) and access from Mayarí is good through a network of local roads in good condition; it can also be accessed from Santiago de Cuba.
* **Area**: 12 km2.
* **Metals**: Cr.
* **Genetic type of mineralization**: Podiform chromites.
* **Current degree of study**: Partial Exploration at "Casimba", where resources in Measured and Indicated categories have been estimated. Prospection in "La Sin Nombre", "Carlos I", "Carlos IV" and "Casimba Oeste".
* **Researching proposal**: To complete Exploration at "Casimba" and Exploration - Exploration in "La Sin Nombre" and other nearby mineral occurrences that could require it.
* **Data on mineralization:** "Casimba": A body of abruptly deeping metallurgical chromites (over 45 °), pocket like shape and associated with dunites bands.
* **Reported grades**: "Casimba": Cr2O**3** = 27.25 %; SiO2 = 16.84 %; poor Al2O3 contents.
* **Mining activity**: "Casimba" was exploited by open pit up to 10 – 15 m depth. "Carlos I" and "La Sin Nombre" were also exploited by open pit. Other small mineral occurrences are located nearby, most of which were partially exploited until the 50`s.

**CALEDONIA – ESTRELLA DE MAYARI (NO 22f)**

* **Location**: This sector is located on the NE flank of the Pinares de Mayarí plateau, 15 to 20 km from Mayarí town. Relief is steep and dissected, generating a difficult access to most of the prospects of interest and mineral occurrences. It is possible to access the plateau by good local way, both from Mayarí and from Santiago de Cuba. Areas of interest can be accessed from the plateau by mountain roads and paths in poorly preserved.
* **Area**: 14 km2.
* **Metals**: Cr.
* **Genetic type of mineralization**: Podiform chromites.
* **Current degree of study**: Prospection in several deposits ("Caledonia", "Nueva Caledonia", "Nueva Caledonia I", "Nueva Caledonia II", "Estrella de Mayarí", etc.).
* **Researching proposal**: To complete Prospection in all prospects and mineral occurrences, and to carry out Exploration where it is justified.
* **Data on mineralization**: Some mineral occurrences like "Caledonia", "Nueva Caledonia I", "Nueva Caledonia II" and “Estrella de Mayarí" have been partially studied. Lenticular mineral bodies of chromite prevail in all them, usually closely associated with dunites bands. Body’s dimensions vary from one to another, like morphology and attitude; usually they are lenticular in shape with both soft and steep wedging. The thickness reach up to 20m and length can exceed 100 m. The main mineral present is the chromiumspinel, which usually appears both in massive and disseminated way. Generally speaking major promising is expected below 50 m depth.
* **Reported grades**: Overall mineral composition is averaged as follows: Cr2O3 = 45 - 48 %; SiO2 = 4 - 7 %; Al2O3: 10 - 12 %.
* **Mining activity**: Almost every mineral occurrence was mined (or partially mined) before 1959. Total ore mined exceed 250 000 t of metallurgical very high grade chrome. "Caledonia" was exploited by several adits as well as "Estrella de Mayarí".
* **SIERRA MAESTRA REGION**

The Sierra Maestra mountain chain is the main geographical feature of eastern Cuba; it runs parallel to the south coast, both to the west and east of Santiago de Cuba city. Its extension eastward is known as Sierra de la Gran Piedra (Fig. 7).

Geologically this region is mainly constituted by the Insular Paleogene Volcanic Arc, which shows numerous volcano-tectonic and subvolcanics intrusive structures. This arc is predominantly submarine. It is affected by three major fracture systems, one of them of sub latitudinal trend (to which belongs the fault named “El Cobre” that hosts the well known cooper deposit of the same name) and other two trending NW and NE.

The region is distinguished by a metallogenetic zonation from south to north. At the southern part are developed porphydic (with Cu, Mo, Au), mesothermal / epithermal of medium sulfidation (with Cu, Ag and Au) and Skarn (Fe, Cu, Au) mineralization. Next appear felsic VMS (Kuroko type), and at the northern limit of the mountain chain, volcanogenic deposits of manganese.

Possibilities of finding precious metals (Au, Ag), base metals (Cu, Zn, Pb) iron an manganese in this region are really high. A large number of mineral deposits are known in this great geological structure, among which outstand the copper deposit named “El Cobre" (one of the oldest mines of America); Manganese deposits like "Charco Redondo" (already mined), "El Cristo", "Los Chivos", "Barrancas" and others; as well as the iron deposits "La Yuca", "Chicharrones", etc.

**DESCRIPTION**

* **Title (general)**: Reconnaissance and Geological Researches (Prospection - Exploration) at risk, for precious metals (gold and silver), base metals (copper, lead, zinc) and other minerals of interest in prospects and promising areas in the Sierra Maestra Region.
* **Project Description**: To carry out Reconnaissance works and Geological Researches (Prospection - Exploration) for precious metals (gold and silver), base metals (copper, lead, zinc) and other minerals of interest in the Sierra Maestra region, in order to locate economically attractive deposits of these minerals, which could justify the creation of a Joint Ventures for the exploitation, processing and marketing of minerals discovered.
* **Investment capital**: They will be defined depending on each project magnitude (how big it will be, works to do, etc.) and the investigation phase to work in (Reconnaissance, Prospection or Exploration).
* **Modality of foreign investment**: International Economic Association contract (AEI) at Risk for Reconnaissance and Geological Research (Prospection and Exploration). Those prospects with sufficient progress in their degree of study (prior or reached during the AEI contract) could be assessed to establish a future Joint Venture.
* **Market**: In the context of these AEI contract it will only be carried out geological investigations for a period of up to five years, so no final products will be obtained; information gotten will help to take the decision of passing to a Joint Venture or not. Final products to be obtained by the future Joint Venture (for any of the minerals to be found) would basically be focused to the foreign market, however Cuban enterprises will always have priority for purchasing these products.

**MAIN FEATURES OF THE PROPOUSED AREAS**

**MAREA DEL PORTILLO (NO 23)**

* **Location**: This area is located in the westernmost part of the Sierra Maestra mountain chain, in Granma province, at about 50 km from Manzanillo city and 70 km from Bayamo city. This is a highly dissected mountainous territory, so that access to the selected area is quite difficult. The main access to the area is the Granma road and then it should be used internally mountain roads and paths.
* **Area**: 244.36 km2.
* **Metals**: Cu, Au, Ag and possibly Zn.
* **Genetic type of mineralization**: Mesothermal / epithermal of intermediate sulfidation. Possibly felsic VMS (Kuroko type) also.
* **Current degree of study**: Geological Survey.
* **Researching proposal**: Reconnaissance all throughout the area.
* **Data on mineralization**: Four main mineral occurrences are known in the area: “Marea del Portillo”, “Marea del Portillo II”, “Rio Mota” and “Limones de Mota”. No details available.
* **Reported grades**: "Marea del Portillo": 0.32 - 8.63 % Cu; up to 2 g / t Au and 30 g / t Ag. “Marea del Portillo II”: 79.75 % barite, 4 - 60 g / t Ag and up to 1 % Sr. “Rio Mota”: 0.4 - 1, 6 g / t Au and 5 - 20 g / t Ag. “Limones de Mota”: 0.1 - 1.98 g / t Au.
* **Mining activity**: No reported.

**Fig. 7:** Investment opportunities in the Sierra Maestra Region

**VEGA GRANDE - JUANICA (NO 24)**

* **Location**: At the central part of the Sierra Maestra, just in its northern flank. The area is characterized by rugged terrain and difficult access; this can be achieved only by mountain roads.
* **Area**: 288.0 km2.
* **Metals**: Cu, Ag, Au and possibly Zn.
* **Genetic type of mineralization**: Meso and epithermal of intermediate sulfidation. Possibly felsic VMS (Kuroko type).
* **Current degree of study**: Reconnaissance in "La Cristina", "La Nicolasa" (Vega Great Sector) and "Juanica". Geological Survey in the remaining area.
* **Researching proposal**: Prospection in "The Cristina", "La Nicolasa" and "Juanica". Reconnaissance in the remaining area.
* **Data on mineralization**: Two prospects ("La Cristina" and "Juanica") and over 10 mineral occurrences ("La Mañana", "La Nicolasa", "Veta Rey", "Seguridad", "El Agga", "Nerida", "San Rafael", "La Risueña", "Lirios", "Lirios I," Guama Sur "and others) have been identified in this polygon. All them associated with volcanic rocks of the El Cobre Formation and to numerous intrusive bodies acidic and medium in composition. Typical mineralization here is VMS, meso - epithermal and even porphyry.
* **Reported grades**: "La Cristina": 0.7 - 3.63 % Cu; 1.0 - 6.54 g / t Au. "Juanica": 1.98 – 4.0 % Cu (up to 11.7 %); 0.5 g / t Au (up to 20 - 35 g / t) and 56 g / t Ag (up to 147 g / t). "Veta Rey": 191.6 - 2897 g / t Ag; 1.24 g / t Au; 7.09 - 14.51 % Cu and 0.16 % Zn. "La Mañana": 0.21 - 1.07 % Cu; 1.18 - 2.2 g / t Au and 16.8 g / t Ag "La Nicolasa". 0.3 - 1.75 % Cu. "El Agga": 5.91 % Cu with native silver. "San Rafael": 5.89 - 66.94 g / t Ag "Nérida": 58.8 g / t Ag "Columbus": 200 g / t Ag "La Gloria": 0.04 - 29.70 g / t Au. "Seguridad": 0.15 - 0.99 % Cu and 1.0 - 500 g / t Ag.
* **Mining activity**: "La Cristina": The so called Eureka mine produced about 2000 t of ore with 7% Cu, in 1947. At "Juanica" prospect there are seven old mine workings properly named. "The Agga": Three old adits 50 meters spaced, caved between 1950 and 1956. "La Gloria": Two old adits located on the northern flank of Loma La Gloria, and a third one in the western flank of Loma La Ursulita. "Colón": There are some old mine workings where Ag and Cu ore was mined. "Security": An old adit.

**ESPERANZA – EL COBRE (NO 25)**

* **Location**: The sector is about 10 - 40 km north from the city of Santiago de Cuba; El Cobre village and “El Cobre” copper mine are located inside the polygon. It is easy to access to some places like “El Cobre” mine by paved road, but the most of the area is rugged and rather tough for accessing.
* **Area**: 336.0 km2.
* **Metals**: Cu, Au, Ag, Zn, Pb, Cd and possibly Mo.
* **Genetic type of mineralization**: Meso - epithermal of intermediate sulfidation, felsic VMS (Kuroko type) and porphyry (Cu - Mo ± Au).
* **Current degree of study**: Exploration in "El Cobre". Prospection in "Bueycabón". Reconnaissance in other occurrences.
* **Researching proposal**: In "El Cobre" Further Exploration and Feasibility Study to resume operation. Prospection – Exploration at "Bueycabón" and Reconnaissance in other occurrences.
* **Data on mineralization**: All mineral showings are associated with volcanic rocks of the “El Cobre” Group and many acids to medium intrusive bodies; typical mineralization is representative of massive sulfides, meso - epithermal, and even porphyry. Are remarkable the old reservoir "El Cobre", the occurrences "Santa Rosa", "El Desquite", "La Esperanza", “Bueycabón", "La Cuaba " and other smaller showings.

Main copper ore bodies in "El Cobre" reservoir are cutting the structure, but also were detected stratiform bodies concordant with ignimbrites, which host polymetallic mineralization of Zn - Pb. Gold has been repoted in the "Cobre Norte" sector (up 3.5 % Cu and 6.4 g / t Au). The site named “Oro Barita” encompasses its western flank.

* **Reported grades**: "El Cobre": 0.97 - 6.40 % Cu (average between 1.38 - 2.63 %); 4.87 % Zn (in stratiform bodies); 3.5 % Cu and up to 6.4 g / t Au in “Cobre Norte” sector. "Santa Rosa": 0.3 - 17.39 % Cu; 0.37 - 39.48 % Zn; up to 1.08 % Pb; up to 1.0 % of Cd and up to 100 g / t Ag. "El Desquite": Up to 10 % Zn; 1.0 % Cu and 0.3 – 1.0 % Cd. "La Esperanza": 0.1 – 10 % Zn; 1.0 – 2.0 % Cu; 100-300 g / t Ag and 0.3 – 1.0 % Cd. "Bueycabón": 0.05 - 5.34 % Cu (average 0.808 %) and 0.05 % Mo. "Cuaba": 0.38 - 1.82 g / t Au.
* **Mining activity**: "El Cobre" cupper deposit was discovered in1530 and started operations in 1540 by underground mining, remaining mining activities up to 1958, including several periods of standby. Between 1962 and 1997 mining operations continued by open pit. No more operations have been carried out since that year. The pit, now flooded, is about 800 m long x 400 m wide and over 100 m deep. Several thousand m of galleries and cross cuts were built during about five centuries of exploitation. The main mining shaft is sealed.

"El Desquite": There are 4 tunnels (adits). "La Cuaba": There is an ancient gallery of 100 m in length, excavated in an oxidation zone.

Significant resources still remain at depth.

**HIERRO SANTIAGO (NO 26)**

* **Location**: Located in the southeastern part of the Santiago de Cuba province, about 20 to 30 km SE of Santiago city, extending from the southern foothills of the Sierra de La Gran Piedra to the south coast. Relief of the area is hilly to mountainous, with altitudes between 100 and 900 m. Main access road is the Baconao - Santiago de Cuba route, and then inland along embankments and roads.
* **Area:** 380.56 km2**.**
* **Metals and other technical minerals**: Fe, Cu, Au, garnets and possibly Zn and Ag.
* **Genetic type of mineralization**: Skarn (Fe and Fe - Cu – Au) and possibly Epithermal (Au – Ag).
* **Current degree of study**: Prospection at “Antoñica”, “Chicharrones”, “La Yuca”, “La Grande”, “Sigua” and other areas.
* **Researching proposal**: Further Exploration for Au and base metals deposits in the “Hierro Santiago" Mineral District; further Prospection at “Sigua” and Reconnaissance in the remaining areas.
* **Data on mineralization**: In this area are clearly highlighted the “Hierro Santiago” Mineral District and the vulcano plutonic “Sigua” structure. In the first one all assessments have been focused to iron skarn mineralization. In the most deposits belonging to the “Hierro Santiago” Mineral District there are open pits with a significant amount of resources still to be extracted; garnets are abundant among the host rocks. In "Sigua" there are narrow silicified and mineralized magmatic rocks with gold sulfides.
* **Reported grades**: "La Yuca": 39.78 - 58.60 % Fe; up to 1.0 % Mn and 0.3 % Ti. "Concordia": 33.43 - 47.40 % Fe; 0.05 - 0.7 % Cu. "Antoñica": 32.86 % Fe; 0.19 - 2.79 % Cu (up to 8.9 %); 0.1 - 3.2 g / t Au; 50 - 200 ppm of Ge. "Chiquita": 20.0 - 68.2 % Fe; 0.12 % Cu; free Au; 30 - 200 ppm of Ge. "Arroyo La Poza": 44 - 52.7 % Fe; 0.1 – 2.0 % Cu and 0.1 – 1.0 % Zn. "El Descanso": 22.2 - 67.3 % Fe; 0.1 – 2.0 % Cu and 0.1 to 1.0 % Zn. "La Grande": 22.7 - 51.5 % Fe; 50 - 200 g / t of Ge. "El Norte": 20 - 57.95 % Fe "Vinent": 61.49 % Fe. In other occurrences: "Sigua 1": up to 18.75 % Cu; 0.1 % Pb; 0.57 % Zn. "Cupey I": 0.6 g / t Au; 18.6 g / t Ag "La Linet I": 6.27% Cu and 1.0 g / t Au. "Cupey": 0.4 – 11.0 % Cu; 0.1 % Ba; Free Au.
* **Mining activity**: Deposits belonging to the “Hierro Santiago” Mineral District began to be exploited between 1880 and 1890. By the early twentieth century had already been put into operation "Vinent", "Alfredo" and "East"; being incorporated in a short time "Folia" and others. The extraction was done by opencast mining in quarries that had up to 5 benches of exploitation. A total of 10.4 million t of ferrous ore was extracted from 1906 to 1932. Quality of the ore mined those years was as fallow: 58.40 - 62.76 % Fe; 6.90 - 12.80 % SiO2; 0.07 - 0.37 % of S and 0.29 - 0.38 % P. Mining operation ceased in 1947, apparently in close relationship with the end of the World War II and the discovery of the huge Fe deposit "Cerro Bolívar" in Venezuela. At the "Cupey" occurrence exploration workings (trenches and small pits) for Au and Ag were made before 1959. At "Sigua I" there are old excavations; in "La Linet I" there are 3 small pits and an old trench 5 m long.

**MANGANESO EN CUBA ORIENTAL (No 27 a, b, c, d, e, f)**

* **Location**: The six main sectors are encompassing areas of the Granma and Santiago de Cuba provinces.

1) “Cristo - Ponupo – Los Chivos” sector: Located between 15 and 40 km NNE of the Santiago de Cuba city. It is crossed in its southern portion by the Central Highway (in its section Santiago de Cuba - Guantanamo).

2) “Guisa - Los Negros” sector: Located in Granma and Santiago de Cuba provinces, at the southern flank of the Central Highway, ESE of the Bayamo city, south of Jiguaní town and East of Guisa village.

3) “Botija” sector: Located about 30 km WNW of Santiago de Cuba city, and to the East of “Margarita de Cambute” sector.

4) “Iris – Joturo” sector: Located in the northern part of the Santiago de Cuba province at about 50 km from Santiago city, between the municipalities of Julio Antonio Mella and Mayarí Arriba.

5) “Margarita de Cambute” sector: Located on the northern slope of the Sierra Maestra mountain chain, about 40 km toward the West of Santiago de Cuba city.

6) “Palmarito de Cauto” sector: It`s located between Palma Soriano and Julio Antonio Mella towns, NNW of Santiago de Cuba city. It is crossed by the road Palma Soriano - Cueto.

* **Area**: 2000 km2.
* **Metals**: Mn. Possibly Cu, Zn, Au and Ag.
* **Genetic type of mineralization**: Mn volcanogenic. It is possible the presence of VMS felsic (Kuroko type).
* **Current degree of study**: Prospecting and Exploration in major known deposits in the six sectors.
* **Researching proposal**: Further Exploration in those deposits partially exploited if required; Prospection in poorly evaluated deposits and occurrences; Reconnaissance in the whole area, in order to find new blind manganese deposits and also massive sulfides beneath the known manganese mineralization.
* **Data on mineralization**: Ore bodies are usually massive, shaped or lenticular layers; sometimes veins and irregular bodies can appear. They are usually associated with celadonite alteration ("green rocks") and jasperoids (known as “bayates”) at its bottom limits. These horizons of “bayates” can reach up to 500 - 1000 m long x 1-20 m thick. It is also common the presence of haematite tuffs in the hanging flank. The main Mn-bearing minerals in these deposits are psilomelane and pyrolusite; others Mn minerals are less common. To a lesser extent there are some re deposited accumulations hosted in carbonate rocks.
* **Reported grades**: Between 15 and 50% Mn.
* **Mining activity**: Manganese exploitation in this region date to the first half of the past century, but it was much more intense between 1940 and 1946. Mining operation was predominantly by open pit; underground mining was limited to some mines at their late stages.

The full extent of the extractions performed is unknown, but only between 1940 and 1946 there were processed about 10 million t of poor ores (coming from Cristo - Ponupo – Los Chivos district) in the beneficiation plant then located nearby the town of El Cristo (10 km from Santiago de Cuba).

Following World War II, because of a lower demand for Mn, most mining activities ceased, continuing only in "Los Chivos", "El Quinto", "Ponupo" and "Charco Redondo". Finally the exploitation of these deposits ceased in 1968.

* **ISLA DE LA JUVENTUD SPECIAL MUNICIPALITY**

This island is located about 100 km south of the Cuban main land. It´s basically composed of a terrigenous - carbonatic metamorphic massif, quite possibly of pre Jurassic age (Pinos Terrain). Metamorphism is of Regional type with a high T / P ratio (Fig. 8).

Its metallogeny is markedly different from the one characterizing the rest of the cuban territory, even the Guaniguanico and Escambray Terrain, outstanding Mesothermal gold veins (ex. "Delita", the biggest gold deposit in Cuba) and to a lesser extent wolframític mineralization in quartz - tourmaline veins (also hydrothermal) associated with porphyry dikes. The latter may related with Cu - Mo mineralization detected in the vicinity, apparently of Porphyry type.

The most abundant minerals in the island are the so called technical minerals (marbles, micas, kaolin, silica sand, kyanite, etc.). The best and biggest kaolin deposits are located in the island, where tens of reservoirs and occurrences of this mineral are known, most of them with some degree of study, even a few of them with resources estimated in high categories. According to Its properties these kaolin minerals may be classified as plastic or no plastic, refractory or shortly refractory.

The most important metallic mineralization is the auriferous one, which is basically represented by the "Delita" gold deposit, known and partially exploded since the early twentieth century. Besides it is important the "Lela" tungsten deposit, also known and partially exploded since the 40´s of last century. Two separated anomalies of copper and molybdenum have been identified close to tungsten mineralization.

Two different projects are being proposed for this territory, one for the tungsten (and potentially copper and molybdenum) mineralization, and other for technical minerals (mica and kaolin). Both are listed below:

**DESCRIPTION**  
**Project 1:**

* **Title (general)**: Geological Researching (Prospection - Exploration) at risk for tungsten in "Lela" prospect area.
* **Project Description**: This project is proposed to carry out geological investigations (Prospection - Exploration) in "Lela" prospect and surrounding areas, in order to find and evaluate new wolframític bodies, which increase the known resources so far. Moreover, if it is of interest for the investors the project is open to evaluate copper and molybdenum mineralization known in the vicinity of the tungsten deposit.
* **Investment capital**: A total investment of approximately 6 832 400 MUSD has been estimated, nevertheless this value must be adjusted during project preparation, taking into account the project scope, researching methods to be used and other items.
* **Modality of foreign investments**: International Economic Association contract at risk, for Reconnaissance and Geological Researching (Prospection - Exploration). A Join Venture for the Exploitation and Marketing of these minerals could be created, if an economic evaluation (Pre Feasibility Study) supports it.
* **Market**: Only geological investigations for a period of up to five years will be carry out in the context of these AEI; so no final product will be obtained; the result to obtain will only help to decide about the creation or not of a Joint Venture. Productions to obtain by the future Joint Venture (for any of the minerals under evaluation) would basically focused to the foreign market, however if the country need any of these products, will always have priority for purchasing them.

**Project 2:**

* **Title (general)**: Geological Surveys and Research (Exploration - Exploration) at Risk for technical minerals (mica and kaolin) in several prospects located in the Isla de la Juventud.
* **Project Description**: It is proposed to carry out Geological Researching (Prospection - Exploration) in several mica (muscovite) and kaolin deposits and promising areas located in the “Isla de la Juventud”, in order to identify new accumulations of these technical minerals, or to develop known deposits of them, that could be economically attractive and justify the creation of a Joint Venture.
* **Investment capital**: Total investment capital is estimated at around 5 288 000 MUSD, nevertheless this value must be adjusted during project preparation, taking into account the project scope, researching methods to be used and other items.
* **Modality of foreign investment**: International Economic Association contract at risk, for Reconnaissance and Geological Researching (Prospection - Exploration). A Join Venture for the Exploitation and Marketing of these minerals could be created, if an economic evaluation (Pre Feasibility Study) supports it.
* **Market**: Only geological investigations for a period of up to five years will be carry out in the context of these AEI; so no final product will be obtained; the result to obtain will only help to decide about the creation or not of a Joint Venture. Productions to obtain by the future Joint Venture (for any of the minerals under evaluation) would basically focused to the foreign market, however if the country need any of these products, will always have priority for purchasing them.

**Fig. 8:** Investment opportunities in the special municipality Isla de la Juventud**.**

**MAIN FEATURES OF PROPOSED AREAS FOR BOTH PROJECTS**

**(For Project 1)**

**LELA (NO 28)**

* **Location**: Located at about 50 km SW of the city of Nueva Gerona and 2 km E of Hotel Colony. Topography is hilly with good roads, allowing access by paved road to less than 2 km from the prospect.
* **Area**: 9.5 km2.
* **Metals**: Tungsten. Possibly Cu and Mo.
* **Genetic type of mineralization**: Hydrothermal and possibly Skarn.
* **Current degree of study**: Prospection. There are estimated resources of tungsten in the Indicated and Inferred categories. Degree of study for Cu and Mo is much lower.
* **Researching proposal**: Exploration for tungsten vein systems. Prospection - Exploration in anomalous areas for Cu and Mo.
* **Data on mineralization**: The mineral deposit consists of several quartz vein systems with tourmaline (dravidite) and varying amount of tungsten. These veins are usually associated with slightly older porphyry dikes of quartz - feldspar composition. Veins are usually long, narrow and irregulars in shape; lengths up to over 200 m with wedging and local disappearances are common; thickness varies from a few centimeters to 10 m (encompassing mineralized and hydrothermally altered zones). They usually dip steeply and have been cut at depths greater than 200m.

Main tungsten minerals identified are wolframite, ferberite and hubnerite; no scheelite has been identified. Copper mineralization was located on the NE flank of the tungsten deposit, being cut in eleven DDH; Thickness range from less than 1 m to over 20 m; with Cu values a little bit higher than 1.0 %. Among the sulfide minerals have been described: Arsenopyrite, pyrrhotite, chalcopyrite, pyrite and sphalerite. Molibdenite mineralization is located at the SE flank of the tungsten deposit, clearly associated with a wide area rich in porphyry dikes and may be the apical zones of a granite intrusion, as well as extensive explosive breccias bodies quite rich in tourmaline.

* **Reported grades**: WO3 = 0.61 % (average); Cu = 0.5 % (average); Mo = Up to 400 g / t.
* **Mining activity**: This tungsten deposit was partially exploited for an American company during the World War II. About 1 000 t of WO3 are reported to be mined. Three shafts were sunk, as well as several underground workings (drives, cross cuts and rises) and five adits plus numerous pits at surface.

**(For Project 2)**

**EL ALEMAN (NO 29)**

* **Location**: Located about 10 km SW of *Nueva Gerona* city. Local topography is flat and communication infrastructure is good, allowing access by paved road to the prospect site.
* **Area**: 0.46 km2.
* **Mineral**: Muscovite.
* **Genetic type of mineralization**: Residual.
* ***Current degree of study***: Exploration. There are resources estimated in Measured, Indicated and Inferred categories. A Pre Feasibility study and a preliminary technological evaluation have been prepared.
* **Researching proposal**: Further Exploration in the studied portion. Prospection - Exploration toward the southern flank.
* **Data on mineralization**: The mineral deposit is outcropping. It consists of a package of migmatitic and granitic rocks (gneisses, migmatites and anatectic granites) strongly greisenized. Weathering reaches up to 40m depth (average 28), making rocks considerably crumbly.

All these rocks are structurally interbedded (rather banded), with a North - South trend and dipping eastward (greater than 60 °). Mineral zone extend over 200 m and along trend, and the width is around 100 - 120 m.

Muscovite contents in different type of host rock are as follows: granites = 25 %; Migmatites = 24 %; Gneisses = 22.5 %. Predominant muscovite crystals are shorter than 2 mm sides, but they occasionally can reach more than 30 cm in isolated nests.

* **Reported grades**: Muscovite: 24.5% (average).
* **Mining activity**: No more than 10 000 t of mineral was mined from a small pit.

**CIRO REDONDO (NO 30)**

* **Location**: Located about 15 miles west of *Nueva Gerona* city. The terrain is flat and roads are good, allowing access by paved road to almost the own mineral deposit.
* **Area**: 2.25 km2.
* **Mineral**: Muscovite.
* **Genetic Type of mineralization**: Residual.
* ***Current degree of study***: Reconnaissance. Mineral was cut by a single hole.
* **Researching proposal**: Prospection and Exploration.
* **Data on mineralization**: Mineral almost outcrops (it is only covered by 15-20 cm of soil). The occurrence consists of a sequence of migmatitic and granitic rocks (gneisses, crystalline schists and migmatites: also anatectic granites) strongly greisenized. Weathering reaches up to 20m depth, making rock considerably friable. Predominant muscovite crystals are shorter than 2 mm sides, but locally they can reach more than 10 cm in isolated nests.
* **Reported grades**: Muscovite: 15 % (average).
* **Mining activity**: None.

**EL BOBO (NO 31)**

* **Location**: Located about 10 km west of Nueva Gerona city. The local terrain is flat and roads are in good conditions, allowing access by paved road up to about 500 m from the mineral occurrence.
* **Area**: 5.25 km2.
* **Mineral**: Muscovite.
* **Genetic Type of mineralization**: Residual.
* **Current degree of study**: Reconnaissance. Mineral has been identified in several outcrops.
* **Researching proposal**: Prospection.
* **Data on mineralization**: Mineral has been located in some poorly defined outcrops of migmatitic rocks. Abundant muscovite scattered everywhere in an area of more than 2 km2.
* **Reported grades**: Muscovite: 20 % (unrepresentative data).
* **Mining activity**: None.

**RIO DEL CALLEJON (NO 32)**

* **Location**: The site is 18 km SW of Nueva Gerona city and 2 km NE of La Demajagua village. Terrain is flat and access in quite easy; paved road cross the southern part of the mineral deposit.
* **Area**: 2.0 km2.
* **Mineral**: Kaolin.
* **Genetic Type of mineralization**: Residual.
* **Current degree of study**: Exploration. There are resources estimated in Measured, Indicated and Inferred categories. Kaolin mineral has been exploited since the early 70´s.
* **Researching proposal**: Further Exploration.
* **Data on mineralization**: The mineral deposit was formed by the weathering of a thick sequence of schistose rocks rich in feldspar (micaceous quartz - micaceous, graphitic and graphitic - micaceous in composition). From the structural point of view the sequence of weathered rock is interbedded and folded, but mostly deeping northward. The mineralization is extended to more than 50 m depth. Kaolins of different colors (black, gray, white and variegated) are distributed along de deposits, in accordance with primary rocks, which remain hard and well preserved at depth.

For its alumina content this mineral is of low refractory; they are also of low plasticity.

* **Reported grades**: Al2O3: 21.17 - 33.67 %, Fe2O3: 1.5 - 2.7 %. Performance at plant: 31.7 - 33.4 %.
* **Mining activity**: This deposit has been continuously exploited by a local company since the 70´s. At site there are two pits, one of which is flooded and abandoned. Nowadays a small sector of around 0.5 km2 is exploited by a local company, it includes the other pit.

**SANTA BARBARA - BUENA VISTA (NO 33)**

* **Location**: It is located about 25 km SW of the city of Nueva Gerona and 3-4 km NW of the La Demajagua village. Local topography is quite flat and access is good. Well preserved local no paved roads and embankments cross the area everywhere.
* **Area**: 10.12 km2.
* **Mineral:** Kaolin.
* **Genetic Type of mineralization**: Residual.
* **Current degree of study**: Reconnaissance. Mineral has been identified in several isolated drill holes.
* **Researching proposal**: Prospection.
* **Data on mineralization**: Kaolinitic mineralization has been identified in several holes drilled for mapping purposes. The apparent thickness of useful mineral varies from a few meters to more than 50 m. Kaolinitic mass colors vary from dark gray to white and variegated. In accordance with the local geological map it appears that the kaolinization is associated with a sequence of graphitic - micaceous schists, which is more than 10 km long and 1-2 km wide. This area could be a stretching of “Río del Callejón” to the southwest.
* **Reported grades**: No representative data available. Little plastic and of low refractory gray, white and variegated kaolins have been reported.
* **Mining activity**: None.

**LA JUNGLA (NO 34)**

* **Location**: Located about 30 km south of Nueva Gerona city and 10 km west of Santa Fe town. Terrain is flat and roads abundant. A paved road connecting Santa Fe and La Demajagua cross through the center of the area of interest.
* **Area**: 1.14 km2.
* **Mineral**: Kaolin.
* **Genetic Type of mineralization**: Residual.
* **Current degree of study**: Reconnaissance. Mineral have been identified in several outcrops and manual probes.
* **Researching proposal**: Prospection.
* **Data on mineralization**: The kaolinitic mineralization has been identified in several outcrops and manual probes. There is no representative data on the composition of these kaolins. In accordance with to the local geological map it appears that the kaolinization is associated with a sequence of graphitic - micaceous schists of about 1 km long.
* **Reported grades**: No representative data. Low plasticity and gray in color mineral is the most reliable information available.
* **Mining activity**: None.

**KM 13** **(NO 35)**

* **Location**: Located 13 km south of the Nueva Gerona city, nearby the highway Gerona - Santa Fe, just 1 km toward the eastern side. The terrain is flat and roads re good. A paved local road connects the highway with the prospect.
* **Area**: 0.23 km2.
* **Mineral**: Kaolin.
* **Genetic type of mineralization**: Residual.
* **Current degree of study**: Prospection. Even there are resources evaluated in Indicated and Inferred categories.
* **Researching proposal**: Exploration.
* **Data on mineralization**: kaolinization has been developed on a package of metamorphic rocks (schists and gneisses) of more than 10 m thick and shallow dipping (less than 30°).
* **Reported grades**: Kaolins gray in color and of low plasticity. Al2O3: 29.6 %, Fe2O3: 2.09 %.
* **Mining activity**: Partly exploited since the early 40´s. There are two abandoned and flooded pits.