Technical – Economic Study and Exploitation project of the marble stones

Object "Mali i Shenmerise" Mat (Albania)

Tirana, March 2008

Topographic map of the area
(Requested area for Exploitation Permit)
Scale 1 : 25 000

Corners	Northing	Easting	Elevation
1	46 11 610	44 26 833	920
2	46 11 412	44 27 168	948
3	46 11 264	44 27 079	1010
4	46 11 258	44 27 035	1014
5	46 11 258	44 27 035	1014
6	46 11 297	44 26 900	1004
7	46 11 472	44 26 810	940
8	46 11 546	44 26 810	920

Total area = 0.072 km^2

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1.General data on the mining object
1.2. General considerations

The compiled project aims the investigation of the possible exploitation of the marble stones of the object "Mali i Shenmerise" by the private subject "KUMEGA" sh.p.k., which has presented the request for obtaining the mining exploitation permission.

For the compilation of this technical – economic study and the exploitation project, the following data are considered:

- Geographic location and the relations of the object with the habitable centers.
- Topography and the climate of the area, where the considered object lies.
- Hydrology and hydrography of the surrounding area
- Present state of the infrastructure in total and the one of the subject area, the possibilities for its improvement, constructions and other necessary installations for the exploitation of the object from the mining point of view.
- The available geological material on the area and on the object, quantity and quality of geological and exploitable ore reserves within the exploitation defined limits.
- Measurements and different mappings compiled in field concerning to the geomechanical features, physical – mechanical characteristics and geotechnical parameters of the formations of the deposit, that can condition the size of the rock blocks in surface and depth of the object and need the use of suitable methods for exploitation.
- Different needs for equipment and other investments for the development and exploitation of the object.
- The kind of the final products and their market.

1.2.Location of the object

The object of the marble "Mali i Shenmerise", municipality Lis, Dibra county, lies 3 km distant northeast of this village. Southeast of the object, some 3.5 km distant is the village Vinjoll and northeast almost at the same distance is the village Vig of Macukulli municipality. West of the object, some 0.5 km distant, is the road that connects Burreli town with villages Lis and Vig and with Peshkopia town, known as "the old road" (see the map, scale 1:25 000).

The object is limited by the following coordinates (see table Nr.1).

Table Nr. 1.

Corner	Northing	Easting	Elevation
	X	Y	Z
1	46 11 610	44 26 833	920
2	46 11 412	44 27 168	948
3	46 11 264	44 27 079	1010
4	46 11 258	44 27 035	1014
5	45 11 265	44 26 961	1015
6	46 11 297	44 26 900	1004
7	46 11 472	44 26 810	940
8	46 11 546	44 26 810	920

The requested area for exploitation is 0.072 km^2.

1.3. Geography of the area

From the geographical and morphological point of view, the area represents a hilly - mountainous relief with precipitous summits. It becomes smoother towards northeast and southwest. The highest elevation, + 1045 m, lies in its southern. Almost the area is above the elevation + 900 m.

1.4. People, climate and infrastructure
People
The area of the object is not habitable. The nearest habitable centers are the villages Lis, Vinjoll and Vig, some 2-3 km distant. Their people is traditionally occupied with agriculture and breeding. Only a small number of the people of the area is occupied in construction, mining or forestry, but these activities operate far from this area. A part of the people works in emigration abroad, in Greece, England, Italy. The total people of the area is 3 600 habitants.

Climate
The sector of the object belongs to Mati area. The climate is mediterranean continental with long cold winter and hot short summer. In summer, the temperatures vary from $+25^0$ to 35^0, and in winter from $+7^0$ to -4^0 and less lower, these temperatures belong to January. The annual rainfalls vary from 600 mm to 1 200 mm, in average 750 mm, mainly at the end of autumn, winter and spring. The thickness of snow reaches 40 cm – 50 cm and it lasts for 4 weeks.

Generally, the object is well exposed. Only its surroundings are forested with pines and shrubs.

Hydrology and hydrography of the surrounding area of the exploitable object

The main river of the area is Mati. It flows some 20 km south of area.
From the hydrological and hydrographycal point of view, the object lies in good conditions. The area morphology does not allow a sustained basin for undeground waters, so there are not springs. A small spring with 0.6 l /sec, is close to the object. The rainfalls originate some temporary streams that flow towards the lower quotas. The spring water has a total mineralization 150 g /l, pH 5.2 – 5.6. The underground water is not aggressiv.

Vegetation
The area of the object is partly covered by vegetation. The part, totally exposed is selected for exploitation. There are only shrubs.

Present infrastructure
The object lies east of the road Burrel – Vig which is an unpaved road. It is less maintained, but allows the connection with other areas during most year. South of the object it is the branch that connect the village Vinjolle.

1.5. Economy and other activities in the area
The area is rural one and the people, traditionally, has been occupied of breeding and less of agriculture. Some people is employed in building and mining. A part, mainly young people, has emigrated abroad, in England, Italy and Greece. The economy is of an average level in comparison with the economic level of the whole country.

2 . Brief data on Geology
2.1. Geology of the area
Several geological surveys, prospecting – exploration workings and exploitation workings by the company "KUMEGA"sh.p.k., are carried out at the area, where the deposit of marble "Mali Shenmerise" lies. Since the year the company "KUMEGA" sh.p.k. has the license to produce blocks near the requested object.

The geology of the area consists of magmatic, sedimentary and volcano-sedimentary rocks.
Deposits of Triass – Jurassic are limestones overlain by volcanic sedimentary rocks, consisting of marls, argillaceous shales and garnet – muscovite – quartzite schist.
Deposits of Upper Jurassic – Lower Cretaceous are intercalations of sandstones, argillas and efusive rocks.
Deposits of Cretaceous predominate in the area. They are conglo- breccias of ultramafic and carbonate composition and represent the base of the carbonatic formations. They extend from Vinjolli to Dukagjini. The massive limestones overly them. The only layered limestones are the ones of Mali i Shenmerise of Albian – Aptian age, that are the object of marbled limestones under consideration.

Magmatic rocks

These rocks occur at the southwestern part of the area and consis of harzburgites, serpentinites and gabbros.
Harzburgites and serpentinites are limited while gabbros are more frequent. They are gabbrodiabases, anortosites, gabronorites. Olivine gabbros occur at the contact with the ultramafic rocks.
Serpentinites are frequent, especially along the fault zones and the process of serpentinization has affected all the other ultramafic rock types.

Deposits of Quaternary are alluvial deposits and other products of rock alteration that occur at the depressions of the area.

.2.2. Geology of the ore deposit
The deciphering of the geology of the ore deposit, to which the object belongs is done by the geological survey, scale 1 : 2 000, which enabled the compilation of the geological map. The object has a simple geology, consisting mainly of the formations of Triass.

Formations of Lower – Middle Triass
These formations occur at the eastern part. They are thin layers of limestone intercalated with quartzite and argillaceous schists. Generally, they have northeastern extension and western dip with dip angle 60^0. They have tectonic contact with the deposits of Upper Triass.

Formations of Upper Triass
These formations compose the ore deposit of limestones and marble of Mali i Shenmerise. They have gray – cream to white color, occur at the upper part of the section and occupy the northern and eastern part of the ore deposit. The limestones are massive and layered with layers 2.5 m – 3 m thick. They extend with 235^0 and have northwestern dip with 35^0- 54^0.

3.3. Brief data on the mineral type
The mineral to be exploited consists of marbled limestone that can be used for the production of blocks, which can be sawed to produce plates, that after a slight treatment get good decorative features and can be used in the building industry for inner or outer coating, or like gravel for production of plates for floor covering.

To judge on the field of the use of the material of this object, the necessary samples are picked up and the chemical and physical – mechanical analysis are accomplished.

The chemical composition of the marble of the object are as shown in the table Nr. 2.

Table Nr. 2. Chemistry of the limestones of the object

components	Lowest %	Highest %	Average
SiO_2	0.06	2.55	1.30
Al_2O_3	0.08	0.88	0.48
Fe_2O_3	0.27	1.89	1.08
CaO	52.90	55.48	54.19
$CaCO_3$	94.16	98.75	96.45
MgO	0.29	1.18	0.73
P_2O_5	0.08	0.01	0.05
S	0.02	0.04	0.03
L.O.I.	41.54	43.98	42.76

The analysed samples show that the physical – mechanical features of these limestones are:

* natural humidity   0.051 %

* capacity of humidity	0.060 %
* specific gravity	2.79 t/m^3
* compactness	99.44 %
* porosity	0.56 %
* resistance under compression in natural state	900 – 1360 kg/cm^2
* resistance under compression in humid state	1000 - 1200 kg/cm^2
* resistance in freeze	750 - 1000 kg/cm^2
* resistance of friction or test DEVAL Do	3.22 %
* volume weight	2.68 t/m^3
* water absorption	0.103

The material produced from them can be used for the production of decorative plates for inner and outer coating of buildings as well as like decorative construction rocks. The size of blocks that can be produced is of the order 1.35 m x 2 m x 1.2 m to 1.8 m x 0.9 m x 1.1 m. Like gravel it can be used for the production of decorative plates for floor covering.

2.4. Hydrogeological conditions of deposit

Based upon the geology, two hydrogeological complexes can be distinguished in the area:
- water-bearing complex of friable deposits;
- water – bearing complex of compact rocks.

The water-bearing of the friable deposits is related to the alluvium, gravels and colluvium, brown argillas with limestone and magmatic clasts. The basins of these deposits are too small and they have water only during the periods of rainfall, so the related small springs are only temporary.

In the water-bearing complex of the compact rocks, occur the waters of the alteration zone. The springs occur only during the periods of rainfall, that dry after them. The morphology of the area conditions the lack of the water springs. Only at its western part, towards Vigu, there is a spring with 0.6 – 1 l/sec, with total mineralization 150 g/l an pH 5.2 – 5.6. The water is not aggressive.

The waters are of the carbonate – magnesium type, good for drinking and the highest pH is 5.8 – 7.2.

Based upon the relief, geology and the hydrogeological data obtained by the investigations in field, we can conclude that the hydrogeological conditions are not complicated.

2.5. Technical – mining conditions

The other deposits present do not condition the selection of the exploitation method.

The rock have a mechanical stability above the intermediate one and with fissure network in intermediate level, especially at the upper part.
The RQD index for these limestones are:
- along the extension of the limestones package: 85 – 89 %;
- along the cross direction with the structure (along the dip): 79 – 86 %.

2.6. Tectonics
The area of Mali i Shenmerise deposit is part of Mirdita tectonic zone. It represents e small syncline with northwest – southeast extension. The subvertical tectonics is well developed and it can originated the formation of the marbled limestones.

2.7. The accomplished workings and the method of reserve calculation, geological and exploited ore reserves in quantity and quality.
Several workings are carried out in this deposit: prospecting – exploration workings by the Geological Enterprise of Tirana, Tirana in the years '60, and exploitation workings by the company "KUMEGA" sh.p.k. during the period 1997 – 2007 according to a license for an area close to the deposit. Based upon these data and new ones collected in the context of this investigation, we have compiled the geological map of the ore deposit and entire the other attached geological – mining material. These workings have enabled the recognition of the geology of the ore deposit, the calculation of ore reserves, the determination of the boundaries of overburden and their thickness, and the data on tectonics and hydrogeology.

The reserves of the object of marbled limestones of Mali i Shenmerise are calculated with the method of vertical sections, measuring the surface in section for each bench, because the exploitation method will be the open pit.
.
When the difference between two limiting surfaces is less than 40 %, the used formula for volume calculation is:

$$V = \frac{S_I + S_{II}}{2} \times L$$

While, when this difference is higher than 40 %, the used formula is:

$$V = \frac{S_I + S_{II} + \sqrt{S_I + S_{II}}}{3} \times L$$

The exploitable reserves are calculated after subtraction of the overburden thickness consisting of quaternary deposits and the altered part of limestones that can not be used for the block production. The empties formed by carst activity are subtracted as well. Following the experience and the recommended literature, in the exploitable reserves it is operated with block coefficient of the limestone (percentage of block volume against the total reserves to be mined).

The forecast development and production in the exploitation project is based upon the reserves and overburden calculated for each bench, and precisely from the bench + 920 m to the one + 1010 m, shown in the tables below.

Table Nr. 3. Total areas in sections, in m^2

horizon	Section K	section I	Section II	Section III	Section IV	Section V	Section K
1010					77	45	45
1000				25	245	221	221
990				235	360	450	450
980			60	355	586	730	730
970			385	545			
960			635	650			
950	326	326					
920	326	326					

Table N. 4. Geological reserves in benches and between sections (m^3)

horizon	K-1	I - II	II - III	III - IV	IV - V	V - K	total
1010					4042	1575	5617
1000				8120	15 610	7735	31465
990				20673	27068	14210	61951
980			13090	32597	48910	22797	117394
970			32 387				32387
960			44963				44963
950	9780	11410					21190
920	8150						8150
total	17930	11410	90440	61390	95630	46317	323117

3 . Mining part

3.1. General data

For the compilation of the mining part of this study, selection of the mining method and order and other elements, the followings are considered:
- topography of the exploitable part of the objects and its surroundings;
- quantity of the exploitable reserves in different elevations of the object;
- quantity of overburden and wastes to be displaced outside the exploitable area;
- mean ezposure coefficient;
- possibility of the connection of object with the road Burrel – Vig;

- the physical – mechanical and geotechnical charakteristics of the formations of the deposit;
- fissure system, their orientation and their filling material;
- important geomechanical and geotechnical indexes.

3.2. Selection of the mining method, with open pit or underground
After the preliminary calculation, the geological and exploited reserves, separated for each bench, and the other indexes, are given in the following tables.

Table Nr. 5. Areas for altered rocks and overburden (m^2)

<---------------- altered rocks ------------------------------ -><-overburden ->

Horizon	Section K	Section I	Section II	Section III	Section IV	Section V	Section V - K	Section III	Section IV
1010					101	30	30		
1000				76	105	64	64		
990				59	93	62	62		70
980			40	84	184	72	72	42	80
970			72	105				80	
960			52	63				44	
950		120	24						
920	120	120							

Table Nr. 6. Calculation of overburden, unused for block production

horizon	Sections K- I	Sections I - II	Sections II - III	Sections III - IV	Sections IV - V	Sections V - K	Total
+1010					2881	1050	3931
+ 1000				6300	5606	2240	14146
+ 990				5273	5159	2170	12602
+980			4247	9147	8657	2520	24571
+970			6160				6160
+ 960			4013				4013
+ 950	3600	4620					8220
+ 920	3000						3000
Total	6600	4620	14420	20720	22303	7980	76643

Table Nr. 7. Summarized indexes of reserves and overburden (m^3)

<----------- sections ------------------>   <---Reserves----------->

Horizon	K-I	I-II	II-III	III-IV	IV-V	V-K	total	overburden	Without overburden	Without karst	Converted reserves	block
1010					3872	1680	5552	3931	1621	1459	1021	306
1000				10523	18502	9065	38090	14146	23994	21550	15085	4525

990				22167	27412	15085	64664	12602	52062	46856	32799	9840
980			13533	31803	39864	23100	108300	24571	83729	75356	52749	15825
970			27207				27207	6160	21047	18942	13260	3978
960			41323				41323	4013	37310	33579	23505	7052
950	9060	30893					39953	8220	31733	28560	19992	5998
920	7550						7550	3000	4550	4095	2867	860
total	16610	30893	82063	64493	89650	48930	332623	76643	255996	230396	161277	48383

The selection of the open pit method, although the high overburden to be displaced, is conditioned mainly by the mining technology for the marble blocks, that in surface is applied with a technology not so advanced.

The use of this exploitation method is conditioned also by the present geological knowledge belonging only the near surface part of the deposit and the lack of the data concerning the depth. Other factors that favor this exploitation method are:
- hydrography of the area, that does not creates problems for the entire area in general as well for the object, in particular.
- Hydrology and springs, that are lack in the exploitation zone and its surroundings.

3.3. Extractive capacity of the mine, work regime, daily shifts, days per month or year, schedule of exposure workings and schedule of production for all the mine

Extractive capacity
The production of this mine will be destined for use in the domestic construction industry as well as for export abroad. The part of the material not suitable for block production, will be treated separately to produce gravel for the construction industry, as well. For this reason, depending on the studied and expected market, the subject forecasts to produce some 4 500 m^3 / year.

Work regime
For the completing of the forecasted production, the open pit will work some 200 – 240 days per year, 20 – 22 days per month, with 1 shift per day.
For the first year of its activity, the open pit will work with high intensity to complete the exposure, the road of development of the lower part, different arrangements of production.

Schedule of exposure and production

The total quantity of exposure of this open pit is 76 643 m^3 and it is foreseen to be completed within 9 years, with high intensity in the first year, and then proportionally for the next years. During the exploitation will be displaced also a quantity of reserves that do not ensure the standards for block production. This volume is calculated to be 112 856 m^3.

For the first year, the production of 3000 m^3 marbled limestone blocks and 10 000 m^3 exposure of overburden.

For the first year, the daily volume for the exposure will be 40 -50 m^3 /day, the suitable material for block 30 – 35 m^3 / day, while the daily block production will be 12 – 15 m^3 / day. The exposure and production belong to the benches + 1010 m and + 1000 m.

In the following years, the daily exposure volume will be 30 – 40 m^3 / day, the suitable material for block 34 – 50 m^3 / day and the block production 20 – 23 m^3 /day.

The exposure in the quarry is foreseen to be done along the whole extension and dipping of the marbled limestone orebody:

For the lower part of the quarry, below the quota + 940 m, at the area from the northwestern contour of exploitable zone. For the upper part, above the quota + 960 m, from the center of quarry at the area between the sections I – I and II – II, in both the extension directions.

The total volume of exposure of 33 250 m^3, that will be completed during several years, will be temporary stockpiled at the quota + 890m, outside the exploitation contour.

The forecasted production for year in each bench is given in the table below.

Table Nr. 8. The forecasted block production for year in each bench

nr	horizon	Exctrated reserves	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	total
1	1010	382	362										362
2	1000	3055	2638	417									3055
3	990	9352		4250	4666	436							9352
4	980	17222				4231	4666	4667	3658				17222
5	970	4730							1008	3722			4730
6	960	7281								945	4666	1670	7381
7	950	2288										2288	2288
8	920	908										710	710
9	total	45 142	3000	4667	4666	4667	4666	4667	4666	4667	4666	4668	45000

3.4. Variants of the development of ore deposit, argumentation and selection of development method

The followings are considered for the study of the ore deposit development variants:

- quota of the present road + 845 m;
- the upper quota of the exploitable zone, + 1010 m;
- geometric parameters of the exploitable zone;
- presence of the altered part of the area to be exploited;
- distribution of the extracted reserves against the total ones;
- the highest and lowest average slope of the object area and surroundings;
- possibility of the connection with road for the lower part of the quarry, above the quota + 950 m up to the quota + 1010 m at the southeastern part;

The development of this deposit will be done with outer trench. The development trench will be the continuation of the branch opened from the road Burrel – Vig, that needs to be reconstructed. The trench will start at the quota + 950 m and ends at the quota + 1010 m, with 60 m difference in level.

3.5. Mining method and related technical – economic indexes

The following factors are considered for the selection of the mining method:

- method for the production of marbled limestones blocks;
- method of loading and transport of wastes;
- method of exposure workings;
- method of loading and haulage of marbled limestone blocks within and outside the quarry.

The exploitation of this deposit will start after the opening of the main trench of development, the cutting trench, displacing of the overburden and the material that surrounds the blocks of limestone reserves. The opening of the main trench will be done by holes and explosion for shattering. The displacement of the material from the trench will be done by excavator and loaded on lorry, and when possible to put it on the flanks of the trench. The opening of the cutting trench and the displacement of the overburden and other material (mainly the karst one) will be done without the use of explosive to avoid the artificial damage of the block recovery, but using the excavator.

The cutting of blocks will be done using holes and helicoidal wire and the holes by pneumatic hammer. The air for the pneumatic hammers will be supplied by a compressor, put on the quarry. The blocks will be square or rectangular. The holes will be 5 – 10 cm distant from each other, depending on the frequency of the fissures within the block. The depth of the holes will be the same as the block thickness. The bench horizon will be divided in blocks 20 m wide and as long as the width of the bench. The trend of exploitation will be northeast – southwest, the one of advancement west – east. The blocks will be cut by holes on their four sides. Their displacement and haulage will be done by excavator.

The blocks of higher size will be cut by helical wire. The electric power will be supplied from the cabin of power, near to the quarry. The helicoidal wire will be fed with water which helps the cutting process.

It is foreseen that half of the block production be done by pneumatic hammer and the other half by helical wire. The most effective length of the cutting by helical wire is 10 m – 15 m. At the beginning will be produced the blocks by pneumatic hammer and later, after having ensured the blocks of higher size, the helicoidal wire will be used.

Based upon above mentioned, the forecasted mining method is simple with the transport of wastes within the quarry up to 150m distance and its storage near the quarry, at its lower part.

The elements of the mining method to be used are:
- height of the quarry bench is 10 m;
- width of the working space is 10 m – 20 m;
- the angle of the bench scarp is 70^0 ;
- daily capacity $1.5 – 2$ m^3;
- mechanized displacement and haulage;
- the cutting of marbled limestone by holes and helicoidal wire;
- production per effective workday of the direct workers $2.3 – 2.8$ m^3 /workday;
- production per effective workday of the total workers $1.8 – 2.2$ m^3 /workday.

3.6. Order and trend of exploitation and the related schedules
a) Order and trend of exploitation
After the exposure of the upper part of the quarry in the first year and other arrangements, in the same year it is foreseen to start the production of the limestone in the quantity of 3 000 m^3. The exploitation in benches to reach this production will be:

- at the bench + 1000 m, 0.8 year with a total production of 3 417 m^3;
- at the bench + 990 ~ 1000 m, 2.1 years with a total production of 9 652 m^3;
- at the bench + +980 m ~ +990 m, 3.8 years with a total production of 17 222 m^3;
- at the bench + 970 m ~ + 980 m, 1 year with a total production of 4 730 m^3;
- at the bench + 980 m ~ + 990 m, years with a total production of 17 222 m^3;
- at the bench + 980 m ~ + 990 m, 2.3 years with a total production of 10 279 m^3.

After the opening and development of the bench + 1080 m, the production will start and continue successively.

The trend of exploitation will be from the center towards southeast and northwest up to the extreme exploitation contours. The general direction of the benches will follow the contour lines of the relief (see the quarry plan in final state).

b) Geometrical elements of the quarry in final state

Considering the location of the quarry, relief and the geometrical parameters of benches, the quarry will be a stair of southwest – northeast direction, with the following parameters:

- Vertical depth of the quarry, 90 m;
- Number of benches 5;
- Width of the upper part of the quarry in plane will be 270 m;
- Width at the lower part of the quarry in plane (quota + 920 m) will be 15 m;
- Length of the quarry at its upper part 285m;
- Length of the quarry at its lower part 400 m;
- Angle of smooth of benches depending on the quarry extension is 56^0 ;
- Bench height 10 m;
- Height of exploitation slide is 2 – 3 m along the whole bench length;
- Exploitation direction will be northwest – southeast and the one of exploitation advancement within the block, south – north.
- Quarry area together the trenches is 0.0035 km^2.

3.7. Passports of hole – explosion for exposure and the production fronts; calculation of the quantity of explosive to be used.

The forecast of the hole – explosion is based upon these factors:

- need to use explosion for the opening of the main trench outside the contour of the quarry reserves;
- drilling of holes will be done by hand pneumatic hammer

Determination of dangerous zones by the hole – explosion workings

The work with the use of explosive in quarry is limited only for the opening of the road branch to the object and the main trench to be used for the exploitation. The explosive will not be used for block production, because it damages the block quality for other use purposes.

The quantity of explosive that will be used is limited. The explosive is the ammonite with detonator and common wick, but can be used the electrical detonators, as well. In the process of block production, the black powder and electrical detonators will be used for the displacement of the blocks.

The powder quantity in a hole is 60 g – 70 g and there will be 5 – 6 holes.

The use of explosive and black powder will follow the instructions described later.

3.8. Argumentation and selection of drilling, loading and haulage equipments

As mentioned in the part "exposure and production", the total exposure volume for the first year will be 14 750 m^3 and the block production 3 000 m^3, so in total 17 500 m^3. The daily volume for the first year will be 90 – 105 m^3 /day, and for the other years 95 –110 m^3/ day.

During the exploitation process, the handy pneumatic hammers will be used.

For the reaching of this daily production, for the first year as well as for the other years, one excavator and one lorry are needed.

It should be mentioned that the technical indexes of these loading and transport equipments are of the kind that they can face this production.

3.9. Selection of stockpiles for wastes and other byproducts storage

The operations for the exposure, opening of the road and trench and the ones of production will be completed as follows:

For exposure: the total exposure for whole the quarry will be completed during all the years, the last one excluded.

The total quantity of exposure and of the unsuitable material for block production is 189 427 m^3, and this quantity will be stored at the western part of the quarry, outside the exploitation contour. The stockpile contour is shown in the plan related to this study.

3.10. Technical security in the working process for the development – exploitation and object management
a) execution of norms of regulation of technical security

During the exercise of the mining activity, the subject should always consider and execute the problems of security in working process.

The technical director of the workings, before it starts and during whole the process, should execute the regulations and norms defined in:

1. Regulation of the Technical Security in Mines and Quarries of the year 1999, approved by the Order of the Minister, Nr. 132, dated 07.04.1999, based upon the article 17 of the Albanian Mining Law, Nr. 7796,dated 17.02.1994, published in the year 2001.
2. Regulation of the Technical Security for Works with Explosives in Mines and Oil, published in March, 2002.

These regulations will be executed in each working process defined in the planning of the exploitation compiled by the technical director and approved by the director of company and it should contain:

- planning of the working organization compiled before the exploitation starts;
- planning of the working organization is compiled by the technical director of the workings;
- the technical director or the charged person should carry out the technical control and the accurate updating of the mining workings of every kind, for which the subject has the exploitation permission;
- the order of workings is defined in detail in the planing and should be approved by the director of company;
- in this technical – organization planning, the measures on technical security should be of the first order;
- the technical director should execute regular monthly and three – monthly instructions, treating specific themes for all the professions;
- the workers that will work on the block production, control of the bench slopes, loading platforms, roads, maintenance of bench slopes and the direct or subcontracted miners will be tested every three months by the company.
- Special care will be for the creation of working conditions, clearing of bench platforms, roads, bench slope maintenance, etc.

- A severe control will be executed on the applying of the technical passports of the workings with explosive for the opening of the road and the main trench, as well as of the work with black powder for the displacement of the blocks, preliminary compiled by the technical director and approved by the director of company;
- A severe control will be executed on the applying of the technical passports of the inner transport workings, from one bench to the other.

b) security from land slides and maintenance of the calculated slope angles

Considering the geomechanical indexes of the rock formations, the slope angle of scarp and it is agreed to be 70^0. The scarp angle at the convex parts of the benches (quarry caps) is accepted to be 4^0-6^0 lower.

To ensure a normal stability of scarps and work platforms, it is foreseen that these laters have an inclination of 1-2 % towards the main trench allowing the normal water flow and avoiding the watering of the argjillaceous formations.

3.11. Work organization and manpower

Considering the geographical and climatic conditions of the quarry area, it is foreseen that the duration of exploitation will be more than 10 years.

The manpower for one shift will be as follows:
1. Technical director   1
2. excavator driver   1
3. lorry driver   2
 4. miner + assistant miner   3
8. watchman, quarry worker   2
9. ……………
10. …………….
11. …………….
12. …………….
13. …………….
14. …………….
    Total

The working regime will be with one shift / day and 20 – 22 working days / month.

The employees will be with experience in mining workings of this kind.

4.Construction part

The exploitation of the marbled limestone of this object is a mining activity of the subject, for the providing of the raw material for the production of byproducts of limestone and lime.

For the exposure, development, exploitation and processing of limestones, and the service to equipments, the following objects will be built:

4.1.Road for the object development and exploitation

Some 500 m main road and 350 m branches towards the quarry will be built.

 The road inclination is 8 % - 12 %. It will be 5 m wide and its scarp angles will be 70^0 – 72^0.

4.2.Industrial and equipment service objects

The foreseen objects of this kind will be:

4.3.Social objects

Since the beginning of the activity, it is foreseen the construction of one building to serve like office and refreshment environment.

4.4. Power supply and phone

An electrical cabin, completed with transformer and other necessary accessories, will be built to supply power to the processing installation with helicoidal wire.
The phone connection will be by mobile phone.

4.5.Other objects

Other objects to be built are a storehouse and some arrangements at the center of the object.

5.Economic part

5.1.Forecasted investments

For the exploitation of the marbled limestone of "Mali i Shenmerise", the forecasted investments are as follows:

5.2.Investments in roads, platforms and sistemations

These investments in total will be 8 000 000 lek.

5.4. Investments in social buildings

These investments will be 2 000 000 lek.

5.5.Investments in equipments and technology

Table Nr. 9. Investments for equipments and technology

Nr.	Equipment	
1	Compressor 10 m^3	
2	Excavator > 10 t	
3	Installation of wire cutting	
4	Electrical cabin	
5	Water pump	
6	Pneumatic hammer, 2 units	
7	Lorry, 20 ton	
8	Total	
9		
10		
11		
12		
13		
14		
15		

All the forecasted investments will be completed within 2 years, separated in 2 investment phases.

Table Nr. 10. Summarized table of investments

Nr.	Items of investments	Total value, lek		Second phase:01.01.-30.12.2008
1	Construction - assembling			
2	Machinery - equipment			
3	Other investments			
4	Equipment - furniture			
5	Total investments			

5.6. Calculation of the cost of production up to saleable product

Considering the forecasted cost for all items of annual production and the related investments, the forecasted cost of production is given in the table below.
The amortization value is assumed taking into account that the activity of exploitation will be only 10 years.

Table Nr. 11. Cost of production for 1 m^3 limestone in the object

Nr.	item	unit	norm	price	Value in lek
1	Auxiliary materials				
2	Black powder				
3	Cutting wire				
4	sand				
5	power				
6	oil				
7	lubricants				
8	Drill equipment				
9	Spare parts				
10	Direct salary				
11	Adds on salary				
12	Company expenses				
13	Environment expenses.				
14	Cost without amortization				
15	Amortization				
16	Operational cost				

5.7. Market prices. Marketing of the product, etc.

In the domestic market, the marble blocs to be used for the production of plates and decorative stones, there is demand and the price for 1 m³ block is some 40 000 lek /m³ in the location side.

Considering the trend of the construction industry in Albania, there will be not difficulties for the market of the marbles and marbled limestone blocks for the production of plates.

5.8. DCF for the entire duration of the quarry

Table Nr. 12. Calculation of expenses and return during the entire life of the mine, object Shenmeria

Nr.	unit	unit											
1	Block production	m³	45000	3000	4667	4666	4667	4666	4667	4667	4667	4666	4667
2	Product cost	Lek/m											
3	Product expenses	lek											
4	Seal price	Lek/m											
5	Input from sale	lek											
6	Fee on the add value	lek											
7	royalty	lek											
8	amortization	lek											
9	Fee for area	lek											
10	Environment expenses	lek											
11	Study/project	lek											
12	License fee	lek											
13	Total expenses	lek											
14	Total return	lek											
15	Fee on return 20%	lek											
16	Net return	lek											

6. Conclusions and recommendations

The compiled project aims the possibility of exploitation of the marbled limestones of the object "Mali Shenmerise" by the private subject "KUMEGA" sh.p.k., that has presented the request for mining permission.

The area is part of the territory of Lisi municipality and under the jurisdiction of Dibra county. The rural administrative center is Lisi, some 3 km distant, and the nearest habitable centers are the villages Vig and Vinjolli.

The road Burreli – Peshkopi passes some 0.5 km west and north of the object.

Some 1.5 km far from the object, the high voltage line passes.

The object area lies at the sheet of the topographic map, scale 1:25 000, and is limited by the following corners:

Corner	Northing	Easting	Elevation
	X	Y	Z
1	46 11 610	44 26 833	920
2	46 11 412	44 27 168	948
3	46 11 264	44 27 079	1010
4	46 11 258	44 27 035	1014
5	45 11 265	44 26 961	1015
6	46 11 297	44 26 900	1004
7	46 11 472	44 26 810	940
8	46 11 546	44 26 810	920

The requested area is 0.072 km^2.

The relief of the area is steep and eroded, with enormous clastic deposits at the lower part of the object.

The requested area is not fertile land.

The forests are almost totally lack. There are only some shrubs, typical for the area.

The biggest river is Mati, that runs through the southern part of the region, while at the area of the object there is not any stream.The area is dried with simple hydrogeological conditions.

It is connected with the unpaved road Burrel – Vig - Peshkopi.

The quantity of the exploitable reserves in the requested area is 323117 m^3, the overburden and altered part is 76 643 m^3 .

For the development of this deposit the forecasted investments are 10 369 500 lek.

The longevity will be over 10 years with annual production of 4 666 m^3 / year.

After the exploitation of this deposit, the forecasted net return is 10 870 400 lek.

During the exploitation process, the Regulation of Technical Security in Mines and Quarries, published in 2001, will be executed with care.

The normal course of the exploitation process needs the care for the maintenance of the widths of the working platforms and bench scarps.

Another problem is the maintenance of the inclination of the working platforms for the drainage of the waters.

The exploitation of this object does not affect the water flows, does not occupies fertile land and does not damages meadows and forests.

The production of blocks will be done by holes and helicoidal wire cutting, their displacement by excavator or by the use of black powder.

7. Data on the identification of the impact on the environment during the object development and exploitation

7.1. Loss of meadows
The total area occupied by the object during the exploitation is 5.5 ha. It is not fertile land and does not represent a meadow. After the exploitation finishes, all the area will be arranged and planted with trees. All the area will be covered by the alluvial deposits of the displaced overburden, allowing the planting and cultivation of different local plants and trees.
So, there will be not loss of meadows.

7.2. Loss of land slope
In project, the slope of bench scarps is foreseen to be 70^0. This slope is higher than the natural one of the relief of the object. After the final arrangement and filling, the will decrease with other 10^0.

7.3. Land pollution from flows
The inclination of working platforms and channels of the road are determined in project to allow the decantation of scarce mud by the waters within the working area. During the dried season, these decantations will be moved to the stockpile.

7.4.Land contamination by wastes
The waste by exposure will be stockpiled at the site planned in the project. Later, they partly will be brought back to fill the bench platforms and the lower platform + 950 m. They are friable material that do not contain contaminants for the environment. These deposits are fertile and serve for the remedy of the quarry.

7.5.Land contamination by muds
  There are not foreseen muds during the exploitation process.

7.6.Erosion during the object development and exploitation
    The project foresees a such exploitation order that together with the other measures of filling, arrangement and treatment, avoid the erosion and landslide of the quarry scarps and of the surrounding land.
7.7.Water plants
There are none water plants in the exploitation area.

7.8.Flora and fauna

There are none species of flora and fauna protected by special status. The local flora and fauna will be not affected by the exploitation because the object area is almost exposed in surface without any vegetation.

7.9.Water treatment
The mining technology foresees the use of the technological water to help the block cutting process and block separation. These waters that are in small quantities together with the ones of rainfalls, will be arranged to follow their natural flow.

7.10. Noise during exploitation
The cumulative noise from the simultaneous function of the machinery at 7 m distance is 180 dB. Considering the expression of the acoustic intensity level of a noise by the relation:

$$L = 10 \lg (I_1/ I_0)$$ where:

L – acoustic level of the considered noise;
I_I – acoustik intensity of cumulative noises;
I_0 – referred acoustic intensity;

we can conclude that acoustic level of noise in road is lower than the one of a car which runs through it. Practically, it is 40 – 50 dB, that is the one of a normal talk.
Analysis of the noise frequency emited by these machineries shows that they are below the mean frequency 200 – 2000 Hz that is acceptable by the human ear.

7. 11.Dust during the work
Because the use of water, there will be not dust during the exploitation.

7.12. Effect of explosive in environment
The explosive will be used only for the opening of the road and outer trench, so in this case it will have not effect in the environment.

7.13. Effect of gases emited by machineries in environment
There will be not emission of gases, liquids and other toxic products that can affect the health of workers, and the plants and animals of the surrounding environment.

7.14. Waste production
During the development and exploitation of the object there will be a temporary stock for some 33 250 m^3 wastes that at the end of exploitation will be brought back to the quarry. They are not dangerous and have the characteristics of the surrounding environment.

7.15. Landscape remediation

Area planning

To avoid the erosion and landslides, the project plans the combined exploitation of the area and of the quarry benches.

Arrangements, construction of connecting road and start of exploitation are planned to be completed in the first year and continue over 10 years.

The filling, arrangement and covering of the area is planned to be done step by step up to the end of the activity.

This will allow to replant different local trees that will contribute to avoid the erosion and to improve the landscape of the area.

Technical measures

To prevent erosion and landslide, the subject plans to carry out each year the following works:

After the exploitation of the first bench, different waste quantities, consisting of fertile alluvial deposits, will be put back here. This to prevent slope erosion and to precede the planting of typical local plants and trees.

During the activity, the geometric and geomechanical parameters of the exploitation benches will be maintained as suggested by project.

During the exploitation, the inclination of the benches and other areas will be maintained to allow the normal flow of rainfall water and to prevent their accumulation and liscivation of the exploited and covered areas.

Aesthetic and ecological measures

During its activity, the subject will accomplish each year these works:

- arrangement of final scarps of the quarry benches following their geomechanical and geometric parameters;
- leaving of protective strips between the exploitation area limits and the surroundings;
- arrengement, treatment and covering of the horizontal areas of benches turning them in small terraces;
- arrengement, treatment and covering of stockpile area;
- creation of suitable conditions for planting and cultivation of different plants and trees;
- planting of bench areas with typical local plants and trees, mainly pines, etc.

7.16. Surface damage from digging

At the end of exploitation the area surface will have the view of e terraced complex of 6.6 ha, partly filled and arranged.

7.17. Impact in infrastructure of the area

The object will be connected with the road Burrel – Vig.. The haulage of the material from the object to the destination will be done by lorries 20 ton following this road. This transport does not affect the traffic in this road, because usually the daily number of cars is scarce, 1 - 2 cars / day.

7.18. Impact in the health of the employees and habitants of the area

The employees will be protected, especially by the noise affect, providing them the necessary equipment.

The process will not have environmental impact and consequences in the people health, so people displacement due to this activity are not expected.

7.19. Impact in transport and communication

The haulage activity of the object does not affect the traffic on the road Burrel – Vig, because usually the daily number of cars is scarce, 1 car / day.

7.20. Planning of environment monitoring

a) Monitoring planning

Because we have to exploit limestones in the environment of a mountain slope, this needs the continuos monitoring of the area to be exploited.

The monitoring planning will consist of:

- monitoring of the geometrical parameters of the quarry benches: inclination, height, scarp angle, inclination of working platform as well as the geometrical ones planned in the project;
- Monitoring of the behavior of rock formations at the outer quarry contours and the prevention of possible slides and subsidences;
- Monitoring of the possible area of dust distribution during exploitation;
- Monitoring of behavior of present vegetation in the area and prevention of their damages;
- Monitoring of areas filled by material and fertile land to prevent the leaching and formation of holes;
- Monitoring of planted areas, cultivated plants and trees and their normal development. The damaged plant and trees will be substituted by new ones. This monitoring will continue for 4 years, time this sufficient for them to be independent from human care.

Measures for environment remedy

The step by step measures, beside the exploitation, will consist of:

- creation of areas for planting;
- arrangement of the material of exposure stockpiled at the limits of permission area;
- planting of new areas with pine trees and other plants;
- maintenance of the planted areas.

b.1. Accumulation of active soil on the quarry area

The area to be remedied from the subject during whole its activity, is 5.5 ha.

The soil volume only for the quarry is 35 281 m^2 x 0.20 m (thickness) = 7 056 m^3.

The necessary soil quantity will be taken by the exposure material that will be brought back to the quarry. Apart this, there is the area of the material stocked during the exploitation, to be remedied, some 2 ha. The soil to be used is in situ but it should be distributed in evenness.

This process is planned to start in the third year to continue for several others. The cost is included in the production cost.

b.2. Planting of young trees
Table of the foreseen cost for environment remedy.

1	Pine tree buying	unit			
2	Hole opening	unit			
3	Soil accum. + transport	m^3			
4	planting	unit			
5	service	unit			
6	Total cost , in lek				

8. Data on employment and training of Albanian citizens
There will be 7 persons employed in the quarry. They will be skilled in different work processes of mining.

9. Data on the expected infrastructure requests and related measures
 The development and exploitation of this quarry needs only the construction of a road, branch of the main road Burrel – Vig, which passes close to the quarry.
The exploitation of the quarry needs the installation of an electrical cabin, while the power line is built since before. The phone line is not necessary.

Technical-Economic Project Was Developed by doctor.htm of the Company Kumega Ltd

ADOPTED

**President of the company Kumega Ltd Albania
Engineering Geologist Shefki Hysa**