РЕПУБЛИКА СРБИЈА
МИНИСТАРСТВО ЖИВОТНЕ СРЕДИНЕ
И ПРОСТОРНОГ ПЛАНИРАЊА

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REPUBLIC OF SERBIA
MINISTRY OF ENVIRONMENT
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По мери природе

Бр/N°: 353-02-1153/2009-02
Датум/Date: 07.09.2009. године

Ministry of Environment and Water
Minister's Cabinet
1000 Sofia, 67 William Gladstone Str.
REPUBLIC OF BULGARIA

Dear Minister,

In accordance with art. 3 of the Convention on environmental impact assessment in transboundary context (ESPOO), we hereby notify you that Serbia intends to develop the project "Exploitation of phosphorite ore from the "LISINA" deposit near Bosilegrad and production of phosphate concentrate (K/P_2O_5)"

We are enclosing the Notification to an affected Party of a proposed activity as required by article 3 and by Decision I/4 of the Espoo Convention.

Would you be so kind as to notify us as soon as possible but no later than 6 weeks from the day of the receipt of this notification,, if Bulgaria would like to participate in the EIA procedure.

In the case that your decision is to participate in the procedure, please send the response to the notification, including information on the potentially affected environment, on the activities within the potential affected region etc., in the format required by Decision I/4 of the Parties to the Espoo Convention.

We look forward to accessible cooperation between our two ministries.

MINISTER

Dr Oliver Dulic

CC: Ministry of Foreign Affairs of Serbia
Directory for Europe
24, Kneza Milosa street, Belgrade

VICTORIA PHOSPHATE
MEMBER OF VICTORIA GROUP
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INFORMATION TAKEN FROM DOCUMENTATION ON ENVIRONMENTAL IMPACT ASSESSMENT OF THE PROJECT "EXPLOITATION OF PHOSPHORITE ORE FROM THE "LISINA" DEPOSIT NEAR BOSILEGRAD AND PRODUCTION OF PHOSPHATE CONCENTRATE (K/P_2O_5)"

PURSUANT TO ARTICLE 4, APPENDIX II OF THE"LAW ON CONFIRMATION OF THE CONVENTION ON ENVIRONMENTAL IMPACT ASSESSMENT IN A TRANSBOUNDARY CONTEXT"

Bosilegrad, August 2009

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PURSUANT TO ARTICLE 4, APPENDIX II OF THE"LAW ON CONFIRMATION OF THE CONVENTION ON ENVIRONMENTAL IMPACT ASSESSMENT IN A TRANSBOUNDARY CONTEXT"

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1 DATA ON PROJECT MANAGER

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Pursuant to Article 4, Appendix ii of the "Law on Confirmation of the Convention on Environmental Impact Assessment in a Transboundary Context"

A. DESCRIPTION OF PROPOSED ACTIVITY

- The project of exploitation of phosphorite ore from the "Lisina" deposit near Bosilegrad and the production of phosphate concentrate (K/P_2O_5) is based on the exploitation of the phosphorite mineral raw material deposit, which has been found and explored in metasedimentary formations of the Serbian – Macedonian mass in the southeast Serbia, in the vicinity of the Serbian – Bulgarian border, in the Bosilegrad municipality.

  The technical – technological concept of the usage of mineral phosphorite raw material obtained from the "Lisina" deposit, defined by the Investor's Project task, has been elaborated in line with valid standards of "sustainable development" according to the principle of "rational exploitation of nonrenewable mineral resources" and full protection of the natural environment (water, air, land). Ecological solutions are integrated in a unique technical – technological system with basic production processes. Furthermore, the production price comprises the price of full protection of the natural environment.

  All technical – technological solutions in the project are compliant with high legal standards of "sustainable development", which, in its final effect, satisfy the coherent functional interaction of techno – economical, ecological and social indicators of the project with its natural environment, at the location where production facilities for exploitation of phosphorite raw material from the "Lisina" deposit are to be built. The starting point is that the "sustainable exploitation" of natural resources with positive movement of indicators of its development must not provoke negative indicators in the natural environment.

  During the elaboration of technical – technological solutions of exploitation and primary processing of phosphorite ore from the "Lisina" deposit, it was taken care that all production operations are maximally concordant with potentials of the natural environment – both on macro and micro plan. The investor's project task required that the Feasibility Study includes state-of-the-art technologies, equipment and supplementary devices; that the phosphorite raw material is used rationally as nonrenewable natural resource thereby effectively protecting the environment: land, water, air.

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- The project is realized on the territory of the Bosilegrad municipality, which is located in the southeast part of the Republic of Serbia bordering the following:
  - Surdulica Municipality in the north,
  - Vranje municipality in the north-west,
  - Trgovište municipality in the west,
  - The Republic of Macedonica in the south-west and
  - The Republic of Bulgaria in the east

  The border with the Republic of Macedonia is 9 km long, whereas with the Republic of Bulgaria it is 54 km in length.

- The deposit (ore field) of phosphorite ore "Lisina", the exploitation of which the Project is based on, lies in the north-west of Bosilegrad. It stretches through the mountain massif of Milevska mountain, the Bozicka river valley (Picture A - 1). It borders the Ljubatska River to the south, Gloska Mountain to the east (Mečit – 1,756m). In the north, it stretches to the Kozjedolska River, and to the east, it borders with Miljevska Mountain (Mali Mečit – 1,561 m), which is the mountain bordering Bulgaria. The area of The ore field Lisina covers the area of 12.5 km^2.

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Picture A – 1: Panoramic photo of the Bozicka River valley downstream from the village Donja Ljubata

Bosilegrad region, where the phosphorite ore deposit is located, is characterized by high mountain terrains with steep slopes intersected gullies and streams-tributaries of the Bozicka and Ljubatska Rivers. Valleys of the two rivers are deeply cut into the terrain, so differences in altitude range from 400 to 800 meters with a horizontal distance of 2-3 kilometres.

The ore body appears as a stratum with the general strike oriented towards northwest-southeast with a fall at an angle of 20-30° towards NE. The thickness of the stratum at the outcrops varies between 16 and 32 m. Exploration drilling established the 5.5 km continuity of the phosphorite stratum. Based on data obtained from the exploration drilling, the average thickness of apatite metasands equals 22 m. The deposit has been explored at the length of 6 km, while the largest width goes up to 2 km at the horizontal crosscut.

The narrower part of the terrain, which underwent detailed exploration, covers the area of 550 ha.

Differences in altitude within the deposit equal 300 m, from the lowest ground level (850m in the valley of the Bozicka River near the Manastir site), to the highest ground level (1,150m) at the site of Panjevica as well as on the other side of the valley with similar alititude. The terrain on both sides gradually declines downwards toward the Bozicka River.

- The phosphorite mineral raw material (ore) from the "Lisina" deposit has a complex chemical and mineralogical composition. A useful component, the apatite mineral, contains around 9.55% of P_2O_5, which is 3 (three) times lower than the lowest content required for the implementation in further chemical processing. The content of harmful ingredients: iron and aluminium oxides (around 7.0%), carbonate (from 9.1 to 48.6%), silicium dioxide (11.6 to 56.4%), mica (from 2.9 to 21.3%) and others, exceeds significantly the content required by processing standards for implementation in the chemical industry (Fe_2O_3 max 1.5%, Al_2O_3 max 1.5%, SiO_2 max 10%, Cl max 300 ppm, CO_2 max 3.5%, etc). Consequently, in order to be able to use the phosphorite raw material obtained from the "Lisina" deposit for the mining exploitation, in addition to production facilities, it is necessary to build facilities for primary technological processing (apatite concentration) – production of phosphate concentrate (K/P_2O_5) with the P_2O_5 content of minimum 32.0%, Fe_2O_3 maximum 1.4%, Al_2O_3 maximum 1.0%, SiO_2 max 8% etc.
- Technical –technological solutions of exploitation and primary processing of phosphorite ore obtained from the "Lisina" deposit for production of phosphate concentrate (K/P_2O_5) are defined according to: coordinates of the deposit; tectonics; hydro-geological conditions in the deposit; chemical, physical,

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mechanical, physical-chemical and mineralogical characteristics of the phosphorite ore and waste; experimental data on technological analyses of the concentration of phosphorus mineral (apatite) in the phosphate concentrate (K/P_2O_5); natural conditions – availability of the terrain; water courses and amounts of available water; available road infrastructure; energetic facilities (electrical energy and other).

The construction of production and infrastructural facilities is anticipated for the usage of around 1,500,000 t of dry ore/year (around 1,540,000 t of run-of-mine – wet ore/year):

- For open pit mining exploration (operating in the first eight years), with tailing ponds for mining waste;
- For underground exploitation (operating from the seventh year until the end of production);
- For primary processing (flotation) and production of phosphate concentrate (K/P_2O_5);
- For disposal of flotation waste, tailing ponds;
- Infrastructural facilities:
  - For power supply,
  - For water supply,
  - Mining-flotation circle
  - Road infrastructure for rational functioning of the open pit mine; underground mine; mining, flotation and mutual mining-flotation circle, tailing ponds; facilities and buildings for power and water supply; transportation of phosphate concentrate and waste, in operational connection with existing main road R -122.
  - The system for regulation of the Bozicka River, for production and environmentally safe setting of the total production infrastructure in its valley.

- Production facilities and infrastructural buildings for exploitation and primary processing of the phosphorite ore and production of phosphate concentrate (K/P_2O_5) will, according to the Feasibility Study, be built in the valley of the Bozicka River. The layout map with coordinates of wider area of the exploitation field, production facilities and infrastructural buildings is given in A – Appendix 1.

  Areas of potential influence of production facilities and infrastructural buildings of the project are as follows:

Description	ha
• The area of potential impact of production facilities used for exploitation and primary processing (flotation) of the phosphorite ore obtained from the „Lisina" deposit near Bosilegrad with infrastructural buildings	539.92
• Production facilities and infrastructural buildings within the area of potential impact	174.63
o Open pit mine	63.43
o Mining waste landfill (outside the open pit mine)	29.32
o Infrastructural facilities (flotation, mine, common, roads)	12.00
o Flotation tailing pond	65.88

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o Water supply structure at the Ljubatska River (including the land surface for the pipeline route)	4.00

B. DESCRIPTION OF REASONABLE ALTERNATIVES (FOR EXAMPLE, REGARDING LOCATION OR TECHNOLOGIES) TO PROPOSED ACTIVITIES AS WELL AS ALTERNATIVES IN CASE OF REJECTION

The project is based on the usage of natural mineral raw material whose physical – chemical, mineralogical, mechanical and general characteristics of the deposit and surrounding area predispose the possibility and concept of technical – technological solutions of mining exploitation and technological processing for production of commercial product (in this case the phosphate concentrate, K/P_2O_5, for further chemical processing). The Bozicka River valley is seen as the functional location for basic production facilities (mining exploitation – primary processing – tailing pond), with optimal techno-economic parameters (part A – Appendix 1). However, a part of the main road R – 122 would have to be moved and the Bozicka River flow would have to be diverted for the length of the open pit mine. Water supply source for the supply of production capacities with industrial water (around 25 l/s) is planned to be on the Ljubatska River, upstream from its intersection with the Bozicka River.

- Reasonable Alternatives
  There is no functional and cost-effective alternative to technical – technological solutions and locations of the production facilities: mining exploitation and primary processing (flotation) of the phosphorite ore from the „Lisina“ deposit.

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Ony for the tailing pond for disposal of flotation waste amounting to 1,125,000 t/year, which is a very important facility, alternatives were considered for:

- various disposal technologies
- various disposal locations (alternative to the Bozicka River valley)

  - Technologies for disposal of flotation waste.

    - Version 1: the "Božička River" tailing pond with hydraulic disposal of tailings and cycloning

According to this version, waste is hydraulically transported from the flotation plant to the tailing pond. Physical characteristics of the waste pulp (suspension) are as follows: 194.35 m^3/h of suspension, 144.52 m^3/h of water (solid phase content is around 50%)

The tailing pond is formed in the Bozicka River valley after displacement of the regional road and deviation of the river itself.

For the formation and functioning of the "Bozicka River" tailing pond the following hydro-technical facilities are to be constructed: downstream initial dam (ID), upstream dam (DU), downstream dam (DD), drainage system and safety overflow body with the collector (SOB) – overflow collector.

The drainage water is taken to the pump station by water drainages (PSWD) situated downstream from the outer slope of the downstream dam. In order to protect the tailing pond system from damage caused by high waters, there will be a safety and overflow body (SOB) – overflow collector with diameter of D=1.0m and total length of L=820m. The collector is made of reinforced concrete and it eliminates the water in the Bozicka River bed. Although this facility is planned to be constructed, it is expected that its operation will not be needed.

- Version 2: the tailing pond "Božička River" with the disposal of filtered tailings

According to this version, the waste is transported from the flotation plant to the tailing pond by trucks. Physical characteristics of the waste are as follows: 75.33 m^3/h of waste, with the water content of 15% (25.5 m^3/h water). This version is optimal for high rate utilization of return waters (over 90%)

The tailing pond is formed in the Bozicka River valley after relocation of the regional road and deviation of the river.

For the formation and functioning of the "Bozicka River" tailing pond the following hydro-technical facilities are to be constructed: upstream dam (DU), downstream dam (DD), drainage system and safety overflow body with the collector (SOB) – overflow collector and protecting rim channels.

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For the purpose of controlled gathering and dewatering of drainage waters from the tailing pond site, it is anticipated that the drainage is carried out from the downstream side of the upstream dam that is, from the upstream side of the downstream dam.

It is also planned to carry out the drainage along the whole length of the tailing pond at the bottom of the old bed of the Bozicka River. Such drainage system is able to collect all chemically polluted drainage waters into the suction chamber of the drainage water pump station from where it is pumped into the tailing pond.

At the location of future landfill, Bozicka River, if a version with disposal of filtered waste is applied, it is necessary to ensure that the surface water which comes from lateral catchment basins is directed downstream from the landfill.

It is planned that the water from both lateral sides of the landfill will be collected by a rim channel and directed downstream from the landfill.

Geometrical characteristics of catchment basins are determined according to digitalized topographic basis with the contour line equidistance of 10 metres. It is a relatively small, extremely steep catchment basin where the prevailing vegetation cover is forest. The high water calculation was carried out based on a triangle synthetic unit hydrograph (Jovanović, 1989).

- Locations for Disposal of Flotation Waste

The location in the Božička River valley discussed in previous chapter and shown in the layout map in A – Appendix 1, is seen as optimal.

However, although seen as techno – economically less favourable, the "Zvancev Dol" location is taken as an alternative. This location is situated west to the Bozicka River whose basin emerges at the Ljubatska River valley.

Furthermore, two versions of disposal technologies were considered for the "Zvancev Dol" location: with hydraulic transport and disposal by hydrocycloning (Version 3) and with disposal of filtered waste (Version 4).

Version 2 - the location in the Bozicka River valley, with disposal of filtered waste, was chosen at this stage of Feasibility Study development. This version is more favourable as a technological and ecological solution since the concentrate and waste thickening and filtering in the flotation plant (first time in domestic practice) enables the extraction of used process water (419.15 m^3/h, which is 90.97% of the total amount) and its return in the primary processing in the form of return water.

Namely, in the primary processing of phosphorite ore obtained from the "Lisina" deposit for the production of phosphate concentrate (K/P_2O_5) around 2.79 m^3/water per t of ore is used, which is around 544.28 m^3/h (151.19 l/s). These waters contain certain amounts of reagents, which are below allowed limits and are not toxic. Nevertheless, they should not be, if possible, discharged in natural watercourses. Consequently, the usage of return waters is an essential issue which is given the highest priority in this project.

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By applying the version with disposal of filtered waste, the following return water balance in the flotation plant can be achieved:

Process stage of return waters	Return water		
	(m^3/h)	(l/h)	(l/sec)
Thickener overflow K/P_2O_5	134.74	134,740	37.43
Filter press filtrate for K/P_2O_5	46.96	46,960	1304
Thickener overflow for waste	194.43	194,430	54.01
Filter disc filtrate for waste	119.02	119,020	33.06
Total	**495.15**	**495,150**	**137.54**

C. DESCRIPTION OF ENVIRONMENT AFFECTED BY PROPOSED ACTIVITY

The analysis of current quality of land, water and air, in the wider area of the location where the construction of production facility is to be built, was carried out in the detail study made at the end of 2008 and beginning of 2009, in the "0" state category.

- Land

The area is covered with mountainous, forest, very shallow soil of the 6th and 7th class and even the least favourable 8th class.

The terrain is characterized by specific mountainous ecomorphology and severe slopes. The soil which is sampled by probes belongs to somewhat deeper forest soil since it represents drifts. The content of the skeleton in all samples contain fragments of sharp edged 2-30 mm large rocks with different percentage share. According to the percentage share of the skeleton, the soil belongs to the skeletoid land.

Based only on these parameters, this soil is classified as the soil that cannot be used in agricultural production, only perhaps partly as forest land.

According to the active acidity (pH u H_2O), it could be said that it belongs to the class of soil with moderate to poor acid reaction (pH = 6.0 – 6.5). These values of active acidity prevent high mobility of toxic metals and radionuclides, both along the vertical and horizontal profile axis, which is a great advantage when using such land in future measures. The classification of active acidity was carried out in line with the American soil classification according to the pH value in water suspension (ratio 1:2.5).

Substitute acidity (in KCl) is also stable and ranges from poor acid to neutral reaction (pH = 5.0 – 6.5). Therefore, it could be concluded that it is the stable soil with fine buffering capacity. The classification of substitute acidity is carried out according to the Penk's soil classification (1983), based on pH value in KCl.

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A high content of organic substances at certain locations is one of the advantages of this soil, since it prevents the mobility of toxic metals and radionuclides in all directions through the soil with its specific organic substance molecules. The high content of organic substance can be used later in the process of soil remediation (recultivation), since it is a good material for the borrow area for the landfill recultivation.

SiO_2/R_2O_3 (R=Al, Fe) ratio indicates that this is a forest soil. SiO_2/ Al_2O_3 ratio ranges between 2.58 to 4.23.

The CaO and MgO content in the soil is low, without significant oscillations.

The sulphate content in soil is low.

The highest content of PO_4^{3-} of 0.88 % has been reported in the soil sample at the location planned for the part of the open pit mine. This proves that in this case the substrate-rock played an important role in the soil formation of this site. Extremely dense and outspread root system of grass vegetation which is described during the terrain probing, is yet another proof that the phosphorus is available to plants to a large extent as a necessary macro element.

The content of toxic metals and uranium is checked because, based on geological basis, it was suspected that they are present in high contents. Uranium is in above mentioned rocks commonly an accompanying element, which, ecologically speaking, could be a serious and restricting environmental problem.

The total content of toxic metals Pb (70 – 110 ppm), Zn (71 – 190 ppm) and Cu (24 – 89 ppm) is slightly higher and is in line with rocks and substrate from which the surrounding soil is formed. Therefore, these values are not a restricting problem. The uranium content is within the limits of natural phon for that type of soil and it varies in the Serbian soil ranging between 1.04 – 2.47 mg/kg (ppm) *(Petrović i Mitrović, 1991; Miljević i sar.,1999).*

- Water

According to the Water Classification Regulation (Official Gazette of SRS 5/68), regulated pH values for waters of I, II and IIa classes range from 6.8 – 8.5, from 6.5 – 8.5 for class IIb waters and from 6.0- 9.0 for waters of class III. Based on pH values, all analyzed waters belong to the I and II class categories, since the pH value of analyzed waters ranges between 7.29 – 8.14. The final classification depends on other parameters.

According to the Water Classification Regulation (Official Gazette of SRS 5/68) and Rules on Hazardous Substances in Water (Official Gazette of SRS 31/82) all analyzed water samples belong to the I and II water class.

The water in the area of construction of production facilities contains heavy metals: Pb (< 0.01 mg/l), Zn(0.015 – 0.028 mg/l), Cu (< 0.01 mg/l), U (0.087 – 2.70 mg/l), etc.

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A high content of organic substances, primarily humus, in the soil where surface water was analyzed in contact, reduces the mobility of toxic metals in all directions through the soil and soil solutions. Values of active and substitute soil acidity prevent high mobility of toxic metals both along the vertical and horizontal profile axis. From the aspect of sustainable development, this presents a great advantage for usage of this type of soil in future activities.

The respective site has a high content of phosphorus which belongs to a group of elements with low mobility in the nature. A significant portion of soluble phosphate in the soil is in the form of organic phosphates, whose presence contributes to the precipitation of uranium, lead, zinc and cadmium especially in conditions which are close to neutral. Analyzed chemical and physical-chemical features of the soil classify it as phosphate induced pollutant stabilizer.

The analyzed high stability soil with fine buffer capacity is a natural geological barrier which contributes to the immobilization of harmful parameters in the eco system thus preventing contamination of surrounding watercourses and underground waters and their incorporation in biological systems. All above mentioned facts are proved by chemical analyses of tested water.

- Air

Water quality measurements were carried out in the „0" state category on a wider terrain of realization of the project of phosphorite ore exploitation and processing. The purpose of these measurements was to establish the state of air dustiness prior to commencement of works, as well as to provide the picture on the quality of air in the observed location. Measurements of settling substances during the exploitation will be able to determine the impact of these works on the environment.

Having in mind that the "Lisina" deposit is situated in a sparsely inhabited area without any industrial facilities or any other significant potential pollutants, it could be said that the planned location is situated in a **uninhabited area.** The immission threshold value (ITV) for this area equals ***300 mgm^{-2}day^{-1}***, whereas for **inhabited areas** it equals ***450 mgm^{-2}day^{-1}***. These values refer to the total settling substances.

Results of analyses show that all values of measured total settling substances are far below regulated immission threshold values (ITV).

Heavy metal contents (Cd, Pb, Zn) from ashes of settling substances are below immission threshold values (ITV) for uninhabited areas. For Co, Cr, Ni and Mn the legislator has not anticipated the maximum allowed values.

All measured values for all settling substances, together with all measured values of heavy metals are far beyond immission threshold values (ITV) which are regulated by the Regulation on Threshold Values, immission measurement methods, criteria for defining measurement locations and record keeping (Official Gazette RS 54/92 and 30/99).

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D. DESCRIPTION OF POTENTIAL IMPACT OF PROPOSED ACTIVITY ON THE ENVIRONMENT, ITS ALTERNATIVE AND ASSESSMENT OF ITS IMPACT

Taking into consideration the whole technological process of exploitation and primary processing of phosphorite ore for production of phosphate concentrate (K/P_2O_5), the following potentially negative environmental impacts could be observed:

- Soil degradation

✓ By complete development of open pit mine and formation of multi level profiles (front: H = 10 m; slopes 75^0; flat surfaces B = 6 m); around 63.43 ha of land in the Bozicka River valley is degraded;

✓ By opening a tailing pond of an open pit mine it is degraded by

North tailing pond		5.27 ha
Central tailing pond		25.41 ha
South tailing pond		7.95 ha
	total:	38.36 ha

✓ With the formation of the tailing pond in the Bozicka River valley for disposal of flotation waste, in the final exploitation stage (around 48 years) the upper surface which has the characteristics of tailings (grain size 85% -0.074 mm; P_2O_5 content ~ 1.02%; SiO_2 ~67.15% Al_2O_3 ~11.34%; loss due to annealing around 2.66%, etc) will be around 65.88 ha

✓ With the construction of production (flotation) and infrastructural facilities (mining plant, common buildings, water supply system and pulp pulpline) around 16 ha of soil is degraded, but it is immediately recultivated in order to obtain unobstructed process functioning.

- Air Pollution

The air is the first medium influenced directly by all emissions. The content of harmful substances in the air has been noticed on the local pollution level, and depends on the number and intensity of sources emitting dust, gases and heat.

In addition to dustiness which appears as an inevitable consequence of soil and rock degradation, combustion products of internal combustion engines produced by transportation vehicles as well as combustion products of energy generating products appear during the performance of regular works on exploitation of phosphorite ore, no matter whether it is an open pit or underground mine or its transportation to the flotation plant.

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products appear during the performance of regular works on exploitation of phosphorite ore, no matter whether it is an open pit or underground mine or its transportation to the flotation plant.

- ✓ *Dust.* The main air, water and soil pollutant at the observed location may be mineral dust, which is carried by the wind and depending on the dust particle size it settles in the surrounding area, while the finest fractions remain in the air or are blown away from the source. Settled dust is washed away from plants by atmospheric precipitation and is carried by currents to watercourses or is settled on the surrounding soil. As dust carries anionic and cationic radicals it can influence the process of soil acidification and thereby influence the appearance of heavy metal ion mobility in the soil and their accumulation in plants.

  The appearance of dust is inevitable during drilling and blasting oeprations in the exploitation area. Removing of dust during the drilling process is carried out using dust collector systems placed in a drilling machine.

  Particle pollution places will be defined through the main project as well as through rehabilitation measures. In that way the dust emission will meet demands of the Law on Environmental Protection and Emission Regulations. Particle pollution on a wider area can appear in case of adverse meteorological conditions, in case of which particles can be dispersed and deposited on shorter or longer distances from the exploitation field.

- ✓ *Gaseous pollutants.* During the operation of internal combustion engines of transportation vehicles, hydrocarbons and other chemical compounds, diesel fuel ingredients, are emitted in the atmosphere. As the content of diesel fuel changes within limits where: C = 86 - 88%, H = 11.5 – 13.5 % and S = 0 – 0.4%, it can be concluded that the quantity of combustion products changes with regards to the content of combustible components in the diesel fuel. Anyway, the combustion product volume is equal to the sum of individual combustion product volumes. The emission of gaseous pollutants can be calculated with high accuracy. However, having in mind that the engaged engines will operate in the open area, at the altitude of around 800 m, in forest surrounding (it is a well known fact that hlorophyta in their photosynthesis processes adopt CO_2) which will generate certain amounts of exhaust gases, it can be claimed with high certainty that the danger of air pollution with gaseous pollutants is practically non-existent, that is, that during the performance of mining exploitation works at the open pit mine, the quality of air in the area surrounding the site shall not decrease.

  - Water and soil pollution

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Having in mind the whole exploitation process and primary processing, and being aware of basic relationships which have a particular significance for the impact assessment of potential air and soil pollution, the following can be concluded:

- ✓ All above mentioned agents which are used in the process of primary processing belong to the category of low or weakly toxic substances and if used in a standard manner do not present a threat to the environment. The danger arises only in case of accident – spillage. In order to prevent that, the staff shall previously attend thorough trainings regarding manipulation and constant control will be established.
- ✓ Influence of process water– Generally, the process will be conducted in such manner that any kind of pollution of surface and underground water will be avoided. The identification of potential dangers will lead to considering the likelihood of accidents, for example destruction of various tanks and alike.
- ✓ Concentrations of most pollutants, which come from vehicles, directly depend on the period of dry weather before the rain and on the traffic load;
- ✓ Scattering of substances from the road during dry weather due to air flow caused by passing vehicles does not significantly influence the increase of concentration;
- ✓ The largest concentrations of pollutants in the water which flows away from the manipulative surfaces will be during rainy periods, when washing away of asphalt surfaces is more intensive; The largest concentrations are expected in the first 10-15 minutes of raining. After that, they decrease sharply.
- ✓ The pollution of surface water caused by draining of road surfaces is possible. However, pollution of the Bozicka River is avoided by its diverting and by construction of tunnels and collectors.
  Lubricating oil will be supplied in barrels and bins with the maximum capacity of 200 litres. In order to prevent the spillage during the loading and unloading, special dishes for catching of spilled oil will be provided. As for the waste water, including fecal water, the problem will be solved by purchasing and installment of modern cleaning systems so that they can be drained in the nearest watercourses as harmless.

- Noise

All research focused on defining possible negative impacts regarding the exploitation of phosphate ore show that in certain situations the noise can present one of the important factors of jeopardizing the environment. Without discussing characteristics of individual types of noise, we will only say that it comes from several basic sources whose characteristics vary considerably.

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- ✓ *Traffic noise* – appears primarily as a consequence of vehicles transporting the ore from the open pit and underground mine to the flotation site as well as of vehicles transporting the concentrate and waste. The appropriate level of traffic noise is determined by basic characteristics of the source.

- ✓ *Machine noise* which is created during the manipulation process on the open pit mine can, in certain situations, represent a factor important for defining of potential negative impacts. This factor is not critical in case of underground exploitation.

- ✓ *Blasting noise* – as for the underground exploitation, there is no direct impact on occurrence of noise and air blast nor on the effect of scattering rocks. This effect is fairly more noticeable in the open pit mine exploitation. Due to the appearance of harmful and dangerous effects caused by detonation of explosive charges, safety zones around the seismic activity are defined.
- ✓ *In the technological process of primary processing, the noise sources* may include crusher-milling devices, separators, flotation machines, pumps, compressors and other noise producing machines.
  The Rule Book on Permitted Noise Level in the Environment (Official Gazette RS 54/92) regulates the permitted level of noise and noise level measuring methods. The highest allowed noise level in the environment where people reside, expressed in dB(A) for residential buildings, is: from the source of noise within the building 35 dB; from the source of noise outside the building 40 dB

E. DESCRIPTION OF MODERATION MEASURES WHICH WILL KEEP NEGATIVE ENVIRONMENTAL EFFECTS TO A MINIMUM

Moderation measures which will keep negative environmental effects to a minimum are considered and solved:

- ✓ In the stage of development of basic technical – technological solutions of exploitation and primary processing of phosphorite ore, and
- ✓ During the operation of production facilities.

  - Measures for moderation of negative impacts in basic technical – technological solutions

    - o Usage of natural water:

In exploitation processes and primary processing of phosphorite ore obtained from "Lisina" deposit for the production of phosphate concentrate, large amounts of process water are used. Around 544.28 m^3/h or 151.19 l/s of water will be used particularly in "wet" primary processing: grinding of crushed ore, flotation and

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magnetic separation. Such large consumption and need to fully control waste waters require the implementation of state-of-the-art and effective technical – technological solutions for "dewatering" (thickening and filtering) of all products in the process by careful collection of already used water and their usage in the form of return water.

Owing to these solutions, used in the production process of primary processing of phosphorite ore, 495.15 m^3 (137.54 l/s), out of 544.28 m^3 (151.19 l/s) of water is used as the return water. According to that the balance of fresh process water for primary processing, which should be collected from natural watercourses at the "Lisina" deposit site, is as follows:

Type of water	m^3/h	l/h	l/s
▪ **Necessary amounts of water**	544.28	544.28	151.19
▪ **Return water from the process**	495.15	495.15	137.54
▪ **Necessary fresh process water**	49.13	49.13	13.65

For continual renewal of process water in an unobstructed operation of the plant for primary processing of phosphorite ore (flotation) at least 13.65 l/s of fresh water from natural watercourses is required. In addition, certain amounts of process water are necessary for open pit and underground exploitation (primarily for borehole drilling). Therefore, it has been calculated that required amounts of fresh process water equal 25 l/s. Such decrease in quantity is a great contribution to the decrease of potentially negative impact.

o Protection of natural watercourses:

All production facilities are constructed in the Bozicka River valley (A – Appendix 1): open pit mine, underground mine, flotation, tailing pond for flotation waste and all infrastructural facilities apart from the water intake system for fresh water which is constructed at the Ljubatska River near the mouth of the Bozicka into Ljubatska River.

One of the major characteristics of the whole terrain is a lack of vegetation on higher parts, while steeper slopes are covered with low vegetation and deciduous forest. Heavier precipitations lead to erosion and drainage of larger quantities of materials into major watercourses.

The hydrographic network is developed. This region is drained by two rivers: the Bozicka River from the northwest and the Ljubatska River from the west. They are joined together near Bosilegrad (west) in the Dragovistica River which flows towards the south-east and crosses the Bulgarian border near the village of Ribarci. It eventually flows into the Struma (Aegean basin). There are no larger watercourses in the north part, apart from smaller periodical and torrential watercourses, steeply cut into the transverse valley of the Bozicka River. The south part is, from the north to south, drained by: the Buceljevska River, Bresnicka River and Bistarska or

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Brankovacka River, which drains far south-east parts of Serbia (border of Serbia, Macedonia and Bulgaria). All rivers of the south part are right tributaries of the Dragovistica River.

The atmospheric precipitation has a direct impact on the level of water in major rivers which are periodically characterized by torrential watercourses. Amounts of water in dry periods are substantial and their flow rate does not fall below 1.0 m^3/sec, although the influence of climate changes, which in the last couple of years has led to a decrease in the watercourse flow, should not be neglected.

For efficient monitoring and reclamation of potential waste water from production plants (before they flow into natural watercourses), avoiding of potential pollution of the Bozicka River during the mass open pit exploitation and for the safe construction of tailing ponds for flotation waste, the following is planned:

- ✓ High usage (over 90%) of return waters obtained by dewatering of flotation products (phosphate concentrate and waste),
- ✓ Relocation of the Bozicka River bed by construction of tunnel – collector
- ✓ Protection of Bozicka River

In the process of finding the most favourable solutions for the construction and operation of the mine and flotation plant with the tailing pond, in order to prevent the pollution of the Bozicka River, one of the anticipated tasks is the relocation of its river bed by constructing a tunnel through the rocks. Also, at the part where the route passes through the river bed, a collector (17'', A – Appendix 1) shall be constructed.

In order to begin designing of the tunnel – collector it was necessary to establish relevant amounts of water which could occur in the Bozicka River:

- ✓ Upstream from the chosen site for the "LISINA" mine is a "LISINA" dam with an artificial lake. The "LISINA" dam is a rock-fill dam with a central core.
- ✓ A lateral overflow for Q=450m3/S and duration of the flood wave T = 4h is envisaged for the evacuation of a flood wave.

  In the part between the "LISINA" dam and a part where the Bozicka River was diverted is a catchment basin from which the atmospheric water flows into the Bozicka River bed. It is necessary to establish competent amounts of atmospheric water. The accepted probability precipitation P=1% is taken as competent.

In the process of designing the tunnel-collector for the needs of relocating the river bed and in order to protect the Bozicka River, the profile with following characteristics was considered: a small, extremely steep basin, which would mainly be covered with forests. Geometrical characteristics are defined from the topographic map scaled at 1 : 25,000.

Having conducted hydrological analysis of the Bozicka River Basin (synthetic unit hydrographs SUH was constructed), calculatory rainfall analysis, calculation of

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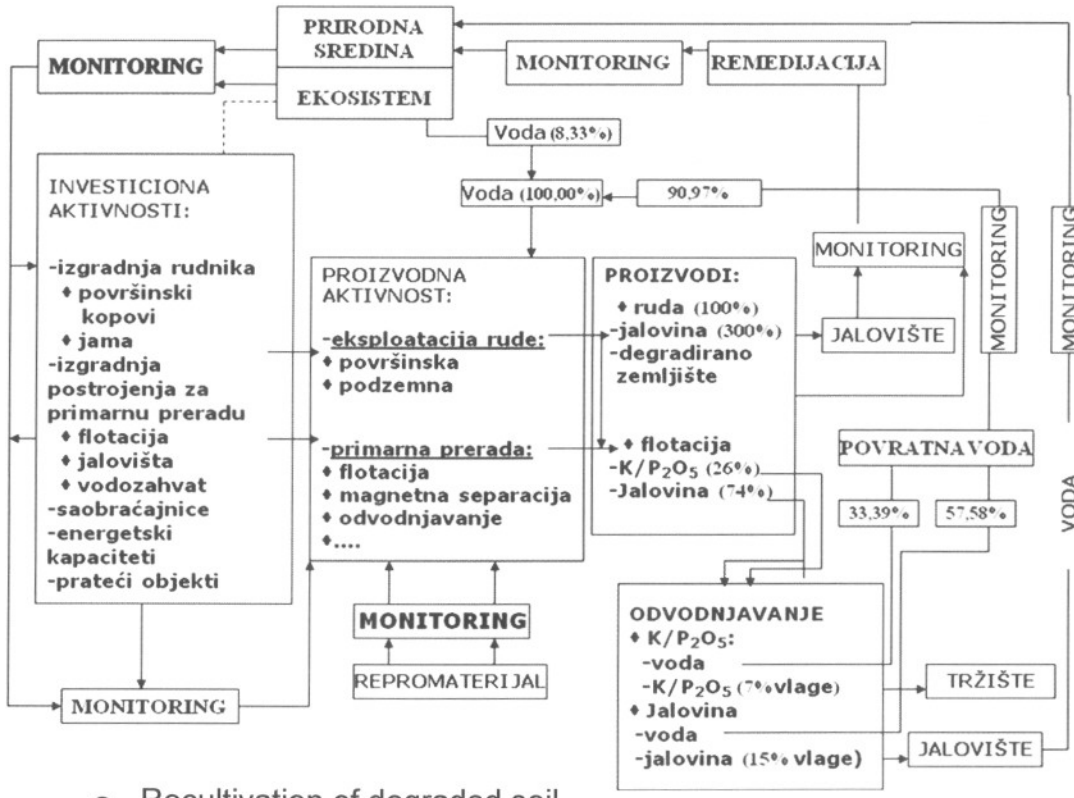
runoff hydrograph (for the return period of 20, 50 and 100 years) – it is anticipated that the tunnel will be L = 2,955 m long with D = 3 m diameter and the collector of L = 419 m in length.

In addition to the tunnel and collector for the protection of the Bozicka River, a sewage system (L = 500 m) will be constructed together with the system for treatment of sanitary – fecal waters.

- Measures for reducing the negative impact during the operation of production capacities

Exploitation and primary processing of phosphorite ore from the "Lisina" deposit for the production of phosphate concentrate (K/P_2O_5) will be carried out in line with strict and most up to date solutions and requirements of the "sustainable development" strategy as well as applicable laws regarding the environmental protection.

A closed and controlled system will be established: production – monitoring – products (commercial) – monitoring – waste material – monitoring – cleaning and remediation (recultivation) – monitoring – natural environment:



- o Recultivation of degraded soil

✓ <u>Open pit mine</u>

– Flat surfaces covering the area of 43.47 ha (out of 63.43 ha of degraded soil) are recultivated in the final contour, out of which:

- "Panjevica" site 12.54 ha

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- "Lisina" site 30.93 ha

– Front part (slopes) of mine levels, at an angle of 75^0, are not recultivated

✓ Open pit mine tailing pond

– Flat surfaces are recultivated as follows:

- "North" tailing pond 3.49 ha
- "Central" tailing pond 16.98 ha
- "South" tailing pond 2.00 ha

Total 22.47 ha

– There remains a problem of tailing pond slopes which are formed at an angle of 35^0 and which cover the area of around 16.16 ha. This problem should be dealt with and solved in the stage of project design.

✓ Flotation waste tailing pond

– The tailing pond surface in the final exploitation (deposition) phase is 65.88 ha and its full recultivation shall be performed after completion of the ore exploitation.

F. RELEVANT DATA USED IN RELATION TO THE ENVIRONMENT AND PRECISELY EMPHASISED FORECAST METHODS

- In the stage of designing the Feasibility Study on the Exploitation of the Phosphorite Ore from the "Lisina" Deposit and the Production of Phosphate Concentrate (K/P_2O_5), at the end of 2008, a detailed testing was conducting regarding the quality of water, soil, air, noise, electromagnetic radiation at the site as well as around certain locations anticipated for the construction of facilities for exploitation of phosphorite ore in the territory of the Bosilegrad municipality ("0" ecological state). Analyses were performed by competent and accredited institutions (ITNMS – Belgrade, Vinča Institute– Belgrade, IMS – Belgrade).
  This comprehensive study of the "0" state generated relevant data on the environment in the area where production facilities are to be built. For the operation of production facilities these data will be a measure of efficiency of adopted environmental protection solutions.

- In order to be able to project the level and aspects of impacts of production processes, monitoring will be introduced in all stages. As a result, issues regarding the complete recovery will be dealt with.

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For example, at the important facility – tailing pond for disposal of flotation waste, due to large quantities and specific characteristics, an auscultation system will be constructed. The purpose of this system is observation of the situation at the tailing pond both during the exploitation period and after the completed exploitation cycle.

Having in mind all instances which significantly influence the permanent stability of all parts of the tailing pond, several types of observations will be performed:

- ✓ Visual observation,
- ✓ Geodetic observation,
- ✓ Piezometric observation,
- ✓ Geo-technical observation and
- ✓ Hydrometric observation.

G. RECOGNIZING INSUFFICIENT KNOWLEDGE AND UNCERTANTIES REVEALED DURING THE PROCESS OF INFORMATION GATHERING

The most up-to-date technical-technological conditions of exploitation and primary process of phosphorite ore have been fully elaborated: modern equipment which proved to be reliable and efficient for the environmental protection is planned to be introduced; solutions for constant control and potential soil, water and air recovery are anticipated in line with high standards of "sustainable development"; all possible measures of control and protection are anticipated. Consequently, there are no major drawbacks.

H. POST PROJECT ANALYSIS

If the need be, Victoriaphosphate is ready to actively participate in the development of post-project analysis, pursuant to Article 7 of the Law on Confirmation of the Convention on Environmental Impact Assessment in a Transboundary Context (Official Gazette RS – International contracts no 102/07)