



MINING AND METALLURGY INSTITUTE BOR
and
TEHNICAL FACULTY BOR, UNIVERSITY OF BELGRADE



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**53rd International October
Conference on Mining
and Metallurgy**

PROCEEDINGS

Editors:
Ana Kostov
Milenko Ljubojev

3 – 5 October 2022. Hotel "Albo" Bor, Serbia



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TABLE OF CONTENTS

PLENARY LECTURES

Nikhil Dhawan

RECYCLING OF ELECTRONIC WASTE FOR RECOVERY OF
THE METALLIC VALUES 3

Aleksandra Ivanovic

APPLICATION OF THE SIMPLEX METHODS FOR TESTING THE INFLUENCE OF
COLD DEFORMATION LEVELS, ANNEALING TEMPERATURE AND CHEMICAL
CONTENT ON THE MECHANICAL CHARACTERISTICS OF SOME ALLOYS OF
THE Pd-Au SYSTEM 5

Saša Stojadinović, Dejan Petrović

ECONOMIC JUSTIFICATION FOR EXPLOITATION
THE BORON MINERALS IN BALJEVAC 9

Mirko Stijepović

APPLICATION OF OPTIMIZATION IN THE INDUSTRIAL PROCESSES 13

GEOLOGY, MINING AND MINERAL PROCESSING

Tamara Maričić, Marijana Pantić, Marina Nenković-Riznić

THE CRITERIA AND INDICATORS FOR DEFINING THE SOCIAL ASPECTS
IN SPATIAL PLANNING OF MINING REGIONS 19

*Radmilo Rajković, Daniel Kržanović, Miomir Mikić,
Milenko Jovanović, Emina Požega*

FORMATION OF A REACTIVE MATERIAL DUMP FROM
THE "ČUKARU PEKI" MINE NEAR BOR 25

*Daniel Kržanović, Radmilo Rajković, Milenko Jovanović,
Miomir Mikić, Sandra Milutinović*

MEDIUM-TERM PLANNING OF COPPER ORE EXPLOITATION AT
THE OPEN PIT VELIKI KRIVELJ NEAR BOR, SERBIA 29

*Sandra Milutinović, Milena Kostović, Ivana Jovanović,
Miomir Mikić, Daniel Kržanović*

DETERMINATION THE ADVANTAGE OF SOLUTION IN EASTERN SERBIA USING
THE FTOPSIS METHOD AND COMPARISON WITH THE TOPSIS METHOD 33

Snežana Ignjatović, Milanka Negovanović

DEFINING THE LOCATION AND DIP OF MAGNETIC ANOMALY SOURCES
APPLYING THE MATHEMATICAL TRANSFORMATION 39

Ivan Jovanović, Mladen Supić, Katarina Milivojević, Dušan Tašić

VENTILATION AND DISCHARGE SYSTEMS IN THE MINES WITH
THE UNDERGROUND EXPLOITATION OF NON-FERROUS METALS 43



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3 - 5 October 2022, Bor, Serbia

<https://ioc.irmbor.co.rs>

<i>Srdana Magdalinović, Silvana Dimitrijević, Aleksandra Ivanović, Stevan Dimitrijević, Stefan Đorđević</i> APPLICATION OF MINERAL PROCESSING METHODS IN RECYCLING THE WASTE PRINTED CIRCUIT BOARDS	47
<i>Lidija Đurđević Ignjatović, Vesna Krstić, Vanja Đurđević, Dragan Ignjatović</i> THE USE OF CEMENT PASTE IN THE MINING INDUSTRY AND ECOLOGY	51
<i>Dragan Ignjatović, Dušan Tašić, Vanja Đurđević, Lidija Đurđević Ignjatović</i> WICKHAM AND BIENAWSKI ROCK CLASSIFICATION IN MINING	55
<i>Katarina Milivojević, Mladen Supić, Ivan Jovanović, Dušan Tašić</i> METHODS OF DEFINING THE SWELING VOLTAGE AT EXPANSIVE SOILS	59
<i>Sanja Petrović, Grozdanka Bogdanović</i> THE EFFECT OF ALCOHOL ON LEACHING BY HYDROGEN PEROXIDE IN SULFURIC ACID SOLUTION	63
<i>Vladan Kašić, Slobodan Radosavljević, Vladimir Simić, Ana Radosavljević-Mihajlović, Jovica Stojanović, Slavica Mihajlović, Melina Vukadinović</i> PRELIMINARY GENETIC MODEL OF ZEOLITIC TUFF DEPOSITS IN THE TERTIARY BASINS OF SERBIA	67
<i>Sladana Krstić, Sanja Petrović, Ivana Jovanović, Slavica Miletić, Emina Požega, Daniela Urošević, Lidija Kalinović</i> APPRAISAL OF USABILITY THE DISINTEGRATED GRAVELLY SANDSTONE (TO THE GRADE OF NATURAL MIXTURE OF SAND AND GRAVEL)	71
<i>Ivana Jovanović, Sandra Milutinović, Mile Bugarin, Igor Svrkota, Dragan Milanović</i> COMPARISON OF THE SAG MILL POWER CALCULATION BY DIFFERENT METHODS	75
<i>Ivana Jovanović, Vesna Conić, Ana Kostov, Daniel Kržanović, Sandra Milutinović</i> EXAMPLE OF THE ANN CONTROL SYSTEM FOR THE FLOTATION PLANT	79
<i>Ivana Jovanović, Jasmina Nešković, Sonja Milićević, Milenko Ljubojev, Predrag Ivanović</i> DEPENDENCE OF THE OVERFLOW PARTICLE SIZE ON THE INLET SLURRY PRESSURE OF THE INDUSTRIAL HYDROCYCLONE	83
<i>Jovica Sokolović, Zoran Štirbanović, Ivana Ilić, Sandra Vasković</i> APPLICATION OF A COPPER SLAG AS A CONSTRUCTION MATERIAL	87
<hr/> METALLURGY, MATERIAL SCIENCE, TECHNOLOGY AND CHEMISTRY <hr/>	
<i>Zoran Karastojković, Ana Kostov, Radiša Perić</i> REASONS FOR BRAZING WITH COPPER FILLER METAL ALLOYED WITH THE COPPER (I) AND IRON (III) OXIDES	93
<i>Srdan Matijašević, Veljko Savić, Vladimir Topalović, Jovica Stojanović, Jelena Nikolić, Snežana Zildžović, Snežana Grujić</i> COMPLEX CRYSTALLIZATION OF THE POTASSIUM-NIOBIUM-GERMANATE SYSTEM ...	97
<i>Veljko Savić, Vladimir Topalović, Jelena Nikolić, Srdan Matijašević, Snežana Zildžović, Snežana Grujić</i> SINTER-CRYSTALLIZATION OF COAL FLY ASH BASED GLASS	101



<i>Nebojša Tadić, Žarko Radović</i> THE EFFECTS OF INITIAL PROFILE ON THE SHAPE OF COLD ROLLED STRIPS	105
<i>Žarko Radović, Nebojša Tadić, Sanja Šćepanović</i> THE EFFECT OF CHEMICAL COMPOSITION ON THE EAF DUST RECYCLING	111
<i>Ana Petrović, Radmila Marković, Emina Požega</i> STRUCTURE AND PROPERTIES OF CARBON NANOTUBES: A REVIEW	115
<i>Mirjana Stojanović, Milan Adamović, Jasmina Kustura, Enita Kurtanović, Muhamed Harbinja</i> MULTIFUNCTIONAL FERTILIZER BASED ON PYROPHYLLITE IN ACCORDANCE WITH THE REGULATION EU 2019/1009	119
<i>Emina Požega, Saša Marjanović, Milijana Mitrović, Milenko Jovanović, Ana Petrović, Radmilo Rajković, Slavica Miletić</i> ELECTRONIC TRANSPORT PROPERTIES OF THE Bi _{0.5} As _{1.5} Te _{2.98} Se _{0.02} SINGLE CRYSTAL: PART I	123
<i>Emina Požega, Anja Radičević, Danijela Simonović, Ana Petrović, Zdenka Stanojević Šimšić, Radmilo Rajković, Miomir Mikić</i> ELECTRONIC TRANSPORT PROPERTIES OF THE Bi _{0.5} As _{1.5} Te _{2.98} Se _{0.02} SINGLE CRYSTAL: PART II	127
<i>Franjo Kozina, Zdenka Zovko Brodarac, Luka Zeljko, Barbara Tubić Bulat, Primož Mrvar, Almir Mahmutović, Snježana Zeljko</i> TECHNOLOGICAL DEVELOPMENT OF THE CASTING PROCESS FOR THE THIN-WALLED GRAY CAST IRON	131
<i>Zdenka Stanojević Šimšić, Ana Kostov, Aleksandra Milosavljević, Emina Požega</i> CHARACTERISATION OF THE CuAlAg ALLOYS WITH 90 at. % Cu	135
<i>Vladimir Topalović, Srdan Matijašević, Jelena Nikolić, Veljko Savić, Marija Došić, Snežana Grujić</i> THE EFFECT OF La ₂ O ₃ ADDITION ON THE CRYSTALLIZATION CHARACTERISTICS OF POLYPHOSPHATE GLASSES	139
<i>Anja Antanasković, Dragan Radulović, Mladen Bugarčić, Tatjana Šoštarić, Vladimir Adamović, Zorica Lopičić, Milan Milivojević</i> IMMOBILIZED BENTONITE IN THE ALGINATE MATRIX – EFFICIENT SORBENT OF BRILLIANT GREEN	143
<i>Marko Pavlović, Marina Dojčinović, Aleksandar Sedmak, Igor Martić, Filip Vučetić, Zagorka Acimović</i> SYNTHESIS AND CHARACTERISATION OF THE MULLITE-BASED PROTECTIVE COATINGS	147
<i>Ana Kostov, Zdenka Stanojević Šimšić, Aleksandra Milosavljević, Ivan Jovanović</i> MICROSTRUCTURAL ANALYSIS OF CuAlAu ALLOYS	151
<i>Milijana Mitrović, Saša Marjanović, Biserka Trumić, Jasmina Petrović, Emina Požega, Miloš Janošević</i> INFLUENCE OF THERMO-MECHANICAL PROCESSING PARAMETERS ON THE TENSILE STRENGTH OF COPPER WIRE PRODUCED BY THE "UP CAST" PROCESS	155



<i>Saša Marjanović, Milijana Mitrović, Emina Požega, Biserka Trumić, Miloš Janošević</i> HARDNESS OF BIMETALLIC STRIP Cu – Č.4571 AFTER THE COLD ROLLING AND ANNEALING	161
<i>Milijana Mitrović, Saša Marjanović, Jasmina Petrović, Emina Požega, Miloš Janošević</i> INFLUENCE OF CHEMICAL COMPOSITION ON THE QUALITY OF CASTINGS OBTAINED BY THE EASY MELTING MODELS	165
<i>Silvana B. Dimitrijević, Suzana Veličković, Filip Veljković, Slađana Alagić, Stevan P. Dimitrijević, Aleksandra T. Ivanović, Saša Ivanović</i> CHARACTERIZATION OF THE GOLD MERCAPTOTRIAZOLE COMPLEX USING THE TANDEM QUADRUPOLE MASS SPECTROMETRY (TQD)	169
<i>Vesna Marjanović, Radmila Marković, Aleksandra Ivanović</i> SCANNING ELECTRON MICROSCOPY (SEM) METHOD IN A COMBINATION WITH THE ENERGY-DISPERSIVE SPECTROSCOPY (EDS) FOR ANALYSIS THE SURFACE OF HYDROUS IRON OXIDE-IMPREGNATED HYBRID POLYMER USED FOR SELENIUM ADSORPTION	173
<i>Vesna Marjanović, Radmila Marković, Silvana Dimitrijević, Zoran Stevanović</i> ANALYSIS THE SURFACE OF MODIFIED LIGNIN BASED MICROSPHERES USED FOR SELENIUM ADSORPTION BY THE SEM-EDS ANALYTICAL METHOD	177
<i>Ionelia Voiculescu, Victor Geanta, Radu Stefanoiu, Diana Chioibas, Andrei Popescu, Nicu Scarisoreanu, Emilia Binchiciu</i> CHARACTERIZATION OF ALUMINA COMPOSITE THIN COATINGS MADE BY THE DIRECT LASER DEPOSITION ON A HIGH ENTROPY ALLOY	181
<i>Rustam Sharipov, Essen Suleimenov, Bolysbek Utelbayev, Galymzhan Maldybayev, Maxat Myrzakhanov</i> APPLICATION OF COMBINED ELECTROCHEMICAL REACTIONS IN METALLURGICAL TECHNOLOGIES	187
<i>Rustam Sharipov, Maxat Myrzakhanov, Essen Suleimenov, Bolysbek Utelbayev</i> CORROSION: PROBLEMS AND CHALLENGES	191
<i>Vesna Conić, Suzana Dragulović, Dragana Božić, Dragan Milanović, Ivana Jovanović, Srđan Stanković, Jelena Avdalović</i> CORRELATION OF Fe ²⁺ WITH Cu ²⁺ AND Zn ²⁺ IN THE BIOLEACHING PROCESS	195
<i>Vesna Conić, Suzana Dragulović, Dragana Božić, Dragan Milanović, Ivana Jovanović, Srđan Stanković, Jelena Avdalović</i> COMBINATION OF CHEMICAL AND BIOLEACHING PROCESS FOR Cu AND Zn RECOVERY FROM THE SEDEX TYPE ORE	199

ENVIRONMENTAL PROTECTION

<i>Vesna Marjanović, Aleksandra Ivanović, Nevena Marjanović</i> SIGNIFICANCE OF THE SWOT ANALYSIS FOR MONITORING THE IMPROVEMENTS OF APPLICATIONS THE ISO 14001: 2015 STANDARD	205
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<i>Milenko Jovanović, Daniel Kržanović, Radmilo Rajković, Miomir Mikić, Emina Požega</i> ADVANTAGES AND PURPOSE OF BIOCOMPOSITE GEOGRIDS	209
<i>Milenko Jovanović, Daniel Kržanović, Radmilo Rajković, Miomir Mikić, Emina Požega</i> APPLICATION OF GEOGRIDS IN RECULTIVATION MEASURES OF DEGRADED LAND	213
<i>Miomir Mikić, Emina Požega, Radmilo Rajković, Milenko Jovanović, Daniel Kržanović</i> RECULTIVATION OF DEGRADED AREAS FORMED BY DEPOSITION OF TAILINGS AT THE FLOTATION TAILING DUMP “STUBIČKI POTOK”, LEPOSAVIĆ	217
<i>Viša Tasić, Tatjana Apostolovski-Trujić, Ivan Lazović, Nikola Mirkov, Zvonko Damnjanović</i> AUTOMATIC METEOROLOGICAL STATION (AMS/2022) BASED ON THE LOW-COST SENSORS (part 1)	221
<i>Viša Tasić, Tatjana Apostolovski-Trujić, Ivan Lazović, Nikola Mirkov, Zvonko Damnjanović</i> AUTOMATIC METEOROLOGICAL STATION (AMS/2022) BASED ON THE LOW-COST SENSORS (part 2)	225
RELATED FIELDS: MECHANICAL ENGINEERING, CIVIL ENGINEERING, ARCHITECTURE, ELECTRONICS, INFORMATICS, MANAGEMENT, ETC.	
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<i>Nenad Marković, Slobodan Bjelić, Filip Marković</i> SIMULATION MODEL OF DYNAMIC STATES IN AN ASYNCHRONOUS MACHINE WITH A SHORT-CIRCUITED ROTOR	231
<i>Slavica Miletić, Marko Trišić, Ana Milijić, Emina Požega, Slađana Krstić</i> AHP ANALYSIS OF THE COMPETENT LABORATORY ACCREDITATION STAFF	237
<i>Tanja Stanković, Nikola Stanić, Dejan Bugarin, Aleksandar Milijanović</i> ECONOMIC ANALYSIS OF INVESTMENTS IN CAPACITY INCREASE TO 1,000,000 TONS OF LIMESTONE AT THE KAONA SURFACE MINE NEAR KUČEVO	241
INDEX OF AUTHORS	247

RECULTIVATION OF DEGRADED AREAS FORMED BY DEPOSITION OF TAILINGS AT THE FLOTATION TAILING DUMP “STUBIČKI POTOK”, LEPOSAVIĆ

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Abstract

Degraded areas were formed by deposition of flotation tailings at the location of “Stubički potok” near Leposavić. The final couter of the flotation tailing dump was designed, and it is at the elevation K + 570 m above sea level. In order to protect the environment, the protection measures are taken at the flotation tailing dump by reclamation of all degraded areas. For this purpose, an analysis will be performed to determine the optimal method of reclamation. In order to prevent the air pollution and erosion of tailings material through torrents and its transport to the surrounding land, a special attention is paid to the possibility of afforestation and greening of degraded areas by the deciduous and coniferous species. In this way, the seedlings of ash tree and hornbeam are planned applying the biological reclamation. The alternating combination of these plant species enables the binding of substrate and gives a beautiful aesthetic appearance to the environment.

Keywords: *flotation tailings, environment, reclamation*

1 INTRODUCTION

The newly formed flotation tailing dump “Stubički Potok” is located in the immediate vicinity of Leposavić. It belongs to the Trepča mine. The location of the flotation tailing dump was chosen to be near the flotation plant located to the east, next to the main road M-22.3 Raška - Leposavić.

The flotation tailings dump itself is located in the west of the existing one, i.e. active flotation tailings pond consisting of three fields, which will be united according to the existing project (Figure 1).

The location of the new flotation tailing dump was chosen due to the advantages of the existing terrain, namely it is located in a basin, between two peaks of southern Rogozna. The basin has a west-east direction. The river Ibar with its bed is situated between the two flotation tailing dumps. In the foreground, the terrain is quite flat, after that the southern slopes of the Rogozna mountain begin to spread. They are characterized by a steep slope and vegetation.

The approach to the location in question is from the main road M-22.3 Raška - Leposavić, which continues to the rural road leading to the foot of the future dam of the newly designed flotation tailing dump.

The pulp pipeline from the flotation to the flotation tailings pit is placed under the main road, and then extends parallel to it and part of the railway line. The pulp pipeline was installed to the existing flotation tailing dump, and to the newly designed one; it will be routed under it and transferred by a bridge over the river Ibar to the newly designed flotation tailing dump.



Figure 1 *Spatial location of the “Stubički Potok” flotation tailing dump and surrounding facilities*

2 CHOICE OF RECULTIVATION METHOD

From the point of view of technology, the flotation tailings represent a necessary mining facility, and from the point of view of the environment, a real danger to the ecological elements of the environment, whether they are in operation or disposal process has been completed.

The impact of flotation tailings on the environment is reflected in the impact on the basic life factors: water, air and soil. In this case, the flotation tailing dump “Stubički Potok”, due to its characteristic position and size, can be viewed as a potentially large polluter. Due to this reason, it is necessary to take all the measures that will enable a reduction of the potentially negative impact of flotation tailings to reasonable limits, preferably to a minimum. This will be done applying the adequate measures. One of the basic measures is remediation of the flotation tailing dump. Applying the optimal recultivation will greatly reduce the dust emissions from the flotation tailing dump, prevent washing of material from dams and slopes of the flotation tailing dump, and indirect pollution of surface and underground water, occurrence of faults, initiation of the bio-pedological processes in degraded land, as well as the establishment of vegetation on the beaches of the flotation tailing dump [1].

The basic object of recultivation the physically, chemically and biologically damaged lands is to establish the function of managing the land space, as a resource that has been damaged by the anthropogenic activities.

The added humus layer of the soil serves to activate the work of soil microflora and initiate pedological processes in a direction of creation the organic matter and later humus, as well as the accessible elements for plant nutrition.

Due to the condition of surfaces after disposal of flotation tailings and specific pedological, microclimatic and climatic conditions for recultivation the “Stubički Potok” flotation tailing dump, an optimal recultivation with grassing is foreseen.

The recultivation will take place in two phases: technical and biological phase, and dynamics of works are expected to last for two years.

3 DEGRADED SURFACES

During the formation of the “Stubički Potok” flotation tailing dump, the natural surfaces will be degraded. The total area that has been degraded is 279800 m². The flotation tailing dump will be formed by damming the Stubički stream with a 70 m high dam, elevation K+575. Within the reservoir, the flotation tailings will be deposited up to elevation K+570.

4 TECHNICAL PHASE OF RECULTIVATION

Technical reclamation includes the degraded areas of the flotation tailing dump, i.e., the dam and dry beaches. The technical phase of reclamation at the “Stubički Potok” flotation tailings pond represents the stage of preparatory works, which enable the implementation of biological reclamation. As part of technical recultivation, in order to ensure the execution of works, several operations will be carried out, namely: excavation, loading, transport, unloading of soil humus material on degraded surfaces. At the same time, the final layer of soil material will be formed on the dry beaches of the flotation tailing dump. After formation of the final layer, the agrotechnical works are carried out to prepare the substrate for grassing these areas. Within the framework of technical recultivation, the works on excavation pits for seedlings are also included. Excavation of pits will be carried out by machine, and on surfaces where mechanized access is impossible, such as dam slopes, excavation will be done manually.

5 BIOLOGICAL PHASE OF RECULTIVATION

The biological phase of optimal recultivation is the application of phytomelioration measures on the previously prepared soil substrate (degraded surface) in order to establish and survive vegetation for later formation of the stable ecosystem. The greening of the degraded surface has primarily the role of environmental protection and, at the same time, contributes to a better appearance of the environment and better microclimate of the area.

A biological method of recultivation will be applied for the greening of degraded areas at the location in question, namely:

- Sowing a mixture of grasses 35 g/m² in the mixture (350 kg/ha):
 - Red fenugreek (50%)
 - English rye (35%)
 - Yellow star (10%)
 - White clover (5%)
- Shrub vegetation: *Carpinus orientalis*. It is used for afforestation of bare areas and prevention of erosion, so it is a good choice for afforestation of the subject area.
- Woody plants: Black ash - *Fraxinus ornus L.* It was chosen for its characteristics to bind the soil well on steep terrains.

In this case, the biological phase of reclamation involves a combination of afforestation and grassing of degraded areas.

Grass will cover the degraded areas of the flotation tailing dump, namely beaches and dams. If the conditions are right, grassing is preferably done in autumn.

The planting of deciduous shrub crops implies a square scheme, on flat surfaces, with a mutual arrangement of 3 m, and about 1100 seedlings can be planted on one hectare. The planting of deciduous shrub crops on the slopes of the landfill will be carried out according to a triangular scheme with a spacing of 3 m, with about 1100 seedlings per hectare. The distance between rows on the slopes of dam is 3 m.

Figure 2 shows the transverse profile of the flotation tailing dam with the arrangement of crops for afforestation. 1100 seedlings per hectare were adopted for the planting of hornbeam and black ash. The picture shows that the combined method of grassing and afforestation of the areas was carried out.

A mosaic of culture was planted on the beach of the flotation tailing dump (Figure 3). Roads for mechanization were designed along the beach, which were covered with grass.

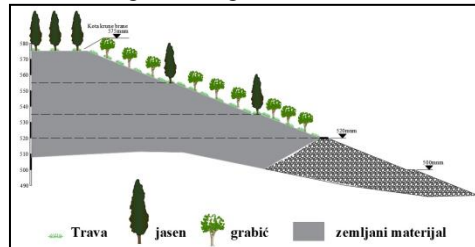


Figure 2 Sketch of the cross-section of the dam of the flotation tailing dump showing the arrangement of cultures

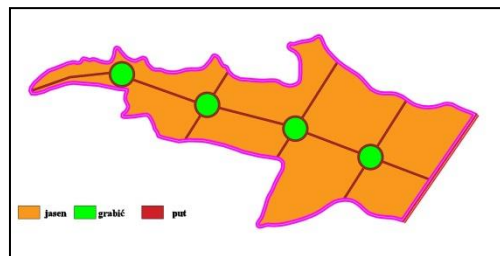


Figure 3 Sketch of the cross-sectional profile of the beach of the flotation tailing dump showing the distribution of cultures

6 CONCLUSION

The restoration and revitalization of the space represents the last, very important phase (after the end of exploitation) and requires appropriate planning activities for its realization.

In this case, the effects of recultivation of degraded areas are reflected in the fact that:

Forest plantings enable better binding of the soil, stimulate the development of ground flora, activate pedological processes in the substrate with the root system, prevent insolation and drying of the soil, blowing of strong winds and raising of dust.

The application of grass cover on the final levels aims to prevent the erosion of humus (soil) applied in a layer of 50 cm height and enable the creation of grass surfaces.

Afforestation of degraded areas contributes to the environmental protection, improvement of the microclimate and aesthetic appearance of the environment.

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