NON – TECHNICAL SUMMARY

of the Environmental Impact Assessment Report /EIAR/

of the Investment Proposal for

Construction of a National Disposal Facility for low and intermediate radioactive waste, NDF

EMPLOYER - SE RAW

Sofia, October 2010

The subject of the Environment Impact Assessment Report/EIAR is the Investment Proposal /IP/ of the State Enterprise «Radioactive waste» / SE «RAW» for the implementation of a near surface type **National Disposal Facility for low and intermediate short-lived radioactive waste /NDF/** at the "Radiana" site near the village of Harlets, Kozloduy Municipality, District of Vratsa, UCATTU[1] 775548.

The EIAR has been developed by a team of experts from «Eco Energoproekt» Ltd. in accordance with the requirements of the Environmental Protection Act/EPL (SG[2] No. 25/18.03.2003, last amended in SG. No.29/16.04.2010) and the Assignment for establishing the scope and content of the EIA by MEW (ref. №EIA-493/22.03.2010). Alll statements and recommendations from the competent authorities – MEW and RIEW Vratsa – have been taken into account, as well as all departments, institutions, population, management, ecological NGOs and others that might be affected by the implementation of the IP.

The main objectives of the EIAR are to evaluate on the earliest possible stage the impact on all environmental components and the factors which affect the environment and, especailly, the health of the local population and the occupational personnel during the construction, operation and closure of the repository and to offer measures which will minimize the negative effects of the IP on the environment.

The EIAR includes an ecological analysis of the options, as well as a justification for the environmentally friendly nature of the version chosen and which has been approved for further stages of project development and construction.

The Republic of Bulgaria commissioned the first power unit of "Kozloduy" NPP in 1974, and by August 1991, 5 more reactors were consecutively commissioned. As part of the memorandum between the Bulgarian government and the European Committee from 1999, Units 1 and 2 were disconnected from the energy system on the 31st of December 2002, and Units 3 and 4 – on the 31st of December 2006. Alll of them are to be decommissioned in accordance with the Updated Decommissioning Strategy for Units 1-4 of Kozloduy NPP. Meanwhile, the Belene project envisages the construction of two WWER-1000 Power Units.

Radioactive waste has to be safely and definitively isolated from the environment. In accordance with the recommendations of the International Atomic Energy Agency, the EU directives and the experience and good practice of countries with developed nuclear power industries, this is achieved through disposal in specially constructed repositories.

The NDF is intended for the disposal of conditioned and packed low and intermediate short-lived radioactive waste, generated during the operation and decommissioning of "Kozloduy" NPP, the future operation of Belene NPP and from conventional sources – medicine, scientific research, technical applications and others.

With the construction of the NDF, the cycle of management of low and intermediate radioactive waste is closed in accordance with the requirements of the national legislation, *The Joint Convention on Safety of Spent Fuel Management and the Safety of Radioactive Waste Management* (ratified by Law, accepted by the 38th National Assembly on 10.05.2000, SG No.42/23.05.2000), safety standards of the International Atomic Energy Agency (IAEA), as well as the good practices for management of radioactive waste in the EU. The management cycle of RAW is shown in **Figure 1**.

[1] Unified Classification for Administrative-territorial and territorial units

[2] State Gazette

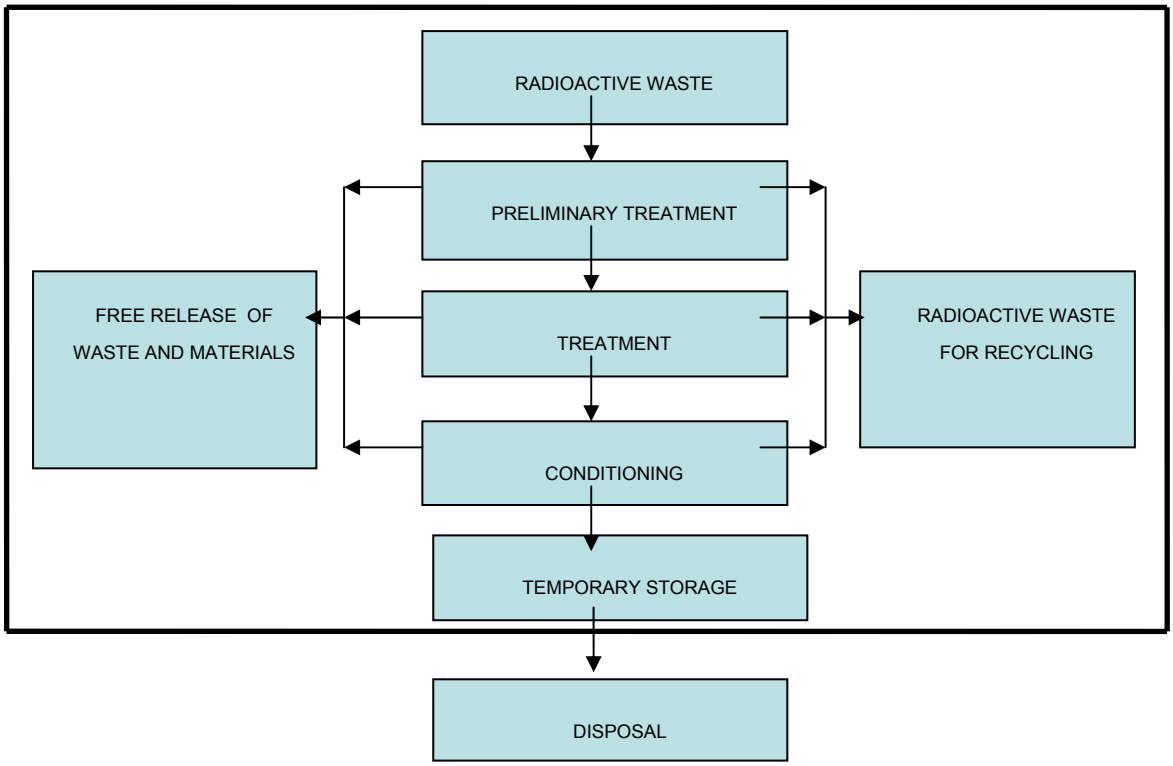


Figure 1 Management cycle of radioactive waste

The construction of the NDF shall be done in accordance with the *Strategy for Management of Spent Fuel and Radioactive Waste*, approved by the Bulgarian government on 23.12.2004, according to which an NDF has to be constructed by 2015. By the end of 2010, an *Updated Strategy for management of spent fuel and radioactive waste* until 2030 is to be adopted by the Council of Ministers, which also defines the construction of the NDF as a prime state priority and confirms the set deadline of 2015.

The construction of an NDF before 2015 has been assigned to the State Enterprise "Radioactive Waste" by the Council of Ministers Decree №683/25.07.2005.

The main goal of building an NDF is to provide for the safe disposal of low and intermediate short-lived radioactive waste and its storage and final isolation from the environment and the populace.

The NDF is a near-surface modular multi-barrier trench type engineering facility, designed for the disposal of low and intermediate short-lived radioactive waste, conditioned and packaged in reinforced concrete containers.

The NDF is a site of national significance under the Spatial Planning Act.

The Investment proposal of SE RAW for the construction of NDF at the Radiana site in the village of Harlets, Kozloduy Municipality, District of Vratsa, UCATTU 775548 includes:

- Construction by modules system, designed for disposal of RAW;
- Inspection and monitoring;
- Construction of small surface servicing buildings.

All construction activities of the NDF are subject to licensing by the Nuclear Regulatory Agency/NRA.

The location of the NDF has been defined in accordance with the permit requirements for the site selection, issued by BNRA. The site is situated in northern Bulgaria (**Figure 2**), in the vicinity of Kozloduy NPP between two roads, on the north – a road, controlled by Kozloduy NPP and regarded as internal for the plant, connecting the town of Kozloduy with Kozloduy NPP, and on the south – a second-class road (road №11), connecting the village of Harlets and the town of Kozloduy. The site is located within the boundaries of the 3-km Radiation Protected Area of Kozloduy NPP (**Figure 3**). It is positioned 3.2 km south-east from the regulatory line of Kozloduy, 6.6 km south-west from the construction boundaries of the village of Harlets and 4.0 km south-west from the right bank of the river Danube.

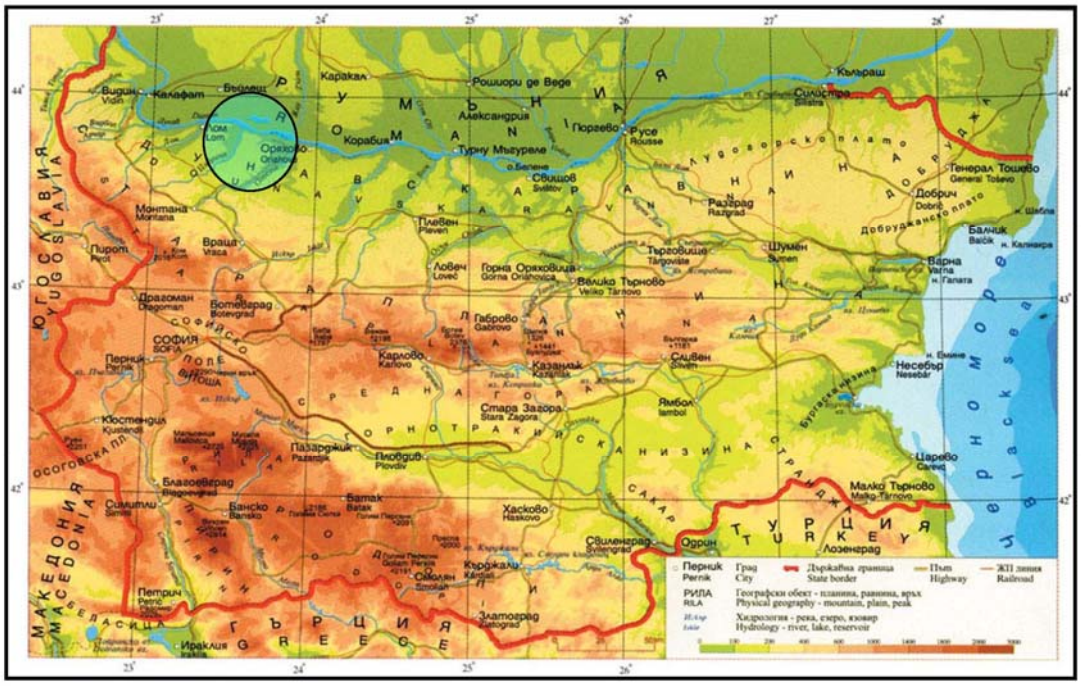


Figure 2 Physico-geographical map of Bulgaria with the marked position of the NDF site

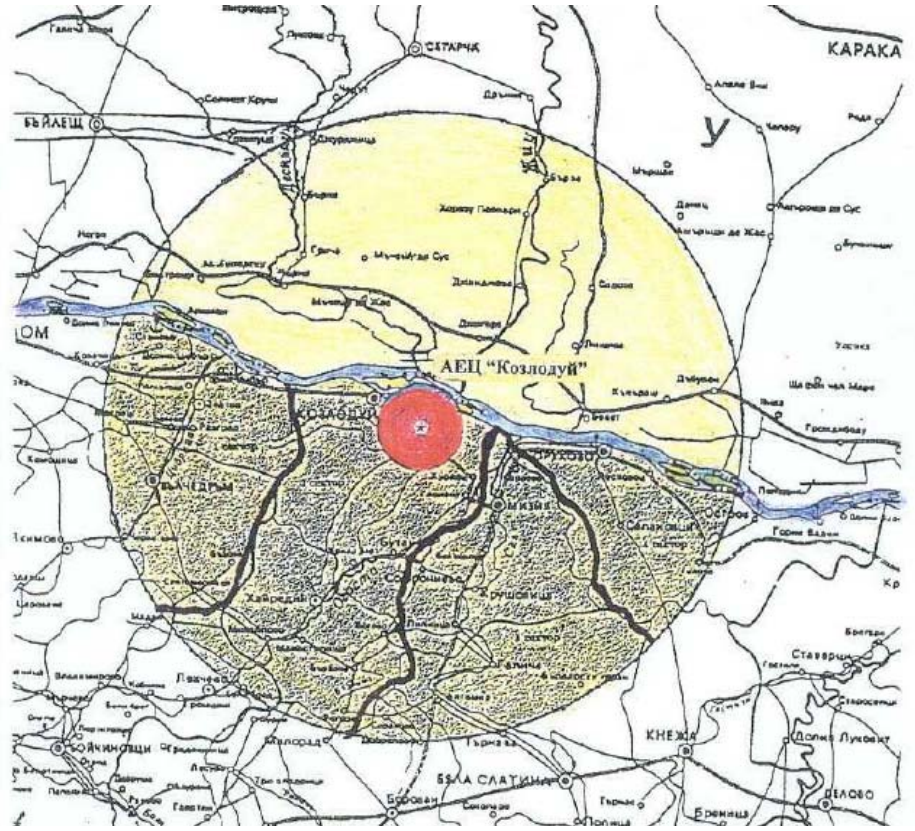


Figure 3 Map of the three-kilometer Radiation Protected Area and the thirty-kilometer Monitored Area of „Kozloduy" NPP

The NDF site and its facilities will occupy an area of around 36 hectares. During the construction, additional space will not be necessary, as the temporary activities are planned to be executed within the boundaries of Radiana site. The status of the land is primarily state private property owned by the "State Land Fund".

The necessary land areafor the implementation of the investment proposal is around 36 hectares. A significant part of it, practically half of it, will not be affected, or it will remain as land which will be cultivated for the creation of an esthetic environment. The maximum land area which will be occupied by the disposal facility and servicing facilities is estimated at around 17 hectares, including 5.8 hectares of green areas and 3.5 hectares of roads and communications.

The Investment proposal does not affect any private property, nor does it adjacent to any. The lands are not used for agricultural purposes.

The terrain is overgrown with low-stem forest, mainly acacia and shrubs.

Main principles, requirements and safety criteria

In its essence, the NDF has to ensure the safe isolation of disposed radioactive waste and effective protection of the occupational personnel, the population and environment from the potential effects of the disposed waste throughout the lifecycle of the facility – the operational period, as well as during the closing and the post-operational periods.

The safety assurance measures are taken on all stages – site selection, project development, construction, operation, closing and the period of institutional control.

The main principles and safety requirements are:

1. The NDF shall be positioned, planned, constructed, operated and closed in such a manner that the exposure of the personnel and population does not exceed the limits specified in the *Regulation on Basic Norms for Radiation protection* and the *Regulation for Safe Management of Radioactive Waste*;

2. The exposure of the personnel must be kept at the lowest possible reasonably achievable level, as both economic and social factors are taken into account (the ALARA principle);

3. The level of population protection outside the national borders must not be lower than the level of protection of the population in the country;

4. The level of protection of future generations must not be lower than the level of protection of the current generations;

5. The future generations must not be burdened by the existence of the NDF by having to make efforts to restore or maintain the safety level of the facility;

6. The NDF must be positioned, planned, constructed, operated and closed in such a manner that it provides environmental protection in accordance with the requirements of the *Environmental Protection Act* and the international requirements in the field of environmental protection;

7. When NDF safety is provided, the containment and isolation principle is applied;

8. The construction of the NDF must be in line with the latest scientific and technical achievements, as well as the worldwide accepted operational experience;

9. NDF safety is provided by passive means;

10. NDF safety is based on the application of a defense in depth strategy, which is based on the application of a system of physical barriers and administrative measures, providing the following levels of protection:

   - ⇒ A system of sequential physical barriers to the spreading of radioactive substances in the environment;
   - ⇒ A system of technical and organizational measures to protect the barriers and maintain their effectiveness;
   - ⇒ A system of technical and organizational measures to protect the operational personnel;
   - ⇒ A system of technical and organizational measures to protect the population and the environment.

11. The system of physical barriers is based on the multibarrier concept, as each barrier contributes to the safety provision through its safety functions. NDF safety cannot be based on a single barrier. If a given barrier is not capable of performing its safety functions, then the system as a whole must ensure the isolation of RAW in accordance with the safety criteria.

12. The construction of disposal facilities must enable the implementation of corrective measures, including changes in the system of protective barriers and/or partial or total withdrawal of the RAW placed in the repository.

13. The construction of disposal facilities must ensure easy and effective operation, maintenance, control and monitoring;

14. The overall construction process of the NDF must be transparent and an open dialogue with the population must be established. The demands of the community must be taken into account in the process of the site selection and must be implemented to the degree which is technically possible and economically reasonable;

The main safety criteria are the **radiological criteria** determined in the *Regulation on Basic Norms for Radiation Protection* and the *Regulation for Safe Management of Radioactive Waste*:

1. The annual individual effective dose for the respective critical group of the population during normal operation of NDF must not exceed 0.3 mSv;
2. The annual individual effective dose for the respective critical group of population caused by design-based accidents at the repository must not exceed 5 mSv;
3. The annual individual effective dose for the respective critical group of the population after the closure of NDF must not exceed 0.3 mSv;
4. The limit of the effective dose for the occupational personnel of DNF is 100 mSv for a period of 5 consecutive years, as the maximum effective dose for each year must not exceed 50 mSv;
5. The annual equivalent dose limits for the occupational personnel of NDF are 150 mSv for the eye lens, 500 mSv for the skin and 500 mSv for palms, armrests, feet and ankles.

The dose limits for the population during the operation of the NDF and after its closure (post-operational period) are lower than the limits for the annual effective dose determined for a single member of the population - 1 mSv/a, defined by the *Regulation on Basic Norms for Radiation Protection*. The safety criteria are in accordance with the IAEA safety standards, *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources* [323] and the recommendations of the International Commission for Radiological Protection.

Description of NDF

The NDF is a near-surface, modular, multi-barrier trench type facility. The preliminary design has been developed on the basis of a concept developed by the Bulgarian Academy of Sciences. It is based on the worldwide experience in this area and the good practices, demonstrated during the planning, construction and operation of such repositories in the developed countries like Centre d'Obe – France, El Cabril – Spain, Dukovany – Czech Republic, Mochovce – Slovakia, Japan and others.

The NDF consists of disposal facilities, service buildings and other facilities, as shown in **Figure 4.**

Radioactive waste shall not be processed and/or conditioned on the NDF site.

The Radioactive waste shall be delivered conditioned (in a cement matrix) and packaged in reinforced concrete containers (RCC) with outer size 1.95 x 1.95 x 1.95 m low and intermediate radioactive waste, as shown on **Figure 5**.

Currently, these containers are stored on the Kozloduy NPP site in the Storage Facility for conditioned radioactive waste (SFCRAW) of the State Enterprise "Radioactive waste" (**Figure 6).**

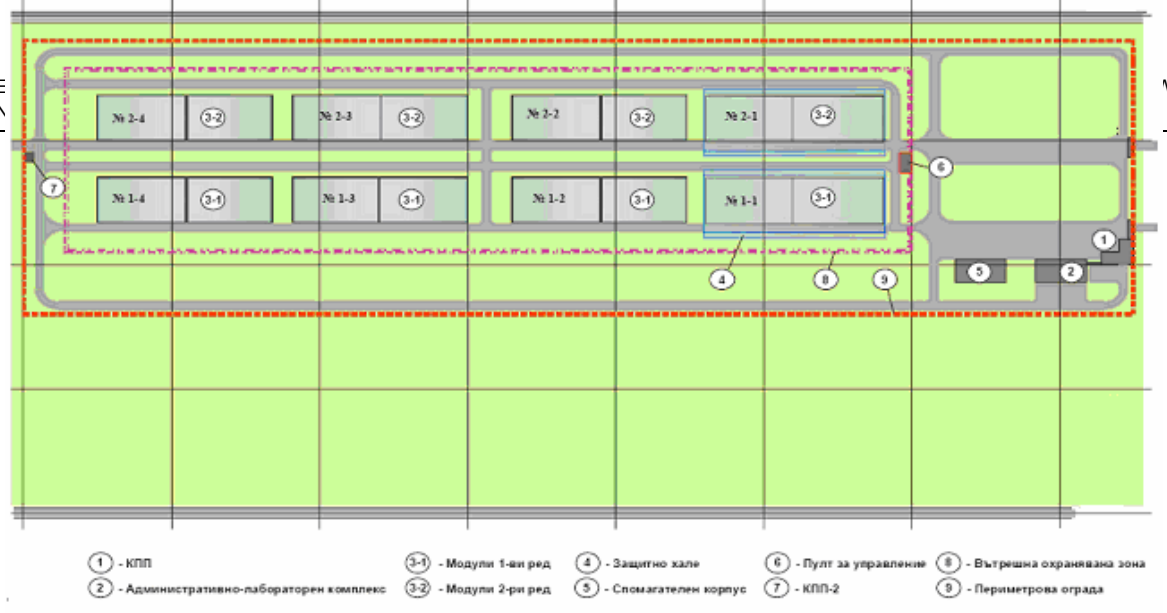


Figure 4 Layout of facilities in the general NDF

Figure 5 Reinforced concrete containers for disposal of RAW in the NDF

Figure 6 Temporary storage in the storage facility at Kozloduy NPP site

The investment proposal envisages the construction of 8 uniform reinforced concrete modules, placed in two parallel rows. The predefined outer size of each module is 117 m in length, 35.5 m in width and 10 m in height. The modules are divided by longitudinal and transverse partition walls, which form the isolation chambers. Each module consists of 16 uniform chambers, also placed in two parallel rows of 8 chambers each. Due to constructive considerations, an expansion gap is planned in the middle of each module between every 4 pairs of chambers..

The size and quantity of the chambers in each module is defined by technological and constructional measures and the characteristics of the chosen site. The chambers are rectangular – 17 m in length and 14 m in width. The reinforced concrete containers (RCC) are placed in 4 rows in front of the disposal chambers. They are grouped in 4 groups in front of each chamber. The groups, which contain 4x3x4 RCC units in all four corners of the chamber, as is shown in **Figure 7,** and are separated by 90 cm of empty space, which allows the inspection of the condition of the RCC during the operational period. Each chamber can contain up to 92 RCC units.

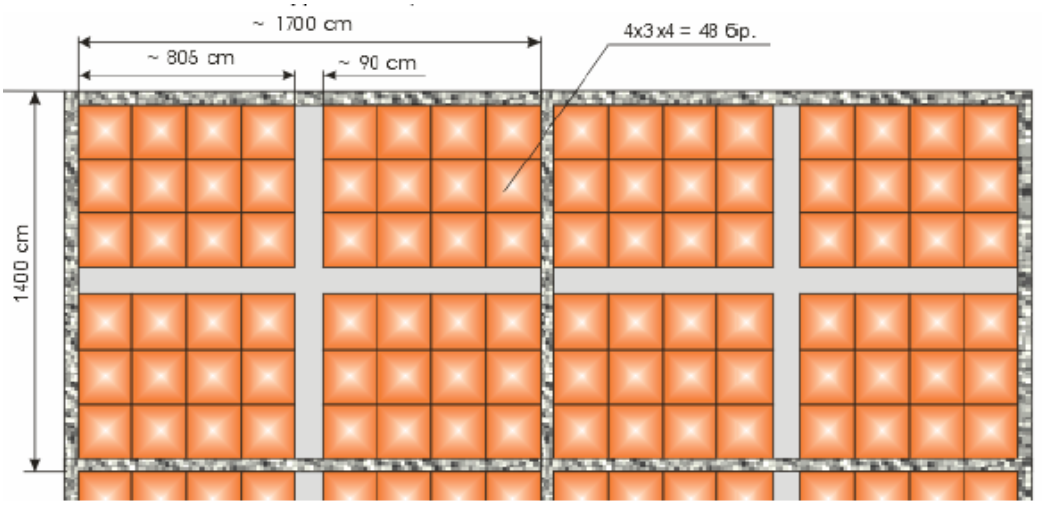


Figure 7 General view of the RCC disposal chamber

The chambers are constructed from reinforced concrete with a wall thickness of 500 mm and thickness of the bottom plate of 1000 mm. The walls and bottom of each chamber are covered with hydro insulation material.

The bottom of each chamber is inclined towards its center, where a drainpipe is placed for the draining of occurred water. The bottom is covered with a compacted gravel layer of rubble and large mesh sand, aligned strictly horizontally. Under the bottoms of the chambers are constructed inspection (drain) galleries from reinforced concrete (one gallery for each parallel row of chambers in a given module), which traverse the whole length of the modules, and which form a system of inspection galleries under the repository. The chamber drain pipes are discharged into them. They are used for inspection of the bottom of the disposal chambers and are part of the leakage control system. Their predefined size (2.00 x 2.20 m) allows the personnel to perform inspections freely.

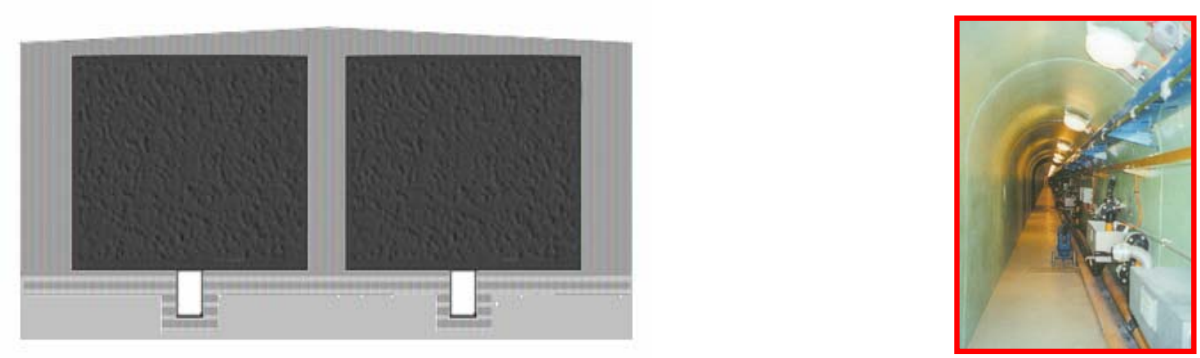


Figure 8 Illustration of the inspection (drain) galleries (a) layout;
(b) View of the galleries, following the model of the Mochovce repository, Slovakia

This approach complies with the good modern practices. The inspection (drain) galleries are illustrated in **Figure 8a.** Next to them, in **Figure 8b** shows the placement of the drainpipes, following the model of the repository for low and intermediate radioactive waste in Mochovce, Slovakia. The ventilation of the tunnels is done through natural aeration by a system of ducts and air vents.

The modules are constructed on a loess-cement cushion with approximate thickness of 4000 mm, which ensures the gradual transition between the earth level and the disposal modules, enabling the increase of the admissible soil load in the foundation zone and creating an additional filter shield against the flow of subterranean waters from and towards the repository. The inspection (drain) galleries are

incorporated in loess-cement cushion. It is sealed with a 100 mm cement overlay. From the outer wall of the modules, other loess-cement shields (walls) are built, with thicknesses of approximately 1m, and the empty space is filled with compacted loess.

When sealing the module, the empty space between the containers is filled with loess-cement solution, in which is included a suitable adsorbing material (zeolite). Then, a reinforced concrete plate-cover is built, which is covered with a suitable hydro-insulation material, an additional layer of loess-cement with a thickness of up to 1 m, similar to the one around the walls of the module and thus, a **multi-barrier protective cover** is built. (**Figure 9**).

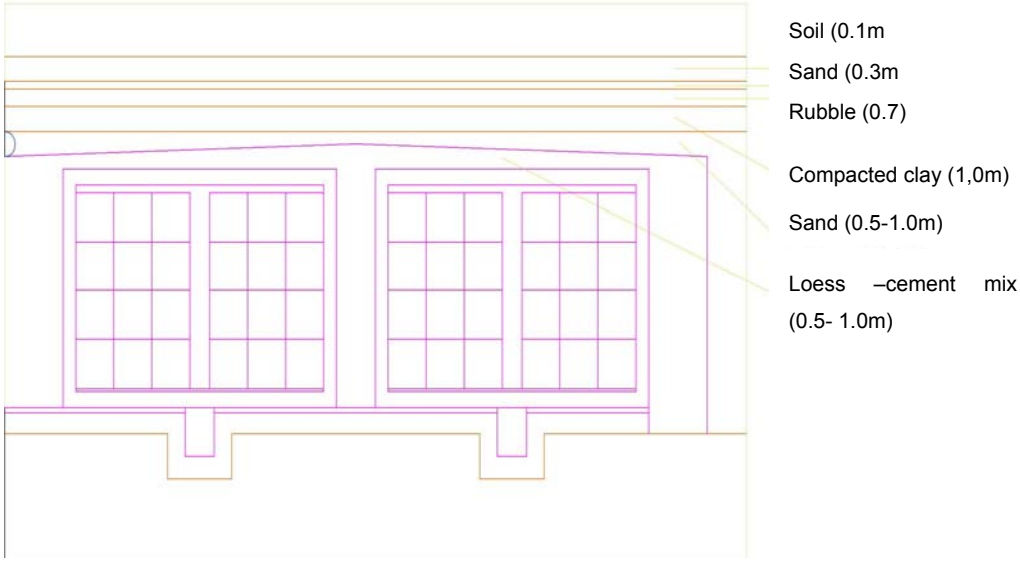


Figure 9 Plan of the sealed module with a multi-barrier protective cover

The purpose of the multibarrier protective cover is to permanently isolate the waste in the modules from outer impacts. It consists of a sand layer with a drainage function, a layer of compacted clay with an isolation function (it does not allow the penetration of rain water in depth), sand and rubble with a drainage function. It is topped with a soil layer, which is stabilized by planting of suitable vegetation in order to protect the facilities from erosion. The rain waters from the multibarrier cover are lead to the site's drainage system, which is built around each module.

Figure 10 Sealed modular trench type repository with a built multibarrier protective cover

The final view of the sealed repository is shown in **Figure 10**, following the model for the Belgian repository planned for construction.

With the proposed construction, the safety of the disposal facilities is ensured by a multibarrier approach, providing a defense in depth:

⇒ **The first engineered barrier** is the cement matrix, in which the radioactive waste is conditioned;

⇒ **The second engineered barrier** is the walls of the reinforced concrete container, covered by a hydro-insulation material.

⇒ **The third engineered barrier** is the reinforced concrete walls of the chamber, covered by hydro-insulation material and a loess-cement filling material, containing natural, inorganic sorption materials (zeolite)

⇒ **The fourth engineered barrier** is the powerful loess-cement layer around the chambers

⇒ **The fifth engineered barrier** consists of the compacted loess.

⇒ **The sixth (natural) barrier** is the loess complex, in which the modules are built and sealed – as current research has shown, this complex is practically absolutely dry, and it has good sorption capacity, obstructing the migration of radionuclides.;

⇒ **The seventh engineered barrier** is the protective multi-barrier engineering cover.

The accepted solution provides the opportunity for inspection and control of the condition of the packages and the facility throughout the entire operational period – before and after the sealing of the modules.

The Regulation for Safe Management of Radioactive Waste requires the construction of disposal facilities to enable applying of corrective measures, including changing of the system of protective barriers and/or the partial or full withdrawal of the radioactive waste stored in the repository. The accepted solution enables the fairly easy undertaking of measures for the rehabilitation of structures and/or the withdrawal of RAW packages.

During the operational period of the disposal facilities, the modules are protected by a protective hall, fitted with a gantry crane. **(Figure 11)**.

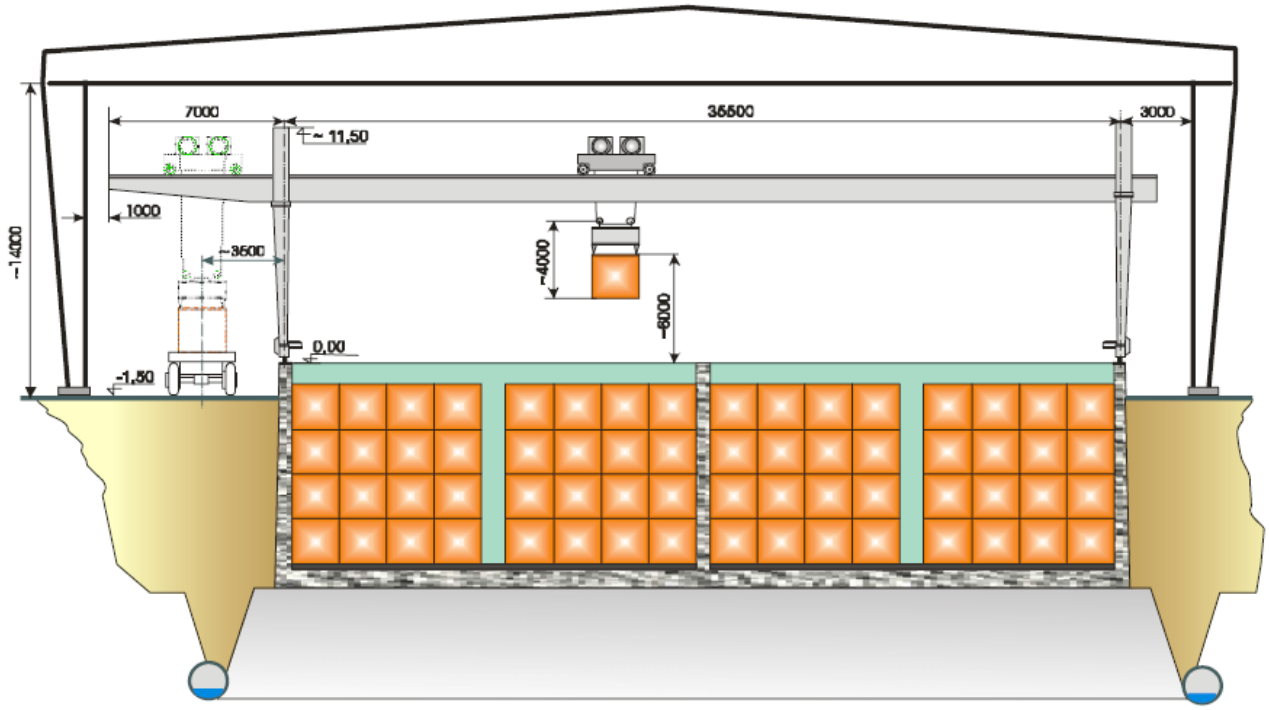


Figure 11 Cross section of the module for disposal with a gantry crane in the protective hall

Its purpose is to provide protection from atmospheric impacts on the working area during transportation and technological activities; on the personnel during inspections, as well as on the opened chambers. The outer size is approximately 51x60x20 m (width/length/height). The protective hall is mobile. It covers half of the module. After the filling of the chambers in the first half of the module, the protective hall is moved over to the second half. After the successful completion of the work in the first module, the hall is dismantled and moved to the second module. The deployment of the reinforced concrete containers (RCC) in the chambers is done remotely by a gantry crane with a remote controlled trolley, which is dismantled after the work on the first module is finished and then installed in the second module.

The proposed approach is similar to the EU good practices. For illustration, **Figure 12** shows examples from the repositories at La Obe, France, El Cabril, Spain and Mochovce, Slovakia.

Figure 12 Modern repositories for low and intermediate RAW with protective structures during the period of operation a) Center La Obe – France, b) El Cabril – Spain, c) Mochovce – Slovakia.

The National Disposal Facility for low and intermediate radioactive waste must provide:

⇒ Capacity for the disposal of the stored radioactive waste, generated in the country and stored at the places where they had been generated or in the facilities for radioactive waste management of SE RAW;

⇒ Capacity for the disposal of the waste to be generated up to 2075.

The preliminary evaluation of the quantity of radioactive waste to be disposed in the NDF is estimated to about 138 200[(1)] m^3 (345 500t), which defines the maximum capacity of the facility. The evaluation has been done within the framework of the PHARE program.

Radionuclide composition is the most important basis defining characteristic of radioactive waste. The radionuclide inventory of the NDF is also defined in the framework of the text mentioned above.

In accordance with IAEA recommendations and good practices in the area of RAW management, the radionuclide inventory is subject to clarification and updating along with the characterization of different waste streams and the implementation of analysis methods. A mandatory requirement throughout the entire lifecycle of NDF is to maintain records and store information about the characteristics of the disposed radioactive waste.

(1) The volume includes the radioactive waste itself, as well as the size of the reinforced concrete containers, in which it is packaged.

The NDF throughput is from 3 to 4 RCCs per day. It is defined in accordance with the placement of the available RCCs within two years time (which are currently stored in the Storage Facility at the SU RAW - Kozloduy site, on the territory of Kozloduy NPP). The throughput also takes into account the planned increase of the throughput of RAW treatment on the territory of Kozloduy NPP as a result of the decommissioning of Units 1 to 4 of Kozloduy NPP .

The maximum annual throughput is 800 RCCs, defined on the basis of receiving RAW for **200 days per year**, taking into account that RAW transportation is carried out only on working days and that it will not be carried out in bad weather conditions.

Stages of the investment proposal

The main stages of the investment proposal are:

1. Site selection 2006 -2011;
2. Design 2010 – 2012;;
3. Construction 2012 - 2014 ;
4. Operation 2015 – 2075;
5. Closing 2075 – 2090,
6. Institutional control 2090 – 2390.

Characteristics of the expected waste and emissions

Waste and emissions during the construction of NDF

During the construction of NDF, 1000 m^3 of industrial waste is expected to be generated during the first stage of the construction of 4 modules. This includes around 750 m^3 of industrial waste from the removal of existing facilities on the site (destroyed concrete surface of the playground, that stemming from the moving of the irrigation channel M1) and from defective, not accepted construction works, as well as around 200 m^3 of standard waste from the pump for concrete. The workers are going to use chemical WCs.

The quantity of industrial waste during the second stage of construction has been estimated at around 300 m^3.

With the chosen technology for staggered arrangement of the modules for RAW disposal, 1 200 000 m^3 of earth masses and 60 000 m^3 of humus will be dug out**.** The quantities are evenly distributed between the two stages. During the first stage of the construction, around 600 000 m^3 of earth masses will be generated. Half of this (300 000 m^3) will be used in the back filling and the preparation of loess-cement. The rest will be used by "Kozloduy" NPP for technological upgrading of the hot channel 2 (90 000 m^3) and for the placement of a depot next to said hot channel (40 000 m^3). The Kozloduy municipality has agreed to provide for the disposal of 170 000 m^3 of earth masses.

During the second stage of the construction, another 600 000 m^3 of earth masses will be generated. Half of it (300 000 m^3) will be used for the back filling and the preparation of loess-cement. At the current stage of the investment proposal, the other 300 000 m^3 is planned to be transported to the depot mentioned above. Since the second stage of the NDF construction will begin after the completion of the decommissioning of Units 1-4 of „Kozloduy" NPP, by that time other ways of utilizing the earth mass will probably be defined. The humus and earth mass that will be used are stored on the site until they are transported to the construction waste depot of Kozloduy municipality.

Waste and emissions during the operation of the NDF

Minimal quantities of secondary RAW are expected to be generated, including contaminated working clothes and personal protective equipment; potentially contaminated shower water; contaminated waters from the radiochemical laboratory, liquids and preparations for decontamination of contaminated work surfaces and tools. According to the level of beta contamination, the work clothes, underwear and other means of personal protection are divided into three groups: group I, up to 200 β particles/cm^2.min; group II, up to 1000 β particles/cm^2.min; group III, above1000 β particles/cm^2.min. The contaminated clothes from groups I and II will be decontaminated by chemical reagents. Group III clothes will be treated as secondary RAW and are not subject to decontamination.

No decontamination facilities are envisaged for waste packages, equipment or contaminated working clothes and shoes at the repository. The organization for the reception of RAW containers and the subsequent operations practically excludes the generation of contamination from groups II and III, and only the theoretical possibility of such contamination from group 1 exists.

Despite this, during the operation of the disposal facility, secondary RAW are planned to be collected, packed and transported to SE "RAW-Kozloduy" for processing. The waste, generated during the liquidation of emergencies will be treated in the same way – in accordance with the emergency plans of the repository.

Contaminated waters from the operation of NDF, if any are generated, will be collected in specialized tanks and delivered for processing in SE "RAW Kozloduy".

Gas emissions during the construction, operation and closing of the facility are not expected due to the negligibly small amounts of gas-generating radionuclides in the repository's inventory.

During repair and maintenance works, minimal quantities of industrial waste will be generated.

Waste and emissions during the closing of the NDF

An estimated preliminary evaluation shows that during closing around 150 m^3 of industrial waste will be generated.

Waste and emissions during the period of regulatory control

The example of the closed repository in La Manche, France, shows that no radioactive waste is expected to be generated during the regulatory control, except a small amount of laboratory waste. At the end of the regulatory control, the building fund will be dismantled, which will generate construction waste.

Social significance – The chosen method is disposal in a near-surface, multibarrier engineering trench type modular facility. This has been tested in the practice of the developed European countries and is approved by the International Atomic Energy Agency as a method that is safe for both people and environment.

The storage of low and intermediate radioactive waste is a question of key importance, because firstly, it is connected to environmental protection, guaranteeing quality of life for future generations, and secondly, the guarantee of safe storage of this waste is directly connected to the increase of confidence in the atomic power industry as a whole (there is a clear correlation between safe storage and a change of attitude towards the atomic energy towards the positive). This is exactly what allows us to state that the construction of the NDF is of major social significance.

The social significance of the site is of concern for the chosen alternative for disposal of low and intermediate short-live radioactive waste: a **near-surface, multibarrier engineering trench type of facility**, described above in the characterization of the investment proposal.

Regarding a healthy living environment, the official statistics show that the level of oncological diseases in the area is lower than the average for the country. To avoid an increase of the incidence of such diseases, it is important to observe the best European and worldwide practices in this area of expertise.

The location of the "Radiana" site defines the international nature of the groups concerned, as there are also Romanian settlements in the vicinity. The alternative technical solutions and the choice of the current solution are planned in such a way that a risk-free environment is guaranteed for workers, local residents and, indirectly, the other affected groups. The site has no impact as regards an additional radioactive contamination, and it has a significant reliability of control and management of the low and intermediate radioactive waste. The choice of the storage technology is based on the calculated cost/risk ratio, and this ratio is based on foreign experience with such technologies. This guarantees safety; or rather, the lack of an increased risk, as experience shows that health risk is excluded.

In the different stages of the construction of NDF, new jobs are expected: designers and specialists, taking part in the research and planning of NDF; during construction – 75 workers and employees; during operation – 64 people; during closing - 15 people. There will also designers and specialists taking part in the research and planning of NDF, specialized units for maintenance of the facilities, and firms taking part in construction works, delivery of materials and equipment and others.

Alternative sites and technical solutions for the implementation of the NDF

Location of the alternative chosen – The selection of sites for the NDF has been made in accordance with the national legislation and the documents of the IAEA, based on the research conducted by the Geological and Geophysical Institutes of the Bulgarian Academy of Sciences and the University of Mining and Geology "St. Ivan Rilski".

After long years of research for the selection of a suitable site for the NDF, it was decided to conduct a detailed survey of the 4 sites: “Radiana”, “Marichin Valog”, “Brestova padina” and “Varbitsa”. After careful analysis, and expert evaluation, the "Radiana" site was chosen.

The choice of site is determined on the following priorities:

⇒ Assuring the safety of the population and the environment throughout the entire operational life of NDF, during its operation, closure and the period of active and passive regulatory control

⇒ The timely provision of the necessary capacity for the disposal of radioactive waste, taking into account economicand social aspects of the activity

Based on the research and analysis, “Radiana” is defined as the most suitable site for construction of the NDF.

"Radiana" offers the most favorable conditions for its construction and operation, provided that the environment and human health are protected and undue burdens on future generations are avoided.

The location of "Radiana" is determined in accordance with the license issued by the NRA "License № NH-3211/05.05.2006 for the siting of NDF", which includes four phases, each of which is subject to licensing and control by the NRA: "Developing a concept for disposal and the planning of the site selection," Data collection and analysis of the regions ", "Site characterization" and "Site Approval” and after taking into account the specific objectives of all the aspects on the matter (NRA, the local administration, a critical group of the population and SE RAW), as well as human health, environmental, technological and demographic requirements for the construction of the repository for disposal of short-term low and intermediate RAW.

The detailed study of the 4 sites (“Radiana”, “Marichin Valog”, “Brestova Padina” and “Varbitsa” and their comparison was carried out at the stage "Sites Characterization”. The results for each of the sites are classified and analyzed uniformly in the report on the implementation phase. This description includes: location, lithostratographical construction, tectonic and neotechtonic conditions, geomorphologic conditions, geotechnical conditions, hydro-geological conditions, migration of radionuclides, seismicity, exogeodinamic processes, the impact of floods, meteorological processes and phenomena, hazards of man made nature, water and mineral resources, land use and ownership of the land, transportation of RAW, population and urban network, plant and animal species, national cultural and historical treasures, nuclear experience of the population and proximity to the NPP, infrastructure, proximity of the state border, public acceptability.

Criteria for the site selection were defined in accordance with the requirements of the *Regulation for Safe Management of Radioactive Waste*, the *Regulation on Ensuring the Safety of Nuclear Power Plants* and recommendations of the IAEA,. The criteria include: safety determined by the geological conditions, safety determined by the hydrogeological characteristics, the migration of radionuclides, safety defined by the geochemical characteristics (geochemistry of groundwater and sorption minerals in the geological environment), safety determined by the tectonic and seismic conditions, impact on the environment and the population (presence of water and mineral resources in the area of NDF impact, land use, presence of environmental or cultural protected zones in the area of impacts of NDF), transportation of RAW (distance to the NDF, the presence of a developed road network, the number of settlements on the track), socio-economic acceptability (public acceptance, the blocking of productive land, new infrastructure, adverse affects on economic activities).

Based on the multi-criteria analysis, "Radiana" was defined as the site which offers the most favorable conditions for the construction of the NDF. At the stage of "Site Approval” further in-depth studies of the site were conducted and they confirmed the correctness of the choice made.

Chosen alternative in terms of technical solution - After a precise projective analysis and a technical and economic evaluation of the proposed technological solutions, the implementation of the *Strategy for the Management of Spent Fuel and Radioactive Waste*, the performance of reliable monitoring, which provides an adequate site management of the investment proposal with the purpose of protecting the environment, public health and the health of the workers, the selected is the construction of a trench type repository for the disposal of low and intermediate level radioactive waste.

Small auxiliary buildings shall be built - checkpoints, an administrative and laboratory unit, a building, an ancillary unit and an information center. They will be of light types of construction; their foundation will be of strip footing. The bearing structure will be a skeletal-beam system with structural elements of steel and reinforced concrete. Wall claddings will be made of aerated concrete blocks and the internal partitions of gypsum boards. The internal coatings and linings will be latex, glazed ceramic and terracotta tiles and granite. At the design stage the construction of other ancillary buildings shall be defined (where necessary) so to ensure the implementation of activities directly related to the operation of the NDF (e.g. garages, warehouses, etc.).

Estimates of the NDF impact on the components and factors of the environment

EIAR authors have made a detailed assessment of the impact of the NDF during the periods of construction, operation and closure on the individual components and environmental factors in non-radiation and radiation aspects. Measures have been proposed to minimize negative impacts and to prevent any health risk to the population in the area and workers on the site.

In a non-radiation aspect

Atmospheric air - In the *construction* period excessive air pollution is not expected in the area provided that the proposed measures are followed. During *operation* the NDF will not affect air quality. Significant changes in the microclimate of the territory are not expected (the microclimate is one of the main determinants of biodiversity in the region);

Underground. Groundwater.

Groundwater - During the **construction period** groundwater is not expected to receive a significant negative impact on non-radiation and radiation terms.

During normal operation and closure of the NDF groundwater impact is not expected **in a non-radiation aspect**. R**adiation** impact is also not expected. During normal operation an impact on groundwater is not expected because engineering barriers will retain their integrity and design features.

Underground. **As regards non-radiation aspects,** impact during construction will result in: mechanical disruption of the earth in preparation for the construction site and the construction phase for the NDF. This impact will be unavoidable, direct, permanent and irreversible, within the site, and possibly part of the terrain around it (for temporary roads, landfill surplus land masses, etc.). Depending on the approved type of repository, the impact of a trench type repository seems to be relatively increased in degree of distortion of the earth. There is a possibility that small amounts of polluted water generated in the process of construction will infiltrate into the surface layer of earth. As regards radiation, the impact on the earth is not expected because of the absence of radioactive sources during construction.

Underground. **As regards nonradiation-relatedaspects,** it is not expected that there will be an impact on the soil during normal operation and closure. Generated domestic sewage will be discharged for treatment outside the site of the NDF. Occasionally infiltrated rainwater will be discharged through a constructed drainage system, collection of the infiltrate, and local treatment and preservation of potentially contaminated water.

No impact on **mineral diversity** is expected since there are no mineral resources of economic value in the area of "Radiana" site.

Surface waters - During the *construction* period – provided that the safety measures, technology and organization of construction are kept, it is not expected that there will be any impacts on groundwater and surface water in the area.

During the *operational* period –no processes with water are used for the activity of the NDF. The domestic waste waters generated are minimal and are discharged off the site of the NDF. Industrial waste waters will not be generated at the site. It is proposed that waste water generated from the washing of vehicles should be reused after treatment. Also, the quantities of this kind of waste water will be minimal.

During the *closing* period – *waste waters are in minimum quantities*.

A minimum amount of drainage water is expected to be generated. When it is, the same treatment possibilities apply for it as for the waste water generated during operation (a connection between drain system and collector tanks has been made).

In a non-radiation aspect: Minimum quantities of drain water are collected and sent to SE «RAW» on the site of NPP «Kozloduy» for purification.

No negative impact is expected on the surfaces and underground waters in non-radiation aspects, as a result of the closing of the NDF, if all EIAR measures and requirements are respected.

Soils – In a non-radiation aspect, the data analyzed so far, provided that the experts' measures and requirements are respected, allow us to conclude that the construction of an NDF on the territory of "Kozloduy" NPP will not have an additional negative impact on the territories and soils of the NDF site or of the surrounding territories.

During the construction of NDF, the soil will be effected by: digging activities and transportation activities. During the construction, no adjacent territories will be directly affected. Indirectly, due to dust and gas emissions, no negative impacts are expected, but nevertheless measures for their optimum reduction have been implemented (by observing certain conditions – optimum maintenance for the construction and transport mechanics, irrigating the sites during dry weather and others). The only lands that could be considered permanently damaged are the ones on the site on which facilities, buildings, roads, alleys and others are built.

During the operational period, no negative effects on the soil in the region are expected. During closing, re-cultivation will have a positive effect on the soils around the site.

Biodiversity

Vegetation. The IP is connected with construction and installation activities, which affect the terrains of the existing vegetation on a big part of the site. According to the construction plan, the vegetation will be removed in phases. With the change of the terrain's purpose, so does the terrains' shape.

In a non-radiation aspect:

Way of impact – direct. There could be an indirect impact in a 3-km radius, where the excess earth masses will be transported during the construction. Level of impact: high, but reversible after an adequate re-cultivation of the terrain. *Duration of the impact*: *temporary* – until the adequate re-cultivation of the terrain; *Frequency of the impact*: during the construction and operation; *Cumulative impacts*: not expected; *Transboundary impacts:* not expected.

Reversibility of the impact: a change of the site's land statute is needed for the construction of new infrastructure and breaking the surfaces of lands from the land fund. This is reversible to a degree, after carrying out a technical and biological re-cultivation. There is the possibility for the construction of a vegetation zone and landscaping with vegetation.

In a radiation aspect no effects on the vegetation are expected, due to the lack of direct radiation sources during the construction and operation.

No plant species were foundpresent in the R B or the appendices of the LB for protected plant species were found on the territory of the IP. Considering this, along with the relatively small affected land in the area, the negative impacts on the vegetation during the construction of NDF will be insignificant. .

Expected effects on the fauna

In a non-radiation aspect:

Overall, no negative impacts on the fauna in this part of the Danube plain can be expected during the construction of any of the options for the near-surface LILRAW facility. On the site and in its vicinity (around 360 ha), there are no groups of habitats of rare and endangered species of wildlife fauna – no such species have been registered during the inspections of the site, nor are there any written data. The territory itself is placed in a somewhat preserved, but fragmented area, which is surrounded by areas, affected by men – south of the second-class road Harlets – Kozloduy, with agricultural land beyond it, north from the access road to NPP Kozloduy and the NPP site itself, to the east and west – agricultural land. All this obstructs to a degree the free access of species, travelling by land, especially those who have a higher limit for the unrest factor.

On the protected territories and zones – *during the implementation of NDF* there cannot be any direct or indirect (dust, etc.) negative impacts on the closest protected zones and habitats, subject to preservation, mainly because of the distance between these and the site, including the depot for earth masses. In this aspect, the agricultural land which occupies the space between the protected zones and the IP could have a much greater negative effect.

Expected impacts on the landscape

Visual impact on the terrain can cause a negative feeling for an excessive human activity in the area. This depends on the landscaping of the terrain with vegetation. After an adequate landscaping, with vegetation, the object can be well integrated into the scenery.

A limited impact is expected, within the territorial range. The dug earth masses are planned to be disposed within the provided terrain. *Way of impact* – direct. *Level of Impact*: minor to low, concerning the aesthetics of the environment. The terrain is in an industrial type local landscape. *Duration of the impact*: *temporary* – during the construction (7 years); *Frequency of the impact*: during the construction. *Cumulative impacts*: not expected;*Transboundary impacts:* not expected. The impact is reversible to a certain degree, after the construction phase. Possibility for the construction and landscaping of a vegetation zone.

If all EIAR measures are respected and strong control and effective management are applied, no negative impacts on the environment are expected.

Impact on the cultural heritage – If all measures described in the Law on cultural heritage and those mentioned above are followed, all potential negative impacts on all registered or unregistered cultural heritage sites will be prevented.

Waste Prognosis and evaluation of these impacts – during the construction, only non-radioactive waste will be generated, which will be treated in accordance with the Waste Management Program. It will not be left on the site, but will be transported immediately after its generation for further treatment. It is expected to have a negative impact on the NDF site only during its construction, i.e. its impact on the site will be limited and will end with the construction phase.

In the operational and closing periods, the non-radioactive waste will be mainly household waste and will be treated in accordance with the regulatory requirements, so that there will be no negative impact on the environment.

Impacts from noise, vibration and other non-radiation factors. The impact of the generated noise on the environment will occur mainly during the construction. It is inevitable, negative, temporary and periodic (only during the day). It affects the territory of the construction site and parts of the surrounding terrains. For the lands around the site of the future object, there are no noise regulations, but the construction activities will temporarily change the current noise background. No impact on the territories of the residential areas is expected, due to their remoteness from the construction site of the future facility.

Impacts of hazardous substances – If all instructions associated with the use of hazardous substances and those under the WSHFS standards are observed, no negative impacts on the environment or health risk for the working personnel on the site are expected.

Impacts from radiation aspect during the implementation of NDF in the construction, operation and closing phases

The total area of the NDF lands is around 36 ha. During the construction, no additional space will be required, as all activities are planned to be performed within the boundaries of the Radiana site itself. Separate modules with a depth of 50 m for the disposal of radioactive waste are planned to be constructed – they are reinforced steel structures, placed 35 m deep under the surface.

The radiation aspects of the investment proposal for NDF are examined and analyzed with the necessary level of detail.

The full characteristics the site chosen for the IP for the NDF from a radiation point of view of are presented. The site is located in the close vicinity of NPP Kozloduy. The territory has been controlled by the Radio-ecological monitoring department since 1972.. It has been proved convincingly that the operation of the reactors has not changed the radiation status of the air, waters or soils in the controlled territory.

Impacts on the population and environment from any nuclear installation or radioactive source are theoretically expected through the air, water or a change of the radiation background. For the NDF, this impact has been examined during the construction, operation and closing phases of the repository.

In the preliminary safety analysis of the NDF project, all these sources have been analyzed and it has been proven that during all operational phases, including the closing phase, the radiation status of the environment will not change. The constructed repository will not generate any radioactive gases or emissions.

Liquid waste during the NDF operation is not expected. If due to an emergency or another reason any kind of water pollution is identified, water will be collected in special tanks from of from 2 to 10 m^3, measured and sent for treatment at SE "RAW Kozloduy", placed on the site of "Kozloduy" NPP .

Solid RAW will be generated mainly as PPE – protective clothes, shoes and gloves. Work clothes will be washed/decontaminated in special laundries if the contamination is higher than what is allowed in the BNRP-2004. If the contamination cannot be removed, which is very unlikely, these PPEs will be treated as radioactive waste. RAW will be collected in plastic bags and transported over a certain route, in transport containers, on a transport vehicle, accompanied by a vehicle, equipped with radiation control devices, equipment for personal protection, decontamination and fire extinguishing and others, necessary for coping with emergencies. For every activity with RAW, there are specific instructions, the observing of which are of an extreme importance for the radiation protection of the personnel, the environment and the population.

Despite the excessive conservatism, the results from the dose evaluation after the closing of the repository show that in normal evolution, the individual dose for members of the public does not exceed the regulatory limit of 0.01 mSv/a. On the basis of this, it can be stated that the site is suitable for the construction of a near-surface repository for low and intermediate level radioactive waste.

The investment proposal for the NDF guarantees that the radiation exposure of the personnel is in accordance with the ALARA principle and is limited within the regulations stated in BNRP - 2004. It is assumed that the acquired experience during the observation of procedures in NPP "Kozloduy" will be applied during normal and emergency actions and conditions and that in the future, this will bring the radiation exposure to a minimum.

All regulatory requirements for radiation protection of the personnel and nuclear safety will be observed, as described in the Legislation section of this EIAR, as well as those which will be given as a condition for the operational license of the NDF. Due to the particularities of the performed activity, the expected actual dose effects will be many times lower than the limit value.

In accordance with the Investment proposal, the radiation protection of the personnel, working at the NDF building will be provided through:

- Appropriate shielding (protection) to avoid exceeding the limits for exposure;

- Continuous radiation monitoring with alarm devices;

- Minimizing the time for work, repairs and maintenance in a radioactive environment;

- Zoning of the rooms in the NDF;

- Controlled access to premises Controlled Area (CA) of NDF;

- Dosimetric monitoring of personnel

- Administration of personal protective equipment when assessing the risk of the activity and the need for their use.

Compliance with all limits associated with radiation and dosimetric parameters is achieved mainly with technical measures implementing the principle of multiple barriers of protection from a radioactive source. All RAW is kept immobilized in a cement matrix in a sealed container. Containers are placed in modules, closed and filled with inert components. Modules themselves are dug into the earth, as the surrounding earth has the best properties for the retention of potential radioactive nuclides, leaked as a result of incidents.

The shielding, depending on the phase of operation is ensured by the very matrix in which the RAW is fixed in reinforced concrete containers and their walls, the walls of the buildings and depth of disposal with inert material. Last but not least is the effect of the self-shielding arrangement of containers.

During the operation and closure of the repository, a monitoring program is implemented. The overall objective of the monitoring program is to provide direct evidence of the measured presence or absence of radionuclides and radiation in the environment that may be related to the disposal facilities. Programming is closely related to the evaluation of safety so that monitoring results can be applied for the confirmation of the assumptions in the safety assessment.

In accordance with the Regulation for the conditions and procedure for establishing of special-statutory areas around nuclear facilities and facilities with sources of ionizing radiation, these are: the **Radiation Protection Area** and the **Monitored Area**.

According art.3 (2), the monitored area is the territory, where the radiation monitoring takes place for the radiation protection of the population and environment. The monitoring takes place in the pre-operational period, during the operational phase and after the closing of the facility.

The radiation monitoring program must comply with the requirements of the Regulation for radiation protection during activities with sources of ionizing radiation, chapter 8, and the requirements of the Regulation for the conditions and procedure for establishing of special statutory areas around nuclear facilities and facilities with sources of ionizing radiation Art. 14 (1). The radiation monitoring must include as a minimum:

- Gamma dose rate;
- Total and specific activity of liquid and gas-aerosol releases into the environment;
- Specific activity of gases and aerosols in near-surface air;
- Specific activity of the fall out, surface soil layer and vegetation;
- Specific activity of surface and groundwater;
- Contamination of water supply networks and facilities;
- Contamination with radionuclides of vehicles;
- Specific activity of plant and animal products and raw materials;
- Meteorological data.

In addition, the program covers also the geodynamic monitoring because of the special importance of the safety of the facility.

It is necessary to state that the results from the radiation monitoring carried out for the last three years in the region, for the purposes of the NPP, show that the radiological purity of the air, soils, waters, vegetation and some animal species and products from them meets the regulatory requirements, as the measured values are within the natural limits for the region and under the limits, and they are practically not impacted by the operation of NPP "Kozloduy". Bearing this in mind, a cumulative effect during the NDF operation in the region cannot be expected.

The analysis of all data which contain information for the determining the environmental radiation impact of NDF on the population and environment shows that during the normal operation of NDF, if all regulatory requirements and the established program for radiation protection are respected, the radiation effect on the personnel performing servicing activities of the containers/packages of RAW will be within the limits of the project requirements, given in the Investment Proposal. No impacts from radiation on the personnel working on the NPP Kozloduy site are expected.

EXPERTS CONCLUSION

The current EIAR of the investment proposal of SE ''RAW'' for the implementation of an NRRAW on the lands of Harlets, Kozloduy Municipality, Vratsa region was prepared by a group of licensed experts in the fields of EIA and EA.

The consultations, opinions and advice obtained from the meetings with the affected public, the competent authorities, departments and institutions, concerning the preparation of the ToR, the structure and the content of the EIAR are taken into account in the analysis and assessments on the level of impact of the object on the respective components of the environment, and the factors that affect them, as well as the suggestions of measures which would reduce the negative impact from the site on the environment to the minimum possible,.

The EIAR was prepared on the basis of:

- A plan for the scope and contents of EIAR;
- Visual inspections and field observations of the NDF site;
- Research, designs and other documents;
- Inventory, analysis and assessment of the existing information for the preparation of the report (actual observation and measurements, scientific research, publications, reports and others);
- Consultations with specialists;
- Statements of the environmental protection agencies, the opinions and advice of authorities and institutions affected by the implementation of the investment proposal, the local population and authorities, non-governmental ecological organizations and others;
- Methods for the assessment and prognosis of the impact of the object used by the experts on the respective components of the environment and the factors that impact it;
- Regulatory documents

Prognoses and assessments have been made for the potential impact of the NDF during its periods of construction, operation and decommissioning on the components of the environment, the personnel, and the population of the region. Measures have also been proposed to minimize these impacts, in accordance with all requirements of the European legislation.

An ecological analysis of the alternative solutions has been performed in the EIAR, and a number of measures and recommendations the negative impact on the environment and the factors that impact it as much as possible have been put forward, in order to guarantee the full safety of the occupational personnel and the population of the region during the periods of construction, operation and closure of the NDF, with regard to both radiation and non-radiation aspects.

Provided the management of the NDF is effective, no significant negative impacts on the environment are expected. The implementation of the predicted safety measures guarantees that there will be no health hazards for the personnel and local population.

The territorial span of the impact is within the boundaries of the field of the investment proposal and the immediate perimeter;

- There is no planned construction of new water ways for the supply of the NDF;
- The underground waters as well as the existing ground water installation on the perimeter around the investment proposal are in no danger of contamination with wastewaters or radionuclides from the NDF.

The impact on the underground substrata is expected to be considerable in non radiation aspect, but practically unavoidable. It will stem mainly in earthwork associated with the construction of the NDF and the concomitant buildings and installations. Its territorial coverage is within the boundaries of the field of the investment proposal.

The investment proposal has pointed out advisable measures for the protection of the underground substrata and the underground waters from the penetration of pollution and radionuclides after the closure of the NDF.

The long-term examinations of the drinking water conducted by NPP Kozloduy under the environmental monitoring program show that the values for the total beta activity are considerably below the maximum permissible values according to the requirements of Regulation no. 9/16.03.2001 on the quality of the drinking water. The amounts of radionuclides 90Sr and 137Cs are by orders below the limits according to the Regulation of Basic Norms of Radiation Protection .For the year 2008 these values are: total beta activity 0.019÷0.13 Bq/l, 137Cs – below the detection limit, 90Sr in the range < 0.7÷1.6 mBq/l.

The long-term examinations and the environmental monitoring to date give the results of the examined parameters that characterize the quality of the individual parameters of the environment as below the norm according to the Basic Norms of Radiation Protection. The implementation and operation of the NDF are not expected to cause additional impacts on the individual components of the environment or on the factors have an impact on it and, thus, there are no expected health hazards for the population in the region.

The results from the evaluation of the doses in the period after the closure of the repository in the Preliminary Safety Analysis show that because it evolves normally, the individual effective dose for members of the public will not exceed the 0.01 mSv/a limit. In accordance with Article 10 from the Regulation for safe management of radioactive waste, this means that the best possible means for RAW management have been used and the exposure of the personnel and population is kept to the lowest reasonably achievable level.

On these grounds it can be stated that the site is suitable for the construction of a near surface disposal facility for low and intermediate level short-lived radioactive waste.

Radioactive aspects

In the development of the concept for the construction of the NDF it has been found that a surface, multi-barrier repository of the trench type, composed of individual modules for the arrangement of the reinforced concrete containers, is most suitable.

The nine fundamental principles of RAW management formulated by the IAEA will be applied in the construction of the NDF:

- 1st principle: Human health protection
- 2nd principle: Environmental protection
- 3rd principle: Protection beyond the nation's borders
- 4th principle: Protection of the future generations
- 5th principle: No burden on future generations
- 6th principle: National legislation
- 7th principle: Control over the generation of RAW
- 8th principle: Dependencies between the generation of RAW and its management
- 9th principle: Safety of the facility

According to the Act on the Safe Use of Nuclear Energy (1):

- *Article 3 (1) Nuclear energy and ionizing radiation shall be used in compliance with nuclear safety and radiation protection requirements and principles. With the aim of ensuring the protection of human life, health and living conditions of both present and succeeding generations, the environment and property against harmful impact of ionizing radiation.*
- *(2) In the uses of nuclear energy or ionizing radiation, and in the radioactive waste management and spent fuel management:*
- *1. Nuclear safety and radiation protection shall have priority over all other aspects of the activity;*

- *2. Occupational and public exposure to ionizing radiation shall always be kept as low as reasonably achievable*

All these principles were taken into account during the preparation of the Conceptual Design and are rated in the Preliminary Safety Analysis (PSA).

The dose burden of the personnel during the operation will not exceed the limits under BNRP 2004 and will practically be considerably lower, as are the requirements of ALARA principle.

The NDF must provide effective protection of the health of the population and the environment against the potential impact of the radioactive waste stored in it after its closure by avoiding the uncontrolled spread of radioactive substances into the biosphere with the aid of the multi-barrier protection of the biosphere and a number of technological and administrative measures.

The basic criteria proving that the goal has been reached are the radiological criteria established in the Regulation on Basic Norms for Radiation Protection and the Regulation for Safe Management of Radioactive Waste.

In this line of thought the last point of the analysis of EIAR is the **limit of the annual individual effective dose of a critical group of the population.** The conclusions are based on the presented Conceptual Design and the PSA.

The National Disposal Facility for short-lived low and intermediate radioactive waste will be operated and managed by SE"RAW". The "Radiana" site for the NDF location is in the immediate vicinity of Kozloduy NPP

According to the chosen Conceptual Design the repository is of the trench type. The monitoring program will fulfill its functional goals in the support of the Environmental Impact Assessment Report

A safety assessment of near surface disposal facilities has been made. This is a procedure for the assessment of the behavior of the disposal facilities and specifically, of their potential radiological impact on human health and the environment. The safety assessment defines the dissemination paths of radionuclides in the environment and assesses the potential health hazards..

Pre-operational monitoring provides the basic levels for the assessment of all the surplus changes in the environment which could be linked to the discharges from the disposal facilities.

Monitoring during operation and after closure of the disposal facility is intended to show that the actual measurements in the environment do not invalidate the assumptions and estimates of the safety assessment.

For near-surface disposal facilities, the approval by the regulator of the project of the facility and demonstration of compliance after the beginning of the operation are based on a comparison of results of safety assessments of the facility and the applicable norms and standards. The monitoring data provides support for the assumptions of the assessment and its results. The monitoring shall be designed so that the result "less of an activity or concentration" is sufficient to support the safety assessment. Similarly, the surveillance program of the facilities is being developed in such a way that the degradation of structures and systems of the disposal facility to the extent that compromise the validity of the safety assessment cannot occur without being detected.

It is expected that there will be no significant migration of radioactive substances from the disposal facility, at least during the operation and after its closure during the control period. Maintenance of monitoring will be the absence of detected specific radionuclides and the absence of statistically significant changes in the levels of other pollutants.

During operation are not expected environmental radiation impacts beyond regulatory limits.

The Radiana site is appropriate in terms of the possible spread of radionuclides in groundwater and groundwater space. All investigated radionuclides (including 129I) are retained and decayed in the aeration area under the storage facility and they do not reach groundwater. The activity of 129I makes it safe to

groundwater and there is no real risk of radioactive contamination of the region through these waters. There are no excluding factors in it and its characteristics meet the requirements of the regulations and safety criteria.

Despite the excessive conservatism, the results of the assessment of the doses in the period after closure of the repository shows that with normal evolution, the individual effective dose for members of the public does not exceed the legal limit of 0.01 mSv / a.

Based on the expert assessments carried out, it can be stated that the implementation of the NRRAW during the periods of construction, operation and closure will not have any transnational impacts.

The team of independent experts that has prepared the report on the EIA, in light of the studies and analyses performed; the conclusions reached; the estimates developed; and the implementation of the measures proposed, recommends to the competent authority **MEW** that it allow the implementation of the investment proposal of the Employer - **SE "RAW"** for the construction of the NRRAW at the "Radiana" site on the lands the village of Harlets, Kozloduy Municipality.

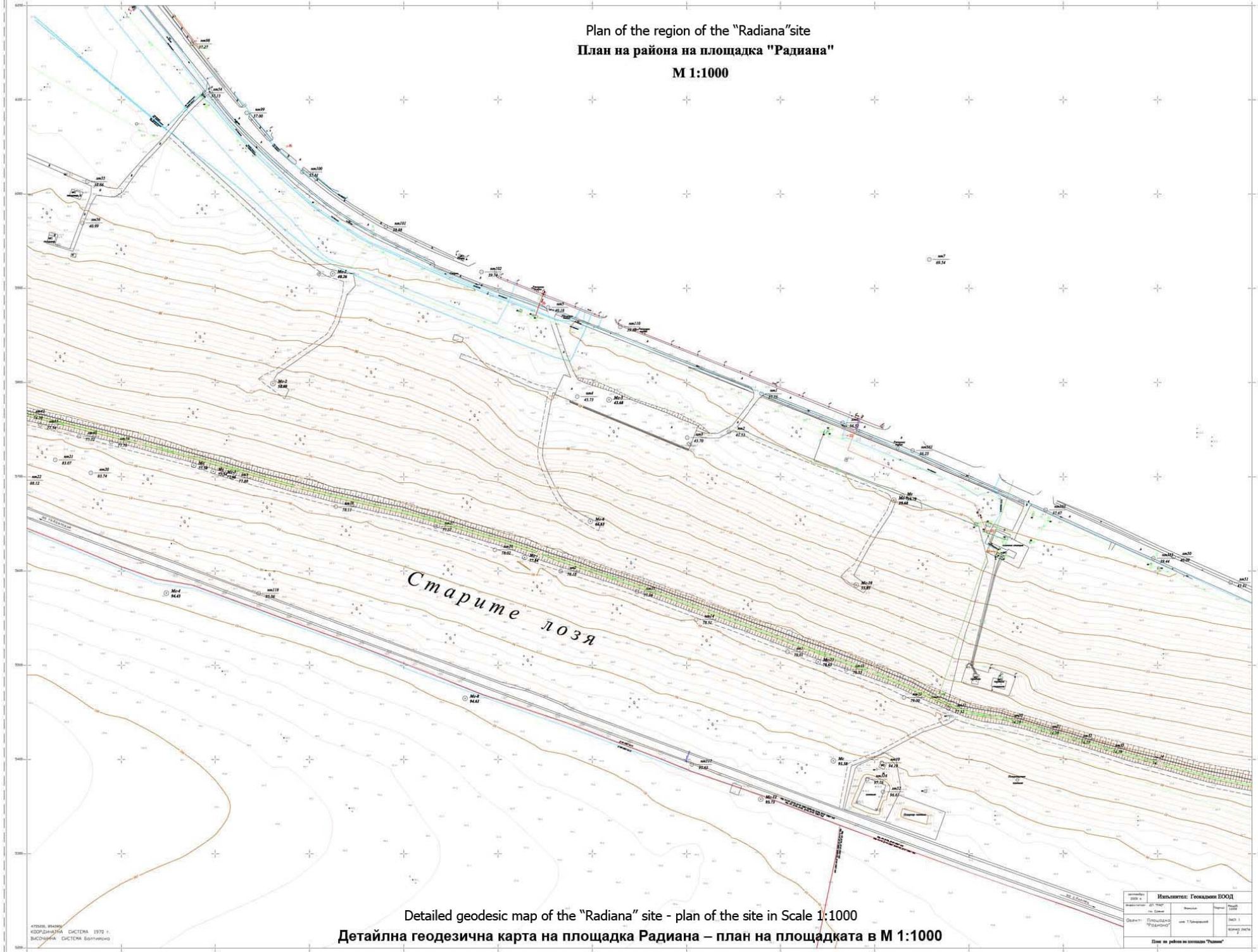
DESCRIPTION OF APPENDICES

1. A detailed geodesic map of the Radiana site – site plan on a 1:1000 scale.
2. General plan of the engineer multibarrier near-surface trench type National Storage Facility on the Radiana site
3. Transport scheme from the SE RAW depot to the Radiana site
4. Scheme for the placement of a depot for earth masses

Plan of the region of the "Radiana"site

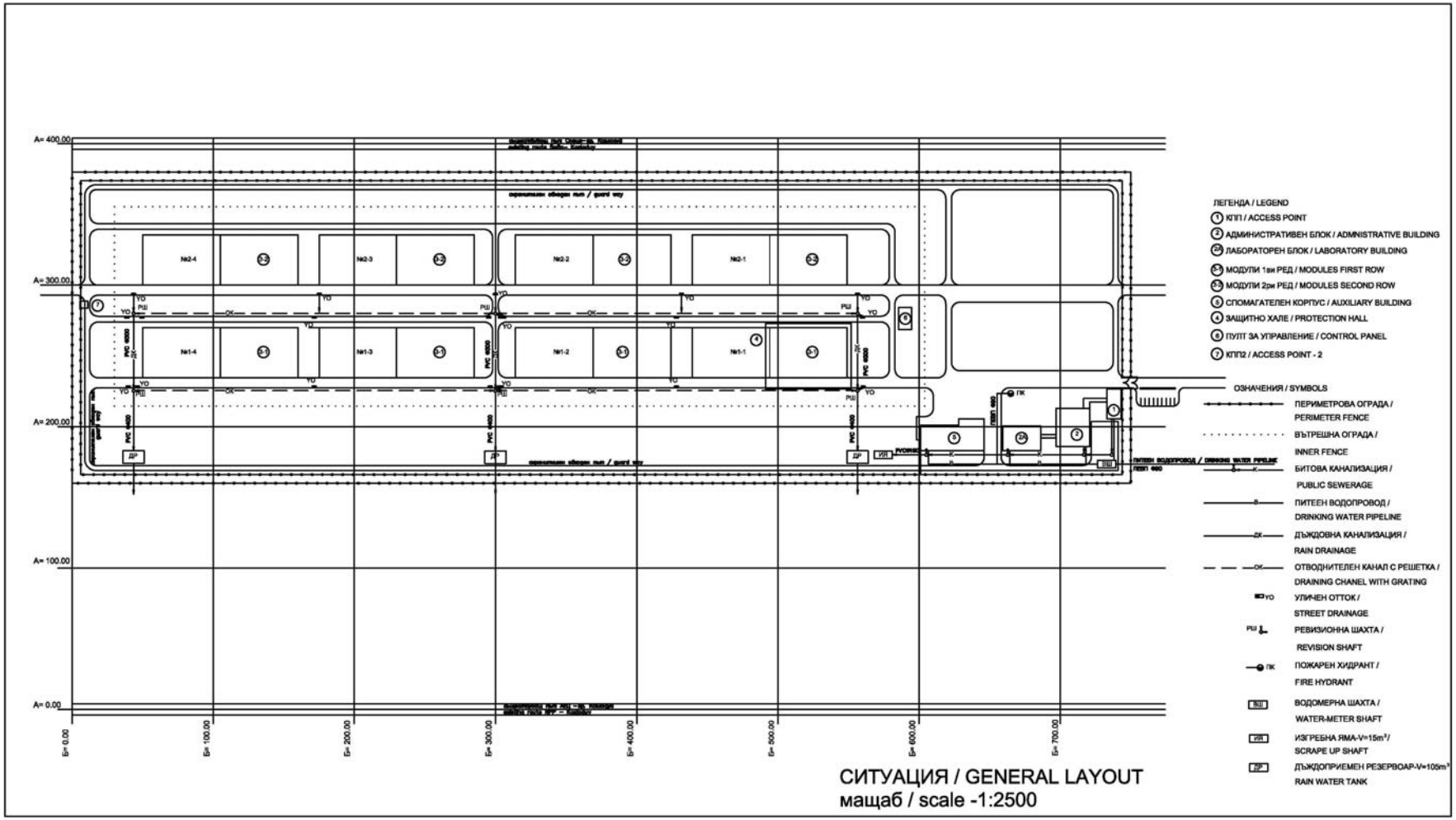
План на района на площадка "Радиана"

М 1:1000



Detailed geodesic map of the "Radiana" site - plan of the site in Scale 1:1000

Детайлна геодезична карта на площадка Радиана – план на площадката в М 1:1000



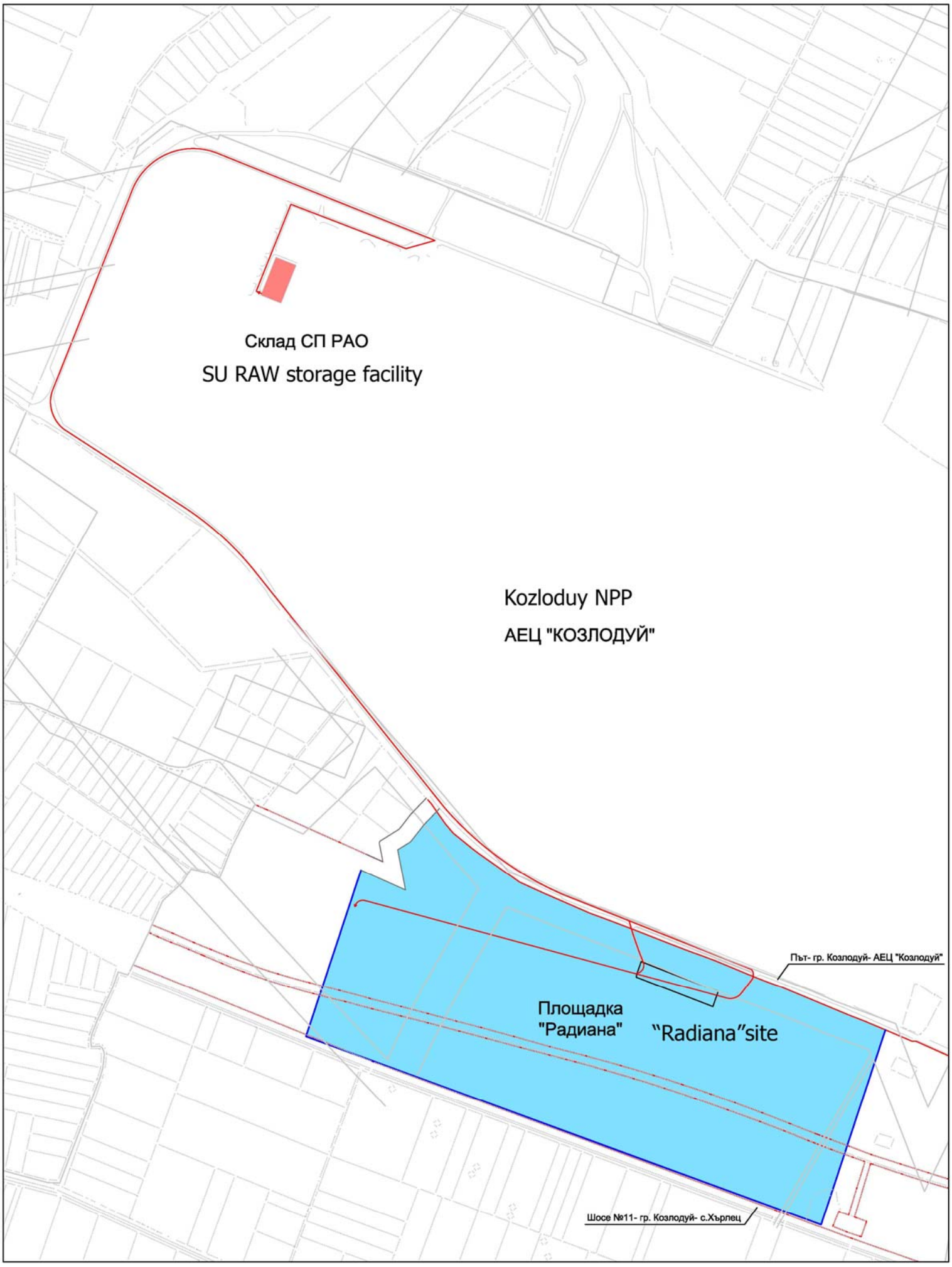
Генерален план на инженерно многобариерно приповърхностно траншейно хранилище на площадка Радиана

General layout of the engineering multibarrier nearsurface trench-type repository of the "Radiana" site

Transport scheme from the SU RAW storage facillity to the Radiana site

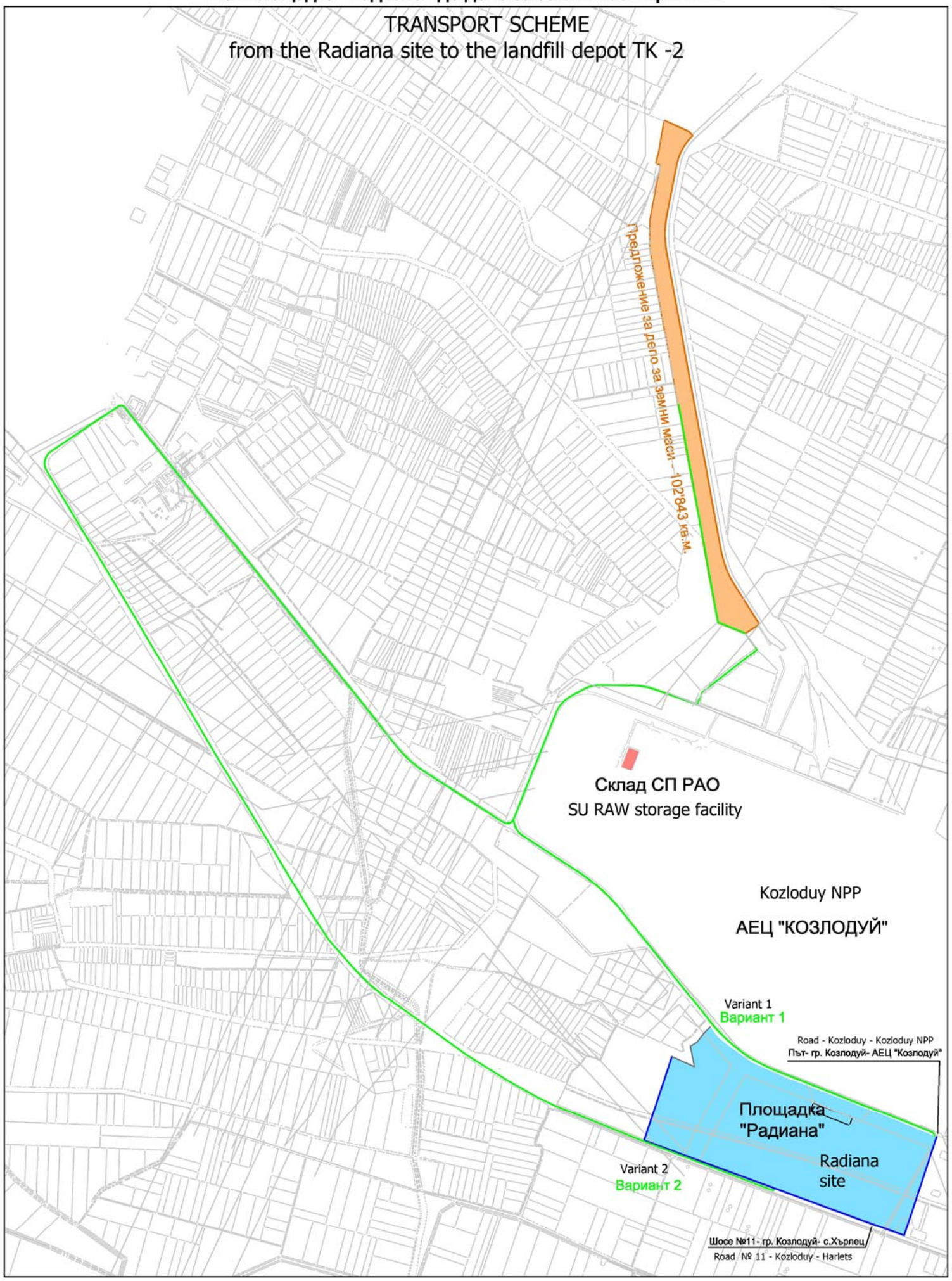
ТРАНСПОРТНА СХЕМА

от Склад на СП РАО до площадка "Радиана"



М 1:6000

ТРАНСПОРТНА СХЕМА
от площадка "Радиана" до депо за земни маси при ТК-2



М 1:12000