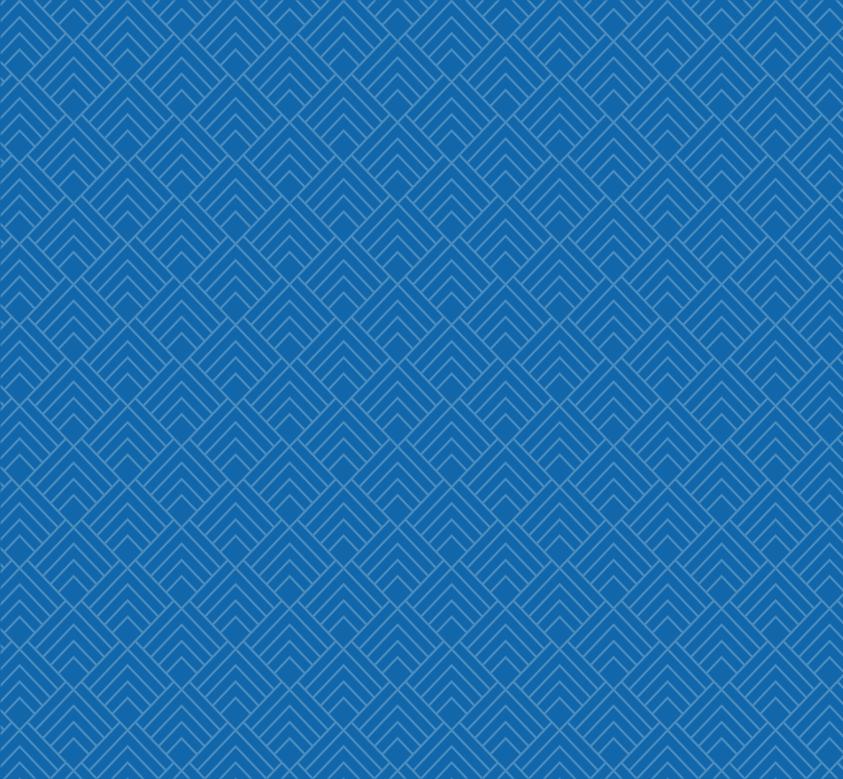


FSUE «National operator for radioactive waste management»

REPORT

on environmental safety for 2020

Moscow 2021



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Report on environmental safety for 2020

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GENERAL CHARACTERISTICS AND PRIMARY ACTIVITY OF NORWM 1

The Great Arctic State Nature Reserve is the largest not only in Russia, but also in the whole of Eurasia. It is located in the north of the Krasnoyarsk Territory. It has an area of 4 million 200 thousand hectares and covers an area of 1000 km from west to east and 500 km from north to south.

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GENERAL CHARACTERISTICS AND PRIMARY ACTIVITY OF NORWM

1.1. General information

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In the international practice the most secure way to isolate radioactive waste (hereinafter - RW) is recognized to be its final disposal at special facilities. The final disposal of RW is the final, particularly important, and environmentally responsible stage of RW management, aimed at RW isolation from human habitation environment ensuring reliable long-term safety for the entire period of RW activity.

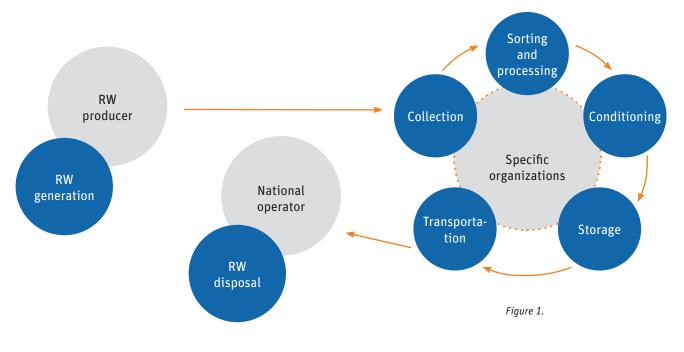
The Federal State Unitary Enterprise «National Operator for Radioactive Waste management» (FSUE «NORWM») was created in accordance with the Federal Law No.190-FZ of July 11, 2011 "On management of radioactive waste and on amendments to some acts of law of the Russian Federation" on the basis of the state enterprise «Central Research Laboratory of Industrial Innovation Technologies», established by the order of the Ministry of Atomic Energy and Industry of the USSR of April 9, 1990 No.269.

According to the order of the Government of the Russian Federation dated March 20, 2012 No.384-p, FSUE «NORWM» got the status of the national operator for radioactive waste management and is the only organization, authorized to dispose radioactive waste and perform other activities related to that.

The place of FSUE «NORWM» in the general process chain of the RW management is shown in Figure 1.



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General scheme of RW management

Key goal

Providing a solution to the problems of the accumulated nuclear legacy and newly- produced radioactive waste, the enterprise is, in fact, a state production and environmental enterprise, the key goal of which is the final disposal of radioactive waste, considering any potential risks to the environment and human health.

The mission of NORWM

The mission of FSUE "NORWM" is to ensure the environmental safety of the Russian Federation in the field of final disposal of radioactive waste.

FSUE "NORWM" was assigned as an organization suitable to operate nuclear facilities and carry out activities in the field of atomic energy use (Certificate of March 07, 2012 No.GK-S008, effective amended as of November 13, 2017) by the governing body in the person of State Atomic Energy Corporation Rosatom (ROSATOM).

The main activities of FSUE "NORWM" in accordance with the Charter, are as follows:

- radioactive waste disposal;
- ensuring the safe handling of radioactive waste accepted for final disposal;
- ensuring the operation and closure of the final disposal facilities;
- ensuring nuclear, radiation, technical, fire safety, environmental protection;
- ensuring radiation control on the territory of RW final disposal facilities including routine radiation surveillance after closing down such facilities;
- performing customer functions for the design and construction of final disposal facilities for radioactive waste including design and survey;
- forecasting the volumes of RW final disposal; developing the infrastructure of the RW management system, placing relevant and time-bound information at the websites of ROSATOM and NORWM;
- providing technical and information support for the State System of Accounting and Control of Radioactive Waste and Nuclear Materials;
- informing of the public, governmental authorities, affiliated state bodies, municipal agencies on the safety issues while RW treatment and radiation situation at the territories of RW disposal facilities location;
- carrying out of the RW disposal facilities inventory;
- performing the preparatory and pre-project works, related to the construction of RW final disposal facilities;
- purchasing the land sites, objects of incomplete

construction, special equipment in the aims of RW disposal engineering development scope of works;

- designing, manufacturing and assembling equipment for the purposes of radioactive waste disposal;
- conducting the works on the research and development to justify the increasing disposal facilities safety on the operational and closure phases;
- storing radioactive waste before transferring it to the disposal facilities;
- elaboration and implementation of the community-focused activities, considering the social and economic development, as well as the environmental safety programmes of the Russian Federation's regions, where RW disposal facilities are located; such programmes shall be aimed at the people' social protection, including public health service for those, who inhabits the areas adjoining to RW disposal facilities;
- developing and implementing measures to ensure the physical protection of final disposal facilities, including the elements and physical protection system itself;
- implementing measures on revealing locations for potential radioactive waste disposal facilities placement, involving social and marketing research, legal aspects analysis associated with potential radioactive waste disposal facilities placement, implementation of research efforts, R&D and other studies necessary for decision making on disposal facilities placement;

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- ensuring protection of state secret information as well as other restricted access information in accordance with the Russian Federation legal and regulatory documents and State Atomic Energy Corporation Rosatom local documentation;
- organizing and conducting public hearings.

Nuclear materials, radioactive substances, radioactive waste are subject to state accounting and control in the state accounting and control system for nuclear materials and in the state accounting and control system for radioactive substances and radioactive waste according to Article 22 of the Federal Law «On the Use of Atomic Energy». One of the activities of FSUE «NORWM» is the technical and informational support for the state accounting and control of radioactive substances and radioactive waste. In 2016, the Russian Government issued Resolution No. 542 of June 15, 2016 «On the Management of the State System for Accounting and Control of Radioactive Material and Radioactive Waste», which establishes, inter alia, the procedure for carrying out state accounting and control of RW, i.e. collecting, recording information on the amount, the qualitative composition and transporting of radioactive waste; registration of radioactive waste; registration of RW storage facilities; maintaining the register of radioactive waste; maintaining cadaster registration of the passport of radioactive waste.

Currently, FSUE «NORWM» is mainly active in two major areas:

1. operational activities;

2. creating final disposal facilities for radioactive waste. (pre-project activities, design, and construction).



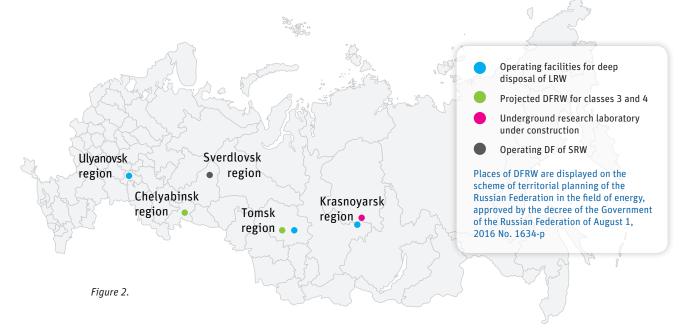
1.2. NORWM operational activities

The enterprise consists of the central office and the following branches and offices in the regions where existing and future final disposal facilities for radioactive waste are located:

- 1. DIMITROVGRAD branch (Dimitrovgrad, Ulyanovsk region);
- 2. ZHELEZNOGORSK branch (Zheleznogorsk, Krasnoyarsk Region);
- 3. SEVERSK branch (Seversk, Tomsk region);
- 4. NOVOURALSK department of SEVERSK branch (Novouralsk, Sverdlovsk region);
- 5. OZERSK branch (Ozersk, Chelyabinsk region).

Dimitrovgrad, Seversk and Zheleznogorsk branches are engaged in the deep disposal of liquid radioactive waste (LRW). Department «Novouralsk» of Seversk branch is performing the near surface disposal facility for the 3rd and 4th classes of radioactive waste. Branch Ozersk was established at the end of 2017 for the construction and subsequent operation of a near surface disposal facility for 3 and 4 classes of radioactive waste.

The map of projected and operating NORWM's RW disposal facilities



Liquid radioactive waste disposal

The deep disposal facility for liquid radioactive waste (DDF LRW) encloses a complex of under- and above-ground facilities predesignated for low and intermediate level radioactive waste disposal the deep geological formations, isolated from the above and below lying aquifers liquid.

Table 1 Operation activities of NORWM branches on class 5 RW disposal

Branch	Dimitrovgrad branch	Zheleznogorsk branch	Seversk branch
Name	«Experimental industrial technological test site» (DDF EITTS)	Technological test site «Severny» (DDF of «Severny» technological test site)	DFRW of LRW «The technological ground of the sites №18 and 18a
Location	Ulyanovsk region, 6 km to south-west of Dimitrovgrad, at the territory of JSC «SSC RIAR» industrial site	Krasnoyarsk Territory, 60 km from Krasnoyarsk, 18 km from Zheleznogorsk. Within limits of FSUE MCC sanitary protection area	Tomsk region, 10 km from Tomsk city, 2,5 km from Seversk city living area at the territory of SCC JSC industrial site
Year of constitution	1966	1967	1963
Type of disposed waste	LRW, classified as Class 5 in accordance with disposed RW classification pursuant to the RF Government Regulation dated 19.10.2012 N 1069 (low- and intermediate level RW)		

Waste allocation (depth horizons)	Deep-seated collector formations, isolated from below and above aquifers. For waste allocation the following horizons are used:			
	Horizon III – at depth of 1419–1514 m, Horizon IV – at depth of 1114–1342 m.	Horizon I – at depth of 355 – 500 m, Horizon II – at depth of 180 – 280 m.	Site 18: Horizon II – at depth of 375–430 m. Horizon III – at depth of 260–303 m. Site 18a: Horizon II – at depth of 315–345 m.	
Number of wells	28 observation; 4 injection	82 observation; 13 injection	212 observation; 15 injection	
The area of subsurface mining allotment	15 455 ha	4 490 ha	10 970 ha	
Potential radioactive hazard category (in accordance with Principal Sanitary Radiation Safety Rules OSPORB-99/2009 requirements)	Category III (impact in case of emergency shall be limited to site territory; the border of sanitary- protection area conforms with that of industrial site)	Category II (impact in case of emergency is possible at the territory of sanitary- protection area and measures might be required for impact mitigation).	Category III (impact in case of emergency shall be limited to site territory; the border of sanitary-protection area conforms with that of industrial site)	

The technological process of injection eliminates the possibility of negative impact on the components of the environment and the population. There were no emergencies leading to radiation impact on the environment and local population for all the operation time.

LRW disposal is accompanied by systematic observations over the distribution of waste using a network of observation and test wells only at predetermined boundaries of the geological environment and conducting special studies.

Scheduled repairs, technical control and maintenance, and quality control are constantly carried out. Disposal sites are serviced 365 days a year, 24 hours a day.

Solid radioactive waste disposal

Novouralsk department of Seversk branch operates a near surface disposal facility for radioactive waste in Novouralsk (hereinafter – NSDFRW). Establishing the facility in Novouralsk, Sverdlovsk Region, was provided for by the federal target program «Nuclear and Radiation Safety in 2008 and for the period up to 2015».

The construction of NSDFRW was carried out in accordance with the project developed by the Ural Design and Research Institute "VNIPIET". The operation of NSDFRW began in November 2016, when the first batch of solid 3rd-class radioactive waste from the Ural Electrochemical Combine was accepted.

NSDFRW is located in the industrial zone of the city of Novouralsk, at the industrial-purpose area, to the north of the residential areas. The nearest settlements: Novouralsk is located 4 km to the south; the village of Belorechka is 4.5 km to the north, the village of Verkh-Neyvinsky is 4.8 km to the south-east, the village of Neivo-Rudyanka – 5 km to the northeast.

NSDFRW is intended for disposal of 3rd and 4th classes of radioactive waste according to the classification of the radioactive waste, approved by the Decree of the Government of the Russian Federation of October 19, 2012, No.1069.

NSDFRW includes RW storage (map No.10), building No.1, integrated transformer substation and other facilities.

NSDFRW safety is provided by successive implementation of in-depth multi-barrier protection principles, based on deployment of physical barriers systems on the way of ionizing radiation and radioactive substances transmission into the environment, on the use of technical procedures system for physical barriers protection and capacity retention as well as employees (personnel), population and environment protection measures.



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1.3. Activities to create the final disposal facilities for radioactive waste

Clause 4 of the Decree of the Government of the Russian Federation dated November 19, 2012, No.1185 «On establishing a process and timeframe for creation of a unified state system for management of radioactive waste» provides for the creation of a system of final disposal facilities for radioactive waste.

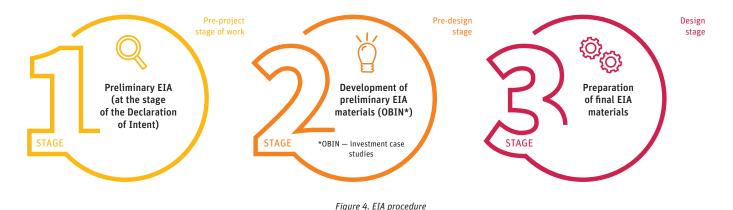
One of the most important aspects of minimizing the negative impact on the environment and preventing environmental and radiation risks, as well as a crucial step in the process of creating final disposal facilities, is the pre-design stage, where prospective sites are determined and selected. The basic principles of the siting for the placement of such facilities are shown in Figure 3.

Only a combination of these conditions makes it possible to consider the sites as suitable for the placement of disposal facilities. At the pre-project and project stages, a major part of work is to conduct an environmental impact assessment (EIA), which the safety of not only the facility itself, but also the region of its location will



Figure 3. Basic principles for the placement of final disposal facilities for radioactive waste

depend on in the future. Impact assessment is carried out in several stages (shown in figure 4) in accordance with the Regulation on environmental impact assessment of the planned economic and other activities in the Russian Federation, enacted by Order No.372 of the State Environmental Committee of the Russian Federation dated May 16, 2000.



NORWM facilities at the stage of design and construction

1. Construction of underground research laboratory in the Krasnoyarsk region

Underground research laboratory (URL) is being created in the Krasnoyarsk region (Nizhnekansky massif) for final disposal of the 1st and 2nd class radioactive waste.

More details about the laboratory creating project can be found on the website: http://nkmlab.ru/.

In the framework of the URL creation (according to the state contract) in 2020 NORWM had carried out the construction and installation works on the lay-up of a high-voltage (220 kV) overhead line. Along with that NORWM continued the construction and installation works on facilities and structures of the "Energocomplex" phase of a project, completed the engineering works at the surface part of the laboratory, produced the external water supply and sewerage networks via internal railway tracks.

NORWM had awarded the state contract on the mining operations performance. In the conduct of this project specialists of NORWM interacted with its counterparts in the Nuclear safety institute of the Russian Academy of Sciences, as the last is in charge of the project's scientific management.

The working and design documentation is presently being adjusted, allocating the «Energocomplex» phase of the project, aiming to put the supply facilities into commissioning for making possible carrying out of the mining operations. A repeat State inspection will be carried out on completion of this adjustment. "Energocompley" stage of the project is planned for putting into commissioning in 2022

"Energocomplex" stage of the project is planned for putting into commissioning in 2022.



The decision on radioactive waste disposal facility creation shall be taken only after comprehensive long-term safety case confirmation based on the results of research made in the underground research laboratory and holding public hearings and obtaining license for facility operation.

2. Reconstruction of the near-surface disposal facility for the RW (hereinafter NSDFRW) of 3d and 4th classes of in Sverdlovsk region (city of Novouralsk)

In 2020 NORWM had completed the construction and installation works on the project of «Reconstruction of a near-surface disposal site for solid radioactive waste in the city of Novouralsk». As a part of the engineering



project NORWM had developed the following facilities: acceptance control facility Nº16; land disposal sites for RW (Nº11,12,13) with storage sheds, fire tanks, complex of storm water drainage system («Dam») fitted with collection bowl and a number of other requisite structures. Installation and commissioning of technological and lifting equipment has been completed.

Also completed in 2020:

- an assessment on the environmental impact during the NSDFRW in Novouralsk operation; the license justification materials, acknowledging the operation of the NSDFRW, had been approved;
- public discussions on the materials, providing the justification of the NSDFRW in Novouralsk operation license; the community got the answers to all its questions on the matter in the framework of the discussions;
- the license justification materials had been provided to "Rosprirodnadzor" to address the State environmental expertise.

Basing on the results of the State ecological expertise, carried out by the order of "Rosprirodnadzor" dated January 15-th, 2021, No.13/SEE, a positive conclusion, made by the expert commission of the State ecological expertise for the license justification, had been approved, including the materials on the environmental impact assessment.

3. Near surface disposal facility for 3d and 4th classes RW (Chelyabinsk region, Ozersk municipality)

In accordance with the contract for the implementation of design and survey works in 2020, the working documentation development has been carried out. In 2020, the work on tree felling and planning of the territory for the road has been completed.

The license No.GN-(S)-01-304-3914 dated 8th of August 2020 has been obtained for the placement and construction of a near-surface disposal facility for solid radioactive waste of 3d and 4th classes in the Ozersk municipality of Chelyabinsk region.

As a part of the license terms fulfillment measures the necessary plans has been developed and are being implemented.



4. The Near surface disposal facility construction for 3d and 4th classes of radioactive waste in Tomsk region, municipality – Closed Administrative-Territorial Unit (CATU) Seversk

Working documentation has been developed in accordance with the contract for the implementation of design and survey works in 2020. In 2020 the site works on tree felling and planning the area for the road had been completed.

A license from 22.06.2020 No.GN-(S)-01-304-3853 has been obtained for the placement and construction of a near-surface disposal site for solid radioactive waste of 3d and 4th classes of RW in the municipality (CATU) Seversk of Tomsk region.

As a part of the license fulfillment terms the necessary measures plans have been developed and are being implemented.



ENVIRONMENTAL POLICY OF NORWM

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The state Nature Reserve "Denezhkin Kamen" is located in the north of the Sverdlovsk region. This is the only reserve with an area of 80 thousand hectares, completely located on the eastern slope of the main Ural watershed. It is located at the intersection not only of the ranges of some animals, but also of various types of ecosystems.

ENVIRONMENTAL POLICY OF NORWM



NORWM is an environmentally significant organization of the nuclear industry in accordance with the List of environmentally significant organizations of ROSATOM, approved on December 14, 2018.

In 2018, in accordance with the Unified Industry Environmental Policy of ROSATOM and its organizations, approved by order of ROSATOM No.1/1232-P dated December 12, 2017, the NORWM Environmental Policy was revised, and new wording was enacted by the FSUE "NORWM" order No.319-01/22-P dated January 17, 2019.

On planning and implementing its main activities, NORWM is guided by the following principles:

the principle of compliance – ensuring the compliance of NORWM and its branches activities with the legislative and other regulatory requirements along with the other correspondent standards, including the international substitute in the field of environmental safety and protection ensuring;

the principle of potential environmental hazard presumption – awareness of any enterprise's (NORWM) activity may lead to a negative impact on the environment; the priority mandatory of environmental factors consideration and assessing of the whole possible spectrum of negative impact on the environment while planning and implementing NORWM and its branches activities; **the principle of scientific decisions soundness** – scientifically based approach to making environmentally significant decisions, which could be elaborated by the NORWM's management and its branches officials, involving the expert community and modern scientific state-of-the-art achievements;

the principle of consistency – combination of environmental, economic and social interests of NORWM and the community, public organizations, state authorities and local governments in the regions of NORWM branches location with a view to create sustainable development, provide favorable environmental situation and ecological safety;

the principle of environmental efficiency – ensuring of a high environmental activities performance level; reducing negative impact on the environment, caused by the possible NORWM and its branches activities; using the natural resources only at the reasonable level of costs;

the informational openness principle – observance of the public right on receiving reliable information about the environment state in the regions of NORWM and its branches presence (in accordance with the established procedure with due regard for transparency and availability of environmental information);

the readiness principle – constant readiness of the NORWM employees and its management to preventing, emergency containment and incident elimination of possible technological accidents or other emergency situations consequences;

the principle of acceptable risk – a risk-based approach for environmentally effective management decisions;

the principle of continuous improvement – continuous improvement of the system of environmental management and environmental safety through the use of targets and indicators of environmental performance;

the principle of best practices – the use of advanced domestic and foreign experience to improve the quality of the environment and ensure environmental safety.

To implement the basic principles of environmental activities, NORWM undertakes the following obligations:

1.1. Conduct predictive assessment of the environmental impact of the RW disposal on the environment, to reduce the risks and prevent accidents.

1.2. Ensure the reduction of specific indicators of emissions and discharges of pollutants into the environment, the volume of waste generation, including radioactive waste, as well as the reduction of environmental impact.

1.3. Implement and maintain the best methods of environmental management and environmental safety in accordance with national and international standards in the field of environmental management.

1.4. Provide the necessary resources, including personnel, financial and technological, to environmental protection and environmental safety activity.

1.5. Improve the system of industrial environmental control and monitoring, apply modern methods and measurement tools to develop automated systems of environmental control and monitoring.

1.6. Involve, in accordance with the established procedure, interested individuals and stakeholders, representatives and speakers of public and other non-profit organizations into discussion of the

proposed activities in the RW disposal field in the scope of environmental protection and safety issues.

1.7. Ensure the interaction and coordination of activities in the field of environmental protection and environmental safety with the state authorities of the Russian Federation, state authorities of the constituent entities of the Russian Federation and local authorities.

1.8. Ensure reliability, openness, accessibility and objectivity of information on the environmental impact of NORWM branches on the environment in their location areas, as well as the measures taken to protect the environment and ensure environmental safety.

1.9. Promote the establishment of environmental culture, the development of environmental education for all employees of NORWM and environmental education of the population in the regions where branches of NORWM are located.

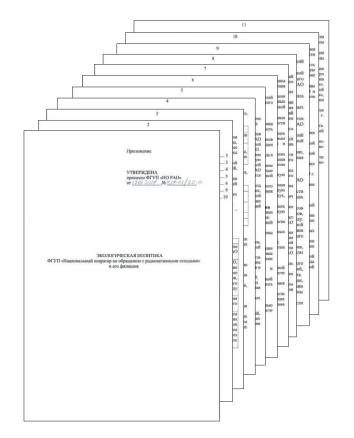


Figure 5. Environmental policy of NORWM

SYSTEMS OF ENVIRONMENTAL MANAGEMENT, QUALITY MANAGEMENT, HEALTH AND LABOR SAFETY MANAGEMENT 3

The Krasnoyarsk Pillars National Park is the oldest specially protected natural area in Russia. The park is located on the north-western spurs of the Eastern Sayan on an area of 48 thousand hectares. Rock objects are the main attraction of the reserve. Almost all the rocks of the reserve have names. The oldest of them are about 600 million years old.

SYSTEMS OF ENVIRONMENTAL MANAGEMENT, QUALITY MANAGEMENT, HEALTH AND LABOR SAFETY MANAGEMENT

3.1. Quality management system



In 2014 NORWM introduced a quality management system (hereinafter – QMS) and the quality policy, the last had been updated in 2019.

The NORWM QMS is effectively functioning, certified and meets the requirements of GOST R ISO 9001-2015, which is confirmed by the certificate No. ROSS RU.C.04XZH.CK.0785 issued by the certification body "EuroStandardRegistr" (valid until 25.03.2023).

The main accomplishment of the QMS of NORWM in 2020:

1. Three internal audits of the QMS were carried out in accordance with the program of internal QMS audits of the NORWM structural divisions for 2020 (according to NORWM order dated February 21, 2020 No. 319-01/139-RP):

- Dimitrovgrad branch of NORWM QMS audit;
- Novouralsk department of the Seversky branch of NORWM QMS audit;
- central office Personnel management service of NORWM QMS audit".

The discrepancies revealed during the audits were eliminated.

2. In accordance with the order of NORWM dated June 16, 2020 No. 319-01/410-P, the subdivisions responsible for quality had connected to a specialized program — the unified sectoral quality management system of ROSATOM «USS-Quality», the responsible performers had been appointed.

3. The QMS developed and put into force the enterprise standard STO No.319-06.04-03-20 «Suppliers audit organization and conduct» (based on the NORWM order dated 07.08.2020 No. 319-01/554-P).

4. Three on-site events had been held in St. Petersburg, Cheboksary and Krasnoyarsk cities. The goal was to evaluate the quality conformity of the equipment manufactured by an external supplier

and equipment inspection before its delivery to the Zheleznogorsk branch of NORWM.

3.2. Environmental management system (EMS)

The environmental policy of NORWM, introduced in 2014, was developed in accordance with the basic principles and provisions of environmental management standards of the GOST R ISO 14000 series, in 2019 it was revised and a new version approved by the order of FSUE" NORWM" dated 17.01.2019 No. 319-01/22-P.

In 2019, in order to improve activities in the field of environmental safety, reduce environmental risks and negative impact on the environment, NORWM introduced an environmental management system (hereinafter - EMS), all conditions for EMS development, improvement and continuous improvement at the enterprise were created.

In accordance with the EMS Manual (order of NORWM dated November 29, 2019 No. 319-01/917-P) and the conclusion on the operation of the EMS in 2019 (No. 319-09/2213-VK dated May 19, 2020), works in 2020 had been carried out in the following areas:

- continuing the subdivisions information within the EMS area and the employees of NORWM on the functioning of the EMS (including the presentation of the information stand on environmental protection and EMS in the central office);
- EMS training was organized and conducted in

accordance with ISO 14001: 2015 (GOST R ISO 14001-2016) from 05 to 09 October 2020, 14 people were trained;

- an internal EMS audit has been carried out (in 24 structural divisions of the enterprise, including branches, remotely), according to the results of which inconsistencies were not identified, a report on the internal environmental audit of the EMS was approved (order of NORWM dated 15.12.2020 No. 319-01 / 972-P);
- subdivisions and branches carried out the identification and assessment of risks associated with predicted emergencies and other emergency situations;
- identified opportunities in divisions or branches related to environmental aspects, commitments and other factors;
- the Program for Achieving the Environmental Goals of NORWM for 2021 was approved;
- the updating of the regulatory framework in the field of EMS of NORWM was ensured.

Due to the epidemiological situation in 2020 committed by the new coronavirus infection, the external EMS certification compliance audit with the requirements of the international standard ISO 14001: 2015 (GOST R ISO 14001-2016), scheduled for 2020, should be taken place in 2021.

MAIN DOCUMENTS REGULATING ENVIRONMENTAL PROTECTION ACTIVITIES OF NORWM The Tunguska Nature Reserve is located in the central part The Central Siberian plateau on the territory of the Krasnoyarsk Territory. The main purpose of its creation is to study the consequences of the fall The Tunguska meteorite in 1908. It is known for its rich flora and fauna – there are more than 140 types of land animals on its territory alone. The total area of the reserve is 297 thousand hectares.

MAIN DOCUMENTS REGULATING ENVIRONMENTAL PROTECTION ACTIVITIES OF NORWM

The company's activities are based on strict compliance with legal and other regulatory requirements, as well as environmental standards and radiation safety, including the following documents:

4.1. Federal Laws

- Federal Law dated November 21st, 1995, No.170-FZ "On the Use of Atomic Energy";
- Federal Law dated January 10th, 2002, No.7-FZ
 "On Environmental Protection";
- The Law of the Russian Federation dated February 21st ,1992, No.2395-1 "On Subsoil";
- Land Code of the Russian Federation dated October 25th, 2001, No.136-FZ;
- Water Code of the Russian Federation dated June 03rd, 2006, No.74-FZ;
- Forest Code of the Russian Federation dated December 04th, 2006, No.200-FZ;
- Federal Law dated November 23rd, 1995, No.174-FZ "On environmental expertise";
- Federal Law dated January 09th, 1996, No.3-FZ
 "On the radiation safety of the population";
- Federal Law dated June 24th, 1998, No.89-FZ "On Production and Consumption Waste";

Federal Law dated July 11th, 2011, No.190-FZ "On management of radioactive waste and amendments to some acts of Law of the Russian Federation";

- Federal Law dated December 7th, 2011, No.416-FZ "On water supply and wastewater disposal";
- Federal Law dated March 30th, 1999 No. 52-FZ "On the Sanitary and Epidemiological Welfare of the Population";
- Federal Law dated May 4th, 1999, No.96-FZ "On the protection of atmospheric air" and others.

4.2. Russian Federation Government Resolutions

- Order of the Government of the Russian Federation dated October 19th, 2012, No.1069 "About criteria of classifying solid, liquid and gaseous waste as radioactive waste, criteria of classifying radioactive waste as special radioactive waste and as removable radioactive waste and criteria of the removable radioactive waste classification";
- Resolution of the Government of the Russian Federation dated December 31st, 2020, No.2398

"On approval of classification criteria for objects of I, II, III and IV categories negatively affecting the environment";

- Resolution of the Russian Federation Government dated January 28th, 1997, No.93 "On the procedure of development of radiation-hygiene certificates for companies and territories";
- Order of the Government of the Russian Federation dated December 26th, 2020, No.2290 "About licensing the activities for collection, transportation, processing, utilization, neutralization, disposition of waste of the I-IV classes of danger" (with Regulations on licensing of activities for collection, transportation, processing, utilization, neutralization, disposition of waste of the I-IV classes of danger);
- Order of the Russian Federation Government dated March 29th, 2013, No.280 "On licensing of activities in the sphere of atomic energy utilization" and others.

4.3. Other documents

- Russian Federation State Committee on the Environmental Protection Order dated May 16th, 2000 No.372 «On the environmental impact Procedure approval of the assessment concerning the planned business activity affecting environment in the Russian Federation»;
- Natural resources and ecology ministry of Russian Federation Order dated February 28th, 2018, No.74 «On approval of requirements to the contents of industrial environmental control

program, procedure and terms of reporting on the results of implementation of industrial environmental control»;

- Natural resources and ecology ministry of Russian Federation Order dated December 8th 2020 No.1026 "On the procedure for certification and standard forms approval for the I — IV hazard classes waste passports";
- The Resolution of the Russian Federation Chief State health inspector dated July 07th, 2009, N47 "On approval of SanPiN 2.6.1.2523-09" (together with "NRB-99/2009 SanPiN 2.6.1.2523-09. Norms of Radiation Safety. Sanitary rules and norms");
- ► Resolution of the Russian Federation Chief State health inspector dated April 26th, 2010 № 40 "On approval CP 2.61.2612-10 "Basic Sanitary Rules for the Radiation Safety Ensuring (OSPORB-99/2010)" (together with "SP 2.6.1.2612-10 OSPORB-99/2010. Sanitary rules and standards...");
- The state registration certificates of the NORWM objects, having a negative impact on the environment are listed as follows:
- the Dimitrovgrad branch certificate No.AO3FQHL3 dated December 30th, 2016,
- the Seversk branch certificate No.BB1GYRAA dated February 9th, 2017;
- the Zheleznogorsk branch certificates
 No. EJNEZO9C dated September 25, 2020,
 No. EJNEZO9D dated September 25, 2020,
 No. EJNEZO9E dated September 25, 2020.
- There is a number of Federal norms and rules authorizing the operation of the NORWM objects mentioned above:

- Federal norms and rules in the field of atomic energy use "Disposal of Radioactive Waste. Principles, Criteria and General Safety Requirements" (NP-055-14);
- Federal norms and rules in the field of atomic energy use "Near Surface Disposal of Radioactive Waste. Safety Requirements" (NP-069-14);
- Federal norms and rules in the field of atomic energy use "Radioactive Waste Acceptance requirements for Disposal" (NP-093-14) and others.

4.4. Permits

NORWM carries out the types of activities from among those provided by the charter, directly related to the radioactive waste management at the very stage of its disposal, as well as to the radiation safety ensuring of personnel, society and environment sanctioned by the following documents:

- license dated July 16th, 2018, No.GN-03-304-3539, issued by the Federal Service for Environmental, Technological and Atomic Supervision on the operation of a stationary facility and facilities intended for the radioactive waste disposal distributed to the Dimitrovgrad branch of NORWM;
- license dated July 16th, 2018, No.GN-03-304-3538, issued by the Federal Service for Environmental, Technological and Atomic Supervision on the operation of a stationary facility and facilities intended for the radioactive waste disposal distributed to the Zhelez-

nogorsk branch of NORWM (amend No. 2 to the license No. GN-03-304-3538 dated July 16th, 2018 – borehole decommissioning A-57 P-2);

- license dated July 16th, 2018, No.GN-03-304-3540, issued by the Federal Service for Environmental, Technological and Atomic Supervision on the operation of a stationary facility and facilities intended for the radioactive waste disposal distributed to the Seversk branch of NORWM;
- license dated December 27th, 2016, No.GH-01.02-304-3318 issued by the Federal Service for Environmental, Technological and Nuclear Supervision for the placement and construction of an underground research laboratory in the Nizhnekansk rock massif (CATU Zheleznogorsk of Krasnoyarsk Territory);
- license dated August 05th, 2015, No.GN-02-304-3058, issued by the Federal Service for Environmental, Technological and Atomic Supervision for the Novouralsk radioactive waste storage facility construction permission (FSUE; department of the Seversk branch);
- license dated November 10th, 2015, No.GN-03-304-3092 with Amendment No.1, issued by the Federal Service for Environmental, Technological and Atomic Supervision for the right to operate the first stage of a stationary facility intended for the radioactive waste (RW) disposal distributed to the Novouralsk department of the Seversk branch;
- license dated June 22th, 2020, No.GN-(S)-01-304-3853, issued by the Federal Service for Environmental, Technological and Atomic Supervision for the deployment and con-

struction of a near-surface disposal facility for solid radioactive waste of 3d and 4th classes, distributed to the Seversk branch of NORWM, located in the CATU Seversk of Tomsk region;

- license dated August 25th, 2020, No.GN-(S)-01-304-3914, issued by the Federal Service for Environmental, Technological and Atomic Supervision for the placement and construction of a near-surface disposal facility for solid radioactive waste of 3d and 4th classes, distributed to the Ozersk branch of NORWM, located in the CATU Ozersk of Chelyabinsk region;
- license No. ULN 15637 ZE, issued by the Federal Agency for Subsoil Use (Rosnedra) for the right to use subsoil of the State Scientific Center — Research Institute of Atomic Reactors and its technological test site for the low and medium liquid radioactive waste disposal (in Dimitrovgrad district of Ulyanovsk region);
- license No. KRR 15638 ZG, issued by Rosnedra for the right to use subsoil for the purpose of liquid radioactive waste disposal at the polygon "Severny" in the CATU Zheleznogorsk;
- license No. TOM 15636 ZG, issued by Rosnedra for the right to use subsoil for the purpose of liquid radioactive waste disposal in underground geological formations by the Seversk branch of NORWM.

The NORWM branches have developed the supporting documents and received the following permits in the sphere of environmental impact:

 permit on emissions of radioactive substances into atmosphere, dated March 30th, 2015, No.17/2015, issued by the Federal Service for Environmental, Technological and Atomic Supervision distributed to the Zheleznogorsk branch (continuance in effect till March 26th, 2020; the permit has been extended in accordance with the letter, dated March 26th, 2020, No. 06-02-05/492 until the individual decision by Rostechnadzor on refusal/issuing the permit for emissions;

- permit dated December 25th, 2014, No. 15/2014 on the release of radioactive substances into the atmospheric air, distributed to the Seversk branch by the Federal Service for Environmental, Technological and Atomic Supervision (continuance in effect till December 29th, 2019; the permit period has been extended in accordance with the letter dated January 24th, 2020, No. 06-02-05/113 until the individual decision by Rostechnadzor on refusal/issuing the permit for emissions;
- waste generation standards and waste disposal limits No.265 dated March 23rd, 2016, valid up to March 23rd, 2021, established by the Federal Service for Supervision of Natural Resources (Rosprirodnadzor), distributed to the NORWM Zheleznogorsk branch, located in Krasnoyarsk region;
- declaration on the of the Seversk branch environmental impact dated March 23rd, 2020, including information on the waste generation and disposal volume had been accomplished by the Seversk branch specialists and submitted by the order of the Federal Service for Supervision of Natural Resources of Tomsk region.

Contracting organizations, providing services and performing works on the territory of NORWM disposal facilities, had also been provided with a full set of necessary permits and licenses.

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	недр. координаты угловых точек, копии
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Figure 6. Copies of mining licenses

INDUSTRIAL ECOLOGICAL CONTROL AND ENVIRONMENTAL MONITORING

The Ilmen Nature Reserve is located in the eastern foothills of the Southern Urals on the Ilmen Ridge in the Chelyabinsk region. This is the only place in the world where about 200 types of minerals are found on an area of 300 sq. m. Many of them have from 2 to 15 varieties. There are over 400 mineral mines on the territory of the reserve, the first gems were mined in them at the end of the XVIII century.

INDUSTRIAL ECOLOGICAL CONTROL AND ENVIRONMENTAL MONITORING

The main task of industrial ecological/ environmental and radiation monitoring, carried out in the regions of NORWM presence, is to ensure activities within the established standards and in accordance with the requirements of current legislation and regulatory documents.

Industrial, environmental and radiation monitoring performed at the branches and departments of NORWM is generally active in two major areas:

1. control of the compliance with the environmental legislation requirements;

2. control of the compliance with the radiation protection requirements.

Industrial environmental and radiation monitoring include the following:

- control of radioactive substances emissions into the air;
- control of production and consumption of waste generation volumes;
- control of the secondary radioactive waste generation volume, the procedure for handling this waste;
- control of the radioactive substances content of in the atmospheric air surface layer and in the atmospheric precipitation;
- control of the harmful chemical and radio-

active substances content in the surface waters and ground waters;

- radiation monitoring of soil and vegetation;
- control of personnel's individual ionizing radiation doses;
- rating control of the gamma radiation dosage, density of alpha and beta particles flux at the workplaces, manufacturing areas and the disposal facilities' territory in total;
- control of the radioactive aerosols content in the air at the manufacturing zones and other auxiliary areas;
- control of the radioactive aerosols content in the air at the manufacturing zones and other auxiliary areas;
- control of the working surfaces and equipment radioactive substances contamination levels, including worker's clothes and personnel's skin cover;
- control of the vehicles' radioactive substances pollution level;
- radiation monitoring on conducting the works on decontamination of equipment, manufacturing and auxiliary areas along with in-situ territories of the final disposal facilities.

Data, obtained in 2020, resulting the conduction of industrial ecological control, shows the following:

- the controlled radiation factors, including the radionuclides content in the environmental samples, do not exceed the legitimate values, established by the legislation and authorization documentation;
- the RW management system complies with the modern standards, as well with the latest safety requirements criteria; the radioactive waste disposal process adheres the relevant safety principles;
- > all the NORWM disposal facilities' organization is implicitly aligned with safety requirements.

The of the environmental and radiation monitoring at the NORWM facilities is carried out in accordance with the programs, developed by the NORWM branches specialists, approved by the Russian State Federal biomedical agency.

For some laboratory tests and researches in the framework of industrial environmental and radiation control programme the third parties are accredited to conduct a number of specified types of services on the basis of the contracts, signed by the authority, for the provision of this very type of works.

Subsoil monitoring

The subsoil and environment state observation systems of Dimitrovgrad, Zheleznogorsk and Seversk branches include the geophysical, hydrochemical and hydrodynamic surveys as a part of the underground repository RW filling process. One of the main methods, controlling the waste spread in the subsoil, is the geophysical study of the boreholes.

Geophysical surveys include the following types of work:

- gamma logging: to determine the natural gamma background, created by the section forming rocks, and gamma anomalies, caused by the radioactive waste emplacement in any interval of the section;
- thermometry: to determine the layers temperature rise and to detect interstratial crossflows, to monitor the observational boreholes production columns of impermeability;
- resistivity measuring: to determine the electrical resistivity of waters, filling the borehole, that serves as an indirect method of the boreholes casing strings integrity determination;
- magnetic-impulse defect detection: to monitor the integrity of casing strings, as well as to determine areas of increased corrosion.

Hydrochemical studies include the boreholes water samples observation, followed by the chemical and radiometric analysis.

Hydrodynamic studies are aimed to determine the piezometric surface position of groundwater reservoir and overlying horizons (measuring the pressure levels at the top of wells). The study on the groundwater depth level changes is carried out to determine the hydrodynamic parameters of the barriers

and to study the breached pressure regime of reservoirs and overlying aquifers, as well as to monitor the barriers permeability.

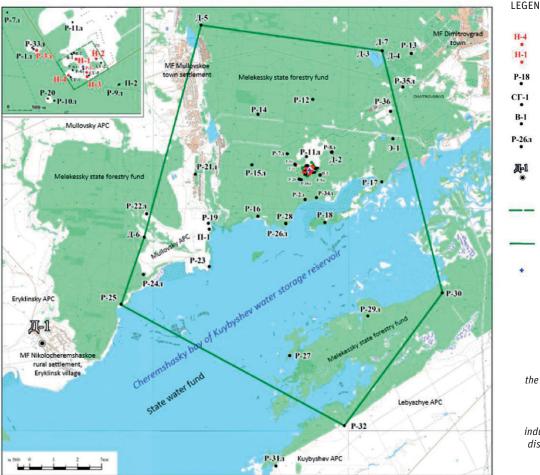
Dimitrovgrad branch

Industrial environmental control in the Dimitrovgrad branch of NORWM is carried out in accordance with:

- The program of industrial environmental control,
- > The program of radiation monitoring for "Experimental and industrial landfill" LRW DDF,
- The program of subsoil monitoring for "Experimental and industrial landfill" of NORWM, this control includes the following:
- sampling from observation boreholes of LRW deep disposal site;
- carrying out the physicochemical and radiometric analyzes of formation water from observation boreholes.
- radiation parameters control:
 - radionuclides emissions into the atmosphere;
 - radionuclides content of the water sources;
 - ambient dose equivalent rate of gamma radiation at the territory of deep disposal site;
 - surface radioactive contamination at the territory of deep disposal site.

In the reporting year, measurements of the monitored radiation parameters were made in full. Physicochemical and radiometric studies of formation waters from observation boreholes and the determination of radionuclide content of the water supply sources were conducted in the laboratory of radiation control of JSC "SSC RIAR".

The scheme of the observational network of "Experimental and industrial landfill" LRW DDF site is represented at the Figure No. 7.



LEGEND



and sanitary-protective zone of "Experimental industrial landfill" LRW deep disposal site (Dimitrovgrad, Ulvanovsk region)

According to hydrodynamic, hydrochemical, and geophysical monitoring data, the current state of the subsoil in the deep disposal site area is acceptable and predictable. The impact on the subsoil by the disposal of waste is expected and acceptable. The buried waste is distributed within the licensed subsoil block in the operating complexes. Signs of human-induced changes in the natural geological conditions in the buffer and overlying aquifers, including in fresh groundwater, were not observed.

Table 2The scope of works performed on subsoil monitoring in 2020

Types of works	Scope of works
Hydrodynamic studies in observation boreholes	122
Hydrochemical analysis of samples from observation boreholes	61
Geophysical studies in observation wells	84





Table 3 The main results of industrial environmental monitoring for 2020

Subject of monitoring	Defined parameters	Units	Average value	Maximum value	Hygiene norm
	Specific total alpha activity	Bq/kg	0,08	0,19	0,2
Water from water	Specific total beta activity	Bq/kg	0,06	0,09	1,0
supply sources	Specific activity Cs-137	Bq/kg	0,01	0,02	11
	Specific activity Rn-222	Bq/kg	3,00	3,92	60
Territory of LRW DDF	Ambient dose equivalent rate of gamma radiation (at the boundary)	μSv/h	0,08	0,12	1,2
	Surface radioactive contamination	particles / cm²min	not found	not found	

Zheleznogorsk branch

The production environmental and radiation monitoring of NORWM FSUE Zheleznogorsk branch facilities in 2020 had been carried out on the grounds of:

- Radiation monitoring programs at DDF landfill «Severny» IN F01-04.111-2014;
- Contract dated January 14th, 2019, #0573100027090000023_301743 for the provision of a services range for water and gas samples laboratory analysis for radionuclides and hazardous chemicals indication in the area of liquid radioactive waste deep disposal facility landfill "Severny" of Zheleznogorsk branch of NORWM;
- Contract dated December 13th, 2018, #0573100027017000147_301743 301743 for the provision of services for continuous radio-environmental monitoring in the area of liquid radioactive waste deep disposal facility landfill "Severniy" of Zheleznogorsk branch of NORWM.

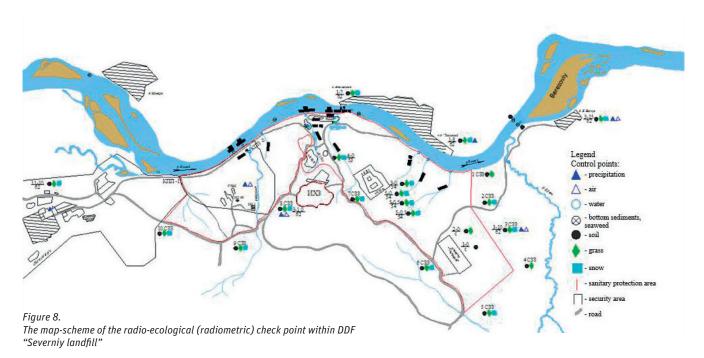
The scope of works performed on subsoil monitoring is represented in Table No. 4.

Types of works	Scope of works
Hydrodynamic studies in observation boreholes	1086
Hydrochemical analysis of samples from observation boreholes	383
Geophysical studies in observation boreholes	393

Table 4 The scope of works performed on subsoil monitoring in 2020

According to hydrodynamic, hydrochemical, and geophysical monitoring data, the current state of the subsoil in the deep disposal site area is acceptable and predictable. The impact on the subsoil by the disposal of waste is expected and acceptable. The buried waste is distributed within the licensed subsoil block in the operating complexes. Signs of anthropogenic environmental impact to the natural geological conditions in the buffer and overlying aquifers, including in fresh groundwater, were not observed.

The map-scheme of the radio-ecological (radiometric) studies within DDF "Severniy landfill" is represented on the Figure No. 8.



The average annual ambient dose rate of external radiation at the boundary of the sanitary protection

zone.

On the fencing of DDF landfill «Severny» boundary:

0.10±0.06 µSv/h – average value;

0.11±0.07 µSv/h – maximum value;

<0.10 µSv/h – minimum value.

The principal output of the average annual volume (proportional) radionuclides activity monitoring in the open water bodies and in the atmospheric sanitary protection zone (in units of water intake, admissible specific activity) for 2020 are presented in Table 5.

Table 5

Average annual volume (proportional) of the radionuclides activity in the open water bodies and atmospheric sanitary protection zone (in units of water intake, admissible specific activity)

			Volume	activity			
S No.	Control point name	Radionuclide type	Bq/kg	in units of water intake			
		WATER					
1	The location of nameless creek inflow into the B. Tel	General alpha activity	<0,2				
	river	General beta activity	<0,2				
	AIR						
			Volumo				
			votume	activity			
S No.	Control point name	Radionuclide type	Bq/m ³	activity admissible specific activity			
S No.	Control point name	Radionuclide type Strontium-90		admissible specific			
	1 km to the north		Bq/m³	admissible specific activity			
S No. 2		Strontium-90	Bq/m³ <20E-6	admissible specific activity <7,4E-6			

Seversk branch

The industrial environmental and radiation control of the branch is carried out in accordance with the following documents:

- production control programs for ensuring radiation safety in the NORWM Seversk branch No. RB P-319-f20-100-2020;
- radiation monitoring programs for the DDF LRW of NORWM Seversk branch No. RB PR-319-2/212-2017;
- industrial environmental monitoring programs of NORWM Seversk branch No. PR-319-2/253-2018.

The scope of works on subsoil monitoring performed in 2020 are represented in Table 6.

Table 6The scope of works on subsoil monitoring performed in 2020

	Facility	site 18	site 18a	Regional control boreholes	Total
vorks	Hydrodynamic studies in boreholes ¹	924	580	164	1668
pe of v	Samples hydrochemical analysis	43	49	7	99
and scope of works	Geophysical studies in boreholes (logging complex № I²)	38	42	0	80
Types	Geophysical studies in boreholes (logging complex № II³)	28	10	2	40

¹ Besides the standard hydrochemical studies in accordance with monitoring program, 175680 measurements were taken for underground water levels using the formation water level meters with the interval of once an hour (in 20 boreholes).

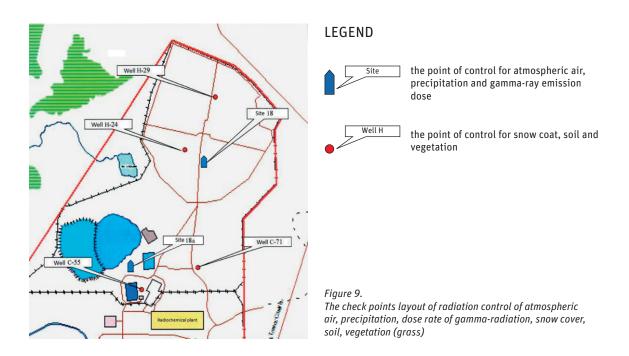
² Logging complex I is used to evaluate the degree and disposition of the operating horizons filling at the LRW DDF of the NORWM Seversky branch to estimate the distribution of LRW effluent.

³ II Logging complex is used for evaluation of boreholes underground condition.



According to hydrodynamic, hydrochemical, and geophysical monitoring data, the current subsoil state of the in the DDF area is acceptable and predictable. The impact on the subsoil by the disposal of waste is expected and acceptable. The buried waste is distributed within the licensed subsoil block in the operating complexes. Signs of anthropogenic environmental impact to the natural geological conditions in the buffer and overlying aquifers, including in fresh groundwater, were not observed.

The check points layout of radiation control of atmospheric air, precipitation, dose rate of gammaradiation, snow cover, soil, vegetation (grass) is represented on Figure 9; groundwater control locations are shown on Figure 10. Annual report for 2020





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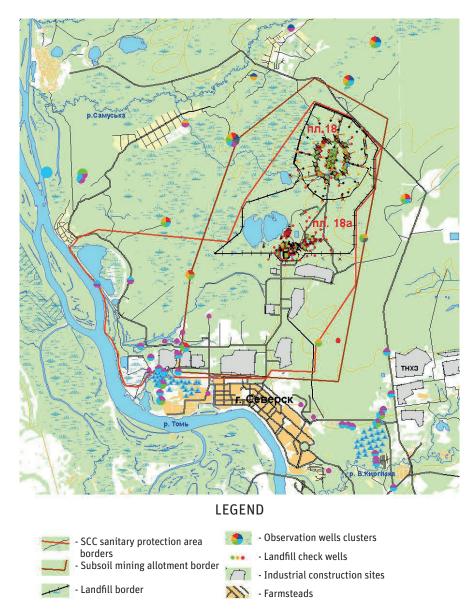


Figure 10. The observational boreholes layout of LRW DDF of NORWM Seversk branch

Environmental monitoring of the DDF 18 and 18a sites area had been conducted by the accredited Environmental Protection Laboratory of the Radiation Industrial and Sanitary Laboratory (RPSL) of JSC "SCC" under the contract with JSC "SCC" on the provision of contract of services delivery dated January 10th, 2019, #0573100027018000176_301743.

The following indicators had been subjected to monitoring:

- radionuclides emissions into the atmosphere;
- radionuclides content in the atmospheric surface layer;
- radionuclides content in the atmospheric precipitation;
- radionuclides content in the snow cover;
- radionuclides content in the soil;
- radionuclides content in the vegetation;
- values of equivalent dose rate of gamma radiation during sampling;
- values of equivalent dose rate of gamma radiation in the field.

Content of radionuclides in the atmospheric surface layer

The average annual radionuclides activities of in the atmospheric surface layer above the 18 and 18a sites were at levels close to ambient and in 2020 amounted to:

- strontium-90 1.10E-06 Bq/m3, which is 7 orders of magnitude lower than permissible volumetric activity, specified by "Radiation Safety Norms (NRB 99/2009)" for strontium-90;
- cesium-137 <1.06E-06 Bq/m3, which is 8 orders of magnitude lower than permissible volumetric activity, specified by "Radiation Safety Norms (NRB 99/2009)" for cesium-137;
- sum of alpha-active nuclides 2.0E-5 Bq/m3, sum of beta-active nuclides 3.20E-4 Bq/m3, which is 2-5 level numbers lower than permissible volumetric activity for plutonium-239, -240 and strontium-90 accordingly.

Content of radionuclides in atmospheric precipitation

The values of alpha- and beta-active nuclides (strontium-90 and cesium-137) substance in atmospheric precipitation do not exceed the average values typical for the territory of the sanitary protection zone of JSC "SCC", where the DDF is located, and in 2020 were equal the following rates:

- sum of alpha-active nuclides 7 Bq/m²;
- sum of beta-active nuclides 92 Bq/m²;
- strontium-90 <2.4 Bq/m²;
- cesium-137 <11 Bq/m².

The content of radionuclides in snow cover, soil and vegetation (grass)

The content of alpha-active nuclides in the snow cover was in the range from 2.9 to 3.2 Bq/m2 (background station – 9.4 Bq/m2), the content of strontium-90 was in the range from <1.2 to 8.7 Bq/m2 (background station – < 1.2 Bq/m2), the content of cesium-137 was at the lower limit of determination of < 48 Bq/m2 (background station – < 48 Bq/m2).

The strontium-90 radionuclide content in the soil ranged from <1.12 to 1.6 kBq/m2 (background station – 0.16 kBq/m2), the cesium-137 content in the soil ranged from < 14.7 to 25.9 per kBq/m2 (background station – 1.67 kBq/m2), the plutonium-239, -240 content in the soil ranged from 0.61 to 1.72 kBq/m2 (background station – 0.07 kBq/m2).

The specific content of the strontium-90 radionuclide in the grass ranged from 10.4 to 68.8 Bq/kg (background station – 3.1 Bq/kg), the specific content of cesium-137 is at the lower limit of determination of < 30 Bq/kg (background station – < 30 Bq/kg), the specific content of plutonium-239, -240 ranged from 0.52 to 3.11 Bq/kg (background station – 0.07 Bq/kg).

The indicated values of the radionuclide content correspond to the levels of long-term observations on this territory.

Novouralsk department of Seversk branch

The industrial radiation (industrial environmental) control of natural locations at the near-surface disposal facility (NSDF) and in the sanitary-protection area of the NSDF is carried out in accordance with the following documents:

- enterprise instruction I-319-4-2-2017 «Industrial radiation control procedure at the near-surface disposal facility of Novouralsk department of Seversk branch of NORWM;

- radiation control programs for Novouralsk near-surface disposal facility of solid radioactive waste (dated March 5th, 2019, #319-4/964-VK). The program is approved by Interregional administration #31 of Russian State Federal biomedical agency.

Figure 11 shows the layout of NSDF with environmental control objects.

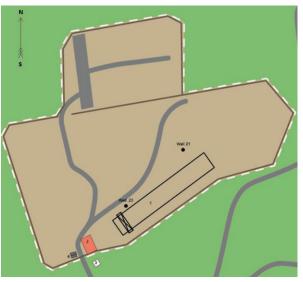


Figure 11.

NSDF layout. 1 – map #10, 2 – building #1, 3 – complete transformer substation, 4 – fire tanks. Well 21, Well 23 – observation wells.

The main monitored parameters of natural objects at the NSDF (atmospheric air, groundwater from observation wells, snow cover, vegetation, soil, surface water) are:

- a) yspecific/volume activity by the sum of alpha-emitting radionuclides;
- b) specific/volume activity by the sum of beta-emitting radionuclides;
- c) specific/volume activity of Am-241, Co-60, Cs-137, Sr-90, Pu-239 radionuclides;
- d) mass fraction of natural uranium isotopes, mass fraction of uranium-235;
- e) concentration of Cu, Ni, Cd, Pb, Cr, Zn, Fe, F (for underground, surface water);

f) the equivalent dose rate of gamma radiation at the border of the sanitary protection zone of the NSDF;

g) the level of radioactive contamination of the surface (total contamination) alpha- and beta- at the border of the sanitary protection zone of the NSDF;

h) volume activity by the sum of alpha -, beta-emitting radionuclides at the border of the sanitary protection zone of the NSDF.

The main results of industrial and environmental control of samples of environmental objects at the NSDF for 2020 are presented in Table 7.

Table 7

Results of the industrial and environmental control of samples of the environment objects at NSDF for 2020

The object of control and parameter to be defined	Units	Average	Maximum
1. Atmospheric air at NSDF			
volume activity by the sum of alpha-emitting radionuclides	Bq/m ³	<4,37E-05	1,08E-04
volume activity by the sum of beta-emitting radionuclides	Bq/m ³	<1,00E-03	<1,00E-03
2. Groundwater			
specific activity by the sum of alpha-emitting radionuclides	Bq/dm ³	9,13E-02	4,70E-01
specific activity by the sum of beta-emitting radionuclides	Bq/dm ³	2,65E-01	1,20E-01
3. Snow cover at NSDF			
specific activity by the sum of alpha-emitting radionuclides	Bq/dm ³	<0,05	<0,05

specific activity by the sum of beta-emitting radionuclides	Bq/dm³	<0,01	<0,01
4. Soil at NSDF			
specific activity by the sum of alpha-emitting radionuclides	Bq/kg	6,91E+02	7,68E+02
specific activity by the sum of beta-emitting radionuclides	Bq/kg	2,80E+02	2,90E+02
5. Vegetation at NSDF			
specific activity by the sum of alpha-emitting radionuclides	Bq/kg	3,50E+00	3,60E+00
specific activity by the sum of beta-emitting radionuclides	Bq/kg	<2,60E+02	<2,60E+02
6. NSDF border of the sanitary protection zone			
volume activity by the sum of alpha-emitting radionuclides	Bq/m³	1,40E-05	1,90E-05
volume activity by the sum of beta-emitting radionuclides	Bq/m³	1,00E-03	1,00E-03
gamma dose rate	μSv/h	0,08	0,14
fluence rate of alfa-emission	Pt/(cm²min)	<0,01	<0,01
fluence rate of beta-emission	Pt/(cm²min)	5,58	12,80

The content of volume alpha-, beta-activity, volume activity of radionuclides (Am-241, Co-60, Cs-137, Sr-90, Pu-239) in atmospheric air samples does not exceed the permissible volume activity of individual radionuclides in the inhaled air for critical population groups (NRB-99/2009).

The results of measurements of specific alpha-, beta-activity in the underground water of controlled wells and snow cover do not exceed the permissible levels for drinking water supply (SanPiN 1.2.3685-21 «Hygienic standards and requirements for ensuring the safety and (or) harmlessness of environmental factors for humans»). The results of measurements of the specific activity of radionuclides (Am-241. Co-60, Cs-137, Sr-90, Pu-239) in the underground water of controlled wells and snow cover do not exceed the level of intervention for the content of individual radionuclides in drinking water (NRB-99/2009).

Analysis of the results of the content of specific alpha-, beta-activity, specific activity of radionuclides (Am-241, Co-60, Cs-137, Sr-90, Pu-239) in soil and vegetation samples of 2020 in comparison with the result obtained in 2019 did not reveal significant changes.

The results of measurements of the mass concentration of pollutants (Cu, Pb, Cr, Cd, Zn, F) in underground water from controlled wells do not exceed the permissible levels for drinking water supply (SanPiN 2.1.4.1074-01 «Drinking water. Hygienic requirements for the water quality of centralized drinking water supply systems. Quality control. Hygienic requirements for ensuring the safety of hot water supply systems»). The average annual value of the gamma dose rate at the border of the sanitary protection zone of the

NSDF is 0.08 μ Sv/h. (The background value of the gamma dose rate for the Ural region is 0.3 μ Sv/h).



Conclusion:

The results of industrial and environmental control of environmental objects at the NSDF of 2020 show that the content of radioactive substances in the controlled objects is significantly lower than the permissible levels (NRB-99/2009, SanPiN 2.1.4.1074-01).

ENVIRONMENTAL IMPACT

1.6

The South Ural State Nature Reserve was established in order to preserve unique natural complexes – mountain-taiga spruce-fir forests, high-altitude plant communities and swamps. It is located on an area of 253 thousand hectares, is the largest on the territory of the Southern Urals.

ENVIRONMENTAL IMPACT



In accordance with the criteria approved by the Decree of the Government of the Russian Federation of 31.12.2020 No. 2398 "On approval of criteria for classifying objects that have a negative impact on the environment as objects of categories I, II, III, IV", branches of NORWM FSUE (Zheleznogorsk. Seversky, Dimitrovgrad) are assigned to the II category of objects that have a negative impact on the environment, meaning those objects that have a moderate impact on the environment. Branches of NORWM FSUE have received certificates of state registration of objects of NORWM FSUE that have a negative impact on the environment.

6.1. Water intake from water sources

Dimitrovgrad and Seversk branches, Novouralsk department of the Seversk branch

Independent water intake from natural sources is not carried out, as they receive water under contracts for the water supply services.

Zheleznogorsk branch

At the end of the year, 5.12 thousand m^3 of water was pumped out of the production level in order to compensate for intralayer pressure (of which 5.0 thousand m^3 used for production needs, 0.12 thousand m^3 used for household needs). The permissible water intake from discharge wells is 65 thousand m^3 . In 2020, drinking water was supplied to the staff of the Zheleznogorsk branch in bottles under the service contract of 20.02.2020 No. 319/253-D.

6.2. Discharges into the open hydrographic network

Zheleznogorsk, Dimitrovgrad and Seversk branches, Novouralsk department of the Seversk branch

No discharges of harmful chemical and radioactive substances were done into the open hydrographic network. Water is disposed in sewer networks under contracts for the provision of complex services. 60

6.3. Emissions into the atmospheric air

6.3.1. Emissions of harmful chemical substances (HCS)

Zheleznogorsk, Dimitrovgrad and Seversk branches, Novouralsk department of the Seversk branch

Due to the fact that there are no own stationary sources of emissions of HCS to the atmospheric air, HCS emissions into the atmospheric air are excluded.

6.3.2. Radionuclide emissions

Dimitrovgrad branch

The branch has no sources of radioactive substances released into the air that are subject to regulatory control.

Zheleznogorsk branch

The total release into the atmospheric air of

- beta-emitting nuclides was1.029×106 Bq/year, which is 286 times lower than the established standards of MPE (maximum permissible emissions).
- There are no emissions of alpha-emitting nuclides.

Seversk Branch

The total release into the atmospheric air of:

 alpha-emitting nuclides was 3.66×105 Bq/year, which is 0.43% of the established standards of MPE; beta-emitting nuclides was 2.73×106 Bq/year, which is 0.36% of the established MPE standards.

Novouralsk department of the Seversk branch

In the course of operational activities of the NSDF, the Novouralsk department does not emit radioactive substances into the atmospheric air, since there are no stationary sources of emissions at the NSDF.

6.4. Waste 6.4.1. Operation and consumption waste management

The operation and consumption wastes generated at RW disposal facilities are handled at the branches in accordance with the requirements of the Federal Law #89-FZ dated June 24th, 1998, "On Operation and Consumption Wastes" and the Instructions on the management of operation and consumption wastes in the branches of FSUE «NORWM». In the branches, responsible persons are appointed for the collection and accounting of production and consumption wastes.

Dimitrovgrad branch

In 2020, the branch got its own office space. In this regard, a contract for services for the solid household waste management was signed with the regional operator LLC «Ecosystem». Under this agreement, the regional operator is obliged to accept waste in the

volume and at the place, specified by the agreement, and to ensure its transportation, processing, disposal in accordance with the legislation of the Russian Federation.

The volumes of waste generated in 2020 are shown in Table 8.

Table 8

The volume of operation and consumption waste generated in Dimitrovgrad branch in 2020

Type of waste	Hazard class	Volume of generated waste, tons	Transferred to specialized organisation, tons	Presence at the branch as of the end of the year	Name of the organization receiving wastes
Wastes from office and utility spaces, unsorted (excluding oversized) (Federal Classification Catalog of Wastes (FCCW) code 73310001724)	IV	3,85	3,85	0,000	Ecosystem LLC (license of 27.09.2016
Paper and carton wastes of paperwork and office activities (FCCW code 40512202605)	٧	0,4	0,4	0,000	№ 073 0117)

Zheleznogorsk branch

During 2020, 5.82 tons of solid household waste were generated. Solid household waste was transferred to the regional operator RostTech LLC under the contract dated 22.05.2020 No. 319/2597-D. In 2020, 5.82 tons of solid household waste were transferred to the waste company.

The amount of waste generated in 2020 in the Zheleznogorsk branch is presented in Table 9.

Table 9 The volume of operation and consumption waste generated in Zheleznogorsk branch in 2020

Type of waste	Hazard class	Volume of generated waste, tons	Transferred to specialized organisation, tons, tons	Presence at the branch as of the end of the year	Name of the organization receiving wastes
Wastes from office and utility spaces, unsorted (excluding oversized) (FCCW code 73310001724)	IV	5,40	5,40	0,000	RostTech LLC (license of
Paper and carton wastes of paperwork and office activities (FCCW code 40512202605)	V	0,42	0,42	0,000	04.09.2020 № (24) - 5420 - STO/P)

Table 10 Dynamics of production and consumption waste generation in Zheleznogorsk branch

Type of waste	Hazard class	Generation standard, tons	2016, tons	2017, tons	2018, tons	2019, tons	2020, tons
Wastes from office and utility spaces, unsorted (excluding oversized) (FCCW code 73310001724)	IV	5,40	4,054	5,40	5,40	5,40	5,40

Paper and carton wastes of paperwork and office activities (FCCW code 40512202605)	V	0,42	0,316	0,42	0,42	0,42	0,42
	Total	5,82	4,37	5,82	5,82	5,82	5,82

Seversk branch

Operation and consumption waste is collected in places specially equipped for that. Waste removal from the territory of the DF is carried out by the specialized organization ABF Sistema LLC under the contract No. 319/2563-D dated 27.03.2020. Waste generated in leased office premises, is removed by the lessor, Dom-8 LLC, in accordance with the lease agreement No. 319/2295-D dated 19.09.2019.

The amount of waste generated in 2020 in the Seversk branch is presented in table 11.

Table 11

The amount of operational and consumption wastes generated at Seversk branch in 2020

Waste type	Hazard class	Volume of generated waste, tons	Transferred to specialized organisation, tons	Presence at the branch as of the end of the year	Name of the organization receiving wastes
Mercury, mercury-quartz, fluorescent lamps, which have lost consumer properties (FCCW Code 47110101521)	Ι	0,0	0,0	0,038	_
Wastes from office and utility spaces, unsorted (excluding oversized) (FCCW Code 73310001724)	IV	1,8	1,8	0,000	ABF System LLC (license dated 25.09.2017 # (70)-1844-ST/P)

Table 12 Progress of operational and consumption waste generation at Seversk branch

Waste type	Hazard class	Generation standard, tons	Waste generation by year, tons				
			2016	2017	2018	2019	2020
Mercury, mercury-quartz, fluorescent lamps, which have lost consumer properties (FCCW Code 47110101521)	Ι	0,052	0,085	0,028	0,045	0,033	_
Wastes from office and utility spaces, unsorted (excluding oversized) (FCCW Code 73310001724)	IV	2,750	0,600	0,900	1,3	1,5	1,8
Garbage from twigs, branches from logging (FCCW Code 15211001215)	V	1,584	0,200	_	_	_	_

In 2020, the branch completely stopped the generation of spent mercury fluorescent lamps (the volume of generation in 2018 - 0.045 tons, in 2019 - 0.033 tons). All fluorescent lamps have been replaced with LED lamps with an increased operational resource, without mercury content.

The generation of unsorted garbage from office and household premises of organization (excluding oversized) has increased: in 2019 - 1.5 tons, in 2020 - 1.8 tons, which is associated with an increase in the number of personnel and the establishment of new work places.

Novouralsk department of the Seversk branch

Operational and consumption waste is collected in places specially equipped for that. Waste is transferred to specialized organizations under contracts.

The amount of waste generated in 2020 in the Novouralsk department is presented in Table 13.

Table 13 The amount of production and consumption waste generated in the Novouralsk department in 2020

Transferred Volume of Presence at the Name of the Hazard to specialized Waste type generated organization branch as of the class organisation, waste, tons end of the year receiving wastes tons Wastes from office and **TBO Ecoservice** utility spaces, unsorted LLC (license of (excluding oversized) 5,8 5,8 ΙV 0 26.07.2016 066 (FCCW Code № 00444) 73310001724) Wastes from construction SPECAVTOKOM LLC (license of and building works I٧ 1,0 1,0 0 (FCCW Code 12.07.2016 066 8900001724) № 00424) Printing devices SPECAVTOKOM cartridges with less than LLC (license of 7% of toner content I٧ 0.0105 0.0105 0 12.07.2016 066 (FCCW Code № 00424) 48120302524) Scrap metal and wastes with the content of uncontaminated black SPECAVTOKOM metals in the form LLC (license of V 0,5 0,5 0 of pieces or objects, 12.07.2016 066 unsorted № 00424) (FCCW Code 46101001205)

6.4.2. Radioactive waste management

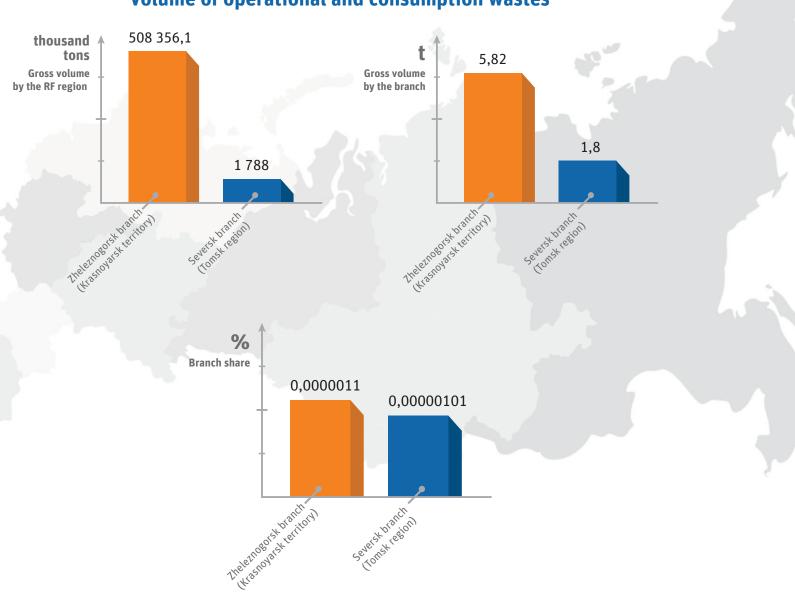
Zheleznogorsk, Dimitrovgrad and Seversk branches, Novouralsk department of the Seversk branch

During the normal operation of the DF, solid radioactive waste (SRW) is not formed. The formation of SRW occurs during repair work and decontamination of surfaces. SRW formed during repair work is transferred to a specialized organization.

All branches have the necessary primary collecting boxes and other equipment for the collection and temporary storage of radioactive waste.

6.5. The percentage of production and consumption waste of NORWM branches in the total volume of the branches territory

The impact of the activities of the NORWM branches on the health of the population and various environment objects is minimal; this is confirmed by the data on the specific weight of operational and consumption waste of the NORWM branches in the total waste volume on the territory of its location – the Tomsk region and the Krasnoyarsk territory, given below. Data on regional indicators are shown in the State Report on the environment state and protection in the Krasnoyarsk territory for 2020, posted on the website http:// mpr.krskstate.ru/dat/File/3/Doklad-2020.pdf, and on the website of the territorial body of the Federal State Statistics Service of the Tomsk region (https://tmsk.gks.ru), in the section «Main indicators characterizing the impact of economic activity on the environment».



Volume of operational and consumption wastes

6.6. Environmental impact during the construction of disposal facilities

The construction of radioactive waste disposal facilities (in Zheleznogorsk, Novouralsk, Seversk and Ozersk) is also associated with environmental impact.

The impact on atmospheric air was exerted during the construction of linear structures (highways, power lines, water pipelines), buildings and other structures. The main sources of influence on the state of atmospheric air during the construction of facilities are: emissions of pollutants during the operation of construction equipment; emissions of pollutants from vehicles during the delivery of construction materials to construction sites and transportation of construction waste from them; emissions of pollutants during welding and painting works. Atmospheric air pollution during the construction process is short-lived, local, and insignificant.

Due to the absence of centralized networks of domestic drinking and industrial water supply at the construction sites, domestic drinking and technological needs are provided with vended water.

Due to the lack of centralized drainage networks at the construction sites, temporary drainage ditches were created to collect surface water runoff from construction sites; and containers for collecting contaminated wastewater were installed. There is no additional negative impact on surface and underground water from water consumption and sanitation. The most significant impact is the clearance of the territory and the removal of the soil cover (surface layer) and the felling of trees. However, the removal of the soil cover is local. The withdrawn soil is used for backfilling. After the completion of the construction work, reclamation measures will be carried out.

There is no impact on rare and endangered species, as well as species included in the Red Books. Compliance with environmental measures allows us to consider the impact on the animal world as moderate.

The main sources of acoustic pollution of the territories of objects during construction work: the work of construction equipment; noise from trucks during the delivery of building materials and other transport operations. The acoustic effect is characterized as strong, but short-term. At the border of the nearest settlements, the sound level created by noise sources during construction does not exceed the regulatory requirements.

The issues of waste management generated during construction and installation works on construction sites belong to the area of responsibility of contractors engaged in construction. General environmental requirements for construction contractors, as well as their responsibility for violations of environmental legislation (including in the field of waste management) are reflected in the contracts. According to those, contractors, at their own expense, organize the collection, loading and unloading, transportation and transfer of waste, generated during the execution of work to the places of their disposal or to specialized organizations for their disposal, processing, neutralization, place-

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ment. NORWM monitors the performance of construction and installation works by contractors constantly.

All the work is carried out on the basis of approved project design documentation that presents the necessary calculations confirming that the impact does not exceed the established requirements. Positive conclusions of the state environmental expertise were obtained for the EIA materials as part of the license justification documents, confirming the permissibility of the impact with account taken of the planned measures for environmental protection.

6.7. The state of the NORWM location territories

During 2020, no cases of contamination with radionuclides were registered on the location territories of operational sites of NORWM branches and department. There are no territories contaminated with HCS and radionuclides.

As it follows from long-term monitoring of the environment in the location area of the Dimitrovgrad, Zheleznogorsk and Seversk branches, liquid radioactive waste is safely allocated in geological horizons and does not have any direct impact on surface and underground waters and other environmental objects.

According to the measurement results of samples of environmental objects at the NSDF in Novouralsk, including in the surrounding area, for the period of 2015-2020 (atmospheric air, snow cover, soil, vegetation, underground and surface water, etc.), this object does not have a negative impact on the environment.

6.8. Biomedical characteristics of NORWM branches regional locations

Dimitrovgrad, Ulyanovsk region

The stable population of Dimitrovgrad is 113.47 thousand people as of 01.01.2020.

According to the Ulyanovsk State Statistics Service, 787 children were born in Dimitrovgrad in January-October 2020, and the number of births decreased by 143 people (84.6%) compared to the level of previous year (930 people).

The population in the Ulyanovsk region, as in most regions of the Russian Federation, is decreasing. At the same time, most of the population losses is associated with natural decrease, which is partly due to the age structure of the region. In addition, in 2020, there is an increase in the mortality rate of the population in the region, including in the municipality of Dimitrovgrad (+251). The reason for the increase was the coronavirus, since it not only causes death by itself, but also provokes a more severe course of other diseases. However, according to demographic processes in the region, Dimitrovgrad belongs to the territory with a relatively stable level of depopulation.

Dimitrovgrad, as well as the Ulyanovsk region as a whole, is included in the group of relatively favorable regions of the Russian Federation in terms of the environmental situation, although there are still problems caused by emissions from industrial enterprises and motor vehicles.

There are no environmentally dirty (chemical, petrochemical, metallurgical) industries in the city. The main industrial enterprises of the city are mechanical engineering enterprises that do not produce large emissions into the atmosphere and do not consume a large amount of water for production purposes. Thermal power plants and boiler houses of the city use only natural gas as fuel.

Despite the general situation that developed in 2020, related to the spread of a new coronavirus infection (COVID-19), there are also relatively high numbers of diseases of the cardiovascular and endocrine systems. The diseases of the endocrine system are due to iodine deficiency in the Ulyanovsk region and in Dimitrovgrad.



Other diseases incident rate in the city are either at the level of other settlements in Russia, or below them.

The incidence rate of cancer in the city (which is usually associated with exposure to radiation) has recently been below the national average and has approached it only now.

Closed Administrative Territorial Unit (CATU) Zheleznogorsk, Krasnoyarsk territory

The population of Zheleznogorsk with the settlements of Tartat, Dodonovo, Novy Put and Shivera included in its district, which is closest to the disposal facility for liquid radioactive waste Severny, is 91.379 thousand people. The distribution of the population is extremely uneven: the western and south-western sectors do not have stable population, the land belongs to the State Forest Fund. Having the status of a closed administrativeterritorial unit, CATU Zheleznogorsk belongs to the category of monotowns and is included in the list of single-industry municipalities of the Russian Federation (monotowns), approved by the decree of the Government of the Russian Federation No. 1398r of 29.07.2014. According to the list, Zheleznogorsk belongs to the third category of single-industry towns – monotowns with a stable socio-economic situation.

The demographic situation in Zheleznogorsk had a decrease in the size of permanent population in 2020. The structure of the permanent population of Zheleznogorsk is following: the share of the urban population (Zheleznogorsk, the village of Podgorny) is 97.4%, the share of the rural population (the settlements of Dodonovo, Novy Put, Tartat, Shivera village) accounts for 2.6%.

The level of general incidence rate of the population living in the 20-km monitoring area around the LRW DDF is lower than corresponding



indicators among the population living in the control Mansky district according to the longterm observation period. The incidence rate of malignant neoplasms among the population living in the 20-km monitoring area does not differ from the corresponding indicators among the population living in the control area, and the mortality rate from malignant neoplasms in the monitoring area is 20.4% lower than in the control area.

CATU Seversk, Tomsk region

The permanent population of Seversk was 112.8 thousand people as of 01.01.2020. CATU Seversk ranks second in terms of population after the city of Tomsk in the Tomsk region. The trend of reducing the population of the city of Seversk remained in 2020 as in previous years. There is still natural decrease of the population: 937 people were born in 2020, which is 117 people less than in 2019 (1054 people were born in 2019). The death rate of the population increased by 13 people and amounted to 1416 people.

One of the peculiarities of the demographic situation in CATU Seversk is the age structure of the population, as people over 60 years make up for 22.3%.

Over the past 10 years, the birth rate in CATU Seversk has increased 1.4 times, that led to an



increase of children share in the population structure.

The overall mortality rate among men is 1.3 times higher than among women.

Negative demographic processes of recent years (a decrease in the birth rate, a natural decrease of the population, a negative balance of migration) have a significant impact not only on the size of permanent population, but also on its structure. The evidence is the decrease of the working-age population.

CATU Novouralsk, Sverdlovsk region

The population of the Novouralsk urban district is approximately 93.849 thousand people. According to the results of 2020, mortality increased in the country as a whole and in the Sverdlovsk region particularly (in the region – by 17% compared to



2019) due to the coronavirus pandemic situation. The mortality rate among Novouralsk inhabitants had already increased by 6.7% from the beginning of autumn before the surge in mortality from coronavirus during the second wave which was considered the least severe period. The situation is also aggravated by the fact that the birth rate is falling in the region, which means that the natural decrease of the population is recorded. Compared to last year, it has almost doubled.

The population of the city district is expected to decrease further by an average of 500 people annually. In comparison with the average regional indicators, the indicators of total mortality and mortality of people of working age are lower in the district, but at the same time the birth rate is also lower.

The structure of total mortality has not changed for a number of years: mortality from cardiovascular diseases (up to 55%) is on the 1st place, mortality from cancer (up to 19.3%) is on the 2nd place, and mortality from injuries and poisoning (up to 8.1%) is on the 3rd place.

IMPLEMENTATION OF NORWM ENVIRONMENTAL POLICY 3.11

The Vasyugan marshes are the largest swamp system in the northern hemisphere of the planet, which is located in the center of the Siberian Federal District. The state nature reserve "Vasyugansky" occupies 615 thousand hectares. The Big Vasyugan swamp accumulates from 3 to 10 million tons of carbon dioxide per year and produces 1.4-4 million tons of oxygen, is a storage of 400 cubic km of fresh water and the source of more than 20 rivers of the Ob and Irtysh basins.

IMPLEMENTATION OF NORWM ENVIRONMENTAL POLICY



FSUE "NORWM" and its branches implement the Environmental Policy considering the requirements of the Environmental Policy of State Atomic Energy Corporation Rosatom and its organizations.

In order to implement the Environmental Policy efficiently, a three-year Plan for the Implementation of the NORWM Environmental Policy is developed and approved, and it is updated annually. A report is generated based on the results of the Plan implementation. In 2020, the planned activities have been fully implemented. In 2021, it is planned to develop an Environmental Policy Implementation Plan for 2022 – 2024.



Final disposal of radioactive waste is an effective environmental protection measure that prevents the effects of waste on the population and the environment. Performing this activity, in accordance with the existing legal documentation, additional measures are taken to meet the requirements of sanitary, radiation and environmental safety in order to ensure the allocation of waste – a sanitary protection zone is arranged, and a mining allotment is obtained. Verification of compliance with the requirements is carried out on the basis of monitoring, measurements and analysis of its results, calculations and

modeling to ensure sanitary and radiation safety of the final disposal of RW.

A large number of environmental activities were carried out in 2020. The costs of ensuring environmental protection were aimed at ensuring the radiation safety of the environment and amounted to:

Dimitrovgrad branch

60,165.0 thousand rubles (including current (operating) costs for environmental protection of 48,247.0 thousand rubles and costs of services related to environmental conservation of 11,918.0 thousand rubles).

Zheleznogorsk branch

206,162,0 thousand rubles (including current (operating) costs for environmental protection of 201,270.0 thousand rubles and costs of services related to environmental conservation of 4,892.0 thousand rubles).

Seversk branch

185,087 thousand rubles (including current (operational) costs for environmental protection of 90,415.0 thousand rubles and costs for environmental services of 94,672.0 thousand rubles). Payment for the disposal of operational and consumption waste is 4,764.44 rubles.

Novouralsk department

13,146.35 thousand rubles (including current (operational) costs for environmental protection of 13,146.35 thousand rubles).



ENVIRONMENTAL AND EDUCATIONAL ACTIVITIES. PUBLIC ACCEPTANCE

The Putoransky Nature Reserve is located in the polar zone of the Krasnoyarsk Territory. It is one of the largest in Russia, its area is 1 million 887 thousand hectares.The main natural attraction of the Putoransky Reserve is the landscapes of the Putorana plateau: table mountains with a height of 1000-1500 m above sea level, canyon – like basins of tectonic lakes, many waterfalls.

ENVIRONMENTAL AND EDUCATIONAL ACTIVITIES. PUBLIC ACCEPTANCE

The process of creation of the system for final disposal of radioactive waste involves supervision authorities as well as representatives of the public, mass media, environmental organizations. One of the main activities of NORWM, while planning the company operations in the location regions, is providing information to the public on environmental and technological aspects of final disposal process, aimed at educating and improving radioecological literacy in the issues of safe handling and disposal of radioactive waste, in accordance with art. 20 of the Federal Law No. 190-FZ of 11.07.2011 «On the management of radioactive waste and on amendments to certain legislative acts of the Russian Federation».

Key tasks within the framework of communication work in the environmental area:

1. Developing close interaction with mass media, publishing the environmental-related materials;

2. Involving environmental entities and organizations into mutual work to enlarge the expert community;

3. Ensuring effective communication between experts and the public on the issues of final disposal of radioactive wastes;

4. Developing close interaction with state

authorities and local government at the Enterprise geographical regions;

5. Developing international cooperation in engineering and scientific-and-educational sphere as well as in environmental safety;

6. Developing educational projects.

The environmental safety issues and public acceptance are the main priority in taking the decisions on locations for radioactive waste final disposal.

8.1. Interaction with state authorities and local self-government bodies. Key events of 2020

The main form of interaction of NORWM with state authorities and local self-government bodies is the approval of construction and operation plans for radioactive wastes final isolation facilities, as well as communication with state legal and licensing authorities.

In this framework the following results were achieved within 2020:

- public hearings were held on the license justification for the operation of the near-surface disposal of radioactive waste of classes 3 and 4 in Novouralsk, Sverdlovsk region, in the period from July to September. The hearings were held in the form of a survey of residents due to restrictive measures related to mass events restrictions during this period;
- license No. GN-(C)-01-304-3853 of 22.06.2020 was obtained for the placement and construction of a near-surface disposal facility for solid radioactive waste of 3 and 4 classes, Tomsk region, CATU Seversk city district;
- license No. GN-(C)-01-304-3914 of 25.08.2020 was obtained for the placement and construction of a near-surface disposal facility for solid radioactive waste of 3 and 4 classes, Chelyabinsk Region, Ozersk city district.

During the past year the state supervisory and control bodies of the executive power of the Russian Federation (Rostechnadzor, Russian State Federal biomedical agency, Federal Rescue Service) have been inspecting NORWM branches in order to assess nuclear and radiation safety, safety of construction and installation work, sanitary and hygienic, industrial and fire safety.

8.2. Interaction with public environmental organizations, scientific and social institutions. Public information. Key results for 2020

Presentations of the Environmental Safety Report for 2019 were held in the Sverdlovsk, Chelyabinsk, Tomsk, Ulyanovsk regions and the Krasnoyarsk territory as part of NORWM information program for the population about environmental safety in the radioactive waste management. The report is published in the framework of the policy of public reporting of ROSATOM and nuclear industry enterprises.

In order to increase the environmental literacy of the population in the regions of the enterprise's presence, the implementation of the project «Ecology Week» continued, the main purpose of which is to discuss issues related to the activities of NORWM and the creation of a unified state system of the radioactive waste management. In 2020, the discussion was held within the framework of the XIII Public Regional Forum-Dialogue «Environmental Solutions and Society».

In 2020, new communication projects were created. These aimed at demonstrating and discussing the essence of the process of creating disposal facilities for radioactive waste and the matter of ensuring the environmental safety of the Russian Federation. Virtual video excursions were filmed at the operating radioactive waste disposal facility (3 and 4 classes) near Novouralsk and at the construction site of the URL in Zheleznogorsk,

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Krasnoyarsk territory. In addition, NORWM made videos, showing the chronology and progress of construction work at these facilities. The printed products were custom-made specially for these facilities. NORWM presented a brochure «Underground Research Laboratory», a booklet «Final disposal facility of radioactive waste for the 3rd and 4th classes in Novouralsk, Sverdlovsk Region», an information profile about the enterprise for interaction with journalists and stakeholders and a comic book about radioactive waste for school-age children.

NORWM organized different events for schoolchildren and students in the Krasnoyarsk territory and the Tomsk region in 2020. In order to form a culture of radiation and environmental safety among the younger generation, cooperation agreements were signed with the Siberian State University of Science and Technology named after Academician M. F. Reshetnev, the National Research Tomsk State University and the National Research Nuclear University.

The staff of NORWM took part in the All-Russian ecological clean-up event «Green Spring», held on the territory of the Central Station of Young Naturalists. Similar events were held in the branches of the enterprise. The employees of the branches also supported different sports events, such as cultural and educational cycling event «Super Gut Route» in Dimitrovgrad and cycling event dedicated to the 75th anniversary of the nuclear industry in Zheleznogorsk.

Other events in the regions where NORWM operates:

Sverdlovsk region

- A round table was held as part of the Federal target program "Ensuring Nuclear and Radiation safety for 2016-2020 and for the period up to 2030" (FTP NRS-2);
- A series of on-line round tables was held in the frameworks of public hearings for the license justification materials for the operation of the radioactive waste disposal facility (3 and 4 classes) in Novouralsk on the following topics: "Improving the solutions for the final disposal facility of RW as a result of its reconstruction"; "Evolution of the final disposal facility of RW. Public acceptance. International experience"; "Summing up the results of public hearings".

Tomsk region

- The Eco-Lecture Hall project was implemented together with the Atomic Energy Information Center. Face-to-face events were held for students and schoolchildren in Tomsk and Seversk in January.
- Specialists of the enterprise answered the questions on ensuring the long-term safety of nuclear industry facilities and final disposal facilities of radioactive waste as part of the public conversation "Radioactive waste. The evolution of safety".
- Reviewing the results of the work of NORWM in 2019, a round table was organized for representatives of the public, the scientific community and the media of the Tomsk region.
- A discussion about the issues of information exchange in the new social conditions was held on the online platform of the X School-Conference

of Young Nuclear Scientists of Siberia.

Reviewing the results of the activities of NORWM in 2020, a seminar was organized for representatives of the mass media of the region.

Ulyanovsk region

- A round table, discussing issues of legislation in the field of radioactive waste management, technological and organizational features of the creation, operation and monitoring of radioactive disposal facilities, was held for journalists. The event was organized jointly with the Ulyanovsk Atomic Energy Information Center.
- A screening and discussion of the popular-science film "Shelter for the Atom. Underground research laboratories" was arranged for young scientists of the Nuclear Reactir Research Institute (NIIAR), students of specialized universities and representatives of the public of Dimitrovgrad.
- Within the framework of the public conversation "Radioactive waste and where to "find" them", there was a discussion of the activities of NORWM, types of radioactive waste and ways of their final disposal.
- Reviewing the results of the activities of NORWM in 2020, a seminar was organized for journalists of the region.

Krasnoyarsk Territory

In the frameworks of the trilateral agreement on scientific, educational and technical cooperation between NORWM, the Nuclear Safety Institute of the Russian Academy of Sciences (RAN) and the Siberian Federal University (SFU), the public expert council on the safe radioactive waste management in the Krasnoyarsk territory is being arranged.

- 14 technical and press tours to the disposal facility for liquid radioactive waste "Severny" and the construction site of the URL were arranged for representatives of the public, the scientific community, political and public parties and movements, and journalists.
- An online conference on the scientific support of the URL project was held together with scientists of the (RAN).
- Field training was organized for students of the Department of "Technosphere safety" of the Polytechnic Institute of SFU at the Severny liquid radioactive waste disposal facility.
- The festival "CATU! Science" was held together with the Atomic Energy Information Center for students of schools in Zheleznogorsk.
- In the framework of the special events dedicated to the 70th anniversary of Zheleznogorsk city, the event called "Scientific meadow" and the quest "Find out the radiation background in the park" were organized.
- Reviewing the results of the activities of NORWM in 2020, a seminar was organized for representatives of the mass media of the region.

8.3. The development of international cooperation in the sphere of technology and environmental safety assurance. Key events of 2020

The international cooperation of National operator for radioactive waste management aims to provide information on enterprise operation correspondence to approved international standards and exchange scientific-technical experience in the field of radioactive wastes management, as well as demonstrate real examples of safe operation of the disposal facilities in Russia and abroad.

In 2020 new agreements on cooperation were reached with foreign partners:

- Russian-Chinese trilateral agreement on cooperation, experience exchange and advisory support in research and scientific works is signed by NORWM, (RAN), and Beijing research Institute of uranium geology (BRIUG).
- trilateral agreement on cooperation in the field of creation of final disposal facilities is signed by NORWM, (RAN), and Nagra (National cooperative for radioactive waste disposal of Switzerland).

During 2020 the specialists of NORWM took part in the following events of the International Atomic Energy Agency:

 Third Technical Meeting of the Working Group on the Use of Monitoring Programmes in the Safe Development of Geological Disposal Facilities for Radioactive Waste;

- technical meeting on Spent Fuel and Radioactive Waste Information System (SRIS);
- technical meeting on the guidance for preparing and conducting regulatory reviews and assessments of geological disposal programmes;
- technical meeting on waste acceptance criteria for the management of radioactive waste;
- workshop on the strategic environmental assessments of nuclear power programmes.

Within the framework of Nuclear Energy Agency project under the Organization for Economic Cooperation and Development (OECD NEA), NORWM specialists joined the discussions of the OECD NEA Crystalline Club, the working group on DGR and liability for nuclear damage.

NORWM specialists took part in the conferences: «The concept of multinational radioactive waste disposal facility: joint solutions to the problems of radioactive waste management for emerging countries and countries with a small nuclear program» and «Technology of deep disposal of SNF and HLW in wells: history, status of projects, difficulties and prospects», held under the auspices of the International Framework for Nuclear Energy Cooperation (IFNEC).

In order to implement the signed five-party cooperation agreement between NORWM, The Nuclear Safety Institute of Russian Academy of Sciences, Federal Institute of geoscience and natural resources (BGR, Germany), BGE TECNOLOGY GmbH (BGE TEC, Germany) and the Society for Reactors and Installations Safety (GRS), a working meeting was held to coordinate joint research work on the Nizhnekansk rock massif in five directions with the German side.

In February 2020, the employees of NORWM made a presentation at the International Conference

on Geological Barrier Systems, Characteristics of Host Rocks and the Site Selection for Underground Disposal Facilities in Hannover, Germany.





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The Visimsky Nature Reserve is located in the western part Middle Urals, at the confluence of three urban districts (Gornouralsky, Kirovogradsky and Nizhnetagilsky). The border of Europe and Asia passes through the territory of the reserve. It is located on an area of 33 thousand hectares and is one of the most studied areas of the nature of the Urals.

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The Taimyr Nature Reserve is one of the oldest and largest in Russia. It is located in the north of the Krasnoyarsk Territory, on the Taimyr Peninsula and is completely located in the zone of continuous permafrost. It has an area of 1 million 782 thousand hectares. Scientists are studying the typical tundra ecosystems of the peninsula, as well as the population of wild reindeer in the reserve. The reserve is a specially protected area of federal significance.

ANNEX

Annex 1

Radioactive waste – materials and substances not subject to further use, as well as equipment, products (including spent sources of ionizing radiation), the content of radionuclides in which exceeds the levels established in accordance with the criteria established by the Government of the Russian Federation. Radioactive waste can be recognized as materials with a high content of natural radionuclides, produced during non-atomic energy-related activities for the extraction and processing of mineral and organic raw materials with a high content of natural radionuclides, if these materials are not to be further used.

RW is classified as follows:



Annex 2

Safety measures when disposing radioactive waste. Protective barrier system

RW disposal method, containment structure, type and properties of safety barriers are defined depending on RW characteristics and volume, considering the natural conditions of disposal site location and the results of safety assessment in accordance with NP-055-14 requirements.

3 and 4 class RW are to be disposed in near-surface disposal facilities – the facilities constructed above, at the level or lower the ground surface at depths down to one hundred meters.

DFRW safety is provided by successive implementation of in-depth multi-barrier protection principles, based on deployment of physical barriers systems on the way of ionizing radiation and radioactive substances transmission into the environment.

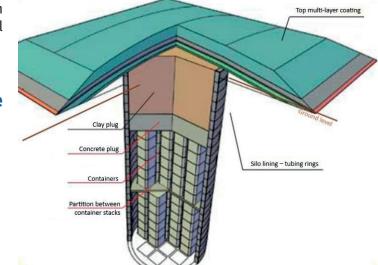
Safety assurance during RW disposal is implemented mostly by using the multi-barrier protection principle, when the breach of one safety barrier (natural or engineered) as well as probable external natural or man-caused event shall not cause the decrease of facility long-term safety level.

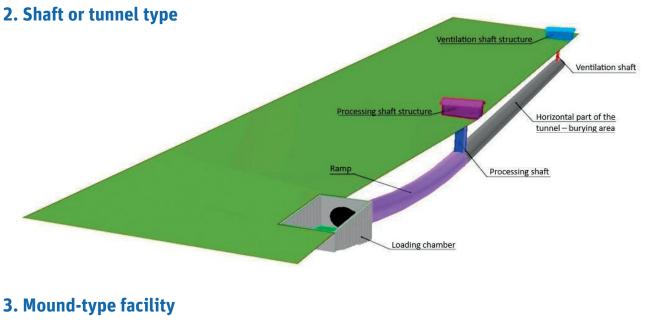
The engineered barriers for DFRW include the RW packaging, its separate elements (form, container), DFRW engineering structures and their separate parts and elements including the construction facilities, buffer materials, underlying and covering screens.

The natural barriers for DFRW refer to natural geological formations including carrying and (or) surrounding formations.

At present, the following types of design options are available for 3 and 4 class RW final isolation:

1. Silo type

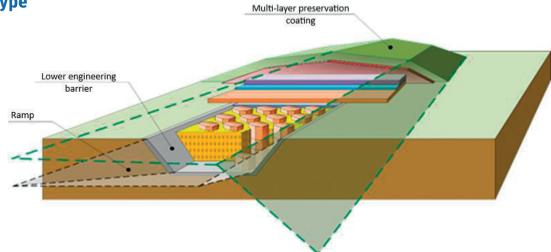




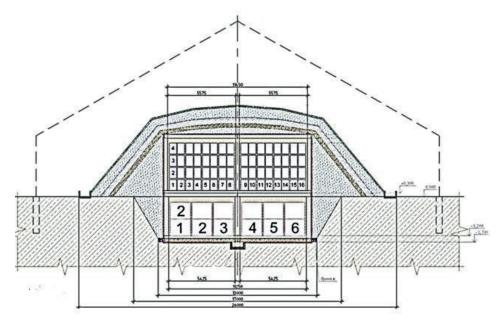


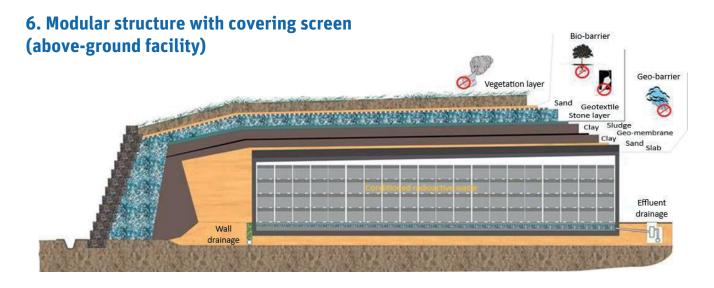
1- grass reinforcement; 2 – natural layer 0,1 m; 3 – natural soil 0,9 m; 4 – quarry stone protection layer 0,5 m; 5 – crushed stone 0,3 m; 6- 20-feet containers with 4 class waste (OHRAW); 7 – contaminated soil; 8 – 4 class waste (OHRAW) in 200l steel barrels; 9 – bentonite mat 2 layers; 10 – levelling layer of sand 0,7 m; 11 - geogrid; 12 – drain trench; 13 – Big Bags with contaminated soil; 14 – reinforced concrete foundation; 15 – crushed stone 0,3 m; 16 – bentonite mat 2 layers



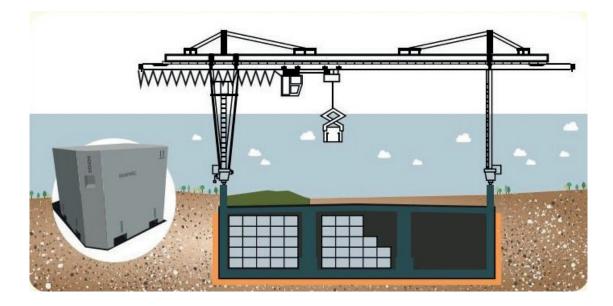


5. Combined type





7. Modular structure (underground facility)



LRW DDF engineering barriers system includes the following:

- LRW DDF wells casing, water-proof along the full depth, restricting the low-laying aquifers breach into upper-laying ones, with engineering barrier service life of not less than 100 years;
- wells annulus and inter-tube space materials shall have the permeability factor not exceeding that of confining formations drilled through by the well, with service life of not less than 100 years;
- plugging materials used for wells abandonment (specifications for plugging materials shall be chosen and justified in design projects for wells abandonment and LRW DDF closure.

Natural barriers for LRW DDF are the natural geological formations – bearing strata, introduced by reservoirs and confining layers.

Annex 3 About the activities of the RW disposal abroad

International practice says that the safest way to isolate radioactive waste (hereinafter referred to as RW) is its final disposal (final placement or final isolation) in special facilities. NORWM keeps in touch with all countries involved in the final stage of RM management. The exchange of experience and its generalization are important components of the work of specialists of the global nuclear industry in ensuring environmental well-being of future generations.



Complete information about the international cooperation of NORWM FSUE with foreign operating organizations and regulatory authorities in the field of radioactive waste management can be found on the website http://norao.ru/international_activity/ in the section "International activity/ in the section "International activities".

Also, information about foreign practices of SNF and RW disposal can be found on the website http://nkmlab.ru/mezhdunarodnyy-opyt/ in the section "International experience".

Here is the list of main foreign regulators and operators:

Belgian Agency for Radioactive Waste and Enriched Fissile Materials (ONDRAF/NIRAS) was created in 1980 and responsible for safe RW management, NPP decommissioning and research and development in nuclear area.

Office for Nuclear Regulation (ONR)

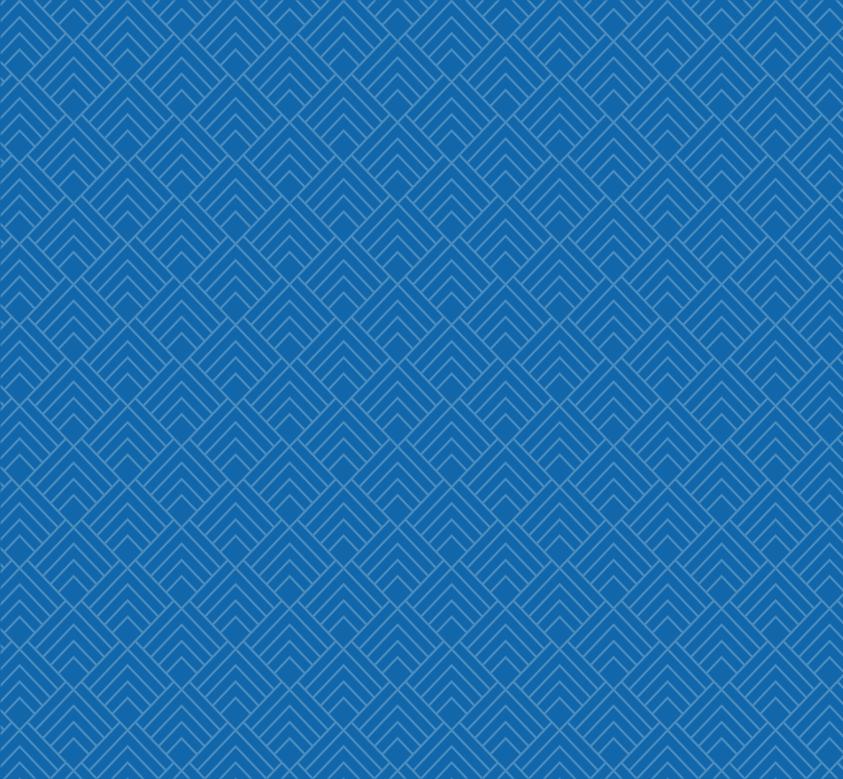
is responsible for nuclear safety regulation throughout the Great Britain. The mission is to protect society by securing safe nuclear operations.

- The National Radioactive Waste Management Agency (ANDARA) was created in 1991 as state body responsible for radioactive waste management and subordinate to the Ministry of environment, energy and sustainable development and to the Ministry of science.
- Nagra (National Cooperative for the Disposal of Radioactive Waste) was created in 1972 and is responsible for safe RW management.
- Federal Company for Radioactive Waste Disposal (BGE) started its work in 2017. The organization is responsible for final disposal of RW and management operating disposal facilities and the URL.
- The Central Organisation for Radioactive Waste (Centrale Organisatie Voor Radioactief Afval, or COVRA) works in the Netherlands starting from 1982.
- Svensk Kärnbränslehantering AB (Swedish Nuclear Fuel and Waste MAnagement Company) was created in 1972 to transport and dispose RW from Swedish NPPs.
- Nuclear Waste Management Organization (NWMO) was established in 2000 and responsible for final disposal of RW.

More information about the national operators' activity is on the websites:

- Belgian Agency for Radioactive Waste and Enriched Fissile Materials (ONDRAF/NIRAS) <u>https://www.ondraf.be/</u>
- 2. Office for Nuclear Regulation (ONR) <u>http://www.onr.org.uk/</u>
- 3. The National Radioactive Waste Management Agency (ANDRA) https://international.andra.fr/
- 4. Nagra (National Cooperative for the Disposal of Radioactive Waste) https://www.nagra.ch/
- 5. Federal Company for Radioactive Waste Disposal (BGE) https://www.bge.de/en/bge/
- 6. The Central Organisation for Radioactive Waste (Centrale Organisatie Voor Radioactief Afval, or COVRA) — <u>https://www.covra.nl/</u>
- 7. Svensk Kärnbränslehantering AB (Swedish Nuclear Fuel and Waste Management Company) <u>https://www.skb.com/</u>
- 8. Nuclear Waste Management Organization (NWMO) <u>https://www.nwmo.ca/</u>

For notes





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