



EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR ENERGY

DIRECTORATE D – Nuclear energy, safety and ITER
D.3 – Radiation protection and nuclear safety

Verification under the terms of Article 35 of the Euratom Treaty

Technical Report

BULGARIA
Haskovo

**Drinking and groundwater radioactivity monitoring arrangements in
the city of Haskovo and the surrounding area**

6-8 December 2022

Reference: BG 22-06

**VERIFICATIONS UNDER THE TERMS OF ARTICLE 35
OF THE EURATOM TREATY**

FACILITIES Monitoring of radioactivity in drinking water and groundwater

LOCATIONS Republic of Bulgaria (Bulgaria), Haskovo

DATES 6-8 December 2022

REFERENCE BG 22-06

TEAM MEMBERS Ms K. Peedo (team leader)
 Ms A. Chirtes

REPORT DATE XX May 2023

SIGNATURES

K. Peedo

A. Chirtes

TABLE OF CONTENTS

1	INTRODUCTION	5
2	PREPARATION AND CONDUCT OF THE VERIFICATION	5
2.1	BACKGROUND	5
2.2	DOCUMENTS	6
2.3	PROGRAMME OF THE VISIT	6
3	LEGAL FRAMEWORK	9
3.1	LEGISLATIVE ACTS REGULATING MONITORING RADIOACTIVITY IN DRINKING WATER	9
3.2	LEGISLATIVE ACTS REGULATING MONITORING RADIOACTIVITY IN GROUNDWATER	9
3.3	LEGISLATION ON CONDUCTING STATE HEALTH CONTROL ON WATER QUALITY	9
4	BODIES HAVING COMPETENCIES FOR RADIOACTIVITY MONITORING IN BULGARIA	11
4.1	ROLES AND RESPONSIBILITIES FOR MONITORING RADIOACTIVITY IN DRINKING WATER	11
4.1.1	Ministry of Health	11
4.1.2	Regional Health Inspectorates	11
4.1.3	National Centre of Radiobiology and Radiation Protection	11
4.1.4	Water Supply and Sewerage company	12
4.2	ROLES AND RESPONSIBILITIES FOR MONITORING RADIOACTIVITY IN GROUNDWATER	12
4.2.1	Ministry of Environment and Water	12
4.2.2	Environmental Executive Agency	12
4.2.3	Basin Directorates	13
5	WATER SUPPLY DISTRIBUTION NETWORK IN THE REGION OF HASKOVO	14
6	RADIOACTIVITY MONITORING IN THE REGION OF HASKOVO	15
6.1	DRINKING WATER MONITORING PROGRAMMES	15
6.1.1	Monitoring conducted by the water supply company	15
6.1.2	Monitoring conducted by the Regional Health Inspectorate	15
6.2	ACTIONS IN CASE OF NON-COMPLIANCE	16
6.3	GROUNDWATER MONITORING	16
6.3.1	Monitoring conducted by the water supply company	16
6.3.2	Monitoring conducted by the state environmental authorities	17
7	INFORMATION TO THE GENERAL PUBLIC	19
7.1	DRINKING WATER	19
7.2	GROUNDWATER	19
8	SITUATION OF THE ACCESS TO DRINKING WATER IN HASKOVO BETWEEN 2017 AND 2021	20
8.1	BACKGROUND	20
8.1.1	Situation and measures taken in 2017	20
8.1.2	Situation and measures taken in 2021	21
9	VERIFICATION ACTIVITIES	22
9.1	INTRODUCTION	22
9.2	MONITORING PROGRAMME FOR GROUNDWATER AND DRINKING WATER IN THE REGION OF HASKOVO	22
9.3	CAPABILITIES OF THE LABORATORIES TO MONITOR RADIOACTIVITY	23

9.3.1	Environmental Executive Agency regional laboratory in Haskovo	23
9.3.2	Laboratory of Regional Health Inspectorate Plovdiv	25
9.3.3	Laboratory DIAL Ltd.	26
10	CONCLUSIONS	28

Annexes

Annex 1	Verification programme
Annex 2	Drinking water sampling points
Annex 3	Groundwater monitoring programme

Abbreviations

BD	Basin Directorate
BD EASR	Basin Directorate "East Aegean Sea Region"
EEA	Executive Environmental Agency
HPGe	High-purity Germanium
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
LIMS	Laboratory Information Management System
MH	Ministry of Health
MOEW	Ministry of Environment and Water
NCRRP	National Centre of Radiobiology and Radiation Protection
NSEM	National System of Environmental Monitoring
RHI	Regional Health Inspectorate
PS	Pumping Station
SG	Official Journal
SZ	Supply Zone
ViK	Water Supply and Sewage company

TECHNICAL REPORT

1 INTRODUCTION

Under Article 35 of the Euratom Treaty, all Member States must establish the facilities necessary to carry out continuous monitoring of the levels of radioactivity in air, water and soil and to ensure compliance with basic safety standards¹. Article 35 also gives the European Commission the right of access to such facilities to verify their operation and efficiency. The radiation protection and nuclear safety unit of the European Commission's Directorate-General for Energy is responsible for undertaking these verifications. The Joint Research Centre provides technical support during the verification visits and in drawing up the reports.

The main purpose of the verifications under Article 35 of the Euratom Treaty is to provide an independent assessment of the efficiency and adequacy of monitoring facilities for:

- liquid and airborne discharges of radioactivity from a site into the environment.
- levels of environmental radioactivity at the site perimeter and in the marine, terrestrial and aquatic environment around the site, for all relevant pathways.
- levels of environmental radioactivity on the territory of the Member State.

The Commission Communication 2006/C 155/02² describes practical arrangements for Article 35 verification visits in Member States.

2 PREPARATION AND CONDUCT OF THE VERIFICATION

2.1 BACKGROUND

The Commission services were made aware through the European Parliament Question E-4964/2021³ and the Petition 1361/2021⁴ of the situation of the residents of the city of Haskovo and the surrounding villages who have been deprived of safe access to quality drinking water due to its high content of Uranium. To gain a complete understanding of the situation, the Commission contacted the Bulgarian authorities on several occasions during 2021-2022 to seek additional information on the causes, actions taken and planned remedial actions related to the situation in the Haskovo region. After evaluating the information received from the Bulgarian authorities, the Commission considered necessary to also perform a verification mission in Bulgaria, pursuant to Article 35 Euratom Treaty.

The aim of the Article 35 Euratom Treaty verification mission was to check aspects related to the implementation of Council Directive 2013/51/Euratom (Euratom Drinking Water Directive)⁵ and of

¹ Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom (OJ L 13, 17.1.2014)

² Commission Communication *Verification of environmental radioactivity monitoring facilities under the terms of Article 35 of the Euratom Treaty — Practical arrangements for the conduct of verification visits in Member States* (OJ C 155, 4.7.2006)

³ https://www.europarl.europa.eu/doceo/document/E-9-2021-004964_EN.html

⁴ <https://www.europarl.europa.eu/petitions/en/petition/content/1361%252F2021/html/Petition-No-1361%252F2021-by-K.P.-%2528Bulgarian%2529%252C-bearing-7-signatures%252C-on-the-lack-of-safe-access-to-and-poor-quality-of-drinking-water-in-Bulgaria>

⁵ Council Directive 2013/51/Euratom of 22 October 2013 laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption (OJ L 296, 7.11.2013, p. 12–21)

Council Directive 2013/59/Euratom (Basic Safety Standards Directive) by assessing the operation and efficiency of the facilities for monitoring the level of radioactivity in groundwater and drinking water in the city of Haskovo and in the surrounding area. The verification focused on the analyses of gross alpha-activity, gross beta-activity, natural Uranium content, identification of specific radionuclides, and assessment of total indicative dose performed by the Bulgarian authorities. The verification activities also included visits to the laboratories in charge of performing the relevant analyses by looking at the infrastructure, analytical methods, quality assurance and control aspects. In addition, the verification inquired on the way monitoring data is made available to the general public.

The Commission notified Bulgaria of its decision to conduct an Article 35 verification in a letter addressed to the Bulgarian Permanent Representation to the European Union. A contact person from the Bulgarian National Centre of Radiobiology and Radiation Protection was designated to coordinate the preparations for the visit and the communication between relevant Bulgarian authorities and the Commission.

2.2 DOCUMENTS

To assist the verification team in its work, the national authorities supplied an information package in advance⁶. Additional documentation was provided during and after the verification visit. The information provided was used as a source for the descriptive sections of the current report.

2.3 PROGRAMME OF THE VISIT

The Commission verification team and the representatives of the relevant Bulgarian authorities discussed and agreed on a programme of verification activities in line with the Commission Communication 2006/C 155/02. Additional information was provided, and practicalities of the verification were discussed during an online meeting preceding the actual visit.⁷

The team then carried out the verifications in accordance with the programme in Annex 1 as summarised below:

- The verification mission started on 6 December 2022 in Haskovo, at the premises of the Executive Environmental Agency regional office. The morning session offered an opportunity to review the Bulgarian system of monitoring radioactivity in groundwater and drinking water in the Haskovo region e.g. institutional set-up, interconnections between the responsible institutions, procedures in case of exceedance of the parametric values, public information. In the afternoon, a visit of the Regional Laboratory of the Executive Environmental Agency was carried out. The team looked at the entire analysis procedure for Uranium concentration determination in the groundwater i.e. sampling, registration of samples, equipment, protocol of registering the results and the follow-up procedures.
- The mission continued on 7 December 2022 in Plovdiv, at the premises of the Regional Health Inspectorate Plovdiv. The discussions followed a similar structure as in the first day. The morning session was dedicated to reviewing the system of radioactivity monitoring in drinking water, while, during the afternoon session, the team visited the Regional Laboratory Plovdiv, where the steps of the analyses of the gross alpha/beta activity, and Uranium concentration in drinking water were presented.

⁶ Replies to the preliminary information questionnaire addressed to the national competent authority, received on 16 November 2022

⁷ Practicalities of the verification visit were discussed at the online meeting on 10 November 2022

- During the final day of the mission, on 8 December 2022, the team visited the laboratory Dial in Buhovo, selected since this laboratory is contracted by the Water Supply and Sewage Company Haskovo for the analysis of the radioactivity in drinking water.
- The mission ended with a closing session at the headquarters of the Ministry of Health in Sofia, where the summary of the mission and the preliminary recommendations and suggestions were presented by the verification team.

The Commission verification team met the following representatives of the national authorities and other parties involved:

Ministry of Health

- Iliya Tasev - Director of Public Health Protection and Health Control Directorate
- Katalina Valkova – Head of Health Control Department, Public Health Protection and Health Control Directorate

National Center of Radiobiology and Radiation Protection

- Kremena Georgieva Ivanova – Deputy Director “Radiation Protection”,
- Rositza Kamenova – Totzeva – Head of Laboratory "Pubic Exposure Monitoring Laboratory"

Regional Health Inspectorate Plovdiv

- Siyka Dimcheva – Director of Regional Health Inspectorate Plovdiv
- Tsveta Zaharieva Ivanova – Director of Public Health Directorate
- Ivanka Stoycheva Kaeva – Head of Radiation Control Department Public Health Directorate
- Mariana Angelova laneva – Expert in Laboratory Complex
- Metin Hikmet Dormush – Chemical expert in of Radiation Control Department Public Health Directorate
- Yana Viktorova Petrova - Chemical expert in of Radiation Control Department Public Health Directorate

Regional Health Inspectorate Haskovo

- Stanimira Tananova – Director of Regional Health Inspectorate Haskovo
- Neva Ivova Dryanovska – Chief Inspector, State Health Control Department, Public Health Directorate
- Dimitar Tonev - Director of Public Health Directorate
- Daniela Ivanova Daneva – Chief Inspector, State Health Control Department, Public Health Directorate
- Plamen Peresterov – Head of DKK Department, Public Health Directorate

Executive Environment Agency - Ministry of Environment and water

- Elitsa Encheva Maneva – Head of Laboratory "Radiation Measurements" Department

East Aegean River Basin Directorate, Plovdiv

- Petya Grozeva – Chief Expert

- Zhelyazka Kalcheva Georgieva – Chief Expert
- Nikola Belovski - Chief Expert

Regional Laboratory-Haskovo Department, General Directorate LAD, Executive Environment Agency

- Daniela Tsvetanova Dinevska - Head of Regional Laboratory-Haskovo Department

Water Supply and Sewerage company-ViK Haskovo

- Bozhidar Zhelyazkov – Manager
- Lozko Lozev – Chief Engineer
- Vesela Santova– Head of Laboratory

DIAL Ltd.

- Ilko Mladenov - Manager

3 LEGAL FRAMEWORK

3.1 LEGISLATIVE ACTS REGULATING MONITORING RADIOACTIVITY IN DRINKING WATER

In Bulgaria, the following legal texts regulate the monitoring of radioactivity in drinking water:

- Ordinance No. 9 on the quality of water intended for drinking and domestic purposes, issued by the Minister of Health, the Minister of Regional Development and Public Works and the Minister of the Environment and Water (SG No. 30 of 28 March 2001), last amended and supplemented SG No. 6 of 16 January 16, 2018, hereinafter referred to as 'Ordinance No. 9'.

The Ordinance regulates at national level the quality of drinking water also including the monitoring of radioactivity in the water intended for human consumption. The latter Ordinance lays down values for the gross alpha and beta activity, radon, tritium and the so-called 'total indicative dose', which covers many other radionuclides.

3.2 LEGISLATIVE ACTS REGULATING MONITORING RADIOACTIVITY IN GROUNDWATER

In Bulgaria, the following legal texts regulate the monitoring of radioactivity in groundwater:

- Water Act, in force from 28 January 2000 (SG No. 67 of 27 July 1999), last amended SG No. 102 of 23 December 2022.
The Law regulates the ownership and management of water on the territory of Bulgaria and the ownership of water management systems and facilities.
- Ordinance No. 1 of 11 April 2011 on water monitoring, issued by the Minister of Environment and Water (SG No. 34 of 29 April 2011), last amended SG No. 20 of 15 March 2016.
The Ordinance regulates the planning of water monitoring and establishing water monitoring networks in each basin management area of Bulgaria, as well as the implementation of activities related to the basin areas' operation, maintenance, communication and laboratory-information service.
- Ordinance No. 1 of 10 October 2007 on exploration, use and protection of groundwater, issued by the Minister of Environment and Water, the Minister of Regional Development and Public Works, the Minister of Health and the Minister of Economy and Energy (SG No. 87 of 30 October 2007), last amended and supplemented SG No. 102 of 23 December 2016.
The Ordinance regulates the specific requirements for the exploration and use of groundwaters, including mineral waters, and their protection from pollution and deterioration.

3.3 LEGISLATION ON CONDUCTING STATE HEALTH CONTROL ON WATER QUALITY

The activities of state health control in the field of drinking water are regulated in the Health Act (SG No. 70 of 10 August 2004), last amended and supplemented SG No. 8 of 25 January 2023, and the Water Act (SG No. 67 of 27 July 1999), last amended SG No. 102 of 23 December 2022.

The subordinate normative documents related to the conduct of state health control, including radioactivity monitoring are the following:

- Ordinance No. 36 of the Ministry of Health on the conditions and procedures for exercising state health control, issued by the Minister of Health (SG No. 63 of 7 August 2009)⁸, last amended and supplemented SG No. 82 from 3 October 2014.

⁸ In particular, Art.62, para. 1, pursuant to which the state health and radiation control is carried out by certain RHIs, as laid down in the Organisational Rules of the Regional Health Inspectorates. Also, Art. 61, para. 2, point 3 clarifies that the health radiation control includes the control of the radiation factors of the environment.

The Ordinance defines the conditions and procedure for exercising state health control on the sites and facilities of public purpose, products and goods relevant to human health, activities relevant to human health and environmental factors.

- Organizational Rules of the Regional Health Inspectorates (SG No. 6 of 18 January 2011), as last amended and supplemented SG No. 69 of 20 August 2021.⁹

The Organisational Rules regulate the activity, functions, structure and number of personnel of the Regional Health Inspectorates.

- Ordinance No. 9, mentioned above, which defines the requirements of the quality of water intended for drinking and domestic purposes. This Ordinance aims to protect people's health from the adverse effects of drinking water pollution by laying down requirements for its quality and safety. The Ordinance also defines the commitments and obligations of water supply and sewerage companies (ViKs),¹⁰ including also the requirement to the monitoring carried out by them and the competent authorities at the national and regional level, including also the requirements of their control monitoring of the quality of drinking water at the consumer's tap.

⁹ In particular Appendix No. 31 to Art. 36, para. 1 pursuant to which RHI-Plovdiv carries out state health control for compliance with the requirements for the protection of persons from the effects of ionising radiation on the territory of Haskovo region.

¹⁰ The obligations of the ViKs are regulated in line with the Ordinance No. 9 and the Water Act.

4 BODIES HAVING COMPETENCIES FOR RADIOACTIVITY MONITORING IN BULGARIA

4.1 ROLES AND RESPONSIBILITIES FOR MONITORING RADIOACTIVITY IN DRINKING WATER

According to the Water Act and the Ordinance No. 9, the water supply and sewerage companies are solely responsible for monitoring radioactivity in drinking water. Their activities are overseen by the respective Regional Health Inspectorates (RHIs) and the National Centre for Radiobiology and Radiation Protection (NCRRP), which are organisations under the Ministry of Health (MH). This Ministry ensures that the monitoring of the drinking water quality - including radioactivity monitoring - is implemented according to the relevant legislation.

4.1.1 Ministry of Health

The Ministry of Health (MH) manages the national health care system and exercises state health control for ensuring health protection. To this end, it ensures compliance with the principles of radiation protection by controlling the exposure to ionising radiation.

Through its specialised units, the Ministry carries out specific functions in the field of healthcare in respect of activities using nuclear energy and ionising radiation. The state health control's role of ensuring compliance with the requirements for protecting the population against the impact of ionising radiation is carried out by the five RHIs designated by the MH and by the NCRRP.

4.1.2 Regional Health Inspectorates

The RHIs carry out on the territory of the respective districts the activities related to state health control, monitoring the factors of the living environment, and other activities with importance for the health of the population. Bulgaria has 15 RHI; five of them have laboratories with radioactivity monitoring capabilities (Burgas, Varna, Vratsa, Plovdiv and Ruse).

The RHI Haskovo implements the state health policy in the city of Haskovo and its surroundings. Among its functions is to oversee the activities of the water supply and sewerage company ViK Haskovo related to the monitoring of radioactivity in the supplied drinking water.

The radioactivity analyses of the drinking water are carried out in the laboratories of the RHI Plovdiv, which also provides their opinion and advice to the RHI Haskovo if access to the drinking water must be restricted.

4.1.3 National Centre of Radiobiology and Radiation Protection

The NCRRP carries out the state health and radiation control in nuclear facilities and at the sites of the former uranium mining industry on the territory of the whole country, as well as in facilities with sources of ionising radiation on the territory of Sofia (Stolichna district) and the districts of Sofia, Pernik, Kustendil and Blagoevgrad. The NCRRP is responsible also for the radiological monitoring in the living environment around nuclear facilities, as well as for the radionuclides content in drinking water, food and building materials on the territory of Sofia and the districts of Sofia, Pernik, Kustendil and Blagoevgrad.

The NCRRP departments carry out the following activities:

- Monitoring of the public exposure from natural and increased radiation background and assessment of the radiation risk

- Analysis of the radioactive substance content in environmental samples
- Monitoring and control of the content of radioactive substances in consumption goods, relevant for the population health (drinking water, food, building materials)
- Monitoring of the radiation background in Sofia.

With regard to drinking water in Haskovo region, the NCRRP provides methodical and expert assistance to RHI Plovdiv in the areas of radiation protection, including the radioactivity monitoring of drinking water.

4.1.4 Water Supply and Sewerage company

The state-owned¹¹ water supply and sewerage company, the ViK Haskovo supplies the drinking water to the city of Haskovo and its surroundings. It is responsible for monitoring the quality of drinking water, including the monitoring of radioactivity in 11 Bulgarian municipalities: Haskovo, Harmanli, Simeonovgrad, Lyubimets, Svilengrad, Ivaylovgrad, Madjarovo, Stambolovo, Topolovgrad, Dimitrovgrad and Mineralni Bani and in the respective rural areas.

The radioactivity monitoring programme is prepared by the ViK Haskovo in co-operation with RHI Haskovo. The implementation of this programme is carried out by the ViK Haskovo, which has an obligation to submit the monitoring results to the RHI Haskovo.

4.2 ROLES AND RESPONSIBILITIES FOR MONITORING RADIOACTIVITY IN GROUNDWATER

4.2.1 Ministry of Environment and Water

The Ministry of Environment and Water (MOEW) monitors the state policy for environmental protection. The system of competent bodies on environmental protection includes:

- Environmental Executive Agency (EEA)
- Regional Inspectorates of Environment and Water
- Basin Directorates
- National Parks Directorates.

The MOEW monitors the environment on the territory of the country, issues orders, permits, instructions and manages the National System of Environmental Monitoring (NSEM) through the EEA. The Regional Inspectorates of Environment and Water, the Basin Directorates and the National Parks Directorates ensure the implementation of the state policy on environmental protection at regional level. Their number, territorial scope, activity, functions and structure are determined by rules issued by the MOEW.

4.2.2 Environmental Executive Agency

The Environmental Executive Agency (EEA) is an administration under the MOEW. The EEA performs assessment and information functions related to the control and protection of the environment in Bulgaria.

The Agency is entrusted with the design and management of the NSEM, which includes also the national monitoring network of groundwater.

¹¹ The asset owner of the ViK Haskovo is the Ministry of Regional Development and Public Works, which is responsible for the strategies for development and management of the water supply and sanitation sector.

The network of EEA laboratories for radiological analyses consists of a central laboratory in Sofia and seven regional laboratories. All the EEA laboratories are accredited according to ISO/IEC 17025 by the EA BAS¹².

For the region of Haskovo, the EEA Haskovo regional laboratory carries out the groundwater monitoring for natural Uranium content. The gross alpha/beta analyses of groundwater are performed in the central laboratory in Sofia.

4.2.3 Basin Directorates

The management of the waters in Bulgaria takes place at the national and basin level. Four basin directorates (BD) have been established by the MOEW: BD Danube Region with its centre in Pleven, the BD Black Sea Region with its centre in Varna, the BD East Aegean Sea Region with its centre in Plovdiv, and the BD West Aegean Sea Region with its centre in Blagoevgrad. The aquatic environments in the city of Haskovo and its surroundings are managed by the Basin Directorate "East Aegean Sea Region", which is responsible for establishing the national monitoring programme for groundwater in its respective territories and informing general public of the monitoring results.

¹² Executive Agency Bulgarian Accreditation Service

5 WATER SUPPLY DISTRIBUTION NETWORK IN THE REGION OF HASKOVO

In Haskovo, the water intended for human consumption, which is supplied from a distribution network, is abstracted primarily from groundwater. The water supply system in Haskovo was modified between 2017 and 2020. Eight new water extraction facilities for the abstraction of groundwater were installed, which duplicated the number of contaminated wells (1 in supply zone (SZ) Uzundzhovo II; 3 in SZ Haskovo – East and 4 in SZ Haskovo – North).

The new water extraction facilities were commissioned at the end of 2019. Since 2020 the water is supplied by the following 4 supply zones:

- Supply Zone No 1 Haskovo North - Yabalkovo PS
- Supply Zone No 2A Haskovo South - Uzundzhovo Stage II PS
- Supply Zone No 2B Haskovo East - East Zone PS
- Supply Zone No 3 Haskovo Low Zone - Haskovo 1 PS

Currently, the water from the Yabalkovo PS is mixed in the individual water supply zones with water from two other water supply systems. By means of high pressure and pumping through three levels, the water from the Yabalkovo PS is delivered to SZ No 1 Haskovo North and SZ No 3 Haskovo Low Zone, where the water is mixed. This is intended to ensure that drinking water quality complies with the parametric values given in the legislation.

6 RADIOACTIVITY MONITORING IN THE REGION OF HASKOVO

6.1 DRINKING WATER MONITORING PROGRAMMES

6.1.1 Monitoring conducted by the water supply company

At the beginning of each year, the water supply and sewerage company ViK Haskovo, in co-operation with the RIH Haskovo puts in place the monitoring programme where the sampling locations and frequency at each water supply zone are determined. The monitoring programme was extended in 2020 and includes currently quarterly analyses for natural Uranium concentration and gross alpha/beta activity.

The staff of ViK Haskovo collects tap water quarterly at the predefined sampling points (Annex 2). The samples are sent to the external laboratory¹³ for the analyses of natural Uranium concentration, and gross alpha/beta activities. If the gross alpha activity exceeds 0,1 Bq/l or the gross beta activity exceeds 1,0 Bq/l, analyses for specific radionuclides are carried out by the external laboratory for the assessment of the Total Indicative Dose (TID). If the gross alpha/beta activities are less than 0,1 Bq/l and 1,0 Bq/l, the assumption is that the TID is less than the parametric value of 0,1 mSv and further radiological investigation is not needed.

ViK Haskovo sends the analyses results to the RIH Haskovo.

6.1.2 Monitoring conducted by the Regional Health Inspectorate

The state health control authorities check the quality of the drinking water supplied to consumers in terms of radiological indicators through a control monitoring programme. At the beginning of each year, the RHI Plovdiv draws up a delivery schedule of drinking water samples that are to be analysed in their radiochemical laboratory. This schedule is sent to the RHI-Haskovo.

The sampling points of RHI Haskovo are the same as in the monitoring programme of ViK Haskovo. Samples are taken by state health inspectors from RHI Haskovo, who have the required qualifications for the sample taking (samples of drinking water are taken from the tap). The samples and the accompanying sampling reports are then delivered to the laboratory of RHI Plovdiv for analyses of gross alpha/beta activity and concentration of natural Uranium. Consequently, the RHI Plovdiv issues an analysis report, which is forwarded to RHI Haskovo. A 'health report', checking the compliance with the regulatory requirements, is drawn up for each analysis report. When necessary, the health report provides an opinion and instructions on the need to analyse additional radionuclides to assess the indicative dose. If the gross alpha activity and the gross beta activity are respectively lower than 0,1 Bq/l and 1,0 Bq/l, it is considered that the total indicative dose is lower than the parametric value of 0,1 mSv and further radiological analyses are not necessary. If the gross alpha activity exceeds 0,1 Bq/l or the gross beta activity exceeds 1,0 Bq/l, then the indicative dose must be assessed by an external laboratory based on the activity values derived from the radionuclide identification.

In addition to the annual radioactivity monitoring programme, the RHI Haskovo arranges additional controls on the quality of drinking water when complaints and reports are received from individuals, legal entities or institutions.

¹³ ViK Haskovo has an on-site laboratory, which is not accredited for radioactivity analyses on the water samples and therefore these analyses are subcontracted to a competent ISO 17025 accredited laboratory or laboratories via public procurement.

6.2 ACTIONS IN CASE OF NON-COMPLIANCE

ViK Haskovo

If the analyses results of the water samples exceed the control limits as defined in the Ordinance No. 9, the ViK Haskovo immediately informs the RHI Haskovo, the District Governor, and the mayors of the affected municipalities. Besides informing relevant authorities, the ViK Haskovo also performs control sampling, monitoring and investigation into the causes of these discrepancies. By the decision of RHI Haskovo, the ViK Haskovo distributes the drinking water in the affected areas by means of special water carriers .

Regional Health Inspectorate (RHI) Haskovo

In case of deviations from the parametric values given in Ordinance no.9, the RHI Haskovo informs the public of any restrictions related to the use of drinking water.

If necessary, at the request of RHI Haskovo, the laboratory of RHI Plovdiv examines an additional number of samples for radiological indicators.

When the RHI Haskovo has identified a non-compliance of the quality of drinking water related to the radiological parameters, as defined in the Ordinance no. 9, the following actions are taken:

- In order to take a decision and follow-up actions, the RHI Haskovo submits all collected information (test reports – current and previous) to the Radiation Department of the RHI Plovdiv for an opinion, RHI-Plovdiv is authorised to request additional analyses for the determination of specific radionuclides.
- A working group is created to examine and discuss the available information, composed of experts from the Radiological Control department of the RHI Plovdiv together with the experts from RHI-Haskovo who know in detail the characteristics of the specific water supply area.
- After having received the results and the conclusion of RHI Plovdiv, the RHI Haskovo takes the final decision on the use of drinking water. If necessary, it limits the use of drinking water for drinking and other purposes, such as food preparation, etc.
- The RHI Haskovo issues and delivers an instruction to the water supply company with specific implementation measures.
- The RHI Haskovo gives instructions to the ViK company to carry out detailed investigation to establish the cause of the non-compliance.
- The RHI Haskovo immediately notifies the population through its official website and provides them with the necessary advice.
- The RHI Haskovo notifies local, municipal and regional administrations, the MH and the Basin Directorate of the East Aegean Sea Region (BD EASR).
- If necessary, the RHI Haskovo takes other actions to protect health.

When, after an imposed restriction, the use of drinking water is restored, RHI Haskovo notifies through its official website the users, the mayors of municipalities and affected settlements, the Regional Governor and the MH.

6.3 GROUNDWATER MONITORING

6.3.1 Monitoring conducted by the water supply company

The ViK Haskovo carries out their own monitoring - sampling and analyses of raw water from the relevant wells, catchments, boreholes, etc., according to the conditions of the water use permits for water abstraction from groundwater issued by the Director of the Basin Directorate of the East Aegean Sea Region (BD EASR). The ViK Haskovo sends all the results of the performed analyses and information about the flow rates, water levels of the water abstracting facilities to the BD EASR.

6.3.2 Monitoring conducted by the state environmental authorities

The testing of groundwater for the purposes of the NSEM is carried out under programmes developed by the Basin Directorates and approved by order of the MOEW. The EEA, structured in fifteen units, implements these programmes of the BDs. The Haskovo region falls within the scope of the territory of BD “East Aegean Sea Region” (BD EASR), which prepares a monitoring program for verifying the chemical state of groundwater.

For the region of Haskovo, 14 monitoring points are included for groundwater analysis of radiological indicators – Uranium concentration, gross alpha/beta activity and radium-226. A map in Figure 1 illustrates the sampling points for the Haskovo region. A detailed list with sampling locations and frequencies of sampling per year for radiological analyses over the last four years is given in Annex 3.

The main water source for drinking and household needs is the groundwater body (GWB) with the code BG3G00000NQ009 – Porous water in Neogene - Quaternary — Haskovo. The Monitoring program of this GWB includes 5 points, 2 of the points are located in the region of Haskovo:

- a point with a code BG3G00AHN12MP249 - Well No 1, water treatment plant-drinking-household water supply "Haskovo - 1" (under use since 2016, when it has replaced a point with a code BG3G00AHN12MP019 - Well No. 3, water treatment plant-drinking-household water supply "Haskovo -1");
- a point with a code BG3G00AHN12MP021 - Haskovo-East area, water treatment plant-drinking-household water supply - 15 Wells - Haskovo, municipality of Haskovo, region of Haskovo.

In the programs for monitoring the chemical condition of the groundwater, monitoring of radiological indicators (gross alpha-activity and gross beta-activity) started in 2010 in Well No 3, water treatment plant-drinking-household water supply "Haskovo - 1". In 2013 were included also the indicators natural Uranium and Radium 226.

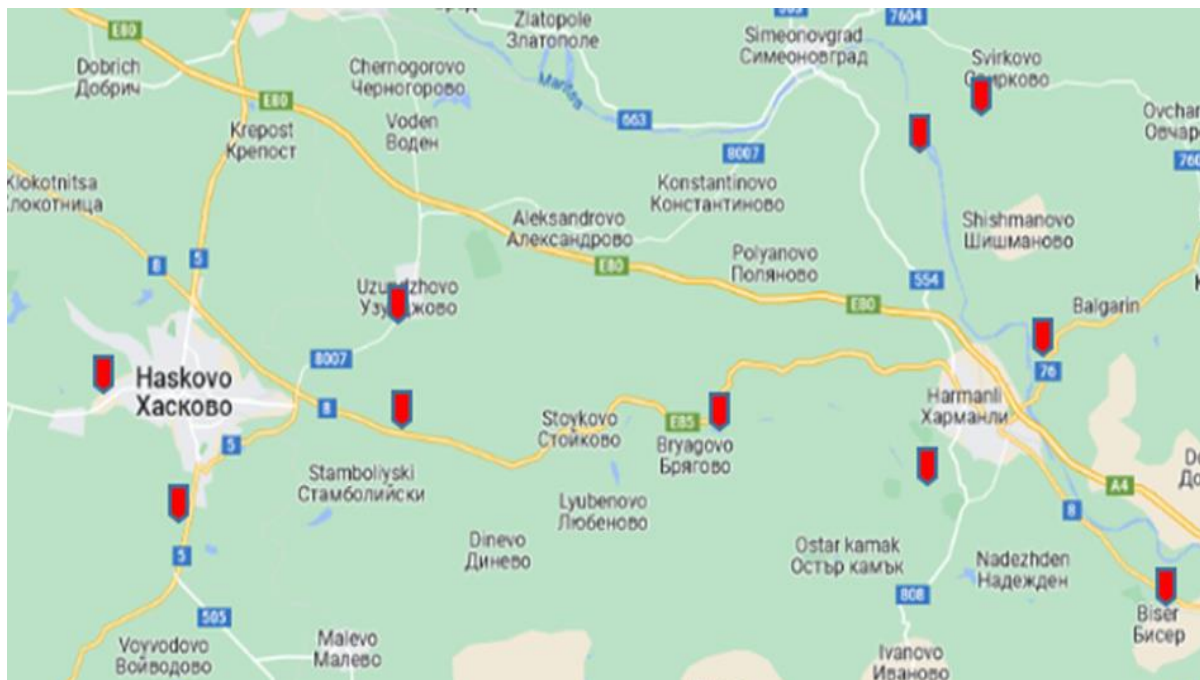


Figure 1. Map of the groundwater sampling points in the town of Haskovo and its surroundings (red markers show the approximate location of the sampling locations).

Sampling and analyses related to the national monitoring programme are carried out by the EEA Regional Laboratory of Haskovo. The analyses results are sent to the BD EASR, which assesses the status of groundwater bodies. On the website of BD EASR, information is published with data on

deviations in the quality of groundwater. Ordinance No. 1 defines the threshold value as follows: for gross alpha activity - 0,5 Bq/l; for gross beta activity - 1,0 Bq/l and for natural Uranium concentration - 0,06 mg/l.

With regard to the surface water, according to the Bulgarian authorities, there is no radiological impact expected in Haskovo. Therefore, the monitoring of Haskovska river for radiological indicators (natural Uranium, gross alpha-beta activities and Radium) was not carried out until 2022.¹⁴ Following the Order No. RD 479 of 9 June 2022 of the MOEW, a monitoring point of the Haskovska river (BG3MA00185MS0060) was included in the Monitoring Program. This monitoring point of the Haskovska river is located in the village Dinevo (the bridge before the village). The point was sampled and analysed for the radiological indicators (Uranium, gross alpha-beta activity and Radium-226) in August and October 2022, i.e. twice a year. In the new monitoring program, approved by the Order No. RD 3 of 06 January 2023 of the MOEW, the Haskovska River - Dinevo village, the bridge before the village point is included for monitoring of radiological indicators four times a year.

¹⁴ Before 2022, the closest monitoring point in the Haskovo region for surface water was located in Svilengrad, in the Maritsa River (a point with a code BG3MA01191MS0010), at which monitoring of radiological indicators (natural Uranium, gross alpha-beta activities and Radium) has been made four times per year since 2019. Until now, analyses have not shown any increase with respect to the radiological control values.

7 INFORMATION TO THE GENERAL PUBLIC

7.1 DRINKING WATER

The routine radioactivity monitoring results of the drinking water are available to the public at the official website of RHI Haskovo¹⁵, where the information on monitoring data is published every 15 days. The results of the analyses of the drinking water samples are also published on the website of RHI-Plovdiv.¹⁶

The information on the restrictions regarding the use of water for drinking and household purposes and information on the remedial actions are published under the 'News' section of the RHI Haskovo website¹⁷. The ViK Haskovo publishes the results of the radioactivity monitoring conducted by the company through their official website¹⁸.

If restrictions in using drinking water are imposed, the ViK Haskovo fulfils the instructions of RHI Haskovo and promptly informs the public on the results of the monitoring and on the restrictive measures of using drinking water. This information is published on the company's website¹⁹, in the media and by distributing the information leaflets. An announcement is also made by the mayors of the affected municipalities.

If the monitoring of water intended for human consumption indicates non-compliance with a parametric value, the RHI Haskovo notifies the public of Haskovo region and relevant authorities by taking the following actions:

- immediately notify through its official website and provides them with the appropriate advice;
- notify the mayors of municipalities and affected settlements, the latter are responsible of informing the population, with the information reaching every resident;
- notify the Regional Governor;
- notify the Ministry of Health in order to inform and indicate methodological assistance if necessary;
- within seven days, inform the BD EASR.

7.2 GROUNDWATER

Information concerning radiation monitoring on groundwater is provided by the EEA to the public through semestrial reports and a bulletin with indicated exceedances of the standard values, which are uploaded on the EEA website²⁰ and are publicly available (e.g. at this website the report²¹ is published on the groundwater monitoring for the second half of 2022, following the Order No. RD 479 of 9 June 2022).

If there are exceedances for any of the indicators, the EEA notes this in the test reports that are sent to the BD EASR.

Monthly (until the 10th of each month), the Basin Directorates publish on their websites²² the results of regular monitoring and maintain an archive with the published results for the previous twelve months. Every year, the BD EASR publishes on its website the results of a report on the state of

¹⁵ https://www.rzi-haskovo.org/?page_id=2635

¹⁶ <https://riokozpd.com/index/377-monitoring.html>

¹⁷ <https://www.rzi-haskovo.org/?cat=1>

¹⁸ <https://vikhaskovo.bg/page/48/druga-informatsiya>

¹⁹ <https://vikhaskovo.bg/news>

²⁰ <https://eea.government.bg/bg/dokladi/threemonth/>

²¹ https://eea.government.bg/bg/dokladi/threemonth/threemonth_04_2022/water/water_bul_2022.pdf

²² https://earbd.bg/SPRAVKI_ZA_PREVISHENIYa-c761

waters in the territory of the East Aegean Sea region in the respective year. A National Report on the state and protection of the environment is prepared annually and published on the website of the MOEW and the EEA.

8 SITUATION OF THE ACCESS TO DRINKING WATER IN HASKOVO BETWEEN 2017 AND 2021

8.1 BACKGROUND

In 2021, the Commission services were made aware - through the European Parliament question E-4964/2021 and the EP Petition 1361/2021 - of the situation of the residents of the city of Haskovo and the surrounding villages who have been deprived of safe access to quality drinking water. The Commission contacted the Bulgarian authorities and received more detailed information on the restrictions of using water for drinking and household purposes in the town of Haskovo and its vicinity for two periods (13.04.2017 – 18.05.2020) and (22.09.2021 – 10.11.2021).

Checks and analyses of the anthropogenic impact in the region have not revealed an industrial source of the contamination. Uranium mineralisation in the aquifers was first discovered in 1966 during drilling for water extraction in the town of Haskovo. A survey was then launched, which found Uranium mineralisation, formations and deposits in numerous zones in the Haskovo region.

The analyses carried out show that the increased concentrations are a result of natural processes. The data from the monitoring of the groundwater body from which water is extracted, at the four monitoring points, show that the increased amounts are observed only at one of the points, which, according to Bulgarian authorities, show that the increase is local in nature.

An opinion prepared by scientists from the Geology Institute at the Bulgarian Academy of Science confirms that the Uranium content in drinking water in Haskovo is due to natural factors. The increase in the concentration of natural Uranium is due to fluctuations in the level of groundwater and its exploitation.

8.1.1 Situation and measures taken in 2017

Monitoring of groundwater carried out by the EEA regional laboratory revealed that the control level of alpha activity had been exceeded and natural Uranium content was above the maximum permitted amount in water samples taken at a groundwater monitoring point (at the pumping station Haskovo-1). The follow-up actions taken by the Bulgarian authorities were the following:

- Notification of the national competent authorities and of the World Health Organisation.
- Joint actions to avoid the risk to the health of the population, consisting in restrictions of water for drinking and food preparation from 13.04.2017. ViK Haskovo was supplying water by means of special vessels (water carriers) and of bottled water.
- Studies started on the factors contributing to the identified values.
- Increased monitoring of radiological indicators in groundwater and drinking water.
- Establishment of an interdepartmental working group set up to protect public health, coordinate the actions of the competent authorities in resolving the issue and investigate the causes of the deviations identified as regards the quality of the groundwater used for Haskovo's water supply for drinking and household purposes, and of a Temporary Committee of the Bulgarian Parliament dedicated to the issue.
- Decision to modify the water supply distribution scheme, which would allow mixing water from different water supply zones to decrease the content of Uranium in the drinking water.

- Between 2019-2021, after the introduction of the new water supply scheme, the RHI Haskovo and the ViK Haskovo carried out monitoring of the drinking water at the tap across all indicators at numerous points in the city, supplemented by an assessment of the 'total indicative dose' health indicator.

Based on the results of the analyses of the samples taken that indicated compliance with the requirements, including with the 'natural Uranium content' and 'total indicative dose' indicators, a decision of the health authorities was issued on 18.05.2020 to lift the restrictions on the use of drinking water in Haskovo.

8.1.2 Situation and measures taken in 2021

The ViK Haskovo notified the RHI Haskovo on 22 September 2021 about an accident and suspension of the operation of the Yabalkovo pumping station. The accident in the Yabalkovo pumping station interrupted the mixing water from different water supply zones. Unlike in 2017, the 2021 situation was triggered by a technical accident at a pumping station and not by the increased radioactivity content of the drinking water. The follow-up actions by the Bulgarian authorities were the following:

- The RHI Haskovo instructions on 22 September 2021 restricting the use of water for drinking and household purposes in one supply zone in Haskovo, which covered several residential districts in the area.
- Supply of drinking water through dedicated recipients to the public from the affected water supply zones.
- Organisational arrangements put in place for supplying drinking water to the public in all affected water supply zones, using containers designed specifically for that purpose.
- Monitoring and analyses were carried out of drinking water at the tap in the affected water supply zones with regard to its compliance with the quality and safety requirements in accordance with the legislation in force.

At the end of October 2021 the ViK Haskovo notified of the rectification of the situation at the Yabalkovo PS and the completion of the preliminary washing and decontamination of the water supply facilities and networks by the RHI Haskovo and the ViK Haskovo.

On 10 November 2021, the restrictions were lifted by the RHI Haskovo based on the results of the analyses not indicating any deviations in the drinking water.

9 VERIFICATION ACTIVITIES

9.1 INTRODUCTION

The verification team carried out the verification activities according to the agreed programme (Annex 1). This chapter summarises the verifications carried out by the verification team. The team has assessed the monitoring arrangements based on their own expertise, following the requirements laid down in the Euratom Drinking Water Directive and the Basic Safety Standards Directive.

Prior to verification the verification team took note of information received in the framework of the European Parliament Question E-004964/2021 and Petition 1361/2021 referring the access restrictions to quality drinking water for citizens of Bulgarian town of Haskovo and nearby villages due to the increased levels of Uranium.

The outcome of the verification is expressed as follows:

- A ‘Recommendation’ is made when there is a clear need for improvement in implementing Article 35 of the Euratom Treaty. These are included in the main conclusions of the verification. The Commission requests a report on the implementation of the recommendations – lacking implementation of a recommendation can lead to a reverification.
- A ‘Suggestion’ is made when the verification team identifies an action that would further improve the quality of the monitoring.

In addition, the team may ‘commend’ particularly good arrangements, which could serve as a best practice indicator for the other EU Member States.

9.2 MONITORING PROGRAMME FOR GROUNDWATER AND DRINKING WATER IN THE REGION OF HASKOVO

The verification team reviewed the national and regional framework for monitoring radioactivity in drinking and groundwater, in particularly for the city of Haskovo and its surroundings. The team noted the following:

- In Bulgaria, a functioning system for monitoring the radioactivity of groundwater and drinking water has been introduced for the district of Haskovo. The EEA Haskovo Regional Laboratory performs the groundwater monitoring, and the BD Eastern White Sea Region supervises the implementation of the groundwater monitoring. The RHIs Haskovo and Plovdiv carry out control monitoring of the radioactivity in drinking water at the tap at the consumer.

Drinking water monitoring arrangements

- For drinking water, Bulgaria has established a monitoring programme for four water supply zones in the Haskovo region. The sampling and analyses frequencies are linked to the volume of drinking water distributed each day within each water supply zone.
- Since 2017, an increased monitoring on the drinking water is being carried out: every three months by the ViK Haskovo and twice a year by the state health control authorities (RHI Haskovo and Plovdiv).
- Regular monitoring data should be accessible to the general public via the RHI Haskovo webpage; however, at the time of the verification, there were technical issues with this webpage and not all relevant information could be accessed. After the verification, in April 2023, the Bulgarian authorities informed that the webpage is functional and provided the link to the monitoring data.

- Remedial actions are considered when there is a need to improve the quality of drinking water. This was the case following the two events of 2017 and 2021, described in chapter 8 above.
- The Bulgarian authorities appear to have taken measures to monitor, respond and remedy situations potentially posing risks to the health of the population from the affected areas – both in 2017 and 2021 and expressed a commitment to continue to regularly monitor the drinking water quality, as required by the applicable legislation. In both cases, based on the results of the analyses of samples confirming compliance with the parametric values, the temporary restrictions had been lifted.
- The monitoring data still occasionally indicate an increase in gross alpha activity in the ground and drinking water, hence the Total Indicative Dose must be evaluated to assess the health risk to the population.

Groundwater monitoring arrangements

- As regards the groundwater monitoring programme, due to the identified deviations in the gross alpha/beta-activity and natural Uranium at the monitoring points of groundwater body (BG3G00000NQ009) the analyses frequency has been increased to four samples a year for each sampling point. This will allow to follow the trends in the concentrations and the levels of radiological indicators and natural Uranium.

Public information arrangements

- There have been studies and analyses performed in Bulgaria on the anthropogenic impact in the region, which have not revealed an industrial source of the contamination. The analyses carried out show that the increased concentrations of Uranium are a result of natural processes. The increase in the concentration of natural Uranium is due to fluctuations in the level of groundwater. There was no evidence that these evaluations were made available to the public.

The verification team recommends that the Bulgarian authorities ensure that the public is adequately informed of the results of the relevant studies commissioned to assess the causes of the increased natural Uranium concentration.

Considering the persistence of anthropogenic effects in the region of Haskovo, the verification team suggests to the Bulgarian authorities to evaluate the feasibility of alternative options to the current mixing scheme that is based on diluting the content of the natural Uranium.

9.3 CAPABILITIES OF THE LABORATORIES TO MONITOR RADIOACTIVITY

9.3.1 Environmental Executive Agency regional laboratory in Haskovo

Determination of Uranium concentration in groundwater

The verification team verified the monitoring facilities of the laboratory “Instrumental Analytical Methods” at the EEA regional laboratory complex in Haskovo, where the groundwater samples from Haskovo region are analysed for natural Uranium concentration. The laboratory is accredited following the ISO17025 standard for analyses of Uranium concentration in groundwater.

Groundwater sampling is carried out by the laboratory staff. Acidified water samples accompanied with the sampling protocol are received in the reception room of the samples. At this stage the integrity of a sample and sample protocol is assessed, and the data are registered in the paper-based logbook. The laboratory is considering changing the current system to an electronic registration of incoming samples. The laboratory “Instrumental Analytical Methods” analyses about 44 groundwater samples a year for Uranium content.

The laboratory has an inductively coupled plasma mass spectrometer ICP-MS Agilent 7500 for determining the natural Uranium content in the groundwater. The system was installed in 2014 and is functional.

The verification team observed that there are operational quality control and calibration procedures in place for checking the performance and stability of the mass spectrometer.

The test reports together with the sampling protocols are submitted to the East Aegean Sea Basin Directorate. The analyses of the test results are carried out by the East Aegean River Basin Directorate. The samples are stored in the laboratory until the measurements have been completed and the results transmitted.

The verification team noted that in 2017 the number of samples analysed by the EEA laboratory in Haskovo had increased to 50 samples per month as for regular monitoring of the Uranium concentration the number of samples had been 44 samples per year. In case of an excess of samples, the laboratory in Haskovo can be supported by the central laboratory or other regional laboratories of the EEA, who have also capacity to carry out analyses for Uranium concentration, gross-alpha beta or Radium-226.

The planning for the period 2023-2024 of the EEA laboratory in Haskovo includes the participation in inter-laboratory comparison tests for determining the characteristic of natural Uranium in water.

Determination of gross alpha and beta activity in groundwater

The EEA laboratory staff of Haskovo carries out sampling of groundwater also for analyses of gross alpha-beta activity and Radium-226. These samples are delivered to Sofia for analyses of gross alpha-beta activity and Radium-226, to the EEA central laboratory, which is accredited according to the ISO17025 and possesses the analytical equipment as shown in Table 1.

Table 1. Analytical capacity of the EEA central laboratory in Sofia

Measured indicator	Standard for sample preparation and testing	Technical device
Gross alpha activity	BDS EN ISO 9696	Thermo Scientific FHT 770T Low Profile Alpha Beta Counter
Gross beta activity	BDS EN ISO 9697	Thermo Scientific FHT 770T Low Profile Alpha Beta Counter
Uranium	BDS EN ISO 17294-2	Inductively coupled plasma mass spectrometer, type ICP-MS Agilent 7500
Radium-226	BDS EN ISO 13165-2	Portable Radon monitor Alpha GUARD 2000 PRO, Genitron Instruments GmbH

The laboratory for radiation measurements in Sofia successfully participated in the interlaboratory comparisons organized by the Joint Research Center (JRC) and the International Atomic Energy Agency (IAEA), as presented in Table 2.

Table 2. EEA central laboratory in Sofia -participation in inter-laboratory comparisons

Period of participation, program, report from the organizing body	Products and indicators	Test method	Result from participation
January - May 2020 JRC-REM 2019-PT Report - November 2020	Water – mineral gross <u>alpha activity</u> gross <u>beta activity</u>	BDS EN ISO 9696:2017; BDS EN ISO 9697:2019	$ Z \leq 2$
December 2020 - March 2021 IAEA-RER7014-TC- TEL-2020-05 ALMERA Report - March 2021	Water – groundwater gross beta activity	BDS EN ISO 9697:2019	$ Z \leq 2$
July - November 2020, IAEA-TEL-2020-03 ALMERA Report - November 2020	Water - groundwater gross alpha activity gross beta activity	BDS EN ISO 9696:2017; BDS EN ISO 9697:2019	$ Z \leq 2$

The verification team reviewed the capabilities of the central EEA laboratory based on the written communications provided by the Bulgarian representatives and information given during the verification. The team did not visit the laboratory in Sofia.

No remarks

9.3.2 Laboratory of Regional Health Inspectorate Plovdiv

The verification team verified the analysis process and facilities of the RHI Plovdiv, which carries out radiochemical analyses of the drinking water samples for the city of Haskovo and its surroundings. The laboratory is accredited according to the standard ISO/IEC 17025 "General requirements for the competence of testing and calibration laboratories". It has well established procedures, work instructions and data registration in every step from the sample receipt until issuing a report with analytical results. The laboratory has 2 persons carrying out the radiochemical analyses.

Determination of Uranium in drinking water

The verification team verified the measurement method inductively coupled plasma mass spectrometer (ICP-MS), which is used to determine the Uranium content in the microgram level in drinking water. Prior to the analyses each water sample is filtrated in order to remove solid particles. The laboratory has the ICP-MS model PlasmaQuant MS in use since 2018. The measurement method developed follows the standard ISO 17294-2: 2016. The laboratory has in place an adequate quality control mechanism ensuring the stability and performance of the measurement system. The results of last interlaboratory comparison in 2018 were acceptable, within the internationally defined acceptance limits ($Z < 2$).

Determination of Gross Alpha and Beta Activities in drinking water

The verification team verified the analytical method for gross alpha-beta activity determination in drinking water samples. A two-litre water sample is evaporated to a thin layer of solid residue in a stainless-steel planchet, which is then measured with the alpha-beta-measuring station LB 2046 for the simultaneous determination of alpha and beta activities. The laboratory has currently 1 channel detector Berthold LB2046. The measurement method follows the international standard ISO 9696:2017 and the national standard BDS 12577:1975. The results of the last interlaboratory comparison related to the determination of the gross alpha-beta activity underestimated the gross alpha activity; however, the result was still within the internationally defined acceptance limits.

The verification team noted the purchase of new equipment for gross alpha-beta counting, the Mirion's LB4200 with four detectors. This equipment had been received and installed recently and

during the Art.35 verification, the laboratory was in the process to start the validation process of the new detector for accreditation.

Gamma Spectrometry

At the time of the verification, the laboratory was in the process to replace the old gamma spectrometry system with the new one. Hence, currently there are no analyses carried out for the detection of radionuclides at the radiochemical laboratory of RHI Plovdiv. The verification team saw the newly acquired High-purity Germanium (HPGe) detector from Mirion, which had recently been installed. The validation process of the new spectrometry system for the accreditation was about to start.

The verification team was informed that if the RHI Plovdiv defines a need to determine the activities of specific radionuclides, the water supply company ViK Haskovo should arrange the sampling and gamma spectrometry analyses based on the instructions issued by RHI Haskovo.

Alpha spectrometry

The verification team noted also that the RHI Plovdiv had acquired a new alpha spectrometry system 'Alpha Analyst' from Mirion along with Apex-Alpha software. Once the measurement process of this equipment has been validated for the accreditation, the laboratory will have an excellent system for measuring the isotopic composition of Uranium and other radioactive elements that decay by the emission of an alpha particle.

Currently there are only two radiochemists operating all the analytical work related to the radioactivity analyses in drinking water samples. Taking into account the persistent need to monitor and control the drinking water quality for radioactivity indicators in the Haskovo region and an increase in workload is expected when additional equipment (alpha spectrometry) is commissioned.

The verification team commends the acquisition of the new detectors for the radioactivity analyses in the laboratory of the Regional Health Inspectorate Plovdiv.

The verification team recommends that the RHI Plovdiv restores the gamma spectrometry analyses capability in the laboratory by the end of 2023.

The verification team suggests that the Regional Health Inspectorate Plovdiv finalise the procedure of accreditation of the new equipment (gamma spectrometer, low level gross alpha/beta counter and alpha spectrometer).

The verification team suggests that the Regional Health Inspectorate Plovdiv considers increasing the number of staff working in the laboratory, particularly in the context of the new equipment purchased.

9.3.3 Laboratory DIAL Ltd.

The verification team visited the private laboratory of DIAL Ltd. (<https://dial-ltd.com/bg/>), which has a contractual agreement with the water supply company ViK Haskovo to perform the radioactivity monitoring on the drinking water samples from the region of Haskovo.

The history of laboratory complex of DIAL Ltd dates back to 1965, when it started analysing the Uranium concentration for the Uranium industry as a state-owned institute. The scope of radiochemical analyses in different sample matrixes has expanded since its privatisation in 1992. In 1996, the DIAL Ltd. received its first accreditation according to the standard ISO 17025.

The verification team was informed that the DIAL Ltd. has signed a contract with ViK Haskovo for another two years to carry out the following analyses in the drinking water: Uranium concentration, gross alpha-beta activity, radionuclide identification, levels of Tritium and Radon.

As regards the radioactivity analyses on the drinking water samples, the DIAL applies the following international standards and internal procedures:

- ISO 9696 for gross alpha testing method
- ISO 9697 for gross beta testing method
- Internal validation procedure for analyses of Tritium
- ISO 13164-4 for analyses of Radon
- ISO 17294-2 for analyses of Uranium concentration
- EN ISO 10703 for determination of radionuclides

The verification team received a detailed overview on the following equipment and procedures that the DIAL Ltd can use for analyses of radioactivity in the drinking water samples from the Haskovo region:

- Liquid Scintillation Counting-Perkin Elmer for radon and tritium analyses
- Alpha Guard for Radon
- Canberra Tennelec Series S low level alpha-beta activity counter with a automated sampler holder for 50 samples.
- Alpha Spectrometry
- ICP-MS PlasmaQuant MS
- 3 spectroscopy systems with different detector efficiencies are used for radionuclide identification

If the analyses of alpha-beta activities indicate increase in parametric values, on the request of ViK Haskovo, the laboratory DIAL Ltd. is in position to identify additional radioisotopes using their gamma-spectrometry system and provide service to assess the Total Indicative Dose.

The verification team ascertained that the radioactivity analyses provided by the DIAL Ltd. to the ViK Haskovo are carried out following the high-quality standards and working procedures. The stability and performance of detectors is regularly verified following the well-established quality control procedures.

No remarks

10 CONCLUSIONS

All planned verification activities were completed successfully. The information supplied in advance of the visit, as well as the additional documentation received during and after the verification activities was useful.

The evaluation of the information provided and the findings of the verification gave rise to the following conclusions:

- (1) Overall, the radioactivity monitoring programmes and facilities related to the drinking water and groundwater monitoring in the city of Haskovo and its surroundings are in line with the requirements of Article 35 of the Euratom Treaty. Bulgaria has put in place a functional monitoring system for monitoring the radioactivity in drinking water and groundwater.
- (2) The verification activities found that, in case the monitoring results of drinking water indicate non-compliance with a parametric value, the Bulgarian authorities have in place a structured interorganisational communication for investigating, as well as for taking measures and actions for protecting human health from a radiation protection point of view.
- (3) A number of recommendations and suggestions have been formulated in this report. The conclusions of the verification, including the recommendations made are also set out in the 'Main Conclusions' document addressed to the Bulgarian competent authorities. They concern in particular the information to the general public and laboratory equipment.
- (4) The Commission services request the Bulgarian authorities to submit, before end of 2024, a report on how the team's recommendations have been implemented and, subsequently, as appropriate, on any significant changes in the set-up of the monitoring system. Based on this reporting, the Commission will consider the need for a follow-up verification in Bulgaria.
- (5) The verification team acknowledges the very good cooperation it received from all persons involved in the activities it undertook during its visit.

Annex 1

VERIFICATION PROGRAMME

EURATOM ARTICLE 35 VERIFICATION IN BULGARIA (HASKOVO)

6 – 8 December 2022

Tuesday 6 December

- 09:00 **Opening meeting**
(Regional Laboratory of ExEA in Haskovo, 6300 Haskovo, Dobrudzha St., 14)
- Welcome address
 - European Commission Art. 35 verification programme introduction
 - Verification planning
- Overview of the radioactivity monitoring arrangements of the drinking and ground water in the city of Haskovo and its surrounding area**
- Summary of the exchanges with the Bulgarian authorities on the situation of drinking water in Haskovo
 - Review of events and radiological indicators in 2017 and 2022
 - Water supply system in Haskovo
 - Groundwater monitoring
 - Drinking water monitoring (discussion continues in day 2 in Plovdiv)
 - Public information arrangements
- 14:00 **Groundwater radioactivity monitoring capabilities in Haskovo at the Regional Laboratory of ExEA**
- Laboratory introduction
 - Laboratory equipment
 - Sampling equipment

Wednesday 7 December

- 09:00 **Drinking water radioactivity monitoring capabilities in Haskovo**
(Regional Health Inspectorate (RHI), Plovdiv, Perushtitsa St., 1)
- Structure and responsibilities of the RHI Plovdiv
 - Discussions on the drinking water monitoring in the Haskovo region
 - Public information arrangements
 - Presentation on the laboratory activities related to the drinking water monitoring at the RHI Plovdiv
 - Determination of the Total Indicative Dose
- 14:00 **Drinking water radioactivity monitoring capabilities in Haskovo**
(Regional Health Inspectorate (RHI), Plovdiv, Perushtitsa St., 1)
- Laboratory introduction
 - Laboratory equipment
 - Sampling equipment

Thursday 08 December

- 09:30 **Drinking water radioactivity monitoring by the water supplier**
(DIAL, 1830, Sofia-Buhovo, Mina Buhovo St., 111)
- Laboratory introduction
 - Laboratory equipment

- Sampling equipment
- Determination of the Total Indicative Dose

12:30

Closing meeting

(Ministry of Health, Sofia 1000, St. Nedelya Sq., 5)

Annex 2: Drinking water sampling points for ViK Haskovo and RHI Haskovo

Water supply zone	Municipality	Location	Sampling point (address and site of sampling)
ZONE 1 "Haskovo-North"	Haskovo	Haskovo town	Orfey residential complex, the building of Water supply and sewerage
Pumping Station "YABALKOVO"	Haskovo	Haskovo town	Republika residential complex, Café aperitif "Nikol"
Pumping Station "HANCHETO"	Haskovo	Haskovo town	Badema quarter, Café aperitif "Antik"
Pumping Station "NORTH ZONE"	Haskovo	Haskovo town	Kaufland hipermarket
Pumping Station "IZVORA"	Haskovo	Haskovo town	Druzhiba quarter 1- Café aperitif "Victoria"
	Haskovo	Haskovo town	Kuba quarter – Detelina Supermarket
	Haskovo	Haskovo town	Poroyni quarter-Bakery, Madara Street
	Haskovo	Haskovo town	Kamenni quarter, Meat shop
ZONE 2 A "Haskovo-South"			
Pumping Station "Uzundzhovo stage II"	Haskovo	Haskovo town	Hisarya quarter, Peshtera Street
	Haskovo	Haskovo town	Prohlada Street, Grocery store
Pumping Station "East Zone"			
	Haskovo	Haskovo town	"Voevodski" quarter, "Stankov" shop
	Haskovo	Haskovo town	Central part, Bakery "Manolov"
	Haskovo	Haskovo town	L.Karavelov residential complex, Banska Street, Grocery store
Zone 3 "Haskovo-low zone"			
Pumping Station HASKOVO NO. 1			
Pumping Station "YABALKOVO"	Haskovo	Haskovo	Kenana residential complex fountain behind Kenana Restaurant
Pumping Station "HANCHETO"			
Pumping Station "NORTH ZONE"	Bolyarovo	Haskovo	Bolyarovo quarter – 'Milev' Grocery store
Pumping Station "IZVORA"	Haskovo	Vaglarovo	Grocery store, private residence
ZONE 2 B "Haskovo East"	Haskovo	Haskovo town	'Practis' Store
Pumping Station "East Zone"	Haskovo	Podkrepa village	Grocery store on the square, private residence
	Haskovo	Stamboliyski village	Grocery store on the square, private residence

Annex 3: Groundwater monitoring programme of BD EASR 2018-2021 from the area of the town of Haskovo,

No.	European point code	Name of point according to database	Latitude	Longitude	Radiological indicators	Samples per year, according to the orders of the Ministry of Environment and Water			
						RD-175/ 02.04.2018	RD-230/ 28.03.2019	RD-267/ 03.04.2020	RD-602/ 09.06.2021
1	BG3G00AHN12MP249	Haskovo, Drilling No. 1, Monitoring of groundwater bodies Haskovo - 1	41°56' 07,5"	25°32'14,7"	α, β, U, Ra-226	4	4	4	4
2	BG3G00AHN12MP021	Haskovo-East zone, Monitoring of groundwater bodies - 15 , Drillings	41°55'17,8"	25°39'6,5"	α, β, U, Ra-226	1	4	4	4
3	BG3G0000AQHMP022	Брягово, ПС - 3 Кладенеца + 6 Сондажа	41°55'23,5"	25°47'40,6"	α, β, U, Ra-226	-	1	4	4
4	BG3G000000NMP023	Uzundzhovo, Monitoring of groundwater bodies - new	41°57'15,5"	25°39'16,9"	α, β, U, Ra-226	4	4	4	4
5	BG3G0000AQHMP024	Strandzhevo (Madjarovo), shaft well	41°38'60,0"	25°46'17,0"	α, β, U, Ra-226	-	1	-	-
6	BG3G0000AQHMP025	Strandzhevo (Madjarovo), drainage	41°38'60,0"	25°46'17,0"	α, β, U, Ra-226	-	1	-	-
7	BG3G0000AQ2MP027	Simeonovgrad, Monitoring of groundwater bodies – Well	42°0'11,5"	25°52'54,8"	α, β, U, Ra-226	4	1	4	4
8	BG3G0000AQ3MP035	Skobelevo, Monitoring of groundwater bodies – Well	42°05'35,5"	25°22'39,4"	α, β, U, Ra-226	1	4	4	4
9	BG3G000000NMP266	Bisser, Monitoring of groundwater bodies ‘Harmanli’ section Bisser – TK No. 8	41° 52' 26,3"	25°59'13,7"	α, β, U, Ra-226	-	-	4	-
10	BG3G000000QMP267	Balgarin, Monitoring of groundwater bodies ‘Balgarin’ - shaft well No. 1	41° 56' 39,8"	25°55'57,8"	α, β, U, Ra-226	-	-	4	4
11	BG3G0000PG2MP088	Haskovo, Drillings of the State Committee of Geology and Mineral Resources on the Speed Track	41°54'00,4"	25°33'18,4"	α, β, U, Ra-226	-	1	-	4
12	BG3G0000PTMP198	Harmanli, Spring ‘Prikazkite’	41° 54' 31,0"	25°53'00,8"	α, β, U, Ra-226	-	1	1	4
13	BG3G00000PGMP271	Borislavtsi, Monitoring of groundwater bodies ‘Borislavtsi’ - shaft well with drainage	41° 39' 57,6"	25°55'46,2"	α, β, U, Ra-226	-	-	4	4
14	BG3G00000PTMP276	Svirkovo, Monitoring of groundwater bodies ‘Svirkovo’ - TK	42°00'55,7"	25°54'21,7"	α, β, U, Ra-226	-	-	-	4