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Radiation protection

TECHNICAL REPORT

VERIFICATIONS UNDER THE TERMS OF ARTICLE 35 OF THE EURATOM TREATY

Environmental radiological monitoring in Latvia

10 to 13 June 2014

Reference: LV 14-01

VERIFICATIONS UNDER THE TERMS OF ARTICLE 35

OF THE EURATOM TREATY

SCOPE	National monitoring network for environmental radioactivity
LOCATIONS	Riga, Baldone, Ķekava, Jelgava, Jurmala, Talsi, Salaspils
DATES	10-13 June 2014
REFERENCE	LV 14-01
TEAM MEMBERS	V. TANNER (team leader) A. RYAN T. TOLLEFSEN
REPORT DATE	20 January 2015

SIGNATURES

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ABBREVIATIONS

AGM	Automatic Gamma Monitoring
AMS	Automatic Monitoring Station
BIOR	Institute of Food Safety, Animal Health and Environment
EC	European Commission
EU	European Union
EURDEP	European Radiological Data Exchange Platform
FVS	Food and Veterinary Service
FWHM	Full Width at Half Maximum
HELCOM	Helsinki Commission
IAEA	International Atomic Energy Agency
ILC	Inter-Laboratory Comparison
LEGMC	Latvian Environmental, Geological and Meteorological Centre
PMS	Permanent Monitoring Station
RSC	Radiation Safety Centre

1 INTRODUCTION

Article 35 of the Euratom Treaty requires that each Member State shall establish the facilities necessary to carry out continuous monitoring of the levels of radioactivity in air, water and soil and to ensure compliance with the Basic Safety Standards[1]. Article 35 also gives the European Commission (EC) the right of access to such facilities in order that it may verify their operation and efficiency. The Radiation Protection unit (ENER D.3) of the EC's Directorate-General for Energy (DG ENER) is responsible for undertaking these verifications.

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

- Liquid and airborne discharges of radioactivity into the environment by a site (and control thereof).
- 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.

Taking into account previous bilateral protocols, a Commission Communication[2] was published in the EU Official Journal on 4 July 2006 describing practical arrangements for the conduct of Article 35 verification visits in Member States. The Commission follows this communication when carrying out verifications.

2 PREPARATION AND CONDUCT OF THE VERIFICATION

2.1 PREAMBLE

The EC's decision to conduct an Article 35 verification was notified to the Latvian Government by a letter addressed to the Latvian Permanent Representation to the European Union. The Latvian Government subsequently designated the Latvian Environmental, Geological and Meteorological Centre (LEGMC) to lead the preparations for this visit.

2.2 DOCUMENTS

In order to facilitate the work of the verification team, a package of information was supplied in advance by the national authorities. Additional documentation was provided during and after the visit. The information thus provided has been extensively used for drawing up the descriptive sections of the report.

2.3 PROGRAMME OF THE VISIT

The EC and the LEGMC discussed and agreed upon a programme of verification activities, with due respect to the Commission Communication of 4 July 2006 setting out practical arrangements for the conduct of Article 35 verification visits. The verifications were carried out in accordance with the programme in Appendix 1.

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1 Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation (OJ L-159 of 29/06/1996) which will be superseded by 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 of 17.1.2014, p. 1)

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, p. 2–5).

During the opening meeting an outline presentation of the situation with regard to environmental radioactivity monitoring in Latvia was given. Subsequently presentations were given by the following entities during the course of the verification visit:

- LEGMC - legal framework, monitoring programmes and description of the national radioactive waste near-surface repository "Radons" site
- Institute of Food Safety, Animal Health and Environment (BIOR) - overview of activities and main tasks.

The verification team notes the quality and comprehensiveness of all presentations made and documentation provided.

The following representatives of the national authorities and other parties involved were met:

Ministry of the Environmental Protection and Regional Development and its subordinated institutions

Ms Zita Cerepenko	Ministry of the Environmental Protection and Regional Development, Senior Officer, Department of Environmental Protection
Mr Marcis Slavinskis	Radiation Safety Centre of State Environment Service, Director
Mr Voldemars Polis	Radiation Safety Centre of State Environment Service, Deputy Director / Head of the Inspection Division
Ms Arija Berzina	Radiation Safety Centre of State Environment Service, Head of the Early Warning Sector
Mr Andris Abramenkovs	State Limited Liability Company "Latvian Environmental, Geological and Meteorological Centre", Leading Analyst
Ms Gita Rutina	State Limited Liability Company "Latvian Environmental, Geological and Meteorological Centre", Legal Advisor
Ms Valentina Malecka	State Limited Liability Company "Latvian Environmental, Geological and Meteorological Centre", Head of Laboratory department
Ms Vita Slanke	State Limited Liability Company "Latvian Environmental, Geological and Meteorological Centre", International Relations Specialist
Ms Inita Stikute	State Limited Liability Company "Latvian Environmental, Geological and Meteorological Centre"
Ms Aija Grivite	State Limited Liability Company "Latvian Environment, Geological and Meteorological Centre", Leading nuclear engineer of the national radioactive waste near-surface repository "Radons"

Ministry of Agriculture and its subordinated institutions

Mr Vadims Bartkevics	The Institute of Food Safety, Animal Health and Environment - "BIOR", Head of food Environmental Investigations Laboratory
Ms Jelizaveta Cernihovica	The Institute of Food Safety, Animal Health and Environment - "BIOR", Senior Expert
Ms Tatjana Garanca	Food and Veterinary Service, Deputy Director of Border Control Department in food and non-food products border control issues
Ms Sarmite Spigere	Food and Veterinary Service

Ministry of Health

Ms Anita Seglina	Senior expert of the Division of Environmental Health of the Public Health Department

University of Latvia

Mr Janis Rudzitis	Institute of Chemical Physics, Administrator of Salaspils Research Reactor complex, scientist
Ms Gunta Kizane	Institute of Chemical Physics, Head of Laboratory of Radiation Chemistry of Solids, leading scientist

Dozimetrs Ltd.

Dzintars Zarins	General Manager

3 MONITORING PROGRAMMES AND ORGANISATIONS RESPONSIBLE

3.1 INTRODUCTION

The overall responsibility for environmental radioactivity monitoring in Latvia is under the Ministry of Environmental Protection and Regional Development. The ministries and organisations involved in the current Latvian national environmental radioactivity monitoring programme, radiological surveillance of foodstuffs and emergency preparedness are summarised in the table below.

	Programme	Ministries and organisations in charge of the programme	Laboratories/services
1.	Environmental radioactivity monitoring	***The Ministry of Environmental Protection and Regional Development*** The Radiation Safety Centre (RSC) of the State Environment Service	Monitoring stations
		The Ministry of Environmental Protection and Regional Development State Limited Liability Company "Latvian Environmental, Geological and Meteorological Centre (LEGMC)	Environmental laboratory
2.	Radiological surveillance of food stuffs	***The Ministry of Agriculture*** Food and Veterinary Service (FVS)	Institute of Food Safety, Animal Health and Environment (BIOR)
3.	Nuclear and radiological emergency preparedness	***The Ministry of the Interior*** The State Fire-Fighting and Rescue Service	First responders
		The Ministry of the Environmental Protection and Regional Development The Radiation Safety Centre (RSC) of the State Environment Service	First responders, field assistance teams

3.2 RADIATION SAFETY CENTRE

The Radiation Safety Centre (RSC) of the State Environment Service (supervising body of the Ministry of Environmental Protection and Regional Development) operates the monitoring stations (early warning monitoring system) and ensures the exchange of information in accordance with the requirements of international agreements related to radiation safety and nuclear safety.

3.3 LATVIAN ENVIRONMENTAL, GEOLOGICAL AND METEOROLOGICAL CENTRE

The State Limited Liability Company "Latvian Environmental, Geological and Meteorological Centre" (LEGMC) coordinates and organises environmental radiation monitoring. LEGMC is in charge of monitoring airborne radioactivity, radioactivity in soil, water and in the marine environment. LEGMC reports annually to the European Commission on environmental radiation monitoring and control of radioactivity in foodstuffs. Regarding these delegated responsibilities LEGMC is supervised by the Ministry of the Environmental Protection and Regional Development.

3.4 RADIOLOGICAL SURVEILLANCE OF FOODSTUFFS

For monitoring of foodstuffs the overall responsibility lies with the Ministry of Agriculture, which has delegated the work to the Food and Veterinary Service (FVS). FVS is responsible for organising the radioactivity monitoring for foodstuffs and providing this information to the RSC. Laboratory and diagnostic investigations related to radiological monitoring of foodstuffs are performed by the Institute of Food Safety, Animal Health and Environment (BIOR), which is a public research institute.

3.5 NUCLEAR AND RADIOLOGICAL EMERGENCY PREPAREDNESS

For the nuclear and radiological emergency preparedness the responsibility lies with the Ministry of the Interior and the Ministry of the Environmental Protection and Regional Development. RSC, in co-operation with the State Fire-Fighting and Rescue Service, are the competent authorities for readiness and first responders in case of emergencies in places where activities with sources of ionising radiation are performed.

4 LEGAL FRAMEWORK FOR ENVIRONMENTAL RADIOACTIVITY MONITORING IN LATVIA

4.1 ENVIRONMENTAL RADIOACTIVITY MONITORING

Latvia has comprehensive legislation in the area of radiation and nuclear safety. The main national legal acts regulating environmental radiation monitoring are:

- Law on Radiation Safety and Nuclear Safety (23 November 2000.);
- Regulations for Protection against Ionising Radiation (Regulation No.149, 9 April 2002.);
- Procedures for Licensing Activities with Sources of Ionising Radiation Cabinet (Regulation No.723, 20 September 2011);
- Requirements for Operations with Radioactive Waste and Materials Related Thereto (Regulation No 129, 19 March 2002);
- Statute of State Environment Service (Regulation No.962, 23 November 2004);
- Cabinet Order No 448 "On liquidation of State Agency "Latvian Environmental, Geological and Meteorological Agency" and State Hazardous Waste Management Agency and establishment of State Limited Liability Company "Latvian Environmental, Geological and Meteorological Centre" (1 July 2009);
- Cabinet Order No 130 "Environmental Policy Strategy 2014-2020" (26 March 2014).

Apart from legal documents specific to radiation and nuclear safety there is a set of other legal acts dealing with environmental protection, which also have an impact on the monitoring of radioactivity in the environment:

- Environmental Protection Law (28 December 2006);
- Law on Environmental Impact Assessment (3 December 1998.);

- Procedures for the Environmental Impact Assessment of an Intended Activity (Regulation No. 83, 25 January 2011).

In addition to national legal requirements, the following important documents are relevant to environmental radioactivity monitoring:

- Treaty establishing the European Atomic Energy Community (Euratom);
- 2000/473/EURATOM: Commission Recommendation of 8 June 2000 on the application of Article 36 of the Euratom Treaty concerning the monitoring of the levels of radioactivity in the environment for the purpose of assessing the exposure of the population as a whole;
- 90/143/EURATOM: Commission Recommendation of 21 February 1990 on the protection of the public against indoor exposure to radon;
- 2001/928/EURATOM: Commission Recommendation of 20 December 2001 on the protection of the public against exposure to radon in drinking water supplies;
- 96/29/EURATOM: Council Directive of 13 May 1996 laying down basic safety standards for the health protection of the general public and workers against the dangers of ionising radiation;
- Environmental and Source Monitoring for Purposes of Radiation Protection, IAEA Safety Guide, No. RS-G-1.8;
- HELCOM Recommendation 26/3, Monitoring of radioactive substances;
- HELCOM Recommendation 19/3, Manual for the Marine Monitoring in the COMBINE programme of HELCOM;
- Convention on the Protection of the Marine Environment of the Baltic Sea Area (HELCOM, 1992).

4.2 RADIOLOGICAL SURVEILLANCE OF FOODSTUFFS

The main national legal acts regulating radiological surveillance of foodstuffs and feeding stuff are:

- Law on Radiation Safety and Nuclear Safety (23 November 2000.);
- Regulations for Protection against Ionising Radiation (Regulation No.149, 9 April 2002);
- Mandatory Safety and Quality Requirements for Drinking Water, and the Procedures for Monitoring and Control Thereof (Regulation No.235, 29 April 2003);
- Regulations Regarding the Radiometric Control of Goods and Vehicles at the State Border (Regulation No.233, 5 April 2005);
- Mandatory safety requirements for food products treated with ionising radiation, and additional requirements for labelling such products (Regulation No.323, 20 April 2004).

Other documents:

- Measurement of Radionuclides in Food and the Environment: a Guidebook, IAEA Technical Reports Series No 295;
- Council Regulation (Euratom) No 3954/87 of 22 December 1987 laying down maximum permitted levels of radioactive contamination of foodstuffs and of feeding stuffs following a nuclear accident or any other case of radiological emergency;
- Council Regulation (EC) No 733/2008 of 15 July 2008 on the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power station;

- Commission Regulation (EC) No 1609/2000 of 24 July 2000 establishing a list of products excluded from the application of Council Regulation (EEC) No 737/90 on the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power station;
- Commission Regulation (EC) No 1635/2006 of 6 November 2006 laying down detailed rules for the application of Council Regulation (EEC) No 737/90 on the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power-station;
- Commission Implementing Regulation (EU) No 322/2014 of 28 March 2014 imposing special conditions governing the import of feed and food originating in or consigned from Japan following the accident at the Fukushima nuclear power station;
- Directive 1999/2/EC of the European Parliament and of the Council of 22 February 1999 on the approximation of the laws of the Member States concerning foods and food ingredients treated with ionising radiation;
- Directive 1999/3/EC of the European Parliament and of the Council of 22 February 1999 on the establishment of a Community list of foods and food ingredients treated with ionising radiation;
- IAEA-TECDOC-1092 "Generic procedures for monitoring in a nuclear or radiological emergency", IAEA, June, 1999.

4.3 NUCLEAR AND RADIOLOGICAL EMERGENCY PREPAREDNESS

The main national legal acts regulating nuclear and radiological emergency preparedness are:

- Law on Radiation Safety and Nuclear Safety (23 November 2000.);
- Requirements for Preparedness for Radiological Emergency and Actions in the Event of Such Emergency (Regulation No.152, 8 April 2003);
- Procedures for Licensing Activities with Sources of Ionising Radiation, Regulation No.723, adopted 20 September 2011);
- Regulations for Protection against Ionising Radiation (Regulation No.149, 9 April 2002);
- By-law of the State Fire-fighting and Rescue Service (Regulation No.398, 27 April 2010);
- Cabinet Order No 369 "State Civil Protection Plan" (9 August 2011).

Other documents:

- Council Decision 87/600/Euratom of 14 December 1987 on Community arrangements for the early exchange of information in the event of a radiological emergency.

5 ENVIRONMENTAL RADIOACTIVITY MONITORING IN LATVIA

5.1 INTRODUCTION

Environmental radioactivity monitoring is performed according to the National Environmental Programme, which was accepted by the Ministry of Environmental Protection and Regional Development on 19.04.2010 (Order No.121 "Environmental Monitoring Programme"). This programme determines the monitoring network, parameters, regularity and methods. It is implemented and organised by institutions supervised by the Ministry of Environmental Protection and Regional Development - RSC, LEGMC, the Latvian Institute of Aquatic Ecology and the Nature Conservation Agency.

The programme is divided in four chapters: air, water, soil and biodiversity. Environmental radioactivity monitoring is included in these chapters. The environmental radioactivity monitoring network has been slightly reduced due to financial reasons and considering that closing the Ignalina nuclear power plant reduces the risk of a radiation emergency.

In 2014 a new Environmental Policy Strategy 2014-2020, including the environmental monitoring programme strategy, was accepted. In compliance with this strategy a new environmental monitoring programme will be developed.

Monitoring of foodstuffs and feeding stuff is implemented in accordance with the radiation safety programme under the responsibility of the FVS.

Operators who have a special permit (licence) to perform activities with sources of ionising radiation are responsible for radiation safety, nuclear safety and also for implementing site specific radioactivity monitoring. Chapter 6 provides information on monitoring programmes carried out by operators, in so far as this is relevant to the verification mission.

5.2 EXTERNAL GAMMA DOSE RATE MONITORING

The first early warning monitoring system purchase and installation in Latvia was carried out in 1992. Modernisation of the radiation monitoring system took place in 2013 and early 2014; thus the description of the external gamma dose monitoring system in Latvia is divided in two sections in this report.

Until 2014 the radiation monitoring system included 17 gamma monitoring stations:

- 9 automatic gamma monitoring stations (AGM) equipped with FHZ 621 GL broadband detectors, which only provided the radiation dose rate. They were also fitted with a rain sensor that showed the presence or absence of precipitation.
- 7 permanent (spectrometric) monitoring stations (PMS) equipped with FHZ 621 GL broadband detectors, which determined the gamma radiation dose rate. In addition, there was an automatic NaI-spectrometer and probes for measuring the volume of rainfall and the outside temperature.
- 1 automatic aerosol radioactivity on-line monitoring station ABM (FHT-59-Si), which monitored the alpha and beta specific radioactivity of radionuclides present in the air.

The locations of the monitoring stations until 2014 were as follows:

No	Location	Station	Latitude	Longitude	Assessed parameters	Rain sensor (S) or measurement (M)
1.	Demene	AGM	55°44.1′	26°31.9′	γ-dose rate	S
2.	Rucava	AGM	56°09.6′	21°10.2′	γ-dose rate	S
3.	Madona	AGM	56°51.3′	26°13.6′	γ-dose rate	S
4.	Reekne	AGM	56°30.3′	27°20.2′	γ-dose rate	S
5.	Salacgriva	AGM	57°45.6′	24°22.0′	γ-dose rate	S
6.	Salaspils	AGM	56°51.2′	24°20.9′	γ-dose rate	S
7.	Ventspils	AGM	57°23.2′	21°32.9′	γ-dose rate	S
8.	Talsi	AGM	57°14.7′	22°35.4′	γ-dose rate	S
9.	Jekabpils	PMS	56°31.1′	25°55.9′	γ-dose rate	M
10.	Valmiera	PMS	57°32.0′	25°25.0′	γ-dose rate	M
11.	Liepaja	PMS	56°30.8′	21°01.2′	γ-dose rate	M
12.	Balvi	PMS	57°07.8′	27°16.2′	γ-dose rate	M
13.	Daugavpils	PMS	55°52.2′	26°31.8′	γ-dose rate	M
14.	Baldone	PMS	56°45.7′	24°19.0′	γ-dose rate	M
15.	Jurmala	PMS	56°57.8′	23°49.6′	γ-dose rate	M
16.	Daugavpils	AGM	55°52.8′	26°32.4′	γ-dose rate	S
17	Daugavpils	ABM	55°87′	26°53′	α, β radioactivity	---

Figure 1. Monitoring stations of the 'old' network

In 2014 a project which aimed to modernise the Latvian radiation monitoring system was carried out with support from the EU Cohesion fund and the IAEA Technical cooperation programme. During the project old monitoring stations were completely replaced by new spectrometric monitoring stations and a new set of hardware and software was installed in the network data centre. As a result, currently 24 new stations are operational throughout the territory of Latvia. There are 20 new stationary spectrometric monitoring stations (AMS), one portable spectrometric station, one aerosol monitoring station and two water monitoring stations.

The general technical specifications of the AMS are as follows:

	Aerosol AMS	**Water AMS**
Total weight (kg)	25	120
Dimensions (mm)	400x400x250	1000x1500x330
Power supply	1/N/PE AC 230V	1/N/PE AC 230V
Input power	60VA/7,8w (when using battery)	600VA
Backup power supply	Battery source for 72 hours	-
Frequency	50Hz	50Hz
Shielding (according to the IEC 60529)	IP 65	IP 54
Maximum relative humidity	100%	95%
Operation temperature (^{o}C)	-10 ÷ +60	-10 ÷ +50
Communication	GSM/GPRS/EDGE	GSM/GPRS/EDGE

Continuous measuring mode provides information about gamma dose rate in the environment. An alarm is received every time dose rate exceeds the limit set according to early warning standards. It allows detection of trans boundary radioactive contamination and estimates the gamma radiation dose received by the population.

These stations have been installed at the following locations:

No	**City**	**Monitoring station (AMS)**	**Latitude**	**Longitude**	**Assessed radionuclides**
1.	Demene	Spectrometric AMS	55.7304	26.5335	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
2.	Daugavpils	Spectrometric AMS	55.8971	27.1548	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
3.	Daugavpils	Spectrometric AMS	55.8664	26.5338	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
4.	Daugavpils	Spray AMS	55.8971	27.1548	^{239}Pu, ^{60}Co, ^{137}Cs, $\sum\alpha$, $\sum\beta$, Gamma, Other (Bq/m^3), Dose rate (nSv/h)
5.	Medumi	Spectrometric AMS	55.7676	26.3386	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
6.	Silene	Spectrometric AMS	55.7486	26.7815	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
7.	Rezekne	Spectrometric AMS	56.502	27.3365	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)

No	City	Monitoring station (AMS)	Latitude	Longitude	Assessed radionuclides
8.	Balvi	Spectrometric AMS	57.1239	27.2633	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
9.	Madona	Spectrometric AMS	56.8502	26.2246	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
10.	Valmiera	Spectrometric AMS	57.5362	25.418	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
11.	Salacgriva	Spectrometric AMS	57.7545	24.3652	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
12.	Riga	Spectrometric AMS	56.9653	24.1032	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
13.	Jurmala	Spectrometric AMS	56.9635	23.8259	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
14.	Kekava	Water AMS	56.9675	24.1299	^{40}K (CPS), ^{214}Pb, ^{214}Bi, ^{60}Co, ^{131}I, ^{137}Cs (Bq/m^3), Dose rate (nSv/h)
15.	Salaspils	Spectrometric AMS	56.8701	24.3871	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
16.	Baldone	Spectrometric AMS	56.7394	24.3003	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
17.	Baldone	Spectrometric AMS	56.7634	24.3276	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
18.	Jelgava	Spectrometric AMS	56.6558	23.7109	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
19.	Talsi	Spectrometric AMS	57.2467	22.5873	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
20.	Liepaja	Spectrometric AMS	56.5128	21.0152	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
21.	Ventspils	Spectrometric AMS	57.3947	21.5862	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
22.	Rucava	Spectrometric AMS	56.1628	21.1747	^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)
23.	Kraslava	Water AMS	56.9681	24.1464	^{40}K (CPS), ^{214}Pb, ^{214}Bi, ^{60}Co, ^{131}I, ^{137}Cs (Bq/m^3), Dose rate (nSv/h)

No	City	Monitoring station (AMS)	Latitude	Longitude	Assessed radionuclides
24.	Riga	Mobile Spectrometric AMS			^{40}K (CPS), ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo (Bq/m^3), Dose rate (nSv/h)

Figure 2. Monitoring stations of the 'new' network

5.3 AIR MONITORING

5.3.1 Air samplers

There is one automatic air filter station located in the national radioactive waste near-surface repository "Radons" in Baldone. LEGMC maintains the station. Analytical laboratory methods are used to determine ^{137}Cs and ^{7}Be radionuclide specific radioactivity in aerosol filters. If necessary (i.e. nuclear accident), activated carbon filters can be contaminated by radioiodine ^{131}I and this radioactivity can be determined in the laboratory. If ^{137}Cs specific radioactivity exceeds 0.3 Bq/m^3, ^{90}Sr and other radionuclides are measured.

Air sampling is performed using a Snow White (JL-900) sampler with the following parameters: Filter type: Whatman GF/A; Productivity: 900 m^3/h; Filter size: 530 mm x 420 mm. Sampling is carried out for one week, 4 times per year.

LEGMC carries out aerosol radioactivity monitoring as shown below:

No	Position	Latitude	Longitude	Frequency	Radionuclides assessed
1	"Radons" in Baldone	56.76345	24.328156	4 /year	^{7}Be, ^{137}Cs, ^{40}K, ^{232}Th, ^{238}U, iodine radionuclides, and other gamma radionuclides

5.3.2 Dry/wet deposition collectors

Radioactivity monitoring using dry/wet deposition collectors is implemented in operator controlled zones, not within the framework of national environmental monitoring programme.

5.4 Water monitoring

5.4.1 Surface waters

For surface water LEGMC carries out the following monitoring programme:

No	River	Position	Latitude	Longitude	Frequency	Assesses radionuclides
1	Daugava	Daugava river, 3 km before Daugavpils city	55.868292	26.625934	4 /year	$\sum\alpha$, $\sum\beta$, ^{137}Cs
2	Daugava	Riga city	57.056967	24.047633	4 /year	$\sum\alpha$, $\sum\beta$, ^{137}Cs

Sampling is carried out according to Quality Assurance manuals LP5700, LIN5704. Sampling quantities are 25 l for gamma analysis and 250 ml for total alpha and beta analysis.

5.4.2 Drinking water

Within the framework of the national environmental radioactivity programme LEGMC carries out sampling of drinking water as detailed below:

No	City	Position	Latitude	Longitude	Frequency	Assessed radionuclides
1	Daugavpils	Daugavpils, "Ziemeli"	56.531111	27.988472	4 /year	^{3}H, ^{222}Ra, $\sum\alpha$, $\sum\beta$, ^{137}Cs
2	Daugavpils	Daugavpils, "Vingri"	56.262472	28.059583	4 /year	^{3}H, ^{222}Ra, $\sum\alpha$, $\sum\beta$, ^{137}Cs
3	Baldone	Baldone, Riga street 67	56.082694	27.261888	4 /year	^{3}H, ^{222}Ra, $\sum\alpha$, $\sum\beta$, ^{137}Cs
4	Riga	Brivibas street	55.744694	26.541888	4 /year	^{3}H, ^{222}Ra, $\sum\alpha$, $\sum\beta$, ^{137}Cs

Drinking water sampling procedures are implemented according to Quality Assurance manuals LP5700 and LIN5704. Sampling quantities are 25 l for gamma analysis and 1 l for total alpha and beta, tritium and radon analysis.

5.4.3 Sea water

Sea water sampling is performed by the Latvian Institute of Aquatic Ecology (LIAE); samples are analysed by LEGMC. For each point 40 l of seawater is taken.

Sample type	Sampling location	Number of samples	Latitude	Longitude	Frequency	Assessed radionuclides
Near bottom water	Gulf of Riga, station 119	1	57.180	23.510	1/year (August)	^{137}Cs
Surface water	Gulf of Riga, station 119	1	57.180	23.510	1/year (August)	^{137}Cs
Near bottom water	Gulf of Riga, station 121	1	57.370	23.370	1/year (August)	^{137}Cs
Surface water	Gulf of Riga, station 121	1	57.370	23.370	1/year (August)	^{137}Cs

5.5 SOIL, SEDIMENT AND BIOTA MONITORING

5.5.1 Soil and sediments

Within the framework of the national environmental radioactivity monitoring programme soil sampling is not implemented. Sampling of seabed sediments is performed by LIAE whilst the samples are analysed by LEGMC. At each station the sample core is divided into 15 slices of 2 cm thickness. For each point 15 sliced core samples are taken.

Sample type	Sampling location	Number of samples	Latitude	Longitude	Frequency	Assessed radionuclides
Sediment	Gulf of Riga, station 119	15	57.180	23.510	1/year (August)	^{137}Cs, [Bq/kg, Bq/m^2]
Sediment	Gulf of Riga, station 121	15	57.370	23.370	1/year (August)	^{137}Cs, [Bq/kg, Bq/m^2]

5.5.2 Terrestrial and aquatic biota and flora

Within the framework of the national environmental radioactivity monitoring programme sampling for terrestrial and aquatic biota and flora (including mushrooms) is not implemented. LEGMC carries out environmental radiation monitoring of plants (pine needles) in the operator supervised zone of the national radioactive waste near-surface repository "Radons" in Baldone.

5.6 FOOD AND FEED MONITORING

5.6.1 Introduction

The FVS is the authority responsible for the foodstuffs and feeding stuff sampling programme. Analytical measurements relating to national surveillance and control of foodstuffs and feeding stuff are implemented by BIOR.

Samples are taken in accordance with sampling procedure KR.10.P.229 "Methodological guidelines for food stuffs sampling for testing in laboratories to determine the level of radiation pollution and assess testing results".

5.6.2 Milk

In accordance with Regulations for Protection against Ionising Radiation and the programme developed by RSC, entitled "Monitoring programme for ionising radiation objects of national significance" milk sampling is carried out four times per year at two sites.

No	Food stuffs samples	Sampling site	Number of samples	Frequency	Assessed radionuclides
1	Cow milk	Laucesa district	5	4 times per year	^{137}Cs, ^{40}K, ^{90}Sr
2	Cow milk	Demene district	5	4 times per year	^{137}Cs, ^{40}K, ^{90}Sr

Also raw milk samples are taken in milk processing enterprises.

No	Food stuffs samples	Sampling site	Number of samples	Frequency	Assessed radionuclides
1	Raw milk	Milk processing enterprise	8	1 time per year	^{137}Cs, ^{90}Sr

5.6.3 Mixed diet

Samples are taken in one of the largest Latvian public catering enterprises, which is located in the "Gailezers" clinical hospital in Riga. Each sample consists of 3 meals: breakfast, lunch, dinner.

No	Food stuff samples	Sampling site	Latitude	Longitude	Frequency	Number of samples	Assessed radionuclides
1	Daily food samples	Public catering enterprise in "Gailezers" clinical hospital	56.933333	24.10	4 times per year	4	^{137}Cs, ^{90}Sr, ^{40}K

5.6.4 Foodstuffs

Sampling for foodstuffs in Latvia is carried out in accordance with the FVS Radiation Safety Control Programme, adopted on 19 February 2013.

No	Foodstuffs samples	Number of samples	Assessed radionuclides
1	Fish	6 per year	^{137}Cs, ^{90}Sr
2	Meat	6 per year	^{137}Cs, ^{90}Sr
3	Potatoes	2 per year	^{137}Cs, ^{90}Sr
4	Carrots	3 per year	^{137}Cs, ^{90}Sr

Sampling of imported foodstuffs is implemented in accordance with the FVS adopted programmes: "Food control programme for imported foodstuffs in Designated Points of Entry (19 February 2013) and "Food control programme for imported foodstuffs in Designated Points of Entry according to special conditions" (19 February 2013).

No	Foodstuff samples	Number of samples per year[1]	Assessed radionuclides	Kind of analyses
1	Food supplements	15	Treatment with ionising radiation	Qualitative analysis
2	Dried aromatic herbs, spices and vegetable seasonings	3	Treatment with ionising radiation	Qualitative analysis in cases when treatment is allowed - Maximum overall average absorbed radiation dose (kGy)
3	Berries	4	^{134}Cs, ^{137}Cs, ^{131}I, ^{103}Ru, ^{106}Ru, ^{241}Am	
4	Wild mushrooms	3	^{137}Cs, ^{134}Cs (together with ^{40}K)	All wild mushroom consignments from third countries mentioned in regulation 1635/2009 are sampled
5	Products from Japan	0 or random	^{137}Cs , ^{134}Cs	No imports

[1] Since 2014

5.6.5 Feeding stuff

Within Latvia monitoring of feeding stuff is not implemented, however at external borders samples are taken in case of suspicion.

5.7 LABORATORIES PARTICIPATING IN THE NATIONAL ENVIRONMENTAL RADIOACTIVITY MONITORING PROGRAMME

5.7.1 LEGMC Laboratory

The radiation subdivision of the LEGMC Laboratory Division has two main sectors, both located at the LEMGC headquarters: TLD sector and Radioactivity testing sector. LEGMC reports their findings and results to the RSC.

The radiation subdivision is responsible for most of the analytical measurements of the national and site related environmental monitoring programmes in Latvia. It measures radionuclides in groundwater, surface water, precipitation, soil, air sampling filters, biological samples (pine needles) and marine environmental samples.

The TLD sector laboratory is equipped with two RADOS TLD readers and one RADOS TLD irradiator. These are used only for personnel dosimetry - there is no TLD application for environmental monitoring.

- *Sample reception*

Certified laboratory staff collects most of the samples themselves. The procedures for sampling, analysis and data handling are well defined (labelling of samples, responsibilities of individuals, record keeping, etc.) according to QA manuals LP5700 and LIN5704. Incoming samples are recorded in the laboratory registration book and entered into a programme called "STARLIMS". Every sample receives an individual identification number.

- *Sample preparation*

The laboratory has two furnaces for drying or ashing samples and a drying cabinet. The laboratory uses electrical scales, which are calibrated by an external calibration service every 2 years. For size reducing activities, the laboratory has sample crushing and milling facilities.

- *Sample measurements*

An Ortec gamma spectrometer (50% detector relative efficiency) is used mainly for water sample measurements. A 1 l Marinelli beaker is used for gamma radioactivity measurements. According to the quality manual, the counting time should be ≥24 hours, depending on the necessary accuracy and MDL. The spectrometer is calibrated annually.

A Canberra gamma spectrometer (40% detector relative efficiency) is generally used for soil, biota and filter sample measurements. Different geometries are used: 1 l Marinelli beaker, 0.5 l Marinelli beaker, 170 ml beaker G170 and Williams's beaker W2 with 27 ml volume for gamma radioactivity measurements. According to the quality manual, the counting time should be ≥24 hours, depending on the necessary accuracy and MDL. The spectrometer is calibrated annually.

Technical specifications for the gamma spectrometry equipment are as follows:

Detector type / Specifications	Germanium closed-end coaxial detector	Germanium closed-end coaxial detector
Manufacturer	CANBERRA Industries Inc., made in USA	ORTEC Inc., made in USA
Detector model	GC4019	GEM50P4
Cryostat model	7500SL	CFG-PV4, DWR-30
Preamplifier model	2002CSL	DSPEC jr 2.0
Relative efficiency	40%	50%
Resolution	1.9 keV (FWHM) at 1.33 MeV	1.75 keV (FWHM) at 1.33 MeV

Diameter of detector	62 mm	76 mm
Length of detector	57 mm	not specified
Distance from window	5 mm	5 mm
Bias voltage	(+) 2500 V DC	(+) 3000 V DC
Digital spectrum analyser	DSA-1000	DSPEC jr 2.0
Software	Genie 2000	Gamma Vision - 32
Working energy range	59 keV to 2 MeV	40 keV to 2 MeV
Minimum detectable activity of ^{137}Cs for water samples in 1 l Marinelli geometry	0.09 Bq/l if counting time 99h, and volume 1 l	0.01 Bq/l if counting time 72 h and volume 1 l

A Quantulus 1220 liquid scintillation counter is used for the determination of tritium, radon, total alpha and total beta in water samples. Each measurement has a different measuring time defined in the laboratory working procedures. Tritium activity is usually measured for 12 hours, radon activity 6 hours and total alpha/beta for 24 hours. The counter is calibrated annually.

In addition the laboratory has an Eberline FHT-40G portable dose rate measuring instrument with alpha, beta and gamma probes for determination of gamma fields and surface contamination.

- *Measurement results*

The basic principles of document management are defined in the Quality Assurance manual LP4300. Measurement results are processed using the "STARLIMS" computer programme, according to the Quality Assurance manual LIN 4513. All measurement certificates are prepared using STARLIMS. This system also deals with archiving procedures. Results are also printed out on paper and stored in the corresponding file for 10 years, in accordance with the quality assurance handbook.

- *Data handling and reporting tools*

Data handling is carried out using an Excel spreadsheet and the STARLIMS computer programme. Spectrum analysis and activity calculations are done with the analysis programmes Canberra Genie 2000, Gamma Vision-32 or EasyView. Correction coefficients for density and coincidence summing are added manually in Excel spreadsheets.

Analysis results are transferred into the STARLIMS system for preparation of the corresponding certificate. The following Quality Assurance manuals deal with data handling:

- LP5800 data stream management;

- LIN5001, LIN5003 on preparation of certificates and results;

- LP5403, LIN5404 on uncertainties.

- *Statutory accounting and reporting obligations with respect to environmental sample results*

Environmental sample results for the national radioactive waste near-surface repository "Radons" in Baldone are submitted annually to the Baldone municipality and RDC by the LEGMC. Environmental radioactivity data for air, surface and drinking water is reported annually to the EC Joint Research Centre's (JRC) Radioactivity Environmental Monitoring (REM) database in Ispra (Italy). Seawater and sediment data is reported to HELCOM.

- *Sample storage (archiving) requirements*

In most cases the samples are discarded after the measurements or after the analysis report is finished. There is no formal time limit for storing the samples for the possible need of new measurements. The disposal of samples is regulated by the Quality Assurance manual LIN5804.

- *Quality assurance and control procedures put in place*

The LEGMC has accreditation according to ISO 9001:2008. The laboratory has ISO 17025:2005 accreditation until 4 December 2018 from the Latvian National Accreditation Bureau (LATAK) and is audited regularly. Whether it will be extended depends to a large extent on the number of personnel in the laboratory. A quality assurance and control manual is in place and implemented through a compilation of written working instructions.

The accredited methodologies for radioactivity measurements are:

- Determination of radionuclide concentration in water with gamma spectrometry (Method LVS ISO 10703:2008) (2013);
- Determination of radionuclide concentration in construction materials with gamma spectrometry (Method LVS ISO 257:2000) (2013);
- Determination of total alpha and total beta activity in water samples with a liquid scintillation counter (Method T105-R-01-2010) (2010);
- Determination of tritium activity concentration with liquid scintillation counter (Method LVS ISO 9698:2011) (2013);
- Determination of radon activity concentration with liquid scintillation counter (Method T105-R-02-2013) (2013);
- Determination of alpha, beta and gamma surface radioactivity (Method T105-R-04-2013) (2013);
- Determination of gamma dose rates (Method T105-R-05-2013) (2013).

Calibration of the measuring devices (spectrometers) is done annually by the laboratory staff. The portable dose rate measuring instrument is calibrated every 2 years in the Secondary Standard Dosimetry Laboratory of the University of Latvia. Calibration of HPGe detectors' efficiency, energy and peak width (FWHM) is controlled using a ^{137}Cs standard. Calibration procedures for germanium detectors are described in the measurement methodology documents. Calibration sources and reference materials are kept in a safe at a sufficient distance from the germanium detectors.

- *Participation in national/international inter-comparison exercises or proficiency tests*

LEGMC laboratory regularly participates in IAEA proficiency tests, international comparison exercises such as ALMERA and JRC Inter Laboratory Comparisons exercises (ILC). Recent test participation includes:

- IAEA-TEL-2014-003 worldwide proficiency test on determination of anthropogenic and natural radionuclides in water, seaweed and sediment samples (2014);
- EC comparison on gross alpha/beta activity determination in waters (2012);
- EC Comparison on the determination of ^{40}K, ^{90}Sr and ^{137}Cs in Bilberry Powder (2011);
- The IAEA-TEL-2011-04 ALMERA proficiency test on the determination of radionuclides in soil and water (2011);
- The IAEA-CU-2010-04 ALMERA proficiency test on the determination of natural radionuclides in water and Ra-226 in soil (2010);

- The IAEA-2009-03 world wide open proficiency test on the determination of natural and artificial radionuclides in moss soil and spiked water (2009).

5.7.2 BIOR Laboratory

The Laboratory of Food and Environmental Investigations "BIOR" is the largest laboratory of the Institute of Food Safety, Animal Health and Environment. It is responsible for analytical measurements related to national surveillance and control of foodstuffs and feeding stuff. BIOR operates under the Ministry of Agriculture and reports to the FVS. The laboratory is accredited according to the ISO/IEC 17025:2005 standard "General requirements for the competence of testing and calibration laboratories".

BIOR laboratory operates an electronic registration system JUNDA, which allows registration of the date and time of sample receipt, description of sample (form, amount, packing), sampling dates, analyst name and results of the analysis. To avoid possible corruptive actions, the system does not provide customer data to the technician performing the analysis.

In the Radiology Division of the BIOR laboratory there are specific fridges and freezers for long-term sample storage. Samples are stored and destroyed in accordance with the BIOR internal quality control procedures.

The Radiology Division provides quality control for each method used in the laboratory. All devices are regularly verified using reference materials with added radionuclides and those with a defined activity. Before starting measurements devices are tested and calibrated with reference materials.

Methods used by the BIOR laboratory include:

1) ^{90}Sr analysis: The method is based on ^{90}Sr and ^{90}Y natural balance of the test sample. Ashed samples are dissolved in hydrochloric acid and ^{90}Y is extracted with 10% of di (2-ethyl-hexyl) phosphoric acid in toluene, preventing mono- and divalent ions remaining in the acid solution. Then ^{90}Y is extracted from the organic phase with nitric acid and converted to yttrium hydroxide. The quantity of ^{90}Y in the sample is determined with a Quantulus 1220 liquid scintillation counter.
2) ^{137}Cs and ^{40}K analysis: Gamma spectroscopy using HPGe semiconductor detectors (Gamma spectrometer GS-02-9).

5.7.3 University of Latvia, Secondary Standard Dosimetry Laboratory

The Secondary Standard Dosimetry Laboratory of the University of Latvia, Institute of Chemical Physics in Salaspils is a member of IAEA/WHO SSDL network and holds an accreditation according to ISO/IEC 17025:2005 (issued on 28.12.2013). The laboratory regularly participates in national/international inter-comparison exercises or proficiency tests, most notably the IAEA TLD Postal Quality Audit for Cs-137 and Co-60 radiation protection calibrations in 2008, 2010 and 2012.

Applied methodologies (standards) for measurements of samples are:

- Activity concentration of radionuclides in water - High resolution gamma spectrometry (LVS ISO 10703:2008)
- Determination of the radionuclides and specific activity of radionuclides in building materials - Gamma spectrometry (LVS ISO 257:2000)
- Determination of tritium activity concentration in water - Liquid scintillation counting (LVS ISO 9698:2011)

The laboratory is equipped with the following measurement devices:

- Gamma spectrometer DUG35190 S/N 07027734 (quality control once per year with certified nuclides);
- Liquid scintillation counter Hidex 300 SL S/N 2080031 (quality control once per year with certified nuclides).

Sample reception and registration is carried out according to laboratory procedures and the quality system. Also recording and archiving of measurement results is performed according to laboratory procedures and the quality system.

5.8 MOBILE MEASUREMENT SYSTEMS

RSC has one mobile AMS monitoring station, which is equipped with a GPS system for recording the exact geographical location of the mobile monitoring station. The radiation measurement equipment of the station is identical to the fixed AMS installations. Radionuclides which the mobile AMS station assesses are ^{40}K [CPS], ^{60}Co, ^{140}Ba, ^{134}Cs, ^{137}Cs, ^{133}I, ^{132}Te, ^{131}I, ^{129}Te, ^{106}Rh, ^{103}Ru, ^{99}Mo [Bq/m^3] and dose rate [nSv/h].

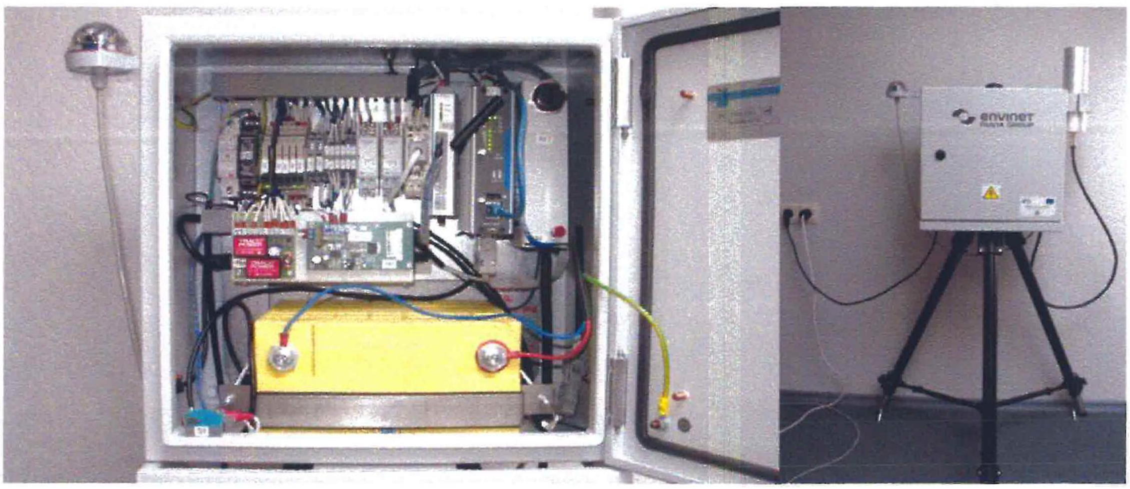

Figure 3. Mobile AMS monitoring station.

General technical specifications of the mobile AMS are the following:

General technical specification of the mobile AMS	
Total weight (kg)	25
Dimensions (mm)	400x400x250
Power supply	1/N/PE AC 230V
Input power	60VA/4,7W (when using battery)
Backup power supply	Battery source for 72 hour
Frequency	50Hz
Coverage	IP 65
Maximum relative humidity	100%
Operation temperature (^{0}C)	-40 ÷ +60
Communication	GSM/GPRS/EDGE

6 SITE-SPECIFIC ENVIRONMENTAL RADIOACTIVITY MONITORING

6.1 INTRODUCTION

In accordance with Latvian national legal acts the operator of an installation which employs a source of ionising radiation shall develop an environmental radioactivity monitoring programme in order to receive a special permit (licence).

Currently there are four such licenced operators, two of which have (had) nuclear materials, radioactive waste and waste substances, and two which use radio-pharmaceuticals:

- National radioactive waste near-surface repository "Radons"
- Salaspils Research Reactor
- Riga East University Hospital
- State Limited Liability Company "Pauls Stradins Clinical University Hospital"

Background information is given below on the first two, which were verified during the visit. Though information on the two hospitals was provided by the Latvian Competent Authority this is not included in the present report as these installations were not subject to verification.

6.2 NATIONAL RADIOACTIVE WASTE NEAR-SURFACE REPOSITORY "RADONS"

6.2.1 General information

The national radioactive waste near-surface repository "Radons" in Baldone was built in accordance with the former Soviet Union standard requirements. The repository is designed for disposal of low and intermediate level waste. The site, with a total area of 7 ha, is situated in the Riga district, about 5 km from the centre of Baldone and 27 km from the centre of Riga. It is managed by the LEGMC. The operations at "Radons" started in 1962.

The disposal site is divided into two zones: a control zone (zone B) and a supervision zone (zone A). The administrative buildings, the pass office, and the garage for transport vehicles are located in the supervision zone. The main facilities in the control zone are:

- decontamination building,
- five closed radioactive waste disposal vaults (filled and sealed),
- vault presently in operation (operation started in 1995),
- equipment for aerosol sampling and precipitation collection,
- 27 boreholes established around the vaults for ground water monitoring.

6.2.2 Provisions for environmental radioactivity monitoring

The current monitoring programme was defined by the RSC during the licensing procedure. LEGMC carries out the programme. The main parameters to be monitored are radiation in ambient air, radioactive surface contamination of working premises, specific activity of ground/surface water and radioactive contamination of precipitation, soil and plants. The map of borehole positions and sampling places is given in figure 4.

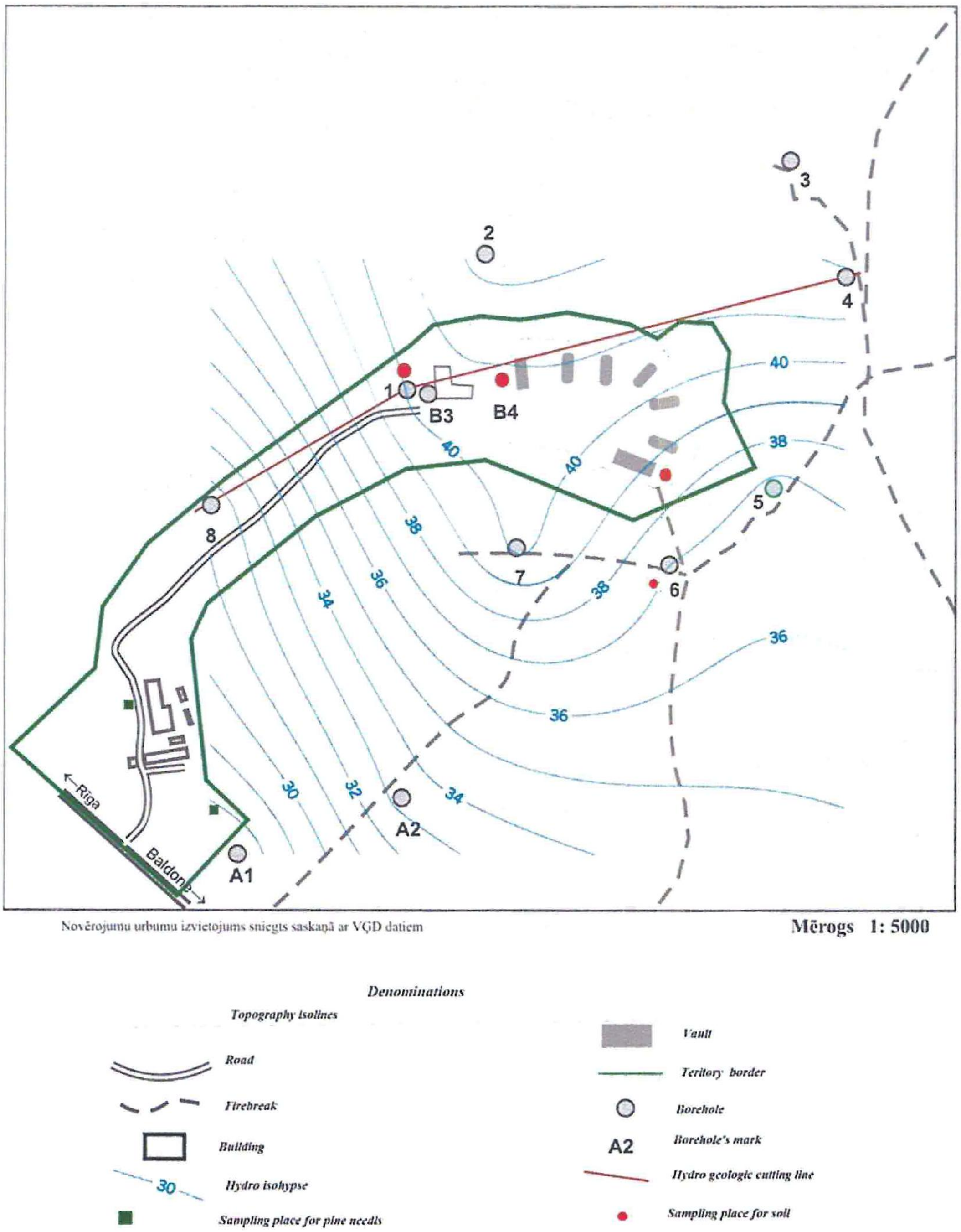

Figure 4. Map of the Radons site

The environmental radioactivity monitoring programme managed by the LEGMC in the Radons site is presented below. Samples are taken by the local LEGMC staff. Sample pre-treatment is performed on site by local staff or at the measuring laboratories. Analytical measurements are performed at the LEGMC Laboratory (Riga).

Radons monitoring programme

No	Operation	Latitude	Longitude	Samples per year	Analytical requirements
1	**Groundwater**				
1.1.	Groundwater (boreholes B3, B4)	56.76389 56.76389	24.32679 24.32679	12	^{3}H, $\sum\alpha$, $\sum\beta$, ^{137}Cs, ^{40}K, ^{232}Th, ^{238}U
1.2.	Groundwater (boreholes 6, 7, 8)	56.76267 56.76325 56.76419	24.32747 24.23596 24.32677	4	^{3}H, $\sum\alpha$, $\sum\beta$, ^{137}Cs, ^{40}K, ^{232}Th, ^{238}U
1.3.	Groundwater (boreholes A1, A2, 1, 2, 3, 4, 5)	56.76054 56.76132 56.76407 56.76444 56.76296 56.76416 56.76343	24.32171 24.32517 24.32637 24.32824 24.33006 24.33038 24.32896	1	$\sum\alpha$, $\sum\beta$, ^{137}Cs, ^{40}K, ^{232}Th, ^{238}U
2.	**Surface water (2 points)**	56,76897 56,76446	24,33060 24,31172	4	^{3}H, ^{137}Cs, ^{40}K, ^{232}Th, ^{238}U
3.	**Precipitation (integrated sample)**	56.76399	24.32326	4	$\sum\alpha$, $\sum\beta$, ^{137}Cs, ^{40}K, ^{232}Th, ^{238}U
4	**Soil**				
4.1.	Control zone (3 points)	56.76403 56.76399 56.76329	24.32478 24.32326 24.32328	2	^{137}Cs, ^{40}K, ^{232}Th, ^{238}U, other gamma radionuclides
4.2.	Supervised zone (1 point)	56.76140	24.32066	2	^{137}Cs, ^{40}K, ^{232}Th, ^{238}U, other gamma radionuclides
5.	**Plants in the supervised zone (2 points – pine needles)**	56.76140 56.76075	24.32066 24.32163	1	^{137}Cs, ^{40}K, ^{232}Th, ^{238}U, other gamma radionuclides
6.	**Air (integrated filter sample)**	56.7634	24.3281	4	^{7}Be, ^{137}Cs, ^{40}K, ^{232}Th, ^{238}U, other gamma radionuclides

6.3 SALASPILS RESEARCH REACTOR

6.3.1 General information

The Salaspils Research Reactor (SRR) is located at Salaspils, some 25 km from Riga. It was designed and constructed by the Soviet Union as a derivative of the IRT-1000 reactor (pool-type light water reactor) originally built at the Moscow Kurchatov Institute in the late 1950's. SRR was put into operation in 1961. Between 1973 and 1975 the reactor was closed for upgrading. In 1979 the secondary cooling system was reconstructed and the thermal power increased to 5 MW. After modifications the reactor fuel had an enrichment of 90% ^{235}U, which motivated strict security measures.

SRR was permanently shut down in 1998. The fresh nuclear fuel was sent to Russia in 2005 and the spent nuclear fuel in 2008.

In accordance with the planned decommissioning of the SRR, dismantling of the reactor should have been completed by 2010. However, funding for this action has not been granted for some years and the project has still not been implemented.

According to the new Environmental Policy Strategy 2014-2020 (26 March 2014) decommissioning of the SRR is planned. Radioactive waste arising in the process of reactor dismantling will be stored at the national radioactive waste near-surface repository "Radons".

Presently the SRR is owned by LEGMC, but operated by the University of Latvia on the basis of a contract signed between LEGMC and the University of Latvia on 25 November 2011. It is planned to transfer the management of the reactor facility to the University of Latvia in order to create a scientific radiation research centre.

6.3.2 Provisions for environmental and radioactive discharge monitoring

The site-related monitoring programme for the SRR site was defined by RSC during the licensing procedure. It covers groundwater, sewage, ground deposition, precipitation, soil and radiation in the ambient air (table below). The environmental monitoring programme is implemented by the Secondary Standard Dosimetry Laboratory of the University of Latvia.

Salaspils Research Reactor monitoring programme

No	Measurement	Latitude	Longitude	Samples per year	Analytical method	Measured parameter	Total measurements per year
1	**Gamma radioactivity measurements**						**450**
1.1.	Research reactor territory using net method Step: 10×10 m	56.870128	24.385464	2 (May, Sept.)	RM[2]	µSv/h	400
1.2	Technological zone (10 points)	56.870134	24.385453	4	RM	µSv/h	40
1.3	Outside the research reactor territory using net method Step: 200×200 m	56.871236	24.387781	1 (June)	RM	µSv/h	10
2	**Groundwater measurements[(1)]**						**72**
2.1	Research reactor territory (Borehole 5V, depth 6-9m)	56.870351	24.385206	2	RCh[4]	$A_T(H^3)$, Bq/l	2
2.2	Research reactor territory (Boreholes 7A, depth 3m, 7V, depth 6-9m)	56.870632	24.385539	2	RM, total β, GSPM[3]	Σ_β, A_γ Bq/l	8
2.3	Research reactor territory (Boreholes 8A, depth 3m, 8V depth 6-9m)	56.870685	24.385904	2	RM, total β, GSPM	Σ_β, A_γ Bq/l	8
2.4	Research reactor territory (Borehole 9V, depth 6-9m)	56.869981	24.385088	2	RM, total β, GSPM	Σ_β, A_γ Bq/l	8
2.5	Research reactor territory (Borehole 10V, depth 6-9m)	56.870257	24.385292	2	RM, total β, GSPM	Σ_β, A_γ Bq/l	4

No	Measurement	Latitude	Longitude	Samples per year	Analytical method	Measured parameter	Total measurements per year
2.6	Outside the reactor territory (Boreholes 1A, 3m, 1B, 5m, 1V, 6-9m)	56.870527	24.384509	2	RM, total β, GSPM	Σ_β, A_γ Bq/l	12
2.7	Outside the reactor territory (Boreholes 2A, 3m, 2B, 5m, 2V, 6-9m)	56.870691	24.384809	2	RCh	$A_T(H^3)$, Bq/l	6
2.8	Outside the reactor territory (Boreholes 3A, 3m, 3B, 5m, 3V, 6-9m)	56.870779	24.385013	2	RM, total β, GSPM	Σ_β, A_γ Bq/l	12
2.9	Outside the reactor territory (Boreholes 4A, 3m, 4B, 5m, 4V, 6-9m)	56.873394	24.388146	2	RM, total β, GSPM	Σ_β, A_γ Bq/l	12
3	**Surface water** (1 point ditch)	56.868023	24.378426	2	RM, total β, GSPM	Σ_β, A_γ Bq/l	**4**
4	**Precipitation** (integrated sample)	56.870679	24.386258	2	RM, total β, GSPM	Σ_β, A_γ Bq/l	**4**
5	**Soil** Inside the territory (3 points) Outside the territory (2 points)	56.869565 56.869735 56.871131 56.871529 56.869102	24.385979 24.386386 24.386461 24.387899 24.384316	1	RM, total β, GSPM	Σ_β, A_γ Bq/l	**10**
6	**Air** – special ventilation system			2	RM, total β, GSPM	Σ_β, A_γ, Bq/m^3	**4**
7	**Sewage wells** *(2 wells)*	56.870204	24.384895	4	RM, total β	Σ_β, Bq/l	**8**

[1] Groundwater sampling boreholes are shown in Figure 4.
[2] RM - radiation dose rate monitoring
[3] GSPM - gamma spectrometry
[4] RCh - radiochemical analysis

7 REPORTING OF ENVIRONMENTAL RADIOACTIVITY MONITORING RESULTS TO THE EUROPEAN COMMISSION

In accordance with Commission Recommendation 2000/473/Euratom of 8 June 2000, the Latvian competent authorities forward to the EC the results of monitoring of the levels of radioactivity in the environment and foodstuffs as follows:

Airborne particulates: ^{137}Cs, ^{7}Be, gross beta

No	Position	Latitude	Longitude	Frequency	Assessed radionuclides
1	"Radons" in Baldone	56.76345	24.328156	4 /year	^{7}Be, ^{137}Cs

Surface water: ^{137}Cs, residual beta

No	River	Position	Latitude	Longitude	Frequency	Assessed radionuclides
1	Daugava	Daugava river, 3km before Daugavpils city	55.868292	26.625934	4 /year	$\sum\alpha$, $\sum\beta$, ^{137}Cs
2	Daugava	Riga city	57.056967	24.047633	4 /year	$\sum\alpha$, $\sum\beta$, ^{137}Cs

Drinking water: ^{3}H, ^{90}Sr, ^{137}Cs

No	City	Position	Latitude	Longitude	Frequency	Assessed radionuclides
1	Daugavpils	Daugavpils, "Ziemeli"	56.531111	27.988472	4 /year	^{3}H, ^{222}Ra, $\sum\alpha$, $\sum\beta$, ^{137}Cs
2	Daugavpils	Daugavpils, "Vingri"	56.262472	28.059583	4 /year	^{3}H, ^{222}Ra, $\sum\alpha$, $\sum\beta$, ^{137}Cs
3	Baldone	Baldones city, Riga street 67	56.742495	24.392298	4 /year	^{3}H, ^{222}Ra, $\sum\alpha$, $\sum\beta$, ^{137}Cs
4	Riga	Brivibas Street	55.744694	26.541888	4 /year	^{3}H, ^{222}Ra, $\sum\alpha$, $\sum\beta$, ^{137}Cs

Milk: ^{137}Cs, ^{90}Sr, ^{40}K

No	City	Latitude	Longitude	Frequency	Assessed radionuclides
1	Daugavpils	55.871389	26.516111	4 /year	^{137}Cs, ^{40}K, ^{90}Sr

Mixed diet: ^{137}Cs, ^{90}Sr, ^{14}C

No	City	Latitude	Longitude	Frequency	Assessed radionuclides
1	Riga	56.933333	24.10	4 /year	^{137}Cs, ^{40}K, ^{90}Sr

8 VERIFICATIONS

The following verifications were carried out and are described in chronological order, according to the verification programme in Annex 1.

8.1 EXTERNAL GAMMA DOSE RATE MONITORING NETWORK

8.1.1 RSC data centre

Data servers of the radiation monitoring system are located at the RSC headquarters. RSC duty officer receives the data at 10 minutes intervals from all stations. The data is available to the public through the EURDEP web-based system. On 12 June 2014 both radiation monitoring systems networks were in operation ("old" in full operation mode and "new" in test mode).

Alarm limits of the system are 150 µSv/h and 300 µSv/h. So far there has been no testing with actual radiation carried out on the system.

System software includes a library of nuclides, which are used on the NaI spectrum analysis. It is important to restrict this library only to nuclides, which can actually be detected in air after a nuclear accident.

The new AMS network sends data regularly to the EURDEP system. A sample check in September 2014 by the verification team confirmed that all fixed stations were delivering data.

> *The verification team recommends 'live' alarm testing of the system and RSC duty personnel training by exposing monitoring stations to actual radiation (using for example sealed Cs-137 point sources).*
>
> *Furthermore it is recommended that RSC reviews the content of the system nuclide library and removes 'unrealistic' nuclides.*

8.1.2 Baldone

In total three stations were visited in the area of Baldone, PMS station 14 of the "old" network and AMS stations 16 and 17 of the "new" network. Station 14 was located within the national radioactive waste near-surface repository "Radons", on the roof of a building near the entrance. The area is securely fenced and the only access to the monitoring station was from within the building. The rain detector was out of order, since the water collection bucket was clogged by leaves.

Also within the "Radons" site there is an AMS, situated at a height of 1.5 m on a grass surface, 2.5-3 m from the disposal vault currently in operation. An extra antenna has been fitted due to low signal strength. There were no other obstructions in the vicinity.

The second AMS was situated on the flat tarred roof of a municipal building; access was only possible from inside. In general the situation was good, with the detector being 1.5 m above the roof surface with no obstructions in the vicinity.

> *The verification team points out that a 'tipping bucket' rain detector requires regular maintenance in order to make sure the water collection bucket is not clogged. (Old PMS stations in Latvia will be removed after the new system test period in July 2014 and the modern stations do not use this type of rain detection method.)*

8.1.3 Kekava

This water AMS 14 is located indoors in one of the inlet channels of the pumping station which supplies most of the water for Riga. Water is pumped from an artificial lake which also supplies water to a hydroelectric power plant nearby.

The electronics unit of the station is identical to other ENVINET AMS-stations. Battery back-up allows for 72 hours of independent operation. Detector is a NaI-scintillator immersed in water. The measurement software provides data both on Bq/m^3 and µSv/h, but it is unclear how the system calibration for water has been done. Taking into account the high radiation attenuation in water, it seems that the efficiency of the system is very low, i.e. the water should be significantly contaminated with radioactivity in order to get a statistically meaningful result within the 10 minute collection time. In addition the concept of providing a radiation dose rate value under water is highly questionable, since essentially it means a radiation dose rate of a diver or swimmer in the water.

During the verification the system was showing only zero values, which indicates either no radioactivity or no signal. In this type of systems it would be good to add a small Cs-137 radiation source next to the detector in order to provide a stable continuous baseline signal to be sure the system is stable and functioning correctly.

The detector is located at the end of a long thick rolled cable (~50 m) which means that it can be moved to a different inlet channel if needed. However this long cable may reduce the resolution of the system.

> *The verification team recommends that RSC clarifies the efficiency calibration methods used by the system provider for this water station. The software should be adapted to show only Bq/l (Cs-137), not µSv/h.*
>
> *Furthermore the team suggests validating the calibration results experimentally by immersing the detector in a barrel of water containing a known amount of radioactivity.*
>
> *If there is no real need for the extra cable between the detector and the electronics, the verification team suggests shortening the cable to the required length.*

8.1.4 Jelgava

The "new" AMS station No. 18 is located on the side of a three storey State owned administrative building as the picture below illustrates. Whilst the detector is positioned some 3.5 m above the ground it is however very close to the building. The rain detector is nevertheless about 1 m from the building.

In addition to the overhanging roof there was a tree some 10 m away. Whilst the tree is currently quite small this may further shadow the detector in the future.

> *The verification team suggests reviewing the siting of the detector at Jelgava, in particular to ensure that it is not so close to a building and that it is placed in the same manner as at other sites (1.5 m from the ground, on a flat surface).*

Figure 5. Jelgava AMS

8.1.5 Jurmala

Both the "old" PMS station 15 and the "new" AMS station 13 were located at a laboratory facility belonging to the LEGMC. At the time of the visit the new station was fixed to the structure of the old one but when the latter is removed the former will be placed on a metal post, like all other stations within the network. The area is fenced. Both detectors were located on a grass surface which was well maintained. A chestnut tree at some 10 meter distance could cause some obstruction in the future; this can be eliminated by siting the "new" detector at a greater distance when it is removed from the structure of the "old" station.

The rain detector of the old PMS station was out of order, since the water collection bucket was clogged by leaves.

> *The verification does not give rise to any specific recommendations.* However, the *verification team points out that a 'tipping bucket' rain detector requires regular maintenance in order to make sure the water collection bucket is not clogged. (Old PMS stations in Latvia will be removed after the new system test period in July 2014 and the modern stations do not use this type of rain detection method.)*

8.1.6 Talsi

The "old" AGM station, No. 8 and the "new" AMS, No. 19 are located separately on the roof of a small annex, built on the roof of a municipality building within an urban area of the town. The pole holding the old detector has become detached from the wall and this station will be removed in the near future. The new detector is securely fixed at a height of 1.5 m above the roof surface.

Verification does not give rise to any specific comments.

8.1.7 Salaspils

The "new" standard AMS station No. 15 is located on the roof of the site entrance building about 5 m above the ground. There is a tree growing next to the entrance building, which may shadow the detector in the future.

Verification does not give rise to any specific recommendations. The verification team suggests making sure the tree branches do not grow close to the detector.

Figure 6. Salaspils AMS

8.2 Latvian Environmental, Geological and Meteorological Centre laboratory division

The verification team visited the laboratories where sample treatment, from receipt through to the delivery of results was explained in detail. All instrumentation is labelled with details of calibration, transcribed from the official certificates. Only low activity samples are handled, there is no procedure in place to cope with high activity samples. Total staff of the laboratory is 35 people but most are engaged in areas not related to analysis of environmental samples, as relevant to Article 35. Concerns were expressed regarding the level of staffing for environmental radioactivity sample analysis in the event of an emergency and particularly the possible negative consequences this could have on future ISO 17025 certification. All procedures are readily to hand. A random sample from early 2014 was chosen and staff were quickly able to provide the results protocol.

The laboratory uses the standard nuclide library provided with the gamma spectroscopy system manufacturer (Ortec), however not all of the nuclides in this library can be found in environmental samples.

The laboratory has very good TLD measurement capacity, but it is not used in environmental monitoring. In other countries (for example the Ignalina area in Lithuania) TLDs are used as a low-cost system for accurate long term dose monitoring in the environment.

With regard to staffing in the area of environmental radioactivity analysis the verification team encourages maintaining both a sufficient number, but also appropriately trained staff to ensure continuation of the quality levels seen, in conformity with ISO 17025 certification.

In order to simplify the gamma spectroscopy analysis and reporting, the verification team suggests removing 'unrealistic' nuclides from the nuclide library.

The verification team suggests that in the long-term the LEGMC considers using the existing TLD measurement capacity also for long-term environmental dose monitoring.

8.3 NATIONAL RADIOACTIVE WASTE NEAR-SURFACE REPOSITORY RADONS

In addition to the AMS noted above (8.1.2) various sampling locations were seen, in particular the boreholes B3, B4 and 8 for ground water sampling and sampling sites for soil and pine needle sampling. One precipitation sampler is in operation with water being collected in a plastic container. The sampler is not heated, which could seriously affect the quantities collected during periods of ice and snow.

The only automatic air sampler (Snow White) in the network was not operational at the time of the visit as the repair of a broken electronic plate was necessary. Sampling is carried out 4 times per year and it was hoped that the repair could be carried out to enable the measurement timetable to be respected. An older air sampler of Russian design, using a 30×100 cm filter cloth, has not been in operation after the Snow White was transferred here from Daugavpils in 2006. Following the verification it was confirmed that a new iCAM™ Alpha/Beta Air Monitor (Canberra) was installed at the facility in October 2014.

As already noted during the 2006 verification the quantity of hazardous radioactive waste to be stored on-site will increase significantly when decommissioning of the Salaspils research reactor commences.

The verification team points out that operating the air sampler only four times a year for one week does not fulfil the requirement of 'continuous' monitoring under Article 35, therefore the LEGMC should consider options for establishing a permanently operating measurement system for radioactivity in air at this site or at another suitable location.

The verification team points out that monitoring precipitation does not provide information about the radiological impact of the site, but should be regarded as a part of the overall national monitoring programme. The verification team suggests installing a heated precipitation sampler to enable consistent samples to be taken all year round.

With regard to the expected increase in the quantity of material to be stored, due thought should be given to the issue of adequate sampling frequency.

8.4 INSTITUTE OF FOOD SAFETY, ANIMAL HEALTH AND ENVIRONMENT LABORATORY DIVISION

The laboratory division of the Institute of food safety, animal health and environment (BIOR) carries out laboratory analysis of foodstuffs both for public and private customers, including radioactivity measurements. The institute has regional offices for sample reception, but all radiation measurements are done in Riga. Activities of Cs-137, Sr-90 and K-40 in foodstuffs are regularly communicated through the national authorities to the Joint Research Centre's environmental radioactivity database in Ispra, Italy.

The quality management system meets international standards (LVS ISO 17025:2005 accreditation), and all the laboratories have been accredited at the national level (LATAK system). BIOR is the only laboratory in Latvia carrying out radioactivity measurements in foodstuffs.

The BIOR laboratory is well equipped for radioactivity measurements, but the verification team was informed that only one person has been trained to carry out these measurements.

The laboratory has an HPGe gamma spectroscopy system, which is calibrated every Monday using a very low-activity Cs-137 (Internal reference material ST#830, dry milk containing radionuclides Cs-137, K-40, with activity Cs-137 (A=13.00 Bq ± 5%) and K-40 (A=318 Bq±5%) on 3/01/2008) standard. There is no multi-nuclide standard available and there is no regular control of system stability in terms of energy and resolution.

The verification team recommends the BIOR laboratory to review the procedure for the gamma spectroscopy system calibration by acquiring a multi-nuclide calibration standard of reasonable activity and by including in the regular calibration controls also control of system energy (Cs-137 peak location) and resolution (FWHM of the Cs-137 peak) stability.

The verification team recommends the BIOR laboratory to make sure there are a sufficient number of persons trained for radioactivity measurements, also having in mind the possible significant increase in the number of samples in the event of a radiological emergency.

8.5 UNIVERSITY OF LATVIA SECONDARY STANDARD DOSIMETRY LABORATORY

The secondary standard dosimetry laboratory of the University of Latvia carries out radioactivity monitoring related to the Salaspils reactor site and its decommissioning activities. The legacy of the reactor operation includes for example large underground tanks full of contaminated water, some H-3 activity on local ground water and some 250 tonnes of solid radioactive waste. Currently the reactor decommissioning work is halted due to economic constraints.

Overall the laboratory is well equipped to carry out radioactivity monitoring. Some state of the art equipment has been provided specifically for monitoring during the decommissioning work, which has not yet started. Currently the main activity of the laboratory is the ground water control programme focussing on the underground waste water tanks.

Four HPGe spectrometers are available in the laboratory's counting room; only one of these is in use. Calibration of this system has been done by the Latvian Metrological Institute. Regular calibration controls (energy, efficiency and resolution) are carried out in order to monitor system stability.

All the necessary sample evaporation and ashing equipment for sample preparation are available. The laboratory has also a β-counter (Canberra iSolo) and a liquid scintillator counter (Perkin Elmer TriCarb), which is functional but not yet calibrated.

The laboratory regularly participates in intercomparison exercises.

The verification does not give rise to recommendations. Since the decommissioning project is delayed, specific attention should be paid to maintaining the staff expertise and equipment.

Additionally it is pointed out that monitoring precipitation does not provide information about the radiological impact of the site, but should be regarded as a part of the overall national monitoring programme.

8.6 SALASPILS RESEARCH REACTOR

Due to financial constraints there is currently no decommissioning work going on at the Salaspils site. There is a new automatic radiation dose rate monitoring station at the site entrance and the regular environment monitoring programme for the site and its surroundings is maintained. However, the radiological surveillance of the reactor building discharges has deteriorated - the reactor area dose rate monitoring system and the gaseous discharge monitoring system in the stack are out of order. Following the verification visit the Commission was informed that in October 2014 funds were granted from the State budget for the operation of the monitoring systems.

The verification team recommends restoring functionality of the reactor building *dose rate monitoring system and the stack gaseous discharge monitoring system as soon as possible, but in any case before the dismantling and decommissioning work commences.*

9 CONCLUSIONS

All verification activities that had been planned were completed successfully. In this regard, the information supplied in advance of the visit, as well as the additional documentation received during and after the verification activities, was useful.

The information provided and the verification findings lead to the following observations:

(1) The verification activities that were performed demonstrated that the facilities necessary to carry out continuous monitoring of levels of radioactivity in the air, water and soil in Latvia are adequate. The Commission services could verify the operation and efficiency of these facilities.

(2) The verification activities that were performed demonstrated that the facilities necessary to carry out continuous monitoring of levels of radioactivity in the air, water and soil at the Radons radioactive waste disposal site and at the Salaspils Research Reactor site are adequate at the current moderate level of work activity at both sites. The Commission could verify the operation and efficiency of these facilities.

(3) With regard to the status of discharge monitoring at the Salaspils Research Reactor, the verification team recommends restoring functionality of the reactor building dose rate monitoring system and the stack gaseous discharge monitoring system as soon as possible, but in any case before the dismantling and decommissioning work of the reactor commences.

(4) In addition, a few technical recommendations are formulated, in particular as regards continuity of monitoring, commissioning of the new dose rate monitoring network, laboratory staffing and detector calibration issues. These recommendations aim at improving some aspects of the surveillance of environmental radioactivity and radioactive discharges in Latvia. The recommendations do not discredit the fact that environmental monitoring is in conformity with the provisions laid down in Article 35 of the Euratom Treaty.

(5) The Commission services request a report on the implementation of the recommendations by the Latvian authorities and about any significant changes in the set-up of the monitoring systems before the end of 2016. Based on this report the Commission will consider the need for a follow-up verification in Latvia.

(6) The verification team acknowledges the excellent co-operation it received from all persons involved in the activities it performed.

APPENDIX 1

VERIFICATION PROGRAMME

Date	Time	Actions
Tuesday 10 June	15.00 – 17.00	Opening meeting ***The Ministry of Environmental Protection and Regional Development,*** ***Peldu Street 25, Riga***
Wednesday 11 June	9.00 – 12.30	State Limited Liability Company "Latvian Environmental, Geological and Meteorological Centre" Laboratory Division ***Maskavas street 165, Riga***
	13.30 – 17.30	National radioactive waste near-surface repository "Radons" ***Baldone, Baldone district***
Thursday 12 June	9.00 – 17.30	Various PMS and AMS stations, in particular any stations not seen in 2006 or added since then.
Friday 13 June	9.00 – 12.00	The Institute of Food Safety, Animal Health and Environment - "BIOR" Laboratory Division ***Lejupes Street 3, Riga***
	13.00 – 16.00	University of Latvia, Secondary Standard Dosimetry Laboratory Salaspils Research Reactor ***Miera Street 31, Salaspils***