National Report

Convention on the
Safety of Spent Fuel Management
and on the Safety of Radioactive Waste Management

Republic of Latvia

The Radiation Safety Centre
Republic of Latvia
2005

Introduction

This is the second report submitted by Latvia under the Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The report provides updated information (since November 2003) about Latvia's implementation measures to meet the objectives of the Convention.

Several requirements of the Convention are not directly applicable to Latvia because there are no nuclear power plants and the research reactor at Salaspils is already shut down and is in early stage of decommissioning.

Latvia's policy aspects related to **Joint Convention**:

- We recognise that the operation of nuclear research reactors has generated spent fuel and radioactive waste along with the fact that other applications of nuclear technologies also generate radioactive waste. Moreover, the decommissioning of reactor will generate much larger amount of radioactive waste than during its operational period.
- Latvia's objectives are to ensure safe management for spent fuel and radioactive waste; therefore all activities shall be done by present generations and within a comprehensive framework of radioactive waste management.
- We recognise the importance to the international community in ensuring that approrpiate practices are implemented for the safety of spent fuel and radioactive waste management, because only joint activities could solve technical issues and safety concerns, but safety non-compliance in any country will imply stronger requirements in other countries and reduce public acceptance for such practices.
- Latvia emphasizes the importance of informing the public on issues regarding the safety of spent fuel and radioactive waste management due to a vital need for public acceptance as waste management activities lead to long term impacts and significant investments, therefore without such acceptance it is impossible to reach safety objectives. Moreover, requirements for public information are defined as obligations under other environmental protection agreements and also have direct relation to the constitutional rights of citizens.
- Latvia stresses that the ultimate responsibility for ensuring the safety of spent fuel and radioactive waste management rests with the State.

Nuclear safety regulatory infrastructure

There are no changes for regulatory infrastructure. The Radiation Safety Centre (in Latvian Radiācijas Drošības Centrs, henceforth RDC) was established in 2001 as the state regulator responsible for radiation and nuclear safety issues in Latvia.

Functions of the Centre related to implementation of the Joint Convention are defined by legislation, and include to:

- draft policy proposals for supervision and control of radiation and nuclear safety;
- supervise and control radiation safety;
- licence practices with radiation sources;
- coordinate combat of illicit trafficking of radioactive and nuclear materials;
- encourage introduction of new technologies to minimise the possible harmful effects;
- co-ordinate technical cooperation in the field of radiation safety;
- prepare national reports;

- assess implementation of international recommendations;
- draft proposals of legal documents to maintain adequate legal framework;
- maintain data bases on practices, sources and exposures.

The RDC consists of the following main divisions: Inspection division including Early warning sector, Licensing division, Laboratory division including Radiation safety sector and TLD sector, Public affairs division, and Administrative division including Legal sector. RDC employs 30 specialists with high level of competence in radiation and nuclear safety.

There are around 800 licensed operators under supervision and control of the RDC, among them only around 30 operators are potential generators of radioactive waste. The largest group of operators in Latvia is from medical applications. Total inventory of radioactive materials and sealed radiation sources is around 8000 starting from very small sources for smoke detectors (containing mostly Pu) up to high activity sources from blood irradiator and teletherapy equipment.

The maintenance of safety culture and high quality standards at the level of national regulatory authority has crucial impact to national radiation and nuclear safety infrastructure including safety performance at the level of operators. Therefore, it is necessary to establish a full scope quality assurance and quality control system within the organisation responsible for supervision and control, starting from top-level management to staff at all levels. Thus, since last report RDC with the support from EU (under PHARE program) during the years 2004-2005 developed the comprehensive management system in accordance with IAEA and other international recommendations.

Consequently these are the major changes for regulatory authority.

National policy regarding nuclear activities

There are no changes in the national policy regarding the nuclear activities – no Nuclear Power Plants (NPP) will be constructed on the territory of the Republic of Latvia according to the framework plan for development of energy supply sector. In addition, Latvia has not commissioned any nuclear power plant, nor any nuclear fuel cycle facility. The lack of possibilities for the disposal of spent fuel in Latvia serves as one of the objections in decision-making process regarding construction of large-scale nuclear installations, including nuclear power plants.

Detailed *article per article* review

CHAPTER 1. OBJECTIVES, DEFINITIONS AND SCOPE OF APPLICATION

ARTICLE 3. SCOPE OF APPLICATION

Latvia has no nuclear facilities according to the definition of this Convention; however some provisions are applicable for Soviet design pool type research reactor, which was shutdown in June 1998.

Radioactive waste in Latvia originates exclusively from civilian programs. The main producers of radioactive waste are:
a) Traditional areas:

- **medicine**: radiotherapy – Co-60, 2 hospitals, 220 TBq in total (as on January 2005);
- **research**: main nuclides – Co-60 (irradiator) 198 TBq (as on January 2005), Pu-Be 1,5 TBq;
- **industry**: the main nuclides – Cs-137 (~44 TBq), irradiation, nuclide gauges, calibration, Am-Be (115 GBq), well logging.

b) Specific areas:

- decommissioning of Salaspils Research Reactor – the foreseen total volume of radioactive waste ~1200 m^3;
- management of contaminated scrap metal, which was imported either for reprocessing or transit purposes.

CHAPTER 2 SAFETY OF SPENT FUEL MANAGEMENT

ARTICLE 4. GENERAL SAFETY REQUIREMENTS

Legal framework
There are no major changes Latvia in the framework of legal document regarding safe management of spent fuel. The system is based on three main pillars:

1) **International legal instruments** to which Latvia is the Party;
2) **EU legal instruments;**
3) **National regulations**.

Since May 2004 several legal documents had been adopted (e.g. EU regulations replaced national regulations) and modified (some additional provisions from EU directives and recommendations had been incorporated in national regulations), but since late 90^{ies} of last century Latvia worked on preparations of legal framework in harmony with system used in EU, there are no major changes.

Implementation measures of legal requirements

Spent fuel has been put currently in the wet storage tank adjacent to the reactor pool according to the decommissioning concept. It is planned to be moved out of Latvia in the framework of USA–IAEA–Russia co-operation project and proposed Latvia–Russia intergovernmental Agreement on co-operation in the spent fuel management, until this event storage conditions are permanently controlled by the operator and supervised by the RDC, besides, since 1995 fuel assemblies are regularly controlled by IAEA inspectors.

To ensure that obligations related to the safe management of spent nuclear fuel (from the research reactor) are fulfilled, Latvia is implementing a technical program financed by the USA government (in the frame of DOE/FIB project) for combating of illicit trafficking of nuclear and radioactive materials and prevention of radiological terrorism.

ARTICLE 5. EXISTING FACILITIES

Background information

There are no major changes regarding the existing facilities. Latvia used to have a Nuclear Research Centre with a pool type 5 MW_{th} IRT reactor. The Cabinet of Ministers in 1995 made the decision to start preparations for the decommissioning and in 1998 the second decision was made about permanent shutdown of the reactor. Presently a Hazardous Waste Management State Agency "BAPA" manages the decommissioning project of this research reactor.

According to the decommissioning concept, approved by the Cabinet of Ministers in 1999 (updated concept was approved in 2005) the decommissioning of the research reactor is envisaged by the end of year 2010.

ARTICLE 6. SITING OF PROPOSED FACILITIES

Latvia has no plans to establish spent fuel management facility; therefore these provisions are only partly incorporated in national nuclear legislation.

Should such legal acts be needed, the system and steps for the licensing of nuclear facilities and major modifications to such facilities are prescribed in the Licensing Regulations "*On the Procedure of issuing of a Special Permit (Licence) or Permit for Activities involving Ionising Radiation Sources and Procedure for Public Dispute on the Establishment of Ionising Radiation Facilities of State Significance or Essential Modifications thereto"*.

The Law on Environmental Impact Assessment and relevant Cabinet Regulations govern potential evaluating of relevant site-related factors likely to affect the safety of facility. The Law on Environmental Impact Assessment prescribes requirements for assessment of impact of proposed nuclear facilities on the environment. The mechanism of public hearing is established by licensing regulations. Proper communication with nearby Contracting parties is governed by relevant Conventions having been ratified.

ARTICLE 7. DESIGN AND CONSTRUCTION OF FACILITIES

As there is no government plan to build any nuclear facility, these provisions are only partially incorporated in national nuclear legislation. In general legislation, the potential necessary provisions are introduced by the Law on Radiation Safety and Nuclear Safety, the Law on Conformity Assessment, Basic safety regulations and Licensing Regulations.

ARTICLE 8. ASSESSMENT OF SAFETY OF FACILITIES

Taking into account that Latvia has no nuclear installations, these provisions are not yet fully elaborated in the national legal framework. Provisions related to the safety assessment for nuclear facility are only partly incorporated in legislation because currently no new facility is planned. Should such necessity be raised, the legal basis for the safety impact assessment is given in the Law on Environmental Impact Assessment.

Other safety assessment requirements are partly elaborated in Licensing Regulations as well as Regulations on Activities including Nuclear Materials and Regulations on Physical Protection.

The safety assessment for reactor in safe enclosure stage and also for decommissioning is made with respect the Law on Environmental Impact Assessment and relevant Licensing Regulations.

The general public and any municipal or other institution in relevant regions should have access to information concerning the evaluation of potential threat from nuclear facilities, as prescribed by the Licensing Regulations. Information about planned activities and major modifications of nuclear and radiation facilities should also be provided to the public.

ARTICLE 9. OPERATION OF FACILITIES

1) Provisions on safe storage of the spent fuel (including its maintenance, monitoring, inspections and testing) have been elaborated in the Cabinet Regulations on Activities including Nuclear Materials, Related Materials and Equipment and Regulations on Physical Protection;
2) Relevant activities are carried out in compliance with the Licence issued by RDC for interim storage of the spent fuel, for ensuring nuclear safety without power and safe maintenance of relevant equipment of the Research Reactor.
3) Inspections, accounting and reporting are carried out in compliance with national (and EU) Regulations and International Conventions (Safeguards Agreement, Additional Protocol, etc.).

RDC regularly provides inspections to verify compliance with legal requirements – according the Law on Radiation Safety and Nuclear Safety any nuclear facility is "*ionising radiation facilities of state significance*", thus according the roles of procedure for RDC the regular planed comprehensive inspections is carried out not less than 4 times per year, in addition to regular topical inspections are organized (e.g. on safeguards issues together with IAEA and EU inspectors) and for any safety significant activity, which is planed by the operator.

ARTICLE 10. DISPOSAL OF SPENT FUEL

The spent fuel is planned to be moved out of Latvia in accordance with internationally agreed practice.

CHAPTER 3 SAFETY OF RADIOACTIVE WASTE MANAGEMENT

ARTICLE 11. GENERAL SAFETY REQUIREMENTS

Legal background

According to the Cabinet Regulations on Practices Involving Radioactive Waste and Related Materials, the radioactive waste is classified in several groups, *inter alia*, also according the amount of generated heat power for high activity waste.

Criticality issues are specified in Regulations on Protection against Ionising Radiation in Transportation of Radioactive Materials, which set up also limitations on radioactivity content in packages/containers.

According to the law **"On Natural Resources Tax**" and the law **"On Radiation Safety and Nuclear Safety"** – in the case of import into the Latvia of radioactive substances that, after use thereof, generate radioactive waste, which needs to be disposed of in Latvia, **a natural resource tax is payable on the import of such substances.**

According to the Regulations of the Cabinet of Ministers, the operator who plans to import sealed ionizing radiation sources, containing radioactive materials whose radioactivity when using given sources for a period of 10 years will exceed 100 MBq, prior to acquisition of said sealed ionizing radiation sources into possession or tenure, must take all possible measures so that possibility to send back mentioned sealed sources to the producer be specified in the purchase and sales contract or in the grant agreement.

In case when the purchase and sales contract or the grant agreement does not contain provisions on send-back of disused sealed sources to producers thereof:

i. other possible suppliers must be sought or;
ii. requirement to pay a fee for import of radioactive substances into Latvia.

The following legal acts directly governing radioactive waste management are:

1. The Law "On Radiation Safety and Nuclear Safety";
2. The regulations of the Cabinet of Ministers "Requirements for the Practices with Radioactive Waste and Related Materials";
3. The regulations of the Cabinet of Ministers "The Principles of Determination of the Equivalence of Various Radioactive Waste."

As practices with radioactive waste are in the same time also practices with radiation sources all other regulations are applicable (e.g. basic safety requirements, requirements for physical protection, safe transport, etc.).

Strategy for radioactive waste management

A Concept of the management of radioactive waste was approved by the Cabinet of Ministers in 2002, which was elaborated, based on:

a. **IAEA *generic*** principles for radioactive waste management,
b. ***Site-specific*** conclusions recommendations of CASSIOPEE study on Safety Assessment of Baldone repository,

c. National legislation and other **site-specific items** (conditions, government documents, planned tasks) prescribe the solutions for the safe management of radioactive waste in the next 5–10 years (the time period from 2003 till 2010).

ARTICLE 12. EXISTING FACILITIES AND PAST PRACTICES

Operator of radioactive waste management

A "BAPA" is the only organization in Latvia dealing with all stages of radioactive waste management, including processing, conditioning, transportation, long-term storage and disposal of radioactive waste. "BAPA" has two main sites – research reactor site in *Salaspils* dealing with safe enclosure of research reactor and decommissioning activities and the near surface radioactive waste repository "*Radons*" in Baldone. Since first peer-review Conference there is a change for operator (from State non-profit organisation "RAPA" Ltd. to the State Agency for management of hazardous waste "BAPA").

For technical details see more in the Annex 1-2 of this report.

Implemented measures

1) During 2004 outline design for expansion of the site was prepared by financial support from EU (Phare 2001);
2) Since first peer-review Conference some upgrades of safety for radioactive waste management facilities were performed:
    a. Commissioning of liquid radioactive waste cementation equipment (at Salaspils site for conditioning of all radioactive waste), which assure better management of waste from small producers – the same system is used for waste from decommissioning;
    b. More efforts to retrieve and update inventory of radioactive waste in order to get more precise information about activity levels and forms to continue Safety Assessment of the disposal site.
3) The EIA study for expansion of the site was performed in 2005.

Planned measures

According to the Concept and outline design (see in more details in Annex 3):
1) Two new vaults should be build,
2) The new long term storage is planned to ensure safe storage of waste (including spent sealed sources), which is not suitable for the disposal in near surface.

ARTICLE 13. SITING OF PROPOSED FACILITIES

The required measures are provided by the set of legislation acts, in particular:
1. The Law "On Radiation Safety and Nuclear safety" stating that "The job manager, either directly or through the media, informs members of the public about radiation safety and nuclear safety measures carried out or proposed at the site concerned".

2. The Licensing Regulations "On the Procedure of issuing of a Special Permit (Licence) or Permit for Activities involving Ionising Radiation Sources and Procedure for Public Dispute on the Establishment of Ionising Radiation Facilities of State Significance or

Essential Modifications thereto", by requiring 4 major steps to be made prior to of the facility, and establishing the mechanism of public hearing;

3. The Law on Environmental Impact Assessment governing potential evaluating of relevant site-related factors likely to affect the safety of facility, and prescribing requirements for assessment of impact of proposed nuclear facilities on the environment.

The detailed project drafts for the enlargement of the radioactive waste depository "Radons" and for the long-term storage had to be prepared in 2003. After the preparation of the outline design, the EIA was performed for the assessment of the technical project including the construction of a new vaults and the long-term storage.

During 2003-2005 environmental impact assessment was performed both related to the extension of the radioactive waste depository "Radons" and the decommissioning of the research reactor in Salaspils.

ARTICLE 14. DESIGN AND CONSTRUCTION OF FACILITIES

These provisions have been incorporated into general legislation by the Law on Radiation Safety and Nuclear Safety. The Law on Conformity Assessment, the Law on Environmental Impact Assessment, National BSS and Licensing Regulations must also be observed and complied with.

These legal provisions are used by RDC to prepare license conditions for "BAPA" and for authorisation of any changes relevant to the safety of facility.

ARTICLE 15. ASSESSMENT OF SAFETY OF FACILITIES

Current plans for building of new waste storage spaces in Latvia have been elaborated on the basis of recommendations derived from Long-term safety analysis of the Baldone repository performed by CASSIOPEE in 2001-2002:

- to build a dedicated long storage for spent sealed sources and long-lived waste,
- to modify disposal vault's design to meet best available practices in other countries.

The anticipated radiological impact of the new building vaults has been evaluated in the frame of CASSIOPEE analysis and more recent EIA (in 2004-2005), including applicable criteria, conditions, input data, hypotheses, advanced methodologies (ISAM) and computing tools (RESRAD, Microshield 5) as well as recommended corrective measures.

ARTICLE 16. OPERATION OF FACILITIES

Licensing procedures

The licensing procedures for nuclear facilities are regulated mainly by set of licensing regulations, which cover the conceptual stage, design, construction, commissioning and operation of the facility. The operation license is valid for a period of 3 to 5 years.

The last licence issued to the operator of radioactive waste management facility is based on conclusions obtained from Long-term safety analysis of the Baldone repository and EIA study. RDC is assessing compliance with requirements of national legislation, existing standards. All safety related instructions; guidance and Quality Assurance programmes prepared by Operator have been analysed and accepted by RDC.

Assurance of engineering and technical support

Radioactive waste management is mainly funded from the State budget, thus assurance of support in safety related fields are considered annually and the Ministry of Environment, which may provide extra resources if needed.

External engineering and technical support is provided in the frame of the relevant IAEA Technical Co-operation Projects, EU (PHARE Projects and other EC funded activities), by co-operation with USA (Department of Energy) etc.

Radioactive waste characterization

Provisions for characterization and segregation of radioactive waste are in detail elaborated in national regulations.

Waste characterization and sorting is provided by the producer and introduced in the regulations, which for radioactive waste segregation foresee that *waste **producer** (owner) **ensures** such conditions:*

- ***Each** waste **container** shall contain **only 1** respective group of radioactive waste;*
- *shall **prevent** in a container a **mixing** of:*
    - *radioactive waste subject and, respectively, not subject to treatment;*
    - ***long-lived** and **short**-lived radioactive waste;*
    - *low and intermediate level waste with high level radioactive waste.*

Incident Reporting system

The provisions required reporting of incidents has been implemented in the Law on Radiation Safety and Nuclear Safety – the job manager informs state and local government institutions and, either directly or through the media, informs members of the public about potential incidents, accidents and the necessary measures for protection of members of the public in the event of an accident. Fortunately, there was no such event up to now. The minor deviations from safety requirements are registered by operator and discussed with RDC inspectors during the planned inspections. The corrective actions are always prepared and implemented.

Provisions regarding operating experience

Provisions regarding collection and analysis of experiences have been included in the Law on Radiation Safety and Nuclear Safety, setting up to the Radiation Safety Centre, inter alia, following obligations:

- *to collect, analyze and submit information to the Radiation Safety Board and major users of ionising radiation sources on the radiation safety situation in the country,*
- *to encourage introduction of new technologies to minimize the possible harmful impact resulting from the ionizing radiation sources.*

Provisions regarding decommissioning of radioactive waste management facilities, closure of a disposal facility

Regulations dealing with licensing and with preconditions for applicants request to elaborate future decommissioning plan for any facility where radioactive materials are envisaged to be used. During application for first license an outline of decommissioning plan is requested, which is updated during entire operational period receiving each next license.

Cabinet Regulations „Requirements for the practices with radioactive waste and related materials" provide detailed consecutive implementation of a set of measures with an aim to upgrade safety before closure of the disposal facility. The possibilities for meeting of these requirements are subject to licensing conditions.

ARTICLE 17. INSTITUTIONAL MEASURES AFTER CLOSURE

Provisions related to activities after closure of facility are incorporated and in detail specified in Cabinet Regulations „Requirements for the practices with radioactive waste and related materials".

There are no major changes for these requirements; some minor suggestions are elaborated during the EIA study.

CHAPTER 4 GENERAL SAFETY PROVISIONS

ARTICLE 18. IMPLEMENTING MEASURES

Obligations under this Convention have been implemented in above mentioned national laws, Cabinet Regulations; besides, the Concept of the Management of Radioactive Waste defines some additional tasks and measures related to International Conventions.

A summary of results for the entire programme of monitoring undertaken since 1995 is given in Annex 2. The results include:

Monitoring at on-site locations:
- γ-radiation dose rates in air, at different locations in the controlled area and supervised area, in monitoring wells and in buildings; γ-dose rates in monitoring are mostly due to γ-radiation from activity in the soil due to partial shielding of cosmic and solar radiation and airborne activity;
- β and α-contamination of workplaces and of surfaces in the buildings;
- Specific ground water activity levels in monitoring wells (onsite and close the site boundaries);
- Specific activity levels in air samples from monitor in the B-zone.

Monitoring at off-site locations:
- Specific activity levels in air samples;
- Specific activity in soil samples;
- Specific activity levels in plant samples;
- Specific water activity levels in water reservoirs in the vicinity of site;
- Specific activity level in precipitation.

ARTICLE 19. LEGISLATIVE AND REGULATORY FRAMEWORK

Legislation in Force

The Law on Radiation Safety and Nuclear Safety came into force on 26 October 2000. The law defines all practices with radioactive or nuclear materials and all sources of ionizing radiation. It establishes the basic principles of radiation and nuclear safety (justification, optimisation and limitation) and also contains provisions on third party nuclear liability.

Operators of radiation facilities must provide all necessary information to the RDC showing that safety measures are being implemented. RDC may then deliver licences (for commercial activities) or permits (for non-commercial activities) for the case. The RDC may at any time withdraw or revoke licences or permits if radiation protection and nuclear safety requirements are not met.

There are no major changes since the first peer-review Conference. Several regulations had have minor modifications e.g. Statutes for RDC, Statutes for Radiation Safety Board, radiometric control on the state border, licensing regulations etc.

ARTICLE 20. REGULATORY BODY

The Law on Radiation Safety and Nuclear Safety states that state supervision and control in the radiation safety and nuclear safety field is independently carried out by a state regulatory authority called the Radiation Safety Centre, which is supervised by the Ministry of Environment.

The system of state authority under supervision of relevant ministry, which has no functions in the uses and promotion of atomic energy assure that RDC is an independent national authority and can implement its decisions also independently from its supervisor.

The finances for RDC are granted annually by Saeima (the Parliament) as separate budget line, including portion of incomes from the services provided by the RDC to radiation workers – TLD measurements. The RDC own income constitutes less than 30% from the total budget, such level assures no potential negative impact from the services to main functions – supervision and control.

Since first peer-review Conference the only changes for RDC is further upgrades of its technical capabilities and introduction of comprehensive management system (including quality management based on relevant ISO standards).

ARTICLE 21. RESPONSIBILITY OF THE LICENCE HOLDER

To obtain a licence, the applicant must fill an application, which, along with other documents, will be reviewed by the RDC. Once delivered, a licence is usually valid for three years. However, any licence may be subject to revocation should a violation of safety standards be detected during inspection. Upon expiration, the licence is not automatically renewed, and a new application has to be submitted.

According to the Law on Radiation Safety and Nuclear Safety the licence holder has prime responsibility on safety. These provisions have not changed.

The “BAPA” is the only organisation in Latvia dealing with maintenance of nuclear facilities and management of radioactive waste. “BAPA” is the licence holder for the relevant activities subject to this Convention, in particularly, for interim storage of the spent fuel, for ensuring nuclear safety without power and safe maintenance of relevant equipment of the research reactor as well as for a complete cycle of radioactive waste management.

ARTICLE 22. HUMAN AND FINANCIAL RESOURCES

1) The Law states that the job manger:

> *ensures that workers involved in practices using ionising radiation sources are sufficiently trained to implement protective measures, are aware of circumstances and of the requirements of normative acts, and are informed of potential risk related to given practices.*

2) “BAPA” is mainly financed from the State Budget. The Ministry of Environment explains and gives proof to the Government concerning adequate funding for each fiscal year and long term programmes. The Ministry provides also extra funds from its resources (including extra-budgetary resources from Latvian Environmental Protection Fund) and assists in finding donors by maintaining cooperation with international organisations.

For decommissioning of research reactor the Cabinet and for implementation of the Concept of Radioactive Waste Management the Government should allocate additional financial resources.

For staff training and qualification upgrading the Latvian Environmental Protection Fund, EC, Sweden and RDC provided finances for preparation of the radiation protection manuals. Latvian University has established radiation protection course for the workers and job supervisors. Qualification upgrading is also implemented in the frame of EU projects and is a precondition during the licensing process.

ARTICLE 23. QUALITY ASSURANCE

The quality assurance programmes are requested by the Cabinet Regulations on Protection against Ionising Radiation.

Detailed requirements of QA programmes are also included in Regulations on Radiation Protection during the Transport of Radioactive Materials (including radioactive waste) as well as Licensing Regulations prescribing a special request of QA and stating that the licence must be issued for a shorter time period, if the QA programme is not adequate.

„BAPA" has implemented a quality assurance system, which comply with all aforementioned requirements, appreciated by RDC by issuing in appropriate licences. "BAPA" has also accreditation of certain laboratory activities under ISO 17025 standard.

ARTICLE 24. OPERATIONAL RADIATION PROTECTION

Discharges are specified and quantitatively limited by Regulations on Practices Involving Radioactive Waste and Related Materials. Environmental situation is controlled in accordance with the State Control Program for the Ionising Radiation Facilities of National Significance.

Additional dose limits related to radioactive waste management are specified in Requirements for the practices with radioactive waste and related materials, namely:

> *If, based on the results of environmental monitoring and on the long-term safety assessment, it is identified that the potential exposure dose to the members of the public living in the direct vicinity of a radioactive waste disposal facility, is:*
>
> > *1) Above or equal to 5 mSv/year, obligatory measures must be taken to bring the situation to normal and to reduce radiation dose to approximately 300 µSv/year,*
> > *2) Between 1 and 5 mSv/year, respective measures must be taken during over the next five years to bring the situation to normal and to reduce radiation dose to approximately 300 µSv/year,*
> > *3) Less or equal to 1 mSv/year, the implementation of measures is considered on the basis of the financial and technical capabilities;*
>
> *The maximal exposure dose to the critical group of population shall not exceed 100 µSv/year, but maximal average dose – 10 µSv/year.*

"BAPA" has a qualified licensed emergency response group for mitigating the effects of unplanned release of radioactive materials into the environment, should such occur.

There is no any case when radiation workers of "BAPA" had received external exposures above 6 mSv/year (1/3 from the dose limit), in majority cases the doses are on the level 1-2 mSv/year, which demonstrates that operational safety measures correspond to good practices.

ARTICLE 25. EMERGENCY PREPAREDNESS

The Law on Radiation Safety and Nuclear Safety sets the requirements for immediate flow of information regarding radiation accidents and emergencies, namely

> *The job manager reports immediately to the operator, the Centre and the State Fire Protection and Rescue Service on all accidents and incidents, which occur during practices involving ionising radiation sources.*

According to the Law on Civil Protection, the main institution responsible for planning and implementation of emergency preparedness in Latvia is the Fire and Rescue Service.

Based on above mentioned laws the Cabinet accepted the Regulations on preparedness and response in cases of radiation accidents and it annually approves the National Emergency Preparedness Plan (there are no significant changes annually on the subject matters, but as always some minor changes on institutional level and operational procedures – mainly the technical annexes of the Plan are changed annually).

There are no changes in allocation of responsibilities for governmental bodies co-ordinating the actions in the case of an emergency. They are the State Fire and Rescue Service and the Radiation Safety Centre:

- Radiation Safety Centre is responsible for supervision of operative actions at the accident site.
- A larger scale accident activates the State Fire and Rescue Service.

Some other requirements for the emergency planning and response are set out also in some several regulations e.g. on Protection against Ionising Radiation, on Safe transport, on Licensing etc.

"BAPA" has implemented 2 local plans, in agreement with relevant local municipalities:

- Preparation for and Action in the Case of Accident in Salaspils Research Reactor, and
- Preparation for and Action in the Case of Accident in the Baldone Radioactive waste disposal site.

There are no changes on regional level – according to the Agreement signed by all states in Baltic Sea region the states concerned have to provide data from their monitoring stations to all parties of the Agreement. Since first peer-review Conference RDC participates also in EU EurDep network and uses CoDec system for data exchange.

There are no new bilateral agreements since first report, but practical implementation of emergency plans and data exchange had been tested in regional exercises (organised by Sweden for 4 countries, also co-ordinated by Lithuania for three Baltic States) and also on bilateral level (between RDC and Ukraine regulatory authority).

Regulations on Preparedness for and Actions in the Case of Radiation Accidents provide that appropriate training for the testing is necessary for the testing of the emergency plans. Such training is carried out on regular basis, providing the opportunity to test the different levels of organization and improve the key aspects of the emergency planning.

By financial support of EU (PHARE 2003) the new project was launched to further elaborate training and teaching materials, which had been developed in 2001-2002 by Latvia's authorities. The aim is within 10 months period (starting from October 2005) to develop set of lecturers notes including all slides for demonstrations and some video materials. More over the practical exercises both for emergency response of RDC and RDC activities with respect to illicit trafficking case will be organised in 2006.

ARTICLE 26. DECOMMISSIONING

Decommissioning and dismantling of the Salaspils nuclear reactor is an ongoing process according to the Cabinet resolution from October 1999, which was slightly modified in 2004. Decommissioning and dismantling of the Salaspils nuclear research reactor is to be carried out until so called “brown field” status, which means, that infrastructure will be used for establishment of national cyclotron centre to replace loss of possibilities for nuclear related research and for production to short lived isotopes, which will be used for diagnostics.

Financing: Special funds and extra financing have been allocated by Saeima and Cabinet of Ministers.

Provisions for operational radiation protection and protection of the public

Proper level of operational radiation protection as well as that of control on discharges and unplanned/uncontrolled releases is ensured by the Quality Assurance System of “BAPA” and State Control Program for the Ionising Radiation Facilities of National Significance.

EIA process for the decommissioning of the Salaspils nuclear reactor has finished in 2004 in parallel with preparation of the detailed project for decommissioning, but EIA study for expansion of radioactive waste disposal site was prepared during 2005.

The System of Accounting and Transfer of Radioactive Waste of “BAPA” provides that all physical objects being in the control zone of the Research Reactor and not being necessary for its further maintenance, initially are considered as radioactive waste or related materials. RDC is receiving also regular reports from the operator and approves the free release of exempted materials.

CHAPTER 5 MISCELLANEOUS PROVISIONS

ARTICLE 27. TRANSBOUNDARY MOVEMENT

Basic provisions of this Article have been implemented in Cabinet Regulations on the Procedure governing Activities involving Nuclear Materials, Related Materials and Equipment, regulations "Requirements for the Practices with Radioactive Waste and Related Materials" as well as Regulations on General Principles of Exchange Procedure of Different Radioactive Waste, requiring, in general, agreement of the state of destination and – in case of the spent fuel – agreement with IAEA. Possible export of the spent fuel from Latvia is foreseen in the frame and terms of the IAEA-Latvia-Russia Project.

In Regulations "Requirements for the Practices with Radioactive Waste and Related Materials" it is set up that:

It is prohibited to send radioactive waste:

a) *to a destination state south of latitude 60 degrees South,*
b) *to the Africa, Caribbean and Pacific States – Contracting Parties of the Loma Agreement (15.12.1989),*
c) *to the states having insufficient technical, legal or administrative basis for safe management of radioactive waste without causing danger to population;*

RDC forwards an application for the permit to export radioactive waste and the corresponding Permission Form to the Authority of that state where it is planned to carry out waste reprocessing and to Authorities of all those states whose territories will compose the transportation route of this waste, followed by an relevant request to give a corresponding conclusion;

RDC is authorized to issue a permit to export radioactive waste for its re-processing only after receipt of official permit from the Authorities of all those states to whom RDC had forwarded the permit to export radioactive waste for the purpose of its re-processing.

ARTICLE 28. DISUSED SEALED SOURCES

Proper possession and accounting of disused sealed sources is ensured by the requirements of the Law on Radiation Safety and Nuclear Safety, setting up to the RDC following obligations:

- *to ensure identification, investigation and assessment of unknown ionising radiation sources discovered on national territory, or of undeclared ionising radiation sources discovered at the state's border, and to organise disposal thereof should it fail to be possible to identify the user or the owner of a radiation source;*
- *to ensure accounting of ionising radiation sources; to establish and update data bases on radioactive substances, nuclear materials, radioactive waste and other ionising radiation sources.*

Management of disused sealed sources is prescribed also in the requirements by Cabinet regulations on licensing and on regulations on Requirements for the Practices with Radioactive Waste and Related Materials.

Based on these legal provisions and some experiences for practical implementation Latvia sent notification to the IAEA about implementation of Code of Conduct and recommendations for transboundary movements.

Practices towards safe disposal of disused sealed sources

Practices towards safe disposal of disused sealed sources are implemented on the basis of CASSIOPEE Recommendations (including also Design Criteria for a Centralized Spent Sealed Sources Facility), which were used to prepare outline design for long term storage of sources and radioactive waste, which are not suitable for disposal in near surface (implementing the PHARE project “Design of additional waste disposal vault and integral storage facility for long-lived waste”).

The Cabinet Regulations “Requirements for the practices with radioactive waste and related materials”, which together with the Law on Natural Resource Tax encourage return of disused sources to their producers.

Practices towards safe final disposal of long-lived disused sealed sources Latvia are implemented by seeking and evaluating possibilities to use regional disposal option, thereby, by joining in 2004:

1) the EC regional project SAPIERR (Support Action: Pilot Initiative for European Regional Repositories) integrating the states wishing to explore the feasibility of regional solutions for the deep final disposal, and submitting to SAPIERR administration the data on RW inventory to be disposed in a deep disposal site,
2) international association *ARIUS* (Association for Regional and International Underground Storage).

Annex 1

SITE DESCRIPTION

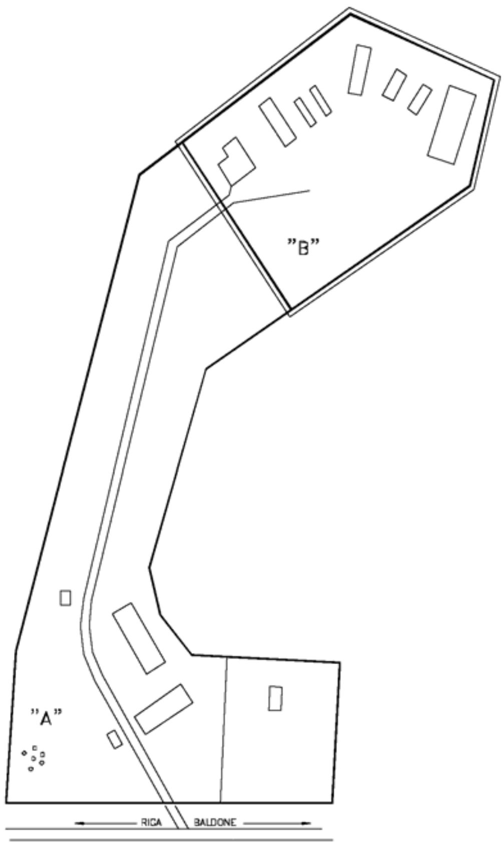
Disposal of Low and Intermediate Level Waste (LILW)

Basic information about facility

"Radons" was commissioned in October 1962. The site of this enterprise is located at a hill that rises up to a level of 35 m higher than the territory surrounding it. In the vicinity of the site, the level of groundwater is 18 m below the earth surface. Hence, penetration of groundwater into the near-surface vaults for radioactive waste disposal is practically excluded. There is a zone with radius of 1 km around the centre of the site where no residential houses are found.

The "BAPA" shall ensure also storage of all long-lived radioactive waste until the establishment of a geological repository or finding of other solution. The institutional control after the closure of the repository is foreseen for the period of 300 years.

The site of "Radons" covers an area of 7 hectares. A general lay-out of the site is given in Fig. 1.1. The operator-controlled area (i.e. the site) is dived in a controlled area (the B-zone) and a supervised area (the A-zone). The physical boundaries of the premises and buildings are used as a boundary of these areas (zones).



Diagrammatic arrangement of the radioactive waste disposal facility

Figure 1.1 Arrangement of the radioactive waste disposal facility

The administrative building, the auxiliary building and equipment of the repository are situated in the A-zone. This zone is protected by a 2.5m high metallic grating.

The B-zone is situated in the prolongation of the A-zone, towards the top of the hill. In the B-zone are the current storage facilities. The soil of the B-zone has been excavated/levelled so that all the storage facilities are nearly at the same level. The B-zone, being a controlled area, is of restricted access and is protected by a 2m high concrete panel fence serving in some places (boundary with higher relief zones) as a retaining wall.

The storage/disposal facilities of the B-zone comprise essentially:

- A temporary storage facility for sealed sources, located in the Decontamination Building;
- The so-called “old disposal facility” which is composed of six underground vaults (vaults identified N1 to N6) which are now filled and closed;
- The so called “new disposal facility” is presently composed of one underground vault, identified N7, which comprises a number of storage compartments (‘Cells’) and also some auxiliary equipments such as a waste cementation facility, a hot cell and an overhead crane.

This facility is a special storage room located within the Decontamination Building. The sealed radiation sources are stored in nine underground cylindrical cells, with a volume of $3m^3$ each, and closed by a shielding lid.

The sources stored in the storage room of the Decontamination Building are not considered as radioactive waste, since they are still the property of external enterprises or organisations to which they should be returned after a temporary storage period. They are therefore not included in the waste inventory of the repository, but are registered separately.

In addition to the nine underground cells, the storage room for sources comprises the following equipment:

- a light overhead crane for moving the lids of the cells and for handling the sources;
- 2 safe boxes for storage of small sources.

Inside the B-zone near the surface, at a depth of four to six metres, reinforced concrete vaults have been constructed where radioactive waste containers are disposed of. There are currently 7 waste disposal vaults:

- two with a volume of 40 m^3 each (vaults 4 and 5),
- four with a volume of 200 m^3 each (vaults 1, 2, 3, and 6),
- one (vault 7) with a volume of 1200 m^3.

Vaults 1, 3, 4, 5 and 6 have been sealed by covering with a layer of concrete followed, except in case of vault 6, by layers of clay, bitumen emulsion and sand. Vault 2 is empty and sealed with a layer of asphalt.

Vault 7, having a volume of 1200 m^3, was commissioned in 1995 and is currently in use. One of the 10 sections (“cells”) in this vault contains 64 standard 1.2m×1.2m×1.2m reinforced concrete waste packages (A-172 type) and is now full. Several of the remaining sections are used for temporary storage of long-lived disused sealed radiation sources. These are contained in:

- 130 0.2 m^3 steel drums, in which the sources are conditioned in concrete; and
- two 0.2 m^3 steel drums, in which the sources are loosely packed (i.e. unconditioned).

It is intended that all of these drums will be removed and transferred to the long-term waste store; thus making 9 cells available for receipt of further A-172 type packages. On that basis vault 7 still has capacity for 9 x 64 = 576 waste packages.

The total radioactivity of waste accepted for disposal or long term storage over 40 years of operation of the site, taking into account the radioactive decay, at the end of 2002 was circa 4.44×10^{14} Bq, while at the end of 2001 it was circa 3.07×10^{14} Bq. The amount of radioactive waste accepted per year varies from one year to another, fluctuating between 3.7×10^{11} Bq and 3.7×10^{13} Bq. The volume of radioactive waste varies accordingly.

In summary, the volume of radioactive waste at the disposal site "Radons" reached about 780 m^3 in December 2002, while on 1 June 2004 it was 802 m^3 that is, an increase by 22 m^3 within the last year and a half.

Vault N° 1

Vault N° 1 has a net capacity of 200 m^3. It is an underground vault of dimensions (L x W x H) 15x5x3m constructed with prefabricated concrete elements. No drainage system is provided.

The filling technique of the vault was as follows: the radioactive waste packages – plastic bags for bulk low-level, metallic drums for higher level and possibly some sealed sources in their shielding container – were placed in the vault. When a layer of about 1.5 m thickness was reached, the voids between the packages were filled with mortar, possibly prepared with contaminated effluents resulting from the treatment of liquid waste.

The filling of vault N°1 started in 1962 and was finished in 1973. The filling grade is 50%, i.e. 100 m^3 of effective waste. After being filled, the vault was closed with reinforced concrete slabs, and covered with a hydro-isolating layer completed by a layer of sand and soil, forming a small tumulus, which is now covered by vegetation.

Vault N° 2

Vault N°2 consisted of an underground 200m^3 tank made of stainless steel for the storage of liquid waste, and encased in a concrete monolith structure. In 1988, the liquid waste accumulated in the tank was treated and the radioactive residues were solidified by cement and used as mortar for immobilising the waste packages within the disposal vaults for solid waste.

Afterwards, the empty tank was cleaned and put out of service. The top of vault N°2 was covered with a layer of asphalt, forming a small tumulus. In the future it is intended that vault 2 will be filled with drums of concrete-encapsulated radioactive waste that are currently stored in vault 7.

Vaults N° 3 and 6

These two vaults are mostly identical in size and construction to vault N°1. Like vault N°1, vault N°6 was constructed in the initial period of the Baldone repository. Vault N°3 was constructed later, in the 1970s.

Compared with the other vaults for solid waste, vault 3 contains a significantly higher quantity of spent sealed sources and, therefore, a much higher content of radioactivity.

The filling of vault N°3 started in 1973 and finished in 1986, after an effective filling grade of 80% was reached (i.e. 160 m^3 of waste). The filling of vault N°6 started in 1988 and finished in 1996, after an effective filling grade of 70 % was reached (i.e. 140 m^3 of waste).

Vault 3 was closed and covered the same way as vault N°1.

A layer of concrete has been placed on top of the closure slabs of vault 6, forming a small tumulus, and a light building (25m x 9m) was constructed on top of this. This building is at present used as a garage for the mobile crane of the facility. As the building is generally in a poor state of repair, and the walls contain asbestos panels, it is planned that this building will be dismantled and removed from the site.

<u>Vaults N° 4 and 5</u>

Vaults N° 4 and 5 are smaller size vaults ($40 m^3$ capacity each), but of which the construction design, filling technique and closure system (tumulus) are very similar to vaults N° 1 and 3. The filling of vault N°4 started in 1974 and finished in 1988, after a filling grade of 90% was reached (i.e. 36 m^3 of waste). The filling of vault N°5 started in 1987 and finished in 1991, after a filling grade of 85 % was reached (i.e. 34 m^3 of waste).

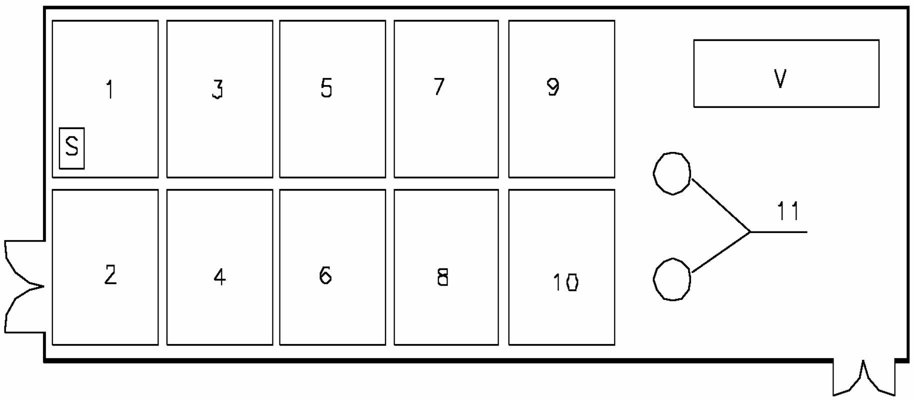
<u>Vault N°7</u>

The new vault N°7 (see also Fig. 1.2) consists essentially of ten 130 m^3 underground concrete walled storage cells, protected from the weather conditions by a light building. The building is equipped with a remote controlled overhead bridge crane with lifting capacity of 5 tonnes to lift the reinforced concrete shielding slabs on top of the cells as well as to lower the radioactive waste containers into the storage vault.

In addition to the ten storage cells, the building also contains:

- a small cementing facility,
- a hot cell for the dismantling of sealed sources,
- 2 underground ‘boreholes’ initially intended for the storage/disposal of dismantled sealed sources (design developed by Moscow “Radon”). These boreholes were never used.

The 10 underground storage cells are distributed in 2 rows, with five cells in each row; their internal dimensions were initially 5.0m x 5.1m x 5.6m (L x W x H). The wall thickness of vault 7 and also of the other vaults is 40 cm.



Vault N7

1. LRW accumulating hold
2. BRW storage
3. Cast-in LRW storage
4. IRS and RW primary treatment, storage
5. Low activity IRS (α, β, γ) storage
6. Storage of contaminated materials, equipment, etc.
7. Storage of IRS containing Pu, Pu+Be, Ra, Am and other long-life isotopes
8. Storage of high activity γ and β IRS
9. Storage of high activity Co-60 and Cs-137 sources
10. Interim storge of useful IRS
11. Working off IRS disposal holds without containers

S. closet for decontamination means
V. technological wagon

Fig. 1.2. Arrangement of Vault 7

Table 1.1(a) shows total activities of the main radionuclides in Vaults 1, 3 to 6 – it should be noted that the long-term safety assessment takes account of a wider range of nuclides.

Table 1.1(a)

Radionuclide activity in vaults 1, 3, 4, 5 and 6 (as on January 2005)

Nuclide	Vault 1	Vault 3	Vault 4	Vault 5	Vault 6	Total [Bq]
Ag-110m		3.65E+02			4.50E+03	4.86E+03
Al-26		1.05E+12				1.05E+12
Am-241		1.06E+11	3.03E+10		5.43E+11	6.79E+11
Ba-133	8.35E+08	3.49E+11	3.78E+07		9.08E+08	3.51E+11
Bi-207		7.22E+07			1.79E+08	2.51E+08
Bi-210m		2.64E+08				2.64E+08
C-14	4.44E+11	1.00E+12	2.81E+11	1.23E+08	1.02E+11	1.83E+12
Cd-109		1.74E+07	6.74E+05		9.36E+07	1.12E+08
Cd-113m		8.43E+07				8.43E+07
Ce-144		4.32E+02				4.32E+02
Cl-36 *	1.01E+12	4.29E+12	1.22E+08	4.11E+07	2.45E+10	5.33E+12
Cm-244					6.51E+05	6.51E+05
Co-57		9.77E+03	6.54E+02	2.25E+02	2.50E+05	2.60E+05
Co-60	2.78E+11	1.48E+12	1.50E+11	9.10E+07	1.15E+12	3.06E+12
Cs-134	1.14E+06	1.06E+09	2.54E+06	6.48E+05	3.20E+07	1.10E+09
Cs-137	2.78E+12	5.86E+13	2.16E+12	2.97E+07	1.91E+13	8.27E+13
Eu-152	2.76E+08	6.13E+09			2.31E+10	2.95E+10

Nuclide	Vault 1	Vault 3	Vault 4	Vault 5	Vault 6	Total [Bq]
Eu-154	6.01E+07	3.86E+09				3.92E+09
Eu-155	1.38E+04					1.38E+04
Fe-55	4.26E+07	3.49E+10	7.31E+08	1.48E+06	3.93E+09	3.96E+10
H-3	4.61E+10	1.79E+13	1.25E+10	2.15E+07	5.08E+12	2.30E+13
In-113			3.70E+07			3.70E+07
K-40	3.70E+10	8.81E+10				1.25E+11
Kr-85	2.38E+09	6.08E+10	1.55E+10		4.02E+10	1.19E+11
Mn-54		1.17E+05	1.82E+03	1.06E+03	5.63E+04	1.76E+05
Mo-93		1.84E+07			1.84E+07	3.68E+07
Na-22	5.48E+06	1.30E+10	1.54E+06	4.46E+05	2.27E+07	1.30E+10
Nd-144	9.96E+07				1.00E+08	2.00E+08
Ni-59		1.80E+09		4.11E+07		1.84E+09
Ni-63	1.73E+11	9.31E+12			3.73E+10	9.52E+12
Pb-210	5.46E+10	8.40E+11	1.94E+07	4.60E+07	8.64E+08	8.96E+11
Pd-107		5.55E+09			1.82E+09	7.37E+09
Pm-147	8.03E+07	1.10E+11	2.90E+09		3.90E+10	1.52E+11
Po-210					4.76E+02	4.76E+02
Pu-238		6.14E+09	3.25E+10		2.41E+11	2.80E+11
Pu-239	1.85E+11	1.60E+12	8.87E+10	1.85E+09	1.02E+12	2.89E+12
Ra-226	8.59E+11	7.75E+10	3.46E+04	3.67E+07	2.70E+11	1.21E+12
Ru-106		1.12E+06	1.07E+03		6.11E+04	1.18E+06
Sb-125	4.24E+07	1.91E+09			8.76E+06	1.96E+09
Sm-151		2.06E+08				2.06E+08
Sn-119m		1.30E+02			6.38E+03	6.51E+03
Sn-121m		2.95E+07				2.95E+07
Sr-90	1.53E+12	2.72E+12	5.50E+11		1.44E+12	6.24E+12
Tc-99		1.10E+09	8.98E+07		3.20E+08	1.51E+09
Th-228			2.12E+02		4.43E+04	4.45E+04
Th-230		1.67E+04				1.67E+04
Th-232	4.24E+06	9.39E+05			1.72E+08	1.77E+08
Ti-44		2.37E+09			1.25E+08	2.49E+09
Tl-204	1.16E+09	4.52E+09	2.17E+09		7.36E+10	8.15E+10
U-232	5.53E+10					5.53E+10
U-233		3.50E+04	3.84E+04		8.72E+05	9.45E+05
U-234		2.21E+03			2.15E+04	2.38E+04
U-235	6.07E+05	3.57E+04			4.27E+03	6.47E+05
U-238	8.22E+07	2.17E+07	8.00E+06		2.70E+07	1.39E+08
Zn-65					7.90E+03	7.90E+03
Zr-93	1.78E+07	1.41E+09			2.22E+07	1.45E+09
Total	**7.47E+12**	**9.97E+13**	**3.33E+12**	**2.28E+09**	**2.92E+13**	**1.40E+14**

In order to optimise the storage capacity at "Radons", vault 2 will be filled with the 130 drums of concrete-encapsulated radioactive waste that are currently stored in vault 7. Other wastes to be emplaced in vault 2 are the contaminated heat exchangers from the Salaspils research reactor, low-active waste from the dismantled Dubulti facility and low-active Cs-137 contaminated sand from the Salaspils reactor. The current and planned future inventory of waste in vault 2 is shown on Table 1.1(b).

The waste in vault 2 will be immobilised and voids filled up with concrete by using the method that was earlier applied to the other closed vaults (i.e. subsequent layers of waste and layers of concrete). No ingress of water to vault should occur 2 because of its original design as a storage tank for liquid waste.

Table 1.1(b)

Radionuclide activity in vaults 2

Nuclide	Vault 2 (current)	Transfer from	Vault 2 (future)
Ag-110m	1.42E+01	6.31E+02	6.45E+02
Al-26			
Am-241		4.88E+09	4.88E+09
Ba-133	3.52E+06	2.50E+06	3.77E+06
Bi-207			
Bi-210m			
C-14	8.24E+08	7.38E+09	8.21E+09
Cd-109	1.64E+04	2.62E+04	4.25E+04
Cd-113m			
Ce-144			
Cl-36 *			
Cm-244			
Co-57		7.10E+06	7.10E+06
Co-60	1.23E+06	3.52E+09	3.52E+09
Cs-134		4.85E+02	4.85E+02
Cs-137		1.31E+12	1.31E+12
Eu-152		3.41E+05	3.41E+05
Eu-154			
Eu-155			
Fe-55		2.23E+09	2.23E+09
H-3	2.86E+08	2.84E+10	2.87E+10
In-113			
K-40			
Kr-85		4.03E+10	4.03E+10
Mn-54	2.36E+01	8.76E+03	8.78E+03
Mo-93			
Na-22		2.64E+04	2.64E+04
Nd-144			
Ni-59			
Ni-63		5.37E+08	5.37E+08
Pb-210			
Pd-107			
Pm-147		1.71E+11	1.71E+11
Po-210			
Pu-238		9.71E+05	9.71E+05
Pu-239		1.07E+11	1.07E+11
Ra-226	5.89E+09	4.48E+08	6.34E+09
Ru-106			
Sb-125			
Sm-151			

Nuclide	Vault 2 (current)	Transfer from	Vault 2 (future)
Sn-119m			
Sn-121m			
Sr-90		4.61E+10	4.61E+10
Tc-99			
Th-228		2.03E+03	2.03E+03
Th-230			
Th-232		1.35E+08	1.35E+08
Ti-44			
Tl-204		5.65E+09	5.65E+09
U-232			
U-233		3.80E+04	3.80E+04
U-234		7.30E+01	7.30E+01
U-235			
U-238		1.46E+08	1.46E+08
Zn-65		2.24E+03	2.24E+03
Zr-93			
Total	**7.01E+09**	**1.73E12**	**1.74E12**

At present, vault 7 contains the following waste types:

- Spent sealed β- and γ-radiation sources such Co-60, Cs-137 and Sr-90 with high-activity are generally conditioned in concrete in shielded drums. These drums are then placed inside 1.2m x 1.2m x 1.2m concrete containers. One cell is now full with such packages (64 in total) and these will remain in their current location.
- Thorium-tungsten waste arising from a former factory working for the military sector. The thorium-contaminated waste is cemented in 0.2 m^3 steel drums, and also in 1.2m cubic concrete containers. These drums will be removed from vault 7 and placed in the long-term store.
- Spent sealed sources containing Pu, Pu+Be, Ra, Am and other long-life isotopes are conditioned and stored in drums and concrete containers:
  - The neutron radiation sources (Pu+ Be) were placed in stainless steel capsules sealed with a stainless steel or lead plug.
  - Where necessary, the capsules were placed in a polyethylene or paraffin container, before being immobilised in drums or in concrete containers.
  - Sources containing Ra, Am and other long-life isotopes are conditioned and packaged in a similar way, the neutron absorbing material being replaced by g radiation shielding material.
  - Small Pu sources (e.g. smoke detectors) are dismantled in a laboratory hood and placed in a stainless steel capsule sealed with a stainless steel or lead plug. The sealed capsules are afterwards embedded in cement within steel drums. These drums will be removed from vault 7 and placed in the long-term store.
- Cemented liquid radioactive waste contained in 0.2 m^3 steel drums. These drums will be removed from vault 7 and placed in the long-term store.
- Disused sealed sources containing Pu, U, Ra, Am and other long-life isotopes that have not been conditioned. These drums will be removed from vault 7 and placed in the long-term store.

Table 1.2. shows total activities of the main radionuclides, as at February 2005. The safety assessment assumes that the space vacated when the long-lived radiation sources are transferred

to the new long-term waste store will be used largely for Salaspils decommissioning waste. Table also shows the revised inventory, also at February 2005, following the removal of the long-lived sources and the wastes intended to be transferred to vault 2.

Table 1.2

Radionuclide inventory in vault 7, present status, and after removal of long-lived sources

Radionuclide	Total Current Inventory [Bq]	Current inventory of Long-lived Waste [Bq]	Inventory after Removal [Bq]
Ag-108m	6.71E+04		6.71E+04
Ag-110m	6.07E+07	1.74E+03	6.07E+07
Am-241	3.37E+12	5.13E+09	3.36E+12
Ba-133	1.19E+07	2.60E+05	1.16E+07
Bi-207	9.58E+04		9.58E+04
C-14	2.08E+10	8.43E+09	1.24E+10
Cd-109	1.79E+09	4.51E+04	1.79E+09
Ce-139	3.06E+04	1.92E+02	3.04E+04
Cm-244	1.10E+09	1.09E+09	5.39E+06
Co-56	4.34E+02		4.34E+02
Co-57	5.15E+08	1.80E+07	4.97E+08
Co-60	1.58E+14	7.52E+13	8.33E+13
Cs-134	6.78E+02	6.78E+02	
Cs-137	3.57E+13	1.34E+12	3.44E+13
Eu-152	2.40E+11	3.59E+05	2.40E+11
Eu-154	5.66E+09		5.66E+09
Fe-55	5.03E+10	1.66E+10	3.37E+10
Gd-153	5.85E+08		5.85E+08
H-3	5.76E+13	3.00E+10	5.76E+13
I-131	3.00E+04		3.00E+04
Ir-192	4.90E+02		4.90E+02
Kr-85	4.75E+12	4.29E+10	4.70E+12
Mn-54	2.61E+05	1.97E+04	2.41E+05
Mo-99	1.30E+05		1.30E+05
Na-22	1.52E+05	3.45E+04	1.18E+05
Ni-63	4.69E+09	5.41E+08	4.15E+09
Np-237	1.10E+05		1.10E+05
Pb-210	1.47E+07		1.47E+07
Pm-147	5.47E+11	2.22E+11	3.24E+11
Pu-238	4.95E+12	4.95E+12	9.84E+08
Pu-239	1.20E+12	1.19E+12	2.84E+09
Ra-226	9.69E+08	4.48E+08	5.21E+08
Ru-106	1.00E+10		1.00E+10
Sm-145	2.47E+09	1.23E+08	2.35E+09
Sn-113	1.47E+04		1.47E+04
Sr-90	2.91E+13	4.72E+10	2.91E+13
Ta-182	3.63E+03		3.63E+03
Tc-99	1.60E+08		1.60E+08
Th-228	5.42E+05	2.92E+03	5.39E+05
Th-232	1.74E+08	1.35E+08	3.87E+07

Ti-44	1.95E+05		1.95E+05
Tl-204	3.98E+11	6.79E+09	3.91E+11
U-233	1.48E+05	4.80E+04	1.00E+05
U-238	4.52E+10	4.52E+10	4.70E+02
Y-88	1.04E+04		1.04E+04
Zn-65	2.81E+06	6.31E+03	2.81E+06
Total	**2.97E+14**	**8.31E+13**	**2.14E+14**

Current arrangements for safe operation of vault 7

The safety emplacement and/or retrieval of waste packages in vault 7 is ensured by establishing requirements for the qualification and certification of the personnel undertaking these activities and by having a system of working procedures that are strictly observed. Special emphasis is given to ensuring that personnel are equipped to deal with accidents. These various requirements are established by the operational procedures established by "BAPA" for the „Radons" facility.

Requirements for Certification of Staff and Equipment

All personnel undertaking waste handling activities are required to attend an annual training course on radiation safety and to have special medical certification for work with radioactive substances. Personnel undertaking waste handling operations must have completed a training course on working with dangerous equipment and have obtained an appropriate certificate.

Mechanisms and equipment that lift and move containers (bridge crane, auto crane, strops, hooks) must be in complete working order, having been subject to regular technical checks and certified according to terms set out in legislation.

Method of Working in vault No. 7

Access to the facility is strictly controlled and personnel are required to carry a TLD dosimeter and to wear appropriate clothing whilst working in the facility. In exceptional cases (dose rates larger than 20 μSv/h), a direct reading individual dosimeter will also be supplied to personnel.

Special requirements are applied to all activities that make use of the bridge crane, and to waste container and cover panel movements, using the crane, in particular. The maximum lift height above normal floor level is limited to 20 cm. Barrier protection is provided around an individual disposal cell in the event that it remains uncovered for a significant period of time.

Following emplacement of a waste package in a disposal cell, the relevant data is entered into the electronic database.

Procedure in case of emergency (falling of a container during handling, when container is damaged and radioactive waste spread into sections of the storage)

Accidents will normally be dealt with directly by the personnel engaged in waste emplacement activities, though there is provision for specialist assistance from the "BAPA" in exceptional circumstances.

In the event of an accident the following measures are taken as a minimum:

- Barriers are erected around the site of the accident;
- Measurements are taken, to assess dose rate at the site and borders of contaminated area;

- The contaminated area is marked;
- Activities to localise further spread of radioactive substances are carried out (e.g. application of water on dust at the site of accident, use of special clothing and individual protective means);
- Any resulting radioactive waste is collected and packed, and the affected area is decontaminated.

Arrangements for receipt and emplacement of waste

On arrival into the receipt area of vault 7, waste package documentation is verified and measurements are made of the radiation dose rate and the presence of surface contamination, together with a visual inspection of the package. Specifically, the dose rate is measured at a distance of 1 cm and 1 m from the package surface and, apart from exceptional circumstances, the dose rate on the package surface must be less than 10 mSv/h, but the maximum dose rate at 1 m from the package surface should not exceed 100 µSv/h (Transport Index = 10).

The operator of „Radons" will also check that the package dimensions and mass are compliant with the waste acceptance requirements, together with the technology used for treatment and processing of the waste. Provided the package complies with the established QA requirements for the facility, it is then moved into position in one of the disposal cell using the bridge crane.

Further regular inspections are made of stored packages to confirm their continued physical integrity and to check for evidence of leakage or surface contamination.

An electronic database is maintained that includes details of all waste emplaced in the „Radons" vaults, comprising data about the waste producer, the radionuclides and associated activities in each package, whether or not the waste is conditioned and the conditioning medium used. The database has the capability to recalculate activity levels taking account of radioactivity decay, so that the operator of the facility can check overall levels of radioactivity in the vault, for comparison with the limits established by the RDC.

Annex 2

RESULTS FROM THE MONITORING PROGRAMME

This annex describes information about contamination of „Radons" site and surrounding area with radionuclides and evaluation of trends of spread of contamination, using existing monitoring network:

- Contamination of soil;
- Contamination of shallow groundwater;
- Contamination of surface run-off water;
- Analysis of ionising radiation measurement results;
- Total contamination of the area (including air contamination);
- Need for recovery activities.

The current monitoring regime was established in 1995, following a review by the Ministry of Environment. The programme involves testing of samples of groundwater, surface water, air, soil and plants, to detect the presence of any radioactivity being released from the waste vaults, especially as signalled by increased gamma radiation levels. The current monitoring programme is described in a Work Procedure of the Radioactive Waste Management State Agency.

Contamination of soil and plant life

Soil

Soil characteristics will vary according to the composition (sand/clay etc.) and geographical location. Many naturally occurring radionuclides are common in soil samples e.g. U-238, Th-232 and K-40. The concentration of the radionuclides can differ largely between radionuclides. In case of K-40 activity concentrations 120-750 Bq/kg are common in Latvia. In addition to naturally occurring radionuclides, activity of man-made radionuclides is present as a result of the Chernobyl accident in 1986 and nuclear tests in the early years of the nuclear era.

Independent γ-spectrometric analyses from the soil samples, which were taken in "Radon", 300 m and 5 km away, showed concentrations of Cs-137 (3.8-14.8 Bq/kg) and Sr-90 (4.2-7.6 Bq/kg). This is close to the results from agricultural service data from control points (Olaine, Valle, Mārupe – in Riga District) Cs-137 (9.6-1122 Bq/kg) and Sr90 (5.0-5.6 Bq/kg). From the comparison of these measurements one may conclude that (above the minimum detection limit) no contaminations due to the operations at „Radons" 'have been observed.

The measured values of Cr-137 and Sr-90 activity concentrations are below the minimum significant specific radioactivity concentration for these radionuclides (300 and 3000 Bq/kg). However, it is recommended to perform a nuclide-specific analysis (also for tritium and chemical analyses) of the soil at various depths in the area where excavations will take place in preparation of building constructions. This allows to have a base-line – levels for activity concentrations near the new buildings and it allows to make detailed assessment of the consequences of dispersion of dust from local soil during excavations and other construction activities.

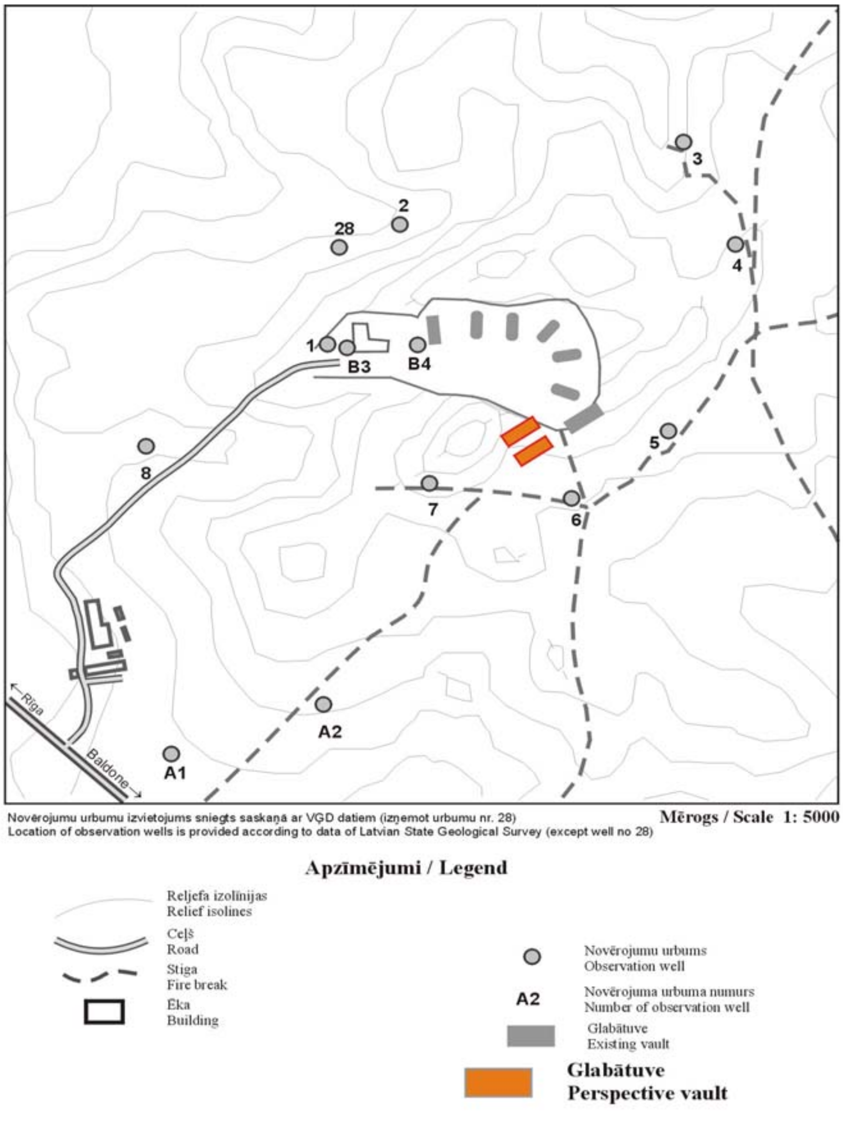
Plant Life

The results of plant samples taken in the vicinity of the site since 1995 indicate the presence of Cs-137, such as observed in soil samples. The levels found in the samples (0.3-25 Bq/kg) have remained constant during the sampling period and correspond to the mean values for Latvia. This value is below the maximum limit of radioactive contamination of animal feed for Cs-137 (500 Bq/kg). Also the concentrations of U-238, Th-232 and K-40 (natural occurring radionuclides) are below their maximum limits. The concentration of Cs-137 is also below the maximum permissible limits of radioactive contamination in fresh vegetables (200 Bq/kg if Cs-137 in the only man-made radionuclide present).

This means that consumption of meat or other products of animals eating these plants as well as the direct consumption of these plants is radiological safe.

Contamination of shallow groundwater

For control of groundwater contamination, a network of monitoring wells has been established, comprising 12 wells in total - A1; A2; B3; B4; 1; 2; 3; 4; 5; 6; 7; and 8 (see Figure 2.1.). Wells A1, A2, B3 and B4 have been established during the 60^{th}; the others were established in the 80^{th} of last century.



2. att. Novērojumu urbumu izvietojums Baldones radioaktīvo atkritumu glabātuvē
Fig. 2. Locationof observation wells in Baldone radioactive waste deposit

γ- and β-activity in groundwater

Table 2.1. shows the results of radioactivity measurements in groundwater beneath the site during 2003 and 2004.

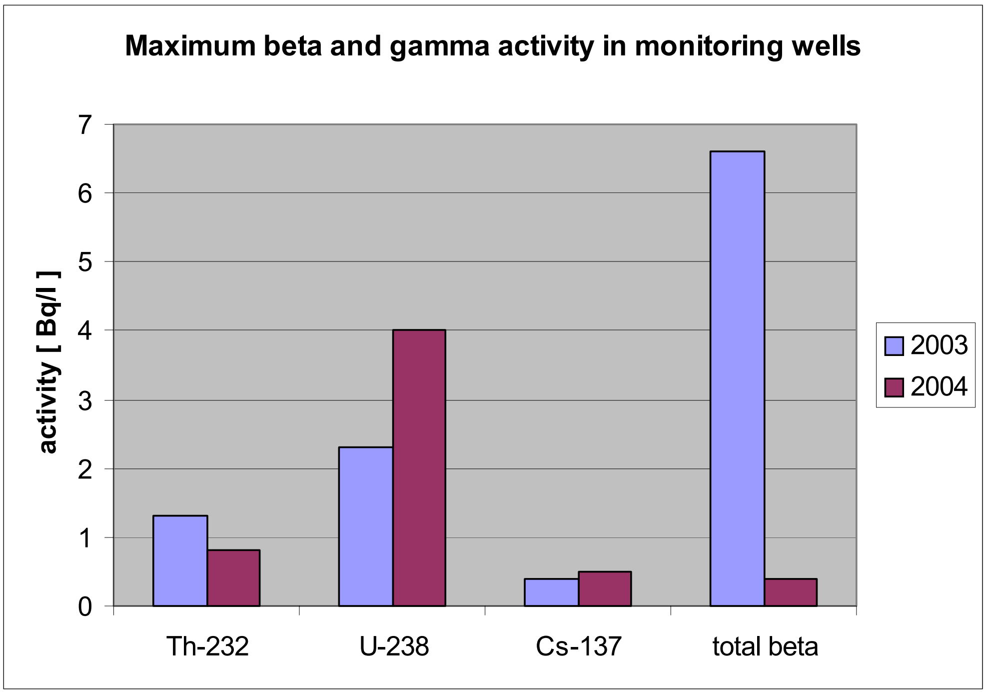
Table 2.1.

Range of γ- and β-activities in recent groundwater measurements

Year	γ-activity by radionuclide, Bq/l				β-activity, Bq/l
	Th-232	U-238	Cs-137	K-40	
2003	<0.3–1.3	<0.3–2.3	<0.3–0.4	<0.3-83	<0.05–6.6
2004	<0.3–0.8	<0.3-4	<0.3–0.5	<4–10.6	<0.03-0.4

Figure 2.2.

Range of γ- and β-activities in recent groundwater measurements



Activity concentrations in groundwater vary with e.g. soil characteristics and quantity and quality of precipitation and water flow patterns. K-40 is a naturally occurring radionuclide. U-238 and Th-232 are also naturally occurring radionuclides, but are also present in the waste. Cs-137 is present in the waste, though other common sources of this nuclide are the Chernobyl accident in 1986 and the nuclear tests in the early years of the nuclear era.

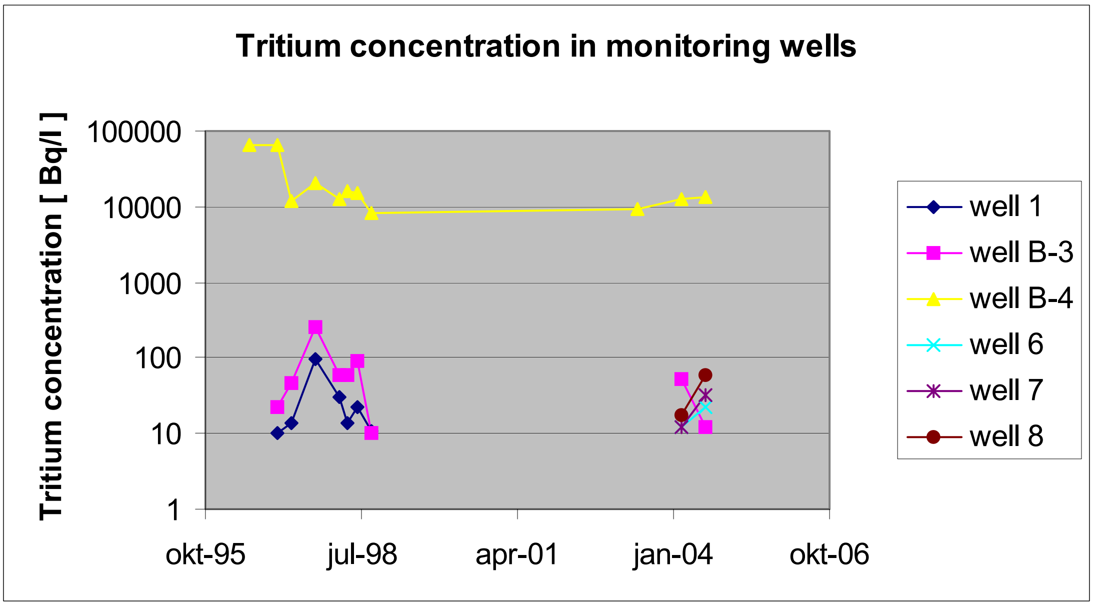
From the comparison of concentrations in ground water near „Radons” and at other locations, it may be concluded that there is no evidence of leakage of Th-232, U-238 and Cs-137 contamination from the „Radons”. It should be mentioned that other man-made radionuclides, which are present in the vaults, such as Co-60 and Sr-90 are not found in the ground water.

Tritium in groundwater

Tritium has been measured in wells adjacent to the disposal vaults since 1996 (see Figure 2.3). Its presence has also been found in wells further downstream, in zone A of the „Radons".

Figure 2.3

Tritium concentration in monitoring wells



Tritium occurs naturally on the earth's surface, being produced in the stratosphere by reactions induced by cosmic rays. Man-made tritium, in amounts substantially larger than the natural inventory, is far more important as a source of contamination. The complete confinement of tritium in conditioned waste is difficult. The main reasons for this are the small size of the molecules and the high mobility of this light-weight gas. As a consequence, it is practically impossible to stop tritium from diffusing through most solid and liquid materials.

The measured tritium levels are highest in well B-4, adjacent to vault 6, and have remained at a broadly constant level for several years, suggesting a steady rate of release from the waste. Tritium is also found in several other wells outside the B-zone, but at significantly lower levels. The tritium levels in the groundwater downstream of the waste vaults do not present a safety hazard, For example, consumption of 1095 l/year of water found in well 8 by an adult person, results in an annual dose of 1.2 μSv. This value is below the basic limit of the effective dose for the population of 1 mSv. Nonetheless, options for reducing the levels further will be considered during the licensing phase, in accordance with the radiological protection principle that releases of radioactivity should be as low as reasonably achievable (ALARA).

Trends of spreading of tritium contamination in groundwater

Enhanced tritium concentrations in groundwater have been observed. Due to ground water flows tritium will be transported to other areas such as locations where ground water is used as drinking water by the population, by cattle and sometimes used for irrigation.
Presently, the main groundwater flow goes from vault 1, 2, 3, 7 and future vault 8 to direction WNW and is monitored in well 2. Here no significant contamination has been observed. The other main flow goes from vaults 4, 5 and 6 to direction SSW and is monitored in well 1 and partially in well 8. Here, as expected from the large tritium concentrations in well B-4 (vault 6), contaminations are enhanced.