

# Peer Review of the RPII's Environmental Monitoring Programme 2009

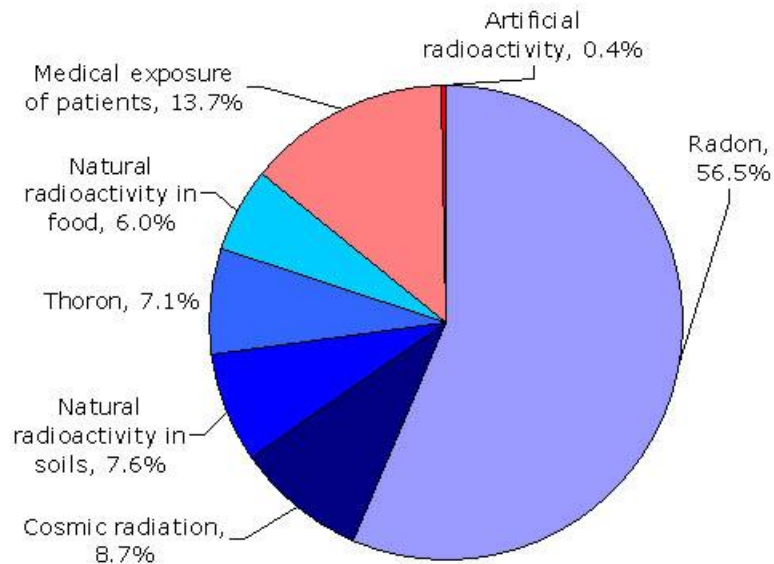
## Foundation Document

### A. Introduction to the Radiological Protection Institute of Ireland and the Environmental Monitoring Programme

#### 1. Operational Context

In 2008 the RPII published an assessment of the doses received by the Irish population (Colgan et al, 2008). This assessment concluded that the average annual dose to an individual Irish person is 3,950  $\mu$ Sv from all sources of radiation. The breakdown of this total by source is presented in Figure 1. By far the largest contribution of approximately 86 per cent comes from natural sources. Man-made sources contribute approximately 14 per cent and are dominated by the beneficial use of radiation in medicine. Doses from other man-made or artificial sources account for less than 1 per cent.

Figure 1: Contribution to annual average dose from all sources of radiation



The primary objective of the RPII environmental monitoring programme is to assess the exposure to the Irish population resulting from radioactivity in the Irish environment and to estimate the associated risks to health. In addition, the programme aims to assess the distribution of contaminating radionuclides and to identify long-term trends.

In addition to these requirements for assessment of public exposure and protecting human health, the RPII's monitoring strategy takes into account the need to provide public reassurance in relation to the operation of nuclear facilities abroad and other radiological hazards which may be of concern. It is noted that there remains a high level of public and political concern in relation to the operation of nuclear facilities abroad such as those at Sellafield on the north-west coast of England.

The RPII aims to provide high quality scientifically-based advice on radiation protection issues as an input to Government policy. The RPII's monitoring programme forms a key part of its strategy to support its advisory role. Crucial to this role is the assessment of current temporal and geographic distribution of radioactivity in the environment and the prediction of likely future trends. It is noted, for example, that following the increase in technetium-99 discharges in the mid nineties, the Institute was asked to provide detailed information to Government on the distribution of this radionuclide in the Irish environment.

The RPII's monitoring programme must also satisfy certain national commitments arising internationally under the EURATOM Treaty and The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention"). With regard to the EURATOM Treaty, the Commission Recommendation on the application of Article 36 of the Euratom Treaty (2000/437/Euratom) constitutes an important input into the design of the Institute's monitoring programme.

Taking into consideration the importance of agriculture to the Irish economy there is a need to maintain the capability to respond effectively to radiological incidents, which may result in contamination of the environment. Therefore, the maintenance of a national laboratory capable of measuring a range of artificial radionuclides in food and environmental samples is considered to be of strategic national importance. In the event of an incident with the potential to result in contamination of the Irish food chain, the ability to assess radioactivity levels in foodstuffs against EU food intervention levels would, for example, be of vital national interest. It is noted also that the passage of time since the Chernobyl accident and the decreasing levels of radioactivity in the Irish marine environment both present challenges going forward regarding the maintenance of expertise/ analytical capability.

## **2. Sources of Radioactivity in the Irish Environment**

Ireland has no nuclear installations and there is no significant production of technologically enhanced natural radioactivity. Consequently, the only source of radioactive discharge to the environment is the use of unsealed sources in medicine, education and research.

Radioactivity in the environment is present due to fallout from thermonuclear weapons tests in the 1950s and 1960s, the residual contamination from the

accident at the Chernobyl nuclear power plant in the Ukraine in 1986, and the authorised discharge of radioactive wastes from nuclear and other facilities.

## 2.1 Sellafield

The largest source of anthropogenic radioactivity influencing the Irish marine environment continues to be the licensed discharge of low level liquid radioactive waste from the Sellafield nuclear fuel reprocessing plant on the Cumbrian coast. This has a major influence on the monitoring programme.

Sellafield is located approximately 170 km from the north east coast of Ireland. The main activities at the plant include reprocessing of spent fuel from nuclear power reactors and storage of nuclear waste.

Liquid radioactive waste is discharged from the plant into the Irish Sea via a pipeline, about 3 km from land. Gases are released from the plant via a number of chimneys (referred to as 'stacks'). Discharges into the Irish Sea peaked in the mid-1970s and have dropped significantly in recent years (see Figures 2 and 3). This is as a result of improved waste treatment facilities at Sellafield, which convert much of this radioactive waste into a solid for long-term storage. The impact of these reductions can be seen in the continuing fall in doses to the Irish public as described in the RPII's Environmental Monitoring Reports.

Low but measureable levels of artificial radioactivity resulting from Sellafield discharges are detected in samples collected and analysed as part of the RPII Marine Monitoring Programme. These results demonstrate that the increased radiation exposure resulting from artificial radioactivity in the Irish marine environment is very small and, even for those who consume large amounts of fish and shellfish from the Irish Sea, this amounts to much less than 1 per cent of the total radiation dose received by a member of the Irish public from all sources of radiation.

Figure 2: Marine Discharges of Cs-137 from Sellafield, 1953-2008

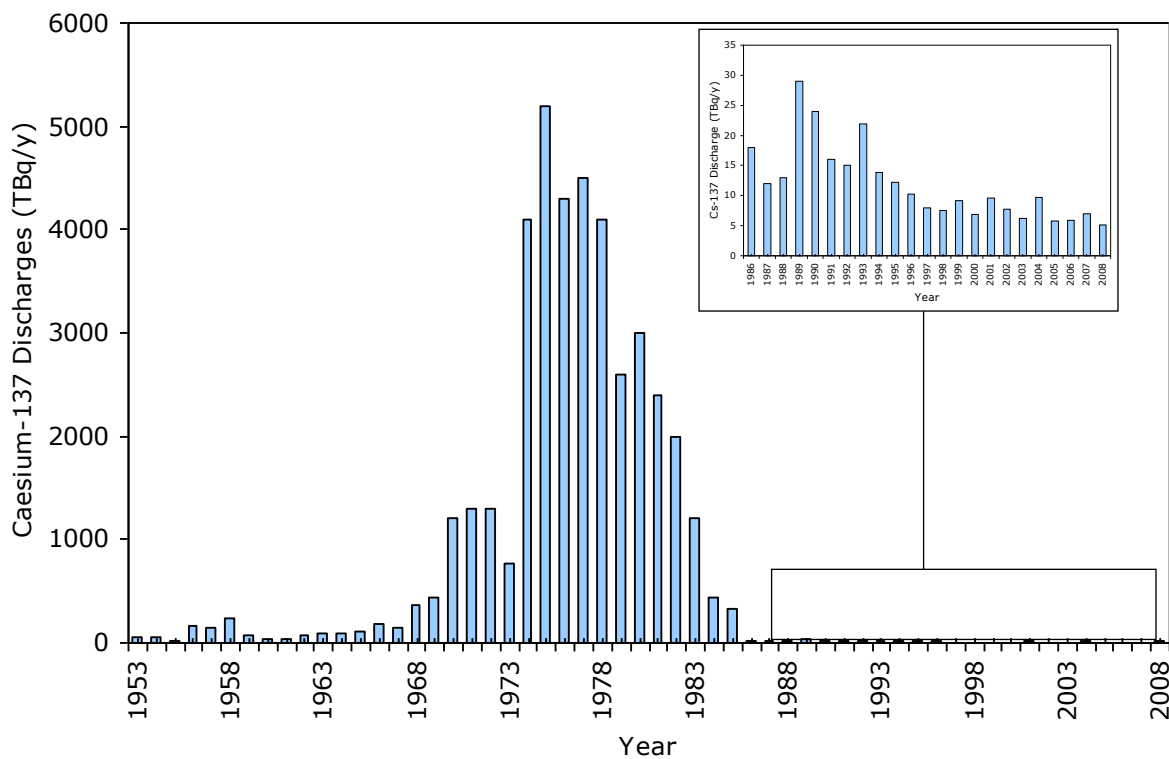
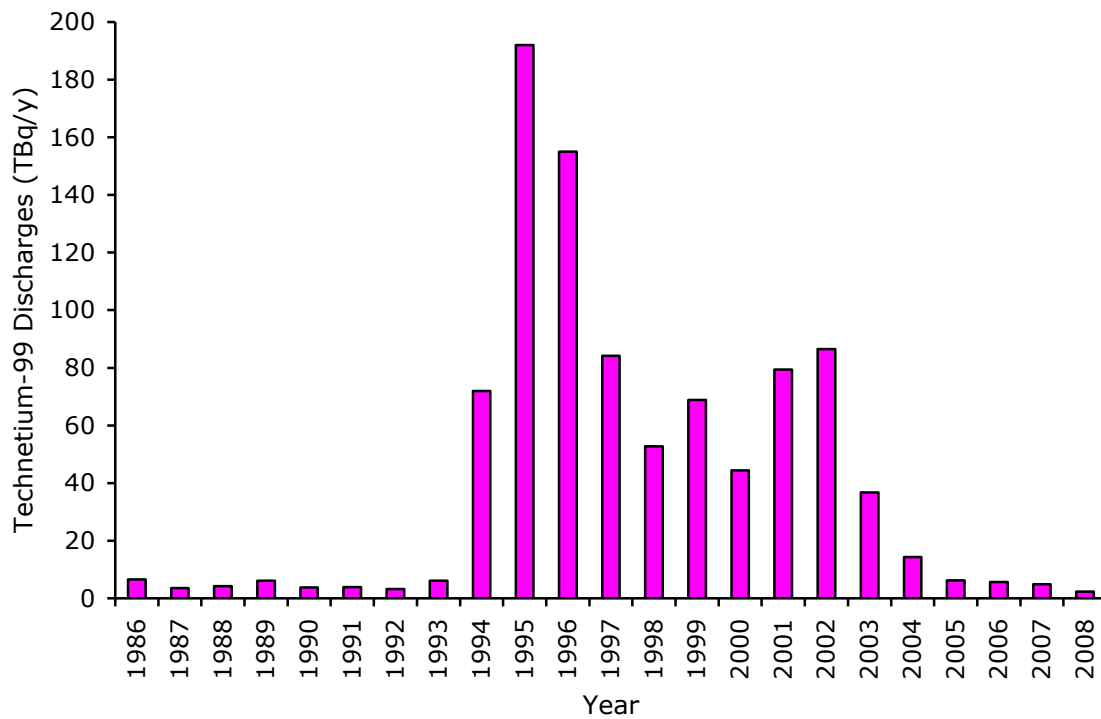


Figure 3: Marine Discharges of Tc-99 from Sellafield, 1986-2008



### **3. Radiological Protection Institute of Ireland**

The Radiological Protection Institute of Ireland is the national organisation with regulatory, monitoring and advisory responsibilities in matters pertaining to ionising radiation. In particular the Institute concerns itself with hazards to health associated with ionising radiation and with radioactive contamination in the environment.

The RPII is an independent public body under the aegis of the Department of Environment, Heritage and Local Government. It was established in 1992 under the 1991 Radiological Protection Act, which conferred on the RPII a broad remit in relation to radiological protection in Ireland. The RPII is financed by grant-in-aid from the Exchequer and by income from the provision of radiological protection services and from research contracts.

### **4. Statutory Requirements and National and International Commitments**

National and European legislation, and national and international commitments which are relevant to the RPII Environmental Monitoring Programme are summarised in the Overview of the Peer Review. Legislation is also presented in more detail in Supplementary Document A.

### **5. Aims and Objectives of the RPII Monitoring Programme**

The aims and objectives of the RPII Environmental Monitoring Programme are:

1. To assess doses to individuals and the population from radionuclides in the environment.
2. To assess the temporal and geographical distributions of concentrations of artificial and natural radionuclides in the environment.
3. To maintain the capacity to facilitate a rapid assessment of environmental contamination in the event of a nuclear or radiological incident so that effective countermeasures to protect the Irish public can be implemented.
4. To provide up to date and accurate information on radiation levels in the environment to Government and the public.
5. To support the RPII's role to provide high quality scientifically-based advice as an input to Government policy.
6. To support the Irish food and agriculture industry through the rigorous assessment of the radioactivity status of Irish foodstuffs.

More details are provided in the Overview of the Peer Review.

## **6. RPII Strategic Plan 2008 – 2010**

The RPII Strategic Plan is important for the purposes of this Peer Review. The plan is summarised in Annex 1 with particular emphasis on those aspects relevant to the Environmental Monitoring Programme.

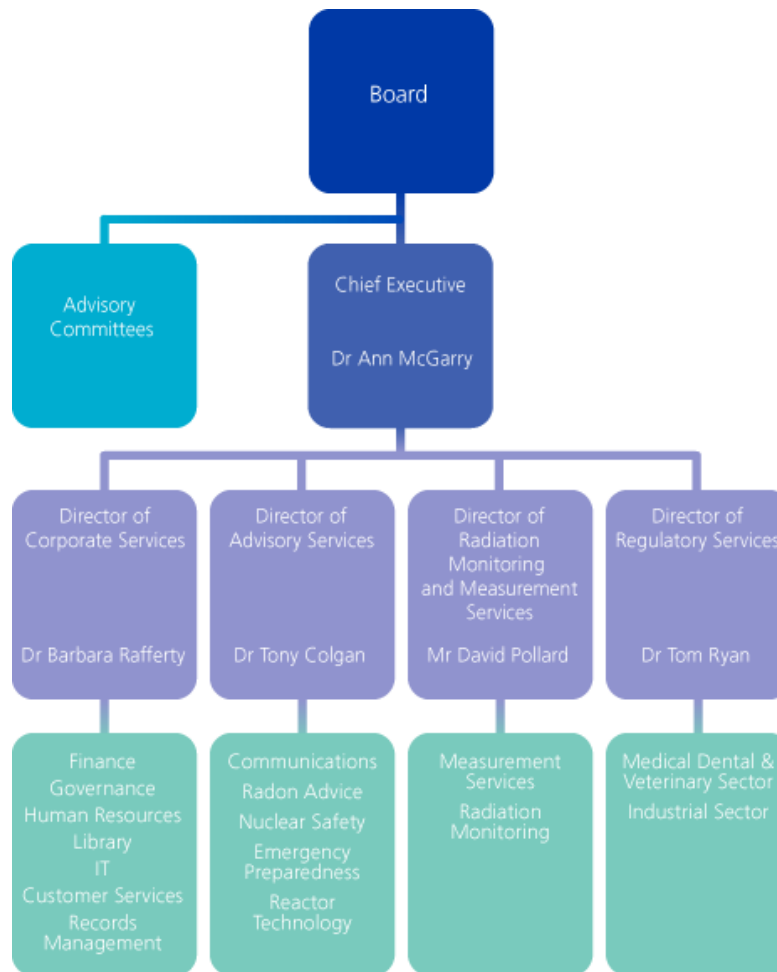
A number of actions for achieving set goals have been laid out in the Strategic Plan. Those relevant to the Environmental Monitoring Programme include:

- To monitor radiation levels and assess health impacts through direct measurement and through the provision of radiation protection services
- To advise the Government, the public and other State organisations
- To meet the organisational challenges that ensure the resources, skills, finances, governance and compliance infrastructure is robust and that appropriate management information systems are in place
- To communicate and influence those in a position to act, based on sound scientific research and best practice
- To undertake research to support the RPII's work and to enhance the standing and knowledge of the RPII

## **7. Structure of the RPII**

Figure 4 provides a diagram of the RPII structure and an outline of the roles and responsibilities of each department.

**Figure 4: Structure of the RPII**



The Chief Executive of the Institute reports to a Board appointed by the Minister for the Environment, Heritage and Local Government. The role of the RPII Board is to provide strategic leadership, direction, support and guidance for the RPII.

A number of advisory committees, including an Environmental Radiation Advisory Committee, provide advice to the Board and Chief Executive on issues arising.

### 7.1 Radiation Monitoring Section

The Radiation Monitoring Section is responsible for the RPII's environmental radioactivity monitoring programme. There is a total of 9 staff in the Section: 5 scientists, 3 technicians and 1 administrative support.

#### 7.1.1 Training and Development

RPII staff members involved in the environmental monitoring programme participate in a number of for a including:

- Analysts' Informal Working Group (AIWG). The AIWG is a small group of chemists from several Government laboratories in the UK having an interest in radionuclides in the environment
- EURATOM Article 35/36 Representatives Group
- National Physical Laboratory (NPL) Nuclear Spectrometry Users' Forum (NSUF) and Liquid Scintillation Users' Forum (LSUF)

Regular participation in relevant conferences (most recently the International Conference on Radioecology and Environmental Radioactivity 2008 in Bergen) and training courses is encouraged.

### *7.1.2 Infrastructure*

The RPII's radio-analytical capability includes:

- Sample preparation and radiochemical facilities
- 8 gamma spectrometers including 1 well detector and 3 connected to Canberra sample changers
- 1 low level liquid scintillation counter
- 1 ultra-low level liquid scintillation counter
- 20 alpha spectrometers
- 1 Tennelec gas flow proportional counter with automatic sample changer
- 1 10 channel low level gas flow proportional counter
  
- Canberra Apex gamma and alpha spectroscopy software
- Labware Laboratory Information Management System (LIMS)

### *7.1.3 Quality Assurance*

The RPII places a strong emphasis on quality assurance and reliability of data and commits to the continuous improvement of the effectiveness of its management system. A laboratory quality system is operated. The majority of the RPII's Radiation Monitoring Laboratory's tests are accredited to meet the requirements of ISO 17025 (INAB, 2008), the technical quality standard for testing laboratories, through the Irish National Accreditation Board (INAB). The laboratory is assessed regularly by INAB.

Analytical techniques are validated through exchange of samples with other laboratories and through analysis of certified reference materials for proficiency testing. The Section participates in an active programme of intercomparison exercises, which provide independent evaluation of the quality of the analysis performed within the laboratory and is a requirement for laboratory accreditation. More details of planned and recent intercomparisons are presented in Annex 2.

#### *7.1.4 Analytical Services*

On request, a service to certify the radioactivity of food and drinks which may be required by producers exporting to certain markets outside of the EU is provided by the RPII. Certificates of Radioactivity Measurement are issued on the basis of both individual sample results for the product concerned and the environmental monitoring programme. Other analytical services, including analysis of wipe samples for licensing purposes, dredging samples related to the London Dumping Convention and drinking water samples and testing for levels of radon in buildings are also offered by the RPII. Note that consideration of these is beyond the scope of this review.

#### *7.1.5 Publishing of Results*

The results of the RPII's continuous monitoring programmes are published in an annual environmental monitoring report. Prior to 2003 marine and terrestrial monitoring data were published as separate reports. Monitoring data is also reported annually to the Joint Research Centre (JRC) in fulfilment of Ireland's obligations under Article 36 of the Euratom Treaty. These data also form the basis of national reports to OSPAR.

RPII monitoring data is also made available on the RPII's website, including 'real time' display of external gamma dose rate measurements. Gamma dose rate data is also published hourly on the EURDEP public and restricted-access websites (<http://eurdep.jrc.ec.europa.eu>).

## **References**

Colgan, P.A., Organo, C., Hone, C. and Fenton, D., 2008. Radiation Doses Received by the Irish Population, RPII 08/01.

INAB, 2008. RPII Accreditation Certificate. Dublin: Irish National Accreditation Board.

RPII, 2008. Radiological Protection Institute of Ireland – Strategic Plan 2008 – 2010.

## **Annex 1: RPII Strategic Plan 2008 – 2010**

The RPII has mapped out a clear strategy to strengthen radiation protection in Ireland over between 2008 and 2010, set out in full in the document RPII Strategic Plan 2008-2010 (RPII, 2008).

### *Mission Statement*

The RPII mission statement is:

In the three year period from 2008 to 2010 the RPII will grow the level of awareness and implementation of the measures needed to protect people in Ireland from the harmful effects of ionising (and non-ionising) radiation through scientifically based regulation, monitoring and advice.

### *Values of the RPII*

In devising its Strategic Plan in 2008 the opportunity was taken by the RPII to assess its fundamental organisation values and principles on which its work is based.

These are:

- Scientific integrity
- Commitment to the task at hand
- Public service ethos
- Independence
- High standards and integrity
- Customer service
- Positive work environment

### *General Goals*

As part of the strategy, the general goals have been set. The goals related to the Environmental Monitoring Programme include:

- Information about radiation protection must be readily available, accessible and understandable to a non-scientific audience, so that the public is confident of its ability to be protected from its harmful effects
- The information provided by the RPII must be scientifically-based and accurate at all times. It will seek to sustain its position as a trusted source of information to public and professional audiences in Ireland in this area
- The RPII will continue to provide high-quality scientifically-based advice on radiation protection issues as an input to Government policy. A targeted research programme will support this advisory role.

### *Action Plan*

To achieve these goals, the RPII has devised an action plan. The actions related to the Environmental Monitoring Programme include:

- To monitor radiation levels and assess health impacts through direct measurement and through the provision of radiation protection services
- To advise the Government, the public and other State organisations
- To meet the organisational challenges that ensure the resources, skills, finances, governance and compliance infrastructure is robust and that appropriate management information systems are in place
- To communicate and influence those in a position to act, based on sound scientific research and best practice
- To undertake research to support the RPII's work and to enhance the standing and knowledge of the RPII

### *Specific Objectives*

The general goals of the RPII strategy have been broken down into specific objectives which the RPII aim to achieve by 2010. The objectives related to the Environmental Monitoring Programme include:

- Where necessary, review business processes and develop appropriate ICT support systems
- Make arrangements for RPII programmes and publications to be peer reviewed, as appropriate
- Ensure that monitoring programmes are implemented which are high quality, fit for purpose and efficient
- Ensure that the necessary information on radioactivity in the environment and on radiation doses received by the Irish population needed to provide authoritative advice is available
- Develop and maintain staff and technical resources in order to respond to customer needs
- Develop the website as the primary communications tool of the RPII and improve its functionality in line with customer expectations
- Make the public and Government more aware of the actual risks following a nuclear accident and the actions that need to be taken
- Ensure that the Government is kept up to date with key radiation protection issues
- Provide efficient and effective corporate services that are in line with best practice, provide value for money and meet the needs of internal and external RPII customers
- Undertake research to support the monitoring, advice and emergency planning functions of the RPII

The success of the RPII strategy will be judged by concrete results. Key performance indicators for achievements by the end of 2010 (or earlier) were defined. The indicators related to the Environmental Monitoring Programme include:

- A peer review of the RPII's environmental monitoring programme to be undertaken in 2009 and of the RPII's regulatory activities in 2010
- A compilation of RPII's monitoring data to be published annually and the monitoring data on the RPII's website to be updated on an ongoing basis
- The first comprehensive assessment of the doses to the Irish population published in 2008
- The RPII to establish formal arrangements with all Government Departments and agencies with whom it interacts by the end of 2010
- The RPII to undertake appropriate research and publish it in peer-reviewed journals

## **Annex 2: Intercomparisons and Proficiency Testing**

Current and planned intercomparison exercises in which the RPII is participating in include:

### *Determination of natural radionuclides in spiked water*

This proficiency test exercise is organised by the IAEA. The analysis involved in this exercise includes:

- Determination of gross alpha and gross beta
- Determination of radium

### *Determination of gross alpha and gross beta in clean water*

This proficiency test exercise is organised by Aquacheck who are managed and operated by LGC Standards Proficiency Testing. The analysis involved in this exercise is:

- Determination of gross alpha and gross beta in clean water.

### *NPL Environmental Radioactivity Proficiency Test Exercise 2009*

This exercise is organised by the National Physical Laboratory (NPL) on an annual basis for a range of radionuclides. The radionuclides and analyses that will be tested in 2009 include:

- Sr-90 in an aqueous sample
- Gamma analysis of an aqueous sample containing a mixture of  $\gamma$ -emitting radionuclides in the range 1-20 Bq/g
- Gamma analysis of an aqueous sample containing a mixture of  $\gamma$ -emitting radionuclides in the range 1-20 Bq/kg
- Cs-137 analysis in synthetic sand

### *Proficiency Test in the Analysis of Gamma Spectra for Malevolent Radiological Situations (MALRAD)*

A proficiency exercise organised by the Nordic Nuclear Safety Research (NKS) involving the electronic distribution and analysis of spectral and ancillary data intended to simulate the sort of information an analyst may expect to encounter in relation to sources being used for malevolent acts.

Intercomparisons in which the RPII participated in 2008 are summarised in Table 5.

**Table 5: 2008 Intercomparison Exercises**

<b>Name of Intercomparison</b>	<b>Organiser</b>	<b>Radionuclide of Interest/Analysis</b>	<b>Matrix</b>
Tc-99 intercomparison exercise	AIWG, UK	Tc-99	Seaweed
Environmental Radioactivity Proficiency Test Exercise 2008	NPL, UK	Sr-90, Tc-99, various $\gamma$ -emitting radionuclides	Aqueous Solution
IAEA-CU-2008-03	IAEA	Ra-226, Gross alpha and Gross beta	Water
Analysis of Remotely Accrued Complex Gamma-ray Spectra – Proficiency Test (REMSPEC)	NKS (NRPA)	Gamma Analysis	Spectra containing unknown radionuclides.

Participation in intercomparison exercises and proficiency tests is dependent upon the relevancy to the Radiation monitoring laboratory. They are carefully selected to suit the requirements and capabilities of the laboratory.