Dear Minister

It is my pleasure to forward to you for presentation to the Parliament of New South Wales the Annual Report of the Radiation Advisory Council for the period 1 July 2015 to 30 June 2016. This report has been prepared in accordance with the provisions of the *Radiation Control Act 1990*.

Yours sincerely

Sarah Gardner
Chairperson
Radiation Advisory Council
4 November 2016
Chairperson’s review ........................................................................................................ 1
Responsibilities of the Council ........................................................................................ 3
Objects of the Act ............................................................................................................ 3
Annual report of the Council ............................................................................................. 3
Constitution of the Council ............................................................................................... 4
Functions of the Council ................................................................................................... 5
Meetings of the Council .................................................................................................... 6
Memorandum of understanding between the EPA and the Council ............................. 7
The Council’s strategic direction ...................................................................................... 7
The Council’s work .......................................................................................................... 7
National Uniformity and Radiation Health Committee ....................................................... 7
Implementation of radiation legislation ............................................................................. 8
New and emerging issues in radiation protection ............................................................. 9
EPA radiation compliance and audit program ................................................................... 9
Advice to Council ............................................................................................................10
Council’s advice to the EPA on other radiation matters ................................................... 11
Committees of the Council .............................................................................................. 12
National Directory Committee ......................................................................................... 12
Review of Guideline 6 Committee ................................................................................... 12
Licensing and accreditation ............................................................................................ 13
Advice to the EPA ...........................................................................................................15
Advice to the EPA on other radiation matters ................................................................ 15
Radiation accidents ..........................................................................................................19
Mandatory requirement to report radiation accidents ....................................................... 19
Serious accidents reported to the Health Care Complaints Commission (HCCC) ........ 19
Number of accidents reported to the EPA ........................................................................ 19
EPA radiation compliance and audit program ............................................................... 19
Advice to Council ...........................................................................................................19
Advice to the EPA on other radiation matters ................................................................ 19
Advisory committees of the Council during 2015–16 ....................................................... 20
Appendix 1: Memorandum of understanding between the EPA and the Council ........29
Statement of common intent ............................................................................................ 29
Agreed details of how the Council and the EPA collaborate ............................................. 29
Appendix 2: Membership of Committees of the Council during 2015–16 ....................32
Acronyms and abbreviations ........................................................................................... 33
Chairperson’s review

The Radiation Advisory Council (the Council) provides advice to the Minister for the Environment (the Minister) and the Environment Protection Authority (EPA) on technical and policy matters in relation to managing radiation in NSW within the parameters of the Radiation Control Act 1990 (the Act) and the Radiation Control Regulation 2013 (the Regulation).

In June of this period the Chair of the Council, Mr Craig Lamberton, advised the Minister and the Council that he was retiring (effective from 1 July 2016). Mr Lamberton was first appointed as the Chair of the Council in 2004. Council members have expressed their appreciation for his leadership as Chair and for his contribution and his commitment to the development of important radiation protection initiatives that have been successfully implemented in NSW.

During the 2015–16 reporting period, the Council held six meetings and provided policy and regulatory advice to the EPA on the administration of the Act and on a wide range of radiation matters.

The Council’s work and activities during the reporting period included:

- review of, and input into, national codes and standards developed for inclusion in the National Directory for Radiation Protection (NDRP)
- overseeing implementation of the Act specifically keeping a brief on and consideration of matters relating to radioactive ores (now exercised by the Department of Trade and Investment)
- review of, and provision of advice to the EPA on the EPA’s radiation compliance and audit program
- review of the work of the Council’s Guideline 6 Committee, specifically the review of Radiation Guideline 6: Registration requirements & industry best practice for ionising radiation apparatus used in diagnostic imaging. The review is to provide coverage for new technology being used in NSW and to align the guideline with the new requirements of the Act. In this period the committee completed its review of Guideline 6.
- keeping itself informed of new and emerging issues in radiation protection, highlighting a presentation from the Australian Radiation Protection and Nuclear Safety to the Council on the detection of the inadvertent import or export of radioactive material to and from Australia.

During the reporting year, the Council also continued to provide advice to the EPA on radiation matters:

- radiation licensing (user and management licences)
- new radiation-related technologies
- assessment of radiation safety courses for licensing and accreditation purposes
- accreditation of consulting radiation experts (CREs) and radiation security assessors
- review of radiation accidents and incidents.
In the year ahead, the Council’s work will focus primarily on:

- review of, and contribution to, national codes and standards in the NDRP
- review of CREs skills following the publishing of Radiation Guideline 6
- review of CREs accreditation conditions
- review of *Radiation Guideline 3: Recommendations for minimum standards and safety requirements for fixed radiation gauges (sealed source devices).*

I sincerely wish to thank all the members of the Council for their contribution and commitment to radiation safety in NSW. I would also like to acknowledge the work of the EPA staff in supporting the Council.

Sarah Gardner  
Chairperson  
Radiation Advisory Council
Responsibilities of the Council

The Radiation Advisory Council is established under section 29 of the *Radiation Control Act 1990*. The Act and the Radiation Control Regulation 2013 are administered by the Minister through the EPA.

Objects of the Act

Section 3 of the Act prescribes the objects of the Act as follows:

(a) to secure the protection of persons and the environment from exposure to ionising and harmful non-ionising radiation to the maximum extent that is reasonably practicable, taking into account social and economic factors and recognising the need for the use of radiation for beneficial purposes

(b) to protect security enhanced sources from misuse that may result in harm to people or the environment

(c) to promote the radiation protection principles.

The radiation protection principles are as follows:

(a) **justification of a practice** by assessing that the benefits of the practice involving exposure to ionising radiation outweigh any detriment

(b) **optimisation of protection** by ensuring that each of the following is kept as low as reasonably achievable, taking into account economic and social factors:

   - the magnitude of individual doses of ionising radiation
   - the number of people exposed to ionising radiation
   - the likelihood of exposure to ionising radiation.

(c) **dose and risk limitation** by setting dose limits or imposing other measures so that the health risk to any person exposed to ionising radiation is kept below levels that are generally considered to be unacceptable.

A person is to take the radiation protection principles into consideration when exercising functions under this Act or under a licence.

Annual report of the Council

Section 33(1) of the Act requires that ‘as soon as practicable after 30 June (on or before 31 December) in each year, the Council is to prepare and forward to the Minister a report of its work and activities for the 12 months ending on 30 June in that year’.
Constitution of the Council

The Council consists of 17 members appointed by the Minister. Those members are:

(a) the Chairperson of the Authority or a member of staff of the Authority, who is to be the Chairperson of the Council
(b) a medical practitioner who is a specialist in radiology
(c) a radiographer with expertise in the field of human diagnostic radiography
(d) a person with expertise in the industrial uses of radiation
(e) a person with expertise in health physics
(f) a medical practitioner who specialises in nuclear medicine
(g) a person with expertise in non-ionising radiation
(h) a person with expertise in work health and safety
(i) a person who is an Australian lawyer of at least 7 years’ standing
(j) a person who represents community interests
(k) a person nominated by the Secretary of the Ministry of Health
(l) a radiation oncologist
(m) a medical physicist
(n) a person nominated by the Secretary of the Department of Finance, Services and Innovation and who is employed in the part of the Department that is principally involved in the administration of the Work Health and Safety Act 2011
(o) a person with expertise in naturally occurring radioactivity (o1) a person with expertise in mine radiation safety
(p) a person chosen by the Minister for such reasons as the Minister thinks fit.
Functions of the Council

Section 30 of the Act prescribes the functions of the Council, namely:

(1) The Council is to advise the Minister on:
   (a) proposed amendments to this Act and the making, amendment or repeal of regulations under this Act
   (b) the administration of this Act and the regulations
   (c) measures to prevent or minimise the dangers arising from radiation
   (d) the granting of exemptions authorised by the regulations for periods exceeding 60 days, and
   (e) such other matters relating to radiation safety as the Minister considers appropriate.

(2) Any such advice may be given either at the request of the Minister or without any such request.

(2A) The Council may at any time, and must on the request of the Authority, provide advice to the Authority about licences and accreditations under Part 2 of the Act.

(2B) The advice provided to the Authority may be general or specific, as the circumstances require.

(3) The Council has such other functions as are conferred or imposed on it by or under this or any other Act.

The EPA exercises responsibilities and powers under the Act, and the EPA staff of the Hazardous Materials, Chemicals and Radiation Section support the work of the Council.
Meetings of the Council

During the reporting period ending 30 June 2016, the Council met on six occasions. The attendances of members at meetings during this period are shown in Table 1.

Table 1: Meeting attendance by members of the Radiation Advisory Council 2015–16

<table>
<thead>
<tr>
<th>Member</th>
<th>Appointed position</th>
<th>Meetings attended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr Craig Lamberton (reappointed 16/12/2013) (retired 1/7/2016)</td>
<td>Chairperson</td>
<td>6</td>
</tr>
<tr>
<td>Mr Jon D’Astoli (reappointed 16/12/2013)</td>
<td>A person with expertise in work health and safety</td>
<td>5</td>
</tr>
<tr>
<td>Mr Brent Rogers (reappointed 16/12/2013)</td>
<td>A person with expertise in health physics</td>
<td>5</td>
</tr>
<tr>
<td>Ms Vanessa Brooks (appointed 16/12/2013)</td>
<td>A person nominated by the Secretary of the Ministry of Health</td>
<td>3</td>
</tr>
<tr>
<td>Assoc. Prof. Lee Collins AM (reappointed 1/12/2014)</td>
<td>A person with expertise in non-ionising radiation</td>
<td>6</td>
</tr>
<tr>
<td>Dr Richard Smart (reappointed 1/12/2014)</td>
<td>A medical physicist</td>
<td>4</td>
</tr>
<tr>
<td>Mr Frank Galea (reappointed 1/12/2014)</td>
<td>A person with expertise in the industrial uses of radiation</td>
<td>6</td>
</tr>
<tr>
<td>Ms Elizabeth Bailey (appointed 1/12/2014)</td>
<td>A person chosen by the Minister</td>
<td>2</td>
</tr>
<tr>
<td>Ms Colleen Harris (appointed 1/12/2014)</td>
<td>A person nominated by the Secretary of the Department of Finance, Services and Innovation involved in the administration of the Work Health and Safety Act 2011</td>
<td>3</td>
</tr>
<tr>
<td>Mr Cameron Jeffries (appointed 1/12/2014)</td>
<td>A person with expertise in naturally occurring radioactivity</td>
<td>5</td>
</tr>
<tr>
<td>Ms Fiona Henderson (appointed 1/12/2014)</td>
<td>A person who is an Australian lawyer of at least 7 years’ standing</td>
<td>4</td>
</tr>
<tr>
<td>Ms Elizabeth Akmentins (appointed 1/12/2014)</td>
<td>A person who represents community interests</td>
<td>6</td>
</tr>
<tr>
<td>Dr Hugh Dixson (reappointed 22/1/2016)</td>
<td>A medical practitioner who specialises in nuclear medicine</td>
<td>5</td>
</tr>
<tr>
<td>Dr Mary Dwyer (reappointed 22/1/2016)</td>
<td>A radiation oncologist</td>
<td>6</td>
</tr>
<tr>
<td>Mr Robert McLaughlin (reappointed 22/1/2016)</td>
<td>A person with expertise in mine radiation safety</td>
<td>4</td>
</tr>
<tr>
<td>Dr Philip Pasfield (reappointed 22/1/2016)</td>
<td>A medical practitioner who is a specialist in radiology</td>
<td>4</td>
</tr>
<tr>
<td>Mr Glen Burt (reappointed 22/1/2016)</td>
<td>A radiographer with expertise in the field of human diagnostic radiography</td>
<td>6</td>
</tr>
</tbody>
</table>
Memorandum of understanding between the EPA and the Council

The Council at its April 2016 meeting reviewed the memorandum of understanding (MoU) between the EPA and the Council and endorsed the MoU with no changes. The MoU was signed by both parties on 30 June 2016 and is provided in Appendix 1.

The Council’s strategic direction

The Council continued to focus on its strategic direction for 2013–16 by:

- developing uniform regulatory initiatives through the National Directory for Radiation Protection (NDRP) by reviewing national codes and standards and identifying regulatory gaps that may need to be addressed
- identifying and addressing emerging issues in radiation protection (in particular, new technology)
- identifying procedures and requirements to prevent or minimise dangers arising from the misuse of radiation materials. The council will continue to focus on emergency response capabilities through support for, or participation in, multi-agency emergency management exercises and through participation in national programs.

The Council’s work

During the reporting period the Council focused on the following matters.

National Uniformity and Radiation Health Committee

National uniformity was agreed to at the Australian Health Ministers’ Conference (AHMC) in August 1999. The first edition of the NDRP was endorsed by the AHMC in May 2005. This process allows all jurisdictions, including the Australian Government, to achieve national uniformity for radiation protection through each jurisdiction’s radiation protection framework.

National uniformity for radiation protection that is developed by the Radiation Health Committee (RHC) and facilitated by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) is delivered through the NDRP.

During the reporting period the RHC met on three occasions: 18 November 2015, 23 March 2015 and 15 June 2016. The Council was kept informed of and provided comment on the RHC deliberations and recommendations.

Significant issues that were considered by the Council during this period included:

- the proposal to withdraw Radiation Health Series publications and move towards the adoption of International Atomic Energy Agency (IAEA) documents. The Council raised concerns regarding this proposal emphasising that this policy change was a move away from national uniformity and the agreed process for issue resolution for the NDRP. The Council believes this may result in NSW and other jurisdictions not being able to adopt IAEA documents:
  - as they have not been subjected to the required Regulatory Impact Statement, a rigorous process for analysing the most feasible (efficient and effective) options available to produce the greatest net benefit to society, while simultaneously meeting the needs of government.
  - are not written for the Australian context i.e. they contain different terminology and definitions making these documents difficult to implement and enforce.
The Council also considered that this may result in NSW and other jurisdictions having to develop their own standards/codes. The EPA wrote to ARPANSA on behalf of the Council outlining the Council’s concerns.

- the outcomes of the RHC meeting held on 23 March 2016 specifically the possible discontinuation of the Australian Clinical Dosimetry Service established in early 2011. The Council wrote to ARPANSA expressing that it believes that independent dose auditing for radiation oncology is a useful tool which provides a surety to clinics that the dose being delivered to patients is appropriate. Council suggested that this initiative should be continued through the NDRP, which would allow jurisdictions to mandate these requirements through their existing regulatory frameworks.

- a response received from the RHC on concerns raised by the Council in the previous period in relation to the potential for some research proposals governed by ARPANSA’s Code of Practice for the Exposure of Humans to Ionizing Radiation for Research Purposes (2005) bypassing (by submitting the proposal as ‘standard care’) the requirement for the radiation component of the proposal to be assessed by a medical physicist. The RHC informed the Council that the wording in the guideline is clear and that the responsibility for ensuring that this requirement is not bypassed, and rests with the ethics committee when considering research proposals. The Council recommended that the EPA write to the Ministry of Health regarding concerns raised by the Council.

- providing comment on the following documents:
  - ARPANSA Draft Radiation Protection of the Environment Safety Guide
  - ARPANSA Draft Code for Radiation Protection in Medical Exposure
  - ARPANSA Draft Code for Radiation Protection in Planned Exposure Situations
  - Cone Beam Computed Tomography (CBCT) and panoramic radiography machines in Australia: table and graphs of current numbers
  - The Australian Commission on Safety and Quality in Health Care Summary Report Reduction in Radiation Exposure to Children and Young People from CT Scans. The Council noted the report and acknowledged that the report had some limitations (i.e. being based on Medicare data, not including patients imaged as public inpatients and only including data on children up to the age of 16).
  - IAEA Draft Preparedness for Nuclear Radiation Disaster Standard.

### Implementation of radiation legislation

Certain functions under the Act are now exercised by NSW Trade and Investment (T&I) with regard to radioactive ore that is located at any place to which the Coal Mine Health and Safety Act 2002 or Mine Health and Safety Act 2004 applies, or at any place where activities that are regulated under the Petroleum (Offshore) Act 1982 or Petroleum (Onshore) Act 1991 are carried out.

The Council during the reporting period continued to keep a brief on and considered matters relating to radioactive ores. The Council considered advice from T&I on the following matters:

- three applications for uranium exploration had been received however none had been granted a licence to date
- progress reports on the new EPA online user licensing system and invitation to members to review proposed online user licensing forms for online radiation user licence applications

Several Council members/nominees participated. The aim of the review was to improve the user’s experience when using this system.
• T&I are in discussion with ARPANSA regarding the mineral sands industry providing dose information to the ARPANSA dose register

• the Australian Nuclear Science and Technology Organisation (ANSTO) report on Naturally Occurring Radioactive Materials (NORM) for underground mines in NSW. The report concluded that radiation arising from NORM were not of regulatory concern. Council reviewed the report undertaken by ANSTO and concluded that the overall findings of the report were reasonable for the limited monitoring that was undertaken. Council also noted that the report identified up to four mines that were capable of producing high radon concentrations. Council therefore advised that in those mines it was important to:
  o verify the assumptions used in the report, specifically whether there were:
    – working hours across all underground workgroups
    – occupancy controls in place on entry to unventilated areas
    – active ventilation control procedures in place for working areas (for example, ventilation was not a ‘set and forget’ issue); daily or intra-shifts; and checks to ensure that ventilation remained effective
  o monitor radon decay products for any future investigations (allows for a more direct assessment of occupational exposure)
  o assess the effect of the reduction in the international radon risk factor on the findings of this report
  o adopt the recommendation of ARPANSA Technical Report 161 to investigate deportment of radionuclides at one mine site in NSW. Recirculating radionuclides might create an issue for radiation exposure.

New and emerging issues in radiation protection

During the reporting period the Council kept itself informed of new and emerging issues in radiation protection by:

• inviting agencies to address the Council on the current status on the detection of the inadvertent import or export of radioactive material to and from Australia. During the reporting period the Council was given a presentation by Mr Lock Castle, Director Source Control, ARPANSA on this topic.

• reviewing new hybrid dental computed tomography equipment and current licensing requirements. At the time of writing this report the Council was still considering this matter.

EPA radiation compliance and audit program

The Council:

• reviewed and provided advice on the EPA’s Radiation Compliance Program 2016–17, including the EPA compliance campaigns

• considered the finalized EPA Radiation Work Program for 2015–16, which Council provided input into during the previous period.

The Council was provided with an overview of the EPA’s Source Security Plan Compliance Campaign where the EPA had visited all category 1 source holders, and a percentage of category 2 and 3 source holders. The Council suggested that further work by the EPA needed to take place to increase compliance within the industrial radiography sector. During the reporting period the EPA had commenced the audit of industrial radiography facilities and informed the Council that initial findings identified some significant issues which the EPA will revisit in its 2016–17 compliance program.
was advised that Universal Dye Works Pty Ltd pleaded guilty to not being licensed and for disposing a source without EPA consent. The Magistrate reserved its decision until 5 July 2016.

Advice to Council

The Council considered:

- the advice on national threat levels – in the previous period the Council asked the EPA to investigate whether improvements could be made to distinguishing between the Security of Radioactive Sources Code threat level and the Australian Terrorism Public Alert Level in public communication following confusion about the impact of an increase in the terrorism alert level on the radiation security threat level.

  The EPA advised that Security of Radioactive Sources code threat level differs from the Australian Terrorism Public Alert Level as the Radiation Security Code threat level is relayed by Police only to responsible persons who deal with a sealed radioactive source as prescribed by the Security of Radioactive Sources code whereas the other is a public alert.

- an update on the status of the National Waste Repository for low-level and intermediate level radioactive waste, advising that Hill End was nominated as a possible NSW site

- advice regarding the arrival of a shipment of intermediate level radioactive waste (spent fuel reprocessed by a French company) on 5 December 2015 to be transported to ANSTO

- an article published by the Internal Medicine Journal: Nuclear medicine incident reporting in Australia: control charts and notification rates inform quality improvements by George Larcos

- a media report on a NSW radiation oncologist convicted of assault – Council discussed the impact this may have in relation to this oncologist being a fit and proper person to hold a licence under the Act. Council recommended that the EPA liaise with the Australian Health Practitioner Regulatory Agency (AHPRA) to ascertain the status of the oncologist’s registration prior to considering any regulatory action in relation to his radiation licence. The EPA suspended the oncologist’s licence until the oncologist’s registration as a specialist medical practitioner is reinstated by AHPRA.

- advice from the EPA that ARPANSA had approached the EPA seeking the EPA’s participation in the IAEA audit program (the IAEA audit program is established to ascertain whether Australia is compliant with IAEA standards). The EPA advised ARPANSA that it would not participate in such a review unless the EPA was provided with financial support to redress the diversion of EPA resources, and that the participation of all state and territories be included equally in the review.

- advice from the EPA on an investigation being undertaken by the Health Compliance Branch of the Australian Government Department of Health in relation to a mobile dental practice provider. At the time of writing this report the EPA was investigating whether the provider was also in breach of requirements under the Act.

11 The Magistrate judgement on 5 July 2016 resulted in the defendant having to pay the prosecutor’s costs of $15,000; and forfeit of the radiation gauge to the Crown, including meeting the cost of the destruction (approximately $10,000).
Council’s advice to the EPA on other radiation matters

During the reporting period the Council continued to provide advice to the EPA in relation to radiation and general matters, including:

- non-standard licensing applications
- acceptance of radiation safety courses for the purposes of licensing
- new radiation technologies
- non-standard accreditation applications
- radiation accidents and incidents
- review of Council business documents.
Committees of the Council

Under section 31 of the Act the Council may establish committees to help it perform its functions. In 2015–16 the Council had two committees:

- National Directory Committee
- Review of Guideline 6 Committee

The roles and work of each of the Council’s committees are outlined below.

The membership of the Council’s committees and working group are provided at Appendix 2.

National Directory Committee

The Council established the National Directory Committee to help it to develop and implement the NDRP and to ensure that the recommendations proposed by the national RHC are practical and effective in controlling radiation risks to human health and the environment.

The RHC advises the CEO of ARPANSA and the Radiation Health and Safety Advisory Council on matters relating to radiation protection, including formulating draft national policies, codes and standards for consideration by the Australian, state and territory governments.

The committee’s role is to provide advice to the Council and the EPA on the priorities and suitability of material proposed for inclusion in the NDRP, as well as on its legislative, financial and operational impact on the EPA, other NSW Government agencies and NSW as a whole.

The committee reviews documents that are produced by the RHC.

The committee did not meet during the reporting period but specific issues arising from the RHC were considered directly by the Council.

Review of Guideline 6 Committee


The aim of the review is to incorporate new technology and to update the requirements of the six-part guideline to align with the new requirements of the Act. The six parts of the guideline are:

- Part 1: Mammography
- Part 2: Fluoroscopy & radiography
- Part 3: Dentistry (including maxillofacial)
- Part 4: Veterinary science
- Part 5: Computed tomography & bone mineral densitometry
- Part 6: Test protocols for parts 2–5.

During the reporting period the committee met on six occasions and finalised Guideline 6: Compliance Requirements for Ionising Radiation Apparatus used in Diagnostic Imaging Part 1 Mammography; Part 2 Radiology; Part 3 Dentistry; Part 4 Fluoroscopy; Part 5 Computed Tomography; and Part 6 Veterinary. The EPA released the draft guideline for public comment in the latter part of 2015. The committee considered and included feedback from the public consultation process.

In the next period the EPA in conjunction with the committee will look at CREs training requirements in order for CREs to be upskilled so as they may be able to undertake the assessment requirements contained within the new guideline.
Licensing and accreditation

The EPA, under Part 2 of the Act, is the authority responsible for administering radiation user and management licences, and consulting radiation experts and radiation security assessor accreditations. Section 30 of the Act provides that the Council may give generic or specific advice to the EPA on applications under Part 2 of the Act.

During the reporting period the Council advised the EPA on licensing and accreditation matters.

The Council’s standing advice was taken into account in the EPA’s consideration of applications submitted to it under the Act. The Council and the EPA work together on determining the outcomes of applications, as set out in the MoU between the Council and the EPA (see Appendix 1).

The Council considered and reviewed routine licensing and accreditation statistics provided at each meeting.

The EPA provided advice to the Council on:

- the online user licence applications initiative scheduled to be available in latter part of 2016
- the outcomes from the consultation process regarding the revised user licences – the EPA in December 2015 sent all radiation user licence holders the draft user licence conditions for consideration.

The Council in the previous period established the Review of Radiation User Licence Conditions Committee to review all EPA radiation user licence conditions. The Committee reviewed 76 user licence conditions and endorsed 6 new general licence conditions.

An overview of radiation user licences, management licences, accreditation of consulting radiation experts and accreditation of radiation security assessors are provided below.

Radiation user licences

Section 7 of the Act requires a natural person who intends to use regulated material\(^2\) to hold a radiation user licence and comply with any conditions the licence is subject to.

Purpose of a radiation user licence

The aim of a user licence is to:

- regulate, restrict or prohibit the use of regulated material
- ensure that persons who use regulated material:
  - are fit and proper persons
  - have appropriate knowledge of the principles and practices of radiation safety and protection applicable to the activities proposed to be carried out
  - protect the NSW community and the environment from harmful exposure to radiation through the application of conditions of licence that restrict how, when and where radiation may be used.

---

\(^2\) Regulated material means any of the following: radioactive substances, ionising radiation apparatus, non-ionising radiation apparatus of a kind prescribed by the regulations, and sealed source devices.
Occupations requiring a user licence
User licences are held by individuals who work across a wide range of occupations in NSW such as scientists, medical specialists, nurses, radiographers, industrial radiographers, service engineers, technologists, dentists, chiropractors and tertiary lecturers.

Number of user licences issued by the EPA
During the reporting period ending 30 June 2016, the EPA issued 1,782 radiation user licences and renewed 4,977 user licences. At the end of the reporting period there was a total of 13,679 radiation user licences (3,977 one-year licences and 9,702 three-year licences) issued by the EPA.

Council’s advice to the EPA
During the reporting period, the Council gave the EPA specific expert advice in relation to radiation safety and licensing requirements across a wide range of occupational areas that use radiation (see below).

Non-standard licence conditions
The Council:
- considered a licence variation and recommended that the applicant be granted an IA10 condition of licence to use radiation apparatus for installation and servicing subject to the licence being restricted to the servicing of cabinet X-ray apparatus only.
- considered thresholds for radionuclides to be utilised for the purposes of establishing when a licence application is to be referred to the Council.

Radiation user licence conditions
The Council:
- reviewed the supervision conditions to use mammography apparatus for breast screening (IA14M) following representations from Charles Sturt University (CSU) and the Cancer Institute of NSW. Concern was raised that the ‘immediate supervision’ restrictions of six months for graduates undertaking mammography screening were unworkable. The Council considered the representations and recommended that graduates of the CSU Graduate Diploma in Mammography must be required to have, at the least, one month immediate supervision by a licensed person experienced in mammography screening. The EPA informed all parties of the Council’s recommendation.
- was provided with clarification from the EPA that the supervision of a person holding the newly created IA14M condition to use radiation apparatus for medical diagnostic breast screening is to take place at all practices and is not restricted to one location
- requested the EPA investigate the issue of radiation therapists automatically receiving a user licence condition from the EPA to use radiation apparatus for bone mineral analysis (IA27). The EPA informed the Council that the issue had been resolved advising that radiation therapists would only receive this licence condition if requested.
- considered and approved the licensing of dental assistants to use orthopantomograms (OPGs) and lateral cephalometric X-rays subject to dental assistants providing evidence of completion of the Certificate IV Dental Assistants course as approved by the Council.
- considered the request from ATX Medical Solutions seeking endorsement to allow a radiographer to undertake X-ray procedures at a location remote to the patient undergoing the X-ray. The Council recommended that it did not consider the request appropriate and noted that remote operator requirements are already in place.
endorsed the EPA proposal to amalgamate user licences with a supervised practice program (SPP) with their respective full licence conditions. This removes the administrative burden of SPP licensees who had completed their SPP year having to upgrade to a full licence.

considered the document *Guidance on Safe Use of Hand-held Dental X-ray Equipment* issued by Public Health England.

endorsed new conditions of licence and criteria for veterinary assistants handling I-131 waste following veterinary therapy nuclear medicine procedures.

requested that the EPA investigate the potential issue of unauthorised requests of imaging procedures.

**Radiation safety courses**

The Council considered and approved the following radiation safety courses for the purpose of licensing:

- **Laboratory Analysers Australia course**: *XRF Analyzer Operator Training* and *XRF Safety Training* to use portable X-ray fluorescence (XRF) radiation apparatus for analysis (IA19)
- **Sietronics Pty Ltd course**: *Radiation and Safety with Handheld XRF* to use portable X-ray fluorescence (XRF) radiation apparatus for analysis (IA19)
- **The Canberra Hospital course**: *Radiation Safety Course for Medical Practitioners Involved in Fluoroscopy* to use radiation apparatus for medical fluoroscopy - Specialists other than radiologists (AI22)
- **Virtual Accident Pty Ltd online course**: *Ionising Radiation and Research* to use radiation apparatus for analytical purposes (IA5) and scientific or research purposes (IA8)
- **Portable XRF Services course**: * Radiation Theory and Training in the Use of Portable XRF’s* (delivered via Skype) to use portable X-ray fluorescence (XRF) radiation apparatus for analysis (IA19)
- **RADSMART course**: *X-Ray Safety for Operators of Dual Energy X-Ray Absorptiometry Equipment* to use radiation apparatus (dual energy X-ray absorptiometry) for bone mineral or body composition analysis (IA27). It was noted that any person completing this course will also need to provide a certificate by the manufacturer Hologic as completing the manufacturer training
- **Radtest Australia course**: Radiation Safety with Portable Moisture and Density Gauges Using Radioactive Sources to use soil moisture and density gauges (S30).

The Council considered but did not approve the following radiation safety courses for the purpose of licensing:

- **Brainlab Australia Pty Ltd course**: *Radiation Safety and Protection for Service Engineers*. The Council considered that a 40-minute online training course was not sufficient for this licence type as service engineers needed to attain and demonstrate a significantly higher level of competence than provided in the course. The Council also found that the course content was not conducive to the Australian context and an extensive revision of the course would be required for the use of appropriate units of measure, terminology and data.
- **ANSTO course**: *Safe Use of X-ray devices*. The Council considered that the course was not targeted to the needs of service engineers and that the material presented could not realistically be delivered adequately in the timeframe indicated.
• Sirona Dental Systems Pty Ltd course: *Cone Beam Radiography and Application Course with Hands-on Training* for the purposes of licensing the use of orthopantomogram (OPG) or dental computed tomography (CT). The Council considered that the course was targeted to the application of the equipment but lacked core radiation safety knowledge for the purposes of licensing the use OPGs or CTs.

**Radiation management licences**

**Requirement for management licences**

Under Section 6 of the Act persons responsible for regulated material are required to hold a radiation management licence and to comply with the conditions of the licence.

The EPA issues two types of management licence: one to own, store, give away, sell and possess regulated material and the other only for the purpose of selling regulated material.

**Persons responsible for regulated material**

Persons responsible for regulated material are: owners of regulated material; persons storing, selling or giving away regulated material; and persons in possession of regulated material, other than:

(a) a person who is the holder of a radiation user licence in respect of the regulated material and who has possession of the regulated material only for the purposes of using the regulated material, or

(b) a person who has possession of the regulated material only for the purposes of transporting the regulated material.

**Purpose of management licences**

The purpose of management licences is to regulate, restrict or prohibit the possession, sale, storage, giving away and disposal of regulated material so as to secure the protection of people and the environment from exposure to radiation.

**Number of management licences issued by the EPA**

During the reporting period ending 30 June 2016, the Council was advised that the EPA issued 247 general management licences and 8 sell-only management licences. At the end of the reporting period there was a total of 2,558 management licences (2,394 general and 164 sell only) issued by the EPA.

**Council’s advice to the EPA**

During the reporting period, the Council:

• considered the application of clause 28 of the Regulation requiring employers to prepare/adopt radiation management plans. The EPA agreed to consider the matter in the next period.

• reviewed the policy on wipe testing of sealed source devices, in particular, the frequency of wipe testing on devices that have had their recommended manufacturers working life extended. The issue arose due to a query from the NSW Department of Primary Industries. The Council recommended that the EPA adopt ARPANSA’s regulatory guide requirement of yearly wipe testing.
Consulting radiation experts

Accreditation and activities of consulting radiation experts

Section 8 (1) of the Act provides for the accreditation of CREs. The Regulation sets out the activities of a CRE, which include:

(a) advising on the design of premises, in relation to radiation safety requirements, on which regulated material is kept or used, for the purpose of certifying compliance with any conditions imposed on a radiation management licence

(b) assessing plans for premises on which regulated material is kept or used, for the purpose of certifying compliance with any conditions imposed on a radiation management licence

(c) assessing any regulated material and the premises at which it is kept or used, for the purpose of certifying compliance with any conditions imposed on a radiation management licence

(d) assessing the integrity of any shielding of premises at which any regulated material is kept or used, for the purpose of certifying compliance with any conditions imposed on a radiation management licence.

Purpose of accrediting consulting radiation experts

CREs are accredited by the EPA to assess apparatus and/or premises and issue a certificate of compliance verifying that they comply with the requirements of licensing.

Council’s advice to the EPA

The EPA under section 9A of the Act may seek the Council’s advice on accreditation matters. During the reporting period ending 30 June 2016 the Council considered:

- and recommended approval of a CRE application for accreditation to assess general diagnostic imaging equipment subject to the applicant undergoing an assessment by an independent CRE

- the Statement of Concern raised by Western Sydney Local Health District (WSLHD) concerning the roles and responsibilities of EPA-accredited CREs certified in radiology physics by the Australian College of Physical Scientists and Engineers in Medicine (ACPSEM). The statement included recommendations to redefine the roles and responsibilities (with the inclusion of appropriate limitations) of CREs prescribed activities as defined in Clause 12 of the Regulation, specifically in relation to Qualified Medical Physics Specialists. The EPA in response provided clarification and advice to the concerns raised by WSLHD and indicated that the EPA in conjunction with the Council had developed guidance on shielding, and is liaising with the ACPSEM to develop acceptable criteria for accreditation of CREs to carry out prescribed activities in relation to shielding.

Number of CREs accredited by the EPA

As at 30 June 2016 the EPA has 108 accredited CREs to perform one or more of the prescribed activities.
Radiation security assessors

Accreditation and activities of radiation security assessors

Section 8(2) of the Act provides for the accreditation of radiation security assessors. The activities of a radiation security assessor, as prescribed in Clause 13 of the Regulation, are:

- reviewing security plans or amended security plans to assess whether the plans are made or amended in accordance with the Act
- endorsing security plans so that the plan, or the plan as amended, satisfies the requirements of the Act.

Purpose of accrediting radiation security assessors

The purpose of accrediting radiation security assessors is to ensure that the persons responsible for security-enhanced sources\(^3\) prepare source security plans and source transport security plans in accordance with the requirement of the Act.

Number of radiation security assessors accredited by the EPA

As at 30 June 2016 the EPA had accredited a total of five radiation security assessors to perform the prescribed activities.

Summary of licences and accreditations issued by the EPA

Table 2 summarises the total numbers of radiation user licences, management licences and accreditations issued by the EPA as at 30 June 2016.

Table 2: Summary of the total numbers of active licences and accreditations issued as at 30 June 2016

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licence to use regulated material</td>
<td>13,679</td>
</tr>
<tr>
<td>Management licences (general)</td>
<td>2,394</td>
</tr>
<tr>
<td>Management licences (sell only)</td>
<td>164</td>
</tr>
<tr>
<td>Accreditation of consulting radiation experts</td>
<td>108</td>
</tr>
<tr>
<td>Accreditation of radiation security assessors</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total no. of radiation licences and accreditations</strong></td>
<td><strong>16,350</strong></td>
</tr>
</tbody>
</table>

\(^3\) A sealed radioactive source (or an aggregation of sealed radioactive sources) that is a category 1, 2 or 3 source is a **security-enhanced source** for the purposes of the Act.
Radiation accidents

Mandatory requirement to report radiation accidents

The mandatory requirements imposed on persons responsible for regulated material for the reporting and recording of radiation accidents is outlined in clauses 38 and 39 of the Regulation. Clause 37 of the Regulation specifies the types of incidents that are classified as radiation accidents for the purposes of the Act.

The Council reviews accident reports at the request of the EPA. The Council emphasises that it is vital that accidents are consistently reported, even if the dose received has been negligible. This is not just because of the legal requirement, but also because the knowledge gained can be used to develop processes and procedures that reduce the risk of similar accidents occurring in the future. Most reported accidents do not result in any actual harm to an individual.

Causes of radiation accidents

Radiation accidents are normally caused by either deficiencies in management systems or failures on the part of individuals to implement those systems correctly. Where investigations reveal that accidents have been caused by a deficiency in the management system, the Council may recommend that new procedures be developed and implemented or that specific regulatory action be taken. Where an individual is at fault, the Council may (if this has not been done by the organisation) recommend counselling or further training to prevent this type of incident from recurring.

Serious accidents reported to the Health Care Complaints Commission (HCCC)

The Council may also recommend that serious health-related accidents be referred to the HCCC. The EPA has standing advice from the Council to refer all matters considered significant by the Council to the HCCC.

Number of accidents reported to the EPA

During the reporting period ending 30 June 2016, the EPA was informed of 70 instances where radiation accidents may have occurred. These involved 76 people.

The Council considered each case and, where appropriate, made recommendations that, in its opinion, would reduce the risk of a recurrence. The EPA also provided the Council with information on 23 incidents that involved doses of less than 1 mSv (milliSievert). These are not included in the accident summary below.

Advice to the EPA

During the reporting period the Council also:

- requested that licensees be reminded of the requirements to report radiation accidents. The EPA agreed to inform licensees by including this information on their licence renewal notices.

- in the last period, raised the issue that similarly named radionuclides are still consistently being misidentified and suggested that colour labelling or another system of differentiation be considered. The EPA agreed to engage an appropriately qualified person to consider the issue of better labelling of radionuclides in NSW. The Council at its December 2015 meeting was advised that a tender process had commenced for a consultant to look at better labelling of radionuclides. The EPA informed Council that the preferred consultant...
had declined to take on the project due to other commitments and that the EPA was exploring other consulting options.

- raised the issue of terminology used in the reporting of accidents suggesting that the term 'unplanned' seemed inappropriate as procedures are all planned. Also several members raised concern with the term 'accident' indicating that the terminology used in current safety documentation use the term 'incident'. The Council recommended that the terminology in the Regulation pertaining to the reporting of radiation accidents is in need of review so that it more accurately reflects contemporary usage of current language. The EPA advised members that the Regulation is required to be reviewed every 5 years (next due by Sept 2018) and that existing provisions of the Regulation relating to the classification and reporting of accidents would be included in the next review.

Summary of radiation accidents considered by the Council 2015–16

A summary of accidents reported to the Council is given below. The summary is grouped by categories of accidents: nuclear medicine, therapy, radiology and other.

Nuclear medicine

During the reporting period the Council reviewed the following accidents and the controls instigated by the facilities responsible to correct deficiencies in their standard operating procedures or equipment. The Council was satisfied with the steps organisations had taken to prevent these types of incidents from recurring and unless indicated no further action was recommended by the Council.

- A patient received a scan in error as the booking request was not amended when a different scan was requested. The patient received an estimated effective dose of 26 mSv. The Council recommended that the EPA write to the facility recommending that any changes to a referral must be documented in writing and signed off by the appropriate person and that a policy be put in place with these requirements.
- The wrong patient received a Sestamibi scan due to the wrong patient being selected from the electronic medical record. The patient received an estimated effective dose of 7.6 mSv.
- A patient was not injected with the correct dose of F-18 during a whole body PET/CT scan due to the cannula not being properly sited. The patient received an estimated effective dose of 5.2 mSv.
- A patient was undergoing a cardiac scan when the CT scanner stopped due to a malfunction. The patient received an estimated effective dose of 1.6 mSv.
- A patient was injected with 1000 MBq Tc-99m HDP for a bone scan study. The second part of the study was unable to be performed as the patient was not transported back to the practice for imaging in time. The patient received an estimated effective dose of 5 mSv.
- A patient was injected with 1000 MBq Tc-99m Tetrofosmin instead of 1000 MBq Tc-99m Pertechnetate due to the incorrect radiopharmaceutical being selected. The patient received an estimated effective dose of 8.2 mSv.
- Two patients undergoing a SPECT/CT scan required repeat scans due to the scanner malfunctioning. The patients received an estimated effective dose of 2 mSv and 1 mSv respectively.
- A patient was injected with Tc-99m Disofenin instead of Tc-99m MAA due to the wrong radiopharmaceutical being dispensed. The patient received an estimated effective dose of 2.3 mSv.
• A patient during a seizure was to be given 1 GBq Tc-99m Sodium Pertechnetate. On inspection of the scan it was observed that the uptake was less than expected and the scan was deemed to be non-diagnostic. The error occurred as a result of the radiopharmaceutical not being administered correctly into the cannula. The patient received an estimated effective dose of 5.5 mSv.

• A patient was given a repeat PET/CT scan due to the request form not being properly interpreted, resulting in the wrong region being scanned. The patient received an estimated effective dose of 9.3 mSv.

• A patient undergoing a PET/CT scan had the CT part of the scan repeated due to operator error. The patient received an estimated effective dose of 14 mSv.

• The wrong patient was given a renal study due to patient misidentification. The patient received an estimated effective dose of 2 mSv.

• A patient was administered with Tc99m Sestamibi for a cardiac stress scan. Part of the procedure requires the administration of adenosine. The infusion of the adenosine failed to occur due to a fault in the injector. The scan was repeated. The effective dose to the patient was estimated to be between 6.4 and 7.3 mSv.

• A patient was injected with Tc-99m MIBI instead of Tc-99m MDP (for a bone scan). The patient received an estimated effective dose of 3.1 mSv.

• A patient was injected with Tc-99m labelled Colloid instead of Tc-99m labelled MAA (for a lung scan). The patient received an estimated effective dose of 1.65 mSv. The Council requested that further information be provided as to why the radiographer undergoing the supervision practice program was not supervised. The Council received the information and as a result a review of policy will require supervised practice radiographers to be under immediate supervision until they are able to safely work under general supervision.

• A patient was incorrectly administered with Tc-99m Phytacis (liver agent) instead of the requested Tc-99m Renocis (kidney agent). The patient received an estimated effective dose of 5.6 mSv.

• A patient was incorrectly injected with Tc-99m Cardiolite instead of Tc-99m HDP. This occurred due to a miss-draw by the supplier of the radionuclide Cardiolite. The patient received an estimated effective dose of 9.2 mSv.

• Two patients were injected with Tc-99m Pertechnetate instead of Tc-99m MIBI. Patient’s A and B received an estimated effective dose of 1.2 mSv and 3.6 mSv respectively.

• A patient required a repeat SPECT/CT of the pelvis as the scanner stopped midway through scanning. The patient received an estimated effective dose of 1.4 mSv.

• Two radiation technologists were exposed to F-18 FDG during an incident when the locking mechanism that holds the vial of 49.6 GBq of F-18 FDG in the dispensing rig failed causing the vial and the locking device to fall out of the pig. The glass vial shattered on contact with the laboratory bench top causing contamination of the general laboratory area. The dose rate in the hot-lab was measured at approximately 0.6 mSv/h at the door. It is estimated that technologist A might have been exposed at the most to 0.25 to 0.5 mSv. Technologist B is estimated to have been exposed to up to 0.05 mSv. Other hospital staff are estimated to be exposed to no more than 0.02 mSv. The radiation dose rate was elevated in one area of the general hospital pharmacy and in a corridor between nuclear medicine and the pharmacy.

• A patient was required to have a repeat DTPA scan as the first scan was paused in error. The screen was accidently touched where the pause acquisition button was. The data produced was not sufficient to produce a diagnostic image. The patient received an estimated effective dose of 2 mSv.

• A patient was incorrectly injected with Tc-99m Cardiolite instead of Tc-99m HDP. This occurred due to a miss-draw by the supplier of the radionuclide Cardiolite. The patient received an estimated effective dose of 9.2 mSv.

• Two patients were injected with Tc-99m Pertechnetate instead of Tc-99m MIBI. Patient’s A and B received an estimated effective dose of 1.2 mSv and 3.6 mSv respectively.
• The PET/CT scanner broke down after a patient had been injected with F-18 FDG. The breakdown could not be rectified and the patient could not be scanned resulting in the patient receiving a repeat injection. The patient received an estimated effective dose of 4.7 mSv.

• A patient required a repeat CT scan as the PET/CT scanner stopped working mid scan. The fault was found to be in the X-ray tube of the CT. The patient received an estimated effective dose of 1.8 mSv.

• A radiochemist, during a practice labelling exercise for a therapy procedure, was dividing Lutetium-177 into two amounts behind a lead shield in the PET hot-lab. The staff member’s clothes appear to have been contaminated as their OSD (optically stimulated device) badge received a beta reading. The dose to the radiochemist was estimated at 1.26 deep dose, 40.14 mSv lens dose, 107.63 mSv shallow dose.

• A patient during being injection with Tc99m MIBI for a scan, was contaminated with the radionuclide when the cannula attached to a 3-way tap became loose and the radiopharmaceutical leaked onto the patient and the linen on the bed. The injected amount of radioactivity was insufficient for a diagnostic scan and it was abandoned. The patient received an estimated effective dose of 2.63 mSv.

• A patient had a gated blood pool study but the left ventricular E fraction could not be accurately measured as the injected radiopharmaceutical did not sufficiently bind to the red blood cell. The patient received an estimated effective dose of less than 10.7 mSv.

• A patient undergoing a Ga-68 PSMA scan was contaminated with the radionuclide when the cannula leaked due to either the cannula not being correctly attached or the patency of the vein failing. The patient received an estimated effective dose of less than 7.3 mSv.

• Two patients were injected with 18F-FDG. When the CT was carried out for co-registration attenuation correction the data was found to be corrupt. The error occurred due to a software issue. The patient received an estimated effective dose of 17 and 18 mSv respectively.

• A patient was administered with 500 MBq of 18F-FDG instead of 185 MBq 18F-FDG due to a calculation error when entering the patient’s information into the schedule. The patient received an estimated effective dose of 6.0 mSv.

• A patient was administered with the wrong radiopharmaceutical due to the incorrect pharmaceutical being selected when reconstituting the dose for the patient. The patient received an estimated effective dose of 1.56 mSv.

• A patient received a cardiac shunt scan in error due to the wrong procedure being booked. The patient received an estimated effective dose of 3.3 mSv.

• A patient was undergoing a CT scan when the CT scanner failed half way through the scan. The patient received an estimated effective dose of 2.6 mSv.

• A patient received 300 MBq of 99mTc being of no clinical benefit due to operator error which led to the infusion pump stopping during a stress sestamibi procedure. The patient received an estimated effective dose of between 2.37 and 2.7 mSv.

• Two patients had repeat PET studies due to PET equipment failure. One patient was re-administered with 150 MBq of Ga68-Dotatate and a low dose CT scan receiving an estimated effective dose of 7 mSv. The second patient was administered with 250 MBq FDG and a low dose CT scan resulting in an estimated effective dose of 8 mSv.

• A patient was administered with 436MBq Tc-99 Sestamibi instead of 1136 MBq of TC-99m Sestamibil due to resistance during administration. The patient received an estimated effective dose of 3.4 mSv.
A patient was required to repeat a rest and stress myocardial viability study using TC-99m Sestamibi as the scan could not be used for diagnostic purposes. The error occurred due to protocols not being followed when administering Anginine (required to be given prior to the rest dose of Tc-99m Sestamibi). The patient received an estimated effective dose of 4.1 mSv.

A patient received an additional dose of Tc-99m Sestamibi due to misinterpretation of the request form, believing the patient was attending for another rest study instead of an exercise stress test. The patient received an estimated effective dose of 3.6 mSv.

Two patients were injected with 99mTc-Sestimibi for myocardial perfusion studies but were not able to be imaged due to gamma camera equipment failure. Both patients received an estimated effective dose of approximately 7.2 mSv.

Therapy

During the reporting period the Council reviewed the following accidents and the controls instigated by the facilities to correct deficiencies in their standard operating procedures. The Council was satisfied with the steps the organisations had taken to prevent these types of incidents from recurring and unless indicated no further action was recommended by the Council.

A patient received 1 of 2 fractions to the lumber spine region with the treatment fields approximately 5 cm inferior to the intended area due to the wrong hard coded plan details not being checked when transferred onto the treatment system. The patient received an estimated dose of 4 Gy.

A patient undergoing a radiation oncology treatment received a 7 Gy dose instead of the intended 5.5 Gy due to the reduced dose not being loaded into the planning system. The patient received an additional estimated dose of 1.5 Gy.

A patient was delivered radiation treatment via stereotactic radiation therapy to a portion of the brain that was not required due to the head mount of the patient’s mask being incorrectly positioned. The patient received a dose to the brain estimated to be 8 Gy.

A patient received a CT scan as part of the planning for treatment of the whole brain. The MRI imaging showed no disease and therefore the brain CT was not required. The dose to the patient was DLP 1 Gycm.

A patient was being treated with 785.4 MBq of I-125 for a tumor located in the caruncle of their left eye. Post procedure, the patient complained of lower eye lid pain and the surgeon discovered that the plaque had moved to the inferior fornix. The patient received an estimated dose of 35 Gy.

Two patients had repeat CT scans due to two different errors in the CT system. The patients received an estimated effective dose of 12.5 mSv and 4.2 mSv (with thyroid receiving 29 mSv) respectively.

During the reporting period the Council reviewed the following accident and the controls instigated by the facilities to correct deficiencies in their standard operating procedures. Due to the seriousness of the accident the Council recommended that this accident be referred to the HCCC.

A patient was prescribed 1.7 Gy per fraction and a total of 29 fractions were delivered. The patient received 49.3 Gy overlap in error. At the time of writing this report a response had not yet been received.
Follow up from previous period

During the previous period a patient received radiation treatment to the wrong groin due to the incorrect entry on the patient’s treatment plan. The patient received an estimated dose of 30 Gy. Due to the seriousness of the accident the Council recommended that this accident be referred to the HCCC.

During the reporting period the Council reviewed and noted the HCCC assessment of the accident. The HCCC investigated the complaint and referred the matter to the Medical Council of NSW as the HCCC were of the view that the matters raised in the complaint could be managed by the Medical Council. The HCCC advised that it also referred the three practitioners directly involved in the incident to the Medical Radiation Practice Council as it was of the view that the Medical Radiation Practice Council could conduct such interventions as necessary to ensure that lessons had been learnt and that the same mistakes would not be repeated.

Radiology

During the reporting period the Council reviewed the following accidents and the controls instigated by the facilities responsible to correct deficiencies in their standard operating procedures. The Council was satisfied with the steps the organisations had taken to prevent these types of incidents from recurring and unless indicated no further action was recommended by the Council.

- The wrong patient was given a renal scan due to the wrong name being placed on the request form. The patient received an estimated effective dose of 10 mSv.
- A patient was given a repeat X-ray due to the request form being incorrectly completed by the person who was not authorised to complete request forms. The patient received an estimated effective dose of 1.4 mSv.
- The wrong patient was given a CT of the abdomen and pelvis due to the patient’s identification not being checked. The patient received an estimated effective dose of 14 mSv.
- A patient was given a repeat CT scan of the abdomen/pelvis as a result of the CT being corrupted and preventing reconstruction of the images. The patient received an estimated effective dose of 8.6 mSv.
- A patient was given a repeat CT scan of the abdomen/pelvis due to poor communication of the request. The patient received an estimated effective dose of between 5.2 and 5.6 mSv.
- A patient was given a repeat CT scan of the abdomen/pelvis due to CT scan malfunction. The patient received an estimated effective dose of 3.1 mSv.
- A patient incorrectly received a CT pulmonary angiogram due to the procedure being ordered for the wrong patient. The patient received an estimated effective dose of 3 mSv.
- The wrong patient received a CT of the brain due to the wrong patient being selected during the request ordering process. The patient received an estimated effective dose of 1.4 mSv.
- The wrong patient was ordered a CT of the brain due to the wrong patient being selected on the request. The patient received an estimated effective dose of between 1.2 and 5.4 mSv.
- A patient received an additional CT of a post-operative knee replacement due to two requests being completed for the same procedure. The patient received an estimated effective dose of between 27 mSv.
• A patient received repeat scans due to the electronic patient record system not updating their record which included their CT images.

• A patient was referred for a CT scan of the brain but the data on reconstruction could not be used as a large artefact was observed on the images making them non-diagnostic. The patient received an estimated effective dose of 1.7 mSv with the brain receiving 34 mSv and the lenses 45 mSv.

• A patient incorrectly received a chest CT instead of a neck CT due to the protocol not being checked against the request. The patient received an estimated effective dose of 5.5 mSv.

• A patient received a chest CT scan but because of a scanner malfunction that happened after the scan was taken, all the scan data was lost. The patient received an estimated effective dose of 7.9 mSv.

• A patient received a repeat CT of the left shoulder due to two requests being raised. The patient received an estimated effective dose of 11 mSv. The Council requested further information on the accident which it reviewed at the next meeting with no further action being recommended.

• A patient was given a thoracolumbar spine x-ray procedure in error due to the incorrect patient being selected when the request was raised. The patient received an estimated effective dose of 1.2 mSv.

• A patient received a brain CT scan that was not required due to the wrong patient ID sticker placed on a referral. The patient received an estimated effective dose of 1.68 mSv.

• The wrong patient received several abdominal X-rays in error due to protocols not being followed. The patient received an estimated effective dose of 3 mSv. The Council requested that the EPA check with the Australian Health Practitioner Regulation Agency (AHPRA) to ascertain whether the person involved in this accident has had their registration suspended. The EPA ascertained that the radiographer was no longer registered with AHPRA and advised that the radiation user licence was surrendered to the EPA on 4 April 2016.

• The wrong patient received a brain CT due to misidentification of patient during ordering process. The patient received an estimated effective dose of 2 mSv.

• A patient received an unplanned CT of the chest instead of abdominal/pelvis CT due to wrong positioning of patient on gantry. The patient received an estimated effective dose of 3 mSv.

• A patient was undergoing a CT when the scan stopped midway through the scan. The patient received an estimated effective dose of 1.3 mSv.

• The wrong patient received a repeat CT scan due to patient misidentification. The patient received an estimated effective dose of 27 mSv.

• A nurse was exposed during a CT brain imaging procedure as no countdown on the CT console was indicated and nurse was still in the room during the scanning. The error occurred as a new injector system was used rather than the usual hand inject system. The nurse received an estimated effective dose of between 1.7 to 2 mSv.

• A patient received an unnecessary CTPA scan as a result of an incorrect request by the ordering officer. The patient received an estimated effective dose of between 3.7 mSv.
Other

During the reporting period the Council was informed that the EPA was notified by a scrap recycling centre that they had detected radiation from a load of scrap metal. The EPA identified the radiation coming from a cooking pot which had a dose rate measure at 115 µSv per hour on contact. The EPA informed the Council that it could not ascertain where the item came from other than being imported from overseas. The EPA raised this issue with ARPANSA as there were no discernable markings on the pot, and for ARPANSA to raise and highlight this issue with the Australian Department of Immigration and Border Protection (DIBP).

The Council asked the EPA whether any progress had occurred regarding DIBP initiatives on the detection of radioactive substances at Australian ports and whether a site visit could be arranged. The EPA wrote to DIBP and ARPANSA extending an invitation to provide the Council with advice on current measures to detect and prevent inadvertent importation of radioactive material or nuclear weapons into Australia. ARPANSA provided a presentation to the Council at its June 2016 meeting outlining current initiatives.

Follow up from previous period

- In the previous period an accident occurred at the premises of Global Medical Solutions (GMS), a supplier of radiopharmaceuticals, when two guide needle holders (used for iodine dispensing) required repair and during the repair process the needles released approximately 180 MBq of liquid Iodine-131 which contaminated the floor and the bench of an office at the premises. In addition to surface contamination, airborne contamination had also occurred. The contamination involved 13 staff members with three chemists receiving an estimated effective dose of 3 mSv, 9 mSv and 25 mSv respectively, and the remaining staff of 10 received an estimated effective dose of 1 mSv or less. The Council requested further advice on the accident from the organisation. After reviewing the details of the accident the Council expressed concern at the poor adherence to proper radiation safety practice exhibited by staff working within GMS.

During 2015–16 reporting period, on the advice of the Council, the EPA requested that the CEO of GMS attend a Council meeting to clarify issues surrounding this accident and other matters of non-compliance attributed to GMS. The CEO and several staff members of GMS attended the Council’s August 2015 meeting to discuss the matter. After this meeting on the recommendation of the Council the EPA wrote to GMS advising that the Council appreciated the efforts made by GMS so far to enhance its safety culture but feels that there was scope for further improvement in the areas of staff training and supervision, and in the improvement of its management systems. The Council specifically recommended the improvement of GMS management system through the process of achieving accreditation to ISO 9001’s Quality Management Systems. The EPA continues to monitor GMS performance and is to undertake an audit of GMS compliance, in the next period, against relevant requirements of the Act and Regulation including requirements contained in the GMS Radiation Management Plan, approved by the EPA under clause 28 of the Regulation.

- In December 2014 the EPA issued a notice to take action on Independent Logging Services Pty Ltd (ILS) to retrieve a 37 GBq americium-241 neutron source which became detached from the probe while being used during a geophysical investigation and fell down a borehole. The Council at that time recommended that in the case where the source could not be recovered, its presence and location should be added to the section 149 planning certificate of the property. The Council also recommended that a concrete plinth be erected on the site to indicate that a radioactive source was located below ground level.
During this reporting period the Council was provided with a report from ILS and was satisfied with the actions taken by ILS, however in addition, the Council requested that:

- ILS arrange for a pressure test of the borehole to be taken after the source had been entombed to ensure the integrity of the site – the results are to be provided to the EPA
- the EPA obtain proof that a plaque has been placed on the borehole of the entombed source
- ILS provide the EPA with an annotated copy of the Section 149 Certificate of the land obtained from the Balranald Shire Council with the details of the lost source.

The following accident is not a radiation accident covered by the Regulation as it occurred outside the NSW jurisdiction however it was provided to the Council for information:

- An outpatient treated for neuroendocrine cancer therapy with Lutetium 177 Octreotate was incontinent of urine on the journey home and a quantity of Lutetium 177, later estimated to be 1 GBq was released inside their vehicle, mostly over the rear seat. The patient was required to commute a long distance and the incontinence was not assessed prior to releasing the patient. The Council requested that a copy of the hospital’s policy on discharging of patients treated with Lu-177 Octreotate be requested as information.

Table 4 summarises the accidents reported to the EPA in specific categories between 2008–09 and 2015–16.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear medicine</td>
<td></td>
<td>14</td>
<td>9</td>
<td>14</td>
<td>4</td>
<td>13</td>
<td>19</td>
<td>17</td>
<td>38</td>
</tr>
<tr>
<td>Therapy</td>
<td></td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Radiology</td>
<td></td>
<td>6</td>
<td>10</td>
<td>9</td>
<td>4</td>
<td>12</td>
<td>16</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>–</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>26</td>
<td>24</td>
<td>28</td>
<td>9</td>
<td>28</td>
<td>41</td>
<td>39</td>
<td>70</td>
</tr>
</tbody>
</table>

The total number of accidents reported relate to the level of awareness within the radiation industry community of the requirements for the mandatory reporting of radiation accidents. The increase of accidents reported in this period in the categories of nuclear medicine and radiology are due to increased reporting and changes to legislative reporting requirements.
Table 5 provides a summary of the types accidents reported to the EPA in the specific categories of radiation accidents as reported to the Council in 2015–16.

Table 5: Summary of causes of radiation accidents reported 2015–16

<table>
<thead>
<tr>
<th>Type of accident</th>
<th>Categories:</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NM – Nuclear medicine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ther – Therapy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rad – Radiology</td>
<td></td>
</tr>
<tr>
<td>Patient notes/patient plans/requests not interpreted/read/checked correctly</td>
<td>3 x NM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 x Ther</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 Rad</td>
<td>9</td>
</tr>
<tr>
<td>Incorrect isotope selected and drawn up</td>
<td>7 x NM</td>
<td>7</td>
</tr>
<tr>
<td>Incorrect isotope drawn up by a supplier</td>
<td>1 x NM</td>
<td>1</td>
</tr>
<tr>
<td>Equipment/software failure</td>
<td>10 x NM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 x Ther</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 x Rad</td>
<td>17</td>
</tr>
<tr>
<td>Booking/Request error</td>
<td>Incorrect procedure requested for the right patient</td>
<td>1 x NM</td>
</tr>
<tr>
<td></td>
<td>1 x Rad</td>
<td></td>
</tr>
<tr>
<td>Wrong patient selected when procedure ordered</td>
<td>1 x NM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 x Rad</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Ther</td>
<td>7</td>
</tr>
<tr>
<td>Booking request not amended with new scan requested</td>
<td>1 x NM</td>
<td>1</td>
</tr>
<tr>
<td>Wrong patient name entered on request form</td>
<td>1 x NM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 x Rad</td>
<td>2</td>
</tr>
<tr>
<td>Radiopharmaceutical not administered correctly (injection into cannula)</td>
<td>5 x NM</td>
<td>5</td>
</tr>
<tr>
<td>Transport – failed to get patient back to hospital for imaging</td>
<td>1 x NM</td>
<td>1</td>
</tr>
<tr>
<td>Operator error (CTs, PET/CT)</td>
<td>4 x NM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 x Ther</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 x Rad</td>
<td>6</td>
</tr>
<tr>
<td>Physiology (extravasation/ prevented binding to occur)</td>
<td>2 x NM</td>
<td>2</td>
</tr>
<tr>
<td>Calculation error</td>
<td>1 x NM</td>
<td>1</td>
</tr>
<tr>
<td>Protocols not followed (scan ordered before diagnostic MRI received; inadequate handover; unauthorised person incorrectly completed request form)</td>
<td>2 x Ther</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1 x Rad</td>
<td></td>
</tr>
<tr>
<td>Patient ID not checked</td>
<td>3 x Rad</td>
<td>3</td>
</tr>
<tr>
<td>Other (radioactive source detached from the planned position; New protocol required for new system)</td>
<td>1 x Ther</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1 x Rad</td>
<td></td>
</tr>
<tr>
<td><strong>Total number NM, Ther and Rad reported accidents</strong></td>
<td><strong>69</strong></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 1: Memorandum of understanding between the EPA and the Council

Statement of Common Intent

This Memorandum of Understanding has been agreed between the Environment Protection Authority (EPA) and the Radiation Advisory Council (the Council) to document the practical aspects of the way that each will work with the other to advance radiation safety in New South Wales. The EPA provides administrative support to the Council.

Both the Council and the EPA are committed to a cooperative and collaborative partnership with the aim of advancing the objectives of the Radiation Control Act 1990 (the Act). This Memorandum of Understanding shall be reviewed every 3 years and remain in force until such time as both parties agree otherwise.

The roles and responsibilities for each body are set out in the Act. Fundamentally, the Council provides expert advice to the EPA and the Minister for the Environment (the Minister) across all radiation safety matters, whereas the EPA has responsibility for administering the regulatory functions provided by the Act. This Memorandum of Understanding includes an agreement on how advice from the Council will be utilised by the EPA in the details of issuing licences and accreditations.

The Council also has a key role in helping the EPA to develop radiation safety policy for New South Wales. The EPA has responsibility for formally adopting and giving effect to such policies. The EPA must also take into account New South Wales Government policy, any direction from the Minister and other advice it receives in developing and implementing policy. In recognition of the Council’s special expertise, the EPA will engage openly, early and in detail with the Council in the development of radiation safety policy matters.

Agreed details of how the Council and the EPA collaborate

1. Development of regulatory guidelines and policies

The EPA will provide the Council with drafts of any new or amended guidelines, policies or standards that are developed or reviewed by the EPA or other external bodies.

The EPA will seek the formal advice of the Council at each stage in the process of the development of these guidelines, policies and standards. This consultation will include the results of any feedback obtained in community consultation processes. The Council will also be formally asked to consider endorsing the final products of the development of guidelines, policies and standards.

2. Provision of advice from the Council to the Minister

Section 30 of the Act gives the functions of the Council in relation to provision of advice to the Minister.

1. The Council is to advise the Minister on:
   (a) proposed amendments to this Act and the making, amendment or repeal of regulations under this Act,
   (b) administration of this Act and the regulations,
   (c) measures to prevent or minimise the dangers arising from radiation,
   (d) the granting of exemptions authorised by the regulations for periods exceeding 60 days,
   (e) such other matters relating to radiation safety as the Minister considers appropriate.
2. Any such advice may be given either at the request of the Minister or without any such request.

The Council may also provide advice to the EPA from time to time, as it sees fit and on issues that it considers of relevance, at the request of the EPA or of its own accord.

3. **Correspondence**

When requested by the Council to prepare correspondence on its behalf, the EPA will present a draft of the correspondence for comment. After amendments to the draft have been prepared in light of the comments offered by the Council, the EPA will submit a final version for endorsement before it is signed by the Chair of the EPA Board.

The time frames for the preparation of drafts and presentation of final versions of correspondence for endorsement by the Council will be managed by the EPA to accommodate the workload of the Hazardous Materials, Chemicals and Radiation Section at the time.

Finalised correspondence that has been mailed out, and correspondence received, will be tabled by the EPA at the next Council meeting, subject to the deadlines for submission of business papers for that meeting.

4. **Storage of documents**

Records of meetings, including agendas, minutes, and all documents associated with the meetings of the Council, are kept by the EPA. These records will, as far as is possible, be kept in electronic format and will be made available to the members of the Council upon request to the EPA, in a timely manner.

5. **Provision of secretariat support**

The EPA will provide secretariat support to the Council and all its committees. This support will include:

- preparation of agendas for meetings of the Council and committees, and their distribution to Council members
- taking of minutes and their distribution to members
- preparation of any correspondence requested by the Council.

6. **Development of procedures**

The EPA and the Council will further develop the system of generic advice for applications to the EPA for licences and accreditations, and the EPA will continue to refer applications not covered by the generic advice to the Council. The EPA will also seek the advice of the Council in regard to radiation accidents and incidents and their investigation, and in regard to the assessment of radiation safety courses.

The EPA will seek active input from the Council on strategic and policy matters. These will include substantive input on any review or development of legislation, with emphasis on the development of standards, codes of practice and guidelines. There will be substantial activity during the development of the National Directory for Radiation Protection.

While recognising that the Council performs an advisory function and that the EPA is the decision maker, the parties agree to work through disagreement as follows:

- There will be an opportunity for discussion, including consideration of the decision-making processes of both the Council and the EPA.
• The EPA will advise the Council if it has formed a view that it intends to make a decision that is inconsistent with the Council’s advice; the EPA will provide an opportunity for discussion about the differences.

• The Council may request the EPA to provide an independent facilitator, and the EPA will agree to consider each such request in good faith.

• If the EPA decides to proceed in a manner inconsistent with the Council’s advice, it will provide the Council with a written explanation of why it has decided to do so.

7. Determinations for licensing and accreditation

The EPA is the determining authority for applications for licences and accreditations as made under Part 2 of the Radiation Control Act 1990. The EPA is empowered by section 9(8) of the Act to seek and take into consideration the advice of the Council on such matters.

Section 30 (2A and 2B) of the Act empowers the Council to provide advice to the EPA on Part 2 applications at any time and requires the Council to do so when so requested by the EPA. The advice provided by the Council may be generic or specific, as the circumstances require.

The Council has provided the EPA with generic advice on Part 2 applications. This advice, known as ‘standing advice’, is recorded at Schedule 2 of the Council’s Corporate Governance and Operating Procedures manual. It is the duty of the EPA to maintain the standing advice in Schedule 2 up to date. Part 2 applications that are fully covered by the standing advice at Schedule 2 are known as ‘routine applications’. Part 2 applications that are not covered, or are only partly covered, by the standing advice are known as ‘non-routine applications’.

Before an officer with the delegated authority to do so determines a Part 2 application, she or he must have regard to the relevant requirements of Part 2 of the Act, the Radiation Control Regulation 2013, and the standing advice of the Council.

Unless the CEO of the EPA has agreed in writing to the following procedure being varied, the officer:

• may approve any routine application without first seeking the specific advice of the Council on the application, but

• before approving any non-routine application must seek and take into consideration the advice of the Council on the application, and

• before refusing any application must seek and take into consideration the advice of the Council on the application.

Normally the CEO of the EPA will approve a variation in this procedure only in an emergency, in which case the concurrence of the Council with the determination is to be sought retrospectively as soon as practicable.

Barry Buffier
CEO
Environment Protection Authority

Craig Lamberton
Chairperson
Radiation Advisory Council

The MoU was signed by both parties on 30 June 2016
Appendix 2: Membership of Committees of the Council during 2015–16

### National Directory Committee

<table>
<thead>
<tr>
<th>Member</th>
<th>Membership category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Richard Smart</td>
<td>Medical physicist</td>
</tr>
<tr>
<td>Mr Jon D’Astoli</td>
<td>Work health and safety</td>
</tr>
<tr>
<td>Dr Philip Pasfield</td>
<td>Radiologist</td>
</tr>
<tr>
<td>Dr Mary Dwyer</td>
<td>Radiation oncologist</td>
</tr>
<tr>
<td>Mr Lee Collins</td>
<td>Expert in non-ionising radiation</td>
</tr>
<tr>
<td>Mr Frank Galea</td>
<td>Expert in industrial uses of radiation</td>
</tr>
<tr>
<td>Mr Len Potapof</td>
<td>EPA (Hazardous Materials, Chemicals and Radiation Section)</td>
</tr>
<tr>
<td>Ms Daniela Freschi</td>
<td>EPA (Hazardous Materials, Chemicals and Radiation Section)</td>
</tr>
</tbody>
</table>

### Review of Guideline 6 Committee

<table>
<thead>
<tr>
<th>Member</th>
<th>Membership category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Richard Smart</td>
<td>Medical physicist</td>
</tr>
<tr>
<td>Mr Lee Collins</td>
<td>Expert in non-ionising radiation</td>
</tr>
<tr>
<td>Dr Philip Pasfield</td>
<td>Radiologist</td>
</tr>
<tr>
<td>Mr Glen Burt</td>
<td>Diagnostic radiographer</td>
</tr>
<tr>
<td>Mr Paul Cardew</td>
<td>Expert outside RAC – medical physicist specialist (radiology, radiotherapy and mammography)</td>
</tr>
<tr>
<td>Ms Tiffany Chiew</td>
<td>Expert outside RAC – radiographer</td>
</tr>
<tr>
<td>Dr Jennifer Diffey</td>
<td>Expert outside RAC – medical physics specialist (radiology)</td>
</tr>
<tr>
<td>Dr Ravinda Grewald</td>
<td>Expert outside RAC – medical physics specialist (radiology)</td>
</tr>
<tr>
<td>Mr Adam Jones</td>
<td>Expert outside RAC – medical physicist</td>
</tr>
<tr>
<td>Mr Peter Williams</td>
<td>EPA (Hazardous Materials, Chemicals and Radiation Section)</td>
</tr>
<tr>
<td>Ms Daniela Freschi</td>
<td>EPA (Hazardous Materials, Chemicals and Radiation Section)</td>
</tr>
</tbody>
</table>
Acronyms and abbreviations

ACPSEM  Australian College of Physical Scientists and Engineers in Melbourne
AHMC    Australian Health Ministers’ Conference
AHPRA   Australian Health Practitioner Regulatory Agency
ARPANSA Australian Radiation Protection and Nuclear Safety Agency
ANSTO   Australian Nuclear Science and Technology Organisation
CRE     consulting radiation expert
CSU     Charles Sturt University
CT      computed tomography
EPA     Environment Protection Authority
Gy      Gray
HCCC    Health Care Complaints Commission
IAEA    International Atomic Energy Agency
MBq     megabecquerel
MoU     memorandum of understanding
mSv     milliSievert
NDRP    National Directory for Radiation Protection
NORM    Normally Occurring Radioactive Materials
OPG     orthopantomogram
PET     positron emission tomography
RAC     Radiation Advisory Council
RHC     Radiation Health Committee (National)
RPS     Radiation Protection Series
SPP     supervised practice program
T&I     NSW Trade & Investment
WSLHD   Western Sydney Local Health District