



**REPORT OF THE**

**RADIOLOGICAL COUNCIL**

**for the year ended**  
**31 December 2008**



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## CHAIRMAN'S REVIEW



As this triennium draws to an end, I have great pleasure in presenting the 2008 Annual Report of the Radiological Council. This is the 9<sup>th</sup> report that I have presented since my appointment as Chairman of the Council in June 2000.

It is pertinent to dwell on some of the significant achievements of the Council during the period when I was member and Chairman of Council. This period saw the introduction of the compulsory compliance testing of medical, dental and chiropractic diagnostic x-ray equipment to ensure safety from the use of such equipment. Detailed workbooks for compliance testing have been developed. The Council has been

involved in the assessment and approval of new imaging and therapeutic modalities such as High Dose Rate Brachytherapy and Positron Emission Therapy (PET) as well as the commissioning of the Cyclotron.

Council has also moved towards the upgrading of radiology services in the metropolitan area when it required that such services be carried out only by appropriately qualified radiographers (now medical imaging technologists). X-ray operators who have Council approval and training in basic radiography will continue to provide a very important and valuable service in country areas where the provision of major x-ray facilities and qualified technologists is not viable.

The Council has continued to carry out efficiently its day to day responsibilities of licensing and registration of premises, equipment and persons; of providing professional advice to Government and the Minister of Health on all radiation health issues such as the Nuclear Waste Storage and Transportation (Prohibition) Act; the investigation of medical radiation incidents; the management of industrial, environmental and mining radiation incidents and the upgrade of radiation safety legislation to keep up with the times. New or newly recognised environmental issues involving NORM (Naturally Occurring Radioactive Material) had to be investigated.

During this period, the role and responsibilities of Council has changed to accommodate Government decisions. In this regard, I refer to the changes that needed to be made with the establishment of the Medical Radiation Technologists Board, the emergence of nurse practitioners and the introduction of a National Directory for Radiation Protection to permit consistency on a national level. Furthermore, the Council has had to consider changes necessary to empower it to keep vigilance of radioactive sources against malicious use of such sources.

This year, as in all previous years, the Council has dealt with a number of very important issues which are described more fully in the body of this report.

In the last report Council reported that it had reconsidered the regulation of solaria premises and equipment in Western Australia. I am pleased to confirm that solaria are now regulated under the Radiation Safety Act. The most important aspect of these regulations is the prohibition of persons under the age of 18 years and very fair skinned (skin type I) persons from using solaria in an effort to decrease the incidence of skin cancer and melanoma.

The number of radiation incidents reported to the Council in 2008 did not increase from that reported in previous years. While I am pleased to report that the majority of incidents reported have been relatively minor, it is necessary that the Council continues to monitor all incidents to ensure that public safety is not compromised. In this regard, the Council keeps itself informed of best international practice in radiation safety and has reviewed a range of reports dealing with regulatory developments.

The trend in the reduction of staff and the increased workload faced by the staff of the Radiation Health Branch observed and referred to in the previous few years continued in 2008. This remains to be of concern to the Council. As was discussed last year, the number and complexity of irradiating apparatus and radioactive substances used and regulated under the Act continue to grow and this relentless growth in the face of a reduction in staff numbers places considerable pressure on the officers of the Branch. I once again wish to thank them for their efforts in guarding the safety of people of Western Australia from the detrimental effects of ionising radiation.

The term of the present Council expires in June 2009, when a new triennium will commence. I would like to express my appreciation to both the current and past members of the Radiological Council for their expertise, their contributions and hard work. The same must also be said of the previous and current staff of the Radiation Health Branch who have always provided a high standard of support to the Council and without whom the Council would not be able to function.

From time to time, changes to the Council are contemplated. While it is acknowledged that Council needs to adapt to changing circumstances, this must not be at the expense of a loss of its independence. The International Atomic Energy Agency recommends that radiation regulatory authorities be independent of government departments and agencies that are themselves responsible for the promotion and development of the practices being regulated. It is vitally important that Council's advice to the Minister continues to be, and perhaps more importantly, be seen to be independent of government departments that are substantial users of radiation, such as the Department of Health. I am very pleased to confirm that this independence has been accepted and welcomed, by successive Governments during discussion of major issues and this independence must not be diminished.

Finally, I would like to express my appreciation to the Health Ministers who over my nine years as Chairman have supported me personally and the Council in particular.

A handwritten signature in black ink, appearing to read 'Psaila Savona', written in a cursive style.

**Dr P Psaila-Savona**  
**CHAIRMAN**

13 March 2009

## **RADIATION SAFETY ACT 1975 – 2006**

### **STATUTORY RESPONSIBILITIES OF THE COUNCIL**

The Radiological Council is appointed under Section 13 of the Radiation Safety Act to assist the Minister to protect public health and to maintain safe practices in the use of radiation.

In its position as an independent regulatory authority, the Council is required to administer the Act and to —

- implement the scheme of licensing and registration;
- conduct inquiries into alleged contraventions of the Act and, where necessary, to suspend or cancel licences and registrations;
- advise the Minister and make recommendations with respect to the technical aspects of radiation safety requirements, the methods that may be used to prevent or minimise the dangers arising from the use of radioactive substances, irradiating apparatus and electronic products, including the preparation of regulations;
- investigate and prosecute offences.

The Council is also required to keep under review manufactured or assembled devices which emit radiation to determine if control of these devices is necessary under the Act.

Section 10 requires the Minister at all times to have regard to the expressed views of the Council.

### **MEMBERSHIP OF THE COUNCIL**

The Council comprises —

- a medical practitioner appointed by the Governor on the recommendation of the Executive Director Public Health;
- a medical practitioner who is a specialist in radiology or radiotherapy;
- a physician specialising in nuclear medicine;
- a person who possesses relevant qualifications or experience as a physicist;
- a person who possesses relevant qualifications or experience as a radiation engineer or electronic engineer;

- a representative of the interests of tertiary educational institutions.
- two other persons with special expertise in radiation protection may be nominated by the Minister on the advice of the other members of the Council.
- a medical radiation technologist.

The present members, approved by the Governor, are listed in attachment 1.

The Council met six times in 2008.

### **ADVISORY COMMITTEES**

The Council may appoint committees under Section 19 of the Act to investigate and advise on any aspect of its functions, or to carry out any function other than those relating to licences and registrations. The present policy is to create, when necessary, short-term working parties which address a specific issue and report back to the Council.

The only exception is Council's Chiropractic Advisory Committee which is appointed to supervise the radiation safety examination for chiropractors who wish to apply for licences to operate diagnostic x-ray equipment. The committee, which also advises Council on other chiropractic matters, met once in 2008.

### **ADMINISTRATIVE SUPPORT**

Section 10(4) of the Act provides for the administration of the Act to be paid out of moneys appropriated by Parliament for the purpose. However, the Council is not funded directly and relies on the Department of Health's Radiation Health Branch for administrative and scientific support. While the greater part of the Branch's duties are directly concerned with supporting the Council's needs, and many of the staff are appointed authorised officers under Section 4(1) of the Act for this purpose, the Branch also provides separate advice to the Department on a range of radiation issues.

The Radiation Health Branch also provides the Secretary of the Council. The position has been held by Ms H Upton (Managing Health Physicist) since February 2002, with Mr L Dahlkog (Senior Health Physicist) or Mrs M Aerts (Health Physicist) performing these duties in Ms Upton's absence.

## **STATE ELECTORAL ACT**

For the purposes of Section 175ZE of the State Electoral Act, the Radiological Council has no expenditure to report. Council's functions are supported from within the budget assigned by the Department of Health to the Radiation Health Branch. The Council does not have a budget in its own right.

## **STATE RECORDS ACT**

The Radiological Council's record keeping systems are managed by the Radiation Health Branch of the Department of Health, and thus the Council's compliance with the State Records Commission Standard 2, Principle 6 is linked to compliance by the Department of Health.

## **THE RADIOLOGICAL COUNCIL WEBSITE**

In 2004 the first version of the Radiological Council Website was finalised and was made available for access by the public at the address [www.radiologicalcouncil.wa.gov.au](http://www.radiologicalcouncil.wa.gov.au). There were no amendments made to the website during 2008 although; due to feedback from users of the site, a new draft website is being developed.

## **REGISTRATIONS, LICENCES AND TEMPORARY PERMITS**

Registration and licensing are the principal means by which the use of radiation is regulated. A summary of the legislative system for registration and licensing in Western Australia is included in appendix 1.

## **QUALIFICATIONS AND TRAINING OF RADIATION USERS**

A summary of the legislative scheme for ensuring the appropriate qualifications and competence of persons applying for licences is included in appendix 2.

## **CHANGES TO LEGISLATION**

Amendments made to the regulations in 2008 are listed in attachment 2.

## RADIATION INCIDENTS

Reported incidents involving radiation rarely pose a major health risk to the individuals exposed. Regulation 19A of the Radiation Safety (General) Regulations requires registrants to notify the Council in writing and as soon as practicable should any of the abnormal or unplanned radiation exposures specified in that regulation occur.

Although there is no certainty that all incidents are reported, Council encourages reporting and rigorous investigation of the cause as this provides a forum for improving work practices and minimising the risk of recurrence of such incidents.

The Council was notified of 17 incidents during 2008.

### *Medical Incidents*

- The 2007 Annual Report noted an incident concerning a doctor in a hospital cardiology department who had received reportable radiation doses over three successive months in 2007. Further information was sought from the hospital in relation to the degree of supervision given to the doctor by a licensed medical practitioner.

The hospital and the supervising physician confirmed that the doctor was always supervised by a licensed cardiologist but had been involved in three cases where patients were critically ill, each requiring extraordinary life saving procedures. A shortage of cardiology registrars had led to an increased workload and an increased radiation exposure risk but steps had been taken to relieve the situation.

Council also was advised that the doctor now wears a personal dose monitor with an audible alarm which has resulted in fine tuning of work practices and a reduction in radiation dose.

Council agreed that the actions taken appeared appropriate.

- Council was informed of an incident in a nuclear medicine department involving the misadministration of 20 MBq  $^{99m}\text{Tc}$  to a two-month old patient.

The telephoned examination request had been misinterpreted by the clerk as an order for  $^{99m}\text{Tc}$  DMSA rather than the required  $^{99m}\text{Tc}$  MAG-3 scan. This resulted in the incorrect radiopharmaceutical being ordered, delivered and administered. After evaluating the patient the consulting nuclear medicine physician requested the correct MAG-3 radiopharmaceutical, which was performed the following week.

The department advised the Council that the misadministration could have been averted if the booking and request form had been checked before the examination. This step in the protocol would be strictly enforced to ensure that an incident such as this is not repeated. Council agreed that the actions taken to prevent a recurrence appear to be appropriate.

- Council received notification from a personal radiation monitoring service provider that radiation monitoring badges, worn by personnel in a hospital department, had been lost in the post when the envelope containing the films was torn in transit. A total of 9 badges were lost for the monitoring period 1 October 2007 to 1 January 2008. Council's officers checked previous records of the affected personnel and confirmed that no one had a reportable dose in the preceding two years. Council was satisfied that no further action was required.
- Council was informed by a personal radiation monitoring service provider of three high radiation doses for staff working in the cardiology and radiology departments of a hospital.

The radiation safety officer advised Council that two of the doses were almost certainly the result of the badges having been worn in the wrong position on the body (swapping the collar / trunk positions). Three doctors had been counselled and reports placed on their personal files.

Council agreed that the reported doses were of concern and informed the hospital accordingly. The radiation safety officer subsequently provided information on additional measures that were being taken to further reduce the risk of high doses being received by staff.

Council directed its officers to continue monitoring the situation.

- A licensed nuclear medicine physician at a hospital department advised Council of the misadministration of a therapeutic radiopharmaceutical.

The administration of  $^{117m}\text{Sn}$  for the therapeutic palliation of skeletal metastases by licensed nuclear medicine specialists had been previously approved by the Council. The therapy is similar in principle to those using  $^{89}\text{Sr}$  or  $^{153}\text{Sm}$  and similar conditions were placed on the procedure.

After administration of what was thought to be 500 MBq  $^{117m}\text{Sn}$  DTPA, a post therapy whole body scan demonstrated unexpected delivery of the therapeutic agent to the liver and spleen rather than the skeleton. Further investigation determined that the incorrect radiopharmaceutical had been administered. The correct therapeutic agent was administered later.

The Council was particularly concerned about the potential consequences of the misadministration but noted the nuclear medicine specialist's advice that the patient's life expectancy prior to the administration was expected to be less than 5 years.

Additional enquiries by Council's officers raised further concerns in relation to personnel training and occupational radiation doses. Council agreed that it would continue to monitor the department's activities.

- Council was advised by a personal radiation monitoring service provider that a radiation dose of 4.7 mSv for the period between 12 January 2008 and 3 March 2008 was recorded for an employee in a hospital nuclear medicine department.

An investigation suggested that the dose most likely arose from a small spill of  $^{131}\text{I}$  on to the monitoring badge, probably caused by faulty connectors in an infusion tubing set. Prolonged storage of the employee's coat, and attached badge, too close to a radioactive waste bin appeared also to be a contributing factor. Council was advised that the coat rack had been moved further away from the waste bin and extra shielding has been placed around the bin to further reduce the radiation dose rate in the area.

Council agreed that these matters raised issues about the level of formal radiation safety training received by personnel at the hospital. Further information has been requested.

- Council was informed by a hospital radiation safety officer that three low activity marker sources were lost from a nuclear medicine department in June 2008. The radiation safety officer believed that they had not been removed from a patient who had left the department and returned home. The radiation safety officer said that the patient had been contacted but the sources were not located.

The sources were  $^{133}\text{Ba}$  with an activity of approximately 1.5 MBq each, ie a total of 4.5 MBq. The exempt activity under the regulations is 0.4 MBq.

Council asked its officers to further investigate the matter with particular emphasis on the investigations carried out by the hospital and the protocols that were in place.

While in hindsight the radiation safety officer believed that the patient's residence should have been visited, there were a number of factors contributing as to why this was not done. Initially, it had been difficult to contact the patient and the patient then said that they did not leave with any sources attached to them. The radiation safety officer believed it was most likely that the patient had removed them before getting dressed and may have discarded them in a

rubbish bin or laundry bin within the Department which would have been emptied before the sources were found to be missing.

The hospital advised that protocols had been amended to prevent the likelihood of patients leaving the department before marker sources have been accounted for.

- Council was informed by an international personal radiation monitoring service provider of reportable personal radiation doses for three staff members in a hospital radiology department for the period 1 June – 30 June 2008.

The doses were investigated by the provider and a delegate of the hospital's radiation safety officer. They found that the wearers of these films were on leave during the wearing period and that the badges had not been worn.

Council noted that the personal radiation monitoring provider also had advised of a number of other reportable doses from institutions around Australia for the period 1 June – 1 July 2008.

Council discussed whether cargo x-ray screening systems may have been responsible for the apparent doses. Unlike those used for carry-on luggage at airports, cargo x-ray equipment can deliver relatively high radiation doses. This cannot be conclusively assumed to be the cause of the doses and the hospital was advised to closely monitor future dose assessment reports.

- A hospital radiation safety officer informed the Council that a dose of 4.3 mSv had been recorded for an employee in the hospital's nuclear medicine department. The radiation safety officer's report showed that the dose was the result of the user, a new employee, hanging their laboratory coat, with monitoring badge attached, in a high background radiation area overnight.

Council was concerned that this incident demonstrated an apparent failure in the hospital's induction and training system for new employees. The hospital has been informed of this concern and was requested to provide information on the training of new employees and how this training is followed-up to ensure its efficacy.

- The radiation safety officers of a nuclear medicine dispensing facility and a nuclear medicine department informed Council of a radiopharmaceutical recall.

The outer labels of two radiopharmaceutical shielded packages had been transposed during wrapping and handling at the dispensing facility resulting in the wrong product being delivered to two sites. The product label on the syringe in the packages did not match the label on the exterior lead shielded container. The products that were mislabelled were 1091 MBq  $^{99m}\text{Tc}$  Sodium Pertechnetate and 1065 MBq  $^{99m}\text{Tc}$  Myoview (Tetrofosmin).

The dispensing facility was notified by one of the nuclear medicine departments of the labelling discrepancy and immediately initiated a recall of the two doses, however, only one dose was recovered before use as the other dose had already been administered.

The patient at the second department was advised by staff of the misadministration and the risks of receiving an unnecessary radiopharmaceutical were explained. The estimated unplanned effective dose to the patient was 12.5 mGy.

Both the dispensing facility and the nuclear medicine departments provided reports on the actions taken to reduce the likelihood of further occurrences of these types of incidents. These reports were reviewed by Council who agreed that the matter had been handled appropriately and that no further action was required.

- Council was advised of an incident involving a spill of  $^{99m}\text{Tc}$  Sestamibi within a nuclear medicine department.

As the dose of 740 MBq of  $^{99m}\text{Tc}$  Sestamibi was being injected, the extension tubing detached from the cannula and the entire dose leaked out onto the patient's gown and stretcher. The report stated that the appropriate hospital staff were informed of the spill immediately and assisted in the decontamination and wipe testing to assess residual contamination levels. The spillage was contained and cleaned according to departmental protocol.

The reports indicated that the spillage appeared to have been due to deficiencies in the administration apparatus which had now been modified to prevent any future recurrences.

- Council was informed that an incident had occurred in a radiation oncology department in December 2008. During maintenance work in the evening, a relief cleaner entered a treatment room while the linear accelerator was operating. The report provided by the hospital's radiation safety officer estimated the doses received by the cleaner as 65 µGy skin dose and a 1.5 cm depth dose of 40 µGy.

Council agreed that the incident was potentially very serious and that all the recommendations put forward by the hospital must be implemented with a final report provided to Council when they have been completed.

### Industrial Incidents

- Notification was received from a well-logging company that two logging sources (a 74 GBq <sup>137</sup>Cs source and 148 GBq <sup>241</sup>Am-Be source) had been abandoned in a borehole offshore in the north west of the State.

The company was working on an offshore well when the logging tools fitted with the radioactive sources became stuck at a depth of 1506.5 m and 1503.4 m for the <sup>137</sup>Cs and <sup>241</sup>Am-Be sources respectively. Source recovery operations were unsuccessful and the tools were deemed unrecoverable.

The conditions of the company's registration require that where a source is irretrievably lost in a borehole, written notification is given to the owner and/or operator of the borehole that the source is to be cemented in situ; the location of the source is to be documented for the owner's records; and that no further drilling in the immediate vicinity of the source that risks intersecting with the source is permitted. In compliance with the conditions of registration, the registrant took the specified actions to cement the source in place.

Notification was also provided to the National Offshore Petroleum Safety Authority and the Petroleum Division of the Department of Industry and Resources.

- A report was received by the radiation safety officer of an industrial radiography company of an incident where an exposed industrial radiography source had become jammed and could not be returned to the shielded container or moved in the opposite direction for recovery.

The incident had occurred when licensees were exchanging the sources in two of their Gammamat TI-F projectors. The second projector was reloaded with the <sup>192</sup>Ir source but this jammed while being wound back into the projector (the shielded container).

The report provided by the radiation safety officer had outlined the source recovery operations that were undertaken by the licensees and an approved assistant. The company estimated the doses received by personnel as 1.4 mSv, 1.5 mSv, 0.5 mSv and 0.5 mSv for the assistant. The company had also promptly sent the monitoring devices to the service provider for assessment and the dose report provided by the personal radiation monitoring service provider indicated that doses received by these personnel were much less than calculated – 240 µSv, 80 µSv, 70 µSv and 0 µSv respectively.

Council agreed that the incident was managed appropriately and that no further action was required by the Company.

- Council received preliminary information from an industrial radiography company about an incident at a field site in the north west of Western Australia where an industrial radiography source had become detached from the wind-out cable. Investigations are ongoing.
- Notification was received from a well logging company that two logging sources had been abandoned in a borehole offshore in the north west of the State.

The company was working on an offshore well when the logging tools with installed radioactive sources became stuck at a depth of 3393 m and 3388 m for the <sup>137</sup>Cs and <sup>241</sup>Am-Be sources respectively. Source recovery operations were unsuccessful and the tools were deemed unrecoverable.

The conditions of the company's registration require that where a source is irretrievably lost in a borehole, written notification is given to the owner and/or operator of the borehole that the source is to be cemented in situ; the location of the source is to be documented for the owner's records; and that no further drilling in the immediate vicinity of the source that risks intersecting with the source is permitted. In compliance with the conditions of registration, the registrant took the specified actions to cement the source in place.

Notification was also provided to the National Offshore Petroleum Safety Authority and the Petroleum Division of the Department of Industry and Resources.

- Notification was received from a well logging company that two logging tools had been abandoned in boreholes offshore in the north west of the State in two separate incidents.

The first incident occurred when the company was working on an offshore well when the logging tool with installed radioactive sources (63 GBq  $^{137}\text{Cs}$ , 2.22 kBq  $^{137}\text{Cs}$ , 37 kBq  $^{137}\text{Cs}$  and 59.2 GBq  $^3\text{H}$ ) became stuck at a depth of 1326.9 m. Source recovery operations were unsuccessful and the tool was deemed unrecoverable.

The second incident occurred a month later when the company was working on an offshore well when the logging tool with installed radioactive sources (63 GBq  $^{137}\text{Cs}$ , 2.22 kBq  $^{137}\text{Cs}$ , 37 kBq  $^{137}\text{Cs}$  and 59.2 GBq  $^3\text{H}$ ) became stuck at a depth of 4394 m. Source recovery operations were unsuccessful and the tool was deemed unrecoverable.

The conditions of the company's registration require that where a source is irretrievably lost in a borehole, written notification is given to the owner and/or operator of the borehole that the source is to be cemented in situ; the location of the source is to be documented for the owner's records; and that no further drilling in the immediate vicinity of the source that risks intersecting with the source is permitted. In compliance with the conditions of registration, the registrant took the specified actions to cement the source in place.

Notification of the abandonments was provided to the National Offshore Petroleum Safety Authority and the Petroleum Division of the Department of Industry and Resources.

## PROSECUTIONS

The following matters were finalised in 2008.

- In 2007 Council initiated prosecution of a company under Section 52 (2) of the Act for the alleged continuing offence of failing to register a cabinet x-ray unit.

On 14 February 2008 the company pleaded guilty to the charge under Section 52(2) under which a person who, when required to do so under this Act, fails to furnish within a reasonable time thereafter any information which the Council or an authorised officer has asked for in relation to any matter, or furnishes false or misleading information, commits an offence.

The company was fined \$750 and required to pay costs of \$890.75

- In 2007 Council initiated prosecution of a transport company under regulations 6(1) and 6(2) of the Radiation Safety (Transport of Radioactive Substances) Regulations for failure to comply with the requirements of the Code of Practice for the Safe Transport of Radioactive Materials.

In March 2008 the company pleaded guilty to the charges and a fine of \$2,500 was imposed with costs of \$1,269.20.

- A prosecution under the Radiation Safety (General) Regulations (regulation 53B) was initiated by the Western Australian Police in relation to the alleged possession of an unregistered Class 3B laser pointing device. The Criminal Prosecution Act allows the WA Police to initiate prosecution under any legislation unless specifically excluded by the legislation concerned. Council supported this prosecution.

The possession of laser pointers other than Class 1 or 2 is a breach of Regulation 53B unless the person:

- (a) *is acting in the performance of his or her functions as a member of the Police Force, or a special constable appointed under Part III of the Police Act 1892;*
- (b) *is carrying out scientific research, scientific work or scientific observations, whether or not for remuneration;*
- (c) *is the lawful user of a firearm, within the meaning of Section 4 of the Firearms Act 1973, and the laser pointer is part of a laser assisted sight for the firearm;*  
*or*

*(d) has the written approval of the Council to do so.*

The Western Australian Police advised on 6 November 2008 that the person charged was found guilty of an offence under Regulation 53B and received a fine of \$50 plus court costs of \$590.20. An order for forfeiture of the laser pointer also was made.

## **MEDICAL AND RELATED RADIATION MATTERS**

### ***Compliance Testing***

Council's compliance testing program, which commenced in 1997, applies to all diagnostic x-ray equipment used on living humans for medical radiography, fluoroscopy, chiropractic radiography, dental radiography and computed tomography.

No x-ray equipment may be used for human diagnostic purposes unless it has a current certificate of compliance, a certificate of conditional compliance, or an exemption from compliance.

Through conditions imposed on the registration under Section 36 of the Act, the registrant (the owner) is legally responsible for satisfying the requirements of the compliance testing program.

The number of compliance tests of diagnostic x-ray equipment assessed by Council in 2008 was 1125. A summary of the statistics for the compliance program per type of diagnostic medical imaging equipment is included in attachment 3.

### ***Compliance Testing Working Group***

The Council's Compliance Testing Working Group developed a set of workbooks for digital radiographic equipment testing which were approved by the Council at its October 2007 meeting and published in 2008.

The workbooks complement the existing six workbooks previously developed by the Compliance Testing Working Group. The Working Group has now developed 11 workbooks that comprehensively describe the tests to be undertaken for each category of equipment as well as the approved test protocols to ensure that the full range of diagnostic x-ray equipment can be periodically tested for compliance with the State's Radiation Safety (General) Regulations and any additional criteria that the Council may apply to the equipment under test.

During 2008 Council was informed that a Qualified Expert had raised concerns in regard to one of the testing protocols in the new digital compliance testing workbooks. Council agreed that a Working Group should be convened to investigate the issue and the working group has so far met once in 2008.

### ***Approvals for Exposure to Radiation for Human Subjects in Medical Research***

In Western Australia, all research projects involving exposure of human participants to ionising radiation must be evaluated by the radiation safety officer. When the level of radiation dose involved exceeds certain levels, Radiological Council approval must be obtained.

In keeping with the Australian Radiation Protection and Nuclear Safety Agency Radiation Protection Series # 8 (2005) *Exposure of Humans to Ionizing Radiation for Research Purposes*, the Council assesses research projects which involve exposing humans to ionising radiation without proven benefits to the irradiated subjects and where the dose to any individual adult subject exceeds 5 mSv in any year.

Council assessed and approved the radiation component of the following research applications in 2008.

Research Project Title	Institution
<i>Colon Cancer Staging: Effect of CT and PET-CT on Patient Management</i>	Royal Perth Hospital
<i>Transthoracic Pneumonostomy for Severe Emphysema</i>	Sir Charles Gairdner Hospital
<i>The function of the Human Zona Incerta and its potential as a target for Deep Brain Stimulation (SCGH HRECTrial No 2008 065).</i>	Sir Charles Gairdner Hospital
<i>Human research project using radiation: Adjuvant Immunotherapy with Anti-CTLE-4 Monoclonal Antibody (Ipilimumab) versus Placebo after Complete Resection of High-Risk Stage III Melanoma</i>	Sir Charles Gairdner Hospital
<i>Prospective Feasibility Study of the Apnex Medical Hypoglossal Nerve Stimulation (HNS) System to Treat Obstructive Sleep Apnea (OSA).</i>	Sir Charles Gairdner Hospital
<i>A double-blind, randomised, multi-dose, phase III, Multicentre study of pharadin in the treatment of patients with symptomatic hormone refractory prostatic cancer with bone metastases</i>	Sir Charles Gairdner Hospital

**INDUSTRIAL, ENVIRONMENTAL and MINING RADIATION*****Industrial Compliance Testing***

The Council's compliance testing program for fixed radiation gauges commenced in 1999. The program requires that gauges are not used unless they have a current certificate of compliance. The number of compliance tests received by the Council in 2008 was 494. A summary of compliance tests assessed in 2008 is included in attachment 3.

***Standards for Council Examinations***

Council had previously agreed that improved control over industrial radiation safety examination standards was necessary and had decided that while course providers may continue to invigilate examinations, all industrial papers would be returned to Council's officers for marking. The program commenced during the last quarter of 2002. In 2008, Council officers marked 562 industrial examination papers. The number of exams marked in each category is listed in attachment 4.

***Radioactive Waste Disposal in Western Australia***

The Mt Walton East Intractable Waste Disposal Facility (IWDF) was established in 1992 as a site for the disposal of hazardous and intractable wastes. Radioactive waste is taken to the IWDF and buried in near-surface trenches or boreholes (shafts) according to the appropriate codes and guidelines that have previously been approved by the Radiological Council.

During 2007 and early 2008 Council officers had reviewed a number of the most recent international and national documents relating to best practice methods for the disposal of radioactive waste and produced a report for Council's review and consideration.

Council agreed that a working party be set up to consider the report with a view to amending, if appropriate, the conditions placed on the site to ensure that the site is operated in accordance with international best practice.

### ***Uranium Mining***

On 17 November 2008 the Premier, the Hon Colin Barnett, announced that the State Government had lifted the ban on uranium mining following Cabinet approval. Uranium mining and processing, certain exploration activities and the transport of uranium ore will be subject to the Radiation Safety Act and any subsidiary legislation.

Council officers have been invited to participate on a number of intergovernmental committees that are reviewing and assessing the Western Australian regulatory requirements.

## **MISCELLANEOUS**

### ***Solaria***

In late 2007 the then Minister for Health, the Hon Jim McGinty sought advice from the Council on options available under the Act for the regulation of solaria.

The Council advised the Minister that the preferred option for regulation was to use nationally agreed minimum requirements as the basis of regulation under the Radiation Safety Act. The recommendation was provided to the Minister in a cabinet submission on 22 February 2008 and official notification of Cabinet's decision to adopt the Council's recommendation to regulate solaria in accordance with the nationally agreed standards was received on 26 March 2008.

The regulations were gazetted on 2 September 2008. Registration of all sun-tanning units which use ultra-violet radiation for cosmetic tanning services in a commercial establishment is now mandatory. As of 31 December 2008 there were 48 company registrations.

### ***Security of Radioactive Sources***

The *Code of Practice for Security of Radioactive Sources* was published in 2007 by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

Legal advice was sought from the State Solicitor's Office concerning the implementation of the Code. That advice indicated that complete implementation of the Code would require amendments to the Act to permit measures to be taken for the purpose of national security, as preventing terrorist attacks was not something contemplated when the current Radiation Safety Act was being drafted. This is being investigated further with a view to updating legislation.

***Security Screening Using X-radiation at Australian Airports***

In 2008 the Australian Government started a trial to test new ways of detecting prohibited items in airports. The Department of Infrastructure, Transport, Regional Development and Local Government (Infrastructure) had been issued with an Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) licence to deal with two x-ray backscatter body scanners in trials to determine their effectiveness in detecting explosives in liquids, aerosols and gels and other threat objects in the aviation environment. The trials were carried out at Adelaide, Melbourne and Sydney airports from mid-October to the end of November 2008.

Infrastructure is a Commonwealth entity as defined in Section 13 of the Australian Radiation Protection and Nuclear Safety Act 1998 and therefore Infrastructure's dealings with the body scanners falls under the jurisdiction of ARPANSA and not under that of any State or Territory. Local radiation protection regulators were not consulted in the licence application assessment.

Council will be kept informed of the trials outcomes and will keep abreast of proposed developments in security screening.

***Radiation Health Committee***

The Radiation Health Committee is a body established to advise the Chief Executive Officer of the Australian Radiation Protection and Nuclear Safety Agency and its Radiation Health & Safety Advisory Council on matters relating to radiation protection, formulating draft national policies, codes and standards for consideration by the Commonwealth, States and Territories.

Western Australia has representation on the Radiation Health Committee through the Secretary of the Radiological Council who attends the committee meetings tri-monthly.

A list of publications for 2008 is in attachment 5.

***National Directory for Radiation Protection***

At the Australian Health Ministers' Conference (AHMC) held in June 2004, the Ministers endorsed the adoption of the National Directory for Radiation Protection, Edition 1, as the Framework for National Uniformity in Radiation Protection.

Further development of the National Directory continued in 2008 through the national Radiation Health Committee with a number of amendments being approved.

Council continued its participation in the development of the National Directory and provided comment to the Radiation Health Committee.

### ***Personal Radiation Monitoring Services***

Council currently recognises five organisations for the provision of a personal radiation monitoring service in accordance with the Regulations:

- ARPANSA (Australian Radiation Protection and Nuclear Safety Agency), the Commonwealth Government's radiation safety agency in Victoria
- New Zealand National Radiation Laboratory, the New Zealand national radiation safety organisation  
(Australian agent: Australia Radiation Services Pty Ltd, Victoria)
- Australia Radiation Services Pty Ltd, a company based in Victoria
- Landauer Inc (USA) for the Luxel based system.  
(Agent: Landauer Australasia Pty Ltd.)
- Global Dosimetry Solutions, a company based in USA.

## **Appendix 1: Registration and Licensing**

### ***Registrations***

Section 28 of the Act requires prescribed radioactive substances, x-ray equipment and electronic products, together with the associated premises, to be registered. Registrants may include individuals, companies, organisations or institutions.

All x-ray equipment is prescribed while prescribed electronic products include lasers, transilluminators and microwave ovens.

Radioactive substances that exceed the exempt quantities prescribed in the regulations are subject to registration. A small number of devices containing radioactive substances in excess of the exempt limits, but which pose a minimal hazard to users, have been exempted by regulation from control under the Act.

The numbers of devices and sealed radiation sources registered as at 31 December 2008 are included in attachment 6.

### ***Licences***

Section 25 of the Act requires persons who manufacture, store, transport, sell, possess, install, service, maintain, repair, use, operate or otherwise deal with prescribed radioactive substances, x-ray equipment or electronic products to be licensed or, where permitted, work under the direction and supervision of a licensee.

Section 29 of the Act also creates an offence for a person to sell any prescribed substances or devices unless they require the purchaser to produce evidence that they hold a relevant licence or are otherwise exempted by the Act or regulations. Sales also must be notified in writing to the Council, without delay, identifying the purchaser and the particulars of the relevant licence or exemption.

### ***Exemptions from Licence***

A licence is not required where a general exemption is provided by the regulations or where a person has been granted an individual exemption from licence. Although exempt from licensing, the regulations nevertheless specify the minimum qualifications or training required for these radiation workers.

***Temporary Permits***

The shortest period for which a licence or registration can be granted is 12 months. However, for shorter periods an application may be made for a Temporary Permit. Permits cannot exceed a duration of 3 months. Twenty two Temporary Permits were current as at 31 December 2008.

***Conditions, Restrictions and Limitations***

A range of performance and safety requirements for radioactive substances, x-ray equipment and the prescribed electronic products are specified in the regulations. However, additional safety measures may be applied by the Council under Section 36 of the Act through conditions, restrictions and limitations applied to registrations, licences, temporary permits and exemptions.

Failure to comply with a condition is an offence.

Attachment 7 shows the types and numbers of licences and registrations (or individual exemptions) granted or renewed in 2008.

***Commonwealth Government Agencies and Contractors***

The Radiation Safety Act does not apply to Commonwealth agencies or to their employees (or contractors) who might use radiation in Western Australia. Those agencies are regulated by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) under the Commonwealth Government's Australian Radiation Protection and Nuclear Safety Act 1999.

## Appendix 2: Licence Prerequisites

Before a licence may be granted, the Council has an obligation to ensure that an applicant has appropriate qualifications, competence and experience (Section 33).

Protocols have been developed which prescribe the prerequisite qualifications and experience necessary for a wide range of radiation uses. Some qualifications are recognised by the Council because an appropriate degree of radiation safety training is inherent in gaining those qualifications. However, other applicants may be required to attend a recognised radiation safety course and pass an examination. The Council has authority to impose examinations under the Radiation Safety (Qualifications) Regulations.

Persons who are not required to hold a licence themselves but who must work under the direction and supervision of a licensee may also be required to hold certain qualifications or to have undergone additional radiation safety training. These requirements may be imposed by regulation or through conditions, restrictions and limitations imposed under Section 36. The registrant for the premises where the individual works is primarily responsible for ensuring compliance with these criteria.

Courses in various aspects of radiation safety are offered by both the government and private sectors, for example:

- Bone Densitometry*
- Compliance Testing of Diagnostic X-ray Equipment*
- Fluoroscopy – Medical*
- Fixed Radioactive Gauges*
- Industrial Radiography*
- Lasers – Medical and Industrial*
- Portable Radioactive Gauges*
- Transport of Radioactive Substances*
- Unsealed Radioisotope Handling*
- Well (Borehole) Logging*
- X-ray Operator*

**Attachment 1: Radiological Council****MEMBERS OF THE 11<sup>TH</sup> RADIOLOGICAL COUNCIL**

<b>Members</b>	<b>Qualification or Designation</b>	<b>Deputy</b>
<i>Appointment under Sections 13(2)(a) and 13(3) of the Act</i>		
Dr P Psaila-Savona (Chairman)	Medical Practitioner	Dr G Groom
<i>Appointment under Sections 13(2)(b), 15(1) and 17 (1) of the Act</i>		
Dr E Wylie <sup>1</sup>	Radiologist	Dr M Bynevelt
Dr M Bennett <sup>2</sup>	Radiologist	Dr Deepthi Dissanayake
Dr G Groom	Nuclear Medicine Physician	Dr G Bower
Dr R Fox	Physicist	Dr R Price
Mr J Hunter <sup>3</sup>	Electronic Engineer	Vacant
Mr M Ross <sup>4</sup>	Electronic Engineer	Mr J O'Donnell
Professor C Atkins <sup>5</sup>	Tertiary Institutions representative	Vacant
Mr N Tsurikov	Expert in Mining Radiation Hazards	Mr G Fee
Mr N Hicks	Expert in Medical Imaging	Mr B Stock
Mr B Cobb	Co-opted member	not applicable

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<sup>1</sup> Resigned effective April 2008.

<sup>2</sup> Appointed by the Governor on 19 May 2008 for the period ending 2 August 2009.

<sup>3</sup> Resigned effective January 2008.

<sup>4</sup> Appointed by the Governor on 19 May 2008 for the period ending 4 July 2009.

<sup>5</sup> Appointed by the Governor on 14 August 2007 for the period ending April 2008.

**2008 MEETING ATTENDANCE**

	21 Feb	10 Apr	12 Jun	14 Aug	9 Oct	11 Dec
Dr P Psaila-Savona	✓	✓	✓	✓	✓	✓
Professor C Atkins	✓	✓	-	-	-	-
Dr R Fox	✓	✓	A	✓	✓	✓
Dr G Groom	✓	✓	✓	✓	✓	✓
Mr N Hicks	✓	✓	✓	D	D	✓
Mr M Ross	NA	NA	✓	✓	✓	✓
Dr E Wylie	✓	✓	-	-	-	-
Dr M Bennett	NA	NA	A	✓	✓	✓
Mr B Cobb	✓	✓	✓	✓	✓	✓
Mr N Tsurikov	A	A	A	✓	✓	✓

✓ attended A apology D deputy NA not appointed at the time
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## **Attachment 2: Legislation Amendments**

### **RADIATION SAFETY ACT**

None

### **RADIATION SAFETY (GENERAL) REGULATIONS**

Radiation Safety (General) Amendment Regulations 2008  
Regulations to prescribe solaria and require registration of equipment and premises under the Act.

Government Gazette 2 September 2008 pages 4117-20.

### **RADIATION SAFETY (TRANSPORT OF RADIOACTIVE SUBSTANCES) REGULATIONS**

None

### **RADIATION SAFETY (QUALIFICATIONS) AMENDMENT REGULATIONS**

None

### Attachment 3: Compliance Testing

#### Medical

- A** *Compliant*  
**B** *Conditionally compliant*  
**C** *Non-compliant*<sup>6</sup>

Category	A	B	C	Total
CT	35	-	2	37
Dental – intraoral	508	-	21	529
Dental – panoramic and/or cephalometric	69	-	4	73
Fluoroscopic – fixed	34	1	17	52
Fluoroscopic – fixed C or U arm	20	-	4	24
Fluoroscopic – mobile	83	-	3	86
Mammography	62	-	6	68
Radiographic – fixed	128	2	53	183
Radiographic – mobile	69	-	4	73
Total	1008	3	114	1125

#### Industrial – Fixed Gauges

- A** *Compliant*  
**B** *Non-compliant*<sup>7</sup>

Category	A	B	Total
Density	353	12	365
In-stream analysis	74	-	74
Level	61	5	66
Thickness	1	-	1
Total	489	17	506

<sup>6</sup> Equipment deemed to be non-compliant may continue to be used for a further three months while the problem is being addressed provided that the reason for non-compliance does not significantly increase the radiation dose to the patient. A re-test is then required. Of the 102 re-tests conducted during 2008, 100% resulted in the equipment being granted either a compliance or conditional compliance certificate.

<sup>7</sup> Equipment that has been assessed as non-compliant cannot be used until it has been re-tested and issued with a certificate of compliance. Of the 3 re-tests conducted during 2008, 100% resulted in the equipment being granted a compliance certificate.

**Attachment 4: Industrial Radiation Safety Examinations***Current at 31 December 2008*

<b>Category</b>	<b>2008</b>	<b>2007</b>	<b>2006</b>	<b>2005</b>
Borehole Logging	78	46	23	28
Fixed Gauges	141	78	82	57
Industrial Radiography	56	40	35	26
Industrial Radiography (Assistant)	92	65	85	64
Portable Gauges	73	96	61	61
Portable Gauges (WA Requirements)	8	4	2	0
Transport	27	28	11	13
Service – Cabinet X-ray	10	1	5	2
Service – Industrial Radiography (X-ray)	0	1	0	0
Service – X-ray Analysis	4	0	0	0
X-ray Analysis – Use	4	0	5	9
X-ray Analysis – Use and Restricted Service	69	50	43	27
<b>Total</b>	<b>562</b>	<b>409</b>	<b>352</b>	<b>287</b>

**Attachment 5: List of Australian Radiation Protection and Nuclear Safety Agency publications for 2008**

Title
RPS No. 2 Code of Practice for the Safe Transport of Radioactive Material (2008 Edition)
RPS No. 2.1 Safety Guide for the Safe Transport of Radioactive Material (2008 Edition)
RPS No. 14 Code of Practice for Radiation Protection in the Medical Applications of Ionizing Radiation (2008)
RPS No. 14.1 Safety Guide for Radiation Protection in Diagnostic and Interventional Radiology (2008)
RPS No. 14.2 Safety Guide for Radiation Protection in Nuclear Medicine (2008)
RPS No. 14.3 Safety Guide for Radiation Protection in Radiotherapy (2008)
RPS No. 15 Safety Guide for the Management of Naturally Occurring Radioactive Material (NORM) (2008)
RPS No. 16 Safety Guide for the Predisposal Management of Radioactive Waste (2008)

## Attachment 6: Registered Irradiating Apparatus, Electronic Products and Radioactive Substances (sealed sources)

Current at 31 December 2008

**A** *Irradiating apparatus and electronic products<sup>8</sup>*

**B** *Radioactive substances (sealed sources only)*

Category	A	B
Bone densitometry	41	-
Cabinet x-ray equipment	116	-
Calibration	2	301
CT	80	-
CT/SPECT	5	-
Dental – intraoral	1611	-
Dental – panoramic and/or cephalometric	208	-
Education and research	14	896
Fluoroscopic – fixed <sup>9</sup>	93	-
Fluoroscopic – mobile	89	-
Gauges – density/level	6	1856
Gauges – in stream analysis	-	109
Gauges – logging	15	269
Gauges – neutron moisture/density portable	-	289
Gauges – other	-	50
Irradiator	-	48
Isotope Production	1	-
Laser – entertainment	34	-
Laser – industrial	45	-
Laser – medical	160	-
Laser – other medical	116	-
Laser – research	75	-
Linear accelerator	11	-
Mammography	73	-
Non-destructive testing	62	67
Non-destructive testing – crawler control	-	8
Portable mineral analyser	-	16
Radiographic – fixed	338	-
Radiographic – mobile	408	-
Sealed Sources – other	-	104
Simulator	2	-

<sup>8</sup> This data column specifically excludes x-ray equipment that is no longer operable but for which compliance testing data is held.

<sup>9</sup> Includes equipment used in DSA/Cardiac Cath Lab

Category	A	B
Special purpose x-ray	67	-
Static detection/measurement	-	3
Static elimination	-	6
Storage	-	142
Sun Tanning Unit	53	-
Superficial radiotherapy	4	-
Test source	4	-
Therapy	1	44
Therapy – HDR brachytherapy	-	2
Transilluminator	95	-
X-ray analysis	219	-
Total	4048	4210

**Attachment 7: Licences and Registrations***Current at 31 December 2008**Including individual exemptions granted under Section 6 of the Act.*

	<b>X-ray and/or Electronic Products</b>		<b>Radioactive Substances</b>		<b>TOTAL</b>	
	2008	2007	2008	2007	2008	2007
<b>Licences</b>	3401	3075	1554	1381	4955	4456
<b>Registrations</b>	1466	1256	333	318	1799	1574
<b>TOTAL</b>	4867	4331	1887	1699	6754	6030
<b>Change from 2007</b>	+12.4%		+11.1%		+12.0%	

## Attachment 7 (cont)

## Purposes for Licences and Exemptions from Licence

**Note:** *A single licence may be granted for one or more purposes.*

**A** *Granted or renewed in 2008*

**B** *Total current*

<b>A</b>	<b>B</b>	<b>Purpose</b>
4	6	Bone Densitometry
1	5	Bone Densitometry (Exemption)
31	59	Cabinet X-ray Equipment
1	1	Cobalt Teletherapy Maintenance
19	46	Compliance Testing - Diagnostic X-ray Equipment
26	74	Compliance Testing - Radioactive Gauges
1	3	Cyclotron Operation
1	5	Cyclotron Servicing
2	5	Education (Apparatus)
17	35	Education (Substances)
65	174	Fluoroscopy - Medical
75	157	Fluoroscopy - Medical (Exemption)
2	2	Fluoroscopy - Medical (Non-Specialist Exemption)
1	1	Fluoroscopy - Research
0	1	Fluoroscopy - Veterinary
1	2	Gamma Irradiator - Use
110	263	Gauges - Industrial
4	12	Gauges - Industrial (Installation)
1	3	Gauges - Level (CO <sub>2</sub> )
157	315	Gauges - Logging
181	367	Gauges - Moisture and/or Density (Portable)
2	6	Gauges - Other (Apparatus)
11	21	Gauges - Other (Substances)
0	2	Installation of X-ray Equipment
3	7	Installation of X-ray Equipment - Dental
2	2	Installation of X-ray Equipment - Linear Accelerator
7	11	Lasers - Acupuncture
2	7	Lasers - Chiropractic
25	49	Lasers - Dental
2	10	Lasers - Educational
4	10	Lasers - Entertainment
16	48	Lasers - Industrial
87	220	Lasers - Medical
26	62	Lasers - Physiotherapy

<b>A</b>	<b>B</b>	<b>Purpose</b>
12	30	Lasers - Research
12	46	Lasers - Service
0	0	Lasers - Veterinary
0	0	Manufacture of Lasers and Laser Products
1	2	Manufacture of X-ray Equipment
1	2	Medical Physics
3	4	Medical Physics - Radiotherapy (Apparatus)
3	4	Medical Physics - Radiotherapy (Substances)
27	64	Medical Radiation Technology - Diagnostic Nuclear
262	796	Medical Radiation Technology - Medical Imaging
58	144	Medical Radiation Technology - Radiation Therapy Irradiating Apparatus
79	185	Medical Radiology
1	3	Non-Medical Irradiation
8	26	Nuclear Medicine - Diagnostic
8	25	Nuclear Medicine - Therapeutic
1	1	Nuclear Medicine - Veterinary
4	12	Pathology Tests
10	45	Portable Mineral Analysers
41	82	Portable Mineral Analysers (X-ray)
2	7	Possession of X-ray Equipment - Diagnostic Medical
1	1	Quality Assurance Procedures
15	29	Radioactive Ores - Mining and/or Processing
1	5	Radioactive Substances - Calibration Sources
0	2	Radioactive Substances - Medical
10	43	Radioactive Substances - Sale
7	19	Radioactive Substances - Service of Devices
0	1	Radioactive Substances - Tracer Studies
9	19	Radioactive Substances - Tracer Studies (Industry)
3	4	Radiography - Chiropractic (Exemption)
9	41	Radiography - Chiropractic (Extended)
43	118	Radiography - Chiropractic (Restricted)
113	259	Radiography - Industrial (Gamma)
114	260	Radiography - Industrial (X-ray)
1	4	Radiography - Medical (Direction and Supervision)
1	1	Radiography - Security
205	520	Radiography - Veterinary
2	3	Radiology - Veterinary
4	17	Radiopharmaceutical Manufacture and Dispensing
4	15	Radiotherapy - Medical (Apparatus)
7	18	Radiotherapy - Medical (Substances)
3	8	Radiotherapy - Medical Superficial

<b>A</b>	<b>B</b>	<b>Purpose</b>
1	2	Radiotherapy - Veterinary (Apparatus)
0	3	Radiotherapy - Veterinary (Substances)
11	18	Research
33	81	Research - Unsealed Radioactive Substances
1	7	Research - X-ray
11	17	Sale of Electronic Products
25	62	Sale of X-ray Equipment
8	21	Service of X-ray Equipment - Analytical
8	13	Service of X-ray Equipment - Dental
28	70	Service of X-ray Equipment - Diagnostic
4	16	Service of X-ray Equipment - Diagnostic (Extended)
0	0	Service of X-ray Equipment - High Energy Therapeutic
3	5	Service of X-ray Equipment - Industrial NDT
0	2	Service of X-ray Equipment - Intraoral
3	12	Service of X-ray Equipment - Linear Accelerators
14	28	Service of X-ray Equipment - Other
0	1	Smoke Detectors - Sale
3	9	Special Purpose Enclosed X-ray Equipment
0	1	Static Detection
1	1	Static Electricity Measurement
1	2	Static Elimination
1	4	Storage
9	22	Transilluminators
33	77	Transport
1	2	X-ray Analysis
1	1	X-ray Analysis (Research)
15	48	X-ray Analysis - Use
75	163	X-ray Analysis - Use and Service (Restricted)

**Attachment 7 (cont)****Purposes for Registrations and Exemptions from Registration**

**Note:** *A single registration may be granted for one or more purposes.*

**A** *Granted or renewed in 2008*

**B** *Total current*

<b>A</b>	<b>B</b>	<b>Purpose</b>
2	6	Bone Densitometry
10	25	Bone Densitometry (Exemption)
34	64	Cabinet X-ray Equipment
1	1	Cyclotron Operation
1	5	Cyclotron Servicing
0	1	Disposal of Radioactive Waste – Mt Walton East IWDF
1	4	Education (Apparatus)
3	9	Education (Substances)
1	5	Education - Demonstration Radioactive Sources
0	3	Education - Demonstration Radioactive Sources (Exemption)
1	4	Education - Demonstration Sources
1	1	Fluoroscopy - Medical
1	1	Fluoroscopy - Medical (Image Intensifiers)
1	2	Gamma Irradiator
48	119	Gauges - Industrial
4	12	Gauges - Industrial (Installation)
1	3	Gauges - Level (CO2)
4	20	Gauges - Logging
12	37	Gauges - Moisture and/or Density (Portable)
3	7	Gauges - Other (Apparatus)
0	6	Gauges - Other (Substances)
5	10	Lasers - Acupuncture
2	4	Lasers - Chiropractic
12	35	Lasers - Dental
0	1	Lasers - Educational
5	12	Lasers - Entertainment
6	21	Lasers - Industrial
0	2	Lasers - Manufacture
32	77	Lasers - Medical
13	36	Lasers - Physiotherapy
0	5	Lasers - Research
12	46	Lasers - Service
0	2	Lasers - Storage

<b>A</b>	<b>B</b>	<b>Purpose</b>
0	0	Lasers - Veterinary
2	7	Lasers - Sale, Service, Maintenance and Testing
2	4	Manufacture of X-ray Equipment
50	100	Medical Radiology
1	2	Non-Medical Irradiation
13	22	Nuclear Medicine
2	4	Nuclear Medicine – CT (X-ray)/SPECT
1	1	Nuclear Medicine - Veterinary
6	9	Pathology Tests
5	15	Portable Mineral Analysers
25	49	Portable Mineral Analysers (X-ray)
11	39	Radioactive Ores - Mining and/or Processing
0	5	Radioactive Substances - Calibration Sources
1	2	Radioactive Substances - Medical
5	8	Radioactive Substances - Sale
2	3	Radioactive Substances - Service of Devices
1	1	Radioactive Substances - Tracer Studies
0	2	Radioactive Substances - Tracer Studies (Industry)
0	1	Radiography - Chest Screening
23	53	Radiography – Chiropractic
5	7	Radiography - Chiropractic (Referrals)
223	597	Radiography - Dental
0	1	Radiography - Forensic
6	18	Radiography - Industrial (Gamma)
6	18	Radiography - Industrial (X-ray)
4	10	Radiography - Mammography Screening
1	2	Radiography - Medical (GP Extended)
19	59	Radiography - Medical (Operator)
5	15	Radiography - Medical (Unrestricted)
29	68	Radiography - Medical Ancillary (Referrals)
0	1	Radiography - Medical Superficial
3	7	Radiography - Physiotherapy Referrals
2	5	Radiography - Podiatry Referrals
1	1	Radiography - Security
75	205	Radiography - Veterinary
1	1	Radiography - Veterinary (Hospitals)
1	2	Radiology - Veterinary
2	2	Radiopharmaceutical Manufacture and Dispensing
1	3	Radiotherapy - Medical (Apparatus)
5	10	Radiotherapy - Medical (Substances)
0	1	Radiotherapy - Veterinary
2	2	Regulatory Authority

<b>A</b>	<b>B</b>	<b>Purpose</b>
3	7	Research (Substances)
6	15	Research - Unsealed Radioactive Substances
0	5	Research - X-ray
3	6	Sale of Electronic Products
10	20	Sale of X-ray Equipment
5	30	Secondary Schools – Demonstration Sources (Exemption)
7	14	Service of X-ray Equipment
0	2	Smoke Detectors - Sale
48	48	Solaria - Possession and Operation
1	8	Special Purpose Enclosed X-ray Equipment
0	1	Static Electricity Measurement
3	3	Static Elimination
0	5	Storage (Apparatus)
5	18	Storage (Substances)
5	14	Transilluminators
4	10	Transport
1	5	X-ray Analysis
30	84	X-ray Analysis - Use

## ABBREVIATIONS

### General Terminology

ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
CT	Computed Tomography
CT/SPECT	Computed Tomography/Single-Photon Emission Computed Tomography
DSA	Digital Subtraction Angiography
HDR	High Dose Rate
NDT	Non-Destructive Testing
NHMRC	National Health and Medical Research Council
PET	Positron Emission Tomography

### Units of Activity

Bq	becquerel (1 disintegration per second)
MBq	megabecquerel (1,000,000 becquerels)
GBq	gigabecquerel (1,000,000,000 becquerels)

### Units of Effective Dose

Sv	sievert (1 joule per kilogram multiplied by a modifying factor for the type of radiation and the radiological sensitivities of the organs and tissues being irradiated)
mSv	millisievert (one thousandth of a sievert)
μSv	microsievert (one millionth of a sievert)





