The Environmental Permitting Regulations (England and Wales) 2011 Compliance Handbook

This document serves to:

- present mandatory instructions and guidance for University managers and radiation workers to enable them to comply with the provisions of the Environmental Permitting Regulations (England and Wales) 2011 (EPR2011) and

- demonstrate to the Environment Agency (EA) that the University of Manchester uses **B**est **A**vailable **T**echniques (BAT) to protect the environment and the population from the effects of radioactive waste discharges.

The need for this document has arisen through a requirement under EPR2011 for radiation workers to minimise the generation of radioactive waste, employ BAT and, specifically, to ensure that critical group exposures do not exceed 20 mSv y^{-1}.

While the primary aim of this document is to secure compliance with the EPR2011, it also addresses matters of commonality with the Ionising Radiations Regulations 1999 (IRR99), which is overseen by the Health and Safety Executive (HSE).

Objective

This document plays a fundamental role in enabling all research and teaching activities involving sources of ionising radiation at the University of Manchester to be conducted in a safe, effective and legal manner.

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Memorandum

The roles and responsibilities of individuals in the Management of radioactive work in compliance with EPR2011.

Principal User: This person is defined as the individual responsible both personally and on behalf of the University for:

- complying with the requirements of the EPR2011,
- preparing operating procedures that will secure BAT, and
- securing BAT in the University.

The 'User' is defined by the Environment Agency as the 'principal manager'; at the University of Manchester this individual is the President, Dame Professor Nancy Rothwell.

Radiation Protection Officer: An individual appointed by the University, and responsible for:

- Co-ordinating the exchange of information between the externally-appointed RWA/RPA and University Heads of Schools/RPSs.
- Providing RPSs with information relating to routine radiological safety and radioactive waste issues, not requiring direct RWA/RPA input.

Radioactive Waste Adviser (RWA): an individual responsible both personally and on behalf of the University for:

- Advising senior management of the University on procedures involved in the disposal of radioactive waste material;

- Ensuring that such procedures are carried out in accordance with The Environmental Permitting Regulations (England and Wales) 2011.

The University RWA has responsibility, delegated to him by the President (i.e. The "principal manager"), for:

i. Advising and assisting the University on radioactive waste management including operations, tenders and pre-qualifications and ensuring that all work which is the subject of the Services is carried out in accordance with the principles of ALARP.

ii. Arranging for visits to the University in order to inspect and / or assist in developing procedures for radioactive waste handling and disposal

iii. Liaising with the University's clients, as instructed by the University or as otherwise reasonably required, on any matters relevant to the provision of the Services and advise / report accordingly.

iv. Advising and assisting the University on all matters in connection with the provision of the Services relating to implementation and maintenance of a radioactive waste management system at the University's premises in order to satisfy the requirements of the University and the relevant statutory Regulations. This advice and assistance shall include, but not be limited to, policies, processes, procedures, engineering controls, dosimetry, etc.

v. Liaising with the University to assist on general enquiries relating to the handling and disposal of radioactive waste.

vi. Providing general and detailed advice to the University on legislative requirements where relevant to the provision of the Services.

vii. Advising and assisting to the University in dealings with the Environment Agency.

viii. Performing activities as required by statutory bodies in connection with the Services.

ix. Providing data and theoretical and practical information to the University on all aspects of the handling and use of ionising radiation emitting equipment or substances to ensure compliance with EPR2011;

x. Providing advice to the University on changes in legislation and safety issues that are relevant to the University's acquisition and disposal of radioactive materials;

xi. Providing advice to the University on the preparation of Local Rules and Systems of Work for the handling of radioactive materials, as required under IRR99;

xii. Overseeing the maintenance of the University's Environment Agency Permits to obtain, store and dispose of Radioactive materials; preparation of applications for any

necessary variations in such Permits, as determined by changing work practices within the University;

xiii. Providing advice on interpretation and implementation of the EPR2011 Exemption Orders;

xiv. Overseeing arrangements for the disposal of redundant sealed sources to appropriate contractors;

xv. Overseeing the preparation of the annual Pollution Inventory returns to the Environment Agency on behalf of the University;

xvi. Overseeing the maintenance of central records of all unsealed radioactive material acquisitions and waste disposals by and from the University, as required to demonstrate compliance with EPR2011, and to retain such records for inspection by the Environment Agency

The RWA at the University of Manchester North and South Campuses is Mr Julian Dunderdale (Public Health England). The RWA for The Dalton Cumbrian Facility is Mr Peter Shaw (Public Health England). The RWA for the Cancer Research UK Manchester Institute Paterson and the Wolfson Molecular Imaging Centre is Mr Brian Murby (Christie Medical Physics and Engineering).

Radiation Protection Adviser (RPA): An individual appointed by a body approved by the HSE; The University RPA has responsibility, delegated to him by the President (i.e. The "Principal User"), for:

- Liaising with architects and in the examination of plans for installations of new or modified sources of ionising radiation in relation to engineering controls, design features, safety features and warning devices provided to restrict exposure to ionising radiation;
- Overseeing the implementation of requirements as to the designation of Controlled and Supervised areas for work with ionising radiation sources;
- Arranging for the calibration of equipment provided for monitoring levels of ionising radiation and the regular checking that such equipment is serviceable and correctly used.
- Organising the periodic examination and testing of engineering controls, design features, safety features and warning devices, and regular checking of systems of work to restrict exposure to ionising radiation;

The RPA at the University of Manchester North and South Campuses and The Dalton Cumbrian Facility is Public Health England. The RPA for the Cancer Research UK Manchester Institute Paterson and the Wolfson Molecular Imaging Centre is Christie Medical Physics and Engineering.

Heads of Schools: All University Schools have a local Health and Safety Committee, usually chaired by the Head of School who is advised by a Radiation Protection Supervisor (RPS) of the internal policies and legislative requirements underpinning the acquisition, storage and transfer/disposal of radioactive materials.

Each Head of School is responsible for (i) the safe use of ionizing radiations within his/her School, (ii) ensuring that School self-inspections are carried out in accordance with the requirements of the Management of Health and Safety at Work Regulations 1992, and (iii) ensuring that all members of staff and research students are aware of the hazards associated with radiation work and of their responsibilities to both themselves and others.

Radiation Protection Supervisors: Each Head of School must appoint one or more RPS. The Head of School must confirm all such appointments in writing, with copies being sent to the appropriate University Radiation Protection Officer (RPO) and to the Secretary of the Radiation Protection Advisory Group.

The role of the RPS is to provide direct supervision, enabling compliance with the requirements of the relevant legislation within any School where sources of ionising radiation are in use. He or she should be directly involved with the School's work with ionising radiation, preferably in a line management position that will allow the exercise of close supervision to ensure that all work is done in accordance with the Local Rules. General responsibility of compliance with the Regulations lies with the Head of School; this responsibility cannot be delegated to the RPS any more than it can to the RPA.

The RPS has a duty to ensure that all relevant information received from the RPO is circulated to Radiation Workers in the School, maintaining and keeping all necessary records, arranging training of Radiation Workers, and keeping the RPO informed of changes in personnel engaged in radiation work within the School.

The core duties of an RPS include:-

- Monitoring to ensure that all radiological work within his/her area of responsibility is taking place within the terms of agreed Local Rules, current legislation and accepted good practice.
- Monitoring the inventory of radiation sources within his/her area; checking that they remain at their specified locations under appropriate management control; and that they are ultimately disposed of by an authorised route.
- Compiling and maintaining a list of radiation workers within his/her area. The Radiation Protection Officer must be informed of any changes.
- Providing non-specialist advice to staff, students and management in regard to radiation protection matters.
- Referring promptly to the Head of School any radiation protection problem that cannot be resolved locally on a time scale commensurate with the risk.
- Liaising with fellow RPSs, the campus RPO, Safety Co-ordinators and other central advisers in Health and Safety matters.
- Attending meetings of the relevant committees when required, and in particular the Ionising Radiation Technical Advisory Group.

- Ensuring that incidents accidents involving ionising radiation are reported and investigated.
- Disseminating radiation protection information and reports to appropriate staff and students.
- Ensuring that new members of the School receive adequate information, instruction and training with respect to radiation protection matters.
- Identifying academic and technical staff and students in his/her area who would benefit from appropriate radiation protection training or occupational health surveillance.
- Co-ordinating the implementation of advice from the campus RPO.
- Periodically (and not less frequently than annually) reviewing radiation protection procedures within his/her area.
- The Head of School may also assign such other radiation protection duties to an RPS as appropriate.

Principal Investigators

In accordance with the general policy for Management of Health and Safety within the University, Principal Investigators (PIs) have a duty, delegated to them from the Head of School, to provide "such supervision as is necessary" to ensure the safety of all the research students for whom they are responsible. This includes all postgraduate and undergraduate students working with sources of ionising radiation. In the first instance, PIs shall seek advice from their RPS regarding any work which they intend to carry out with ionising radiation, and will inform him or her in advance of any intention to bring radioactive material onto campus.

As part of their role and management function, PIs must ensure that those working under their supervision receive the necessary information, instruction and training to enable them to work in a safe manner and in accordance with the relevant Local Rules. PIs themselves should have received adequate training and should clearly understand their management role in the School. PIs must supervise closely those working under them until the individuals concerned can demonstrate that they are capable of working independently and responsibly with sources of ionising radiation. All PIs should note, however, that they still have a responsibility to supervise radiation workers by a regular monitoring of their activities even after they have demonstrated competence.

Principal Investigators are required to:

- Notify the RPS of all new staff and students that are required to attend a course in Radiation Safety Awareness;

- Arrange for intending radiation workers to receive within-laboratory instruction and training appropriate to their intended work with radioactive materials;

- Arrange for the above individuals to become Registered Radiation Workers, following satisfactory completion of training;

- Ensure that all procedures involving radioactive materials are covered by an appropriate Risk Assessment and Project Registration, which may be generic in nature.

PART 1: JUSTIFICATION AND RISK ANALYSIS OF THE USE OF SOURCES OF IONISING RADIATION

The use of sources of ionising radiation is subject to the process of 'justification', which means that all applications to work with such sources must be assessed, and a decision made on whether the potential benefits of the research (to society) outweigh the potential radiation-induced detriment (to people and the environment).

- The HSE have issued a generic justification under the provisions of the *Justification of Practices Involving Ionising Radiation Regulations* that extends to the majority of applications involving radioactive sources within universities. However, the use of the radioactive material should be undertaken for sound reasons of advantage to the work being undertaken.

- The justification of any novel (i.e. non-generic) applications must be addressed on a case-by-case basis, with final approval being sought from the HSE.

In the first instance, persons applying to work at the University of Manchester with any source of ionising radiation in a NEW project must justify their need to use that source on a Project Registration form (PRO-1 or PRS-1 for open (unsealed) and closed (sealed) sources, respectively, and PRX-1 for X-ray work) describing the intended protocol, demonstrating compliance with the terms of the University's Environmental Permits under EPR2011, and identifying disposal routes for any waste generated that are consistent with the implementation of BAT.

Under BAT, consideration must be given to purchasing the minimum amount of radioactive material. Appropriate Risk Assessment(s) must be undertaken, and must be forwarded to the appropriate RPS for approval. Advice may be sought from the University RPO on any aspect of Risk Assessment or BAT options. Instructions for undertaking a Risk Assessment, and template forms for Project Registrations and Risk Assessments, are available on the Radiation Safety webpage.

PART 2: THE MANAGEMENT OF RADIATION WORK

Responsibilities

The University Ionising Radiation Code of Practice (i.e. Chapter 25 of the University Health and Safety Procedures) and the EPR2011 Compliance Handbook have the status of legal documents; failure to comply with the requirements of these two documents may result in legal action being taken against individuals, by an enforcing agency, in a Court of Law. This

is in addition to any action that may be brought by the University for failure to comply with the conditions of a Contract of Employment.

The President, Deans of Faculties and Heads of Schools each have a legal responsibility for the safe acquisition, storage, use and disposal of sources of ionising radiation by the University. However, this does not imply that radiation workers are exempted from responsibility. Section 7 of the Health and Safety at Work Act (1974) clearly states that every employee (including research students) is responsible for their own acts and omissions, and for assisting the employer (i.e., the President) to comply with statutory requirements.

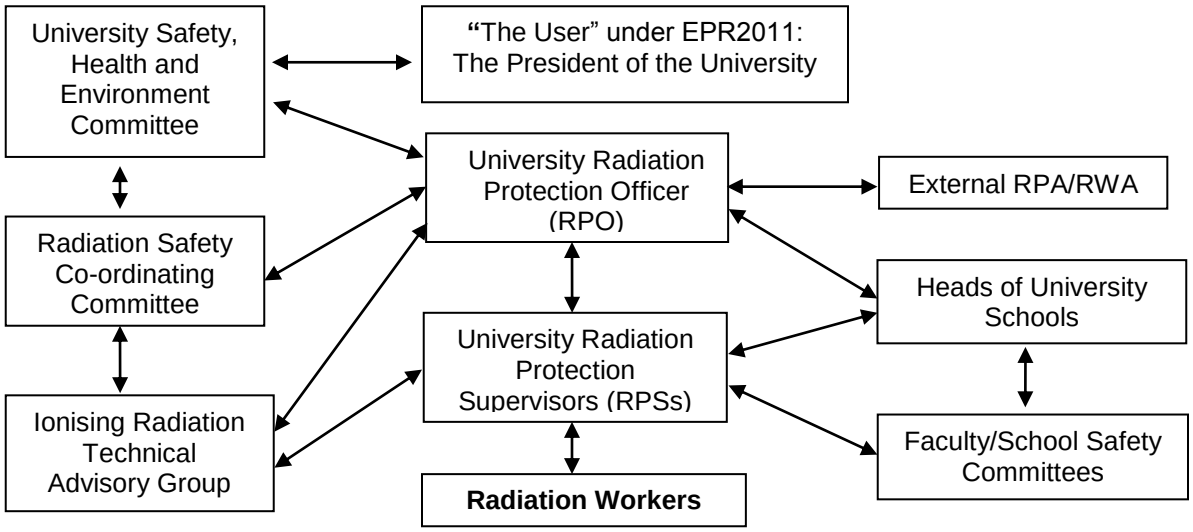
- All managers and radiation workers must comply with the requirements of Local Rules and Mandatory Instructions, and with those of the EPR2011 Compliance Handbook.

- It is the responsibility of radiation workers to ensure that Project Registrations and Risk Assessments have been prepared for their research work, and that they are familiar with the current version(s) of relevant Local Rules and any relevant Systems of Work.

- Deans, Heads of Schools and Principal Investigators must ensure that Local Rules, Risk Assessments and, where appropriate, Systems of Work, have been prepared for all radiation activities undertaken within their jurisdiction. RPSs should assist PIs in executing their duties in this respect.

Internal Regulatory Structure

A Summary of the key Committee structures relating to radiation safety within the University of Manchester, and in compliance with EPR2011 is given below.



Mandatory written instructions:
The University of Manchester has a hierarchical system of mandatory instructions, with which all radiation workers are required to familiarise themselves. All work must be carried out in accordance with instructions contained within the following documents, which are:

- Chapter 25 ("Ionising Radiation Safety") of The University **Health and Safety Procedures,** which occupies the summit position, requires radiation workers to co-operate with the site RPO and area RPS(s) in complying with the requirements of IRR99 and EPR2011.

- At the next level, the **EPR2011 Compliance Handbook** and the **Radiation Safety Code of Practice**, which make general provisions regarding the conduct of radiation work, personal responsibilities, and the duties of managers and radiation workers.

- **Local Rules**, governing the uses of sources of ionising radiation, which are aimed at providing instruction on the safe handling of specific sources of ionising radiation and on the implementation of appropriate contingency plans within individual University Schools.

- **Risk Assessments, Project Registrations** and **Systems of Work,** which make provision for the preparation of experimental / laboratory protocols within individual Schools. An RPS may determine that it is necessary to have additional protocols in place, since they are the persons having scientific expertise and are therefore best placed to make such a judgement.

University EPR2011 Permits

Each University site where radioactive sources are used is issued with appropriate Permits(s) by the Environment Agency. In order for the University to demonstrate compliance with EPR2011, it is vital that the specific conditions associated with each Permit are understood and adhered to at all times. The key conditions associated with the EPR2011 Permits are as follows:

Information Security: The Permits must not be copied to third parties without prior consultation with the Environment Agency; sealed source Permits must be kept locked away when not in use, and those who have legitimate access to it must be made aware of the security restrictions. If such a Permit is moved, it must be transported securely in an unmarked 'double envelope'. A copy of the Permit must NOT be transmitted electronically (e.g. by e-mail) to third parties.

Management: The radiological management system within the University must include definitions of the roles, responsibilities and authorities of all relevant staff. The relevant staff, facilities and equipment necessary must be identified, together with staff training needs. Procedures for the procurement, operation and maintenance of sealed sources and associated equipment must be specified within the Local Rules of relevant Schools. Within the Local Rules of each School, procedures should be documented for dealing with radiological incidents, together with the associated investigations and preventative measures, and adequate record-keeping procedures should be in place, together with arrangements for checking compliance with the local arrangements.

All staff who manage, supervise or work with sealed sources must have a full understanding of the Permit conditions, together with the necessary skills and the ability to perform their role. They must be provided with sufficient time and the necessary facilities to carry out the work, and an understanding of when to seek assistance, and how this should be obtained. A copy of the EPR2011 Permit must be made available to all those with duties under it or affected by it (but see above for restrictions regarding Permits for sealed sources).

Records must be maintained to demonstrate that the management system for sealed radioactive sources remains suitable and sufficient.

Where it is necessary to acquire or work with a HASS, additional training and operational instructions must be made available to relevant individuals, taking into account the nature of the source.

Operations: The site Permits require that the use of radioactive sources is limited to those applications specified – however, as these are generic in nature, this should not be the cause of any difficulty. No sealed or unsealed source should be brought onto University premises without the expressed authority of the RPO, who will check that it can be accommodated within the terms of the relevant Permit, with respect to the nature of the radionuclide and its activity.

There are special conditions for keeping and using mobile sources, especially when ‘off-site’, and both the site RPO and the RPA should be consulted by the RPS in all such cases.

PART 3: RADIATION FACILITIES

Responsibility for Prior Consultation on Proposals for New / Refurbished Radiation Facilities

Schedule 5 of the IRR99 and the BAT addition to the EPR2011 require the 'Radiation Employer / User' to consult and closely involve an RPA in all new build or refurbishment projects; such consultation should be continuous throughout all stages of the project, i.e. from inception to final commissioning. All plans and modifications thereof, for new builds of refurbishment projects must be approved by the RPA where there is a radiological protection interest.

Acceptance and Commissioning

All new builds, refurbished radiation facilities and new installations such as fume cupboards, shielded enclosures, services installations must be subject to a 'Critical Examination', undertaken by an RPA, prior to formal 'handover' *(IRR99, Regulation 31).*

Laboratory Design

The granting of Environmental Permits by the Environment Agency is conditional on the 'Radiation Employer' complying with standard conditions and limitations. In particular, the Permit specifies that radiation laboratory facilities must meet a minimum design standard.

The principles of good laboratory design must be adopted for all new buildings and refurbishment projects. Heads of Schools, Estates Personnel, architects and other contractors commissioned by the University, should consider the principles of design laid down in the information document "*Design Standard for Laboratories designated as "Supervised Areas" for work with Unsealed Sources of Ionising Radiation*" available *via* the Radiation Safety Unit webpage.

Designation of Radiation Laboratories

There are two classes of radiation laboratories at The University of Manchester:
(i) **Supervised Areas** and (ii) **Controlled Areas**.

(i) Supervised Areas

These are laboratories that are specifically designated for the handling of biologically significant activities of radioisotopes. The risk of radiation exposure is such that control measures are necessary, although some work activities in these areas may be of a non-radioactive nature.

Supervised areas may contain designated fume cupboards for general use, or for the dispensing of high-activity stocks, ("Controlled" Areas, see below).

(ii) Controlled Areas

These are areas where the risk of radiation exposure is such that controls are necessary to protect radiation workers and the environment from potentially damaging releases of radioactive materials. Controlled Areas may be designated in fume cupboards etc. and used solely for the purposes of dispensing high activity stocks or radio-iodination work.

All radiation workers should have a clear understanding of the laboratory classification system, and must work within the constraints imposed by individual room designations. It is the responsibility of radiation workers to communicate with their RPS in order to ensure that their acquisitions of radioactive materials and disposals of radioactive waste do not exceed the local stock-holding and disposal limits, respectively.

All incidences of non-compliance with statutory legislation or site Permit limits must be reported to the appropriate University RPO without delay. If it is suspected that a local aqueous waste disposal limit has or may have been breached, it may be possible for the University RPO to provide an additional disposal allocation, on a temporary basis.

Rooms Database

The EPR2011 Permit requires the 'Radiation Employer' to maintain a detailed database of all radiation facilities (including building / design / site plans). In practice, the RPO will undertake this task on behalf of the University.

Decommissioning of radiation facilities

Once a radiation laboratory or facility has been vacated, the RPS must notify the RPO so that a decommissioning survey can be organised by the Radiation Safety Unit before contractors occupy the site for refurbishment or refitting. A decommissioned laboratory is defined as one that has been completely checked, using a suitable monitor, and any residual contamination removed: the necessary checks include the monitoring of floors, walls, furniture and fittings, and the internal surfaces of drains and fume cupboards etc.

A 'decontamination plan' must be produced when any substantial refurbishment or demolition is contemplated. In such cases, the University RWA will agree and document the method of carrying out the work with the Environment Agency. The plan will consist of (a) determining the scale of the problem by records and/or monitoring, (b) characterising the waste for potential disposal options, and (c) recording how the work is to be done.

The facilities, including the drains associated with the building, will need to be monitored or records produced to demonstrate to the Environment Agency that only short-lived radionuclides were used within the affected room(s). The University RWA must be provided with as much information as possible on where radioactive materials have been used

and/or stored in the past. Building and floor plans must be annotated with details of radionuclides, dates and activities used.

Attention must be given to segregating of the waste into separate streams that can be disposed of with minimal cost, and in accordance with the requirements of BAT. The RWA may be asked by the Environment Agency to give an estimate of the amount of waste likely to be produced. The RWA (in association with the relevant RPO, RPS and any appointed specialist contractor) will subsequently prepare a report characterising the waste, which will be discussed with the Environment Agency to decide on appropriate ways and routes for disposal of the waste.

The University, in consultation with the RWA, may appoint specialist contractors to undertake the pre-decommissioning survey work, and also the decommissioning work itself. If the contractor subsequently sends radioactive waste for disposal, it must work within the University's EA Permit (including the management conditions). A system of auditing must be in place to track items of waste from the site of origin through to final disposal.

At the end of the decommissioning and waste disposal operations, a final report will be prepared explaining what was undertaken and what methods were used etc. Following decommissioning, certificates will be issued by the RWA and the Rooms Database amended.

Finally, it should be noted that decommissioning surveys can **only** be initiated and conducted by the site RPO, or by contractors appointed by the RWA on behalf of the University.

Decontamination

Should severe contamination be found during the course of decommissioning, or should severe contamination of a facility be otherwise discovered, the contaminated area must be sealed and further access prevented forthwith. A Decontamination Safety Case will then be prepared, in consultation with the relevant RWA, prior to any further activities being undertaken.

PART 4: THE ACQUISITION OF RADIOACTIVE SOURCES

Definition of a Radioactive Substance

Table 2.3 of the government guidance to EPR2011 lists values below which a radionuclide is considered to be 'out of scope' of EPR2011; this value is radionuclide-specific and can range from 10 mBq/g to 10 kBq/g depending upon the radionuclide.

Unsealed Radioactive Sources

This document is primarily concerned with the control of use of unsealed radioactive materials, since the waste material derived from these sources has the greatest impact on

the environment. The purchase of unsealed radioactive sources must be overseen by the relevant RPO. These individuals, in association with the School RPSs play key roles in applying BAT, since it is they, acting with the delegated authority of the President, who will approve each purchase or acquisition of a radioactive substance.

Source control (Purchase, Use and Disposal) for unsealed sources

In order to ensure that the principles of BAT are employed, the University RPOs will have adopted procedures for

- approving the purchase or acquisition of unsealed radioactive sources;
- accounting for the movement and use of radioactive materials on University premises;
- authorising and accounting for the disposal and transfer of radioactive waste;
- making an annual BAT report to the Environment Agency**.**

The University RPOs and RWAs require that the following procedures are adhered to closely.

In the first instance, a Principal Investigator intending to use an unsealed source of ionising radiation within a University School must complete a Project Registration Form (PRO-1) and submit this to the University RPO.

A Project Registration allows a School to purchase and use radioactive materials, and transfer and/or dispose of the resultant waste material through an appropriate channel. It also gives recognition to the authority of the RPS to give approval to the purchase or acquisition of unsealed radioactive materials.

- Radiation workers must seek approval from the area RPS for each purchase or acquisition of radioactive materials.
- Unsealed radioisotopes for use on the South Campus MUST be requisitioned through the University Radiation Safety Unit; for other University sites, the site RPO must be consulted in advance, to ascertain the approved procedure. The above arrangements will ensure that radioisotopes received by the University can be accommodated within the terms of the EPR2011 Permit relevant to that particular site.
- Radioisotope purchases will initially be received and logged centrally by the RPO for each University site, for onward transit to the user's premises. A uniquely-numbered user accountancy sheet will be issued with each item.
- From this point onwards the Head of the relevant University School is responsible for the safety and security of the radioactive material, and for completing the required records of its use and disposal, though these duties may be delegated to the area RPS.
- The user is responsible for the disposing of solid and aqueous waste through the appropriate, Permitted route(s).

- The RPS must ensure that there are suitable local protocols describing the arrangements for the disposal of low-level solid and aqueous radioactive waste. Such arrangements may typically be described within the Local Rules for the area.
- Waste disposal records from individual Schools will be processed separately into annual cumulative records for each University site, and appropriate documentation demonstrating compliance with the site-specific EPR2011 Permits will be forwarded by the site RPO to the Environment Agency on an annual basis.

Minimisation of Radioactive Waste

The University of Manchester is strongly committed to the minimisation of radioactive waste generation, and proactively seeks to affect the policy of minimisation by requiring radiation users to adhere to the requirements of this EPR2011 Compliance Handbook.

Waste minimisation is *de facto* the practice of applying BAT to all procedures involving the use of radioactive materials in such a manner that effective control is exerted at all stages from education, through purchasing, storage and use, to final disposal.

Procedure to be followed to secure the Best Available Techniques of minimising the generation of radioactive waste

In consideration of the requirements of BAT, users are required to:

- Carefully plan any experimental procedure where unsealed radioactive material is used, selecting the most suitable radionuclide, and an appropriate activity. The optimum activity is that which will deliver statistically meaningful results while minimising the potential radiation exposure.

- Consider whether it is beneficial to purchase the radionuclide jointly with colleagues, thereby minimising costs, the number of packages being delivered, and the likelihood of having to dispose of excess outdated stock as waste material

Source control (Purchase, Use and Disposal) for sealed sources

Schools wishing to acquire sealed radioactive sources must initially contact the site RPO to determine that the intended source(s) can be accommodated within the maximum allowable holding specified in the site Permit. Wherever possible, sources should be acquired on a lease arrangement with the supplier, with the cost of end-of-life transfer/disposal built into the leasing costs.

HASS requisitions
Under the HASS Directive 2005, any University School wishing to purchase a HASS-applicable sealed radioactive source must identify a disposal route and an appropriate source of funding, before the Environment Agency will consider any necessary variation in the University's sealed source Permit. The Head of School should consult the relevant RPO for assistance in assessing the final disposal costs, and identifying a disposal route. The RPO and RPA must also be contacted and consulted with respect to the required security precautions, training requirements and mandatory notifications relevant to locating a HASS on University premises. The Environment Agency and local CTSA may elect to inspect the intended location of the HASS, to ensure that the required security measures are in place, prior to the source being ordered.

Information
Adequate and appropriate records of each sealed source acquisition, unique ID, activity and location are essential contributory factors to demonstrating compliance with the site EA Permit. All such records must be legible, prepared and updated without delay and, if amended subsequently, a copy of the pre-amended version must be retained. All records should be kept securely, until notified by the Environment Agency that they are no longer required.

Contingency Plans
In the event of any malfunction, breakdown or failure of equipment, techniques, or accident resulting in actual or potential loss or damage to a source, **it is vital that both the RPA and the Environment Agency are contacted immediately, by the relevant RPS, using the EA 24h-Emergency hotline on 0800 807060**. The water supply Company must also be contacted if it is suspected that a sewer has become contaminated as a consequence of (for example) release of material from a damaged sealed source.

In the event of an actual or suspected loss, theft or attempted theft of a sealed source, a procedure must also be in place, and specified within the Local Rules:

- For the RPS to inform the police immediately AFTER contacting the EA (as directed above);
- For the RPS to contact the RPO and RPA/RWA immediately AFTER contacting the EA (as directed above);
- To use all reasonable efforts to recover the source,

As soon as practicable, the circumstances surrounding the event, and the subsequent action(s) taken, must be reported to the EA, in writing, by the site RPO.

PART 5: RADIOACTIVE WASTE DISPOSAL

Environment Agency Site Permits
The University uses radioactive sources and materials with the permission of the Environment Agency; in accordance with EPR2011, site-specific Permits for Sealed and Unsealed sources have been granted to the North and South campuses of the University, the Dalton Cumbrian Facility, the Wolfson Molecular Imaging Centre, and the Cancer Research UK Manchester Institute. The use of such materials at each of these sites is subject to compliance with compliance with the conditions attached to each Permit.

Permit conditions
The issue of Permits by the Environment Agency is conditional upon the University (the "User") complying with a number of specific mandatory conditions, the most important of which are summarised below.

- The User shall ensure that the keeping and use of radioactive materials are supervised by a person competent and able to secure compliance with the limitations and conditions specified in the certificates.

- The User shall, so far as is reasonably practicable, prevent the loss of any radioactive materials or accumulated radioactive waste, and the access to any radioactive materials or accumulated radioactive waste by any person not authorised by the user.

- The User shall, so far as is reasonably practicable, ensure that any radioactive materials or accumulated radioactive waste are kept either in a suitable container under continuous surveillance, or in a suitable container in a suitable store both of which are so constructed, maintained and used so as to prevent the loss or unauthorised removal of radioactive materials or waste. The latter should be constructed of non-combustible materials, and should not contain nor be located close to any corrosive, explosive or flammable material. They should be clearly and legibly marked with the word 'Radioactive' and with the ionising radiation symbol complying with BS 3510: 1968 or ISO 361 and any other information necessary for the identification of the radioactive materials or waste present.

- The User shall, so far as is reasonably practicable, ensure that all relevant parts of the premises are constructed, maintained and used in such a manner that they do not readily become contaminated, and any contamination which does occur can be easily removed.

- The User shall ensure, so far as is reasonably practicable, that the means, under his control for the storage and use of radioactive materials, and means by which disposals of radioactive waste are made, are maintained and kept in good repair.

- If the User believes or has reasonable grounds for believing that any radioactive materials or accumulated radioactive waste has been lost or stolen he shall without delay inform the Police and the environment Agency.

- If the User believes or has reasonable grounds for believing that any radioactive materials or accumulated radioactive waste is escaping or has escaped from any container or location in which it is stored or being accumulated he shall without delay inform the Environment Agency and, so far as is reasonably practicable prevent any further escape, and minimise the spread of any contamination;

- If the User believes or has reasonable grounds for believing that the keeping of radioactive materials or the accumulation / disposal of radioactive waste is occurring or has occurred which does not comply with the permissions he shall without delay inform the Environment Agency and, so far as is reasonably practicable prevent the further accumulation and disposal of radioactive waste.

- The User shall make up-to-date, clear and legible records for each registered material showing the radionuclide present, the date on which it was received and the activity on that date, and, so far as is reasonably practicable its location on the premises, and, the activity present on the premises at the end of each calendar month, and such other information as the authorised person may require.

- The User shall make, on the day of accumulation or disposal as appropriate, clear and legible records of accumulation and of disposal of radioactive waste.

- The User shall keep records available for inspection at any reasonable time by an authorised person; such records are kept by the site RPO.

Academic Supervisors / Principal investigators and radiation workers are required to organise, manage and execute their work with ionising radiation sources in such a manner that they will not cause the University to breach any of the conditions of the site EPR2011 Permit(s). Furthermore, they must assist the University in complying with the conditions of the Permit by drawing the attention of an RPS and RPO (and, by implication, the RPA) to any suspected incidents or occurrences that they consider may place the University in breach of the site Permit conditions.

Permitted Disposal routes

Radioactive waste may only be disposed of from laboratories via one of the routes specified in the relevant Local Rules. These disposal routes derive directly from the site EPR2011 Permit. Each waste disposal route will have been subjected to an environmental impact assessment, prior to approval by the EA.

- Radiation workers may ONLY dispose of radioactive waste through the routes specified in their Local Rules. Before disposing of any aqueous radioactive waste, workers must check to make sure their disposal will not cause the relevant monthly limit to be exceeded. Should it be necessary to exceed any of the allocated internal disposal limits, the RPS may apply to the relevant University RPO for a temporary variation.

- Radiation workers must comply with the detailed instructions for the disposal of radioactive waste.

Aqueous waste disposal

All sites of the University of Manchester have a specific EPR2011 Permit to dispose of Low level aqueous radioactive waste to the public sewer. The radionuclides permitted, and the maximum allowable monthly quantities are specified in the Permit. The RPO will allocate a fraction of the total monthly allowance to each relevant School.

Aqueous waste should be decanted into a Designated Sink and washed down with copious quantities of water; the tap should be left running for ~10 minutes. Care must be taken to ensure that any splashes are cleaned up and that contamination is not allowed to arise. Any incidences of contamination or any spillages must be cleared up immediately as specified in the Local Rules.

Actual disposals must be recorded against the maximum allowance, giving details of the date of disposal, radionuclide, activity and user. Monthly disposal records must then be forwarded to the RPO for inclusion in the site database of radioactive waste discharges.

Solid waste disposal

The LLW solid waste route specified in the relevant site Permit must only be used for the disposal of solid radioactive waste, such as items that have become knowingly contaminated through contact with radionuclides, or laboratory consumables, wipes, tissues, Benchkote®, gloves, etc. suspected of being contaminated. Records must be made of each radionuclide disposed of, the activity, and the date of disposal.

Low Level Solid Radioactive Waste (LLW) is permitted to be accumulated in Schools and Academic Units, by authorisation of the relevant RPO, and in accordance with local

procedures prepared by each RPS, acting on behalf of their Head of School. The rationale and generic protocols for the accumulation of such waste are described in the RPS Information Pack, available *via* the Radiation Safety Unit webpage.

N.B. It is vitally important that the requirements and agreed procedures for waste transfer and disposal specified in each site EPR2011 Permit are followed, without deviation. Breaches of Statutory Instruments or site Permit conditions relating to waste accumulation or storage are liable to result in Enforcement Action by the EA and/or HSE.

The Central Low-level Waste (LLW) Store (South Campus)

For University Schools on the South Campus ONLY, accumulated LLW should be transferred at monthly intervals to the central LLW store managed by staff of the Radiation Safety Unit (see below).

The South Campus LLW store is constructed of materials that provide adequate resistance to fire, and is sufficiently well ventilated to prevent the accumulation of noxious and flammable vapours. Monitoring equipment is used to check that the area is always kept free from contamination.

Radiation workers must transfer LLW to the store in a safe manner, in accordance with Local Rules and protocols, and are required to assist the RPS in the execution of his / her duties. Radiation Safety Unit staff will manage the LLW store in line with the requirements of this Handbook and the conditions of the University's EPR2011 Permits.

Solid waste disposal from other University sites

For University Schools OTHER than those on the South Campus, the relevant EPR2011 Permit will specify the Permitted routes(s) for the disposal of LLW material. In the first instance radiation workers should discuss their waste disposal requirements with the area RPs, who will consult with the site RPO as and when necessary.

Environmental impact assessment

It is the requirement of the RWA to undertake periodic assessments of the environmental impact of the University's disposal of radioactive waste material. This assessment will be based on the quantities and nature of the released radionuclides, the routes employed, and the dilution of waste leaving the campus.

Pollution inventory & compliance record

The records of acquisition, use and disposal of radioactive materials made in each relevant laboratory will be collected by the RPS, summarised, and then submitted to the appropriate RPO at the end of each calendar month, for entry into the pollution control database. The

RPO will then check the waste record against the site Permit, consulting the RWA if necessary.

- The University site RPOs, acting on behalf of The User, must make a Pollution Inventory Declaration to the Environment Agency on an annual basis, by the end of February each year.

PART 6: COMPLIANCE AND RECORD KEEPING

Sealed sources:
Schools must compile and maintain records of the activities and locations of sealed radioactive sources; these should be kept for at least two years after the record was made. Accounting for sources must commence immediately after receipt of the source, and records should contain the following information:

- Means of identification (unique ID of source and container)
- Date of receipt
- Activity on date of receipt
- Location of source (updated regularly)
- Date and route of disposal/removal
- Activity on date of removal/disposal

Records of disposal should be kept for a minimum of 4 years.

Sealed radioactive sources must be uniquely identified, and the relevant details (source identification no., radionuclide, activity on receipt) must be recorded on both a local (i.e. School) and central register. Monthly checks should be made by the area RPS on the location of all sealed sources, records forwarded to the site RPO. The central register will demonstrate compliance with the site EPR2011 Permit. Where sources are used in different laboratories within a School, they should be logged in and out of an appropriate locked store or safe. Whilst out of secure storage, the location of such sources should be monitored by the RPS on a frequent basis (e.g. daily), and appropriate records kept.

The purpose of such records is to enable any losses to be identified quickly. Any ‘missing’ sources must be reported immediately to the RPS, so that relevant regulatory authorities (e.g. the EA, HSE, Police) may be informed. The site RPO must also be informed without delay.

An annual audit should be undertaken of all sealed sources to ensure that the accounting record is a true record. This will normally be undertaken by the site RPO.

Disposal of waste deriving from unsealed sources

Radiation workers must make full and proper records of their disposals of radioactive waste and to check these against their isotope usage records to ensure that all radioactive materials, and the quantities thereof, are accounted for at all times.

Radiation workers are required to monitor their workplace for contamination on each and every occasion that they work with radioactive materials, and to make and keep written records as appropriate.

PART 7: INFORMATION, INSTRUCTION AND TRAINING

This BAT Compliance Handbook presents basic instruction and information on how radiation work must be undertaken at the University of Manchester in order to comply with the underpinning legislation. This document is supported by individual sets of Local Rules, together with information and guidance notes and mandatory instructions which are available on the Radiation Safety webpage. Heads of Schools/Institutes / Academic Units, Academic Supervisors / Principal Investigators, radiation workers and other managers and persons who have a responsibility for work with ionising radiation must understand and comply with all mandatory instructions that are applicable to their work. It is the responsibility of these persons to familiarise themselves with the relevant University procedures; it is NOT the University's responsibility to bring their attention to such rules and procedures as might exist.

In order to become a registered user of radioactive materials within the University of Manchester, individuals must have received relevant **Information, Instruction** and **Training**. The provision of suitable and sufficient information, instruction and training is an essential component in equipping radiation workers and managers with the theoretical knowledge and practical skills to operate in a safe, efficient and effective manner.

Information is provided centrally by the University Radiation Safety Unit in the form of a one-day course in Radiation Safety Awareness. This includes an assessment exercise, on which the award of a Certificate will be determined.

Formal **instruction** is provided by the Local Rules, Risk Assessments, Systems of Work, etc relevant to the area and nature of the proposed work activity.

Training will be provided during a "probationary" period by the 'trainee' individual working alongside a person who is proficient in the relevant techniques or procedures.

Once deemed to have gained sufficient theoretical knowledge, and a level of practical competency consistent with safe working practices, the “probationary” trainee will be in a position to (i) complete the University form RW1, (ii) have this countersigned by their RPS and Project Supervisor (or Principal Investigator), and (iii) return it to the University RPA. The individual will then be entered onto the “Registered Radiation Users” database held centrally in the Radiation Safety Unit.

University Radiation Protection Supervisors are expected to attend the annual RPS Workshop organised by the University Head of Radiation Safety.