

Radioactive Substances Act Guidance (RASAG)

Chapter 2 - Authorisations

Operational instruction

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What's this document about?

This guidance provides information to support staff in carrying out non-nuclear regulatory duties under Radioactive Substances Act 1993 (RSA93).

This chapter deals with authorisation.



Document details

Who does this apply to?

RSR staff carrying out casework under RSA93

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Related documents



Feedback

This guidance note is intended for internal Environment Agency use, to assist officers in interpreting and enforcing the relevant legislation. The explanatory note is based on information contained in the relevant legislation, and on current understanding. The note may be subject to change in the light of regulatory changes, future Government guidance or experience of applying the legislation. In the interests of transparency, this note is available to others. However, it has no status other than as internal Environment Agency guidance to its staff. Compliance with the law remains the user's responsibility. If users have concerns over compliance, they should seek professional advice, or contact their regulator or local authority.

Contact for queries

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Non-nuclear very low level radioactive waste

1 Introduction

- 1.1 The Agency routinely authorises non-nuclear sites to dispose of VLLW from non-nuclear premises with ordinary refuse, subject to standard authorisation conditions. These conditions define VLLW including specifying the maximum activity to be disposed of in any 0.1 cubic metres of waste, of the maximum activity of any individual item, and the route by which the waste will be removed from the premises and disposed of. They are made in the light of the Government policy: "Policy for the long term management of solid low level radioactive waste in the United Kingdom", Defra, March 2007.
- 1.2 Such authorisations are intended to permit the disposal of small quantities of low activity radioactive waste, without further controls. Some RSA93 Exemption Orders also permit the disposal of VLLW.

2 Agency Policy

- 2.1 Generic assessments of the radiological impact of the disposal of radioactive waste as VLLW are such that the continued use of this disposal route for small quantities of VLLW is acceptable and should be authorised routinely. There is no requirement for any site-specific radiological assessment, in the case of disposals from non-nuclear premises.
- 2.2 The definition of VLLW now includes alpha-containing waste.

3 Standard Conditions of Authorisation

- 3.1 "very low level waste" means waste in the form of solid, which can be disposed of with municipal, commercial or industrial waste:
- each 0.1m³ of waste containing less than 400 kBq of total activity; and
 - single items containing less than 40 kBq of total activity.
- For wastes containing carbon-14 or tritium:
- each 0.1m³, the activity limit is 4,000 kBq for carbon-14 and tritium taken together; and
 - for any single item, the activity limit is 400 kBq for carbon-14 and tritium taken together.
- 3.2 The user may dispose of very low level waste as defined in Schedule 1 at any suitable location.
- 3.3 When deciding what is a suitable location for disposal, any hazardous properties of the waste should be taken into account since the requirements of the Hazardous Waste (England and Wales) Regulations 2005 do not apply to this waste.

Accumulation of radioactive waste on non-nuclear premises

1 Introduction

This guidance is intended to apply to radioactive waste accumulated on non-nuclear premises in accordance with the requirements of an authorisation or exemption order under RSA93 or the equivalent arrangements made by MoD. Users should also note the guidance issued by the Agency and HSE on control of radioactive substances (irp8) and security aspects of waste storage.

RSA 93 provides for users carrying out an undertaking on premises to accumulate radioactive waste under the terms of an authorisation, provided:

- the waste is accumulated with a view to disposal
- the premises is not on a nuclear licensed site
- the waste is not exempt from such authorisation through an Exemption Order or by an order made by the Secretary of State.

Officers will need to consider suitable arrangements for accumulation when determining applications for authorisation or during an inspection visit. Standard RSA93 authorisations and some RSA93 exemption orders contain conditions on accumulation of radioactive waste. Many of the decisions on accumulation of radioactive waste are required to be made on a “reasonably practicable” basis. Additional guidance on such decisions is given in the Agency’s current guidance on Best Practicable Means (BPM) (this can be found in the Radioactive Substances Act Guidance - Chapter 4 - Generic Issues).

Normally, Officers should not issue RSA93 permissions for processes which create wastes for which there is no likelihood of a suitable disposal route being available. An exception would be when disposal routes have temporarily closed, e.g. use of radium sources, which have been difficult to dispose of.

There are two generally acceptable reasons (below) for accumulation of radioactive waste. Any other reasons proposed by a user should be subject to careful site specific consideration with full supporting case. The generally acceptable reasons are:

- i. to allow short-lived radionuclides to decay, either to reduce the radiological impact of the subsequent disposal or to achieve compliance with activity or concentration limits, e.g. for very low level waste (VLLW) or Substances of low activity (SOLA) exemption limits.
- ii. to allow periodic disposals of individual consignments of wastes, for example organic liquid scintillant waste despatched to an incineration contractor, or VLLW collected with the ordinary refuse from the applicant's premises.

Accumulation for other reasons is only acceptable when clear benefits arise or reasons preventing prompt disposal have been identified by the applicant/user.

These should be assessed on a case by case basis. The following are examples of circumstances when this might be necessary:

- a) Where decommissioning work on a site results in creation of wastes which take a long time to dispose of, e.g. disposal to LLWR near Drigg may take a long time to arrange and complete after the waste was created.

- b) Closed sources which have become disused and are either:
- i. awaiting disposal but cannot be disposed of within the 12 week period of the Waste Closed Sources Exemption Order, or
 - ii. are not scheduled for immediate disposal because of the difficulty in allocating funds to pay for disposal.

Such sources should be included in authorisations with suitable accumulation time limits, when practicable. The time for accumulation in such circumstances should be agreed between the Officer and the user. If the time limit proves inadequate then the Officer may consider reissuing the authorisation with an extended period, provided he or she is content with the efforts being made for future disposal and with the storage arrangements. In the past, some waste sources have been accumulated for long periods because funding was not available. This is no longer considered appropriate – accumulation is a short-term measure and Officers should seek prompt disposal where possible.

The arrangements for accumulation of waste should be documented in order to make it clear that the waste is being disposed of as soon as reasonably practicable as required by authorisation conditions. This will form part of both the BPM Assessment and Management Systems in place.

Where there is a realistic potential for significant doses to workers from accumulated waste or from accidents involving accumulated waste, Officers should seek to ensure that the user has received suitable advice from an RPA and consider whether it is appropriate to seek a view from HSE.

2 Management of Waste

Accumulation of waste needs to be covered by written procedures in the user's management system. The organisational structure must be sufficient to support the accumulation of waste and adequate resources must be available. The waste must be managed to ensure that disposals are made:

- to the appropriate disposal route
- on the intended date after storage for decay

and to ensure that any necessary confirmatory checks (e.g. radiation monitoring) are carried out before disposal.

Specific guidelines are as follows.

- 2.1 The arrangements put into place should be proportionate to the risk posed by the waste, including security.
- 2.2 The storage arrangements must be tidy and well organised so that waste can be readily identified, lead to timely authorised or exempt disposal.
- 2.3 Waste must be labelled so that it is identifiable as radioactive waste and its origin and production date are clear. In the case of waste being disposed of as VLLW, it is appropriate to ensure that any such labels are removed or obscured before disposal takes place.

- 2.4 Appropriate records of accumulation should be kept until notified in writing by the Agency that they no longer need to be retained. The Agency has issued separate guidance (this can be found in the Radioactive Substances Act Guidance - Chapter 4 - Generic Issues) on interpretation of this requirement.
- 2.5 All relevant properties of the waste should be taken into account in planning and managing accumulation, e.g. biohazardous or clinical waste.
- 2.6 The period authorised for accumulation of VLLW should normally be two weeks, unless a longer period is warranted in terms of either a less frequent collection regime or storage for decay. Suitable accumulation periods for wastes accumulated for collection by an external specialist contractor, e.g. solid or organic liquid waste to be incinerated, should be judged on the circumstances of each case.
- 2.7 Accumulation for decay of aqueous wastes is acceptable provided suitable facilities have been provided. and a comprehensive BPM assessment, considering all relevant factors, including potential exposures to staff, supports such action. In cases where consideration of BPM means that accumulation for decay is the preferred option, Officers are advised to carefully check the basis of the BPM Assessment, as the costs can be significant; the Agency's current guidance on BPM is relevant (this can be found in the Radioactive Substances Act Guidance - Chapter 4 - Generic Issues).
- 2.8 The Agency's experience is that applicants may generally be able to manage the decay storage of wastes containing radionuclides with half-lives of up to a few weeks, such that the decay storage period is of the order of a few months. Iodine-125 (half-life of 60 days and moderately radiotoxic) is acceptable for accumulation, but longer-lived radionuclides would not normally be authorised for decay storage. I-125 requires accumulation for 1-2 years to provide a worthwhile reduction in activity and such long storage needs careful managerial control. Officers should be convinced that any proposals to accumulate longer-lived radionuclides represent BPM in waste handling.
- 2.9 The period for which waste should be kept to take advantage of optimum decay will depend on the half life and intended disposal route. The arrangements should ensure that the waste is kept for sufficiently long to benefit from the decay but not for unnecessarily long periods once the principal benefit from decay has been achieved.
- 2.10 The point in time at which accumulation of radioactive waste is considered to start is subject to some judgement from the relevant Agency Officer, e.g. in a laboratory where a short-term waste bin is maintained before transfer to a main waste store. The priority for the Agency is for proportionate regulation to achieve BPM in the protection of the environment by maintenance of control over the waste. Experience suggests that the most vulnerable point is transfer of the waste from the point of origin, and users' Management Systems should cover the issues of control and transfer satisfactorily. Control over emptying of laboratory bins and transfer of waste to the main store should be maintained by the user at all times; it is unsatisfactory to allow unskilled cleaners to carry out this operation. Provided effective control is maintained by the user, the period of authorised accumulation should normally be taken to commence when waste is transferred to a store from a laboratory or facility where the waste originates. However, the time in the laboratory should be reasonable, taking into account the overall hazard presented by the quantity, type and throughput of waste and the radiation types and activities. As a

guideline, a weekly laboratory holding period may be considered satisfactory in a range of circumstances.

2.11 In cases where the accumulated activity is substantial, an assessment of doses possible from a fire can be assessed using a methodology of the type specified in NRPB-W63. In such cases consideration should be given to the balance of doses between:

- doses to members of the public (critical group) from discharge without decay,
- doses to members of the public (critical group) saved with decay,
- doses to workers arising from the accumulation, and
- potential doses arising from accidents.

3 Arrangements for Accumulation

In general, Officers should consider whether the arrangements for accumulation of waste are reasonable, by reference to the type and volume of waste, the radionuclides and their quantities, the proposed storage facilities, and the proposed disposal routes. Stored wastes need to be suitably contained so as to prevent contamination of other materials. Flammable wastes must be protected from fire, although simple arrangements are sufficient where the hazard is low, see below.

The following aspects should be expected to have been considered by the applicant or user, with the objective of ensuring that accumulations are managed in accordance with the requirements of authorisation and exemption order conditions:

- 3.1 Suitable written procedures are included in the Management System.
- 3.2 Security of the waste against unauthorised access by people either within or external to the organisation. If there is any doubt about appropriate standards of security, users should be encouraged to seek advice from a Counter Terrorism Security Adviser (CTSA).
- 3.3 The waste store must be appropriately labelled according to the requirements of RSA93 authorisations and the Ionising Radiations Regulations 1999. Conflict between such labelling requirements and security concerns should be avoided where possible.
- 3.4 Protection should be provided from environmental factors such as heat, cold, humidity, mechanical damage, vermin, fire or flooding.
- 3.5 Safety from internal factors such as flammable or corrosive properties of the waste and chemical reactions within the waste should be considered.
- 3.6 Containment. Potential for loss from immediate containers may be rapid or slow, liquid, gaseous or powdered in form and loss may be caused by corrosion, radiation damage to container or mechanical impact, e.g. knocking over containers. Simple drums should normally be adequate for low hazard waste or higher containment for more hazardous waste.
- 3.7 To avoid double-handling of waste intended for off-site disposal, it may be appropriate for waste to be accumulated in containers that meet the requirements

of the relevant transport regulations, or disposal as appropriate, provided these are also suitable for containment in storage.

- 3.8 Radiological protection of workers is a matter for regulation by HSE. Waste stores should be designed and operated according to good radiological protection practice and any clear failings in this area should be noted and HSE informed.
- 3.9 Different waste types may need segregation within stores or separate stores depending on their physical, chemical, hazardous or radiological properties.
- 3.10 Readily decontaminable surfaces should be provided where necessary.
- 3.11 Information must be provided in the form of signs indicating important features, labels on waste containers and training of staff.
- 3.12 There should be adequate space and lighting.
- 3.13 There should be suitable ventilation when required.
- 3.14 Appropriate emergency equipment should be provided, depending on the hazards presented.
- 3.15 Measures to prevent contamination from waste in storage should be considered where necessary. This could include ready access to hand washing facilities or hand wiping cloths, especially where waste handlers may also be completing statutory records within the store.

4 Highly Flammable Waste

If the waste is itself dangerous because it could cause harm to people from fire or explosion, then the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) may apply. In a radioactive waste context such substances are most likely to be solvents or other flammable liquids. These regulations require employers to carry out risk assessments, provide measures to eliminate or reduce risk as far as reasonably practicable, provide equipment and procedures to deal with contingencies, provide information to employees and mark places where potentially explosive atmospheres may occur. When appropriate, Agency Officers should ask to see a copy of any risk assessment carried out under these regulations relating to radioactive waste. Additionally, certificates issued under the Fire Precautions Act 1971 may contain special requirements on storage of flammable materials or liquids.

HSE recommends that the following safety principles be used when working with flammable substances:

Ventilation – good ventilation will assist in dispersion of vapours from spills, leaks or other releases.

Ignition – avoidance of ignition sources such as electrical equipment or heating equipment.

Containment – e.g. lidded containers and spill trays.

Exchange – substitution of flammable substances with non-flammable ones.

Separation – use of a physical barrier to protect from damage and ignition.

Additional precautions that may be adopted to reduce the risk of fire include:

- Quantity kept to a minimum

- Smoking prohibited
- Good standard of housekeeping
- Different liquids should not be mixed
- Dedicated store rooms or appropriate segregation within a store
- Flammable liquids should not be dispensed or poured within stores.
- Fridge and other circuitry may provide a source of ignition for flammable liquids. Spark resistant lighting is recommended.

Specialist advice on the suitability of facilities for accumulation of flammable radioactive waste may need to be sought from a suitably qualified and experienced person when substantial quantities are being stored.

- See also [Fire Safety An Employer's Guide](#) by Home Office, Health and Safety Executive, Department of Environment (Northern Ireland) and Scottish Executive (HMSO, 1999).

RSA authorisation for NAIR participants

- 1 A consistent approach is needed and a suggestion has been made for inclusion of appropriate standard wording in all authorisations (excluding those issued for nuclear sites) held by Stage 1 Participants in the National Arrangements for Incidents involving Radioactivity (NAIR) to cover accumulation and disposal of any waste collected. By doing so the involvement of the user will be placed on a proper basis in relation to RSA93.
- 2 All new authorisations for non-nuclear NAIR participants should include the condition specified in 474_05 SD02, in the Modifications section of the Schedule. Currently this condition states:
 1. The user may accumulate radioactive waste, not being waste otherwise authorised to be accumulated, which is collected as a result of the user's participation in the National Arrangements for Incidents involving Radioactivity provided that the user:
 - i) without delay informs the Agency and
 - ii) as soon as practicable provides, in writing, available details of the nature of the accumulated waste, the radionuclides present and their activities.
 2. The user may dispose of radioactive waste, not being waste otherwise authorised to be disposed of, which is collected as a result of the user's participation in the National Arrangements for Incidents involving Radioactivity provided that the user:
 - i) transfers the waste to a person whom the Environment Agency has agreed in writing may receive that waste; and
 - ii) as soon as practicable provides available details in writing of the nature of the radioactive waste, the radionuclides present, their activities and the manner and date of disposal.
- 3 Where it is felt advantageous this may be done by the issue of a variation notice covering the specific conditions.
- 4 No charge will be made under the Charging Scheme for any change to solely to cover NAIR involvement.

Regulation of industrial tracer studies

An Industrial Tracer Study is one where radioactive material is released into a process and the study is carried out while the radioactive material is in the process. The radioactive material is then released from the process and it becomes radioactive waste. Control of the radioactive material is maintained whilst it is in the process and in theory, control is not lost by the operator until it is released to the environment. Examples include measurement of process flow rates and premises drain flows and process mixing studies.

Industrial Tracer Studies shall be regulated as follows:-

1 Operator carrying out tracer study on own premises

- 1.1 If the **operator** is carrying out the study on his own premises then he should apply on the appropriate forms (RSA1(Open Sources) and RSA3) for :-
- (i) a registration under section 7 of RSA93 to keep and use radioactive material, and
 - (ii) an authorisation under section 13(1) to dispose of the radioactive waste from the tracer study. The radioactive material will be released as waste from the process stream and also as contaminated items e.g. gloves, tissues etc. from carrying out the tracer study.
- 1.2 Some of the radioactive material used in the test may become incorporated in the operator's product. If necessary, to take account of this and to minimise the radiation dose to members of the general public, it is suggested that the following condition is added to the modifications section of Schedule 2 of the section 7 open source registration:
- "The company shall ensure at the time any of its products leave the premises that:
- a) the product shall contain no radionuclide, derived from the tracer study, of half life greater than 40 hours; and
 - b) the concentration in the product of all radionuclides derived from the tracer study, taken together, shall not exceed 0.4 Bq/g."
- 1.3 The section 7 registration shall state in Schedule 2 the maximum quantity of radioactive material that may be present on the premises at any one time and in the modifications section of Schedule 2 either the daily/weekly/monthly (as appropriate) usage for the proposed test.

2 Contractor carrying out tracer study on behalf of operator

- 2.1 If the study is to be carried out by a contractor on behalf of the operator on the operator's premises, then because the operator is in control of the process, he is in control of the release of the radioactive waste to the environment and must be authorised for the release.
- 2.2 The **operator** should apply on the appropriate forms (RSA1(Open Sources) and RSA3) for:-
- (i) a section 7 registration to keep and use radioactive material

- (ii) a section 13(1) authorisation to dispose of the radioactive material used in the study as radioactive waste.
- 2.3 Again to take account that some of the radioactive material may be incorporated into the product, the conditions given in 1.2 above should be included in the modifications section of Schedule 2 of the section 7 registration.
- 2.4 Inspectors should advise the operator that his contract or agreement with the contractor should specify that the contractor is to make himself aware of the conditions in the operator's registration and authorisation. In the event of non-compliance, only the **operator** would be subject to enforcement action and he would have to pursue the contractor for damage, negligence etc. through the terms of the contract.
- 2.5 If necessary the **contractor** should apply on the relevant forms (RSA1(Open Sources) and RSA3) for :-
- (i) a section 7 registration for his base location if the radioactive material to be used in the study will be held by the contractor at his base. If considered appropriate, limits may be specified in paragraph 4 of Schedule 2 in the contractor's registration of the maximum quantities of radioactivity that can be transferred to any one premises for the purposes of undertaking a tracer study. This would enable the Agency to take enforcement action against the contractor if he makes an error in this respect.
 - (ii) an authorisation under section 13(1) for his base premises to dispose of any unused radioactive material from the study and any solid radioactive waste e.g. contaminated gloves, tissues etc. generated during tracer studies and returned to the contractor's premises. The section 13 authorisation would normally be generic to cover studies at several locations.

Finally it is very important to differentiate between an Industrial Tracer Study and an Environmental Study.

In an Environmental Study the radioactive material is released into the environment and control is lost of the material. This is covered by the definition of section 9.2(b) of RSA 93 and is therefore covered by a registration under section 10. Examples of Environmental Studies are oil well studies and silt movement studies in river estuaries.

Applications should be submitted on form RSA2 (Environmental Studies).

Liquid discharges from hospitals via patients

- 1 When a radiopharmaceutical is administered to a patient, a percentage of the administered dose is excreted in the patient's urine and faeces, and is thus discharged to drain by the hospital. The percentage varies between different radiopharmaceuticals. Guideline percentage values, provide a reasonably pessimistic but practical basis for calculating the activity discharged in this liquid waste from hospital premises.
- 2 Authorised discharge limits set by the Agency, and disposer's systems for accounting for liquid waste disposals, have generally had regard to these best estimate percentage figures. But it has been accepted that, in specific cases, users may propose and officers may agree alternative arrangements if the disposer can provide information to justify departing from the guidelines. (For example, hospitals often assess the proportion of an I-131 administration for thyroid ablation therapy which is taken up by each individual patient). It is advised that this is a sound approach which should continue. A view should be sought from RSR Process Management on such cases.
- 3 The International Commission on Radiological Protection, in ICRP Publication 53, has published biokinetic data for radiopharmaceutical compounds.
- 5 Where patients have Tc-99m administered in one hospital and return to another, 30% of the administered dose is to be ascribed to the administering hospital and 10% to the hospital to which the patient returns. For other radionuclides the pessimistic "100% (or 30% or 50% or 60% if appropriate) at each" assumption should be made in the absence of evidence to the contrary.
- 4 The full list of figures for administered dose appearing in liquid waste is given in Table 1.

TABLE 1 Radiopharmaceuticals: percentage of administered dose taken as appearing in liquid waste

<u>I-131</u>	<u>Ablation Therapy</u>	<u>100%</u>
<u>I-131</u>	<u>Thyrotoxicosis treatment</u>	<u>50% inpatients, 30% outpatients</u>
<u>I-131</u>	<u>DAT scan</u>	<u>30%</u>
<u>Tc-99m</u>	<u>Range of scans</u>	<u>30%</u>
<u>P-32</u>		<u>30%</u>
<u>Ga-67</u>		<u>30%</u>
<u>Tl-201</u>		<u>30%</u>
<u>I-123</u>	<u>MIBG</u>	<u>60%</u>
<u>I-123</u>	<u>Other compound</u>	<u>100%</u>
<u>Y-90</u>	<u>For retention in the body in microspheres or other form</u>	<u>Zero</u>
<u>Y-90</u>	<u>Zevalin</u>	<u>10%</u>
<u>Others</u>	<u>Eg In-111, Se-75, Cr-51</u>	<u>100%</u>

Accumulation of technetium-99m waste

1 Introduction

This guidance is unusual in that it represents good practice which users of technetium- 99m would be expected to observe, and that it was produced by a user organisation (the Institute of Physics and Engineering in Medicine, IPEM) and endorsed by the joint Liaison Group operated by the Agency and 'Small Users' of Radioactive Materials.

It is issued within the Agency to promote an awareness of accepted good practice which Agency Inspectors may refer to when inspecting relevant premises.

2 Good Practice for Users Accumulating Technetium-99m Waste

This procedure applies **only** to technetium-99m waste which will normally be in the form of sharps in a cin-bin or similar container. There is no reason why this procedure cannot equally apply to other forms of technetium waste.

- 2.1 Waste containers should not be overfilled. Normally they should be sealed when two thirds full.
- 2.2 There is no need to record the activity of individual items (*i.e.* hypodermic needles) disposed of into the waste container.
- 2.3 When containers are sealed, their total activity should be determined using a suitably calibrated monitor. Normally this will be a contamination monitor fitted with a scintillation probe. The monitor should be regularly tested under the responsibility of the Qualified Person.
- 2.4 The container(s) should then be placed in a suitable locked store. Stores suitable for the accumulation of radioactive waste have been described in a number of publications (*e.g.* IPSM Report 63).
- 2.5 The container should remain in the store for a period of at least one week (7 days).
- 2.6 On removal from the store the container(s) should be checked with a contamination monitor to ensure that there is no residual activity which would indicate the presence of isotopes other than technetium-99.
- 2.7 If activity is detected, the container should be returned to the store and thereafter considered as other radioactive waste to be disposed of accordingly through an approved route. An attempt should be made to determine the isotope present.
- 2.8 Containers verified as technetium waste should be disposed of promptly as non-active waste (clinical or domestic, according to type).
- 2.9 A record should be made of each container placed in the store. This should record the date that the container entered the store, the activity on that date and the date of disposal (*i.e.* removal from the store).
- 2.10 If the accumulation of technetium-99m waste is undertaken in a store used for **the** accumulation of other radioactive waste it must be segregated.

Guidance on requirements for revocation of rsa93 non-nuclear authorisations

1 Introduction

This guidance note is primarily aimed at providing guidance to small non-nuclear users in the medical, research, and pharmaceutical sectors on the requirements when seeking revocation of authorisations issued under the Radioactive Substances Act 1993 by the Environment Agency. It does not apply to radioactively contaminated land legislation, which is subject to separate guidance. The scope of advice is restricted to the Radioactive Substances Act 1993; there may also be obligations on the user under other legislation, including the Ionising Radiations Regulations 1999 (for example, making notification to the Health and Safety Executive).

2 Procedural Steps

Requesting the Environment Agency to revoke an authorisation under the Radioactive Substances Act 1993 to accumulate and/or dispose of radioactive waste (falling within the scope of the Act) implies that no radioactive waste remains on the site and that no more will be created. It is also taken that residual contamination on the premises constitutes waste if the premises are being redeveloped or demolished or contaminated soil is being excavated, and the authorisation to accumulate this waste needs to remain in force until it has been demonstrated that residual contamination has been removed. The Environment Agency will not revoke an authorisation until it is satisfied that no radioactive waste remains on the site that is subject to regulation under the Act. Rights of appeal exist against certain decisions taken by the Environment Agency.

The procedure to allow an applicant to achieve revocation of a non-nuclear authorisation certificate can be broken down into five steps:

1. historical research
2. sampling and monitoring strategy
3. remediation strategy
4. agreement of end point criteria
5. implementation of sampling, monitoring, remediation, waste disposal and submission of documentation, including clearance survey reports

These are not chronologically sequential and, for example, the “end point” will influence the monitoring and remediation strategies.

It should be borne in mind that biological or chemical contaminants may also be present during the clean up of a site. Advice should be sought as appropriate on safety and legal aspects of this.

Costs are not addressed in this guidance, either relating to remediation measures or Agency costs, which might be charged under section 37 of the Environment Act 1995. Current practice is that normal subsistence rates are charged by the Agency on all authorisations (with fees for intermediate and major variations if necessary) until the authorisation is cancelled. The current charging scheme should be consulted in respect of subsistence for any authorisation revocations. It should be expected that requests for revocation may take considerable time in complex cases.

3 Site Redevelopment

Although this guidance speaks in terms of final revocation of the authorisation certificate, the same logic applies to site redevelopment where work with open sources will continue, and there may be only a change in use or closure of part of the facilities. For example equivalent measures to final revocation should be applied to the demolition of an incinerator or radiochemical laboratory. It is recommended that the redevelopment is discussed with the local inspector with respect to Agency requirements.

4 Public Information

The applicant should appreciate that, although not all details are placed onto public registers, under the Freedom of Information Act and Environmental Information Regulations 1992, any potential purchaser of the land is entitled to request full details in deciding what liability, if any, is being purchased. It is in the interest of both the Agency and the applicant for revocation that a thorough well-documented exercise is carried out. The inspector will be preparing an internal audit trail in deciding whether revocation of an authorisation is recommended.

Step 1 Historical research

It is an obligation on the authorisation holder to keep records of radioactive waste disposals made during the lifetime of the current authorisation and previous authorisations. This is not generally a problem for recently authorised sites. Although there are recommended minimum retention periods for records (RASAG), it will assist the operator in pursuing revocation of an authorisation if a summary of the information is preserved indefinitely. However, for older sites there may have been site redevelopment and records may be incomplete. It is worth doing as much detective work as possible looking at site plans including drainage, identifying areas where open sources have been used, speaking to retired or current workers and collating old cancelled certificates. The Environment Agency may be able to assist by examining its own files, which in some cases date back to 1963. **At all stages of revocation dialogue with your local inspector is recommended.**

It is important to validate any site maps, building plans, and drawings of drains and ventilation systems by physical inspection.

In collating the information it may be useful to cross-refer to, and divide into zones, a site map (including drains) by risk into areas where use of open sources was

- known,
- suspected, and
- unlikely to have taken place.

The half-lives of the individual radionuclides will be relevant since short-lived radionuclides will be expected to have decayed away and that long-lived nuclides (e.g. tritium and carbon-14) may only be those of significance. Old authorisation certificates can be informative where no records exist. Where known use buildings (or stores) have been demolished there will be a need to confirm that

no contamination is left, particularly in drains, and annotation of the site map should reflect this.

The size of holding and scale of the work with open sources will be useful information. Certificates will give details of disposal routes (which may include soakaways), and for on-site incineration it is particularly important to identify where ash and pollution abatement residues were disposed of (often in the site grounds) and identify plume deposition zones. A survey of the land topography and walk-over surveys with a low level gamma monitor may assist in identifying any areas where waste has historically been buried. In such cases, or where there is evidence of damage to drains, potential pathways to the environment outside the site boundary should be investigated (e.g. limited invasive contamination monitoring).

In summary, it should be relatively straightforward to identify potentially contaminated areas on recently authorised sites or sites where only short half-life radionuclides have been used. The more difficult sites are where there was use prior to 1963 (when the Radioactive Substances Act 1960 came into effect), and where the absence of information is compounded by poor disposal practices, where there was use of working surfaces prone to persistent contamination, or where potentially contaminated areas have been covered up.

Step 2 Sampling and monitoring strategy

Having collated the information on potentially contaminated areas it is appropriate to make contact with the local Environment Agency inspector as soon as possible in order to discuss the proposals. To carry out surveys and remediation that does not satisfy the Agency's requirements could be expensive.

The types of surface involved and the radionuclide characteristics need to be considered if direct monitoring, swabbing or depth profiling (by core sampling) are needed. Different protocols are appropriate to different risk zones on the site map. Where areas to be sampled are large then the applicant should indicate his proposed sampling matrix. Accessible points in the discharge system (liquid or gaseous) may be suitable for demonstrating that discharge routes are free of contamination. Monitoring costs, particularly for direct monitoring are not large, and for a large site several hundred data points would be reasonable, with higher resolution around zones of known or suspected contamination. Use of monitors linked to global positioning systems may be justified in some cases. The use of portable gamma spectrometry equipment may also be appropriate in order to fingerprint the isotopic composition of different areas. This would also assist in estimating the inventory of waste for disposal.

Although there are obvious items for detailed investigation along authorised disposal routes such as sinks, delay tanks, incinerator stack linings and fume cupboard ducting, accidental contamination such as on or in benches and floors must also be considered.

The monitoring instruments selected must be appropriate for the radionuclides and be sufficiently sensitive. Special consideration should be given to monitoring for soft beta emitters (e.g. S35, C14) and electron capture nuclides (e.g. Fe55) where direct monitoring may not be possible because of shielding. For H3, swabbing and analysis of samples will normally be appropriate. analysis of samples from a range of depths may be required. The limits of detection must be

below the end point clearance criteria that have been agreed. The calibration of monitoring instruments must be auditable within a quality assurance system.

After remediation of an area, validation monitoring will be needed in order to demonstrate that the remediation work has been successful. This may be carried out at the same time as the remediation works for practical purposes e.g. to define that the removal of contaminated materials has been adequate. An agreed sampling and monitoring regime may be a condition within the certificate of authorisation to accumulate and dispose of the waste.

Step 3 Remediation Strategy

The use of a dose or risk assessment by the applicant in assessing options for remediation is encouraged by the Agency for certain sites, such as radium contaminated sites. The applicant should clarify whether the remediation work intended is either a practice or an intervention. Predictive dose estimates for the intended future use of premises may be useful in determining whether any planning restrictions should be applied to the site, and may contribute to determining the residual risk level to which remediation is pursued. Such dose estimates may need to include probabilistic estimates of future habits, occupancy etc.. The Health and Safety Executive should be consulted on aspects relating to workplace exposure to ionising radiation.

The results of the sampling and monitoring will assist in defining an approach to the remediation works. Three important points must be made:

- The accumulation and disposal of radioactive waste must be authorised, unless it is covered by an Exemption Order. A variation to an authorisation may be necessary e.g. a transfer route to the LLWR near Drigg may need to be authorised for non-combustible low level waste if there are no locally available disposal routes such as controlled burial. It will be necessary to make estimates of the volume and isotopic inventory likely to be generated in each waste stream during decommissioning. To avoid delay in issuing the variation, early dialogue with the Agency and any waste recipients is needed.
- Optimisation of decontamination should be applied where secondary wastes are created and segregation of wastes should be carried out in order to minimise the volume of solid waste generated, and to ensure that the most appropriate disposal routes are used.
- Waste is categorised by its specific activity when created, and deliberate dilution with substantially non-active material in order to meet clearance levels or exempt levels of material is not generally permitted. The sampling volumes and protocols need to be agreed.

In addition to these guiding principles, operators should be aware of disposal routes permitted under relevant Exemption Orders which might be appropriate. Use of Exemption Orders carry important obligations, such as record keeping, which must be adhered to. Clearance of radium contaminated sites, for example, may rely heavily on the application of the *Phosphatic Substances, Rare Earths etc.* Exemption Order and the interpretation of the schedule limits for radium should accord with Agency guidance.

The recycling of wastes (such as gaseous tritium) should be explored as an option, rather than to transfer waste for disposal at a third party site.

Step 4 Agreement of Endpoint

Current standards for deregulation of premises are site specific and will need to be agreed with the local inspector, but are usually a combination of the following parameters:

- a limit on the specific activity of material remaining on the site (e.g. from Schedule 1 of the Act, the *Substances of Low Activity Exemption Order*, or the *Phosphatic Substances, Rare Earths etc. Exemption Order*)
- a dose rate limit
- a surface contamination limit for alpha emitters
- surface contamination limits for beta-gamma emitters and electron capture nuclides

Such limits may be derived from predictive dose estimates to future occupiers of the premises. Taken on a case by case basis, these limits might typically be:

- 0.4 Bq/g for solid material (the limit in the SoLA Exemption Order),
- an ambient dose rate comparable with the local regional background, and
- the surface contamination limits, or a fraction of them, specified in guidance such as NRPB (now HPA) publication DL2 for contamination of work areas to where access need not be restricted.

The area over which surface contamination measurements are averaged should be limited to that which is typically applied in occupational protection, e.g. 1000 cm² for floors, walls and ceilings. Widespread contamination over more than such an area may require further decontamination even if it were below the limits which had been agreed. The volume over which activity is averaged should be agreed with the Environment Agency inspector and will depend on the volume of waste arising.

Dose rate limits will depend on the ambient background and the future use for the site.

The NRPB (now HPA) publication *Radiological Protection Objectives for Land Contaminated with Radionuclides* is a useful discussion document that recommends a “design target” residual risk of 10⁻⁶ per year, below which the requirement for optimisation of protection could be relaxed. This corresponds to an annual individual dose below about 30 microSieverts.

STEP 5 Implementation of sampling, monitoring, remediation, waste disposal, and submission of documentation, including clearance survey reports.

The onus of proof is on the applicant, therefore attention should be given to documenting the work and a draft final report should be discussed with the local inspector. It may be necessary to diverge slightly from strategies if unexpected contamination is found. In a building by building demolition, a staged submission to the inspector may be appropriate. A large volume of numerical data will benefit from commentary and summary maps and tables.

Retention of Records

Records should be retained within the document management system of the organisation for a period and at a place agreed with the local inspector. Under section 20 of the Radioactive Substances Act 1993, the Environment Agency may impose requirements on the holders of authorisations or registrations to retain records for a specified period before certificates are cancelled/revoked. Also Inspectors should use this section to require copies of important records to be furnished to the Environment Agency for long term retention after the authorisation has been revoked.

It is generally advisable to retain records of the site history in view of possible future redevelopment or land sales. If the project comes within the scope of the Construction (Design and Management) Regulations, then it may be appropriate to include summary information about the remediation work and clearance monitoring in the Safety File for passing to the new owner. Otherwise important record should be retained by the Agency.