

DRAFT FOR COMMENT

**SAFEGROUNDS GOOD PRACTICE GUIDANCE FOR THE
MANAGEMENT OF CONTAMINATED LAND ON
NUCLEAR AND DEFENCE SITES**

Version 2

Outline Contents

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PART 1 INTRODUCTION AND OVERVIEW

1 INTRODUCTION

1.1 Scope

- The guidance focuses on the two major types of site on which radioactive contamination is likely to be found: *nuclear-licensed sites* and non-nuclear *defence sites*.
- *Nuclear-licensed sites* include civil nuclear sites that are being used for electricity generation or other purposes, defence nuclear sites that are being operated for MoD by contractors, and nuclear sites that are being decommissioned and are the responsibility of the NDA. Most of the radioactive contamination on such sites is from past activities and has been there for years or decades.
- The most common source of radioactive contamination on non-nuclear *defence sites* is the production, maintenance and disposal of luminised instruments for vehicles, aircraft and ships. The peak period for luminising was from the 1930s to the 1970s. MoD has a programme of work to clean-up its non-nuclear sites and sell those that it no longer needs.
- The guidance is for *radioactive, non-radioactive and mixed contamination* on nuclear-licensed sites and those non-nuclear defence sites on which there is radioactive contamination. It does not apply to non-nuclear defence sites on which there is only non-radioactive contamination.
- Most of the guidance is about radioactive contamination and mixed contamination, including interactions between radioactive and non-radioactive contaminants, and how the presence of radioactive contamination can influence how non-radioactive contamination is dealt with. There is a considerable amount of other guidance on managing land that only has non-radioactive contamination and this is signposted, as is guidance for unique aspects of defence sites (eg the possible presence of explosives and ordnance).
- For completeness, limited guidance is given for other types of site on which there is, or could in future be, radioactive contamination. These are:
 - *nuclear defence sites* that would be nuclear-licensed sites if the Nuclear Installations Act 1965 applied to the MoD (these are called here 'non-licensed nuclear defence sites')
 - former and current industrial, medical and research sites on which there is *long-standing radioactive contamination* from past activities
 - land outside the other types of site that has recently been *contaminated by a nuclear accident or radiological emergency*.
- In the last of these cases the guidance is for dealing with radioactive contamination in the longer term, after short and medium term countermeasures have been taken and when the land is being restored or prepared for new uses.
- For all types of site, the guidance covers *strategic* approaches for all the contaminated land on a site and case-by-case approaches for *specific areas*.

1.2 Purpose

- To help those responsible for the management of contaminated land and inform other stakeholders.
- To supplement government and regulatory guidance.

1.3 Status

- This is the second version of the guidance and like the first it is a living document that it is intended to revise at intervals in the future.
- The guidance is not binding on site owners/operators and has no legal standing.

- Participation in SAFEGROUNDS (by organisations or individuals) must not be taken as an indication of support for or disagreement with the whole of the guidance.

1.4 Structure

- The guidance is in four parts:
 - Part 1 contains this introduction, the SAFEGROUNDS key principles for the management of contaminated land on nuclear and defence sites, and an overview of the process of managing contaminated land.
 - Part 2 contains guidance for the whole of the management process, in general and for the various types of site.
 - Part 3 contains guidance for each stage in managing contaminated land, in general and for the various types of site.
 - Part 4 contains a list of references, in which the most important ones are highlighted (eg statutory and regulatory guidance documents), and a glossary, including a key to acronyms).
- The SAFEGROUNDS documents that support this main guidance are:
 - Citizens' Guide (currently being drafted)
 - Option Comparison Guide (currently being drafted)
 - Site Characterisation Guidance (currently being revised)
 - Guidance on Assessment of Health and Environmental Risks (to be revised during 2008)
 - Record Keeping Guidance (about to be published on the website)
 - Regulatory Framework Information Paper (new version about to be published on the website).

1.5 Definitions

1.5.1 Contaminated Land

- The guidance uses the terms *contaminated land*, *radioactively contaminated land* and *non-radioactively contaminated land* with the following meanings:

contaminated land – any land in, on or under which there are radioactive or non-radioactive contaminants above natural and artificial background levels that are typical of the area of the UK in which the site is located.

radioactively contaminated land – any land in, on or under which there are radioactive contaminants above natural and artificial background levels that are typical of the area of the UK in which the site is located.

non-radioactively contaminated land – any land in, on or under which there are non-radioactive contaminants above natural and artificial background levels that are typical of the area of the UK in which the site is located.

- These definitions are for the purposes of SAFEGROUNDS only.
- They have been chosen because they best reflect the views of stakeholders on the levels of contamination with which the SAFEGROUNDS guidance should be concerned.
- Guidance on determining background levels typical of an area is given in Section 10.2 and expanded in the revised site characterisation guidance.
- Where it is necessary to refer to other definitions in statutory, government or regulatory guidance quotation marks are used and the source of the definition given, eg “contaminated land” as defined in the Part 2A regime for England and Wales. Details of these other definitions are given in the Regulatory Framework Paper.

1.5.2 Management and Remediation of Contaminated Land

- The terms *management* (of contaminated land) and *remediation* (of contaminated land) have the following meanings in this guidance.

management of contaminated land – the taking of any actions to detect, characterise, control, monitor or remove (wholly or partially) contamination in, on or under land, and all the processes that lead up to decisions to take such actions.

remediation of contaminated land – the taking of any actions to reduce the risks to humans or other organisms from contamination in, on or under land.

- These definitions are for the purposes of SAFEGROUNDS only.
- They have been chosen to be consistent with the scope of SAFEGROUNDS guidance.
- With the definition above, remediation is a part of management, because control or removal of contamination reduces risks.
- Prevention of contamination is excluded from management because it is outside the scope of SAFEGROUNDS.
- Where it is necessary to refer to other definitions in statutory, government or regulatory guidance quotation marks are used and source of the definition given, eg “remediation” as defined in the HSE SAPs. Details of these other definitions are given in the Regulatory Framework Paper.

1.5.3 Strategies and Options for the Management of Contaminated Land

- In this guidance an *option* is a method, approach or technology that can be used for the management of a specific area of contaminated land.
- A *strategy* is a broad plan for the management of all the contaminated land on a site. It will often include different options for various areas within the site.

1.5.4 Stakeholder Involvement

- *Stakeholders* are all the people with an interest in the management of the contaminated land. They include regulators, local authorities, government departments (central and in the devolved administrations), site owners, site operators, local residents, CBOs and NGOs.
- *Involvement* includes communication, provision of information, consultation and participation in decision-making processes. It does not include taking final decisions on how to manage contaminated land because these are always the sole responsibility of the site owner or operator (on nuclear-licensed sites the licensee and on defence sites MoD).

2 KEY PRINCIPLES FOR THE MANAGEMENT OF CONTAMINATED LAND

- SAFEGROUNDS has identified five key principles for the management of contaminated land on nuclear and defence sites. The principles are complementary and apply at various stages in land management (see Section 3). They are:

Principle 1: Protection of People and the Environment

The fundamental objective of managing contaminated land on nuclear-licensed sites and defence sites should be to achieve a high level of protection of people and the environment, now and in the future.

Principle 2: Stakeholder Involvement¹

Site owners/operators should develop and use stakeholder involvement strategies in the management of contaminated land. In general, a broad range of stakeholders should be invited to participate in decision-making.

Principle 3: Identifying the Preferred Land Management Option

Site owners/operators should identify their preferred management option (or options) for contaminated land by carrying out a comprehensive, systematic and consultative assessment of all possible options. The assessment should be based on a range of factors that are of concern to stakeholders, including health, safety and environmental impacts and various technical, social and financial factors.

Principle 4: Immediate Action

Site owners/operators should take measures immediately to monitor and control all known (or suspected) contamination and continue such measures until an acceptable management option has been identified and implemented.

Principle 5: Record-Keeping

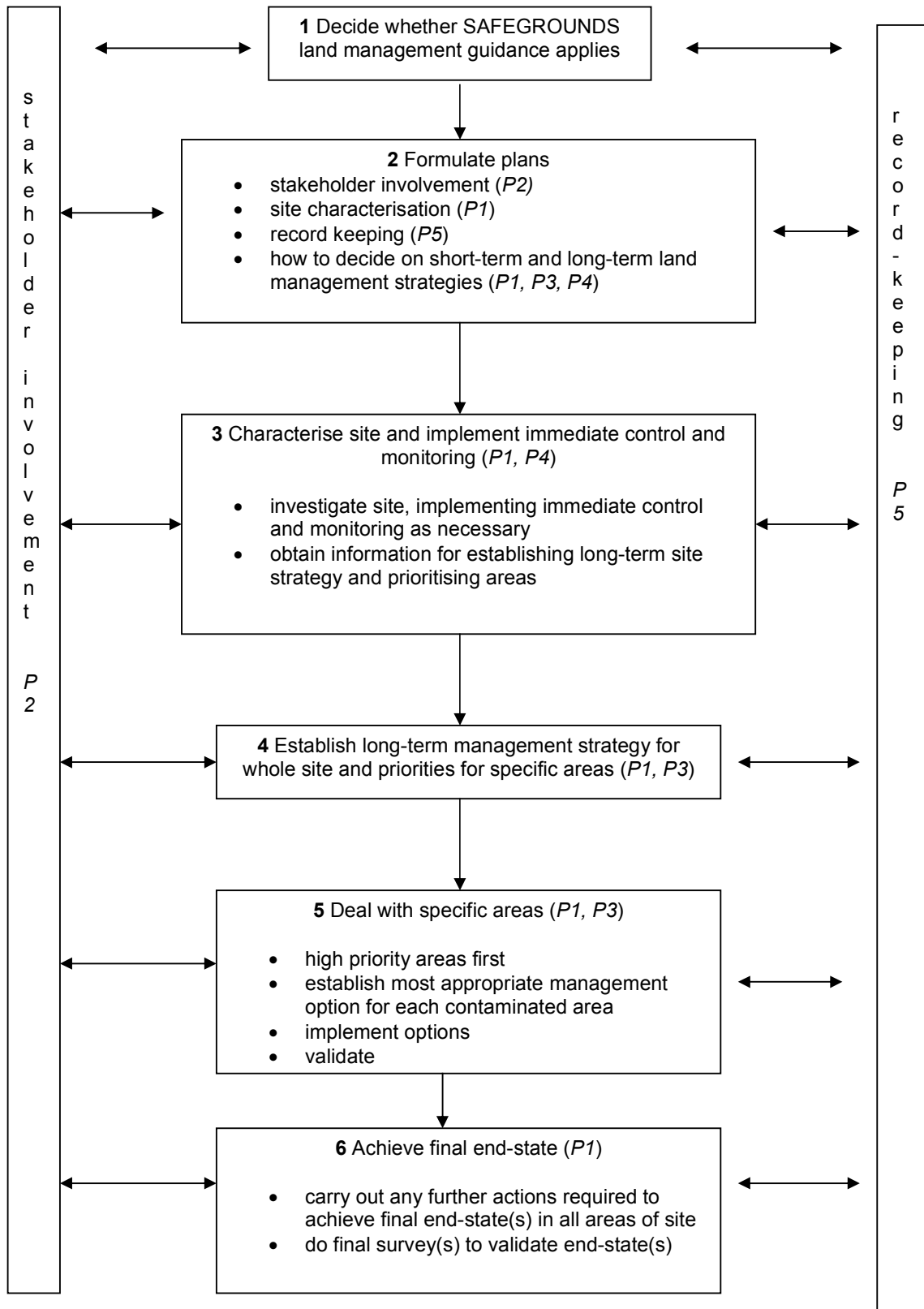
Site owners/operators should make comprehensive records of the nature and extent of contamination, the process of deciding on the management option for the contaminated land and the findings during the implementation and validation of the option. All records should be kept and updated as necessary.

¹ There is a suggestion to change the wording of this principle, see consultation document.

3 OVERVIEW OF THE PROCESS OF MANAGING CONTAMINATED LAND

- Figure 1 shows a generic flow diagram for the management of contaminated land. In the diagram, P1, P2 etc are the key principles (see Section 2).
- Principles 2 (stakeholder involvement) and 5 (record-keeping) apply throughout the land management process. In Figure 1, the arrows between the boxes for these principles and the boxes for the various land management stages are all two-way. This is because stakeholder involvement includes communication, consultation and participation (see Section 1.5.4) and because site owners/operators should use records as well as make records (see Section 8 and Record Keeping Guidance).
- The process begins with a decision as to whether this guidance applies (box 1 in Figure 1). It applies if it is known or suspected that radioactive contamination is present on the site, with or without non-radioactive contamination. In this context, 'radioactive contamination' is defined to be any concentration of radionuclides above the ubiquitous natural and artificial background for the area in which the site is located (see Section 1.5.1). The guidance does not apply if it is certain that there is only non-radioactive contamination on the site.
- The arrow to and from 'stakeholder involvement' represents asking some stakeholders whether they have any information about whether a site may be radioactively contaminated, then informing all stakeholders that it is known or suspected that there is radioactive contamination on the site. In practice stakeholders may not be asked for information or informed that radioactive contamination is known or suspected to be present until later, when they are consulted about the site owner's/operator's plans for how to proceed.
- The site owner/operator should identify the relevant legislation and statutory and regulatory guidance as soon as possible after deciding that the SAFEGROUNDS guidance applies (see Section 5).
- The next stage (box 2 in Figure 1) is to formulate plans for stakeholder involvement throughout the rest of the land management process, and plans for site characterisation, record-keeping and taking the decisions on the short-term and long-term strategies for the management of the contaminated land.
- The appropriate level of stakeholder involvement varies from one type of site to another and from one stage in land management to another. The stakeholder involvement strategy should be tailored to the situation (see Section 7).
- It is good practice to consult stakeholders about site characterisation plans because they may have views on the contaminants of concern, the techniques to be used etc (see Section 10.2 and Site Characterisation Guidance).
- The short-term strategy for managing the contaminated land consists of the control and monitoring measures that it would be appropriate to implement as soon as practicable after contamination is discovered, and criteria for deciding when to implement such measures in a particular area (see Section 10).

Figure 1 Generic Flow Diagram for Management of Contaminated Land



- There are several steps in establishing the most appropriate long-term management strategy for a site or the most appropriate management option for an area within a site (boxes 4 and 5 in Figure 1):
 - identifying envisageable strategies/options
 - screening out those that are not feasible or are clearly unacceptable
 - assessing and comparing the remaining strategies/options on a range of attributes
 - making a decision.
- Stakeholders should be involved to some extent in all these steps (see Option Comparison Guide for further details of the assessment and comparison process).
- Assessments of health and environmental risks should begin as soon as enough site characterisation data are available. They are particularly important for providing input to prioritisation of areas and comparisons of potential management strategies and options. The supporting document on assessments of health and environmental risks gives further guidance on the types of assessment required at each stage.
- The last stage in the land management process is to achieve the final end-state, ie the one beyond which no further action is required. There may be one final end-state for a whole site or different final end-states for various areas.
- If the chosen long-term management option does not achieve the final end-state at the time of implementation (eg if it is long-term control and monitoring to allow radioactive decay), further action may be needed, perhaps many years later (eg removal of residual contamination).
- In all cases a final survey or surveys should be performed to validate that the final end-state has been achieved in all areas of a site.
- For simplicity, iterations have been omitted from the generic diagram in Figure 1. In practice, several parts of the land management process are iterative. For example, the long-term management strategy for the site will probably need to be reviewed in the light of experience in implementing options for specific areas.

PART 2 **GUIDANCE FOR THE WHOLE PROCESS OF MANAGING
CONTAMINATED LAND**

4 IDENTIFYING MANAGEMENT STAGES

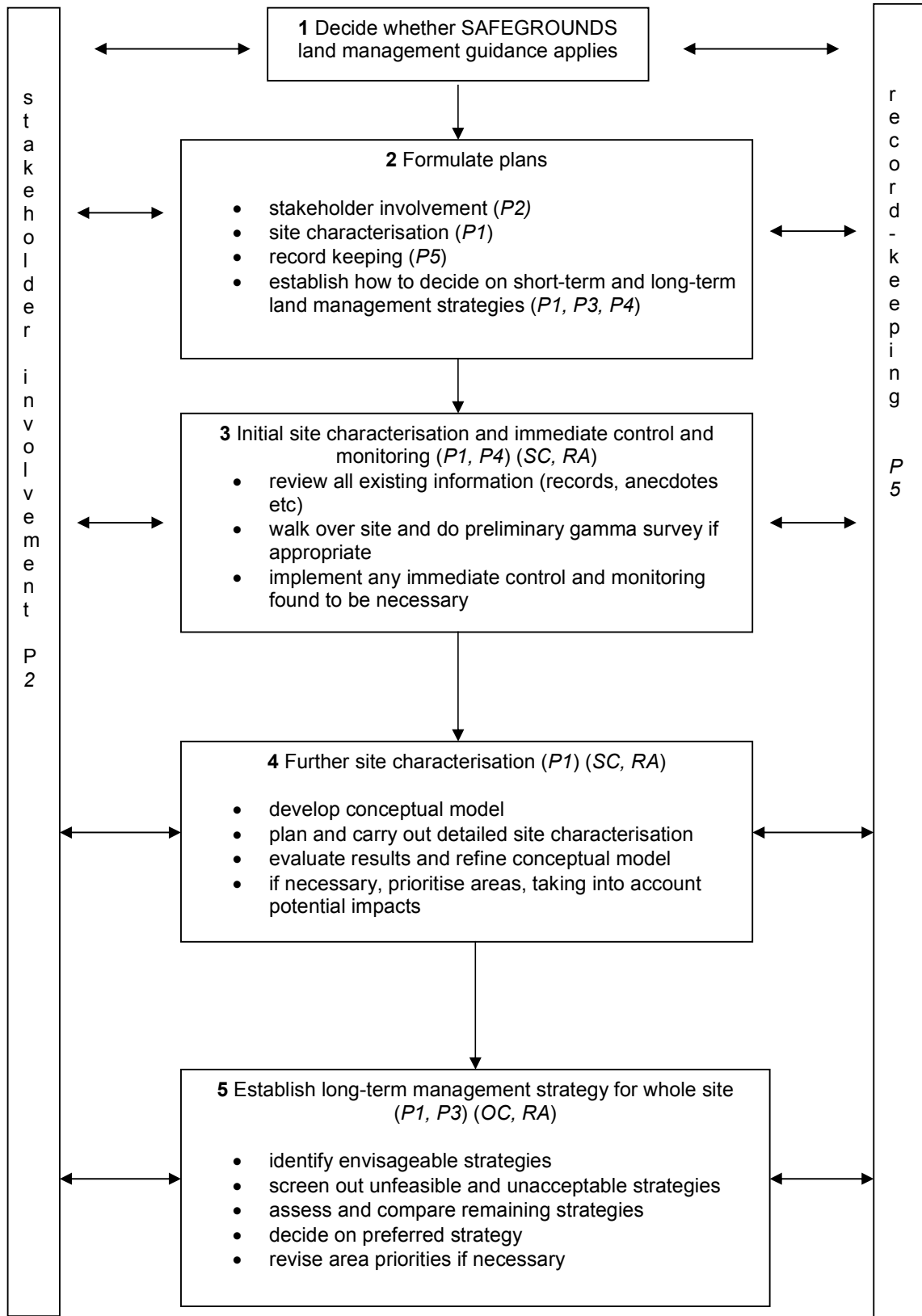
- It is recommended that site owners/operators prepare a flow diagram for the management of contaminated land on their site. The complexity of the diagram should be consistent with the patterns of contamination that are known or anticipated to be found.
- For sites with only one or two areas of contamination, or with relatively uniform contamination over the whole site, the generic diagram in Figure 1 could be used.
- Figure 2 shows the type of diagram that would be appropriate for a site with several areas of contamination. Figure 3 shows a diagram for a very complex site (for example one of the older nuclear sites on which there have been many different types of activities over several decades).
- The differences between the diagrams are in the number of stages involved in initial site characterisation, control and monitoring, and dealing with the various areas of the site in turn (see Table 1).

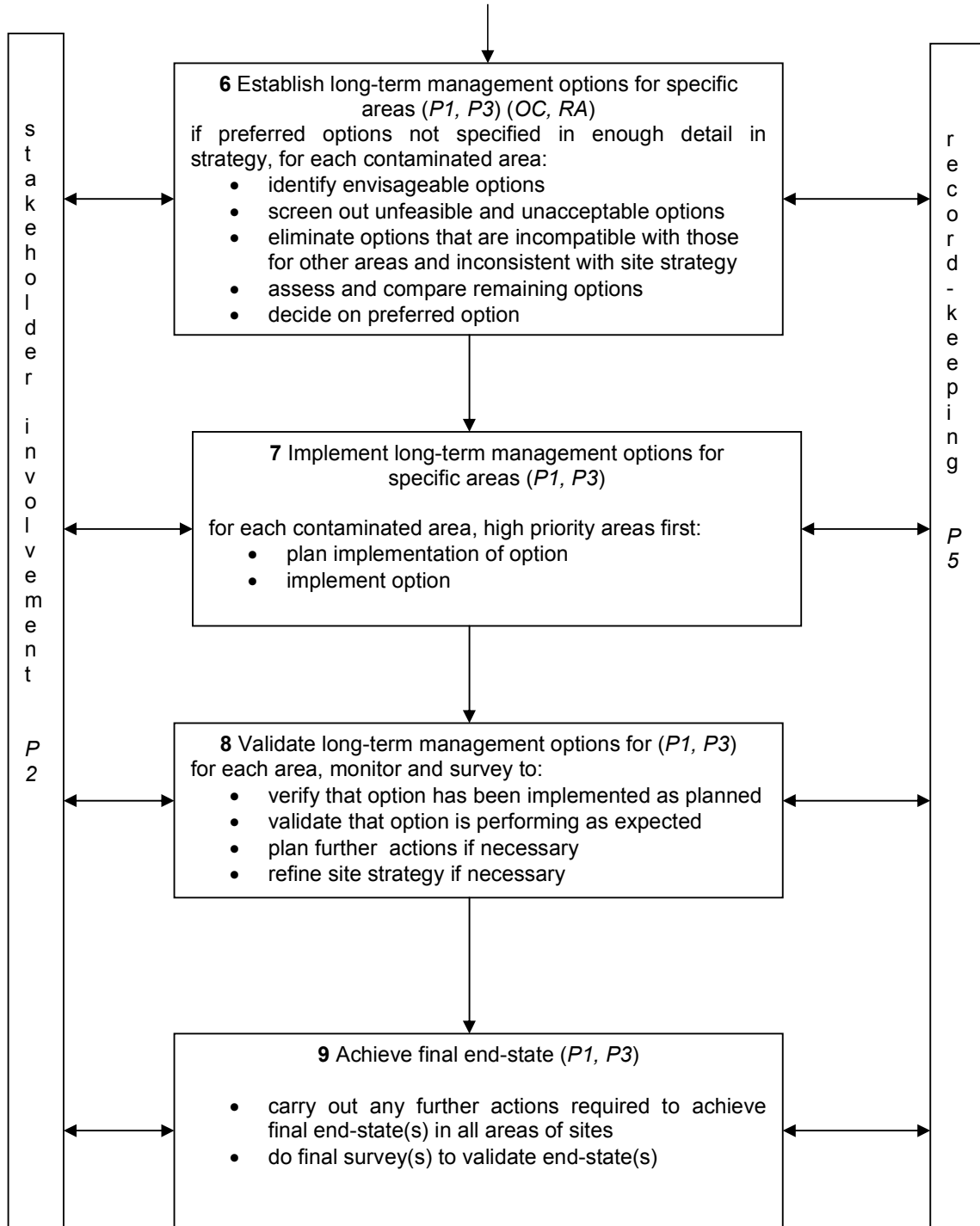
Table 1 Stages in Managing Contaminated Land

<i>Main stage in land management process</i>	<i>Box no. in flow diagram</i>		
	<i>Figure 1 Generic Diagram</i>	<i>Figure 2 More Complex Sites</i>	<i>Figure 3 Very Complex Sites</i>
Deciding this guidance applies	1	1	1
Formulating plans	2	2	2
Site characterisation and immediate control and monitoring	3	3-4	3-7
Establishing long-term land management strategy	4	5	8
Dealing with high priority areas	5	5-8	9-11
Dealing with other areas	5	5-8	12-15
Achieving final end-state	6	9	16

- On a very complex site it is necessary to classify areas and prioritise them for action (boxes 4-6 in Figure 3) before carrying out detailed characterisation. The high priority areas are then dealt with first when a long-term management strategy for the site has been agreed (boxes 9-11 in Figure 3).
- On all sites it is essential that the short-term and long-term strategies for the management of contaminated land are consistent with the objectives and plans for the whole site. For example, on a nuclear-licensed site that is being decommissioned, the contaminated land management strategy should be consistent with the decommissioning strategy for the site, including the chosen end-state(s), and the integrated waste strategy.

Figure 2 Flow Diagram for More Complex Sites





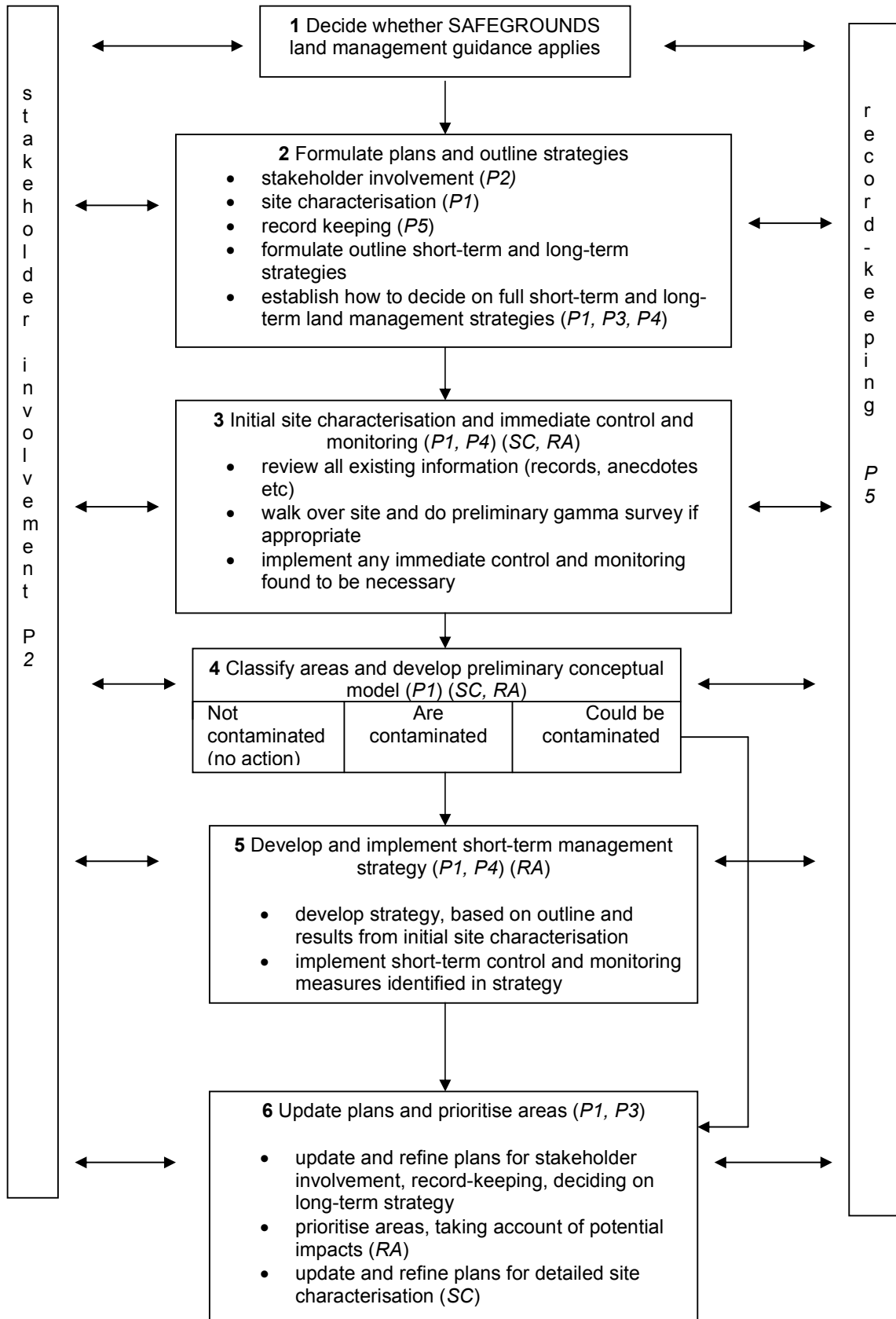
Key

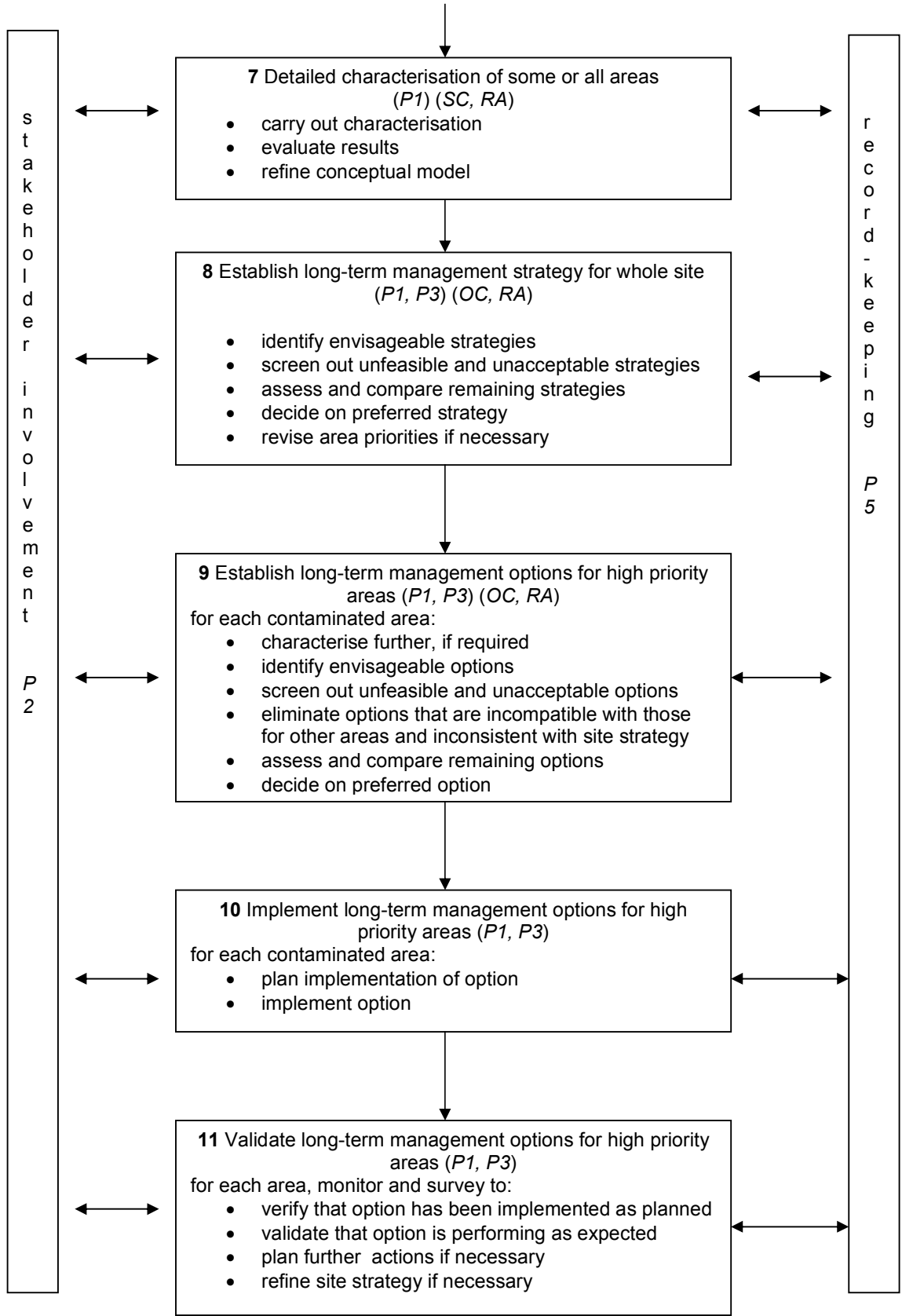
P1, P2 etc are the SAFEGROUNDS key principles for the management of contaminated land.

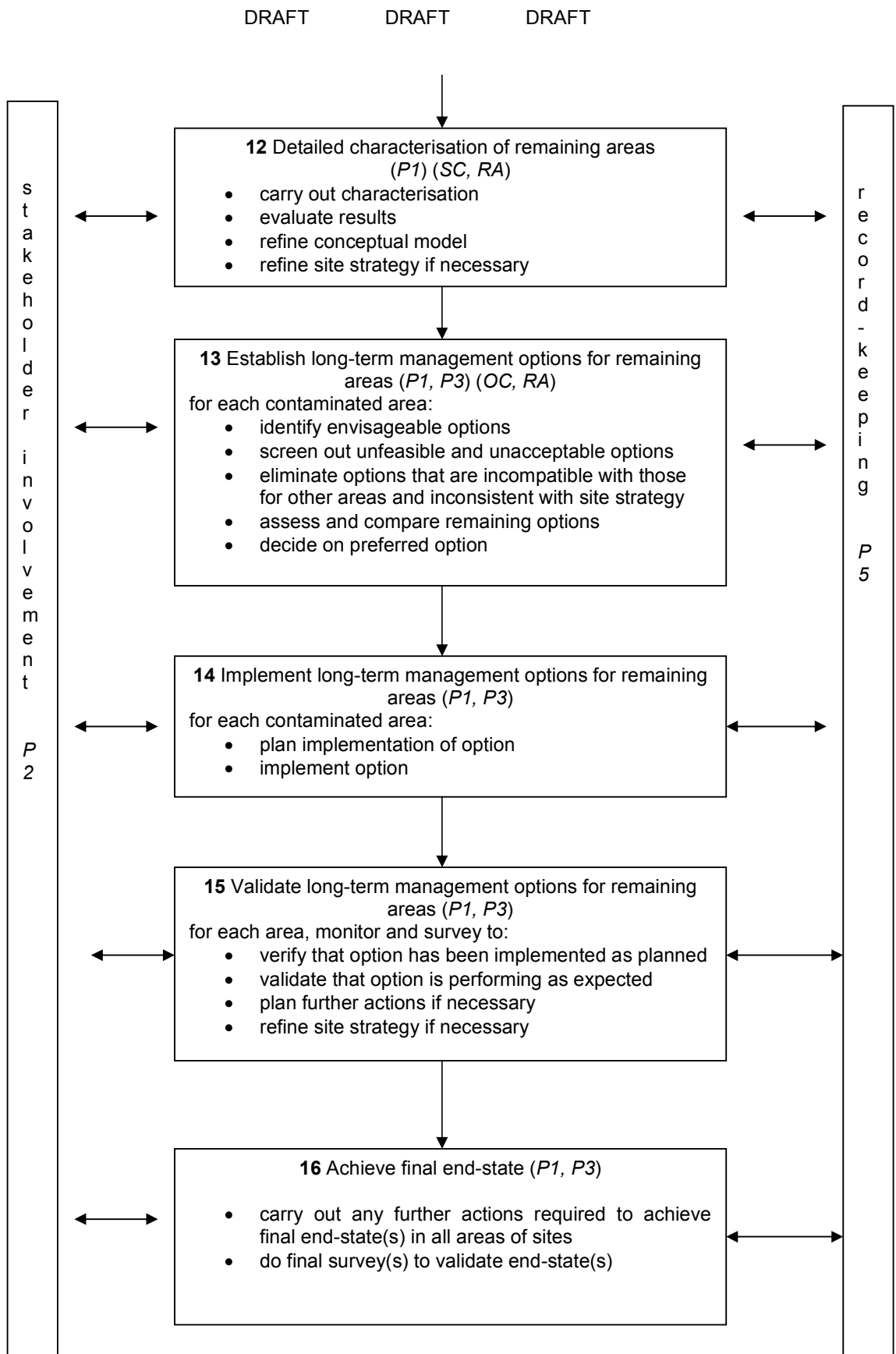
SC, RA and OC are the supporting documents for the SAFEGROUNDS land management guidance:

- SC – site characterisation
- RA – assessments of health and environmental risks
- OC – comparisons of land management options

Figure 3 Flow Diagram for Very Complex Sites







Key – see Figure 2

5 REGULATORY REGIMES AND GUIDANCE

- Once it has been established that there is, or could be, radioactively contaminated land on a site, the site owner/operator should identify the relevant regulatory regime, legislation and statutory, government and regulatory guidance.
- The regimes, regulators and guidance are identified in Tables 2, 3 and 4. Further details are in the Regulatory Framework Paper and in the regulatory area of the SAFEGROUNDS website (insert link).
- For radioactively contaminated land on nuclear-licensed sites the principal regime is that of the Nuclear Installations Act 1965, the principal regulator is HSE and the main guidance document is the HSE safety assessment principles (SAPs).
- For non-radioactively contaminated land on nuclear-licensed sites the principal regime is that of Part 2A of the Environmental Protection Act 1990, and the principal regulators are the Environment Agency and SEPA. When the site is delicensed and used for other purposes the planning regime applies. See Table 4 for the main guidance documents for these regimes.
- For all contaminated land on non-nuclear defence sites the principal regimes are those of Part 2A of the Environmental Protection Act 1990 (if no change of land use is proposed) and of planning legislation (if a change of land use is proposed). The principal regulators are the environment agencies (ie the Environment Agency, SEPA and EHS(NI)).
- Nuclear safety on non-licensed nuclear defence sites is regulated by MoD's DNSR, using essentially the same principles as in the HSE SAPs. Part 2A for radioactive and non-radioactive contamination also applies with the environment agencies as regulators.
- The situation on other sites with long-standing contamination is as for non-nuclear defence sites, except that the Radioactive Substances Act applies for the disposal of radioactive wastes from land investigations and remediation.
- Land contaminated by a radiological emergency would be regulated under Part 2A by the environment agencies if it met the criteria for "radioactive contaminated land" under Part 2A. There are to be new regulations for land contaminated by an accident at a nuclear site. (More to be added when regulations appear later this year.)

Table 2 Regulatory Regimes

Type of site	Radioactive contamination	Non-radioactive contamination	Mixed contamination
1. Nuclear-licensed sites			
1.1 operational sites	NIA, (RSA)	Part 2A	NIA, (RSA), Part 2A
1.2 sites to be delicensed	NIA, (RSA), (planning regime)	Part 2A, (planning regime)	NIA, (RSA), Part 2A , (planning regime)
2. Defence sites (non-nuclear)			
2.1 no change of land use proposed	Part 2A, (MoD)	Part 2A	Part 2A, (MoD)
2.2 change of land use proposed	planning regime, (RSA)	planning regime	planning regime, (RSA)
3. Non-licensed nuclear defence sites	MoD, Part 2A	Part 2A	MoD, Part 2A
4. Other sites with long-standing radioactive contamination			
4.1 no change of land use planned	Part 2A, (RSA)	Part 2A	Part 2A, (RSA)
4.2 change of land use planned	planning regime, (RSA)	planning regime	planning regime, (RSA)

Key

NIA – Nuclear Installations Act 1965 (as amended)

RSA – Radioactive Substances Act 1993 (as amended)

Part 2A – Part 2A of the Environmental Protection Act 1990 (and associated Regulations and Statutory Guidance)

planning regime – see PPS 23 for England, PAN 33 for Scotland, WLGA et al guidance for Wales

Regimes in parenthesis are relevant but subsidiary.

Table 3 Principal Regulators

	Radioactive contamination	Non-radioactive contamination	Mixed contamination
Nuclear-licensed sites	HSE	Environment Agency, SEPA	HSE, Environment Agency, SEPA
All defence sites (non-licensed)	Environment Agency, SEPA, EHS(NI), MoD, HSE	Environment Agency, SEPA, EHS(NI)	Environment Agency, SEPA, EHS(NI), MoD, HSE
Other sites with long- standing contamination	Environment Agency, SEPA, EHS(NI), local authorities	Local authorities (environment agencies on "special sites")	Environment Agency, SEPA, EHS(NI), local authorities

Key

HSE – Health and Safety Executive (in Great Britain, Northern Ireland has its own agency, the Health and Safety Executive for Northern Ireland (HSE(NI)))

SEPA – Scottish Environment Protection Agency

MoD – Ministry of Defence

EHS(NI) – Environment and Heritage Service (Northern Ireland)

Note

There are no nuclear-licensed sites in Northern Ireland.

Table 4 Statutory, Government and Regulatory Guidance

Regime	Guidance documents	
	Short ref.	Full reference
NIA65	HSE SAPs	HSE, 2006. <i>Safety Assessment Principles for Nuclear Facilities</i> . 2006 Edition.
Part 2A	Defra, 2006	Defra, 2006. <i>Environmental Protection Act 1990: Part 2A Contaminated Land. Statutory Guidance</i> . Defra Circular 01/2006. London, Defra.
	SE, 2006	Scottish Executive, 2006. <i>Environmental Protection Act 1990: Part IIA Contaminated Land. Statutory Guidance: Edition 2</i> . Paper SE/2006/44.
	WAG, 2006	Welsh Assembly Government, 2006. <i>Part 2A Statutory Guidance on Contaminated Land (2006)</i> .
Planning	PPS 23	ODPM, 2004. <i>Planning Policy Statement 23: Planning and Pollution Control, Annex 2: Development on Land Affected by Contamination</i> .
	PAN 33	Scottish Executive, 2000. <i>Planning Advice Note 33. Development of Contaminated Land</i> .
	WLGA et al, 2006	Welsh Local Government Association, Welsh Assembly Government and Environment Agency, 2006. <i>Land Contamination: A Guide for Developers</i> .
RSA	EA, 2002	Environment Agency, 2002. <i>Environment Agency Guidance on the Characterisation and Remediation of Radioactively Contaminated Land</i> .
	REPs	Environment Agency, 2005. <i>Radioactive Substances Regulation Environmental Principles (Interim). A framework for technical decisions and technical guidance on radioactive substances regulation. Version 1</i>
Part 2A & Planning, Non-Radioactive Contaminated Land	CLR11	Environment and Defra, 2004. <i>Model Procedures for the Management of Land Contamination. Contaminated Land Report 11</i>

6 PROTECTION OF PEOPLE AND THE ENVIRONMENT

6.1 General

- In Key Principle 1, 'protection of people' refers to the health and well-being of the public and workers.
- The 'environment' includes land, water, air, flora, fauna, buildings, natural resources and sites of historical and cultural importance.
- It should not be assumed that protecting people protects the environment or vice versa.
- In deciding what is a 'high level' of protection (see Key Principle 1) account should be taken of important scientific uncertainties (for example, about the effects of radioactive and non-radioactive contaminants on human health). Differences of view amongst stakeholders about such issues should be recognised and given explicit consideration in decision-making processes.
- Protection of people and the environment in the future should be at least to the same standards as used today.
- Management strategies and options that would reduce contaminant concentrations to levels close to background should always be considered because these achieve the highest level of protection of people and the environment from the contaminated land. The amount of consideration given to such strategies and options will vary from site to site. In some cases they will be screened out as not practicable; in others they will be assessed in detail and compared to other strategies and options on a range of attributes.
- Where the regulatory regime allows, the range of strategies and options considered should also include some that just make the site suitable for its present use, or next planned use if that it is to be different.

6.2 Levels of Protection from Radioactively Contaminated Land

- It is inherent in the ALARA and ALARP principles that 'acceptable risk' is a relative, not an absolute concept, and that it is situation-specific, not generic. Both ALARA and ALARP require assessment and comparison of options for taking action to reduce radiation risks. The acceptable level of risk for the situation in question is the one corresponding to the option that emerges from the assessment and comparison as preferred on a range of factors.
- For radiation exposure, the concept of 'unacceptable risk', or more usually 'intolerable risk', is primarily used in the context of levels above which action must be taken to reduce the risk, whatever the circumstances. For example, dose limits are set to be the boundary between what is tolerable and what is not in routine situations, and they should never be exceeded. It does not follow that any risk below the intolerable level is acceptable. Further action is always needed below the intolerable level, in the form of an assessment and comparison of options to find out whether action should be taken so as to reduce the risks to ALARA or ALARP.
- That said, there is a level of radiation risk to human health that is considered by regulators to be 'broadly acceptable' to society in the UK. This level is a risk of death to an individual of one in a million per year [HSE, EA, Defra and HPA refs to be given, including delicensing criterion]. ALARA and ALARP still apply if risks are assessed to be below one in a million, but only to the extent that it should be shown that there are no low cost actions that could be taken to reduce risks.
- With this background it is clear that there is no one level of protection that can be specified as appropriate for all radioactively contaminated land. This guidance recommends a case-by-case approach, with stakeholder involvement, in which the level of protection is not selected in advance but emerges from assessment and comparison of strategies or options for the management of the contaminated land.

The level is the one that the preferred strategy or option would achieve if implemented.

- This approach is recommended even if an assessment by the site owner/operator shows that risks are below the one in a million per year level. This because there are differing views amongst stakeholders on the health risks from intakes of radionuclides and on the risks per unit dose of external radiation. These differences of view are best addressed by involving stakeholders in assessments and comparisons of land management strategies and options. In this way it will be possible to explore the practical implications of the various views on radiation risks for management of the land in question.
- The approach is also recommended when radioactively contaminated land is investigated under the Part 2A regime and it is found that radioactive contamination is present but the land is not “radioactive contaminated land” in the Part 2A sense (ie the individual doses from the land in its current use are below 3 mSv per year). In such cases there is no legal obligation on anyone to take further action. However it is likely that some stakeholders will request that a more comprehensive risk assessment be undertaken and that options for reducing risks be assessed, particularly if estimated doses are above constraints applied in other circumstances (eg the 0.3 mSv per year used for radioactive discharges).

6.3 Levels of Protection from Non-Radioactively Contaminated Land

- The UK regulatory approach for non-radioactively contaminated land uses ‘unacceptable risk’ to mean the level of risk below which no action need be taken and above which options for reducing risks should be assessed and compared [CLR11, CLAN 6/06]². It is acknowledged in the approach that stakeholders may have views on what constitutes an unacceptable risk from a particular non-radioactive contaminant but the recommended process for managing non-radioactively contaminated land does not contain any mechanism for taking such views into account in decision-making processes [CLR11].
- A risk assessment for non-radioactively contaminated land can be generic or site specific, as can the criteria for determining what is an unacceptable risk. The criteria are absolute, ie they are not linked to any comparison of land management strategies or options. They are usually expressed in terms other than risk to health, for example guideline values of contaminant intakes or concentrations in soils [CLR11, CLAN 6/06].
- This approach was developed for the relatively large number of sites on which there is only non-radioactive contamination. On most of these sites remediation will be carried out in connection with redevelopment and stakeholders can be involved through the planning regime processes, rather than by any special means.
- The CLR11 approach is not consistent with regulatory approaches for radioactivity, particularly not with the ALARA and ALARP principles (see Section 6.2). If it is used for sites on which there is both radioactive and non-radioactive contamination, the owners/operators should discuss and agree with stakeholders the criteria to be used to judge what are unacceptable risks, ie to decide when further action is necessary and when it is not. Stakeholders should be involved in assessments and comparisons of options for the management of non-radioactively contaminated land on such sites, in the same ways as they are involved for radioactively contaminated land.
- On each site where there is radioactive and non-radioactive contamination, there should be a single integrated strategy for the management of radioactively

² CLR11 – Environment Agency Contaminated Land Report 11, Model Procedures for the Management of Land Contamination (2004).

CLAN 6/06 – Defra Contaminated Land Advice Note 6/06, Soil Guideline Values: the Way Forward (2006).

contaminated land, non-radioactively contaminated land and land with mixed contamination. This strategy should be developed using the case-by-case approach to levels of protection discussed in Section 6.2.

7 STAKEHOLDER INVOLVEMENT

7.1 General Guidance

- The benefits of stakeholder involvement include acquiring new perspectives on problems, drawing attention to issues that may otherwise escape scrutiny, reinforcement of safety and environmental protection cultures (see Section 9), and generally enhancing safety and environmental protection performance [INSAG-20³ and other refs].
- It is important to begin stakeholder participation early in a decision-making process so that people have a legitimate opportunity to participate and to shape the outcome. Other advantages of early involvement include: not wasting time in carrying out technical work on options that most stakeholders will never accept, shorter formal public consultation processes and shorter regulatory approval procedures [INSAG-20 and other refs].
- Involvement of stakeholders throughout a cycle of planning and decision-making is more effective than separate consultations on a number of issues [Involve and NHS NCI]. At sites where management of contaminated land will continue over many months or years, or even decades, means should be established to involve stakeholders throughout this period, not simply when a particular project is being planned and carried out.
- The range of stakeholders to involve and the extent of their involvement depends on both the significance of the contaminated land problem (technical and societal) and the stage in the land management process. A broad range of stakeholders should be involved in strategic decision-making for problems that are seen as significant by many groups within society. Lower profile decisions for smaller problems warrant much less involvement.
- If there is doubt about who to involve and how, the best course of action for the site owner/operator is to consult key stakeholders about what should be done. Communities remote from the site need to be consulted if they may be affected by management of the contaminated land, for example because they live near a disposal facility that could be used for remediation wastes.
- Stakeholders should be given enough information to enable them to participate effectively. Every effort should be made to avoid relying on national security or commercial confidentiality as reasons for failing to involve a wide range of stakeholders or for denying them information.
- The resources required by stakeholders should be discussed with them at the planning stage. The stakeholder involvement programme should be designed to be reasonable in terms of the time, effort and financial resources required from all concerned, and commensurate with the scale of the problem.
- Site owners/operators should show how stakeholders' views have been taken into account in their decisions.

7.2 Guidance for Nuclear-Licensed Sites

- Stakeholder involvement activities for the management of contaminated land should be integrated with the involvement programme for all the activities on a site. This is

³ INSAG-20 – Stakeholder Involvement in Nuclear Issues, a report by the International Nuclear Safety Group (IAEA, 2006)

because there are close links between a site’s decommissioning strategy, integrated waste strategy (IWS), contaminated land strategy and related issues such as choice of end-state(s), and many of the same stakeholders need to be involved in each case.

- It is important that site owners/operators build and maintain relationships with their stakeholders, particularly local communities. Events such as consultations on particular topics should be recurrent features in an on-going programme, not self-contained, one-off exercises.
- Where they exist, site stakeholder groups (SSGs) can be the starting point for involvement in contaminated land matters. They may need to be augmented by other stakeholders, for example from communities affected by waste transport and disposal, and may wish to employ experts in particular aspects of contaminated land. At sites where there is no SSG, consideration should be given to changing the composition and remit of the group that does exist (eg the local liaison committee) so that it can perform the required role.
- For NDA sites the National Stakeholder Group has a role in the development of the NDA’s overall contaminated land management strategy.
- There are good examples of on-going stakeholder involvement in decommissioning and restoration of nuclear sites in the US, where a variety of techniques are used to improve public participation [eg www.sandia.gov/about/community/environment for the Sandia site and www.ecy.wa.gov/programs/nwp/index.htm for the Hanford site).
- The appropriate level of stakeholder involvement in the management of contaminated land varies from one stage in the process to another, as shown in Table 5. The level of involvement is highest when plans are being formulated and when a long-term strategy for the management of all the contaminated land on a site is being established.

Table 5 Levels of Stakeholder Involvement at Nuclear Sites

<i>Stage in contaminated land management process</i>	<i>Box no. in Figure 3</i>	<i>Level of stakeholder involvement</i>
Deciding this guidance applies	1	low
Formulating plans	2	high
Site characterisation and immediate control and monitoring	3-7	low
Establishing long-term land management strategy	8	high
Dealing with high priority areas	9-11	medium
Dealing with other areas	12-15	low
Achieving final end-state	16	medium

- It is a legal requirement that final decisions on the management of contaminated land on nuclear-licensed sites be taken by the site licensee. See Section 10 for information on regulatory procedures and stakeholder involvement in these.

7.3 Guidance for Non-Nuclear Defence Sites

- Non-nuclear defence sites vary greatly in terms of their size and the extent of contamination, and hence in the time it will take to carry out the contaminated land management process. The nature of stakeholder involvement for sites that are to be sold for redevelopment differs from that for sites that are to remain in MoD ownership.

- For large, complex sites that are to be sold, the guidance in Section 7.2 is generally applicable, but there will be no SSG or equivalent group in existence. Consideration should be given to setting up a 'project liaison group', made up of representatives of the local community, other affected communities, CBOs, regulators, local authorities and perhaps consultants, contractors and prospective developers. Such a group would work throughout the land management process, with levels of involvement varying as shown in Table 5.
- For smaller, high profile sites that are to be sold the stakeholder involvement programme can be of shorter duration but should involve as broad a range of people as for larger sites. There should be meetings with stakeholders at which candidate strategies and options for the management of the land are discussed and compared.
- For smaller, low profile sites that are to be sold, and for sites that are to remain in MoD ownership, more limited stakeholder involvement is appropriate. Regulators, owners of neighbouring land, local authorities and representatives of the workforce should be informed and consulted but this may be all that is necessary.
- At all defence sites that are to be sold, stakeholders should be made aware that government ministers have a role in final decisions. In practice it is very rare for ministers to refuse to approve strategies and options agreed between MoD and its stakeholders.

7.4 Guidance for Other Sites

7.4.1 Non-Licensed Defence Nuclear Sites

- The situation for non-licensed defence nuclear sites is similar to that for nuclear-licensed sites but there are additional security considerations. These should not restrict interaction with stakeholders but should be assessed when planning a stakeholder involvement programme.
- At non-licensed defence nuclear sites that are next to nuclear-licensed sites run for MoD by contractors, stakeholder involvement for contaminated land can be via the nuclear-licensed site's SSG or equivalent and integrated with other involvement activities.

7.4.2 Industrial, Medical and Research Sites

- The guidance in Section 7.3 is largely applicable to former and current industrial, medical and research sites. If the site is large and complex it may be best to set up a project liaison group made up of key stakeholders. They can be involved to varying extents throughout the process of managing the contaminated land, and any related demolition or redevelopment activities.
- At smaller sites simpler stakeholder involvement mechanisms can be used but it will be necessary to involve a broad range of stakeholders in high profile situations.
- Stakeholders should always be informed as soon as it is known or suspected that radioactive contamination is present. Full information should be given about the contamination, the likely health risks and the process that will be used to decide on and implement an appropriate land management strategy and options. This is particularly important for sites that were contaminated by past activities and are now being used for other purposes.

7.4.3 Sites Contaminated by Accidents or Emergencies

- The stakeholders in this case are people who used the land before the accident and may use it again after remediation, nearby communities, local authorities, regulators and others who have been involved in the short and medium term emergency response.
- The involvement approach depends on the size of the affected area and the severity of the contamination. The 'project liaison group' approach could be appropriate for

large areas that will take a long time to remediate, especially if the land was and will be used for a variety of purposes. One-off consultation exercises could be carried out for smaller areas with less diverse land use patterns.

8 RECORD-KEEPING

- SAFEGROUNDS key principle 5 requires site owners/operators to make comprehensive records about the management of contaminated land, to keep these records and to update them as necessary.
- The records should cover all site characterisation work, the process of deciding how to manage the contaminated land, implementing the chosen strategy and options, validation, and interactions with stakeholders throughout the process.
- Practical guidance on record-keeping is given in a separate SAFEGROUNDS document [ref. and link]. This guidance recommends that a 'land quality file' (LQF) be set up for each nuclear or defence site so that information about contaminated land can be held in a formalised structure. The LQF should be part of the record management system of the organisation that owns or operates the site and should be accessible to stakeholders.
- The LQF concept is applicable to other types of site covered by this guidance. Which organisations make and keep the records will depend on the situation. For example, at a former industrial site that is being remediated under Part 2A, whoever is responsible for remediation should make the records but they could be kept by the current owner of the site. If the organisations concerned have no formal system for managing records of this type it would be sensible to create one, either on their own or together with other organisations involved in the management of radioactively contaminated land.
- There is an unresolved national problem of how to keep records of radioactively contaminated land in the long term. Nuclear site licensees have to keep records until their 'period of responsibility' ends, which may be decades away. There is no mechanism for keeping records in an accessible form after this, nor for updating records for land that has been delicensed and sold for use for non-nuclear purposes.
- MoD has arrangements for keeping records for considerable periods but would not update these once it has sold the land. Local authorities and the environment agencies maintain registers of 'special sites' and of other land that has been designated as "contaminated" under Part 2A and subsequently remediated. These registers are not suited to keeping or maintaining detailed records such as LQFs.
- Until some form of national system is established for keeping records of radioactively contaminated land in the long term, it is recommended that site owners hold records for the duration of their ownership of the site and pass the records on to new owners.

9 ORGANISATIONAL CULTURES AND MANAGEMENT SYSTEMS

9.1 Safety Culture

- The IAEA and the HSE define a safety culture as: 'the assembly of characteristics and attitudes in organisations and individuals that establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance' [IAEA Safety Glossary and HSE SAPs]. Such a culture enables an organisation to achieve and maintain high standards of safety. It minimises the number of incidents and accidents, and saves time and effort in meeting regulatory requirements.
- There are already strong safety cultures at UK nuclear sites. These should apply in the management of contaminated land as they do in all other activities on the site [HSE SAPs].
- At other sites that are covered by this guidance there may be a weaker safety culture or, if the site has not been used for a number of years, no permanent workforce within which a safety culture could be established. In such cases it is important that organisations that fund the management of contaminated land choose consultants and contractors that have a strong safety culture.

9.2 Environmental Protection Culture

- The environment agencies try to encourage the growth of an environmental protection culture in all the organisations that they regulate, including nuclear-licensed sites. A strong environmental protection culture helps to reduce the numbers of incidents and accidents that have off-site consequences and saves the effort and time of site operators as well as regulators.
- It is recommended that site owners/operators should establish an environmental protection culture and maintain it throughout the management of contaminated land. Other organisations that fund the management of contaminated land should choose consultants and contractors that have a strong environmental protection culture.

9.3 Stakeholder Involvement Culture

- In addition to its other benefits (see Section 7), timely and appropriate stakeholder involvement increases openness and accountability, and helps to strengthen safety and environmental protection cultures.
- A culture of stakeholder involvement will make it easier for a site/owner operator to sustain an involvement programme throughout the management of contaminated land. Such a culture is particularly important for long programmes, in which effective participation depends on building and maintaining good relationships with stakeholders.

9.4 Security Culture

- There is a well-established security culture at nuclear sites and operational MoD sites. The management of contaminated land may require temporary or permanent changes to security plans and arrangements. Approval for such changes should be gained before work commences.

9.5 Quality Management Systems

- All the main organisations involved in the management of contaminated land should have an appropriate quality management system (QMS).
- The QMS should be based on national and international standards and should be reviewed periodically.

PART 3 **GUIDANCE FOR EACH STAGE IN THE PROCESS OF MANAGING CONTAMINATED LAND**

10 PLANNING AND SHORT-TERM ACTIONS

10.1 Planning for the Management of Contaminated Land

10.1.1 General Guidance

- After deciding that this guidance applies and identifying the relevant regulatory regime(s), the next steps are to make plans for stakeholder involvement (see Section 7) and for record keeping (see Section 8 and Record Keeping Guidance).
- It is important to make stakeholders aware of any pre-existing objectives for the management of the contaminated land (for example, to enable land on a nuclear-licensed site to be delicensed, to enable a non-nuclear defence site to be sold). The status of such objectives should be explained and it should be made clear whether they can be changed (for example, in the light of detailed site characterisation and a comprehensive assessment of land management options).
- Stakeholders should also be told about any pre-existing short-term or long-term strategy for the management of the land and the status of this strategy.
- The context for decisions on the management of the land should be set out, together with the decision-making procedures envisaged, the regulatory procedures, and proposed stakeholder involvement in these.
- The programme for stakeholder involvement should be agreed with stakeholders before the end of the planning stage.

10.1.2 Guidance for Nuclear-Licensed Sites

- Planning should take full account of the requirements in the HSE SAPs for:
 - preparation of a strategy for managing radioactively contaminated land up to the time of any delicensing
 - detecting radioactively contaminated land on or adjacent to nuclear-licensed sites
 - when radioactively contaminated land is discovered, identifying and controlling the source of contamination
 - characterisation of the contaminated areas
 - monitoring and surveillance
 - preparing and implementing plans for the control and remediation of all radioactively contaminated areas
 - record-keeping
 - remediating radioactively contaminated land before any new facilities are constructed on it
 - preparing, reviewing and maintaining safety cases for radioactively contaminated land and for facilities on the site that may be affected by it.
- At nuclear sites that are to remain operational for many years the emphasis can be on immediate and short-term actions but a long-term management strategy is also required.
- At nuclear sites that are being decommissioned, or where decommissioning will start in the near future, more emphasis needs to be given to the long-term strategy, and to planning how to decide on and implement long-term management options for areas within the site.
- In all cases it is essential to integrate the contaminated land strategy with the decommissioning strategy and the IWS for the site. Interactions with EIAD procedures should be considered at reactor sites that are being decommissioned.

10.2 Site Characterisation

- The aims of initial site characterisation should be established. These could be to acquire enough information to enable immediate and short-term actions to be identified and implemented, and/or to gather sufficient data to provide input to assessments and comparisons of long-term management strategies and options.
- Stakeholders should be asked for their views on various aspects of site characterisation, for example:
 - the contaminants of most concern (eg which radionuclides and in which physical or chemical forms)
 - the areas of most interest (eg around the boundary of the site)
 - characterisation techniques (eg based on experience elsewhere).
- Plans should be made for making background measurements off-site. There should be enough measurements to establish the concentrations of ubiquitous contaminants (eg fallout radionuclides, natural background radiation) that are typical of the area, and to distinguish contaminant concentrations due to the site from those due to nearby sites. The plans for background measurements should be agreed with the relevant environment agency, who should be asked whether independent measurements will also be required.
- The regulatory regimes for site characterisation activities should be identified, including those for disposal of any wastes generated during characterisation.
- At all sites a conceptual model of contaminated and uncontaminated areas should be produced at an early stage in site characterisation. The model should be used to direct further characterisation and refined as more data are acquired.
- On very complex sites initial characterisation data should be used to classify areas as not contaminated, contaminated and potentially contaminated. This classification should be used in modelling and planning further characterisation (see Figure 3).
- Further information is given in the SAFEGROUNDS Site Characterisation Guidance.

10.3 Selecting Immediate and Short-Term Land Management Methods

- The objectives of immediate and short-term management are to control the source of the contamination (if it is still present), to prevent further spread of the contamination (especially if it is moving towards the site boundary), to control exposures to contaminants (for example by limiting people's access to areas), and to institute appropriate monitoring until long-term management methods are implemented..
- At sites where contamination has been present for a long time it may not be practicable or necessary to take much immediate or short-term action.
- Care should be taken not to prejudice long-term management of the contaminated land.
- Immediate clean-up can be appropriate for small spills and incidents, provided that there are management routes for any wastes generated.
- On some sites it may be necessary to assess and compare short-term management options for particular areas. This can be done using similar techniques to those recommended for long-term management options (see Option Comparison Guidance).
- The extent of stakeholder involvement in decisions on immediate and short-term management methods varies from one type of site to another. Only very limited involvement is required on sites where there is no public access and where it is intended to decide on and implement long-term management methods in the near future.

11 ESTABLISHING LONG-TERM MANAGEMENT STRATEGIES AND OPTIONS

11.1 Establishing Long-Term Strategies for Whole Sites

11.1.1 General Guidance

- The steps in establishing a long-term management strategy for all the contaminated land on a site are:
 1. site owner/operator and stakeholders assess and compare candidate strategies
 2. site owner/operator identifies preferred strategy, with stakeholder input
 3. preferred strategy is considered in regulators' and others' acceptance procedures
 4. site owner/operator develops proposed strategy
 5. regulators and decision-makers assess proposed strategy
 6. site owner/operator decides on strategy to be implemented.
- Guidance on steps 1 and 2 is given in the Option Comparison Guidance. Guidance on the other steps is given below, by type of site.

11.1.2 Guidance for Nuclear-Licensed Sites

- The main regulatory assessment procedures for a contaminated land management strategy on a nuclear-licensed site are those of HSE. The SAPs indicate what HSE require.
- The Environment Agency and SEPA also have an interest. They are the regulators for non-radioactive contamination under Part 2A and HSE would consult them for radioactive contamination.
- At sites that are their responsibility, the NDA needs to approve the contaminated land management strategy.
- There should be stakeholder input to steps 3, 4 and 5, but this can be more limited than in steps 1 and 2.

11.1.3 Guidance for Defence Sites

- At non-nuclear defence sites and non-licensed nuclear defence sites the main regulatory assessment procedures for radioactively contaminated land are those internal to MoD, but the relevant environment agency and HSE would also be consulted in most instances.
- The environment agencies are the regulators if the land is "contaminated land" or "radioactive contaminated land" under Part 2A.
- Ideally there should be stakeholder input to steps 3-5 but this can be quite limited if there has been considerable input to steps 1 and 2, or if it has been determined that the site is low profile (see Section 7.3).

11.1.4 Guidance for Other Sites

- If the site has "radioactive contaminated land" in the Part 2A sense, there is a need to carry out 'justification' and 'optimisation' studies to determine whether remediation is required and if so what form it should take. The justification study can be included as an extra step in the assessment and comparison of candidate strategies. This assessment and comparison includes all the matters that would be considered in an optimisation study so no further work is need to fulfil this requirement (see Option Comparison Guidance for more details). The environment agencies are the regulators for Part 2A.

11.2 Prioritising Contaminated Areas

- On complex sites it is necessary to prioritise areas according to the urgency with which they should be characterised in detail and the timescale on which long-term management options should be decided on and implemented.
- It is recommended that a 'source-pathway-receptor' approach be used in prioritisation, with consideration given to:
 - the nature of the contaminants (their toxicity for people and other organisms)
 - contaminant concentration levels (how far they are above background)
 - the mobility of contaminants in the environment (especially if they are moving off-site via water, air, burrowing animals etc)
 - the locations of potentially exposed people, other organisms, SSSIs and other sensitive areas.
- It is useful to do a preliminary risk assessment to assist with prioritisation (see Guidance on Assessment of Health and Environmental Risks).
- Prioritisation should not include designating contaminated areas as not requiring action to reduce risks. Such decisions should only be made after a comparison of management options for these areas (see Section 11.3).

11.3 Establishing Long-Term Management Options for Specific Areas

- The guidance for establishing long-term management strategies for whole sites (see Section 11.1 and the Option Comparison Guidance) also applies to establishing long-term management options for specific areas on a site.
- There can be less stakeholder involvement for area options than for site strategies, especially for low priority areas.
- The outcome of an assessment and comparison of options could show that no further action is needed to reduce long-term risks, or that it would be best to monitor the area and reassess options at a later date.
- It is advisable to review the site strategy at intervals in the light of the further characterisation of areas and decisions on options.
- The CLR11 approach can be used in establishing options for areas with only non-radioactive contamination, provided that the non-radioactive contaminants are not affecting the radioactive contaminants, and that there is no link between management options for the radioactively and non-radioactively contaminated areas.

12 IMPLEMENTATION AND VALIDATION

12.1 Implementing Options for Areas

12.1.1 Planning

- Detailed planning should be completed for each area before implementing the long-term management option for that area. Matters to be considered are:
 - health, safety and environmental protection procedures
 - monitoring procedures
 - waste management arrangements
 - contingency measures
 - record-keeping arrangements
 - stakeholder involvement programme.

12.1.2 Health, Safety and Environmental Protection Procedures

- Regulations made under the Health and Safety at Work etc Act apply at all sites. Those that are particularly relevant are the IRRs, MHSW, CDM and COSHH.

- If the site has no RPA, one should be appointed.
- Work should be planned and carried out so that all radiation doses are ALARP.
- Where the site has an environmental protection policy and an environmental management system, work should be planned and carried out so as to comply with them. Elsewhere, clients for the implementation should satisfy themselves that their contractors will meet appropriate environmental protection standards.
- Further information is given in the Site Characterisation Guidance.

12.1.3 Monitoring Procedures

- Sampling, monitoring and testing requirements for implementation should be specified. These should cover, for example:
 - transport and off-site disposal of soils
 - on-site disposal of soils
 - discharges of liquids
 - materials brought on to site
 - workers' exposure to contaminants
 - off-site impacts (eg dust, noise)
 - groundwater
 - residual contaminant levels.
- Monitoring can be carried out by those undertaking the work and those managing it. Some independent third party monitoring is also recommended (see Sections 12.2 and 12.3).

12.1.4 Waste Management Arrangements

- Waste management requirements will have been considered when establishing the option to be implemented. When planning implementation these arrangements should be put in place. This can take a considerable time if, for example, a new or revised authorisation under the Radioactive Substances Act is required.
- See SD:SPUR regulatory framework paper for further information on disposal of solid wastes.

12.1.5 Contingency Measures

- It is important to have contingency measures for situations such as finding higher levels or more extensive contamination than expected, and incidents and accidents during remediation work.
- The necessary measures should be identified via hazard and risk assessments that are additional to those carried out to provide input to decisions on long-term management options.

12.1.6 Record-Keeping Arrangements

- Records should be made throughout the implementation process, not completed retrospectively at the end.
- It is important to record any deviation from the planned implementation of the option, including any contingency measures employed.
- All those involved should make records and the site owner/operator should keep a collated set.
- See Record Keeping Guidance for further information about the records required.

12.1.7 Stakeholder Involvement Programme

- As a minimum, stakeholders should be kept informed of progress with implementation.

- In cases where implementation work extends over a long period, site owners/operators should provide stakeholders with opportunities to review and discuss progress, and be involved in deciding on any changes to strategies or options in the light of experience.

12.2 Validating Options

- The purpose of validation is to check that the management option for the area has been implemented correctly and that it will achieve the desired level of protection of people and the environment.
- Surveys are required when work has been completed. On-going monitoring may also be needed over many years (for example to check that contaminants are not moving into groundwater).
- The results of validation surveys and monitoring should be evaluated by the site owner/operator and provided to regulators and other stakeholders. If it is apparent that further implementation work is required, stakeholders should be consulted about what is to be done.
- Especially where land is to be released for new uses, it is valuable for there to be checks by an organisation that is independent of the site owner/operator and of those who have carried out remediation. The extent of the checks should be agreed with the relevant stakeholders, who may also wish to be involved in choosing who carries out the checks.
- Site owners/operators should arrange to hold a complete set of records of validation and check surveys and monitoring.

12.3 Achieving the Final End-State(s) for the Site

- There will be cases in which implementing the chosen long-term management options for each area achieves the final end-state for the site, or end-states if these vary from one area to another.
- In other cases the long-term management options may not achieve the final end-state immediately, for example when there has been long-term control and monitoring to allow radioactive decay. In such cases it is necessary to revisit some areas of the site, to carry out further characterisation and determine whether further actions are required.
- If it is not obvious which actions are needed, an option assessment and comparison should be performed. The chosen option should then be implemented and validated.

13 CHECKLISTS

- Checklists to be inserted for the various stages in the management of contaminated land, with cross-references to the text containing guidance for that stage, and to the supporting documents.
- Separate checklists for nuclear-licensed sites and non-nuclear defence sites, with notes on their application to other sites.

PART 4 REFERENCES AND GLOSSARY

14 REFERENCES

15 GLOSSARY