IAEA
SAFETY
STANDARDS
SERIES

Remediation of Areas Contaminated by Past Activities and Accidents

SAFETY REQUIREMENTS

No. WS-R-3

IAEA
International Atomic Energy Agency

IAEA SAFETY RELATED PUBLICATIONS

IAEA SAFETY STANDARDS

Under the terms of Article III of its Statute, the IAEA is authorized to establish standards of safety for protection against ionizing radiation and to provide for the application of these standards to peaceful nuclear activities.

The regulatory related publications by means of which the IAEA establishes safety standards and measures are issued in the **IAEA Safety Standards Series**. This series covers nuclear safety, radiation safety, transport safety and waste safety, and also general safety (that is, of relevance in two or more of the four areas), and the categories within it are **Safety Fundamentals**, **Safety Requirements** and **Safety Guides.**

Safety Fundamentals (blue lettering) present basic objectives, concepts and principles of safety and protection in the development and application of nuclear energy for peaceful purposes.

Safety Requirements (red lettering) establish the requirements that must be met to ensure safety. These requirements, which are expressed as 'shall' statements, are governed by the objectives and principles presented in the Safety Fundamentals.

Safety Guides (green lettering) recommend actions, conditions or procedures for meeting safety requirements. Recommendations in Safety Guides are expressed as 'should' statements, with the implication that it is necessary to take the measures recommended or equivalent alternative measures to comply with the requirements.

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Information on the IAEA's safety standards programme (including editions in languages other than English) is available at the IAEA Internet site

www-ns.iaea.org/standards/

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REMEDIATION OF AREAS CONTAMINATED BY PAST ACTIVITIES AND ACCIDENTS

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The Agency's Statute was approved on 23 October 1956 by the Conference on the Statute of the IAEA held at United Nations Headquarters, New York; it entered into force on 29 July 1957. The Headquarters of the Agency are situated in Vienna. Its principal objective is "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world".

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SAFETY REQUIREMENTS

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FOREWORD

by Mohamed ElBaradei
Director General

One of the statutory functions of the IAEA is to establish or adopt standards of safety for the protection of health, life and property in the development and application of nuclear energy for peaceful purposes, and to provide for the application of these standards to its own operations as well as to assisted operations and, at the request of the parties, to operations under any bilateral or multilateral arrangement, or, at the request of a State, to any of that State's activities in the field of nuclear energy.

The following bodies oversee the development of safety standards: the Commission on Safety Standards (CSS); the Nuclear Safety Standards Committee (NUSSC); the Radiation Safety Standards Committee (RASSC); the Transport Safety Standards Committee (TRANSSC); and the Waste Safety Standards Committee (WASSC). Member States are widely represented on these committees.

In order to ensure the broadest international consensus, safety standards are also submitted to all Member States for comment before approval by the IAEA Board of Governors (for Safety Fundamentals and Safety Requirements) or, on behalf of the Director General, by the Publications Committee (for Safety Guides).

The IAEA's safety standards are not legally binding on Member States but may be adopted by them, at their own discretion, for use in national regulations in respect of their own activities. The standards are binding on the IAEA in relation to its own operations and on States in relation to operations assisted by the IAEA. Any State wishing to enter into an agreement with the IAEA for its assistance in connection with the siting, design, construction, commissioning, operation or decommissioning of a nuclear facility or any other activities will be required to follow those parts of the safety standards that pertain to the activities to be covered by the agreement. However, it should be recalled that the final decisions and legal responsibilities in any licensing procedures rest with the States.

Although the safety standards establish an essential basis for safety, the incorporation of more detailed requirements, in accordance with national practice, may also be necessary. Moreover, there will generally be special aspects that need to be assessed on a case by case basis.

The physical protection of fissile and radioactive materials and of nuclear power plants as a whole is mentioned where appropriate but is not treated in detail; obligations of States in this respect should be addressed on the basis of the relevant instruments and publications developed under the auspices of the IAEA. Non-radiological aspects of industrial safety and environmental protection are also not explicitly considered; it is recognized that States should fulfil their international undertakings and obligations in relation to these.

The requirements and recommendations set forth in the IAEA safety standards might not be fully satisfied by some facilities built to earlier standards. Decisions on the way in which the safety standards are applied to such facilities will be taken by individual States.

The attention of States is drawn to the fact that the safety standards of the IAEA, while not legally binding, are developed with the aim of ensuring that the peaceful uses of nuclear energy and of radioactive materials are undertaken in a manner that enables States to meet their obligations under generally accepted principles of international law and rules such as those relating to environmental protection. According to one such general principle, the territory of a State must not be used in such a way as to cause damage in another State. States thus have an obligation of diligence and standard of care.

Civil nuclear activities conducted within the jurisdiction of States are, as any other activities, subject to obligations to which States may subscribe under international conventions, in addition to generally accepted principles of international law. States are expected to adopt within their national legal systems such legislation (including regulations) and other standards and measures as may be necessary to fulfil all of their international obligations effectively.

EDITORIAL NOTE

An appendix, when included, is considered to form an integral part of the standard and to have the same status as the main text. Annexes, footnotes and bibliographies, if included, are used to provide additional information or practical examples that might be helpful to the user.

The safety standards use the form 'shall' in making statements about requirements, responsibilities and obligations. Use of the form 'should' denotes recommendations of a desired option.

CONTENTS

1. INTRODUCTION

BACKGROUND

1.1. A number of activities and events have caused significant radioactive contamination of areas in many States. These include: inadequate practices for the management and disposal of radioactive waste; the intentional or accidental discharge of radioactive material to the environment; nuclear accidents; testing of nuclear weapons; incidents involving radionuclides at nuclear installations or other establishments such as hospitals and industrial and research facilities; and past practices[1] that were not adequately controlled. Such contamination may present a hazard to human populations and the environment.

1.2. Some older facilities in which radioactive material was processed when criteria for radiation protection were not as stringent as they are now are sources of radioactive contamination. In most such facilities, operations have been terminated. However, the locations of many such facilities are near large population centres, and this has led to the contamination of urban areas.

1.3. Radioactive contamination can be caused inadvertently by human activities involving processes in which natural radionuclides can become concentrated, in areas not normally controlled by regulatory bodies, to levels beyond the concentration limits set for practices. Such activities include conventional mining and processing of ores (such as mining of copper ore, production of phosphogypsum or mining of mineral sands). The regulatory body may decide to include such material in the national programme of radioactive waste management.

1.4. The IAEA has issued numerous publications dealing with the establishment of intervention[2] levels and criteria for application in the event of

[1] A practice is any human activity that introduces additional sources of exposure or exposure pathways or extends exposure to additional people or modifies the network of exposure pathways from existing sources, so as to increase the exposure or the likelihood of exposure of people or the number of people exposed.

[2] An intervention is any action intended to reduce or avert exposure or the likelihood of exposure to sources which are not part of a controlled practice or which are out of control as a consequence of an accident.

a nuclear or radiological emergency [1, 2] and with criteria and techniques for assessment in the event of contamination of the environment [3].

1.5. The International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS) [4] establish requirements for radiation protection that apply to practices and to interventions. Interventions are divided into emergency exposure situations and chronic exposure situations on the basis of the recommendations of the International Commission on Radiological Protection (ICRP) issued in 1991 [5]. There has been further elaboration by the ICRP on the protection of the public in situations of prolonged radiation exposure, that is, exposures persisting for long time periods due to natural sources and radioactive residues [6].

1.6. The IAEA Safety Fundamentals publication on The Principles of Radioactive Waste Management [7] establishes the internationally agreed principles of radioactive waste management and the associated set of objectives. It provides a common basis for the development of IAEA safety standards in this area.

1.7. While some States have had considerable experience in remediating areas contaminated by past activities and accidents, experience around the world generally is limited. Experience has shown that, in addition to the radiological factors, chemical and biological hazards should be considered, and that socioeconomic factors have a strong influence on the decision making process with regard to the choice of remediation strategies. The involvement of interested parties has also been recognized as a key issue in the decision making process.

1.8. Managing the waste resulting from remediation activities can be another key issue, particularly when large amounts of waste have to be managed or when the infrastructure for waste management does not include facilities for predisposal management of waste or disposal facilities specifically for the types of waste encountered.

OBJECTIVE

1.9. The purpose of this publication is to specify the safety requirements relating to the remediation of areas affected by radioactive residues as a result of uncontrolled events, such as accidents, and certain types of past activities.

SCOPE

1.10. The situations dealt with in this publication are intervention situations in which areas, including land and industrial sites, have been contaminated as a result of human activities and this contamination could cause the prolonged exposure to radiation of workers and members of the public. The requirements in this publication apply to contamination resulting from past events (such as activities at former weapon testing sites) and former authorized activities that are no longer under the provisions of an operational authorization or licence and for which there are no provisions for proper closure. The requirements also apply to past practices that were not adequately controlled, accidents at nuclear facilities, and discharges and disposals that were managed in accordance with less stringent requirements than apply today. For these cases, situations of actual exposure as well as potential exposure are considered.

1.11. Such interventions have become commonly known as 'remediation'[3] situations and in this context the term remediation has a similar meaning to rehabilitation, reclamation and cleanup.

1.12. This publication establishes requirements in relation to protective actions and remedial measures intended to reduce existing prolonged exposure, to avert potential prolonged exposure or to reduce the likelihood of the occurrence of such exposure due to contamination. This includes remedial measures such as the removal or reduction of the source of exposure, as well as other long term protective actions such as restriction of the consumption of foodstuffs, grazing by livestock and the use of fodder, and restrictions on access or on land use. Other important measures linked to remediation activities, such as monitoring programmes, are also mentioned, although they do not contribute directly to the reduction of exposure.

1.13. Where resources for remediation may be inadequate for dealing fully with a hazard, isolation of the contaminated area may be an acceptable step as part of an overall strategy for fully protective and optimized remediation.

[3] 'Remediation' does not imply the elimination of all radioactivity or all traces of radioactive material. The optimization process may lead to an extensive remediation but not necessarily to the restoration of pre-existing conditions.

1.14. In certain situations of radiological contamination, non-radiological hazards may also arise. Although the risks associated with non-radiological hazards should be assessed in combination with radiological risks to develop an optimized remediation strategy, this publication does not establish requirements for such a combined assessment or make recommendations on how to assess non-radiological hazards.

1.15. The scope of this publication excludes situations arising from the normal operation of appropriately controlled practices such as contamination resulting from authorized discharges, the management of radioactive waste, decommissioning activities and the closure of mining sites. Such situations are dealt with in other IAEA safety standards [8–15] as aspects of the practices concerned.

1.16. The scope of this publication also excludes the immediate protective actions required in emergencies, which are dealt with in Ref. [16], such as the immediate relocation of people and the distribution of iodine tablets. With regard to accidents, this publication deals with post-accident situations on the assumption that all immediate protective actions have already been undertaken.

STRUCTURE

1.17. Section 2 discusses the objectives in remediating contaminated areas. Section 3 deals with radiation protection in remediation situations. Section 4 deals with the establishment or amendment of the legal and regulatory framework to take into account remediation situations. Section 5 covers the development and implementation of remediation programmes. Section 6 addresses operational aspects of remediation activities, including waste management. Section 7 deals with post-remediation issues, including the establishment and removal of restrictions.

2. OBJECTIVES IN THE REMEDIATION OF CONTAMINATED AREAS

2.1. Remedial measures shall do more good than harm and shall provide optimized arrangements for protection to maximize the net benefit to society.

2.2. The goal of remediation activities is the timely and progressive reduction of hazard and eventually, if possible, the removal without restrictions of regulatory control from the area. However, there are situations in which the removal of control from the area cannot practicably be achieved. In such cases, at least the unacceptable risks to human health and the environment shall be removed. In these cases, any restrictions on access to or use of the area and any other restrictions shall be established on the basis of an optimization process so as to maximize the net benefit to society. In the choice of the optimized remediation option, a wide variety of factors shall be considered, and impacts on health, safety and the environment shall be considered together with technical, social and financial factors. Non-radiological hazards shall be considered in conjunction with the radiological hazards. Remediation shall be aimed at reducing existing exposures and averting the potential for prolonged exposures to occur in the future. Remediation shall:

(a) Reduce the doses to individuals or groups of individuals being exposed;
(b) Avert doses to individuals or groups of individuals that are likely to arise in the future;
(c) Prevent or reduce environmental impacts from the radionuclides present in the contaminated area.

2.3. Reductions in the doses to individuals and reduced environmental impacts shall be achieved by means of interventions to remove the existing sources of contamination, to modify the pathways of exposure or to reduce the numbers of individuals or other receptors exposed to radiation from the source.

3. RADIATION PROTECTION IN REMEDIATION SITUATIONS

3.1. For contamination resulting from past activities and accidents, the required level of remediation shall be established on a site specific basis and in accordance with the radiation protection principles that apply to intervention situations. Consequently the remedial measures and protective actions that are to be implemented thereafter shall be justified and optimized.

(a) The remedial measures shall be justified by means of a decision aiding process requiring a positive balance of all relevant attributes relating to

the contamination. In addition to the avertable annual doses[4], both individual and collective, other relevant attributes shall be assessed. These attributes shall include at least: the health detriments; the expected reduction in the anxiety caused by the situation; and the benefits, social costs, disruption and environmental effects that may result from the implementation of remedial measures [6].

(b) The remedial measures shall be optimized following the general approach to the optimization of protection in the context of practices. The optimum nature, scale and duration of the remedial measures shall be selected from a set of justified options for remediation. In some cases the restricted use of human habitats may be the outcome of the optimization process for remediation [6].

(c) The results of such a decision aiding process for justification and optimization shall be used as an input for a decision making process which may encompass other considerations (such as residual doses) and may involve relevant concerned parties. Those concerned with the contamination situation shall be involved and shall be given the opportunity to contribute to the decision making process [6].

3.2. A generic reference level for aiding decisions on remediation is an existing annual effective dose of 10 mSv from all sources, including the natural background radiation [6]. This will normally be assessed as the mean dose for an appropriately defined critical group. Remedial measures would often be justified below the generic reference level and national authorities may define a lower reference level for identifying areas that might need remediation.

3.3. If remediation is justified for dose levels below the generic reference level to reduce a dominant component of an existing annual dose, a reference level specific to particular components can be established on the basis of appropriate fractions of the generic reference level. Such specific reference levels (such as intervention levels and action levels) shall be subject to the approval of national authorities for particular situations of prolonged contamination that are amenable to intervention on the basis of the optimization process specified in para. 3.1. Specific reference levels can be expressed in terms of the avertable annual dose or a subsidiary quantity such as activity concentration (Bq/g) or surface contamination density (Bq/cm^2).

[4] The avertable annual dose is the annual dose that could be averted if a countermeasure or set of countermeasures were to be applied.

3.4. For all situations in which the thresholds of annual dose for deterministic effects in relevant organs could be exceeded, the implementation of remedial measures or restrictions on access shall be required. An existing annual equivalent dose of 100 mSv (inclusive of all existing contributions, including doses due to the natural background radiation) to any organ shall justify intervention under almost any circumstances, unless national authorities specifically determine that such measures are not justified.[5]

3.5. In the implementation of remedial measures, the exposure of workers shall be controlled under the system of radiation protection for practices. No worker undertaking remedial measures shall be exposed in excess of the annual dose limits for occupational exposure. If the implementation of remedial measures could result in the temporary exposure of members of the public leading to doses exceeding the dose limits for practices, such additional doses shall be justified on the basis of the resulting net benefit, including the final reduction of the annual dose.

4. LEGAL AND REGULATORY FRAMEWORK

4.1. A national strategy shall be formulated to specify, prioritize and manage remediation situations and to ensure that an adequate legal and regulatory framework, supported where necessary by appropriate guidance material, is in place so that workers, the public and the environment are protected when remediation programmes are undertaken [17]. This strategy shall be commensurate with the risks associated with the contaminated areas and the approach to remediation shall be graded such that the actions to be taken can be prioritized according to the risks. Any possible effects on neighbouring States shall be taken into account as appropriate in the strategy.

4.2. In formulating national strategies, it shall be taken into account that it may be necessary to involve a number of government and private organizations, and provision shall be made for liaison between them. National laws and regulations covering such matters as occupational and public radiation protection, environmental protection, transport of radioactive

[5] Above this dose level, the annual absorbed dose thresholds for deterministic effects in particular organs may be reached [6].

material, mining of ores and food standards, which may be administered by different government bodies, shall be applied to create a coherent regulatory process.

4.3. The legal framework shall be established such that it specifies the situations that are included in its scope, sets objectives and principles for remedial measures, and assigns responsibilities.

4.4. It shall be ensured by means of the legal framework that adequate funding mechanisms are available and that responsibilities are assigned for the financing of remedial measures and protective actions to be taken after remediation that are proportionate, manageable and economically sustainable. It shall be ensured by means of the legal framework that provision is made for adequate funding to be available if organizations or individuals are unable to meet their liabilities. In order to help ensure that the remediation is adequately funded, the regulatory body shall identify all those persons or organizations responsible for the contamination and other appropriate persons to finance the remediation. Voluntary co-operation between owners, industry and the community in partnership shall generally be encouraged in preference to regulatory action.

4.5. The legal framework shall provide the basis for establishing any restrictions that may be placed upon the use of or access to the area before, during and, if necessary, after remediation.

4.6. An appropriate waste management strategy and its associated legal framework shall be established that are capable of dealing with the waste arising from the remediation of contaminated areas. This shall include the assignment of any additional responsibilities for the funding, conduct and regulatory control of waste management activities.

4.7. The legal framework shall provide for appropriate record keeping that covers the nature and extent of contamination, the decisions made prior to and during the implementation of remedial measures, decisions made after remediation and information on verification. The legal framework shall also identify those responsible for these activities.

4.8. The decision making process shall provide for the involvement of a wide range of interested parties in the definition, implementation and verification of remediation programmes and for regular public information exchange on the implementation of these programmes.

4.9. The regulatory body shall establish safety criteria for the remediation of contaminated areas, including conditions on the end points of remediation. The responsibilities of the regulatory body shall include, among other things, the following:

(a) To investigate potentially contaminated areas and to designate as contaminated areas those areas requiring remediation;
(b) To review and approve the strategies and remediation programmes submitted by the organization responsible for implementing the remedial measures;
(c) To develop criteria and methods for assessing the implementation of remedial measures;
(d) To issue any authorization or licence necessary for taking the approved remedial measures;
(e) To review work procedures, monitoring programmes and records during the implementation of measures for remediation and for post-remediation;
(f) To provide and maintain control mechanisms for the future use of lands, structures or resources affected by contamination and by the ensuing remediation;
(g) To review and approve significant changes in procedures or equipment that may have an environmental impact or may alter the exposure conditions for public or occupational exposure;
(h) To receive and assess reports of abnormal occurrences;
(i) To carry out regular inspections and to take enforcement actions as necessary;
(j) To ensure compliance with the legal and regulatory requirements, including the criteria for waste management and discharges established for the remediation programmes.

4.10. The identified responsible parties for the remediation of an area shall be responsible for all aspects of safety until the completion of the remediation effort.

4.11. To ensure an adequate level of safety, the responsible parties shall perform safety assessments and environmental impact assessments; shall prepare and implement appropriate safety procedures; shall apply good engineering practices; shall ensure that the staff are trained, qualified and competent; shall establish and implement a quality assurance programme; and shall keep records as required by the regulatory body.

4.12. The responsible parties shall also:

(a) Prepare and maintain remediation plans;
(b) Establish and maintain arrangements for emergency planning commensurate with the hazards associated with the remediation activities;
(c) Report incidents significant to safety to the regulatory body in a timely manner;
(d) Identify an acceptable waste disposal or storage site, as appropriate, for the generated waste;
(e) Ensure that all waste is transported safely and in accordance with the requirements for its transport [18, 19].

5. DEVELOPMENT AND IMPLEMENTATION OF A REMEDIATION PROGRAMME

5.1. Remediation of a contaminated area comprises the preparation and approval of a remediation plan; remediation operations; and the management of waste resulting from the remediation activities.

5.2. Before planning and implementing a specific remediation programme, the nature of the problem and the associated concerns shall be appropriately characterized. All relevant information concerning the past and present management of the situation and any emergency response actions taken shall be compiled so as to be available for consideration in the development of the remediation strategy.

5.3. An appropriate assessment of both the radiological and non-radiological impacts of the situation and the benefits and detriments associated with possible remedial measures, including the associated restrictions and institutional arrangements following remediation, shall be performed and an optimum strategy shall be established.

5.4. In each specific situation, remedial measures shall be based on reference levels established as part of the decision making process.

5.5. When the organization (or organizations) responsible for implementing the remedial measures is specified, it shall prepare a remediation plan.

A remediation plan showing that remediation can be accomplished safely shall be prepared for each contaminated area, unless otherwise required by the regulatory body. The remediation plan shall be subject to the approval of the regulatory body prior to its implementation. The approved plan shall state, as a minimum: the goal for the remediation; reference levels for remediation; the nature, scale and duration of the remedial measures to be implemented; the waste disposal or storage site, as appropriate; any post-remediation restrictions; and the monitoring and surveillance programmes and arrangements for institutional control for the remediation area.

5.6. Before the formal termination of the remediation programme and the release from further responsibilities of the organization responsible for implementing the remedial measures, compliance with criteria shall be verified and the termination shall be subject to the approval of the regulatory body.

5.7. In the event that the approved goals have not been met, further assessment shall be performed and decisions shall be taken on whether further remedial measures or additional restrictions are required. If either the remediation fails to meet the termination criteria, or the extent or complexity of the contamination is greater than was originally determined, the implementing organization shall assess the new situation. An optimization shall be performed by the responsible organization to determine a new course of action, which may include placing reliance upon restricting access to the affected area. Any such modification to the remedial measures shall be subject to the approval of the regulatory body.

6. OPERATIONAL ASPECTS OF REMEDIATION

6.1. During the implementation of remedial measures, consideration shall be given to radiation safety, transport safety and waste safety, so as to minimize hazardous impacts, and to the potential for prolonged exposure after the termination of remediation operations [4, 7, 8, 18, 19]. Consideration shall also be given to general health and safety issues and environmental issues.

6.2. Activities for predisposal waste management shall be undertaken, where appropriate, to treat and condition the contaminated material arising from remediation operations, including secondary waste generated by the remediation activities. The associated safety programme shall include

considerations of occupational protection and safety, such as training, the use of protective clothing and respiratory equipment, and cleaning facilities [13].

6.3. The area shall be monitored and surveyed regularly during remediation so as to verify the levels of contamination and to ensure compliance with the requirements for waste management. Regular surveillance will also enable the organization responsible for the remediation to detect any unexpected levels of radiation and to modify the remediation plan accordingly. Revisions to the remediation plan shall be subject to the approval of the regulatory body. There may need to be several iterations of review and revision of the remediation plan.

6.4. For the management of radioactive waste arising from the implementation of remedial measures, the objective of the protection of human health and the environment now and in the future without imposing undue burdens on future generations, as set out in Ref. [7], shall apply, with due consideration of the amounts, characteristics, properties and types of radioactive waste.

6.5. The management of radioactive waste arising from the implementation of remedial measures shall be considered one component of the entire decision making process. The costs of transport and disposal of the waste, the radiation exposure of and other risks to the workers handling it, and, subsequently, the exposure of the public associated with its disposal shall all be taken into account in the process of determining the optimum option for remediation.

6.6. The management of radioactive waste shall comply with the international and national requirements for waste management facilities [7, 13, 14].

7. POST-REMEDIATION ACTIVITIES

7.1. Before an area can be released for unrestricted use, a survey shall be performed to demonstrate that the end point conditions, as established by the regulatory body, have been met.

7.2. After the remediation has been completed, the degree, extent and duration of control, if any (ranging from monitoring and surveillance to restriction of access) shall be reviewed and formalized with due consideration

of the residual risk. The organization responsible for the surveillance and verification of activities shall be clearly identified.

7.3. If necessary, specific restrictions shall be established for the following purposes:

(a) To control the removal of radioactive material from contaminated areas or the use of such material, including its use in commodities;
(b) To control access to contaminated areas;
(c) To control the future uses of contaminated areas, including use for the production of foodstuffs and water use, and to control the consumption of foodstuffs from contaminated areas.

7.4. The conditions prevailing after the completion of the remedial measures, if the regulatory body has imposed no restrictions or controls, shall be considered to constitute the background conditions for new practices or for habitation of the land.

7.5. An appropriate programme, including any necessary provisions for monitoring and surveillance, shall be established to verify the long term effectiveness of the completed remedial measures for areas in which controls are required after remediation, and shall be continued until it is no longer necessary.

7.6. A mechanism shall be established for periodically reviewing the conditions in remediated areas and amending or removing any restrictions imposed. If surveillance and maintenance are required after remediation is completed, a surveillance and maintenance plan shall be prepared which shall be periodically reviewed. The plan shall be subject to the approval of the regulatory body.

7.7. Interested parties shall be informed of any restrictions and of the results of all monitoring and surveillance programmes, and shall be invited to participate in decision making after the remediation.

7.8. A final remediation report, including any necessary final confirmation survey, shall be prepared and retained by the responsible party with other records, as appropriate, and a copy shall be submitted to the regulatory body for information.

7.9. A system for archiving, retrieval and amendment of all important records concerning the initial characterization of the area, the choice of options for remediation and the implementation of remedial measures, including all restrictions and the results of all monitoring and surveillance programmes, shall be established and maintained in all cases. Such records shall include lessons learned in the planning of activities for remediation and in taking the remedial measures. The organization responsible for maintaining the permanent records shall be clearly designated. The archive system shall be designed and maintained so as to ensure the preservation of the records for at least as long as the period for which they are required by the regulatory body to be held.

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