

CRC for Contamination Assessment and Remediation of the Environment

National Remediation Framework

**Guideline on documentation, record-keeping and reporting**

Version 0.1: August 2018

# National Remediation Framework

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The following guideline is one component of the National Remediation Framework (NRF). The NRF was developed by the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) to enable a nationally consistent approach to the remediation and management of contaminated sites. The NRF is compatible with the *National Environment Protection (Assessment of Site Contamination) Measure* (ASC NEPM).

The NRF has been designed to assist the contaminated land practitioner undertaking a remediation project, and assumes the reader has a basic understanding of site contamination assessment and remediation principles. The NRF provides the underlying context, philosophy and principles for the remediation and management of contaminated sites in Australia. Importantly it provides general guidance based on best practice, as well as links to further information to assist with remediation planning, implementation, review, and long-term management.

This guidance is intended to be utilised by stakeholders within the contaminated sites industry, including site owners, proponents of works, contaminated land professionals, local councils, regulators, and the community.

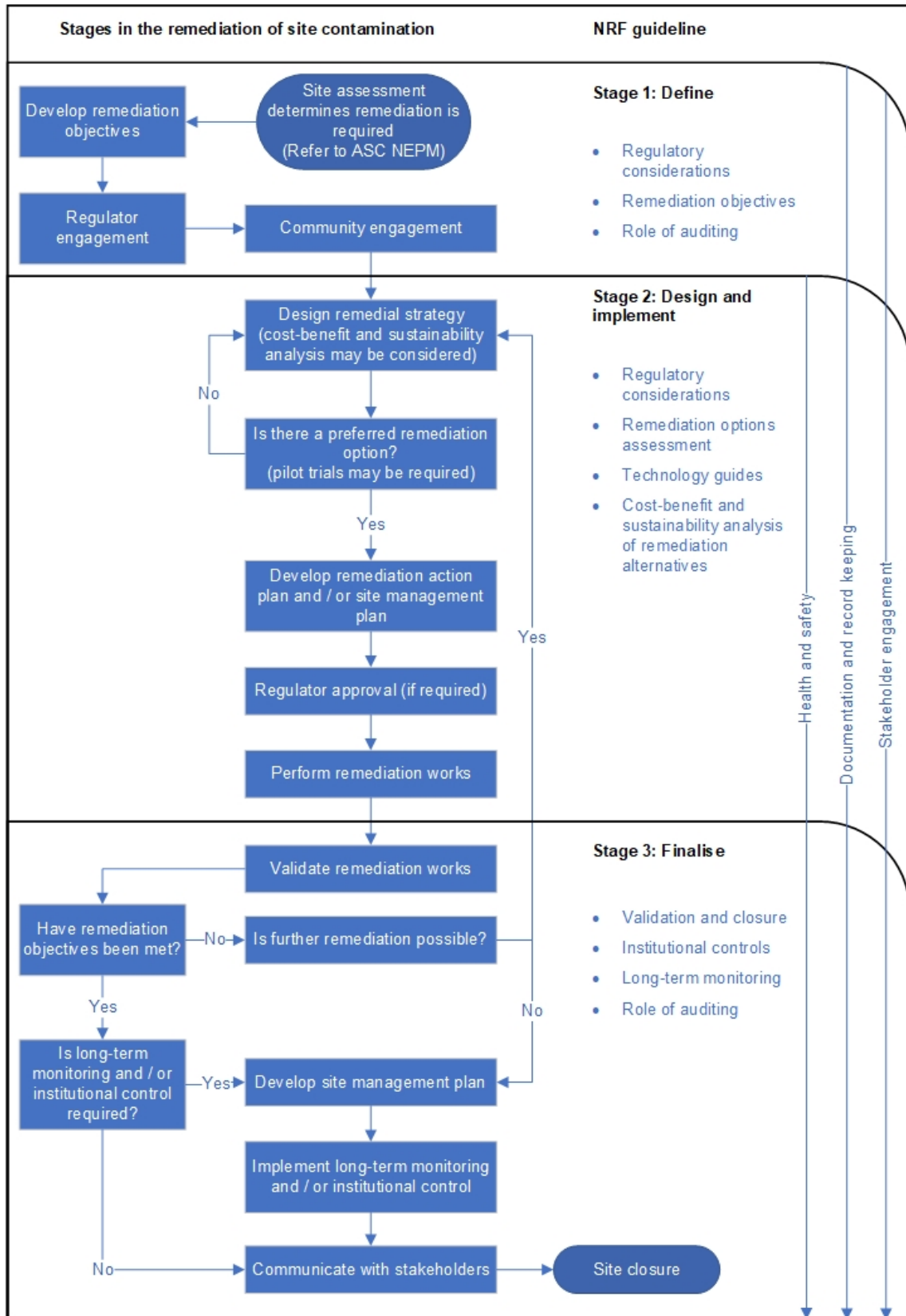
The NRF is intended to be consistent with local jurisdictional requirements, including State, Territory and Commonwealth legislation and existing guidance. To this end, the NRF is not prescriptive. It is important that practitioners are familiar with local legislation and regulations and note that **the NRF does not supersede regulatory requirements**.

The NRF has three main components that represent the general stages of a remediation project, noting that the remediation steps may often require an iterative approach. The stages are:

- Define;
- Design and implement; and
- Finalise.

The flowchart overleaf provides an indication of how the various NRF guidelines fit within the stages outlined above, and also indicates that some guidelines are relevant throughout the remediation and management process.

It is assumed that the reader is familiar with the ASC NEPM and will consult other CRC CARE guidelines included within the NRF. This guideline is not intended to provide the sole or primary source of information.



## Executive summary

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During the remediation and management of contaminated sites, a range of activities may be undertaken. These activities take place following careful planning to address site-specific conditions. This guideline aims to provide general guidance to practitioners as they consider the information they should develop, maintain and make available during the remediation and management of contaminated sites to effectively record the process and meet the reporting requirements of relevant national, state and territory government agencies.

This guideline includes information on documentation, record keeping and reporting for:

- Remediation objectives
- Remediation options assessment;
- Remediation action plans / site management plans;
- Validation and closure reports;
- Monitoring and ongoing management plans;
- Audits; and
- Institutional controls.

## Abbreviations

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ACT	Australian Capital Territory
CRC CARE	Cooperative Research Centre for Contamination Assessment and Remediation of the Environment
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Assessment of Site contamination) Measure 1999 (amended 2013)
NRF	National Remediation Framework
NSW	New South Wales
NT	Northern Territory
RAP	Remediation Action Plan
SA	South Australia
VIC	Victoria
WA	Western Australia

## Glossary

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Audit	An independent review by an appointed auditor of a site contamination consultants' activities to ensure the work complies with current regulations and guidelines for that jurisdiction and meets the standard appropriate for the proposed land use.
Auditor	Individuals accredited under state specific formal auditing schemes, to independently review site contamination consultants' activities to ensure the work complies with current regulations and guidelines and meets the standard appropriate for the proposed land use.
Concentration	The amount of material or agent dissolved or contained in unit quantity in a given medium or system.
Conceptual site model	A representation of site-related information including the environmental setting, geological, hydrogeological and soil characteristics together with the nature and distribution of contaminants. Contamination sources, exposure pathways and potentially affected receptors are identified. Presentation is usually graphical or tabular with accompanying explanatory text.
Contaminant	Any chemical existing in the environment above background levels and representing, or potentially representing, an adverse health or environment risk.
Contaminated site	A site that is affected by substances that occur at concentrations above background or local levels and which are likely to pose an immediate or long-term risk to human health and/or the environment. It is not necessary for the boundaries of the contaminated site to correspond to the legal ownership boundaries.
Contamination	The presence of a substance at a concentration above background or local levels that represents, or potentially represents, a risk to human health and/or the environment.
Environment(al) protection authority / agency	The government agency in each state or territory that has responsibility for the enforcement of various jurisdictional environmental legislation, including some regulation of contaminated land.
Environmental Value	A particular value or use of the environment or any element or segment of the environment which: <ul style="list-style-type: none"> <li>· is important for a healthy ecosystem;</li> <li>· is conducive to public benefit, welfare, safety, health or aesthetic enjoyment which requires protection;</li> </ul> or

- is declared in state or territory environment protection policy to be a beneficial use.

Definitions for 'beneficial use' or 'environmental value' may differ among jurisdictions (e.g. may include additional considerations for 'environmental harm' as defined in jurisdictional legislation)

See also "beneficial use"

Practitioner	Those in the private sector professionally engaged in the assessment, remediation or management of site contamination.
Proponent	A person who is legally authorised to make decisions about a site. The proponent may be a site owner or occupier or their representative.
Remediation	An action designed to deliberately break the source-pathway-receptor linkage in order to reduce the risk to human health and/or the environment to an acceptable level.
Risk	The probability that in a certain timeframe an adverse outcome will occur in a person, a group of people, plants, animals and/or the ecology of a specified area that is exposed to a particular dose or concentration of a specified substance, i.e. it depends on both the level of toxicity of the substance and the level of exposure. 'Risk' differs from 'hazard' primarily because risk considers probability.
Site	A parcel of land (including ground and surface water) being assessed for contamination, as identified on a map by parameters including Lot and Plan number(s) and street address. It is not necessary for the site boundary to correspond to the Lot and Plan boundary, however it commonly does.
Site Management Plan	Provides details in relation to the risk-based management of a site if remediation is not required.

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# 1. Introduction

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During the remediation and management of contaminated sites, a range of activities may be undertaken. These activities take place following careful planning to address site-specific conditions. This guideline aims to provide general guidance to practitioners as they consider the information they should develop, maintain and make available during the remediation and management of contaminated sites to effectively record the process and meet the reporting requirements of relevant national, state and territory government agencies.

It is assumed that the reader is familiar with the ASC NEPM and will consult other relevant guidelines including those within the NRF. This guideline is not intended to provide the sole or primary source of information about auditing or remediation.

It should be noted that each state or territory has legislation and guidance related to documentation, record keeping and reporting. **This guidance does not supersede those state based regulatory requirements**, and familiarity with local legislation and regulations is necessary before proceeding with environmental remediation and management. It is also noted that the information in this guideline was current at the time of publication.

The 'practitioner' addressed in this guideline is the person responsible for the coordination of remedial or management activities on a contaminated site. The practitioner is usually a professional who works as a site contamination consultant.

In a typical situation, a practitioner is engaged by a site owner or developer to conduct a site assessment, undertake any necessary remediation, and validate the work completed. Another professional—an accredited site auditor—may be required to independently review the work undertaken by the practitioner and provide an opinion (in a report) as to whether the practitioner's work complies with current regulations and guidelines, whether there is evidence to support decisions or actions relating to the site and/or whether the site is suitable for the intended use(s).

Documentation, record-keeping and reporting are ongoing responsibilities of practitioners as they manage the entire remediation and management process on a contaminated site. These responsibilities begin during the assessment stage, they are ongoing while remediation activities are taking place, and continue beyond the completion of works on site.

Establishing and maintaining an organised comprehensive record-keeping and documentation system will assist practitioners to:

- Develop written plans and strategies that provide clarity for people working on-site or affected by site activities;
- Provide an accurate and complete record of remedial activities as well as alterations to the original plans;
- Gauge the success of remediation and management activities against remediation objectives;
- Provide written detail about site activities when required;

- Meet post-remediation requirements, e.g. for the purposes of validation and closure, long-term monitoring, auditing, and the setting of institutional controls regarding the site;
- Present a legally defensible position regarding actions taken to remediate the site;
- Defend those implementing remedial activities from regulatory, worker or public action concerning potential exposure to contaminants; and
- Support possible legal action against potentially responsible parties who may have contributed to the contamination of the site.

Good documentation and record-keeping practices are crucial to the effective management of the activities that are undertaken on a contaminated site. Methods for documenting information include:

- Daily, weekly and monthly reports;
- Site entry or induction records;
- Training forms;
- Sample logs or groundwater well installation logs;
- Air monitoring logs;
- Copies of permits;
- Manifests; and
- Analytical reports.

This guideline highlights likely documentation, record-keeping and reporting requirements related to remediation or management activities on a contaminated site. Information about reporting, documentation and record-keeping requirements related to the assessment of contamination is available through state and territory environment protection authorities and is not the focus of this guideline.

## 1.1 National harmonisation

While specific processes relating to the remediation and management of contaminated sites vary across states and territories, and the names and functions of people involved in these processes also vary, in general the functions, processes and plans are broadly consistent, as documented within this guideline.

Because of the limitations presented by differences in the regulation of contaminated sites across Australia, this guideline provides general guidance only. Environmental protection authorities / agencies in all states and territories have their own specific requirements and guidelines that stipulate the content, method and process of reporting on each aspect of remediation and management. Practitioners should make regular contact with relevant Commonwealth, state or territory government authorities to ensure their documenting, record-keeping and reporting activities comply with local requirements and site-specific conditions. There are specific regulations and documentation requirements that apply to remediation and management activities relating to airports, mining, defense and underground storage tanks in certain states or territories, and practitioners should refer to relevant Commonwealth, state or territory legislation as appropriate.

In accordance with the overall aims of the NRF, the information within this guideline has been synthesized from existing material from a range of sources. To maintain relevance for practitioners these sources are predominantly Australian in origin, and include guidelines published by the Commonwealth, state or territory government agencies that have legislative or regulatory responsibility for work undertaken on contaminated sites.

Along with specific guidance provided by state and territory environment protection authorities and other regulatory agencies, readers are directed to the NRF guideline on regulatory considerations.

## 2. Remediation objectives and options assessment

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The decisions made regarding the objectives and options for remediation and management of a contaminated site occur after careful consideration of the conditions on a specific site. It is important that practitioners document the decision-making process they use while considering their overall remediation and management strategy. This information may be required, often in summary form, in reports made to environmental protection and other regulatory authorities during the implementation of the remediation and management plan. Practitioners should aim to provide clear justification for the setting of objectives and their choice of appropriate remedial and management options and technologies.

In general practitioners will need to demonstrate that they have clearly identified and considered issues likely to occur during the remediation and management project and how they will manage or mitigate those issues. This should include contingency planning, with details provided about what will be done if selected strategies or plans fail.

### 2.1 Remediation objectives

The setting of remediation objectives follows the assessment of a site as being contaminated and in need of some level of remedial action or other management. The remediation or management objectives are usually formulated through a risk management process, with the overall goal being to remediate the site such that it will be suitable for the proposed use and will not pose an unacceptable risk to human health or the environment.

Carefully developed and clearly documented objectives are the foundation of remediation and management planning. As well as giving everyone associated with a contaminated site a clear understanding about why particular activities are being undertaken, they also provide the practitioner with a basis from which to:

- Identify remedial options and select the most appropriate option for a specific site;
- Select the remedial technologies most suited to the options chosen;
- Build an evidence base to justify particular activities or strategies used on the site; and
- Establish performance indicators with which to measure and validate the remedial or management activities undertaken on the site.

Factors that practitioners may consider when setting remediation objectives include:

- The requirements for minimising risk where there is significant uncertainty;
- Protecting current and future groundwater use;
- The health of ecological systems;
- Relevant environmental values;
- The distribution of the contamination;
- Future use(s) of the site;

- The capabilities of the available suitable remediation technologies;
- The sustainability of the remediation or management objectives; and
- Legal and social considerations, including incorporating community consultation.

Specific guidance on deciding remediation objectives is contained within the NRF *Guideline on establishing remediation objectives*.

## **2.2 Remediation options assessment**

The development and documentation of clear remediation objectives allows the consideration of the most appropriate remedial or management strategy for the site and provides a record of evidence to support decisions that are made.

Specific guidance on choosing a remediation option is provided in the NRF *Guideline on performing remediation options assessment*, and in the various NRF *Technology guides*.

Specific guidance on performing a cost benefit and sustainability analysis is provided in the NRF *Guideline on performing cost benefit and sustainability analysis on remediation options*.

### 3. Remediation action plan

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Following the setting of remediation objectives, and the selection of remediation strategies, practitioners can plan the activities that will constitute the remediation.

All state and territory environment protection authorities have guidance that encourages practitioners keep accurate and comprehensive records during this planning process. Practitioners may be required to report on site activities at various stages through the assessment, remediation and management process. The primary record relating to the planning of remediation and management activities is commonly referred to as a remediation action plan (RAP). In different states and territories across Australia, this plan may be known by various names and may be structured in different ways, for example, as one 'umbrella' plan or as a series of smaller plans, depending on regulatory requirements and site-specific conditions. There is, however, general national consistency in the way such plans detail the procedures, processes and plans that will be implemented during the remediation works.

The specific detail provided within these plans is obviously dependent on site-specific objectives and conditions, as well as the requirements of state and territory environment protection authorities. Operational and other site-specific planning will always involve careful consideration of the issues involved, but in some situations may require only limited documentation to document site activity and meet reporting requirements. At other times, comprehensive plans may need to be developed to guide and record what is occurring on the site, for example, where contamination scenarios and remedial techniques are complex and require significant stakeholder engagement.

To produce a coherent picture of the condition of the site, some of the information collected and reported upon when the site is first investigated and assessed, for example, site history, conditions, geology and hydrogeology, and risk assessment, is included (usually in summary form) in the RAP. Practitioners and environment protection authorities are then able to access all the information needed to make informed decisions regarding the remediation of the site.

The RAP may also stipulate the ongoing reporting requirements during and following remediation or management activities. This is important as it allows the practitioners to plan the type and frequency of information that must be collected during the remediation works. Failure to plan the documentation requirements prior to the commencement of remediation works may result in the required records not being kept, which may prevent or delay validation and site closure.

An example of a RAP is provided as **Appendix A**. The example RAP is a synthesis of information required of practitioners by various state and territory environmental protection authorities. It includes information that will have been gathered or developed during the assessment stage and prior to the beginning of remediation.

Information that may be required for including in an RAP:

- Identification of remediation and/or management objectives for the site;
- Discussion of the extent of the remediation required;
- Discussion of the available remedial and management options and how risk can be reduced;

- Discussion of the community's involvement in the selection of remediation or management options through a planned community consultation process;
- Environmental modelling to predict possible outcomes of remedial actions or to consider 'no further action' (if included);
- Justification of the chosen option against other available technologies or management options where the method chosen is not consistent with the hierarchy of options for site remediation or management;
- Rationale for the selection of the recommended remedial option;
- Details about how the remedial technique will be carried out;
- Contingency planning for possible failure of remedial or management strategies;
- Site or environmental management plan during remediation operations;
- Site management plan for any necessary ongoing monitoring as required;
- Documentation and reporting requirements during remediation; and
- Validation procedures, including remediation criteria or end-points.

### **3.1 Site preparation and administration**

Regardless of the type of plan developed for a contaminated site, practitioners will be required to produce documentation relating to site preparation and administration.

Common elements included when reporting on site preparation and administration include:

- Details of site preparation—fencing, erection of warning signs, storm water diversion, onsite water usage;
- Demonstration of compliance with regulatory requirements such as licenses and approvals;
- Remedial or management action schedule, including the expected life of the project;
- Staged progress reporting schedule;
- Hours of operation;
- Names and phone numbers of appropriate personnel to contact during remediation; and
- Name and phone number of an emergency contact for the site.

### **3.2 Environmental management plan**

This plan provides detail about the way environmental issues will be addressed during remedial or management works.

Common elements included when reporting an environmental management plan include:

- Water management (including surface and groundwater quality, and leachate control)
- Wastewater management

- Soil management
- Noise management (including noise and vibration)
- Air management (including dust and odour control)
- Waste management (including solid/liquid waste, and special waste (medical, radioactive, chemical))
- Hazardous materials management (including scheduled wastes, resource storage, pest control, household chemicals, compressed/liquid gas)
- Flora and fauna
- Heritage (including indigenous heritage)

### 3.3 Health and safety plans

These plans provide details about the way the health and safety of workers, and the public, will be addressed during remedial or management works.

Common elements included when reporting a health and safety plan include:

- General site and project information
- Safe systems of work
- Induction, training and supervision
- Preparing for emergencies
- Reporting and record-keeping related to health and safety
- Provision of health and safety information to workers and members of the public

For specific guidance on health and safety readers are directed to the NRF Guideline on health and safety.

### 3.4 Stakeholder engagement plan

This plan provides details about communicating with stakeholders, including the local community, throughout the remediation and management process, including involvement in decision-making where appropriate.

Common elements included when preparing a stakeholder engagement plan include:

- Identification of relevant stakeholders for the project
- Information that will be provided to and sought from stakeholders
- How, when and where stakeholder consultation will take place
- How input from stakeholders will be considered and incorporated into the decision-making process relating to the management of the site

Specific guidance on stakeholder engagement is provided in the NRF *Guideline on stakeholder engagement*.

### 3.5 Other site-specific plans

These plans may be required by environment protection authorities or other relevant government agencies when there are contamination issues present on the site, e.g.



asbestos, or when particular remedial strategies are to be used, e.g. soil bioremediation.

The content of these plans will depend on site-specific conditions and the reporting requirements of state and territory environment protection authorities and other regulatory agencies.

## 4. Validation plan and closure

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While remediation validation and closure actually occur following the completion of remedial or management works on a site, a validation plan is usually developed prior to the start of remedial works. This plan provides a record of the process by which the practitioner intends to measure the outcome of works against the remediation and management objectives. Validation also helps to determine whether any further remediation work or restrictions on land use are required.

Common elements to include in a validation and closure plan include:

- Rationale and justification for the validation strategy including clean-up levels and statistically based decision-making methodology, validation sampling and analysis plan;
- Other validation criteria and trigger levels (eg concentration trend analysis, mass flux trend analysis)
- Details of a statistical analysis of validation results and evaluation against the clean-up levels;
- Assessment of reasons for any failure to meet targets and proposals for any additional work to be completed to achieve original objectives;
- Documentation to confirm disposal of waste (landfill dockets) and certification of clean fill; and
- Verification of compliance with regulatory requirements (licenses, approvals and development consents) set by environment protection authorities and other local and state regulatory agencies—in particular, documentary evidence is often required to confirm that any disposal of soil offsite has been done in accordance with relevant regulations.
- Verification testing (eg compaction tests for liners or capping layers, leak testing of vapour barriers)
- Operational / performance records for groundwater remediation systems
- Survey of final levels if earthworks were involved

Readers are directed to the NRF *Guideline on validation and closure* for more detailed information.

## 5. Monitoring and/or ongoing management plan

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Monitoring and/or ongoing site management plans provide details about the way chemical substances and/or the site will be managed in the long term. Remedial activities may or may not have taken place.

Sometimes, contaminants may be present on site, for example, in deep soils below the ground but, for the existing or proposed use, it may be more practical and present less environmental and/or health risk for the contaminants to be safely managed on-site.

Common elements to include in general monitoring or ongoing management plans include:

- The nature and location of chemical substances remaining on the site;
- The objectives of long-term management of the site;
- How the site in general, and remaining chemical substances in particular, will be managed and monitored;
- Who will be responsible for implementation;
- Evidence of acceptance by the responsible party to implement the plan;
- Contingency plans in the case of unsuccessful management measures; and
- Time frames for action and for reporting to relevant government regulatory agencies.

If a specific long-term monitoring plan is required, it will detail the actions, responsibilities and timeframes for monitoring one or more processes, for example, stack emissions, wastewater discharges and groundwater. It will usually also include information on the history of the site, its surrounding environment (including geology and hydrogeology), field and laboratory sampling and analysis plans, as well as quality control and assurance strategies.

A long-term monitoring program should document the following:

- Timeframes, e.g. commencement and expected length of the program;
- Details about ongoing site monitoring requirements (soil, groundwater, surface water, air emissions), including monitoring locations, parameters and frequency;
- Methodology of monitoring, including field and laboratory techniques;
- Results of monitoring analyses including relevant Quality Analysis/Quality Control reporting;
- Any pre-determined trigger levels for further action, i.e. to trigger active remediation;
- Details of party(s) responsible for the monitoring program;
- Details of reporting frequency; and
- Details of what should be reported and to whom.

For more details readers are directed to the NRF *Guideline on implementing long-term monitoring*.

## 6. Audits

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An audit is an independent review by an appointed auditor of a site contamination consultants' activities to ensure the work complies with current regulations and guidelines for that jurisdiction and meets the standard appropriate for the proposed land use.

Depending on the jurisdiction some form of audit may be required of remedial or management decisions and works on a contaminated site. Sometimes, however, an audit is only required in situations where there is a change in land use to a more sensitive use, if the contamination at the site is particularly complex, off-site receptors are affected, or regulation takes up significant resources of regulatory authorities. The relevant Commonwealth, state or territory government agency, which may be an environmental protection authority or a planning and development control authority, considers the site audit report before making decisions about the future use of the site.

While the form that audit takes may vary according to the legislative and regulatory priorities of the relevant Commonwealth, state or territory government authority, the impact of audits on the work of practitioners is similar across Australia.

If an audit is required, it is sensible to involve the auditor early in the assessment and remediation process. This makes it possible for the practitioner and the auditor to communicate about the specific documentation that will need to be developed, maintained and made available to meet the requirements of the audit. It is usually stressed, however, that the involvement of the site auditor should be limited to the auditor providing advice on their information requirements and criteria for determining the suitability of the site for use.

An audit of a contaminated site culminates in a report being written by the site auditor for presentation to an environment protection authority or other regulatory agency. There are, therefore, no direct reporting responsibilities belonging to the practitioner in relation to an audit. However, the practitioner is required to make available clear and comprehensive documentation and records that relate to remediation and management activity on the site to enable the auditor to form an opinion and write their report.

Comprehensive guidance is available for site auditors to enable them to fulfil their auditing responsibilities, and this guidance is also of value to practitioners, enabling them to gain a solid understanding of the information they may be required to provide.

Specific guidance on audits is provided in the NRF *Guideline on the role of auditing*.

## 7. Institutional controls

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The placement of institutional controls onto a contaminated site may occur following the completion of remedial works or in the absence of remedial works. While specific approaches vary across Australia's states and territories, land-use planning processes such as development approvals are often used to apply controls to monitor or regulate activity on a site.

Some of the controls currently used in Australia include:

- Notations on land titles;
- Use of contaminated land registers and management plans to apply conditions to the use or development of sites or the activities undertaken on sites;
- Conditions on planning permits;
- Agreements with planning authorities;
- Pollution abatement notices; and
- Clean-up notices.

Accurate and comprehensive documentation and record-keeping by the practitioner during all remedial or management activities ensures that environment protection authorities can access the information required to make important and long-term decisions about the management of a contaminated site.

The placement of institutional controls is a responsibility of the relevant Commonwealth, state or territory agency. There are, therefore, no direct reporting responsibilities belonging to the practitioner in relation to institutional controls. However, the practitioner is required to make available all the documentation and records that relate to remediation and management activity on the site.

For more detailed information readers are directed to the NRF *Guideline on implementing institutional controls*.

## Appendix A – Example RAP

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This appendix provides an example of the content that may be included in a RAP, summarised in Table 1. It incorporates information that may need to be gathered, developed and reported at any stage during the assessment, remediation and management of a contaminated site.

During the implementation of the RAP, reporting requirements usually allow for a summary of information to be provided where it has been reported in detail to the same regulatory agency on a previous occasion. Where relevant, this is noted on this example plan.

The information in this example plan has been drawn from:

- ACT EPA (2013)
- NSW EPA (2013);
- QLD DEHP (2006);
- SA EPA (2015); and
- WA DEP (2001).

**Table 1: Summary of suggested content of a RAP**

<b>Section</b>	<b>Content</b>
Executive summary	<ul style="list-style-type: none"> <li>• Background;</li> <li>• Objectives of remediation and management of the site;</li> <li>• Scope of works;</li> <li>• Summary of sampling results/previous investigations; and</li> <li>• Summary of conclusions and recommendations.</li> </ul>
Scope of work	<ul style="list-style-type: none"> <li>• Clear statement of the scope of work.</li> </ul>
Site identification	<ul style="list-style-type: none"> <li>• Property name, street number, street name and suburb;</li> <li>• Land title details, e.g. mine lease northern references, lot number, land titles office plans, tenure type, parcel and unit references;</li> <li>• Geographic co-ordinates related to a nearby cadastral corner of a state survey control marker or recognised reference mark (where the contamination is limited to a portion of a lot);</li> <li>• Locality map;</li> <li>• Current site plan with scale bar, showing north, infrastructure, lot on plan boundaries, local water drainage and other local environmentally significant features; and</li> <li>• Legal framework, including local government authority, decision-making authorities and involved agencies.</li> </ul>

<p>Site history (summary adequate if detailed information previously provided)</p>	<ul style="list-style-type: none"> <li>• Site owner—past and present</li> <li>• Zoning—previous, present and proposed (including chronological list of site uses, indicating information gaps and unoccupied periods);</li> <li>• Site use—previous, present and proposed;</li> <li>• Heritage (including Aboriginal heritage);</li> <li>• Surrounding land use and zoning—historical, present and proposed;</li> <li>• Summary of council rezoning, relevant development and building approvals records;</li> <li>• Review of aerial photographs—current and historical;</li> <li>• Site photographs (with date and location indicated on site maps, direction photo was taken);</li> <li>• Inventory of chemicals, wastes and by-products associated with site use and their on-site storage location;</li> <li>• Possible contaminant/pollutant sources and potential off-site effects;</li> <li>• Site layout plans showing present and past industrial processes;</li> <li>• Sewer and service plans;</li> <li>• Description of manufacturing processes;</li> <li>• Details and locations of current and former underground and above-ground storage tanks;</li> <li>• Product spill and loss history;</li> <li>• Discharges to land, water and air;</li> <li>• Disposal locations;</li> <li>• Filling history (where applicable);</li> <li>• Relevant complaint history;</li> <li>• Disposal locations;</li> <li>• Local site knowledge of residents and staff—both present and former;</li> </ul>
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Section	Content
	<ul style="list-style-type: none"> <li>• Summary of local literature about the site, including newspaper articles;</li> <li>• Details of building and related permits, licenses, approvals and trade waste agreements; and</li> <li>• Local usage of ground/surface waters, and location of bores/pumps.</li> </ul>
Site condition and surrounding environment (summary adequate if detailed information previously provided)	<ul style="list-style-type: none"> <li>• Data quality assessment (assessment of the accuracy of information);</li> <li>• Topographical layout and contours, drainage patterns;</li> <li>• Conditions at site boundary such as type and condition of fencing, soil stability and erosion;</li> <li>• Visible signs of contamination such as discolouration or staining of soil, bare soil patches—both on-site and off-site adjacent to site boundary;</li> <li>• Visible signs of vegetation stress;</li> <li>• Presence of drums, wastes and fill material;</li> <li>• Odours;</li> <li>• Condition of buildings and roads;</li> <li>• Quality of surface water;</li> <li>• The proportion of site sealed and unsealed, integrity of seal, e.g. whether the concrete hardstand is cracked;</li> <li>• Flood potential;</li> <li>• Type, location and distance to any human receptors in proximity to the site; and</li> <li>• Details of any relevant local sensitive environments, e.g. rivers, lakes, creeks, wetlands, local habitat areas, endangered flora and fauna.</li> </ul>

<p>Geology and hydrogeology (summary adequate if detailed information previously provided)</p>	<ul style="list-style-type: none"> <li>• Soil stratigraphy using recognised classification methods,</li> <li>• Location and extent of imported and locally derived fill;</li> <li>• Description of soil contamination, actual/potential contaminants (solubility, density, stability, persistence and partitioning characteristics);</li> <li>• Site borehole logs or test pit logs showing stratigraphy;</li> <li>• Detailed description of the location, design and construction of on-site wells;</li> <li>• Description and location of springs and wells in the vicinity;</li> <li>• Groundwater conditions (e.g. unconfined, confined, ephemeral and perched), known or expected depth to groundwater table, direction and rate of flow and ambient groundwater quality;</li> <li>• Presence of multi-layered aquifer;</li> <li>• Direction and rate of groundwater flow;</li> <li>• Permeability of strata on the site;</li> <li>• Direction of surface water run-off;</li> <li>• Groundwater discharge location;</li> <li>• Ambient groundwater chemistry;</li> <li>• Groundwater/surface water interaction;</li> <li>• Beneficial use of groundwater in the vicinity such as public drinking water supply and source areas, domestic irrigation, aquatic ecosystems, and the potential impacts on these uses;</li> <li>• Background water quality;</li> <li>• Preferential water courses/migratory pathways;</li> <li>• Location of sensitive receptors/users;</li> <li>• Summary of local meteorology; and</li> <li>• Assessment on storm surge impacts from inundation and wave motion.</li> </ul>
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Section	Content
Basis for assessment criteria	<ul style="list-style-type: none"> <li>• Table listing all selected assessment criteria/levels and references;</li> <li>• Rationale for and appropriateness of the selection of assessment levels criteria;</li> <li>• Assumptions, uncertainties and limitations of assessment levels criteria; and</li> <li>• Adjustment of assessment criteria for composite sampling in jurisdictions where such sampling is accepted.</li> </ul>
Results	<ul style="list-style-type: none"> <li>• Summary of previous results, if appropriate;</li> <li>• Summary of all results for all environmental media (surface waters, groundwaters, sediments, soil and air), in a table that: <ul style="list-style-type: none"> <li>• shows all essential details such as sample numbers and sampling features, e.g. depth and points;</li> <li>• shows assessment criteria levels; and</li> <li>• highlights all results exceeding the assessment criteria levels.</li> </ul> </li> <li>• Site plan showing all sample locations, sample identification numbers and sampling features, e.g. depths in soil and sediment, extent in groundwater plumes; and</li> <li>• Site plan showing the extent of solid and groundwater contamination /pollutant exceeding selected assessment criteria levels for all media (with consideration of the sampling features, e.g. depth in soil and sediment, extent of groundwater plumes).</li> </ul>
Site characterisation/risk assessment	<ul style="list-style-type: none"> <li>• Assessment/characterisation of type of all environmental contamination/pollutants in all media, e.g. soil, soil gas and groundwater;</li> <li>• Assessment of extent of soil and groundwater contamination, including off-site effects;</li> <li>• Assessment of the chemical degradation;</li> <li>• Assessment of possible exposure routes and exposed populations, i.e. human and ecological/health risk assessment; and</li> <li>• Assessment of receiving environment's sensitivity/ecological risk assessment.</li> </ul>

Remedial and/or management planning	<ul style="list-style-type: none"><li>• Remediation and management objectives;</li><li>• Discussion of the extent of remediation required;</li><li>• Discussion of possible remediation and management options and how risk can be reduced;</li><li>• Discussion of community involvement in selection of remediation and management options;</li><li>• Rationale for the selection of recommended remedial options;</li><li>• Contingency planning as required for site incidents/failure of remedial or management strategies;</li><li>• Justification of the chosen option against other available technologies or management options where the method chosen is not consistent with the hierarchy of options for site remediation or management;</li><li>• Interim site management/preparation plan (prior to commencing remedial actions), including fencing, erection of warning signs, storm water diversion, onsite water usage;</li><li>• Demonstration of compliance with regulatory requirements such as licenses and approvals;</li><li>• Remedial and management action schedule, including expected life of project;</li><li>• Hours of operation;</li><li>• Names and phone numbers of appropriate personnel to contact during remediation;</li><li>• Staged progress reporting;</li><li>• Operational and other site-specific plans that include details about managing and/or mitigating potential impacts, incorporating the following components:<ul style="list-style-type: none"><li>• Environmental management, including:<ul style="list-style-type: none"><li>• Water management (including surface water and groundwater quality, and leachate control);</li><li>• Wastewater management;</li><li>• Soil management;</li><li>• Noise management (including noise and vibration);</li><li>• Air management (including dust and odour control);</li></ul></li></ul></li></ul>
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Section	Content
	<ul style="list-style-type: none"> <li>• Waste management (including solid/liquid waste, and special waste (medical, radioactive, chemical));</li> <li>• Hazardous materials management (including scheduled wastes, resource storage, pest control, household chemicals, compressed/liquid gas);</li> <li>• Flora and fauna; and</li> <li>• Heritage (including Indigenous heritage).</li> <li>• Health and safety plan;</li> <li>• Stakeholder engagement plan;</li> <li>• Other site-specific plans, e.g. bioremediation strategy, asbestos, underground petroleum storage systems;</li> <li>• Validation plan; and</li> <li>• Long-term site management plan.</li> </ul>
Conclusions and recommendations	<ul style="list-style-type: none"> <li>• Summary of all findings;</li> <li>• Assumptions used in reaching the conclusions;</li> <li>• Extent of uncertainties in the results;</li> <li>• Where remedial action has been taken, a list summarising the activities and physical changes to the site;</li> <li>• Where relevant, a clear statement that the practitioner considers that there is a potential for off-site migration and the main issues that need to be considered to address the off-site issues;</li> <li>• Summary of engagement outcomes and agreements reached prior to remediation and management activities taking place;</li> <li>• A clear statement that the practitioner considers the subject site to be suitable for the proposed use, with a draft site management plan included;</li> <li>• A statement detailing all limitations and constraints on the use of the site; and</li> <li>• Recommendation for further work, if appropriate.</li> </ul>

## Appendix B – References

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