DEPARTMENT OF DEFENCE
ENVIRONMENT AND ENGINEERING BRANCH
DIRECTORATE OF CONTAMINATION ASSESSMENT, REMEDIATION AND MANAGEMENT

Contamination Management Manual

Annex B
Contamination Investigation, Remediation and Management
March 2019, Amended August 2019
Quick Reference Guide

Why is this an issue for Defence?

Commercial Risk
Defence may be exposed to a future clean-up liability, and reputational risk, if contamination is not appropriately assessed and managed.

Defence Capability
Project delays and costs associated with assessing and managing contamination can have a significant impact on Defence capability and operations.

HSE Risk
Exposure to certain contaminants could cause unacceptable human health risks to Defence personnel, contractors and site users. Health, safety and ecological risks may arise from contamination depending upon the nature, extent and concentration of the contaminant and exposure pathway.

Mandatory Requirements

- The following requirements are mandatory when undertaking contamination investigation, remediation and management project work:
- Defence Project Managers must consider the risk of contamination and management options at each stage of the Capability Life Cycle.
- The Garrison Estate Management System, Environmental Factor Management – Contaminated Site Records (GEMS EFM – CSR) must be reviewed when planning any contaminated land investigation on the Defence estate. A GEMS EFM – CSR search may not be necessary where immediate clean-up and validation works are undertaken in response to an environmental incident.
- An appropriate level of contamination assessment in accordance with the NEPM (Section 3) must be conducted to quantify the nature and extent of contamination and the potential remediation liabilities.
- Defence Project Managers should liaise with DCARM, the Defence Environment and Sustainability Manager (ESM) or the Assistant Director Environment and Sustainability (ADES) regarding the appropriate level of assessment required to inform risk management.
- A Pre-construction Contamination Assessment (PCA), Stage 1 Preliminary Site Investigation (PSI) or Stage 2 Detailed Site Investigation (DSI) must be conducted to identify and/or delineate contamination, and to inform an assessment of risk, impacts and appropriate management measures for any Defence projects that have potential to interact with legacy site contamination. Consideration of all available legacy data provided in GEMS EFM - CSR and Consultation with DCARM should be undertaken to inform adequate planning and budget allocation for contamination management, particularly for redevelopment projects.
- Data and reports generated from contamination investigations and assessments are to be captured in the GEMS EFM – CSR and in Defence ESdat (soil and water chemical data), where necessary in accordance with Annex L.

The need to complete each stage of investigation, assessment or remediation (Section 3) must be determined based on a risk assessment (the Contamination Risk Assessment Tool [CRAT] is available on DEQMS). Every project must evaluate the practical application of this guidance and determine which stages outlined in this Guidance are suitable for completion.
Where to get help or more information

- *Defence Contamination Management Manual*
- Defence ESM and ADES
- [ASC NEPM toolbox](#) field checklists for site characterisation
# Table of contents

Quick Reference Guide .................................................................................................................. ii
Abbreviations ............................................................................................................................... vi
1. Introduction ................................................................................................................................. 1
   1.1 Background ............................................................................................................................. 1
   1.2 Purpose .................................................................................................................................. 1
   1.3 Defence Documentation ......................................................................................................... 2
   1.4 Contamination Management Stages ...................................................................................... 2
2. Regulatory Overview .................................................................................................................... 4
   2.1 Overview ............................................................................................................................... 4
   2.2 Other national reference documents ...................................................................................... 6
3. Contamination Management Stages ............................................................................................ 8
   3.1 Background ............................................................................................................................. 8
   3.2 Contamination Framework and Tools .................................................................................... 9
   3.3 Pre-construction Contamination Assessment ....................................................................... 14
   3.4 Stage 1 Preliminary Site Investigation ............................................................................... 15
   3.5 Stage 2 Detailed Site Investigation ..................................................................................... 17
   3.6 Stage 3 Risk Assessment – Human Health and Ecological ................................................ 20
   3.7 Stage 3 Remediation Planning and Design .......................................................................... 22
   3.8 Stage 4 Remediation Management ....................................................................................... 23
   3.9 Stage 5 Further Management Action .................................................................................... 25
   3.10 Environmental Incident Response ...................................................................................... 26
   3.11 Unexpected Finds ................................................................................................................. 27
   3.12 Specialist Investigations ....................................................................................................... 27
   3.13 Health and Safety ............................................................................................................... 27
   3.14 Accredited Environmental (Contaminated Land) Auditor and Technical Advisor Roles ....... 28
4. Data and Reporting ...................................................................................................................... 30
   4.1 GEMS EFM – CSR ................................................................................................................. 30
   4.2 Geographic Information Systems .......................................................................................... 30
5. Projects and Contamination Management .................................................................................. 31
   5.1 Case Studies .......................................................................................................................... 31
   5.2 Case Study 1: Site redevelopment and unexpected finds .................................................... 32
   5.3 Case Study 2: Management of known legacy burning sites .............................................. 33
6. References ................................................................................................................................... 34
Table index

Table 3-1 Phases of contamination ................................................................. 12

Figure index

Figure 1-1 Overview of Defence Environmental Documentation and Annex B ........ 2
Figure 1-2 Contamination Management Sequence ........................................... 3
Figure 3-1 – Reporting Flowchart – CSR, PCSR, PPS .................................... 10
Figure 3-2 Example Conceptual Site Model – Fuel Distribution and Storage Sites ................................................................................................................................................. 13

Appendices

Appendix A – PCA Report Table of Contents
Appendix B – Stage 1 PSI Report Table of Contents
Appendix C – Stage 2 DSI Report Table of Contents
Appendix D - Remediation Action Plan Table of Contents
Appendix E – Generic Protocol for Unexpected Finds
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADES</td>
<td>Assistant Director Environment and Sustainability</td>
</tr>
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<td>AS</td>
<td>Australian Standard</td>
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<td>National Environment Protection (Assessment of Site Contamination) Measure 1999 (Cth) (NEPC 2013)</td>
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<tr>
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<td>Construction Environment Management Plan</td>
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<tr>
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<td>Contaminants of Potential Concern</td>
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<td>CRAT</td>
<td>Contamination Risk Assessment Tool</td>
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<td>Conceptual Site Model</td>
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<td>Contaminated Site Record</td>
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<td>Defence Restricted Network</td>
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<td>Environmental Assessment Report</td>
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<td>Garrison Estate Management System Environmental Factor Management – Contaminated Site Record</td>
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<td>Project Review and Assessment Process</td>
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<td>Quality Assurance</td>
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<td>Remediation Feasibility Study</td>
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<td>SAQP</td>
<td>Sampling, Analysis and Quality Plan</td>
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<td>Site Environment Management Plan</td>
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<tr>
<td>SMARTI</td>
<td>Sustainable Measurable Adaptable Renewable Transferable Infrastructure</td>
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<td>UXO</td>
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1. **Introduction**

1.1 **Background**

The Defence Estate comprises a number of contaminated sites as a legacy of past industrial and military activities and practises.

This document provides guidance on investigating and assessing risks associated with contamination and managing and remediating contaminated sites during all stages of the asset life cycle. This document should be referred to in combination with other relevant property management tools, which are available through the Defence Property Group and the Directorate of Contamination Assessment, Remediation and Management (DCARM).

In this guidance document, contamination refers to existing chemical contamination of soil, water, and sediment associated with:

- Historical/past industrial and military activities and practises that have now ceased.
- On-going operational activities where a recent incident (e.g. spill or leak) has resulted in contamination, but the operation at the area, or in the facility, is continuing.

The management measures used to address both historical and recent contamination are common however the timeframes by which the measures are implemented may differ depending on the degree of risk posed by the contamination to human health and the environment.

1.2 **Purpose**

This guidance is to assist Defence personnel and contractors acting on behalf of Defence, in investigating and assessing risks associated with potential contamination, and managing and remediating contaminated sites.

The information in this document relates to environmental (e.g. soil, water and sediment) contamination and not to the condition of buildings or structures (e.g, the presence of hazardous building materials). The reader is directed to the Work Health and Safety Group for assistance with these matters.
1.3 Defence Documentation

This guidance document is an Annex to the Defence Contamination Management Manual and supports compliance with site contamination management policy as detailed in the Defence Environment and Heritage Manual. An overview of where this Annex fits into the Manual is presented in Figure 1-1.

![Diagram](image)

Figure 1-1 Overview of Defence Environmental Documentation and Annex B

1.4 Contamination Management Stages

Defence uses a sequence of contamination investigation, assessment and remediation stages to manage potential contamination risk. These stages are presented in Figure 1-2 and further described in Section 3.
Figure 1-2 Contamination Management Sequence
2. Regulatory Overview

2.1 Overview

Defence and its contractors must operate to comply with all Commonwealth legislation, including the Work Health and Safety Act (WHS Act), Environmental Protection and Biodiversity Conservation Act (EPBC Act) and the National Environmental Protection (Assessment of Site Contamination) Measures (NEPM). Reference can be made to the Defence Legal Obligations and Compliance Register (LOCR) found on Defence Estate Quality Management System (DEQMS).

Defence may not be subject to State and Territory law in all situations. Whether or not Defence is bound by State and Territory law is a complex issue and legal advice must be obtained to confirm whether a particular State or Territory law is applicable to Defence. Defence contractors must comply with relevant State or Territory laws.

Guidance relating to the assessment of site contamination is outlined in the National Environment Protection Council (NEPC) 1999 (Cth), National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013.

2.1.1 NEPM

The National Environment Protection (Assessment of Site Contamination) Measures 1999 (Cth) (the ASC NEPM) was made under the National Environment Protection Council Act 1994 (Cth). The ASC NEPM is the national guidance document for the assessment of site contamination in Australia. It is given effect by the National Environment Protection Measures (Implementation) Act 1998 (Cth) for the Commonwealth and individual legislation and guidelines in each State and Territory.

The National Environment Protection Council (NEPC) agreed to vary the NEPM by approving an amending instrument to the ASC NEPM in 2013.

All assessments of site contamination on the Defence Estate are to be undertaken in accordance with the recommended process and guidance provided in the ASC NEPM.

The purpose of the ASC NEPM is to establish a nationally consistent approach for the assessment of site contamination; to ensure sound environmental management practices by the community, including regulators, site assessors, site contamination consultants, environmental auditors, landowners, developers and industry parties.

The desired outcome of the ASC NEPM is to provide adequate protection of human health and the environment, where contamination has occurred, through the development of an efficient and effective national approach to the assessment of site contamination.

The ASC NEPM and schedules are available for download through the NEPC website. The ASC NEPM Toolbox contains additional information including calculators, spreadsheets and other supporting documents to assist with application of the amended ASC NEPM.

2.1.2 Work Health and Safety Act 2011 (Cth)

The Work Health and Safety Act 2011 (Cth) (WHS Act) commenced in 2012 and is regulated by Comcare, a Commonwealth Government agency that works in partnership with the Safety, Rehabilitation and Compensation Commission. The WHS Act provides for a nationally consistent framework to protect workers and other persons against harm to their health and safety through the elimination or minimisation of the risks so far as reasonably practicable.

Under the WHS Act, employers must take all reasonably practicable steps to ensure the health and safety of its employees and those who are at or near a workplace under the employer’s control. This means that Defence and its contractors have obligations to protect the health and
safety of workers and others operating within the vicinity of contaminated land that is on or near to a workplace under Defence control.

Model Codes of Practice administered by Safe Work Australia provide practical guides to eliminate and minimise the risks to health and safety as required under the WHS Act.

Any controls outlined in the Defence Work Health and Safety Manual (SafetyMan) must be implemented when managing contaminated materials.

2.1.3 Environment and Heritage Manual

The Environment and Heritage Manual (EHM) (2019) describes the agreed approach to enabling Defence capability through long-term sustainable management of the environment. The EHM provides instruction and policy guidance for all Defence personnel and contractors on Defence's legislative obligations and stewardship goals in line with the Defence Environmental Policy and Environmental Strategy 2016-2036.

The Defence Environment and Heritage Manual is an administrative policy framework document that applies to all Defence personnel.

The EHM is divided into 13 chapters addressing:

- Chapter 1 – Environment and heritage management in Defence
- Chapter 2 – Environmental assessment and approval
- Chapter 3 – Heritage management
- Chapter 4 – Domestic biosecurity
- Chapter 5 – Native species and communities
- Chapter 6 – Soil management;
- Chapter 7 – Bushfire management
- Chapter 8 – Pollution prevention
- Chapter 9 – Site contamination management
- Chapter 10 – Estate water management
- Chapter 11 – Estate energy management
- Chapter 12 – Waste minimisation and management
- Chapter 13 – Estate climate adaptation

Each chapter links back to a Strategic Aim of the Defence Environmental Policy and provides supporting documentation to support the implementation of the policy.

2.1.4 Environment Protection and Biodiversity Conservation Act 1999 (Cth)

The Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage matters of national environmental significance.

The EPBC Act protects:

- The environment, where actions proposed are on, or will affect Commonwealth land and the environment; and
- The environment, anywhere globally on land and water, where a Commonwealth agency – including the Department of Defence – are proposing to take an action.

The EPBC Act also protects nine matters of national environmental significance:

- World heritage properties
National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Listed threatened species and communities
- Listed migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource in relation to coal seam gas development and large coal mining development.

Defence uses a comprehensive environmental impact assessment and approval program to understand and manage the impacts of its activities on the environment and heritage, and to ensure compliance with the EPBC Act.

Under the Defence Environment and Heritage Manual, the Director of Environmental Planning, Assessment and Compliance (DEPAC) is the Defence technical authority for determining compliance with the EPBC Act. All matters that may trigger the EPBC Act are to be referred to DEPAC.

DEPAC undertakes a self-assessment against the Significant Impact Guidelines 1.1 and 1.2 published by the Department of the Environment and Energy to determine if a ‘significant impact’ EPBC Act protected matter is likely. The self-assessment process considers the nature and extent of contamination and if the presence, disturbance, removal or remediation of existing contamination is likely to have a significant impact on EPBC Act protected matters. Where a significant impact to the environment is ‘likely’ the action must be referred to the Minister for the Environment and Energy to make a determination on whether a proposed action is a ‘controlled action’.

For more information with regard to the EPBC Act refer to http://www.environment.gov.au/epbc/.

2.1.5 Off-site migration
The Defence Project Manager should obtain professional advice to inform the reporting and management of any contamination that is found to have migrated off-site into a State/Territory jurisdiction. Delineating the nature and extent of the off-site contamination will assist Defence to implement appropriate mitigation measures and to manage any legal implications. A link to the various State and Territory environmental agencies can be found in the Defence Environmental Strategy, Defence Contamination Management Manual. Any interaction with State or Territory environmental regulators must only occur after first consulting the Directorate of Contamination Assessment, Remediation and Management (DCARM) and if applicable the Environment and Sustainability Manager (ESM).

2.1.6 Defence Legal Obligations and Compliance Register
Defence and its contractors must operate to comply with all Commonwealth legislation, including the WHS Act, EPBC Act and the NEPM. In addition, Defence and its contractors should be generally familiar with the legislative and other regulatory requirements associated with the site activities undertaken relevant to the State or Territory in which the site is located. Contractors must comply with State and Territory laws where applicable. Reference can be made to the Defence Legal Obligations and Compliance Register (LOCR) found on DEQMS.

2.2 Other national reference documents
Contamination investigations should also be consistent with the following National standards:


• Standards Association of Australia 5667:1998 Water quality – Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.

• National Uniform Drillers Licensing Committee (NUDLC), 2011, Minimum Construction Requirements for Water Bores in Australia (NUDLC 2012).
3. **Contamination Management Stages**

3.1 **Background**

Defence follows a sequence of contamination investigation, assessment and remediation (if required) steps to manage contamination risk. The sequence is presented in Figure 1-2. These steps are broadly aligned with the ASC NEPM and include:

- Pre-construction Contamination Assessment (PCA)
- Stage 1 Preliminary Site Investigation (Stage 1 PSI)
- Stage 2 Detailed Site Investigation (Stage 2 DSI) (soil, water, sediment and vapour)
- Stage 3 Risk Assessment (including Human Health and/or Ecological, where required)/Remediation Planning and Design
- Stage 4 Remediation Management Implementation
- Stage 5 Further Management Action or Monitoring

A PCA is useful for construction projects where portions of a site will be disturbed during excavation (e.g. construction of an infrastructure corridor or new building) and will typically include a targeted sampling methodology within the footprint of the development area. Stages 1 to 5 are more commonly undertaken at a precinct or Base level.

The need to complete each stage of investigation must be based on a risk assessment, to determine if the data available are sufficient to manage risks to human health and the environment relevant to ongoing or planned land uses. There is no requirement to complete all stages outlined in this Guidance. All stages including a PCA must commence with a review of existing available reports and data on the Garrison Estate Management System, Environmental Factor Management – Contaminated Site Records (GEMS EFM – CSR) and any associated risk assessments that have been performed using the Contamination Risk Assessment Tool. A risk assessment may need to be performed using the Contamination Risk Assessment Tool (CRAT) where one does not already exist.

Only qualified and experienced persons are to undertake/advise on contamination investigations/assessments, due to the complexity of the process and the need to rely on experience and judgement when interpreting the results and recommending remediation or management programs that may have substantial cost implications. Defence should engage qualified and experienced professionals from the Defence Environment and Heritage Panel or other relevant panel to undertake contamination investigations/assessments. These consultants have qualifications and experience that is recognised by industry associations such as the Australian Contaminated Land Consultants Association (ACLCA), Australian Land and Groundwater Association (ALGA) or Environmental Institute of Australian and New Zealand (EIANZ).

Any intrusive sampling, management or remedial works must be planned to ensure no significant impact is caused to known or potential heritage (including historical and Indigenous) or ecological values. Any contamination investigation activity that is likely to have a significant impact on the environment or a matter of national environmental significance must be managed in accordance with the requirements of the EPBC Act and in consultation with the Defence Environment & Engineering Branch (EE) and GEMS Environmental Management Factor (EFM).

An overview of the sequence of investigations and assessments is presented in Figure 1-2.
3.2 Contamination Framework and Tools

3.2.1 Contamination Management Tools
The following Defence Contamination Management Tools are to be used throughout the contamination management sequence of investigations and assessments:

- **GEMS EFM – CSR** must be reviewed prior to undertaking any contaminated land investigation (access restricted to Defence personnel and contractors with Defence Restricted Network (DRN) access but reports can be downloaded for provision to others). The GEMS EFM – CSR is the starting point for obtaining site-specific information relating to contamination.

- The Property Environment Profile and the CSR Summary Tab in GEMS EFM provides information on the contamination profile of each Defence site known to have a contamination risk.

- **Contamination Risk Assessment Tool (CRAT)** – to be completed in conjunction with, Stage 1, 2 and 3 Investigations to assess the potential risks that are associated with contaminated sites. Where appropriate, the CRAT is also to be used for PCAs where residual contamination is retained or reinstated in the redevelopment works, to either update an existing record or to create a new record.


3.2.2 Definition of a Contaminated Site Record
A contamination risk can be identified and reported in a number of formats in Defence reports dependent upon the completeness of available information to determine if a Source-Pathway-Receptor (SPR) linkage exists and the resulting risk to Defence. A flowchart of contamination risk identification is presented in Figure 3-1.

- Where the **SPR linkage is complete**.
  - A new CSR is raised when an assessment determines that there is a known complete SPR linkage.
  - The new CSR is reported as a Potential CSR (PCSR) throughout the report and once the draft report and CRAT are accepted by Defence, a new CSR ID will be created by request to DCARM (see Annex L).
  - The final report is to be updated with the new CSR ID.
  - Report recommendations need to specifically outline further action required.

- Where the **SPR linkage is incomplete**.
  - A new CSR is not raised where the SPR linkage is incomplete.
  - A CRAT is not required to be completed.
  - Report Recommendations need to specifically outline where there is a need for ongoing management (refer to as Potential Pollution Source (PPS)) OR no further action required.

- Where the **SPR linkage has the potential to be complete**.
  - A new CSR may be raised when an assessment determines that there is the potential for the SPR linkage to be complete.
  - The new CSR is reported as a Potential CSR (PCSR) throughout the report and once the draft report and CRAT are accepted by Defence
- Where the PCSR is to be investigated within 12 months to confirm the status of the SPR, generally where a Stage 2 DSI is conducted in conjunction with or directly behind a Stage 1 PSI, a CSR ID will not be created until the completion of the Stage 2 where the status of the SPR can be confirmed.

- Where the PCSR will not be investigated within 12 months, a new CSR ID will be created by request to DCARM (see Annex L) and sufficient detail is to be added to the CSR to recognise that the link is potential as further investigation is required.

Further detail on the creation of CSRs is provided in Annex L and on the GEMS Gateway.

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**Figure 3-1 – Reporting Flowchart – CSR, PCSR, PPS**
3.2.3 Conceptual Site Model

Overview
The known and potential sources of contamination, pathways for exposure and the sensitive receptors must be assessed to identify the risk posed by contamination. The source-pathway-receptor linkages should be described in a conceptual site model (CSM), in accordance with the ASC NEPM), Schedule B2 Guideline on Site Characterisation. The initial CSM is constructed from the results of a Stage 1 PSI or Stage 2 DSI, or where required the PCA, and is used to identify data gaps and inform a decision on whether further investigation is required.

Key Components
The CSM should identify complete and potential pathways between known or potential contamination sources and receptors, including all phases of contamination (e.g. vapour). Where the pathway between a source and a receptor is incomplete (e.g. due to physical or administrative controls), the exposure to chemical substances via that pathway cannot occur, but the potential for that pathway to be completed (for example, by abstraction of groundwater or a change in land use) should be considered in the assessment.

The essential elements of a CSM include the identification of:

- Known and potential sources of contamination and Contaminants of Potential Concern (CoPC) including the mechanism(s) of contamination (e.g. direct contact, ingestion and inhalation).
- Potentially affected media (soil, water, sediment, groundwater, surface water, indoor and ambient air).
- Human and ecological receptors.
- Potential and complete exposure pathways.

The CSM should be developed with consideration of the management measures or controls that could be implemented to reduce the risks of contamination identified in the risk assessment.

The CSM should be continuously reviewed and updated throughout the investigation/assessment process to inform subsequent decisions on whether further investigation or management is necessary.

Figure 3-2 presents a visual representation of an example CSM and potential pathways for exposure to surrounding receptors.

Contaminants of Potential Concern
The highly varied nature of Defence activities and possible historical uses of Defence sites makes it necessary to determine the CoPC for each site on an individual basis. Contamination may be present in a number of phases, as described in Table 3-1. It is important to note that depending on the type of site and its history of use, not all phases may be present. A review of the present and historical use of each site will assist in determining which contaminants may be present. This site history might be documented in an existing investigation report (e.g. Stage 1 PSI, Stage 2 DSI or supporting report to other developments/applications).

For further information on the CoPC associated with particular Defence activities, refer to Table 3-1 of the Defence Contamination Management Manual of the Defence Environment and Heritage Manual or the activity-based technical Annexures to the Defence Environment Manual.
<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
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<tbody>
<tr>
<td>Dense Non Aqueous Phase Liquid (DNAPL)</td>
<td>Liquid that is denser than water and does not dissolve in water.</td>
</tr>
<tr>
<td>Light Non Aqueous Phase Liquid (LNAPL)</td>
<td>Liquid that is lighter than water and has limited solubility in water.</td>
</tr>
<tr>
<td>Adsorbed</td>
<td>Contaminants can be attached to the soil particles as it moved through the soil profile.</td>
</tr>
<tr>
<td>Dissolved</td>
<td>A relatively small proportion of DNAPL and LNAPL has dissolved in groundwater and moves with groundwater flow.</td>
</tr>
<tr>
<td>Vapour</td>
<td>Vapours which may accumulate in the soil profile and discharge at the ground surface.</td>
</tr>
<tr>
<td>Airborne</td>
<td>Contaminants may be airborne, and available for inhalation, including asbestos fibres, contaminants attached to dust particles and dissolved in aerosol (e.g. water spray).</td>
</tr>
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</table>
Figure 3-2  Example Conceptual Site Model – Fuel Distribution and Storage Sites
3.3 Pre-construction Contamination Assessment

3.3.1 What is it?
A PCA will typically involve limited soil sampling in the footprint of the construction area (e.g. former or existing fuel facility). Groundwater samples may need to be collected if groundwater is shallow and construction will require dewatering.

3.3.2 When to do it?
A PCA is necessary if any of the following apply:

- Spoil and/or waste water from a construction project needs to be characterised for re-use, temporary stockpiling, or for off-site disposal or on-site treatment.
- There is an existing CSR or a recent Stage 1 PSI that indicates contamination exists or has the potential to exist and further investigation is warranted.
- Contamination is known to exist in the absence of a Stage 1 PSI.
- Foreign/unexpected material, with the potential to be contaminated, has been found. (i.e. unexpected find).

The purposes of a PCA are to:

- Delineate the nature and extent of contamination in the construction area through a limited assessment of soils, and other environmental media, if required, in the footprint of the construction area. This may include the collection of composite samples, where appropriate.
- Determine and advise on the requirements for contamination management controls, e.g. under a Construction Environment Management Plan (CEMP) or Site Environment Management Plan (SEMP); or specify if further investigation is necessary to delineate the contamination and define the risk before proceeding with construction with an associated sampling strategy presented.

3.3.3 Scope

The PCA works must:

- Include review of the GEMS EFM – CSR and any previous investigations (e.g. Stage 1 PSI, Stage 2 DSI).
- Be undertaken in accordance with the approved Defence Environmental Clearance Certificate (ECC), Sustainable Measurable Adaptable Renewable Transferable Infrastructure (SMARTI) Manual and Project Review and Assessment Process (PRAP) technical advice. An ECC is required before undertaking any work that involves the disturbance of ground.
- Be consistent with national guidance documents including the ASC NEPM and relevant Australian Standards (refer to Section 2.1.1 and Section 2.2).
- Include a risk assessment of the potential significance of contamination, based on the CRAT.
- Develop or update the CSM, if contamination is identified.
- Define a scope and cost estimate for any recommendations raised in relation to further works including management/monitoring effort of contaminated materials generated during the project.
• Inform updates to the GEMS EFM – CSR.

Appendix A, lists the type of information that would typically be included in a PCA report as a generic table of contents.

3.3.4 Outcomes

The outcomes of a PCA may include:

• No further action.
• Implementation of contamination management controls to reduce the potential contamination risk (under a CEMP).
• Further delineation of the nature and extent of contamination, if required to manage risk.
• Design scope changes to reduce direct and indirect impact to legacy contamination including reduction in cut and fill requirements.
• Development of planning requirements to address the whole of life management of residual contamination waste (e.g. soil stockpiling, waste water disposal) etc.

3.4 Stage 1 Preliminary Site Investigation

3.4.1 What is it?

The Stage 1 PSI is a key process in identifying contamination and is generally a desktop-based investigation with a site inspection and interviews. The objectives of the Stage 1 PSI are to:

• Document the site's current and historical uses to identify potential contamination sources.
• Understand the physical setting of the site (e.g. soil types, hydrogeology, hydrology and topography).
• Identify potential receptors and their risk of exposure to contamination.
• Determine whether a more detailed program of sampling and analysis is required.

The Stage 1 PSI must be consistent with national guidance documents including the ASC NEPM and relevant Australian Standards (refer to Section 2.1.1 and Section 2.2).

Defence personnel are directed to the DEQMS for requirements for a Stage 1 PSI. If there is current and past contaminating activities and sources that are defined in the GEMS EFM-CSR with supporting reporting and data collection, a Stage 1 PSI may not be required and a Stage 2 DSI may be initiated.

A Stage 1 PSI should be sufficient to identify the risk that contamination exists on a site.

3.4.2 When to do it?

A Stage 1 PSI is required only where there is the potential for contamination to be present and an existing appreciation of site history at this location has not previously been conducted and documented. There is the potential for contamination that may restrict current or planned future land uses, where:

• A property or site with an unknown or poorly documented site history is being leased, divested, developed or acquired, or in response to a change in land use for all or part of a property.
• The site is listed as having potential or known contamination on the GEMS EFM – CSR or a State or Territory contamination land register (relevant to land acquisitions).
• Current or historic product losses or inappropriate storage, handling or disposal of toxic or hazardous materials has occurred on a site.
• Areas are known to have been subject to historic land filling or reclamation (i.e. introduction of soils or fill to a site).
• Unexpected foreign material is identified during construction works.
• An Environmental Incident Report identifies environmental effects (e.g. soil odours or staining) with no apparent cause.

3.4.3 Scope
The Stage 1 PSI should include:
• Review of the contaminated sites within the GEMS EFM – CSR.
• Desktop review of available records for the property.
• Consultation with relevant stakeholders e.g. BM, Environment and Sustainability Manager (ESM), current staff (Defence and civilian), former staff (Defence and civilian), others as identified during the Stage 1 assessment.
• A site inspection.
• Interviews with personnel with a knowledge of the site, where practicable.
• Review of the environmental setting.
• A gap analysis of information available.
• A risk assessment using the CRAT.
• Identification of the potential/actual source(s) of contamination, potential/actual pathways and receptors and the development of a CSM, that references (and maps) relevant available chemical soil and water data for the property.
• Development of recommendations and Data Quality Objectives (DQOs) for conducting further stages of site investigation if contamination is identified and it requires delineation.
• Define a scope and cost estimate for any recommendations raised in relation to further works including management/monitoring effort of contaminated materials observed and/or generated during the project.
• Update of the GEMS EFM – CSR (with accompanying CRAT and reports including Appendices).

Some Stage 1 PSIs may incorporate limited sampling and analysis of environmental media (e.g. soil, water, sediment or vapour) to provide a preliminary indication of contaminant presence and to inform a recommendation to proceed with a Stage 2 DSI. At other times, it may be appropriate to commission a Stage 1 and Stage 2 together, particularly for remote sites.

A generic table of contents provided in Appendix B, lists the type of information that would typically be included in a Stage 1 PSI report.

Presentation
The Stage 1 PSIs are to be presented as
• Part A – Main body of the report, Figures and any site imagery.

Note that ALL data created for a project on the Defence estate is to be returned to the Defence PM and uploaded as appropriate by the consultant to NSIMS (or GEO-E once operational), GEMS and ESdat. Refer to DCMM Annex
All imagery provided is to be fully referenced, inclusive of photograph descriptions and directional reference of said imagery.

- Part B – all other supporting appendices

Report Titles are to in accordance with DCMM Annex L Data Management with the specific report title to reference the Property, and where a single or group of CSRs are being targeted, reference is to be specific to those sites.

### 3.4.4 Outcomes

The outcomes and recommendations of a Stage 1 PSI may be:

- No further action if contamination is unlikely to be present or presents a low risk to the current or proposed land use.
- Implementation of pollution prevention or contamination management controls (Stage 5) to reduce the potential contamination risk or maintain the risk to an acceptable level. The pollution prevention or contamination management controls should be included in the property Contaminated Site Management Plans (where applicable) and updated in GEMS.
- Further investigation to delineate the nature and extent of contamination and associated risks as a basis for any subsequent contamination management or remediation decisions (e.g. Stage 2 DSI or Stage 3) if contamination is likely to be present.

### 3.5 Stage 2 Detailed Site Investigation

#### 3.5.1 What is it?

The Stage 2 DSI includes investigation of potentially contaminated media such as soil, water, sediment and vapour to delineate the nature and extent of contamination posing a risk to current or future land uses.

The purposes of a Stage 2 DSI are to:

- Define and map the actual contamination (nature and extent).
- Define the requirements for remediation or management of the contamination, if required to manage risks.

Defence personnel are directed to the DEQMS for requirements for a Stage 2 DSI.

If there is current and past contaminating activities and sources that are defined in the GEMS EFM-CSR with supporting reporting and data collection, additional Stage 2 DSI works may not be necessary to inform remediation design and/or management.

#### 3.5.2 When to do it?

A Stage 2 DSI must be undertaken if either:

- The Stage 1 PSI indicates contamination is likely to be present and the initial risk assessment (based on the CRAT) from a Stage 1 PSI indicates a residual contamination risk that cannot otherwise be managed without delineation and/or
- Contamination is known or considered highly likely to exist in the absence of a Stage 1 PSI. (e.g. known spill or an unexpected find) and it may pose an unacceptable risk to sensitive receptors without delineation.

#### 3.5.3 Scope

The Stage 2 DSI works must include:
• Review of the GEMS EFM – CSR.
• A desktop review of relevant information and available data including the Stage 1 PSI report (if available) and any routine groundwater monitoring results, where relevant.
• Development of a site-specific Sampling, Analysis and Quality Plan (SAQP) including DQOs.
• Site inspections and intrusive sampling (e.g. soil, water, sediment and vapour).
• Delineation of the nature and extent of contamination in relevant environmental media to achieve the data quality objectives.
• Identification of the potential/actual source(s) of contamination, potential/actual pathways and receptors and the development of a CSM.
• Assessment of the significance of the contamination in terms of the potential impacts on sensitive receptors (under existing and potential future land uses) and existing controls, with reference to the CSM and risk (based on the CRAT).
• A clear statement on whether the site is suitable for ongoing uses (existing) and/or future proposed land uses, based on the CSM. This is important to assess the cost/benefit of undertaking further investigations and the extent of any further sampling necessary to manage risk.
• Recommendations for further investigation, assessment or management strategies, if required to achieve suitability for an intended land use, including justification for further works based on risks to the intended land use and clear linkages to the CSM. The scope and cost estimates for any recommended further works by Defence should be provided. Recommendations should also include where relevant a specific breakdown of
  o Pollution Prevention Sources that require management/remedial actions
  o Further Works that Defence with specific reference to timeframes, cost estimates and specific CSRs, where immediate action is required, this should be highlighted to Defence in a covering note.
  o Monitoring wells that should be included in any ongoing monitoring for the site including frequency of assessment and COPCs to be analysed.
• Update of the GEMS EFM – CSR to:
  o Reduce or close out risk.
  o Update risk if/where required.

The Stage 2 DSI works must:
• Be undertaken in accordance with the approved Defence ECC, Range and/or Base Standing Orders and the Initial Environmental Review (IER) if required. An ECC is required before undertaking any work that involves the disturbance of ground.
• Be consistent with the ASC NEPM and relevant Australian Standards (refer to Section 2.1.1 and Section 2.2).
• Develop or update the CSM.
• Include a risk assessment of the significance of contamination to specified, current or planned future land uses
• Update of the GEMS EFM – CSR.
• Detail and justify any further delineation or sampling necessary to address data gaps to prepare a remediation options analysis and/or action plan (e.g. soil volumes, soil types, leachability data, geotechnical considerations, aquifer characteristics).

Appendix C lists the type of information that would typically be included in a Stage 2 DSI report as a generic table of contents.

Laboratory Analysis

Sample analysis should be undertaken based on the CoPC identified in the SAQP of the Stage 2 DSI and the Stage 1 PSI (if completed). Laboratories undertaking analysis of potentially contaminated soil, water, sediment or vapour must be accredited by the National Association of Testing Authorities (NATA) for the test method and matrix (environmental media) for the CoPC. Laboratory methods, including quality control procedures, must comply with the ASC NEPM Schedule B3 Laboratory Analysis of Potentially Contaminated Soils.

All sampling and analysis must be done so in accordance with the DCMM Annex L Data Management unless specifically stated in the tender documents and endorsed by DCARM.

Quality Assurance (QA) / Quality Control (QC)

The sampling and analytical methods must provide appropriate QA/QC of the data, based on guidance provided in the ASC NEPM Schedule B2 Guideline on Site Characterisation and Section 8 of Guide to the investigation and sampling of sites with potentially contaminated soil (AS 4482.1-2005).

All sampling information relating to contaminated sites must be consistent with Annex L – Data Management.

Assessment Guidelines

The ASC NEPM has published investigation levels and screening levels to assist in evaluating potential risks to human health and ecosystems from contamination. The ASC NEPM Toolbox guidance documents and calculators assist in implementing the ASC NEPM.

Data Quality Objectives

A systematic planning approach shall be used to define the problem to be investigated, specific to the site and the risks. The DQOs process is an iterative planning approach that should be developed in accordance with Schedule B2 of the ASC NEPM. The DQO process should be used to define the type, quantity and quality of data needed to inform decisions relating to the environmental condition of the site. It provides a systematic approach for defining the criteria that a data collection design should satisfy, including when, where and how to collect samples or measurements; determination of tolerable decision error rates; and the number of samples or measurements that should be collected.

Presentation

The Stage 2 DSIs are to be presented as

• Part A – Main body of the report, Figures, Bore Logs and any site imagery.

  Note that ALL data created for a project on the Defence estate is to be returned to the Defence PM and uploaded as appropriate by the consultant to NSIMS (or GEO-E once operational), GEMS and ESdat.

  All imagery provided is to be fully referenced, inclusive of photograph descriptions and directional reference of said imagery.

• Part B – all other supporting appendices
Report Titles are to in accordance with DCMM Annex L Data Management with the specific report title to reference the Property, and where a single or group of CSRs are being targeted, reference is to be specific to those sites.

### 3.5.4 Outcomes

The outcomes of a Stage 2 DSI may be:

- No further action
- Update the GEMS EFM – CSR to:
  - Reduce or close out risk.
  - Update risk if/where required.
- Implementation of pollution prevention or contamination management controls to reduce the contamination risk (under a CEMP).
- Further investigation of the nature and extent of contamination, to delineate contamination that poses an unacceptable risk in accordance with a clearly justified sampling strategy.
- Further assessment of human health or ecological risks, to assess the risks to specific receptors from contaminants which have no established soil or groundwater investigation levels or there are a number of exceedances that may pose a risk (Stage 3).
- Remediation and management planning and implementation (Stage 3 and Stage 4).
- Monitoring (e.g. surface water or groundwater) to assess potential changes in the contamination status of a receiving environment (Stage 5).
- Update of any property specific management requirements in GEMS EFM-CSR (where required).

### 3.6 Stage 3 Risk Assessment – Human Health and Ecological

#### 3.6.1 What is it?

As outlined in the ASC NEPM and the Australian enHealth Council (enHealth, 2012), risk assessment is defined as "the process of estimating the potential impact of a chemical, physical, microbiological or psychosocial hazard on a specified human population or ecological system under a specific set of conditions and for a certain timeframe." That is, risk assessments must be activity-, site- and/or time-specific.

Risk assessment is the quantification of the potential effects posed by soil and groundwater contamination, assuming there will be exposure to a receptor (i.e. complete S-P-R). Risk assessment can also include an assessment of the likelihood that the exposure will take place (e.g. whether contamination in soils at depth or under buildings may expose receptors in the future).

The purpose of a human health or ecological risk assessment is to:

- Quantify the risks of known contamination to human health or ecological receptors based on the potential effects of the existing contamination and likely exposure to receptors.

Defence personnel are directed to the DEQMS for requirements for a Stage 3 Risk Assessment.

If there is current and past contaminating activities and sources that are defined in the GEMS EFM-CSR with supporting reporting and data collection, additional investigation works may not be necessary to inform remediation design and/or management.
3.6.2 When to do it?

A Stage 3 Risk Assessment (human health and/or ecological) must be considered if:

- The Stage 2 DSI and the initial risk assessment (based on the CRAT) indicates a high or very high contamination risk and recommends a Human Health Risk Assessment or Ecological Risk Assessment to further develop the CSM. A Stage 3 risk assessment may be warranted to demonstrate that contamination above HILs does not pose a risk to receptors given a more reduced frequency and duration of exposure than the more conservative scenarios envisaged when calculating HILs and screening levels e.g. remote training area or weapons range.
- Site management controls will not reduce the risk to an acceptable level.

3.6.3 Scope

Human health risk assessments usually involve a staged or tiered screening of risks comprising:

- Tier 1 screening level risk assessment based on published investigation levels or screening criteria (typically included in a Stage 2 DSI).
- Tier 2 risk assessment when no relevant investigation or threshold levels are available, or when one or more contaminants exceed the Tier 1 threshold.
- Tier 3 risk assessment when a Tier 1 or 2 does not address the levels of risk, and involves toxicity assessment and/or contaminant fate and transport modelling.

Ecological risk assessments are usually Tier 1 screening level assessments that are based on exposure assessments and use ecologically based criteria designed to protect the most sensitive species and communities.

Human health and ecological risk assessments must:

- Be consistent with the ASC NEPM and enHealth (2012) (refer to Section 2.1.1 and Section 2.2).
- Include a review of the significance of the contamination risks using the CRAT at completion of all investigation works.

3.6.4 Outcomes

The outcomes of a human health or ecological risk assessment may be:

- No further action
- Update the GEMS EFM – CSR to:
  - Reduce or close out risk
  - Update risk if / where required
- Provision of a risk statement that outlines no remediation is required
- Implementation of pollution prevention or contamination management controls (e.g. under a CEMP).
- Evaluation of risk reduction strategies.
- Remediation and management implementation (Stage 4).
- Monitoring (e.g. surface water or groundwater) to assess potential changes in the contamination status of a receiving environment (Stage 5).
• Update of any property specific management requirements in GEMS EFM-CSRs (where required).

3.7 Stage 3 Remediation Planning and Design

3.7.1 What is it?
The strategy to manage and/or remediate contamination to reduce the level of risk may be:
• An active remediation program.
• Site management measures.

The purpose of remediation planning and design is to:
• Define the process and specifications to reduce identified contamination risks to acceptable levels.

If there is current and past contaminating activities and sources that are defined in the GEMS EFM-CSRs with supporting reporting and data collection, additional investigation works may not be necessary to inform remediation design and/or management.

3.7.2 When to do it?
A strategy to manage and/or remediate the contamination should be developed and implemented when contamination has been identified in a Stage 2 DSI, and it has been concluded that the contamination presents a high level of risk to human health or the environment (based on the CRAT or Stage 3 Ecological or Human Health Risk Assessment).

3.7.3 Scope
Planning and design of remediation should consider:

• Commercial and operational considerations (such as cost, certainty of outcome, liability, timing, impact on Defence capability and the value of the land and capacity for uplift in value, if remediation is to facilitate property disposal).

• Sustainability of the remediation and management options including reference to the National Waste Policy.

• The acceptable level of risk to Defence.

• Regulatory considerations.

Remediation planning must follow the hierarchy outlined in the ASC NEPM and relevant State and Territory reporting guidelines. While each State and Territory has a different model for addressing contamination, in general, the preference is, in order:

• Treatment of contamination so that the treated soil can remain on site.

• Containment on-site where this will not pose a risk to site users or the environment.

• Off-site treatment.

• Off-site disposal (e.g. landfill).

Key components in developing a remediation strategy and design may include:

• Further sampling or monitoring to inform specific aspects of the remediation design (if required)

• A Remediation Options Appraisal (ROA) and associated pilot trials and cost benefit analysis

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• Development of a remediation strategy and the associated remediation goals, requirements / procedures based on the outcome of the ROA for incorporation into a RAP
• Development of a RAP
• Development of tender documents
• Development of a fully costed remediation design (including a work program and sequence) and technical specifications to meet the strategy / remediation goals and requirements/procedures set out in the RAP.
• Update of the GEMS EFM – CSR.

Defence and an Environmental (Contaminated Land) Auditor/Technical Advisor must be involved in the final selection of the remedial strategy and design. The auditor/technical advisor should be involved in independently assessing whether the preferred remedial strategy is technically feasible, is consistent with Defence (and if relevant state and/or territory) policies and that the design will make the site suitable for the intended land uses.

The ROA is to present the most logical and achievable options to Defence. There is no requirement to present every industry option where they are not achievable for the specific site the RAP is to be developed to address.

The RAP should be prepared in accordance with the table of contents and minimum requirements outlined in Appendix D.

3.7.4 Outcomes

The outcomes of Stage 3 remediation and design works may include:

• Remediation Options Appraisal/Assessment
  o Detailed logical and achievable, cost estimated options for comparison
  o Recommended preferred option including specific justification requirements (if applicable)

Once the ROA has been accepted by Defence and the need for the delivery of a RAP has been identified, Defence then may request the development of a:

• A Remediation Action Plan including
  o Agreed remediation objectives and criteria - procedures for remediation to address unacceptable risks.
  o Remediation technical specifications to be delivered as part of the Stage 4 scope of works.
  o Contingency procedures to allow for uncertainties.

3.8 Stage 4 Remediation Management

3.8.1 What is it?

Remediation and management measures are intended to:

• Achieve the site specific remediation objectives and reduce the contamination risks to acceptable levels (based on the CRAT).
Defence personnel are directed to the DEQMS for requirements for Stage 4 Remediation Management.

If there is an existing ROA and/or RAP that has been developed, it may not be necessary to repeat these deliverables to inform the remediation management.

3.8.2 When to do it?

Remediation management measures are to be implemented when:

- Identified contamination presents an unacceptable risk to human health or the environment based on the Stage 3 Risk Assessment and the CRAT.
- Procedures have been established for the remediation or management (including contingency procedures for uncertainties) and approved by Defence and an Environmental Auditor/Technical Advisor (TA), if applicable.

3.8.3 Scope

Key components in the implementation of a Stage 4 are:

- A Remediation Action Plan endorsed by DCARM
- Engagement of a remediation works contractor.
  - Early engagement of the contractors is recommended to provide key input into the development of the remediation technical specifications.
- Preparation of remediation documentation including:
  - ECC
  - Remedial Works Plan (RWP)
  - Health, Safety and Environment (HSE) Plan
  - Communications Plan
  - Environmental Assessment Report (EAR) or an Initial Environmental Report (IER)
    - IER is a study based on existing documentation to identify the potential impacts of the proposal and their likely significance and to determine the level of environmental assessment to be conducted. A site investigation may also be involved. An IER is the equivalent of an Environmental Scoping Study (ESS)
    - EAR is an overarching “approval in principle” document that brings together all the information on the impacts from the EIA and EMP
    - Other permits and approvals, such as EMP and IER
- A validation plan.
- Update of the GEMS EFM – CSR to:
  - Reduce or close out risk
  - Update risk if / where required

Other management measures may include:

- Treating water at the point of use or restricting groundwater or surface water use where contamination presents an unacceptable risk (subject to regulatory approval if required).
- Groundwater contamination containment to prevent or limit contaminant migration.

Where required, contamination management controls must be implemented under the appropriate construction management plans or the site specific environmental management plans.
A human health or ecological risk assessment may also be required to be delivered on the completion of Stage 4 works where the selected remediation design/management options inadvertently leaves residual contamination *in situ*. If in-situ contamination is identified during the development of the RAP this assessment should be delivered as part of that stage of the works. However, if in the case that unexpected conditions during remedial activities results in residual in-situ contamination, the project will be required to provide sufficient evidence that the residual contamination poses no unacceptable risks to human health and the environment.

**Presentation**

The Stage 4 Reports are to be presented as

- Part A – Main body of the report, Figures, Bore Logs and any site imagery.

  Note that ALL data created for a project on the Defence estate is to be returned to the Defence PM and uploaded as appropriate by the consultant to NSIMS (or GEO-E once operational), GEMS and ESdat.

  All imagery provided is to be fully referenced, inclusive of photograph descriptions and directional reference of said imagery.

- Part B – all other supporting appendices

Report Titles are to in accordance with DCMM Annex L Data Management with the specific report title to reference the Property, and where a single or group of CSRs are being targeted, reference is to be specific to those sites.

**3.8.4 Outcomes**

The outcomes of Stage 4 Remediation works depend on the success of the remediation strategy and may include:

- Validation works to demonstrate that remediation objectives have been met, followed by close out of the GEMS EFM – CSR and implementation of additional pollution prevention works (where required).
- Review of remedial options, if remediation objectives have not been met.
- Ongoing monitoring of current and potential future contamination areas and risks (e.g. surface water or groundwater) in accordance with a Site Environmental Management Plan

**3.9 Stage 5 Further Management Action**

**3.9.1 What is it?**

Further Management Action refers to actions to manage or monitor contamination on a site and must consider:

- The risk profile (based on the CRAT).
- Practical application of management actions eg fencing on training areas where capability would be impacted by fences, or along natural river lines where flooding would damage fences annually.
- Touch points with existing Defence policy, procedure and estate programs e.g the Estate Routine Water Quality Monitoring Program, estate works program and GEMS.

Further management actions, such as inclusion of the site in routine surface or groundwater monitoring programs or inspection of capped areas, must be undertaken in accordance with approved estate plans and programs...
3.9.2  When to do it?

At the conclusion of every contamination investigation where there are recommendations for monitoring or management activities, the consultants must outline the appropriate Defence policy, procedure or program that requires updating of existing records or creation of new records to reflect the outcomes of the investigation.

Actions to maintain acceptable levels of risk to human health and the environment for a site where residual contamination exists, following remediation activity, management actions must be pursued through estate plans and programs to maintain acceptable levels of risk to human health and the environment.

3.9.3  Scope

Key components in the implementation of a Stage 5 are:

- Update or create record for routine controls in GEMS EFM-CSR e.g inspections, fences etc
- Update of existing groundwater and surface water monitoring programs in accordance with PPMM Annex 1L
- Identify management triggers for estate works programs and redevelopment within an GEMS EFM-CSR and if required develop EMP and associated ECC
- Update GEMS EFM – CSR with any modifications to CSR records

3.9.4  Outcomes

The outcomes of Stage 5 Further Management Action may include:

- No further action
- Implementation of routine controls and water monitoring programs
- Implementation of on-going inspection (e.g annual) of cap integrity
- Implementation of EMP and associated ECC to manage residual contamination during estate works and redevelopment
- Implementation of a contingency plan in the event of unexpected conditions.

3.10  Environmental Incident Response

3.10.1  What is it?

Environmental Incident Response refers to actions to secure the incident area and to prevent the spread of the initial impact from a spill, leak or discharge.

3.10.2  When to do it?

Environmental Incident Response may be necessary in the event of an incident involving a contaminant, for example due to any of the following:

- Spills or leakage of hazardous liquids or chemicals (e.g. fuels, corrosive cleaning chemicals, solvents).
- Explosion or fire.
- Vehicle collision resulting in loss of fuel to ground.
- Unapproved works that disturb contaminated soil, groundwater and/or acid sulfate soils.
• Detection of vapour intrusion in a building.
• Unapproved demolition of infrastructure that contains hazardous material (e.g. asbestos).

3.10.3 Scope
Detailed guidance on incident response is available in the Directorate of Environment and Heritage Policy Development (DEHPD) Pollution Prevention Management Manual (PPMM).

Any work, health and safety incidents must be reported in accordance with SafetyMan.

Environmental Incident Response may include:
• Evacuating personnel, if required.
• Extinguishing a fire or removing explosive risk, where applicable.
• Containing spills.
• Stopping the source of the spill or leak (if ongoing).
• Notifying Defence and relevant stakeholders.
• Contamination investigation, assessment, clean up or other management response, if required.

3.11 Unexpected Finds
Unexpected finds or unexpected conditions could arise during:
• Works relating to facility and infrastructure projects at known contaminated or potentially contaminated sites.
• Inspections and monitoring subsequent to investigation or remedial works.

A Construction Management Plan for a site must include a contingency plan in the event that there are unexpected finds or when unexpected conditions arise.

The contingency plan for unexpected finds must:
• Be site-specific and based on knowledge of the known or potential CoPC.
• Detail actions and responsibilities if unexpected finds or conditions occur.

A generic protocol for unexpected finds is included in Appendix E.

3.12 Specialist Investigations
Specialist investigations in consultation with Defence must be undertaken for the contaminants:
• Unexploded Ordnance (UXO).
• Radioactive substances.
• Biological materials/waste.

Information relating to UXO is available at http://www.defence.gov.au/uxo/

Guidelines for the assessment of sites containing the above specialist contaminants should be obtained from DCARM.

3.13 Health and Safety
The Work, Health and Safety Act 2011 (Cth) (WHS Act) commenced in 2012 and is regulated by Comcare a Commonwealth Government agency that works in partnership with the Safety, Rehabilitation and Compensation Commission. The WHS Act provides for a nationally
consistent framework to protect workers and other persons against harm to their health and safety through the elimination or minimisation of the risks to the extent reasonably practicable.

Under the WHS Act, employers must take all reasonably practicable steps to protect the health and safety at work of its employees and those who are at or in the vicinity of a workplace under the employer’s control. This means that Defence and its contractors have obligations to protect the health and safety of workers and others operating within the vicinity of contaminated land that is on or near to a workplace under Defence control.

Model Codes of Practice administered by Safe Work Australia provide practical guides to achieve the standards of health, safety and welfare required under the WHS Act.

Any controls outlined in SafetyMan must be implemented when managing contaminated materials.

Steps should be taken so that contaminated land investigations are conducted in a manner that protects the health and safety of site assessment personnel, site users, the surrounding community and the environment.

Prior to commencing works the potential hazards and risks must be assessed and the appropriate control measures identified and documented in an appropriate, site specific Work, Health and Safety Plan. All contaminated land investigations that include field work must have appropriate Health, Safety and EMPs in place that conform with the requirements for activities on Defence sites and with AS/NZS 4801:2001 Occupational Health and Safety Management Systems – Specification with guidance for use, and AS 4482.1.

3.14 Accredited Environmental (Contaminated Land) Auditor and Technical Advisor Roles

Defence engage industry experts as required. Typically with respect to Contaminated Lands, Defence engages with either

- an Accredited Environmental (Contaminated Land) Auditor, or
- a Technical Advisor

**Accredited Environmental (Contaminated Land) Auditor**

An Accredited Environmental (Contaminated land) Auditor is an individual who has been accredited by the regulatory authority in a particular State or Territory as an ‘expert’ in the field of contaminated land management and can provide independent assurance that the site has been assessed appropriately and/or has been made suitable for a specified land use.

An Accredited Environmental (contaminated land) Auditor is engaged when Defence are required to interact with a state/territory regulator and/or when an Environmental Audit is required. An Environmental Audit can be undertaken by a state based Accredited Environmental (contaminated land) Auditor when a formal independent opinion as to the contamination status of the land is required to manage contamination liabilities such as to facilitate a property divestment.

Where the property in question is Commonwealth land, a Statutory Environmental Audit, administered by the States and Territories is not applicable. In these cases, Defence may wish to request a non-statutory audit from an accredited Environmental (Contaminated Land) Auditor.

Some States and Territories have reciprocity agreements that allow auditors from one State to practice in another. Environmental (Contaminated Land) Auditors will often have reporting obligations to State/Territory regulators to disclose contamination, under State or Territory legislation. Defence staff and contractors should be aware of these reporting obligations before engaging an auditor. Once engaged the Auditor may have a legal liability to the State/Territory regulators to report any offsite contamination within a specific timeframe.

UNCLASSIFIED
Defence may also engage an Accredited Environmental (Site contamination) Auditors in the capacity of a Technical Advisor (TA) to provide independent advice to Defence on suitability of the outputs of various stage of investigation and particularly when remediation is being proposed. TAs do not liaise with the State and Territory regulators unless requested to do so by Defence. It is best practice to engage an Accredited Environmental (Contaminated Land) Auditor/TA at the earliest stage of the site assessment or investigation, where independent assurance is required.

**Technical Advisor**

A TA is generally an Accredited Environmental (Contaminated land) Auditor (as per above) and can provide independent assurance that the site has been assessed appropriately and/or has been made suitable for a specified land use.

The role of the TA is to ensure that the environmental investigations are fit for purpose in achieving the data quality/remediation objectives, demonstrate due diligence, and comply with the intent of relevant local, state and national regulatory requirements. Two key aims of the Technical Advisor role are to:

- report to Defence on whether the investigation design and conduct will sufficiently identify the nature of the contamination and delineate its lateral and vertical extent to support risk assessment and, if necessary, provide the basis for the development of an appropriate remediation or management strategy (Schedule B2 of ASC NEPM) and
- provide Defence and the Lead Environmental Consultant with pragmatic, responsive advice and technical guidance that can facilitate investigation and remediation to achieve established objectives.
4. Data and Reporting

4.1 GEMS EFM – CSR

Data and reports generated as part of the investigation and assessment of contamination must be captured in the GEMS EFM – CSR (formerly referred to as the Contaminated Sites Register).

The GEMS EFM – CSR is the database used to capture environmental information across the Defence estate, and provides access to historical contamination investigation reports for Defence properties. Contaminated site records are geo-referenced and they can be accessed by Defence personnel or contractors with DRN access.

Contractors/Consultants working on behalf of Defence must provide reports, updated and completed GEMS Data Load Tool (GDL) (for new or existing CSRs), CRAT, ESdat and GIS files relating to contamination to their Defence point of contact, Project Manager or ESM who will be responsible for auditing and validating submissions and ensuring the upload of information into the GEMS EFM – CSR.


4.2 Geographic Information Systems

All mapping (GIS) data is required to be provided to Defence in the National Spatial Information Management System (NSIMS) metadata format. The Defence NSIMS metadata tool is available through an online search and on DEQMS.

5. Projects and Contamination Management

5.1 Case Studies

Case studies are provided as follows that highlight examples of the stages of contamination investigations that are more commonly undertaken on Defence land. These case studies highlight the potential risks, management measures and sources of further information available for contamination investigations.

These case studies are hypothetical examples only and are not based on actual site conditions.
5.2 Case Study 1: Site redevelopment and unexpected finds

5.2.1 Scenario

Construction of an engine-testing bay was proposed for a vacant site adjacent to an active RAAF Base runway. Construction was scheduled over 12 weeks, with sufficient time allowed to conduct a PCA during the design phase of the project.

A Defence contractor was engaged to construct a concrete slab for establishment of the engine-testing bay. A PCA conducted prior to excavation works on the vacant land identified waste material in the subsurface below the proposed slab footprint, including oil and grease containers, fragments of asbestos sheeting and exploded ordnance waste. The waste material was likely to be from historical uncontrolled filling. Construction timeframes and budgets were adjusted appropriately prior to commencement of works, to allow for management of contaminated materials identified during the PCA. There were no unexpected finds during construction due to the rigour of the assessment undertaken during the PCA.

5.2.1 Lessons Learnt and Risks

Human Health – Commencing design and construction activities without adequate characterisation of the ground conditions may expose construction workers and adjacent site users, to a human health risk.

Defence Capability – The project delays and remediation costs associated with managing unexpected contamination during construction of a strategic asset, can have a material impact to Defence capability.

5.2.2 Key considerations and management measures

- Review the GEMS EFM – CSR to assess available data and site history information (current and former land use).
- Is an ECC required?
- Has an unexpected finds protocol been developed as part of a CEMP?
- Prior to construction, has a PCA been conducted to identify potential contamination issues across the property or within the construction footprint?
- Does the contamination warrant a Stage 2 DSI (including sampling and analysis)? Can sampling be conducted to characterise the soil/fill quality prior to excavation commencing?
- If off-site disposal of excavated spoil/wastes is required, have the appropriate disposal permits been obtained through the relevant State or Territory regulatory framework?
- How will the movement of excavated material be tracked from its origin (e.g. RAAF Base) to its final destination (e.g. licensed landfill)?

5.2.3 More information

- Checklist for Development of Defence Land (Annex A, Appendix C)
- Annex K – Management of Per- and Poly-Fluoroalkyl Substances (PFAS) Contamination
- GEMS EFM – CSR
- ESM
- Annex C – Stockpiles and reuse of excavated material
5.3 Case Study 2: Management of known legacy burning sites

5.3.1 Scenario
A known former burning ground is located on a Defence site. The burning ground was used for approximately 30 years between 1980 and 2010. A number of burn pits were historically located across the site, typically in cleared areas.

A maintenance contractor undertaking routine works reported an area of dead vegetation and surface ponding of oily water close to a nearby stream. The maintenance contractor reported the incident to Defence, and following consultation with the Defence ESM, investigations into the source of the liquid were undertaken.

5.3.2 Risks

Human Health – Without appropriate site assessment to characterise and delineate the contamination, site activities may have commenced in areas of contaminated media. This may potentially expose Defence personnel or its contractors to site contamination.

Environmental – Risk of contamination of shallow soils, as materials were historically burnt directly on the ground surface. Potential for leaching of CoPC to groundwater and insufficient knowledge of groundwater conditions. Storage of residual waste directly on the ground surface for extended periods may have resulted in leaching of contaminants into the soil profile and potentially impacting groundwater.

Commercial – Significant costs may be involved with investigations, remediation and monitoring.

5.3.3 Key considerations and management measures

- Review the GEMS EFM – CSR to assess available data and site history information (current and former land use).
- If existing information is not available, the physical setting of the site must be characterised via a site investigation and the collection of environmental samples (as required). Site investigations may include a Stage 1 PSI and Stage 2 DSI.
- Depending on the contamination risk (based on the CRAT), undertake a Stage 3 Human Health and/or Ecological Risk Assessment (if required).
- Prepare a CEMP including a contingency plan for unexpected finds.
- Implement Pollution Prevention and Contamination Controls to prevent potential ongoing contamination and off-site migration of contamination.

5.3.4 Further information

- GEMS EFM – CSR
- ESM
- Defence Pollution Prevention Management Manual
6. References


Appendices
Appendix A – PCA Report Table of Contents
PCA Report – Table of Contents (minimum content requirement)

This guidance material should be used by consultants preparing a PCA report (typically a brief letter report) to inform the minimum contents required (including but not limited to).

The report must be generally consistent with the reporting guideline in ASC NEPM, Schedule B2 Guideline on Site Characterisation.

Executive Summary

The executive summary is critical for presentation of high level key findings and conclusions for Defence management to obtain an appreciation of the issues without reliance on detailed technical information.

The key issues should be summarised. These will generally be limited to no more than three key issues. The scope of work should be concisely described in no more than two paragraphs and include a clear description of the area assessed with reference to the property boundaries and where applicable the CSR number.

Summary of conclusions and recommendations

Conclusions should only mention significant exceedances and those that are judged to be a high risk to Defence. Recommendations need to be clear action items and identify responsibilities. They should include indicative cost estimates and timeframes for completion with justification.

List of Acronyms

Introduction

- Background
- Objectives – these should be clear measurable objectives for what the PCA is intended to achieve
- Scope of works
- Methodology – this should be brief, with detail provided in an Appendix
- Regulatory / Policy Framework (this should cover Defence policy / programs and relevant regulatory framework including Commonwealth and State / Territory and specifically referencing aspects of policy that particularly apply to the PCA e.g PFAS Construction and Maintenance Framework)
- Sources of information (must include a reference to any GEMS EFM - CSR)

Background Data

- Site description
- Surrounding land use
- Topography
- Geology and Soils
- Hydrology and Hydrogeology
- Historical Activities (can be drawn from Stage 1 PSI if available – check the GEMS Contaminated Site Records)
- Historical data – check the Defence ESdat records for the project footprint (requested through ncrp@defence.gov.au with the project footprint shapefile)

Data Quality Objectives

- Site and problem specific data quality objectives in accordance with the ASC NEPM, Schedule B2 Guideline on Site Characterisation and with reference to the relevant land use criteria (e.g is the area proposed for on-Base accommodation)
Sampling, Analysis and Quality Plan
- Rationale should be provided for the selection of the sampling pattern, density, location and depths with reference to defining risk to land uses.
- Rationale should be given for sampling analysis, analytical methods and analytes for samples
- Summary of sampling methods (equipment, decontamination and handling procedures and preservation methods) and description of field screening protocols

Assessment Criteria
- Table listing all selected assessment criteria, including references
- Assumptions and limitations of criteria

Field Observations

Analytical Results
- Summary of results. QA / QC Summary (field and laboratory)

Preliminary Conceptual Model
- Contaminants of potential concern, sources, pathways and receptors
- Presented in a visual and tabular form as necessary to clearly express the conceptual site model

Risk Assessment
- Assessment, including significance of known or potential contamination, based on the CRAT, with clear relevance to current, or planned future land uses

Conclusions
- Brief summary of all findings
- Assessment, including potential significance of contamination that may be present based on the CRAT
- Assumptions used in reaching conclusions and extent of uncertainties in results

Recommendations
- Provide recommendations on whether further investigation or assessment, monitoring, pollution prevention, contamination management controls or remediation is required and include cost estimate(s), where relevant

References

Limitations

Figures
- May include photograph plates with detailed description, coordinates and directional reference

Appendices
- May include:
  - Survey of sampling locations and groundwater monitoring wells
  - Result Tables
  - Laboratory Certificates
  - QA / QC Assessment
  - Calibration records
  - Groundwater well sampling field forms
Excel output of CRAT (the Excel file must also be submitted to the Defence Project Manager)

Detailed Data Quality Objectives and Methodology

References:

For example:

NSW EPA, 2011, Contaminated Sites, Guidelines for Consultants Reporting on Contaminated Sites
**Stage 1 PSI Report – Table of Contents (minimum content requirement)**

This guidance material should be used by consultants preparing a Stage 1 PSI report to inform the minimum contents required (including but not limited to).

The report must be generally consistent with the reporting guideline in ASC NEPM, Schedule B2 Guideline on Site Characterisation.

**Executive Summary (no more than 2-3 pages)**

The executive summary is critical for presentation of high level key findings and conclusions for Defence management to obtain an appreciation of the issues without reliance on detailed technical information.

The key issues should be summarised. These will generally be limited to no more than five key issues and may include an important conclusion (e.g. the Stage 1 PSI report has identified five high risk areas which must be delineated to identify impacts for planned facility development in this footprint). The scope of work should be concisely described in no more than two paragraphs, and include a clear description of the area assessed with reference to the property boundaries.

**Summary of conclusions and recommendations**

Conclusions (one to two paragraphs) should only mention significant exceedances and those that are judged to be a high risk to Defence.

Recommendations need to be clear action items and identify responsibilities. They should include indicative cost estimates and timeframes for completion with justification relevant to proposed land uses.

**List of Acronyms**

**Introduction**

- Background
- Objectives – these should be clear measurable objectives for what the Stage 1 PSI is intended to achieve. (for example – the identify if contamination exists that would pose a risk to ongoing (residential, commercial etc) land uses in area (x) or to off-site receptors)
- Data Quality Objectives – this should be brief, with detail provided in an Appendix
- Scope of works
- Methodology – this should be brief, with detail provided in an Appendix
- Regulatory / Policy Framework (this should cover Defence policy / programs and relevant regulatory framework including Commonwealth and State / Territory and specifically referencing aspects of policy that particularly apply to the PSI)
- Sources of information (must include a reference to any GEMS EFM - CSRs)

**Background Data (refer to reporting on the GEMS EFM module, where relevant, for data on listed and identified heritage and ecological values)**

- Site description
- Surrounding land use
- Topography
- Geology and Soils
- Hydrology
- Hydrogeology
- Climate
- Flora and Fauna
- Aboriginal and Historic Heritage Protections
- Historical Activities
Historical data – check the Defence ESdat records for the project footprint (requested through ncrp@defence.gov.au with the project footprint shapefile)

**Historical information – chronological list of site uses**
- Previous owners and land users
- Defence lease / ownership details of whole site
- Lease arrangements over site
- Zoning and relevant development approval records
- Planned or Proposed future use (where applicable)
- Inventory of chemicals and wastes associated with site use and onsite storage locations
- Review of aerial photography
- Site condition and surrounding environment
- Geology and hydrogeology
- Site inspection and interviews
- Site layout plans, including services
- Previous investigations
- Other relevant reports
- Gap analysis of information available, with clear reference to risk to land uses

**Conceptual Site Model**
- Contaminants of potential concern, sources, pathways and receptors
- Presented in a visual and tabular form, where relevant to the site. A simple CSM, where there is only one source and pathway may be described in words

**Risk Assessment**
- Brief summary of all findings
- Assessment, including potential significance of contamination that may be present based on the CRAT
- Summary table

**Conclusions**
- A clear concluding statement linked to the Objective as to whether contamination is likely to exist on the site (and where) that would pose a risk (and what risk) to current or future land uses (on site) or to off-site receptors (where relevant)
- An opinion on whether pollution prevention, contamination management controls or further investigation is required to make the site suitable for the intended land use

**Recommendations**
- Provide recommendations on whether further investigation or assessment, pollution prevention or contamination management controls are required, with a cost estimate and justification linked to risk
- Data Quality Objectives for Stage 2 DSI and proposed Sampling, Analysis and Quality Plan (if required)
- Proposed regulatory guidelines and criteria

**References**

**Limitations**

**Figures**
- Photographs – plates with detailed description, coordinates and directional reference
- Conceptual Site Model for known and / or potential contamination
Appendices

- Excel output of CRAT (the Excel file must also be submitted to the Defence Project Manager)
- Detailed Data Quality Objectives and Methodology

References:

For example:

- NSW EPA, 2011, Contaminated Sites, Guidelines for Consultants Reporting on Contaminated Sites
**Stage 2 DSI Report – Table of Contents (minimum content requirement)**

This guidance material should be used by consultants preparing a Stage 2 DSI report to inform the minimum contents required (including but not limited to).

The report must be generally consistent with the reporting guideline in ASC NEPM, Schedule B2 Guideline on Site Characterisation.

**Executive Summary (no more than 2-3 pages)**

The executive summary is critical for presentation of high level key findings and conclusions for Defence management to obtain an appreciation of the issues without reliance on detailed technical information.

The key issues should be summarised. These will generally be limited to no more than five key issues and may include an important conclusion (e.g. the Stage 2 DSI report has defined the nature and extent of contamination at five high risk areas which may affect Defence capability by diverting staff to potential environmental issues in time of strategic exercises to prepare Defence for overseas conflict).

The scope of work should be concisely described in no more than two paragraphs, and include a clear description of the area assessed with reference to the property boundaries.

**Summary of conclusions and recommendations**

Conclusions (one to two paragraphs) should only mention significant exceedances and those that are judged to be a high risk to Defence.

Recommendations need to be clear action items and identify responsibilities. They should include indicative cost estimates and timeframes for completion.

**List of Acronyms**

**Introduction**

- Background
- Objectives – these should be clear measurable objectives for what the Stage 2 DSI is intended to achieve
- Scope of works
- Methodology – this should be brief, with detail provided in an Appendix
- Regulatory / Policy Framework (this should cover Defence policy / programs and relevant regulatory framework including Commonwealth and State / Territory and specifically referencing aspects of policy that particularly apply to the DSI)
- Sources of information (must include a reference to any GEMS EFM – CSRs)

**Background Data (refer to reporting on the GEMS EFM module, where relevant for data on listed and identified heritage and ecological values)**

- Site description
- Surrounding land use
- Topography
- Geology and Soils
- Hydrology
- Hydrogeology
- Climate
☐ Flora and Fauna
☐ Aboriginal and Historic Heritage Protections
☐ Historical Activities (check the GEMS Contaminated Site Records)
☐ Historical data – check the Defence ESdat records for the project footprint (requested through ncpp@defence.gov.au with the project footprint shapefile)

Summary of Stage 1 PSI or PCA Investigations (including but not limited to)
☐ Findings of previous reports, including what findings of the Stage 1 PSI have been incorporated into the Stage 2 DSI report
☐ Gap analysis of information available, with clear reference to risk to land uses

Data Quality Objectives
☐ Site and problem specific data quality objectives in accordance with the ASC NEPM, Schedule B2 Guideline on Site Characterisation and with reference to the relevant land use criteria (e.g. is the area proposed for on-Base accommodation)

Sampling, Analysis and Quality Plan
☐ Rationale should be provided for the selection of the sampling pattern, density, location, depths with reference to defining risk to land uses
☐ Rationale should be given for sampling analysis, analytical methods and analytes for samples
☐ Detailed description of sampling methods (equipment, decontamination and handling procedures and preservation methods)
☐ Detailed description of field screening protocols

Assessment Criteria
☐ Table listing all selected assessment criteria, including references
☐ Assumptions and limitation of criteria

Field Observations

Analytical Results
☐ Summary of results providing site characterisation
☐ QA / QC Summary (field and laboratory)

Conceptual Model
☐ Contaminants of potential concern, sources, pathways and receptors
☐ Presented in a visual and tabular form, where relevant to the site. A simple CM, where there is only one source and pathway may be described in words

Risk Assessment
☐ Assessment, including significance of actual contamination, based on the CRAT, with clear relevance to current, or planned future land uses

Summary table

Conclusions
☐ Brief summary of all findings
☐ Assessment, including significance of contamination should be presented based on the CRAT
Clear statement of what risk the delineated contamination poses to current or planned future land uses (with reference to the problem statement and Objective) for the project.

Summary table

Relevant assumptions used in reaching conclusions

Extent of uncertainties in results

Recommendations

Provide recommendations on whether further investigation or assessment, monitoring, pollution prevention, contamination management controls or remediation is required, with a cost estimate, to make the site suitable for the intended land uses, or to restrict off-site migration of contamination, with justification

References
For example:

NSW EPA, 2011, Contaminated Sites, Guidelines for Consultants Reporting on Contaminated Sites

Limitations

Figures

Photographs – plates with detailed description, coordinates and directional reference

Conceptual Site Model for known and / or potential contamination

Appendices

Survey of sampling locations and groundwater monitoring wells

Result Summary Tables

Laboratory Certificates

QA / QC Assessment

PID calibration records

Groundwater well sampling field forms

Excel output of CRAT (the Excel file must also be submitted to the Defence Project Manager)

Detailed Data Quality Objectives and Methodology
Appendix D - Remediation Action Plan Table of Contents
Remediation Action Plan - Table of Contents (minimum content requirement)

This guidance material should be used by consultants preparing a Remediation Action Plan (RAP) to inform the minimum contents required (including but not limited to).

Executive Summary (no more than 2 pages)

The executive summary is critical for presentation of high level information for Defence management to obtain an appreciation of the plan without reliance on detailed technical information.

The key information relating to the RAP should be concisely described. This will generally be limited to a brief background and a statement of the purpose and objectives of the RAP and a high level summary of the scope of works included under the RAP to achieve the remedial goal, including a clear description of the area to which the RAP relates, with reference to the property boundaries.

List of Acronyms

Introduction

□ Background

□ Purpose of the report

□ Remediation goal which must be specific and measurable, including a clear statement regarding the purpose and objective(s) of the remediation and the proposed end use of the land

□ Regulatory / Policy Framework (this should cover Defence policy / programs and relevant environmental and WHS regulatory frameworks including Commonwealth and State / Territory and specifically referencing aspects of policy that particularly apply to the RAP)

□ Scope of work - details relating to the scope of remediation activities including site area and boundaries, general arrangement (site shed, fencing/signage, active remediation areas/zones) and construction areas

□ Methodology - details relating to the remediation method to be employed

Site Context and Environmental Setting

□ Site description including EMR/CLR listing (if applicable) and current title information

□ Topography

□ Hydrology

□ Geology and Soils (including acid sulphate soils)

□ Hydrogeology (regional and local and any beneficial uses of groundwater)

□ Surrounding land uses including any potentially sensitive receptors

□ Aboriginal and Historic Heritage Protections

□ Historical Activities

□ Existing underground services

□ Potential for unexploded and/or exploded ordnance

□ Site history summary – one to two paragraphs to summarise pertinent information.

□ Historical data – check the Defence ESdat records for the project footprint (requested through ncrp@defence.gov.au with the project footprint shapefile)
Contamination Summary

- A list of previous investigations (including a list of previous reports, including Stage 1 PSI or Stage 2 DSI and Stage 3 risk assessment and / or remediation design / options assessment
- Scope of each of the previous investigations and the pertinent findings/recommendations
- Summary of site contamination status including a Conceptual Site Model (CSM), Contaminants of potential concern, affected matrices (i.e. soil, groundwater, sediments etc.) key sources, pathways and receptors that will be treated through implementation of the RAP, presented in a visual or tabulated form.
- Extent of contamination in all relevant matrices (soil, groundwater, gas)

Remediation Options Assessment Overview and Strategy

- Summary of the remediation options assessment including the options that have been considered aligned with the Preferred Hierarchy of Clean Up and including the Remediation Options for each affected media (e.g soil, groundwater and surface water)
- Remediation Strategy including:
  - Remediation assumptions - e.g. end land use, site topography, capping layer, material re-use and approvals
  - Remedial Acceptance Criteria – basis for criteria derivation and assumptions, table of all selected assessment criteria for all relevant matrices and activities, for example soil, groundwater, air, surface water, water discharges, waste for offsite disposal (as applicable)

Remediation Works Program and Procedures

- Remediation Works Plan including (but not limited to)
  - Notifications and approvals
  - Roles and responsibilities - description of the project team for example the contractor, environmental consultant, Environmental (contaminated Land) Auditor, Defence PM and communication protocols
  - Decision authority levels and hold-points
  - Program and overview of key construction stages / phases
- Remediation Works Procedures – these can be appended to the RAP and should include (but not limited to):
  - Hours of Operation
  - Transport & Tracking of Materials
  - Off-site Disposal of Materials
  - Materials Treatment
  - On-site Containment
  - Importation of Fill
  - Stockpile Management
  - Remedial Contingency
- Stakeholder Management Plan including – this can be appended to the RAP and should include (but not limited to):
  - Key Defence personal - Defence, or Defence contractor, operational and PM staff
- Community consultation
- Regulatory Authority Consultation

- Environmental Management including - this can be appended to the RAP and should include (but not limited to):
  - Relevant environmental legislation and regulations
  - Site records and inspection / audit documentation
  - Key risks and hazards
  - Soil & Water Management
  - Noise Control Management
  - Odour Control Management
  - Dust Control Management
  - Acid Sulphate Soils Management
  - Environmental incident and Complaints Reporting and Resolution including Notification of environmental harm, environmental incident reporting, complaint handling procedure, delivery outside operating hours

- Health and Safety Plan - this can be appended to the RAP and should include (but not limited to):
  - Relevant Work Health and Safety Legislation and Regulations
  - Site records and inspection / audit documentation
  - Key risks and hazards
  - JSEAs or equivalent
  - Personal Protective Equipment
  - Hazard Analysis Controls

**Site Validation Sampling, Analysis and Quality Plan**

- Validation Principles
- Validation Sampling Requirements for all relevant matrices (e.g. soil, groundwater, gas)
- Stockpile Sampling and/or Classification - Rationale should be provided for the selection of the sampling pattern, density, location, depths
- Rationale should be given for sampling analysis, analytical methods and analytes for samples
- Detailed description of sampling methods (equipment, decontamination and handling procedures and preservation methods)
- Detailed description of field screening protocols
- Quality assurance and quality control plan:
  - QA/QC Definitions
  - Data Quality Objectives
  - Field QA/QC
  - Sample Collection, Handling and Preservation
  - Sample Nomenclature
- Field Duplicate Samples
- Rinsate Blank Samples
- Calibration
- Laboratory QA/QC
- Laboratory Methods
- Laboratory Blanks
- Laboratory Duplicates
- Laboratory Control Samples
- Matrix Spikes
- Surrogates
- Laboratory Data Quality Indicators
- Analytical Data Validation
- Corrective Actions

☐ Groundwater Monitoring (as applicable)
☐ Soil gas and vapour monitoring (as applicable)
☐ Outline of the Remediation and Validation Reporting that will be completed.

**Site Management Plan**

The Site Management Plan (SMP) for the management of residual contamination post remediation and / or post remediation monitoring, should be a stand-alone document provided as an Appendix to the RAP. The SMP should include:

☐ Background and overview of the remediation works undertaken
☐ Snapshot of the current contamination status of the site - focussed on residual contamination (if existing)
☐ Scope of post remediation monitoring program (as applicable) and thresholds / triggers to ramp this monitoring up or down
☐ Figures showing the extent of residual contamination (if existing) and on-going monitoring points (if required)

**References**

**Limitations**

**Figures and appendices**

☐ Site plans showing remedial target areas and extents, proposed validation sampling locations and post-remediation groundwater monitoring or inspection points (if required)

☐ Result Summary Tables from previous investigations

☐ Photographs - (with scale reference, GPS and GEMS EFM – CSR number on each as applicable)

☐ Conceptual Site Model

☐ Plans relevant to the RAP (e.g. Stakeholder Management Plan, Environmental Management Plan, Health and Safety Plan and Site Management Plan)
Documents to support the proposed methodologies such as standard operating procedures and data quality objectives.

Any other supporting information

Where contamination remains insitu post remedial activities (eg in bedrock, or practical excavation is not achievable) a CRAT and/or ongoing monitoring/management recommendations (inclusive of costings) are to be included. The GEMS EFM - CSR is to be updated with the results of the RAP and outline that validation was/was not achieved and any ongoing monitoring and/or management that is required.
Appendix E – Generic Protocol for Unexpected Finds
Generic Protocol for Unexpected Finds

**Purpose**
This protocol details the actions to be taken when potential contaminated soil / material is encountered during excavation / construction activities.

**Induction / Training**
All personnel are to be inducted on the identification of potential contaminated soil / material along with this protocol during the inductions and Toolbox Talks.

**Scope**
This protocol applies to all activities conducted by all Defence personnel and contractors that have the potential to uncover / encounter contaminated material.

**Procedure**
If during any site earthworks or excavation, offensive or noxious odours and / or evidence of gross contamination not previously detected is observed:

1. **STOP ALL WORK** in the immediate / affected area
2. Immediately notify the site manager
3. Set up an exclusion zone in the affected area, if required
4. Prior to any contamination investigation, management or remediation activities, appropriate health, safety and environmental measures are to be implemented
5. Commission a suitably qualified and experienced contamination specialist to examine the material
6. Undertake sampling to classify the material in accordance with the nominated trigger values in the Construction Environment Management Plan (CEMP) (contaminated land section)
7. Develop and implement appropriate actions, such as further investigation, remediation or management in accordance with the CEMP. This may include:
   - Leaving contamination undisturbed, capping of contamination, treatment or off-site disposal. If the material is to be disposed of off-site, ensure the waste has been classified, the waste facility is appropriately licensed and applicable permits have been obtained
   - If the material is classified as acid sulphate soil or potential acid sulphate soil, the management procedures outlined in the CEMP are to be followed
8. Liaise with relevant Defence contacts regarding the appropriate management measures to be implemented
9. Maintain records of the measures taken to address the unexpected finds
10. Recomence works once the unexpected finds have been appropriately assessed and remediated / managed.