



ATTACHMENTS

UNDER SEPARATE COVER

Ordinary Council Meeting

16 September 2025

Table of Contents

13.1	Policy Review - POL121 Contaminated Land Policy 2025	
	Attachment 1 POL121 Contaminated Land Policy	4
13.3	Policy Review - POL133 Working with Asbestos Policy & Procedure	
	Attachment 1 POL133 Working with Asbestos Policy	45
	Attachment 2 Working with Asbestos Procedure	56
13.4	Policy Review - Development & Environment Policies POL062, 080, 092	
	Attachment 1 POL062 Mobile Food Trading Policy.....	114
	Attachment 2 POL080 Body Worn Video Device Policy.....	122
	Attachment 3 POL092 Compliance and Enforcement Policy	129
13.5	National Carp Control Plan - In Principle Support	
	Attachment 2 The National Carp Control Plan 2022	143



Contaminated Land Policy 2025

POL121



NARRANDERA SHIRE COUNCIL

Chambers: 141 East Street Narrandera NSW 2700
Email: council@narrandera.nsw.gov.au

Phone: 02 6959 5510
Fax: 02 6959 1884



Policy No: POL121
Policy Title: Contaminated Land Policy
Section Responsible: Development & Environment
Minute No/Ref: XXXXXXX
Doc ID: 12129

1. INTENT

The purpose of this policy is to establish a framework that outlines how Council will act in good faith with the Contaminated Land Planning Guidelines when considering the potential of site contamination in its land-use planning and development control decision-making processes.

2. SCOPE

This policy provides information to internal and external stakeholders, interested parties and the broader community on Council's position on managing land contamination.

This policy applies to all land within the Narrandera local government area.

This policy is predicated on the requirements of Chapter 4 ('Remediation of Land') of the State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP)¹, as elaborated in its contaminated land planning guidelines².

This policy is applicable to staff involved in Council land-use planning and development control functions, as well as in waste management and in managing public land and Council assets.

This policy is also applicable to:

- a principal certifying authority
- consultants (for example, strategic and statutory planning, contaminated land practitioners, underground petroleum storage systems practitioners)

¹ The content of Chapter 4 of the *Resilience and Hazards SEPP* was formerly the *State Environmental Planning Policy No. 55 – Remediation of Land* (guidelines for which can be found in *Managing Land Contamination: Planning Guidelines: SEPP55 – Remediation of Land*, <https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/clm/managing-contaminated-land-guidelines-remediation.pdf>).

² These guidelines, referred to in the *Resilience and Hazards SEPP*, are those found in Schedule 6(3) of the *Environmental Planning and Assessment Act 1979*.

- property developers
- landowners and/or managers
- members of the public.

3. OBJECTIVE

This policy aims to:

- enable Council to consider the likelihood of land contamination as early as possible in land-use planning and development control processes
- avoid any inappropriate restrictions on land use
- ensure a proposed change in land use or any development will not increase the risk of harm to human health and the environment
- ensure any contaminant is remediated to a level that complies with relevant contamination criteria as required by regulation, thereby ensuring the land is suitable for its intended use
- enable Council to provide accurate and timely information and advice to inform and support decision-making in land-use planning and development control processes
- enable the community to be informed of Council's requirements regarding the management of contaminated land
- enable Council to exercise its land-use planning and development control functions with a reasonable standard of care and diligence.

4. POLICY STATEMENT

Council acknowledges that land contamination poses a risk of harm to human health and the environment.

5. PROVISIONS

5.1 RESPONSIBILITIES

1. Council will act in good faith with the Contaminated Land Planning Guidelines by ensuring due care and diligence in considering land contamination in Council's land-use planning and development control functions.
2. Council will identify, evaluate and manage contaminated land so as to not increase the risk of harm to human health and the environment:
 - a. when preparing or making a planning instrument (including a planning proposal) and a development control plan (Part 3 of the EP&A Act)
 - b. when considering the potential for land contamination in development assessment and consent processes (Part 4 of the EP&A Act) and in environmental impact assessment processes (Part 5.1 of the EP&A Act)
 - c. in building and subdivision certification processes (Part 6 of the EP&A Act)
 - d. when managing public land and assets, including land managed or under the control of Council
 - e. when managing waste, including contaminants in soil.

3. Council will not approve a development application or lodge a planning proposal unless it is satisfied, based on information available to it under this policy, that that land is suitable, or can be made suitable, for its proposed use.
4. Council will consider the potential of land contamination in a process to furnish the contaminated land information that is required on planning certificates (section 10.7 of the EP&A Act).
5. With respect to sites with operational or abandoned underground petroleum storage systems, Council acknowledges that it is the ARA under the UPSS Regulation. Council also acknowledges the regulation of these sites is also under various other legislation administered by state departments and agencies, including SafeWork NSW and NSW Fair Trading.

5.2 INFORMATION MANAGEMENT

1. Council will maintain and update a contaminated land site register so as to comply with section 59(2) of the CLM Act in furnishing contaminated land information on planning certificates under section 10.7 of the EP&A Act.
2. The contaminated land site register will include information on actual and potential land contamination to inform its land-use planning and development control functions in alignment with the Contaminated Land Planning Guidelines.
3. The list of sites in the contaminated land site register will be compiled, maintained and updated in good faith in the interests of responsible land-use planning and development control and is to be used as a first point of reference by Council.
4. Information on actual or potential land contamination contained in Council's contaminated land site register is to be supplied to the public only by either:
 - a. issuing a section 10.7 planning certificate under the EP&A Act
 - b. a Council officer with delegation to approve the release of reports identified in Appendix 3 that have been provided to Council
 - c. providing access to information and documents in accordance with Local Government Act 1993 and Government Information (Public Access) Act 2009.

5.2.1 Contaminated land site register

1. Council's contaminated land site register should contain accurate and reliable information for individual parcels of land on:
 - a. land-use history and zoning so as to flag the potential for land contamination for a parcel of land if Council reasonably suspects historical land use or zoning may indicate a use of land involving a potential land use or activity listed in Appendix 2
 - b. artefacts received by Council in relation to
 - i. reports on the assessment of site contamination listed in Appendix 3
 - ii. site audit statements
 - iii. EPA notifications under section 59(1) of the CLM Act
 - iv. notification for category 2 remediation works
 - v. notification of completion of category 1 and category 2 remediation works
 - c. any land-use restrictions on the land relating to possible contamination, such as notices issued by the EPA or other regulatory bodies.

2. If an EPA notification under section 59(1) of the CLM Act lists reports on the assessment of site contamination, Council will request copies of these reports to be included in its contaminated land site register.
3. Council will either modify an existing record or create a new record in its contaminated land site register if it approves a new or significant modification (as defined by the UPSS Regulation) to an existing underground petroleum storage system.
4. Information contained in this register is to be used by Council in
 - a. furnishing contaminated land information required on section 10.7 planning certificates under the EP&A Act
 - b. determining the suitability of land for its proposed use
 - c. determining conditions of development consent so as to not increase the risk of harm, to human health and the environment, of an approved use of land.
5. Council will consider the potential for contamination of adjacent land in any process prescribed in section 6.3(8).
6. Council will update records in the contaminated land site register with:
 - a. information provided to it in relation to the (actual or potential) contamination status of land, including notifications, notices and orders, and reports on the assessment of site contamination
 - b. information obtained from Council's inspection and monitoring of contaminated sites and from the inspection of sites operating underground petroleum storage systems
 - c. information directly obtained by Council in land-use planning and development control processes from
 - i. EPA online databases, in relation to sites subject to an investigation order and/or regulation under the CLM Act
 - ii. SafeWork NSW, in relation to underground petroleum storage systems licensed under Schedule 11 of the Workplace Health and Safety Regulation 2017
 - iii. NSW Fair Trading, in relation to registered retail fuel service stations
 - iv. other sources of information used as input into an assessment of historical land use.
7. In lieu of a contaminated land site register, Council should identify and assess historical land use using information identified in section 6.3(10)(c) in any process prescribed by section 6.3(8).

5.2.2 Section 10.7 planning certificate

1. Council will furnish contaminated land information required on section 10.7(2) planning certificates including:
 - a. whether any adopted Council policy restricts the development of land subject to the planning certificate if Council knows or reasonably suspects land contamination
 - b. information prescribed by section 59(2) of the CLM Act
 - c. whether the land was or remains the subject of a preliminary investigation order under section 10(1)(a)–(b) of the CLM Act

- d. whether the land is a remediation site
 - e. information on the potential of contamination of the land subject to the planning certificate due to its historical or current use. This information may be furnished using the annotations provided in Appendix 4 of this policy.
2. Council may furnish additional contaminated land information on section 10.7(5) planning certificates, including:
- a. report(s) possessed by Council and identified in Appendix 3 relating to the assessment or regulation of site contamination of that land or adjacent land
 - b. a statement that the site has been assessed and/or remediated
 - c. a statement that any person relying on the certificate is advised to consider these artefacts and to seek Council's advice regarding further development of the site.

5.3 COUNCIL LAND-USE PLANNING FUNCTION

1. Council will consider land contamination in land-use planning processes in accordance with processes, procedures and standards prescribed by the Contaminated Land Planning Guidelines.
2. Council will consider the potential for land to be contaminated when there is a proposed change in the permissible uses of that land.
3. Council will not include land in a zone that would permit a change of use of that land from the existing use unless:
 - a. Council has considered whether the land is contaminated
 - b. if the land is contaminated, Council is satisfied that the land is suitable in its contaminated state or can be made suitable for its proposed use after remediation, for all purposes for which land in the zone concerned is permitted to be used
 - c. if the land requires remediation to be made suitable for any purpose for which land in that zone is permitted to be used, Council will impose conditions in development consent and approvals under Parts 4 and 5 of the EP&A Act to ensure the land is suitable for its proposed use through remediation prior to or during development works.

5.3.1 Initial evaluation

1. Council will undertake an initial evaluation to investigate the potential for land contamination when preparing or making a planning instrument, development control plan or planning proposal (rezoning proposal) under Part 3 of the EP&A Act, using the potential land uses and activities listed in Appendix 2 as a guide in this evaluation.

5.3.2 Preliminary site investigation

1. In alignment with Local Planning Directions 4.4 ('Remediation of Contaminated Land'), Council will prepare and submit a preliminary site investigation report with a planning proposal if that proposal seeks to rezone land to a proposed use that is a sensitive receptor (as defined by this policy), and there is no knowledge (or

incomplete knowledge) as to whether that and adjacent land involve a land use or activity listed in Appendix 2.

2. The preliminary site investigation is to be carried out in accordance with the requirements of relevant guidelines made or approved by the NSW EPA in alignment with the requirements of the CLM Act. The proponent is responsible for engaging a suitably qualified consultant to undertake this investigation.
3. Council will require a preliminary site investigation to be provided if it reasonably suspects, from an initial evaluation, that land may be contaminated because of the land's history (or historical zoning), condition or other information known to Council.
4. If the risk of contamination of land subject to a land-use planning process makes the land unsuitable for its proposed use, and it is not feasible to make the land suitable (that is, remediate the land) for its proposed use, Council will either:
 - a. restrict the range of permissible uses of that land in planning instruments
 - b. elect not to proceed with the planning proposal to rezone that land.
5. If the preliminary site investigation identifies that the land can be made suitable for its proposed use through remediation, Council will include provisions in its local environment plan or development control plan that ensure the potential for contamination and the suitability of land for any proposed use is further addressed prior to the development of that land.

5.4 COUNCIL DEVELOPMENT CONTROL FUNCTION

5.4.1 Development assessment

1. In alignment with section 4.15(1)(c) of the EP&A Act, Council shall consider land contamination in subdivision and development applications, particularly when a change in land use is proposed. This is to ensure that contaminated land:
 - a. is suitable for its proposed use in its contaminated state
 - b. can be made suitable for its proposed use through remediation
 - c. presents no increased risk of harm to human health and the environment.
2. Council will undertake an initial evaluation to identify and consider the possibility of all forms of potential contamination based on an assessment of the historical or current use of that or adjacent land, particularly if the historical or current use is a use or activity listed in Appendix 2, and the proposed use is a sensitive receptor.
3. If the initial evaluation identifies a potential for land contamination then, in alignment with section 4.6(4) of the Resilience and Hazards SEPP, Council will initiate an assessment of site contamination (as prescribed in section 5.5.1 of this policy) to ascertain the nature and extent of contamination.

5.4.2 Exempt and complying development

1. Development must not be carried out on land designated as 'significantly contaminated land' within the meaning of the CLM Act for complying development specified for Codes identified in section 1.19 under Part 1 of the Exempt and Complying Development Codes SEPP.

2. During development work on land subject to a complying development certificate, if land contamination is detected or reasonably suspected, Council requires that:
 - a. all development work immediately ceases
 - b. Council and the EPA be notified of the potential contamination
 - c. the notification be sent by the PCA or by the person who issued the complying development certificate.
3. Exempt development must not be carried out on land designated as 'significantly contaminated land' within the meaning of the CLM Act.

5.4.3 Development consent

1. Council will, under section 4.17 of the EP&A Act, impose conditions in development consent to ensure there is no increased risk of harm to human health and the environment associated with:
 - a. development works (including complying development) on land that is known to be or is potentially contaminated
 - b. onsite management of contaminants in soil, including
 - i. soil used as infill at a development site (that is, virgin excavated natural material)
 - ii. soil that may contain asbestos
 - iii. contaminated soil from remediation works
 - c. offsite management of contaminants in soil, including waste material generated during remediation for offsite processing (a waste classification report³ must be provided prior to transporting waste material offsite)
 - d. the detection of contamination on land that is subject to a complying development certificate
 - e. the ongoing operation of an approved use of land that involves a land use or activity listed in Appendix 2.
2. Standard conditions prescribed by Council in development consent related to contaminated land are those either:
 - a. contained in the Council Guidance on Implementing the Contaminated Land Policy document
 - b. developed by the NSW Department of Planning and Environment and located in the NSW Planning Portal (voluntary contaminated land conditions)
 - c. developed by Council in accordance with the NSW Department of Planning and Environment's Guide to Writing Conditions of Consent and which align with the 'Newbury Test'.
3. Council can impose a condition of development consent that requires the applicant to:
 - a. prepare a report on the assessment of site contamination, and to submit this report to Council prior to issuance of a subdivision works or construction certificate

³ <https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/contaminated-land/20p2233-consultants-reporting-on-contaminated-land-guidelines.pdf>

- b. submit a validation report to Council prepared by a certified consultant prior to commencing development works, confirming the land has been made suitable through remediation for its proposed use, and whether any ongoing monitoring is required to manage residual site contamination
- c. prior to lodging a construction certificate, provide Council with the design specifications for a new or significantly modified underground petroleum storage system that was prepared by a 'duly qualified person' (within the meaning of the UPSS Regulation)
- d. prior to lodging an occupation certificate, provide Council with
 - i. works as executed plans related to the installation of new or significantly modified underground petroleum storage systems by a 'duly qualified person'
 - ii. a copy of the fuel system operation plan that has been prepared in accordance with the UPSS Regulation
- e. engage an accredited site auditor to review an assessment of site contamination and reports thereon, including a validation report. This is most appropriate for high-risk sites involving a change in land use to a sensitive receptor.

5.5 ASSESSMENT OF SITE CONTAMINATION

- 1. Council will require:
 - a. investigations on the nature and extent of land contamination to be undertaken by appropriately qualified contaminated land consultants
 - b. reports on these investigations to be prepared, or reviewed and approved by, an appropriately qualified and certified consultant in accordance with relevant guidelines made by the NSW EPA.

5.5.1 Preliminary site investigation

- 1. If the initial evaluation identifies a potential for land contamination, then, in alignment with section 4.6(4) of the Resilience and Hazards SEPP, Council will require a preliminary site investigation to be submitted with a subdivision works or development application to carry out development where the land concerned is:
 - a. land that is within an investigation area (within the meaning of the CLM Act)
 - b. land on which development for a purpose listed in Appendix 2 is currently being, or is known to have been, carried out
 - c. to the extent to which it is proposed to carry out development on it for residential, educational, recreational or childcare purposes, or for the purposes of a hospital – land
 - i. in relation to which there is no knowledge (or incomplete knowledge) as to whether development for a purpose listed in Appendix 2 has been carried out
 - ii. on which it would have been lawful to carry out such development during any period in respect of which there is no knowledge (or incomplete knowledge).

2. Council will also require a preliminary site investigation when:
 - a. Council reasonably suspects the land is contaminated because of its historical use (or zone), its condition or other information known to Council
 - b. the land has been investigated and/or remediated, but there is insufficient information available to Council on the nature and extent of contamination and/or remediation works undertaken, or the circumstances have changed
 - c. there are restrictions on, or conditions attached to, the use of the land by a regulatory or planning authority that are or may be related to contamination, but there is insufficient information available to Council on the nature and extent of contamination
 - d. Council records show that the land is associated with pollution incidents or the illegal dumping of waste
 - e. the land is adjacent to land historically or currently being used for a purpose listed in Appendix 2, and Council reasonably suspects it is likely that this use may have contaminated the land subject to the preliminary site investigation
3. The preliminary site investigation is to be carried out in accordance with the requirements of relevant guidelines made or approved by the NSW EPA in alignment with the requirements of the CLM Act. The applicant is responsible for engaging a suitably qualified consultant to undertake this investigation.

5.5.2 Detailed site investigation

1. Council will require a detailed site investigation to be undertaken when either:
 - a. the results of the preliminary site investigation state the potential for or existence of contamination that may not be suitable for the proposed use of the land
 - b. Council is not satisfied with the content and/or completeness of the preliminary site investigation.
2. Council may request the preliminary and detailed site investigations to be combined when the land is known to be contaminated.
3. The detailed site investigation is to be carried out in accordance with the requirements of relevant guidelines made or approved by the NSW EPA in alignment with the requirements of the CLM Act. The applicant is responsible for engaging a suitably qualified consultant to undertake this investigation.
4. A report on the detailed site investigation must include a statement as to whether the land is suitable for its proposed use or if remediation is necessary to make the land suitable for its proposed use. If remediation is required, the report must list the feasible remediation options available.

5.6 REMEDIATION

5.6.1 Remediation action plan

1. A remediation action plan is to be provided to Council if the report on the preliminary or detailed site investigation states that the land is not suitable for its proposed use but can be made suitable through remediation.

2. Prior to determining a subdivision or development application, Council must be satisfied that remedial measures have been or will be undertaken in accordance with the remediation action plan lodged with Council.
3. A remediation action plan must identify, upon completion of remediation works, the need for ongoing land management due to residual contamination. This plan may also include an outline of the environmental management plan.

5.6.2 Validation report

1. A validation report must be lodged with Council after remediation works have been completed.
2. Where applicable, Council will include a condition of development consent requiring this report to be provided to Council prior to issuance of the subdivision works or construction certificate.

5.6.3 Remediation works

1. Remediation work that is ordinarily category 2 remediation work but which is ancillary to designated development that requires development consent under Part 4 of the EP&A Act and an environmental impact statement under Part 5 of the EP&A Act may, as an applicant chooses, either:
 2. be made part of the subject of the development application for the designated development instead of being made the subject of a separate development application
 3. be treated as category 2 remediation work, which does not require the consent of Council.
4. All remediation work must be consistent with the Contaminated Land Planning Guidelines and carried out in accordance with guidelines made or approved by NSW EPA as required by the CLM Act.
5. Council requirements regarding site management of remediation works are outlined in Appendix 5 and are required to be included in a remediation action plan.
6. Council must be notified within 30 days of the completion of remediation works, in alignment with section 4.14(2) of the Resilience and Hazards SEPP. This notice is required to include:
 - a. information prescribed in section 4.15 of the Resilience and Hazards SEPP
 - b. a validation report.

5.6.4 Category 1 remediation works

1. Remediation work that requires development consent is category 1 remediation work. Category 1 remediation work is remediation work that is either:
 - a. identified in section 4.8(a)–(f) of the Resilience and Hazards SEPP
 - b. not being work to which section 4.11(b) of the Resilience and Hazards SEPP applies
 - c. not carried out in accordance with the site management provisions outlined in Appendix 5.

5.6.5 Category 2 remediation works

1. Remediation work that does not require development consent is category 2 remediation work. Section 4.11 of the Resilience and Hazards SEPP defines what constitutes category 2 remediation work.
2. Council must be notified of the intent to undertake category 2 remediation work at least 30 days before commencement. This notification is to include the information identified in section 4.13(3) of the Resilience and Hazards SEPP.
3. Council also requires the following information to be lodged 14 days before commencing these works:
 - a. a copy of the preliminary site investigation report, detailed site investigation report and remediation action plan for these works
 - b. a copy of the soil and water management plan, where applicable (that is, for the management of flooding and of contaminants in soil)
 - c. the contact details of the contractor responsible for remediation works and of the party responsible for ensuring compliance of remediation work with all relevant regulatory requirements.
4. A validation report is to be submitted to Council upon the completion of category 2 remediation works.
5. For category 2 remediation works associated with underground petroleum storage systems, Council requires:
 - a. if a storage system is to be decommissioned, that the person responsible for the storage system notify Council no later than 30 days before the storage system is decommissioned or removed, and that the notification include both
 - i. a report on the assessment of site contamination, which is likely to be a report on the preliminary site investigation
 - ii. a remediation action plan
 - b. if a storage system is decommissioned, that the person responsible for the storage system either
 - i. submit a site report (preliminary site investigation report) to Council no later than 60 days after the system is decommissioned
 - ii. submit the site report and a validation report to Council if remediation of the site is required, and submit these 60 days after the completion of the remediation works
 - c. if a storage system is to be modified and involves the removal or replacement of an underground petroleum storage tank, that the person responsible
 - i. not commission the modified underground petroleum storage system unless the reports prescribed by this clause are submitted to Council
 - ii. submit an updated fuel system operation plan to Council
 - iii. prepare, in accordance with guidelines made by the NSW EPA, the reports prescribed by this clause.

5.7 SITE AUDIT

1. Specific circumstances that may trigger an independent review ('audit') of information pertaining to an assessment of site contamination (including reports thereon) include when Council either:
 - a. reasonably suspects that information provided by the applicant is incorrect or incomplete
 - b. needs to verify that information provided by the applicant adheres to appropriate standards, procedures and guidelines
 - c. does not have the capacity to technically review reports on the assessment of site contamination.
2. A statutory site audit is required only when there is a requirement to demonstrate compliance with:
 - a. a requirement under the CLM Act
 - b. an approved voluntary management proposal
 - c. a requirement imposed by at least one of the following
 - i. the CLM Act
 - ii. the Resilience and Hazards SEPP
 - iii. the EP&A Act (that is, development consent or any other approval under this Act)
 - d. any other requirement imposed by or under a relevant Act.
3. Independent review ('audit') can be undertaken by a consultant with the necessary competencies and qualifications.
4. A statutory site audit must be undertaken by a site auditor accredited under the relevant provisions of the CLM Act.
5. For statutory site audits (within the meaning of the CLM Act), Council must be provided:
 - a. the site audit statement that outlines the conclusions of a site audit
 - b. the site audit report that summarises the information reviewed by the accredited site auditor.
6. Requirements of site auditors are prescribed in the relevant guidelines made by the NSW EPA on the site auditor scheme under the CLM Act.
7. Costs associated with an independent review or the site audit process are with the applicant.

5.8 ENVIRONMENTAL MANAGEMENT PLAN

1. An environmental management plan is required when either:
 - a. residual contamination on land requires ongoing management to manage the risk of harm to human health and the environment, especially when onsite containment of contamination is proposed or is in place
 - b. there are restrictions on the use of the land due to contamination.
2. An environmental management plan is to consider:
 - a. suitable management systems (active or passive)
 - b. potential for intrusive works, including any works arising from the maintenance of service infrastructure or exempt and complying development works

- c. ecologically sustainable development
- d. management of offsite contamination.
- 3. Council can, under section 4.17 of the EP&A Act, include a condition of development consent that requires an applicant to prepare and submit to Council an environmental management plan.
- 4. An environmental management plan is to be prepared in accordance with the requirements prescribed by the NSW EPA Practice Note: Preparing Environmental Management Plans for Contaminated Land.
- 5. An environmental management plan is to be prepared by an appropriately qualified contaminated land consultant and can be reviewed by an accredited site auditor. Environmental management plans prepared to comply with the CLM Act must be prepared, or reviewed and approved by, a contaminated land consultant who is certified under a certification scheme recognised by the NSW EPA.
- 6. Notations indicating that land is subject to an environmental management plan are required in:
 - a. section 10.7(2) and 10.7(5) planning certificates under the EP&A Act
 - b. covenants registered on a land title under section 88B of the Conveyancing Act 1919.
- 7. Provisions of environmental management plans must be legally enforceable. Council can rely on section 4.17 of the EP&A Act to include, as a condition of development consent, that an ongoing environmental management plan be prepared and may also consider orders under section 124 of the Local Government Act 1993.

5.9 MAINTAINING COMPLIANCE WITH DEVELOPMENT CONSENT

5.9.1 Contaminated Land

- 1. Council will monitor sites subject to an environmental management plan in accordance with any role or responsibility prescribed to it under that plan.
- 2. Council may monitor sites subject to remediation works to confirm that those works are undertaken in accordance with the site management provisions in Appendix 5.

5.9.2 Underground petroleum storage system

- 1. Council authorised officers may inspect and monitor these sites to ensure that the operation of underground petroleum storage systems maintains compliance with development consent and does not present an increased risk of harm to human health or the environment through site contamination (for example, through leaks and spills). The following are excluded:
 - a. sites with operational or abandoned underground petroleum storage systems licensed under Schedule 1 of the POEO Act
 - b. Council-owned or managed sites with operational or abandoned underground petroleum storage systems for which the NSW EPA is the ARA.
- 2. The inspection and monitoring of underground petroleum storage systems will focus on:
 - a. retail fuel service stations
 - b. fuel depots

- c. multipurpose premises with retail fuel service (for example, general stores and post offices).
- 3. Council monitoring of these sites will be proportionate to the risk of harm posed by the underground petroleum storage system, which is to be determined by Council as a function of:
 - a. the age of underground petroleum storage tanks
 - b. existence of an onsite fuel system operation plan
 - c. evidence of loss monitoring
 - d. evidence leak detection
 - e. proximity to a sensitive receptor, which would also include both
 - i. irrigation channels for agricultural use
 - ii. the use of groundwater for potable water use.
- 4. Council may determine and/or amend the potential risk of harm for an individual underground petroleum storage system site using information obtained from any of the following:
 - a. an annual inspection
 - b. an inspection at a frequency commensurate with the risk of the site
 - c. an assessment of responses provided to the Council's survey of underground petroleum storage system sites by the person responsible for the underground petroleum storage system, with the survey to be sent every 2 years
 - d. a formal notification received by Council under Part 5.7 of the POEO Act in relation to a potential leak in the underground petroleum storage system
 - e. any other notification sent to Council regarding the operation or decommissioning of the underground petroleum storage system
 - f. notifications under sections 91 and 96 of the POEO Act in relation to clean-up and prevention notices, respectively
 - g. the finding of an abandoned underground petroleum storage tank on public or private land.
- 5. Artefacts generated from Council's inspection and monitoring of underground petroleum storage systems are to be kept in Council's electronic document and records management system and linked to Council's contaminated land site register and/or to Council's database of underground petroleum storage systems.

5.10 DUTY TO NOTIFY

- 1. Where Council considers that contamination on a site triggers the duty to report contamination under clause 60 of the CLM Act, and it is not clear whether or not the polluter or site owner has reported the contamination, Council may notify the EPA.
- 2. Where the land is under Council management and/or control, or Council is the polluter of land, Council will notify the EPA in accordance with clause 60 of the CLM Act.

5.11 PUBLIC LAND

1. Community or public land (or part thereof) under Council's control or management that is known to be contaminated will be managed so as to not increase the risk of harm to human health and the environment⁴.

5.12 USE OF CONSULTANTS

1. Contaminated land investigations will be undertaken by, and reports on these investigations are to be prepared, or reviewed and approved by, an appropriately qualified and certified consultant in accordance with relevant guidelines made by the NSW EPA.
2. The design and installation of underground petroleum storage systems will be undertaken by duly qualified persons within the meaning of the UPSS Regulation.

6. DEFINITIONS

Term	Definition
Abbreviations	
ARA (appropriate regulatory authority)	Under section 6(3) of the <i>POEO Act</i> , Council is declared as the ARA for matters under the <i>UPSS Regulation</i> .
PCA (principal certifying authority)	A certifier can be either a council or a registered certifier. A registered certifier is also known as a private certifying authority. Certifiers have statutory obligations and functions under the <i>Building and Development Certifiers Act 2018</i> , the <i>EP&A Act</i> and other legislation, including the <i>Building and Development Certifiers Regulation 2020</i> . This includes issuing construction and occupation certificates under Part 6 of the <i>EP&A Act</i> .
UPSS (underground petroleum storage system)	A system of tanks, pipes, valves and other equipment that is designed to either contain petroleum or to control its passage into, out of, through or within the system. The system includes any structure through which petroleum routinely passes from one part of the system to another.
Legislation	
<i>Contaminated Land Management Act 1997 (CLM Act)</i>	Establishes a process for the EPA to identify, investigate and (where appropriate) order the remediation of land if the EPA considers the land to be significantly contaminated.
<i>Contaminated Land Planning Guidelines</i>	Under Schedule 6 section 3 of the <i>EP&A Act</i> , the Minister can notify the publication of planning guidelines related to contaminated land under the <i>Resilience and Hazards SEPP</i> for purposes of Schedule 6 section 2 ('good faith' provisions) of the <i>EP&A Act</i> .
<i>Environmental Planning and Assessment Act 1979 (EP&A Act)</i>	The principal legislation of the NSW planning system that governs land-use planning and development control functions in NSW.

⁴ <https://www.epa.nsw.gov.au/your-environment/contaminated-land/managing-contaminated-land/procedures-for-land-managers>

Term	Definition
<i>Protection of the Environment Operations Act 1997 (POEO Act)</i>	Establishes a framework to protect, control and investigate pollution.
<i>Protection of the Environment Operations (Underground Petroleum Storage System) Regulation 2019 (UPSS Regulation)</i>	Establishes a framework for the design, installation, operation, maintenance and decommissioning of an underground petroleum storage system. Also designates Council as the 'appropriate regulatory authority' to administer the requirements of the <i>UPSS Regulation</i> .
<i>State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 (Exempt and Complying Development Codes SEPP)</i>	Establishes the rules and standards for exempt and complying development.
<i>State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP)</i>	Outlines a planning framework for the remediation of contaminated land. Formerly known as SEPP55 – Remediation of Land.
Processes	
Category 1 remediation work	Remediation work that requires the consent of Council under the <i>Resilience and Hazards SEPP</i> .
Category 2 remediation work	Remediation work not requiring the consent of Council under the <i>Resilience and Hazards SEPP</i> .
Detailed site investigation	An investigation to define the extent and degree of contamination, to assess the potential risk posed by contaminants to health and the environment, and to obtain sufficient information for developing a remediation action plan if required. Reporting requirements for a detailed site investigation are as outlined in the <i>National Environmental Protection (Assessment of Site Contamination) Measure 1999</i> (amended 2013) and in relevant guidelines made by the EPA regarding reports to be prepared by contaminated land consultants.
Independent review	An evaluation by an independent expert, with the appropriate competencies and qualifications, of the work of a primary consultant for all types of contaminated sites.
Initial evaluation	A process undertaken by Council to consider the potential for land to be contaminated, and the impacts of that contamination on the suitability of the land for proposed uses, when determining development applications or when preparing environmental planning instruments.

Term	Definition
Preliminary site investigation	An investigation to identify any past or present potentially contaminating activities; provide a preliminary assessment of site contamination; and, if required, provide a basis for a detailed investigation. Reporting requirements for a preliminary site investigation are as outlined in the <i>National Environmental Protection (Assessment of Site Contamination) Measure 1999</i> (amended 2013) and in relevant guidelines made by the EPA regarding reports to be prepared by contaminated land consultants.
Remediation	The remediation of contaminated land is the (i) preparation of an environmental management plan (if required); (ii) removal, dispersal, destruction, reduction, mitigation or containment of the land contamination; and (iii) elimination or reduction of any hazard arising from the land contamination (including by preventing the entry of persons or animals on the land).
Remediation action plan	A plan that sets out remediation goals and that documents the proposed process for remediating a site. Reporting requirements for a remediation action plan are outlined in the relevant guidelines made by the EPA regarding reports to be prepared by contaminated land consultants.
Validation	The process of determining whether the objectives for remediation and any conditions of development consent have been achieved. A report on the validation is to detail the site work undertaken and demonstrate compliance with the remedial action plan for the site, and compliance with the contaminated land planning guidelines and all other applicable regulatory requirements. Reporting requirements for validation are elaborated in the relevant guidelines made by the EPA regarding reports to be prepared by contaminated land consultants.
Terms	
Authorised officer	Authorised officers have regulatory powers and functions under environment protection legislation, as prescribed in Council's delegations of authority.
Complying development certificate	A certificate indicating approval for straightforward residential, commercial and industrial development, generally for building works larger than exempt development.
Contaminated land	Contaminated land is typically land that have been used for industrial or agricultural activities, or individual sites that store chemicals, such as service stations and dry cleaners <i>Also see - Appendix 2</i>
Contamination	The presence in or under the land of a substance above the concentration at which the substance is normally present in or under that land at the same locality, being a presence that poses a risk of harm to human health or any other aspect of the environment (section 5 of the <i>CLM Act</i>). <i>Also see – 'pollution incident'</i>
Development control plan	Provides detailed planning and design guidelines to support the planning controls in the local environmental plan developed by Council.
Environmental management plan	An environmental management plan for contaminated land documents the mitigation measures and/or monitoring requirements where full clean-up of a site is not feasible or where the onsite containment of contamination is proposed.
EPA guidelines	Guidelines made or approved by the EPA in relation to managing site contamination.

Term	Definition
Investigation area	Land declared to be an investigation area by a declaration in force under Part 3 Division 2 of the <i>CLM Act</i> .
Local environment plan	A plan that guides planning decisions for Council through zoning and development controls. Amendments to the local environment plan are through planning proposals.
Newbury test	The Newbury test states that a condition of consent must be imposed for a planning purpose (not an ulterior one); must fairly and reasonably relate to the development that is the subject of the development application; and must not be so unreasonable that no planning authority would have imposed it.
Planning proposal	Council may draft a planning proposal to amend a local environment plan and submit it to the department for Gateway determination.
Pollution incident	An incident or set of circumstances during or as a consequence of which there is or is likely to be a leak, spill or other escape or deposit of a substance, as a result of which pollution has occurred, is occurring or is likely to occur. It includes an incident or set of circumstances in which a substance has been placed or disposed of on premises. <i>Also see – ‘contamination’</i>
Section 10 planning certificates	Formerly section 149 planning certificates. Section 10 planning certificates provides information regarding the development potential of a parcel of land. There are two types of planning certificates – section 10.7(2) and section 10.7(5). These certificates show the zoning of the property, its relevant state, regional and local planning controls and other property constraints such as land contamination, level of flooding and bushfire prone land. Section 10.7(5) certificates also include advice from ‘other authorities’ and certain information that Council holds on a property that is relevant to the land but is not disclosed in a section 10.7(2) certificate.
Sensitive receptor	Receiving environment or sensitive receiver. This is either a use of land for residential, educational, recreational or childcare purposes, or for the purposes of a hospital, or land identified as sensitive environmental land.

7. ROLES AND RESPONSIBILITIES

7.1 STAFF

- must comply with this policy and any reasonable instruction or procedure relating to health and safety at the workplace
- Ensure due care and diligence in considering land contamination during land-use planning and development control functions, acting in good faith with the Contaminated Land Planning Guidelines.
- Identify, evaluate, and manage contaminated land to prevent increased risks to human health and the environment, including assessing land during planning, development, and asset management processes.
- Maintain and update the contaminated land site register, including accurate information on potential and actual land contamination, land-use history, notices, and restrictions, to inform decision-making.

- Impose and monitor conditions of development consent related to land contamination, including requirements for site investigations, remediation, validation reports, and environmental management plans.

7.2 DEPUTY GENERAL MANAGER / MANAGER

- Ensure compliance with the policy.
- Oversee the assessment and management of land contamination during development assessment, including requiring investigations, approving remediation plans, and ensuring compliance with relevant legislation and guidelines.

7.3 GENERAL MANAGER

- Ensure that adequate resources are available for the management and staff to fulfill the obligations of the policy.

8. RELATED LEGISLATION

- Building and Development Certifiers Act 2018
- Building and Development Certifiers Regulation 2020
- Contaminated Land Management Act 1997
- Conveyancing Act 1919
- Environmental Planning and Assessment Act 1979
- Environmental Planning and Assessment Regulation 2021
- Environmentally Hazardous Chemicals Act 1985
- Government Information (Public Access) Act 2009
- Home Building Act 1989
- Local Government Act 1993
- Local Planning Directions
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended)
- Protection of the Environment Operations Act 1997
- Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019
- Protection of the Environment Operations (Waste) Regulation 2014
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008
- State Environmental Planning Policy (Resilience and Hazards) 2021, Chapter 4 ('Remediation of Land')
- Water Management Act 2000
- Workplace Health and Safety Act 2011

- Workplace Health and Safety Regulation 2017

9. RELATED POLICIES AND DOCUMENTS

- Model Contaminated land Policy (version 2023.4) prepared by Riverina and Murray Joint Organisation, Riverina Easter Regional Organisation of Councils, Far North West Joint Organisation, Dubbo Regional Council
- Guidelines
 - Guide to Complying Development (2022)
 - Guide to Writing Conditions of Consent (2021)
 - Guidelines for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019 (2020)
 - Guidelines for the Vertical Mixing of Soil on Former Broad-Acre Agricultural Land (2003)
 - Noise Policy for Industry
 - Interim Construction Noise Guideline
 - Liquid Trade Waste Management Guidelines (DPIE, 2021)
 - Managing Land Contamination: Planning Guidelines: SEPP55 – Remediation of Land (1998) (and its revised form, the Contaminated Land Planning Guidelines, when released)
 - Managing Urban Stormwater: Soils and Construction (4th ed., LANDCOM, March 2004)
 - Waste Classification Guidelines (2014)
 - Statutory guidelines made or approved by the NSW EPA under the Contaminated Land Management Act 1997
 - Non-statutory guidance documents made by the NSW EPA
- Standards
 - Australian Standard AS 1940-2017: Storage and Handling of Flammable and Combustible Liquids
 - Australian Standard AS 4897-2008: The Design, Installation and Operation of Underground Petroleum Storage Systems
 - Australian Standard AS 4976-2008: The Removal and Disposal of Underground Petroleum Storage Tanks.

This policy is supported by a range of capacity resources, documents, forms and templates that are either included or referred to in:

- Appendix 1 – ‘Best Practice Resources on Managing Contaminated Land’ (including the Council Guidance on Implementing the Contaminated Land Policy) to assist and inform Council's navigation of the contaminated land regulatory landscape
- Appendix 2 – ‘Potential Land Uses and Activities That May Cause Site Contamination’
- Appendix 3 – ‘Artefacts Generated in the Process of Managing Contaminated Land’
- Appendix 4 – ‘Annotations for Section 10.7 Planning Certificates on Contaminated Land’

- Appendix 5 – ‘Site Management Provisions for Remediation Works’.

10. VARIATION

Council reserves the right to review, vary or revoke this policy in accordance with legislation, regulation and award changes, where applicable. Council may also make changes to this policy and the relevant procedures from time-to-time to improve the effectiveness of its operation.

11. PREVIOUS VERSIONS

Reference to a superseded policy number and/or name is also considered a reference to the new policy number. This policy was previously named:

- TS320 Contaminated Land Management Policy 2017

POLICY HISTORY

Responsible Officer	Development & Environment Manager		
Approved by	General Manager		
Approval Date	DD Month 202Y		
GM Signature <i>(Authorised staff to insert signature)</i>			
Next Review	August 2030		
Version Number	Endorsed by ELT	Endorsed by Council	Date signed by GM
1 Adopted		21/02/2017	17/03/2017
2 Reviewed	DD/MM/YYYY	DD/MM/YYYY	DD/MM/YYYY

NOTE: This is a controlled document. If you are reading a printed copy, please check that you have the latest version via Council’s website (external) or MagiQ (internal). Printed or downloaded versions of this document are uncontrolled.

Appendix 1 – Best practice resources on managing contaminated land

The resources listed in Table A1.1 below are based on *Managing Land Contamination: Planning Guidelines: SEPP55 – Remediation of Land (SEPP55 Guidelines)*, guidelines made or approved by the EPA and on resources developed by the EPA and other NSW councils. They have been updated, where applicable, to reflect changes in the regulatory landscape.

The resources are also provided for processes ancillary to managing contaminated land, including underground petroleum storage systems, onsite and offsite management of contaminants (including waste material) in soil, and the selection of consultants, among other processes.

A draft revision of the *SEPP55 Guidelines* (that is, the *Contaminated Land Planning Guidelines*) was released by the NSW Department of Planning and Environment in 2018 but has yet to be finalised at the time of finalising the model policy. As already noted, the Contaminated Land Framework includes (where appropriate) elements of the draft guidelines.

Table A1.1: Best practice resources available to Council on managing contaminated land and underground petroleum storage systems

Resource	Author	Description
<i>Assessment of Site Contamination Reports</i>	RAMJO-REROC, Ballina and Bathurst CRCB projects	A resource to assist Council to ascertain the completeness of the report and to assist in the interpretation and use of its content. Also includes checklists to provide Council with a degree of confidence and certainty on the report.
<i>Managing Offsite Transport of Soil</i>	Ballina, RAMJO-REROC and FNWJO CRCB projects	A resource outlining best practices in the offsite management of soil, including soil that includes waste materials generated during remediation, for offsite processing.
<i>Managing Asbestos in Development Control Processes</i>	FNWJO CRCB project	A resource for Council on managing asbestos in its operations. It is complementary to the Council <i>Asbestos Management Policy</i> .
<i>A Guide to Selecting a Consultant</i>	RAMJO-REROC and Ballina CRCB projects	An important resource for Council to identify the required competencies and qualifications of consultants for specific stages of the assessment of site contamination, in the design and installation of underground petroleum storage systems, and in managing asbestos.
<i>A Guide to Retail Service Station Owners on Managing UPSS Systems</i>	NSW EPA (updated by RAMJO-REROC and FNWJO CRCB projects)	A quick reference guide on the obligations of owners, operators and site managers of UPSS infrastructure. This guide is a retired NSW EPA resource that has since been updated by RAMJO and its collaborators.
<i>UPSS and Council ARA Responsibilities</i>	RAMJO-REROC CRCB project	A quick reference guide for Council on their responsibilities as the ARA regarding UPSS systems.
<i>Decommissioning an Underground Petroleum Storage Tank or System</i>	NSW EPA	A fact sheet for Council on the process to decommission an underground petroleum storage system.
Statutory guidelines made or approved by the EPA	NSW EPA	The NSW EPA has made or approved a range of statutory guidelines dealing with different types of contamination. These guidelines are to be considered by accredited site auditors, contaminated land

		consultants, and those with a duty to report contamination to the NSW EPA.
Non-statutory guidelines made or approved by the EPA	NSW EPA	The NSW EPA has made or approved a range of non-statutory guidance documents dealing with different types of contamination. These guidance documents are to be considered by accredited site auditors, contaminated land consultants, and those with a duty to report to the EPA.

Note: RAMJO = Riverina and Murray Joint Organisation; REROC = Riverina Eastern Regional Organisation of Councils; CRCB = Council Regional Capacity Building; FNWJO = Far North West Joint Organisation.

Appendix 2 – Potential land uses and activities that may cause site contamination

Information provided in this appendix is taken from the Department of Planning and Environment's draft *Contaminated Land Planning Guidelines*. This information relates to activities that may cause contamination, as well as industries and associated chemicals that may cause contamination. The coverage of activities, industries and associated chemicals are largely the same when compared to the corresponding table in the *SEPP55 Guidelines*. Differences are presented in *italics*.

The information in these tables is to be used as a guide by Council in an initial evaluation of the potential for site contamination. However, a conclusive find as to whether land is 'contaminated' or 'not contaminated' can only be determined after a preliminary site investigation or a detailed site investigation.

Table A2.1: Activities that may cause site contamination

Acid and alkali plant and formulation	Iron and steel work
Agricultural and horticultural activities	Landfill sites
Airports	Metal treatment
Asbestos production and disposal	Mining and extractive industries
Battery manufacture and recycling	Oil production and storage
Breweries and distilleries	Paint formulation and manufacture
Chemical manufacture and formulation	Pesticide manufacture, formulation and use
<i>Council depots</i>	Power stations
Defence works	Printing shops
Drum reconditioning works	Railway yards
Dry-cleaning	<i>Research institutions (laboratories)</i>
Electrical manufacturing (transformers, capacitors)	Scrap yards
Electroplating and heat treatment premises	Service stations and fuel storage facilities (depots)
Engine works	Sheep and cattle dips
Explosives industry	Smelting and refining
<i>Firefighting training and the use of firefighting foams</i>	Tanning and associated trades
Foundries	<i>Waste processing, storage and treatment</i>
Fuel storage	Water and sewerage treatment plants
Gas works	Wood preservation
<i>Hospitals</i>	

Source: Table 1 in Appendix 1 of the Department of Planning and Environment's draft *Contaminated Land Planning Guidelines*. The use of *italics* indicates an activity not identified in these guidelines but is known to cause site contamination.

Table A2.2: Industries and associated chemicals that may cause contamination

Industry or activity	Main chemical group	Associated chemicals
Agricultural and horticultural activities		See – ‘chemical manufacture and use’ (‘fertiliser’, ‘fungicides’, ‘herbicides’ and ‘pesticides’).
Airports	Hydrocarbons	Aviation fuels (total petroleum hydrocarbons, kerosene), <i>PFAS</i>
	Metals	Particularly lead, aluminium, magnesium, chromium, chlorinated solvents
Asbestos production and disposal	Asbestos	Asbestos (bonded and fibrous). Be aware of assessments in areas of naturally occurring asbestos. ¹
Battery manufacture and recycling	Acids	Sulfuric acid
	Metals	Lead, manganese, zinc, cadmium, nickel, cobalt, mercury, silver, antimony
Breweries and distilleries	Alcohol	Ethanol, methanol, esters
Chemical manufacture and use	Acid and alkali	Mercury; chlorine (chloralkali process); sulfuric, hydrochloric and nitric acids; sodium and calcium hydroxides
	Adhesives and resins	Polyvinyl acetate, phenols, formaldehyde, acrylates, phthalates
	Drum reconditioning works	Chemicals, paints, resins, tars, adhesives, oils, fuels, solvents, drum residues
	Dyes	Chromium, titanium, cobalt, sulfur organic compounds, nitrogen organic compounds, sulfates, solvents
	Explosives	Acetone, nitric acid, ammonium nitrate, pentachlorophenol, ammonia, sulfuric acid, nitroglycerine, calcium cyanamide, lead, ethylene glycol, methanol, copper, aluminium, bis(2-ethylhexyl) adipate, dibutyl phthalate, sodium hydroxide, mercury, silver
	Fertiliser	Calcium phosphate, calcium sulfate, nitrates, ammonium sulfate, carbonates, potassium, copper, magnesium, molybdenum, boron, cadmium, arsenic
	Flocculants	Aluminium
	Foam production	Urethane, formaldehyde, styrene
	Fungicides	Carbamates, copper sulfate, copper chloride, sulfur, chromium, zinc
	Herbicides	Ammonium thiocyanate, carbamates, organochlorines, organophosphates, arsenic, mercury, triazines
	Paints	<u>Heavy metals</u> – arsenic, barium, cadmium, chromium, cobalt, lead, manganese, mercury, selenium, zinc, titanium

Industry or activity	Main chemical group	Associated chemicals
		<u>Solvents</u> – toluene oils, either natural (for example, pine oil) or synthetic, hydrocarbon
	Pesticides	<u>Active ingredients</u> – arsenic, lead, organochlorines, organophosphates, sodium tetraborate, carbamates, sulfur, synthetic pyrethroids <u>Solvents</u> – xylenes, kerosene, methyl isobutyl ketone, amyl acetate, a wide range of chlorinated solvents
	Pharmaceutical	<u>Solvents</u> – acetone, cyclohexane, methylene chloride, ethyl acetate, butyl acetate, methanol, ethanol, isopropanol, butanol, pyridine methyl ethyl ketone, methyl isobutyl ketone, tetrahydrofuran
	Photography	Hydroquinone, sodium carbonate, sodium sulfite, potassium bromide, monomethyl para-aminophenol sulfate, ferricyanide, chromium, silver, thiocyanate, ammonium compounds, sulfur compounds, phosphate, phenylene diamine, ethyl alcohol, thiosulfates, formaldehyde
	Plastics	Sulfates, carbonates, cadmium, solvents, acrylates, phthalates, styrene
	Rubber	Carbon black
	Soaps, detergents	<u>General</u> – potassium compounds, phosphates, ammonia, alcohols, esters, sodium hydroxide, surfactants (sodium lauryl sulfate), silicate compounds <u>Acids</u> – sulfuric acid and stearic acid <u>Oils</u> – palm, coconut, pine, tea tree
	Solvents	<u>General</u> – ammonia <u>Hydrocarbons</u> – for example, BTEX <u>Chlorinated organics</u> – for example, tetrachloroethene (perchloroethylene) trichloroethene, trichloroethane, dichloroethane, carbon tetrachloride, methylene chloride
<i>Council depots</i>		Hydrocarbons, PAH, asbestos, heavy metals, pesticides, herbicides, <i>PFAS</i>
Defence works		Hydrocarbons, <i>PFAS</i> , asbestos <i>See also</i> – ‘chemical manufacture and use’ (‘explosives’), ‘foundries’, ‘engine works’, ‘service stations and fuel storage facilities (depots)’
Dry-cleaning	Chlorinated solvents	Tetrachloroethene (perchloroethylene), trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, white spirit (mixed hydrocarbons)
Electrical manufacturing	Solvents, metals	PCBs (transformers and capacitors), solvents, tin, lead, copper, mercury
Engine works	Hydrocarbons, metals, solvents, acids, alkalis, refrigerants	<u>Refrigerants</u> – chlorofluorocarbons, hydro chlorofluorocarbons, hydrofluorocarbons

Industry or activity	Main chemical group	Associated chemicals
	Antifreeze	Particularly aluminium, manganese, iron, copper, nickel, chromium, zinc, cadmium, lead, and oxides, chlorides, fluorides and sulfates of these metals
Foundries	Metals	Particularly aluminium, manganese, iron, copper, nickel, chromium zinc, cadmium, lead, and oxides, chlorides, fluorides and sulfates of these metals
<i>Firefighting training and the use of firefighting foam</i>	PFAS	Hydrocarbons, solvents, chlorinated solvents, inorganics
Gas works	Inorganics	Asbestos, ammonia, cyanide, nitrate, sulfide, thiocyanate, aluminium, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, zinc
	Organics	BTEX, phenolics, PAHs and coke
<i>Hospitals</i>	Waste	Asbestos, various
	Radioactive material	Diagnostic and therapeutic isotopes
Iron and steel work	Organics, metals	BTEX; phenolics; PAHs; metals and oxides of iron, nickel, copper, chromium, magnesium, manganese and graphite
Landfill sites	Gases, metals, organics	Methane, carbon dioxide, ammonia, sulfides, heavy metals, organic acids, hydrocarbons, asbestos
Marinas	Antifouling paints	Copper, tributyltin <i>See also</i> – ‘engine works’, ‘metal treatments’ (‘electroplating’ metals)
Metal treatment	Electroplating	Metals – nickel, chromium, zinc, aluminium, copper, lead, cadmium, tin Acids – sulfuric, hydrochloric, nitric and phosphoric acids General – sodium hydroxide, 1,1,1-trichloroethane, tetrachloroethylene, toluene, ethylene glycol, cyanide compounds
	Liquid carburising baths	Sodium, cyanide, barium, chloride, potassium chloride, sodium chloride, sodium carbonate, sodium cyanate
Mining and extractive industries		Arsenic, mercury and cyanides. <i>See also</i> – ‘chemical manufacture and use’ (‘explosives’). Aluminium, arsenic, copper, chromium, cobalt, lead, manganese, nickel, selenium, zinc and radio radionuclides. The list of heavy metals should be decided according to the composition of the deposit and known impurities. Consideration should be given to chemicals associated with any mineral processing that also occurred on the mine site.

Industry or activity	Main chemical group	Associated chemicals
		PFAS chemicals associated with firefighting equipment to protect mining infrastructure
Oil production and storage		See – ‘service stations and fuel storage facilities (depots)’
Paint formulation and manufacture		See – ‘chemical manufacture and use’ (‘paints’)
Pesticide manufacture, formulation and use		See – ‘chemical manufacture and use’ (‘pesticides’)
Power stations		Asbestos, PCBs, fly ash metals, water treatment chemicals
Printing shops		Acids, alkalis, solvents, chromium, trichloroethene, methyl ethyl ketone See <i>also</i> – ‘chemical manufacture and use’ (‘photography’)
Railway yards		Hydrocarbons, asbestos, arsenic, phenolics (creosote), heavy metals, nitrates, ammonia
<i>Research Institutions (laboratories)</i>		Various, depending on the nature of work being carried out. A case-specific evaluation is required.
Scrap yards		Hydrocarbons, metals, solvents, asbestos
Service stations and fuel storage facilities (depots)	Petroleum hydrocarbons, PAHs and lead	Aromatic hydrocarbons, BTEX, naphthalene, PAHs, phenols, lead
Sheep and cattle dips		Arsenic, organochlorines, organophosphates, carbamates, synthetic pyrethroids
Smelting and refining		Metals, fluorides, chlorides and oxides of copper, tin, silver, selenium lead, and aluminium
Tanning and associated trades	Various	<u>Metals</u> – chromium, manganese, aluminium <u>General</u> – ammonium sulfate, ammonia, ammonium nitrate, arsenic phenolics, formaldehyde, sulfide, tannic acid
Water and sewerage treatment plants	Metals and chemicals used in water treatment and wastewater and biosolids treatment	Aluminium, arsenic, cadmium, chromium, cobalt, lead, nickel, fluoride, lime, zinc
<i>Waste processing, storage and treatment</i>	Fire retardants, plastics	Polybrominated diphenyl ethers, PFAS, plasticisers

Industry or activity	Main chemical group	Associated chemicals
Wood preservation	Metals	Chromium, copper, arsenic, naphthalene, ammonia, pentachlorophenol, dibenzofuran, anthracene, biphenyl, ammonium sulfate, quinoline, boron, creosote, organochlorine pesticides

Note: PFAS = per- and polyfluoroalkyl substances; BTEX = benzene, toluene, ethylbenzene, xylene; PAH = polycyclic aromatic hydrocarbons; PCB = polychlorinated biphenyl.

Source: Table 2 in Appendix 1 of the Department of Planning and Environment's draft *Contaminated Land Planning Guidelines*.

The use of *italics* indicates an activity not identified in these guidelines but is known to cause site contamination.

¹ <https://trade.maps.arcgis.com/apps/PublicInformation/index.html?appid=87434b6ec7dd4aba8cb664d8e646fb06>

Appendix 3 – Artefacts generated in the process of managing contaminated land

Table A3.1 lists artefacts either prepared by or for Council in a process to consider and assess site contamination. These artefacts should be retained in Council's electronic document and records management system and also linked to the respective record in Council's contaminated land site register.

These artefacts can also be provided with section 10.7 planning certificates under the *EP&A Act*.

Table A3.1: Artefacts generated in a process to assess site contamination

Process	Artefact	Prepared by	Description
Initial evaluation	Checklist	Council	To guide Council's consideration of the potential for site contamination.
Preliminary site investigation	Report on the preliminary site investigation	Consultant	Reports the possibility of potential contamination based on historical land use. It includes the development of the conceptual site model.
	Checklist	Council	Confirms whether the requirements of the investigation have been met.
Detailed site investigation	Report on the detailed site investigation	Consultant	Defines the extent and degree of contamination and assesses potential risks posed to health and the environment by contaminants. The investigation is also used to obtain sufficient information for the development of a remediation action plan if required.
	Checklist	Council	Confirms whether the requirements of the investigation have been met.
Remediation	Remediation action plan	Consultant	A plan that sets out remediation objectives and documents the proposed remediation process.
	Validation report	Consultant	Reports on whether the objectives for remediation and any conditions of development consent have been achieved.
Site audit	Site audit report	Consultant	A summary of information reviewed by the accredited site auditor.
	Site audit statement	Consultant	An outline of the conclusions of a site audit.
Environmental management plan		Consultant	Outlines the mitigation measures and/or monitoring requirements where the full clean-up of a site is not feasible or where onsite containment of contamination has been proposed.

Table A3.2 lists key artefacts generated in a process to regulate contaminated land and underground petroleum storage systems.

These artefacts should be retained in Council's electronic document and records management system, and also linked to the respective record in Council's contaminated land site register.

These artefacts may also be included on section 10.7 planning certificates under the *EP&A Act*.

Table A3.2: Artefacts generated in a process to regulate contaminated land and underground petroleum storage systems

Process	Artefact	Prepared by
EPA notices and orders under the <i>CLM Act</i>	Preliminary investigation order	EPA
	Significant contaminated land notice	EPA
	Management order	EPA
	Voluntary management proposal	Landowner, or person managing an activity that caused the site contamination
	Environmental management plan	EPA/landowner
	Revocation of orders under the <i>CLM Act</i>	EPA
Pollution prevention	Waste classification report	Person responsible for remediation
	UPSS inspection form	Council
	Contaminated land investigation form	Council
	<i>POEO Act</i> section 91 clean-up notice	Council/EPA
	<i>POEO Act</i> section 96 prevention notice	Council/EPA
	Leak notification under the <i>POEO Act</i> Part 5.7	Council / UPSS operator
	Fuel system operation plan	Council / UPSS operator
	Loss monitoring reports	Council / UPSS operator
	Leak detection reports	Council / UPSS operator
Decommissioning of a UPSS (category 2 remediation works)	Development application	
	Notifications (leak notification)	UPSS owner
	Validation report	Consultant
Information management	<i>POEO Act</i> section 192 and 193 requests for information	Council
	Survey of UPSS operators	Council
Compliance	Penalty infringement notices	Council

Note: UPSS = underground petroleum storage system.

Appendix 4 – Annotations for section 10.7 planning certificates on contaminated land

Council is required to include contaminated land information on section 10.7 planning certificates. This requirement is anchored in:

- the *EP&A Act*
 - section 10.7(2), as elaborated by the *Environmental Planning and Assessment Regulation 2021*
 - section 10.7(5), in relation to advice on other matters affecting the land
 - section 10.7(6), in relation to furnishing of contaminated land information in good faith with Schedule 6 of the *EP&A Act*
- section 10(1) in schedule 2 of the *Environmental Planning and Assessment Regulation 2021* in relation to whether an adopted Council policy restricts the development of land because of site contamination
- the *CLM Act*
 - section 10(1)(a)–(b), in relation to preliminary investigation orders issued by the EPA for the land
 - section 44, in relation to the EPA's repeal or revoking of orders and notices issued under section 10 of the *CLM Act*
 - section 59(2), in relation to matters that are to be included in section 10.7 planning certificates.

The information required to be included on a planning certificate is outlined in Table A4.1. Council must note that information prescribed under section 59(2) of the *CLM Act* pertains to land that 'is' subject – not 'was' subject – to the prescribed regulatory processes. However, Council can elect to include this historical information on planning certificates in accordance with its *Contaminated Land Policy*.

Table A4.1: Contaminated land information required on section 10.7 planning certificates

Planning certificate	Contaminated land information
Section 10.7(2)	A statement that Council has adopted a policy to restrict the development of land because of the actual or potential likelihood of that land being contaminated. See Table A4.2 for annotations that Council can use.
	At the date of issue of the planning certificate, a statement that the land to which the planning certificate relates is: • significantly contaminated land within the meaning of the <i>CLM Act</i>, including whether only part or all of the land is significantly contaminated • subject to a management order under the <i>CLM Act</i> • the subject of an approved voluntary management proposal under the <i>CLM Act</i> • subject to an ongoing maintenance order under the <i>CLM Act</i> • the subject of a site audit statement under the <i>CLM Act</i>.
	Council may elect to include information on the potential of site contamination because the historical use of that land is known or reasonably suspected by Council to be an activity identified in Appendix 2. See Table A4.2 for annotations that Council can use.
Section 10.7(5)	Information provided on section 10.7(2) planning certificates and additional information Council may elect to disclose pertaining to the actual or potential contamination of the land. See Table A4.2 for annotations that Council can use.

Table A4.2: Annotations for additional information on section 10.7 planning certificates for land that is or may be contaminated

Situation	Annotation
Council has identified that the land: • has a previous land-use history that could have involved the use of contaminants on the site (for example, the land may have been used for an activity listed in Appendix 2) • is known to be contaminated but has not been remediated.	'Council has adopted by resolution a policy on contaminated land that may restrict the development of the land. This policy is implemented when zoning or land-use changes are proposed on lands that have previously been used for certain purposes. Consideration of Council's adopted policy and the application of provisions under relevant State legislation is warranted.'
Council has identified that the land is known to contain contaminants but that it has been remediated for a particular use or range of uses, and some contamination remains on the site (for example, encapsulated).	'Council has adopted by resolution a policy on contaminated land that may restrict the development of the land. This policy is implemented when zoning or land-use changes are proposed on lands that are considered to be contaminated or on lands that have been remediated for a specific use. Consideration of Council's adopted policy and the application of provisions under relevant State legislation is warranted.'
Council records do not contain a clear site history without significant gaps in information, and Council cannot determine whether the land is contaminated and, therefore, the extent to which Council's policy should apply.	'Council has adopted by resolution a policy on contaminated land that may restrict the development of the land. This policy is implemented when zoning or land-use changes are proposed on lands that have previously been used for certain purposes. Council records do not have sufficient information about the previous use of this land to determine whether the land is contaminated. Consideration of Council's adopted policy and the application or provisions under relevant state legislation is warranted.'

Note: The information in this table applies where Council has adopted a policy to restrict the development of land because of the actual or potential likelihood of that land being contaminated.

Appendix 5 – Site management provisions for remediation works

Council can impose site management provisions for proposed remediation works. Council will request that these provisions be included in a remediation action plan that is to be lodged to Council prior to commencing these works. Council will require remediation works to be carried out in accordance with the remediation action plan.

The site management provisions listed in Table A5.1 are taken from the *Resilience and Hazards SEPP* and amended to reflect best practice site management, as included in the draft *Contaminated Land Planning Guidelines* and in other Council contaminated land policies.

Remediation work must comply with the requirements of the:

- *CLM Act*
- *Contaminated Land Planning Guidelines*
- *Resilience and Hazards SEPP*
- *POEO Act*.

Council will also require the validation report to be lodged with Council within 60 days of the completion of remediation works and, where applicable, prior to the issuance of a subdivision or construction certificate.

Table A5.1: Site management provisions to be included in a remediation action plan

Parameter	Provision to be included in a remediation action plan
Air quality	Emissions of dust, odour and fumes from a remediation site are to be appropriately controlled and in accordance with relevant regulations and guidelines made or approved by the EPA. These may include but are not limited to: • ensuring no onsite burning of material • maintaining equipment in a functional manner to minimise exhaust emissions • covering vehicles transporting soil (including contaminated soil) and/or infill onsite or offsite • establishing dust suppression and control measures to minimise windborne emissions of dust, having regard to site-specific wind conditions • monitoring and managing odours, including the use of a hydrocarbon mitigating agent on the impacted areas and materials • covering stockpiles of contaminated soil that remain onsite for more than 24 hours (see 'stockpiles' for additional provisions) • regularly monitoring air quality throughout remediation work.
Bunding	Any areas used for remediation or the stockpiling of construction materials or contaminated soils shall be controlled to contain surface water run-off and run-on and be designed and constructed so as to prevent the leaching of contaminants into the subsurface or groundwater. Locate stockpiles and construction materials away from drainage lines and provide bunding of disturbed areas and excavations to prevent run-off to waterways or stormwater where necessary. All surface water discharges from the bunded areas to Council's stormwater system shall not contain detectable levels of the contaminants of concern and must comply with the relevant EPA and ANZECC standards for water quality. Any discharge must satisfy the provisions of the <i>POEO Act</i>.
Capping or containment of contaminated soil	Capping of contaminated soil should occur only after alternative remediation works have been investigated, particularly in urban zoning or areas identified as future growth in Council's local environment plan or development control plan.

Parameter	Provision to be included in a remediation action plan
	Contaminated soil is only permitted to be capped if it does not prevent any permitted use of the land and if it can be demonstrated that there will be no ongoing impacts on human or environmental health. Capping of contaminated soil that exceeds zoning permissible levels is classified as category 1 remediation work and may only be permitted with development consent. The soil investigation levels for urban redevelopment in NSW are contained in <i>National Environment Protection (Assessment of Site Contamination) Measure 1999</i> (as amended). Where the proposed remediation involves the onsite containment of contaminated material, the need for a continuing monitoring program should be assessed by both the 's consultants and Council. To ensure that future owners of the site are aware of the contaminated material and any ongoing maintenance and monitoring, Council may impose a consent condition on any subsequent development application for the subject site, requiring a covenant to be registered on the title of the land that gives notice of the existence of onsite containment of the contaminated soil. The covenant may also bind the owners or any future owners to the responsibility of ongoing monitoring and maintenance (as described in an environmental management plan) and any future remediation works required. Records of any maintenance undertaken on the site shall be kept for future reference and provided to Council annually. The cost of preparing the covenant is borne by the applicant.
Consultants	Ensure consultants (or contractors) undertaking the remediation works have the required competencies and qualifications. Remediation work requiring validation by a site auditor (that is, a statutory site audit) must use a site auditor accredited under Part 4 of the <i>CLM Act</i>. Validation of remediation work that is not a statutory site audit is to be undertaken by a consultant with the necessary competencies and qualifications.
Consultation	Written notification to adjoining owners and occupants is to occur at least two days prior to commencing remediation works. This notification is to include: - the estimated length of remediation work - the hours of remediation work - the contact details of the site manager. Signage visible from the road and adjacent to site access is to display the site manager and remediation contractor contact details for the duration of the works.
Decommissioning of underground petroleum storage systems	The removal of all UPSSs is to be undertaken in accordance with the: <i>UPSS Regulations</i> - SafeWork NSW requirements <i>Australian Standard AS 4976-2008: The Removal and Disposal of Underground Petroleum Storage Tanks.</i> Decommissioning of an underground petroleum storage tank or system must be undertaken by a duly qualified person who holds a demolition licence from SafeWork NSW and is competent and experienced in the task.

Parameter	Provision to be included in a remediation action plan
	Following the removal of an underground petroleum storage tank or system, the site area, which includes bowser lines and fuel lines, shall be assessed, remediated if need be and validated in accordance with the requirements above and with guidelines made or approved by the NSW EPA. All documents must be submitted to Council, including (but not limited to) a validation report (or tank pit validation) prepared in accordance with relevant guidelines made or approved by the EPA.
Erosion and sediment control	An erosion and sediment control plan (ESCP) shall be prepared and submitted to Council for approval prior to commencing remediation works. The ESCP shall be developed with regard to the requirements detailed in Council's <i>Soil and Water Management Policy</i> and Council's <i>Engineering Guidelines and Technical Specifications</i> and must include leachate collection and disposal. Sediment control structures shall be provided to prevent sediment from entering drainage systems, particularly where surfaces are exposed or where soil is stockpiled. All erosion and sediment control measures must be maintained in a functional condition throughout the remediation works. Vehicles are to be cleaned prior to leaving the site. <i>Also see</i> – 'soil and water management' for related provisions.
Hazardous material	Hazardous and industrial wastes arising from the remediation work shall be removed and disposed of in accordance with the requirements of the NSW EPA and SafeWork NSW, together with the: • <i>Workplace Health and Safety Act 2011</i> • <i>Workplace Health and Safety Regulation 2017</i> • <i>CLM Act</i> and subordinate regulations • <i>Environmentally Hazardous Chemicals Act 1985</i> and subordinate regulations. Under the <i>POEO Act</i>, the transportation of Schedule 1 hazardous waste is a scheduled activity and thereby required by the EPA to be carried out by a transporter licensed by the NSW EPA. <i>Also see</i> – 'waste' for additional related site management provisions.
Health and safety	All works associated with remediation works must comply with workplace health and safety legislation and other applicable SafeWork NSW requirements. This requires: • the preparation of a health and safety plan • site fencing, public safety warning signs and security surveillance (where applicable) to be established for the remediation site.
Hours of work	All remediation work (including the delivery and removal of materials or equipment) shall be limited to the following hours of work (unless through an alternative mutual agreement in writing with Council): • Monday to Saturday – 7.00 am to 5.00 pm • Sunday and Public Holidays – no remediation work is permitted Note: The hours of work listed above are in accordance with the <i>Exempt and Complying Development Codes SEPP</i>.

Parameter	Provision to be included in a remediation action plan
Importation of infill	All fill imported to the site shall be validated as virgin excavated natural material as defined in the <i>POEO Act</i> to ensure that it is: • suitable for the proposed land use from a contamination perspective • compatible with the existing soil characteristics for site drainage purposes. Council may, in certain instances, require the details of the appropriate validation of imported fill material to be submitted with any application for the future development of the site. Hence, all fill imported onto a site is to be validated by one or both of the following methods during remediation works: • Imported fill should be accompanied by documentation from the supplier that certifies that the material is not contaminated, based upon analyses of the material or the known past history of the site where the material is obtained. • Sampling and analysis of the fill material should be conducted in accordance with the NSW EPA <i>Sampling Design Guidelines</i> to ensure that the material is not contaminated. Fill should be imported and exported in accordance with the provision of a virgin excavated natural material exemption or an NSW resource recovery order and exemption. Fill is permitted for use provided that it: • is not itself contaminated, particularly with waste material (including asbestos) • is weed and pest free • is compatible with the existing soil characteristics so as not to adversely affect site drainage.
Landscaping and rehabilitation	The remediation work site must be stabilised to ensure that no offsite impacts occur on the site after completion. This requires: • the preparation of a landscaping plan • landscaping of the site in accordance with the landscape plan • the progressive stabilisation and revegetation of disturbed areas in accordance with the landscape plan. There shall be no removal or disturbance to trees or native understorey without prior written consent obtained through Council's tree preservation order process. All trees that will be retained on the site must be suitably protected from damage during remediation works. This includes the provision of protective fencing to protect the root zone of these trees. The fencing must extend, at a minimum, to the drip line of each tree. No stockpiling, storage, excavation, vehicle parking or vehicle movement is to occur within the root zone protection area. Tree protection fencing must remain in place until the end of remediation works. All exposed areas shall be progressively stabilised and revegetated upon the completion of remediation works.
Noise and vibrations	Any noise and vibrations from the site shall be limited by complying with the NSW EPA's <i>Noise Policy for Industry</i> (2017) and the <i>Interim Construction Noise Guideline</i>. All equipment and machinery shall be operated in an efficient manner to minimise noise from the site on adjoining properties, including (when necessary) ensuring that plant equipment noise is suppressed.

Parameter	Provision to be included in a remediation action plan
	The use of any plant or machinery shall not, on any premises, cause vibrations in excess of the relevant NSW EPA guidelines and Australian Standards.
Rodents and vermin	Rodents and vermin are to be adequately controlled and disposed of in an environmentally appropriate manner.
Site access and vehicle use	Vehicle access to the site shall be designated to prevent the tracking of sediment onto public roadways and footpaths. Soil, earth, mud or similar material must be removed from the roadway by sweeping, shovelling or a means other than washing on a daily basis or as required by an appropriate authority. Soil residue from vehicle wheels shall be collected and disposed of in an appropriate manner. All vehicles are to: • enter and exit the site in a forward motion • comply with all road rules, including vehicle weight limits • minimise the use of local roads by using state roads where available • be cleaned pre-work and post-work to prevent the movement of weed seeds • have all loads securely covered or sealed to prevent the release of any dust, fumes, soil or liquid emissions during transportation • conduct deliveries of soil, materials, equipment or machinery during the hours of remediation work (see 'hours of work').
Site security and lighting	The site shall be secured to ensure against all unauthorised access by using appropriate fencing. It is recommended that security lighting be used to deter unauthorised access. If security lighting is used, it shall be shielded to protect the amenity of adjoining landowners.
Soil and water management	All remediation works shall be conducted in accordance with a site-specific soil and water management plan prepared in accordance with the requirements of LANDCOM's <i>Managing Urban Stormwater: Soils and Construction</i>.¹ The plan should aim to segregate and manage both contaminated and non-contaminated areas in a manner that minimises the potential dispersal of contaminants and any cross-contamination of contaminated and non-contaminated materials. In some cases, standard erosion and sediment control requirements will be inadequate for managing contaminated soils and water. Where remediation work involves the excavation of soil, the person responsible for the remediation work shall consult Council's flood mapping. Where works are proposed to be undertaken within an area identified by Council as having the potential to be impacted by flood waters (that is, inundation), such works shall be undertaken in alignment with the responsive actions for such potential site inundation as described in the site-specific soil and water management plan. A copy of the remediation action plan and the soil and water management plan shall be kept onsite and made available to Council officers on request. Soil and water management measures for remediation work in relation to stockpiles, site access, excavation pump-out, landscaping and rehabilitation, and bunding are discussed elsewhere in this table. See – 'erosion and sediment control' for related provisions.
Stockpiles	No stockpiles of soil or other materials shall be placed on public land (for example, footpaths, reserves or nature strips).

Parameter	Provision to be included in a remediation action plan
	All stockpiles shall be placed away from drainage lines, gutters or stormwater pits or inlets. All stockpiles of soil or other material shall be maintained to prevent dust, odours or seepage. All stockpiles of contaminated soils shall be secured to prevent dust, odour or seepage if being stored for more than 24 hours. Stockpiling of contaminated materials requires special measures to manage the generation of leachate, run-off, vapours, odours and airborne particulates. Store any temporary stockpiles of contaminated soil in a secure area.
Unexpected finds during remediation works	Council is required to be notified of any new information that comes to light during remediation works that has the potential to alter previous conclusions regarding site contamination.
Validation report	The validation report is to be prepared in accordance with relevant guidelines made by the NSW EPA. A copy of the validation report is to be provided to Council within 60 days of completing the remediation works and prior to commencing development works at the site. The validation report is to: • contain a copy of any reports or records taken during remediation or following the completion of validation works • contain a validation statement detailing that all works have been undertaken and completed satisfactorily and in accordance with relevant guidelines made or approved by the EPA • demonstrate that the objectives of the remediation action plan have been achieved, any conditions of development consent have been complied with and whether any further remediation work or restrictions on land use are required • provide evidence confirming that all NSW EPA, SafeWork NSW and other regulatory authorities' license conditions, approvals and/or regulatory requirements have been met, including in respect of managing contaminated soil and other waste material generated by the remediation works • identify the need for continued monitoring in situations where clean-up is not feasible or onsite containment has occurred • state the suitability of the site for its current or proposed use. Successful validation is the statistical confirmation that the remediated site complies with the clean-up criteria set for the site. The full cost of the validation is borne by the applicant.
Vertical mixing (on agricultural land)	The <i>Guidelines for the Vertical Mixing of Soil on Former Broad-Acre Agricultural Land</i> relates to the remediation of large agriculture properties with low-level but broad-spread contamination. The relevant NSW EPA guidelines are not designed or suitable for use in the remediation of contamination, including lead contamination, on small allotments. Therefore, Council will not support remediation action plans relying on this methodology, and an alternative remediation methodology shall be used for small allotments.
Waste	If contaminated soil and other waste material generated by the remediation works are to be treated and managed onsite, the treatment and management of each is to be in accordance with relevant guidelines made or approved by the EPA. If contaminated soil and other waste material generated by the remediation works are to be removed from the site, then this must be in accordance with the <i>POEO Act</i> and its waste regulation. This includes:

Parameter	Provision to be included in a remediation action plan
	- the preparation of a waste management plan - that the waste classification process complies with the <i>Protection of the Environment Operations (Waste) Regulation 2014</i> and is undertaken by an appropriately qualified consultant - record-keeping for waste going to a licensed landfill or a resource recovery facility regarding - how the waste is to be treated and transported - evidence that the landfill is licensed to accept this waste - the requirement that transport of the waste to or from a site must be by a licensed waste transport contractor. Any enquiries associated with the offsite disposal of waste from a contaminated site should be referred to the EPA helpline (phone 131 555). If contaminated soil or other waste generated by the remediation works is to be transported to Council's landfill or waste management facility: - Council's Waste Management Facility only accepts waste in accordance with its Environment Protection Licence. - Section L5 Waste requires that waste be general solid waste. Analysis of the contaminated soil is to be undertaken to verify that the waste is general solid waste. - All documentation is to be provided to Council's Waste Management Team and approved prior to the waste entering the landfill. See – 'hazardous material' for related site management provisions.
Water quality: dewatering – excavation and groundwater pump-out	Only clean and unpolluted waters are to be discharged to Council's stormwater system or any watercourse. Any discharge must satisfy the provisions of the <i>POEO Act</i>. Prior to any dewatering commencing, a dewatering management plan shall be submitted to Council. All pump-out water must be analysed for concentrations of suspended solids, pH and any contaminants of concern. The analytical results must comply with the relevant NSW EPA and ANZECC standards for the quality of water discharged to stormwater. If necessary, the water shall be treated prior to discharge. If the water quality does not comply with the identified criteria, then it cannot be discharged to stormwater. Alternative arrangements for the disposal of water shall be provided, if necessary (for example, offsite disposal by a licensed liquid waste transporter for treatment or disposal at an appropriate waste treatment or processing facility). Dewatering may require a licence from the NSW Office of Water.
Water quality: groundwater	Any contamination assessment, carried out in accordance with the requirements of the relevant guidelines made or approved by NSW EPA in accordance with the <i>CLM Act</i>, shall address the potential for contamination of groundwater at the site. Any work below the water table may require a licence from the NSW Office of Water. Such works include bores for water supply, testing and monitoring, and any dewatering or extraction. If the groundwater at the site is found to be contaminated, then Council, the NSW Office of Water and the NSW EPA are to be notified

Note: ANZECC = Australian and New Zealand Environment and Conservation Council; UPSS = underground petroleum storage system; ESCP = erosion and sediment control plan.

¹ <https://www.environment.nsw.gov.au/research-and-publications/publications-search/managing-urban-stormwater-soils-and-construction-volume-1-4th-edition>



Working with Asbestos Policy 2025

POL133



NARRANDERA SHIRE COUNCIL

Chambers: 141 East Street Narrandera NSW 2700
Email: council@narrandera.nsw.gov.au

Phone: 02 6959 5510
Fax: 02 6959 1884



Policy No: POL133
Policy Title: Working with Asbestos Policy
Section Responsible: Work Health Safety
Minute No:
Doc ID: 392664

1. INTENT

Narrandera Shire Council is committed to protecting the health and safety of our community, workers, and visitors by recognising the serious health hazards associated with asbestos exposure. We acknowledge that although asbestos was phased out of Australian building materials in the 1980s and its supply has been prohibited since 2003, legacy asbestos materials remain present in many homes, buildings, and infrastructure within our Local Government Area.

Our intent is to proactively minimise the risk of asbestos exposure by implementing appropriate management practices across all relevant council functions and activities. We will ensure that materials suspected or confirmed to contain asbestos are identified, handled, and disposed of in accordance with legislative requirements and best safety practices. Where asbestos is in a non-friable, undisturbed, and sealed state, we will maintain and monitor its condition, taking action only if it becomes damaged or disturbed.

As part of our commitment, we will:

- Conduct regular assessments and inspections of Council managed assets and land
- Provide guidance and support to residents, contractors, and staff regarding asbestos awareness and safe handling
- Incorporate asbestos considerations into land use planning, development, and demolition approvals
- Respond effectively to asbestos-related emergencies
- Manage contaminated land and naturally occurring asbestos risks responsibly
- Promote safe waste management and disposal practices for asbestos materials

Through these actions, Narrandera Shire Council aims to minimise asbestos-related health risks as far as reasonably practicable, safeguarding public health and ensuring a safe environment for current and future generations.

2. SCOPE

This policy applies to all the Narrandera Shire Council Local Government Area (LGA) within council's jurisdiction.

The policy provides information for council workers, the local community and wider public and must be read in conjunction with the Working with Asbestos Procedure. Part 1 of the procedure includes the sections that are likely to be of most interest to the local community and wider public. Part 2 is information that applies to workers associated with council including employees, contractors, consultants, and volunteers (as defined by the NSW *Work Health and Safety Regulation 2011*).

The policy applies to friable, non-friable (bonded) and naturally occurring asbestos (where applicable) within the LGA.

The policy and procedure outlines council's commitment and responsibilities in relation to safely managing asbestos and contains general advice. For specific advice, individuals are encouraged to contact council or the appropriate organisation.

The policy does not provide detail on specific procedures. Practical guidance on how to manage risks associated with asbestos and asbestos containing material can be found in the:

- *Code of practice on how to manage and control asbestos in the workplace* (catalogue no. WC03560) published by SafeWork NSW.
- *Code of practice on how to safely remove asbestos* (catalogue no. WC03561) published by SafeWork NSW.
- Additional guidance material listed in the Procedure.
- Detailed information on council's procedures and plans may be found in other documents, which are referenced in part 2 under section 18.1.

3. OBJECTIVE

The objective of this document is to act as a guide to inform all persons, including Contractors employed by NSC, of the safe work procedures when undertaking work in an environment that has been identified, or suspect of, containing Asbestos or material that contains asbestos.

This policy aims to outline:

- the role of council and other organisations in managing asbestos

- council's relevant regulatory powers
- council's approach to dealing with naturally occurring asbestos, sites contaminated by asbestos and emergencies or incidents
- general advice for residents on renovating homes that may contain asbestos
- council's development approval process for developments that may involve asbestos and conditions of consent
- waste management and regulation procedures for asbestos waste in the LGA
- council's approach to managing asbestos containing materials in council workplaces
- sources of further information.

4. POLICY STATEMENT

This policy and associated procedure was formulated to be consistent with council's legislative obligations and within the scope of council's powers. This policy should be read in conjunction with procedure, relevant legislation, guidelines and codes of practice. In the case of any discrepancies, the most recent legislation should prevail.

This policy and associated procedure is based upon the Model Asbestos Policy for NSW Councils developed by the Heads of Asbestos Coordination Authorities to promote a consistent Local Government approach to asbestos management across NSW.

This policy and associated procedure does not constitute legal advice. Legal advice should be sought in relation to particular circumstances and liability will not be accepted for losses incurred as a result of reliance on this policy.

Council is committed to fulfilling its responsibilities to workers under the NSW Work Health and Safety Act 2011 and Regulation 2017 and maintaining a safe work environment through Council's:

- General responsibilities
- Education, training and information for workers
- Health monitoring for workers and record retention for 40 years
- Procedures for identifying and managing asbestos containing materials (ACM) in Council premises

The WHS Regulations provide for measures including the identification (by a competent person) of asbestos that is found and its location, and registration, as well as the development and maintenance of an Asbestos Management Plan.

5. ROLES AND RESPONSIBILITIES OF COUNCIL

5.1 Educating residents

Council shall assist residents to access appropriate information and advice on the:

- prohibition on the use and re-use of asbestos containing materials
- requirements in relation to development, land management and waste management
- risks of exposure to asbestos
- safe management of asbestos containing materials
- safe removal and disposal of minor quantities of asbestos containing materials.

Educational information and website links for educational materials can be found in Appendices A and B of the Procedure.

5.2 Managing land

Council is responsible for managing public land. This may include land with naturally occurring asbestos as described in section 4 and land contaminated with asbestos as outlined in section 5 of the Procedure.

5.3 Managing waste

Where council is the appropriate regulatory authority, council is responsible for:

- Issuing clean up notices to address illegal storage or disposal of asbestos waste or after an emergency or incident (under the Protection of the Environment Operations Act 1997).
- Issuing prevention or clean up notices where asbestos waste has been handled (including stored, transported or disposed of) in an unsatisfactory manner (under the Protection of the Environment Operations Act 1997).
- Issuing penalty infringement notices for improper transport of asbestos (under the Protection of the Environment Operations Act 1997).
- Applying planning controls to proposals to dispose of asbestos waste on-site, seeking advice from the Environment Protection Authority (EPA) on this matter and making notation on planning certificates (section 149 certificates) where on-site disposal is permitted.
- Council operates only the Narrandera Waste Facility that accepts only bonded asbestos waste.

Waste facilities that are licensed to accept asbestos waste are listed in section 9 & Appendix F of the procedure.

5.4 Responsibilities to workers

Council is committed to fulfilling its responsibilities to workers under the NSW *Work Health and Safety Act 2011* and NSW *Work Health and Safety Regulation 2011* and maintaining a safe work environment through council's:

- general responsibilities
- education, training and information for workers
- health monitoring for workers
- procedures for identifying and managing asbestos containing materials in council premises.

These responsibilities are outlined in part 2 of the Procedure.

5.5 Regulatory responsibilities

Council has regulatory responsibilities under the following legislation, policies and standards in situations where council is the appropriate regulatory authority or planning authority:

- Contaminated Land Management Act 1997 (NSW)
- Environmental Planning and Assessment Act 1979 (NSW)
- Environmental Planning and Assessment Regulation 2000 (NSW)
- Local Government Act 1993 (NSW)
- Protection of the Environment Operations Act 1997 (NSW)
- Protection of the Environment Operations (General) Regulation 2009 (NSW)
- Protection of the Environment Operations (Waste) Regulation 2014 (NSW)
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008
- State Environmental Planning Policy No. 55 – Remediation of Land
- Demolition work code of practice 2015 (catalogue no. WC03841).

Additional legislation, policies and standards relating to the safe management of asbestos are listed in Appendix G of the procedure.

The situations in which council has a regulatory role in the safe management of asbestos are listed in Table 1.

Table 1: Situations in which council has a regulatory role in managing asbestos

Issue	Council's role	Section of procedure
Contaminated land	- Record known asbestos site contamination on section 10.7 certificates where practicable and for council workplaces, record on council's asbestos register. - Notify stakeholders of land use planning policy requirements relating to contamination. - Manage residential asbestos contaminated land that is not declared 'significantly contaminated' under the <i>Contaminated Land Management Act 1997</i> (excluding oversight of removal or remediation work which is the role of SafeWork NSW).	Section 4
Development assessment	- Assess development applications for approval under the <i>Environmental Planning and Assessment Act 1979</i>. - Set conditions of consent for renovations, alterations, additions, demolitions or other developments requiring consent and which may involve disturbance of asbestos containing materials. - Ensure compliance with development conditions. - Apply conditions relating to development involving friable and non-friable asbestos material under the relevant legislation and planning codes and as outlined in section 8.	Section 8
Demolition	- Approve demolition under the <i>Environmental Planning and Assessment Act 1979</i>. - Council certifiers approve development as complying development under the <i>State Environmental Planning Policy (Exempt and Complying Development Codes) 2008</i>.	Section 8
Emergencies and incidents	Regulate the clean up of asbestos waste following emergencies where sites are handed over to the council or a local resident by an emergency service organisation (excluding oversight of licensed removal or remediation work which is the role of SafeWork NSW). Council may consider the need to issue a clean up notice, prevention notice or cost compliance notice under the <i>Protection of the Environment Operations Act 1997</i>.	Section 6
Naturally occurring asbestos	- Verify compliance with environmental planning and assessment legislation for development applications that could disturb naturally occurring asbestos. - Prepare an asbestos management plan for council workplaces or road works which occur on land containing naturally occurring asbestos.	Section 4
Residential premises	- Respond to any public health risks (risks to council workers and wider public) relating to the removal of asbestos containing materials or asbestos work at residential properties that does not involve a business or undertaking. - Respond to complaints about unsafe work at a residential property that is undertaken by a resident (not a worker, which is the role of SafeWork NSW). - Respond to public health risks posed by derelict properties or asbestos materials in residential settings.	Section 8
Waste	- Manage waste facilities in accordance with environmental protection legislation. - Respond to illegal storage, illegal dumping and orphan waste. - Regulate non-complying transport of asbestos containing materials.	Section 9

6. OTHER STAKEHOLDERS INVOLVED IN MANAGING ASBESTOS

Council is committed to working collaboratively with other government agencies and where appropriate, other stakeholders as needed to respond to asbestos issues.

The Procedure provides for the following: Appendix E notes useful contacts and Appendix H notes agencies involved in managing asbestos. Various asbestos scenarios requiring stakeholders to work together are outlined in Appendix I.

7. POLICY NON-COMPLIANCE

The following actions shall be considered as being non-compliant with this policy:

- Failure by workers to adhere to this policy
- Failure by managers to adequately inform relevant workers of this policy

Council's disciplinary procedures shall be followed in the event of employees failing to comply with this policy.

Action to be taken in the event of non-compliance may include:

- providing education and training
- issuing a verbal or written warning
- altering the worker's duties
- terminating the worker's services in the case of serious breaches

Each case shall be assessed on its merits with the aim of achieving a satisfactory outcome for all parties.

8. ROLES AND RESPONSIBILITIES

8.1 GENERAL MANAGER/DEPUTY GENERAL MANAGERS (OFFICER OF THE PCBU)

The General Manager and Deputy General Managers have a duty to exercise due diligence to ensure that Council complies with the NSW Work Health and Safety Act 2011 and the NSW Work Health and Safety Regulation 2017. This includes taking reasonable steps to ensure that Council has and uses appropriate resources and processes to eliminate or minimise risks associated with asbestos.

8.2 DEPUTY GENERAL MANAGERS

It is the responsibility of the Deputy General Managers to ensure that:

- this policy is followed.
- all works to be done on premises or sites identified to contain asbestos are done so by following the procedures listed in the following appendices.
- the procedures herein are communicated to Council employees or contractors assigned to the relevant works.

8.3 MANAGERS/SUPERVISORS

Managers are responsible for ensuring workers who report to them have access to this policy and appropriate information, documentation, training and individual health records.

8.4 STAFF

Workers have a duty to take reasonable care for their own health and safety and that they do not adversely affect the health and safety of other persons. Accordingly, workers:

- must comply with this policy and any reasonable instruction or procedure relating to health and safety at the workplace
- must use any personal protective equipment provided, in accordance with information, training and reasonable instruction provided so far as the worker is reasonably able to
- may cease, or refuse to carry out, work if the worker has a reasonable concern that to carry out the work would expose them, or other persons, to a serious health or safety risk, emanating from an immediate or imminent exposure to a hazard
- should ensure they are using the latest version of all relevant procedures, plans, guidelines and legislation.

9. RELATED LEGISLATION

- Work Health and Safety Act 2011 (NSW)
- Work Health and Safety Regulation 2017

10. RELATED POLICIES AND DOCUMENTS

- Asbestos Register
- Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Dust (2nd Edition)
- Work health Safety Policy
- Health Monitoring Procedure
- NSW Government – Asbestos Blueprint: A guide to roles and responsibilities for operational staff of state and local government November 2011
- Office of Local Government Model Asbestos Policy for NSW Councils
- Safe Work Australia Code of Practice: How to Manage and Control Asbestos in the Workplace 2016
- Safe Work Australia Code of Practice: How to Safely Remove Asbestos 2016

11. VARIATION

Council reserves the right to review, vary or revoke this policy in accordance with legislation, regulation and award changes, where applicable. Council may also make changes to this policy and the relevant procedures from time-to-time to improve the effectiveness of its operation.

12. PREVIOUS VERSIONS

Reference to a superseded policy number and/or name is also considered a reference to the new policy number. This policy was previously named:

- WHSA008 Removal and Working with Asbestos Contained Material (ACM).

POLICY HISTORY

Responsible Officer	Risk and Safety Coordinator		
Approved by	General Manager		
Approval Date	August 2025		
GM Signature <i>(Authorised staff to insert signature)</i>			
Next Review	August 2029		
Version Number	Endorsed by ELT	Endorsed by Consultative Committee and/or WHS Committee	Date signed by GM
1 Adopted			

NOTE: This is a controlled document. If you are reading a printed copy, please check that you have the latest version via Council's website (external) or MagiQ (internal). Printed or downloaded versions of this document are uncontrolled.

13. Acknowledgement of Training Received

I hereby acknowledge that I have received, read and understood a copy of Council's Removal and Working with Asbestos Containing Material Policy.	
Employee Name	
Position Title	
Signature	
Date	



Working with Asbestos Procedure

2025



Document Title: Working with Asbestos Procedure 2025

Section Responsible: Infrastructure

Minute No: XXXX

DOC ID: 813630

1. OBJECTIVE	5
2. SCOPE.....	5
3. PROCEDURE STATEMENT	5
Part 1- ASBESTOS IN THE LOCAL GOVERNMENT AREA	6
4. INFORMATION FOR THE COMMUNITY	6
4.1 Naturally occurring asbestos.....	6
4.2 Responsibilities for naturally occurring asbestos.....	6
4.3 Managing naturally occurring asbestos	6
4.4 Management of naturally occurring asbestos by council	6
5. CONTAMINATION OF LAND WITH ASBESTOS.....	6
5.1 Responsibilities for contaminated land.....	7
5.2 Finding out if land is contaminated.....	7
5.3 Duty to report contaminated land	7
5.4 Derelict buildings.....	8
6. RESPONDING TO EMERGENCIES AND INCIDENTS	8
6.1 Responsibilities in the clean up after an emergency or incident	8
6.2 Advice to the public regarding clean up after an emergency or incident.....	9
7. COUNCIL'S PROCESS FOR CHANGING LAND USE.....	9
8. COUNCIL'S PROCESS FOR ASSESSING DEVELOPMENT	9
8.1 Responsibilities for approving development.....	10
8.2 Providing advice to home owners, renovators and developers	10
8.3 Identifying asbestos.....	10
8.4 Removing asbestos, refurbishments and demolitions	11
8.4.1 Removing asbestos at domestic premises	11
8.4.2 Removing asbestos at workplaces.....	12
8.4.3 Obtaining approval for demolition	12
8.5 Exempt or complying development	12
8.5.1 Exempt development	12
8.5.2 Complying development.....	12
8.6 Development applications.....	13
8.6.1 Pre-development application advice regarding asbestos	13

8.6.2	Conditions of consent.....	13
8.7	Compliance and enforcement.....	14
8.7.1	Responsibilities for compliance and enforcement.....	14
8.7.2	Compliance strategies	14
9.	MANAGING ASBESTOS AS A WASTE.....	15
9.1	Responsibilities for asbestos waste management	15
9.2	Handling asbestos waste for disposal	15
9.3	Transporting asbestos waste.....	15
9.4	Disposing of asbestos waste at waste facilities.....	16
9.4.1	Situations in which asbestos waste may be rejected from waste facilities	16
9.5	Illegal dumping of asbestos waste	16
9.6	Asbestos remaining on-site	17
10.	COMPLAINTS AND INVESTIGATIONS.....	17
	Part 2 – MANAGEMENT OF ASBESTOS RISKS WITHIN COUNCIL	18
11.	RIGHTS AND RESPONSIBILITIES OF WORKERS AT THE COUNCIL WORKPLACE	18
11.1	Duties of council workers at the council workplace	18
11.1.1	The General Manager.....	18
11.1.2	Workers	18
11.1.3	Prohibited work activities.....	18
11.2	Responsibilities of council to council workers	18
11.2.1	Council’s general responsibilities	18
11.2.2	Education, training and information for workers.....	19
11.2.3	Health monitoring for workers.....	19
12.	IDENTIFYING AND RECORDING ASBESTOS HAZARDS IN THE COUNCIL WORKPLACE	19
12.1	Identifying asbestos.....	19
12.1.1	Material sampling.....	20
12.2	Indicating the presence and location of asbestos.....	20
12.3	Asbestos register	20
12.4	Suspected asbestos	20
13.	MANAGING ASBESTOS-RELATED RISKS IN THE COUNCIL WORKPLACE	20
13.1	Asbestos management plan	20
13.2	Asbestos management plan for naturally occurring asbestos.....	20
13.3	Management options for asbestos-related risks in the council workplace	20
13.4	Sites contaminated with asbestos that are council workplaces	21
13.5	Demolition or refurbishment of council buildings and assets	21
13.6	Removal of asbestos in the council workplace	21
13.6.1	Removal by council employees	22

13.6.2	Removal by contractors.....	22
13.6.3	Clearance inspections and certificates	23
14.	ACCIDENTAL DISTURBANCE OF ASBESTOS BY WORKERS.....	23
15.	COUNCIL'S ROLE IN THE DISPOSAL OF ASBESTOS WASTE.....	23
15.1	Responding to illegal dumping	23
15.2	Transporting and disposing of asbestos waste	24
15.3	Operating council's waste facility permitted to accept asbestos waste	24
15.3.1	Asbestos waste incorrectly presented to council's waste facility	24
15.4	Recycling facilities	25
15.5	Re-excavation of landfill sites.....	25
16.	ADVICE TO TENANTS AND PROSPECTIVE BUYERS OF COUNCIL OWNED PROPERTY	26
17.	IMPLEMENTING COUNCIL'S ASBESTOS POLICY & PROCEDURE	26
17.1	Supporting documents	26
17.2	Communicating the policy.....	26
17.3	Non-compliance with the policy	27
18.	VARIATIONS TO THIS POLICY	27
	APPENDICES.....	28
	Appendix A – General information and guidance	28
	What is asbestos?	28
	Where is asbestos found?	28
	Situations where asbestos contamination may occur.....	30
	Significantly contaminated land	31
	Potentially hazardous activities.....	31
	Health hazards	32
	Appendix B – Further information	33
	Appendix C – Definitions.....	35
	Appendix D – Acronyms.....	40
	Appendix E – Relevant contacts.....	40
	Appendix F – Waste management facilities that accept asbestos wastes	42
	Appendix G – Asbestos-related legislation, policies and standards	42
	Appendix H – Agencies roles and responsibilities	43
	Appendix I – Scenarios illustrating which agencies lead a response in NSW	47
	Appendix J – Asbestos containing materials.....	51
	Appendix K – Asbestos licences	56
	Appendix L – Map	57
19.	PROCEDURE HISTORY	58

1. OBJECTIVE

The objective of this document is to act as a guide to inform all persons, including Contractors employed by NSC, of the safe work procedures when undertaking work in an environment that has been identified, or suspect of, containing Asbestos or material that contains asbestos.

This policy aims to outline:

- the role of council and other organisations in managing asbestos
- council's relevant regulatory powers
- council's approach to dealing with naturally occurring asbestos, sites contaminated by asbestos and emergencies or incidents
- general advice for residents on renovating homes that may contain asbestos
- council's development approval process for developments that may involve asbestos and conditions of consent
- waste management and regulation procedures for asbestos waste in the LGA
- council's approach to managing asbestos containing materials in council workplaces
- sources of further information.

2. SCOPE

All Council workers must comply with this procedure. The procedure applies to work carried out at workplaces under Council's control or management and or as part of Councils business or undertakings including work that could result in the contact or identification of asbestos products.

3. PROCEDURE STATEMENT

This procedure is based upon the Model Asbestos Policy for NSW Councils developed by the Heads of Asbestos Coordination Authorities to promote a consistent Local Government approach to asbestos management across NSW.

This procedure does not constitute legal advice. Legal advice should be sought in relation to particular circumstances and liability will not be accepted for losses incurred as a result of reliance on this procedure.

Council is committed to fulfilling its responsibilities to workers under the NSW Work Health and Safety Act 2011 and Regulation 2017 and maintaining a safe work environment through Council's:

- General responsibilities
- Education, training and information for workers
- Health monitoring for workers and record retention for 40 years
- Procedures for identifying and managing asbestos containing materials (ACM) in Council premises

Part 1- ASBESTOS IN THE LOCAL GOVERNMENT AREA

4. INFORMATION FOR THE COMMUNITY

4.1 Naturally occurring asbestos

Naturally occurring asbestos whilst not known to be present within the Narrandera Local Government Area, only poses a health risk when elevated levels of fibres are released into the air, either by human activities or by natural weathering and these fibres are breathed in by people. Information on naturally occurring asbestos, work processes that have the potential to release naturally occurring asbestos fibres into the air and known locations of naturally occurring asbestos in NSW is provided in Appendix A under section 2.1. This information is indicative, and not a complete picture of all naturally occurring asbestos in NSW.

4.2 Responsibilities for naturally occurring asbestos

For naturally occurring asbestos that will remain undisturbed by any work practice, council is the lead regulator.

Where development applications propose activities that may disturb areas of naturally occurring asbestos (such as excavation), any consent or approval should contain conditions requiring: testing to determine if asbestos is present, and the development of an asbestos management plan if the testing reveals naturally occurring asbestos is present. Council will verify compliance with environmental planning and assessment legislation and together with the EPA and SafeWork NSW will coordinate enforcement where non-compliance is suspected.

Where naturally occurring asbestos will be disturbed due to a work process, including roadwork, excavation and remediation work, SafeWork NSW is the lead regulator. Requirements for workplaces are summarised in the *Naturally-occurring asbestos fact sheet* (catalogue no. WC03728) published by SafeWork NSW. Where naturally occurring asbestos is part of a mineral extraction process, the NSW Department of Industry is the lead regulator.

4.3 Managing naturally occurring asbestos

Where naturally occurring asbestos is encountered or suspected, the risk from disturbance of the naturally occurring asbestos should be assessed by an occupational hygienist.

The management of naturally occurring asbestos that stays in its natural state is not prohibited if managed in accordance with an asbestos management plan. Requirements for risk management, asbestos management plans and provisions for workers are outlined in the *Naturally-occurring asbestos fact sheet* (catalogue no. WC03728) published by SafeWork NSW. The SafeWork NSW website provides further information on naturally occurring asbestos and supporting documents on what people can do to avoid contact with naturally occurring asbestos.

4.4 Management of naturally occurring asbestos by council

Council will aim to prevent the exposure of workers and the public to any naturally occurring asbestos that is known or discovered in the council workplace.

If naturally occurring asbestos is discovered in the LGA, council will develop risk controls, an asbestos management plan in relation to the naturally occurring asbestos in the council workplace and provide guidance materials where necessary.

5. CONTAMINATION OF LAND WITH ASBESTOS

Background information on contamination of land with asbestos and potential disturbance of asbestos contaminated sites can be found in Appendix A under sections 2 and 3. The nature of asbestos contamination of land can vary significantly and there can be a number of different mechanisms available to address this contamination depending upon its source and extent.

5.1 Responsibilities for contaminated land

Responsibility for cleaning up contaminated land lies with the person responsible for contaminating the land or the relevant landowner.

Council may issue a clean up notice to the occupier of premises at or from which council reasonably suspects that a pollution incident has occurred, or is occurring, requiring asbestos waste to be removed (under part 4.2 of the *Protection of the Environment Operations Act 1997*).

Council may also issue prevention notices (under part 4.3 of the *Protection of the Environment Operations Act 1997*) to ensure good environmental practice. If a person does not comply with a prevention notice given to the person, council employees, agents or contractors may take action to cause compliance with the notice.

Any reasonable costs incurred by council in monitoring or enforcing clean up and prevention notices may be recovered through a compliance cost notice (under part 4.5 of the *Protection of the Environment Operations Act 1997*). Council shall keep records of: tasks undertaken; the hours council employees have spent undertaking those tasks; and expenses incurred.

During site redevelopment council will consider contamination with asbestos containing materials in the same way as other forms of contamination as stipulated by the *Environmental Planning and Assessment Act 1979*. That is, council will apply the general requirements of *State Environmental Planning Policy (SEPP) No. 55 – Remediation of Land and the Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land*.

Council provides information about land contamination on planning certificates (issued under section 149 of the *Environmental Planning and Assessment Act 1979*) as outlined in section 6.2.

For sites that are 'significantly contaminated' and require a major remediation program independent of any rezoning or development applications, the EPA and SafeWork NSW are the lead regulatory authorities as outlined in Appendix A under section 2.4.2.

The management of council workplaces contaminated with asbestos is outlined in section 14.4.

5.2 Finding out if land is contaminated

A person may request from council a planning certificate containing advice on matters including whether council has a policy to restrict the use of land due to risks from contamination. Certificates are issued under section 149(2) of the *Environmental Planning and Assessment Act 1979*.

Factual information relating to past land use and other matters relevant to contamination may also be provided, even when land use is not restricted. When council receives a request for a certificate under section 149(2), it may also inform applicants of any further information available under section 149(5). Council may also use section 149(5) certificates to record other information, particularly anything else of a factual nature about contamination which council deems appropriate (such as details of land history, assessment, testing and remediation).

Council records can only indicate known contaminated sites. Any site may potentially be contaminated.

Council may issue notices to land owners or occupiers requiring information about land it has reason to believe may be contaminated by asbestos using section 192 and section 193 of the *Protection of the Environment Operations Act 1997*.

5.3 Duty to report contaminated land

A person whose activities have contaminated land or a landowner whose land has been contaminated is required to notify the EPA when they become aware of the contamination (under section 60 of the *Contaminated Land Management Act 1997*). Situations where this is required are explained in the document: *Guidelines on the duty to report contamination under the Contaminated Land Management Act 1997*.

The EPA will inform council of contaminated land matters relating to the LGA as required under section 59 of the *Contaminated Land Management Act 1997*.

5.4 Derelict buildings

Concerns regarding potential health risks from derelict properties may be directed to council. Derelict properties include abandoned buildings, fire damaged buildings and otherwise dilapidated buildings. Where derelict properties contain friable asbestos and asbestos is exposed, either from human activities or weathering, this poses a potential risk to public health.

Council may respond to derelict properties that pose a demonstrable public health risk using a range of regulatory tools according to the particular circumstances.

Council may issue a clean up notice or prevention notice and compliance cost notice as noted in section 6.1.

Council may also order a person to demolish or remove a building if the building is so dilapidated as to present harm to its occupants or to persons or property in the neighbourhood (under section 121B 2(c) of the *Environmental Planning and Assessment Act 1979*). An order may require immediate compliance with its terms in circumstances which the person who gives the order believes constitute a serious risk to health or safety or an emergency (under section 121M of the *Environmental Planning and Assessment Act 1979*). If a person fails to comply with the terms of an order, council may act under section 121ZJ of the *Environmental Planning and Assessment Act 1979* to give effect to the terms of the order, including the carrying out of any work required by the order.

If the derelict building is on a site that is a workplace then SafeWork NSW is the lead agency responsible for ensuring that asbestos is removed by appropriately licensed removalists.

6. RESPONDING TO EMERGENCIES AND INCIDENTS

Emergencies and incidents such as major collapses, cyclones, explosions, fires, storms, or vandalism can cause damage to buildings or land that contain asbestos. This may include working with state agencies in accordance with the NSW Asbestos Emergency Plan and the Disaster Assistance Guidelines. This can create site contamination issues and potentially expose emergency service workers and the wider public to asbestos. Emergencies or incidents can arise from natural hazards, or from accidental or deliberate human activities including criminal activity.

6.1 Responsibilities in the clean up after an emergency or incident

Council may play a role in ensuring that asbestos containing materials are cleaned up after an emergency or incident. If the emergency or incident occurs at a workplace, SafeWork NSW is the lead agency.

Council may issue a clean up, prevention, cost compliance or penalty infringement notice as outlined in section 3.3 and section 6.1.

Alternatively, council may act under the *Environmental Planning and Assessment Act 1979* as outlined in section 6.4 of this policy.

Council will determine an appropriate response depending on the nature of the situation.

This may include to:

- Seek advice from an occupational hygienist on the likely level of risk and appropriate controls required.
- Liaise with or consult the appropriate agencies.
- Inform emergency personnel of any hazards known to council as soon as practicable.
- Follow the Code of practice on how to safely remove asbestos (catalogue no. WC03561) published by SafeWork NSW.
- Ensure that any council workers attending the site have appropriate training and are wearing appropriate personal protective equipment.
- Exclude the public from the site.
- Inform the public of the potential sources of exposure to asbestos, health risks and emergency management response.
- Minimise the risks posed by any remaining structures (see section 6.4).

- Address the risks posed by disturbed asbestos containing materials by engaging a licensed removalist (as outlined in section 14.6.2) or issuing a clean up or prevention notice (as outlined in section 6.4) to ensure asbestos containing materials are removed for disposal.
- Ensure that the site is kept damp, at all times or sprayed with PVA glue, particularly where friable asbestos is present, if considered appropriate (noting that in some instances this may not be appropriate, for example if there are live electrical conductors or if major electrical equipment could be permanently damaged or made dangerous by contact with water).
- Ensure that asbestos containing materials are disposed of at a facility licensed to accept asbestos waste and sight proof of appropriate disposal through weighbridge dockets or similar documentation.

6.2 Advice to the public regarding clean up after an emergency or incident

During a clean up after an emergency or incident, the possibility of neighbours being exposed to asbestos fibres may be very low if precautions are taken to minimise the release and inhalation of asbestos dust and fibres.

As a precautionary measure, where council is involved in a clean up, council may consider advising those in neighbouring properties to:

- avoid unnecessary outdoor activity and do not put any laundry outside during the clean up
- close all external doors and windows and stay indoors during the clean up
- consider avoiding using air conditioners that introduce air from outside into the home during the clean up
- dispose of any laundry that may have been contaminated with asbestos as asbestos waste after the clean up (advice on disposing of asbestos waste is provided in section 10)
- use a low pressure hose on a spray configuration to remove visible dust from pathways after the clean up
- wipe dusty surfaces with a damp cloth and bag and dispose of the cloth as asbestos waste after the clean up (advice on disposing of asbestos waste is provided in section 10)
- any other measures recommended by an occupational hygienist following assessment of the situation.

7. COUNCIL'S PROCESS FOR CHANGING LAND USE

Council recognises the need to exercise care when changing zoning for land uses, approving development or excavating land due to the potential to uncover known or unknown asbestos material from previous land uses (for example, where a site has been previously been used as a landfill or for on-site burial of asbestos waste).

State Environmental Planning Policy No. 55 – Remediation of Land states that land must not be developed if it is unsuitable for a proposed use because it is contaminated. If the land is unsuitable, remediation must take place before the land is developed.

8. COUNCIL'S PROCESS FOR ASSESSING DEVELOPMENT

This section applies to development applications assessed under the *Environmental Planning and Assessment Act 1979* and complying development applications assessed under the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* or council's complying codes (see section 9.5.2). This includes alterations and additions to residential development, which may include internal work as well as extensions to the existing main structure, or changes to outbuildings, sheds or garages.

This section also covers renovations that do not require development consent or a complying development certificate. Development consent is not required to maintain an existing structure. For example, the replacement of windows, doors and ceilings may involve the removal of asbestos but is categorised as exempt development under the *Environmental Planning and Assessment Act 1979* and does not require development consent. In these instances, council has an educative role

in providing owners and occupiers with advice and information about the identification and safe management of asbestos.

8.1 Responsibilities for approving development

Council is the consent authority for the majority of development applications in the LGA. The Joint Regional Planning Panel (JRPP) is also consent authority for certain local or regional development. Council may have representation on the JRPP.

Council or the JRPP may impose conditions of consent and a waste disposal policy to a development consent to ensure the safe removal of asbestos, where asbestos has been identified or may be reasonably assumed to be present.

Either council or a private certifier may assess a complying development certificate. Where a private certifier is engaged to assess a complying development certificate, the private certifier is responsible for ensuring that the proposed development activities include adequate plans for the safe removal and disposal of asbestos.

This also applies to the demolition of buildings. Certifiers are able to issue a complying development certificate under the Demolition Code of the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*. Further information on demolition is provided in section 9.4.

When a private certifier issues a complying development certificate and is appointed as the Principal Certifying Authority for the development it is the certifier's responsibility to follow up to ensure that works including asbestos handling, removal and disposal if present, are carried out appropriately in accordance with the *Environmental Planning and Assessment Regulation 2000* (clause 136E). Compliance is covered in section 9.7.

8.2 Providing advice to home owners, renovators and developers

Council is committed to providing information to minimise the risks from asbestos in the LGA. Information is provided below and in Appendix A. Appendix B lists additional sources of information on how to deal safely with the risks of asbestos and Appendix J lists asbestos containing products that may be found around the home.

The key points are:

- Before any renovation, maintenance or demolition work is carried out, any asbestos or asbestos containing materials should be identified (refer to section 9.3).
- Where a material cannot be identified or it is suspected to be asbestos, it is best to assume that the material is asbestos and take appropriate precautions.
- If asbestos containing materials can be maintained in good condition it is recommended that they be safely contained, left alone and periodically checked to monitor their condition, until demolition or redevelopment.
- If asbestos materials cannot be safely contained, they should be removed as outlined in section 9.4.
- For demolition or redevelopment, any asbestos containing materials should be safely removed and disposed of prior to the work commencing.

Anyone who is undertaking renovations themselves without a contractor is encouraged to refer to Appendices A and B for more information and contact council where they require further advice or clarification. Anyone engaging an asbestos removal contractor may contact SafeWork NSW with any queries as SafeWork NSW regulates asbestos removal by workers (as explained in section 9.4). Contact details for council and SafeWork NSW are provided in Appendix E.

8.3 Identifying asbestos

Information on common places where asbestos is likely to be found in residential, commercial and industrial premises with materials from prior to 2004 on the premises is provided in Appendix A.

A person may apply to council for a planning certificate (called a section 149 certificate) for the relevant land. Council may provide information on a planning certificate including whether council has a policy to restrict the use of land due to risks from asbestos contamination, as outlined in section 5.2.

Council aims to ensure that records are, as far as possible, accurate. In some instances, council may not have up-to-date information about asbestos for a property. Council may be able to provide general advice on the likelihood of asbestos being present on the land based on the age of the buildings or structures on the land. A general guide to the likelihood of asbestos presence based on building age is provided in Appendix A under section 2.2.

The most accurate way to find out if a building or structure contains asbestos is to obtain an asbestos inspection by a person competent in the identification and assessment of asbestos, such as an occupational hygienist (a competent person is defined by the *NSW Work Health and Safety Regulation 2011*). This is highly advisable before undertaking major renovations to buildings constructed, or containing materials from prior to 2004.

Property owners and agents are encouraged to inform any tenants or occupiers of the presence of asbestos and to address any potential asbestos hazards where appropriate.

Property owners who let their properties out are required to identify any asbestos within those properties before any work is carried out (this includes residential properties).

The *Work Health and Safety Regulation 2011* states that the person conducting a business or undertaking in any building constructed before 31 December 2003 must identify if there is any asbestos in the building.

All commercial properties that contain asbestos must have and maintain a current asbestos register and asbestos management plan.

8.4 Removing asbestos, refurbishments and demolitions

8.4.1 Removing asbestos at domestic premises

If development is undertaken by contractors, as is the case with a lot of home renovations, then the work is considered to be at a workplace and is regulated by SafeWork NSW under the *NSW Work Health and Safety Regulation 2011*. This requires that a person conducting a business or undertaking who is to carry out refurbishment or demolition of residential premises must ensure that all asbestos that is likely to be disturbed by the refurbishment or demolition is identified and, so far as reasonably practicable, is removed before the refurbishment or demolition is commenced.

Depending on the nature and quantity of asbestos to be removed, a licence may be required to remove the asbestos. The requirements for licenses are outlined below and summarised in the table in Appendix K. SafeWork NSW is responsible for issuing asbestos licences.

Friable asbestos must only be removed by a licensed removalist with a friable (Class A) asbestos removal licence. Except in the case of the removal of:

- asbestos containing dust associated with the removal of non-friable asbestos, or
- asbestos containing dust that is not associated with the removal of friable or non-friable asbestos and is only a minor contamination (which is when the asbestos contamination is incidental and can be cleaned up in less than one hour).

The removal of more than 10 square metres of non-friable asbestos or asbestos containing material must be carried out by a licensed non-friable (Class B) or a friable (Class A) asbestos removalist.

The removal of asbestos containing dust associated with the removal of more than 10 square metres of non-friable asbestos or asbestos containing material requires a non-friable (Class B) asbestos removal licence or a friable (Class A) asbestos removal licence.

Removal of 10 square metres or less of non-friable asbestos may be undertaken without a licence. However, given the risks involved, council encourages residents to consider engaging a licensed asbestos removal contractor. The cost of asbestos removal by a licensed professional is comparable in price to most licensed tradespeople including electricians, plumbers and tilers.

All asbestos removal should be undertaken in accordance with the *Code of practice on how to safely remove asbestos* (catalogue no. WC03561).

If a residential premise is a workplace, the licensed asbestos removalist must inform the following persons before licensed asbestos removal work is carried out:

- the person who commissioned the work
- a person conducting a business or undertaking at the workplace
- the owner and occupier of the residential premises

- anyone occupying premises in the immediate vicinity of the workplace (as described in section 467 of the *NSW Work Health and Safety Regulation 2011*).

In certain circumstances, a premise may be used for both residential and commercial purposes and is therefore classified as a workplace.

All licensed asbestos removal must be:

- supervised by a supervisor named to SafeWork NSW
- notified to SafeWork NSW at least five days prior to the work commencing.

Requirements for the transport and disposal of asbestos waste are covered in section 10.

8.4.2 Removing asbestos at workplaces

The *NSW Work Health and Safety Regulation 2011* specifies requirements for demolition and refurbishment at a workplace with structures or plants constructed or installed before 31 December 2003. SafeWork NSW is the lead agency for regulating the safe management of asbestos at workplaces.

8.4.3 Obtaining approval for demolition

Demolition work is classified as high risk construction work in the *NSW Work Health and Safety Regulation 2011* and demolition licenses are required for some demolition work. The *Demolition work code of practice 2015* provides practical guidance on how to manage the risks associated with the demolition of buildings and structures. In most circumstances demolition of a structure requires development consent or a complying development certificate. Applicants need to enquire to council as to whether and what type of approval is required. Where a development application is required council's standard conditions need to be applied to ensure that asbestos is safely managed. Council's conditions for development consent are referred to in section 9.6.

A wide range of development, including residential, industrial and commercial development, can be approved for demolition as complying development under the *Demolition Code of the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* and the *Environmental Planning and Assessment Regulation 2000* provides mandatory conditions for complying development certificate applications.

Demolition of development that would be exempt development under the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* is also exempt development and does not require consent. This includes minor structures such as carports, fences, sheds and the like.

8.5 Exempt or complying development

8.5.1 Exempt development

Exempt development does not require any planning or construction approval if it meets the requirements of the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*.

This means that there is no ability for council or a private certifier to impose safeguards for the handling of asbestos through conditions of development consent. However, council advises that all asbestos removal work should be carried out in accordance with the *Code of practice on how to safely remove asbestos* (catalogue no. WC03561).

8.5.2 Complying development

The *Environmental Planning and Assessment Regulation 2000* (clause 136E) outlines conditions under which a complying development certificate can be issued for development that involves building work or demolition work and friable or non-friable asbestos.

Applications for complying development certificates must include details of the estimated area (if any) in square metres of friable and/or non-friable asbestos material that will be disturbed, repaired or removed in carrying out the development (under Schedule 1 part 2 of the *Environmental Planning and Assessment Regulation 2000*).

Where more than 10 square metres of non-friable asbestos is to be removed, a contract evidencing the engagement of a licensed asbestos removal contractor is to be provided to the principal certifying authority. The contract must specify the landfill site lawfully able to accept asbestos to which the removed asbestos will be delivered.

If the contract indicates that asbestos will be removed to a specified landfill site, the person having the benefit of the complying development certificate must give the principal certifying authority a copy of a receipt from the operator of the landfill site stating that all the asbestos material referred to in the contract has been received by the operator.

If the work involves less than 10 square metres of non-friable asbestos and is not undertaken by a licensed contractor, it should still be undertaken in a manner that minimises risks as detailed in the *Code of practice on how to safely remove asbestos* (catalogue no. WC03561). In instances where asbestos removal is less than 10 square metres of non-friable asbestos and not from a place of work, then SafeWork NSW would not be the agency responsible for regulating this activity. Concerns or complaints may be directed to council as outlined in section 11.

The *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* outlines the requirements for the applicant to notify their neighbours that works may include asbestos removal.

Further requirements to inform other persons of licensed asbestos removal are described in section 467 of the *NSW Work Health and Safety Regulation 2011* as noted in section 9.4.1 of this policy.

8.6 Development applications

If a proposed building does not meet the requirements of exempt or complying development then the alternative planning approval pathway is a development application (DA). A DA can only be approved by a local council, the JRPP or, for very large, State-significant development proposals, the State Government. A development application needs to be prepared and it will be assessed in accordance with the requirements of relevant environmental planning instruments and the development standards established by council. Council may undertake a site inspection as part of the DA assessment.

8.6.1 Pre-development application advice regarding asbestos

Council's pre-DA service enables proponents to discuss asbestos-related issues with council prior to lodging a DA, if the issue is raised. Council may inform applicants of this policy, fact sheets or websites. Generally this may be most relevant to structures erected or modified before the 1980s and any other structure that could be reasonably suspected to contain asbestos including those with building materials from prior to 2004.

8.6.2 Conditions of consent

Council will apply the following conditions to any development with know or expected exposure to asbestos containing materials:

Asbestos Management

A report that indicates the presence, location and quantity of any asbestos in the building prepared by an accredited contractor is to be presented to Council prior to the demolition or works on the existing building. Should this report identify the presence of asbestos, the report is also to include a management plan for the disposal of the asbestos.

REASON: To ensure that the construction and excavation works and all associated work practices are undertaken in a safe manner complying with the requirements of SafeWork NSW.

Asbestos Management

Asbestos containing products must be identified and removed in accordance with the NSW SafeWork requirements and Work Health and Safety Act 2011. Evidence of disposal must be retained and provided to the Council.

REASON: To ensure that the construction and excavation works and all associated work practices are undertaken in a safe manner complying with the requirements of SafeWork NSW.

Health & Safety and Asbestos Management

- a. All works including asbestos removal are to be undertaken in accordance with SafeWork NSW and the Work Health and Safety Act 2011 and any regulations.
- b. In particular the applicant is to notify SafeWork NSW at least twenty-four (24) hours prior to the demolition.
- c. Evidence of asbestos disposal must be retained and provided to the Council upon request.
- d. Any demolition must be carried out in accordance with AS 2601—2001, The demolition of Structures.

REASON: To ensure that the construction and excavation works and all associated work practices are undertaken in a safe manner complying with the requirements of SafeWork NSW.

Health and Safety

- a. All works are to be undertaken in accordance with SafeWork NSW and the Work Health and Safety Act 2011 and any regulations.
- b. In particular the applicant is to notify SafeWork NSW at least twenty-four (24) hours prior to the demolition of the dwelling if asbestos has been identified in the asbestos management report.

REASON: To ensure that the construction and excavation works and all associated work practices are undertaken in a safe manner complying with the requirements of SafeWork NSW.

8.7 Compliance and enforcement**8.7.1 Responsibilities for compliance and enforcement**

The controls rely on information being provided and checked by the principal certifying authority which may be either the local council or a private certifier. A private certifier has powers under the *Environmental Planning and Assessment Act 1979* to issue construction certificates, compliance certificates, complying development certificates, occupation certificates and to carry out mandatory inspections. Councils will not always be the principal certifying authority. When a council is not nominated as the principal certifying authority for a complying development certificate or development application, the council may not have any knowledge of the asbestos matter. Accordingly, coordination of compliance and/or enforcement actions between the council and the private certifier will be required.

Council may take action on any development for which council has issued the development consent, even when not appointed as the principal certifying authority to ensure enforcement. Where council receives a complaint about a development for which council is not the principal certifying authority, council should consider whether council is the appropriate authority to resolve the matter. Complaints that warrant action by councils because of their greater enforcement powers include:

- urgent matters, for example, a danger to the public or a significant breach of the development consent or legislation
- matters that are not preconditions to the issue of the occupation/subdivision certificate.

In relation to naturally occurring asbestos, council is to verify compliance with environmental planning and assessment legislation and together with the EPA and SafeWork NSW is to coordinate enforcement where non-compliance is suspected.

8.7.2 Compliance strategies

Illegal works include:

- works that are undertaken without a required development consent or complying development certificate
- works that are undertaken that do not comply with the conditions of the development consent or complying development certificate.

Where council becomes aware of illegal work involving asbestos or asbestos containing materials, council will notify SafeWork NSW if the site is a workplace.

The *Environmental Planning and Assessment Act 1979* empowers council to issue orders to direct specific work be undertaken to comply with a development consent.

Council may need to issue an order under the *Local Government Act 1993* (section 124) to direct a person to 'do or refrain from doing such things as are specified in the order to ensure that land is, or premises are, placed or kept in a safe or healthy condition.'

Council may also issue a clean up notice or prevention notice under the *Protection of the Environment Operations Act 1997* as outlined in section 6.1 of this policy.

Council may audit asbestos-related demolition works which council has recently approved by using a legal notice under section 192 of the *Protection of the Environment Operations Act 1997* to require developers to provide information and records regarding disposal of their asbestos waste.

9. MANAGING ASBESTOS AS A WASTE

It is illegal to dispose of asbestos waste in domestic garbage bins or to recycle, reuse, bury or illegally dump asbestos waste. Asbestos must not be placed in general waste skip bins, yet there have been instances where asbestos has been illegally placed in skip bins by third parties. Members of the public need to be aware of this hazard and may need to secure their skip bins to prevent a third party from illegally disposing of asbestos in the skip bin.

Asbestos waste (in any form) must only be disposed of at a landfill site that may lawfully receive asbestos waste.

9.1 Responsibilities for asbestos waste management

Council's responsibilities for asbestos waste management are outlined in section 3.3.

The handling and, where appropriate, temporary storage of asbestos waste at worksites is regulated by SafeWork NSW.

The EPA regulates premises that have or require an environment protection licence in accordance with the *Protection of the Environment Operations Act 1997*. A licence is required where more than 5 tonnes of asbestos waste, brought from off-site, is stored at any time. All other sites where asbestos waste is stored, typically those that are non-work sites, are regulated by local councils.

9.2 Handling asbestos waste for disposal

The *Code of practice on how to safely remove asbestos* (catalogue no. WC03561) provides details on waste containment and disposal and controls applicable to all types of asbestos removal (in section 4.8 of the Code).

9.3 Transporting asbestos waste

The following requirements apply to the transport of asbestos waste and non-compliance with these requirements is an offence under clause 78 of the *Protection of the Environment Operations (Waste) Regulation 2014*:

- (a) any part of any vehicle in which the person transports the waste is covered, and leak-proof, during the transportation, and
- (b) if the waste consists of bonded asbestos material-it is securely packaged during the transportation, and
- (c) if the waste consists of friable asbestos material-it is kept in a sealed container during transportation, and
- (d) if the waste consists of asbestos-contaminated soils-it is wetted down.

Asbestos waste that is transported interstate must be tracked in accordance with the *Protection of the Environment Operations (Waste) Regulation 2014*. The transport of asbestos waste in NSW must be recorded from the place of generation to its final destination. The waste tracking system is administered by the EPA. Operators that use the EPA's WasteLocate system will be in compliance with these requirements. Information about EPA's WasteLocate system can be found at:

www.epa.nsw.gov.au/wasteregulation/transport-asbestos-tyres.htm

An environment protection licence issued by the EPA is required to transport asbestos waste interstate where any load contains more than 200 kilograms of asbestos waste.

It is an offence to transport waste to a place that cannot lawfully receive that waste, or cause or permit waste to be so transported (under section 143 of the *Protection of the Environment Operations Act 1997*). Penalty notices may be issued for \$7,500 (to individuals) and \$15,000 (to

corporations). NSW courts may impose penalties up to \$250,000 (for individuals) and \$1,000,000 (for corporations) found guilty of committing this offence.

9.4 Disposing of asbestos waste at waste facilities

Council only has one waste facility within the LGA that will accept bonded asbestos waste, being:

- Narrandera waste facility – Red Hill Road, Narrandera.
- Operating hours: Tuesday, Wednesday, Friday 9am - 12pm & 1pm - 5pm, Saturday & Sunday 10am - 5pm.
- contact details
- any fees for disposing of asbestos waste is in accordance with the adopted fees and charges.
- Notification must be given on the delivery of asbestos waste.

Persons delivering waste to a landfill site must comply with the following requirements:

- a person delivering waste that contains asbestos to a landfill site must inform the landfill occupier of the presence of asbestos when delivering the waste.
- when unloading and disposing of asbestos waste at a landfill site, the waste must be unloaded and disposed of in such a manner as to prevent the generation of dust or the stirring up of dust.

Non-compliance with these requirements is an offence under the *Protection of the Environment Operations (Waste) Regulation 2014* and these offences attract strong penalties.

9.4.1 Situations in which asbestos waste may be rejected from waste facilities

Asbestos waste may be rejected from a waste facility if the waste is:

- not correctly packaged for delivery and disposal (as per sections 10.2 and 10.3)
- not disclosed by the transporter as being asbestos or asbestos containing materials, or
- taken to a waste facility that does not accept asbestos waste.

Where waste is rejected, the waste facility must inform the transporter of the waste of a waste facility to which the waste may be transported, that is, a waste facility at which the waste can be legally accepted (as required by the *Protection of the Environment Operations (Waste) Regulation 2014*).

Individuals may be fined \$7,500 and corporations may be fined \$15,000 under the *Protection of the Environment Operations Act 1997* and *Protection of the Environment Operations (Waste) Regulation 2014* for transporting asbestos waste to a facility that cannot lawfully receive asbestos waste.

9.5 Illegal dumping of asbestos waste

Illegal dumping is the unlawful deposit of waste onto land. That is waste materials dumped, tipped or otherwise deposited onto private or public land where no licence or approval exists to accept such waste. Illegal landfilling, which is waste used as fill material, with or without the consent of the owner or occupier of the land and without the necessary council or EPA approvals, is also considered to be illegal dumping and pollution of land.

Illegal dumping of asbestos waste in public places such as parks, streets or nature strips can attract regulatory action including:

- on the spot fines of up to \$15,000
- prosecution for pollution of land of up to \$1 million for a corporation and \$120,000 for each day the offence continues (under section 142A of the *Protection of the Environment Operations Act 1997*), or
- up to \$1 million, or seven years imprisonment, or both for an individual (under section 119 of the *Protection of the Environment Operations Act 1997*).

The responsibility for cleaning up illegally dumped waste lies with the person or company that deposited the waste. If they cannot be identified the relevant occupier or landowner becomes the responsible party.

Local councils are the appropriate regulatory authority for illegal dumping unless:

- the activity was part of the carrying on of an activity listed in Schedule 1 of the *Protection of the Environment Operations Act 1997*
- the activity was carried out by a public authority or the state, or
- the site is regulated by a different authority such as the Minister for Planning.

A handbook to assist Aboriginal communities to prevent and arrange the clean up of illegal dumping (published by the EPA) is noted in Appendix B.

9.6 Asbestos remaining on-site

The disposal of asbestos on site is not encouraged as it requires an effective ongoing system of long term management to ensure the material does not pose unacceptable risks to future site activities and occupants. For on-site burial of asbestos waste, council will seek advice from the EPA. Council will confirm if on-site disposal is permitted under planning controls whether or not consent is required and will require recording of on-site disposal on the zoning certificate (section 149 certificate).

10. COMPLAINTS AND INVESTIGATIONS

Complaints and inquiries may be directed to council about incidents in public places and private properties. Complaints and inquiries regarding a workplace should be directed to SafeWork NSW. Complaints and inquiries regarding licensed premises under the *Protection of the Environment Operations Act 1997* should be directed to the EPA.

Council will respond to complaints and inquiries regarding:

- council's requirements in relation to development, land management and waste management
- derelict properties
- general asbestos safety issues
- illegal dumping
- safe removal and disposal of minor quantities of asbestos materials
- unsafe work at a residential property conducted by a homeowner or tenant.

Complaints about council in relation to asbestos may be directed to the NSW Ombudsman.

Part 2 – MANAGEMENT OF ASBESTOS RISKS WITHIN COUNCIL

11. RIGHTS AND RESPONSIBILITIES OF WORKERS AT THE COUNCIL WORKPLACE

11.1 Duties of council workers at the council workplace

11.1.1 The General Manager

The General Manager has a duty to exercise due diligence to ensure that council complies with the *NSW Work Health and Safety Act 2011* and the *NSW Work Health and Safety Regulation 2011*. This includes taking reasonable steps to ensure that council has and uses appropriate resources and processes to eliminate or minimise risks associated with asbestos.

11.1.2 Workers

Workers have a duty to take reasonable care for their own health and safety and that they do not adversely affect the health and safety of other persons. Accordingly workers:

- must comply with this policy and any reasonable instruction or procedure relating to health and safety at the workplace
- must use any personal protective equipment provided, in accordance with information, training and reasonable instruction provided so far as the worker is reasonably able
- may cease, or refuse to carry out, work if the worker has a reasonable concern that to carry out the work would expose them, or other persons, to a serious health or safety risk, emanating from an immediate or imminent exposure to a hazard
- should ensure they are using the latest version of all relevant procedures, plans, guidelines and legislation (refer to Appendix G).

Managers are responsible for ensuring workers who report to them have access to this policy and appropriate information, documentation and training.

11.1.3 Prohibited work activities

Council will not permit the use of the following on asbestos or asbestos containing material:

- high pressured water spray (unless for firefighting or fire protection purposes), or
- compressed air.

Council will not permit the following equipment to be used on asbestos or asbestos containing material unless the use of the equipment is controlled in accordance with the *NSW Work Health and Safety Regulation 2011*:

- power tools
- brooms (note brooms are allowed for use on vinyl floor tiles), or
- any other implements that cause the release of airborne asbestos into the atmosphere.

11.2 Responsibilities of council to council workers

11.2.1 Council's general responsibilities

Council has general responsibilities under the *NSW Work Health and Safety Act 2011* and the *NSW Work Health and Safety Regulation 2011*. Accordingly council will:

- not use any asbestos containing materials (unless in accordance with part 8.1 (419) of the *NSW Work Health and Safety Regulation 2011*) and will not cause or permit asbestos waste in any form to be reused or recycled
- ensure that exposure of a person at the workplace to airborne asbestos is eliminated so far as is reasonably practicable
- ensure that the exposure standard for asbestos (defined in Appendix C) is not exceeded in the workplace
- notify SafeWork NSW immediately if persons are likely to be affected by asbestos fibres or if an air monitoring process records respirable asbestos fibre levels above 0.02 fibres/ml of air

- ensure that any contractors engaged to undertake the removal of asbestos for council are appropriately licensed
- consult with workers as required by the *Work Health and Safety Act 2011*.

Council will not import asbestos or asbestos containing material into Australia as prohibited under the *Customs (Prohibited Imports) Regulations 1956*. If plant or other materials are imported from countries where asbestos is not yet prohibited, council shall ensure the plant or materials do not contain asbestos prior to supply or use in the workplace.

11.2.2 Education, training and information for workers

As required by the *NSW Work Health and Safety Act 2011* and *NSW Work Health and Safety Regulation 2011*, council will:

- provide any information, training, instruction or supervision that is necessary to protect all persons at the workplace from risks to their health and safety arising from work carried out as part of the conduct of council business
- ensure workers who council reasonably believes may be involved in asbestos removal work or the carrying out of asbestos-related work in the workplace are trained in the identification, safe handling and suitable control measures for asbestos and asbestos containing material.
- Topics training may cover are outlined in the *Code of practice on how to safely remove asbestos* (catalogue no. WC03561).

Education and training will only be provided by appropriately accredited individuals

Education and training may include both initial induction and ongoing reinforcement on a regular basis. council may wish to provide examples of how education and training will be delivered and reinforced such as toolbox meetings, general in-house training or on council's intranet.

A record of asbestos training undertaken by each worker will be kept until five years after the day the worker ceases to work for council.

A list of workers who have received the appropriate training to respond to asbestos hazards is available.

11.2.3 Health monitoring for workers

Council will ensure health monitoring is provided to a worker if they are carrying out licensed asbestos removal work, other ongoing asbestos removal work or asbestos-related work at the workplace for council and are at risk of exposure to asbestos when carrying out the work.

The health monitoring will be consistent with the *Code of practice on how to safely remove asbestos* (catalogue no. WC03561) and meet the requirements of the *NSW Work Health and Safety Regulation 2011* (part 8.5 Division 1).

Health counselling may be appropriate where a heightened sense of concern exists for individuals possibly exposed to elevated levels of airborne asbestos fibres.

Employees who were exposed to asbestos in the past and if there is a risk to the health of the employee as a result of that exposure, are covered by the *NSW Work Health and Safety Regulation 2011* (clauses 435-444). Council will ensure these employees are kept on the health monitoring program.

12. IDENTIFYING AND RECORDING ASBESTOS HAZARDS IN THE COUNCIL WORKPLACE

This section outlines how council will identify and record asbestos hazards in the workplace. This section does not cover naturally occurring asbestos which is addressed in section 5 or illegal dumping which is addressed in section 10.5.

12.1 Identifying asbestos

Council will ensure, so far as is reasonably practicable, that all asbestos or asbestos containing material at the workplace is identified by a competent person (as defined by the *NSW Work Health and Safety Regulation 2011*). If a material cannot be identified or accessed, it will be assumed to be asbestos. This does not apply if council has reasonable grounds to believe that asbestos or asbestos containing material is not present.

12.1.1 Material sampling

Council may choose to identify asbestos or asbestos containing material by arranging for a sample to be analysed. Where council arranges sampling of asbestos containing material, this will be undertaken by an appropriately trained and competent council worker or a competent person will be contracted to undertake this task. Analysis of the sample must only be carried out by a National Association of Testing Authorities (NATA) accredited laboratory (refer to Appendix E) or a laboratory approved or operated by the regulator.

12.2 Indicating the presence and location of asbestos

Council will clearly indicate the presence and location of any asbestos or asbestos containing material identified or assumed at the workplace. Where it is reasonably practicable to do so, council will indicate the presence and location of the asbestos or asbestos containing material by a label.

12.3 Asbestos register

Council has an asbestos register which can be found Document id: 29729 in the Council electronic record keeping system.

Council's asbestos register will be maintained to ensure the register lists all identified (or assumed) asbestos in the workplace and information in the register is up to date. The asbestos register will be accessible, reviewed, revised and otherwise managed as mandated by the NSW *Work Health and Safety Regulation 2011* (clauses 425 – 428).

Council will ensure that any worker carrying out or intending to carry out work at a council workplace that involves a risk of exposure to airborne asbestos, is given a copy of the asbestos register.

12.4 Suspected asbestos

If a worker suspect there is asbestos in a council workplace, they should inform their manager or supervisor. A competent worker should check the asbestos register for existing asbestos locations and control measures and may need to arrange for an inspection and sampling of the material (refer to section 13.1.1). If it is likely that asbestos or suspected asbestos is present, the asbestos register will be updated and workers will be notified of any newly identified asbestos locations.

Council may need to manage the suspected asbestos as outlined in section 13. If the suspected asbestos has been disturbed and has, or could, become airborne, council may need to respond immediately as outlined in section 14.

13. MANAGING ASBESTOS-RELATED RISKS IN THE COUNCIL WORKPLACE

13.1 Asbestos management plan

Council has an asbestos management plan for asbestos in the council workplace which can be found in folder id: 5024 of the electronic record keeping system.

The asbestos management plan will be accessible, reviewed, revised and otherwise managed as mandated by the NSW *Work Health and Safety Regulation 2011* clause 429.

13.2 Asbestos management plan for naturally occurring asbestos

Council is not aware of any naturally occurring asbestos in the workplace. If naturally occurring asbestos is discovered, council will prepare an asbestos management plan in relation to the naturally occurring asbestos in accordance with the NSW *Work Health and Safety Regulation 2011* part 8.4 (Management of naturally occurring asbestos)

13.3 Management options for asbestos-related risks in the council workplace

Council's asbestos management plan includes decisions and reasons for decisions about the management of asbestos at the workplace.

Options for managing asbestos-related risks include:

removal of asbestos or asbestos containing materials (preferred wherever reasonably practicable)
interim control measures: enclosure (only for non-friable asbestos), encapsulation (when the original asbestos bond is still intact) or sealing (where the sealed material is unlikely to be subject to mechanical damage) asbestos containing material, to be implemented along with regular inspections by a competent person

leaving asbestos containing material in situ (deferring action).

Council may undertake an asbestos risk assessment, in consultation with workers and/or their representatives, in order to inform decision-making. Only competent persons will perform risk assessments or any subsequent reviews or revisions of risk assessments.

For all asbestos work or asbestos-related work, safe work practices will be in place and suitable personal protective equipment will be used.

13.4 Sites contaminated with asbestos that are council workplaces

Where asbestos is identified as contaminating a workplace, the site will be included in council's asbestos register and asbestos management plan.

Council may need to ensure that an exposure assessment is undertaken and that appropriate risk management options are determined and implemented.

For asbestos in soil or aggregate, a suitably qualified occupational hygienist must carry out an assessment if the material in the soil and aggregate is unknown or classified as friable.

Council should engage specialists, who may include asbestos removalists, for all cases except in the case of minor, non-friable contaminations.

Further details on managing land contaminated with asbestos may be found in section 5.

13.5 Demolition or refurbishment of council buildings and assets

Council will ensure that before any demolition or refurbishment of a council structure or plant constructed or installed before 31 December 2003 is undertaken, the asbestos register is reviewed and a copy provided to the business undertaking the demolition or refurbishment. Council will ensure that any asbestos that is likely to be disturbed is identified and, so far as is reasonably practicable removed.

13.6 Removal of asbestos in the council workplace

Removal of asbestos or asbestos containing materials in the council workplace will be undertaken in accordance with the:

- *NSW Work Health and Safety Act 2011*
- *NSW Work Health and Safety Regulation 2011.*

Council may also refer to the *Code of practice on how to safely remove asbestos* (catalogue no. WC03561).

For licensed asbestos removal work, a licensed asbestos removalist must meet the requirements of the *NSW Work Health and Safety Regulation 2011* including the requirements to:

- notify SafeWork NSW at least five days prior to the asbestos removal work commencing. However, in the case of emergency work, such as burst pipes, fires and illegally dumped asbestos, council may request to SafeWork NSW that this five days period be waived
- prepare, supply and keep an asbestos removal control plan
- obtain a copy of the asbestos register for the workplace before carrying out asbestos removal work at the workplace (this does not apply if the asbestos removal work is to be carried out at residential premises, for example cleaning up asbestos that has been illegally dumped at a residential premises)
- inform the person with management or control of the workplace that the licensed asbestos removal work is to be carried out at the workplace
- erect signs and barricades
- limit access to the asbestos removal area

- properly dispose of asbestos waste and dispose of, or treat, contaminated personal protective equipment
- arrange a clearance inspection and clearance certificate.

Where council is informed that asbestos removal work is to be carried out at the workplace, council will inform workers and those in the immediate vicinity of the workplace and limit access to the asbestos removal area as per the *NSW Work Health and Safety Regulation 2011*.

13.6.1 Removal by council employees

A list of employees trained and nominated to remove asbestos as well as the nominated supervisors should be listed in council's asbestos management plan.

Council will ensure that before any council employee undertakes asbestos (or suspected asbestos) removal work they are:

- appropriately trained
- adequately supervised
- provided with appropriate personal protective equipment and clothing
- provided access to this policy
- provided with information about the health risks and health effects associated with exposure to asbestos and the need for, and details of, health monitoring.

Council may refer to any council processes or templates eg for preparing safe work method statements.

13.6.2 Removal by contractors

Where council commissions the removal of asbestos at the workplace, council will ensure asbestos removal work is carried out only by a licensed asbestos removalist who is appropriately licensed to carry out the work, unless specified in the *NSW Work Health and Safety Regulation 2011* that a licence is not required.

Where council requires the services of asbestos removalists, council will require the licence details of asbestos removalists prior to engaging their services and will verify the licence details with SafeWork NSW's Certification Unit prior to entering a contract or agreement with the licensed asbestos removalists.

Council is required to ensure that the work is carried out by a competent person who has been trained in the identification and safe handling of, and suitable control measures for, asbestos and asbestos containing material. Council will therefore require a statement in a written contract or agreement with the licensed asbestos removalist that the licensed asbestos removalist who will undertake the work has been adequately trained and is provided with appropriate health monitoring by their employer.

The licensed asbestos removalist is to provide the following documentation prior to carrying out asbestos removal work:

- Asbestos removal control plan
- Public liability certificate of currency
- Workers compensation certificate of currency
- SafeWork NSW confirmation details to carry out the removal work

Council will provide a copy of the asbestos register to the licensed asbestos removalist.

Where council becomes aware of any breaches by licensed asbestos removalists, council will report this to SafeWork NSW.

13.6.3 Clearance inspections and certificates

Where council commissions any licensed asbestos removal work, council will ensure that once the licensed asbestos removal work has been completed, a clearance inspection is carried out and a clearance certificate is issued by an independent licensed asbestos assessor (for Class A asbestos removal work) or an independent competent person (in any other case) before the asbestos removal area is re-occupied.

The friable asbestos clearance certificate will require visual inspection as well as air monitoring of the asbestos removal site. Air monitoring is mandatory for all friable asbestos removal. The air monitoring must be conducted before and during Class A asbestos removal work by an independent licensed asbestos assessor.

The friable asbestos clearance certificate is to state that there was no visible asbestos residue in the area or vicinity of the area where the work was carried out and that the airborne asbestos fibre level was less than 0.01 asbestos fibres/ml.

14. ACCIDENTAL DISTURBANCE OF ASBESTOS BY WORKERS

In situations where asbestos is accidentally disturbed by council work and has, or could, become airborne, council will act to minimise exposure of workers and the wider public to airborne asbestos.

It may be appropriate that council:

- stop works in the vicinity of the asbestos immediately
- inform the site supervisor immediately, inform necessary workers and record the incident
- evacuate the area
- provide personal protective equipment and briefing to appropriately trained workers who will respond to the incident
- restrict access to the area and ensure only appropriately trained and equipped council workers attend the site
- exclude the public from the site and provide information to the public if in a public area
- wet surfaces to reduce the dust levels
- prevent the spread of contamination by using wash down facilities
- provide information, training and supervision to all workers potentially at risk
- contact SafeWork NSW to report the disturbance. SafeWork NSW must be immediately notified if persons are likely to be effected by asbestos fibres or if an air monitoring process records a level above 0.02 fibres/ml of air
- implement an air monitoring program to assess asbestos exposure levels and specific risk control measures.
- liaise with or consult the appropriate agencies
- seek advice from an occupational hygienist
- follow the Code of practice on how to safely remove asbestos (catalogue no. WC03561)
- ensure that asbestos materials are disposed of at a facility licensed to accept asbestos materials, and where contractors have been engaged to dispose of asbestos waste, sight proof of appropriate disposal through weighbridge dockets or similar documentation
- update the asbestos register and notify workers of any newly identified asbestos locations.

15. COUNCIL'S ROLE IN THE DISPOSAL OF ASBESTOS WASTE

15.1 Responding to illegal dumping

Where council commissions the removal of illegally dumped asbestos material or suspected asbestos material, council will ensure this is undertaken in accordance with section 13.6.2.

Where council becomes aware of illegally dumped asbestos material outside of council's jurisdiction, council will promptly notify the relevant authority.

15.2 Transporting and disposing of asbestos waste

Council will transport and dispose of waste in accordance with the legislation and as outlined in section 9.

15.3 Operating council's waste facility permitted to accept asbestos waste

Council only accepts bonded asbestos at the Narrandera Waste facility.

Waste management facilities must be managed in accordance with the *Protection of the Environment Operations (Waste) Regulation 2014* including clause 80 which specifies that:

- (1) A person disposing of asbestos waste off the site at which it is generated must do so at a landfill site that can lawfully receive the waste.
- (2) When a person delivers asbestos waste to a landfill site, the person must inform the occupier of the landfill site that the waste contains asbestos.
- (3) When a person unloads or disposes of asbestos waste at a landfill site, the person must prevent:
 - (a) any dust being generated from the waste, and
 - (b) any dust in the waste from being stirred up.
- (4) The occupier of a landfill site must ensure that asbestos waste disposed of at the site is covered with virgin excavated natural material or (if expressly authorised by an environment protection licence held by the occupier) other material:
 - (a) initially (at the time of disposal), to a depth of at least 0.15 metre, and
 - (b) at the end of each day's operation, to a depth of at least 0.5 metre, and
 - (c) finally, to a depth of at least 1 metre (in the case of bonded asbestos material or asbestos-contaminated soils) or 3 metres (in the case of friable asbestos material) beneath the final land surface of the landfill site.

Council has a charging policy for receiving asbestos waste, which reflects the actual cost of managing the asbestos waste, plus any applicable levies.

When council is receiving construction, renovation and demolition waste, council should visually screen and may also inspect incoming loads to minimise asbestos contamination risk as this waste may be high risk for asbestos materials.

Council may issue a receipt for asbestos waste received at a licensed landfill facility. The receipt provided may note the time, date and location of disposal, weight of asbestos containing material disposed, method of disposal (note on handling) and a receipt number. This information must be recorded by the facility, regardless of whether a receipt is issued.

15.3.1 Asbestos waste incorrectly presented to council's waste facility

This section applies to situations where asbestos waste is taken to a council waste facility and the waste is:

- not bonded asbestos
- not correctly packaged for delivery and disposal
- not disclosed by the transporter as being asbestos or asbestos containing materials
- taken to a waste facility that does not accept asbestos waste.

In these situations, council may record relevant details such as the:

- contact details of the transporter
- origin of the asbestos or asbestos containing material
- amount and type of asbestos or asbestos containing material
- reasons why the asbestos waste was not properly packaged, disclosed or transported to a waste facility licensed to receive asbestos waste
- development consent details (if applicable).

Where asbestos waste is not correctly packaged for delivery and disposal, or is not disclosed by the transporter as being asbestos or asbestos containing materials, council may:

- reject the asbestos waste from the facility
- suggest the transporter re-package the load correctly at the facility
- provide a bay for wetting and/or wrapping the asbestos and protective equipment for the transporter eg the option to purchase an asbestos waste handling kit (for non-commercial operators with less than 10 square metres of non-friable asbestos)
- provide the transporter with educational material such as SafeWork NSW fact sheets on correct methods for packaging, delivery and disposal of asbestos
- question the transporter about the source of asbestos waste
- issue a clean up notice or prevention notice under the *Protection of the Environment Operations Act 1997*
- issue a compliance cost notice under the *Protection of the Environment Operations Act 1997*
- issue a penalty infringement notice for improper transport of asbestos (under the *Protection of the Environment Operations Act 1997*).

Where asbestos waste is taken to a waste facility that does not accept asbestos waste, council may reject the waste. Where waste is rejected, council should complete a rejected loads register (a template is available from SafeWork NSW). Council will also inform the transporter of a waste facility to which the waste may be transported, that is, a waste facility at which the waste can be legally accepted (as required by the *Protection of the Environment Operations (Waste) Regulation 2014*). If council suspects that there is a risk of illegal dumping of the rejected waste, council will inform council's rangers or council's compliance officers. Suitable disposal for loads that are refused entry will remain the responsibility of the transporter and at a later date the transporter will need to demonstrate to council that the waste has been appropriately disposed.

Where asbestos waste is illegally dumped at an unstaffed waste station, management options for council include to:

- undertake surveillance via video cameras to issue fines or deter dumping
- provide targeted education to neighbouring landholders to ensure that they do not allow access to the waste station.

15.4 Recycling facilities

Council should screen and inspect incoming loads at recycling facilities for the presence of asbestos or asbestos containing materials to minimise asbestos contamination risk.

To prevent contamination of recycled products and to manage situations where contamination has occurred, council should adhere to the guide: *Management of asbestos in recycled construction and demolition waste*.

15.5 Re-excavation of landfill sites

The re-excavation of a council landfill site where significant quantities of asbestos waste are deposited is not encouraged and should only be considered with reference to any available records on the nature, distribution and quantities of asbestos waste required under the relevant legislation, and consultation with the Environment Protection Authority (as the appropriate regulatory authority under the *Protection of the Environment Operations Act 1997*).

16. ADVICE TO TENANTS AND PROSPECTIVE BUYERS OF COUNCIL OWNED PROPERTY

Council may provide advisory notes to tenants and prospective buyers of council owned property that is likely to contain asbestos.

Council may request that tenants in council property:

- advise council of any hazards relating to asbestos
- minimise damage to asbestos containing material
- co-operate with council in facilitating any risk management work arranged by council
- act on advice from council to minimise risks from asbestos.

17. IMPLEMENTING COUNCIL'S ASBESTOS POLICY & PROCEDURE

17.1 Supporting documents

The implementation of this policy and procedure is supported by council's

- conditions of consent
- guidelines for disposing of asbestos waste.

Council also has several internal documents that support this policy and procedure:

- asbestos management plan
- asbestos register
- complaints handling procedures
- employee health monitoring plans
- incident report form
- maintenance and inspection schedules for council owned assets
- risk register
- safe work method statements/ procedures for asbestos handling and removal for council employees
- training registers/ records (relevant to identifying, handling and removing of asbestos materials).

17.2 Communicating the policy

This is a publicly available policy and procedure. The policy and procedure is to be made available via:

- Council's main administration building and depot
- Council's website: www.narrandera.nsw.gov.au
- Council's electronic record keeping system

All employees shall receive information about the policy at induction from the relevant supervisor.

Any workers (including employees, contractors, consultants and, where relevant, volunteers and members of the public) who are involved in any activity or activities listed in Appendix A under section 3 on behalf of, or for, council shall be provided with access to a copy of this policy and relevant supporting documents. This includes any workers involved in commencing, arranging, undertaking, regulating, inspecting or supervising a potentially hazardous activity or activities. Managers are responsible for ensuring workers who report to them have access to the policy and appropriate information, documentation and training in asbestos awareness (as per the *NSW Work Health and Safety Regulation 2011*) prior to planning the activity or activities. Further information about training is noted in section 12.2.2 of this policy.

Council shall incorporate a statement regarding compliance with this policy in all relevant contracts and agreements with workers (including employees, contractors, consultants and, where relevant, volunteers and members of the public).

In the case of any substantive revisions to the policy, the revisions will be approved by the General Manager and the General Manager will notify all persons who may have cause to undertake, arrange or supervise any activities listed in Appendix A under section 3 on behalf of, or for, council.

17.3 Non-compliance with the policy

Failure by workers to adhere to the policy and failure by managers to adequately inform relevant workers of this policy shall be considered non-compliance with this policy.

Workers should approach their supervisor or manager if they are experiencing difficulties in understanding or implementing the policy or if they are concerned that other workers are not complying with the policy.

18. VARIATIONS TO THIS POLICY

Council reserves the right to review, vary or revoke this policy. The General Manager may allow variations to the policy for minor issues in individual cases.

APPENDICES

Appendix A – General information and guidance

What is asbestos?

Asbestos is the generic term for a number of naturally occurring, fibrous silicate materials. If asbestos is disturbed it can release dangerous fine particles of dust containing asbestos fibres. Breathing in dust containing elevated levels of asbestos fibres can cause asbestosis, lung cancer and mesothelioma.

There are two major groups of asbestos:

- the serpentine group contains chrysotile, commonly known as white asbestos
- the amphibole group contains amosite (brown asbestos) and crocidolite (blue asbestos) as well as some other less common types (such as tremolite, actinolite and anthophyllite).

Further information about the different types of asbestos can be found in: Environmental Health Standing Committee (enHealth), *Asbestos: A guide for householders and the general public*, Australian Health Protection Principal Committee, Canberra, 2013 (available at: www.health.gov.au/internet/publications/publishing.nsf/Content/asbestos-toc~asbestos-about).

In Australia, in the past asbestos was mined and widely used in the manufacture of a variety of materials. Asbestos was gradually phased out of building materials in the 1980s and the supply and installation of asbestos containing goods has been prohibited in Australia since 31 December 2003.

Asbestos legacy materials still exist in many homes, buildings and other assets. It is estimated that 1 in 3 Australian homes contains building materials with asbestos. Where the material containing asbestos is in a non-friable form (or bonded), undisturbed, and painted or otherwise sealed, it may remain safely in place. However, where the asbestos containing material is broken, damaged or mishandled, fibres can become loose and airborne posing a risk to health. Disturbing or removing asbestos unsafely can create a health hazard.

It is often difficult to identify the presence of asbestos by sight. If you are in doubt, it is best to assume that you are dealing with asbestos and take every precaution. The most accurate way to find out whether a material contains asbestos is to obtain an asbestos inspection by a person competent in the identification and assessment of asbestos such as an occupational hygienist. It can be unsafe for an unqualified person to take a sample of asbestos. Licensed asbestos removalists can be found by using the telephone directory. Council encourages residents to ask the contractor for a copy of their licence prior to engaging them. Residents can then check with SafeWork NSW (phone 13 10 50) to confirm the contractor has the appropriate class of licence for the asbestos removal job.

Where is asbestos found?

Asbestos can be found where it occurs naturally and in a variety of materials (from prior to 2004) in residential, commercial and industrial premises and on public and private land.

Naturally occurring asbestos

Naturally occurring asbestos refers to the natural geological occurrence of asbestos minerals found in association with geological deposits including rock, sediment or soil.

Asbestos is found as a naturally occurring mineral in many areas of NSW. Asbestos may occur in veins within rock formations. [The map provided in Appendix L](#) gives an indication of areas in NSW known to have naturally occurring asbestos.

Work processes that have the potential to inadvertently release naturally occurring asbestos into the air include:

- agriculture
- forestry
- landscaping
- mining
- other excavation or construction activities

- pipe works and telecommunications works
- road construction and road works.

Further information can be found in this policy under section 5 and in the *Naturally-occurring asbestos fact sheet* (catalogue no. WC03728) published by SafeWork NSW, which provides a photograph of naturally occurring asbestos. The SafeWork NSW website provides further information on naturally occurring asbestos and supporting documents on what people can do to avoid contact with naturally occurring asbestos.

Residential premises

As a general rule, a house built:

- Before the mid 1980s – is highly likely to contain asbestos containing products.
- Between the mid 1980s and 1990 – is likely to contain asbestos containing products.
- After 1990 – is unlikely to contain asbestos containing products. However, some houses built in the 1990s and early 2000s may have still used asbestos cement materials until the total ban on any activity involving asbestos products became effective from December 2003.

Pipelines installed prior to 1992, particularly black surface coated and grey surface pipes, may contain asbestos.

It is important to note, the most accurate way to find out whether a material contains asbestos is by engaging a licensed asbestos removalist or occupational hygienist to inspect and arrange testing where necessary.

Fibre cement sheeting, commonly known as 'fibro', 'asbestos sheeting' or 'AC sheeting' (asbestos containing sheeting) is the most commonly found legacy asbestos material in residential premises. Other asbestos containing materials were used in 'fibro' houses but also found in brick and timber housing stock from that period. Asbestos materials were sold under a range of commercial names. Some asbestos containing materials found in New South Wales domestic settings are listed in Appendix J.

Common places where asbestos is likely to be found in and around homes include:

Outside

- backyard garden sheds, carports, garages and dog kennels
- electrical meter boards
- imitation brick cladding
- lining under eaves
- wall and roof materials (flat, patterned or corrugated asbestos sheeting).

Inside

- insulation materials in heaters and stoves
- interior walls and sheeting
- sheet materials in wet areas (bathroom, toilet and laundry walls, ceilings and floors)
- vinyl floor tiles, the backing to cushion vinyl flooring and underlay sheeting for ceramic tiles including kitchen splashback.

Asbestos can also be found in:

- angle mouldings (internal and external)
- board around windows and fireplaces
- brake pads and clutch pads to vehicles
- buried and dumped waste materials
- carpet underlay
- ceilings (ceiling tiles or sprayed coatings or loose in the ceiling cavity and may have moved to wall cavities, cornices and sub-floor areas)
- cement flooring
- external toilets

- fencing
- guttering, downpipes and vent pipes
- inside appliances eg irons, whitegoods
- gable ends
- outbuildings
- ridge capping
- swimming pools – reinforcing marble swimming pools
- ventilators – internal and external.

Other places asbestos can be found are listed in Appendix J.

Commercial and industrial premises

In commercial and industrial premises, asbestos may be found in the abovementioned places and also:

- asbestos rope or fabric in expansion joints (for example exhaust flues) and insulation
- bituminous waterproof membrane on flat roofs
- brake disc pads and brake linings
- cloth, tapes, ropes and gaskets for packing
- electrical switchboards and duct heater units
- fillers and filters
- fire doors
- lagging on pipes such as heater flues
- lift motor rooms
- pipes, casing for water and electrical/ telecommunication services
- rubber, plastics, thermosetting resins, adhesives, paints, coatings, caulking compounds and sealants for thermal, electrical and insulation applications
- structural beams of buildings
- yarns and textiles eg fire blankets.

Other places asbestos can be found are listed in Appendix J.

Sites contaminated with asbestos

Contamination of soils from asbestos or asbestos containing materials can present a risk in urban and rural environments if the asbestos can give rise to elevated levels of airborne fibres that people can breathe. Whilst buried material may not give rise to airborne asbestos fibres if securely contained, inappropriate disturbance of this waste could give rise to harmful levels of asbestos fibres in air. Activities such as those listed in section 3 of this Appendix have the potential to encounter and disturb asbestos waste or contamination, particularly where the contamination is not known to be present at the site or has not been appropriately considered.

Situations where asbestos contamination may occur

Situations where asbestos contamination may occur include:

- industrial land, eg, asbestos-cement manufacturing facilities, former power stations, and rail and ship yards, especially workshops and depots
- waste disposal or dumping sites, including sites of illegal dumping eg, building waste
- sites with infill or burial of asbestos waste from former asbestos mining or manufacture processes
- buildings or structures damaged by fire or storm (particularly likely for those with pre-1980s building materials but also possible for those with materials from prior to 2004)
- land with fill or foundation material of unknown composition
- sites where buildings or structures have been constructed from asbestos containing material or where asbestos may have been used as insulation material, eg, asbestos

roofing, sheds, garages, reservoir roofs, water tanks, boilers and demolition waste has been buried onsite

- sites where buildings or structures have been improperly demolished or renovated, or where relevant documentation is lacking (particularly likely for those with pre-1980s building materials but also those with materials from prior to 2004)
- disused services with asbestos containing piping such as water pipes (including sewage systems, water services and irrigation systems), underground electrical and telephone wires and telecommunications trenches or pits (usually within 1 metre of the surface).

Significantly contaminated land

For sites that are significantly contaminated, the EPA and SafeWork NSW are the lead regulatory authorities. The *Contaminated Land Management Act 1997* applies to significantly contaminated land. In general, significant contamination is usually associated with former asbestos processing facilities or where large quantities of buried friable asbestos waste has been uncovered and is giving rise to measureable levels of asbestos fibres in air. Such sites require regulatory intervention to protect community health where the source of the contamination is not being addressed by the responsible person. The Environment Protection Authority has details of sites that have been nominated as significantly contaminated on its Public Register at: www.epa.nsw.gov.au/clm/publiclist.htm

If land is contaminated but not determined to be 'significant enough to warrant regulation' then the *Contaminated Land Management Act 1997* does not apply. In such cases the provisions within the planning legislation and/or the *Protection of the Environment Operations Act 1997* may be the appropriate mechanism for management of such contamination.

Guidance on assessing land can be found in the document: *Guidelines on the duty to report contamination under the Contaminated Land Management Act 1997*.

Potentially hazardous activities

A number of activities could cause asbestos to be inadvertently disturbed and consequently create a health risk.

Before undertaking any of the activities listed below, it should be considered whether asbestos containing materials may be present. If asbestos is present, these activities may be illegal or certain precautions may be required, or an appropriately licensed person may be required to undertake the activity.

Members of the public could inadvertently disturb asbestos through activities including:

- renovations, refurbishments or repairs particularly those involving power tools, boring, breaking, cutting, drilling, grinding, sanding or smashing asbestos containing materials
- sealing, painting, brushing and cleaning asbestos cement products
- demolitions of homes or other structures (dismantling or destruction)
- relocating a house, building or structure
- using compressed air on asbestos containing materials
- water blasting asbestos containing materials
- cleaning gutters on asbestos cement roofs
- handling asbestos cement conduits or boxes
- maintenance work such as plumbing and electrical work on or adjacent to asbestos containing materials such as working on electrical mounting boards
- maintenance or servicing of materials from vehicles, plant or equipment
- checking, removing or replacing ceiling insulation which contains asbestos.

Council could inadvertently disturb asbestos through activities such as:

- abovementioned activities
- asset and building maintenance
- certifying
- inspections of sites and premises
- transport and disposal of illegally dumped materials

- collection, transport and disposal of incorrectly disposed of materials.

Naturally occurring asbestos and contaminated sites could be inadvertently disturbed during:

- road building
- site and construction work
- other excavation activities
- vehicle movements.

Natural processes can create a risk of exposure to asbestos including:

- extensive fire or storm damage to asbestos cement roofs or building materials
- extensive weathering and etching of unsealed asbestos cement roofs.

In addition, work that intentionally disturbs asbestos, such as sampling or removal, should be conducted by a competent person and in accordance with the relevant codes of practice and legislation.

Health hazards

Asbestos fibres can pose a risk to health if airborne, as inhalation is the main way that asbestos enters the body. The World Health Organisation has stated that concentrations of asbestos in drinking water from asbestos cement pipes do not present a hazard to human health.

Breathing in asbestos fibres can cause asbestosis, lung cancer and mesothelioma. The risk of contracting these diseases increases with the number of fibres inhaled and the risk of lung cancer from inhaling asbestos fibres is greatly increased if you smoke. Small fibres are the most dangerous and they are invisible to the naked eye. People who are at most risk are those who have been exposed to high levels of asbestos for a long time. The symptoms of these diseases do not usually appear for some time (about 20 to 30 years) after the first exposure to asbestos.

Asbestosis is the irreversible scarring of lung tissue that can result from the inhalation of substantial amounts of asbestos over a period of years. It results in breathlessness that may lead to disability and, in some case, death.

Lung cancer can be caused by asbestos. Lung cancer is related to the amount of fibre that is breathed in and the risk of lung cancer is greatly increased in those who also smoke tobacco.

Mesothelioma is a cancer of the pleura (outer lung lining) or the peritoneum (the lining of the abdominal cavity). Mesothelioma rarely occurs less than 15 years from first exposure, and most cases occur over 30 years after first exposure. Accordingly, the rates of malignant mesothelioma (an incurable cancer) are expected to rise from the year 2012 to 2020 and are expected to peak in this time.

If asbestos fibres are in a stable material, for example bonded in asbestos-cement sheeting (such as fibro), and these materials are in good condition they pose little health risk. However, where fibro or other non-friable asbestos sheeting is broken, damaged or mishandled, fibres can become loose and airborne posing a risk to health. Disturbing or removing asbestos containing materials unsafely can create a hazard.

The occupational standard for asbestos is 0.1fibre/ml of air and the environmental standard is 0.01fibre/ml in air.

When someone has potentially been exposed to asbestos, or receives or expects they may receive a diagnosis of an asbestos-related disease, they may experience psychological distress, including anxiety and may be in need of support. Their family and those around them may also be vulnerable to psychological distress.

Appendix B – Further information

Aboriginal communities

Illegal dumping prevention and clean-up. Handbook for Aboriginal communities, 2008 (EPA)
www.epa.nsw.gov.au/illegaldumping/resources.htm

Asbestos contractors

Choosing an asbestos consultant fact sheet (catalogue no. WC04547) (SafeWork NSW)
www.safework.nsw.gov.au/formspublications/publications/Pages/Choosinganasbestosconsultant.aspx

For a listing of asbestos removal contractors in your area, refer to your local telephone directory or the Yellow Pages www.yellowpages.com.au or by contacting the Asbestos Removal Contractors Association NSW (ARCA) www.arcansw.asn.au or by emailing: email@arcansw.asn.au. An asbestos removal contractor's licence can be verified by contacting the SafeWork NSW's Certification Unit on **13 10 50**.

Asbestos waste

Advice about safely disposing of household asbestos waste can be found at:
www.epa.nsw.gov.au/managewaste/house-asbestos.htm

Asbestos waste disposal facility search function on the Asbestos Safety and Eradication Agency website: www.asbestossafety.gov.au/search-disposal-facilities

Crackdown on Illegal Dumping: A Handbook for Local Government, 2007 (EPA)
www.epa.nsw.gov.au/illegaldumping/resources.htm

Illegally Dumped Asbestos Clean Up Program (IDACUP): Council may become involved in clean up activities of illegally dumped asbestos waste. Where the responsible party is unknown, unavailable, unwilling (despite a legal obligation to do so) or unable to pay for clean up within the timeframe required to avoid or at least minimise harm to the environment or public health, Council may apply for funding under the IDACUP. Information about the IDACUP is available at www.environment.nsw.gov.au/grants/IDACUP.htm

Regional Illegal Dumping (RID) Squads: are regionally based teams that specialise in dealing with illegal dumping. The squads are funded by the EPA and the member local councils who opt to work together and pool resources to tackle illegal dumping.

RIDonline is a statewide illegal dumping database and reporting tool to assist councils and the EPA develop a comprehensive picture of the extent of illegal dumping in NSW. Members of the community can assist by reporting illegal dumping online through the RIDonline App, available for the public to download in February 2016.

For more information on illegal dumping and safely disposing of asbestos waste visit the EPA website: www.epa.nsw.gov.au

Management of asbestos in recycled construction and demolition waste, 2010 (SafeWork NSW)
www.safework.nsw.gov.au/data/assets/pdf_file/0017/18323/asbestos_recycled_construction_demolition_waste_2772.pdf

Contaminated land

Guidelines on the duty to report contamination under the Contaminated Land Management Act 1997, 2015 (EPA). www.epa.nsw.gov.au/resources/clm/150164-report-land-contamination-guidelines.pdf

Managing land contamination: Planning guidelines SEPP 55 – Remediation of land, 1998 (Department of Planning and Environment and EPA)
www.epa.nsw.gov.au/resources/clm/gu_contam.pdf

Emergency management

Guidance Material: Asbestos and Fire-damaged Buildings, 2015 (EPA)

www.epa.nsw.gov.au/resources/waste/asbestos/150044-asbestos-fire-damaged-buildings.pdf

NSW Asbestos Emergency Plan: The NSW Asbestos Emergency sub plan details the specific arrangements for the coordinated funding and management of asbestos debris during and following a larger scale emergency, being an event that requires a significant and coordinated response, where the presence of asbestos containing material in the community poses a significant risk to public health and safety. www.emergency.nsw.gov.au/publications/plans/sub-plans/asbestos.html

Environmental risk assessment

Environmental health risk assessment: Guidelines for assessing human health risks from environmental hazards, 2002 (Commonwealth of Australia)

Available via email by contacting the enHealth Secretariat: enHealth.Secretariat@health.gov.au

Health

Asbestos and health risks fact sheet, 2007 (NSW Health)

www.health.nsw.gov.au/environment/factsheets/Pages/asbestos-and-health-risks.aspx

Further advice concerning the health risks of asbestos can be obtained from your local public health unit.

Renovation and development

Asbestos: A guide for householders and the general public, Environmental Health Standing Committee (enHealth), Australian Health Protection Principal Committee, Canberra, 2013 (available at: www.health.gov.au/internet/publications/publishing.nsf/Content/asbestos-toc~asbestos-about).

Asbestos Awareness website (Asbestos Education Committee)

www.asbestosawareness.com.au

Choosing and working with a principal certifying authority: A guide for anyone planning to build or subdivide, 2011 (Building Professionals Board)

www.bpb.nsw.gov.au/sites/default/files/public/Finalbuildingapproch.pdf

Practical guidance

Code of practice on how to manage and control asbestos in the workplace (catalogue no. WC03560) published by SafeWork NSW

www.safework.nsw.gov.au/_data/assets/pdf_file/0015/15216/how-to-manage-control-asbestos-workplace-code-of-practice-3560.pdf

Code of practice on how to safely remove asbestos (catalogue no. WC03561) published by SafeWork NSW www.safework.nsw.gov.au/_data/assets/pdf_file/0016/15217/how-to-safely-remove-asbestos-code-of-practice-3561.pdf

Tenants

Tenants rights Fact sheet 26 Asbestos and lead, 2010 (Tenants NSW)

www.tenants.org.au/publish/factsheet-26-asbestos-lead/index.php

Tenants – Housing NSW tenants

Asbestos fact sheet, 2010 (Housing NSW)

www.housing.nsw.gov.au/NR/rdonlyres/F4E1131F-2764-4CB1-BC07-98EB6C594085/0/Asbestos.pdf

Appendix C – Definitions

The terms used in the policy are defined as below, consistent with the definitions in the:

- *Code of practice on how to manage and control asbestos in the workplace* (catalogue no. WC03560) published by SafeWork NSW
- *Code of practice on how to safely remove asbestos* (catalogue no. WC03561) published by SafeWork NSW
- *Contaminated Land Management Act 1997*
- *Environmental Planning and Assessment Act 1979*
- *Emergency Pollution and Orphan Waste Clean-Up Program Guidelines 2008*
- *Protection of the Environment Operations Act 1997*
- *Waste classification guidelines part 1 classifying waste 2008*
- *NSW Work Health and Safety Act 2011*
- *NSW Work Health and Safety Regulation 2011.*

accredited certifier in relation to matters of a particular kind, means the holder of a certificate of accreditation as an accredited certifier under the *Building Professionals Act 2005* in relation to those matters.

airborne asbestos means any fibres of asbestos small enough to be made airborne. For the purposes of monitoring airborne asbestos fibres, only respirable fibres are counted.

asbestos means the asbestiform varieties of mineral silicates belonging to the serpentine or amphibole groups of rock forming minerals including the following:

- a. actinolite asbestos
- b. grunerite (or amosite) asbestos (brown)
- c. anthophyllite asbestos
- d. chrysotile asbestos (white)
- e. crocidolite asbestos (blue)
- f. tremolite asbestos
- g. a mixture that contains 1 or more of the minerals referred to in paragraphs (a) to (f).

asbestos containing material (ACM) means any material or thing that, as part of its design, contains asbestos.

asbestos-contaminated dust or debris (ACD) means dust or debris that has settled within a workplace and is, or is assumed to be, contaminated with asbestos.

asbestos-related work means work involving asbestos that is permitted under the *Work Health and Safety Regulation 2011*, other than asbestos removal work.

asbestos removal licence means a Class A asbestos removal licence or a Class B asbestos removal licence.

asbestos removal work means:

- a. work involving the removal of asbestos or asbestos containing material, or
- b. Class A asbestos removal work or Class B asbestos removal work.

asbestos removalist means a person conducting a business or undertaking who carries out asbestos removal work.

asbestos waste means any waste that contains asbestos. This includes asbestos or asbestos containing material removed and disposable items used during asbestos removal work including plastic sheeting and disposable tools.

certifying authority means a person who is authorised by or under section 85A of the *Environmental Planning and Assessment Act 1979* to issue complying development certificates, or is authorised by or under section 109D of the *Environmental Planning and Assessment Act 1979* to issue part 4A certificates.

Class A asbestos removal licence means a licence that authorises the carrying out of Class A asbestos removal work and Class B asbestos removal work by or on behalf of the licence holder.

Class A asbestos removal work means the removal of friable asbestos which must be licensed under clause 485 of the *Work Health and Safety Regulation 2011*. This does not include: the removal of ACD that is associated with the removal of non-friable asbestos, or ACD that is not associated with the removal of friable or non-friable asbestos and is only a minor contamination.

Class B asbestos removal licence means a licence that authorises the carrying out of Class B asbestos removal work by or on behalf of the licence holder.

Class B asbestos removal work means the removal of more than 10 square metres of non-friable asbestos or asbestos containing material work that is required to be licensed under clause 487, but does not include Class A asbestos removal work.

competent person means: a person who has acquired through training or experience the knowledge and skills of relevant asbestos removal industry practice and holds:

- a. a certification in relation to the specified VET course for asbestos assessor work, or
- b. a tertiary qualification in occupational health and safety, occupational hygiene, science, building, construction or environmental health.

complying development is a fast track, 10 day approval process where a building meets all of the predetermined standards established in either a state or local council planning document. A complying development certificate can be issued by either a local council or an accredited certifier.

complying development certificate

contaminant means any substance that may be harmful to health or safety.

contamination of land means the presence in, on or under the land of a substance at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment

control measure, in relation to a risk to health and safety, means a measure to eliminate or minimise the risk.

demolition work means work to demolish or dismantle a structure, or part of a structure that is loadbearing or otherwise related to the physical integrity of the structure, but does not include:

- a. the dismantling of formwork, falsework, or other structures designed or used to provide support, access or containment during construction work, or
- b. the removal of power, light or telecommunication poles.

development means:

- a. the use of land
- b. the subdivision of land
- c. the erection of a building
- d. the carrying out of a work
- e. the demolition of a building or work
- f. any other act, matter or thing referred to in section 26 of the *Environmental Planning and Assessment Act 1979* that is controlled by an environmental planning instrument.

development application means an application for consent under part 4 of the *Environmental Planning and Assessment Act 1979* to carry out development but does not include an application for a complying development certificate.

emergency service organisation includes any of the following:

- a. the Ambulance Service of NSW
- b. Fire and Rescue NSW
- c. the NSW Rural Fire Service
- d. the NSW Police Force
- e. the State Emergency Service
- f. the NSW Volunteer Rescue Association Inc
- g. the NSW Mines Rescue Brigade established under the *Coal Industry Act 2001*
- h. an accredited rescue unit within the meaning of the *State Emergency and Rescue Management Act 1989*.

exempt development means minor development that does not require any planning or construction approval because it is exempt from planning approval.

exposure standard for asbestos is a respirable fibre level of 0.1 fibres/ml of air measured in a person's breathing zone and expressed as a time weighted average fibre concentration calculated over an eight-hour working day and measured over a minimum period of four hours in accordance with the Membrane Filter Method or a method determined by the relevant regulator.

friable asbestos means material that:

- a. is in a powder form or that can be crumbled, pulverised or reduced to a powder by hand pressure when dry
- b. contains asbestos.

health means physical and psychological health.

health monitoring, of a person, means monitoring the person to identify changes in the person's health status because of exposure to certain substances.

independent, in relation to clearance inspections and air monitoring means:

- a. not involved in the removal of the asbestos
- b. not involved in a business or undertaking involved in the removal of the asbestos, in relation to which the inspection or monitoring is conducted.

in situ asbestos means asbestos or asbestos containing material fixed or installed in a structure, equipment or plant, but does not include naturally occurring asbestos.

licence holder means: in the case of an asbestos assessor licence – the person who is licensed:

- a. to carry out air monitoring during Class A asbestos removal work
- b. to carry out clearance inspections of Class A asbestos removal work
- c. to issue clearance certificates in relation to Class A asbestos removal work, or
 - in the case of an asbestos removal licence – the person conducting the business or undertaking to whom the licence is granted, or
 - in the case of a major hazard facility licence – the operator of the major hazard facility to whom the licence is granted or transferred.

licensed asbestos assessor means a person who holds an asbestos assessor licence.

licensed asbestos removalist means a person conducting a business or undertaking who is licensed under the *Work Health and Safety Regulation 2011* to carry out Class A asbestos removal work or Class B asbestos removal work.

licensed asbestos removal work means asbestos removal work for which a Class A asbestos removal licence or Class B asbestos removal licence is required.

NATA means the National Association of Testing Authorities, Australia.

NATA-accredited laboratory means a testing laboratory accredited by NATA, or recognised by NATA either solely or with someone else.

naturally occurring asbestos means the natural geological occurrence of asbestos minerals found in association with geological deposits including rock, sediment or soil.

non-friable asbestos means material containing asbestos that is not friable asbestos, including material containing asbestos fibres reinforced with a bonding compound.

Note. Non-friable asbestos may become friable asbestos through deterioration (see definition of friable asbestos).

occupational hygienist means a person with relevant qualifications and experience in asbestos management who is a full member of the Australian Institute of Occupational Hygienists (AIOH).

occupier includes a tenant or other lawful occupant of premises, not being the owner.

officer means an officer as defined in the *NSW Work Health and Safety Act 2011*.

orphan waste means materials that have been placed or disposed of on a premises unlawfully that may have the potential to pose a risk to the environment or public health.

person conducting a business or undertaking a 'person' is defined in laws dealing with interpretation of legislation to include a body corporate (company), unincorporated body or association and a partnership.

personal protective equipment means anything used or worn by a person to minimise risk to the person's health and safety, including air supplied respiratory equipment.

respirable asbestos fibre means an asbestos fibre that:

- a. is less than three micrometres wide
- b. more than five micrometres long
- c. has a length to width ratio of more than 3:1.

specified VET course means:

- a. in relation to Class A asbestos removal work – the following VET courses:
 - remove non-friable asbestos
 - remove friable asbestos, or
- b. in relation to Class B asbestos removal work – the VET course Remove non-friable asbestos, or
- c. in relation to the supervision of asbestos removal work – the VET course Supervise asbestos removal, or
- d. in relation to asbestos assessor work – the VET course Conduct asbestos assessment associated with removal.

structure means anything that is constructed, whether fixed or moveable, temporary or permanent, and includes:

- a. buildings, masts, towers, framework, pipelines, transport infrastructure and underground works (shafts or tunnels)
- b. any component of a structure
- c. part of a structure
- d. volunteer means a person who is acting on a voluntary basis (irrespective of whether the person receives out-of-pocket expenses).

waste includes:

- any substance (whether solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment, or
- any discarded, rejected, unwanted, surplus or abandoned substance, or
- any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, processing, recovery or purification by a separate operation from that which produced the substance, or
- any process, recycled, re-used or recovered substance produced wholly or partly from waste that is applied to land, or used as fuel, but only in the circumstances prescribed by the regulations, or
- any substance prescribed by the regulations made under the *Protection of the Environment Operations Act 1997* to be waste.

waste facility means any premises used for the storage, treatment, processing, sorting or disposal of waste (except as provided by the regulations).

worker a person is a worker if the person carries out work in any capacity for a person conducting a business or undertaking, including work as:

- a. an employee, or
- b. a contractor or subcontractor, or
- c. an employee of a contractor or subcontractor, or
- d. an employee of a labour hire company who has been assigned to work in the person's business or undertaking, or
- e. an outworker, or
- f. an apprentice or trainee, or
- g. a student gaining work experience, or
- h. a volunteer, or
- i. a person of a prescribed class.

workplace a workplace is a place where work is carried out for a business or undertaking and includes any place where a worker goes, or is likely to be, while at work. Place includes: a vehicle, vessel, aircraft or other mobile structure, and any waters and any installation on land, on the bed of any waters or floating on any waters.

Appendix D – Acronyms

ACD	Asbestos Containing Dust (an acronym used in the legislation)
ACM	Asbestos Containing Material (an acronym used in the legislation)
ARA	Appropriate Regulatory Authority (an acronym used in the legislation)
DA	Development Application
EPA	Environment Protection Authority
JRPP	Joint Regional Planning Panel
LGA	Local Government Area
NATA	National Association of Testing Authorities
NSW	New South Wales
SEPP	State Environmental Planning Policy
VET	Vocational Education and Training

Appendix E – Relevant contacts**Asbestos-related disease organisations (non-exhaustive)****Asbestos Diseases Foundation Australia Inc**

Phone: (02) 9637 8759
Helpline: 1800 006 196
Email: info@adfa.org.au
Website: www.adfa.org.au

Asbestos Diseases Research Institute

Phone: (02) 9767 9800
Email: info@adri.org.au
Website: www.adri.org.au

Australian Institute of Occupational Hygienists Inc.

Phone: (03) 9338 1635
Email: admin@aioh.org.au
Website: www.aioh.org.au

Dust Diseases Authority

Phone: (02) 8223 6600
Toll Free: 1800 550 027
Email: DDAenquiries@icare.nsw.gov.au
Website: www.icare.nsw.gov.au

Environment Protection Authority (EPA)

Phone: (02) 9995 5000
Environment line: 13 15 55
Email: info@epa.nsw.gov.au
Website: www.epa.nsw.gov.au/epa

Licensed Asbestos Contractors

For a listing of asbestos removal contractors in your area, refer to your local telephone directory or the Yellow Pages website: www.yellowpages.com.au or contact:

Asbestos Removal Contractors Association NSW

PO Box Q1882
Queen Victoria Building
NSW 1230

Email: email@arcansw.asn.au

Website: www.arcansw.asn.au

Verification of an asbestos removal contractor's licence can be checked by contacting SafeWork NSW's Certification Unit Phone: **13 10 50**

Civil Contractors Federation (CCF)

Phone: (02) 9009 4000

Email: ccfnsw@ccfnsw.com

Website: www.ccfnsw.com/

Local Government NSW

Phone: (02) 9242 4000

Email: lgnsw@lgnsw.org.au

Website: www.lgnsw.org.au

NSW Ombudsman

Phone: (02) 9286 1000

Toll free (outside Sydney metro): 1800 451 524

Email: nswombo@ombo.nsw.gov.au

Website: www.ombo.nsw.gov.au

Training providers (non-exhaustive)

TAFE NSW

Phone: 131 601

Website: www.tafensw.edu.au

Housing Industry Association (HIA)

Phone: (02) 9978 3333

Website: www.hia.com.au/

Local Government Training Institute

Phone: (02) 4922 2333

Website: www.lgti.com.au

Comet Training

Phone: (02) 9649 5000

Website: www.comet-training.com.au/site

Master Builders Association (MBA)

Phone: (02) 8586 3521

Website: www.masterbuilders.com.au

SafeWork NSW

SafeWork NSW Information Centre Phone: 13 10 50

SafeWork NSW – Asbestos/Demolition Hotline Phone: (02) 8260 5885

Website: www.safework.nsw.gov.au

Appendix F – Waste management facilities that accept asbestos wastes

Waste management facilities that can accept asbestos waste may be operated by council, the State Government or private enterprise. The fees charged by the facility operators for waste received are determined by the facility.

Not all waste management centres accept asbestos waste from the public. Management of asbestos waste requires special precautions such as a separate disposal location away from other general waste and controls to prevent the liberation of asbestos fibres, such as the immediate covering of such waste.

Council only has one waste facility within the LGA that will accept bonded asbestos waste, being:

- Narrandera waste facility – Red Hill Road, Narrandera.
- Operating hours: Tuesday, Wednesday, Friday 9am - 12pm & 1pm - 5pm, Saturday & Sunday 10am - 5pm.
- contact details
- any fees for disposing of asbestos waste is in accordance with the adopted fees and charges.
- Notification must be given on the delivery of asbestos waste.

Waste management facilities in other areas that accept asbestos wastes

A list of licensed landfills that may accept asbestos waste from the public is available on the EPA website at: www.epa.nsw.gov.au/managewaste/house-asbestos-land.htm

Some of the landfills may accept non-friable asbestos waste but not friable asbestos waste. Some landfills may not accept large quantities of asbestos waste.

Always contact the landfill before taking asbestos waste to a landfill to find out whether asbestos is accepted and any requirements for delivering asbestos to the landfill. EPA does not endorse any of the landfills listed on the website or guarantee that they will accept asbestos under all circumstances.

Appendix G – Asbestos-related legislation, policies and standards

- *Contaminated Land Management Act 1997*
- *Code of practice on how to manage and control asbestos in the workplace* (catalogue no. WC03560) published by SafeWork NSW
- *Code of practice on how to safely remove asbestos* (catalogue no. WC03561) published by SafeWork NSW
- *Demolition work code of practice 2015*
- *Environmental Planning and Assessment Act 1979*
- *Environmental Planning and Assessment Regulation 2000*
- *Local Government Act 1993*
- *Local Government (General) Regulation 2005*
- *Protection of the Environment Operations (General) Regulation 2009*
- *Protection of the Environment Operations (Waste) Regulation 2014*
- *Protection of the Environment Operations Act 1997*
- *State Environmental Planning Policy No. 55 – Remediation of Land*
- *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*
- *NSW Work Health and Safety Act 2011*
- *NSW Work Health and Safety Regulation 2011*
- *Workers' Compensation (Dust Diseases) Act 1942.*

Appendix H – Agencies roles and responsibilities

NSW organisations

Department of Planning and Environment (DPE)

DPE's primary role in the management of asbestos relates to administration of State Environmental Planning Policies, and the *Environmental Planning and Assessment Act 1979* (and associated Regulation).

Whilst DPE does not have an operational role in the management of asbestos, it has a regulatory function and provides policy support relating to asbestos and development. In assessing proposals for development under the *Environmental Planning and Assessment Act 1979*, consent authorities are required to consider the suitability of the subject land for the proposed development. This includes consideration of the presence of asbestos and its environmental impact.

Where asbestos represents contamination of the land (ie it is present in excess of naturally occurring levels), *State Environmental Planning Policy No. 55 – Remediation of Land* imposes obligations on developers and consent authorities in relation to remediation of the land and the assessment and monitoring of its effectiveness.

The *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* enables exempt and complying development across the state. While this includes demolition and the removal of asbestos, the *Environmental Planning and Assessment Regulation 2000* specifies particular conditions that must be contained in a complying development certificate in relation to the handling and lawful disposal of both friable and non-friable asbestos material under the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*.

Dust Diseases Authority (DDA)

The Dust Diseases Authority provides a system of no fault compensation to people who have developed a dust disease from occupational exposure to dust as a worker in New South Wales and to their dependants. The DDA's statutory function is to administer the *Workers' Compensation (Dust Diseases) Act 1942*. Services include:

- payment of compensation benefits to eligible workers and dependants
- co-ordination and payment of medical and related health care expenses of affected
- medical examination of workers exposed to dust in the workplace
- information and education.

Environment Protection Authority (EPA)

EPA's role is to regulate the classification, storage, transport and disposal of waste in NSW, including asbestos waste. The waste regulatory framework includes the *Protection of the Environment Operations Act 1997* and the *Protection of the Environment Operations (Waste) Regulation 2014*. Clauses 77 through to 81 of the *Protection of the Environment Operations (Waste) Regulation 2014* set out the special requirements relating to the transportation and disposal of asbestos waste.

EPA is the appropriate regulatory authority for activities that require an environment protection licence or are carried out by public authorities such as local councils, the Roads and Maritime Services and Sydney Water. Local councils are the appropriate regulatory authority for activities that are not regulated by the EPA, which typically include building demolition, construction sites, residential properties, commercial sites and small to medium sized industrial facilities.

EPA is responsible for assisting councils in fulfilling their regulatory responsibilities. EPA has developed resources to assist Local Government to regulate asbestos waste incidents and prevent illegal dumping. Website links to these resources are provided in Appendix B.

The EPA maintains the regulatory framework for the remediation of contaminated land (the *Contaminated Land Management Act 1997*) and actively regulates land that is declared to be 'significantly contaminated' under the *Contaminated Land Management Act 1997*.

Heads of Asbestos Coordination Authorities (HACA)

The HACA is chaired by SafeWork NSW with senior officials from:

- Department of Industry
- Department of Planning and Environment
- Dust Diseases Authority
- Environment Protection Authority
- Local Government NSW
- Ministry of Health
- Office of Emergency Management
- Office of Local Government.

The HACA group will improve the management, monitoring and response to asbestos issues in NSW by developing coordinated prevention programs. These programs include a comprehensive public awareness campaign to promote the safe handling of asbestos and help prevent the risk of exposure to asbestos-related diseases in the NSW community. Further information about the HACA can be found on the SafeWork NSW website: www.safework.nsw.gov.au.

Local Government NSW (LGNSW)

Local Government NSW (LGNSW) is the peak body for councils in NSW. LGNSW represents all NSW general-purpose councils, the special-purpose county councils and the NSW Aboriginal Land Council.

LGNSW is a credible, professional organisation facilitating the development of an effective community-based system of Local Government in NSW. LGNSW represents the views of councils to NSW and Australian Governments; provides industrial relations and specialist services to councils; and promotes NSW councils to the community.

In 2012, LGNSW commenced a project funded by SafeWork NSW to assist councils to adopt and implement a model asbestos policy. The project is outlined at: www.lgnsw.org.au

NSW Department of Industry

The NSW Department of Industry, Skills and Regional Development (known as the NSW Department of Industry) leads the state government's contribution to making NSW:

- a fertile place to invest and to produce goods and services, and thereby
- create jobs and opportunities for our citizens

The NSW Department of Industry also has responsibilities for:

- skill formation and development to match industry demand
- partnering with stakeholders in stewardship and sustainable use of the state's natural resources; and
- supporting economic growth in the regions.

Within the Division of Resources & Energy in the Department, the Geological Survey of NSW teams of field geologists, geophysicists, mineral geoscientists and palaeontologists and geospatial specialists produce a range of maps. Geological mapping records the distribution of rock types and location of structures at or near the Earth's surface. The maps have applications to land use assessment, engineering construction, environmental management and natural hazard risk assessment.

The Geological Survey of NSW prepared the state-wide mapping of naturally occurring asbestos (NOA) in NSW for the Heads of Asbestos Coordination Authorities.

NSW Ministry of Health

The NSW Ministry of Health does not have express statutory responsibilities for managing asbestos-related risks and incidents in NSW. The Ministry provides an expert advisory service to other governmental agencies on public health issues. This service may include technical information or assistance to prepare public health information bulletins.

NSW Ombudsman

The NSW Ombudsman is an independent and impartial watchdog body. The NSW Ombudsman is responsible for ensuring that public and private sector agencies and employees within its jurisdiction fulfil their functions appropriately. The NSW Ombudsman assists those agencies and their employees to be aware of their responsibilities to the public, to act reasonably and to comply with the law and best administrative practice.

Office of Fair Trading and the Building Professionals Board (BPB)

NSW Fair Trading safeguards the rights of all consumers and advises business and traders on fair and ethical practice. NSW Fair Trading provides services directly to individuals and businesses to create a fair, safe and equitable marketplace.

NSW Fair Trading is establishing a Loose-Fill Asbestos Implementation Taskforce responsible for overseeing and implementing the NSW Government Voluntary Purchase and Demolition Program for properties containing loose-fill asbestos insulation. The Loose-Fill Asbestos Implementation Taskforce will be in place until work is completed on the purchase and demolition of all properties that choose to participate in the Program.

The Building Professionals Board (BPB) is now part of Fair Trading and oversees building and subdivision certification. The BPB's role involves providing practice advice and educational programs to assist certifying authorities (private and council) in carrying out their role. The BPB certifies and audits both private and council certifiers. Further information about the BPB may be found at: www.bpb.nsw.gov.au

Office of Local Government

The Office of Local Government is responsible for local government across NSW. The Office's organisational purpose is to 'Strengthen Local Government' and its organisational outcome is 'Fit for the future councils leading strong communities'.

The Office has a policy, legislative, investigative and program focus in matters ranging from Local Government finance, infrastructure, governance, performance, collaboration and community engagement. The Office strives to work collaboratively with the Local Government sector and is the key adviser to the NSW Government on Local Government matters.

SafeWork NSW

SafeWork NSW is responsible for the issuing and control of licences that are issued to all asbestos removal and demolition contractors. SafeWork NSW works with the employers, workers and community of NSW to achieve safer and more productive workplaces, and effective recovery, return to work and security for injured workers.

SafeWork NSW administers work health and safety, injury management, return to work and workers compensation laws, and manage the workers compensation system. SafeWork NSW's activities include: health and safety, injuries and claims, licensing for some types of plant operators, registration of some types of plant and factories, training and assessment, medical and healthcare, law and policy.

The SafeWork NSW website provides a wide range of asbestos resources, support networks and links at: www.SafeWorkNSW.nsw.gov.au/newlegislation2012/health-and-safety-topics/asbestos/Pages/default.aspx

National organisations

Asbestos Safety and Eradication Agency

The Asbestos Safety and Eradication Agency was established in 2013 to provide a national focus on asbestos issues which go beyond workplace safety to encompass environmental and public health issues. The agency's objective is to eliminate asbestos-related disease in Australia.

The agency has broad functions under its legislation, including:

- reporting on the implementation of the National Strategic Plan on Asbestos Awareness and Management (NSP); reviewing and amending the NSP as required and promoting the NSP
- providing advice to the Minister about asbestos safety
- liaising with all levels of government, agencies or bodies about the implementation of the NSP; as well as asbestos safety in general; and
- commissioning, monitoring and promoting research about asbestos safety.

The agency administers the National Asbestos Exposure Register which was created to record the details of members of the community who may have been exposed to asbestos. Registration forms are online at <https://www.asbestossafety.gov.au/national-asbestos-exposure-register>.

The agency also maintains a national database for asbestos disposal facilities, which members of the public can search to identify their nearest facility that accepts asbestos waste, available online at <https://www.asbestossafety.gov.au/search-disposal-facilities>

Councils interested in finding out more about the agency, updating information listed on the disposal database, or receiving information, flyers or brochures for distribution within the LGA should contact the agency at enquiries@asbestossafety.gov.au.

National Association of Testing Authorities (NATA)

This body has the role of providing accreditation to firms licensed to remove asbestos.

NSW (Head Office) and ACT

Phone: (02) 9736 8222

National Toll Free: 1800 621 666

Website: www.nata.asn.au

Environmental Health Committee (enHealth)

The Environmental Health Committee (enHealth) is a subcommittee of the Australian Health Protection Committee (AHPC). enHealth provides health policy advice, implementation of the National Environmental Health Strategy 2007-2012, consultation with key players, and the development and coordination of research, information and practical resources on environmental health matters at a national level.

Website: www.health.gov.au/internet/main/publishing.nsf/content/ohp-environ-enhealth-committee.htm

Safe Work Australia

Safe Work Australia is an Australian Government statutory agency established in 2009, with the primary responsibility of improving work health and safety and workers' compensation arrangements across Australia.

Phone: (02) 6121 5317

Email: info@swa.gov.au

Website: www.safeworkaustralia.gov.au

Appendix I – Scenarios illustrating which agencies lead a response in NSW

The tables show which agencies are responsible for regulating the following scenarios in NSW:

- emergency management
- naturally occurring asbestos
- residential settings
- site contamination
- waste
- workplaces.

Emergency management

Scenario	Lead organisation	Other regulators
Emergency response	Emergency services	Fire and Rescue (Hazmat) SafeWork NSW
Handover to Local council, owner of property or NSW Police – crime scene following a minor incident	Local council NSW Police	
Handover to State Emergency Recovery Controller	State Emergency Recovery Controller	Recovery Committee Local council EPA SafeWork NSW
Handover to Recovery Committee following a significant incident	Recovery Committee (formed by State Emergency Recovery Controller)	Local council EPA SafeWork NSW
Remediation not requiring a licensed removalist	Local council	Principal Certifying Authority SafeWork NSW (workers)
Remediation requiring licensed removal work	SafeWork NSW	Local council Principal Certifying Authority
Clearance Certificate issued by an Asbestos Assessor	SafeWork NSW	Principal Certifying Authority

Naturally occurring asbestos

Scenario	Lead organisation	Other regulators
Naturally occurring but will be disturbed due to a work process including remediation work	SafeWork NSW	Local council EPA (<i>Protection of the Environment Operations Act 1997</i> Scheduled Activities Public Authorities)
Naturally occurring asbestos part of a mineral extraction process	NSW Department of Industry	Local council EPA (<i>Protection of the Environment Operations Act 1997</i> Scheduled Activities Public Authorities)
Naturally occurring but will remain undisturbed by any work practice	Local council	EPA (<i>Protection of the Environment Operations Act 1997</i> Scheduled Activities Public Authorities) SafeWork NSW (workers)
Soil contaminated with asbestos waste and going to be disturbed by a work practice	SafeWork NSW	EPA (<i>Protection of the Environment Operations Act 1997</i> Scheduled Activities Public Authorities, declared contaminated land sites)
Soil contaminated with asbestos waste but will remain undisturbed by any work practice	Local council	EPA (<i>Protection of the Environment Operations Act 1997</i> Scheduled Activities Public Authorities, declared contaminated land sites) SafeWork NSW (workers on site)
Potential for exposure on public land	EPA (<i>Protection of the Environment Operations Act 1997</i> Scheduled Activities Public Authorities)	Local council SafeWork NSW (workers on site)
Soil contaminated with asbestos waste but at a mine site	NSW Department of Industry EPA (<i>Protection of the Environment Operations Act 1997</i> Scheduled Activities Public Authorities)	Local council

Residential settings

Scenario	Lead organisation	Other regulators
Safe Management of asbestos including: • identification • in situ management • removal requirements • disposal requirements.	Local council Private Certifiers	SafeWork NSW EPA
Site contaminated due to past uses	Local council	SafeWork NSW EPA
Licensed removal work required	SafeWork NSW	Local council Private Certifiers
Removal does not require a licensed removalist	Local council Private Certifiers	SafeWork NSW (workers)
Transport or waste disposal issues	Local council	EPA
Derelict property with fibro debris	Local council or Multi-agency	Multi-agency

Site contamination

Scenario	Lead organisation	Other regulators
Asbestos illegally dumped	Local council	EPA SafeWork NSW
Site contamination at commercial premises	See Workplaces	
Site contamination at residential premises	See Residential settings	

Waste

Scenario	Lead organisation	Other regulators
Waste temporarily stored on-site	SafeWork NSW (worksites) EPA and Local council (non-worksites)	
Waste transported by vehicle	EPA	SafeWork NSW
Waste disposed of onsite	Council or EPA as illegal dumping or pollution of land if no valid council development consent	Local council (consent required to dispose onsite) (section 149 property certificate and development assessment process)
Waste going to landfill site	EPA (advice)	Local council (if managing licensed landfill)
Waste to be transported interstate	EPA	
Waste for export	Department of Immigration and Border Protection	SafeWork NSW Department of Employment

Workplaces

Scenario	Lead organisation	Other regulators
Asbestos installed/supplied after 2003 (illegally)	SafeWork NSW	
Risks to the health of workers	SafeWork NSW	
Asbestos management and asbestos going to be removed	SafeWork NSW NSW Department of Industry (mine sites)	
Risks to the health of the public from worksites	SafeWork NSW (Risks to workers) Local council (Risks to the wider public) Department of Planning and Infrastructure (part 3A approvals) EPA (<i>Protection of the Environment Operations Act 1997</i> licensed sites)	
Waste stored temporarily on-site at worksites	SafeWork NSW	
Transport or waste disposal issues	EPA	SafeWork NSW Local council
Asbestos contaminated clothing going to a laundry	SafeWork NSW	EPA Local council
Contaminated land not declared under the <i>Contaminated Land Management Act 1997</i>	Local council	EPA
'Significantly contaminated' land declared under the <i>Contaminated Land Management Act 1997</i>	EPA	Local council

Appendix J – Asbestos containing materials

Some asbestos containing materials found in New South Wales domestic settings (non-exhaustive list)

Asbestos containing materials	Approximate supply dates
Cement sheets	Imported goods supplied from 1903 locally made 'fribrolite' from 1917
Cement roofing / lining slates	Imported goods supplied from 1903 locally made 'fribrolite' from 1917
Mouldings and cover strips	Available by 1920s and 1930s
Super-six (corrugated) roofing	Available by 1920s and 1930s – 1985
'Tilex' decorative wall panels	Available by 1920s and 1930s
Pipes and conduit piping	Available by 1920s and 1930s
Motor vehicle brake linings	Available by 1920s and 1930s
Striated sheeting	Available from 1957
'Asbestolux' insulation boards	Available from 1957
'Shadowline' asbestos sheeting for external walls, gable ends and fences	Available from 1958 – 1985
Vinyl floor tiles impregnated with asbestos	Available up until 1960s
Asbestos containing paper backing for linoleum	Available up until 1960s
'Durasbestos' asbestos cement products	Available up until 1960s
'Tilex' marbletone decorative wall panels	Available from early 1960s
'Tilex' weave pattern decorative wall panels	Available from early 1960s
'Hardiflex' sheeting	Available from 1960s – 1981
'Versilux' building board	Available from 1960s – 1982
'Hardiplank' and 'Hardigrain' woodgrain sheeting	Available from mid 1970s – 1981
Loose-fill, fluffy asbestos ceiling insulation	During the 1960s and 1970s, pure loose-fill asbestos was sold as ceiling insulation for residential and commercial premises. A Canberra based company known as 'Mr Fluffy' installed insulation in at least 1,000 homes in the ACT and is also understood to have installed insulation into homes in NSW.
Asbestos rope gaskets for wood heaters. Heater and stove insulation	Dates of supply availability unknown but prior to 31 December 2003
Compressed fibro-cement sheets	Available from 1960s – 1984
Villaboard	Available until 1981
Harditherm	Available until 1984
Highline	Available until 1985
Coverline	Available until 1985
Roofing accessories	Available until 1985
Pressure pipe	Available until 1987

Sources:

NSW Government, 2011, *Asbestos Blueprint: A guide to roles and responsibilities for operational staff of state and local government*.

NSW Taskforce Report: *Loose-Fill Asbestos Insulation in NSW Homes* (2015)

www.fairtrading.nsw.gov.au/biz_res/ftweb/pdfs/Tenants_and_home_owners/Loose_Fill_Abestos_Taskforce_Report.pdf (accessed October, 2015).

Asbestos containing materials that may be found in various settings (non-exhaustive list)**A**

Air conditioning duct, in the exterior or interior acoustic and thermal insulation

Arc shields in lift motor rooms or large electrical cabinets

Asbestos-based plastics products as electrical insulates and acid resistant compositions or aircraft seats

Asbestos ceiling tiles

Asbestos cement conduit

Asbestos cement electrical fuse boards

Asbestos cement external roofs and walls

Asbestos cement in the use of form work for pouring concrete

Asbestos cement internal flues and downpipes

Asbestos cement moulded products such as gutters, ridge capping, gas meter covers, cable troughs and covers

Asbestos cement pieces for packing spaces between floor joists and piers

Asbestos cement (underground) pit as used for traffic control wiring, telecommunications cabling etc

Asbestos cement render, plaster, mortar and coursework

Asbestos cement sheet

Asbestos cement sheet behind ceramic tiles

Asbestos cement sheet over exhaust canopies such as ovens and fume cupboards

Asbestos cement sheet internal walls and ceilings

Asbestos cement sheet underlay for vinyl

Asbestos cement storm drain pipes

Asbestos cement water pipes (usually underground)

Asbestos containing laminates, (such as Formica) used where heat resistance is required

Asbestos containing pegboard

Asbestos felts

Asbestos marine board, eg marinate

Asbestos mattresses used for covering hot equipment in power stations

Asbestos paper used variously for insulation, filtering and production of fire resistant laminates

Asbestos roof tiles

Asbestos textiles

Asbestos textile gussets in air conditioning ducting systems

Asbestos yarn

Autoclave/steriliser insulation

B

Bitumen-based water proofing such as malthoid (roofs and floors, also in brickwork)
Bituminous adhesives and sealants
Boiler gaskets
Boiler insulation, slabs and wet mix
Brake disc pads
Brake linings

C

Cable penetration insulation bags (typically Telecom)
Calorifier insulation
Car body filters (uncommon)
Caulking compounds, sealant and adhesives
Ceiling insulation (which may have moved into wall cavities, cornices and sub-floor areas)
Cement render
Chrysotile wicks in kerosene heaters
Clutch faces
Compressed asbestos cement panels for flooring, typically verandas, bathrooms and steps for demountable buildings
Compressed asbestos fibres (CAF) used in brakes and gaskets for plant and automobiles

D

Door seals on ovens

E

Electric heat banks – block insulation
Electric hot water services (normally no asbestos, but some millboard could be present)
Electric light fittings, high wattage, insulation around fitting (and bituminised)
Electrical switchboards see Pitch-based
Exhausts on vehicles

F

Filler in acetylene gas cylinders
Filters: beverage wine filtration
Fire blankets
Fire curtains
Fire door insulation
Fire-rated wall rendering containing asbestos with mortar
Fire-resistant plaster board, typically on ships
Fire-retardant material on steel work supporting reactors on columns in refineries in the chemical industry
Flexible hoses
Floor vinyl sheets
Floor vinyl tiles
Fuse blankets and ceramic fuses in switchboards

G

Galbestos™ roofing materials (decorative coating on metal roof for sound proofing)

Gaskets: chemicals, refineries

Gaskets: general

Gauze mats in laboratories/chemical refineries

Gloves: asbestos

H

Hairdryers: insulation around heating elements

Header (manifold) insulation

I

Insulation blocks

Insulation in ceilings, which may have spread to wall cavities, cornices and sub-floor areas

Insulation in electric reheat units for air conditioner systems

L

Laboratory bench tops

Laboratory fume cupboard panels

Laboratory ovens: wall insulation

Lagged exhaust pipes on emergency power generators

Lagging in penetrations in fireproof walls

Lift shafts: asbestos cement panels lining the shaft at the opening of each floor and asbestos packing around penetrations

Limpet asbestos spray insulation

Locomotives: steam, lagging on boilers, steam lines, steam dome and gaskets

M

Mastik

Millboard between heating unit and wall

Millboard lining of switchboxes

Mortar

P

Packing materials for gauges, valves, etc can be square packing, rope or loose fibre

Packing material on window anchorage points in high-rise buildings

Paint, typically industrial epoxy paints

Penetrations through concrete slabs in high rise buildings

Pipe insulation including moulded sections, water-mix type, rope braid and sheet

Plaster and plaster cornice adhesives

Pipe insulation: moulded sections, water-mix type, rope braid and sheet

Pitch-based (zelemite, ausbestos, lebah) electrical switchboard

R

Refractory linings

Refractory tiles

Rubber articles: extent of usage unknown

S

Sealant between floor slab and wall, usually in boiler rooms, risers or lift shafts

Sealant or mastik on windows

Sealants and mastik in air conditioning ducting joints

Spackle or plasterboard wall jointing compounds

Sprayed insulation: acoustic wall and ceiling

Sprayed insulation: beams and ceiling slabs

Sprayed insulation: fire retardant sprayed on nut internally, for bolts holding external building wall panels

Stoves: old domestic type, wall insulation

T

Tape and rope: lagging and jointing

Tapered ends of pipe lagging, where lagging is not necessarily asbestos

Tilux sheeting in place of ceramic tiles in bathrooms

Trailing cable under lift cabins

Trains: country – guards vans – millboard between heater and wall

Trains – Harris cars – sprayed asbestos between steel shell and laminex

V

Valve and pump insulation

W

Welding rods

Woven asbestos cable sheath

Sources:

Environmental health notes number 2 guidelines for local government on asbestos, 2005 (Victorian Department of Human Services).

www.health.vic.gov.au/environment/downloads/hs523_notes2_web.pdf

NSW Taskforce Report: Loose-Fill Asbestos Insulation in NSW Homes (2015)

www.fairtrading.nsw.gov.au/biz_res/ftweb/pdfs/Tenants_and_home_owners/Loose_Fill_Abestos_Task_force_Report.pdf (accessed October, 2015).

Appendix K – Asbestos licences

Type of licence	What asbestos can be removed?
Class A	Can remove any amount or quantity of asbestos or asbestos containing material, including: - any amount of friable asbestos or asbestos containing material - any amount of asbestos containing dust - any amount of non-friable asbestos or asbestos containing material.
Class B	Can remove: - any amount of non-friable asbestos or asbestos containing material Note: A Class B licence is required for removal of more than 10 m² of non-friable asbestos or asbestos containing material but the licence holder can also remove up to 10 m² of non-friable asbestos or asbestos containing material. - asbestos containing dust associated with the removal of non-friable asbestos or asbestos containing material. Note: A Class B licence is required for removal of asbestos containing dust associated with the removal of more than 10 m² of non-friable asbestos or asbestos containing material but the licence holder can also remove asbestos containing dust associated with removal of up to 10m² of non-friable asbestos or asbestos containing material.
No licence required	Can remove: - up to 10 m² of non-friable asbestos or asbestos containing material - asbestos containing dust that is: - associated with the removal of less than 10 m² of non-friable asbestos or asbestos containing material - not associated with the removal of friable or non-friable asbestos and is only a minor contamination.

An asbestos removal contractor's licence can be verified by contacting SafeWork NSW's Certification Unit on 13 10 50.

19. PROCEDURE HISTORY

Responsible Officer	Position Title		
Next Review	DD Month 202Y		
Version Number	Endorsed by ELT	Endorsed by Consultative / Work Health Safety	Date Finalised
1 Adopted	DD/MM/YYYY	DD/MM/YYYY	DD/MM/YYYY
2 Reviewed	DD/MM/YYYY	DD/MM/YYYY	DD/MM/YYYY



Mobile Food Trading Policy 2025

POL062



NARRANDERA SHIRE COUNCIL

Chambers: 141 East Street Narrandera NSW 2700
Email: council@narrandera.nsw.gov.au

Phone: 02 6959 5510
Fax: 02 6959 1884



Policy No: POL062
Policy Title: Mobile Food Trading Policy
Section Responsible: Development & Environment
Minute No/Ref: XXXXXX
Doc ID: 572080

1. INTENT

The purpose of this policy is to identify Council controlled land where commercial mobile food trading may be approved to operate and to provide a functional framework for managing the approval and operation of commercial mobile food traders on these sites.

2. SCOPE

This policy applies to all commercial mobile food trading on Council controlled land where that trading is at:

- anytime or day, regardless of the frequency or duration
- a single location only
- multiple locations at different times, or simultaneously.

This policy identifies approved Council controlled land, listed in Appendix 1 to this Policy, on which commercial mobile food trading will be permitted.

This policy does not apply to mobile food trading, where that trading:

- i. meets the following development standards specified by the NSW State Environmental Planning Policy (Exempt and Complying Development Codes - Subdivision 27A Mobile food and drink outlets), where the trading:
 - a. has the consent of the owner of the land, being land that is not Council controlled land, on which the development is carried out, and
 - b. does not restrict any vehicular or pedestrian access to or from the land or entry to any building on the land, and
 - c. does not obstruct the operation of, or access to, any utility services on the land or on adjacent land, and

- d. is not located within the canopy of, or result in damage to, any tree growing on the land or on adjacent land, and
 - e. does not result in any damage to public property on the land or on adjacent land, and
 - f. if carried out on land within or immediately adjacent to a residential zone—is only carried out between 7.00 am and 7.00 pm on any day, and
 - g. if located on a public place—has any approval required under section 68 of the *Local Government Act 1993*, and
 - h. if located on private land—be limited to 1 development on that land and not contravene any conditions of a development consent for any other use carried out on the land.
- ii. is conducted on Council controlled land, but controlled by others under a lease, licence or agreement, and that mobile food trading is sanctioned by the lessee, sub-lease, licensee or other
 - iii. is part of an event, where that mobile food trading is sanctioned by the event organiser and covered by the event organiser's public liability and professional indemnity insurance
 - iv. is undertaken by a locally based, not for profit, volunteer-based group.

3. OBJECTIVE

This policy seeks to:

- Provide a fair and balanced approach to the use of public space
- Ensure safe, orderly and appropriate activation of public space
- Provide clarity and certainty for the community
- Formalise roles and responsibilities
- Manage the public risk

4. POLICY STATEMENT

The use of public land for commercial purposes is a privilege not a right. Council seeks to strike a balance between supporting mobile food trading for the benefits of public space activation and preserving those spaces for use by all. This policy seeks to provide assurance to the community that Council will manage mobile food trading on public land transparently, fairly and for the benefit of all.

5. PROVISIONS

5.1 GENERAL

Narrandera Shire Council's general position regarding mobile food trading will:

- support activation of public spaces
- ensure community safety is not compromised
- encourage diversity
- facilitate equitable access
- balance potential competitive and complementary impacts on other traders
- have regard to the social and economic impacts on Narrandera Shire
- require the prior approval from Council seven days before engaging in mobile food trading on any approved Council controlled land in accordance with the requirements of Section 68 of the Local Government Act 1993.
- Any Section 68 approval will be limited to 12 months with a maximum of 52 trading days per year.

5.2 LAND TO WHICH THIS POLICY APPLIES

Commercial mobile food trading will only be permitted on the Council controlled land identified on the Map of Approved Locations, as amended from time to time by NSC (Attachment 1 to this policy).

6. DEFINITIONS

- **Authorised officer:** any person appointed by Council for the purposes of the administration and enforcement of any Act, regulations or local laws which relate to the functions and powers of the Council.
- **Commercial Mobile Food Trading:** means a business based commercial operation that sells or offers for sale any food or drink for human consumption from a vehicle, caravan, table, stall or other similar structure on a not for profit basis.
- **Council:** means Narrandera Shire Council.
- **Council controlled land:** means any of the following

Land under the ownership of Narrandera Shire Council

Community land: being land that has been classified by Council as 'Community Land'.

Public land: being land that is any of the following

- a public road
- Crown Land under the management and control of NSC
- A Common under the management and control of NSC

Public place: being land that is any of the following

- a public reserve
- public swimming pool
- a public road or bridge
- a Crown reserve under the control and management of NSC
- **Locally based, not for profit, volunteer-based group:** includes but is not limited to a local school, community group, service club, Council committee, Church or emergency service organisation undertaking a fund raising event for community purposes.
- **Mobile food trader:** any person or persons who sell or offers to sell any food or drink for human consumption from a vehicle, caravan, table, stall or other similar structure.
- **Mobile food trading:** the sale or offering for sale of any food or drinks from a vehicle, caravan, trailer, table, stall or similar structure.
- **Suitably authorised person:** a person in a position with delegated authority to represent an organisation or agency.

7. ROLES AND RESPONSIBILITIES

7.1 COUNCILLORS

- Adoption of the policy.
- Identifying highly desirable and sustainable sites.

7.2 COUNCIL STAFF

- Administrative review of the policy and all associated reporting to Council
- Applying the policy
- Assessing and determining applications for mobile food trading under Section 68 of the *Local Government Act 1993*
- Ensuring permit holders comply with all conditions of approval
- Providing administrative support and oversight of tender processes
- Providing administrative support and oversight of leases, licences agreements

7.3 PERMIT HOLDERS

- Section 68 application is to be submitted to council not less than twenty-one days prior to the first trading date, with all prescribed fees to be paid in accordance with the NSC fees and charges for Mobile Food Vendors s68 – approval and annual renewal.
- Ensuring that approved mobile food trading is always conducted in accordance with all conditions specified in the approval by NSC.

- Ensuring that a copy of the permit or agreement is always available at the location the itinerant trading is occurring.

8. RELATED LEGISLATION

- Environmental Planning & Assessment Act 1979
- Environmental Planning & Assessment Regulations 2000
- Food Act 2003
- Local Government Act 1993
- Privacy Act 1988

9. RELATED POLICIES AND DOCUMENTS

- Economic Development Strategy 2024 – 2028

10. VARIATION

Council reserves the right to review, vary or revoke this policy in accordance with legislation, regulation and award changes, where applicable. Council may also make changes to this policy and the relevant procedures from time-to-time to improve the effectiveness of its operation.

11. PREVIOUS VERSIONS

Reference to a superseded policy number and/or name is also considered a reference to the new policy number. This policy was previously named:

- Not applicable.

POLICY HISTORY

Responsible Officer	Deputy General Manager Infrastructure		
Approved by	General Manager		
Approval Date	DD Month 202Y <<ADMIN: date that GM signature is added>>		
GM Signature (Authorised staff to insert signature)			
Next Review	August 2029		
Version Number	Endorsed by ELT	Endorsed by Council	Date signed by GM
1 Adopted	26/10/2021	17/05/2022	23/05/2022
2 Reviewed	DD/MM/YYYY	DD/MM/YYYY	DD/MM/YYYY

NOTE: This is a controlled document. If you are reading a printed copy, please check that you have the latest version via Council's website (external) or MagiQ (internal). Printed or downloaded versions of this document are uncontrolled.

Attachment 1: Mobile Food Trading Map of Approved Locations





Body Worn Video Device Policy 2025

POL080



NARRANDERA SHIRE COUNCIL

Chambers: 141 East Street Narrandera NSW 2700
Email: council@narrandera.nsw.gov.au

Phone: 02 6959 5510
Fax: 02 6959 1884



Policy No: POL080
Policy Title: Body Worn Video Device Policy
Section Responsible: Development & Environment
Minute No: XXXXXXXX
Doc ID: 516117

1. INTENT

Body-worn video devices (BWVD) is an overt method by which staff may obtain and secure audio and visual evidence at the scene of an incident or an offence or during the course of investigating an incident or an offence.

Recordings are made and retained for operational purposes and for potential use in Court proceedings. They are restricted and should not be shown or given to unauthorised persons.

The use of BWVD can defuse potentially volatile situations by promoting public assurance and reducing antisocial behaviour. Recordings may provide irrefutable evidence that may assist in the prosecution of cases and reduce the reliance on victim statements as evidence, particularly those who may be vulnerable or reluctant to attend Court.

2. SCOPE

The policy applies to Narrandera Shire Council Rangers, Manager Development & Environment, Information Technology staff, Deputy General Manager – Infrastructure and General Manager.

3. OBJECTIVE

The objectives of this Procedure are to:

1. Provide awareness about the aspects which must be considered and the requirements for the use of BWD in the performance of Council's regulatory functions.
2. Facilitate provision of video evidence for use in potential Court proceedings.
3. Ensure the use of BWD does not result in adverse impact to Councils IT network.
4. Protect the privacy of individuals and ensure that individuals who may be recorded are aware that recording is taking place.
5. Assist in the defusing of conflicting or contentious situations involving individuals.

4. PROVISIONS

4.1 PRIOR TO USE

1. Prior to the use of BWVD the Authorised Officers must have completed training in its use and operation.
2. The equipment is to be checked by the user prior to departure to ensure that it is ready for operation. The device must have adequate storage and the correct date/time setting.
3. The device must be affixed to the user's top left chest area in stand-by mode with the power switch on top.

4.2 RECORDING

1. Use of the body worn video device is mandatory and is to be used in all compliance enforcement situations for the protection of the authorised officer and for the capture of admissible evidence.
2. Recording must be incident-specific and not indiscriminately record entire duties or patrols.
3. Recordings are to include video and audio at incidents that would normally be the subject of an official notebook entry or penalty infringement notice. All such situations are to be treated as potentially evidential.
4. It is evidentially important to record as much of an incident as possible. Recording should begin at the earliest opportunity at the start of an incident, so users should commence recording immediately the user becomes aware of a potential incident.
5. Incidents include the following:
 - o Any situation subject to an official notebook entry.
 - o Any enforcement actions.
 - o Any PINS situation.
 - o Any situation where evidence may be gained.
 - o Staff actions that may require investigation.
6. At the commencement of any recording, the user should make a verbal announcement to indicate why the recording has been activated including stating the date, time and location and the nature of the incident.
7. Immediately the officer meets a person(s) the following statement (or similar) is to be made;
My name is and I am a ranger for Narrandera Shire Council. I am video recording this conversation/ incident. You are not obliged to say or do anything, you may move away from the camera.
8. Recording must continue uninterrupted from the beginning to the conclusion of the incident or the resumption of normal duties.

4.3 MANAGEMENT OF RECORDINGS

1. Recordings must be transferred and uploaded by the user of the BWVD to the approved computer file immediately on return to the Council Administration Centre, via an automatic docking process.
2. The BWVD wearer is not to view or delete or edit the recordings at any time.
3. All recordings will be stored in accordance with the Surveillance Devices Act 2007.
4. Recordings will not be deleted unless the Deputy General Manager – Infrastructure has so authorised and where the matter has been finalised and no further risk to Council presents.
5. Recordings are to be stored in a secure manner and access to them will be restricted to the General Manager, Deputy General Manager – Infrastructure and IT Manager in accordance with POL147 Records Management Policy 2024.
6. Public access to recordings will be managed in accordance with POL020 Access to Council Information Policy 2024.

4.4 MONITORING

4.4.1 Audit and Review

1. Regular audits shall be made of recorded incidents for quality assurance purposes.
2. Should reviews identify areas of potential misconduct an assessment and appropriate action is to be taken.
3. Potential misconduct includes deliberate obstruction of the camera lens, failing to record an obvious incident and interrupting a recording without good reason.

4.4.2 Complaints

1. All complaints received from the public about the conduct of an authorised officer must be recorded through MagiQ.
2. The complainant should be made aware when the BWVD exists.
3. The General Manager or Deputy General Manager – Infrastructure may show the footage to the complainant and provide a commentary of the facts shown in the footage together with an explanation of any procedures disclosed.
4. Where BWVD recordings are made available this should be reviewed by the appropriate officer and a sealed master copy made.
5. If the complaint is withdrawn, a record should be made and signed by the complainant.

4.5 MAINTENANCE OF EQUIPMENT

1. Equipment must be kept maintained to a standard so it is in good working order.
2. Equipment must be charged prior to use.
3. Time and date settings must be synchronised with a central clock.
4. The camera lens should be clean and the picture clarity of suitable quality.

5. In the event of a fault or problem, the device should be repaired or replaced.

5. DEFINITIONS

- Body-worn video devices (BWVD)

6. ROLES AND RESPONSIBILITIES

- Compliance Officer
- Deputy General Manager – Infrastructure
- Development & Environment Manager
- General Manager
- IT Manager

7. RELATED LEGISLATION

- Crimes Act 1900
- Evidence (Audio- and Audio-Visual Links) Act 1998
- Evidence Act 1995
- Government information (public access) Act 2009
- Interpretation Act 1987
- Surveillance Devices Act 2007 Sect 7
- The Companion Animals Act 1998
- The Local Government Act 1993
- The Privacy and Personal Information Protection Act 1998
- The Workplace Video Surveillance Act 1998

8. RELATED POLICIES AND DOCUMENTS

- POL147 Records Management Policy 2024
- POL020 Access to Council Information Policy 2024

9. VARIATION

Council reserves the right to review, vary or revoke this policy in accordance with legislation, regulation and award changes, where applicable. Council may also make changes to this policy and the relevant procedures from time-to-time to improve the effectiveness of its operation.

10. PREVIOUS VERSIONS

Reference to a superseded policy number and/or name is also considered a reference to the new policy number. This policy was previously named:

- N/A

POLICY HISTORY

Responsible Officer	Position Title		
Approved by	General Manager		
Approval Date	DD Month 202Y (ADMIN: date GM signature added)		
GM Signature <i>(Authorised staff to insert signature)</i>			
Next Review	August 2029		
Version Number	Endorsed by ELT	Endorsed by Council	Date signed by GM
1 Adopted	25/08/2020	20/10/2020	4/12/2020
2 Reviewed	DD/MM/202Y	DD/MM/202Y	DD/MM/202Y

NOTE: This is a controlled document. If you are reading a printed copy, please check that you have the latest version via Council's website (external) or MagiQ (internal). Printed or downloaded versions of this document are uncontrolled.

11. Acknowledgement of Training Received

I hereby acknowledge that I have received, read and understood a copy of Council's Body Worn Video Policy.	
Employee Name	
Position Title	
Signature	
Date	



Compliance and Enforcement Policy 2025 POL092



NARRANDERA SHIRE COUNCIL

Chambers: 141 East Street Narrandera NSW 2700
Email: council@narrandera.nsw.gov.au

Phone: 02 6959 5510
Fax: 02 6959 1884



Policy No: POL092
Policy Title: Compliance and Enforcement Policy
Section Responsible: Development & Environment
Minute No/Ref: XXXXX
Doc ID: 607317

1. INTENT

The intent of this policy is to provide structure for consistency and transparency in decision-making, and to facilitate a proportional approach to compliance and enforcement. It is also intended to assist Council staff to act promptly, effectively, and consistently in response to allegations of unlawful activity.

2. SCOPE

This policy applies to all areas within the Narrandera Local Government Area and the officers who are authorised to investigate unlawful activity and proactive compliance monitoring, including but not limited to:

- Planning – development controls, development consents, certification of complying developments and change of use approvals.
- Building and construction – certification and compliance with building standards and fire safety requirements.
- Environmental protection – native vegetation, biosecurity, waste management, noise control, riverine protection, underground petroleum storage systems, stormwater drainage, sewage and grey water systems, contaminated land and solid fuel heaters.
- Public health and safety – food safety, mobile food vendors, skin penetration businesses, cooling towers, warm water system and swimming pools.
- Parking and transport – road openings and closures, structures in or over roadways or footways, traffic management plans and controls, public car parks and road access.
- Companion animal management – registration of dogs and cats, dangerous dogs and surrendered animals.
- Liquor and restaurants – controls on licensed premises and restaurants on footpaths.
- Public areas and issues – graffiti, hoardings, signs, waste bins, protection of public places, busking, street theatre, parks and playgrounds, public events, trees and filming.

- Other activities – hairdressers, beauty salons, mortuaries, backpacker accommodation, boarding houses, camping grounds and caravan parks.

3. OBJECTIVE

The objective of this policy is to:

- Ensure that the Council's functions are exercised consistently and without bias, in accordance with its obligations under section 8 of the *Local Government Act 1993*.
- Provide information for all internal and external stakeholders and interested parties about Council's position on compliance and enforcement matters in the local government area.
- Outline matters to be considered at the various stages of the enforcement process, from the receipt and investigation of reports alleging unlawful activity through to what enforcement option Council will choose and whether to commence criminal or civil proceedings.
- Outline how staff decide whether enforcement action is warranted and what type of enforcement action is appropriate in the circumstance.
- In certain circumstances, Council will have shared enforcement responsibilities with other regulatory authorities. This policy sets out a collaborative and cooperative approach to such matters. Advice and guidance is also provided on the role of council in building and construction compliance matters where there is a private certifier, and the role of councillors in enforcement.
- Responsible Council staff are not limited by this policy in their use of discretion and exercise of official functions. The full circumstances and facts of each case need to be considered and a decision made on the merits.

4. POLICY STATEMENT

Council has statutory obligations as a regulatory authority under several different legislations including in the monitoring of food service venues, the structural and fire safety of buildings and public areas, ensuring the safety of public roads and other public spaces, the effective control of pollution (including noise, water, air and visual pollution), unsafe or unhealthy conditions and compliance with development consents, approvals and permits.

5. PROVISIONS

5.1 COMPLIANCE AND ENFORCEMENT PRINCIPLES

Principle	Action
Accountable and transparent	• Acting in the best interests of public health and safety and in the best interests of the environment. • Ensuring accountability for decisions to take or not to take action. • Acting fairly and impartially and without bias or unlawful discrimination. • Providing information about compliance and enforcement priorities and reasons for decisions to improve understanding and certainty and promote trust by the regulated community. • Ensuring meaningful reasons for decisions are given to all relevant parties, particularly when there is a departure from this policy.

	• Acting on any complaints or concerns about the conduct of compliance officers in accordance with Council's complaints management policy and procedures. • Advising people and organisations subject to enforcement action of any avenues available to seek an internal or external review of a decision.
Consistent	• Ensuring all compliance and enforcement action is implemented consistently. • Encouraging reports about possible unlawful activity by acting reasonably in response to the circumstances and facts of each matter.
Proportional	• Ensuring the level of enforcement action is proportionate to the level of risk and seriousness of the breach. • Making cost-effective decisions about enforcement action. • Taking action to address harm and deter future unlawful activity.
Timely	• Ensuring responses to reports alleging unlawful activity and decision making in relation to those is done in a timely manner.

5.2 RESPONDING TO CONCERNS ABOUT UNLAWFUL ACTIVITY

5.2.1 How reports alleging unlawful activity will be dealt with by Council

- Council will record and assess every report alleging unlawful activity. Council will respond to every such report unless the person raising the matter has indicated they do not wish to receive a response about Council's handling of the matter, or the report is anonymous.
- Not all reports will need to be investigated. A preliminary assessment of all matters will be made to determine the priority for a response and whether investigation or other action is required.
- An investigation of alleged unlawful activity may take a significant amount of time to complete, particularly where the issues are complex. If Council decides to investigate, staff will give the person who reported the alleged unlawful activity regular feedback on the progress of the investigation and any reasons for delay. This does not mean that the individual can expect to be given details about every aspect of the investigation or information that would compromise the integrity of the investigation.
- Decisions about what action should be taken by Council are made at Council's discretion. This objective is that reports alleging unlawful activity will be resolved to the satisfaction of Council and not necessarily to the satisfaction of the person raising the matter. Council will generally try to resolve matters as quickly and informally as possible to avoid the need to take formal action.
- Council staff will endeavour to manage the expectations of people who report alleged unlawful activity and explain that in the absence of sufficient evidence of unlawful activity, Council may be unable to take further action. They will also be advised that Council does not have unlimited resources and powers to deal with reports alleging unlawful activity. If Council is unable to fully investigate or take action on a matter due to being restricted by legal or resource limitations this will be relayed to the customer.

5.2.2 Confidentiality of people who report allegations of unlawful activity

People who report allegations of unlawful activity should not expect that their identity will remain confidential from the subject of their report in all circumstances. Council may have to disclose information that identifies them in the following cases:

- The disclosure is necessary to investigate the matter.
- Their identity has already been disclosed to the subject of their report directly or in a publicly available document.
- The individual was consulted following receipt of a *Government Information (Public Access) Act 2009* application and did not object to the disclosure.
- The individual consents in writing to their identity being disclosed.
- The disclosure is required to comply with principles of procedural fairness.
- The matter proceeds to court.

Council will take seriously any concerns an individual may have about their physical safety being endangered as a result of making a report. However, this may limit Council's ability to investigate the matter.

5.2.3 What Council expects from people who report allegations of unlawful activity

Council expects that people who report allegations of unlawful activity will cooperate and act in good faith in respect of any investigations conducted by Council. This includes:

- Providing a clear description of the problem (and the resolution sought, if relevant).
- Giving all available and relevant information to Council, including any new information about the alleged activity that may become known to the person after making the initial report.
- Not giving information that is intentionally misleading or wrong.
- Cooperating with Council's inquiries and giving timely responses to questions and requests for information.
- Treating Council's staff with courtesy and respect.
- Allowing the investigation to be completed without prematurely taking the matter to other agencies unless referred to by Council.

If these expectations are not met, Council may need to set limits or conditions on the continuation of the investigation or may need to restrict any further communications with the individual.

Any unreasonable conduct will be dealt with in accordance with the principles of the NSW Ombudsman's Managing Unreasonable Complainant Conduct Manual 2021 and any applicable Council policy.

5.2.4 What parties can expect from Council staff

People who report alleged unlawful activity, as well as individuals or businesses that are subject to investigation and any enforcement action, can expect that Council staff will:

- Treat them with courtesy and respect.
- Advise them of the outcome of the allegation reported, including an explanation of the reasons why an outcome is considered to be reasonable.
- Clearly explain decisions in plain English.

- Provide information about any relevant internal and external appeal processes that may be available.
- Carefully assess any new information provided by any party after a decision has been made and advise whether further action will be taken.

5.2.5 Complaints about Council's enforcement actions

- Any complaints about Council's handling of reports alleging unlawful activity will be recorded separately and handled in accordance with Council's complaints management procedures.
- Where a person or organisation subject to enforcement action merely disputes Council's decision to take enforcement action against them, they will be directed to make representations in accordance with any relevant internal and external appeal processes.
- Council staff will act on any complaints about the conduct of compliance officers in accordance with Council's complaints management policy and procedures and the code of conduct.

5.2.6 Complaints about Council's enforcement actions

Anonymous reports will be recorded and assessed in accordance with the above requirements. However, because it is not possible to seek clarification or additional information about a matter, it may be more difficult to evaluate the allegations and these reports are less likely to warrant investigation.

5.2.7 Unlawful activity outside business hours

- Unlawful activity can occur outside business hours. Council may receive reports about matters such as offensive noise and failure to comply with limitations on hours of operation during nights and weekends.
- Due to resource and operational capability restraints, investigations into alleged unlawful activity outside business hours will be assessed on the basis of risk of harm to health, welfare, safety, property or the environment or it is otherwise in the public interest to take such action.

5.2.8 Neighbour disputes

When a dispute between neighbours is a civil matter, Council will often have no authority to resolve the issue. In such cases the parties may be referred to LawAccess NSW and Community Justice Centres.

5.3 TAKING ENFORCEMENT ACTION

When deciding whether to take enforcement action in relation to a confirmed case of unlawful activity, Council will consider the full circumstances and facts of the matter and the public interest. The following common considerations will assist Council staff in determining the most appropriate response in the public interest:

Considerations about the alleged offence and impact:

- The nature, extent and severity of the unlawful activity, including whether the activity is continuing.
- The harm or potential harm to the environment or public health, safety or amenity caused by the unlawful activity.
- The seriousness of the breach, including whether the breach is merely technical or trivial in nature.

- The time period that has lapsed since the date of the unlawful activity.

Considerations about the alleged offender:

- Any prior warnings, instructions, advice that was issued to the person or organisation reported or previous enforcement action taken against them.
- Whether the offence was committed with intent.
- Whether the person or organisation reported has been proactive and assisted in the resolution of the matter.
- With any Council requirements and instructions.
- Any mitigating or aggravating circumstances demonstrated by the alleged offender.
- Any circumstances of hardship affecting the person or organisation reported.

Considerations about the impact of any enforcement action:

- The need to deter any future unlawful activity.
- Whether an educative approach would be more appropriate than a coercive approach in resolving the matter.
- The prospect of success if the proposed enforcement action was challenged in court.
- The costs and benefits of taking formal enforcement action as opposed to taking informal or no action.
- What action would be proportionate and reasonable in response to the unlawful activity.
- Whether Council is prevented from taking action based on earlier advice given, ie: whether an estoppel situation has been created.

Considerations about the potential for remedy:

- Whether the breach can be easily remedied.
- Whether it is likely consent would have been given for the activity if it had been sought.
- Whether there is a draft planning instrument on exhibition that would make the unauthorised use legal.

5.3.1 Legal or technical issues

Where legal and/or technical issues are in question, Council staff will consider whether legal advice or professional advice from duly qualified staff or other experts should be obtained and considered. Council may also require a person subject to possible enforcement action to obtain professional advice in relation to issues of concern to Council for assessment as to whether further action is required.

5.3.2 Requirements of Council staff considering enforcement action

- Prior to taking enforcement action, Council staff will take into account the above considerations as well as the evidence gathered during the investigation. Council staff must act impartially, be mindful of their obligations under Council's Code of Conduct, and not act as a decision-maker in relation to any matter in which they have a personal interest. Enforcement action will not be taken purely as a response to the conduct of an individual, such as persistent demands or threats.
- Council staff are required to maintain records about critical thinking and decision-making processes in relation to reports alleging unlawful activity and any enforcement action, as well as records of interactions with relevant parties. Council

staff will at all times adhere to Council's internal approval processes prior to the commencement of any enforcement action.

- Council staff will take steps to ensure that any enforcement action is taken against the correct person or organisation. Where there are multiple possible parties to an alleged unlawful activity, it will generally not be appropriate to take enforcement action against every person who may be liable for the alleged unlawful activity. In such circumstances, Council staff will be guided by legal advice in determining the appropriate persons to pursue.

5.4 OPTIONS FOR DEALING WITH CONFIRMED CASES OF UNLAWFUL ACTIVITY

- Council will try to use the quickest and most informal option to deal with unlawful activity wherever possible, unless there is little likelihood of compliance with such options. Council staff will use discretion to determine the most appropriate response to confirmed cases of unlawful activity and may take more than one approach.
- Any enforcement action taken by Council will depend on the full circumstances and facts of each case, with any decision being made on the merits.
- At all times, Council's key concerns are:
 - to prevent or minimise harm to health, welfare, safety, property or the environment; and
 - to influence behaviour, change for the common good and on behalf of the community.
- The following enforcement options to be considered by Council are ordered to reflect an escalation in response that is proportionate to the level of risk, the seriousness of the confirmed breach or the need for a deterrent:

Level of risk	Enforcement options
Very low	• Take no action on the basis of a lack of evidence or some other appropriate reason. • Provision of information/advice on how to be compliant.
Low	• Negotiating with the person to obtain voluntary undertakings or an agreement to address the matter. • The issues of concern issuing a warning or a formal caution.
Medium	• Issuing a letter requiring work to be done or activity to cease in lieu of more formal action. • Issuing a notice of intention to serve an order or notice under relevant legislation, and then serving an order or notice if appropriate.
High	• Issuing a penalty notice. • Carrying out the works specified in an order at the cost of the person served with the order.
Very High	• Seeking an injunction through the courts to prevent future or continuing unlawful activity. • Commence legal proceedings for an offence against the relevant Act or Regulation.

5.4.1 Following up enforcement action

All enforcement action will be reviewed and monitored to ensure compliance with any undertakings given by the subject of enforcement action or advice, directions or orders issued by Council. Reports alleging continuation of unlawful activity will be assessed and further action taken if necessary. If the unlawful activity has ceased or the work has been rectified, the matter will be resubmitted for follow up action to ensure compliance outcomes are met. Should initial enforcement action be found to have been ineffective, Council staff will consider other enforcement options.

5.4.2 Following up enforcement action

Penalty notices are a way of imposing a fine on a person who an authorised officer believes is guilty of an offence without commencing criminal proceedings against them. Generally, penalty notices are appropriate where:

- The breach is not serious or ongoing; the degree of harm is low.
- The facts appear unable to be denied or disputed.
- The imposition of the penalty is likely to provide a practical and viable deterrent.
- There are no aggravating factors.

Authorised officers can issue penalty notices in accordance with their statutory responsibilities and delegations, this policy and any guidelines or operating procedures.

- Penalty notices are not appropriate where the breach is on-going or where the prescribed penalty is not adequate to address the severity of the offence. For example, repeated issuing of penalty notices is not appropriate where there have been ongoing instances of unauthorised activity, such as ongoing non-compliance with conditions of consent. Council staff should also consider whether it is appropriate to issue a formal caution as an alternative to issuing a penalty notice in appropriate circumstances and in accordance with the Attorney-General's Caution Guidelines.
- Where an authorised officer proposes (after conducting an investigation of a complaint and assessing the circumstances of the matter in accordance with the criteria outlined above) to issue a penalty notice, the issue of that notice should only be in circumstances where the authorised officer is satisfied that there is sufficient evidence to establish that the offence was committed.
- In circumstances where it is proposed to issue a penalty notice on the basis of information provided only by a complainant (ie: a person who is not a Council staff member), the evidence must include a statutory declaration signed by the proposed witness and confirmation that the witness is prepared to give evidence in court if necessary. Wherever possible it should also include objective evidence demonstrating the offence, for example, photographs. Council staff should be particularly cautious when issuing penalty notices based only on evidence provided by a complainant, with prima facie evidence required.

5.1 TAKING LEGAL ACTION

The council and its delegated staff will be guided by legal advice in deciding whether to commence criminal or civil proceedings and will consider the following:

- Whether there is sufficient evidence to establish a case to the required standard of proof.
- Whether there is a reasonable prospect of success before a court.

- Whether the public interest warrants legal action being pursued.

5.1.1 Whether there is sufficient evidence to establish a case to the required standard of proof

- Council considers the decision to take legal action a serious matter and, as such, will only initiate and continue proceedings once it has been established that there is admissible, substantial and reliable evidence to the required standard of proof.
- The basic requirement of any criminal prosecution is that the available evidence establishes a prima facie case. The prosecutor is required to prove the elements of the offence beyond reasonable doubt.
- In civil enforcement proceedings, Council will require sufficient evidence to satisfy the court that an actual or threatened breach has occurred on the balance of probabilities.

5.1.2 Whether there is a reasonable prospect of success before a court

Given the expense of legal action, Council will not take legal action unless there is a reasonable prospect of success before a court. In making this assessment, Council staff will consider the availability, competence and credibility of witnesses, the admissibility of the evidence, all possible defences, and any other factors which could affect the likelihood of a successful outcome.

5.1.3 Whether the public interest requires legal action be pursued

- The principal consideration in deciding whether to commence legal proceedings is whether to do so is in the public interest. In making this determination, the same factors to be considered when taking enforcement action apply (see Section 5.3, Taking Enforcement Action).
- The following considerations relate more specifically to the decision to commence legal proceedings and will assist council and its delegated staff in making this determination:
 - The availability of any alternatives to legal action.
 - Whether an urgent resolution is required (court proceedings may take some time).
 - The possible length and expense of court proceedings.
 - Any possible counter-productive outcomes of prosecution.
 - What the effective sentencing options are available to the court in the event of conviction.
 - Whether the proceedings or the consequences of any resulting conviction would be unduly harsh or oppressive.

5.1.4 Time within which to commence proceedings

Council staff must be aware of legislative time limits in which enforcement proceedings must be commenced. Sometimes legal action will be statute barred despite good evidence that unlawful activity has occurred.

6. DEFINITIONS

For the purpose of this policy, the following definitions apply:

Term	Meaning
Authorised Officer	Staff member of Council authorised under legislation and by internal delegations to carry out compliance action on behalf of Council.
Complaint	A complaint is an expression of dissatisfaction made about Council services, staff or the handling of a complaint, where a response or resolution is explicitly or implicitly expected or legally required. For the purposes of this policy, a complaint does not include: • A report alleging unlawful activity (see definition below). • A request for information about a Council policy or procedure. • A request for an explanation of actions taken by Council. • A request for internal review of a Council decision.
Enforcement	Actions taken in response to serious or deliberate contraventions of laws.
Regulation	Using a variety of tools and strategies to influence and change behaviour to achieve the objectives of an Act, Regulation or other statutory instrument administered by Council.
Report alleging unlawful activity	An expression of concern or a request for service in relation to alleged unlawful activity, where a response or resolution is explicitly or implicitly expected or legally required.
Unlawful activity	Any activity or work that has been or is being carried out: • Contrary to the terms and conditions of a development consent, approval, permit or licence. • Contrary to an environmental planning instrument that regulates the activities or work that can be carried out on particular land. • Contrary to a legislative provision regulating a particular activity or work. • Without a required development consent, approval, permit or licence. • Contrary to legislation in relation to which the Council is the appropriate regulatory authority. • Includes any activity, place or structure which is a risk to public health and safety but excludes any parking or traffic offences, which are dealt with in accordance with the Australian Road Rules.

7. ROLES AND RESPONSIBILITIES

7.1 STAFF

Council receives information about alleged unlawful activity from members of the public, contact from other government agencies and information gathered by its officers during proactive inspections.

All Council staff who deal with reports alleging unlawful activity are responsible for implementing this policy. Council staff are also responsible for ensuring that any other

possible unlawful activity identified as a result of an inspection, proactive enforcement or other activity is brought to the attention of the appropriate section of Council.

Council staff are required to:

- Treat all relevant parties with courtesy and respect.
- Communicate with all relevant parties and provide feedback on the progress of an investigation and any reasons for delay without compromising the integrity of the investigation.
- Make full and proper records in relation to the assessment and investigation of reports alleging unlawful activity, including reasons for any decisions.
- Inform all relevant parties of reasons for decisions.
- Provide as much information as possible to all relevant parties about the outcomes of investigations to show that adequate and appropriate action was taken and/or is proposed to be taken in response to a report of alleged unlawful activity.
- Provide information to all relevant parties about any avenues to seek an internal or external review of a decision.

All reports alleging unlawful activity are to be entered into Council's records management system and actioned in a timely manner by the appropriate business unit.

Only Council staff with appropriate delegations from the General Manager can undertake investigations or compliance and enforcement action in relation to this policy.

7.2 DEPUTY GENERAL MANAGER / MANAGER

- Ensure all delegated staff are aware of the policy requirements.
- Monitor compliance with the policy.
- Determine required level of enforcement action as detailed within the policy.

7.3 GENERAL MANAGER

- Provide delegations to relevant staff to ensure ability to undertake the functions detailed within the policy.
- Advise the elected members of the policy and the importance of consistently applying the policy.

7.4 COUNCILLORS

Compliance and enforcement matters are sensitive and easily susceptible to allegations of impropriety, bias or inconsistency. To manage those risks, and be consistent with Councillors' Code of Conduct, Councillors do not attend on-site meetings with Council staff, the complainants, or persons the subject of investigation or enforcement action, or direct staff in relation to particular outcomes relating to investigations or enforcement options or actions.

Councillors can help individuals who raise concerns with them by referring them to the relevant areas for the appropriate action to take place as outlined in this Policy.

8. RELATED LEGISLATION

- Local Government Act 1993.

9. RELATED POLICIES AND DOCUMENTS

- NSW Ombudsman “Enforcement Guidelines for Councils” and “Model Policy” (2015).

10. VARIATION

Council reserves the right to review, vary or revoke this policy in accordance with legislation, regulation and award changes, where applicable. Council may also make changes to this policy and the relevant procedures from time-to-time to improve the effectiveness of its operation.

11. PREVIOUS VERSIONS

- Not applicable. New policy based on the NSW Ombudsman “Enforcement Guidelines for Councils” and “Model Policy” (2015).

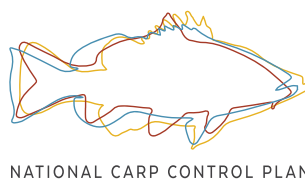
POLICY HISTORY

Responsible Officer	Deputy General Manager Infrastructure		
Approved by	General Manager		
Approval Date	DD Month 202Y (ADMIN: date GM signature added)		
GM Signature (Authorised staff to insert signature)			
Next Review	August 2029		
Version Number	Endorsed by ELT	Endorsed by Council	Date signed by GM
1 Adopted	26/04/2022	21/06/2022	26/08/2022
2 Reviewed	DD/MM/YYYY	DD/MM/YYYY	DD/MM/YYYY

NOTE: This is a controlled document. If you are reading a printed copy, please check that you have the latest version via Council’s website (external) or MagiQ (internal). Printed or downloaded versions of this document are uncontrolled.

12. Acknowledgement of Training Received

I hereby acknowledge that I have received, read and understood a copy of Council's Compliance and Enforcement Policy.	
Employee Name	
Position Title	
Signature	
Date	

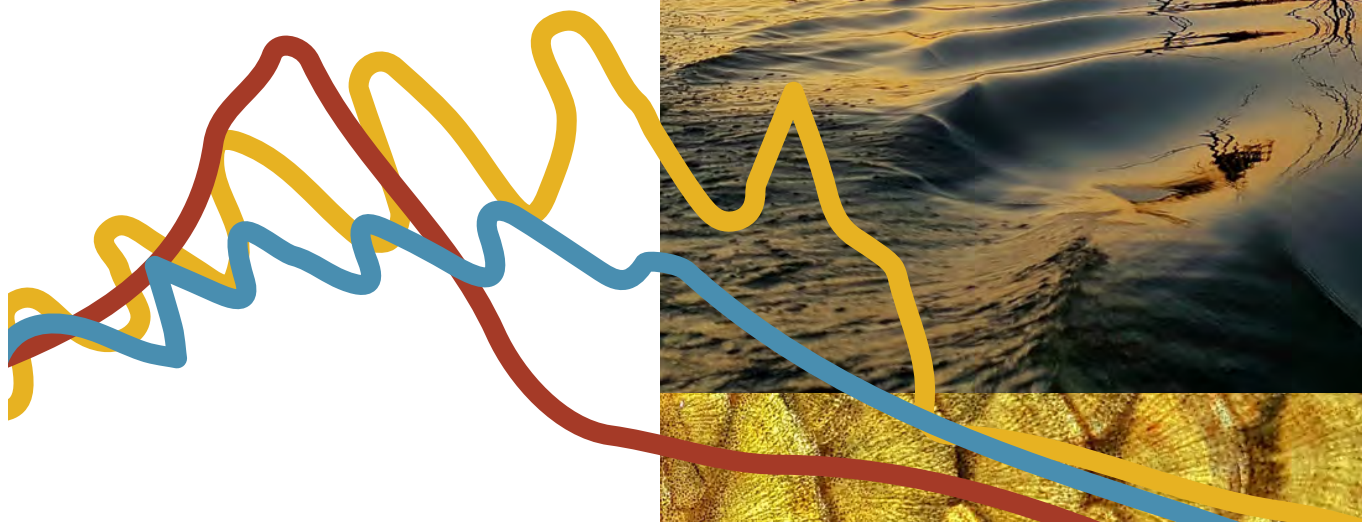


Submitted to
the Department
of Agriculture,
Fisheries and Forestry
representing the
Australian Government

September 2022



The National Carp Control Plan



This document fulfils the requirements of a contract between the Fisheries Research and Development Corporation (FRDC) and the Australian Government to develop the National Carp Control Plan (NCCP). It will be used to inform decision making on whether to proceed with additional activities assessing the carp virus as a carp-control measure in Australia. The information and recommendations in this document represent the latest research and the associate limitations and assumptions of that research.



FRDC

Locked Bag 222, Deakin West ACT 2600

T: 02 6285 0400 E: frdc@frdc.com.au

The FRDC through investing in knowledge, innovation, and marketing aims to increase economic, social and environmental benefits for Australian fishing and aquaculture, and the wider community. The FRDC is a co-funded partnership between its two stakeholders, the Australian Government and the fishing and aquaculture sectors,



**Australian Government****Fisheries Research and Development Corporation**

30 September 2022

The Fisheries Research and Development Corporation (FRDC) is pleased to present the National Carp Control Plan (NCCP, or the Plan) for consideration by the Australian Government.

The NCCP provides an extensive body of research and analysis to inform decision making about the potential use of a virus for biological control of European Carp, or common carp, in Australia. The Plan is the culmination of almost six years' work, including an extended interruption to laboratory studies during the COVID-19 pandemic. The research program underpinning the Plan involved 19 peer-reviewed studies and numerous planning investigations considering various aspects of carp biocontrol. This work represents the largest body of research ever undertaken to evaluate the possible use of a biological control agent for an aquatic pest. Results from this research provide an evidence base to help decision makers determine next steps regarding this important national issue.

Controlling an established pest fish that inhabits varied ecosystems across a vast swathe of south-eastern Australia presents a significant challenge. The Plan has taken a systems approach to dealing with this complex issue. Therefore, while the Plan's research outputs represent enduring contributions to knowledge for pest fish control, the broader process underpinning the Plan's development may also provide insights applicable to other issues at the interface of science, policy, and society.

Uncertainties regarding the release of the virus remain, but this is to be expected given the complexity of the work undertaken. The Plan identifies these uncertainties and sets out actions that may reduce them in an effort to assist further government decision making. Nonetheless, a decision on whether or not to release the virus will always involve some uncertainty. Decision makers will wish to consider residual uncertainties in the context of the scale of the carp problem, and in relation to other relevant factors such as costs, and the regulatory and policy environment.

We commend the Plan to your attention and look forward to the next stages of this important process.

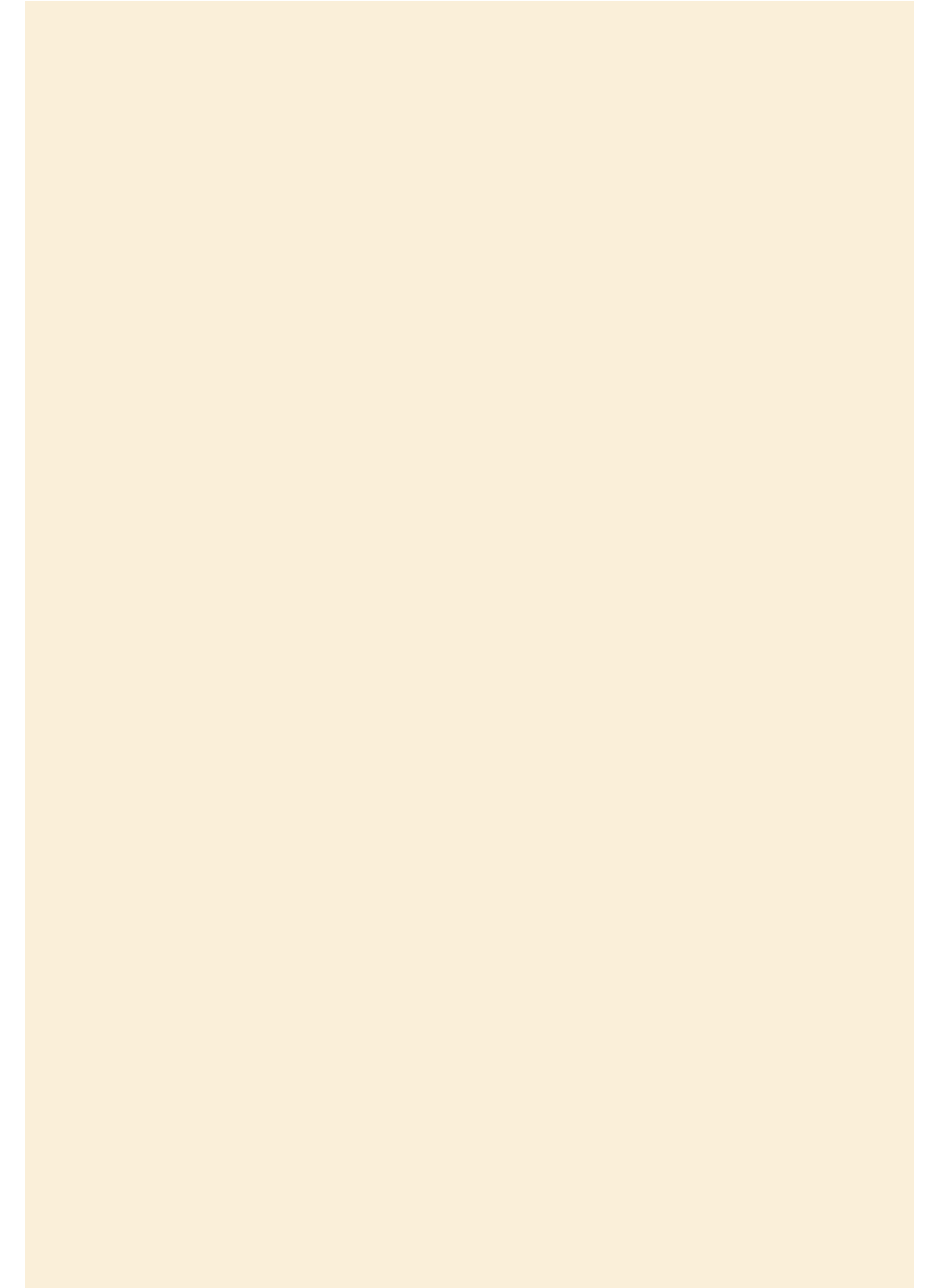
Yours sincerely

Patrick Hone
FRDC Managing Director



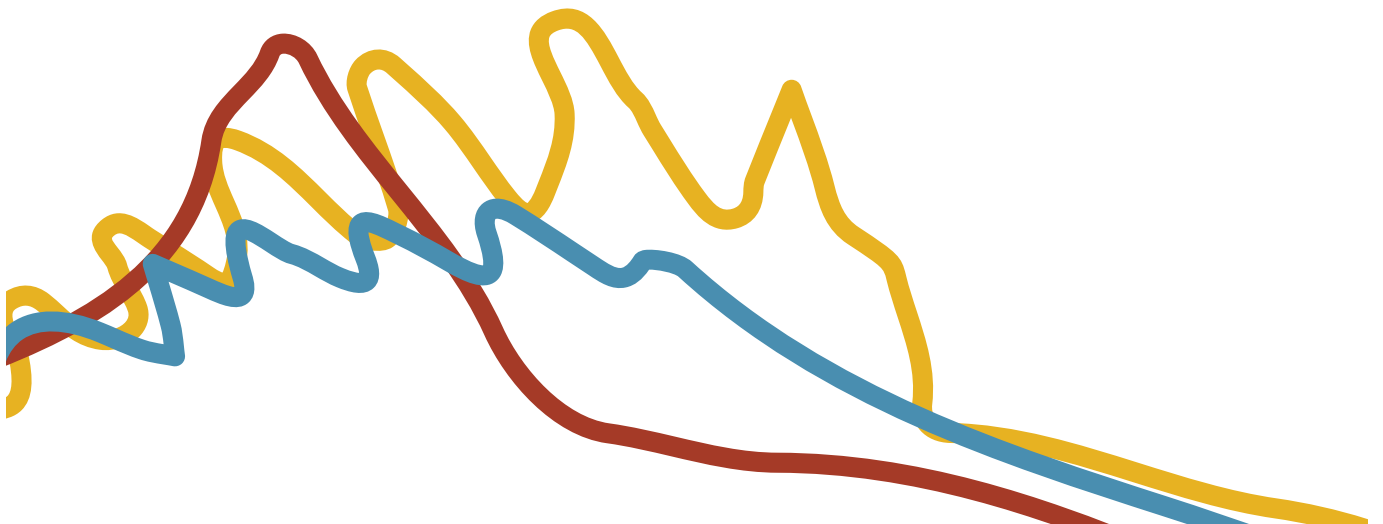
Fisheries Research and Development Corporation
Postal address: Locked Bag 222, Deakin West ACT 2600 Australia
Office location: Fisheries Research House, 25 Geils Court Deakin ACT
T: 02 6285 0400 E: frdc@frdc.com.au www.frdc.com.au

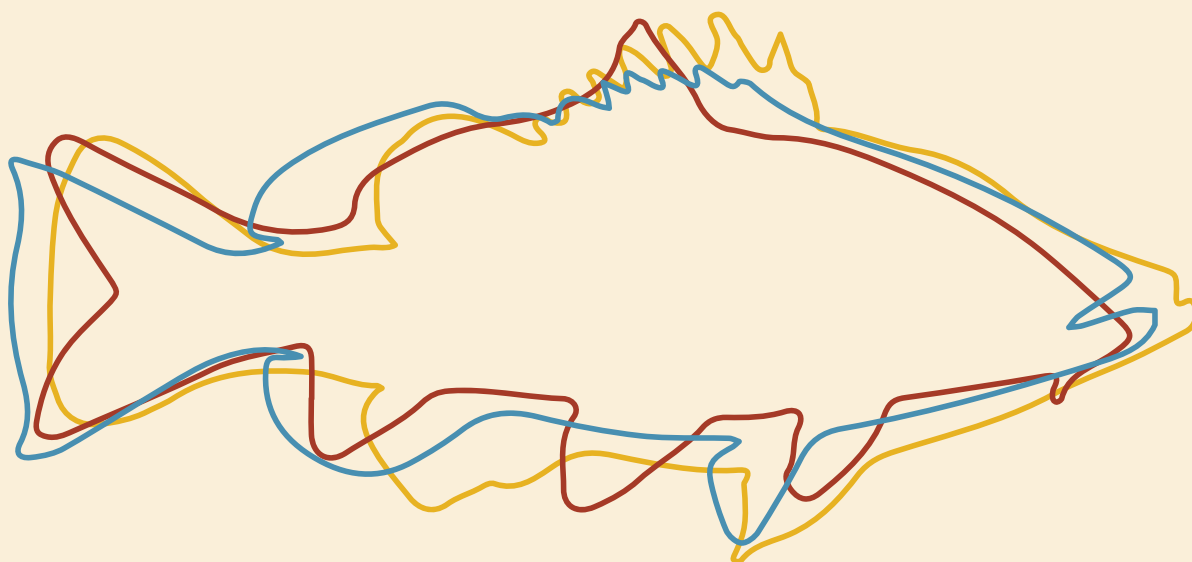






The National Carp Control Plan



**The National Carp Control Plan (NCCP)**

Fisheries Research and Development Corporation (FRDC)
Locked Bag 222, Deakin West ACT 2600
T: 02 6285 0400 F: 02 6285 0499
E: frdc@frdc.com.au W: www.frdc.com.au

© Fisheries Research and Development Corporation 2022

Creative Commons licence. All material in this publication is licensed under a Creative Commons Attribution 3.0 Australia Licence, save for content supplied by third parties, logos and the Commonwealth Coat of Arms.

Creative Commons Attribution 3.0 Australia Licence is a standard form licence agreement that allows you to copy, distribute, transmit and adapt this publication provided you attribute the work. A summary of the licence terms is available from creativecommons.org/licenses/by/3.0/au/deed.en. The full licence terms are available from creativecommons.org/licenses/by/3.0/au/legalcode.

Photos provided by the NCCP, FRDC, Angel Ink or in the public domain unless credited otherwise.
Design by Angel Ink.

CONTENTS

Glossary	11
Abbreviations and acronyms	13
Key points	15
Executive summary	19
1 Introduction	29
1.1 A national problem	30
1.2 The benefits of carp control	31
1.3 Identifying the carp virus's potential as a biocontrol agent	32
1.4 Investigating the potential for carp biocontrol in Australia	33
1.5 NCCP outline	34
2 NCCP research	37
2.1 Effectiveness of the carp virus	37
2.2 Risks associated with carp biocontrol	46
2.2.1 Water-quality risks	46
2.2.2 Water treatment risks	48
2.2.3 Carp virus species specificity	49
2.2.4 Ecological impacts	50
2.3 Socio-economic impacts	54
2.3.1 Traditional Owners	54
2.3.2 Tourism	55
2.3.3 Commercial carp fishers	55
2.3.4 Native fish aquaculture	56
2.3.5 Koi hobbyists and businesses	56
2.3.6 Recreational fishers	57
3 Implementation strategy	59
3.1 Introduction	59
3.2 Implementation objectives	59
3.3 Implementation outcomes	59
3.4 Implementation phases	60
3.4.1 Planning	60
3.4.2 Operations (initial deployment)	62
3.4.3 Operations (post deployment)	62
3.4.4 Completion	62
3.5 Virus deployment strategy	63
3.5.1 Critical success factors	63
3.5.2 Duration of initial carp virus deployment	65
3.5.3 Location of initial carp virus deployment	65
3.5.4 Secondary carp virus deployment	69
3.5.5 Carp virus deployment methods	70
3.6 Carcass management	71
3.6.1 Carcass management strategies	72
3.7 Implementation management and coordination	73
3.8 Integrated pest management	74
3.9 The role of science in management	74

4 Regional case studies	75
4.1 Introduction	75
4.2 Lachlan case study	75
4.2.1 Description of area	75
4.2.2 The carp problem	76
4.2.3 Risks assessment	77
4.2.4 Implementation constraints	78
4.2.5 Management arrangements	78
4.2.6 Carp virus deployment strategy	78
4.2.7 Carcass management strategy	79
4.2.8 Conclusions	79
4.3 Riverland/lower Murray Lock 1 to Lock 3 case study	81
4.3.1 Description of area	81
4.3.2 The carp problem	81
4.3.3 Risks assessment	81
4.3.4 Implementation constraints	82
4.3.5 Possible pre-deployment density reduction	82
4.3.6 Management arrangements	82
4.3.7 Carp virus deployment	82
4.3.8 Carcass management	82
4.3.9 Conclusions	82
4.4 Mid-Murray case study	83
4.4.1 Description of area	83
4.4.2 The carp problem	83
4.4.3 Risks assessment	83
4.4.4 Possible pre-deployment density reduction	84
4.4.5 Implementation constraints	84
4.4.6 Management arrangements	84
4.4.7 Carp virus deployment	84
4.4.8 Carcass management	84
4.4.9 Conclusions	84
4.5 Murray and Murrumbidgee system below Hume Dam case study	88
4.5.1 Description of area	88
4.5.2 The carp problem	88
4.5.3 Risks assessment	88
4.5.4 Possible pre-deployment density reduction	88
4.5.5 Management arrangements	88
4.5.6 Operational costs	88
4.5.7 Conclusions	88
5 Costs and benefits of carp control	91
5.1 Introduction	91
5.2 Costs of carp in Australia	91
5.3 Benefits of carp in Australia	93
5.4 Regional costs of carp biocontrol	93
5.5 National costs	95
5.6 Cost mitigating factors	95
6 Feasibility assessment	97

7 Conclusions and recommendations	103
7.1 Governance recommendations	103
7.2 Research and development recommendations	104
7.2.1 Additional non-target species susceptibility testing	104
7.2.2 Improving understanding of carp virus latency and recrudescence	104
7.2.3 Validating epidemiological modelling with real data	105
7.2.4 Developing methods for large-scale production, storage, and transport of the carp virus	106
7.2.5 Ongoing mapping and investigation of carp aggregations	106
7.2.6 Decision-support and mapping tools for operational activities	106
7.2.7 Assessing carp virus salinity tolerance	106
7.2.8 Assessing animal welfare implications of carp biocontrol	107
7.2.9 Monitoring the evolving relationship between carp and virus	107
7.3 Implementation planning recommendations	108
7.4 Community relations recommendations	108
Appendix 1 Overview of NCCP research	109
Appendix 2 Monitoring and evaluation plan	117

LIST OF TABLES

1	National Carp Control Plan (NCCP) content summary	34
2	Key assumptions of the carp virus's impacts on Australian carp populations	44
3	Indicative biomass of European Carp, <i>Cyprinus carpio</i> , and its distribution in the Lachlan River catchment, New South Wales	76
4	Risk summary, with mitigation options, for carp biocontrol in the Lachlan River catchment, New South Wales	77
5	Risk summary, with mitigation options, for carp biocontrol between Locks 1 and 3 in the lower Murray River, South Australia	81
6	Risk summary, with mitigation options, for carp biocontrol in the mid-Murray River region (Pelican Point to Gunbower Wetlands)	83
7	Feasibility criteria and relevant standards	97
8	Summary assessment of feasibility against specific criteria	98
9	NCCP research project final report acceptance status	111

LIST OF FIGURES

1	Density and distribution of carp in eastern Australia during spring/summer 2017/18, based on NCCP carp biomass estimation and mapping	43
2	Modelled release of the carp virus into the mid-Murray River in 2000, assuming recrudescence and reasonable transmission	43
3	Initial deployment of the carp virus into regulated systems in south-eastern Australia	67
4	Initial deployment of the carp virus – regulated rivers in the MDB and major unregulated rivers in the northern Basin including Queensland	68
5	Secondary deployment of the carp virus – unregulated upland catchments of the MDB and coastal catchments including Western Australia	69
6	Potential carp biocontrol implementation in the Lachlan catchment	80
7	Mid-Murray carp biocontrol case study risks and opportunities scan	85
8	Mid-Murray deployment strategy into carp sub-populations	86
9	Mid-Murray carcass management strategy	87
10	Murray and Murrumbidgee NCCP implementation to address risks	89
11	NCCP research and investigations and outputs	116



GLOSSARY

Aggregations/aggregating – groups of animals or fish gathering in close proximity to each other, often for a specific biological purpose.

Anoxia – in relation to waterbodies, anoxia is a condition in which no dissolved oxygen remains in the water (compare ‘hypoxia’).

Biological control/biocontrol – using pest species’ ‘natural enemies’, such as disease-causing organisms, predators, or parasites, to control their numbers and reduce the economic, environmental, and social harm they cause.

Biological control/biocontrol agent – the organism used to attack a pest species in a biocontrol program (see ‘biological control/biocontrol’).

Biomass – the total mass of a particular species occurring in an area or habitat. Measuring a species’ abundance in terms of biomass would typically involve a description such as ‘the wetland contained 5 tonnes of carp’, and contrasts with describing abundance in terms of the number of individuals present (e.g. ‘the wetland contained 5000 carp’). Biomass may be expressed on a per-area basis (e.g. ‘50 kg of carp per hectare’).

Blackwater events – occur when flooding washes organic material into waterways, where it is consumed by bacteria, leading to a rise in dissolved carbon in the water. During a blackwater event, the water appears black due to the release of dissolved carbon compounds, including tannins, as the organic matter decays, similar to the process of adding water to tea leaves. Rising levels of dissolved carbon causes a sudden depletion of dissolved oxygen in water, which is essential for aquatic organisms that need to breathe underwater. (Source: <https://www.waterquality.gov.au/issues/blackwater-events>.)

Cyanobacteria/cyanobacterial blooms – microorganisms that are related to bacteria but are capable of photosynthesis and can be toxic to other species. Cyanobacteria are commonly called ‘blue-green algae’. Under suitable conditions, cyanobacteria can form large ‘blooms’, covering large areas of waterbodies and potentially harming human and animal health.

Cyprinid herpesvirus 3 (CyHV-3) – a double-stranded DNA virus belonging to the family Alloherpesviridae. Throughout this report, CyHV-3 is referred to as ‘the carp virus’.

Dissolved oxygen – the amount of oxygen present in water, typically expressed as milligrams per litre (mg/L). Most gill-breathing aquatic animals require dissolved oxygen to stay above certain levels (which vary between species) to remain healthy.

Effectiveness (in the context of the NCCP) – the extent to which the carp virus will reduce carp abundance and the environmental damage they cause in natural ecosystems.

Epidemiology – the scientific discipline that studies disease at a population scale.

Genetic biocontrol – methods or technologies that use biology to change the genetics of a target species population to achieve control of that population.

Genetic resistance – occurs when organisms possess genes or gene variants (alleles) that give protection against a particular disease-causing organism (e.g. virus or bacteria).

Hypoxia – a condition in which an environment (e.g. waterbody) is deprived of an adequate supply of oxygen for plants or animals. In contrast to ‘anoxia’, which describes a condition with no oxygen, hypoxia refers to oxygen concentrations that are lower than optimal for some biological process, such as cellular respiration.

Immunity (herd) — is a form of population-level disease resistance that occurs when a sufficiently high proportion of the organisms in a population are protected against an infectious disease because they have either previously been infected and survived, or have received a vaccine. Essentially, the immune systems of these organisms are then 'primed' to recognise and fight the disease. Under herd immunity, even individuals who have not previously been infected or vaccinated receive protection, because there are insufficient susceptible individuals in the population for effective transmission. Herd immunity differs from genetic resistance, which is bestowed by genes or gene variants that make an individual invulnerable to a particular infection and/or disease.

Latent (relating to viral infection) — some viruses possess the ability to 'hide' from the immune system of an infected host, while remaining within the host's body. Latent infections generally do not cause clinical signs of disease, as the virus is dormant or resting. When conditions become suitable (e.g. the host becomes stressed), the latent virus may re-activate (see 'recrudescence') and recommence an active infection.

Legacy nutrients — nutrients that are retained in a natural system (e.g. in the sediments within a waterbody) for extended time periods following their initial addition to the system.

Naïve (relating to epidemiology/immunology) — an individual or immune system that has not previously been exposed to a particular antigen.

Oxbow — a curved or U-shaped lake formed when a meandering river section becomes isolated from the main channel.

Pathogen — a disease-causing organism, especially a microorganism.

Piscivorous (of an animal) — fish-eating.

Prey switching — when an animal (predator) changes its primary source of food.

Recrudescence — the re-activation of latent viral infection (see 'latency').

Serological — blood tests that look for antibodies to a particular disease-causing organism (pathogen).

Transmission (in the context of disease) — the transfer of a virus or other disease-causing organism from an infected to a susceptible individual.

Trojan Y Chromosome approach/technology — a form of genetic biocontrol which introduces sufficient Y chromosomes into a population to bias the sex ratio towards males, thereby reducing and eventually eliminating the reproductive success of the target species or population.

ABBREVIATIONS AND ACRONYMS

AIIMS	Australian Interagency Incident Management System
APVMA	Australian Pesticides and Veterinary Medicines Authority
BIMS	Biosecurity Incident Management System
CCA	Catchment Control Areas
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CyHV-3	Cyprinid herpesvirus 3
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ICS	Incident Control System
IMS	Incident Management Systems
kg/ha	kilograms per hectare
MDB	Murray-Darling Basin
MNES	Matters of National Environmental Significance
NCCP	National Carp Control Plan
OIE	World Organisation for Animal Health
RSPCA	Royal Society for the Prevention of Cruelty to Animals
WTP	willingness to pay



KEY POINTS

Introduced European Carp, or common carp, are a serious pest in Australia's fresh waters, damaging aquatic plants, muddying water, and harming native animals through predation and competition for food.

Research by the National Carp Control Plan (NCCP) has identified that carp occur at high densities across extensive areas of south-east Australia. The national biomass of carp ranges from 200,000 tonnes and possibly up to approximately 1 million tonnes under ideal breeding conditions featuring consecutive high rainfall years.

The NCCP was established to investigate the carp virus's potential to reduce carp populations at a continental scale. The NCCP completed an extensive research and investigations program involving 19 research projects and five investigations overseen by expert advisory groups and scientists. While many uncertainties remain, and preclude an unequivocal recommendation of feasibility at this point, NCCP research confirms that the carp virus has potential as a biocontrol agent. The body of evidence assembled by the NCCP research program is sufficient to enable Australian governments, should they choose, to proceed with additional targeted planning and research activities to inform an eventual decision on whether or not the virus should be used for biocontrol. Such a pathway could reduce, but would not eliminate, remaining uncertainties.

NCCP modelling indicates that, if successfully deployed, the virus could reduce and suppress carp populations by approximately 40–60% (and by up to 80% in less resilient carp populations). These modelled outcomes depend on some assumptions about how the carp virus will move through Australian carp populations, and on the potential development of resistance or immunity via several possible mechanisms. NCCP research indicates reduction of carp impacts may benefit from an integrated approach in which virus deployment is preceded by targeted harvesting, particularly in high-density carp populations. If the virus is eventually released as a biocontrol agent in Australia, an adaptive management approach is recommended which involves ongoing assessment of epidemiological performance to inform virus release operations. This approach would mitigate against departures from the predicted epidemiology.

Preliminary research indicates Australian carp may not possess the gene variants (alleles) that bestow heritable genetic resistance to the virus, meaning that the carp virus could potentially be effective for considerably more than 10 years. However, this work was exploratory, and did not constitute a comprehensive survey of Australian carp genetics. More broadly, the genetic basis for resistance to the carp virus remains imperfectly understood (though considerable international research in this area is ongoing). One uncertainty regarding genetic resistance is the role carp–Goldfish hybrids could play in its evolution. These hybrids are less susceptible than non-hybrid carp to the disease caused by the virus, and this relative invulnerability could bestow a selective advantage. Therefore, the rate at which genetic resistance to the virus would evolve among Australian carp remains largely uncertain, although the NCCP has developed the genetic tools to improve knowledge in this area. The potential emergence of herd immunity is also an uncertainty.

The carp virus will not infect humans or any other mammal, and there is considerable evidence the carp virus will not infect other non-target species (e.g. native fish). However, a very high level of confidence in the species-specificity of any biological control agent is required before its release. Additionally, concern regarding the virus's specificity to carp is relatively common in the Australian community. Unless addressed, such concerns could negatively affect social licence for carp biocontrol. For these reasons, additional non-target species susceptibility testing of selected fish species is recommended if governments wish to proceed with activities to inform an eventual decision on whether or not to proceed with carp biocontrol.

Broadscale and long-term water-quality impacts resulting from carp biocontrol operations are unlikely. Local water-quality impacts are likely under particular conditions, and in some ecosystem types (mainly those with low or no flows). Some aquatic habitats in the Murray-Darling Basin (MDB) already have water-quality parameters (particularly dissolved oxygen levels) that are marginal for native fish species. Further degradation of these parameters by decomposing carp could cause fish kills in these areas unless effectively managed. Carcass management strategies and methods can theoretically mitigate water-quality risks as demonstrated in NCCP case studies, noting that capacity to manipulate river flows specifically to benefit carcass management may often be limited or non-existent and physical collection of carcasses presents challenges.



If Australian governments choose to proceed with the additional activities required to inform a final decision, and this process eventually lead to virus release, implementation of carp virus biocontrol would likely involve two to three years of coordinated deployment focused initially on the MDB, with ongoing adaptive management beyond initial deployment.

A future carp biocontrol program would require investment. An NCCP case study of possible virus deployment in the Murray and Murrumbidgee systems roughly estimated that virus deployment and subsequent post-release management would cost around \$190 million (at 2019 costings). This area covers more than 30% of the carp biomass in Australia including the highest densities of carp. If governments choose to proceed with activities to inform decision making, more accurate and detailed costings will be required.

Although uncertainties and risks remain, these are likely to be reduced through a pathway of targeted further research, implementation planning, adoption of NCCP recommendations, and by development of detailed post-release monitoring plans and an implementation governance structure that enables adaptive management. At the national scale, further regulatory approvals will be required if governments proceed with the assessment pathway. Community consultation, public communications, and stakeholder engagement are also important given the possible impacts and high level of interest in carp biocontrol.





EXECUTIVE SUMMARY

The National Carp Control Plan (NCCP) was established to help governments make decisions about the potential use of a virus called Cyprinid herpesvirus 3 (CyHV-3, hereafter 'the carp virus' or 'the virus') to control European Carp, or common carp, *Cyprinus carpio* (hereafter 'carp'), in Australia. Controlling pest species by using their 'natural enemies' (such as viruses) is called 'biological control' or 'biocontrol'.

To inform a decision about carp biocontrol feasibility, the NCCP addresses the following questions:

1. Will biocontrol using the carp virus be effective?
2. What are the risks associated with carp biocontrol and how can they be managed?
3. How could carp biocontrol be implemented?

In addition to addressing these key feasibility questions, the NCCP provides a preliminary assessment of the impacts, costs, and benefits of carp biocontrol and provides conclusions and recommendations.

Will carp virus biocontrol be effective?

The carp problem is extensive: Carp are one of Australia's most significant pest species. They were introduced to Australia in the mid-19th century, and are now the dominant large-bodied fish in most Murray-Darling Basin (MDB) waterways. The species is also abundant in many eastern coastal rivers, while isolated populations occur in Western Australia.

Ecological impacts attributed to carp in Australian ecosystems include decreased water clarity, destruction of aquatic plants that provide food and habitat for native species, and food chain domination. Carp removal or reduction will not necessarily result in a direct reversal of these effects, but is nonetheless expected to bring environmental, economic, and social benefits.

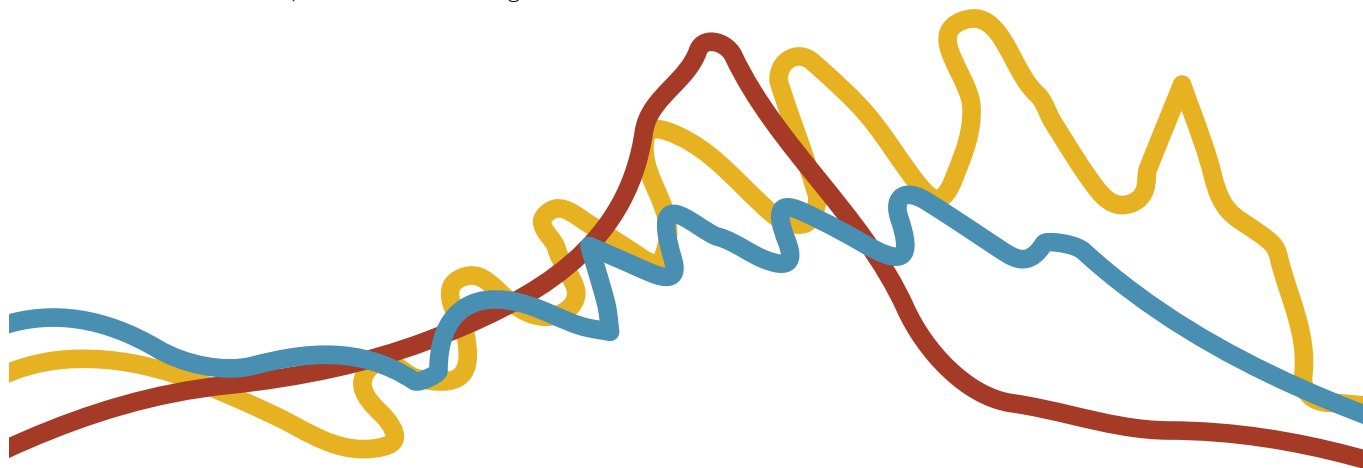
Controlling carp requires a clear understanding of their distribution and abundance in Australian waterways. To achieve this, the NCCP undertook the most comprehensive estimate of total carp biomass ever attempted. This research revealed that, over summer 2017-18, approximately 205,000 tonnes of carp were inhabiting mainland Australia (excluding Western Australia). Three consecutive flood years, which would favour carp population growth, could increase total carp biomass to approximately 1 million tonnes. Carp density is generally highest in lowland, regulated rivers, but can also be high in unregulated northern parts of the MDB.

Effective, long-term carp control is difficult. Carp are widespread, abundant and possess biological traits that mean their populations tend to rebuild rapidly following reductions. No 'silver bullet' for carp control currently exists, nor will biological control constitute such a solution.

Epidemiological modelling indicates that biocontrol could effectively reduce and suppress carp populations, especially if combined with other methods: Modelling conducted under the NCCP indicates that biocontrol using the carp virus could reduce carp populations by approximately 40–60% (and 60–80% in less resilient carp populations). These projected reductions are generalisations and both greater and lesser reductions are expected across the numerous carp sub-populations that constitute Australia's total carp biomass. This modelling depends on assumptions regarding key epidemiological rates. These assumptions were informed by peer-reviewed science, and where possible tested using laboratory experiments. Nonetheless, further targeted research on the population structure of Australian carp, and on interactions between carp and the virus in natural or semi-natural settings (potentially conducted at an overseas institution) could further develop and refine understanding of the virus's likely effectiveness as a biocontrol agent. Additionally, if virus release eventually proceeds, an adaptive management approach will be needed to maximise effectiveness and manage risks.

Carp in Australia undergo large 'boom and bust' population fluctuations, but the virus's suppressive effects are expected to persist during conditions conducive to population increases. Furthermore, a 'Carpageddon' scenario featuring major, approximately simultaneous carp mortalities across a large geographic area is unlikely. NCCP research highlights that the virus is likely to produce substantial, seasonally restricted kills focused on targeted carp aggregation sites. The years following initial deployment should then produce ongoing kills comprised mainly of juvenile carp. Ensuring that sufficient carp within targeted sub-populations are infected during initial virus deployment would be critical for successful biocontrol implementation.

Controlling high-density carp populations may require a multi-method approach: High carp abundances and complex, interconnected population structures mean that the species is very resilient to control efforts. Consequently, any single control measure (including the virus) is unlikely to be successful across carp's entire Australian range if used in isolation. While any level of carp reduction could be beneficial, NCCP modelling indicates that, in Australia's highest-density carp sub-populations, a combined approach in which a portion of the total carp present are harvested before virus deployment offers a more rapid and effective opportunity to reduce carp densities and impacts below ecologically damaging levels. This multi-method approach would provide particular benefit in the lower Murray River where carp density is highest, and to a lesser extent, in the mid-Murray. Because the NCCP focused primarily on assessing the feasibility of viral biocontrol, the magnitude and timing of the fishing effort needed to attain effective carp reduction in high-density populations is unknown, but could be clarified by additional modelling.



Carp biocontrol risks

The carp virus will not affect humans or other mammals: The risk of direct human infection by the carp virus is extremely low. There is no indication that the virus has ever infected, or will ever infect, human beings or any other mammal. No additional investigation of this risk is warranted.

There is evidence that the carp virus will not infect or harm other non-human species, but further work is recommended: The World Organisation for Animal Health (OIE) notes that carp and carp hybrids (e.g. hybrids of carp and Goldfish) are currently the only species that fulfil its criteria for listing as susceptible to infection by the carp virus. The virus's DNA has been detected in a range of northern hemisphere freshwater fishes, a mussel, and a crustacean, but this does not necessarily indicate infection. Furthermore, international experience with the virus over more than two decades has not identified disease caused by the carp virus in any species other than European Carp, and carp hybrids, although viral DNA has been detected in numerous fish and invertebrate species. Australian testing by the Invasive Animals Cooperative Research Centre and CSIRO, with recent re-testing of Murray Cod and Silver Perch, found no evidence of infection in tested animals.

Despite the evidence supporting the virus's specificity to carp, the NCCP recommends some additional non-target species susceptibility testing before a decision is made regarding virus release. NCCP research identified that concerns regarding carp-virus species specificity were relatively common in the Australian community. Likewise, decision makers will need to know this issue has been investigated as thoroughly as is reasonably possible. Therefore, additional testing using an optimally designed viral challenge is recommended to improve confidence in the virus's specificity to carp before making decisions on virus release.

Broadscale and long-term water-quality impacts are unlikely, but impacts may occur in some habitat types: Research has identified and investigated likely impacts of decomposing carp on water quality. Water-quality impacts depend on dead-carp densities and their distribution in waterways, so water-quality research is built on carp mortality predictions generated by epidemiological modelling. Risks investigated included declines in dissolved oxygen, undesirable nutrient increases, harmful algae blooms, proliferation of disease-causing microbes, and impaired capacity to treat water. These variables are relevant for understanding the potential implications of carp kills for both ecosystem health and water use by humans and livestock.

In flowing river channels, carp decomposition is unlikely to compromise water quality beyond acceptable tolerances. However, in still or slow-flowing areas away from main channels, water quality could be reduced, especially when carp densities exceed 300 kilograms per hectare (kg/ha). Reducing high-density sub-populations by targeted physical removal prior to virus deployment could both enhance carp control success and mitigate risks to water quality by reducing the total number of dead carp resulting from disease outbreaks. Unregulated dryland rivers in the northern MDB face particular water-quality risks, as these waterways dry to isolated pools that provide drought refuges for threatened species, endure extended low- or zero-flow periods, and already experience impaired water quality. Virus-induced carp kills (with associated in-situ carcass decomposition) under cease-to-flow conditions in these systems could result in fish kills if not appropriately managed, yet detecting outbreaks and managing carp carcasses (for example, through physical collection) present particular challenges in these generally remote and sparsely populated areas.

Water treatment is unlikely to be compromised at the carp densities expected in most areas. However, water treatment and disinfection would become untenable at very high carp densities (approximately 2000 kg/ha). Carp densities of this magnitude are rare in Australian ecosystems, but could potentially occur in 'point-source' form if dead carp accumulate in small areas as a result of water currents or wind.

Proliferation of harmful bacteria, including those that cause botulism, is possible following carp kills, particularly if water quality more broadly is degraded. Outbreaks of bacterial disease have not been reported in Australia following fish kills, but this risk remains possible, and the biology of botulism outbreaks in particular makes predicting them difficult. Managing carp carcasses would provide the most effective mitigation measure against outbreaks of bacterial disease including botulism.

Carp biocontrol will have social and economic impacts: Carp biocontrol would have both positive and negative socio-economic impacts. Positive impacts would result primarily from improved aquatic ecosystem health following carp reductions. Beneficiaries of improved aquatic health include the tourism industry and a diverse range of river and waterway users, including recreational fishers.

Some stakeholder groups may experience negative impacts, or are already experiencing them in anticipation of implementation. NCCP social impact research outlines effects on commercial carp fishing businesses, tourism operators, native fish aquaculture businesses, and koi carp enthusiasts and businesses. For some stakeholder groups, negative impacts might be offset to some extent by opportunities that carp biocontrol could generate. For example, commercial fishers who target carp might play a valuable role in an integrated carp control program by fishing to reduce high-density carp populations prior to virus deployment.



Implementing carp biocontrol

The NCCP implementation strategy provides a high-level outline for virus deployment and biocontrol operations across carp's mainland eastern Australian distribution. The strategy is designed to clarify the feasibility of managing risks associated with carp biocontrol. Implementation would occur over 10 years with most activity focused on virus deployment and carcass management during the first two to three years.

National implementation objectives include:

- a. widespread reduction and suppression (for at least 5-10 years) of carp populations and the damage they cause in Australian aquatic ecosystems,
- b. management of environmental risks,
- c. management of risks to water quality for town water supply, stock and domestic water needs, irrigation, and cultural and recreational purposes, and
- d. effective and efficient virus deployment and carcass management, where the latter is required.

The NCCP implementation strategy provides national guidelines to achieve objective (a) and an approach and process to achieve objectives b to d (given these objectives will need to involve jurisdictions and more detailed planning).

Active virus deployment is critical for effective biocontrol: Deployment (if it eventually occurs) would require science, planning, coordination, and resources. Initial deployment would involve introduction of the virus into carp aggregations throughout each carp sub-population. Carp sub-populations and aggregations should be mapped prior to deployment. Sufficient numbers of infected carp would need to be introduced into each sub-population to (i) maximise initial knockdown, and (ii) enable ongoing transmission during subsequent years. Deployment during drier (but not drought) conditions that have reduced and concentrated carp populations at known aggregation locations is likely to maximise carp reductions.

Following initial deployment, infection, disease, and death is expected to move through an infected sub-population over approximately four to eight weeks, coinciding with water temperatures within the permissive range for the disease caused by the carp virus (approximately 16-28 °C) (Technical Paper 2; NCCP research project 4). Major carp kills occurring simultaneously across large geographic areas are not expected, as the demonstrated importance of physical contact as a transmission mechanism (NCCP research project 6) should ensure that the virus spreads relatively gradually through targeted sub-populations. After the initial virus deployment, ongoing strategic virus release may be required based on an adaptive management approach.

Carcass management strategies and methods could mitigate water-quality risks, but challenges remain: Numerous carcass management methods have been considered in NCCP case studies and investigations. Many strategies and methods involve strategic use of water regulation to flush, concentrate, and/or strand carcasses, thereby removing or reducing the need for manual carcass collection. However, river managers may not always have the freedom to manipulate flows specifically to benefit carp control operations. Manual carcass collection and removal will still be required at times and places where more mechanised strategies are not adequate and in-situ decomposition is likely to cause negative water-quality impacts. Manual collection of carcasses will, however, be challenging in remote areas or those where access is otherwise difficult.

Specific carcass management methods will depend on local characteristics and conditions, environmental sensitivities, river flow, and weather at the time of a carp kill. Employing an adaptive approach to biocontrol operations will promote the evolution of more effective carcass management methods as the program proceeds. Additionally, while the virus's biology indicates that it is unlikely to move rapidly or unpredictably across large areas, the possibility of unplanned outbreaks cannot be discounted, meaning surveillance will be an important component of effective carcass management strategies.

Coordinated management is necessary: Coordinated management is critical for the successful implementation of a national biocontrol program. Australia has successful operational coordination systems already in use (Incident Management Systems, or IMS). If deployment occurs, carp biocontrol will be a planned and managed event, rather than an emergency incident, but IMS can be readily adapted to the biocontrol context. Furthermore, IMS have been tested and proven through time, and are already used by all jurisdictions that would ultimately be involved in a possible carp biocontrol program.

Achieving integrated pest management: Viral biocontrol has been the NCCP's primary focus. However, best-practice pest management usually requires an integrated approach in which multiple control measures work together to reduce pest impacts. Although any carp reductions are likely to be advantageous, NCCP modelling indicates that a multi-method, integrated approach may be particularly beneficial to reducing carp impacts in very resilient, high-density carp populations (NCCP research project 4). Control approaches that could work in concert with the virus include genetic control technologies, and various forms of physical removal through harvesting. Of these two approaches, physical removal is currently the most readily applicable. NCCP research indicates that, while some genetic technologies offer potential for carp control in Australia in the longer term, considerable and ongoing investment, beyond the NCCP's scope, would be required to overcome substantial biological and logistical barriers to deployment (NCCP research project 3).



Regional case studies illustrate implementation can be effective at a cost: NCCP case studies identified regional risks, opportunities, and strategies for virus deployment and carcass management. Case studies concluded that risks could be managed by applying a range of measures and technologies with coordination across government agencies and regional stakeholders. Case-study results highlight the value of local-scale involvement in carp biocontrol planning and implementation.

Case studies identified a range of potential carcass management methods. Manual carcass removal will likely only be required at particularly sensitive sites. A case study covering the southern Murray and Murrumbidgee systems estimated costs at roughly \$190 million for a three-year virus deployment and management program. This cost estimate does not, however, include costs that may be involved in physically removing carp from high-density sub-populations prior to virus deployment.

Feasibility

Describing the feasibility of carp biocontrol using the virus requires a nuanced and qualified statement. Briefly restated, feasibility criteria are (i) effectiveness, (ii) risk identification and management, and (iii) implementation. When assessed against these criteria, results from NCCP research and investigations indicate feasibility, with qualifications. With strategic virus deployment, carp reductions of varying magnitudes and ongoing suppression appear achievable. From a risk perspective, water-quality impacts (for both ecosystem integrity and human/livestock use) appear manageable in many areas and habitat types, regional case studies have identified strategies for managing dead carp, and water treatment processes appear able to cope with all but the most extreme and unlikely dead carp loadings. To reframe these conclusions, no results have emerged to clearly indicate that further consideration of the virus as a biocontrol agent should cease.

Nonetheless, these broad indications of feasibility are subject to important uncertainties and caveats that preclude an outright and unqualified recommendation of feasibility. Some of these uncertainties could be reduced through targeted additional research, and this report includes suggestions for how this could occur (see next steps and recommendations that follow). Further investigation of the virus's specificity to carp is recommended as part of this additional research. Other uncertainties will likely be more difficult to resolve, and would need to be factored into an adaptive management framework if release eventually proceeds. Thus, while targeted further research is recommended, and could substantially improve the evidence base for decision making, it will not eliminate uncertainty or risk. Balancing these considerations, NCCP research provides sufficient evidence supporting the virus's potential as a biocontrol agent to continue with a pathway of activities to support an eventual decision on whether or not to proceed with virus release. Importantly, feasibility assessment under the NCCP has concentrated on the scientific and operational aspects of carp biocontrol; implementation costs and social and economic impacts reported here are approximate only, but will also be important considerations for decision makers.

Next steps and recommendations

If governments decide to proceed with further assessment and planning actions to support decision making on carp biocontrol the following activities are recommended.

GOVERNANCE

- Establish a national taskforce comprising state, territory, and local government representation to coordinate carp biocontrol implementation.
- Obtain Australian Pesticides and Veterinary Medicines Authority (APVMA) approval.
- Obtain other mandatory legislative approvals, including those required under the *Biosecurity Act 2015*, the *Biological Control Act 1984*, and relevant state and territory regulatory approvals.

A specific timeline for implementation is not provided as this will be determined by the Australian Government, along with state and territory governments, following their decisions about future carp biocontrol directions.

RESEARCH AND DEVELOPMENT FOR IMPLEMENTATION

The following implementation research is recommended should a decision be made to proceed towards the next assessment stages.

- Undertake additional non-target species susceptibility trials.
- Undertake field-based research aimed at understanding carp population structure and movements to inform epidemiological modelling and operational planning. This research would represent a 'zero-loss' investment, because knowledge of carp population structure would be required for any other future carp control measures, even if governments choose not to proceed with virus release.
- Undertake research on carp virus disease dynamics (particularly seasonal patterns of disease reactivation) under field conditions, or in experimental systems that simulate some of the variability found in nature. This research would enable further assessment of proposed virus release strategies and biocontrol efficacy. Within Australia, research using the virus can only take place in biosecure laboratories, so work of this nature would likely best be conducted internationally, in a location where the virus is already endemic.
- Develop methods for large-scale production, storage, and transport of the carp virus.
- Develop decision-support and mapping tools to support biocontrol operations.
- Assess the animal welfare implications of biological control using the carp virus.
- Clarify the carp virus's capacity to kill carp under saline conditions.
- Further investigate the evolution of resistance to the carp virus, including the potential role of carp-Goldfish hybrids in this evolution.
- Develop and assess ecological risk mitigation options for ephemeral dryland river systems and Ramsar wetlands including the South Australian Lower Lakes system and the associated marine system immediately outside the Murray River mouth.
- Develop and implement pre- and post-deployment monitoring and evaluation plans.

PUBLIC COMMUNICATIONS

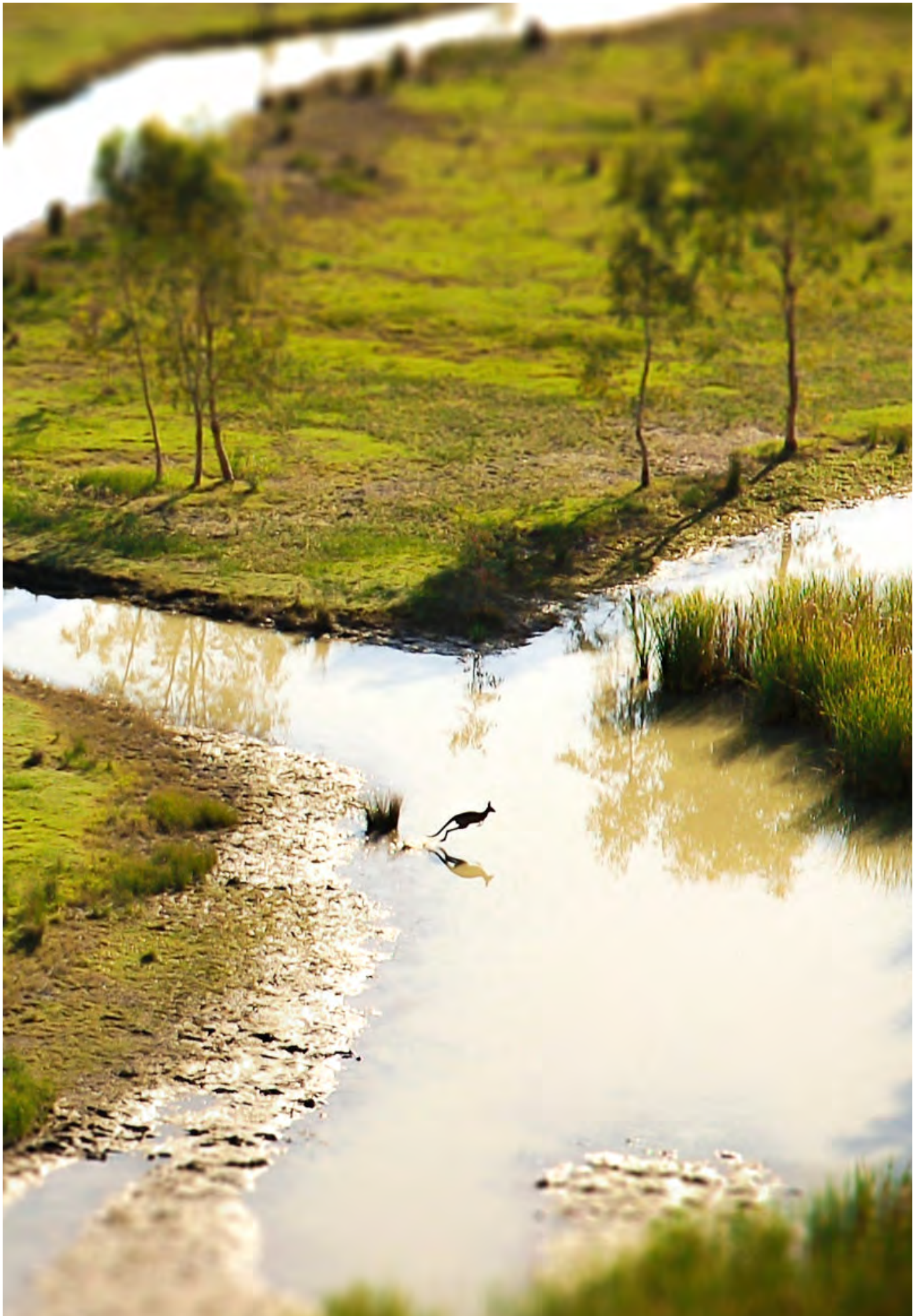
- Develop a comprehensive communications and engagement plan.
- Continue NCCP science communication through the decision-making phase.

COMMUNITY CONSULTATION

- Publish the NCCP and undertake community consultation.
- Undertake tailored consultation, in addition to that completed under the NCCP, with Traditional Owners.
- Undertake specifically designed consultation with other stakeholder groups identified by the NCCP.

STAKEHOLDER ENGAGEMENT

- Actively engage Traditional Owners in decision making and enterprise development associated with carp biocontrol.
- Engage local knowledge and stakeholders in regional implementation planning.
- Acknowledge possible stakeholder impacts, including anticipatory impacts.



1 INTRODUCTION

Introduced European Carp, or common carp (*Cyprinus carpio*, hereafter 'carp') are a serious pest in Australia's aquatic habitats, damaging aquatic vegetation, muddying water, and harming native animals through predation and competition for food. Biological control using Cyprinid herpesvirus 3 (CyHV-3, hereafter 'the carp virus', or 'the virus') offers the potential to control carp over large areas. Before proceeding with virus release, however, fundamental questions of safety for humans and non-target animals, potential impacts on water quality, and broader environmental effects demand evaluation. To address these questions, the National Carp Control Plan (NCCP), funded by the Australian Government, coordinated the most intensive investigation ever devoted to a biological control agent to inform decisions on further planning and potential release. This report summarises the results of these investigations for decision makers. The report's purpose is to provide the information needed to decide whether to proceed with planning and other activities that will ultimately inform decisions on whether or not to release the virus to control carp in Australia.

The NCCP addresses the following feasibility questions to inform a decision about proceeding towards implementation:

- a. Will biocontrol using the carp virus be effective?
- b. What are the risks associated with carp biocontrol and how can they be managed?
- c. How could carp biocontrol be implemented?

In addition to evaluating feasibility, the NCCP provides preliminary estimates of the costs and benefits of carp biocontrol and outlines an implementation strategy. The NCCP is supported by technical papers and project reports (Appendix 1). Readers seeking additional background information are directed to these resources.

This section of the report provides the background to carp in Australia and explains the carp virus's emergence as a potential biocontrol agent. Subsequent sections directly address one or more of the feasibility questions listed in points a-c. Section 2 outlines NCCP research conclusions about likely biocontrol effectiveness and risks (questions 'a' and 'b'). Section 3 provides strategic directions for implementation at the national scale (question 'c'). Section 4 illustrates how regional-scale carp biocontrol implementation could occur (question 'c'). Section 5 reports likely market and non-market costs and benefits accruing from carp biocontrol. Section 6 summarises NCCP findings to develop a feasibility statement. Section 7 outlines conclusions and recommendations for government.

1.1 A national problem

Although first introduced to Australia in the mid-19th century, carp only emerged as an environmental problem during the 1960s, when a genetic strain of carp called the 'Boolarra strain' escaped from a Victorian fish farm. The Boolarra strain's escape began approximately three decades of carp range expansion and population growth. Reasons for the Boolarra strain's success are varied, but flooding during the 1970s probably promoted carp dispersal and reproduction, while cross-breeding between Boolarra carp and genetic strains from earlier introductions may have created vigorous hybrids (see Technical Paper 1). Carp's ability to tolerate poor water quality probably also gave them a competitive advantage over native fish. Regardless of the mechanisms underlying their expansion, by the mid-late 1990s carp occupied a large area of south-eastern Australia, including most of the Murray-Darling Basin (MDB) and many eastern coastal catchments. A smaller population exists around Perth in Western Australia. Isolated populations also occurred in two Tasmanian lakes (Lakes Crescent and Sorrell). A physical removal campaign spanning more than 20 years resulted in the eradication of carp from Lake Crescent in 2007, while functional eradication of the Lake Sorrell population is imminent. The Lake Sorrell population is now strongly female-biased and many of the remaining males have a genetic disease that renders them sterile.

Carp's potential to become invasive was recognised soon after the Boolarra strain's escape, and the Victorian Government recommended carp eradication in 1962. Early control attempts included non-selective methods such as applying fish poisons to carp-affected waterways (Technical Paper 1). As carp expanded their geographic range, the focus shifted to various forms of capture and removal including netting, trapping, and community-based carp 'fish-outs'. While some of these approaches have achieved localised, short-term carp reductions, none have delivered long-term carp control over large areas (Technical Paper 1).

Definitive and concise statements about the ecological impacts of carp are difficult, because the species inhabits ecosystem types ranging from tidal subtropical upper estuaries to temperate, highly regulated dryland rivers. These varied ecosystem types will not experience the same impacts from a given carp density (Technical Paper 1). Additionally, overall carp abundance fluctuates markedly through time, as do the relative proportions of adult and juvenile carp within a given population. Carp impacts also occur with other environmental stressors, such as pollution and river regulation. All of these variables will affect the type and magnitude of impacts exerted by carp in a given ecosystem (Technical Paper 1; NCCP research project 15).

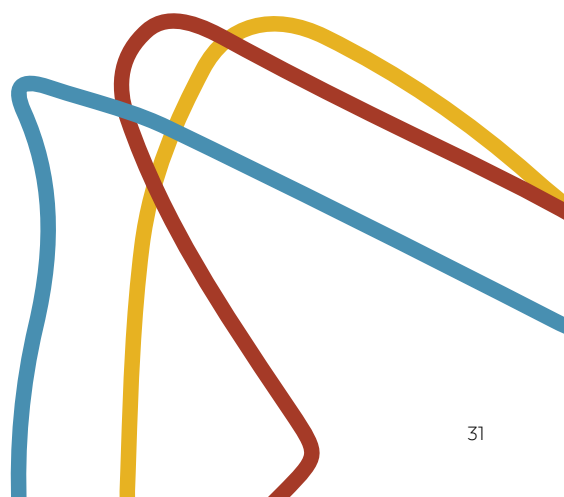
Despite this complexity, there is both scientific and anecdotal evidence that carp cause undesirable changes in at least some Australian freshwater ecosystems (see Technical Paper 1). The primary pathway by which carp damage aquatic ecosystems arises from the species' feeding style. Adult carp feed by syphoning sediment from the riverbed using their vacuum-like mouths, filtering out food items and ejecting the remaining material into the water around them. This feeding style reduces water clarity, adds nutrients to the water (potentially promoting harmful algal blooms), and destroys aquatic plants (Technical Paper 1). Carp also feed directly on small aquatic animals, causing local or regional extinction of some vulnerable species, and changing the composition of aquatic animal and plant communities. A recently recognised, but potentially important, impact is the monopolisation by carp of food resources and energy at the base of the food chain, preventing native fish population growth (Technical Paper 1). While these impacts will not occur in all places where carp occur, or at all times within a given location, they are reported in the scientific literature (Technical Paper 1). Importantly, these impacts also co-occur with other damaging processes, such as pollution, or with the legacy impacts of historical management practices (NCCP research project 15).

The concept of 'damage thresholds' (discussed in more detail in Section 2.1) provides a useful framework for understanding the ecological impacts of carp (Technical Paper 1). The concept posits that the ecological impacts of carp either manifest or intensify when carp densities (usually expressed as kilograms per hectare, kg/ha) exceed particular levels. Different ecosystem components or attributes have different damage thresholds. For example, a recent major review assessing carp impacts across the different continents and habitats in which they are invasive identified a carp density of 50 kg/ha for impacts on other fish species, 100 kg/ha for impacts on aquatic plants, and 150 kg/ha for negative impacts on water clarity (NCCP research project 4). These densities are indicative only and will vary substantially among different species and habitat types, and probably for a given species or habitat through time. Acknowledging the general and approximate nature of these thresholds, NCCP carp biomass estimates clearly demonstrate that carp densities exceed damage thresholds in many Australian aquatic habitats, indicating that carp pose real threats to aquatic biodiversity (NCCP research project 1).

1.2 The benefits of carp control

Long-term carp suppression is likely to benefit many species of aquatic flora and fauna. However, ecosystem responses to carp reduction will differ across the varied habitats comprising the species' Australian distribution. The potential for unexpected ecological consequences must also be acknowledged. For example, controlling carp might create opportunities for other invasive species that have hitherto been suppressed by carp to increase in abundance (NCCP research projects 12 and 15). Additionally, some faunal groups, such as fish-eating birds, may have come to rely upon carp as a food source. Sudden, major reductions in carp abundance could therefore result in food shortages for these species (NCCP research project 12). Such shortages could be short term, as small native fishes, the preferred food of many native predators, may increase their populations relatively rapidly in response to carp reductions. Some native invertebrates are very vulnerable to carp predation, and become locally or regionally extinct at even low carp abundances. Total carp eradication, which biocontrol will not deliver, would be required to restore populations of these species. Finally, the benefits of carp control are most likely to be fully realised when carp suppression is accompanied by action to address other, co-occurring environmental stressors.

These statements are not intended to devalue the worth of carp control; there is both scientific and anecdotal evidence that safe and effective carp control would benefit many Australian aquatic ecosystems. Improved water clarity and increased abundance of native aquatic plants and small animals have all been reported following carp control in Australian freshwater habitats. Modelling studies have also indicated that carp reduction could result in substantial improvements to native fish abundance, especially when combined with improved management of river flows. Biocontrol using the carp virus offers a potential, if partial, solution to a hitherto intractable problem.



1.3 Identifying the carp virus's potential as a biocontrol agent

Outbreaks of the disease caused by the carp virus were first recorded in German and Israeli aquaculture facilities during the mid-1990s. The virus's evolutionary origins are unclear, but it may have circulated in wild carp populations before emerging in aquaculture (Technical Paper 4).

Although currently occurring in 33 countries globally, the carp virus has never been deliberately used as a biological control agent. Disease outbreaks have instead resulted from the virus's unwanted entry to valued carp populations (including koi), or its unintended and unplanned introduction to invasive populations that are viewed as pests. Despite having caused major mortalities among wild carp in Japan, North America, and South Africa, the virus's impact on wild carp abundance in these locations is unclear. Some studies suggest relatively little impact, but data enabling comparison of carp populations before and after virus entry are scarce. Planned and deliberate introduction of the virus into carp sub-populations across the species' range is likely to have greater impact than unintentional, haphazard introduction.

International outbreaks prompted interest in the carp virus as a potential biological control agent for carp in Australia. The Invasive Animals Cooperative Research Centre initiated a research program during which CSIRO researchers studied the virus's capacity to effectively kill carp, and the potential for infections and disease to occur in species other than carp. Both avenues of research indicated that the carp virus had potential as a biocontrol agent; the virus killed a high proportion of infected carp, and appeared species-specific.

Information requirements for implementing a carp biocontrol program, however, exceed knowledge of host-specificity and laboratory-measured efficacy. Disease dynamics must be understood and potential ecological, social, and economic risks, including risks to water quality following carp kills, assessed. The Australian Government therefore funded the NCCP to develop the knowledge base required for informed decision making about biological control using the carp virus.

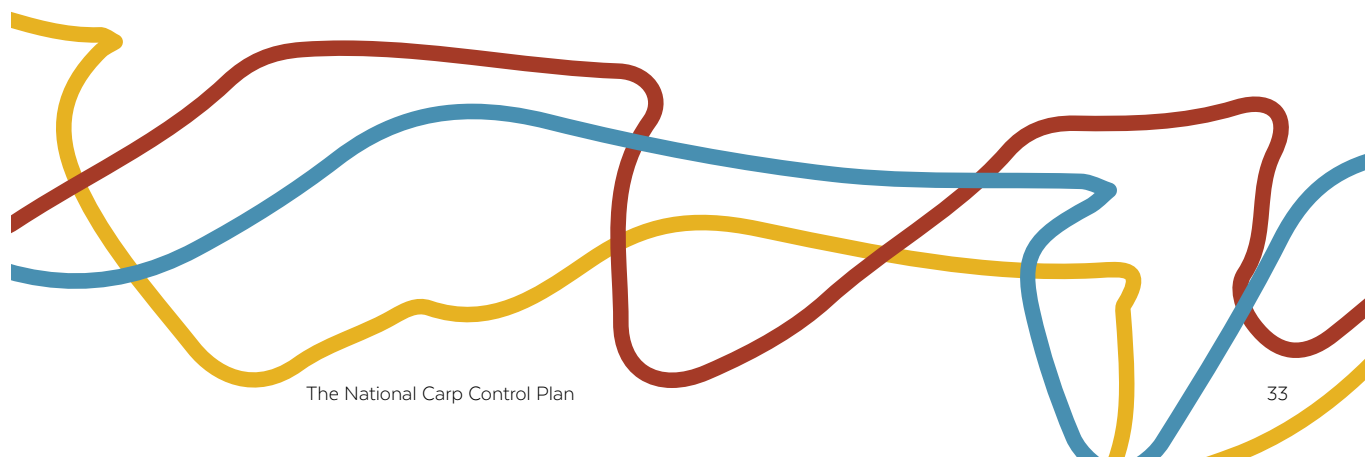


1.4 Investigating the potential for carp biocontrol in Australia

The aims of biocontrol programs typically include reduction in costs to agriculture and/or amelioration of environmental damage caused by target pests, each with attendant social and economic benefits. Regardless of the target and agent organisms and program aims, the basic value proposition for biological control usually lies in the capacity for highly specific biological control agents to spread through pest populations, providing sustained control over large geographic areas with minimal management intervention.

Because carp are an established pest inhabiting a large geographic area and attaining high population densities, a biocontrol agent targeting them needs the basic traits described above; specificity to the target species and a capacity to deliver cost-effective pest suppression across large areas. However, as the first attempt globally at viral biocontrol of a pest fish, carp control using the carp virus poses some unique challenges that differ from previous biocontrol programs targeting terrestrial vertebrates. In particular, because carp inhabit interconnected inland waterways, a viral biocontrol agent that transmits very rapidly and with high lethality among carp populations has the potential to cause major mortalities over large areas, with attendant risks to water quality as numerous carp decay in aquatic environments. Australia's only other vertebrate biocontrol programs – those targeting rabbits using the myxoma virus (MYXV) and rabbit haemorrhagic disease virus (RHDV, 'calicivirus'), and feral cats on Marion Island using feline panleukopenia virus (FPLV) – did not face this challenge because the target species were terrestrial and their decomposition posed few or no environmental risks. Carp biocontrol therefore demands a balance between effective, ongoing carp suppression at the continental scale and transmission dynamics that do not result in unmanageable densities of dead and decaying fish following initial deployment into high-density populations.

NCCP research indicates that the carp virus possesses the attributes required of a biocontrol agent to control carp. Modelling the virus's likely impacts on carp populations indicates that self-propagating transmission of the virus across large geographic areas, with subsequent widespread, major carp mortalities is unlikely. Rather, the virus is likely to only cause major carp mortalities when two factors – water temperature suitable for viral infection and disease in carp, and carp densities sufficient to enable effective transmission – co-occur (Technical Paper 2). Conditions conducive to outbreaks of the disease caused by the carp virus are most likely when carp gather to spawn in spring and early summer (depending upon latitude), meaning that the timing and location of kills may be relatively predictable. These traits provide an opportunity to effectively manage the water-quality risks associated with carp kills (Technical Paper 3). Because carp virus transmission is substantially reliant on direct physical contact between infected and susceptible carp, virus deployment will likely require more active and sustained ongoing releases than some other biocontrol agents (e.g. MYXV and RHDV used for rabbit biocontrol) to ensure effective carp suppression.

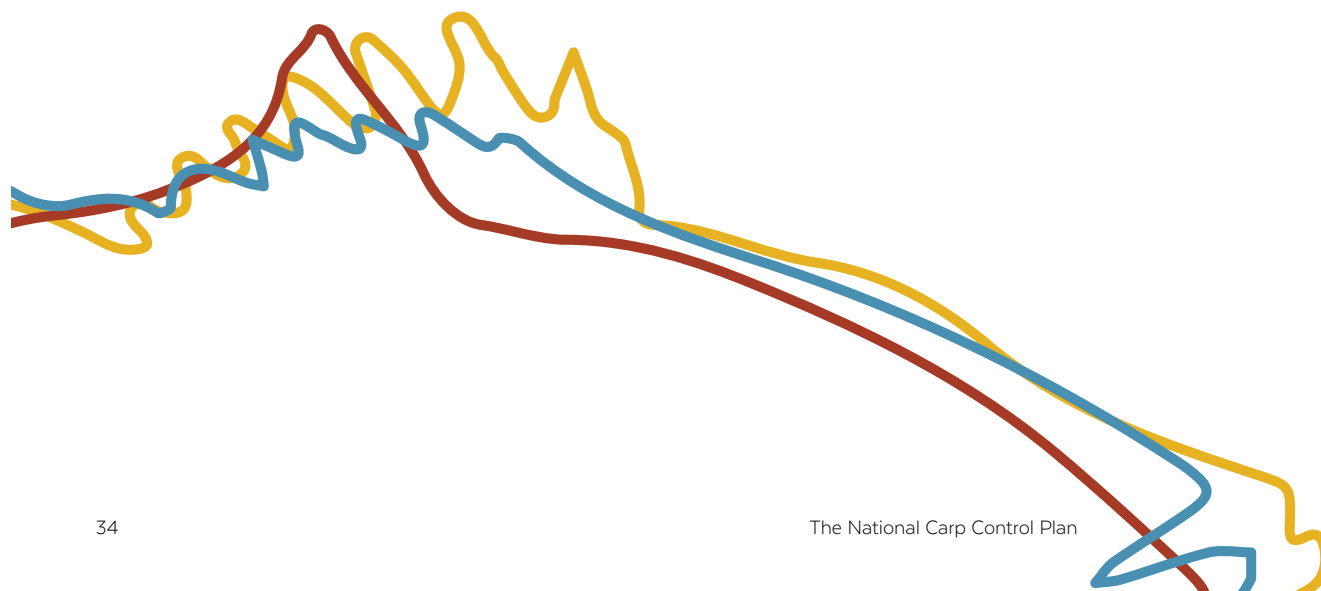


1.5 NCCP outline

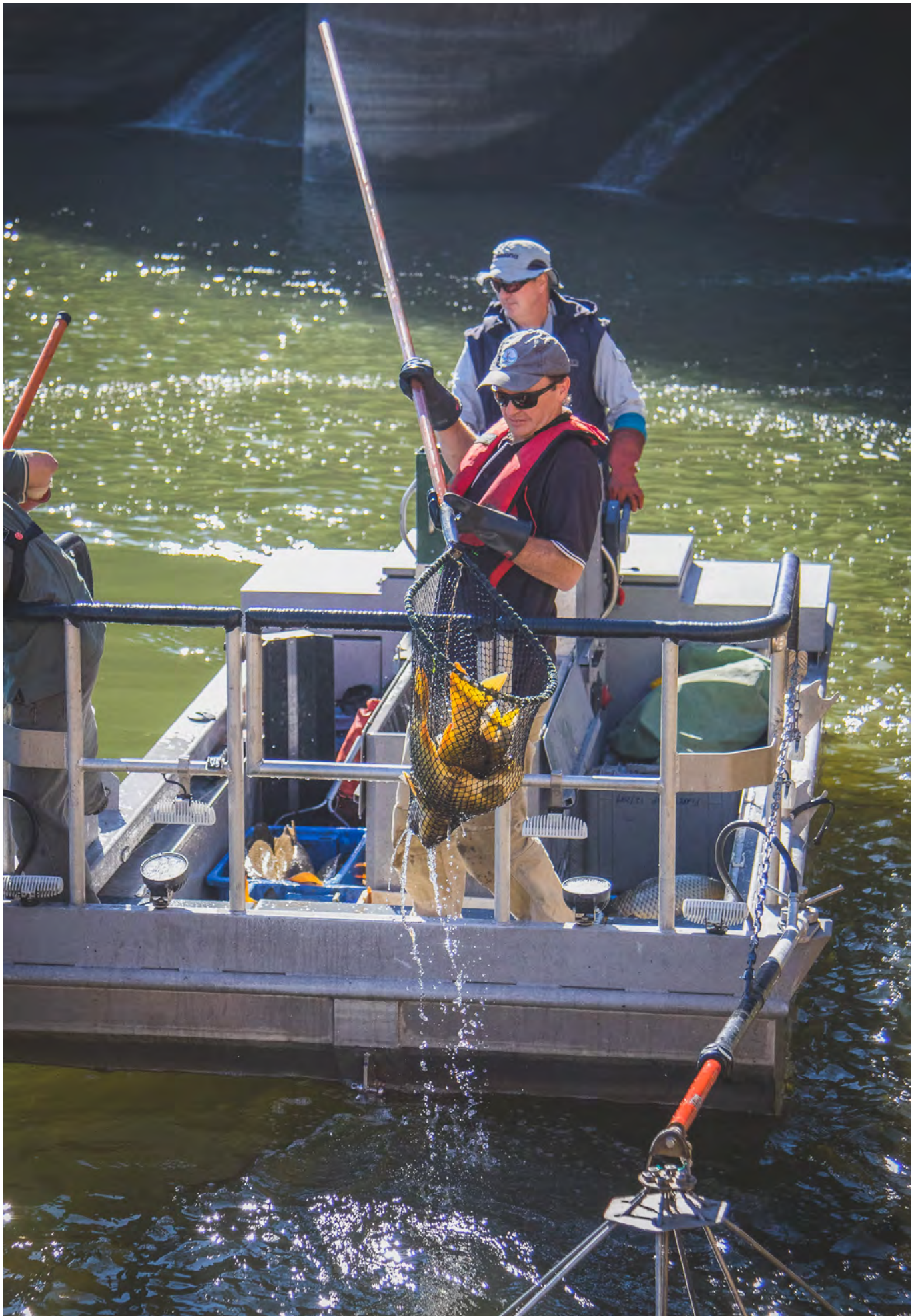
Table 1 outlines to structure of the NCCP and the associated supporting documents.

Table 1: National Carp Control Plan (NCCP) content summary.

NCCP section or supporting document	Title	Subject matter
The National Carp Control Plan		
	Executive summary	Provides a stand-alone summary of the NCCP's underlying rationale, objectives, scope, methodological approaches, and conclusions.
1	Introduction	Summarises the introduction of carp to Australia and ensuing environmental impacts. Introduces Cyprinid herpesvirus 3 (CyHV-3, 'the carp virus') and describes its potential as a biocontrol agent for carp in Australia. Explains the NCCP's role in assessing the feasibility of carp biocontrol.
2	NCCP research	Summarises NCCP research approaches and key results related to effectiveness and risks.
3	Implementation strategy	Outlines how carp virus biocontrol could be implemented at a strategic national scale.
4	Regional case studies	Integrates information from NCCP research and implementation planning in specific regional settings, providing concrete illustrations of the manner in which carp biocontrol could be implemented and managed in particular regions.
5	Costs and benefits of carp control	Integrates key results from, and explains implications of, market and non-market cost-benefit analyses conducted under the NCCP.
6	Feasibility assessment	Defines criteria for assessing carp biocontrol feasibility, provides a summary feasibility assessment based on information from research and planning, and delivers a feasibility statement.
7	Conclusion and recommendations	Outlines steps for governmental consideration if a decision is made to proceed towards carp biocontrol implementation. Recommendations relate to regulatory approvals, research, planning, socio-economic impacts, or community engagement.



NCCP section or supporting document	Title	Subject matter
Supporting documents		
Appendix 1	NCCP research	Outline of NCCP research approach and results.
Appendix 2	Monitoring and evaluation plan	Scope for monitoring and evaluation of carp virus biocontrol.
Technical Paper 1	Carp biocontrol background	Supports the NCCP introduction by providing contextual information on the ecological health of Australian rivers, carp ecology and introduction to Australia, carp control measures that have previously been proposed, trialled, or attempted, the legal status of carp in Australian states and territories, and background to biological control.
Technical Paper 2	Epidemiology and release strategies	Supports NCCP research and risk summaries (section 2) by explaining the epidemiological modelling that underpins predictions about the impacts of virus-induced disease impacts on carp populations.
Technical Paper 3	Carp biocontrol and water quality	Supports NCCP research and risk summaries (section 2) by explaining potential dead carp impacts on water quality. The paper summarises NCCP research and literature reviews addressing dissolved oxygen and nutrient concentrations, risk of dead carp fuelling harmful algal blooms, potential dead carp impacts on water treatment processes, and the risk that decomposing carp could promote growth of disease-causing bacteria, including those responsible for botulism.
Technical Paper 4	Carp virus species specificity	Supports NCCP research and risk discussions (section 2) by summarising and explaining research investigating the potential for the carp virus to infect species other than European Carp.
Technical Paper 5	Potential socio-economic impacts of carp biocontrol	Supports the socio-economic risk discussion (section 2) by summarising NCCP research on the potential social and economic risks posed by carp biocontrol, explaining implications for biocontrol planning and implementation, and proposing risk mitigation options.
Technical Paper 6	Implementation	Describes an implementation pathway for carp biocontrol.
Technical Paper 7	NCCP engagement report	Report on NCCP stakeholder engagement including workshops and web-based feedback.
Technical Paper 8	NCCP Murray and Murrumbidgee case study	Case study for virus deployment and carcass management for the Murray and Murrumbidgee regulated systems.
Technical Paper 9	NCCP Lachlan case study	Case study for virus deployment and carcass management of the Lachlan catchment.



2 NCCP RESEARCH

The NCCP has undertaken a broad-ranging research program including 19 peer-reviewed research projects and five planning investigations including regional case studies (see Appendix 1). The NCCP Strategic Research and Technology Plan 2017-19 provided the blueprint for design and planning of this research program. The Research and Technology Plan was developed shortly after the NCCP began (in early 2017), and provided a framework for identifying strategic research needs to inform a potential carp biocontrol program. The Research and Technology Plan identified three major themes (Environment, Communities, and Informing Possible Implementation), with research priorities identified under each theme. These priority areas guided development of research projects, with applications for research generally sought by select tender. The Strategic Research and Technology Plan was reviewed and endorsed by the NCCP Science Advisory Group (SAG). All NCCP research projects are listed in Appendix 1 together with a more detailed discussion of research program formulation and governance.

Most NCCP research is necessarily theoretical, requiring complex modelling of carp populations, the environments they inhabit, and the interplay between carp and virus (see Appendix 1). NCCP research therefore contains assumptions which are explained next.

A continental-scale carp biocontrol program would encompass many different aquatic habitats spanning a large geographic area. The ecological complexity entailed by this large and diverse control area means that some uncertainties remain. This section describes these uncertainties and their implications.

2.1 Effectiveness of the carp virus

Effective carp biocontrol needs to initially reduce existing carp populations and maintain suppression in the longer term. Three NCCP research projects provided knowledge essential to assessing effectiveness. First, the foundational knowledge about the target species' abundance, distribution, and population dynamics that underlies any pest control initiative was supplied by carp biomass estimation research. Biomass estimates were static 'snapshots in time' for the total weight of carp and its distribution across the various habitats comprising the species' eastern Australian distribution over spring and summer 2017-18. Second, a carp population model provides the capacity to project these static biomass values forward in time so that contemporary population estimates will be available in future years. Third and finally, epidemiological modelling integrated knowledge about carp populations and carp virus biology to predict the virus's impacts on Australian carp populations (see Technical Paper 2 for detailed discussion). Together, these projects provide the primary knowledge base for assessing the carp virus's likely effectiveness as a biological control agent.

Other NCCP research also relevant to understanding biocontrol effectiveness, or that generated data or information for use in the three studies described above, includes development of tools and methodological approaches to study genetic resistance to the carp virus (NCCP research project 7), and work clarifying the relative importance of different virus transmission pathways (NCCP research project 6). Results from these projects feed into epidemiological modelling by either testing key assumptions regarding transmission, or enabling ongoing assessments of efficacy if the virus is eventually released.

Assessing the likely efficacy of carp virus biocontrol is largely a question of applied epidemiology. Therefore, a brief explanation of the approach used for the NCCP epidemiological modelling is warranted. Readers seeking greater detail are directed to Technical Paper 2, and NCCP research project 4 (the epidemiological modelling project report).

Although referred to for convenience throughout this document as ‘epidemiological modelling’, the study developed four interlinked models (for hydrology, carp habitat suitability, carp demography, and carp virus epidemiology). This approach was chosen because the key traits of Australian carp populations that would influence the magnitude and extent of viral knockdown change markedly through time and across the landscape in response to the major environmental variations typical of inland Australian waterways. These environmentally driven fluctuations in carp populations are often referred to as ‘boom and bust cycles’. While major changes in carp abundance are the most obvious feature of these cycles, they also exert more subtle demographic influences, such as changes in the relative abundance of different age classes and the population’s inherent capacity to rebuild following reductions. These demographic traits will influence the population-level impacts of any future carp biocontrol program. The carp virus itself is also subject to environmental constraints, notably in relation to the water-temperature range (16–28°C) under which the virus can infect carp and cause disease.

Understanding the interplay between the demography of the host population(s), the environmental tolerances of the pathogen, and the environmental context against which they will interact is relevant to most infectious diseases, but is particularly pertinent to carp biocontrol because inland Australian rivers and their carp populations are so dynamic. Epidemiological modelling under the NCCP explicitly recognised the linkages between population characteristics, environment, and disease outcomes by using multi-model approach. The four models were developed and integrated for five catchments; the Lachlan River (NSW), the mid Murray River (Hume Dam to Wentworth, NSW), the lower Murray River (Wentworth, NSW, to Goolwa, South Australia), the Glenelg River (Victoria), and the Moonie River (Queensland). Collectively, these catchments represent much of the diversity in carp habitat found throughout the species’ Australian distribution. A brief description of each model and its application follows.

1. The hydrological model reconstructed river flow, water temperature, waterway inundation, and connectivity. These four traits were identified as the key environmental drivers for the distribution of adult and sub-adult carp (flow, temperature) and larvae and juveniles (inundation and connectivity, which facilitate spawning) at an expert workshop funded by the Invasive Animals Cooperative Research Centre in 2014. Other factors (plankton productivity, dissolved oxygen levels and salinity) were also identified as affecting habitat suitability for carp. High-resolution data were not available for these factors across all catchments, so where necessary, surrogate variables were used or the parameter was left as a non-informative model node that could be populated in future if data become available.
2. The habitat suitability model built on the reconstructed hydrological datasets from (1) to classify the habitat suitability of each river reach or waterbody for both adult/sub-adult and larval/juvenile carp for the full study period (1990–2017 for most catchments). Habitat suitability rankings were the primary output from this modelling, but biomass density estimates (kg of carp per hectare) were also derived using conversion factors developed in consultation with freshwater ecology experts. The resulting density estimates enabling cross-validation of the modelling against carp densities estimated independently by the NCCP carp biomass project (NCCP research projects 1 and 2), with the two sets of estimates in close agreement. These habitat-derived carp density estimates (i.e. kg of carp per hectare) were then used as input in the carp demography model.

3. The carp demographic model used the carp density estimates described in point 2. Treating the density estimates as inputs to a demographic projection model meant that key processes and parameters influencing carp populations (e.g. density dependence, environmental carrying capacity) could be modelled. This approach would not have been possible under the simpler approach of deriving carp abundance from density estimates using average weights. As part of the demographic modelling, the structure of carp metapopulations (population groups that may join with, or be separated from each other through time by environmental or behavioural drivers) was also refined. Demographic modelling enabled reconstruction of carp metapopulations featuring six life-history stages (eggs, larvae, early young-of-the-year, late young-of-the-year, sub-adults, and adults). In turn, these reconstructions enabled determination of baseline population sizes for each catchment throughout the study period (which, as previously mentioned, was 1990–2017 for most catchments). Baseline population sizes are important, because they provide a point of reference against which the impacts of a possible carp biocontrol program could be measured.
4. The epidemiological modelling adapted an SEIR (Susceptible-Exposed-Infected-Recovered) infectious disease transmission model by replacing the ‘Recovered’ class with two classes – latently infected (L) and recrudescence (Z)—reflecting the carp virus’s disease dynamics (see Technical Paper 2 and NCCP research project 4 for further discussion of latency and recrudescence). Integrating the epidemiological model and the demographic model enabled exploration of the effects of different epidemiological assumptions on carp mortality and population suppression.

Results from the epidemiological modelling described earlier were considered in terms of the potential for the predicted carp reductions to reduce the environmental damage caused by carp. This approach is consistent with the concept that pest control should aim to reduce the damage caused by pest species – killing pests even in very large numbers may deliver relatively few benefits if population density remains high enough to continue causing damage (NCCP research project 4). Studies evaluating the environmental impacts of carp across the different continents and habitat types in which they are invasive have identified some general ‘threshold densities’ above which carp damage manifests or intensifies (Technical Paper 1). Different ecosystem components or attributes have different damage thresholds. For example, a recent major global literature review identified a carp density of 50 kg/ha for impacts on fish species, 100 kg/ha for impacts on aquatic plants, and 150 kg/ha for negative impacts on water clarity (NCCP research project 4).



These general ‘one size fits all’ damage thresholds for entire groups of species (e.g. all fish), or variables such as water clarity are indicative only, and will vary substantially among ecosystems, and potentially for a given ecosystem through time (Technical Paper 1). Furthermore, these thresholds have been developed by considering carp impacts across different ecosystems and continents. While Australian studies were included in broader analyses by scientists estimating carp-impact densities, these threshold densities were not developed specifically for Australian aquatic habitats.

Acknowledging the desirability of a more advanced understanding of damage thresholds for Australian species and ecosystems (see Appendix 2), the concept has still been useful in considering the likely effectiveness of carp biocontrol. Furthermore, carp damage thresholds of varying magnitudes almost certainly *do* exist – to provide an extreme example, some Australian freshwater snail species become locally extinct in the presence of carp at any density, and therefore effectively have a damage threshold of 0 kg of carp per hectare (Technical Paper 1). Other species and ecosystem characteristics likewise probably have their own damage thresholds.

Despite the use of damage thresholds in this plan as a concept for benchmarking potential outcomes for carp biocontrol in different areas, any reduction in carp density may be beneficial. Even carp reductions that do not force populations below a threshold value may still free resources for use by other species and provide a foundation from which to leverage other control measures.

Other NCCP research considered alternative control methods to complement the virus and to clarify the relative value of carp virus biocontrol over other methods. One project evaluated the potential utility of genetic biocontrol technologies (NCCP research project 3) and another the effectiveness of harvesting or manual carp control approaches (NCCP research project 8). Key results and implications of effectiveness-related research under the NCCP are described next.

RESEARCH CONCLUSIONS – EFFECTIVENESS

- Over summer 2017-18, total carp biomass for eastern Australian was approximately 205,000 tonnes (NCCP research project 1). As a result of necessary simplifying assumptions in the modelling, biomass is likely underestimated (NCCP research project 1). These underestimates are particularly relevant given strong and persistent La Niña conditions in the years immediately preceding publication of the NCCP.
- Population modelling indicates that carp biomass will change markedly in response to climatic drivers (NCCP research project 2). In particular, higher flows, especially those that inundate floodplains, typically promote carp population growth. A ‘worst-case’ scenario for carp abundance, involving three consecutive years of flooding across carp’s entire Australian range, could result in a total carp biomass of just over 1 million tonnes (NCCP research project 2).
- Of the total carp biomass, a greater proportion is contained in waterbodies (e.g. lakes, reservoirs etc) than in rivers (see Figure 1) (NCCP research project 1).
- Planned virus release is unlikely to cause major, uncontrolled carp mortalities over large geographic areas (i.e. there will be no ‘Carpageddon’ scenario). Rather, large carp kills are only likely during spring and early summer, and in places where carp school densely (aggregate) prior to spawning (Technical Paper 2).

- Major kills involving numerous adult carp are only likely in the year of initial virus release, and potentially in the following one or two years. After this, the virus is expected to continue suppressing carp numbers, but mortalities should consist mainly of small juvenile carp, whose carcasses are likely to be less obvious in the environment (Technical Paper 2; NCCP research project 4).
- The degree to which the virus suppresses carp populations will differ both through time and from place to place. At times and places where carp populations are less resilient (e.g. during droughts, or in habitats that are inherently less suitable for carp), the virus could reduce carp populations by 60–80%. At times and places where carp populations are more resilient, populations could be reduced by around 40–60%. Sustained carp suppression could last at least 10 years, but the emergence of genetic resistance and/or herd immunity remain uncertainties.
- NCCP research has identified the tools and approaches needed to investigate the evolution of resistance to the virus among Australian carp. Targeted further work assessing the development of resistance (including the potential role of carp–Goldfish hybrids in this development) is recommended.
- Biocontrol is expected to reduce carp population densities below the intermediate damage threshold of 100 kg/ha across extensive areas of Australia’s inland waterways (Technical Paper 2; NCCP research project 4). In some areas with very high carp densities, biocontrol alone may not be sufficient to reduce populations below theoretical damage thresholds. Targeted intensive harvesting prior to virus deployment is recommended for these areas, and will also serve to reduce the total biomass of dead carp ultimately resulting from viral disease (NCCP research project 4). In other locations where carp populations may already be below damage thresholds, deliberate release of the carp virus may not be necessary. Damage thresholds are used here as a general guide, acknowledging that development or refinement of threshold values tailored specifically to Australian aquatic ecosystems is desirable.
- The modelled impact of the virus on carp explicitly recognises Australian carp populations’ propensity for large fluctuations in abundance (‘booms and busts’), and indicates that the virus will continue to suppress carp populations even at the peak of ‘booms’. That is, the virus’s suppressive effects on carp populations will be moderated but not overwhelmed by conditions that encourage high carp abundance.
- A limited review of genetic biocontrol technologies identified the Trojan Y Chromosome approach as the technique most applicable to carp in Australia (NCCP research project 3). However, considerable technical and logistical barriers would need to be overcome before this technology could be deployed as a continental-scale carp control measure (NCCP research project 3). Notably, implementing Trojan Y would require a multi-decade commitment to breeding and stocking carp carrying the Trojan Y genetic construct (NCCP research project 3).
- A combined literature review and carp population modelling study indicated that physical removal has little capacity to provide sustained, continental-scale carp suppression if used as a stand-alone control measure (Technical Paper 1; NCCP research project 8). Similarly, the carp virus, if deployed in isolation from other measures, is unlikely to reduce high-density carp populations, such as those in the lower Murray River, below the intermediate damage threshold of 100 kg/ha (although even reductions that do not push carp abundance below this threshold may be beneficial). However, using the two approaches together, with targeted physical removal reducing carp abundance prior virus deployment, has considerable potential to suppress resilient, high-density populations that are otherwise very difficult to control (NCCP research project 4).

IMPLICATIONS FOR FEASIBILITY

- Implementing a biocontrol program using the carp virus is expected to require active, targeted virus deployment into pre-identified carp sub-populations under conditions appropriate for infection and disease.
- Viral biocontrol will provide greater suppression, over longer time periods, at times and places with less resilient carp populations (i.e. reduced capacity to 'bounce back' following population reduction). Virus release strategies have been designed to target these opportunities for increased impact.
- While any reduction in carp density brings potential ecological benefits, optimising suppression (and hence outcomes) across the species' entire range is likely to require a multi-method approach (NCCP research project 4). In particular, NCCP modelling indicates that targeted physical removal prior to virus deployment will optimise suppression in high-density carp populations. Assessing biocontrol feasibility was the NCCP's primary focus, meaning detailed assessment of a multi-method, integrated approach was beyond the program's scope. Nonetheless, the desirability of such an approach in at least some parts of carp's Australian range has planning and resourcing implications that will need to be more completely assessed if governments decide to proceed towards implementation.
- Genetic biocontrol technologies, and particularly the Trojan Y Chromosome approach, are potentially applicable to carp in Australia, but substantial biological and logistical challenges would need to be overcome prior to implementation, requiring considerable investment.



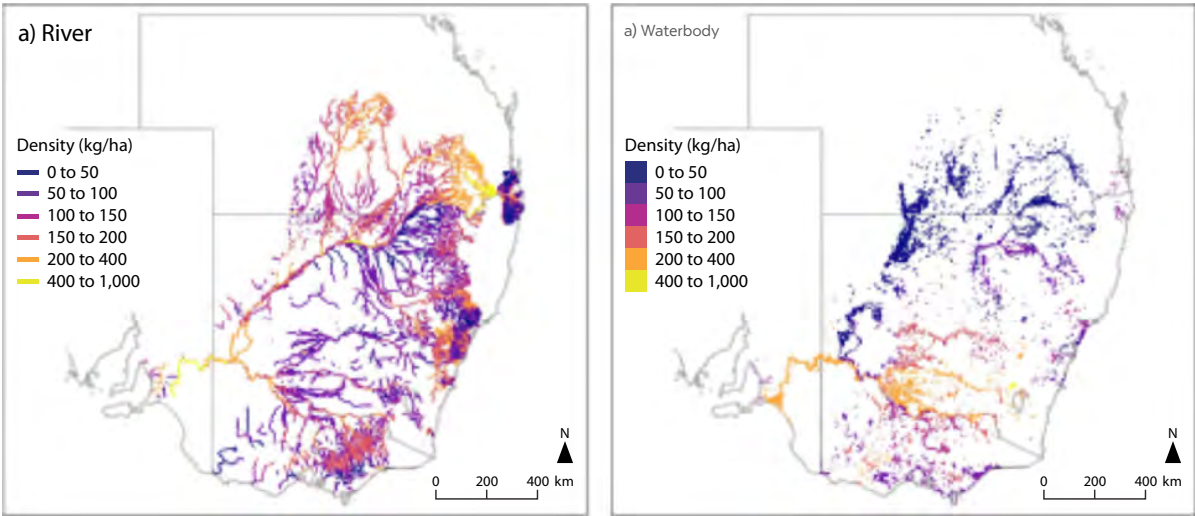


Figure 1: Density and distribution of carp in eastern Australia during spring/summer 2017-18, based on carp biomass estimation and mapping conducted under the NCCP. Carp also occur in some Western Australian coastal catchments.

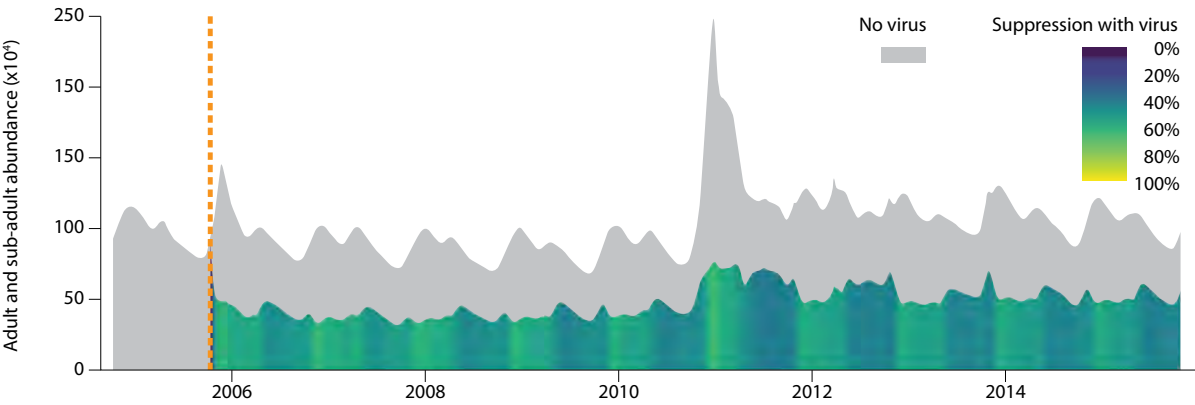


Figure 2: Modelled release of the carp virus into the mid-Murray River in 2000, assuming recrudescence and reasonable transmission. The shaded grey area represents carp populations in the absence of virus release.



KEY ASSUMPTIONS

Some key assumptions underpinning the NCCP epidemiological modelling and the consequences of those assumptions underlie the NCCP epidemiology conclusions as shown in Table 2.

Table 2: Key assumptions of the carp virus's impacts on Australian carp populations.

Assumption	Confidence that assumption is correct	Consequences if assumption is incorrect or inaccurate
Transmission primarily relies on physical contact between infected and susceptible carp. While other transmission pathways for the virus exist (e.g. infection of susceptible carp when they touch or ingest virus floating in the water) exist, experimental evidence from the NCCP and the broader scientific literature indicate that transmission through the water is likely to be relatively less important than physical contact between carp.	High. An NCCP experiment (NCCP research project 6) designed to test the relative importance of two transmission pathways (water-borne and physical contact between carp) confirmed that the latter is likely to be considerably more effective than the former. Transmission through the water can occur, but, in this experiment, the viral concentrations required to cause infection via this pathway were rarely achieved, even when diseased carp were confined in small (40 litre) volumes.	Variable depending on circumstances such as carp aggregation and water temperature, but overall carp mortalities would likely be greater if transmission through water is more effective than expected. If waterborne transmission occurred across long distances, carp kills could occur in unexpected locations, but this is unlikely. Nonetheless, the possibility of outbreaks in unexpected locations cannot be discounted. Such outbreaks could result from long-distance movement by latently infected carp, or from movement of infected carp by either humans or predatory animals/birds.
Direct physical contact between carp is frequent during spawning. The modelling assumes that, during spawning season, direct physical contact between carp occurs frequently.	Medium. While frequent physical contact among carp engaged in spawning behaviour is intuitively likely and based on well-understood reproductive biology, there are no data quantifying this.	The predicted strong seasonality of outbreaks may not be observed. If this assumption is incorrect, planning for deployment will be more difficult.
Latent infection with subsequent reactivation. The modelling assumes that carp surviving initial infection with the virus will develop a latent (i.e. dormant) infection that can be reactivated under suitable conditions, thereby infecting other carp. This reactivation of latent infections leading to disease – called 'recrudescence' – is one of the most important assumptions underlying the predicted impacts of viral disease on carp populations.	Medium. Latent and recrudescence carp virus infections are reported in the scientific literature. Additionally, results from an NCCP experiment supports the existence of latency and recrudescence over short time periods under laboratory conditions and with juvenile carp. Confirmation of latent carp virus infections with subsequent temperature-induced recrudescence, over longer time periods, in adult carp, and under variable environmental conditions (i.e. representing natural environments) is desirable.	If latent infections with subsequent reactivation do not occur, or if herd immunity means that they do occur, but do not cause substantial mortality, the virus's capacity to suppress carp populations in the medium to long term (i.e. 5–10 years) will be greatly diminished. The scenario would be one of a single major disease outbreak followed by rapid population recovery.

Assumption	Confidence that assumption is correct	Consequences if assumption is incorrect or inaccurate
No pre-existing resistance among Australian carp.	Medium. Preliminary work indicates that the genes conferring resistance to the carp virus are not present in Australian carp populations. However, this research was exploratory, and confirmation is desirable.	Viral effectiveness would be reduced, by an amount corresponding to the nature and prevalence of the resistance-conferring genes.
Viral transmission ceases completely outside permissive temperature range (below 16°C and above 28°C).	Medium. Carp maintained in a laboratory at 11°C did not produce infectious virus, supporting this assumption (Technical Paper 2). Nonetheless, fish immunology is complex, and the different processes that could ultimately lead to a carp dying from the disease caused by the virus (i.e. an infected carp secreting virus, a susceptible carp becoming infected, then developing disease and dying) will all proceed at different rates as temperatures change. If new scientific knowledge documenting temperature effects on secretion, transmission, and survival emerges, this can be incorporated into the modelling.	Transmission under temperature conditions that don't allow disease development could facilitate emergence of population-level immunity to the virus.

UNCERTAINTIES

- To effectively initiate outbreaks, infectious carp will likely need to participate in aggregations to ensure high contact rates between infectious and susceptible individuals. Yet, carp aggregations can be transient, sometimes lasting only a day or two before dispersing. Ensuring that infectious carp participate in aggregations could therefore be challenging. Virus deployment strategies based on releasing latently infected carp prior to the spring/early summer spawning period and allowing them to join aggregations naturally could help to overcome this challenge. Both the broader scientific literature and an NCCP laboratory experiment (NCCP research project 5) indicate that latently infected carp may experience temperature-induced reactivation of their infections, but further investigation is recommended.
- NCCP research project 5 was a short-term, laboratory-based study using juvenile carp. Patterns of recrudescence and onward infection over longer timeframes, in adult carp, and in the more variable and diverse environmental and temperature conditions characteristic of natural ecosystems could vary from those reported in this experiment. Furthermore, carp with a recrudescing infection could potentially experience behavioural changes that alter the likelihood of contact with susceptible individuals. Given these considerations, additional research assessing latency and recrudescence in adult carp, over longer timeframes, and under conditions more typical of a natural ecosystem is desirable. Even this additional research will not provide a complete understanding of carp virus disease dynamics, emphasising the importance of detailed and thorough post-release monitoring. Planning for a second year of virus deployment also mitigates against these uncertainties to some extent by providing a second opportunity to initiate outbreaks.

- Carp populations could develop herd immunity, reducing modelled effectiveness of the virus (Technical Paper 2).
- Some uncertainty remains about the role that carp-Goldfish hybrids could play in the evolution of resistance following virus release. Hybrids of European Carp can be infected by the carp virus, but are much less likely to develop serious disease than are 'pure' (i.e. non-hybrid) carp. Following a virus release, this relative invulnerability to disease could bestow a selective advantage on hybrids, potentially leading to their dominance in the population. However, the evolutionary fitness of carp-Goldfish hybrids and their potential role in the emergence of resistance remain knowledge gaps. NCCP research project 7 has developed genetic tools that could help to reduce this uncertainty.

2.2 Risks associated with carp biocontrol

Direct risks associated with carp biocontrol centre on the potential for decaying carp to degrade water quality, with a range of negative consequences. The other main direct risk is for carp virus impacts on non-target species. Secondary ecological risks are also described in the following sections.

2.2.1 Water-quality risks

Decomposing carp have the potential to negatively affect water quality. Most notably, decomposition can deplete dissolved oxygen, stressing or killing gill-breathing aquatic organisms (Technical Paper 3). Decomposition also releases nutrients and ammonia that can respectively fuel harmful algal blooms or are toxic to aquatic life. In combination, decaying carcasses, low or no dissolved oxygen, and algal blooms could potentially cause 'cascades' of negative impacts, including severe oxygen depletion and proliferation of disease-causing bacteria (Technical Paper 3). Modelling and risk assessment under the NCCP have investigated the likelihood that these damaging processes (termed 'exposure pathways') and their negative consequences ('risk assessment endpoints') could emerge following the virus's deployment as a biocontrol agent for carp in Australia (NCCP research projects 9 and 15).

RESEARCH CONCLUSIONS – RISKS

- Where carp densities are below approximately 300 kg/ha, and the water is flowing, key water-quality parameters are unlikely to be seriously impaired (Technical Paper 3). These conditions tend to prevail in most of the regulated river channels of the southern MDB, but are dependent upon broader climatic regimes (e.g. flows reduce or cease during drought) (Technical Paper 3). For perspective, Figure 1 illustrates the distribution of carp biomass during the summer of 2017-18.
- Where carp densities exceed approximately 300 kg, and the water is still or slow-moving, there is potential for low dissolved oxygen conditions and harmful algal (cyanobacterial blooms) to develop (Technical Paper 3). These conditions are most likely to prevail in waterbodies that are disconnected from flowing river channels (e.g. wetlands, lakes, reservoirs etc), and in unregulated rivers that cease to flow and dry to disconnected pools during dry periods (Technical Paper 3).
- Carp kills during dryer conditions will generally pose greater risks to water quality because dead carp are concentrated into a smaller total area (NCCP research projects 9 and 15). Conversely, the virus is likely to reduce carp populations most effectively if released during a relatively dry (not drought) period when carp are concentrated into smaller areas and not undergoing strong population growth (NCCP research project 4). This tension between protecting water quality and maximising carp reductions could be managed through careful implementation planning and management.

IMPLICATIONS FOR FEASIBILITY

- Initial virus deployment should occur during a period of low to moderate carp population density, thereby reducing the likelihood of high dead carp loadings that could compromise water quality.
- Initial virus deployment should occur during a year in which sufficient flow is available to dilute carp decomposition products and aid water-column mixing (noting that river managers may not always be able to manipulate flows specifically to benefit carp control).
- Main river channel habitats are unlikely to experience negative water-quality impacts following carp kills, whereas shallow, off-channel habitats and unregulated dryland rivers may, particularly where carp densities exceed 300 kg/ha.
- In some of Australia's highest-density carp populations, targeted harvesting before virus deployment may enhance carp suppression (NCCP research project 4). Reducing carp density before virus release could also mitigate water-quality risks in areas where carp biomass is high.
- In higher-risk habitats, two important risk mitigation options (manual collection of carcasses and use of water releases to flush away dead carp) are difficult or impossible to implement. There is consequently an argument for restricting planned virus release to the southern, regulated portion of the MDB where carp populations tend to be high and opportunities to use flow to aid carcass collection or flushing in some locations are increased. However, the risk remains that the virus would disperse, either by long-distance movement of latently infected carp, or through human agency, beyond the targeted release areas to locations where negative water-quality impacts are more likely. Therefore, if release proceeds, planning will need to incorporate surveillance and rapid-response measures across carp's mainland eastern Australian distribution, focusing on off-channel areas with carp biomass of 300 kg/ha or greater. Implementing such measures in remote areas, or where access is otherwise difficult, presents logistical challenges requiring adequate resourcing.
- The timing of initial virus deployment would need to be carefully planned to achieve an optimal balance between biocontrol effectiveness and risk management. Acknowledging that rainfall and flow will vary among catchments during any given year, this balance is most likely to be attained if initial deployment occurs under moderate flow conditions (i.e. neither flooding with full wetland inundation, nor drought), and when climatic conditions in the years preceding release have produced relatively low carp populations. Care will also be needed to ensure that virus-induced carp kills do not coincide with 'blackwater' events.

KEY ASSUMPTIONS

- NCCP water-quality modelling uses dead carp densities derived from the NCCP carp biomass and epidemiological modelling projects. Modelled water-quality impacts therefore rest on the fundamental assumption that these two projects' conclusions are approximately correct.
- The water-quality impacts of extreme dead carp densities were also modelled to understand likely impacts on water quality if dead carp densities are much higher than predicted. These investigations confirmed that very high dead carp densities seriously compromise water quality. Serious underestimation of likely dead carp biomass is, however, unlikely.

UNCERTAINTIES

- Nutrients from decaying carp could enter aquatic sediments and remain there, potentially forming a nutrient 'bank' that could contribute to future undesirable events, such as harmful algal blooms, well after carp carcasses have decayed (Technical Paper 3; NCCP research project 7).
- Assessing the extent to which 'legacy' nutrients in the sediment could contribute to environmental problems into the future is challenging, because the chemistry involved in the sequestration and subsequent release of these nutrients from the sediment is both complex and dependent upon local conditions (Technical Paper 3; NCCP research project 9).
- Nutrient accumulation is most likely at sites of high carcass density, such as where carcasses concentrate through current or wind action. Targeted carcass removal focused on these areas will be the most effective risk mitigation approach (Technical Paper 3; NCCP research project 9), but presents difficulties in some areas as outlined previously.
- NCCP water-quality modelling did not account for cumulative risks potentially posed by the downstream movement of water containing decomposition byproducts from successive upstream carp kills (NCCP research project 9).

2.2.2 Water treatment risks

Understanding potential impacts of carp biomass decomposition on water treatment plants and processes is essential for decision making on carp biocontrol. Producing drinking water involves two stages; 'treatment', which ensures water does not contain offensive odours or tastes, and 'disinfection', which kills potentially harmful microorganisms (Technical Paper 3; NCCP research project 14). Research co-funded by the NCCP investigated potential impacts of carp decomposition on both processes (NCCP research project 14).

RESEARCH CONCLUSIONS

- At carp densities typical of those estimated across the species' Australian range, standard water treatment and disinfection processes are effective (Technical Paper 3).
- At carp concentrations towards the upper limits of those estimated in Australian ecosystems, water remains treatable with the addition of powdered activated carbon (Technical Paper 3). Incorporating powdered activated carbon into the treatment process incurs additional costs, but is already routinely used in Australian water treatment plants to remove algal tastes and odours (Technical Paper 3).
- At carp densities substantially higher than those estimated to occur in Australian ecosystems, both water treatment and disinfection are untenable (Technical Paper 3). These very high dead carp densities are most likely to occur in a 'point-source' manner if wind or current caused dead carp to accumulate in a localised areas close to a treatment plant inlet (Technical Paper 3).

IMPLICATIONS FOR FEASIBILITY

- Dead carp densities likely to eventuate from use of the carp virus as a biocontrol agent pose little risk to the operability of water treatment plants.
- In areas with higher carp densities, some additional water treatment processes will likely be needed during peak carp mortalities.
- Carcass management activities will be required to prevent dead carp accumulating at high densities in restricted locations and decaying therein.

2.2.3 Carp virus species specificity

A detailed summary of species specificity information relevant to biocontrol using the carp virus is provided in Technical Paper 4. Key results and their implications for decision making are provided in the following sections.

RESEARCH CONCLUSIONS – SPECIES SPECIFICITY

- Specificity to the target organism is a fundamental requirement for most biocontrol agents.
- Some viruses can infect their hosts without causing disease. In these cases, the host is *infected* but not *affected* by the virus.
- The carp virus can neither infect nor affect any mammal, including human beings.
- Disease caused by the carp virus has only been reported in European Carp (including the ornamental variety), and in hybrids of European Carp (e.g. carp–Goldfish hybrids).
- CSIRO testing that preceded the NCCP (funded by the Invasive Animals Cooperative Research Centre) indicated that none of the 22 non-target species tested (see Technical Paper 4 for details) were either infected or affected by the virus, although some questions remained, leading to further work.
- A literature review commissioned by the NCCP (NCCP research project 11) raised the possibility that the carp virus may be able to infect species other than carp, though apparently without affecting them. This review recommended some additional work to increase confidence in the virus's species specificity before proceeding with virus release. Accordingly, Murray Cod and Silver Perch were re-tested for susceptibility to infection by the carp virus (NCCP research project 12). Attempts were also made to re-test Rainbow Trout, but captive fish experienced a water chemistry issue that led to major mortalities before any exposure to the virus occurred (NCCP research project 12). Therefore, at the direction of the relevant Animal Ethics committees, testing did not proceed for this species.

No evidence of viral infection was found in the re-tested Murray Cod and Silver Perch (NCCP research project 12). However, NCCP research identified viral species-specificity as an important concern for the Australian community. NCCP research project 13 identified that 57% of 4680 people surveyed were concerned that the virus might be transmissible to fish or animals other than carp. Decision makers will also need to be as confident as possible that the virus will only infect carp. Consequently, additional testing is recommended before any decisions are made regarding virus release. This testing should include Rainbow Trout as a minimum, but a small number of additional species could also be identified for inclusion through consultation with scientific experts.

IMPLICATIONS FOR FEASIBILITY

There is no indication that the carp virus has ever infected human beings or any other mammal, or is likely to do so in future. Further investigation of this possibility is not required, and it does not affect the feasibility of carp biocontrol.

The situation regarding potential susceptibility of lower vertebrates – and particularly non-carp fish species – is more complex. While considerable evidence indicates that the virus is specific to carp, community concern regarding species specificity, combined with the absence of Rainbow Trout from the second round of non-target species susceptibility testing (NCCP research project 12), mean that a precautionary approach to this issue is warranted. Therefore, the NCCP recommends that the current level of confidence in the virus's species specificity is insufficient for a clear determination of feasibility, and that additional testing is conducted.

KEY ASSUMPTIONS

The key assumption underpinning carp virus species-specificity considerations is that following any future release, the virus would not evolve in ways that result in the acquisition of new host species. Predicting viral evolution is difficult, and the virus's capacity for evolutionary change over longer timescales cannot be tested in the laboratory. Nonetheless, the carp virus possesses several traits that make it much less likely than many viruses to infect species other than carp (see Technical Paper 4).

UNCERTAINTIES

Absolute guarantees about the species specificity of any virus, including the carp virus, are not possible, so uncertainty in this area will never be completely eliminated. Nonetheless, confidence in the virus's specificity to carp could likely be further improved. Additional, carefully controlled non-target species susceptibility trials could provide the additional evidence required to address community concerns and support a more definitive determination of the virus's host range. These additional trials are therefore recommended before decisions regarding virus release are made.

2.2.4 Ecological impacts

The NCCP research program has considered primary risks (i.e. water quality, including for stock and domestic use, and species specificity) and secondary ecological impacts. These secondary impacts were assessed by reviewing information available in the scientific literature, and through the structured elicitation of expert opinion. A brief summary of the ecological risk pathways and potentially impacted ecosystems and species identified and assessed through this process is provided in the following sections. Risk management and mitigation is outlined in sections 2 and 3.

PROLIFERATION OF DISEASE-CAUSING BACTERIA FOLLOWING CARP KILLS

If dead carp are left to decay in waterbodies following virus-induced carp kills, diverse bacterial communities are likely to use the carcasses as a substrate for growth (Technical Paper 3; NCCP research project 15). These bacteria would include those that had been inhabiting the intestinal tracts of the carp prior to death, various generalist 'spoilage' bacteria associated with decay, and potentially some disease-causing species such as Shiga-toxin producing *Escherichia coli* and various *Aeromonas* species (NCCP research project 15).

The potential proliferation of harmful bacteria following carp kills is largely a consequence of poor water quality (Technical Paper 3; NCCP research project 15). Therefore, the extent to which dissolved oxygen can be maintained, nutrient levels managed, and cyanobacterial blooms averted, will influence pathogenic bacteria risk levels. As with other water-quality hazards, major carp kills during low-flow conditions elevate risk. Additionally, temperature is an important determinant of microbial growth, with bacteria more likely to proliferate when water temperatures exceed approximately 20 °C (NCCP research project 15). Given the carp virus causes disease in carp most effectively at water temperatures between approximately 16–28 °C, carp kills would occur at temperatures suitable for bacterial growth. Therefore, proliferation of bacteria, including species harmful to humans and other animals, is at least theoretically possible following carp kills. Despite the capacity of fish kills to generate conditions suitable for bacterial growth, there are no recorded incidents of bacterial disease outbreaks caused by these opportunistic 'secondary' bacteria in humans, fish, or other faunal groups following fish kills in Australia (NCCP research project 15). Nonetheless, the possibility of such an outcome cannot be discounted, particularly if water quality deteriorates.

REDUCED AVAILABILITY OF CARP AS A FOOD SOURCE FOR NATIVE SPECIES

Carp are now the dominant large-bodied fish species in the MDB, and are also abundant in many coastal catchments. Consequently, piscivorous native species, including fish and waterbirds, may now rely on carp (especially juvenile carp) for a portion of their diets. The NCCP risk assessment (NCCP research project 15) concluded that nesting waterbirds are the group most likely to be affected by this exposure pathway, so the following discussion focuses on this faunal group.

There is little scientific evidence quantifying the importance of carp in waterbird diets. Nonetheless, waterbird breeding usually occurs on inundated river floodplains, thus coinciding both temporally and spatially with carp spawning. The co-occurrence of numerous juvenile carp with waterbirds raising young makes it intuitively likely that juvenile carp form an important food source for waterbirds at these times. Carp reduction could therefore create food shortages for fish-eating waterbirds during their nesting periods (NCCP research project 15).

Treatment options to reduce the risk that carp control will result in food shortages for waterbirds centre on planning initial virus deployment on a catchment or regional basis to avoid waterbird nesting periods. Unfortunately, in at least some parts of carp's Australian distribution (e.g. along the Murray River), waterbird nesting periods and permissive temperatures for carp virus infection and disease coincide, making implementation of this control measure challenging. Supplementing local populations of forage species through hatchery rearing and release programs has also been suggested, but would be costly and both biologically and logistically complex (NCCP research project 15).

PREDATORY SPECIES SWITCHING FOCUS TO PREY ON NATIVE SPECIES FOLLOWING CARP REDUCTION

If piscivorous species do rely on carp as a food source, and this food source is substantially reduced by viral disease, then 'prey switching' may occur as predators refocus their hunting efforts from carp to native species, including small-bodied native fish, juveniles of large-bodied native fish, crustaceans, frogs, and freshwater turtle eggs and young. Potential mitigation measures for this risk are similar to those outlined under the heading 'Reduced availability of carp as a food source for native species'.

BOTULISM OUTBREAKS FOLLOWING CARP KILLS

Botulism is a serious illness caused by bacterial neurotoxins (Technical Paper 3; NCCP research project 15). The bacteria that cause botulism can persist for decades as dormant, harmless spores in aquatic sediments and other environments, including the intestinal tracts of animals. The basic prerequisites for a botulism outbreak are anoxic (no oxygen) conditions and a protein source to fuel bacterial growth (Technical Paper 3; NCCP research project 15). When these conditions occur, dormant spores germinate, with ensuing bacterial growth and toxin production, potentially leading to a botulism outbreak. Botulism outbreaks in wild birds and livestock occur sporadically in Australia (Technical Paper 3; NCCP research project 15).

Although there are seven botulism strains, concern in the carp biocontrol context lies primarily with strains C, D, and C-D mosaic (Technical Paper 3; NCCP research project 15). These strains affect birds, livestock, and, to a much lesser extent, fish, but are not harmful to humans. Strain E is very dangerous to humans and fish, but there is some doubt as to whether this strain occurs in Australia. If strain E is present in this country, it is likely rare and/or has a restricted distribution (Technical Paper 3; NCCP research project 15).

Botulism risk varies with both river flows and water temperatures. Botulism outbreaks are more likely at temperatures greater than 20 °C and in still or slow-moving water. The temperature band within which the virus causes disease most effectively in carp means that outbreaks will usually occur at temperatures above 20 °C (Technical Paper 3; NCCP research project 15). Overall, it is possible that botulism outbreaks could result from mass carp mortalities (Technical Paper 3; NCCP research project 15). This risk rating is conservative and precautionary, reflecting the capacity of major fish kills to produce the fundamental preconditions for a botulism outbreak under some circumstances (i.e. kills occurring in shallow, off-channel waterbodies with high carp densities) (Technical Paper 3; NCCP research project 15). Despite this biological plausibility, fish kills in Australian freshwater ecosystems have not generally triggered botulism outbreaks, with only one recorded outbreak (NCCP research project 15). Nonetheless, depending upon the virus release strategy used, carp kills resulting from planned release of the carp virus could be on an unprecedented scale for Australian systems. The 'possible' risk rating reflects a balance of these considerations. As for pathogenic bacterial risk more generally, treating botulism risk centres on removing carcasses, either manually or through planned water releases where feasible (NCCP research project 15).

EPHEMERAL OR DRYLAND RIVER SYSTEMS

Ephemeral waterbodies are those that either dry completely or shrink to a series of disconnected pools during low-rainfall periods. Ephemeral systems tend to occur in the drier northern and western portions of the MDB, and differ from regulated rivers that tend to have long stretches of permanent water. Ephemeral river systems are ecologically important because the isolated permanent or semi-permanent waterholes that remain in their channels during dry times provide drought refuges for many species, including those that are rare and threatened (NCCP research project 15).

Refuge waterholes generally have little or no flow, and often have generally poor water quality, even in the absence of fish kills (Technical Paper 3). Virus-induced carp kills could potentially exacerbate these conditions, compromising the refuge value of these habitats (Technical Paper 3). These impacts will need to be addressed through regional implementation planning.

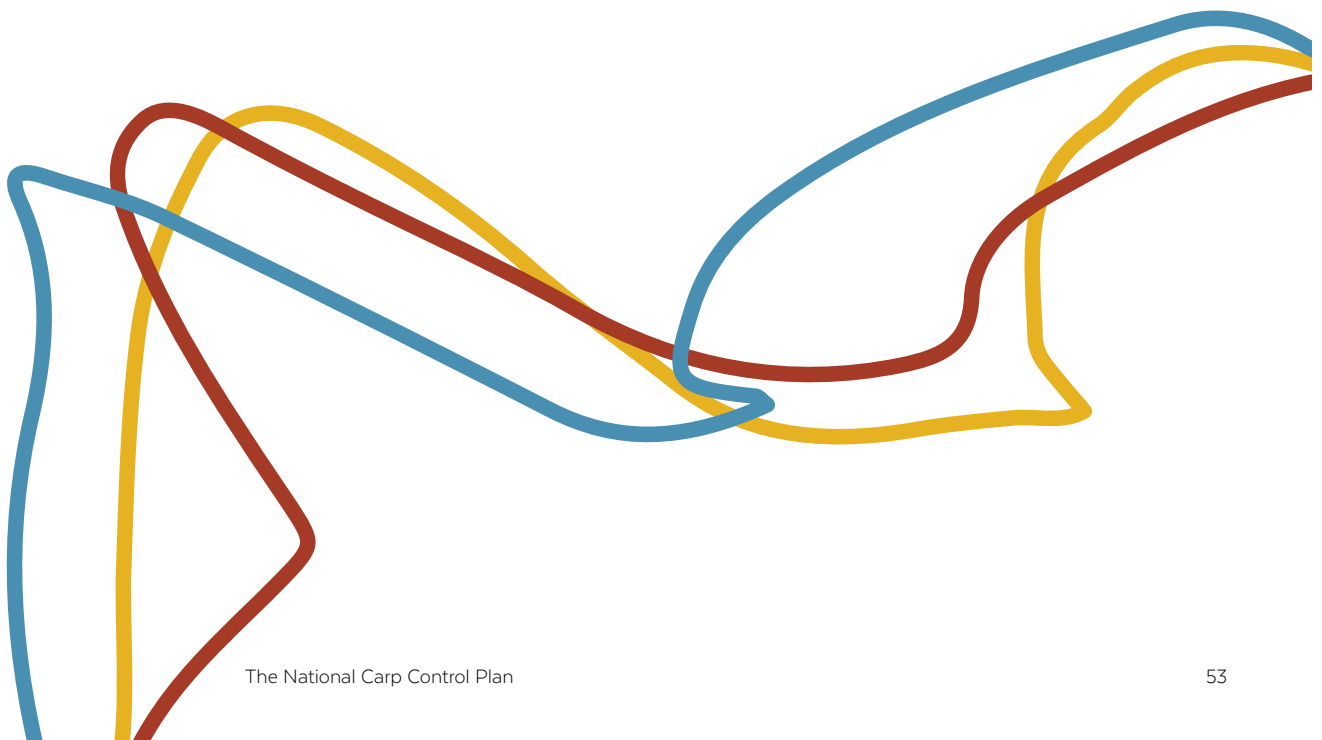


RAMSAR WETLAND SYSTEMS

Twenty-five listed wetlands occur within carp's Australian distribution. These wetlands have high conservation values and are afforded protection by the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Ramsar Convention. These wetlands also tend to have high carp biomass. The NCCP ecological risk assessment (NCCP research project 15) concludes that the following wetlands could possibly be impacted according to criteria established under the EPBC Act:

- The Coorong and Lakes Alexandrina and Albert estuarine wetlands (South Australia),
- Currawinya Lakes (Currawinya National Park) (Queensland),
- Gwydir Wetlands: Gingham and Lower Gwydir (Big Leather) Watercourses (New South Wales),
- Narran Lake Nature Reserve (New South Wales),
- Paroo River Wetlands (New South Wales),
- The Macquarie Marshes (New South Wales),
- Banrock Station Wetland Complex (South Australia),
- Barmah Forest (Victoria),
- Fivebough and Tuckerbil Swamps (New South Wales),
- Gunbower Forest (Victoria),
- Hattah-Kulkyne Lakes (Victoria),
- Kerang Wetlands (Victoria),
- New South Wales Central Murray Forests (New South Wales), and
- Riverland (South Australia).

Implementation planning will need to assess and mitigate possible impacts consistent with EPBC Act requirements. NCCP case studies demonstrated that risk mitigation measures are possible at Barmah Forest and Gunbower Forest (see section 4.4).



2.3 Socio-economic impacts

The feasibility assessment for carp biocontrol presented in the NCCP is limited to scientific and operational matters, and does not formally incorporate potential socio-economic impacts. Nonetheless, the NCCP research program considered these potential impacts (Technical Paper 5; NCCP research projects 13 and 15), and summarised results are presented for consideration by governments.

Positive and negative impacts of the NCCP will vary between stakeholder groups. Carp biocontrol may involve negative impacts for some stakeholder groups, particular in the short term as the virus is deployed and initial major carp mortalities occur. These initial negative impacts may be balanced by longer-term benefits flowing from improved environmental outcomes. Other stakeholders could experience more sustained negative impacts.

NCCP social impact research could only identify potential impacts, as opposed to quantifying actual impacts. Potential impacts were used because the research was conducted concurrently with NCCP biophysical research, and hence could not fully consider final research conclusions and the likely short- and long-term effects of carp biocontrol.

2.3.1 Traditional Owners

Many Aboriginal Nations have strong interest in carp-affected waterways. Many Aboriginal people living outside these regions also have cultural responsibilities to care for carp-affected country despite not currently living on that country.

The NCCP consulted Aboriginal Nations and organisations to discuss carp biocontrol. Consultation directly with Aboriginal communities was limited.

Negative (or potentially negative) impacts of carp biocontrol for Aboriginal people include:

- potential for disempowerment through lack of involvement in carp biocontrol planning, decision making, and implementation,
- potential for negative impacts on health of country if biocontrol has unforeseen harmful effects on ecosystems,
- potential for negative impacts on cultural activities and culturally important sites if biocontrol has unforeseen harmful effects on ecosystems, and
- potential for reduced employment opportunities if biocontrol is ineffective or is planned and implemented in ways that do not empower Aboriginal people.

Positive, or potentially positive impacts of carp biocontrol for Aboriginal people include:

- empowerment through active, meaningful, appropriately resourced involvement,
- potential for improvements in health of country if biocontrol is effective,
- potential for positive impacts on cultural activities and culturally important sites if biocontrol is effective, and
- potential for increased employment opportunities if biocontrol planning and implementation is empowering for Aboriginal people.

A key recommendation is that a specific engagement strategy be developed and implemented for Aboriginal communities which consults at the community as well as nations level. Aboriginal engagement should engage on enterprise outcomes as well as social licence to operate.

2.3.2 Tourism

The tourism sector is defined as any recreation-related business that is reliant on inland freshwater systems or regions for their income (e.g. houseboat operators, fishing guides, nature-based or adventure tourism, and accommodation with water frontage). Poor water quality, regardless of its cause, reduces visitation to freshwater destinations, resulting in negative economic impacts to the tourism sector. For example, the tourism industry has been, and continues to be, negatively impacted by major algal blooms occurring along the Murray River. Perceived declines in water quality can be as damaging to tourism businesses as real reductions. Technical Paper 5 addresses potential socio-economic impacts on the tourism industry, and potential mitigation measures, in detail.

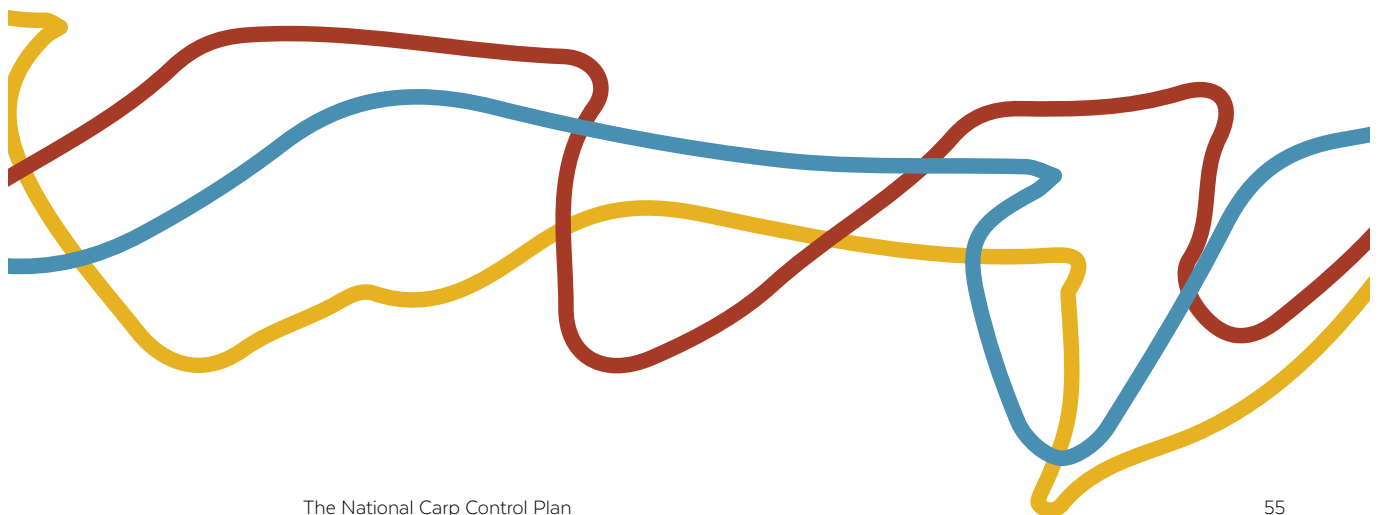
2.3.3 Commercial carp fishers

Commercial carp fisheries in Australian states and territories are currently fairly small, with limited permits issued. Regulatory regimes vary widely across the jurisdictions in which commercial carp fishing is permitted.

Potential negative impacts of carp biocontrol on the commercial fishing sector include:

- uncertainty about the future resulting in psychological distress and mental health impacts,
- severe reduction in profitability, or complete loss of business viability,
- inability to invest in or sell fishing businesses,
- changes to World Organisation for Animal Health (OIE) trade policies that could reduce access to international markets or reduce profitability,
- difficulty or inability to obtain or service finance,
- loss of market access,
- impact on public reputation, and
- increased business costs.

Potential positive impacts or opportunities of carp biocontrol for the commercial fishing sector include potential inclusion of live harvest in an integrated control strategy to support biocontrol. Technical Paper 5 and NCCP research project 13 address potential socio-economic impacts on commercial carp fishers, and potential mitigation measures, in detail.



2.3.4 Native fish aquaculture

Native fish aquaculture is a small but growing industry, which is expanding in both domestic and export markets. Many of these markets are highly sensitive to any change in real or perceived product quality. Viability of the sector is reliant upon price premiums attracted by their products' 'clean and green' image. The sector supplies fingerlings for stocking, export fingerlings for grow-out overseas, and some businesses grow stock into table-size fish for domestic consumption. Markets include conservation restocking, stocked recreational fishing, and consumption.

Potential negative impacts of carp biocontrol on the native fish aquaculture sector include:

- uncertainty about future business viability, including potential for complete loss of viability,
- increased business costs,
- changes to OIE trade policies following virus release in Australia, and
- loss of market access due to negative perceptions (i.e. loss of 'clean and green' image) and/or regulatory barriers.

Potential positive impacts of carp biocontrol on the native fish aquaculture sector include:

- expanded business opportunities if native fish restocking is implemented as an environmental restoration measure alongside carp biocontrol, and
- potential opportunities to address existing regulatory constraints.

Technical Paper 5 details potential socio-economic impacts on the native fish aquaculture industry, and potential mitigation measures.

2.3.5 Koi hobbyists and businesses

Keeping decorative koi carp (an ornamental genetic strain of carp) involves thousands of people and supports many businesses in those jurisdictions where koi may be legally kept (New South Wales and Western Australia). Koi keeping has a long cultural history, and koi keepers have strong connections to their pet fish and to koi communities in other countries.



Potential negative impacts of carp biocontrol on the koi sector include:

- uncertainty about the future resulting in psychological distress, and mental health impacts,
- higher day-to-day business costs resulting from the need to increase biosecurity measures,
- higher koi keeping costs for hobbyists,
- reduced social interaction,
- psychological and financial impacts of loss of koi, for both hobbyists and businesses, and
- longer-term viability of the koi hobby in Australia.

Technical Paper 5 and NCCP research project 13 address potential socio-economic impacts on koi hobbyists and businesses, and potential mitigation measures, in detail.

The NCCP has commissioned a biosecurity strategy for the koi sector to guide risk mitigation following potential release of the carp virus in Australia (NCCP planning investigation 2). The project concluded that:

- improved biosecurity protocols could reduce the risks of adverse impacts on the koi sector, and
- koi sector representatives are concerned that implementing enhanced biosecurity protocols would be costly for both hobbyists and businesses, and would unduly inhibit koi exchanges and events.

2.3.6 Recreational fishers

Recreational fishing is a key driver of visitation and tourism revenue in many freshwater and estuarine areas inhabited by carp. Changes in fishing conditions and opportunities contribute to changing visitor numbers. Within the recreational fishing sector, a relatively small number of fishers specifically focus on carp fishing (coarse fishing, a term originating in the United Kingdom to denote fishing for species other than the salmonids historically recognised as premium sporting or 'game' species). Recreational fishers have been highly engaged in discussions about carp control and in actions to raise awareness of carp as a pest species, for example through conducting regular community-based 'carp buster' competitions.

Potential negative impacts of carp biocontrol for recreational fishers (and particularly those who target carp) include:

- reduced fishing opportunities and/or fishing activity for those wishing to catch carp,
- reduced carp numbers for coarse fishers, and
- reduced profitability for some recreational fishing suppliers or guide businesses if carp constitute a substantial component of their business.

Potential positive impacts of carp biocontrol for recreational fishers include:

- increased fishing success and enjoyment for fishers wishing to catch native species,
- increased revenue for fishing-related businesses if carp control leads to improved ecosystem health and enhanced native fish abundance, and
- opportunities for recreational fisher involvement in carp control and aquatic habitat restoration.

Technical Paper 5 and NCCP research project 13 detail potential socio-economic impacts on recreational fishers, with potential mitigation measures for negative impacts.



3 IMPLEMENTATION STRATEGY

3.1 Introduction

This section describes how carp virus biocontrol could be successfully implemented across Australia. The implementation strategy provides a national framework or strategic 'intent' for more detailed planning should the Australian Government decide to proceed towards implementation. The strategy does not provide detailed implementation actions as jurisdictions and regions are best placed to complete implementation planning according to jurisdictional legislation and local conditions and constraints.

The implementation strategy is based on NCCP research (section 2), and case studies (section 4). Additional information is provided in Technical Paper 6. The case studies reported in section 4 illustrate how implementation could occur in particular regions.

3.2 Implementation objectives

Implementation objectives for carp biocontrol have been developed from NCCP research results and feasibility assessment. The objectives are:

- a. widescale reduction and suppression of carp populations for the medium to long term (5-10 years),
- b. effective environmental risk management with no unacceptable impacts on Matters of National Environmental Significance (MNES) under the EPBC Act,
- c. management of water-quality risks for town water supply, stock and domestic water needs, irrigation, and cultural and recreational purposes, and
- d. effective and efficient virus deployment and carcass management, where the latter is required.

This section provides specific national strategies to achieve objective (a), which is fundamentally informed by technical and scientific considerations and therefore within the scope of NCCP research and investigations. Objectives (b), (c), and (d) are primarily informed by policy, jurisdictional, local, and operational considerations and are therefore addressed conceptually to provide indicative approaches for regional planners. The NCCP case studies demonstrate how these objectives could be achieved in particular regional contexts.

3.3 Implementation outcomes

AT LEAST 40-60% MORTALITY IN TARGETED CARP SUB-POPULATIONS

NCCP modelling indicates that initial virus deployment into targeted carp sub-populations will cause disease outbreaks that reduce those populations by on average 40-60% relative to pre-deployment levels (and 60-80% in less resilient in carp populations) (see Technical Paper 2, NCCP research project 4, and section 2.1 for details, including assumptions and uncertainties).

ONGOING SUPPRESSION OF TARGETED CARP SUB-POPULATIONS

Following virus deployment and associated carp reductions, suppression is expected to result from the combined effects of the initial knockdown and reactivation of latent infections.

3.4 Implementation phases

If governments ultimately decide to proceed towards undertaking a carp biocontrol program, NCCP implementation is proposed over a 10-year timeframe with activities primarily focused in the first four years. Specific timings are dependent on implementation planning and adaptive management. The phases or periods of implementation include:

1. planning – one or two years of implementation planning before virus deployment,
2. operations (initial deployment) – two or three years of virus deployment and carcass management, possibly preceded by harvesting to ‘thin out’ high-density carp sub-populations,
3. operations (post deployment) – five to seven years of significantly reduced operations and ongoing surveillance, and
4. completion.

The phases listed in points 1–4 occur sequentially, however overlaps and delays between the different phases are expected (for example, suitable pre-conditions for deployment may take some time to eventuate). The following sections apply the knowledge generated by NCCP research and planning investigations to address the third feasibility question, namely “how could carp biocontrol be implemented?”.

3.4.1 Planning

The NCCP implementation strategy sets out the national strategic intent and approach to virus deployment and management, and provides the basis from which jurisdictions and regions will undertake more detailed implementation planning. Implementation planning will identify the operational measures and resources required to deploy the virus and manage associated risks. Regulatory approvals will also need to be obtained during the planning stage. Guidelines for the planning phase are given in Technical Paper 6.

LEGISLATIVE APPROVALS

Objectives (b) and (c) (from section 3.2) will be guided by numerous legislative approval processes and then implemented according to those approvals. Legislative approvals requiring completion during the planning stage include those necessary under:

- the EPBC Act,
- legislation administered by the APVMA,
- the *Biosecurity Act 2015*,
- the *Biological Control Act 1984*, and
- relevant state and territory regulatory approvals.

STRATEGIC ASSESSMENT UNDER THE EPBC ACT

On 19 January 2018, a delegate of the then Minister for the Environment and Energy entered into an agreement with the then Department of Agriculture and Water Resources to undertake a strategic assessment of the NCCP. The strategic assessment will be undertaken in accordance with section 146 of the EPBC Act (see dcceew.gov.au/environment/epbc/strategic-assessments/strategic/national-carp-control-plan).

Additional planning, risk assessment and drafting of statutory documents will be required to undertake the strategic assessment should government decide to undertake further work towards implementation of the NCCP.

For the purposes of the strategic assessment, the Plan is to be a document that will describe how the NCCP will be implemented by each state and territory to ensure impacts on Protected Matters are acceptable. A Strategic Assessment Report will be prepared to assess how the implementation of the Plan will ensure the appropriate level of consideration and management of impacts on Protected Matters. A draft Strategic Assessment Report and draft Plan will need to be made available for public comment. Following the public comment period, a Supplementary Report (addressing public comments) and a revised Plan and Strategic Assessment Report (if necessary) will be submitted to the Minister for consideration.

After considering the Strategic Assessment documents the Minister may decide to endorse the Plan if satisfied that the reports adequately address the impacts. If the Minister endorses the Plan, the Minister may then approve the taking of an action, or class of actions, in accordance with the Plan and the EPBC Act. The effect of any such approval decision is that any actions or class of actions would not need further approval by the Minister under the EPBC Act if taken in accordance with the endorsed Plan.

This process takes approximately 18 months. This timeframe depends on the timely preparation of the relevant strategic assessment documents and management of the public consultation process. In past strategic assessments, including those where governments were the proponent, the preparation of this documentation has been undertaken by ecological consultants, with expertise in EPBC Act assessments.

MANAGEMENT AREAS FOR OPERATIONS

Planning would begin by determining Catchment Control Areas (CCAs) for implementation across the designated area of virus deployment. CCAs will be defined by:

- operational considerations such as spans of control,
- prioritised areas for virus release,
- connections and barriers between waterways and carp populations, and
- natural characteristics of the catchment.

DEVELOPMENT OF IMPLEMENTATION PLANS

If governments decide to proceed towards implementation, jurisdictions and regions (as defined by CCAs) will need to develop regional implementation plans detailing specific operational approaches, requirements, and constraints including regional central command and forward command locations (Technical Paper 6). Regional implementation plans will reflect the relevant directions, policies, legislative requirements and frameworks of the appropriate state or territory plan.

ESTABLISHING OPERATIONAL COORDINATION

During the planning phase operational coordination would need to be established according to jurisdictional and regional planning and proposed Australian incident management procedures (Technical Paper 6).

3.4.2 Operations (initial deployment)

Operations would follow implementation planning and would take two to three years to complete. The operational phase would involve the following major tasks:

1. virus preparation,
2. establishment of regional and jurisdictional implementation teams,
3. operational preparation,
4. communications and engagement, and
5. initial deployment field operations.

This phase of viral biocontrol would be the most resource intensive, as it includes the substantial tasks of virus deployment and carcass management (outlined in the following sections). This phase might usefully be preceded by targeted, intense harvesting of carp in high density sub-populations to reduce their abundance prior to viral biocontrol (NCCP research project 4). Details of operations related to implementation are provided in Technical Paper 6.

3.4.3 Operations (post deployment)

Operations in the year after initial deployment would involve a significant reduction in the number of carp kills and the size of the carp in those kills. Kills during this phase are likely to substantially comprise juvenile carp, presenting reduced water-quality risks (Technical Paper 3; NCCP research project 4).

Post-deployment operations involve moving from 'response' arrangements with full incident management systems to a 'maintenance and learning' phase during which active operational activity is substantially reduced. Australian experience with viral biocontrol of vertebrate pests indicates that these programs are most effective when delivered with a long-term, strategic approach to managing the evolving relationship between virus and host. Regional disease surveillance and operational response capability may still be required and could be conducted, with appropriate resourcing, by state/territory agencies. Alternatively, dedicated regional coordination centres could be retained with reduced staffing levels.

Jurisdictions are probably best placed to lead any activities during this period. The need for coordination at the national level would be reduced, but ongoing national monitoring and evaluation would still be required.

3.4.4 Completion

The completion phase would begin when all necessary national actions to deploy the carp virus and manage associated risks have been completed. Completion is likely to begin approximately 10 years after initial virus deployment, but experience during adaptive management could change this projection. Upon completion, jurisdictions would be able to manage risks as part of their usual operations. Ongoing surveillance, monitoring, and research is proposed following completion.

3.5 Virus deployment strategy

3.5.1 Critical success factors

Virus deployment will aim to achieve the first implementation objective, namely:

- widescale reduction and suppression of carp populations for the medium to long term (5–10 years).

Critical success factors for carp virus deployment and carp biocontrol are identified in the following sections. These factors exploit the biological characteristics of carp and the carp virus to maximise knockdown and suppression.

USING VIRUS AND CARP BIOLOGY TO MAXIMISE EFFECTIVENESS

Virus deployment aims to maximise the impacts of viral disease on carp populations by achieving both an initial knockdown and ongoing suppression as modelled by NCCP research (NCCP research project 4).

Four primary biological preconditions will likely determine the virus's impact on carp populations:

- the permissive water temperature for viral infection and recrudescence,
- recrudescence of latent infections,
- carp aggregation behaviour to achieve virus transmission between carp, and
- the proportion of carp infected within a given sub-population (see Technical Paper 2 and NCCP research project 4 for more detailed discussion of these variables).

The carp virus's capacity to kill carp is temperature dependent. The virus only causes disease in carp at temperatures between approximately 16 and 28 °C. Disease is particularly likely in a narrower temperature range between approximately 21 and 25 °C (Technical Paper 2). Within carp's Australian distribution, these water temperatures mainly occur through spring and early summer.

As water temperatures move outside the permissive range, the virus becomes latent within infected carp and does not replicate (see Technical Papers 2 and 6 for descriptions of latency and its potential role in carp biocontrol). The scientific literature and results from a preliminary and limited laboratory experiment under the NCCP indicate that, as water temperature increases into the permissive range during spring in the years following initial deployment, a proportion of latently infected carp will experience reactivation of their infection (recrudescence) (Technical Paper 2; NCCP research project 4). These individuals may or may not get sick and/or die, but most should shed virus, potentially infecting naïve carp with which they have physical contact (NCCP research project 4).

This sequence of latency and recrudescence will be a crucial determinant of the virus's capacity to deliver long-term carp suppression (Technical Paper 2). If latent infections recrudescence and infect naïve carp, the virus should deliver effective ongoing carp suppression for at least 5–10 years, and probably longer, albeit with uncertainties regarding genetic resistance and herd immunity (NCCP research project 4). Recrudescence carp virus infections are documented in the scientific literature, and results from a short-term laboratory experiment under the NCCP also support the existence of recrudescence, although their applicability to the timescales and environmental conditions under which recrudescence would need to occur in the field should be interpreted cautiously (Technical Paper 2; NCCP research project 4). If recrudescence does not occur, or if it does occur but herd immunity reduces mortality rates, the carp virus will deliver large initial mortalities in the year or two following release, but is unlikely to provide longer-term suppression (NCCP research project 4).

Physical contact between infected and naïve carp is almost certainly the most effective transmission pathway for the carp virus (Technical Paper 2; NCCP research project 4; NCCP research project 6). A laboratory experiment under the NCCP (NCCP research project 6) supports this contention, demonstrating that physical contact between carp is required for efficient transmission of the carp virus. In contrast, transmission through water required extremely high viral concentrations that were only rarely obtained even when infected carp with disease symptoms were housed in small (40-litre) volumes of water. The emphasis placed on direct physical contact as the primary transmission route in NCCP epidemiological modelling is therefore supported by experimental evidence. Although the virus can survive in the water column outside its carp host for a relatively short period, this transmission pathway is likely to be substantially less important than direct physical contact between infected and naïve carp (Technical Paper 2; NCCP research project 4; NCCP research project 6).

The requirement for physical contact between carp to ensure transmission presents both opportunities and challenges. The need for physical contact to ensure effective transmission contributes to a geographically and seasonally restricted outbreak pattern that facilitates carcass management. However, transmission through physical contact also means that engineering disease outbreaks of sufficient magnitude to knock down carp populations may be challenging.

Carp spawning behaviour provides the most likely opportunity to initiate outbreaks of the disease caused by the carp virus. Adult carp move to access suitable spawning habitat in early spring, forming large aggregations immediately prior to spawning. Aggregations place numerous carp in close physical proximity. The virus will be deployed by introducing infected carp into aggregations within targeted sub-populations. Two primary potential deployment techniques for getting infected carp into aggregations have been identified by NCCP research and planning investigations. These techniques (i) are capture, injection and release of a subsample of aggregating fish in spring, and (ii) capture, injection and release of latently infected carp during winter prior to onset of aggregating behaviour. An adaptive management approach following virus release (if governments choose to proceed) is most likely to enable refinement and optimal targeting of deployment methods.



Photo Luis Garcia (Wikimedia)

TARGETING AGGREGATIONS ACROSS CARP SUB-POPULATIONS

The most effective virus deployment strategy will target as many aggregations as possible within a given carp sub-population. Depending upon the virus-deployment technique used, deployment may need to occur during a relatively narrow time-period when carp aggregating behaviour and permissive water temperatures coincide. Sufficient virus needs to be introduced into each sub-population to (a) trigger an outbreak that provides initial knockdown, and (b) ensure that a proportion of infected carp develop latent infections to trigger outbreaks in future years. If insufficient aggregations within each carp sub-population are not infected during this period, carp suppression is likely to be suboptimal.

ACHIEVING BROADSCALE INFECTION

Broadscale deployment of the carp virus is required to ensure that as many carp as possible are exposed to the virus while still immunologically naïve (Technical Paper 2). The requirement for broadscale deployment does not initially extend to geographically isolated populations, such as those in coastal catchments. Over time, however, isolated carp populations could still be controlled through secondary deployment of the virus at jurisdictional discretion.

While broadscale virus deployment and impact is desirable, logistical constraints and priorities would almost certainly preclude simultaneous deployment across carp's entire Australian distribution. However, targeting carp meta-populations (connected groups of sub-populations) offers an opportunity to achieve broadscale impacts, while operating at more manageable spatial scales.

The regulated systems within the MDB contain high carp densities, and are proposed as the focus of the initial virus deployment. In areas where carp may not routinely aggregate in large numbers (e.g. some unregulated systems in the northern MDB), initiating outbreaks could be particularly challenging.

3.5.2 Duration of initial carp virus deployment

Initial virus deployment is proposed for the first year with contingency for a second year of deployment based on an evaluation of first-year deployment success. A second year of deployment may be required given the uncertainty regarding the narrow 'window of opportunity' during which permissive water temperatures and carp aggregation align. The extent of virus deployment and carcass management required in the second year would be determined by evaluating first year outcomes.

3.5.3 Location of initial carp virus deployment

If carp biocontrol eventually proceeds, initial virus deployment would likely focus on regulated river systems of the MDB, including irrigation areas (subject to irrigation operations), see Figure 3. Deployment timing would be informed by local surveillance, monitoring, and environmental/weather conditions. Specific decisions about deployment timing and locations would need to be agreed by all jurisdictions and the Australian Government. Deployment and subsequent management would occur over two years across the following management zones and geographic locations.

Mid zone of operations

- the Gwydir River and adjoining waterbodies and lakes from Copeton Dam to the confluence with the Barwon River,
- the Namoi River and adjoining waterbodies and lakes from Keepit Dam to the confluence with the Barwon River,
- the Macquarie River and adjoining waterbodies and lakes from Burrendong Dam to the confluence with the Barwon River,
- the lower sections of the Balonne and Warrego River systems, and
- the Barwon and Darling Rivers to Menindee Lakes.

Southern zone of operations

- Murray River and adjoining waterbodies and lakes from Hume Dam to the Lower Lakes. Including the lower sections of the following tributaries:
 - Ovens,
 - Goulburn,
 - Campaspe,
 - Loddon,
 - Broken, and
 - Lower Darling from Menindee Lakes; including the following tributary/anabranh systems
 - Edward-Wakool,
 - Chowilla, and
 - Darling Anabranh.
- Murrumbidgee River and adjoining waterbodies and lakes from Burrinjuck Dam to the confluence with the Murray River (note there are large carp populations throughout the upper Murrumbidgee catchment and these could be included in the first year of deployment).
- The Lachlan River and adjoining waterbodies and lakes from Wyangala Dam to the confluence with the Murrumbidgee River including the first section of Wyangala Creek.



Murrumbidgee River. Photo Bidgee (Wikimedia)

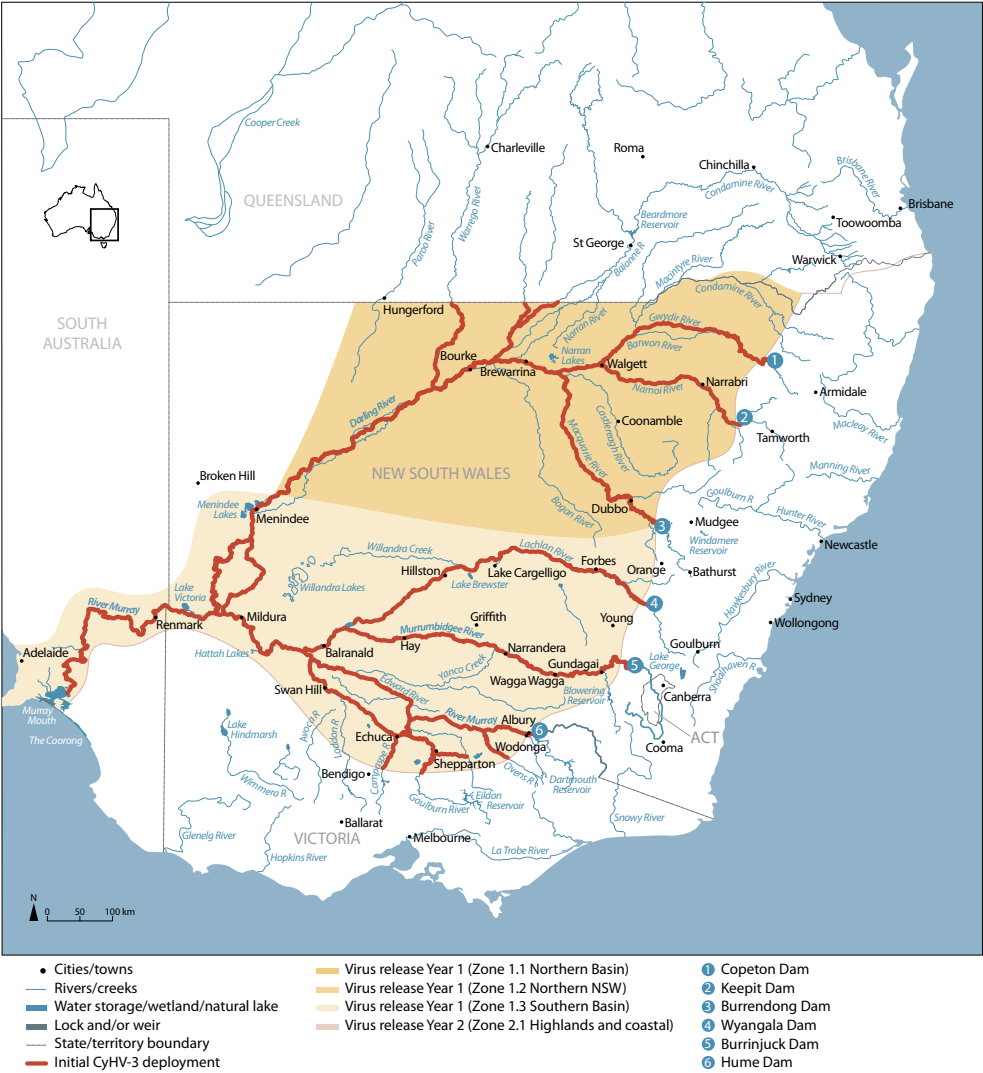


Figure 3: Initial deployment of the carp virus into regulated systems in south-eastern Australia.

The mid zone or northern New South Wales zone will reach permissive water temperatures for viral infection and disease earlier than the southern zone, so deployment could begin and finish slightly earlier in the north.

A potential variation on the release strategy focusing on regulated river systems first would be to include Queensland’s unregulated ephemeral systems in the initial release (Figure 4). These rivers dry to disconnected refuge pools, usually during the season when virus release would need to occur (NCCP research project 15). Refuge pools have important biodiversity values, which could be compromised by decomposing carp at high densities. Furthermore, these pools typically feature dissolved oxygen and temperature profiles that are already marginal for native fish (Technical Paper 3; NCCP research project 15). Dryland ephemeral rivers consequently present a different risk profile to regulated systems. A virus release strategy that includes these sensitive systems in the initial deployment would aim to induce major carp mortalities in a predictable manner while personnel and resources for intensive carcass removal are present. Initial carp mortalities could reduce the overall population, thereby reducing the likelihood of major kills that could compromise water quality in future years. Nonetheless, the challenges associated with implementing such an approach in these remote systems where vehicle access is often very difficult should not be underestimated.

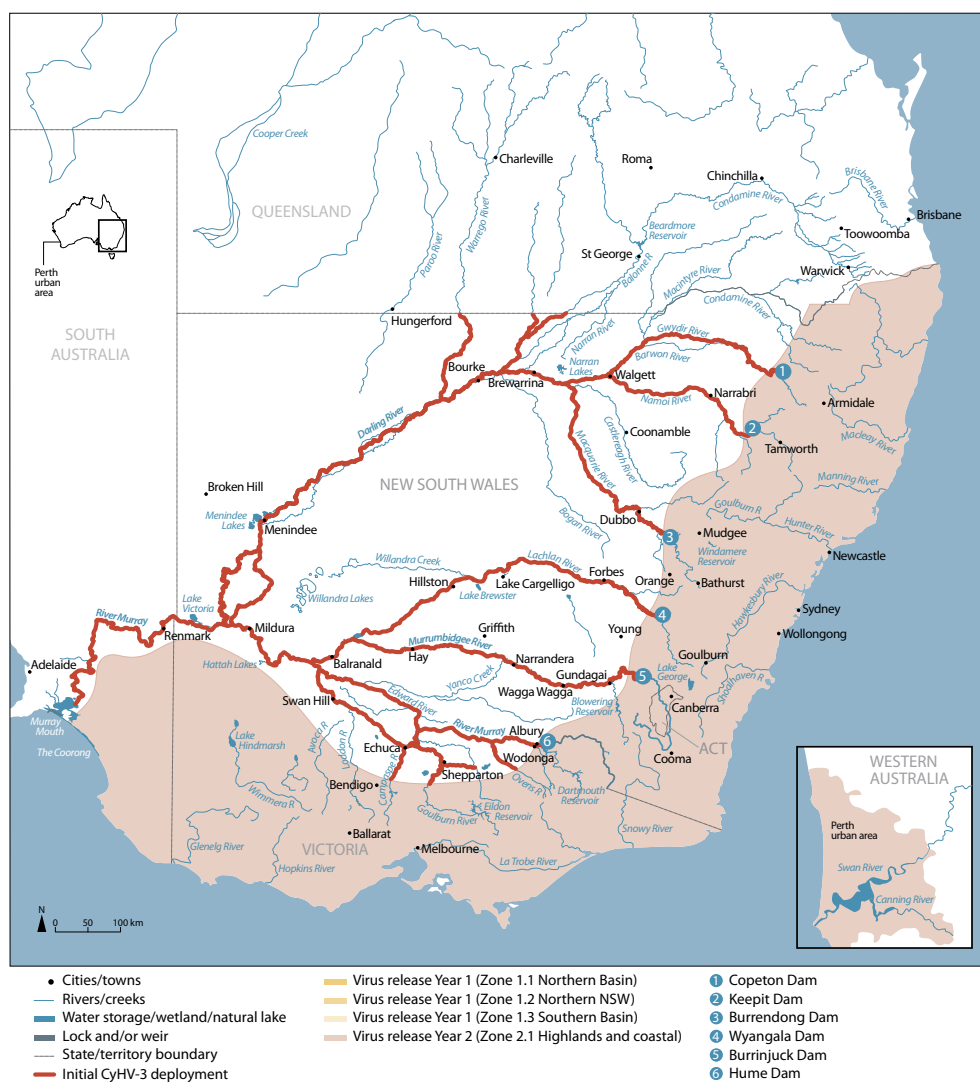


Figure 5: Secondary deployment of the carp virus – unregulated upland catchments of the MDB and coastal catchments including Western Australia.

3.5.4 Secondary carp virus deployment

In the second or third year following initial deployment, the carp virus would be deployed into aggregations within sub-populations in other catchments across the full extent of carp's Australian distribution. This control region is shown in Figure 5 and includes:

- unregulated upland catchments in the MDB, and
- coastal catchments across New South Wales, Victoria, Queensland and (potentially) Western Australia.

Specific locations for deployment can be determined by relevant jurisdictions consistent with national objectives for carp control.

3.5.5 Carp virus deployment methods

There are two potential methods for introducing the virus into carp populations:

1. As carp begin to aggregate in spring, fish in targeted aggregations would be captured, usually by electrofishing, injected with the virus, and released back into the waterway in which they were caught. As many aggregations will be infected as possible across each carp sub-population.
2. In late winter, prior to the onset of aggregating behaviour, dispersed carp would be captured within targeted sub-populations, injected with the virus to initiate a latent infection, and released. As the water warms, the latently infected carp are expected to join spawning aggregations. Because aggregations coincide with warming water temperatures, latently infected carp should experience reactivation of their infections as spawning occurs, thereby infecting other carp in the aggregation and initiating an outbreak. Uncertainties remain about exactly how a virus deployment approach based on latently infected carp would function under field conditions. For example, the extent to which carp experiencing a reactivating viral infection will participate in spawning aggregations is unknown. Some of these uncertainties could potentially be resolved by studying patterns of latency and recrudescence under conditions of environmental variability similar to those that would occur in the field and over timescales of weeks to months. Because Australian research using the carp virus can only take place in biosecure laboratories, studies of this nature would probably best be undertaken internationally, in a location where the virus is already endemic and where its use in scientific experimentation is therefore less restricted. Such experiments would not, however, obviate the need for a thorough post-release monitoring scheme linked to an adaptive governance and management structure to facilitate ongoing evolution of release strategies if carp biocontrol does proceed.

Selecting between these two deployment methods will be an operational decision based on conditions and capability. An adaptive approach should be used during the initial release, with a combination of methods tested depending on regional environmental conditions and operational constraints.



3.6 Carcass management

Carcass management, where required, would follow initial virus deployment. Carcass management is essential to achieve the following implementation objectives:

- management of environmental risks and no unacceptable impacts on MNES,
- management of risks to water quality for town water supply, stock and domestic water needs, irrigation, and cultural and recreational purposes, and
- effective and efficient management of carp virus deployment and carcass management.

Carcass management operations would be implemented within each CCA and would follow deployment operations.

Carcass management will be determined by the maintenance of water quality at levels that mitigate significant risks or specific outcomes. Where possible clear risk thresholds or triggers should be developed to guide operations.

Factors guiding selection of carcass management strategies include:

- predicted dead carp biomass,
- threats to the operability of infrastructure,
- social amenity,
- cost to deploy a method and return on investment,
- resource availability,
- waterway features,
- prevailing water quality in the operational area,
- flow and water movement,
- downstream and upstream assets and impacts,
- potential environmental impacts,
- forecast weather,
- unloading and transport access for equipment, and
- disposal option(s) available.



Technical Paper 6 outlines more specific carcass management strategies and methods. Detailed carcass management strategies will be determined in subsequent implementation planning stages based on specific regional conditions and policies.

To achieve efficient carcass management, methods that do not require manual collection and removal of carcasses should be prioritised where possible. Non-removal methods such as the use of water flow and wind conditions are less labour-intensive and more likely to be rapidly deployed, but may not always be achievable as a result of water availability and the degree to which flows at a given location can be manipulated or regulated.

3.6.1 Carcass management strategies

Potential carcass management strategies are outlined in the following sections. Some of these approaches involve manipulating live carp movements before infection and/or death, ultimately facilitating carcass removal. Section 4 (regional case studies) illustrates the potential application of some methods.

MANIPULATING MOVEMENT AND DISTRIBUTION OF LIVE CARP BEFORE VIRUS RELEASE

- Manipulating river flow and water level, including the use of permanent infrastructure (e.g. weirs, wetland regulators) to promote carp aggregation or concentration.
- Removing live carp from targeted sub-populations before virus release in areas where carp density and habitat traits pose risks to water quality, or in other areas where strategically effective.

MOVEMENT AND DISTRIBUTION OF INFECTED LIVE CARP

- Using permanent and temporary infrastructure (e.g. floating booms and nets) to restrict movement of infected live carp into areas or habitat types where water-quality impacts are more likely to occur and/or have serious consequences.
- Using permanent and temporary infrastructure to contain infected live carp in areas or habitat types where water-quality impacts are less likely to occur and/or have serious consequences.

MOVEMENT AND DISTRIBUTION OF CARP CARCASSES AND NUTRIENTS

- Using regulated water flows and permanent infrastructure to assist the flushing of carp carcasses and nutrients.
- Using regulated flow conditions and permanent and temporary infrastructure to intercept and remove carp carcasses at strategic locations.
- Using regulated water flows and permanent and temporary infrastructure to divert carp carcasses away from locations where water-quality impacts are more likely to occur and/or have serious consequences.
- Using permanent and temporary infrastructure to contain carp carcasses in situ at locations where water-quality impacts are less likely to occur and/or have serious consequences.

STRATEGIC REMOVAL AND DISPOSAL OF CARP CARCASSES

- Physically remove a proportion of carp carcasses from locations where their accumulation cannot be avoided and water-quality impacts are more likely to occur and/or have serious consequences.
- Physically remove a proportion of carp carcasses from strategic locations (e.g. where carcasses accumulate and there is ease of access or facilities for collection).

MITIGATING IMPACTS OF DECOMPOSING CARP CARCASSES

- Aerating waterways.
- Flushing cyanobacterial blooms.
- Native fish breeding and restocking plans (with particular focus on micro-endemic species and to mitigate potential prey-switching impacts, noting considerable logistical and biological challenges in some cases).

3.7 Implementation management and coordination

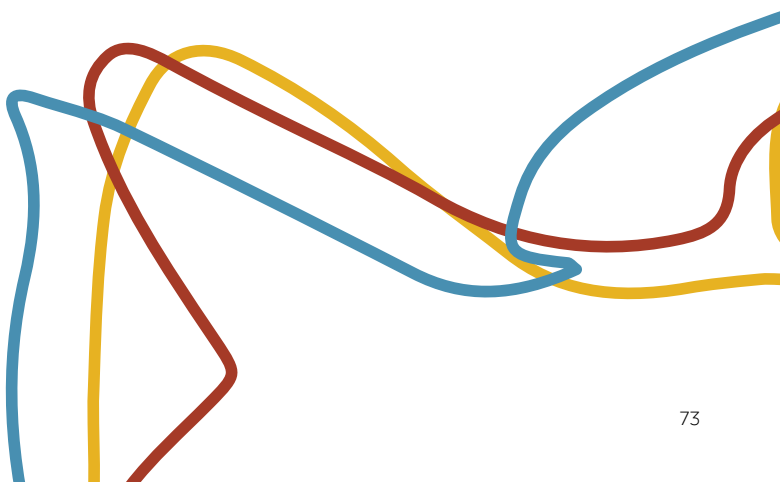
The NCCP will adopt existing cross-jurisdictional management systems that have been extensively applied in Australia and are used by all relevant authorities likely to be involved in carp biocontrol. These systems are relevant for both planned events (such as carp biocontrol) and emergency responses. These systems include:

- the Australian Interagency Incident Management System (AIIMS) Incident Control System (ICS) 2017 that underpins the management and leadership system for all emergency responses across Australia, and
- Biosecurity Incident Management System (BIMS) that is applicable for biosecurity emergency responses and largely aligns with AIIMS ICS except in areas where operations are specific to biosecurity (e.g. destruction and disposal).

Carp biocontrol implementation management should also be guided by the following principles:

- national coordination — led by the Commonwealth and delivered by each state/territory in which carp control is undertaken,
- scalability of management — each state/territory will expand and contract both scale and complexity of management in parallel with expansion and contraction of field operations,
- field operations within a functional management unit or CCAs — management will be situated primarily within local areas of operations (catchment or part thereof) with coordination at the whole-of-state/territory level,
- designated lead agencies — each jurisdiction undertaking carp biocontrol will nominate a single lead agency responsible for coordinating control activities including financial management,
- designated supporting agencies — jurisdictional lead agencies may nominate a supporting agency to represent their jurisdiction at national-level forums,
- jurisdictional delegation — each state/territory will use their authorities, delegations, and legislation to deliver the NCCP, and
- adoption of critical management systems.

Additional information on management arrangements, principles, and procedures is detailed in Technical Paper 6.



3.8 Integrated pest management

Viral biocontrol has been the NCCP's primary focus. Nonetheless, best-practice pest management usually requires an integrated approach. A range of carp control measures, including physical removal and genetic technologies, may have increased effectiveness when deployed against carp populations suppressed by viral disease. Physical removal methods could also be used to reduce carp populations before virus deployment to mitigate water-quality impacts in sensitive locations.

Integrating viral biocontrol with genetic biocontrol technologies is not currently feasible, as none of the potentially applicable genetic approaches are sufficiently advanced to enable field deployment. The Trojan Y Chromosome approach has been assessed as the most promising genetic control method (NCCP research project 3), but substantial investment in research and infrastructure (hatcheries) over approximately 10 years would be necessary to prepare even this technology for field deployment.

3.9 The role of science in management

An ongoing scientific management approach is critical for optimising biocontrol effectiveness and risk management. Remaining uncertainties about carp virus biocontrol could be reduced or managed by targeted additional research that could inform deployment strategies and ongoing management. During deployment, an adaptive, science-based operational approach will increase effectiveness and reduce risks and costs. For example, disease dynamics will probably differ slightly among regions and carp populations and a science-based management approach will be critical for detecting these differences and understanding their implications for biocontrol effectiveness.

To enable evidence-based adaptive management, the following actions and governance arrangements are recommended:

- a national technical advisory committee to frame and guide monitoring and evaluation and advise on initial deployment,
- national knowledge management and decision-support tools that can integrate modelling and monitoring data,
- regional investigations into carp aggregations and movements during planning periods,
- fish biology and water-quality expertise located within regional implementation teams, and
- a national monitoring and evaluation plan which includes the following assessments to inform ongoing management
 - viral effectiveness under varying environmental and carp demographic conditions,
 - impacts of carp decomposition on water quality,
 - the evolving relationship between carp and the virus, and
 - ecological responses during the deployment phase and in the longer term.

Science needs to be integrated into decision making and operational systems. The proposed adoption of AIIMS includes science and planning functions directly into decision making. Investing in an ongoing role for science in carp biocontrol is likely to significantly reduce implementation costs.

4 REGIONAL CASE STUDIES

4.1 Introduction

This section outlines how carp biocontrol could be implemented across four case study regions:

- the Lachlan catchment in New South Wales,
- the South Australian Riverland (Locks 1 to 3 on the Murray River),
- the mid-Murray (Barmah to Koondrook Perricoota), and
- the southern connected basin portion of the Murray and Murrumbidgee River systems (below Hume Dam).

Case-study locations do not span carp's entire eastern-Australian distribution, but focus on high carp biomass areas in the MDB's southern connected systems. Case study areas are high priority for virus deployment as described in section 3. Technical Papers 5, 6, 8, and 9 provide more detailed information.

Case studies were developed through numerous stakeholder workshops within each case-study area. Stakeholders involved in workshops included water managers, water users, environmental water holders, commercial fishers, tourism operators, landholders, local and state government officers, natural resource managers, and water utilities. Workshops used NCCP research results to inform planning and discussions.

Workshops had the following focus questions:

- How much of a problem are carp in the area?
- What are the opportunities for carp control in the area?
- What are the environmental values and locations in the area?
- Where are the social and infrastructure risks from carp biocontrol?
- Where should carp control be implemented and why?
- What are the risks from carp carcasses and how could they be managed?
- Do the NCCP biomass estimates for the area seem accurate?
- What are stakeholder views about use of the carp virus to control carp in the workshop area?

4.2 Lachlan case study

4.2.1 Description of area

The Lachlan case study area includes the entire Lachlan River catchment as shown in Figure 6. The Lachlan catchment encompasses 22 local government areas.

The catchment's main river is the Lachlan and its tributaries. Major off-channel waterbodies include Lakes Cargelligo and Brewster, and Cumbung Swamp. The Lachlan system does not connect directly through to the Murrumbidgee and Murray systems.

Parts of the Lachlan catchment are regulated with permanent waterbodies and flows but substantial ephemeral areas remain. There are many regulators and weirs, including major dams, on the Lachlan River and its tributaries.

4.2.2 The carp problem

The Lachlan catchment has a significant carp problem. Carp are widespread through the catchment, and are most abundant in permanent off-channel waterbodies. There are 70 carp sub-populations located throughout the catchment, highlighting the system’s disconnected nature. Some parts of the catchment above Wyangala Dam remain carp free.

High carp densities (more than 500 kg/ha) occur in sections of the Lachlan river from Forbes to Hillston and in the major off-channel waterbodies. Carp biomass and its distribution within the catchment as estimated during summer 2017-18 is shown in Table 3 (drawn from NCCP research project 1).

Table 3: Indicative biomass of European Carp, *Cyprinus carpio*, and its distribution in the Lachlan River catchment, New South Wales. All biomass estimates in this table are drawn from NCCP research project 1.

Location	Tonnes
Upstream of Wyangala	145
Wyangala to Jemalong	1,901
Lake Cowal and upper drainage area	917
Jemalong to Brewster	866
Lake Cargelligo	208
Lake Brewster	1,077
Willandra Creek	7,491
Brewster to Great Cumbung	4,977
TOTAL	17,582

Carp abundance in the Lachlan catchment varies considerably in response to hydrological conditions. During dry conditions carp become concentrated into permanent waterbodies or die in ephemeral systems.



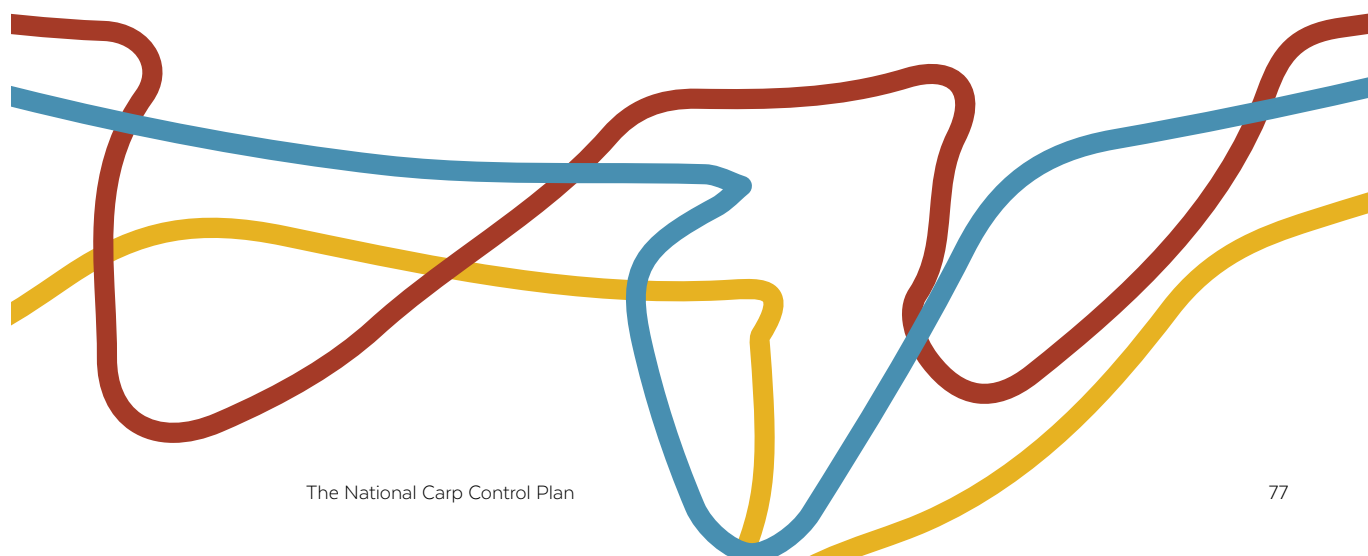
Lachlan River. Photo Mattinbgn (Wikimedia).

4.2.3 Risks assessment

Table 4 summarises the main risks and impacts associated with carp biocontrol in the Lachlan catchment, with mitigation options.

Table 4: Risk summary, with mitigation options, for carp biocontrol in the Lachlan River catchment, New South Wales.

Risk	Possible impacts	Risk mitigation
Environmental		
Native fish nursery sites (e.g. Agassiz's Glassfish [olive perchlet] and Southern Pygmy Perch).	Low if water quality maintained and normal Lachlan River flows.	Strategic carcass management upstream by booms.
Macquarie Perch breeding in the Abercrombie River.	Low if water quality maintained and normal Lachlan River flows.	Strategic carcass management upstream by booms.
Pelican rookery at Lake Brewster.	Could be impacted if water quality not maintained.	Virus deployment during a non-breeding season.
Lake Cowal.	Low due to variable carp populations.	No virus deployment.
Endangered Ecological Community downstream of Wyangala Dam.	Low due to cold water temperatures.	No virus deployment.
Social		
Town water offtakes.	Low due to treatment capability.	Water treatment and carcass management.
Major towns: Forbes, Booligal, Condobolin, Hillston and Cargelligo.	May impact amenity.	Focused carcass management.
Lake Brewster.	Low as no public access. Could affect water quality.	Water regulation to manage carcass impacts.
Lake Cargelligo.	High amenity value and likely high number of carcasses. Possible short-term impacts.	Use of wind and booms to corral carcasses to specific shorelines to reduce impacts.
Irrigation offtakes.	Numerous offtakes likely low impact.	Intake screening.
Weirs.	Low impact.	Operational approvals.



4.2.4 Implementation constraints

The Lachlan catchment has several characteristics that will shape and constrain carp biocontrol operations. In the catchment's ephemeral streams, carp population density is sufficiently low that virus deployment may not be warranted. A substantial portion of the Lachlan River is also affected by cold-water pollution from Wyangala and Carcoar Dams. Water temperatures in these reaches are below the permissive range for the disease caused by the carp virus.

The Lachlan River is not navigable, so physical collection of carp carcasses would generally be restricted to shore-based operations. Adjoining major floodplain waterbodies are navigable but have extensive shallow areas that would restrict operations.

Access to some parts of the catchment is restricted by private property and limited public road access. Operations would therefore be confined to strategic locations at weir points and settlements.

4.2.5 Management arrangements

Carp biocontrol operations for the entire Lachlan catchment could be managed through one CCA (Figure 4). Central command could be located in Forbes and forward commands could be located at Condobolin, Hillston and Oxley. The Oxley forward command could be included in the Murrumbidgee CCA. Most operational activity would occur at locations along the 300 kilometres of river between Forbes and Booligal.

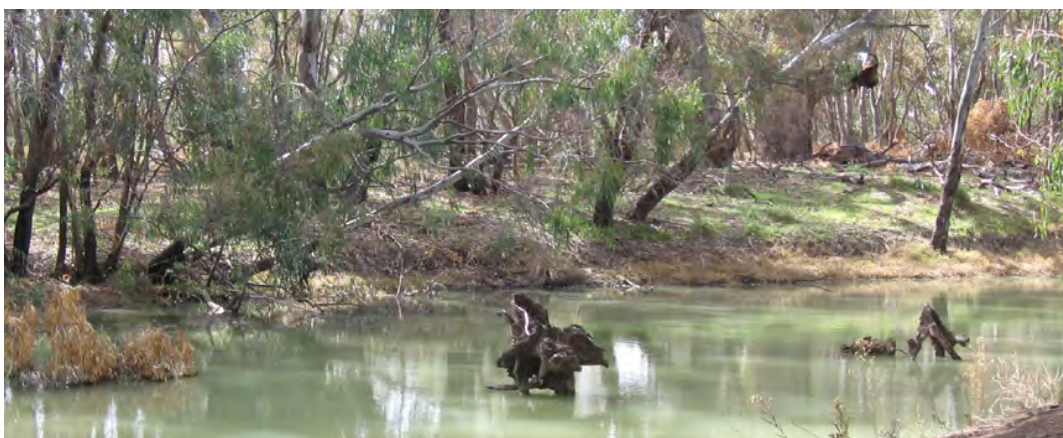
4.2.6 Carp virus deployment strategy

The following sections of the Lachlan catchment would be targeted for carp virus deployment:

- Lachlan River and adjoining systems between Forbes and Booligal at numerous weir points,
- Lake Brewster,
- Lake Cargelligo,
- Booberoi Creek, and
- strategic locations on the Abercrombie River where carp aggregations are known to occur.

Carp aggregations also occur below Wyangala Dam and from Carcoar Dam to Forbes, but these areas are affected by cold-water pollution. Biocontrol using the carp virus therefore may not be successful in these reaches.

The areas listed above hold the Lachlan catchment's highest carp biomass and are also carp spawning sites. Risks in these areas can be managed with appropriate coordination and resourcing. These locations encompass more than 20 carp sub-populations.



Lachlan River. Photo Mattinbgn (Wikimedia).

4.2.7 Carcass management strategy

Carcass management in the Lachlan catchment would focus on areas where the virus had been deployed into carp aggregations and where risks are highest. Operations more generally would focus on the 300-kilometre zone between Forbes and Booligal.

Only a proportion of all carcasses may need to be removed from the river providing favourable flow conditions are available to maintain water quality. More carcasses may need to be removed from Lakes Brewster and Cargelligo, where flow is limited or non-existent.

The following measures and tactics could be applied to manage risks:

- strategic cross-river booms to corral carcasses drifting downstream into shore-based removal locations,
- containment booming and removal of carcasses from aggregations below weir pools, and
- regulation of Lake Brewster to isolate carp carcasses.

Workshops highlighted considerable opportunities to synchronise water-regulation planning with potential virus deployment. Using water releases to assist with carcass management would reduce the need for costly and laborious manual carcass removal activities, but river managers are unlikely to be able to alter operations specifically for carp control.

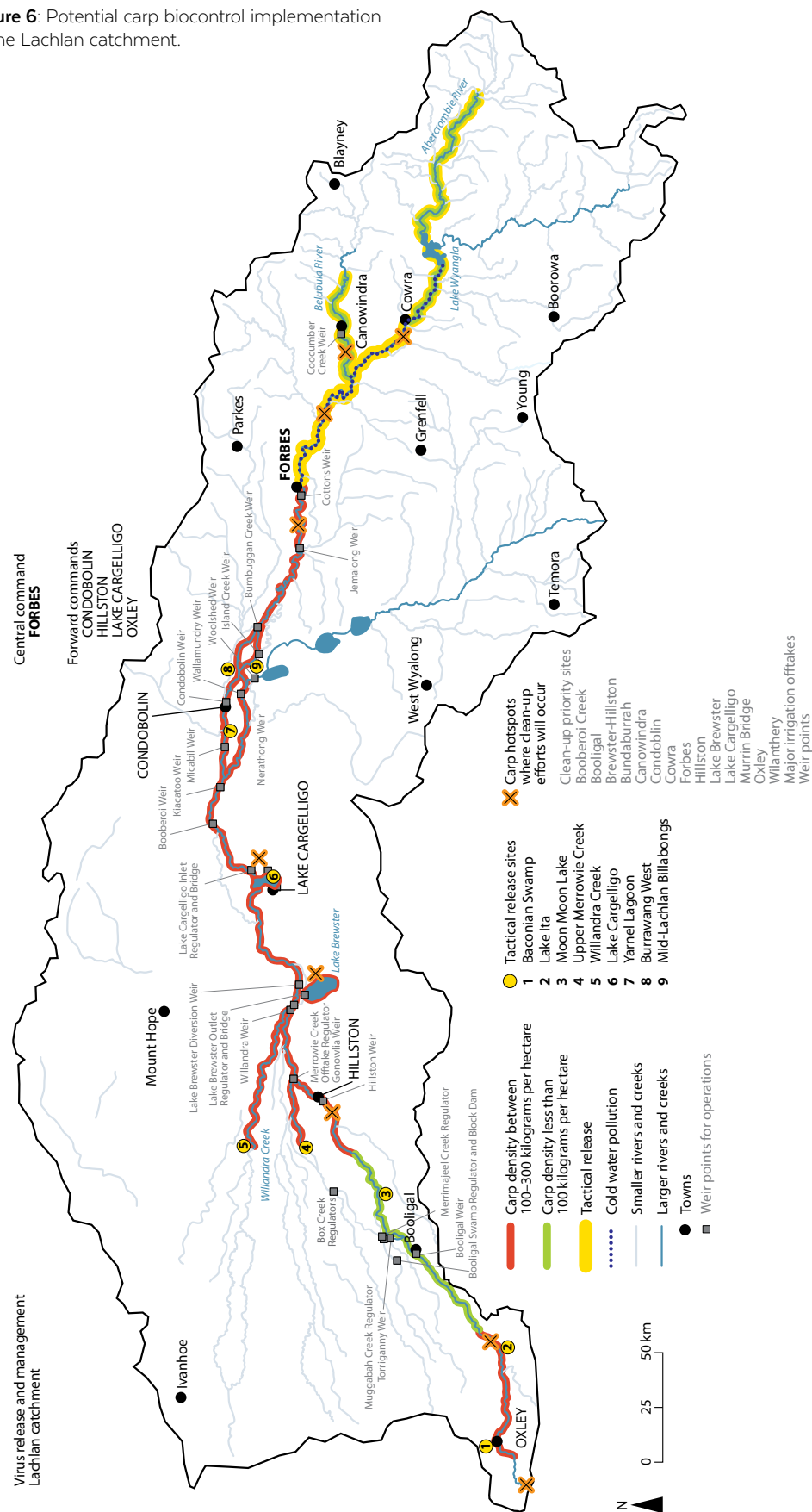
4.2.8 Conclusions

NCCP research and stakeholder workshops indicate that biological control using the carp virus could effectively reduce carp abundance in the Lachlan catchment. Strategic approaches to carcass management generally appear logistically achievable (with some constraints), and are expected to mitigate risks. If carp biocontrol proceeds, operations in the Lachlan catchment would be focused on various locations along the 300-kilometre river stretch between Forbes and Booligal.

Expert workshops emphasised the importance of communications and engagement within the region in advance of, and during, operations. There is considerable local knowledge and expertise in the region that should be utilised in biocontrol implementation. Traditional Owners and recreational fishing groups have expressed interest in planning, decision making, and operational participation.



Figure 6: Potential carp biocontrol implementation in the Lachlan catchment.



4.3 Riverland/lower Murray Lock 1 to Lock 3 case study

4.3.1 Description of area

The mid-Murray case study covers the Murray River between Locks 1 and 3, including Lake Bonney. Carp attain high population densities in the case study area, inhabiting the Murray River channel, adjoining wetlands and oxbows, and Lake Bonney. Commercial activity in the region includes extensive irrigated agriculture, river-based tourism, and commercial carp harvesting in Lake Bonney. Major townships include Waikerie and Morgan.

4.3.2 The carp problem

Over the 2017-18 summer, carp densities in the case study area ranged from 200–500 kg/ha (NCCP research project 1). Carp dominate waterbodies such as Lake Bonney.

4.3.3 Risk assessment

Table 5 summarises the main risks and impacts associated with carp biocontrol in the Riverland/lower Murray area, with mitigation options. Risks are substantially social in nature.

Table 5: Risk summary, with mitigation options, for carp biocontrol between Locks 1 and 3 in the lower Murray River, South Australia.

Risk	Possible impacts	Risk mitigation
Environmental		
Off-channel regulated wetlands.	Invertebrates and amphibians, Murray Cod.	Regulation of flows, carp attractants, carcass removal.
Oxbow systems e.g. Devils Pound.	Invertebrates and amphibians. Reduced dissolved oxygen, algal blooms.	Carcass removal with boats.
Murray River channel.	Murray Cod.	Strategic booms and upstream collection of carcasses.
Social		
Houseboats (hundreds).	Odour, amenity.	Strategic booms and upstream carcass collection. Effectively communicating the extent of affected areas to potential customers.
Waikerie township.	Odour, amenity.	Strategic booms and upstream carcass collection. Small boat carcass removal.
Holiday shacks between Morgan and Blanchetown and off-channel marina.	Odour, amenity.	Strategic booms and upstream collection of carcasses.
Private irrigation offtakes (domestic use).	Water quality.	Screens on intake structures.
Major irrigation offtakes.	Water quality.	Screens on intake structures.
Morgan Lagoon.	Odour, amenity.	Booms and small boats to corral carcasses for collection.
Lake Bonney.	Six hundred tonnes of carp. Odour and amenity.	Booms and small boats to corral carcasses to boat ramps and edges for operations.

4.3.4 Implementation constraints

This case study area imposes several implementation constraints associated with access and infrastructure. Large shallow wetlands, lakes, and oxbow systems are difficult to access with boats and shore-based equipment. Lake Bonney also presents a challenge for operations. The lake is large and shallow with high carp biomass and high salinity. Lake Bonney is also subject to intensive recreational use. The lake experiences strong winds that will affect carcass management operations by blowing dead carp to downwind locations. The wind also naturally oxygenates the lake, potentially mitigating water-quality impacts.

Major river regulation infrastructure is located at each of the locks. Carp carcasses will likely concentrate at these locations. Carp control operations must be conducted without affecting river operations.

4.3.5 Possible pre-deployment density reduction

The lower Murray contains high carp densities. Consequently, the 40–60% carp reductions expected to follow virus deployment may still leave higher densities than would occur in less resilient populations. While any carp reduction has the potential to deliver ecological benefits, such benefits may be enhanced if virus deployment in the lower Murray is preceded by targeted, intensive harvesting to reduce carp ‘starting density’. Assessing the timing, magnitude, and operational planning aspects of this ‘pre-fishing effort is beyond the NCCP’s scope, but could usefully be investigated by some limited additional modelling (NCCP research project 4).

4.3.6 Management arrangements

Operations may involve a control centre located at Waikerie and forward command locations at Lake Bonney and Morgan.

4.3.7 Carp virus deployment

The carp virus should be deployed through the whole river system and adjoining wetlands and oxbow systems.

4.3.8 Carcass management

Priority carcass management locations include areas above water treatment plants, water offtakes, areas around townships and holiday shacks, locks, spot locations in which carcass accumulation is likely (e.g. Pelican Point), and wetlands holding environmental values.

4.3.9 Conclusions

The Riverland area has high carp biomass that could be substantially reduced by carp biocontrol. These reductions could potentially be enhanced by targeted, intensive harvest before virus deployment. Risks in this area are predominantly social, reflecting high levels of tourism and recreational use.

Social risks could be managed with strategic boom placement and collection of carp carcasses. Screens on irrigation intakes provide a solution to mitigate risks such as pump blockage. Lake Bonney would require more sophisticated carcass management using corralling and booming in navigable parts of the lake to direct carcasses to convenient collection points. Workshops highlighted the importance of local communication and engagement, especially with the tourism sector. Workshops also highlighted the importance of working with water authorities and local governments in potential carp virus biocontrol.

4.4 Mid-Murray case study

4.4.1 Description of area

The mid-Murray case study area extends from Picnic Point to the Gunbower wetlands on the Murray River. This section of the Murray forms a highly connected permanent system with large adjoining wetlands including Barmah and Moira Lakes, Gunbower Creek and associated lagoons, and Kow Swamp. The area's flow patterns and geomorphology are ideal for carp.

4.4.2 The carp problem

The region supports high carp densities and spawning hotspots, including Barmah and Moira Lakes and Gunbower Creek. The area's carp population tends to concentrate at these spawning sites during spring and early summer.

4.4.3 Risks assessment

Figure 7 provides a spatial scan of the risks associated with virus release in the study area. Table 6 summarises these risks at particular locations.

Table 6: Risk summary, with mitigation options, for carp biocontrol in the mid-Murray River region (Pelican Point to Gunbower Forest wetlands).

Risk	Possible impacts	Risk mitigation
Environmental		
Ramsar wetlands (Barmah).	Endangered species, bird nesting.	Regulation of flows, timing of virus deployment, strategic carcass removal, carcass dispersal.
Gunbower Creek and lagoons.	Bird nesting, wetland ecology.	Carcass removal with boats.
Kow Swamp.	Bird nesting.	Flow regulation, strategic booms and upstream collection of carcasses, carcass removal.
Social		
Kow Swamp.	Significant cultural site, water quality.	Flow regulation, strategic booms, and upstream collection of carcasses.
Echuca township and associated tourism and recreation including events.	Odour, amenity.	Strategic booms and upstream collection of carcasses, regular small boat carcass removal.
Torrumbarry weir pool.	Odour, amenity.	Strategic booms and upstream collection of carcasses, regular small boat carcass removal.
Gunbower small landholdings.	Odour, amenity, water quality.	Screens on intake structures.
National irrigation channel offtake.	Water quality.	Strategic booms and upstream collection of carcasses.

4.4.4 Possible pre-deployment density reduction

The mid-Murray case-study area holds generally high carp densities. Consequently, the 40–60% carp reductions expected to follow virus deployment may still leave higher densities than would occur in less resilient populations. While any carp reduction has the potential to deliver ecological benefits, such benefits may be enhanced if virus deployment in the mid-Murray is preceded by targeted, intensive harvesting to reduce carp ‘starting density’. Assessing the timing, magnitude, and operational planning aspects of this ‘pre-fishing’ effort is beyond the NCCP’s scope, but could usefully be investigated by some limited additional modelling (NCCP research project 4).

4.4.5 Implementation constraints

The study area’s features and values impose environmental, physical, and social constraints on biocontrol implementation. Important considerations include:

- high levels of year-round tourism and recreational use,
- large shallow inaccessible waterbodies such as Kow Swamp,
- significant cultural values,
- Ramsar wetlands and endangered species,
- requirement to maintain navigable waterways,
- numerous shallow lagoons with poor physical access and high carp biomass, and
- numerous small adjoining landholders.

4.4.6 Management arrangements

The regional control centre could be located at Echuca with forward command centres at Picnic Point and Cohuna.

4.4.7 Carp virus deployment

Virus deployment is illustrated in Figure 8. The case study indicates that eight major carp sub-populations should be targeted for virus deployment.

4.4.8 Carcass management

Carcass management in the region is illustrated in Figure 9. Managing high-risk zones around the Echuca township and Gunbower and Torrumbarry weirs will require adequate resourcing. Cross-channel booms that corral and direct carp carcasses to collection points would constitute the main management method. Booms would be located upstream of high-risk areas. Around Echuca township regular small boat operations would be required to remove as many carcasses as practical. At Barmah and Moira Lakes, risks could be substantially managed by carcass dispersal using flow regulation supplemented by strategic carcass removal at aggregation locations.

4.4.9 Conclusions

The mid-Murray case study illustrates that the carp virus could be deployed and managed successfully in a high-use, complex, connected system with important environmental and social values. The case study area poses some significant challenges to implementation, especially in locations such as Kow Swamp and Gunbower Creek. These locations will require further implementation planning. As with the lower Murray, carp biocontrol outcomes in the mid-Murray could potentially be enhanced if targeted intensive harvesting occurred before virus deployment. Carp biocontrol in the mid-Murray case study area would be relatively costly, reflecting the area’s complexity and high carp biomass.

Figure 7: Mid-Murray carp biocontrol case study risks and opportunities scan.

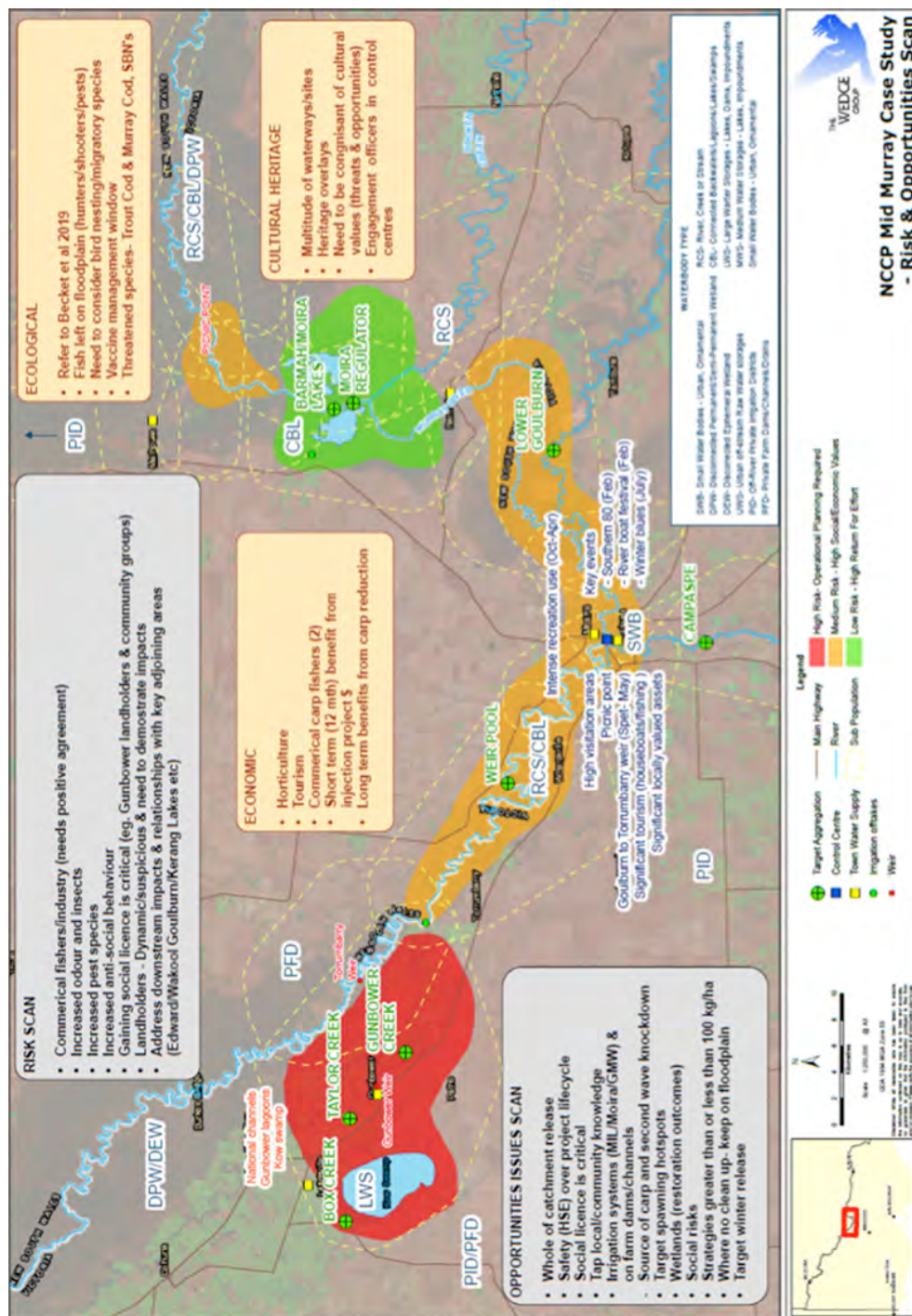
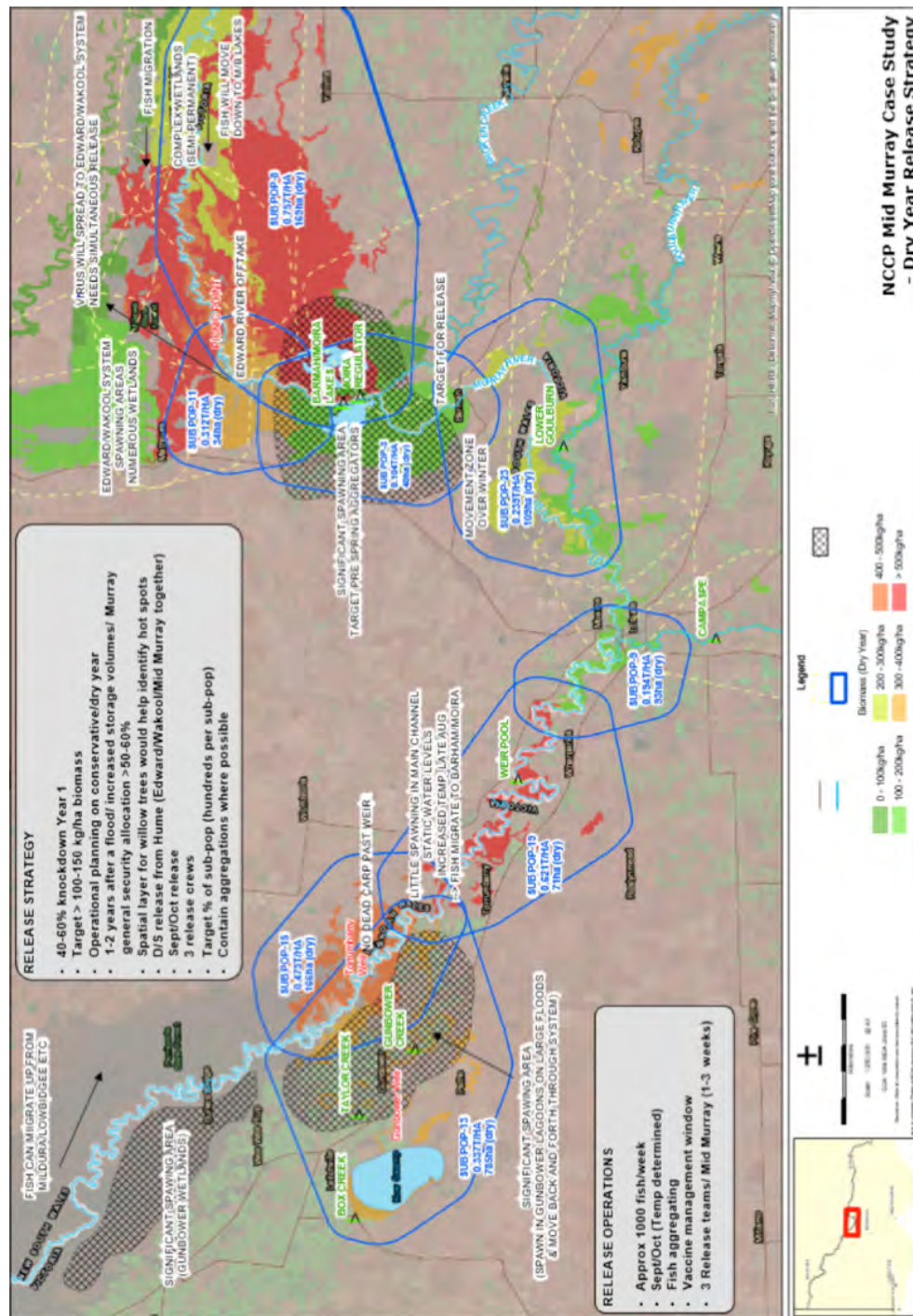


Figure 8: Mid-Murray deployment strategy into carp sub-populations.



[illegible]

4.5 Murray and Murrumbidgee system below Hume Dam case study

4.5.1 Description of area

The case study area represents the southern zone for initial deployment of the carp virus, and encompasses the previous mid-Murray case study, demonstrating how carp biocontrol could be scaled up. This area contains the highest carp biomass and densities of all the case study areas. The area also includes anabranch systems and the lower reaches of tributaries into the main rivers. Parts of the area have high environmental values including Ramsar wetlands.

4.5.2 The carp problem

Carp are abundant in both Murray and Murrumbidgee River systems. During summer 2017–18, carp densities in the area ranged from 100–500 kg/ha (NCCP research project 1). The case study area encompasses numerous carp aggregation and spawning hotspots.

4.5.3 Risk assessment

Figure 10 summarises high-level risks for virus deployment and management. Highest risk areas are located in the lower sections of the Murray River where carp biomass is greatest. Other high-risk areas include waterbodies and reaches that experience periodic low flows, such as the Edward-Wakool anabranch system (EW1 in Figure 10) and the lower Murrumbidgee wetlands (MB6 in Figure 10).

4.5.4 Possible pre-deployment density reduction

This case study area holds some of Australia's highest carp densities. Consequently, the 40–60% carp reductions expected to follow virus deployment may still leave higher densities than would occur in less resilient populations. While any carp reduction has the potential to deliver ecological benefits, such benefits may be enhanced if virus deployment in the Murray and Murrumbidgee system below Hume Dam is preceded by targeted, intensive harvesting to reduce carp 'starting density'. Assessing the timing, magnitude, and operational planning aspects of this 'pre-fishing' effort is beyond the NCCP's scope, but could usefully be investigated by some limited additional modelling (NCCP research project 4).

4.5.5 Management arrangements

Potential management arrangements for operations are outlined in Figure 10. All operations could be managed in four CCAs or regions. Each region would have a central command and at least two forward command locations.

Coordination would be required across regions at the state/territory level. During operations, resource deployment may at times need to be concentrated on particular sites to address emerging risks. Surge operational capacity will also be required.

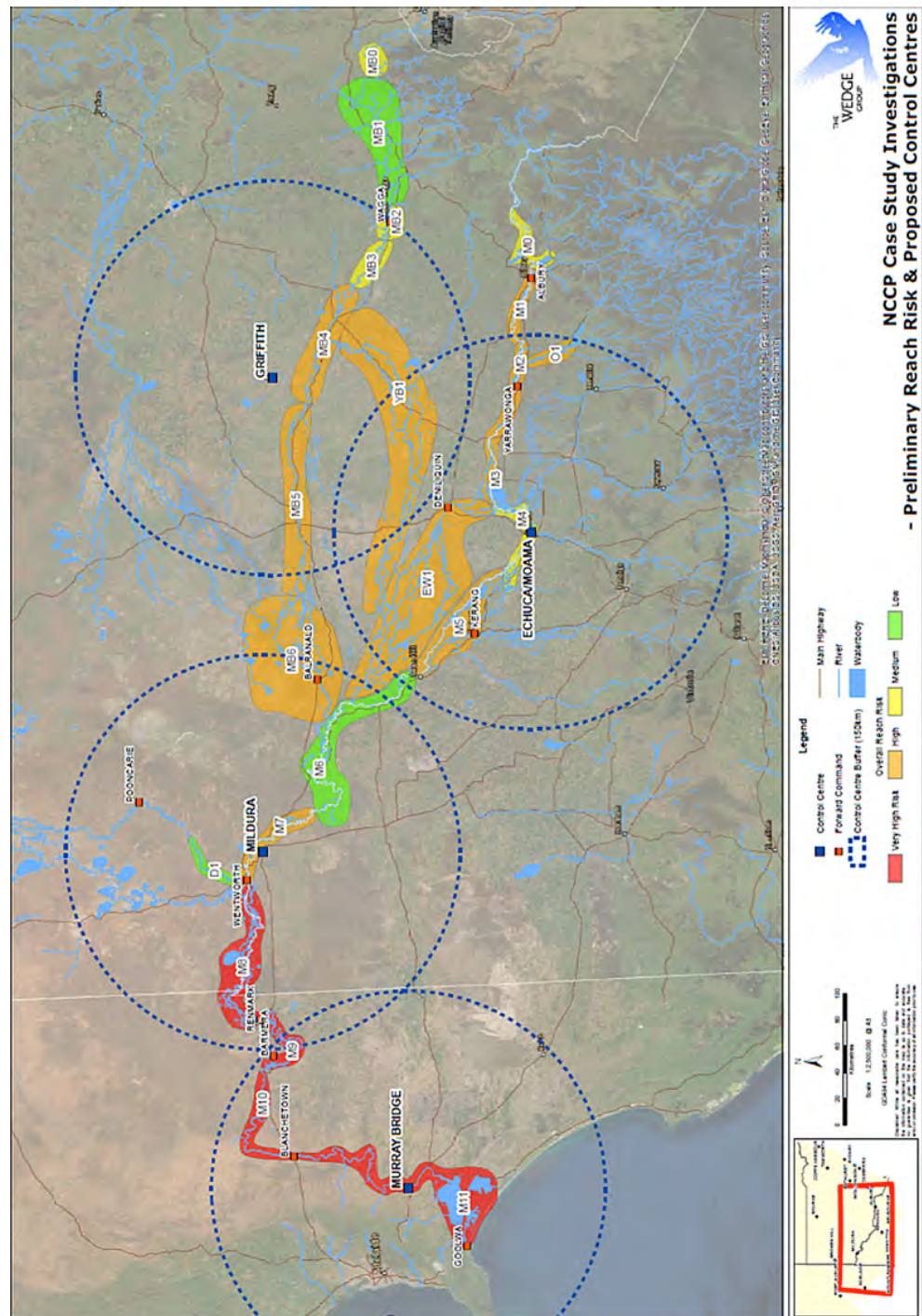
4.5.6 Operational costs

The cost of implementing carp biocontrol in the case study area was estimated at approximately \$190 million over three years with range of assumptions (NCCP planning investigation 5).

4.5.7 Conclusions

This case study highlights the potential for effective and efficient management of carp biocontrol operations across large areas by directing and coordinating operations through smaller regions.

Figure 10: Murray and Murrumbidgee NCCP implementation to address risks.





5 COSTS AND BENEFITS OF CARP CONTROL

5.1 Introduction

This section summarises information from NCCP research assessing:

- the current costs and benefits consequent upon the presence of carp in Australia (i.e. the 'status quo'),
- costs and benefits arising from implementing a biocontrol program using the carp virus, and
- longer-term costs and benefits associated with reduced carp abundance, if a carp control program was successful.

Both market (i.e. readily monetised) and non-market (i.e. less readily monetised, yet still valuable) costs and benefits were considered.

Costs and benefits of carp biocontrol are difficult to assess accurately because carp:

- inhabit a diverse range of Australian aquatic ecosystems,
- vary markedly in abundance among different habitats, and within a given habitat through time, and
- cause habitat-specific ecological impacts that interact with a range of other, non-carp stressors.

Consequently, developing cost-benefit assessments for a limited number of case study locations is likely to provide more meaningful information than a nation-wide estimate with a large error margin. The case study approach also provides a methodological 'template' that can be applied to additional regions as required.

Research under the NCCP has identified that, while the virus has potential to reduce and suppress carp abundance, ecological outcomes in areas with very high carp densities could potentially be enhanced by targeted and intensive carp harvesting before virus deployment. The NCCP was explicitly focused on assessing the feasibility of carp biocontrol, so, beyond a general acknowledgement of the potential usefulness of an integrated approach, costings and plans for a targeted 'fish down' are not presented in this report. Any costs incurred by such an initiative would need to be quantified separately. Using targeted harvesting to reduce carp densities before virus deployment could bring both additional costs and opportunities to reduce expenditure. For example, carcass management activities could potentially be reduced in some areas if carp populations were 'thinned' by harvesting before biocontrol operations began.

5.2 Costs of carp in Australia

Impact costs of carp in Australian waterways have been assembled from available data under the following themes:

- a. reduced water quality,
- b. erosion and increased incidence of algal blooms,
- c. impacts on invertebrates and both native and exotic aquatic plants,
- d. competition with native fish species, and
- e. introduction of pests and diseases.

Total impact costs were generated by including maintenance costs for water treatment and infrastructure, planning and management costs for affected water and land, opportunity costs for tourism, and secondary impacts for primary producers (NCCP research project 19).

Cost assessments indicate that carp do not create substantial market costs in the Australian economy (NCCP research project 19). Rather, most direct and indirect carp impacts are more strongly aligned with non-market costs. Irrigation sectors, water authorities, and primary producers did not report carp as a significant financial threat. Water-treatment plants reported an estimated average increased water-treatment cost of \$211,494 per plant per year due to source sedimentation. This 'per-plant' figure represents a total annual cost of \$21,360,894 for treatment of turbid water when multiplied across 101 treatment plants in New South Wales and Victoria (NCCP research project 19). However, the proportion of this total sedimentation directly attributable to carp is unknown.

Non-market impact costs were calculated based on a per-household willingness to pay (WTP) for primary changes over 10 years following carp suppression. These changes were identified by an ecological expert elicitation panel, with units of change identified as additional expected native fish per kilometre of river, per expected additional 10,000 hectares of wetland free of carp, and per additional expected 1000 waterbirds. The range of possible total WTP calculated for Australia is \$24,372-\$2,076,074,706 for fish, \$39,187-\$313,498,906 for wetlands, and \$5,422-\$601,833,024 for birds (NCCP research project 19).

Calculating total WTP of Australian households requires predicting how many units of expected environmental outcomes will be realised for each affected area. To do so with the greatest accuracy, using the implementation strategy as a guide, a tailored clean-up strategy must be developed, informed by logistical considerations specific to the area, and water-quality implications predicted by the same or 'best fit' case-study area. Each area to be considered must then synthesise epidemiological predictions from the same or 'best-fit' case-study area, and ecological response predictions from the same or 'best-fit' case-study area. Two case study examples are provided later in this section.

In addition to market and non-market surveys, a literature review of economic, environmental and/or social impacts related to the direct and indirect impacts of carp was undertaken. Estimates associated directly with the impact costs of carp ranged from \$11.18 to \$500 million per annum Australia-wide. The latter estimate must be viewed with caution, as the methods used to calculate it are not clearly described. Additional estimates were made for the value of impacts where carp may be a contributing factor, including erosion damage, reduced amenity, biodiversity impacts, and water-quality impacts including algal blooms. Erosion was estimated to cost irrigators \$1.9 million over eight years for channel repairs, while loss of consumer surplus due to algal blooms was estimated to cost \$185 million to \$250 million per annum. Amenity, biodiversity, and water-quality impacts were assessed based on a household WTP for qualitative or quantitative improvements. Willingness to pay for a 1% improvement to an attribute ranged between \$0.46 to \$13.27. Improvements in amenity also attracted a one-off WTP of \$28.75 to \$54.16 for recreational fishing, and \$59.97 to \$104.07 for rivers to be 'swimmable'.



5.3 Benefits of carp in Australia

Carp in Australia generate financial benefits through three key uses; recreational fishing, commercial fishing, and the ornamental koi industry. A small but active community of Australian recreational fishers specialise in targeting carp (and other species) using coarse-fishing techniques (NCCP research project 13). Other recreational fishers catch carp as part of more general fishing activity, in which carp may or may not be one of the target species (NCCP research project 13). Recreational fishers who like or prefer catching carp are likely to constitute a small proportion of total recreational fishing participation in Australia (NCCP research project 19). The economic contribution of recreational carp fishing in Australia has not been estimated. Positive economic impacts from carp fishing competitions (e.g. 'carp-buster' events), also not quantified, may benefit communities through generation of tourism industry income. Importantly, benefits associated with community-based carp-buster events may arise largely from participants' desire to 'get rid of carp' (NCCP research project 19).

Commercial exploitation of carp centres around two key products; fertiliser (Charlie Carp) and carp for table consumption in Australia and abroad. Profitability of carp fishing in Australia has not been estimated.

The commercial ornamental koi sector differs from the other sectors discussed here in that it relies on maintenance of captive imported and locally bred animals rather than preservation of wild populations of carp. The legality of owning and transporting carp varies from state to state in Australia.

5.4 Regional costs of carp biocontrol

The whole Murray and Murrumbidgee systems and the mid-Murray case studies were used to estimate the cost of implementing a carp biocontrol program using the carp virus. The total cost estimate for the whole Murray and Murrumbidgee systems is roughly \$190 million. The rough cost estimate for the mid-Murray is approximately \$14 million. These costs are approximate and indicative only, and reflect 2019 costings and numerous assumptions. If governments choose to continue work towards a final decision on whether or not carp biocontrol should proceed, the methods and processes used to develop these estimates can be used as a template for refining cost estimates.

The costs described here are based on the following key assumptions:

- one year for implementation planning and coordination at the regional level,
- two years of initial deployment,
- the second year of initial deployment assumes 60% of year one costings,
- twelve months of community engagement and establishment of regional operations platforms,
- six months of operations in each year of deployment, with peak resource application September to December annually,
- deployment in a year with average water levels,
- deployment will target populations where average biomass exceeds 150 kg/ha,
- mortality rate of 60%, and
- clean-up operations targeting identified medium- and high-risk (ecological and socio-economic) reaches.

Potential impacts not included in the costs of virus release include:

- loss of amenity for regional communities and tourists due to fish carcass odour in affected waterways,
- increased incidence of algal blooms and/or blackwater events that may reduce aesthetic and recreational amenity values and biodiversity for some affected waterways,
- increased bird mortalities associated with botulinum toxin cycles if carcasses and/or water quality in wetlands and other low-flow waterbodies cannot be managed,
- increased water treatment costs resulting from dead fish blocking plant inlets and/or above-threshold ammonia levels from decomposing fish, and
- increased costs for protection of the koi industry.

Pre-release costs were calculated for factors including

- extensive local consultation and stakeholder engagement,
- local statutory planning functions,
- establishment of operational posts (control centres and forward command centres),
- production, transport, and storage of virus,
- training of virus deployment personnel,
- training and response resources for clean-up personnel, and
- establishment and maintenance of communication channels between monitoring, release, and clean-up personnel.

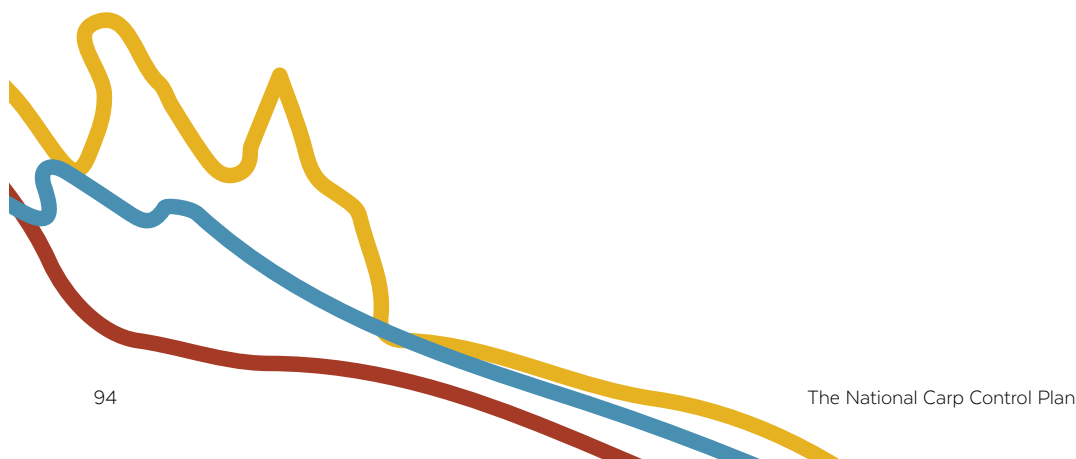
Virus release costs include:

- virus transport and distribution,
- financial remuneration for personnel, and
- hire and/or purchase of tools and equipment.

The two potential viral deployment methods described in section 3.5 incur similar costs.

Following infection of carp populations, costs are largely associated with carcass management, monitoring, communications, and associated operations including:

- contracting personnel to coordinate, patrol, and collect carp from waterways,
- disposing of dead carp, including hire and/or purchase of equipment to direct, confine, collect, or contain dead carp,
- planning and coordinating dead carp disposal including transport routing, access, and designation/design of disposal areas, carcass transport and processing, and
- sourcing and retaining 'surge' resources for response to unforeseen events.



Ongoing (post initial deployment and clean-up) costs include:

- monitoring, assessment, and reporting of carp biomass and aggregation dynamics, hydrological conditions, and long-range meteorological predictions to ensure successful long-term suppression,
- additional modelling, or use of existing models for ongoing management,
- capacity to produce, transport and store virus, and maintain effectiveness through targeted follow-up activities,
- monitoring and reporting virus efficacy (transmission, virulence, potential emergence of host resistance),
- water-quality monitoring and reporting for human and livestock use,
- ecological health monitoring and evaluation of carp suppression,
- monitoring and evaluation of workplace health and safety effectiveness for personnel,
- regular reporting of carp control activities to key stakeholders, and
- monitoring community attitudes towards carp control activities and results for development of effective communication.

5.5 National costs

Accurately identifying a total national cost for carp biocontrol implementation is not currently possible. A total national cost estimate could be generated by adding jurisdictional and national costs to regional costs. Key factors to consider in developing regional costs include:

- A region's geographic, landscape, and ecological features, including characteristics of its carp populations. For example, costs are likely to be highest in regulated systems of the southern MDB, as these have high carp biomass and could receive carp decomposition products from upstream. Consequently, substantial risk mitigation efforts may be required in this region. Tailored risk mitigation approaches are also likely to be needed for ephemeral systems in the northern portions of the MDB, given the particular risk profile presented by these habitats.
- Can a region provide enough financial, technical, and human resources on its own, or will these need to be subsidised?
- Can regions coordinate to mitigate costs and risks?
- Does a region lie within a jurisdiction that has/can obtain contingency and surge resources if needed?
- How extensive will year two and follow up operations need to be?

5.6 Cost-mitigating factors

Opportunities may exist mitigate the costs associated with carp carcass management by using carcasses as raw material for marketable products rather than placing them in landfill (or otherwise disposing of them). To explore potential economic uses of carp carcasses, an NCCP research project trialled several potential products and processing techniques (NCCP research project 17). Products identified as potentially feasible were subject to further cost-benefit analysis. Composting, rendering as mixed inputs to animal feeds, and hydrolysate were the most commercially viable options. Composting was identified as having the greatest net cash benefit per kg input of carp (\$0.438-\$0.338) (NCCP research project 17).

Before developing plans to utilise carp carcasses, potential constraints imposed by jurisdictional environmental protection legislation will need to be considered. For example, in some Australian states, the carcasses of carp killed by the virus may be classified as industrial waste, potentially limiting options for their use.



6 FEASIBILITY ASSESSMENT

The feasibility of proceeding towards carp biocontrol implementation is assessed against the criteria detailed in Table 7. The NCCP assesses scientific and operational feasibility. Feasibility criteria involving financial and policy considerations are not assessed, as these are matters for consideration by governments. The feasibility criteria detailed in Table 7 cover the critical questions for carp biocontrol based on the aims of biocontrol programs generally, previous research, input from NCCP advisory groups, and NCCP research results.

The ecological benefits of carp biocontrol are not included as a feasibility criterion, as accurately assessing the ecological benefits of carp reduction is complex and context specific (Technical Paper 1; NCCP research project 18). The NCCP is underpinned by the fundamental assumption that carp have adverse impacts on freshwater ecosystems, consistent with extensive research and evidence, and that reducing these impacts will improve environmental outcomes (see section 1, and Technical Paper 1).

Table 7 outlines each criterion and any relevant standards defining it.

Table 7: Feasibility criteria and relevant standards.

Feasibility criteria	Definitions and standards
1. Will carp virus biocontrol be effective?	
That there will be widescale reduction and suppression of carp populations for the medium to long term (5–10 years) in Australian aquatic ecosystems.	Long-term carp suppression is defined as 5–10 years, based on the likely shorter suppression durations afforded by other currently available methods. 'Widespread' is defined as occurring across major catchment systems and multiple jurisdictions. Modelled outcomes are likely to suppress carp populations by 40–60% on average.
2. What are the carp virus biocontrol risks and how can they be managed?	
The carp virus will not affect human health, or domestic or stock animal health, as a result of direct infection (i.e. this criteria does not relate to potential secondary impacts, such as those associated with degraded water quality).	The World Organisation for Animal Health (OIE) defines a notifiable impact as occurring if a species is infected by the pathogen in question. Infection is defined as "the entry and development or multiplication of a pathogenic agent in the body of humans or animals".
There are very low risks that the carp virus will infect and cause disease and/or sub-clinical effects in any non-target species.	The OIE defines a notifiable impact as occurring if a species is infected by the pathogen in question. Infection is defined as "the entry and development or multiplication of a pathogenic agent in the body of humans or animals".
There will be no significant impacts on the quality of water used for town water supplies, stock and domestic consumption, irrigation, and cultural and recreational purposes.	Significant impacts are defined under the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (available at https://www.waterquality.gov.au/guidelines/anz-fresh-marine).
3. How can carp virus biocontrol be implemented?	
Implement effective and efficient operations to manage risks and potential impacts.	Guidelines on effective and efficient operations are outlined in the Australian Interagency Incident Management system (AIIMS) Incident Control System (ICS).

NCCP research and planning investigations provide the evidence for assessment against the feasibility criteria. Table 8 summarises the assessment of feasibility against these criteria.

Table 8: Summary assessment of feasibility against specific criteria.

Feasibility criteria	Evidence	Expected outcomes	Feasibility assessment
1. Will carp virus biocontrol be effective?			
i. That there will be widescale reduction and suppression of carp populations for the medium to long term in Australian aquatic ecosystems.	Epidemiological modelling; transmission experiment; latency experiment; carp biomass estimates; population modelling.	Forty to sixty per cent knockdown of carp following initial virus deployment (60-80% in less resilient in carp populations). Carp suppression could continue for at least 10 years, and should persist through booming or highly productive carp population growth periods. Nonetheless, uncertainties regarding the development of genetic and/or herd immunity, and the extent to which recrudescence of latent infections will occur under field conditions remain. Carp populations will likely be reduced below theoretical damage thresholds across extensive areas of Australia's inland waterways (see section 2.1), however this may not occur in high density sub-populations. Benefits may be enhanced if virus deployment in the lower Murray is preceded by targeted, intensive harvesting to reduce carp 'starting density'. Assessing the timing, magnitude, and operational planning aspects of this pre-fishing effort is beyond the NCCP's scope, but could usefully be investigated by some limited additional modelling (NCCP research project 4). Some uncertainty remains about the likelihood of achieving sufficient virus transmission within carp aggregations during the first year of deployment. A second year of deployment may therefore be required.	Feasible (indicative) based on epidemiological modelling, and providing some additional validation and refinement of assumptions underpinning that modelling is conducted.

Feasibility criteria	Evidence	Expected outcomes	Feasibility assessment
2. What are the carp virus biocontrol risks and how can they be managed?			
i. The carp virus should not infect or cause disease in non-target species.	CSIRO and Invasive Animals CRC non-target species susceptibility testing preceding the NCCP; review assessing the carp virus's potential to infect humans; carp virus species specificity review (for non-human species); non-target species susceptibility testing on Murray Cod and Silver Perch.	Additional non-target species susceptibility testing focused on rainbow trout at minimum would provide necessary additional knowledge of the virus's host range.	Additional testing is recommended to inform a clearer feasibility recommendation.
ii. The carp virus must not affect humans or stock health through direct infection (note, this criterion does not refer to impacts on water quality caused by decomposing carp carcasses).	Human health review.	The virus will not infect humans or other mammals.	Feasible based on human health literature review.
iii. Manage prolonged, adverse impacts on water quality for town water supply, stock and domestic water supply, irrigation, and cultural and recreational purposes.	Anoxia and blue-green algae water quality research; water treatment research; ecological risk assessment; regional case studies.	Prolonged broadscale impacts unlikely. Challenges remain in some ecosystem types discussed throughout this report (e.g. northern MDB ephemeral systems). Risks could be managed with sufficient resourcing as per the NCCP implementation strategy and case studies. Water treatment plants can deal with existing carp densities. Some risks can be managed by communication and education. No significant infrastructure risks have been identified.	Feasible (indicative) based on the NCCP water quality modelling and its assumptions and sufficient carcass management.

Feasibility criteria	Evidence	Expected outcomes	Feasibility assessment
3. How can carp virus biocontrol be implemented?			
i. Implement effective and efficient measures and actions that mitigate risks and impacts associated with the release of the carp virus.	Ecological risk assessment; NCCP implementation strategy; regional case studies.	NCCP case studies illustrate that risk mitigation is possible subject to effective coordination, planning, and resourcing.	Feasible based on NCCP case studies and conclusions from water quality, biomass, and epidemiological modelling.

Describing the feasibility of carp biocontrol using the virus requires a nuanced and qualified statement. Briefly restated, feasibility criteria are (i) effectiveness, (ii) risk identification and management, and (iii) implementation. When assessed against these criteria, results from NCCP research and investigations indicate feasibility, with some qualifications. With strategic virus deployment, carp reductions of varying magnitudes and ongoing suppression appear achievable. From a risk perspective, water-quality impacts (for both ecosystem integrity and human/livestock use) appear manageable in many areas and habitat types, regional case studies have identified strategies for managing dead carp, and water treatment processes appear able to cope with all but the most extreme and unlikely dead carp loadings. To reframe these conclusions, no results have emerged to clearly indicate that further consideration of the virus as a biocontrol agent should cease.

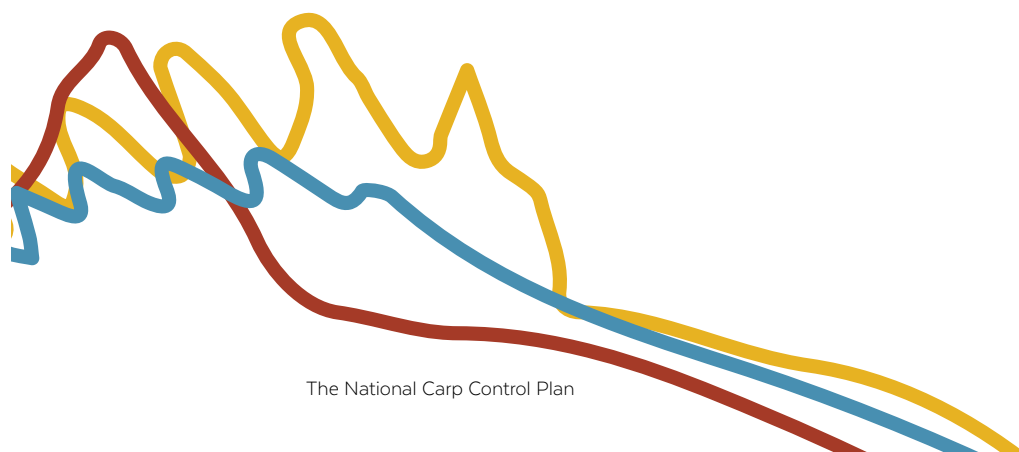


Yet, as has been noted throughout this report, these broad indications of feasibility are subject to important uncertainties and caveats. In particular, the following key uncertainties preclude a definite recommendation of feasibility at this time.

- a. Further non-target species susceptibility testing is recommended.
- b. Investigation of viral latency and recrudescence in adult carp under variable environmental conditions and over timescales similar to those that would be required to initiate outbreaks and sustain carp suppression in natural ecosystems is desirable. Modelled carp suppression outcomes depend on reactivation of latent infections. Therefore, while latent and recrudescence infections are consistent with knowledge of the carp virus's biology and have been indicatively supported by a short-term laboratory experiment using juvenile carp in the NCCP, further confirmation is recommended.
- c. Confirmation of some key epidemiological rates, again ideally generated from longer-term experiments under conditions of environmental variability similar to those encountered in the field, would usefully inform and validate epidemiological modelling.
- d. Improved understanding of the possible existence of alleles conferring resistance to the carp virus in Australian carp, and the potential role of carp-Goldfish hybrids in the evolution of resistance, is desirable.
- e. In addition to these specific issues, broader uncertainties remain regarding the viability of carcass management in waterways that are remote and/or difficult to access (e.g. the ephemeral systems of the northern MDB). Concerns regarding the likely effectiveness of clean-up in these systems is compounded by their relative sensitivity to water-quality impacts.
- f. In a point allied to (e), major and unmanaged carp kills in still-water environments (e.g. off-channel wetlands) could establish the preconditions for avian botulism outbreaks. Given the highly probabilistic nature of botulism outbreaks, quantitatively predicting the likelihood of these events is difficult. Effective carcass management could prevent development of the preconditions for botulism outbreaks, but may be challenging in these habitats. Sufficient resourcing for carcass-management operations may be able to address these concerns.

Points a-d could be addressed with additional, targeted research, potentially leading to a more definitive feasibility determination. A pathway for such research is set out in the Recommendations section of this report. Yet even additional research would not eliminate all uncertainty or risk, necessitating a flexible and responsive adaptive management framework if virus release did eventually proceed.

The above considerations preclude an outright recommendation of feasibility at this time. Yet concluding that carp biocontrol is non-feasible would not accurately represent the results of most of the NCCP science, and risks prematurely discarding one potential option for managing a serious environmental problem for Australian aquatic ecosystems.





7 CONCLUSIONS AND RECOMMENDATIONS

NCCP research and planning investigations have developed a knowledge base from which Australian governments could, if they choose to do so, proceed with further activities to inform decision making on potential use of the virus in Australian biocontrol operations.

A continental-scale biocontrol program targeting an established pest fish inevitably involves risk and uncertainty. As noted in section 6, NCCP research and investigations have clarified risks and reduced, but can never eliminate, uncertainty.

Biocontrol using the virus will not eradicate carp, nor will it provide a stand-alone solution for controlling carp in perpetuity. However, successfully implementing carp biocontrol could achieve the following national outcomes and opportunities:

- reduced environmental damage caused by carp,
- a ‘window of opportunity’ during which ecological restoration measures could be implemented to benefit native fish and aquatic habitats while carp impacts are reduced, and
- an opportunity to develop and refine other carp control measures that could then be deployed against carp populations reduced by viral disease.

If governments decide to proceed with additional activities to further inform decision making, the next stages will involve additional research, legislative approvals and more detailed planning and risk mitigation.

7.1 Governance recommendations

If governments decide to proceed with further activities to support decision making, the following governance tasks are recommended as a minimum to proceed with assessment and coordination:

1. Establish a national taskforce (potentially the existing Freshwater Vertebrates and Invertebrates Working Group of the Environment and Invasives Committee) consisting of state/territory and local government representatives to coordinate planning. The taskforce should include representatives from biosecurity, water, environment, and agriculture portfolios. Key tasks would include policy and regulation, communications and engagement, and operations.
2. Develop and implement an NCCP communications and engagement plan.
3. Progress state, territory, and Commonwealth legislative approvals, as necessary supporting information becomes available.
4. Obtain APVMA approval. This task will involve Australian Government negotiation with the NSW Department of Primary Industries to complete the APVMA approval.
5. Seek approval under other relevant legislation including the *Biosecurity Act 2015*, the *Biological Control Act 1984*, and relevant state and territory regulatory approvals.

A specific timeline for implementation is not provided as this would be determined by the Australian Government and state/territory governments.

7.2 Research and development recommendations

The NCCP research program has made substantial progress towards understanding the carp virus's potential role as a biocontrol agent in Australia. As noted in section 6, several key uncertainties are likely amenable to resolution through carefully planned and targeted research. Recommendations for this research are provided in the following sections.

7.2.1 Additional non-target species susceptibility testing

Although considerable evidence indicates that the carp virus only infects carp, concerns regarding the potential for infection in other species are relatively common in the Australian community. To address these concerns, and improve the level of evidence available to decision makers, a final round of non-target species susceptibility testing is recommended. At minimum, this testing should include rainbow trout. The experiments should be carefully designed to ensure that test subjects are exposed to the virus under optimal conditions for infection.

7.2.2 Improving understanding of carp virus latency and recrudescence

During the NCCP research program, a need for improved understanding of the dynamics of carp virus latency and recrudescence under field conditions has emerged as a key area in which additional knowledge would substantially benefit decision making. These aspects of carp virus infection and disease are important for two reasons.

First, if carp biocontrol does eventually proceed, releasing latently infected carp into waterways during seasons (most likely winter) when water temperatures are below the permissive range for the disease caused by the carp virus may be an effective virus deployment strategy. Latent infections are expected to recrudescence as water temperatures enter the permissive range in spring, which is also when carp in many areas aggregate to spawn. If carp with reactivating infections joined spawning aggregations, they would likely have physical contact with numerous other carp, thereby initiating outbreaks (Technical Paper 2; NCCP research projects 4 and 6).

Second, modelled carp suppression outcomes depend upon recrudescence of latent infections. Under NCCP modelling, if latency does not occur, carp populations rapidly rebuild after initial major outbreaks, meaning the virus would offer only very short-term carp suppression (NCCP research project 4).

Scientific knowledge of carp virus biology supports the occurrence of both latency and recrudescence, as do results from a short-term laboratory experiment under the NCCP (NCCP research project 5). However, the two considerations outlined above are critical to the effectiveness of carp virus biocontrol. Therefore, studying latency and recrudescence in natural ecosystems (or at least in conditions imitating them) could substantially improve understanding of carp biocontrol efficacy. The broad aims of such research would be twofold; to determine whether latency and recrudescence do in fact occur over the timescales (likely weeks to months) on which they would need to operate in a biocontrol program, and to improve understanding of how these processes interact with critical carp behaviours. For example, a key question is whether carp experiencing recrudescence would join spawning aggregations. Additionally, such research should use adult carp, as this is the life-history stage in which latency primarily needs to operate for the virus to be maximally effective as a biocontrol agent.

Conducting research as outlined previously in Australia is difficult. As an exotic (to Australia) virus notifiable to the OIE, all research using the virus in Australia must occur within biosecure laboratories, removing the possibility of field experiments and constraining the scale of laboratory experiments. However, international research institutions in countries where the virus is endemic, and where biosecurity provisions regarding its scientific use are therefore less stringent, possess facilities that could enable research as described earlier. Such facilities include outdoor pond/lake systems and large indoor tanks that would provide an opportunity to study virus dynamics under conditions more representative of natural ecosystems than is generally feasible in the laboratory. If governments choose to proceed with activities to support decision making about carp biocontrol, further consideration of this research would be a useful priority.

7.2.3 Validating epidemiological modelling with real data

By coupling models of carp virus transmission and disease dynamics with those simulating carp demography and ecology, NCCP modellers have produced cutting-edge work with real capacity to inform a pathway to implementation. As with all modelling, assumptions were necessary (see discussion in section 2, and Technical Paper 2), and, while these were informed wherever possible by information available in the scientific literature, the unique challenges posed by carp biocontrol mean that some uncertainty remains.

One of the most useful pieces of research that could be undertaken to inform implementation is further investigation of carp population structure. The carp virus's epidemiology in Australian systems will be influenced by carp population structure and demography, because factors such as population density, age structure (the relative abundance of different age classes in the population), and connectivity between carp sub-populations will influence the knockdown resulting from viral disease (see section 2.1). Consequently, NCCP epidemiological modelling is linked to a carp demographic model. This model is based on the best available scientific information and has been evaluated by carp biology and ecology experts. Nonetheless, additional field-based research investigating carp demography and population structure would refine this model, enabling improved operational planning for virus deployment and outbreak response. Additionally, research to better resolve carp population structure and demography would be a 'zero-loss' investment, because this information would be useful for any future carp control measures if governments choose not to proceed with biocontrol.

Similarly, recently available data on carp virus outbreaks from Japanese waterways provide an opportunity to test and validate the epidemiological modelling. Japanese aquatic habitats differ in some important respect from those in Australia, but applying the models to the Japanese data nonetheless represents a useful opportunity to test assumptions and outcomes, and is recommended. Likewise, the potential approach outlined in section 7.2.2 for studying viral disease dynamics under natural or semi-natural conditions would also yield data to inform the modelling, particularly with regard to some key epidemiological rates.

7.2.4 Developing methods for large-scale production, storage, and transport of the carp virus

APVMA approval requires that virus production, packaging, and distribution processes are standardised, quality-controlled, limit opportunities for mutation or inclusion of adventitious agents, and generally conform to standards similar to those expected of animal health vaccines. From a logistical perspective, the capacity to produce large quantities of virus in forms that enable effective transport and deployment throughout the control area is an essential operational requirement for carp biocontrol.

Potential approaches to producing the virus that meet both APVMA requirements and operational challenges have been discussed by the NCCP Operations Working Group, and a project proposal procured. However, virus production and storage capabilities are logistical questions relevant to the implementation, rather than feasibility assessment, phase of a biocontrol program, and the proposal was consequently not funded under the NCCP. If governments elect to proceed towards implementation, this work will be essential.

7.2.5 Ongoing mapping and investigation of carp aggregations

Understanding the timing and location of carp aggregations is critically important to ensure effective carp virus biocontrol. Scientific knowledge about carp aggregations is currently limited. The NCCP completed a citizen science project that collected important information on the location and characteristics of carp aggregations (NCCP planning investigation 1). Continuation of this project, and research using the data it generates, is recommended.

7.2.6 Decision-support and mapping tools for operational activities

If carp biocontrol is implemented, a suite of decision-support and mapping tools will enhance operational planning and response capabilities. Prospective tools for development have been scoped under the NCCP.

The most important operational support tool will be an online Geographic Information System (GIS) incorporating carp biomass data from both wet and dry years, carp aggregation locations and spawning hotspots, areas important for human use and biodiversity, and carp sub-populations. This GIS would in turn provide the basis for developing a range of decision-support tools to assist operational managers to visualise and explore diverse virus deployment and carcass management scenarios. The ecological and administrative complexity of carp biocontrol operations will mean that visualisation capacity of this nature is essential for effective operational management. Building this system would require modelling and mapping of carp sub-populations through the entire range of biocontrol operations. The NCCP epidemiological modelling project has mapped and modelled carp sub-populations in selected case study catchments, so methodological approaches and data requirements are now well-known.

7.2.7 Assessing carp virus salinity tolerance

Carp inhabit numerous waterways with elevated salinity. Most obviously, coastal waterways such as the Gippsland Lakes (Victoria), Albert and Logan Rivers (Queensland), and the Lower Lakes (South Australia) are saline to varying degrees, and are inhabited by carp. Some inland waterways inhabited by carp are also saline. The carp virus's salinity tolerance is currently poorly understood, so it is possible that the virus's capacity to infect or kill carp could be reduced or eliminated under saline conditions. Research investigating the virus's likely effectiveness in saline conditions would therefore usefully inform operational planning.

7.2.8 Assessing animal welfare implications of carp biocontrol

The Royal Society for the Prevention of Cruelty to Animals (RSPCA) acknowledges the need for pest animal control, but notes that control methods should be as humane as possible for all species, including fish. Under laboratory conditions, carp can take up to 16 days to die from the disease caused by the carp virus (NCCP research project 6). Disease progression involves gill necrosis (breakdown) and haemorrhaging, and probably involves some level of suffering.

Assessing the welfare implications of carp biocontrol in consultation with animal welfare experts is recommended. Preliminary discussions involving the NCCP Science Advisory Group, external scientists with expertise in animal welfare, and representatives of the RSPCA have yielded some initial ideas about how such an assessment could be conducted. The recommended next step is to convene a meeting or workshop expanding upon this early work.

7.2.9 Monitoring the evolving relationship between carp and virus

Following virus deployment, Australian carp populations and the carp virus would begin a co-evolutionary 'arms race'. Tracking this evolving relationship is an important aspect of measuring a biological control program's progress. A pilot study under the NCCP has developed the tools necessary to track the evolution of genetic resistance in Australian carp population if virus release did eventually occur (NCCP research project 7).

Primary areas of uncertainty in predicting the emergence of resistance in Australian carp populations are:

- The potential role that carp-Goldfish hybrids, which are less likely to die following infection with the carp virus than are 'pure' carp, could play in promoting resistance remains uncertain. The Australian freshwater research community has considerable expertise in carp and Goldfish ecology and genetics, and a useful and low-cost next step in addressing this uncertainty could involve convening an expert workshop to review this issue. This recommendation is included in the NCCP monitoring and evaluation plan shown at Appendix 2.
- Research to further investigate the potential existence of the alleles conferring genetic resistance to the carp virus among Australian carp populations is recommended. Exploratory NCCP research found no evidence of these alleles (NCCP research project 7), but did not constitute a comprehensive genetic survey of Australian carp populations. This research did, however, develop the tools required for further assessing this question.



7.3 Implementation planning recommendations

Implementation planning is recommended to address the following important issues:

- mitigation of high to moderate ecological risks identified for ephemeral dryland river systems and Ramsar wetlands including the South Australian Lower Lakes systems and the associated marine system immediately outside of the Murray River mouth (NCCP research project 15),
- improving regionally specific knowledge of carp movement and aggregation behaviour, and
- developing plans and estimating costs associated with potential targeted 'fish down' activities in high density sub-populations.

Further recommendations and guidelines for implementation planning are given in Technical Paper 6.

7.4 Community relations recommendations

The general community and specific stakeholder groups have a high level of interest in the NCCP. If governments choose to proceed with activities to further inform eventual decision making on carp biocontrol, ongoing community consultation and stakeholder engagement is important. All stakeholders have indicated that they would appreciate continued communications and engagement.

Traditional Owners have an important connection to inland waterways and carp control. In NCCP workshops, Traditional Owners have expressed a strong desire to not only be informed about progress towards biocontrol implementation, but also to be actively involved in decision making. The NCCP has begun the process of engaging with Traditional Owners on carp biocontrol. Ongoing dedicated engagement is recommended as planning towards implementation proceeds.

Communications recommendations include:

- continue NCCP science communication through the next phases of research, approvals, and decision-making phase, if governments choose to proceed with these activities,
- develop a comprehensive communications and engagement plan that includes strategies for specific stakeholder groups listed in the NCCP, spans all phases of biocontrol implementation, and is integrated with jurisdictions and regions, and
- communicate reasons for not proceeding towards virus deployment, if Australian governments choose this approach.

Community consultation recommendations include:

- undertake specifically designed and more extensive consultation with Traditional Owners, and
- undertake specifically designed consultation with other stakeholder groups identified by the NCCP.

If governments decide to proceed with activities to support decision making, stakeholder engagement recommendations include:

- actively engage with Traditional Owners in decision making and enterprise development about possible carp biocontrol and its management,
- engage local knowledge and stakeholders in regional implementation planning, and
- acknowledge possible stakeholder impacts, including anticipatory impacts.

APPENDIX 1 OVERVIEW OF NCCP RESEARCH

MEETING A COMPLEX RESEARCH CHALLENGE

Controlling established pests is always challenging. Pest species tend to be hardy and adaptable, and are often widespread. Freshwater pest fish pose particular control challenges because they inhabit inter-connected and often ecologically sensitive environments. Major fish kills can therefore have implications for water quality in freshwater ecosystems. More subtly, established high-impact pests often shaped ecosystems around themselves and become integral to new modes of ecosystem function. Removing these species (or, more realistically, reducing their abundance) can have unforeseen consequences for ecosystems and the human communities that depend upon them for livelihoods and recreation.

Given this complexity, NCCP research needed to span biological, physical, economic, and social questions. Important research areas included understanding carp population size and distribution, the virus's likely effects on these populations, potential impacts of dead carp on water quality and water treatment, community and stakeholder views on carp control, and development of virus release and carcass management strategies. By engaging with these issues, the NCCP research program has produced new knowledge that will inform decision making on future directions for carp biocontrol.

RESEARCH PROGRAM OVERVIEW

The NCCP research program consists of 19 peer-reviewed projects and five investigations spanning the biophysical sciences, social sciences, and applied economics. The research program's 'blueprint' is the NCCP Strategic Research and Technology Plan (available at <https://www.frdc.com.au/knowledge-hub/national-carp-control-plan>), which defines three key themes for NCCP research; environment, communities, and informing possible implementation. These key themes emphasise the multi-disciplinary and applied nature of the NCCP research program. Under each theme sit one or more priority areas that guided development of targeted research projects.

The NCCP research program has made progress towards resolving the uncertainty and complexity inherent in viral biocontrol of an established pest fish. For perspective, no other biological control proposal has received such an intensive research effort to inform decisions on possible release. NCCP research has developed new knowledge that provides:

- the most comprehensive estimate of Australian carp biomass ever obtained,
- a national-scale understanding of the carp virus's likely dynamics in, and impacts on, Australian carp populations,
- understanding of how the carp virus could be deployed to maximise effectiveness,
- clearer insights into the impacts various dead carp concentrations could have on water quality and water treatment processes, and
- potential pathways for implementation.

Inevitably, given the scale and complexity of the carp problem, uncertainties and knowledge gaps remain. The NCCP identifies the key uncertainties for each research theme and explains implications for decision making. Where relevant, actions to reduce these uncertainties are described.

RESEARCH MANAGEMENT

Recognising the need for a broad-ranging investigation, in 2016 the Australian Government provided \$10.211 million for the NCCP's development. The Fisheries Research and Development Corporation (FRDC), a statutory corporation under the *Primary Industries Research and Development Act 1989*, was contracted to develop the NCCP, with the then Commonwealth Department of Agriculture and Water Resources (DAWR, now the Department of Agriculture, Fisheries and Forestry (DAFF)) acting as program manager. A steering committee, comprising senior officials from DAWR, the Department of the Environment and Energy, and the Department of Industry, Innovation, and Science, provided strategic oversight at the programmatic level. Soon after the NCCP's inception, four advisory groups, combining jurisdictional representation with subject-matter expertise, were established to oversee the program's research (Science Advisory Group – see next section), policy, communications, and operations components. By late 2018 the NCCP's Policy Advisory Group had completed its functions, and oversight of policy matters relevant to the NCCP was adopted by the Commonwealth's Environment and Invasives Committee.

THE NCCP SCIENCE ADVISORY GROUP

The NCCP's Science Advisory Group (SAG) has been the principal body overseeing the research program and providing advice to the NCCP Secretariat and National Coordinator. The SAG was formed to provide advice to FRDC on the planning and implementation of the research program. Since its inception in December 2016, and up to the conclusion of the main portion of the NCCP's research program in late 2019, the SAG met quarterly to fulfil its functions. The SAG's tasks included setting research priorities to address knowledge gaps, reviewing and providing feedback on proposals to fill research needs, and reviewing and providing feedback on research outputs. These functions were facilitated by quarterly Principal Investigator Workshops, at which researchers working on NCCP projects presented project updates and results to audiences that include members of SAG and other NCCP advisory groups.

In addition to review by the SAG, NCCP project final reports were reviewed by at least two independent subject-matter experts. These expert reviews were then considered by SAG, which made a final decision on whether or not to formally 'accept' the project reports. The SAG formally accepted a research project if (i) all project objectives were met, and (ii) comments from external reviewers and the SAG (where applicable) were adequately addressed. This process ensured that all NCCP research project final reports were subject to a review process approximately analogous to that involved in peer-reviewed scientific journal publications. Table 9 summarises the SAG's deliberations on NCCP research project final reports.

In order to adequately serve the advisory needs of the NCCP, SAG members were nominated to represent relevant scientific expertise from Queensland, New South Wales, South Australia, Victoria, the Australian Capital Territory, Tasmania, and Western Australia. Disciplines and subject areas represented on the SAG included fish ecology, biology, virology, and epidemiology, human health, and socio-economics. The SAG also included representatives from the then Department of the Environment and Energy (now the Department of Climate Change, Energy, the Environment and Water), and DAFF.

As the main body of NCCP research concluded in 2019, limited additional research questions emerged that, if successfully answered, were likely to reduce some key uncertainties. Consequently, a provisional NCCP was submitted to DAFF in January 2020, with an agreement to update the document on completion of the additional research projects. Completion of these additional research projects, most of which required biosecure laboratory facilities, was delayed by the COVID-19 pandemic, which saw Australian laboratories accredited for research on exotic viruses prioritising COVID-19 research. These projects were completed from early-mid 2022. A modified SAG, referred to as the NCCP 'Special SAG', was convened to assess these projects and advise on their integration into the NCCP. The Special SAG included scientists with the expertise necessary to evaluate the newly completed projects, or with broad, cross-program interests in NCCP research and its application. These discussions occurred over four meetings during early-mid 2022, and the new projects, with the modified SAG's assessment of them, have been included in Table 9.

Table 9: NCCP research project final report acceptance status.

Project number: Project title	Status	Additional comments from SAG or Special SAG
2016-132: Impact costs of carp and expected benefits and costs associated with carp control in the Murray-Darling Basin.	Not fully evaluated, but SAG input to drafts.	The Final Report for this project was submitted in August 2020, well after the original NCCP SAG had concluded its functions and ceased meeting. Therefore, this project was not formally considered for SAG acceptance, but SAG did provide input on drafts, which was accepted and implemented by the project investigators, and engaged with the project team through the project's life, primarily at NCCP Principal Investigator Workshops.
2016-152/2018-189: Building community support for carp control: Understanding community and stakeholder attitudes and assessing social effects/Socio-economic impact assessment and stakeholder engagement.	Not fully evaluated, but SAG input to drafts.	Final Reports for these two linked projects were submitted in December 2019, after the original NCCP SAG had concluded its functions and ceased meeting. Therefore, this project was not formally considered for SAG acceptance, but SAG did provide input on drafts, which was accepted and implemented by the project investigators, and engaged with the project team through the projects' lives, primarily at NCCP Principal Investigator Workshops.
2016-153: Preparing for carp herpesvirus: A carp biomass estimate for eastern Australia.	Accepted.	
2016-158: Development of strategies to optimise release and clean-up strategies underpinning possible use of herpesvirus 3 (CyHV-3) for carp biocontrol in Australia.	Accepted.	

Project number: Project title	Status	Additional comments from SAG or Special SAG
2016-170: Development of hydrological, ecological and epidemiological modelling to inform a CyHV-3 release strategy for the biocontrol of carp in the Murray-Darling Basin.	Accepted (with conditions).	SAG acknowledged that this is an innovative, complex, and detailed body of work. However, given this complexity and detail SAG requested that the published version include a more detailed discussion of current knowledge regarding the epidemiology of CyHV-3 infections and disease outcomes, and clarification of the model assumptions and parameter estimates, particularly regarding immunology, transmission and the role of water temperature effects. The complexity of this work, and the importance of its underlying assumptions, have been acknowledged throughout the NCCP, accompanied where relevant by recommendations for further research to either test key assumptions or to generate key epidemiological rates to inform the models. This research is currently being published in the peer-reviewed scientific literature, with two papers published at the time of writing (September 2022).
2016-180: Assessment of options for utilisation of virus-infected carp.	Accepted.	
2016-183: Cyprinid herpesvirus 3 and its relevance to humans.	Accepted.	
2017-054: Social, economic, and ecological risk assessment for use of Cyprinid herpesvirus 3 (CyHV-3) for carp biocontrol in Australia.	Accepted.	
2017-055/2017-056: Expanded modelling to determine anoxia risk in main river channel and shallow wetlands/Investigation of nutrient interception pathways to enable circumvention of cyanobacterial blooms following carp mortality events.	Accepted.	
2017-094: Review of carp control via commercial exploitation.	Accepted.	
2017-104: The likely medium- to long-term ecological outcomes of major carp population reductions.	Accepted.	

Project number: Project title	Status	Additional comments from SAG or Special SAG
2017-127: Defining best practice for viral susceptibility testing of non-target species to Cyprinid herpesvirus 3: A discussion paper based on systematic quantitative literature reviews.	Not accepted.	SAG acknowledged the extent of the work, which informed design of further studies for non-target species testing for the NCCP. The SAG did not accept this project on the basis that the work did not meet the objective of determining 'best practice' in non-target species susceptibility (as defined by OIE) testing through a practical set of targeted recommendations, but rather provided broad advice for testing of non-target species resistance. To provide more targeted advice on next steps for non-target species testing, a small committee including the Principal Investigator for this study and SAG members with relevant subject-matter expertise was formed. The deliberations of this group led to project 2019-176, which aimed to re-test the susceptibility of Murray Cod, Silver Perch, and Rainbow Trout to infection by the carp virus.
2017-135: Essential studies on Cyprinid herpesvirus 3 (CyHV-3) prior to release of the virus in Australian waters: Excretion and seasonality.	Not accepted (by NCCP Special SAG)*	This work aimed to provide preliminary 'proof of concept' that carp could be infected by the virus, then returned to temperatures below the permissive range to induce a latent infection that would reactive when temperature rose into the permissive range. The work used juvenile carp, and was not intended to provide definitive proof that latency and recrudescence would occur under field conditions. Rather, the experiment was intended as a short-term test of the concept to determine whether or further investigation may (or may not) be useful. The NCCP Special SAG did not to accept this project, not because of its preliminary and short-term nature, but due to some concerns regarding the experiment's execution. These concerns centred on morbidities in some fish tanks that the Special SAG considered had not been adequately explained, water-temperature fluctuations that occurred around tank-water exchanges, and inadequate or unclear explanation of these issues in the project report. Nonetheless, the Special SAG further noted that these limitations do not mean that the study's results should be completely discounted, but rather that they should be presented in context as requiring cautious interpretation.

Project number: Project title	Status	Additional comments from SAG or Special SAG
2017-148: Identifying synergistic genetic biocontrol options for <i>Cyprinus carpio</i> in Australia.	Accepted.	
2017-237: Risks, costs and water industry response.	Accepted.	
2018-120: Population dynamics and carp biomass estimates.	Accepted.	
2019-176: Determination of the susceptibility of Silver Perch, Murray Cod and Rainbow Trout to infection with CyHV-3.	Not accepted (by NCCP Special SAG)*	This project aimed to distil the broad recommendations of project 2017-127 into a more defined and practical scope by re-testing three non-target fish species using best-practice methods. The Special SAG did not accept this work for several reasons. Major mortalities in Rainbow Trout due to inadvertent exposure to chlorinated water at the research facility well before challenge with the virus meant that this species could not be tested. Consequently, the project was unable to meet one of its objectives – testing the susceptibility of rainbow trout to the carp virus. Other key reasons for non-acceptance centred on unexplained mortalities in both test (i.e. exposed to the virus) and control (not exposed to virus) fish, and insufficient data to support a determination of susceptibility or otherwise in test fish. Recognising the importance of determining the virus's specificity to carp with the highest level of confidence practically achievable, the NCCP recommends additional non-target species susceptibility testing to inform decision making on carp biocontrol.
2020-104: Evaluating of the role of direct fish-to-fish contact on horizontal transmission of Koi herpesvirus	Accepted (by NCCP Special SAG)*	
2019-163: NCCP: Understanding the genetics and genomics of carp strains and susceptibility to CyHV-3	Accepted (by NCCP Special SAG)*	

* The NCCP Special SAG was an NCCP Advisory Group formed to assess projects that began later in the overall duration of the NCCP program, and which therefore attained completion after the original NCCP SAG had completed its functions and ceased meeting. The Special SAG included members with the subject-matter expertise necessary to assess the remaining projects, as well as those with broad scientific interests across NCCP research and its implications.

RESEARCH APPROACH

Projects within the NCCP research program use a range of research approaches, including experimentation in biosecure laboratories, field-based research assessing carp abundance, decomposition and associated water-quality impacts, reviews of the scientific literature, diverse modes of social enquiry, and economic modelling. Some crucial NCCP research projects use computer modelling, in which mathematical representations of key environmental variables play out in many different combinations. Modelling was essential to the NCCP for two main reasons. First, modelling enables exploration of phenomena that occur over long timescales and large geographic areas, such as medium- to long-term impacts of the virus on carp populations. These phenomena would be difficult or impossible to study using a traditional experimental approach. Second, the carp virus must remain in a biosecure laboratory until all necessary legislative approvals are gained, severely limiting opportunities for field experimentation. Wherever possible, NCCP modelling has been underpinned by data from field observations, helping to ensure that the modelled system mimics key aspects of Australian aquatic ecosystems as accurately as possible. Additionally, some of the modelling that helps to understand how the virus could impact carp populations is data-driven, which means that researchers search large datasets to identify underlying patterns, rather than beginning with predefined assumptions (see Technical Paper 2 for more detailed discussion of data-driven modelling).

Despite these attempts to ensure that the modelling accurately represents the study systems, assumptions and simplification remained unavoidable. Whenever assumptions are made in modelling, there is a chance that they could be incorrect to some degree. Incorrect assumptions in modelling studies can have consequences for the accuracy of conclusions ranging from minor to severe, depending upon the exact nature of the assumptions. Often, the validity of model outputs can only be assessed by collecting and analysing relevant data from the study system(s). Therefore, the NCCP has identified and communicated key assumptions underpinning research conclusions, and has recommended further work to enable cross-checking/ground-truthing of these assumptions where practical.

RESEARCH AND INVESTIGATIONS PROJECTS

NCCP research and investigations projects are shown in Figure 11, grouped by the broad themes of understanding biocontrol effectiveness, understanding and managing risks, and assessing benefits and costs.

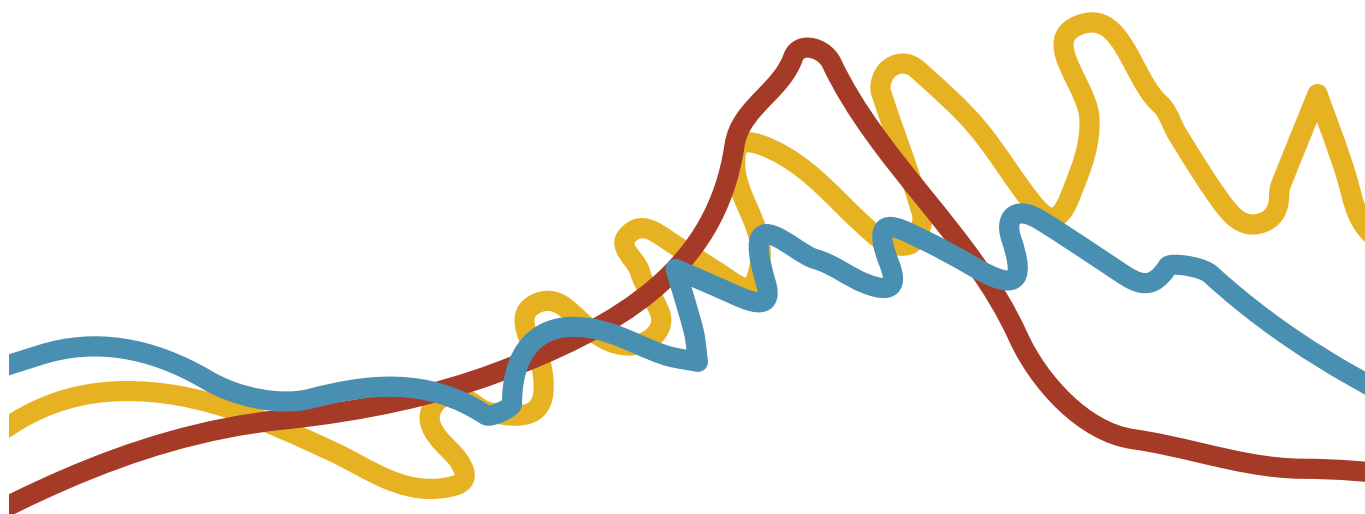


Figure 11: NCCP research and investigations and outputs. Research projects that are peer reviewed are in 'roman' text. Investigations that are not peer reviewed are in 'italic' text. Numbers in the white boxes refer to NCCP research project numbers as cited throughout the Plan's text.



APPENDIX 2 MONITORING AND EVALUATION PLAN

Monitoring design for carp biocontrol using CyHV-3

Introduction

Monitoring and evaluation are essential to successful implementation of any biological control program, including carp control using Cyprinid herpesvirus 3 (CyHV-3). Monitoring enables evaluation of biocontrol success and return on investment, measured against economic, social, and environmental criteria. Crucially, monitoring also enables detection of potential declines in biocontrol effectiveness, such as might emerge from the evolution of host resistance, or attenuation of viral virulence. These declines signal the need to implement additional control measures.

This appendix to the NCCP outlines key monitoring priorities, with the aim of delineating a broad scope for a carp biocontrol monitoring program. Monitoring associated with a carp biocontrol program could encompass three broad themes:

- a. changes in carp abundance, distribution, and population structure following virus release,
- b. ecological and biophysical responses to carp reductions, and
- c. the evolving relationship between carp and the virus, including the latter's progress through, and prevalence in, Australian carp populations.

Conceptually, these three monitoring themes can be divided into those that address questions of population and community ecology (a and b) and those that primarily address questions in the disciplines of virology, epidemiology, and immunology (c). Carp population ecology (point a) and ecological responses to carp reduction (point b), are linked by the concept of 'damage thresholds', which posits that there are threshold carp densities at which impacts on various ecosystem attributes or components begin to manifest (Technical Paper 2; NCCP research project 4).

Monitoring to refine carp threshold densities

The threshold densities at which carp impacts begin to manifest will likely differ considerably among ecosystem components. For example, the carp densities at which impacts on aquatic plants manifest will almost certainly differ from those at which, say, aquatic invertebrates, are affected. Similarly, a given ecosystem attribute or component may exhibit different response thresholds in different areas of carp's Australian range. Understanding the ecological mechanisms underpinning these differing responses to carp reduction should be a key goal of the ecological monitoring that accompanies carp biocontrol. Considerable research effort has been devoted to identifying these damage thresholds internationally, particularly in the United States, but they remain poorly understood in Australia. An improved understanding of these thresholds would be of considerable utility in developing quantitative management targets as carp control activities proceed (if the virus is eventually used a biocontrol agent in Australia). A well-designed ecological monitoring program represents an opportunity to efficiently gather information on carp-impact threshold densities.

Variables for ecological monitoring

Recognising the importance of damage thresholds as a structuring concept for ecological monitoring, key attributes for inclusion in a monitoring program are likely to include:

- carp population density and recruitment dynamics,
- waterbody physico-chemical attributes,
- plankton (both phytoplankton and zooplankton),
- macrophytes,
- aquatic invertebrates,
- fish (non-carp species),
- birds, and
- amphibians.

For each of these attributes, Stocks and Gilligan (2017) and Brooks (2018) list testable hypotheses, key evaluation questions, and potential monitoring designs and sampling protocols. Neither Stocks and Gilligan (2017) nor Brooks (2018) have undergone formal peer review, but would likely provide useful 'blueprints' for developing a national-scale ecological monitoring program. Therefore, expanding upon these reports through workshops or other collaborative mechanisms is recommended as the next step towards developing an ecological monitoring plan for carp biocontrol.

Monitoring the evolving relationship between carp and virus

In any viral biocontrol program, tracking the agent's progress through the host population and monitoring the evolving host-virus relationship is essential for measuring impact on the target pest. These tasks require diagnostic tools that can:

- a. detect the virus's presence in carp populations or sub-populations,
- b. monitor recurrent outbreaks once the virus becomes established in carp populations, and
- c. assess exposure to the virus among carp at the population level, and how this variables change through time. This monitoring component encompasses tracking the evolving relationship between carp and the virus, including the potential emergence of genetic resistance.

In relation to (a), environmental DNA (eDNA) approaches could be useful if their capacity to detect the carp virus at low levels could be confirmed. As for ecological monitoring, the variables listed in points a-c are only a general guide to the kinds of responses that should be monitored. NCCP research has identified cost-effective tools and approaches for monitoring the potential emergence of genetic resistance (NCCP research project 7), but more detailed consultation with subject-matter experts is recommended to develop a detailed plan for monitoring host-virus relationships if governments eventually decide to proceed towards carp biocontrol implementation. This aspect of monitoring is particularly important, as it provides the only means to detect and counteract declines in biocontrol effectiveness.

Baseline monitoring (pre virus release): The foundation for success

Inherent in the concept of monitoring the impact of any intervention is the need for information on pre-intervention conditions to form a 'baseline' against which change can be measured. Thus, both ecological response and host-virus relationship monitoring would need to begin before any future deployment of the virus against Australian carp populations.

A pilot ecological response monitoring program, collecting baseline ecological data from 24 sites across four river systems (i.e. six sites per river system) within the New South Wales portion of the Murray–Darling Basin has already begun (Stocks and Gilligan, 2017). This network of monitoring sites could be expanded to cover a larger portion of carp’s Australian distribution. More detailed guidelines for development of ecological and biophysical monitoring programs are provided by Stocks and Gilligan (2017) and Brooks (2018).

Finally, pre-release reference samples of both carp and virus should be retained. Just as pre-release ecological monitoring establishes a baseline against which responses to carp reductions can be assessed, maintaining pre-release samples of virus and host provide a benchmark against which post-release evolutionary change can be measured. Advice from subject-matter experts should be sought regarding appropriate sampling designs for collection of these reference samples.

Monitoring costs

Detailed monitoring plans have not been developed, so detailed costings are not available. However, funding for monitoring and associated data handling could be allocated to participating states and territories, with coordination to ensure that monitoring results feed back into adaptive management.

Conclusions

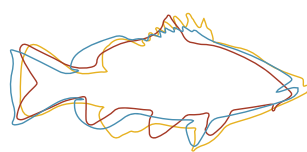
A well-designed monitoring program is essential for evaluating the success of any biocontrol program, and hence for calculating return on investment. Monitoring also provides the only realistic opportunity for managers to detect declining biocontrol effectiveness and implement new control measures. Thus, monitoring needs to encompass:

- a. changes in pest abundance, distribution and recruitment,
- b. ecological responses to pest reductions, and
- c. the evolving relationship between the biological control agent (virus) and host.

For carp control, structuring monitoring for the ecological response component (point b) around the organising concept of damage thresholds will help to ensure that monitoring delivers optimum value for managers. Under the NCCP, frameworks for monitoring both changes to carp populations (point a) and ecological responses (point b) have been developed. These frameworks could be refined and expanded if governments continue with further activities to inform a decision on whether or not carp biocontrol should proceed. Both state/territory and Commonwealth natural-resource and fisheries-management agencies have abundant expertise in monitoring variables encompassed by points (a) and (b) and could usefully contribute to this work. A conceptual framework for monitoring the evolving relationship between carp and virus is less developed, but basic requirements are known, and the expertise to build such a program is available. Finally, monitoring the three key themes listed in points a–c is only useful if baseline conditions against which future changes can be monitored are available. Therefore, establishment of appropriate sampling designs and collection of baseline data and samples will be key priorities if governments proceed with activities to inform decision making on carp biocontrol, and particularly if, after additional research and attainment of legislative approvals, implementation of a carp biocontrol program appears possible.

REFERENCES

- Brooks, S. (2018). Monitoring and evaluating ecosystem responses to release of Cyprinid herpesvirus 3. Unpublished report to the National Carp Control Plan (draft only).
- Stocks, J.R. and Gilligan, D.M. (2017). Baseline data collection to monitor the aquatic ecosystem response within the Murray Darling Basin to the proposed release of Cyprinid herpesvirus 3. Unpublished draft report to the National Carp Control Plan. New South Wales Department of Primary Industries, Batemans Bay, NSW.



NATIONAL CARP CONTROL PLAN



www.carp.gov.au