Australia’s Cleaner Antarctica Strategy

Australia’s Cleaner Antarctica Strategy

**Information Paper submitted by Australia**

Summary

The *Australian Antarctic Strategy and 20 Year Action Plan: Update 2022* reaffirms Australia’s ongoing commitment to best practice environmental stewardship in Antarctica. Related high priority actions over the next five years include establishing a Cleaner Antarctica science program, and developing an actionable Cleaner Antarctica Strategy for Australian stations and sites. This paper summarises the goals of the Cleaner Antarctica Strategy and highlights Australia’s interest to engage and share knowledge with other Parties undertaking or planning similar site assessment and clean-up activities, with the aim of improving environmental outcomes across Antarctica.

Background

Annex III of the Protocol on Environmental Protection to the Antarctic Treaty (Environmental Protocol) establishes requirements for the clean-up of past and present waste disposal sites on land and abandoned work sites of Antarctic activities. To support Parties to address these requirements, the Committee for Environmental Protection (CEP) has developed the CEP Clean-Up Manual (Resolution 2 (2013), Resolution 1 (2019)), which contains key guiding principles and links to practical guidelines.

As noted in the CEP Clean-Up Manual, the environmental risks associated with past waste disposal sites and abandoned work sites are likely to increase over time, as structures and containers deteriorate, and in the context of a changing climate which, through increased melting, creates the potential for localised release and mobilisation of contaminants.

Many Parties have undertaken considerable efforts to minimise the environmental impacts of past waste disposal sites and abandoned work sites in Antarctica[[1]](#endnote-1). As outlined in previous CEP papers, Australia has been conducting ongoing research to inform the development and application of cost-effective and environmentally-effective methods, techniques and tools to assess risk, remediate and monitor recovery of past waste sites and legacy and contemporary fuel spill sites in the vicinity of Australia’s Antarctic stations[[2]](#endnote-2). This work has informed the development of practical guidance materials, some of which have been included in the CEP Clean-Up Manual[[3]](#endnote-3).

The *Australian Antarctic Strategy and 20 Year Action Plan: Update 2022* reaffirms Australia’s ongoing commitment to best practice environmental stewardship in Antarctica. Related high priority actions over the next five years include establishing a Cleaner Antarctica science program, and developing an actionable Cleaner Antarctic Strategy for Australian stations and sites. The strategy is a key component of Australia’s systematic environmental management and full life-cycle approach to sustainable operations in Antarctica.

Overview of Australia’s Cleaner Antarctica Strategy

Having a scientifically robust understanding of the status and environmental risk of contamination and waste is essential to addressing the clean-up requirements under Annex III of the Environmental Protocol. The CEP Clean-Up Manual notes that an assessment should be undertaken of the features of the site that will influence how contaminants behave, and the environmental values that may be impacted, before considering how best to clean-up a site. It identifies ‘site assessment’ as a key stage of the clean-up process. Accordingly, Australia will initially focus on site assessment, to inform the development of a detailed, multi-year, actionable clean-up strategy.

In keeping with the objectives and provisions of the Environmental Protocol, and the key guiding principles highlighted in the CEP Clean-Up Manual, Australia aims to ensure the systematic evaluation of environmental and human health risks associated with legacy waste and work sites, while continuing to evaluate options for environmental remediation and restoration consistent with international best practice. Specifically, over the next five years this will involve:

1. Completing comprehensive site assessment programs across all Australian Antarctic research stations and field camps, including:
   1. Updating or completing desktop studies to document the history of contamination events and known contamination.
   2. Conducting comprehensive on-ground site assessments to inform detailed risk assessments and clean-up planning for each site. Site assessments (see Appendix 1 for more detail) will integrate findings from:
      1. On-site biodiversity assessments (microbes, plants, micro- and macro-invertebrates, and vertebrates) in soil/sediment/water in terrestrial and coastal marine environments.
      2. Site characterisation (hydrology/hydrogeological/physical) assessments of geological and soil features, physicochemical properties (in soil/sediment/water), physical terrain attributes and probable fate and transport of contaminants.
      3. Physical and chemical assessments of soil/sediment/water/waste to determine contaminant levels, if any, and their sources (both local and global) in terrestrial and coastal marine environments. A suite of contaminants will be assessed.
      4. Ecotoxicological assessment of soil/sediment/water as required to derive Environmental Quality Guideline Values (EQGVs) and site-specific Remediation Targets.
2. Derivation of Environmental Quality Guideline Values (EQGVs) and site-specific Remediation Targets. Measures of soil health and effects data from laboratory-based toxicity tests, with a suite of representative local species, will be used to determine tolerance thresholds to key contaminants of concern identified in site assessment programs.
3. Prioritising sites for clean-up based on environmental risk and logistical feasibility, while integrating clean-up with station modernisation programs, where possible.
4. On-going remediation of contemporary fuel spill sites at Casey research station.
5. Continuing to develop cost-effective polar remediation tools and clean-up technologies suitable for the range of contaminants identified, in the range of substrates and environments in which they occur.
6. Developing a detailed, multi-year, actionable clean-up strategy for Australian research stations and sites, with cost-effective and efficient assessment, remediation and monitoring technologies that, in accordance with Article 1.5 of Annex III, ensure remediation and management actions cause no further environmental damage and lead to the greatest net environmental benefit.
7. Collating baseline site-specific biodiversity, site characteristics and contaminant data into a searchable geographic information system / database to inform future planning and monitoring of remediation efficacy and ecosystem recovery.

Next steps

Through the newly announced Cleaner Antarctica science program and work to develop a Cleaner Antarctica Strategy, Australia is strongly committed to promoting knowledge sharing and cooperation in the field of Antarctic contaminated site assessment, remediation, monitoring and clean-up. Over the next five years Australia will develop and share with the international community scientifically robust techniques for the assessment and clean-up of terrestrial fuel spills and contamination arising from waste sites.

Australia would welcome engagement with other Parties who have an interest in, or who are currently undertaking activities, in the field of environmental risk assessment and remediation, and associated research. Arctic-based collaborative partners and new opportunities through SCAR groups (e.g. Integrated Science to Inform Antarctic and Southern Ocean Conservation (Ant-ICON)) will also be sought.

Australia looks forward to further collaboration with interested Parties to share expertise and support clean-up activities across Antarctica.

Appendix 1 – Further detail on methodology for planned site investigations and risk assessments

**On-site biodiversity assessments** (microbes, plants, micro- and macro-invertebrates) in soil/sediment/water in terrestrial and coastal marine environments using a range of sampling strategies (bulk grab/hand samples, cores, photo quadrats and imagery, ROVs and drones) with analysis via traditional taxonomy, molecular analysis, and image analysis techniques, including at appropriate control sites.

**Site characterisation** (hydrology/hydrogeological/physical) assessments of geological and soil features, physicochemical properties (in soil/sediment/water), physical terrain attributes and probable flow paths for migration of contaminants. Achieved through traditional field mapping, drone derived digital terrain models, tracer tests and geophysical surveys (ground or drone derived).

**Physical and chemical assessments** of waste and contamination to determine contaminant levels, if any, in terrestrial and coastal marine environments, and their sources (both local and global). Analysis of contaminants to include metals, petroleum hydrocarbons, volatile organic compounds, polycyclic aromatic hydrocarbons (PAHs), persistent organic pollutants (POPs) and contaminants of emerging concern (CECs) such as flame retardants (PFAS/PFOA), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), asbestos and microplastics. Methods of assessment to include targeted discrete or passive, time-integrated sampling of environmental matrices (soil, sediment, water, vapour, waste) using field suitable or laboratory-based analytical assessment tools (both traditional and novel, project derived tools).

**Laboratory-based toxicity tests** following established protocols developed for marine and terrestrial species or using new protocols to be developed based on-site specific targeted species to determine impacts on local biota to key contaminants of concern. Test media will include environmental samples from contaminated sites (for complex contaminant mixtures) and spiked soils/elutriates/sediments/water (for single high-risk contaminants). This experimental toxicity approach will be used to derive Environmental Quality Guideline Values (EQGVs) and site-specific Remediation Targets applicable to Antarctic and sub-Antarctic sites.

1. For example: ATCM XXXIV/IP017 *Bioremediation of Antarctic soils contaminated with hydrocarbons. Rational design of bioremediation strategies* (Argentina); ATCM XXXV/IP006 *Topic Summary: CEP Discussion on Clean-Up* (Australia); ATCM XXXV/BP11 *Clean-up Techniques for Antarctica* (Australia); ATCM XLI/BP034 *Brazil/Australia Remediation Workshop* (Brazil, Australia). [↑](#endnote-ref-1)
2. For example: ATCM XXXV/BP12 *Clean-up of a fuel spill near Lake Dingle, Vestfold Hills* (Australia); ATCM XXXV/BP013 *Development of environmental quality standards for the management of contaminated sites in Antarctica* (Australia); ATCM XXXV/BP14 *Assessment, monitoring and remediation of old Antarctic waste disposal sites: the Thala Valley example at Casey station* (Australia); ATCM XXXVIII/BP12 *Remediation of fuel-contaminated soil using biopile technology at Casey Station* (Australia); and ATCM XXXVIII/BP013 *Remediation and reuse of soil from a fuel spill near Lake Dingle, Vestfold Hills* (Australia). [↑](#endnote-ref-2)
3. For example: ATCM XXXVII/WP028 *Antarctic clean-up activities: checklist for preliminary site assessment* (Australia); ATCM XLII/WP046 *Report of the intersessional contact group established to review the Antarctic Clean-up Manual* (Australia), including ‘Guidance for Construction and Management of Biopiles for the Bioremediation of Petroleum Hydrocarbon Contaminated Soil in the Antarctic’ and ‘Guidance for Construction and Management of Permeable Reactive Barriers for the Treatment of Hydrocarbon Contaminated Groundwater in the Antarctic’. [↑](#endnote-ref-3)