

Contaminated Site Risk Assessment and Remediation Scoping Project:

Radium Hill Uranium Mine and Low-Level Radioactive Waste Repository

► Introduction

The Department of Primary Industries & Resources South Australia (PIRSA) has engaged consultants ENSR Australia (ENSR) to perform a Contaminated Site Risk Assessment and Remediation Control Scoping study as part of the Radium Hill Uranium Mine Remediation project. This will include a human health and ecological risk assessment covering radiological and non-radiological contaminants for the marine and terrestrial environments.

PIRSA manages the former Radium Hill Uranium Mine & Low Level Radioactive Waste Repository site on behalf of the South Australian Government.

Recognising that there was a need for long-term management of radioactive material at the site, a decision was made in 2003 to formally investigate the site and develop a comprehensive management strategy to effectively deal with issues relevant to the site now and into the future. The approach adopted by PIRSA is compatible with new safety guidance being developed by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) for management of naturally occurring radioactive materials (NORM).

Risk assessment considers the potential human health and ecological ('receptor') exposures which might occur in a given environmental situation in combination with relevant radiological and chemical toxicities. Estimates of exposure and risk are made using realistic but worst case assumptions of contact with the contaminants. Consistent with international practice, the assessment aims to provide risk estimates that are no lower, and almost certainly higher, than actual risks. The assessment then forms a basis for decision-making.

Person-specific risks resulting from exposures would be estimated by taking into account actual individual exposure lifestyle factors such as visitation times to the site. Such estimation requires more detailed risk assessment using information for the individual and the visit duration.

The risk assessments undertaken in the project are consistent with the conservative approaches, assumptions and uncertainties described in established Australian and international government guidance.

Examples of previous successful risk assessment-based projects conducted by ENSR personnel include the remediation for the 2000 Olympic Games site and nearby emerging suburbs at Homebush Bay in Sydney; and a risk assessment-based project on cleanup standards, reclamation design, erosion controls, and adjacent off-site land uses for a former uranium mine site in South Dakota USA.

► The Site

The original Radium Hill project included the establishment, operation and decommissioning of the Radium Hill underground uranium mine.

Upon closure in 1961, the Radium Hill Mine was abandoned, access to mine workings was blocked and infrastructure was removed to the environmental standard of the day. Further rehabilitation was subsequently undertaken, including additional backfilling of old mine openings and covering of the tailings impoundment. At the same time, the site was also established as a repository for low-level radioactive waste materials.

Further information can be found at:

- http://www.pir.sa.gov.au/minerals/mine_site_rehabilitation/radium_hill_mine

The overall management process for the Radium Hill Uranium Mine remediation project comprises four phases:

- Following a formal desktop study, the first phase of the management plan was completed in 2004 with an extensive 'Preliminary Investigation' report being produced for the site; these are available publicly as digital copies on the PIRSA website.
- http://www.pir.sa.gov.au/_data/assets/pdf_file/0016/10825/rb2004_009_radium_hill.pdf
- Phase two includes data gap analysis of the numerous previously completed surveys of the site, and where necessary undertaking and completing further characterisation testing.
- Phase three is the major risk assessment phase and will include human health and ecological risk assessments. In addition, this phase will also set about determining suitable controls to treat any identified risks.
- The final phase would entail the actual development of management plans for the site potentially undertaking any required remediation activities in order to treat the identified risks.

► The Study

The aim of the risk assessment and control scoping study is to measure human and environmental risk in order to identify options for the future, enabling responsible decisions at the agency and political levels to be made regarding remedial action.

The specific project objectives are to:

- Identify human health and ecological risks associated with potential exposure to contaminants (chemical and radiological) present at the site.
- Based on the outcome of the risk assessment, prescribe remediation efforts to appropriate areas which may exceed acceptable risk levels. Potential remediation and control options will be evaluated for their effectiveness in mitigating reported risks and weighed with respect to cost, feasibility and effectiveness.

Key goals throughout the project will include:

- To perform the tasks in a context relevant to the site and its potential future uses.
- Recommendation of management controls for the site which are cost effective, yet comprehensive and responsible.
- Clear and effective communication of risk information to key stakeholders and to the public.

► Approach

The proposed approach to achieve the project goals and objectives detailed above includes a multi-stage process, incorporating the following primary tasks:

Task 1: Review of materials and reports relevant to the site, and identification of critical data gaps for the risk assessment.

Task 2: Development of a conceptual site model and refinement of the workplan for the human health and ecological risk assessments, progressively in consultation with PIRSA and the Environment Protection Authority (EPA). This task will be conducted after the data review stage, in order to allow details of the proposed methodology to be refined based on a comprehensive understanding of the data available for use in the risk assessment process.

Task 3: Human health and ecological risk assessments for the site. The methodology for this task will be finalised in Task 2 above, but the general approach adopted will be consistent with Australian National Environment Protection Council (NEPC) 1999 National Environment Protection Measures (NEPM) and current revisions, and associated appropriate NEPM Schedules. The methodology will also draw upon published international guidelines and best practice including Australian (South Australian Government and ARPANSA), USEPA (including MARSSIM), Canada's Contaminated Sites Management Working Group (CSMWG), and International Commission on Radiological Protection (ICRP), and International Atomic Energy Agency (IAEA) requirements and guidance.

Task 4: Scoping of suitable controls to treat the identified risks (if any). The results/outcome of the risk assessments will be used to evaluate suitable controls for mitigation of risks to acceptable levels. Feasible remediation and control options will be re-evaluated for their effect on potential human health and ecological risk.

Task 5: Communication of the risk assessment and control options to relevant stakeholders, including local community groups, government and other agencies at the outset, during and on conclusion of the project, and as considered being appropriate.

A dedicated ENSR project management team (Director and Manager) is coordinating the delivery of the project. Information relevant to both chemical and radionuclide risk, including physical characteristics of the site, potentially impacted populations, fate and transport modelling, and tailings dam stability assessment, will be addressed in complimentary activities, and unified into the final outputs.

The risk assessment will also take into account potential medium to long term climate change effects at each site. Such considerations may impact on the stability of tailings dam storage areas. Recognition of the risks associated with climate change is a valuable step towards better planning of new structures, especially facilities located within coastal areas.

Several climate variables will be selected to assess their likely impact on the Radium Hill Uranium Mine Remediation site, including sea-level rise, rainfall, wind speed, average temperature, soil moisture and humidity. The potential impacts of these variables will be assessed and incorporated into the hydrological and geotechnical studies undertaken for the project. The output of this assessment will also include conclusions and recommendations relating to addressing potential risks associated with climate change impacts.

► Who We Are

ENSR Australia includes founding members of the Australian Contaminated Land Consultants Association and the Australian Land and Groundwater Association and is one of Australia's leading providers of contaminated land services. We employ some of the industry's foremost contaminated land specialists including NSW, WA and Victorian EPA Accredited Auditors, hydrogeologists, risk assessors and remediation engineers. Our clients include Federal, State and local government bodies, property developers, mining and energy companies, lawyers and financial institutions.

ENSR also draws upon the worldwide environmental and engineering expertise of ENSR and the larger AECOM group of operating companies, a global design and management group with more than 35 000 employees worldwide, servicing the transportation, facilities and environmental markets. Associated Australian operating companies under the global AECOM structure include Maunsell and EDAW, both of which can be called upon to lend expertise to this project.

ENSR has extensive experience (over 25 years) in conducting human health and ecological risk assessments, and has completed thousands of risk assessments throughout Australia and internationally. Members of the project team have addressed similar sites in the United States (i.e. type of contaminants, receptors, pathways, migration, and public sensitivity concerns).

This risk assessment project will be conducted by leading practitioners in Australia and the United States who are able to address the specialist and cross-disciplinary requirements of the project in consultation with the South Australian Government and other relevant regulatory agencies.

► Risk Communication

The risk communication process is considered to be of high importance to this project, given the importance of public awareness of radiological and other risks. Information should be relayed in a timely, effective manner.

Stakeholders include the local community, government agencies, the wider South Australian public, and the broader national audience and conservation groups. While communication directly with all of these groups is challenging, the availability of information and its provision initially to key stakeholders such as the local community, businesses and government agencies are immediate goals, together with provision to inform the wider community and other interest groups where possible and on request.

ENSR personnel have represented local government interests on several national radiological regulatory committees, been engaged by industry to provide risk advice and communication to community reference committees in Homebush Bay Sydney during cleanup of the former Union Carbide chemical plant, and fulfilled successful appointments by local citizen community reference committees, such as at Botany NSW, to peer review consultant risk assessment reports on public and worker exposure during site remediation.

Stakeholder engagement and risk assessment will be undertaken in a manner consistent with the Australian National Environment Protection Council's *Guideline on Community Consultation and Risk Communication* (1999).

The lease holders, Radium Hill Historical Association and local indigenous groups are identified as important initial points of focus for communicating the risk-based approach to the site, its approach and progress, and the ultimate results. It is important that a meaningful cross section of the community, including citizens, business, indigenous and green groups, government, and individuals may be engaged and have an opportunity to provide input, as desired, to the risk communication process and to the project.

Three information pages (including this one) are to be developed at the initiation, during, and at the end of the risk assessment process to accompany, document and explain the risk and control assessment approaches and the progress and results. These are available upon request.

The community are able to enquire and express views, as required, regarding the project, consistent with the sense of value which the community holds for its local area.

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