

eriss research summary

2005–2006



DR Jones, KG Evans
& A Webb (editors)



Australian Government

**Department of the Environment and Water Resources
Supervising Scientist**

It is SSD policy for reports in the SSR series to be reviewed as part of the publications process. This Supervising Scientist Report is a summary of the 2005–2006 research program of the Environmental Research Institute of the Supervising Scientist and has been reviewed internally by senior staff and the editors of the volume.

Dr David R Jones – Environmental Research Institute of the Supervising Scientist, GPO Box 461, Darwin NT 0801, Australia

Dr Kenneth G Evans – Environmental Research Institute of the Supervising Scientist, GPO Box 461, Darwin NT 0801, Australia

Ann L Webb – Office of the Supervising Scientist, GPO Box 461, Darwin NT 0801, Australia

This report should be cited as follows:

Jones DR, Evans KG & Webb A (eds) 2007. *eriss research summary 2005–2006*. Supervising Scientist Report 193, Supervising Scientist, Darwin NT.

The Supervising Scientist is part of the Australian Government Department of the Environment and Water Resources.

© Commonwealth of Australia 2007

Supervising Scientist
Department of the Environment and Water Resources
GPO Box 461, Darwin NT 0801 Australia

ISSN 1325-1554

ISBN-13: 978-1-921069-02-4

ISBN-10: 1-921069-02-3

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Supervising Scientist. Requests and inquiries concerning reproduction and rights should be addressed to Publications Inquiries, Supervising Scientist, GPO Box 461, Darwin NT 0801.

e-mail: publications_ssd@environment.gov.au

Internet: www.environment.gov.au/ssd (www.environment.gov.au/ssd/publications)

The views and opinions expressed in this report do not necessarily reflect those of the Commonwealth of Australia. While reasonable efforts have been made to ensure that the contents of this report are factually correct, some essential data rely on the references cited and the Supervising Scientist and the Commonwealth of Australia do not accept responsibility for the accuracy, currency or completeness of the contents of this report, and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the report. Readers should exercise their own skill and judgment with respect to their use of the material contained in this report.

Printed and bound in Darwin by uniprint NT

Contents

Preface	ix
PART 1: RANGER – CURRENT OPERATIONS	1
Development of a contaminant pathways conceptual model for Ranger uranium mine	5
R van Dam & P Bayliss	
Chronic toxicity of uranium to <i>Lemna aequinoctialis</i> and <i>Amerianna cumingi</i>	7
R van Dam, A Hogan, M Houston, S Nou & N Lee	
Chronic toxicity of uranium in Magela Creek water to a local freshwater fish	12
R van Dam, K Cheng, A Hogan & D Parry	
Development of a reference toxicity testing program for routine toxicity test species	14
A Hogan, M Houston, N Lee & R van Dam	
Toxicity of magnesium in Magela Creek water to local freshwater species	18
R van Dam, A Hogan, M Houston & N Lee	
Toxicity of treated pond water from Ranger uranium mine to five local freshwater species	21
R van Dam, A Hogan & M Houston	
Atmospheric radiological monitoring in the vicinity of Ranger and Jabiluka	24
A Bollhöfer	
Monitoring of groundwater at Ranger	28
B Ryan & A Bollhöfer	
Introduction to SSD's stream monitoring program for Ranger, 2005–06	30
C Humphrey & D Jones	

Chemical and physical monitoring of surface waters in Magela and Gulungul Creeks	31
M Iles	
Continuous monitoring of water quality	35
K Turner	
Toxicity monitoring in Magela Creek	38
C Humphrey, D Buckle & R Luxon	
Bioaccumulation in fish and freshwater mussels from Mudginberri Billabong	42
K Turner, B Ryan, C Humphrey & A Bollhöfer	
Monitoring using macroinvertebrate community structure	48
C Humphrey, J Hanley & C Camilleri	
Monitoring using fish community structure	51
C Humphrey & D Buckle	
Monitoring support tasks	54
C Humphrey	
Surface water radiological monitoring in the vicinity of Ranger and Jabiluka	55
A Bollhöfer, P Medley & C Sauerland	
Surface water transport of uranium in the Gulungul catchment	59
K Mellor, A Bollhöfer, C Sauerland & D Parry	
PART 2: RANGER – REHABILITATION	65
Geomorphic stability of the currently proposed final landform at the Ranger mine using landform evolution modelling	69
J Lowry, KG Evans, D Moliere & G Hancock	
Assessment of the significance of extreme events in the Alligator Rivers Region	72
KG Evans, MJ Saynor & DR Moliere	
Radio- and lead isotopes in sediments of the Alligator Rivers Region (PhD project)	73

A Frostick, A Bollhöfer, D Parry, N Munksgaard & KG Evans	
Use of a natural analogue to determine Ranger pre-mining radiological conditions	78
A Bollhöfer & K Pfitzner	
Developing water quality closure criteria for Ranger billabongs using macroinvertebrate community data	82
C Humphrey & D Jones	
Use of analogue plant communities as a guide to revegetation and associated monitoring of the post-mine landform at Ranger	84
C Humphrey, I Hollingsworth M Gardener & G Fox	
Establishing demonstration landform-vegetation plots at Ranger	87
P Bayliss & M Gardener	
Hydrochemical and ecological processes of constructed sentinel wetlands and reconstructed wetlands in the Magela Creek catchment	90
P Bayliss, D Jones, C Humphrey & J Boyden	
Seed biology of native grasses: BSc (Honours) project by Kathryn Sangster	92
K Sangster, S Bellairs, P Bayliss & M Gardener	
Bioaccumulation of radionuclides in terrestrial plants on rehabilitated landforms	94
B Ryan, A Bollhöfer & R Bartolo	
Development of a spectral library for minesite rehabilitation assessment	98
K Pfitzner, A Bollhöfer & G Carr	
Development of key indicators and indices of ecosystem 'health' to monitor and assess rehabilitation success	104
C Humphrey, G Fox & J Boyden	
Incorporation of disturbance effects in predictive vegetation succession models	105
P Bayliss, D Walden, J Boyden, M Gardener & S Bellairs	

Monitoring sediment movement along Gulungul Creek during mining operations and following rehabilitation	114
D Moliere, M Saynor & K Evans	
Monitoring sediment movement along Magela Creek up and downstream of Ranger	118
D Moliere & K Turner	
PART 3: JABILUKA	123
Monitoring sediment movement at Jabiluka	126
D Moliere, M Saynor & K Evans	
Stream bedload characterisation: Ngarradj catchment	129
MJ Saynor, WD Erskine, DR Moliere & KG Evans	
PART 4: NABARLEK	135
Quantitative use of remotely sensed data for minesite revegetation assessment	138
K Pfitzner & P Bayliss	
Radiological impact assessment of the rehabilitated Nabarlek site	143
A Bollhöfer & B Ryan	
PART 5: GENERAL ALLIGATOR RIVERS REGION	147
Changes in Melaleuca distribution on the Magela floodplain 1950–2004	150
G Staben, J Lowry & G Boggs	
Significant habitats and species in the Alligator Rivers Region	155
C Humphrey	
Ecological risk assessment of Magela floodplain to differentiate mining and non-mining impacts	157
P Bayliss, R van Dam, D Walden & J Boyden	
RESEARCH CONSULTANCIES	163
The tropical rivers inventory and assessment project (TRIAP)	164
R van Dam, R Bartolo, P Bayliss & J Lowry	

Appendix 1 SSD publications for 2005–06	169
Appendix 2 ARRTC Key Knowledge Needs 2005–2006	175
Appendix 3 ARRTC membership and functions	187

