

## GLOSSARY

Below are examples of key terms that may be used in the Ranger Mine Closure Plan.

Key term	Definition
Electrical conductivity	Abbreviated to EC. Electrical conductivity is a measure of how well a material accommodates the transport of electric charge.
Georgetown Billabong	The statutory surface water monitoring point for Georgetown Billabong, which is located downstream of Corridor Creek and the Corridor Creek wetland filter.
Land Application Area(s)	Abbreviated to LAA. An area on the RPA used as an evapotranspiration disposal method polished and unpolished pond water from the constructed wetlands filters and, more recently, permeates from the water treatment plants. However, irrigation of unpolished pond water ceased at the end of 2009. The concept of land application is to retain metals and radionuclides in the near-surface soil profile.
Land Disturbance Permit	An ERA permit required prior to undertaking any work on the RPA that may lead to surface disturbance, for example ground breaking, surface disturbance, clearing etc.
Long Lived Alpha Activity	Abbreviated to LLAA. The presence, generally in airborne dust, of any of the alpha emitting radionuclides in uranium ore, except for the short-lived alpha emitting radon decay products.
MBL Zone	A hydrolithological zone of relatively higher permeability to the south east of Pit 1 identified through testing and pumping of bore MB_L.
Magela Creek downstream	Abbreviated to MG009. MG009 is Ranger downstream statutory or compliance surface water monitoring point. It is located on the Magela Creek, downstream of Ranger operations.
Magela Creek upstream	Abbreviated to MCUS. MCUS is the upstream statutory surface water monitoring point, location on the RPA.
pH	The measure of the acidity of a solution. Solutions with a pH less than 7 are said to be acidic solutions; a pH greater than 7 is said to be basic or alkaline.
Pit 1	The mined out pit of the Ranger #1 orebody, which is used as a tailings repository. Mining in Pit 1 commenced in May 1980 and was completed in December 1994, after recovering 19.78 million tonnes of ore at an average grade of 0.321%.
Pit 3	The mined out pit of the Ranger #3 orebody, which is currently being backfilled with tailings. Open cut mining in Pit 3 commenced in July 1997 and ceased in November 2012.
Processing	Processing is the mining term to describe all phases of the ore treatment from milling through to the final product packaging of uranium oxide.
Radon decay products or radon progeny	The short-lived radioactive decay products of radon-222. This includes the decay chain up to, but not including lead-210, namely polonium-218 (sometimes called radium A), lead-214 (radium B), bismuth-214 (radium C) and polonium-214 (radium C).
Ranger Project Area	Abbreviated to RPA. The Ranger Project Area means the land described in Schedule 2 to the Commonwealth <i>Aboriginal Land Rights (Northern Territory) Act 1976</i> .

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Key term	Definition
Reference level	Abbreviated to RL. Denotes a specific elevation relative to mean sea level and is regularly used to identify the height or depth of plan or mine infrastructure – e.g. the height of the tailings dam, depth of Pit 3.
Retention Pond 1	Abbreviated to RP1. One of four retention ponds used to provide sediment control, dilution and storage of pond and managed release water. RPA provides approximately 390 megalitres of storage under normal conditions. RPA also provide sediment control and dilution prior to passive release into the environment across a control weir and spillway.
Sievert	The Sievert is the unit of absorbed radiation dose, taking into account the differing biological effects of different types of radiation.
Tailings dam	Surface dam used to hold tailings and process water at Ranger. Commonly referred to as "tailings storage facility" or "TSF" in other ERA material. The tailings dam is one of currently three tailings storage facilities at Ranger, the others being Pit 1 and Pit 3.
U <sub>3</sub> O <sub>8</sub>	The most stable form of uranium oxide and the form most commonly found in nature. Uranium oxide concentrate is sometimes loosely referred to as yellowcake. It is khaki in colour and is usually represented by the empirical formula U <sub>3</sub> O <sub>8</sub> . Uranium is normally sold in this form.
Waste rock	The mineral waste produced in the mine but is stockpiled due to its low grade i.e. material which does not enter the processing plant.  For example, 1s waste rock is typically material that has a grade of less than 0.02% U <sub>3</sub> O <sub>8</sub> ; 2s waste rock (or low-grade ore) is typically material that has between 0.02% and 0.12% U <sub>3</sub> O <sub>8</sub> .

## ABBREVIATIONS AND ACRONYMS

Below are examples of abbreviations that may be used in the Mine Closure Plan.

Abbreviation / Acronym	Description
1EY	One every year
AAEC	Australian Atomic Energy Commission
AALL	Annual additional load limit
AAPA	Aboriginal Areas Protection Authority
AEP	Annual Exceedance Probability
AHD	Australian height datum
ALARA	As low as reasonably achievable
ALRA	Commonwealth <i>Aboriginal Land Rights (Northern Territory) Act 1976</i>
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZMEC	Australian and New Zealand Minerals and Energy Council
APR	Annual Plan of Rehabilitation
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency



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<b>Abbreviation / Acronym</b>	<b>Description</b>
ARRAC	Alligator Rivers Region Advisory Committee
ARRTC	Alligator Rivers Region Technical Committee
ASC	Assessment of Site Contamination
ASNO	Australian Safeguards and non-Proliferation Office
BACIP	Before-After Control-Impact Paired
BC	Brine Concentrator
BoM	Bureau of Meteorology
BMM	Bulk material movement
BPT	Best Practicable Technology
C&M	Care and maintenance
CAESAR	Cellular Automaton Evolutionary Slope and River
CCLAA	Corridor Creek Land Application Area
CCMP	Closure Construction Management Plan
CCWG	Closure Criteria Working Group
CCWLF	Corridor Creek wetland filter
CEO	Chief Executive Officer
COPC	Constituents of potential concern
CPT	Cone penetration testing
CRF	Cemented rock fill
CSIRO	Commonwealth Scientific, Industrial Research Organisation
CT	Cross Theme
Cth	Commonwealth
DEM	Digital Elevation Model
DIIS	Commonwealth Department of Industry, Innovation and Science
DITR	Department of Industry, Tourism and Resources
DJKRP	Djalkmara Release Point
DJKPS12	Djalkmara Pump Station 12
DLAA	Djalkamarra Land Application Area
DME	Northern Territory Department of Mines and Energy (now DPIR)
DMP	Western Australian Department of Mines and Petroleum
DPIR	Northern Territory Department of Primary Industry and Resources
EC	Electrical conductivity
EDR	Electro dialysis reversal
EIL	Environmental Investigation Levels

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<b>Abbreviation / Acronym</b>	<b>Description</b>
EIS	Environmental Impact Statement
EPA	Western Australian Environmental Protection Authority
EPBC Act	(Commonwealth) <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPIP Act	(Commonwealth) <i>Environment Protection (Impact of Proposals) Act 1974</i> (repealed)
ERs	Environmental Requirements
ERA	Energy Resources of Australia Ltd
ERISS	Environmental Research Institute of the Supervising Scientist
EXCO	Executive Committee
EY	Exceedances per year
EZ	Electrolytic Zinc Company of Australasia Ltd
FS	Feasibility study
GAC	Gundjehmi Aboriginal Corporation
GC2	Georgetown Creek 2
GCBR	Georgetown Creek Brockman Road
GCH	Gulungul Creek highway (downstream surface water sampling site)
GCLB	Gulungul Creek lease boundary
GCMBL	Georgetown Creek median bund leveline
GCT1 GCT2	& Gulungul Creek Tributary 1 and 2 (monitoring points)
GCUS	Gulungul Creek Upstream (surface water monitoring point)
GIS	Geographic Information System
GTB	Georgetown Billabong
H2	Second half
HAZOP	Hazard and Operability Study
HDPE	High density polyethylene
HDS	High density sludge
HIL	Health Investigation Level
HLU	Hydrolithologic unit
HSEC	Health, Safety, Environment and Community
HSEQ	Health, Safety, Environment and Quality
IAEA	International Atomic Energy Agency
ICMM	International Council on Mining and Metals
ICRP	International Commission of Radiological Protection
IMAP	Inventory multi-tiered assessment and prioritisation framework
ITWC	Integrated tailings, water and closure



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<b>Abbreviation / Acronym</b>	<b>Description</b>
JELAA	Jabiru East Land Application Area
JHA	Job hazard analysis
JLK	Jabiru Kabolkmakmen
JTDA	Jabiru Town Development Authority
KKN	Key Knowledge Needs
KNP	Kakadu National Park
LAA	Land Application Area(s)
LEM	Landscape Evolution Modelling
LIMS	Laboratory and Information Management System
LLAA	Long Lived Alpha Activity
LOAEL	Lowest observed adverse effects level
LT	Long term
MCP	Mine Closure Plan
MCUS	Magela Creek Upstream Reference Site
MG001	Magela Creek Downstream of Georgetown Billabong
MG009	Magela Creek water quality compliance point
MLN1	Mineral Lease Number 1 (Jabiluka)
MNES	Matters of National Environmental Significance
MOL	Maximum operating level
MoU	Memorandum of Understanding
mRL	Metres relative level
MTC	Minesite Technical Committee
NAQS	Northern Australia Quarantine Strategy
NEPM	National Environment Protection Measure
NGO	Non-government organisations
NLC	Northern Land Council
NOAEL	No observed adverse effect level
NOHSC	National Occupational Health and Safety Commission
NP	National Park
NRM	Natural Resource Management
NRMMC	National Resource Management Ministerial Council
NT	Northern Territory
NTEL	Northern Territory Environmental Laboratories
NTU	Nephelometric Turbidity Unit

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<b>Abbreviation / Acronym</b>	<b>Description</b>
OHS	Occupational health and safety
OSS	Office of the Supervising Scientist
PAEC	Potential Alpha Energy Concentration
PAW	Plant available water
Peko	Peko-Wallsend Operations Limited
PFS	Prefeasibility study
pH	Scale of acidity from 0 to 14
PTF	Pit tailings flux (or expressed process water)
R34	A site of indigenous cultural heritage significance located adjacent to Pit 3
R3ARC1	Ranger Access Road Culvert 1 – also denotes other culvert locations – e.g. R3ARC2, R3ARC3, R3ARC4
R3D	Ranger 3 Deeps
RCCF	Ranger closure consultative forum
RDP	Radon decay products
RL	Relative level
RO	Reverse osmosis
ROM	Run-of-mine
RP1	Retention Pond 1 – also denotes other retention ponds used on site – e.g. RP2, RP3, RP6
RP1WLF	Retention Pond 1 wetland filter
RPA	Ranger Project Area
RWMP	Ranger Water Management Plan
SAR	Synthetic Aperture Radar
SSB	Supervising Scientist Branch; formally the Supervising Scientist Division (SSD)
SSD	Supervising Scientist Division
ST	Short term
TARP	Trigger, Action Response Plan
<i>TPWC Act</i>	<i>Territory Parks and Wildlife Conservation Act 2000 (NT)</i>
TLF	Trial landform
TSF	Tailings Storage Facility or tailings dam
TSP	Total Suspended Particulates
TSS	Total Suspended Sediment
TWG	Technical working groups – technical subgroups of the Closure Criteria Working Group
UF/MFRO	Ultrafiltration/microfiltration and reverse osmosis



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Abbreviation / Acronym	Description
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
UTE	Unable to evaluate
VSEP	Vibratory shear enhanced processing
WA	Western Australia
WoNS	Weeds of National Significance
WTP	Water Treatment Plant

## CHEMICAL SYMBOLS AND FORMULAE

Symbols/ formulae	Description
Al	Aluminium
Ba	Barium
Ca	Calcium
Cd	Cadmium
Cl	Chloride
Cr	Chromium
Cu	Copper
Fe	Iron
HCO <sub>3</sub>	Bicarbonate
K	Potassium
Mg	Magnesium
Mn	Manganese
Na	Sodium
NH <sub>3</sub> -N	Ammoniacal nitrogen
Ni	Nickle
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>3</sub>	Nitrate ion
NO <sub>3</sub> -N	Nitrate-N
NO <sub>x</sub>	Total mono-nitrogen oxides (NO and NO <sub>2</sub> )
OH	Hydroxide
P	Phosphorus
Pb	Lead
<sup>210</sup> Po	Polonium

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<b>Symbols/ formulae</b>	<b>Description</b>
PO <sub>4</sub> -P	Phosphate
<sup>226</sup> Ra / Ra-226	Radium
Si	Silicon
SiO <sub>2</sub>	Silica
SO <sub>4</sub> <sup>2-</sup>	Sulfate
TAN	Total ammonia nitrogen
Total-N	Total nitrogen
Total-P	Total phosphorus
U, <sup>238</sup> U	Uranium
V	Vanadium
Zn	Zinc

**SYMBOLS / UNITS OF MEASUREMENTS**

<b>Unit of measure</b>	<b>Description</b>
θ <sub>fc</sub>	Water content at field capacity
θ <sub>pwp</sub>	Permanent wilting point
%	Percentage
µg	Micrograms
Bq	Becquerel(s)
Bq kg <sup>-1</sup>	Becquerel per kilogram
Bq m <sup>-2</sup> s <sup>-1</sup>	Becquerel per square metre per second
cm	Centimetre
dB	Decibels
GL	Gigalitre
ha	Hectare
kg	Kilogram
km	Kilometre
km/h	Kilometres per hour
km <sup>2</sup>	Square kilometres
kt	1,000 metric tonnes
L	Litre
m	Metre





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<b>Unit of measure</b>	<b>Description</b>
m <sup>2</sup>	Square metre
m <sup>3</sup>	Cubic metre
m <sup>3</sup> s <sup>-1</sup> ; m <sup>3</sup> /s	Cubic metre per second
mBq	Millibecquerel
mg	Milligram
ML	Megalitre
mm	Millimetre
Mm <sup>3</sup>	Million cubic metres
MPa	Megapascal
mRL	Metres relative level
mSv	Milli-sievert
Mt	Metric tonne
t/m <sup>3</sup>	Tonne / cubic metre
µm	Micrometre
µS/cm	Micro Siemens per centimetre
µSv/y	Microsieverts per year
wt. %	Weight %
w/w	Weight per weight
Yr	Year

## **CONTRIBUTORS**

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