6 APPENDICES

APPENDIX 1

ERA Notification of Incorrect Stockpiling at Ranger

Received by the Supervising Scientist

1 March 2002

ERA Energy Resources of Australia Ltd
ABN 71 008 550 865

Notification of incorrect stockpiling of material

On Tuesday 26 February stakeholders were advised verbally about two issues relating to the wet season management of the stockpiles at Ranger Mine, namely:

- the placement of freshly mined transition material (2 grade - a mixture of lateritic and primary material) over areas compacted for sheeting of clean rainwater to the new Corridor wetland; and
- inadequate drainage from an ore stockpile.

This notification serves as preliminary written advice that will be followed by a detailed investigation report.

The sequence of events was as follows:

- Recordings of elevated U concentrations at the VLGCRC02 monitoring site (the new Corridor Wetland) during January were interpreted as being due to recent changes in the drainage system (the new culverts and drain leading to the new wetland) and the fact that low flows occurred at these times. (Full data provided in the table below)
- On 20 February an independent sample was taken from the half-pipes leading to the VLGCRC02 during a significant storm. This sample was noted as being turbid and low conductivity. The U level result of 1926 micrograms per litre triggered an internal investigation to identify the source.
- Results from GC2 (the authorized monitoring point on the south side of the project area) indicate a U level of 10.37 micrograms per litre on 20 February.
- Further analysis received on Monday 25 February indicated elevated Iron and Aluminium levels. These were considered a signature of laterite interaction with the sheeted run off water.
- Investigations revealed incorrect placement of transition material on the west side of the 2's stockpile with small laterite plumes from the toe of the stockpile, flowing west to the drain running to the Corridor system.
- In addition, drainage measures for the 4/7 stockpile to the north of the 4P prepared area were found to be insufficient to direct high flow runoff correctly to RP2 but rather allowed some storm runoff to travel to the south across the stockpiles.

The following actions were conducted:

1. The drainage from the 4/7 dump was reinstated to RP2.
2. Capping of exposed transition material on the west side of the 2's stockpile commenced. These works involved:

- Raising the surface of the 2s stockpile on the western side to ensure drainage away from the transition material area (ie ensure that there is no flow over the western batter)

- Constructing a windrow around the western toe area to limit laterite transport.
- Capping of the exposed laterite faces with 2s rock.

3. Follow up monitoring commenced (samples were taken on the evening of the 25th (the next significant event) to confirm the effectiveness of the intervention measures.
4. A specific laterite stockpile area with drainage reporting to RP2 has been re-clarified.

The following further actions are planned:

- A thorough investigation into the cause of the incorrect placement of material to form the basis of a detailed report to stakeholders that will specify actions to ensure that such deviations from operational procedures will not recur;
- Additional monitoring will continue until the source of elevated uranium has been identified.
- Finalisation of an early warning triggers paper and endorsement from the MTC.
- The development of additional early warning triggers for operational monitoring sites in the Corridor wetlands.
- The development of environmental awareness programs specifically for Wet season Mine operations.

While the data at GC2 (and 009) show that the effect to Georgetown Billabong, the Magela Creek and the surrounding environment from this event was negligible, it is apparent that a temporary deficiency in our system lead to transition material not being stockpiled in accordance with agreed plans and procedures.

In addition to this notice and upcoming investigation report, I also extend the invitation to key stakeholders, particularly Traditional Owners, to inspect the site first hand at their earliest convenience so that any questions and concerns regarding this issue can be responded to in a timely and practical manner.

Richard Weston

General Manager - Operations

Site	Date sampled	Comments	Ph	Cond (µS/cm)	Turb (NTU)	Mg (mg/L)	SO4 (mg/L)	Mn (µg/L)	U (µg/L)
VLGCRC	28-Nov-01	F (Weekly)	7.1	343	17	36.7	143.3	50.9	540.4
VLGCRC	2-Jan-02	F (Monthly)	7	278		28.4	104.9	45.6	636.8
VLGCRC02	15-Jan-02	F (Weekly)	7.2	152	18	13.6	50.1	27.9	144.8
VLGCRC02	29-Jan-02	F (Weekly)	6	437	22	37.7	166.2	152	1305
VLGCRC02	30-Jan-02	Storm runoff @ 1930				13.4	52.4	48.4	639.4
VLGCRC02	11-Feb-02	Stockpile runoff wq check	6.6	315		32.3	131.5	110	1972
VLGCRC02	13-Feb-02	F (Weekly)	6.6	222	126	23.8	96.2	75.8	1626
VLGCRC02	20-Feb-02	F (Weekly)	7	172	96	17	64.2	53.9	700.3
GCBR	2-Jan-02	F (Monthly)	6.1	135		12.7	53.7	83.7	126
GCBR	29-Jan-02	F (Weekly)	7.5	420		53.6	9.9	9.03	181.9
GCBR	5-Feb-02	F (Monthly)	7.4	414		53.6	10	2.69	158.9
GCBR	13-Feb-02	F (Weekly)	6.4	24		1.8	6.4	5.4	4.164
GCBR	20-Feb-02	F (Weekly)	7.2	172		18.9	10.7	3.89	69.32
GCMBL	31-Oct-01	F (Weekly) Stagnant	7	474		54.1	179.9	69.6	3.007
GCMBL	7-Nov-01	F (6 Monthly)	7.3	485	4	55.2	168.2	61.7	2.363
GCMBL	14-Nov-01	F (Weekly)	7.7	469		56.8	170	9.42	2.734
GCMBL	4-Dec-01	F (Quarterly)	6.8	260		29.3	85.7	56.3	2.112
GCMBL	11-Dec-01	F (Weekly)	7	261	2	29.3	79.4	13.7	1.567
GCMBL	18-Dec-01	F (Weekly)	7.2	245		28	67	19.7	1.461
GCMBL	27-Dec-01	F (Weekly)	7.3	245		26.7	58.5	18.1	1.601
GCMBL	2-Jan-02	F(Monthly)	6.8	119	14	12.2	29.8	5.01	2.667
GCMBL	8-Jan-02	F (Weekly)	7.3	216		24	59	4.21	1.477
GCMBL	15-Jan-02	F (Weekly)	7.1	190		21.9	38.3	13.4	0.887
GCMBL	22-Jan-02	F (Weekly)	7.3	200		23	36.3	38	0.718
GCMBL	29-Jan-02	F (Weekly)	7.2	168		19	23.7	10.5	0.862
GCMBL	5-Feb-02	F(Monthly)	7.3	194	1	23.3	26.1	8.52	1.012
GCMBL	13-Feb-02	F (Weekly)	6.9	111		12	20	3.14	3.795
GCMBL	20-Feb-02	F (Weekly)	6.8	75		7.6	14	7.52	16.37
GC2	4-Dec-01	F(Quarterly)	7	260	4	28.6	86.4	22.1	3.856
GC2	11-Dec-01	F (Weekly)	7.1	273	9	29.6	83.6	19.1	5.599
GC2	18-Dec-01	F (Weekly)	7.1	278	8	32.2	79.4	14	6.776
GC2	27-Dec-01	F (Weekly)	7.3	266	4	28.3	69.5	9.14	7.163
GC2	2-Jan-02	F (Monthly)	7.2	140	21	14.3	37.6	4.87	6.444
GC2	8-Jan-02	F (Weekly)	7.1	206	6	23.3	56.4	14.1	4.021
GC2	15-Jan-02	F (Weekly)	7.1	190	8	20.9	37.9	14	4.112
GC2	22-Jan-02	F (Weekly)	7.2	190	10	21.7	35.8	22.5	4.419
GC2	29-Jan-02	F (Weekly)	7.2	211	6	18.7	27.9	5.47	3.504
GC2	5-Feb-02	F (Monthly)	7.4	189	5	22.7	28	10.1	3.031
GC2	13-Feb-02	F (Weekly)	6.9	102	10	10.9	17.7	5.21	2.498
GC2	20-Feb-02	F (Weekly)	6.9	79	14	7.9	16.2	5.79	10.37
GB	2-Oct-01	F (Monthly)	6.9	73	25	5	0.5		0.449
GB	7-Nov-01	F (6 Monthly)	6.7	91	195	4.7	3.9		0.862
GB	4-Dec-01	F(Quarterly)	6	30	18	1.3	3.7	34.9	0.539
GB	2-Jan-02	F (Monthly)	5.9	59	16	3.6	12.3	53.7	0.646
GB	5-Feb-02	F (Monthly)	6.2	43	16	3.9	5.8	3.6	0.382

Site	Date sampled	Comments	Ph	Cond (µS/cm)	Turb (NTU)	Mg (mg/L)	SO4 (mg/L)	Mn (µg/L)	U (µg/L)
MG009	28-Nov-01	F (Weekly)First flush am	6.1	20	18	0.5	3.8	12.4	0.079
MG009	28-Nov-01	F (Weekly) 1200	6	15	69	0.5	1.3	25.7	0.077
MG009	5-Dec-01	F (Monthly)	6.5	19	3	1.2	1.9	15.5	0.073
MG009	12-Dec-01	F (Weekly)	6.5	25	3	1.7	3.7	13.6	0.042
MG009	18-Dec-01	F (Weekly)	6.3	18	2	1.3	2.5	10.2	0.039
MG009	27-Dec-01	F (Weekly)	6.3	16	1	0.9	1.7	7.04	0.026
MG009	2-Jan-02	F (Monthly)Pre-Rel	6.2	15	9	1	2.4	7.85	0.096
MG009	8-Jan-02	F (Weekly)	6.2	15	3	1.1	1.9	11.5	0.056
MG009	15-Jan-02	F (Weekly)	6	16	2	1	1.8	6.69	0.04
MG009	22-Jan-02	F (Weekly)	6.4	16	3	0.9	1.5	6.54	0.033
MG009	29-Jan-02	F (Weekly)	6.2	20	9	1	2.3	6.83	0.038
MG009	12-Feb-02	F (Weekly)	5.8	13	6	0.8	1.8	7.17	0.211
MG009	19-Feb-02	F (Weekly)	5.7	7	7	0.4	0.6	6.22	0.152
MCUS	5-Dec-01	F (Monthly)	6.4	14	3	0.8	0.6	12.6	0.032
MCUS	12-Dec-01	F (Weekly)	6.4	17	3	0.9	0.5	8.54	0.024
MCUS	18-Dec-01	F (Weekly)	6.3	13	2	0.8	0.3	7.24	0.025
MCUS	27-Dec-01	F (Weekly)	6.2	12	2	0.6	0.2	5.14	0.018
MCUS	2-Jan-02	F (Monthly)Pre-Rel	6.2	10	5	0.5	0.3	6.13	0.029
MCUS	8-Jan-02	F (Weekly)	6.1	11	2	0.6	0.3	7.89	0.025
MCUS	15-Jan-02	F (Weekly)	5.6	11	2	0.5	0.2	5.05	0.024
MCUS	22-Jan-02	F (Weekly)	6.3	12	4	0.5	0.2	5.35	0.019
MCUS	29-Jan-02	F (Weekly)	6	19	5	0.4	0.3	5.18	0.062
MCUS	12-Feb-02	F (Weekly)	5.7	9	6	0.4	0.3	6.41	0.027
MCUS	19-Feb-02	F (Weekly)	5.7	7	6	0.3	0.3	4.6	0.021

APPENDIX 2

ERA Investigation Report of Incorrect Stockpiling at Ranger

ERA **Energy Resources of Australia Ltd**
ABN 71 008 550 865

Investigation Report

Catchment management, southern stockpile area, Ranger Mine

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1 SUMMARY

Field investigations triggered by elevated uranium levels in runoff water samples collected at the base of the stockpiles ('half-pipes' location) during a storm event on February 20th indicated that the Mining Department had mistakenly deposited 'weathered' waste rock materials. These materials were located on the western batter slopes of stockpiles that, although incomplete in terms of design size, had been prepared in advance of the wet season to maximise rainfall runoff of appropriate quality to the Corridor wetland system. Inadequate drainage works were also identified in the southern stockpile area and, together with incorrect stockpiling, compromised the wet season management objective for the area.

Specific actions were taken in the stockpile catchment area as soon as the mistake in stockpiling procedures and inadequate drainage works were identified. These included covering of the 'weathered' waste rock materials on the western batter slopes with primary rock to minimise erosion and uranium-enriched leachate generation, construction of windrows to redirect runoff, and re-organising drainage to ensure that runoff of inappropriate quality was directed to retention pond 2 instead of to the Corridor wetland system. Monitoring of runoff water has been increased to ensure that these measures have been effective in removing the source of uranium in runoff water directed to the Corridor wetland system.

The measured levels of uranium at an operational monitoring site (GC2) upstream of the fourth constructed wetland filter in the Corridor system ranged from 4-10 μ g/L (parts per billion) during January and February 2002. The uranium is progressively removed from the waters as they pass through the constructed wetland filters as a result of adsorption processes and dilution. This is the designed behaviour and function of constructed wetland filters. In addition, the wetland filters are very effective in reducing suspended sediment loads from waters.

At the primary downstream compliance monitoring site (MG009) in Magela Creek near the boundary of Kakadu National Park, approximately 4 km downstream of GC2, uranium levels during January and February 2002 ranged between approximately 0.03 and 0.25 μ g/L. These values indicate that Kakadu National Park continues to be protected from mining operations at Ranger. ERA maintains a 'watching brief' for uranium levels above 0.2 μ g/L: current values are 0.039 μ g/L. The limit at MG009 is 5.8 μ g/L uranium.

The mistake in stockpiling procedures in the southern stockpile area reflects deficiencies in communication between departments at Ranger.

The elevated levels of uranium in samples collected at VLGCRC2 through January and February (until February 20th) were attributed to the effects of substantial earthworks in the local area (including drain construction) and 'first flush', low flow (low rainfall) events. It was not until direct rainfall runoff from the stockpiles was collected during a storm event on February 20th and the analyses received on February 25th that a potential problem was recognised.

ERA commits to the full implementation of the recommendations of the Supervising Scientist from the 'leak' incident in 2000 and continues to improve environmental performance at Ranger. Specific commitments include a re-organisation of the Environment Department, the participation of senior Environment Department representatives in weekly Mine Planning meetings, and an overhaul of the environmental monitoring systems. Although significant progress has been made, full

compliance with the recommendations cannot be achieved with current ERA resources. Consequently, the Company has committed to contract an appropriate external specialist to review existing environmental management and communication systems within the Ranger operations and to design and implement more effective process management systems.

2 CONTEXT

Routine monitoring of surface water runoff from the southern stockpile area at Ranger Mine during January and February 2002 revealed elevated levels of uranium at the VLGCRC2 monitoring station located within the minesite. This monitoring site is approximately 200m downstream from the stockpiles, in a newly constructed drain leading to a newly constructed wetland. This wetland is the first of four constructed wetlands in the Corridor wetland system in the uppermost reaches of Corridor Creek (Figure 1).

The U concentration data for VLGCRC2 were reviewed and collated as they were received from the laboratory during January and February 2002. However, the data were not interpreted correctly. Low flow conditions due to low rainfall in the catchment at this time, and the fact that earthworks had only been completed in the area on January 13th, led Ranger staff to ascribe the elevated U concentrations to local land disturbance and 'first flush' events. Consequently, no field specific investigations were undertaken.

Field investigations actually commenced in response to elevated levels of U in a non-routine sample of runoff water collected during a storm event on February 20th for which the analytical results were received on February 25th. The water sample was collected from the base of the stockpiles and hence the result was recognised to be directly representative of stockpile runoff compared with samples taken at VLGCRC2. An inspection of the stockpile area on February 26th revealed that waste rock from Pit #3 had been added to stockpile surfaces that had been prepared in order to generate high quality rainfall runoff during the wet season.

The stockpiling of the additional Pit #3 waste rock material in these areas was contrary to the intended management of these stockpiles during the 2001-2002 wet season. In addition, inadequate drainage measures which may have allowed runoff from an active stockpile (4/7 laterite) to enter the drain leading to the Corridor wetland system were identified.

The causes of these deficiencies are the subject of this investigation report.

3 BACKGROUND

3.1 Reporting of monitoring data

In terms of reporting the results of environmental monitoring at Ranger, a statutory report is provided monthly to the Minesite Technical Committee (MTC) members within one month of the end of each reporting period. Contained in the report are water quality data for statutory monitoring sites including GC2 (in the headwaters of the fourth and final constructed wetland in the Corridor wetland system; Figure 1) and MG009 (which is the principal downstream compliance monitoring site in Magela Creek, downstream of the mine at the boundary of the mineral lease).

During each wet season, a weekly report is sent to the NT Department of Business, Industry & Resource Development (DBIRD) as required by the Authorization (Section A.10.3). This weekly report includes surface water monitoring results for Djalkmara Billabong pumping station (DJKPS), the weir in retention pond 1 (RP1), the principal compliance monitoring site in Magela Creek, downstream of the mine (MG009) and the compliance monitoring site in Magela Creek upstream of the mine (MCUS) (Table 1).

On January 14th 2002, The Director of Mines (DBIRD) requested additional wet season monitoring data relating to stockpile runoff. Data were sent to Alan Hughes at DBIRD on January 15th by the Ranger Water Management Coordinator and copied to Minesite Technical Committee (MTC) members who represent all key stakeholders. Further, in response to a request for additional information, the weekly report sent on out on January 25th included monitoring data from GC2. From February 1st, the weekly report to stakeholders included data from all key monitoring sites for the Corridor wetland system, namely GC2, GCBR and VLGCRC2 (Figure 1; Table 1).

Table 1: Reporting of water quality data to stakeholders

Date	Description	Addressees
9-Jan-02	RP1 commenced overflow	
10-Jan-02	Weekly Release report (includes DJKPS, RP1, MG009, MCUS)	DBIRD (AH)
15-Jan-02	Stockpile runoff data – October 19 2001 rainstorm	OSS, DBIRD, NLC
18-Jan-02	Weekly Release report	DBIRD (AH)
25-Jan-02	Weekly Release report, plus GC2	DBIRD (AH)
1-Feb-02	Weekly Release report, plus Stockpile Sheeting sites (GC2, GCBR, VLGCRC2)	DBIRD (AH)
8-Feb-02	Weekly Release report, plus Stockpile Sheeting sites	DBIRD (AH)
15-Feb-02	Weekly Release report, plus Stockpile Sheeting sites	DBIRD (AH,PS), OSS (AZ,WE) NLC (GC)
22-Feb-02	Weekly Release report, plus Stockpile Sheeting sites, plus Swift Creek (JSC, JSCUS)	DBIRD (AH,PS) OSS (AZ,WE) NLC (GC) EWL Sciences
28-Feb-02	January Authorized report; all data to end of Jan-02	DBIRD, OSS, NLC, EWL Sciences
1-Mar-02	Weekly Release report, plus Stockpile Sheeting sites, plus Swift Creek (plus JSCTN2, JSCTC2)	DBIRD (AH,PS) OSS (AZ,WE) NLC (GC) EWL Sciences

3.2 Notification to stakeholders of environmental issues

Elevated U concentrations in samples collected at VLGCRC2 from January 15th were recognised by Ranger staff but attributed to washout from local earthworks during minor rainfall, low flow events in the catchment. On February 23rd EWL Sciences commented by email to Ranger staff on elevated levels of uranium in the surface water samples collected at VLGCRC2 during January and February. A surface water runoff sample had been collected by Ranger staff from the 'half-pipes' at the base of the southern stockpiles (TOPPNOCH sample; Tables 2, 5) during a storm event on February 20th. Analytical results obtained from ERA's contract laboratory on February 25th indicated elevated uranium concentrations directly attributable to runoff from the stockpiles and an investigation was initiated.

Field inspections by mine operational staff and management of the area on the morning of February 26th showed that waste rock had been stockpiled incorrectly onto an area which had been specially prepared to enhance wet season runoff. The Minesite Technical Committee, all representatives of which were attending an Alligator Rivers Region Technical Committee (ARRTC) meeting at East Jabiru that day, were verbally notified in the afternoon after the meeting had concluded (Table 2). Site inspections were carried out on February 27th and 28th. A preliminary written report was forwarded to stakeholders on March 1st.

Table 2: Notification and Consultation with Stakeholders

Date	Description	Stakeholder Group Notified
January 7	Completion of drain earthworks, final preparation of surface of stockpile and commissioning of VLGCRC2 monitoring station	DBIRD, OSS, NLC
January 13	Concreting works completed on 'half-pipes'	n/a
January 15 – February 22	Weekly sampling at VLGCRC2. Field notes include '*background flow*', '*dry*', and '*silted gauge pool*'.	Weekly reports to DBIRD
January 30	Storm runoff sampled at 1930h. High flow; first major rainfall event	n/a
February 11	Stockpile runoff water quality check. Silted gauge pool at VLGCRC2.	n/a
Wednesday 20-Feb-02	TOPPNOCH sample taken from bottom of 'half-pipes' (upstream of VLGCRC2) during storm event – runoff directly from stockpiles	n/a
Monday 25-Feb-02	Received preliminary results for TOPPNOCH sample from NTEL, Uranium 1900 ppb (preliminary result; 2287ppb actual value). Initiated investigation of stockpiles area	n/a
Tuesday 26-Feb-02	Catchment inspection morning of 26Feb02 revealed incorrect dumping of waste rock in area of stockpile prepared for wet season management. Verbal notification to key stakeholders at *eriss* ~1715h	DBIRD, OSS, NLC
Wednesday 27-Feb-02	Site inspection by Alex Zapantis accompanied by Allan Wade and Geoff Mackenzie	OSS
Thursday 28-Feb-02	Site inspection during RPI accompanied by Geoff Mackenzie and Nadine Reithmuller	DBIRD (AH, Yardav Sharma) OSS (WE), NLC (GC)
Friday 1-Mar-02	Written notification: "Notification of Incorrect Stockpile Use"	DBIRD, OSS, NLC

4 STOCKPILE SHEETING

4.1 General information

Monitoring and assessment of stockpile runoff (water shed from the surface of a stockpile without infiltration) and seepage (water that has infiltrated and percolated through the stockpile) has been undertaken at Ranger over a number of years. The investigations have demonstrated that the quality of runoff can be markedly better than that of seepage. Good quality water can be directed to wetland systems whereas poorer quality water is retained on site in retention ponds and must be treated before it can be disposed of. Minimising the proportion of rainfall infiltrating the surfaces of stockpiles has a major influence on the effectiveness of minesite water management.

Investigations of capping techniques for enhancing rainfall runoff from stockpiles situated along the northern wall of the tailings dam demonstrate that compaction of the upper surfaces of a stockpile will increase the proportion of rainfall that is shed from its surface (Hollingsworth & Zimmermann 2002). Current work on the temporal variations in quality and quantities of runoff and seepage is in progress. Additional work in progress is monitoring the behaviour of the new Western Stockpile from the perspective of runoff and seepage (Puhalovich *et al*. 2002). As well, separate studies have indicated that high energy compaction of stockpiles leads to a significant reduction in infiltration, particularly in stockpiles of lateritic or weathered material (Hollingsworth & Welch, 2002).

4.2 Stockpile catchment management

Prior to January 1999 the key focus of the Ranger Mine Environmental Requirements (ERs) pertaining to water management was the Restricted Release Zone (RRZ) concept. Since changes to the ERs have been approved and are being implemented a more flexible approach to the management of water on site has been adopted. Water management is now based on its quality rather than origin or location. This strategy has been aimed at minimising the volume of water retained and managed on the minesite.

Prior to the 2000-01 wet season ERA sought approval for directing stormwater runoff from 2.5 ha of a stockpile of sub-economic grade ore (specifically grade #2, which contains 0.02% to 0.08% U_3O_8) in the southern stockpile area via the constructed wetland filters in the Corridor wetland system. The basis for the proposed change to the catchment was the better quality of surface runoff in comparison with the combined runoff/leachate that previously reported to RP2, and which subsequently required the application of intensive dry season water treatment and disposal strategies.

In preparation for sheeting off the incident rainfall, 2.5 ha of the #2 stockpile was contoured, compacted, and a plastic-lined drain installed to allow for discharge from the upper stockpile area to lower level drainage systems. Seepage from the stockpile continued to report to RP2. Approval for the diversion of runoff to the Corridor wetland system was received from the Supervising Authority by ERA on November 9th, 2000.

Passage of the runoff water through the Corridor wetland system has been demonstrated to lead to an improvement in its quality (Overall *et al*. 2001). This has provided a level of downstream aquatic ecosystem protection, particularly with respect to dissolved uranium and manganese, and ensured that compliance at the primary downstream monitoring site in Magela Creek (MG009) is maintained.

Subsequent to the 2000-01 wet season, approval was sought from the Supervising Authority (via the MTC) by ERA for an increased area of stormwater runoff from the #2 stockpile to be directed towards the Corridor wetland system. The application was granted on April 26th, 2001 subject to the following conditions being met:

1. electrical conductivity of the runoff water determined at the point of debouchment from the stockpile is less than 400 µS/cm; or
2. rainfall exceeding 200 mm has been recorded on site for the current wet season.

An application submitted on October 10th, 2001 to the Minister for Resources (DBIRD) proposed the modification of selected stockpiles (including the #2 stockpile and a stockpile of #4 material) in preparation for diversion of wet season runoff to the Corridor wetland system. The objective was to further increase the capacity at the minesite to shed rainfall runoff rather than retain it in RP2 where it would require treatment prior to disposal. Modification of the stockpiles included contouring and compaction of the surfaces.

By November 28th, 2001, approval had been granted to ERA for runoff from 31 ha of specially prepared (compacted) #2 and #4 stockpiles to be directed to the constructed wetland filters in the Corridor system during the 2001-02 wet season. Approval was subject to the first flush being directed to RP2 under conditions set out above (i.e. maximum EC of the runoff water < 400 μS/cm and at least 200 mm of rainfall having been recorded before directing the runoff water to the wetlands).

Prior to the first flush conditions having been met a bunding system was in place to direct the runoff to RP2. Once the rainfall threshold (200 mm) had been reached, subsequent drainage modifications were made to redirect runoff to the Corridor constructed wetlands. Modifications were completed by January 15th, 2002.

4.3 Surface water monitoring

Surface water quality monitoring requirements for sheeting of rainfall runoff from appropriately contoured and compacted stockpiles in the southern stockpile area are listed in Table 3. The agreed monitoring program included weekly sampling and analysis for key parameters and monthly sampling for the broader suite of chemical and physical attributes.

Information on stockpile runoff and monitoring results is presented in the monthly statutory report provided to stakeholders by ERA.

Table 3: Surface water monitoring related to sheeted stockpiles

Site	Description	Analyses
Southern stockpile areas		
VLGCRC2	Inlet to Corridor Creek constructed wetland system	weekly pH, EC, turbidity, Mg, SO_4, Mn, U continuous flow, pH and EC
GCBR	Corridor Creek wetland (Brockman bund)	weekly pH, EC, Mg, SO_4, Mn, U monthly includes trace metal suite
GC2	Corridor Creek at GC2	weekly pH, EC, Mg, SO_4, Mn, U monthly includes trace metal suite
Northern & Western waste rock stockpile areas		
RP1WF 1 **RP1WF 9**	Cells 1 and 9 in RP1 wetland filter (when in use)	weekly pH, EC, Mg, SO_4, Mn, U monthly includes trace metal suite, N-nutrients & alkalinity
RP1W	RP1 spillway	weekly pH, EC, turbidity, Mg, SO_4, Mn, U monthly includes trace metal suite, nutrients & alkalinity
Primary downstream compliance monitoring site		
MG009	Magela Creek at GS8210009	weekly pH, EC, turbidity, Mg, SO_4, Mn, U

5 INVESTIGATIONS OF STOCKPILE OPERATIONAL AND ENVIRONMENTAL MANAGEMENT

5.1 #2 stockpile

The material in the #2 stockpile immediately east of the tailings dam is primarily 0.02% to 0.08% U_3O_8 materials with a small proportion of weathered grade #3 material (0.08% to 0.11% U_3O_8). It is not economic to mill these materials.

In preparation for the 2001-02 wet season, tipping on the #2 stockpile ceased on September 12th, 2001. During October, the surface of the stockpile was compacted with a high impact compactor to increase run-off and reduce the proportion of water infiltrating the stockpile during the forthcoming wet season. It was intended, as part of the protocol developed by the Environment Department with the Supervising Authority that, once compacted, the #2 stockpile would not be disturbed for the duration of the wet season. However, on January 14th, 2002 the Ranger Mining Department recommenced tipping operations on the western batters of the compacted stockpile (Table 4) in response to operational requirements for stockpiling space[1]. This was consistent with the Mining Department stockpiling plan, which identified that these stockpiles had not yet been completed to design and could be extended. But the activity was inconsistent with the intended wet season operation of the compacted stockpile areas and indicates a deficiency in communication between the Mining Department and the Environment Department. In future a senior representative of the Environment Department will attend weekly Mine Planning Meetings held each Monday morning at 9am at Ranger.

Routine field inspections by Environment or Mining Department staff did not identify the compromised stockpiles.

Table 4: Very low grade ore deposited on the #2 stockpile in 2002

Grade of ore	**mass deposited (10^3 t)**
January 14th to February 26th	*Incorrect dumping*
weathered grade 2	80.9
weathered grade 3	3.6
February 26th	*Cover - Management instructions*
primary grade 2	38.3
Total	122.8

Higher than expected uranium values in the runoff measured at VLGCRC2 from January 15th – February 20th were initially ascribed to local earthwork disturbances and low flow conditions in the newly constructed drain (see Table 2) leading to a newly constructed wetland filter in the Corridor wetland system. However, elevated U concentrations recorded in analytical data received on February 25th for runoff

[1] The Ranger Mine Department found that the amount of grade #2 material mined from Pit #3 during January and February 2002 was considerably greater than that predicted by the geological model used to determine quantities of waste and ore materials to be mined from Pit #3. As a result, the newly constructed Western Stockpile, which is adjacent to Pit #3 and had been the primary repository for #2 materials, reached its 2002 design capacity in early January, earlier than planned. Space for stockpiling was identified by Mining Department personnel in the southern #2 stockpile area where stockpiles had not been completed to design. Consequently, a total of 84,500 tonnes of grades #2 and #3 material (originating from the -35RL bench, 40 to 50 metres below the surface and at the base of the weathered zone in Pit #3) were deposited on the western batters of the sheeted #2 stockpile from January 14th to February 26th 2002 (Table 4).

collected directly from the stockpile area at the 'half-pipes' during a storm event on February 20th triggered field investigations on February 26th that identified the stockpiled materials on the batter slopes of the compacted areas prepared for wet season rainfall runoff.

Following an inspection of the site by the General Manager Operations and the Acting Mine Manager on the morning of February 26th, two instructions were issued, namely (see details in Table 8):

- immediately cover the weathered materials with primary #2 rock, which amounted to 38,320 tonnes. This was completed on March 1st and the objective was to eliminate the incorrectly placed weathered rock as a source of uranium in rainfall runoff. In addition, windrows were constructed around the western toe of the #2 stockpile to limit any sediment transport to the draining leading to the Corridor wetland system.; and
- increase the size of run-off drains surrounding the 4/7 stockpile area to the northeast of the #2 stockpile. This was completed the same day and the objective was to ensure that any runoff from this area was directed to RP2.

Surface waters were sampled throughout the southern stockpile area during and immediately following a rainfall event in the catchment on February 26th (Figure 2) and the analytical results for these samples were received on March 1st.

5.2 #4 stockpile

Stockpiling of freshly mined laterite ore (grades #4 to #7) on the 4/7 stockpile (Figure 2) has continued through the 2001-2002 wet season, as appropriate. Stormwater from the catchment of the 4/7 stockpile is directed to RP2. However, the drains installed to divert runoff from this sub-catchment to RP2 appear to have been inadequate and allowed some overflow to cross into the sheeted stockpile catchment, ultimately reporting to VLGCRC2 and the Corridor wetland system. Potential problems with this drainage system were identified during an inspection on February 26th and immediately repaired (Table 8).

5.3 Water quality data

Prior to January 7th 2002, earthworks in the area between the Corridor Road and the inlet to the new wetland filter system (Figures 1 & 2), which includes monitoring site VLGCRC2, were in progress. The earthworks included drainage works and desilting of the gauge pool at VLGCRC2. Consequently water quality data collected prior to January 15th were for VLGCRC, which was located in the next drain east (Figure 1; Figure 2, Site 7), and were not representative of sheeted stockpile runoff.

Weekly water monitoring results for grab samples collected from VLGCRC2 from January 15th to February 13th 2002 are detailed in Table 5. Samples generally represented low flow conditions from minor rainfall events in the catchment, or were collected from the gauge pool when it was silted up with sediment eroded from the recent earthworks. The analytical results, particularly the elevated U concentrations and low levels of other solutes, were interpreted by Ranger staff to reflect the recent earthworks in the local area. Analytical results for samples collected at VLGCRC2 during storm runoff events on January 30th and February 11th were also interpreted to reflect the recent earthworks (see comments in Table 5).

Through the period from January 15th, water quality results from GC2 (Table 6) do not reflect the elevated levels of U registered at VLGCRC2 in input waters to the constructed wetland filters in the Corridor system. Low flows (below 1.4 m^3/s) at VLGCRC2 are directed into the new constructed wetland (Figure 2) where marked attenuation of uranium is expected on the basis of many years of experience with the behaviour of the RP1 constructed wetland filter (Jones *et al.* 2000). High flows bypass the new wetland filter and enter the Brockman filter (Figure 1). Further attenuation of U would have occurred in the Brockman and MBL filters.

A sample was collected from highly turbid stockpile runoff at the bottom of the half pipes on Corridor road during a storm event on February 20th. In comparison with samples collected at VLGCRC2, samples from this location directly reflect stockpile runoff. Preliminary results received by ERA from the contract analytical laboratory in the afternoon of February 25th indicated that the uranium concentration in the sample was 1900 µg/L (final result 2287 µg/L): this prompted immediate further investigations of the stockpile area on the morning of February 26th. The analytical results for routine weekly samples collected at VLGCRC2 and GC2 on February 20th, prior to the storm event, were also received by ERA on February 25th (700 µg/L of U at VLGCRC2; and 10 µg/L at GC2, refer Tables 5 and 6).

5.4 Additional field investigations

During a storm event in the evening of February 26th, two independent field parties collected samples of runoff from various points in the southern stockpile catchment. The results are summarised in Table 7 and Figure 2. These observations and data suggest that the turbidity and relatively high concentrations of Fe and Al in the particulate suspended fraction of the samples were most probably derived from the recently stockpiled weathered Pit #3 material.

The highest U concentrations were detected in the drain directly to the west of the #2 stockpile (site S11). This drain flows northwards along the western side of the #2 stockpile. The freshly stockpiled material was also deposited to the west of the #2 stockpile. It appears that some of this material was eroded and washed into the stockpile integration drain, which takes runoff from the stockpile area to the Corridor wetland system via VLGCRC2. This accounts for the high turbidity recorded in the February 20th storm runoff at the 'half-pipes' at the base of the stockpiles. This material possibly contributed to the elevated U levels being measured at VLGCRC2 but was mistaken for fines eroded from local earthworks and drain construction. However, field observations and chemical data (Table 7, Figure 2) suggest that leachate from stockpiles is also likely to have been a significant contributor to the elevated uranium concentrations measured in stockpile runoff and at VLGCRC2.

5.5 Efficacy of the Corridor wetland filter system in attenuating solutes

Monitoring site VLGCRC is located at the minesite, approximately 200 metres south of the southern stockpile area near the inlet to the newly constructed upstream wetland in the Corridor wetland system. GC2 is in the upstream part of the fourth and final constructed wetland, which has been in place for many years. Uranium concentration data for VLGCRC (VLGCRC1 – from December 1997; VLGCRC2 - from January 2002) and GC2 (from January 1990) are shown in Figure 3. The historical data for uranium at VLGCRC1 are confounded by various water treatment trials including DW3A water treatment during the 1999-2000 wet season, and RP2 water treatment from September to December 2000. However, comparison of U data for VLGCRC and GC2 indicates that uranium is significantly attenuated via

passage through the Corridor wetland system (Figure 3), as designed, and that the values at GC2 have been consistent over the past several years.

The primary downstream environmental compliance monitoring point for the mine is MG009, which is approximately 3 km downstream from Georgetown Billabong (Figure 1). The limit trigger level for uranium concentration at MG009 is 5.8 μg/L. Data collected at MG009 since 1998 (Figure 4) demonstrates that the dissolved U concentration has been generally maintained at less than 0.5 μg/L

Table 5: Water quality results from VLGCRC2 (15 January to 27 February 2002)

Date sampled	Sample	pH	EC µS/cm	turbidity NTU	Mg mg/L	Mn µg/L	SO_4 mg/L	U µg/L	Flow	Comments
15-Jan-02	F Weekly	7.2	152	18	14	28	50	145	low flow	Background flow
22-Jan-02	Weekly	-	-	-	-	-	-	-	dry	
29-Jan-02	F Weekly	6.0	437	22	38	152	166	1305	low flow	Background flow
30-Jan-02	Storm runoff sampled @ 1930				13	48	52	639	high flow ~5m^3/s	First major rainfall event since completion of drainage and final dressing of stockpiles
5-Feb-02	Weekly								dry	
11-Feb-02	Stockpile runoff water quality check	6.6	315		32	110	132	1972	low flow post event	Silted gauge pool at inlet to wetland following period of consistent rain
13-Feb-02	F Weekly	6.6	222	126	24	76	96	1626	low flow post event	Mobilised U from silt in drain - Watching Brief
20-Feb-02	F Weekly	7.0	172	96	17	54	64	700	moderate flow	Result received from contract laboratory 25 Feb
20-Feb-02	Storm runoff TOPPNOCH Filtrate Residue		85			31 15	33	2287 670	high flow	Result received from contract laboratory 25 Feb - investigation initiated *Note* 1926 µg/L is figure provided by contract laboratory as preliminary data (see Notification to Stakeholders Friday March 1st.
26-Feb-02	Stockpile runoff	6.5	91	2000	9	27	38	159		
27-Feb-02	F Weekly	7.2	138	11	13	36	54	591		

Table 6: Water quality results from GC2 (15 January to 4 March 2002)

Date sampled	Sample	pH	EC µS/cm	turbidity NTU	Mg mg/L	Mn µg/L	SO_4 mg/L	U µg/L	Flow
15-Jan-02	F (Weekly)	7.1	190	8	20.9	14.0	38	4.1	low
22-Jan-02	F (Weekly)	7.2	190	10	21.7	22.5	36	4.4	low
29-Jan-02	F (Weekly)	7.2	211	6	18.7	5.5	28	3.5	low
05-Feb-02	F (Monthly)	7.4	189	5	22.7	10.1	28	3.0	low
13-Feb-02	F (Weekly)	6.9	102	10	10.9	5.2	18	2.5	low
20-Feb-02	F (Weekly)	6.9	79	14	7.9	5.8	16	10.4	low
27-Feb-02	F (Weekly)	7.1	94	8	9.2	6.3	19	7.0	moderate
04-Mar-02	F (Weekly)	7.0	96	5	8.9	12.9	17	5.8	

Table 7: Water quality results of investigative sampling on the minesite during storm event on 26 February 2002 (refer Figure 1)

			General parameters			Major ions					Filtrate							Residue						
	Site Code	Time of Collection	pH	EC (µS/cm)	Turb (NTU)	Na (mg/L)	K (mg/L)	Ca (mg/L)	Mg (mg/L)	SO4 (mg/L)	Al (µg/L)	Cu (µg/L)	Fe (µg/L)	Mn (µg/L)	Pb (µg/L)	U (µg/L)	Zn (µg/L)	Al (µg/L)	Cu (µg/L)	Fe (µg/L)	Mn (µg/L)	Pb (µg/L)	U (µg/L)	Zn (µg/L)
S1	VLGCRC2	6:00 pm	6.4	93	2000	-	-	-	8.7	37.5	330	-	113	27	5.7	159	-	-	-	-	-	-	-	-
S2	4 Stockpile	6:00 pm	5.6	14	449	-	-	-	1.3	4.4	140	-	34	6.8	35	924	-	-	-	-	-	-	-	-
S3	2-Stockpile	6:00 pm	6.1	189	493	-	-	-	18	90	156	-	42	46	11	828	-	-	-	-	-	-	-	-
S4	EDRAINUS	6:00 pm	5.7	85	121	-	-	-	7.8	34	84	-	34	3.9	1.6	550	-	-	-	-	-	-	-	-
S5	VLGRCRC02	6:30 pm	6.3	93	630	0.4	0.8	0.9	8.2	37	79	2.3	24	29	6.2	240	3.5	39420	285	28290	156	368	2210	66
S6	MJWE	6:30 pm	7.3	156	13	1.1	1.1	2.7	12.5	51	47	0.64	<20	1.2	0.09	72	3.4	499	0.17	59	9.7	0.59	14.9	<0.5
S7	VLGCRC	6:30 pm	6.7	163	20	1.4	1.7	2.7	14	53	53	1.3	91	657	0.18	80	9.7	857	2.0	944	16	2.15	32	0.6
S8	Right Channel WR	6:30 pm	-	-	-	0.7	1.9	2.6	16	79	11	28	<20	68	54	2760	5.1	7960	70	5190	26	89	566	6.5
S9	Left Channel WR	6:30 pm	-	-	-	0.5	1.3	2.2	20	93	28	57	<20	89	74	3590	6.1	12200	84	8235	46	110	631	15
S10	End of tails 50	6:30 pm	-	-	-	0.6	1.5	2.6	27.5	128	75	95	<20	105	53	5890	8.5	20170	135	13580	71	136	1030	24.5
S11	WATER EXPR WASTE R	6:30 pm	-	-	-	0.6	1.8	3.5	31	149	98	118	<20	130	95	8140	11.9	13710	94	9280	54	97	653	18
S12	End of Tails	6:30 pm	-	-	-	1	1.7	2.5	34	155	102	156	<20	164	8.7	588	9.8	-	-	-	-	-	-	-

Notes

- High levels of iron and aluminium in the residual fraction of several samples may indicate a clay-rich soil or weathered rock source
- Analyte levels rose significantly between the compacted #4 stockpile (sample 2) and the toe of the south end of the #2 stockpile (sample 9)
- Runoff from the #2 stockpile increased in analyte levels from the top (Sample 3) to the bottom of the drop structure (sample 8). Runoff was flowing into a large 'pipe' part way down the drop structure and seepage was observed at the toe of the #2 stockpile on the western side of the drop structure (sample 11)
- Flow from sample site 11 was entering the runoff drain approximately 50 m from the north-east corner of the tailings dam (sample 10)
- The uranium concentration at VLGCRC2 increased by approximately 80 µg/L in ~30 minutes (compare samples 1 & 5).

6 CORRECTIVE ACTIONS

Actions undertaken to address deficiencies in the management of stockpiles in the southern stockpile area are listed in Table 8.

Table 8: Actions undertaken in response to inappropriate deposition of material on the #2 Stockpile

Date	Action	Comments & Current Status
26 Feb 02	Senior management inspections of stockpile area and instructions issued	ongoing
26 Feb 02	Capping of exposed "transition material" on the #2 stockpile with #2P material	completed
26 Feb 02	Dressing of drainage lines to ensure no concentrated discharge down the west face of the #2 stockpile	completed
26 Feb 02	Windrow constructed around western toe of the #2 stockpile to limit any sediment transport.	completed
26 Feb 02	Dressing of drainage lines to ensure 4/7 laterite stockpile runoff reports to RP2	completed
26 Feb 02	Event sampling of stockpile catchment during and immediately following a 20mm rain event	Preliminary results received 01Mar02
01 Mar 02	Drainage modified to divert runoff away from a low area of the 4 stockpile on the east side of the #2 stockpile	completed
01 Mar 02	Windrow installed to ensure runoff from the active section (north end) of the #2 stockpile reports to RP2.	completed
01 Mar 02	Repairs to the drop structure at the south end of the 2 stockpile.	completed
01 Mar 02	Event based sampling program initiated at five key sites initiated.	Continuing, including • Runoff from #2 stockpile • Runoff from #4 stockpile • Expression point on west side of the #2 stockpile drop structure • VLGCRC2 (Corridor Wetland inflow) • GC2 (Corridor creek)
04 Mar 02	3 X 500 mm pipes installed on the #2 stockpile drop structure.	completed
05 Mar 02	40mm rainfall event ; samples collected	Results expected 12Mar02

In particular:

- an enhanced environmental monitoring regime (Table 8) has been implemented to confirm the effectiveness of drainage works to redirect runoff from stockpiles to RP2 and the capping of incorrectly stockpiled grade #2 materials;
- the Environment Department has been streamlined and focussed by removing responsibilities for Safety, Health, Radiation and Security;
- a new Laboratory Information Management System (LIMS) was purchased in December 2001 and is currently being commissioned. Intensive training in the use of the system is currently underway at Ranger. It is intended that the system will form the basis for more effective management and reporting of environmental data;
- the incumbent Environment Manager was dismissed on March 6th and negotiations are currently underway to fill the position with a suitably qualified candidate;

- an alternative to the current structure and composition of the Environment Department is being developed;
- a senior representative of the Environment Department will attend weekly Mine Planning Meetings held each Monday morning at 9am;
- to ensure effective communications between departments, the Acting Manager Mining has been requested to prepare a document formalising all stockpiling procedures. The Water Management Coordinator (Environment Department) will co-author the document by detailing environmental management requirements for current stockpiles. EWL Sciences will contribute environmental performance criteria and generic construction specifications to the document;
- a review of the Ranger statutory environmental monitoring program is in progress and preliminary progress was discussed with stakeholders late in 2001. An overhaul of the operational environmental monitoring program had commenced prior to this incident, and will be accelerated to ensure that it is established on a sound scientific basis, transparent and cost-effective; and
- follow up contact with stakeholders has been made to provide information and reinforce the invitation to visit the site.

7 COMMITMENTS

Commitments made by ERA in response to implementing recommendations in Supervising Scientist Report 153[2] are relevant to the issue and this investigation of a mistake in management of part of the southern stockpile area at Ranger. These include:

> *Recommendation 3: ERA should strengthen the Ranger Management Team to ensure that there is an effective interface with external stakeholders and that decisions are made quickly to meet the expectations of the stakeholders.*
>
> *Recommendation 4: ERA should take immediate steps to put in place an employee training program designed to ensure that all employees appreciate the need to keep the authorities informed of any event that could be perceived to be of concern to the local Aboriginal people or the broader community not just incidents that are acknowledged infringements of the Ranger General Authorisation or the Environmental Requirements.*
>
> *Recommendation 6: ERA should upgrade the environment protection staff structure at Jabiru to ensure that the company has the on-site ability to effectively identify, interpret and rectify environmental problems.*

Components of all three recommendations have been implemented by ERA. For example:

- The management structure at Ranger Mine has been completely changed as a result of the appointment of a General Manager Operations in charge of a streamlined management team responsible for Health & Safety, Environment Mine, Mill and Human Resources. A General Manager Strategic Planning and a Manager External Relations reporting to ERA's Chief Executive Officer are based in Darwin.

  The streamlined management structure offers a much improved and effective interface with external stakeholders

[2] Supervising Scientist (2000) Investigation of tailings water leak at the Ranger uranium mine. Supervising Scientist Report 153. 46pp plus 5 appendices. (Supervising Scientist, Darwin).

- ERA had commenced training programs, which were referred to the Supervising Scientist for review. In addition, the induction program for all new employees includes environmental awareness. However, ERA is addressing deficiencies in communication between departments in relation to environmental awareness and accountability.

- The Environment Department has been focussed by removing responsibility for Safety, Health, Radiation and Security. In addition, the environmental laboratory function has been contracted out to an accredited chemical laboratory in Darwin. As a consequence, the Senior Environmental Scientist, the Investigative Chemist, EMS Administrator, and field officers including water management specialists, thus had the on-site ability to identify, interpret and rectify environmental problems. However, a number of unforeseen resignations and staff changes recently have impacted on this capability.

  A new Laboratory Information Management System (LIMS) has been purchased and is currently being commissioned. This will form the basis of more effective management and reporting of environmental management data.

  Improved communications between the Mining Department and the Environment Department will be achieved as a result of a senior Environment Department representative attending weekly Mine Planning Meetings on Monday mornings. This will also strengthen the capacity for operational strategies to have appropriate environmental outcomes.

  In addition, an overhaul of the statutory and operational environmental monitoring regimes is in progress and will be discussed with stakeholders and implemented on approval from MTC. Initial discussions were held with stakeholders late in 2001.

Although significant progress has been made, ERA is concerned that full compliance with the recommendations cannot be achieved with current resources. Consequently, the Company has committed to contract an appropriate external specialist to review existing environmental management and communication systems within the Ranger operations and to design and implement more effective process management systems.

8 REFERENCES

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9 FIGURES

Figure 1 – Map of water management areas showing surface water monitoring sites in the Corridor wetland system

Figure 2 – Location of investigative samples collected during a storm event on February 26th, 2002.

Figure 3 - U concentrations at GC2 and upstream at VLGCRC2. U concentration limit at GC2 also shown.

Figure 4 - U concentrations at MG009 & MCUS (1998-2002). Trigger values also shown.

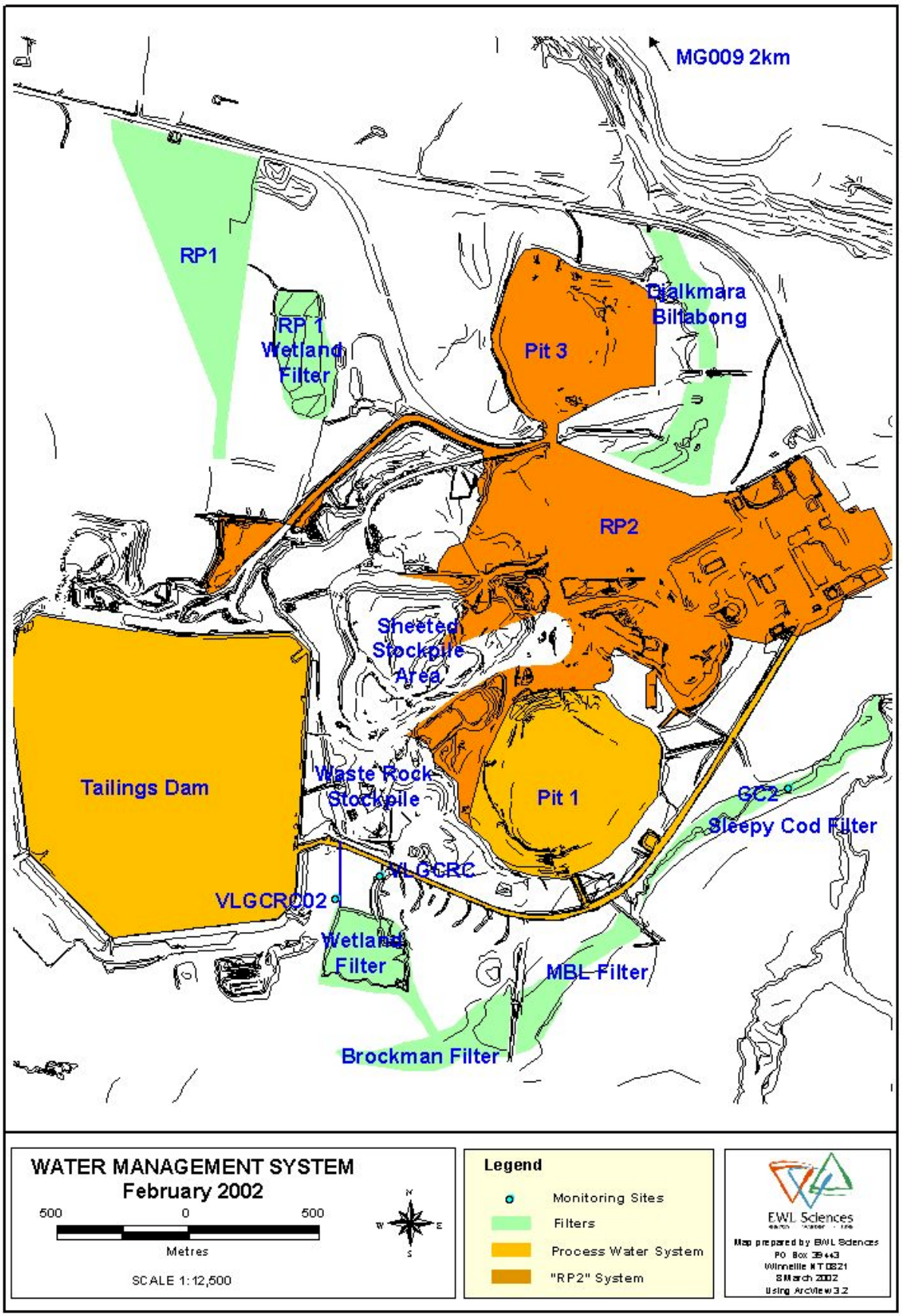

Figure 1 – Map of Ranger Mine water management areas showing surface water monitoring sites in the Corridor wetland system

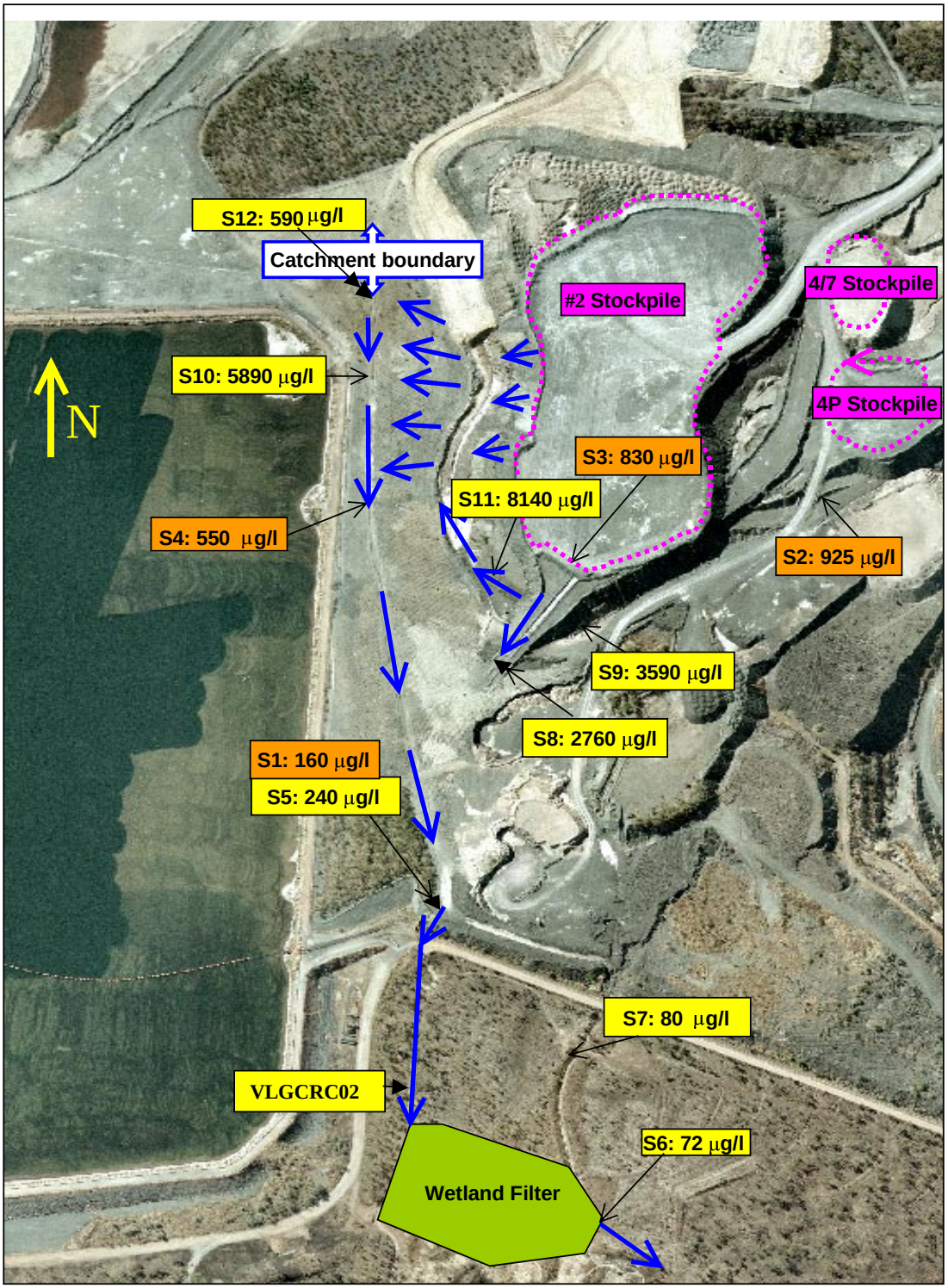

Figure 2 – Location of investigative samples collected during a storm event on February 26th, 2002.

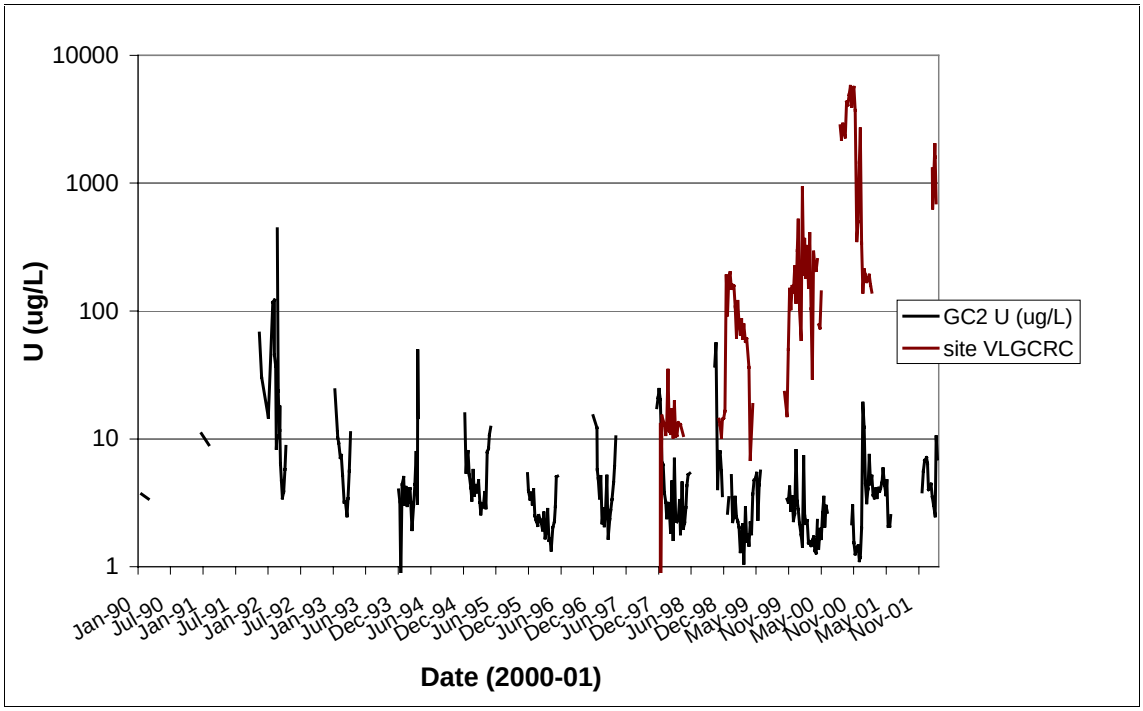

Figure 3 - U concentrations at GC2 and upstream at VLGCRC2. U concentration limit at GC2 also shown. (NB log scale used on y-axis)

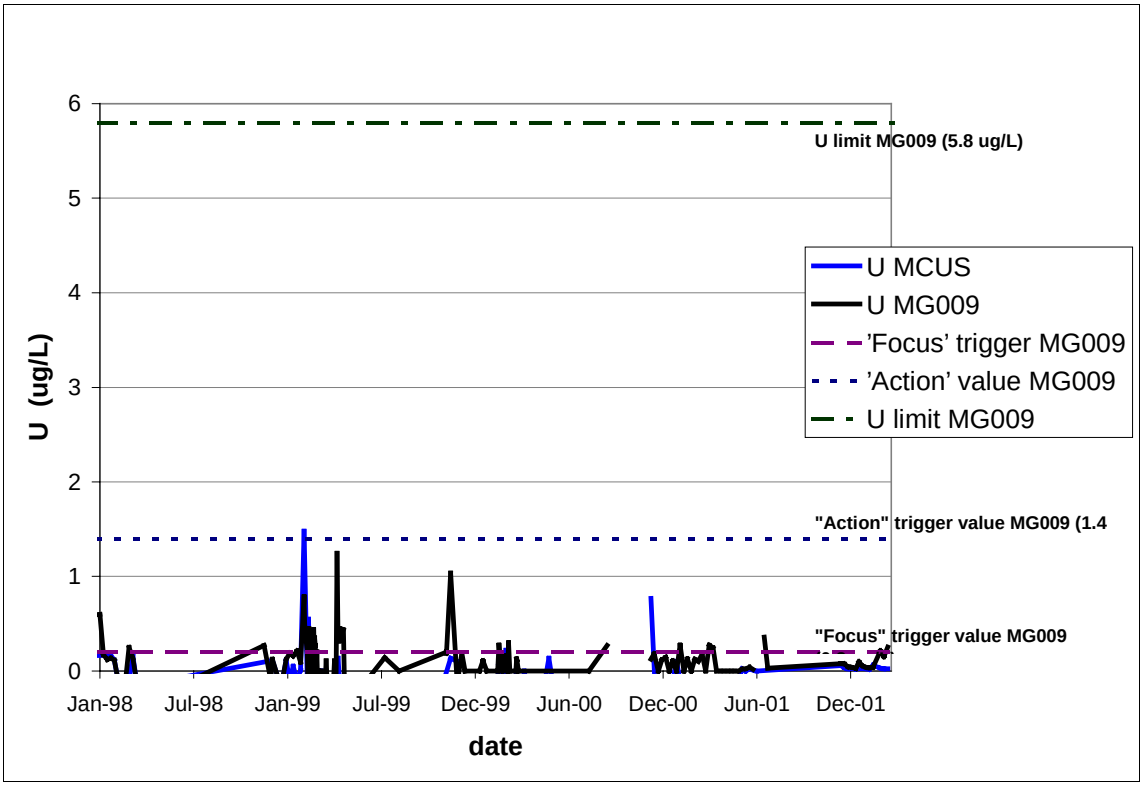

Figure 4 - U concentrations at MG009 (downstream) & MCUS (upstream of Ranger Mine (1998-2002). Trigger values also shown

APPENDIX 3

ERA Notification of Exceedence of Action Levels at Jabiluka

Received by the Supervising Scientist
15 February 2002

ERA Energy Resources of Australia Ltd – Jabiluka Mine
ABN 71 008 550 865

Water Quality Performance of Swift Creek against Triggers and Guidelines

Swift Creek commenced flowing on the evening of 31 December 2001, following a significant rainfall event of approximately 162 mm.

Results of samples since the commencement of flow in Swift Creek are given below:

Site	Date sampled	Ph * *Guideline*	Cond	Mg * *Guideline*	NO3	SO4	U-1
		(Units)	(uS/cm)	(mg/L)	(mg/L)	(mg/L)	(ug/L)
Focus Level		*4.61 - 5.31*	*15*	*0.37*	*0.3*	*0.6*	*0.02*
Action Level		*4.27 - 5.65*	*18*	*0.5*	*0.63*	*0.91*	*0.03*
Limit		*3.92 - 6.00*	*21*	*0.76*	*1.26*	*1.5*	*5.8*
JSC	02-Jan-02	4.84	15	0.5	0.133	0.9	0.03
JSCUS	02-Jan-02	4.72	16	0.4	0.044	0.8	0.02
JSC	08-Jan-02	5.37	19	1.2	0.549	0.3	0.05
JSCUS	08-Jan-02	4.80	18	0.5	-0.022	0.8	0.03
JSC	15-Jan-02	4.82	12				
JSCUS	15-Jan-02	4.73	26				
JSC	22-Jan-02	4.74	13	0.3		0.6	0.06
JSCUS	22-Jan-02	4.68	13	0.3		0.6	0.01
JSC	30-Jan-02	4.89	13				
JSCUS	30-Jan-02	4.79	14				
JSC	05-Feb-02	4.81	13	0.4	-0.022	0.3	0.01
JSCUS	05-Feb-02	4.72	14	0.4	-0.022	0.3	0.01
JSC	12-Feb-02	4.78	11				
JSCUS	12-Feb-02	4.54	13				

First flush samples were collected from Swift Creek at JSC and JSCUS on 2 January 2002. The Focus level for EC was equalled while sulfate at 0.9 mg/l exceeded the Focus level of 0.6 mg/l. The Magnesium result of 0.5 mg/l equalled the Action level as did Uranium at 0.03 ug/l. As these were first flush samples and similar in level to upstream results, further action was not warranted.

Results of samples from 8 January 2002 showed that EC at 19 exceeded the Action level of 18, however, the JSCUS result for the same date was 18 uS/cm. Nitrate exceeded the Focus level on this date. Uranium at 0.05 ug/l remained above the Action level, however, there was yet no established upward trend with only two relevant data points. An outlier value of 1.2 mg/l was reported for Magnesium which exceeded the guideline of 0.76 mg/l.

By the next sample on 22 January 2002, all parameters had dropped below the Focus levels except for Sulfate at 0.6 mg/l, which equalled the Focus level, and Uranium which exceeded the Action level at 0.06 ug/l.

The sample on 5 February 2002, showed all parameters were below Focus levels.

ERA has committed to reporting results exceeding action levels immediately, however, due to temporary personnel changes and relocation of infrastructure, this was not achieved within the expected timeframe. Systems are now in place to ensure this information is reported in a more timely manner in future.