

Alligator Rivers Region Technical Committee

17th Meeting

Darwin, 27–28 February 2006

Members

Mr Ray Evans - Independent Scientific Member
Mrs Jill Fitch – Independent Scientific Member
Mr Mark Foy – Northern Land Council
Dr Carl Grant - Independent Scientific Member
Dr Keith Hayes – Independent Scientific Member
Dr Terry Hillman - Independent Scientific Member
Mr Alan Hughes – Supervising Scientist
Dr Tony Milnes – Energy Resources of Australia Ltd
Prof Jon Nott - Independent Scientific Member
Dr Jenny Stauber - Independent Scientific Member

Apologies

None provided.

Advisers and Observer (present for all or part of the meeting)

Dr Peter Bayliss - Environmental Research Institute of the Supervising Scientist
Mr Julian Barry – Parks Australia North
Dr Andreas Bollhofer - Environmental Research Institute of the Supervising Scientist
Ms Suzanne Davis-Hall - Office of the Supervising Scientist
Mr Graham Dewar - Gundjeihmi Aboriginal Corporation
Mr Don Elphick - Environmental Research Institute of the Supervising Scientist
Dr Ken Evans - Environmental Research Institute of the Supervising Scientist
Dr Mark Gardener – EWL Sciences Pty Ltd
Dr Chris Humphrey - Environmental Research Institute of the Supervising Scientist
Dr David Jones - Environmental Research Institute of the Supervising Scientist
Dr Frans Kalf – Kalf and Associates Pty Ltd
Dr David Klessa – EWL Sciences Pty Ltd
Mr Geoff Kyle - Gundjeihmi Aboriginal Corporation
Mr Ian Loftus - Office of the Supervising Scientist
Mr Ian Marshman - Energy Resources of Australia Ltd
Mr Alan Puhlovich – EWL Sciences Pty Ltd
Mr Bruce Ryan - Environmental Research Institute of the Supervising Scientist
Dr Claudia Sauerland - Environmental Research Institute of the Supervising Scientist
Mr Howard Smith - Northern Land Council
Mr Keith Tayler - Department of Primary Industry, Fisheries and Mines
Dr Lloyd Townley – Rio Tinto Technical Services
Dr Rick van Dam - Environmental Research Institute of the Supervising Scientist
Mr Steve Winderlich – Parks Australia North

1 Introductory Session

1.1 Welcome and Overview

1.1.1 Ray Evans opened the meeting at 9.00am on Monday 27 February 2006 and welcomed members, advisers and observers. He extended a particular welcome to Dr Keith Hayes, recently appointed to ARRTC, and congratulated Alan Hughes on his recent appointment as Supervising Scientist. He then asked everybody to introduce themselves.

1.2 Apologies and Observers

1.2.1 No apologies were noted.

1.3 Declarations of any conflicts of interest with Agenda items

1.3.1 There were no declarations of any conflicts of interest with Agenda items.

2 Draft Summary Record of 16th Meeting

2.1 Draft Summary Record

2.1.1 Members discussed the draft Summary Record of the 16th meeting.

2.1.2 Geoff Kyle raised two issues. In relation to paragraph 3.2.6 he noted that not all Aboriginal people are Bininj and not all Bininj are Mirarr traditional owners of the Ranger Project Area. Many of the Aboriginals referred to in the presentations have either moved to the Ranger Project Area from outside Kakadu, or else are Traditional Owners of surrounding areas of Kakadu or Arnhem Land. He noted that it is not culturally acceptable for an Aboriginal person to make decisions or offer opinions about country which is not his or her country. He sought to have these words incorporated in the draft Summary Record of the 16th meeting. He also raised the issue of the spelling of Gundjeihmi.

2.1.3 Jenny Stauber notes some errors in the second line of paragraph 3.1.33. The word “rates” should be “ratios” and “data” should be inserted after “acute”.

2.1.4 Jenny Stauber also queried paragraph 2.1.12, and whether it should be recorded as an action item. Ray Evans noted that he had spoken with Arthur Johnston and Tony Milnes and that the issue has been resolved through discussion.

2.1.5 Jill Fitch asked that paragraph 6.4.1 be replaced with “Jill Fitch asked who dealt with radiation protection issues at the Department of Primary Industry, Fisheries and Mines. Keith Tayler responded that the Department of Primary Industry, Fisheries and Mines referred to the Department of Health and Community Services for specialist radiation protection advice.”

2.1.6 David Jones noted errors in paragraphs 3.1.34 and 3.1.37. In paragraph 3.1.34 he suggested that “not initially” be replaced with “potentially”. In paragraph 3.1.37 he suggested that “Muddy” should be “Mudginberri”.

ACTION/OUTCOME 2A:

ARRTC agreed that the draft Summary Record was, subject to the amendments noted in paragraphs 2.1.1 to 2.1.6 above, a true record of the 16th ARRTC meeting.

2.2 Actions/Outcomes of the 16th Meeting

2.2.1 Ray Evans noted the need to have some context provided in the Actions/Outcomes summary paper. This would allow the paper to be a “stand alone” document.

ACTION/OUTCOME 2B:

ARRTC requested that further contextual detail be provided in the *Actions/Outcomes* summary paper for the next ARRTC meeting.

Action/Outcome 2A

2.2.2 Ray Evans noted that he was happy with the level of detail and other members agreed.

Action/Outcome 2B

2.2.3 Ray Evans noted that this has been done.

Action/Outcome 2C

2.2.4 Ian Loftus noted that most papers had been made available approximately two weeks prior to the meeting. Ray Evans advised that he will talk with Ian Loftus and Alan Hughes about making the agenda available much earlier.

ACTION/OUTCOME 2C:

ARRTC asked that the Agenda for the next meeting be made available much earlier than has been the case for previous meetings.

Action/Outcome 3A

2.2.5 No further action required.

Action/Outcome 3B

2.2.6 Ray Evans noted that there was a need for further work in relation to the identification of gaps in the Key Knowledge Needs. Jill Fitch noted the earlier plan to revise the Key Knowledge Needs in 2006. Ray Evans noted that this issue would be considered later in the meeting.

Action/Outcome 3C

2.2.7 No further action required.

Action/Outcome 3D

2.2.8 David Jones provided a brief update on Gulungul Creek. He advised that an honours student is doing some work there and that continuous monitoring equipment has been installed.

Action/Outcome 3E

2.2.9 Ray Evans noted that this would be discussed later in the meeting.

Action/Outcome 3F

2.2.10 No further action required.

Action/Outcome 3G

2.2.11 Jon Nott noted that he and David Jones had been in contact in relation to alternative models for landform evolution that take into account the impact of extreme events. He noted the *Caesar* model and advised that a project on this issue would start in June 2007.

Action/Outcome 3J

2.2.12 It was noted that Ian Marshman would consider this issue later in the meeting.

3 Current Operations

3.1 Contextual statements by stakeholders

Energy Resources of Australia Ltd

3.1.1 Tony Milnes gave a presentation on the status of activity at the Ranger uranium mine.

3.1.2 Jill Fitch asked about the sorting of Grade 2 and Grade 3 ore, and Geoff Kyle added that this information would be needed to establish what grade would be used for back-fill during the rehabilitation phase. It was suggested that this is a radiation protection issue. Tony Milnes advised that the strategy for backfill depends on the outcomes of ongoing investigations, including proposed beneficiation projects.

3.1.3 Jenny Stauber asked about the frequency of testing ecotoxicology levels in pond water coming from the new water treatment plant, and whether testing was a one-off exercise. Tony Milnes advised that the treatment of pond water is still in relative infancy but the EC of the permeate product stream is to be monitored continuously, weekly measurements of uranium and radium and monthly measurements of major ion and metals. Whole of effluent toxicity testing was planned only for plant commissioning trials. Alan Hughes talked about the desirability of shifting the compliance point for the water treatment plant upstream to the plant outlet when sufficient performance data had been collected, probably after the first full season of operation. Rick van Dam noted that ERISS will report on ecotoxicology at the next ARRTC meeting.

ACTION/OUTCOME 3A:

ARRTC asked that time-series water quality results for water leaving the Ranger Water Treatment Plant be provided to the next ARRTC meeting.

3.1.4 Ray Evans then asked about progress on the development of Ranger closure criteria. Tony Milnes responded, giving an update. Alan Hughes advised that an initial stakeholder consultation meeting has been held. David Jones added that the closure process is still in relative infancy.

3.1.5 Ray Evans commented that he felt unsure of ARRTC's role in the closure criteria process. He noted that the Traditional Owner view on landform design could have an impact on closure process. Geoff Kyle noted that Traditional Owners' aspirations were subject to what was technically possible, and that was this an issue to be addressed by ERA.

ERA Radiation Management

3.1.6 Ian Marshman provided a presentation on ERA's radiation management framework. He noted that a presentation was made to ARRTC in 2005. He advised that ERA now has a revised (AS4801 compliant) radiation management plan, and a draft proposed monitoring program. He added that the Radiation Protection Working Group is still meeting to discuss these documents. Jill Fitch asked if the AS4801 compliant plan was the original monitoring

program from the early 1980s. Ian Marshman noted that the proposed program is intended to replace the existing (original) one. Jill Fitch also asked for the finalised statistics/analysis document.

3.1.7 Ray Evans then stressed the need to de-couple the operational radiation issues from the scientific radiation issues so that ARRTC does not get dragged into operational issues. Alan Hughes then provided a contextual overview, and suggested that ARRTC could have a role in looking at the science that has gone into the NT Government's approval process. Jenny Stauber noted that there should be an opportunity for ARRTC to provide advice relatively early in the process rather than after the event.

ACTION/OUTCOME 3B:

ARRTC noted that it will seek feedback from out-of-session consultation with Jill Fitch, and asked that this issue be included for discussion at the next ARRTC meeting following action through the MTC process.

Department of Primary Industry, Fisheries and Mines

3.1.8 Keith Tayler gave a report on the Department of Primary Industry, Fisheries and Mines. He advised that it is "business as usual". He added that the Minerals and Petroleum Division structure is still being bedded down, and that a new director is likely to be appointed soon.

3.1.9 Jill Fitch asked about the status of the implementation of the Northern Territory's Environmental Protection Agency (EPA). Keith Tayler and Alan Hughes responded, and advised the meeting about the new processes. Keith Tayler then advised that the Northern Territory is developing specific water quality legislation, and that it is proposed that it be administered by the EPA.

Northern Land Council

3.1.10 Mark Foy and Howard Smith gave a brief update on behalf of the NLC. Howard Smith advised his role has changed and is broader than previously. He also noted recent GAC and MTC consultations.

Hanson Australia Pty Ltd

3.1.11 Jill Fitch asked about Hanson Australia Pty Ltd, and why a Hanson representative did not attend meetings. Howard Smith then talked about Hanson's ongoing role in discussions in relation to Nabarlek. Ray Evans noted that ARRTC appeared to be a low priority for Hanson, but that the company is active in other forums such as ARRAC.

Supervising Scientist

3.1.12 David Jones gave a presentation on the ERISS 2005-06 research program.

3.1.13 Keith Hayes asked whether the source of the uranium in Gulungul Creek could be traced. Andreas Bollhöfer responded, noting that a project is underway to trace the source of the uranium using uranium isotope signatures.

3.1.14 Howard Smith asked about run-off water entering Magela Creek. He queried whether any first flush effect from run-off had been detected. David Jones noted the attenuation of run-off and that no downstream spike had been detected.

3.1.15 Howard Smith asked about a peak on the ERISS continuous monitoring EC chart, and a possible link to the Magela Land Application Area investigation, given that the peak in EC

occurred around a similar time. David Jones suggested that this was very unlikely given the relatively small volume of RP2 water that was irrigated and the very large dilution, even making the most conservative assumption that all of the irrigated water entered the creek.

3.1.16 There was then some general discussion on continuous EC monitoring of the two sides of the west channel at the creekside monitoring pontoon downstream of 009. David Jones noted that this monitoring was only newly introduced, and that he would not be making conclusions from the short data record currently available until the response of the system had been better understood through analysis of the entire wet season data in the third and fourth quarters of 2006.

Parks Australia

3.1.17 Julian Barry gave overview of Gunlom Land Trust rehabilitation, providing details on the history of the project and the role of Parks Australia.

3.1.18 Julian Barry then explained the site selection process, noting that the old South Alligator Valley airstrip site is looking more suitable than others. Jill Fitch asked about the basis for the site selection. Julian Barry advised that a variety of criteria had been developed and used, and that these were similar to those used by the Department of the Education, Science and Training for the Commonwealth radioactive waste repository process. Jenny Stauber queried whether there was community support for the disposal sites, and Julian Barry advised that the identification of the sites had resulted from a process of consultation with stakeholders including the Traditional Owners.

3.1.19 Mark Foy then noted tailings at the old Moline mill as being a possible concern as it was used for milling uranium ore in the 1950s and 1960s. He added that it is not in Kakadu National Park and not in the Alligator Rivers Region, so does not appear to be a responsibility of the Commonwealth. He asked whether ARRTC should have a role in considering Moline. David Jones noted that Moline was polymetallic and that a variety of chemicals would be present in the tailings at the mill.

3.1.20 Julian Barry offered to provide a PowerPoint presentation on the South Alligator Valley sites to the next ARRTC meeting.

<u>ACTION/OUTCOME 3C:</u>

ARRTC thanked Julian Barry for his update.
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3.3 Minesite Technical Committee Decisions

3.3.1 Keith Tayler gave a presentation on the regulatory approvals process in the Alligator Rivers Region. Keith Hayes asked about the availability of data. Keith Tayler noticed that there is no paucity of data. ERA has LIMS and the Supervising Scientist has a website. He added that data are regularly reported to various forums for analysis.

4 Strategic Planning

4.1 Aligning projects, Key Knowledge Needs and Closure Plan Timeline

4.1.1 Alan Hughes talked about the Key Knowledge Needs structure/agenda process, and the meeting then gave some consideration of Key Knowledge Needs issues. Ray Evans

suggested that members should try and deal with this issue out of session and report back at the next ARRTC meeting.

4.1.2 Ray Evans asked whether the projects actually meet the Key Knowledge Needs.

4.1.3 Tony Milnes asked whether ARRTC members found the overview Gantt chart useful, and Keith Hayes commented that he would instead prefer to see project title/method used in the form of a spreadsheet. Ray Evans then noted the need for ARRTC to be more strategic rather than being reactive to ERA and ERISS activity.

4.1.4 Carl Grant then suggested that the meeting process could be improved by identifying each presenter/presentation and allocating time against each one on the agenda. He stressed the need to limit each presentation to its allocated time-slot. He added that the agenda for each meeting should be circulated to ARRTC members for their comment as early as possible so their feedback could be included.

4.1.4 Ray Evans then expressed concern about the volumes of paper used in printing off downloaded documents, and stressed the need to cut down on paper volumes.

4.1.5 Alan Hughes asked if the meeting felt that break-out sessions, which had been included as part of earlier ARRTC meetings, should be included in the agendas of future meetings. Jill Fitch suggested that scheduling a one hour lunch-break would make it easier for ARRTC members to catch up with staff, rather than using a formal break-out session process.

ACTION/OUTCOME 4A:

ARRTC noted that an out-of-session Key Knowledge Need gap analysis would be undertaken with follow-up at the next ARRTC meeting.

4.2 Activity updates

ERA – Update of investigations on Pit 3 for tailings storage

4.2.1 Tony Milnes introduced David Klessa, Alan Puhlovich, Lloyd Townley and Frans Kalf.

4.2.2 Alan Puhlovich then gave presentations on the status of investigations relating to a forthcoming application to the MTC for approval to deposit tailings in Pit 3. Franz Kalf gave a presentation on hydrogeological modeling of Ranger Pit 3 closure and responded to technical questions from the meeting

4.2.4 Keith Hayes asked what was the number of parameters used in the model, and Frans Kalf advised that it was 1005. Tony Milnes explained that ERA is using the outcomes of such modeling to drive the landform design process.

4.2.5 David Jones then asked about Pit 1 versus Pit 3 issues in the context of potential seepage issues. Frans Kalf reiterated that the Pit 1 and Pit 3 situations are not similar; a highly permeable aquifer lies adjacent to the southeast corner of Pit 1 whilst there is no comparable structure adjacent to Pit 3.

4.2.6 Keith Hayes then noted the need for an uncertainty analysis, to look at the reliability of the variables. Lloyd Townley responded, and talked about the software being used. He advised that the software cannot be changed significantly and that limited factors can be varied. There was then some broader discussion about uncertainty analysis. Frans Kalf noted that PEST does allow conditional analysis.

4.2.7 David Klessa then gave a presentation on closure criteria. He spoke about the modeling of solutes in Magela Creek and a re-created Djalkmarra Billabong under wet season effects using historical data.

4.2.8 Terry Hillman then noted difficulties encountered overseas whilst attempting to recreate wetlands, and there was some general discussion on the recreation of wetlands/billabong systems.

Summary of ERA Research and Development

4.2.9 Ray Evans advised that the paper is taken as read, and he asked for comment.

4.2.10 Jenny Stauber asked about the purpose of the wetland filters project in the context of the chemical extraction scheme that might be used to assess bioavailability of metals and radionuclides in wetland sediments. She said that many of the extraction tests that are used are not appropriate for this purpose. Tony Milnes said that he expects a variety of extractants to be used.

4.2.11 Ray Evans raised the issue of land irrigation, and noted possible uncertainty in the numbers, suggesting that David Klessa's work so far has not closed the issue. He queried whether the uncertainty issues were substantial enough for mass balances to be covered off. Tony Milnes confirmed that issue remains uncertain, and will talk to David Klessa in relation to future investigations.

4.2.12 Terry Hillman asked about the land irrigation areas, and what was planned during and after rehabilitation. He queried the topsoil with uranium and different vegetation community that has developed. Tony Milnes acknowledged the irrigation issue, and a change back to no irrigation in the rehabilitation phase of the operation could change the vegetation from that now adapted to "permanently" wet soils. David Jones the talked about research being undertaken in relation to uranium uptake in plants.

4.2.13 Ray Evans queried the reference to "twenty year" of questionable sediment quality monitoring at the bottom of page 7 of ERA's report on R&D projects to February 2006. He asked about solving the problems with representative sampling and chemical analysis by a specifically targeted project approach. Tony Milnes commented that the issue was more about field sampling issues and further work was in progress.

4.2.14 Ray Evans asked about the beneficial use groundwater noted on page 26. Tony Milnes advised that this referred to the uses that people in the area in the future could potentially seek for extracted groundwater. Ray Evans noted that this should be regarded as a resources access issue. Tony Milnes noted that a better definition would make it clearer. Ray Evans noted the potential need to restrict access to some local aquifers on basis of water quality.

4.2.15 Ray Evans asked if the priority for the whole of minesite hydrogeological model had changed. Tony Milnes advised that the project had been approved and would be undertaken in 2006.

ACTION/OUTCOME 4B:

ARRTC thanked EWLS for the report.

Parks Australia

4.2.16 Steve Winderlich introduced himself and spoke about his role in Kakadu National Park. He quickly summarized the paper he had provided and talked through the list of projects in the paper. He then talked about the Kakadu National Park Plan of Management and Kakadu Research Advisory Committee processes that are in place to ensure that research fits into the broader planning processes. He then advised that the landscape change project is particularly important and that several PhD projects have been done.

4.2.17 Jon Nott then asked about channel change. Steve Winderlich advised that a PhD student has been doing work on the impacts of human activity on salt water intrusion in the upper reaches of the South Alligator River floodplain.

4.2.18 Chris Humphrey asked about research into early dry season burning, and Steve Winderlich advised that research had indicated that low-intensity burning should be spread through the year rather than concentrated in the early dry season.

4.2.19 Steve Winderlich then advised that Parks Australia is looking at a formal feedback process so that the Park and Traditional Owners can be provided with information and feedback on research activities. He advised that this would be included in the permit process.

4.2.20 Tony Milnes noted that Mark Gardener of EWLS is working with Parks Australia on a fire mapping project near the ERA leases. Peter Bayliss noted the interaction between staff from ERA, Parks Australia, ERISS and CDU.

ACTION/OUTCOME 4C:

ARRTC thanked Steve Winderlich for his update and expressed ongoing interest in the interactions between research bodies.

Traditional Environmental Knowledge

4.2.21 Howard Smith gave a presentation on Traditional Environmental Knowledge (TEK). He advised that the paper and presentation were the result of work originally started by Elaine Glen. He suggested a link to the New Zealand Cultural Health Index (CHI) website from ARRTC website.

4.2.22 Tony Milnes asked about research on ethnobotany in the Alligator Rivers Region. Howard Smith responded, giving Alcan Gove as an example. He added that the IP belonged to the GAC. Chris Humphrey noted that this has been done for Kakadu National Park and that Parks Australia North has this information.

4.2.23 Ray Evans asked how this issue could be progressed. He added that he would like to see a trial undertaken to establish how it might look. Tony Milnes noted feedback from traditional owners on the Ranger final landform as a good example. Geoff Kyle noted significant paradigm differences between Aboriginal people and other cultures.

4.2.24 Ray Evans asked Howard Smith what NLC would like from ARRTC, and Howard Smith advised that he will consult with GAC to determine its views.

4.2.25 Keith Hayes noted some of the new work (such as that done by Barry Hart) on ecological risk assessment. He noted that the new work included consultation with stakeholders as an important component. He suggested that ARRTC could keep a watching brief on this issue.

ACTION/OUTCOME 4D:

ARRTC asked for a report back on status of progress of Traditional Environmental Knowledge at the next ARRTC meeting.

4.2.26 Tony Milnes noted the need for Traditional Owners to extend invitations to participate in consultations, and that we need to be able to respond. Keith Hayes noted that the western scientific paradigm would be proactive rather than reactive. Howard Smith then noted the different views of time and space, and that we could not engage with Traditional Owners using the same model as white culture.

ACTION/OUTCOME 4E:

ARRTC thanked Howard Smith for his report and noted an ongoing interest in the use of Traditional Environmental Knowledge in the Alligator Rivers Region.

SSD – 2006–07 Research Projects

4.2.27 Peter Bayliss gave a presentation on ERISS 2006-07 research projects, and provided an overview of activities addressing the Key Knowledge Needs including priorities, timelines and project selection.

4.2.28 David Jones then gave an update of bioaccumulation/bushtucker work from a recent workshop. Ray Evans then noted the high quality of the workshop process.

4.2.29 Members then discussed the issue of bushtucker and assessment processes, for example destructive testing of wildlife to determine radionuclide uptake. There was also discussion on radium uptake in mussels.

SSD – Ecosystem establishment workshop

4.2.30 Carl Grant gave a presentation on the ecosystem establishment workshop that was held in December 2005. He gave an overview of the workshop's processes and aims.

4.2.31 Mark Gardener advised that a gap analysis was being presented to ERA's closure team and that it will then feed into ERA's closure processes. Jenny Stauber asked whether any attempt to prioritise tasks had been attempted, and Carl Grant advised that this will be the next step. Peter Bayliss advised that he had met with Mark Gardener and they have restructured the table of key task and responsibility assignments produced from the Ecosystem Establishment workshop to set it out better and make for easier identification of projects.

4.2.32 Geoff Kyle then advised that some Traditional Owners do not understand the processes behind the changes to the Ranger rehabilitation plan that might extend from annual changes to the mine plan. Carl Grant and David Jones noted that the critical science needs to continue in the background, regardless of shifting timeframes for ERA operations.

4.2.33 Ray Evans then noted that he would like to see words turned into projects for later reporting to ARRTC.

ACTION/OUTCOME 4F:

ARRTC thanked Carl Grant for his report.

4.2.34 David Jones then gave a presentation the highlights and time critical components of the ERISS 2006-07 work program.

4.2.35 Ray Evans asked why ERISS was now collecting data on a continuous basis. David Jones advised that, in addition to the key water quality parameters of pH and EC, continuous measurements of turbidity provided the ability to calculate sediment loads. Historically, water samples are collected in the morning whilst storm events occur in the afternoon and evening. Hence, the weekly grab sample turbidity record provides a very poor record of sediment transport in Magela Creek. Ray Evans then noted the need for a hydrologic model to test travel times for water down the Creek. There was then some general discussion on continuous monitoring in Magela and Gulungul Creeks. Alan Hughes noted the long-term usefulness of the program, adding that it is not resource intensive. Jenny Stauber advised that she had already talked to Rick van Dam about the ecotoxicology program, and Jon Nott advised that he will talk with Ken Evans about floods and extreme events, and the need to define an appropriate rainfall scenario to be used for extreme event modeling. He suggested that the Holocene climatic optimum could be an analogue for a future climate regime..

4.2.36 Keith Hayes then noted the need for appropriate control site selection with appropriate controls in place for upstream versus downstream. This is already covered by having a control in another catchment.

4.2.37 Keith Hayes then raised the issue of landscape scale analysis, and noted that he would speak with Peter Bayliss out of session. Keith Hayes then talked about normalizing impacts (the “distance to target” approach). David Jones advised that he regards the landscape scale work as a “flagship” output.

4.2.38 Ray Evans then asked about the non-hydrologic extreme events such as earthquakes and tsunamis. David Jones advised that fire is also regarded as a non-hydrologic extreme event and is being looked at. He added that seismic events are regarded as landform design issues.

4.2.39 Ray Evans then commented on the lack of a specific ERA or ERISS project to quantify the effect of surface/groundwater interactions on the surface flux of solutes. He noted that the groundwater models give average seepage rates but was unsure how that translated to concentrations in the groundwater flow field.

4.2.40 Tony Milnes then noted that CSIRO are currently using isotopes to investigate surface/groundwater interactions. One of the interesting aspects of this work will be looking at the length of time taken by rainfall to exit the above-grade landform system as seepage.

4.2.41 Ray Evans asked about the objective of the Nabarlek groundwater modeling project, and why the work was being done. David Jones advised that it was being undertaken to look at the attenuation of solutes down-gradient from the pit source, as well as to assess the predictive capability of groundwater transport models. Ray Evans considered that pre-model scoping is needed to consider whether there are sufficient data to support such an exercise. David Jones advised that Bruce Ryan is currently doing collation and preliminary assessment of data.

4.2.42 Ray Evans asked Rick van Dam whether the risk assessment processes changed significantly from operational to rehabilitation scenarios. Rick van Dam noted that the current model is based on operational mining, and that it will need to change to ensure that it remains relevant.

4.2.43 Ray Evans queried a possible alkaline pulse from the system after rehabilitation, and both David Jones and Tony Milnes suggested that this was unlikely to be the case.

ACTION/OUTCOME 4G:

ARRTC noted the need for further systemic hazard analysis in the closure planning, noted the need for an integrated closure approach, and asked Tony Milnes to provide an update on the ERA/Rio Tinto Ranger closure plan at the next ARRTC meeting. The first pass Ranger Closure Model was presented to the MTC on 27 March 2006.

SSD – Landform design workshop

4.2.44 Ken Evans introduced himself and gave a presentation on the 2005 landform design workshop. He described the workshop methodology and processes, and the meeting discussed *Siberia* versus *Caesar* modeling.

4.2.45 Jon Nott expressed some concerns in relation to reliability when using rainfall records. Ken Evans advised that he is looking at a range of other factors to get around this. He added that Gary Willgoose will probably assist with this work.

4.2.46 Jon Nott noted the need to cater for extreme event scenarios, and advised that he is able to go back some 30,000 years using rock pool information. He advised that this information showed different extreme event scenarios, and that this is a big improvement on the information available using 2,000 to 3,000 year records. Jon Nott then noted that modeling should use variable rainfall patterns rather than simply static patterns. He added that isotopic/geochemical information (such as stalagmites) could give useful information about extreme events. There was some discussion on this issue, with Geoff Kyle advising that some useful stalagmites are located in the Deaf Adder area of Kakadu National Park but permission for access would likely to be an issue.

4.2.47 Ray Evans asked Ken Evans about the physical characteristics parameters of soil used in the *Siberia* model. Ken Evans responded that soil characteristics do not get put into *Siberia*, and that *Siberia* looks at erosion rates. Ray Evans then asked about soil and water infiltration, and expressed the need to use consistent soil parameters in models in order to get the right outcomes. Keith Hayes agreed.

4.2.48 Ray Evans then noted the need for action, and suggested that some of the *Siberia* parameters could be varied. Ken Evans responded, suggesting that *Siberia* is a tool to identify at an early stage any significant problems that may arise, and then provides an opportunity to fix problems before they occur. Tony Milnes added that objective of the exercise is not to produce a stable landform but to attempt the creation of a landform that will behave in a predictable manner over the long term. Ken Evans noted that the Scinto 6 site in the South Alligator River valley is a useful analogue to derive parameters used in the *Siberia* model.

4.2.49 Ray Evans noted the possible change in soil type, and suggested that different erosion rates can impact on water flows, noting for example, what happened at the Captain's Flat Mine in NSW.

Ranger closure plan consultation

4.2.50 Alan Hughes noted that workshop process demonstrated that landform design is not a simple task. He added that lots of thought has gone into the process.

4.2.51 Mark Gardener then asked ARRTC about settling rates for waste rock. Ken Evans noted the surface stability project which might include modeling. There was then some discussion about the consolidation of the landform during rehabilitation.

4.2.52 Carl Grant asked if there were any lessons to be learned from Nabarlek. Mark Foy responded, advising that there was not much to be learned due to the much smaller pit and different ongoing issues.

4.3 Reassess existing threats

5 Other Business

5.1 Environmental NGO representative

5.1.1 The meeting then considered the issue of an environmental NGO representative for ARRTC.

5.1.2 Tony Milnes then noted the attendance at ARRTC meetings of Geoff Kyle as a GAC observer, and that this probably satisfies the original desire to have a formal NGO representative. He asked about the Environment Minister 2001 decision.

5.1.3 Ray Evans advised that his preference is to maintain the *status quo* for the time being whilst further research is conducted.

5.1.4 Jill Fitch asked about the World Heritage Committee processes, and whether ARRTC was involved in any reporting to the World Heritage Committee. Ian Loftus suggested that he could locate the Australian Government's reports to the World Heritage Committee and make them available to ARRTC.

ACTION/OUTCOME 5A:

ARRTC Asked Ian Loftus to investigate the background to the environmental NGO issue and to locate Australia Government World Heritage Committee reports.

6 Next Meeting

6.1 Next Meeting

6.1.1 Members considered possible dates for the next meeting. It is likely to be 16-17 October 2006 subject to feedback from ARRTC members.

6.2 Induction Information

6.2.1 Ray Evans asked Keith Hayes, Jon Nott and Jenny Stauber about the type of induction/background information they would like. It was agreed that a site visit would be beneficial.

ACTION/OUTCOME 6A:

ARRTC asked Ian Loftus to arrange a Ranger minesite visit back-to-back with next ARRTC meeting.

Appendix 1 – Tabulated Actions/Outcomes List

ACTION/OUTCOME 2A:

ARRTC agreed that the draft Summary Record was, subject to the amendments noted in paragraphs 2.1.1 to 2.1.6 above, a true record of the 16th ARRTC meeting.

ACTION/OUTCOME 2B:

ARRTC requested that further contextual detail be provided in the *Actions/Outcomes* summary paper for the next ARRTC meeting.

ACTION/OUTCOME 2C:

ARRTC asked that the Agenda for the next meeting be made available much earlier than has been the case for previous meetings.

ACTION/OUTCOME 3A:

ARRTC asked that time-series water quality results for water leaving the Ranger Water Treatment Plant be provided to the next ARRTC meeting.

ACTION/OUTCOME 3B:

ARRTC noted that it will seek feedback from out-of-session consultation with Jill Fitch, and asked that this issue be included for discussion at the next ARRTC meeting following action through the MTC process.

ACTION/OUTCOME 3C:

ARRTC thanked Julian Barry for his update.

ACTION/OUTCOME 4A:

ARRTC noted that an out-of-session Key Knowledge Need gap analysis would be undertaken with follow-up at the next ARRTC meeting.

ACTION/OUTCOME 4B:

ARRTC thanked EWLS for the report.

ACTION/OUTCOME 4C:

ARRTC thanked Steve Winderlich for his update and expressed ongoing interest in the interactions between research bodies.

ACTION/OUTCOME 4D:

ARRTC asked for a report back on status of progress of Traditional Environmental Knowledge at the next ARRTC meeting.

ACTION/OUTCOME 4E:

ARRTC thanked Howard Smith for his report and noted an ongoing interest in the use of Traditional Environmental Knowledge in the Alligator Rivers Region.

ACTION/OUTCOME 4F:

ARRTC thanked Carl Grant for his report.

ACTION/OUTCOME 4G:

ARRTC noted the need for further systemic hazard analysis in the closure planning, noted the need for an integrated closure approach, and asked Tony Milnes to provide an update on the ERA/Rio Tinto Ranger closure plan at the next ARRTC meeting. The first pass Ranger Closure Model was presented to the MTC on 27 March 2006.

ACTION/OUTCOME 5A:

ARRTC Asked Ian Loftus to investigate the background to the environmental NGO issue and to locate Australia Government World Heritage Committee reports.

ACTION/OUTCOME 6A:

ARRTC asked Ian Loftus to arrange a Ranger minesite visit back-to-back with next ARRTC meeting.