

Alligator Rivers Region Technical Committee

13th Meeting

Darwin - 15-16 March 2004

Summary Record of Meeting

Members Present

Prof Barry Hart – Chair, Independent Member
Mr Ray Evans - Independent Member
Ms Jill Fitch – Independent Member
Mr Mark Foy – Northern Land Council
Dr Carl Grant - Independent Member
Dr Terry Hillman - Independent Member
Prof Doug Holdway - Independent Member
Dr Arthur Johnston – Supervising Scientist
Mr Tony McGill - Department of Business, Industry and Resource Development
Dr Tony Milnes – Energy Resources of Australia Ltd
Prof Gerald Nanson - Independent Member
Mr Peter Wellings – Parks Australia

Apologies

Mr Shane Maraldo – Pioneer International Ltd

Observers and Advisors Present for Part or All of the Meeting

Dr Peter Bayliss - Environmental Research Institute of the Supervising Scientist
Dr Ken Evans - Environmental Research Institute of the Supervising Scientist
Dr Max Finlayson - Environmental Research Institute of the Supervising Scientist
Ms Elaine Glen – Northern Land Council
Mr Ian Hollingsworth - Earth Water Life Sciences Ltd
Mr Alan Hughes - Department of Business, Industry and Resource Development
Dr Chris Humphrey - Environmental Research Institute of the Supervising Scientist
Ms Michelle Iles - Office of the Supervising Scientist
Dr David Jones - Earth Water Life Sciences Ltd
Dr David Klessa - Earth Water Life Sciences Ltd
Mr Ian Loftus – ARRTC Secretariat
Mr Ian Marshman - Energy Resources of Australia Ltd
Dr Paul Martin - Environmental Research Institute of the Supervising Scientist
Ms Ingrid Meek - Earth Water Life Sciences Ltd
Dr Paul Reddell - Earth Water Life Sciences Ltd
Mr Mark Sonter – consultant to Energy Resources of Australia Ltd
Ms Ann Thompson - ARRTC Secretariat
Dr Rick Van Dam - Environmental Research Institute of the Supervising Scientist
Mr Alex Zapantis – Office of the Supervising Scientist

1 Introductory Session

1.1 Welcome and Overview

1.1.1 The meeting opened at 0900 on Monday 15 March 2004 with Barry Hart welcoming members, observers and advisors.

1.1.2 Barry Hart acknowledged Max Finlayson's receipt of the Australian Society for Limnology (ASL) Medal for 2003 for his work in the world-wide promotion of Australian limnology and wetland management through his involvement and advisory role in international wetland affairs, including his involvement with the Ramsar Convention's Scientific and Technical Review Panel since its inception in 1993.

1.2 Apologies and Observers

1.2.1 The apologies of Mr Shane Maraldo was noted. Barry Hart also noted that a range of observers from various organisations would be present during different parts of the meeting.

1.3 Declaration of any conflicts of interest with agenda items

1.3.1 No conflicts of interest with any agenda items were declared by members.

2 Draft Summary Record of 12th Meeting – September 2003

2.1 Discussion of Draft Summary Record

2.1.1 Max Finlayson noted that Action/Outcome 8 omitted two key dot points which were reflected at 3.5.8 of the draft Summary Record; this paragraph stated "Ray Evans noted that two separate issues existed. First is the operational issue, with funding required for the maintenance/upgrade of the network. Second is the strategic issue, with a need to assess the overall data requirements."

2.1.2 Terry Hillman raised paragraph 4.3.9 as an issue; he noted that the focus of his statement should reflect "what can be done?".

2.1.3 Gerald Nanson raised paragraph 2.1.1 in relation to meeting papers being provided well ahead of meetings. He felt that there needs to be more effective management of papers with relevant papers noted for the attention of members. Arthur Johnston noted that this issue would be considered at agenda item number 8.

2.2 Business Arising

2.2.1 Barry Hart read through the list of action items from previous meeting that was appended to the draft Summary Record of that meeting. He started by noting that the strategic/business plan had not been implemented yet, but suggested that ARRTC was now closer to being able to implement this as the Committee was becoming more strategic and less operational in its focus.

2.2.2 Action/Outcome 3 - *Tony Milnes and Arthur Johnston will work to finalise the Key Knowledge Needs document and then provide it to Barry Hart with the aim being to circulate to ARRTC members by Christmas 2003 with discussion to occur at the March 2004 ARRTC meeting.*

Barry Hart observed that this process did not occur as planned, but would be discussed during this meeting. Tony Milnes noted that he and Arthur Johnston had advised Barry Hart that the Christmas 2003 deadline would not be achieved.

2.2.3 Action/Outcome 4 - *Tony McGill will provide the Radiological Audit report to Jill Fitch.*

Jill Fitch advised that she had seen the report.

2.2.4 Action/Outcome 7 - ARRTC: *Noted the paper on sediment modelling and thanked ERISS staff for their work; and, Noted that more work needed to be done in relation to sensitivity and power analysis.*

Max Finlayson noted that the definitions and use of power analysis seem to differ between engineers and scientists. Max Finlayson advised that further statistical expertise was being sought to ascertain how power analysis could be used with correlated data.

2.2.5 Action/Outcome 10 - ARRTC: *Noted the presentation on wetland filters, and noted their role in both operational and post-mining phases; Requested that the identity of the *Elocharis* species be confirmed and that this be taken into account in future work; Indicated that the information provided gave them a lot of confidence in performance of the wetlands filters; Expressed support for the risk-based approach used in the EWLS report; and, Thanked David Jones for his presentation and paper.*

Tony Milnes advised that Ian Loftus had been provided with a copy of advice relating to the *Elocharis* species issue, and that *Elocharis dulcis* was the plant concerned. Barry Hart noted that this is a critical area with ongoing activity and that it will need to remain as a research priority.

2.2.6 Action/Outcome 12 – ARRTC members: *Noted that radiological monitoring is a high priority area for ARRTC; Welcomed the opportunity to be involved in the process; Noted that it could not proceed any further until further information was provided; Agreed that Jill Fitch would review Ian Marshman's paper and provide feedback to ARRTC at the next meeting; and Sought an updated paper from ERA (with statistical analysis) for presentation to the next meeting.*

Barry Hart noted that this issue would be discussed at this meeting.

2.2.7 Action/Outcome 16 - ARRTC: *Thanked Rod Kennett for his paper and briefing; and Undertook to provide him with the Key Knowledge Needs document when finished.*

Barry Hart reiterated the need to provide the Key Knowledge Needs documents to Rod Kennett when finalised.

2.2.8 Barry Hart then asked members if they had anything further to raise in relation to the business arising from the summary record of the previous ARRTC meeting.

2.2.9 Ray Evans referred to paragraph 3.7.7 noting the end of Wet Season events in Gulungul, Magela and Swift Creeks. He suggested that there may be alternative explanations to the model described at the last meeting, and that he was in contact with EWLS as he has an ongoing interest. Ray Evans will keep a watching brief.

2.2.10 Tony Milnes noted the level of interaction between ARRTC members and other stakeholders. Arthur Johnston then noted the need to keep Ian Loftus in the e-mail loop to ensure that effective coordination of information takes place.

2.2.11 Carl Grant then asked about paragraph 4.3.18 and the Nabarlek rehabilitation bond issue. He asked if Tony McGill could give an overview of the process used in determining the rehabilitation bonds. Tony McGill advised that this information could be provided at a subsequent meeting. Tony McGill then noted some amendments to the bond amounts that he advised at the last meeting, and that the reference should be to \$20m rather than \$10m. He noted that this is an ongoing process. He added that all the money from the previous bond had been released and a new \$400,000 bond set, to cover the estimated rehabilitation requirements. He noted that due to the time taken for the administrative process to be completed, the bond had only been amended several weeks prior to this ARRTC meeting.

2.2.12 Arthur Johnston then noted the requirement for the Northern Territory to consult with the Commonwealth. He then outlined the exchange of letters between the Supervising Scientist, the Commonwealth Minister for Industry, Tourism and Resources, and the Northern Territory Minister for Mines and Energy that had occurred in relation to this matter. He noted that the Northern Territory had undertaken to include the Supervising Scientist in future processes. It was also noted that the bond amount could be increased at some future point if required.

2.2.13 Barry Hart then asked Tony McGill about the scientific basis for the decision to amend the bond amount, and how this related to the calculation of the bond amount. He then noted that Carl Grant's question was very relevant, and that ARRTC needed to be assured of the science behind the decision. Tony McGill noted the basis for the calculation, and added that the rehabilitation costs are often difficult to assess. He added that assessments made by the Northern Territory Government and the mining company are often compared. Tony McGill then noted that some mining companies had better credit ratings than the banks that were being guarantor for rehabilitation bonds.

Action/Outcome No 2A.:

ARRTC:

- endorsed the draft Summary Record of the 12th Meeting subject to amendments noted in discussion; and
- noted that Tony McGill will provide a briefing on the rehabilitation bond processes at the next ARRTC meeting.

3 Research Activities and Key Knowledge Needs

3.1 Key Knowledge Needs

3.1.1 Barry Hart opened discussion on the ARRTC Key Knowledge Needs issue, and referred to the three tabled documents: the draft revised Key Knowledge Needs document, Chapter 12 of the Alligator Rivers Region research summary, and an ERA Research and Development paper. Barry then expressed a desire to have the Key Knowledge Needs focussed into a strategic document at this meeting.

3.1.2 Arthur Johnston reiterated a concern that he had expressed at the September 2003 meeting; that the document needed to be expanded to give ownership to all ARRTC members rather than just the seven independent scientific members. He noted that some areas in the revised document needed further material; and he agreed that Tony Milnes and he would revise the document. Arthur also linked the Key Knowledge Needs discussion to the Supervising Scientist Division Strategic Review currently underway.

3.1.3 The meeting then noted that the revised draft Key Knowledge Needs document is a synthesis of several earlier documents. The meeting noted the structure of the paper, and that some parts are similar in structure to the earlier document, and that some issues have been teased apart and made more specific.

3.1.4 Arthur Johnston noted that he and Tony Milnes felt that the revised document incorporates what ARRTC had originally intended, and that Chapter 12 of the Alligator Rivers Region research summary adds further detail to the smaller document.

3.1.5 Carl Grant advised that he thought that it looked like a new document, rather than being a revised version of the work that the seven independent scientific members originally

undertook. Arthur Johnston responded, adding that the document now included ERA and ERISS views as well as those of the independent scientific members.

3.1.6 Carl Grant suggested that the document had no overall objective, and that some of the bullet points are far too broad. Arthur Johnston responded, noting that he felt that the document actually went further than the original Key Knowledge Needs document in the level of information it presented. Ray Evans advised that the context of the two documents had not made sense until Arthur Johnston had explained and referred to Chapter 12.

3.1.7 Terry Hillman advised that he had spoken with Arthur Johnston, and they had acknowledged that the various stakeholders will not all share the same view of a post-mining Alligator Rivers Region. It is, therefore, difficult to be very specific in a Key Knowledge Needs document because of the different perceptions. Barry Hart then noted that the Commonwealth Environmental Requirements provided information on what the Alligator Rivers Region should look like.

3.1.8 Tony McGill noted a key point, in that there are shifting goalposts and an uncertain future in relation to options for a rehabilitated minesite at Ranger. He noted that there are many options to consider in the overall picture; for example, in 2021 the Jabiru town lease will expire. He asked about other issues, such as what factors need to be considered. He noted that the Key Knowledge Needs would need ongoing revision to remain relevant.

3.1.9 Arthur Johnston then advised that the draft document is based on assumptions that the Ranger mine will progressively wind down operations and that the Jabiluka mine will not proceed.

3.1.10 Terry Hillman then noted that linkages would need to be made between rehabilitation and any future mines; there is a need to define the parameters of where ARRTC is working to ensure that the full scope is known. Carl Grant added that some options require lots of additional change, for example the Ranger Mill Alternative. Tony McGill then noted that the uranium price is currently increasing, and that market forces have the potential to keep Ranger operational for some time.

3.1.11 Barry Hart advised that ARRTC should focus on the current scenario, which is most likely for the time being, but that we should not discount any other possibilities as the Key Knowledge Needs might change significantly.

3.1.12 Arthur Johnston noted that the draft revised Key Knowledge Needs document does include some hypotheticals, for example the Jabiluka issues,

3.1.13 Arthur Johnston then noted that he was keen to get the Key Knowledge Needs document finalised, as it had dragged on for several meetings Barry Hart then acknowledged the environment in which the Key Knowledge Needs were being developed, but noted the ARRTC remit in relation to achieving agreement on the scope.

3.1.14 Ray Evans then advised that he would like to see the Key Knowledge Needs and Chapter 12 document rolled into one single document. Barry Hart then noted that the first Key Knowledge Needs document is a risk framework document, and that the second draft is significantly different. Ray Evans then noted that he felt more time was needed to read documents and get a better understanding of their structures and content.

3.1.15 Carl Grant reiterated that he felt as though the two Key Knowledge Documents were significantly different, and that the original document has been rewritten. Tony Milnes noted that both documents had the same function, and that the revised version incorporates all the original issues. Arthur Johnston advised that the structure had been changed to allow focussed outcomes for ERA and ERISS.

3.1.16 Barry Hart added that the original Key Knowledge Needs document was at a very high level, with the subsequent documents adding extra layers of information. Arthur Johnston added that the original Key Knowledge Needs document had been synthesised to provide a framework for action.

3.1.17 Carl Grant then advised that he could not see the purpose of the Chapter 12 document. Ray Evans noted that the Chapter 12 document provided the context for the Key Knowledge Needs, and that he now sees the draft revised Key Knowledge Needs as “version 2”. He noted that it is important to ensure that the important elements of version 1 are incorporated into version 2.

3.1.18 Jill Fitch advised that she thought that the Key Knowledge Needs document should be a whole-of-ARRTC document, and that joint ownership by the whole of ARRTC (not just the independent scientific members) is needed. She noted that the Chapter 12 document appeared to be authored by only two ARRTC members. Tony Milnes answered and provided some context; he gave an overview of the Johnston & Milnes document, and then talked about the ERA Research and Development Plan discussion held with the Department of the Environment and Heritage in Canberra.

3.1.19 Gerald Nanson advised that he had not attended the original ARRTC Key Knowledge Needs meeting, but that he agrees with Terry Hillman and Carl Grant in that there appeared to be no key objectives for the Key Knowledge Needs, and that these need to be established. He added that the independent scientific members have a different view than other members.

3.1.20 Doug Holdway suggested that there did not appear to be a huge difference between the documents, and that any differences could be resolved. He then added that the remainder of the agenda should not be abandoned in favour of only considering the Key Knowledge Needs.

3.1.21 Barry Hart then asked if context could be added to the new draft Key Knowledge Needs document. Terry Hillman then suggested that there would not be significant change to the document, and added that it could be achieved now.

3.1.22 Carl Grant, again, expressed concern about the context of the Key Knowledge Needs document, suggesting that he could not see the usefulness of the draft document only, and that it needs the Chapter 12 context added. He further noted that it also needs balance across the various Key Knowledge Needs with context added for each dot point.

3.1.23 Jill Fitch advised that she was still worried about authorship of the Chapter 12 document, and that she thought that its purpose was to inform the Key Knowledge Needs. Arthur Johnston then explained the process of writing the dot point Key Knowledge Needs document and its relationship with the Chapter 12 document.

3.1.24 Barry Hart suggested that the two documents go far enough in covering the scope of the Key Knowledge Needs, and that background is needed. Arthur Johnston noted that this level of context would be easy to provide.

3.1.25 Terry Hillman then noted that he did not like the spatial structure of the revised Key Knowledge Needs document, and that he prefers a functional rather than operational level document. He suggested that the Key Knowledge Needs document could pick up some higher level material.

3.1.26 There was then some general discussion on the form that the revised document might take. Doug Holdway suggested that the two documents could be merged. Barry Hart suggested that the revised draft Key Knowledge Needs document could be used as the basis, with context being added from the other documents.

3.1.27 Tony Milnes queried how the Key Knowledge Needs would fit in relation to ARRTC's strategic plan, and Barry Hart advised that he sees this new Key Knowledge Needs document as a draft strategic plan for the next five years.

3.1.28 There was then further discussion on the structure of the revised Key Knowledge Needs document, with Arthur Johnston suggesting that a paragraph under each dot point is needed to provide the required context. Terry Hillman agreed, noting that he would not like to see Chapter 12 wholly reproduced in the Key Knowledge Needs document.

3.1.29 Barry Hart then suggested that the general Alligator Rivers Region material should be located at the front rather than at the back of the Key Knowledge Needs document. Tony Milnes disagreed, noting that the general Alligator Rivers Region projects arose out of the specialised, mine-specific projects.

3.1.30 Barry Hart suggested that two options existed; either spend more time now, or do the work out-of-session and wait until the next meeting. He added that he is looking for an easy way forward that would allow ARRTC to make progress, even though final sign-off of the Key Knowledge Needs document might not happen at this meeting. Barry Hart then suggested that the document could be progressed within the next few weeks, and could be signed off out of session through an e-mail discussion.

3.1.31 Arthur Johnston then went through the Key Knowledge Needs timescale/priorities document and explained the rationale behind the timescales and priorities schema. The timescales are: immediate, 1-5 years, and 5-10 years, and the priorities are: significant, medium, and low. He also noted that the responsible organisation might sometimes overlap. Arthur Johnston then described each of the dot points and explained why certain criteria and rankings had been applied.

3.1.32 The first part of the document considered Ranger current operations. Jill Fitch asked about the wetland filters, and queried whether some had reached saturation point. Tony Milnes advised the meeting that the wetland filters are working well at the moment and are effective. Then some discussion followed on wetland filters.

3.1.33 The second part of the document considered Ranger Rehabilitation, and noted rationales for priorities. Doug Holdway queried whether the timeframe for ecosystem establishment was reasonable. Arthur Johnston responded, noting that the work must be done regardless of whether timeframe is appropriate.

3.1.34 Carl Grant sought clarification of the reference to "testing of trial landforms", and Tony Milnes responded, noting that it came out of an earlier Carl Grant paper in relation to the behaviour of stable rehabilitation landforms.

3.1.35 Ray Evans then asked about the final landform design in relation to the human offsite perspective. Arthur Johnston noted the Environmental Requirement that the rehabilitated landform should look similar to the surrounding landform. Ray Evans noted that the geochemical signature of the waste rock is a concern of his, and Tony Milnes responded, noting off site limits for acidity and water quality closure criteria.

3.1.36 The third part of the document considered Jabiluka. Arthur Johnston gave an overview of this aspect. Ray Evans asked about the Jabiluka irrigation area, and Tony Milnes advised that the area is relatively clean of contaminants and has now been rehabilitated. Ray Evans then asked if he could see relevant reports, and Tony Milnes advised that they could be provided.

3.1.37 Barry Hart then noted the need to add knowledge management and communications to the Key Knowledge Needs. He suggested that the wording used in the original Key

Knowledge Needs document (the version dated 4 June 2003) could be used. Arthur Johnston then advised that some broadly consistent words (four dot points) had been included at the bottom of revised document.

3.1.38 It was then agreed that the two documents would be meshed to develop a final draft Kay Knowledge Needs document, and that this revised document will include the broader context.

3.1.39 Barry Hart then foreshadowed possible discussion on how future scenarios might be incorporated into the Key Knowledge Needs to address the possibility of new events. Tony McGill noted that the Jabiru town lease, the world uranium market, and the future of Jabiru were all likely to have impacts. Mark Foy then noted that the potential for additional mining at Ranger had the potential to impact on any future Jabiluka options.

3.1.40 Tony Milnes then suggested that ARRTC should take an “eminently adaptable role” to avoid getting locked in to fixed futures.

3.1.41 Tony Milnes advised that ERA has taken view that Jabiluka is off the agenda for the time being, and that it very difficult to predict what might happen in relation to Jabiluka in future years. Arthur Johnston suggested that ARRTC could look at reasonable foreseeable scenarios, but should avoid research that could be used to enable further uranium mining.

3.1.42 Jill Fitch then asked about trends in the price of uranium, and whether this could effect the milling of mineralised material as the ore will now become more economic to exploit. She also noted that demand could exceed supply within several years. Ray Evans also suggested that lead time-series (baseline) data would be needed ahead of research to give a picture of how things are pre-mining.

3.1.43 Gerald Nanson noted that some of the long-term studies were unreliable, and that there is a need to get a good grasp of extreme events in the Alligator Rivers Region, including rainfall and flood issues. Tony McGill then noted that extreme events could have a catastrophic impact on human population. Tony McGill and Arthur Johnston then noted the importance considering catastrophic events in relation to Magela Creek due to the storage of tailings in Pit#3.

Action/Outcome No. 3A:

ARRTC:

- agreed, in principle, with the revised draft Key Knowledge Needs document. However, the final draft will include a context of the broad assumptions, context to the headings provided, and provide more information on the dot points – why is it an issue, what is the objective, and what actions will be taken on what timescale.;
- agreed that the document would be amended and then provided to members out-of-session for agreement;
- noted that ERA would provide ARRTC members with copies of documents relating to Jabiluka long term care and maintenance, if requested;
- noted that Gerald Nanson would interact with ERISS on catastrophic events issues; and
- noted that Tony Milnes, Tony McGill, Arthur Johnston, Barry Hart, and Ian Loftus would meet to identify possible future scenarios for the Alligators Rivers Region.

ERA research and development document

3.1.44 ARRTC members then discussed the ERA Research and Development document. Carl Grant queried the comment in the ERA document about a possible substantial reduction in funding, and what the statement actually meant. Arthur Johnston then noted the context of the document; it reflects what had been discussed between ERA and the Department of the Environment and Heritage in relation to the funding provided by ERA to support the work of the Supervising Scientist. Barry Hart noted that this should not concern ARRTC unless it adversely affects the ability of ERISS to conduct research.

3.1.45 Carl Grant queried whether the timeframe for Ranger rehabilitation was realistic or simply a gross estimation, and Tony Milnes advised that the timeframes were only indicative and not based on precise estimations.

Action/Outcome No. 3B:

ARRTC thanked Tony Milnes for his paper and briefing on ERA's research and development program.

3.2 Environmental Research Institute of the Supervising Scientist Research

Magnesium Sulfate (MgSO₄) Toxicity

3.2.1 Rick Van Dam talked to the ERISS paper on Magnesium Sulfate (MgSO₄) toxicity, noting that the paper was prepared in response to discussions held with EWLS in February 2004. He then advised that the paper's content was linked to development of trigger values for MgSO₄.

3.2.2 Arthur Johnston then noted the extremely low concentrations of MgSO₄, and that it was not traditionally regarded as a toxicant. Doug Holdway also noted that it is important to look at Retention Pond 1 toxicity. Rick Van Dam advised that an Mg trigger value could be developed, and that 1.0 mg/L would be the likely level.

3.2.3 Rick Van Dam then talked about Ca:Mg ratios and the amelioration of Mg toxicity by the presence of Ca. Ray Evans asked about the Mg toxicity concentration range, and Rick Van Dam advised that it would be ~4 mg/L.

3.2.4 Rick then gave an update on work in relation to progress of mesocosm experiments. Barry Hart commented that ARRTC had seen this work being done (field trip several meetings ago)

3.2.5 There was then some general discussion on trigger values, and Barry Hart then commented that he had not seen a trigger defined that way. Doug Holdway noted that these MgSO₄ triggers are at the "cutting edge of science", and that good work is being done by ERISS.

3.2.6 Doug Holdway then asked Rick Van Dam about the use of EC as a surrogate for Mg. David Jones then noted derived ecotoxicology values in relation to water quality, and upstream versus downstream comparisons. David Jones then noted that there was also an important philosophical basis of local values of the Kakadu National Park environment.

3.2.7 Arthur Johnston then asked whether the NLC had particular views on the MgSO₄ issue, and Mark Foy noted that he was impressed with progress, and that this type of work had been sought by NLC for some years.

3.2.8 Rick Van Dam then concluded his presentation, and noted that the final version of paper is still under development.

Action/Outcome No. 3C:

ARRTC:

- thanked Dr Rick Van Dam for his paper and presentation on MgSO₄ toxicity; and
- endorsed the process and methodology for MgSO₄ toxicity being used by ERISS.

ISP Landscape Project Progress

3.2.9 Max Finlayson gave an update and overview of progress in relation to the ISP landscape project.

3.2.10 Ray Evans noted that he understood what was trying to be achieved through the paper, and asked about World Heritage and landscape scale issues. He queried if the ERISS work was moving away from original World Heritage Committee remit. Max Finlayson then talked about the landscape issues used, and that they had been based on the analysis of a range of factors, including weeds, fire, feral animals, mining impacts, and climate change impacts on ecosystem.

3.2.11 Barry Hart advised that he could not see any priority in the raft of projects presented, and Max Finlayson responded, noting that a mapping exercise is in place to look at the relative impacts of each factor. Ray Evans asked whether the factors could be spatially mapped, and Max Finlayson advised that it can be done, but not with the same degree of certainty for all.

3.2.12 Gerald Nanson then asked whether the work was too academic, rather than being applied. He then queried how much does it cost each year. Arthur Johnston noted that the cost was important, and that is why it needs to be looked at by ARRTC regularly to ensure continued relevance.

3.2.13 Barry Hart asked about World Heritage values, and whether they are documented. Max Finlayson advised that Peter Wellings would be aware of these. Peter Wellings then advised that *Environment Protection and Biodiversity Conservation Act* attributes are being reported against, and that they are very broad and at a relatively high level.

3.2.14 Arthur Johnston noted that there needs to be a big picture summary of what the issues are and how can they be defined and be reported against. Max Finlayson then noted that an overview paper is intended to be published.

3.2.15 Arthur Johnston then asked the meeting what it felt ARRTC's role should be in this area. Gerald Nanson then queried whether ARRTC's function is to "rubber stamp" the ERISS work. Barry Hart responded, advising that he saw ARRTC's remit as being involved in the higher level issues such as landscape scale. Gerald Nanson then noted that he wants to know which projects are viable and which are less viable. Arthur Johnston then suggested that a quantitative risk assessment of the major factors could be appropriate.

3.2.16 Barry Hart then outlined options at the broader level, noting that Arthur Johnston and Max Finlayson seem to want a judgement as to how things are progressing. Gerald Nanson expressed a view that this type of issue is board of management level, and that lots of time would be needed to evaluate the projects. Tony Milnes then outlined the project approvals process used by ERA.

3.2.17 Ray Evans then queried the impact of an ARRTC decision on the ISP work, and Arthur Johnston responded, advising that he would like to know ARRTC's thoughts in relation to ongoing priorities for landscape scale research. Max Finlayson then added that he

wanted to have ARRTC's confidence that the work being done by ERISS in relation to landscape assessment was on track.

Action/Outcome No. 3D:

ARRTC:

- thanked Max Finlayson for the briefing; and
- looks forward to discussing this matter further at the next meeting.

Conceptual Model

3.2.18 Max Finlayson gave an overview of the conceptual model paper and its context. Max Finlayson then gave an overview of risk/hazard identification in the Alligator Rivers Region context.

3.2.19 Rick Van Dam then talked about the paper's scope, and that it was limited to containment pathways from the Ranger mine. Max Finlayson then advised that Rick Van Dam would be attending a conference in early April to present some of this material.

3.2.20 Barry Hart queried Max Finlayson on what the model would look like and he responded referring to the 1984 Magela transport pathway model. He advised that ERISS is still working at adding additional levels to that earlier model.

3.2.21 Ray Evans noted that this issue is linked to the earlier Key Knowledge Needs version, and that it is still relevant in the context of the revised Key Knowledge Needs. Max Finlayson then noted that much detail and source information relevant to the model is contained within the Johnston & Milnes research summary document.

3.2.22 Tony Milnes then noted that pathways are being picked up by David Klessa's model, which is being refined each year to determine validity. He added that ERA would be holding further Research and Development meetings on this and other work.

Action/Outcome No. 3E:

ARRTC:

- thanked Max Finlayson and Rick Van Dam for their briefing; and
- noted satisfaction with the quality of the science in the paper.

Nabarlek Revegetation

3.2.23 Dr Peter Bayliss presented a paper on research into rehabilitation at Nabarlek. Tony McGill then talked about the Nabarlek bond issue and the results of Peter Bayliss' research. He outlined some of the mistakes of the past, in particular the failure to get an effective tree canopy in place in early rehab period

3.2.24 Barry Hart asked Carl Grant where he saw the outcomes and criteria at Nabarlek. Carl then responded that Nabarlek was not even close to meeting its rehabilitation objectives. He stressed the need to take more intensive action and to apply a greater level of resourcing.

3.2.25 Peter Bayliss noted that weeds are a big problem at the Nabarlek site, and that there needs to be action to actively remove weeds from the site.

3.2.26 Barry Hart then asked about responsibility for any ongoing monitoring, and Tony McGill responded, advising that the Northern Territory Government does groundwater monitoring and that the Supervising Scientist undertakes some vegetation monitoring. DBIRD will continue monitoring water at Nabarlek until after the wet season to identify any changes in the data. Peter Bayliss then advised that EWLS had previously been contracted to undertake vegetation monitoring.

Action/Outcome No. 3F:

ARRTC:

- thanked Peter Bayliss for his presentation;
- expressed satisfaction with the quality of the science; and
- noted that it would further consider this issue at the next meeting.

Hydrological Data Network

3.2.27 Ray Evans gave an overview of hydrological data network issues. Max Finlayson then commented on the two tabled papers, noted that the second paper had been prepared as the original action list was incomplete.

3.2.28 Ray Evans expressed his frustration that this issue had still not been resolved. He specifically noted that the responses did not answer the questions that he raised at the February 2003 meeting. He added that he'd be happy to meet with/talk to with ERISS staff on this issue if appropriate. He noted that he was finding it difficult to get answers on the strategic data needs to inform hydrological data requirements.

3.2.29 Barry Hart then noted Ray's initial question and concerns, and queried whether the ERISS response was sufficient. Gerald Nanson then queried whether the closing down of gauging stations would affect the research/monitoring needs.

3.2.30 Ray Evans advised that he (together with Gerald Nanson) sent many emails to both ERISS and OSS in an attempt to engage on this issue, but had seen a lack of success. Max Finlayson suggested that there may have been a lack of understanding in relation to what was originally requested, and agreed that Gerald Nanson and Ray Evans should sit down and talk with ERISS and OSS, as had been offered by Ray Evans.

Action/Outcome No. 3G:

ARRTC noted that Ray Evans would liaise with ERISS and OSS to discuss what is required to see this issue resolved.

3.3 Energy Resources of Australia Ltd Research

Ranger Final Landform Design

3.3.1 Ian Hollingsworth gave a presentation and talked to his paper on the Ranger final landform design.

3.3.2 Arthur Johnston asked about a lack of cover for the floor of the tailings dam, and Ian Hollingsworth responded, noting that the issue was being looked at and that no final position had been assumed.

3.3.3 Carl Grant then asked about the slope of walls and the rehabilitated landform, and Ian Hollingsworth responded, advising that 1:5 is an acceptable slope. He added that the proposal is a starting point for further discussions on this matter. He added that slopes greater than 1:5 could be achieved but that erosion is a key issue. Max Finlayson then advised that a 1:5 slope allowed earthmoving equipment to be used if required.

3.3.4 Doug Holdway asked about the level of Traditional Owner input to the process, and Ian Hollingsworth then noted this is an important issue and that ERA needs clear feedback from all stakeholders. He then added that the company has commenced a dialogue with Traditional Owners.

3.3.5 Ray Evans then asked whether this proposal was a pre-design attempt or a first-cut proposal, and Ian Hollingsworth advised that it should be regarded as pre-design; it looks at waste rock resources that would remain above grade onsite and what the overall capacity for a final landform is likely to be.

3.3.6 Carl Grant then asked about the presence and absence of species. Ian Hollingsworth responded, noting that his study had not used abundance as he was simply looking at a first order assessment. Carl Grant then emphasised the need to look at species abundance, noting that it gives a clearer picture in ordination studies. He noted that the methodology used by Ian Hollingsworth was not good in identifying keystone species. Ian Hollingsworth responded, advising that his study was based on initial species, and should be regarded as a first pass approach and is not a quantitative ecological examination. He added that species abundance could be used later.

3.3.7 Carl Grant then expressed concern that the study does not indicate the true nature of community structure. Ian Hollingsworth responded, noting that he does not see that abundance would add significantly at this stage of the project.

3.3.8 Barry Hart then asked about the level of species representativeness, and how this linked to what the Traditional Owners thought was appropriate. Ian Hollingsworth responded, advising that Traditional Owners (through GAC) had been involved in consultations. He added that GAC was very keen to be involved and that some 22 Traditional Owners had visited during site inspections. He then added that the Traditional Owners would be happy if the Georgetown analogue could be used as basis for Ranger rehabilitation.

3.3.9 Ray Evans then asked about the biophysical attributes used in the reconnaissance phase. Ian Hollingsworth described the terrain model, and the factors that were used: slope, topographic terrain index (wetness index), erosion, and deposition index (stream power) were all used. He added that elevation had also been used. The model measured soil morphological properties.

3.3.10 Chris Humphreys then asked if quantitative species data had been taken, and whether it could be used to model species abundance. Ian Hollingsworth responded that these data had been collected, and asked if Carl Grant wanted species classification done using abundance. Carl Grant indicated that this would be very useful.

3.3.11 Ray Evans then asked about the 3D aspects of the landscape. For example, what about subsurface aspects such as hydrology. Ian Hollingsworth advised that ERA will be looking at water balance studies in the future.

3.3.12 Ray Evans then asked if they have tried to close a balance, and how water balance aspects operate in the area in relation to the gross hydrology. Ian Hollingsworth responded that they are now looking at doing broader catchment level water balance study.

3.3.13 Ray Evans expressed some concern over how a regional hydrology can be reproduced, and that it would be difficult to use a model to test if an ecosystem would function as designed. Arthur Johnston then asked what influence could variations in hydrology could be, and how could the information be used. Ian Hollingsworth advised what catchment monitoring has been done, and that the focus has been on how to reinstate the natural hydrology on a rehabilitated landscape.

3.3.14 Doug Holdway asked about traditional land use values, and what was meant by the term. Ian Hollingsworth advised that he was thinking in terms of the broader scale such as movement across the land. He added that the broader aim to have the site less radiologically active than prior to mining.

3.3.15 Doug Holdway then asked if the fauna included termites. Ian Hollingsworth advised that it did, and that termites do have biophysical importance and are being considered. The major issue is with termites breaching capping structures on the landforms. Arthur Johnston then asked about the minimum capping over tails, and Tony Milnes responded that many metres of backfill in pits (for example, greater than 20m) is likely.

3.3.16 Gerald Nanson asked about ERA's rehabilitation budget, and Tony Milnes advised that ERA's budget (Rehabilitation Trust Fund) for rehabilitation was significant and in the order of \$45m.

3.3.17 Gerald Nanson noted that the study is impressive, and is a necessary stage in the rehabilitation process. He expressed some concern over how achievable the end result might be, and whether simpler objectives could be used with nature taking over. Ian Hollingsworth advised that ecosystem classification is simply a tool to assist with planning, and is not a model of what might actually be put in place. The focus is on a landscape with a similar energy focus, and similar to natural landscapes with low maintenance. Tony Milnes also noted the need for geotechnical predictive capacity, particularly in relation to issues such as waste rock settlement.

3.3.18 Barry Hart then queried who would peer review the study. Tony Milnes advised that this work is part of Ian Hollingsworth's PhD, and that it is ongoing and evolving. He suggested that it might be appropriate for a nominated ARRTC member to take carriage of this. Barry Hart suggested that Carl Grant might be the appropriate ARRTC member. Ray Evans suggested that 12 ARRTC members could spend some time working with ERA; Ray Evans could be one and either Carl Grant or Gerald Nanson could be the other.

3.3.19 Carl Grant suggested that he found it hard to support the work, noting possible problems with approach. He added that there is a need to get final landform shape. Ian Hollingsworth responded that the final landform design is not yet in place, and that he is progressing the model process.

3.3.20 Barry Hart noted that the approach being used was sound, and was based on good science, and that more interaction between ERA and ARRTC would make it better.

3.3.21 Peter Wellings raised the issue of engagement with Traditional Owners. He then sought information on the timeline for Traditional Owner consultations. Tony Milnes advised that he wants Traditional Owner engagement to test their response to the general process. The next level is progression via the formal MTC process, which involves the NLC as representatives of the Traditional Owners. He noted difficulty in getting Traditional Owner views on how they feel that land should look like, and suggested that the next 6-12 months will be important in this regard.

3.3.22 Ian Hollingsworth then explained the context of initial Traditional Owner involvement, and that it was to give Traditional Owners a real expectation of what the site

would look like. He added that Traditional Owners have asked for pictures and models of what the site might look like. Max Finlayson then noted language problems, and the need to have effective engagement in language to exchange real views.

Action/Outcome No. 3H:

ARRTC:

- thanked Ian Hollingsworth for his paper;
- Carl Grant, Ray Evans and Gerald Nanson will review the landform design and interact with EWLS staff to assist in finding improvements
- noted that the science used in ERA's final landform paper for Ranger was sound; and
- asked that ERA redo its vegetation classification to consider species abundance.

Ranger Revegetation Strategy

3.3.23 Dr Paul Reddell from EWLS introduced himself and then gave a presentation on the Ranger revegetation strategy. He noted that the three elements in the strategy were context, key elements, and implementation issues. He noted that the overall objectives were obtained from the Ranger General Authorisation.

3.3.24 Barry Hart then queried whether history could be used to predict the future; for example, could the last 10,000 years be used as an analogue for the next 10,000 years. Arthur Johnston noted that the 10,000 year timeframe was a function of groundwater dispersion, and that a timetable in the hundreds rather than thousands of years would apply for surface features. Barry Hart agreed that the ecosystem will change, and will not remain the same in the long term. Tony McGill added that the 10,000 year timeframe was related to the long term stability of the tailings.

3.3.25 Gerald Nanson noted that there is a fairly vague understanding of the last 10,000 years, and that the future will also be variable. He suggested that the past is not a good analogue for the future, and that the longer term outcome is likely to be similar but with a different mix of plants.

3.3.26 Tony McGill then noted that strip mining and hard rock mining created very different problems, and this needed to be considered as much of the research in relation to mines in the wet-dry tropics relates to strip mines.

3.3.27 Peter Wellings commented that weed issues might need a higher level of importance in the document, and that they did not appear to be prominent. Paul Reddell noted that this was probably a presentation issue. Terry Hillman noted that weeds fit would into the "opportunists" group described by Paul Reddell. Tony McGill noted the impact of feral animals, and that a strategy is required to manage the spread of spread weeds through feral animal actions.

3.3.28 Doug Holdway suggested that there is a need to add pesticides to the list of risk factors, and that this needs to be factored into the risk framework.

3.3.29 Carl Grant noted that he believes that a sustainable forest ecosystem can be developed on the rehabilitated minesite, but that it will not be exactly the same as pre-mining. He queried whether this needs to be communicated to Traditional Owners. Terry Hillman then suggested that a rosy picture may have been given to the Traditional Owners. Tony Milnes then referred to the rehabilitation at Gunlom, noting that the Traditional Owners have different expectations to other stakeholders.

3.3.30 Peter Wellings outlined possible scope for Traditional Owner interaction, and indicated that this should be moved forward in a partnership process. He suggested that PAN could be involvement in discussions on rehabilitation issues. He advised that the Kakadu Board of Management would probably see this issue as Mirrar business.

3.3.31 Carl Grant noted that this paper represented a major step forward, and that it gives ARRTC a better confidence in the process. The strategy is on track. He added that he would like to see a prioritisation, timeline, and list of who which does research projects, and identification of which is the most appropriate organisation to undertake the research. He concluded that he felt more satisfied than at earlier ARRTC meetings.

3.3.32 Barry Hart asked about the time lines that might be applied the future activities, and Tony Milnes noted that the timelines had been broadly outlined in the Key Knowledge Needs document. Paul Reddell noted the need for reasonably prompt action in the next twelve months.

3.3.33 Carl Grant raised the issue of completion criteria, and noted that the objective is defined in the Authorisation. It is not ambiguous, which make it easier to manage at the higher levels; the next part is more complicated, in that the objective needs to be operationalised once criteria have been defined.

3.3.34 Tony Milnes then noted that the RL0 issue would require extra closure criteria that are site specific measures, and that ERA will move towards a whole of site model.

3.3.35 Arthur Johnston noted the Best Practicable Technology scope, and would could be achieved in relation to the various sites.

3.3.36 Gerald Nanson noted that he had found the presentation to be interesting. He asked about vegetation pathways, and the extent to which a successional pathway could occur. He asked whether the minesite could sustain a mature environment reasonably quickly. Paul Reddell then responded, advising that an environment could be sustained. He then noted some of the key factors influencing the development of an environment: physical property and site hydrology rather than soil nutrients/composition appear to be the more important factors. Gerald Nanson noted that he still has view that a mature community is a complex mixture of factors interacting with each other.

3.3.37 Paul Reddell then described the process, discussing the importance of framework species in the development of a mature community. Carl Grant then noted the difference between primary and secondary succession, and that the aim of the rehabilitation plan is to proceed to secondary succession as quickly as possible. Paul Reddell then noted that there are not many examples of primary succession in wet-dry tropics to use as an example. Tony Milnes then talked about issues associated with bypassing the primary succession process (such as a lack of topsoil).

3.3.38 Arthur Johnston then made a general comment, and asked where ARRTC thought we should be moving in this area. He queried possible changes from an operational to a rehabilitation focus, and possible areas for ERISS to contribute using existing resources. He also asked if there were any areas where ERISS could contribute in the future with new skills.

3.3.39 Max Finlayson noted that Paul Reddell's paper has shown a very coherent overview on revegetation issues, but that a few gaps remain. Max Finlayson suggested that ERISS had lost a lot of capacity to fill knowledge gaps as a result of the 1994 cutbacks, and advised that rebuilding capacity would be a challenge. He noted that there is expertise in assessing ecosystem success (with Dr Peter Bayliss) but that soil/plant growth inter-relationship issues are key gaps.

3.3.40 Tony Milnes then advised ARRTC members about ERA's priorities; he noted that many issues were running concurrently (for example, the whole of mine life plan and the RLO issue).

3.3.41 Arthur Johnston then suggested that the work needed to be considered in the context of Key Knowledge Needs work being progressed. He also suggested that other issues, such as staffing, would also require internal consideration by ERISS.

3.3.42 Doug Holdway queried the availability of two year old trees, and whether sufficient quantities would be available locally. Paul Reddell and Tony Milnes advised that trees would need to be grown, and that this work would most likely be contracted out to another organisation.

3.3.43 Elaine Glen then introduced herself. She then noted that the discussions appeared too scientific and too rational, and that she would find it difficult to relate the outcomes of the discussions to Aboriginal people, particularly if the eventual outcomes will not be as they have anticipated. Barry Hart responded, noting the need for Traditional Owner involvement.

3.3.44 Max Finlayson noted the upcoming full council meeting of the NLC, and the impending sign-off of the Jabiluka long term care and maintenance agreement between the NLC, GAC, and ERA. He suggested that this may signal a good time to move forward with consultations.

Action/Outcome No. 3I:

ARRTC:

- thanked Paul Reddell for his presentation;
- noted the quality of the work;
- noted that EWLS would develop a paper for ARRTC on what is required for Landform/Revegetation to identify knowledge gaps and competencies; and
- supported the strategy.

4 Monitoring

4.1 Supervising Scientist's Monitoring Program

4.1.1 Michelle Iles gave a presentation and paper on the status of the Supervising Scientist's monitoring program. Arthur Johnston noted that ARRTC had, at an earlier meeting, expressed a desire to be kept up to date with developments.

4.1.2 Michelle Iles then explained about the frequency of water monitoring at Jabiluka. She then gave an overview, and explained the rationale for changes to the monitoring program, explained the ongoing regime, and then explained the data presented. She then talked about proposed changes to the program.

4.1.3 Doug Holdway and Carl Grant then asked about Mg, and Michelle Iles answered, advising that the West Tributary is high in Mg, and that downstream has always been higher than upstream.

4.1.4 Carl Grant then asked about the Mg:Ca ratio in readings, and more particularly about the behaviour of Ca. Michelle Iles responded, advising that this information can be answered on notice if required.

4.1.5 Ray Evans then expressed concern that the monitoring regime may tell a different story if altered. Arthur Johnston noted that monitoring will still happen, but on a fortnightly

rather than on a weekly basis. The reinforced focus will be on biological rather than chemical monitoring. Barry Hart then asked about North and Central tributaries. Michelle Iles and Arthur Johnston explained that these are operational, rather than off-site, monitoring points.

4.1.6 Ray Evans advised that he was not taking a dogmatic approach, and is happy with the decision taken. His concerns are only low level. He noted that it is ARRTC's role to test the science and raise issues as appropriate.

Action/Outcome No. 4A:

ARRTC:

- thanked Michelle Iles for the briefing; and
- noted satisfaction with the science behind the revised Jabiluka Monitoring.

SSD Integrated Stream Monitoring

4.1.7 Max Finlayson gave a presentation on the Supervising Scientist's integrated stream monitoring program, assisted by Chris Humphrey and Michelle Iles.

4.1.8 Max Finlayson gave an overview of the monitoring program, and then explained the internal ERISS review of how the program is being conducted. He also advised that the protocols were the subject of an internal Department of the Environment and Heritage audit.

4.1.9 Barry Hart then queried the level of technical capacity the Department of the Environment and Heritage audit committee might have to conduct an audit of the protocols. He queried whether that might not be an ARRTC role. Arthur Johnston noted that the audit would focus on the process of the development of the protocols rather than being a scientific or technical audit.

4.1.10 Michelle Iles then gave a water chemistry presentation. Doug Holdway asked about the precision of the data presented, and Michelle Iles responded, noting an accuracy of 0.005 µg/L. She noted that there is some potential for contamination through sampling techniques, but that duplicate analyses indicates a very high degree of accuracy.

4.1.11 Jill Fitch asked what would happen when the trigger was reached, and Michelle Iles explained the responses that occurred at the focus and action levels.

4.1.12 Terry Hillman asked about the total uranium levels, and Michelle Iles answered, advising that the loads are calculated based on releases from Retention Pond 1 and Djalkmara Billabong. ARRTC members then discussed load issues. Ray Evans then asked about further analysis in relation to total solute loads, and Tony Milnes explained that some work had been done for specific purposes and projects.

4.1.13 Barry Hart talked about using the wealth of data to inform the development of a model, and that the data has a broader usage for research.

4.1.14 Chris Humphrey then talked about the biological monitoring program. Barry Hart asked about the accuracy of the tests. Chris Humphrey advised that snails and fish were used, and that snails are very sensitive to uranium.

4.1.15 Doug Holdway then commented that the quality of the data was good, and that the monitoring program gave him solid proof that no impact on the offsite environment had resulted from mining activities, and that he was impressed with the program.

4.1.16 Barry Hart suggested that the briefing confirmed what the monitoring program was capable of doing, and the data corroborates what we know. He queried what options were

available for making this information available to the broader public. Max Finlayson advised that the results would be published in the scientific literature, where they would be peer reviewed. Tony Milnes suggested that Barry Hart should note his satisfaction in his letter to the Minister.

4.1.17 Arthur Johnston then noted difficulties in presenting monitoring data, and that it was often difficult to interpret. He noted that the dissimilarity format is effective.

Action/Outcome No. 4B:

ARRTC:

- thanked Chris Humphrey and Michelle Iles for their presentation; and
- expressed satisfaction with the biological monitoring data.

4.2 ERA Radiological Monitoring

4.2.1 Tony Milnes introduced Mark Sonter, a consultant engaged by ERA to review ERA's radiological monitoring program. Tony also introduced Ian Marshman, ERA's Radiation Safety Officer. Mark then introduced himself and outlined the tasks given to him by ERA. He then gave a presentation based on the paper supplied to members.

4.2.2 Mark Sonter talked about monitoring site points and changes, monitoring methodologies, dose level justification requirements, dose estimation support requirements, present radiological monitoring plan, and outputs from current program, and he then described the process for monitoring and setting dose limits. He noted that the results had been based on 24 years of radiological data.

4.2.3 Barry Hart commented that some of the assertions made in the paper do not appear to be backed up with evidence. Mark Sonter and Ian Marshman then noted that the paper and presentation were an initial analysis and that the document will be developed further following further analysis.

4.2.4 Members then discussed the statistical methodology used in the analysis, particularly in relation to the treatment of outlier data in order to remove bias from the analysis process. Ian Marshman then noted that the monitoring data is still being examined to see if its distribution is appropriate and that bias is removed.

4.2.5 Barry Hart then sought feedback from the meeting on where they felt the issue should now progress. He added that some of the assertions needed to be backed up and that Jill Fitch had not had much time to review the ERA paper. Barry then asked the meeting whether members felt it appropriate to "sign off" on the radiological monitoring program as they had for the chemical and biological monitoring programs.

4.2.6 Tony Milnes then noted that a new radiological monitoring program was being developed as an outcome of the review. He added that this program was now being developed through the Mining Management Plan process. Ian Marshman then added that other activities needed to be considered to see the broader picture; he noted the development of a radiological monitoring committee formed at Ranger to look at the plan and program.

4.2.7 Ray Evans noted that the outcomes should be linked to future science needs through the Key Knowledge Needs process which is currently underway. Barry Hart then reinforced that ARRTC needed to know that the radiological monitoring program was based on good science and asked members if they needed anything in addition to this assurance.

4.2.8 Doug Holdway noted that Jill Fitch should be happy with the science. He added that the new program could constitute a reduction in monitoring activity and needs to be properly justified. Ian Marshman noted the program was a rationalisation of the existing program and would allow existing resources to be targeted at spot monitoring.

4.2.9 Jill Fitch advised the meeting that she required more time to digest the paper. She noted that the document tended to be worker-focussed rather than public-focussed, and that greater focus needed to be given to protection of the public. She noted that radioactive waste management issues (for example, tailings and contaminated mine plant) were also very important. Tony Milnes advised that all material would be placed in the pits with tailings, and that the Ranger closure plan would detail this. Tony McGill then noted that an important issue to consider is the exact location within pits/rock dumps of contaminated plant etc as this material could be hazardous if the tailings were reworked in the future. Doug Holdway asked about the future of the mill infrastructure, and Tony Milnes advised that infrastructure to be removed from site had to be decontaminated.

4.2.10 Ray Evans asked about land application areas, and Tony Milnes advised that, as appropriate, the land application areas would be scraped and the soil material placed in the pits together with other material.

4.2.11 Jill Fitch advised that she was pleased to see the paper and to have had the discussion that followed Mark Sonter's presentation. She asked whether this issue would be discussed at the next ARRTC meeting once further work had been done on the radiological monitoring paper.

4.2.12 Barry Hart then noted that the radiological monitoring "portfolio" could be allocated to Jill Fitch as an active brief for work out-of-session.

4.2.13 Mark Sonter advised that dose management is the focus, and that it needs to be known and legally defensible. Jill Fitch responded, noting that she was not sure that doses were demonstrated to be as low as reasonably achievable (ALARA). Further information is needed in order to be assured that this is the case; the product packing area was noted as an example.

4.2.14 Jill Fitch then asked whether the Department of Business, Industry and Resource Development made documents such as the radiological audit report available to the public. Tony McGill responded, advising that such would be provided if asked for but not actively disseminated. Jill Fitch then noted public perceptions of uranium mining companies, and the perception that information is being withheld. Tony Milnes noted that ERA's information feeds into the ERA/Rio Tinto annual reporting process. Jill Fitch then noted that Olympic Dam publications on radiation protection issues were made available each year.

Action/Outcome No. 4C:

ARRTC:

- thanked Mark Sonter, Ian Marshman and Tony Milnes for the paper and presentation; and
- noted that Jill Fitch would follow up Mark Sonter and Tony Milnes out-of-session.

5 Operational Mining Issues

5.1 Trigger Values Review

5.1.1 Michelle Iles talked to the tabled paper on the trigger values review that is currently underway, explaining the context of the water quality guidelines. She advised that Internal

Report 563 provides information on the review, and can be made available if requested. She noted that the review is still a work in progress with comments being received from stakeholders.

5.1.2 Ray Evans then stressed need to differentiate between natural and mine-related excursions. Alex Zapantis then noted the water quality guidelines, which provide a framework for assessment.

5.1.3 Ray Evans then noted a possible ARRTC role in defining trigger levels, and that diligence is needed to ensure that appropriate levels are defined. He added that there is a need to consider change versus impact. Arthur Johnston noted that there was concern over downstream levels, and that this needs to be resolved.

5.1.4 Barry Hart suggested that the review process is a good example of adaptive management, and then queried whether any triggers could be reduced. Michelle Iles responded, noting that uranium trigger limits may be reduced under new limits resulting from the review. She also suggested that some EC levels might also be lowered. Barry Hart then asked about significant figures. Rick Van Dam responded that the 5.8 ppb figure for uranium had been revised to 6.0 ppb.

5.1.5 Ray Evans reiterated some of his concerns raised earlier in the meeting that there needed to be some analysis of the reasons for the differences between upstream and downstream signals for some constituents, and that ARRTC should have an opportunity to comment. This was important to resolve as there were now proposals to change the way the trigger values were derived based on particular conceptual models where there were alternative explanations. Ray's view was that this should be resolved before the new trigger value approaches were adopted.

Action/Outcome No. 5A:

ARRTC:

- thanked Michelle Iles for her briefing;
- noted that it is comfortable with the approach being used, but expressed a view that more examination of the upstream versus downstream issues is needed; and
- noted that the issue of the cause of upstream versus downstream differences in some constituents needs to be resolved before the trigger value method is changed for the relevant constituents at the relevant sites.

5.2 Jabiluka Update

5.2.1 Barry Hart then asked Tony Milnes for a very brief Jabiluka update. Tony Milnes then provided the meetings with a quick verbal report on the status of Jabiluka long term care and maintenance.

5.2.2 He advised that waste rock and mineralized material had now been returned to the decline, and that the ore had been mixed with lime. The Interim Water Management Pond had been emptied via irrigation and pumping underground and the pond slurry pumped down the decline. The pond has also been scraped clean and now contains clean water. A bulkhead between the mineralized rock and the waste rock was constructed. A second bulkhead near the adit has also been constructed and the box cut filled with waste rock. Site infrastructure (with the exception of the Interim Water Management Pond) has now been removed. Tony noted that the works had been completed on 10 December 2003.

5.2.3 He added that a monitoring program is continuing under the Long Term Care and Maintenance regime.

Action/Outcome No. 5B:

ARRTC:

- thanked Tony Milnes for his update on the status of Long Term Care and Maintenance at Jabiluka; and
- would like to review the reports that characterise the land application area at Jabiluka as being not necessary for clean up during the phase prior to the implementation of the long term care and maintenance program.

6 Member Reports and Updates

6.1 Parks Australia North

6.1.1 Peter Wellings gave an update on Gunlom issues (detailed in a tabled paper) as well as update on specific Parks Australia North issues. He then talked about cane toads and quolls, but noted that the full picture was not yet known in relation to these issues. ARRTC members then discussed cane toads issues.

6.1.2 Barry Hart then asked Peter Wellings whether the meetings with Gunlom Traditional Owners had been successful, and Peter Wellings advised that the meetings had been successful. Barry Hart expressed an interest in knowing what could be learned from these lessons/experiences, and Mark Foy noted that a lot can be achieved by asking Traditional Owners what they think.

6.1.3 Barry Hart then expressed an interest in accessing Peter Waggitt's papers on some of the Gunlom issues.

6.1.4 Peter Wellings then talked about social impact monitoring issues, and talked about the Jabiru region regional sustainability program. He explained which parties were involved and what the group's objectives were. He noted that the group's aims were related to ERA's role in Jabiru, and were linked to a possible non-mining future for Jabiru. The groups is focussing on governance and planning issues.

6.1.5 Peter Wellings then talked about social indicators, particularly quality of life indicators. He advised that funding options for this type of research were being investigated. He advised that further reports could be provided at subsequent meetings if requested.

Action/Outcome No. 6A:

ARRTC:

- thanked Peter Wellings for his update on Parks Australia North issues; and
- noted that Peter Wellings would provide ARRTC members with information on the World Heritage values; Jabiru Futures; and the Periodic Report on World Heritage values.

6.2 Energy Resources of Australia

6.2.1 Tony Milnes gave a presentation on progress in relation to environmental issues at Ranger and Jabiluka, which include the RLO issue (and workshop), capping designs, operational and strategic monitoring bores, ecosystem reconstruction criteria, a Jabiluka

geochemical risk assessment, acid sulfate soil Gulungul catchment investigation, an amendment of Rehabilitation Plan #29 for Ranger, and the *in situ* treatment of water.

6.2.2 Ray Evans noted that he had attended the RLO workshop in Darwin as ARRTC observer, and found it useful.

6.2.3 Barry Hart asked the meeting what they felt ARRTC's role should be in relation to the oversight/scrutiny of ERA work. Tony Milnes noted that ERA wanted to know early if investigations were on the right track so that the work was appropriately focussed. He confirmed that the RLO workshop process was a very useful exercise.

6.2.4 Barry Hart then noted role of the Supervising Scientist and the Department of Business, Industry and Resource Development in relation to the consideration of ERA work.

6.2.5 Gerald Nanson noted that he felt unsure of the process, and was unsure of how ARRTC could fit in. Barry Hart then queried what processes could help ARRTC fulfil its strategic objectives. Alex Zapantis advised that operational mining issues would be referred to ARRTC for comment at the appropriate stage.

6.2.6 Barry Hart asked whether ARRTC could get involved at the strategic level. Tony Milnes noted the longevity of many projects, and that there is scope for involvement in workshops etc. Ray Evans then noted the level of out of session work, eg networking, catching up etc, that was involved.

6.2.7 Arthur Johnston noted that a clearly defined strategic program, with projects to be reviewed by ARRTC along the way, needs to be implemented. ARRTC consideration would follow submission to the MTC. Barry Hart noted the linkage to ARRTC rolling two year work program

6.2.8 Barry Hart noted that he was looking for a review and assessment process in relation to ARRTC being satisfied; this would not necessarily involve them doing work themselves but could include things such as other peer review.

6.3 Department of Business, Industry and Resource Development

6.3.1 Tony McGill advised that the Hon Kon Vatskalis MLA is the new Northern Territory Minister for Mines and Energy.

6.4 Supervising Scientist

6.4.1 Arthur Johnston gave an overview of the internal strategic review of the Supervising Scientist Division that is currently underway. The review is looking at whether current programs are meeting needs of stakeholders, and whether they are effective and being delivered efficiently. He explained the review process and advised that it is still underway, and that completion is expected by the end of May 2004. Arthur Johnston then advised that the focus of the review is on a post-uranium mining future for ERISS.

6.4.2 He also advised that the wetlands program is being reduced to virtually nil, with the Supervising Scientist Division conducting these activities on a fee-for-service basis.

6.4.3 Arthur Johnston then talked about issues associated with the protection of the environment from the effects of ionizing radiation. He gave an overview of the rationale, which takes this issue beyond the "protection of people = protection of environment" argument that has prevailed.

6.4.4 He added that the issue has risen in importance in recent years, and ICRP will issue guidelines on protection of biota during 2005. He also noted that the IAEA is now looking at this issue.

Action/Outcome No. 6B:

ARRTC:

- thanked Arthur Johnston for his update; and
- noted that the paper he presented at the Stockholm conference on the protection of the environment from ionizing radiation would be e-mailed to ARRTC members.

7 Other Business

7.1 ARRTC Membership

7.1.1 Barry Hart noted Doug Holdway's intention to resign from ARRTC following the 13th meeting of ARRTC. Barry Hart then expressed appreciation of Doug's contribution to ARRTC since his appointment, particularly in the area of ecotoxicology. Doug Holdway then advised the meeting that he had enjoyed his time with ARRTC and thanked the meeting.

7.1.2 Arthur Johnston then asked ARRTC about a possible replacement for Doug, noting that the practice used for initial appointments to the revised ARRTC involved the minister writing to the Federation of Australian Scientific and Technical Societies (FASTS). Arthur then queried whether ARRTC would want to replace Doug with another ecotoxicologist.

7.1.3 ARRTC then briefly discussed issues associated with a replacement for Doug Holdway and agreed that he should be replaced with another aquatic ecotoxicologist.

Action/Outcome No. 7A:

ARRTC:

- expressed its thanks to Dr Doug Holdway for his service to ARRTC in the area of aquatic ecotoxicology since 2001;
- noted that his replacement should be appointed using the same method as was used for his initial appointment; and
- noted that his replacement should be a person with expertise in the area of aquatic ecotoxicology.

7.2 Senate Inquiry into the Environmental Regulation of Uranium Mining

7.2.1 Arthur Johnston provided a brief update on the Senate Inquiry. He advised ARRTC on the process that government follows when developing a response to a senate inquiry.

7.2.2 The committee discussed its role in assessing and responding to specific recommendations made in the Senate Inquiry. Arthur Johnston explained that it is the Australian Government's responsibility to respond to the recommendations.

7.2.3 Barry Hart talked generally about some issues in the Report of the Senate Inquiry, and noted that he felt that some of the evidence submitted to the committee had been selectively used.

7.2.4 Gerald Nanson noted that many of the issues of serious concern raised by the Senate committee were matters of a technical and scientific nature and that ARRTC, as part of its responsibility, should spend time discussing them.

7.2.5 There was some discussion on these issues, and Barry Hart undertook to put some words on this issue into his letter to the Minister following the meeting.

Action/Outcome No. 7B:

ARRTC agreed that Barry Hart would refer to the selective use of evidence by the Senate Environment, Communications, Information Technology and the Arts References Committee in its inquiry into the environmental regulation of uranium mining in his letter to the Minister.

8 Close

8.1 Meeting Close

8.1.1 Ian Loftus spoke to the meeting about a possible timetable for the next ARRTC meeting that involves pre-determining and working within date-specific waypoints.

8.1.2 Arthur Johnston then noted the need for specific issue papers, rather than the general papers that have been provided.

8.2 Next Meeting

8.2.1 Members discussed possible dates for the next meeting, and decided that a three-day meeting from 13-15 September 2004 would be appropriate.

8.2.2 Barry Hart concluded the meeting by extending thanks to those involved in planning and organising the meeting.

Summary of Actions/Outcomes

Action/Outcome	Comments
<p>Action/Outcome No 2A:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • endorsed the draft Summary Record of the 12th Meeting subject to amendments noted in discussion; and • noted that Tony McGill will provide a briefing on the rehabilitation bond processes at the next ARRTC meeting. 	<p>Tony McGill to provide a briefing on the rehabilitation bond process at the next ARRTC meeting.</p>
<p>Action/Outcome No. 3A:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • agreed, in principle, with the revised draft Key Knowledge Needs document. However, the final draft will include a context of the broad assumptions, context to the headings provided, and provide more information on the dot points – why is it an issue, what is the objective, and what actions will be taken on what timescale.; • agreed that the document would be amended and then provided to members out-of-session for agreement; • noted that ERA would provide ARRTC members with copies of documents relating to Jabiluka long term care and maintenance, if requested; • noted that Gerald Nanson would interact with ERISS on catastrophic events issues; and • noted that Tony Milnes, Tony McGill, Arthur Johnston, Barry Hart, and Ian Loftus would meet to identify possible future scenarios for the Alligators Rivers Region. 	<p>Arthur Johnston to finalise Key Knowledge Needs document and circulate, out-of-session, to ARRTC members.</p> <p>ERA to provide to ARRTC members, upon request, copies of documents relating to Jabiluka long term care and maintenance.</p> <p>Gerald Nanson to interact with ERISS on catastrophic events issues.</p> <p>Tony Milnes, Tony McGill, Arthur Johnston, Barry Hart and Ian Loftus to meet to discuss possible future scenarios for the ARR..</p>
<p>Action/Outcome No. 3B:</p> <p>ARRTC thanked Tony Milnes for his paper and briefing on ERA’s research and development program.</p>	<p>No further action required.</p>
<p>Action/Outcome No. 3C:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Dr Rick Van Dam for his paper and presentation on MgSO₄ toxicity; and • endorsed the process and methodology for MgSO₄ toxicity being used by ERISS. 	<p>No further action required.</p>

<p>Action/Outcome No. 3D:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Max Finlayson for the briefing; and • looks forward to discussing this matter further at the next meeting. 	<p>Max Finlayson to provide an update paper on the ISP Landscape Project progress for the next ARRTC meeting.</p>
<p>Action/Outcome No. 3E:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Max Finlayson and Rick Van Dam for their briefing; and • noted satisfaction with the quality of the science in the paper. 	<p>No further action required.</p>
<p>Action/Outcome No. 3F:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Peter Bayliss for his presentation; • expressed satisfaction with the quality of the science; and • noted that it would further consider this issue at the next meeting. 	<p>Peter Bayliss to provide an update paper on Nabarlek rehabilitation for the next ARRTC meeting.</p>
<p>Action/Outcome No. 3G:</p> <p>ARRTC noted that Ray Evans would liaise with ERISS and OSS to discuss what is required to see this issue resolved.</p>	<p>Ray Evans to liaise with ERISS and OSS.</p>
<p>Action/Outcome No. 3H:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Ian Hollingsworth for his paper; • Carl Grant, Ray Evans and Gerald Nanson will review the landform design and interact with EWLS staff to assist in finding improvements • noted that the science used in ERA’s final landform paper for Ranger was sound; and • asked that ERA redo its vegetation classification to consider species abundance. 	<p>Carl Grant, Ray Evans and Gerald Nanson to review the landform design.</p> <p>Ian Hollingsworth to redo the vegetation classification to consider species abundance.</p>
<p>Action/Outcome No. 3I:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Paul Reddell for his presentation; • noted the quality of the work; • noted that EWLS would develop a paper for ARRTC on what is required for Landform/Revegetation to identify knowledge gaps and competencies; and • supported the strategy. 	<p>EWLS to develop a paper for the next ARRTC meeting on what is required for Landform/Revegetation to identify knowledge gaps and competencies.</p>

<p>Action/Outcome No. 4A:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Michelle Iles for the briefing; and • noted satisfaction with the science behind the revised Jabiluka Monitoring. 	<p>No further action required.</p>
<p>Action/Outcome No. 4B:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Chris Humphrey and Michelle Iles for their presentation; and • expressed satisfaction with the biological monitoring data. 	<p>No further action required.</p>
<p>Action/Outcome No. 4C:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Mark Sonter, Ian Marshman and Tony Milnes for the paper and presentation; and • noted that Jill Fitch would follow up Mark Sonter and Tony Milnes out-of-session. 	<p>Jill Fitch to follow up radiation protection issues with Mark Sonter.</p>
<p>Action/Outcome No. 5A:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Michelle Iles for her briefing; • noted that it is comfortable with the approach being used, but expressed a view that more examination of the upstream versus downstream issues is needed; and • noted that the issue of the cause of upstream versus downstream differences in some constituents needs to be resolved before the trigger value method is changed for the relevant constituents at the relevant sites. 	<p>Michelle Iles to give further consideration to upstream versus downstream issues.</p>
<p>Action/Outcome No. 5B:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Tony Milnes for his update on the status of Long Term Care and Maintenance at Jabiluka; and • would like to review the reports that characterise the land application area at Jabiluka as being not necessary for clean up during the phase prior to the implementation of the long term care and maintenance program. 	<p>Tony Milnes to provide copies of ERA reports on Jabiluka land application area issues to ARRTC members.</p>

<p>Action/Outcome No. 6A:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Peter Wellings for his update on Parks Australia North issues; and • noted that Peter Wellings would provide ARRTC members with information on the World Heritage values; Jabiru Futures; and the Periodic Report on World Heritage values. 	<p>Peter Wellings to provide ARRTC members with information at future ARRTC meetings.</p>
<p>Action/Outcome No. 6B:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • thanked Arthur Johnston for his update; and • noted that the paper he presented at the Stockholm conference on the protection of the environment from ionizing radiation would be e-mailed to ARRTC members. 	<p>Arthur Johnston's Stockholm paper to be provided to ARRTC members.</p>
<p>Action/Outcome No. 7A:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> • expressed its thanks to Dr Doug Holdway for his service to ARRTC in the area of aquatic ecotoxicology since 2001; • noted that his replacement should be appointed using the same method as was used for his initial appointment; and • noted that his replacement should be a person with expertise in the area of aquatic ecotoxicology. 	<p>ARRTC Secretariat, in consultation with Barry Hart, to progress replacement for Doug Holdway with Minister's Office.</p>
<p>Action/Outcome No. 7B:</p> <p>ARRTC agreed that Barry Hart would refer to the selective use of evidence by the Senate Environment, Communications, Information Technology and the Arts References Committee in its inquiry into the environmental regulation of uranium mining in his letter to the Minister.</p>	<p>Barry Hart to raise Senate Inquiry issues in his letter to the Minister.</p>