

**The Report of the 2005 Review of the NERC  
Directed Programme RAPID**



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## **Background to the Review**

1. A Directed Programme Review is an external and independent evaluation of scientific and management performance, in this case of the directed programme RAPID (Rapid Climate Change) funded by NERC. It provides an assurance for the NERC Accounting Officer (i.e. Chief Executive) and for Council that the science or service is managed well. This review was part of a NERC marine sector review that has embraced Research and Collaborative Centres, directed programmes and related areas of marine funding. The Review Team membership for RAPID was independent of NERC.
2. The Review Team conducted the review on March 18<sup>th</sup> 2005. The Terms of Reference for the RAPID Review are found at Appendix 1. The membership list can be found at Appendix 2. The timetable for the visit is at Appendix 3.

## **Mission of RAPID**

3. The Rapid Climate Change (RAPID) directed programme is a £20 million, seven-year (2001- 2008) programme of the Natural Environment Research Council. The programme aims to improve our ability to quantify the probability and magnitude of future rapid change in climate, with a main (but not exclusive) focus on the role of the Atlantic Ocean's Thermohaline Circulation in such change.
4. A major aim of the programme is to bring together the diverse research communities, which have the skills to address the problem of rapid climate change. These include researchers working in physical and tracer oceanography, meteorology, palaeo studies, sea ice research and atmospheric, oceanic, ice (sea and land) and climate modelling. The programme provides an underpinning for future climate predictability work and will provide scenarios for use in risk and impact assessments by social and policy analysts.

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**Executive Summary**

5. RAPID directly addresses one of the three priority areas of NERC's Science for a Sustainable Future on 'Climate Change – predicting and mitigating the impacts'. RAPID's aims are fundamental to this published strategy.
6. The team considered the management and leadership provided by Dr Meric Srokosz, Science Co-ordinator, Dr Christine Gommenginger, Deputy Science Co-ordinator and also Dr Lloyd Keigwin, Chair of the Steering Committee, and Dr Phil Newton, Marine Sciences Manager to be excellent.
7. The review team was highly impressed with the enthusiasm shown by everyone connected with the RAPID programme, including the Principal Investigators and Swindon Office staff.
8. The team recommends that the RAPID Science Coordinators should demonstrate to the Steering Committee how the specification for the final operational version of the monitoring system is to be derived. In order to facilitate the use of data sets developed across the international community, the review team recommends that NERC should seek international standardization of datasets.
9. The science that was seen was highly impressive and the team were stimulated by the presentations given.
10. For a directed programme of this magnitude, the team recommends that NERC give consideration to it being managed by a director, rather than a Co-ordinator, with clear responsibility for both the financial resources and the delivery of the programme. The director should be advised by a steering committee and provided with the support of a co-ordinator as necessary.
11. The team believes that use of the full array of standard project management tools, such as a formal work breakdown structure, with associated PERT's (Program Evaluation and Review Technique) and budgets should be made mandatory by NERC for such large, complex projects.
12. The team recommends that overt risk management should be introduced based on an overt risk assessment for the programme as a whole.
13. The review team wished to encourage the RAPID management to continue with its efforts in developing the KT strategy and was pleased to note that a specific post for a Knowledge Transfer officer is being created. There was also a recommendation made that the RAPID management overtly identify to whom it is looking as stakeholders, customers and consumers.
14. The team was pleased that, in such a key programme, a long-term vision was being cultivated, with management and researchers looking beyond the current end of the programme. The team is satisfied that the programme is highly cost-effective. It is a complete fit to NERC priorities and it offers outstanding value for money.

## Report of the Review of the NERC Directed Programme RAPID 2005 Report against the Terms of Reference

### *Term of Reference 1*

*To assess whether the NERC supported marine research and collaborative centres and directed science programmes provide a national capability and source of advice to Government.*

15. The review team believe that, with some minor reservations, the programme is well placed to establish a significant national capability for the monitoring of the rate of climate change in the northern hemisphere, the interpretation of results, and potential source of advice to Government as evinced below.
16. The RAPID programme has invested 25% of its budget (£5M) in the development of a prototype pre-operational meridional overturning circulation (MOC) monitoring system (the thermohaline circulation, THC, is the main component of the MOC). By the end of RAPID, a design for an operational version of the monitoring system, and any technological and other developments necessary to its implementation, should have been produced. The long term objective of such a system is to detect change in the MOC on a decadal time-scale, and to aid prediction of future MOC changes, including early warning of rapid climate change.
17. The review team looked to a series of points to demonstrate that a national capability is being created.

### **Monitoring systems**

18. The team considered that the arrays at 26 degrees N could be effective at sampling heat transport *at that latitude* but felt that sampling at more northerly latitudes may provide a stronger signal and that the impact of any change may therefore be more evident. However, the reasons for choosing 26 degrees N were understood and the review team recognized that the science must necessarily be limited by the number of arrays it is possible to deploy. The team also understood the reasons for concentrating measurements on the Western boundary, since this was where the most intense interactions take place.
19. The review team recognized that both the technology and the overall monitoring system were being prototyped. The team investigated the mechanism whereby the prototype leads through to the final system. They were unclear as to the nature of the final specification. Therefore the team **recommended** that the RAPID Science Coordinators demonstrate to the

Steering Committee how the specification for the final operational version of the monitoring system is to be derived.

### **Models**

20. Datasets. The team was impressed with the proactive use of internal UK data management agencies, ie. BODC and BADC, but felt that more use could be made of datasets available outside the UK. Further discussions with the RAPID science team have lead the review team to understand that use is being made of a broad range of non-UK datasets. The team approved of the intention to look at model inter-comparison. They believed that gaps are being filled. In order to facilitate the use of data sets developed across the international community, the review team **recommends** that NERC should seek international standardization of datasets.

### **Analysis**

21. Analysis capability. The review team believed that an adequate analysis capability is being developed. The team wished to encourage continuation of the existing data assimilation efforts.

### **Training and Public awareness**

22. There is a clear policy for the employment of tied students. A number of complementary training schemes are in existence. The topic of Climate change has already received broad coverage in the UK, but nevertheless the RAPID managers have shown initiative in taking the opportunities to amplify the message as they have arisen – such as using the interest generated by the film ‘The Day After Tomorrow’.

### ***Term of Reference 2***

***To assess the effectiveness of the scientific and management leadership and process for cultivating long-term vision/mission and strategy, and the contribution of the NERC supported marine science towards NERC’s Mission and 5-year Strategy.***

23. The team found that the Science and Implementation Plans are specific with a 5 year strategy in place and stated deliverables. The team was satisfied that these deliverables are clearly measurable. The whole nature of this programme is fundamental to NERC’s published strategy.
24. The team was impressed with the strong leadership and good teamwork of Dr Meric Srokosz and Dr Christine Gommenginger. The scientific leadership is strong with good links being made between the projects. Corrective action had been taken in Round 2 to fill in gaps in the science which became apparent after Round 1. The objectives of this programme are challenging which makes the effective leadership provided by the Chair of the Steering Committee, Dr Lloyd Keigwin, together with

Dr Srokosz, Dr Gommenginger and Dr Phil Newton invaluable. The team believe that the Steering Committee is operating effectively. The team considered it had been a good idea to prune the Steering Committee and to bring in expertise when required. The team were impressed by the enthusiasm shown by everyone connected with RAPID. This manifested itself in the number of people who were eager to attend, observe and participate in the presentations given to the review team.

25. **Finding.** The team were impressed that a long-term vision was being cultivated. Professor Bryden particularly noted in his presentation that he is looking beyond the current end of the programme and looking to extend it. The review team found it satisfying to see that proposals and plans go beyond the term of the programme.
26. RAPID directly addresses one of the three priority areas of Science for a Sustainable Future on ‘Climate Change – predicting and mitigating the impacts’. RAPID is building up our ability to “understand the integrated physical, chemical, geological and biological response to climate variability and the consequent feedback on the climate system” and provides a national and international focus towards “improved prediction of the various drivers of climate change”.
27. The RAPID science objectives are closely aligned with some of the SSF Fundamental Research questions, including “What is the role of the Atlantic overturning circulation in regulating climate?”, “ How has the climate changed in the past, and how will it change in the future?”, “...can we expect to see abrupt climate change at the regional scale?”.
28. RAPID is delivering explicitly on NERC priorities identified in SSF such as “the development of new modelling efforts to predict future climate change” (RAPID objectives 4,5,6,7 & 8) and to “support experimental and log-term observation activities to understand processes and changes in the climate system” (RAPID objectives 1,2 & 3).
29. RAPID provides national and international leadership for rapid climate change research, by encouraging international collaborative projects between world-class researchers, and by facilitating and setting up joint funding opportunities with research councils abroad. The RAPID MOC Monitoring AO (reviewed and evaluated jointly with US NSF) and the Joint International AO (issued, reviewed and evaluated jointly with the research councils of Norway and The Netherlands) used the science objectives of RAPID for the scientific content of the respective calls. The international leverage of RAPID contributed an additional \$7M and €2.5M towards NERC strategic science for rapid climate change research.

### ***Term of Reference 3***

***To assess the effectiveness of arrangements to set research aims and objectives (including monitoring, survey and data management objectives), monitor progress and evaluate output.***

30. The scientific objectives of RAPID are set out in the Science Plan, which was developed by the RAPID Steering committee. The RAPID Steering Committee comprised 18 (now 12) members representing a multi-disciplinary cross-section of the UK rapid climate change community. The SC also includes a number of international representatives (US, Norway, Germany) as well as members from the user/stakeholder community (DEFRA, CEFAS, the Hadley Centre, the Tyndall Centre).
31. To date RAPID has issued four main announcements of opportunity (AOs) which are designed to address specific objectives of the programme. These were the first and second “Science” AOs, a specific “MOC monitoring” AO and a Joint International AO. The “MOC monitoring” AO targeted Objective 1 of the Science Plan while the first “Science” AO targeted the remaining objectives 2 to 8. The second “Science” AO targeted specific objectives of the programme which needed to be addressed following the first AO. The Joint International AO was issued jointly with the research councils of Norway (RCN) and The Netherlands (NWO) and aimed to build on the ongoing investments made by all three research councils on rapid climate change science.
32. Progress of research in the RAPID programme is monitored by the science co-ordinator through regular visits to Principal Investigators and regular email and phone contact with the RAPID PIs, researchers and students. The science co-ordinator liaises with the Steering Committee to assist in its evaluation of pilot projects, which are only partially funded, leading to its decision to proceed or not to full award. A summary of progress is included in the annual report to NERC and output and performance data is gathered as part of the annual NERC OPMs exercise.
33. An annual meeting was instigated in 2004, giving the opportunity for PIs, postdoctorates and students to ‘network’ and to report on progress. This meeting was well received and the format is being built on for the second annual meeting, due in 2005. This second meeting will include participants from the 1<sup>st</sup> and 2<sup>nd</sup> funding rounds and international partners in projects funded by the MOC monitoring AO and the Joint AO giving opportunities for further international collaborations.
34. Two one-day science workshops are scheduled for 2005. These are planned to examine key aspects of the science and to integrate activities across projects. The science co-ordinator acts as a focus for the RAPID



Steering Committee and the RAPID community to put forward topics for workshops.

35. A RAPID Data Centre (RDC) has been set up to support and advise PIs and to ensure that data are lodged with the relevant NERC designated data centre, in accordance with NERC and RAPID data policy. RDC personnel visit RAPID PIs to assess the data management needs of each project. Progress is monitored via regular six-monthly meetings with the science co-ordinator and annual reports to the Steering Committee.
36. The review team was pleased to see that these measures to set research aims and objectives, monitor progress and evaluate output were in place and evolving. However, for a directed programme of this magnitude, the team would have expected it to be managed by a Director, rather than Co-ordinator, with clear responsibility for both the financial resources and the delivery of the programme, advised by a steering committee, and with the support of a co-ordinator as necessary and **recommends** that NERC consider this. The team also **recommended** that use of the full array of standard project management tools, such as a formal work breakdown structure, with associated PERT's (Program Evaluation and Review Technique) and budgets should be made mandatory by NERC for such large, complex projects. In particular the team considered that project linkage could be better documented, for example with a flow diagram showing the linkages and interdependencies between the different strands of the programme.
37. The review team also **recommends** that overt risk management should be introduced for the programme as a whole, with a risk register being produced, identifying e.g. key personnel and key resources, an assessment of the effect of the implied threat to the programme, and identified fallback positions.

#### ***Term of Reference 4***

***To evaluate the achievements and productivity of NERC funded marine research, monitoring, survey and data management activities and to grade the quality of the programme/s informed by previous evaluations and international benchmarks, and based on the NERC Assessment Criteria appropriate for each funding category.***

38. **Finding.** The review team was highly impressed with the quality of the science that they saw. They were unable to recommend specific gradings in accordance with NERC criteria due to the project being only half complete, with most of the anticipated science output yet to be generated – there is a significant time lag between data collection and publication.

39. Each of the four RAPID AOs involved a two-stage process with a preliminary outline bid stage. Successful outline bids were selected on the basis of their science excellence and relevance to the funding call and objectives of RAPID.
40. The assessment panels for the 1<sup>st</sup> and 2<sup>nd</sup> “Science” AO consisted of the RAPID steering committee supplemented by expertise from the PRC and/or Peer Review College where specific expertise was lacking (e.g. due to vested interests). The evaluation panel of the MOC monitoring AO and Joint AO consisted primarily of independent world-leading scientists selected from the international climate change community (e.g. Martin Visbeck, Chair of CLIVAR Atlantic). The MOC Monitoring AO assessment was performed jointly with NSF, and the Joint AO assessment with RCN and NWO.
41. For each RAPID AO, scientific guidance from the outline bid assessment meeting was fed back to successful applicants to assist the preparation of the full proposals. Feedback was provided also to unsuccessful applicants on request.
42. All full proposals were assessed by international referees on the basis of NERC’s criteria. Bids to the 1<sup>st</sup> funding round were assessed for excellence and relevance, while proposals to the 2<sup>nd</sup> AO were assessed against (1) Science Excellence, (2) Fit to priority, (3) Risk/Reward and (4) Value for money. For the Joint International AO, four additional criteria were included: (1) Fit to the joint programme’s science remit (i.e. agreed with RCN and NWO to coincide with the science objectives of RAPID), (2) Builds on or complements work elsewhere (3) Demonstrates how a cross-national initiative will benefit the science (4) Explains relevance to strategic national programmes.
43. The review team was impressed that the RAPID management is achieving good gearing to other funding sources and in its links with Norway, the USA and The Netherlands.
44. The programme is only half way through its life and only a limited sample of the science was experienced during the review. However, what was seen was highly impressive and the team were stimulated by the presentations given. Grading would be best undertaken one or two years after the end of the project.
45. Risk/reward profile. The potential reward from RAPID is very high but the risk is more difficult to assess. For example, there is a risk of losing moorings and also a risk that the transect chosen will provide an

inadequate sample but the team found these risks impossible to quantify during the review, but noted that a risk assessment is currently being carried out for the moorings and a risk register established. Overall the team believed that the balance between high impact science and associated risk was acceptable, although, as stated previously, the team was of the strong opinion that the risk should be overtly managed.

46. The team is satisfied that the programme is highly cost-effective. It is a complete fit to NERC priorities and it offers outstanding value for money. Examples of its cost effectiveness include the use of existing datasets and models, and the gearing obtained from international collaboration.

***Term of Reference 5***

***To review the extent and productivity of national and international scientific links, including the focus the NERC funded marine science provides for international cooperation; for technology expensive projects; for coordinating distributed major programmes solving complex scientific problems; and for fostering a co-operative multidisciplinary approach across different types of research organisation.***

47. RAPID initiated and set up a working collaboration with the National Science Foundation (NSF) in the USA to co-design and co-fund the MOC monitoring system. Joint review and evaluation of proposals took place, which led NSF to invest a further \$7M in studies complementary to the RAPID funded MOC monitoring studies. The National Atmospheric and Oceanographic Administration (NOAA) is also contributing in kind, in terms of observations and ship time.
48. RAPID established links with the Netherlands Organisation for Scientific Research (NWO) and the Research Council of Norway (RCN). This resulted in the issuing of a Joint international AO for proposals involving researchers in the Netherlands, Norway and the UK. NWO and RCN agreed for the scientific scope of the funding call to be focussed on the scientific objectives of the RAPID programme. A total of €4M of funding was made available (NERC 1.5M€, NWO 1.5M€, RCN 1M€) to promote cross-national projects in the area of rapid climate change research. RCN and NWO also agreed to enforce onto their own PIs the NERC requirements for data management and for compulsory participation in RAPID annual meetings (NWO also provides funds towards these costs).
49. RAPID is funding a coupled model inter-comparison experiment to integrate its modelling activities and improve understanding of model uncertainties. The project, led by Jonathan Gregory (U. Reading), will bring together existing modelling activities across RAPID (from some 10

projects) with research taking place within the Hadley Centre and the international Coupled Model Intercomparison Project (CMIP).

50. As part of the NERC International Funding Opportunity AO, RAPID has submitted a bid (led by Peter Challenor, SOC, and a member of the RAPID Steering Committee) for funds for a RAPID visiting fellow scheme and a series of international workshops around the theme of understanding uncertainties in models and quantifying the probability of rapid climate change.
51. After initial concerns about the integration of the various aspects of the programme the review team found that the proposals were sufficiently multidisciplinary and were shown some superb examples during the presentations.
52. The team therefore conclude that the programme has forged effective international links, has good gearing on the science and utilises appropriate technology.

#### ***Term of Reference 6***

***To assess NERC funded marine science knowledge transfer of outputs, and take up by users, from research, survey, and monitoring programmes into new products and services, including data, information and advice.***

53. A RAPID website (<http://rapid.nerc.ac.uk/>) has been set up and is maintained by the Science Coordinator. This enables information to be communicated to the whole RAPID community. The website also served as a useful central resource during funding calls, to provided background information and forms to prospective applicants and to international reviewers. The review team felt that the website provided a good example of effective communication.
54. RAPID Knowledge Transfer (KT) plans have been developed in collaboration with DEFRA, the Hadley Centre, CEFAS, UKCIP and the Tyndall Centre to facilitate the exchange of information between the research and the user/stakeholder communities. A RAPID KT facilitator post has been awarded through the NERC KT AO. The role of the RAPID KT facilitator will be to act as the prime focus for interactions with the RAPID user/stakeholder community.
55. A RAPID data management plan and a specific RAPID data policy have been developed to ensure access to RAPID data during the lifetime of the programme and promote cross-disciplinary collaboration. A dedicated RAPID data centre web site has been set up (<http://www.bodc.ac.uk/projects/rapid>) to provide access to the RAPID

data inventory and RAPID cruise programme, as well as to an online facility to access relevant software and model output.

56. The review team wished to encourage the RAPID management to continue with its efforts in developing the KT strategy. The team **recommended** that the RAPID management overtly identify to whom it is looking as customers or consumers. The review team did not see the KT bid (for funding for a post of KT Facilitator). However, the stakeholders, customers and consumers were identified in that bid and it will be the task of the KT Facilitator to follow up on this.

#### *Term of Reference 7*

*To assess whether efficient, effective and economical use is being made of resources (including manpower, facilities, data and equipment) in order to successfully manage the various delivery mechanisms for marine science and examine the value for money of the activities, including science, in comparison with other providers, where this would be practical.*

57. Exceptional measures were taken to minimise the costs associated with the purchase of £3m worth of equipment for the MOC monitoring array. VAT was saved by purchasing equipment directly through UKORS. This saving enabled more projects to be awarded within the budget available.
58. The MOC monitoring array has benefited from support in kind, such as cruises, qualified sea-going staff and PIs time, from both the Southampton Oceanography Centre and the Proudman Oceanographic Laboratory Core Strategic Funding.
59. Value for money obtained has been enhanced by the sharing of resources, such as shiptime, equipment and technical support, between US and UK researchers involved in the joint NSF/NOAA/NERC projects. This international collaboration enhances NERC's investment in RAPID.
60. Several RAPID projects exploit existing datasets to derive new scientific insights.
61. Now that the RAPID programme is well established the RAPID Steering Committee has been down-sized (with effect from early 2005) from 19 to 12 members. This reflects the change in skills and expertise required to deliver the remaining tasks for the Steering Committee.
62. The review team commented that the links already forged with the Hadley Centre, DEFRA, the Tyndall Centre and UKCIP should be encouraged and built on.

63. The team therefore concluded that effective and economical use is being made of resources.

***Term of Reference 8***

***To assess whether the NERC funded marine science effectively invests in the development and support of major capital equipment, facilities, services and support staff.***

64. Equipment and instruments purchased for the MOC monitoring projects will contribute to the UKORS (UK Ocean Research Services - based at Southampton Oceanography Centre) marine equipment pool. Provision was made within the MOC array project for UKORS technical support for moorings and cruises. RAPID invested £500k through SBRI for the development of new technology relevant to the programme. RAPID projects use NERC services and facilities, particularly HPC (high performance computing) and <sup>14</sup>C (radiocarbon) and isotope analyses. All RAPID data will be lodged at a NERC designated data centre. The review team found that the investments being made appear to be well founded.

## Report of the Review of the NERC Directed Programme RAPID 2005

### **Summary of Findings & Recommendations**

<b>Finding/Recommendation</b>		
ToR 1	That the RAPID Science Coordinators demonstrate to the Steering Committee how the specification for the final operational version of the monitoring system is to be derived.	Paragraph 19
ToR 1	That there is standardization of datasets to make international use easier.	Paragraph 20
ToR 2	The review team found it satisfying to see that proposals and plans go beyond the term of the programme.	Paragraph 25
ToR 3	That NERC give consideration to it being managed by a Director, rather than a Co-ordinator, with clear responsibility for both the financial resources and the delivery of the programme. The Director should be advised by a steering committee, and provided with the support of a co-ordinator as necessary.	Paragraph 36
ToR 3	That the full array of standard project management tools, such as a formal work breakdown structure, with associated PERT's (Program Evaluation and Review Technique) and budgets should be made mandatory by NERC for such large, complex projects.	Paragraph 36
ToR 3	That there should be an overt risk assessment for the programme as a whole, identifying key personnel and key resources.	Paragraph 37
ToR 4	The review team found the quality of science seen highly impressive.	Paragraph 38
ToR 6	That the RAPID management overtly identify to whom it is looking as stakeholders, customers and consumers.	Paragraph 56

## **Appendix 1 Terms of Reference for the 2005 Review of the NERC Directed Programme RAPID**

1. To assess whether the NERC supported directed programme RAPID provides a national capability and source of advice to Government.
2. To assess the effectiveness of the scientific and management leadership and process for cultivating long-term vision/mission and strategy, and the contribution of the NERC supported marine science towards NERC's Mission and 5-year Strategy.
3. To assess the effectiveness of arrangements to set research aims and objectives (including monitoring, survey and data management objectives), monitor progress and evaluate output.
4. To evaluate the achievements and productivity of NERC funded marine research, monitoring, survey and data management activities and to grade the quality of the programme/s informed by previous evaluations and international benchmarks, and based on the NERC Assessment Criteria appropriate for each funding category.
5. To review the extent and productivity of national and international scientific links, including the focus the NERC funded marine science provides for international cooperation; for technology expensive projects; for coordinating distributed major programmes solving complex scientific problems; and for fostering a co-operative multidisciplinary approach across different types of research organisation.
6. To assess NERC funded marine science knowledge transfer of outputs, and take up by users, from research, survey, and monitoring programmes into new products and services, including data, information and advice
7. To assess whether efficient, effective and economical use is being made of resources (including manpower, facilities, data and equipment) in order to successfully manage the various delivery mechanisms for marine science and examine the value for money of the activities, including science, in comparison with other providers, where this would be practical.
8. To assess whether the NERC funded marine science effectively invests in the development and support of major capital equipment, facilities, services and support staff.



## Appendix 2 RAPID Membership Table 18 March, 2005

<b>Contact Details</b>	
<b>Chair</b>	
Dr Chris Fallows	Email: <a href="mailto:FalloChris@aol.com">FalloChris@aol.com</a>
<b>UK Members</b>	
Dr Mike Bell	Head (National Centre for Ocean Forecasting) Met Office FitzRoy Road Exeter Devon EX1 3PB Tel: 01392 886434 Fax: 01392 885681 Email: <a href="mailto:mikebell@metoffice.gov.uk">mikebell@metoffice.gov.uk</a>
Professor Peter Boyle	Professor Emeritus in Zoology University of Aberdeen Email: <a href="mailto:p.r.boyle@abdn.ac.uk">p.r.boyle@abdn.ac.uk</a>
Dr Bogi Hansen	Faroese Fisheries Lab PO Box 3051 Noatun FO-110 Torshavn Faroe Islands Telephone: 298 315092 Email: <a href="mailto:bogihan@frs.fo">bogihan@frs.fo</a>
<i>Secretariat</i>	
Jim Clipson	<a href="mailto:jmcli@nerc.ac.uk">jmcli@nerc.ac.uk</a>
Linda Moore	<a href="mailto:lbcm@nerc.ac.uk">lbcm@nerc.ac.uk</a>
Amanda Wood	<a href="mailto:awood@nerc.ac.uk">awood@nerc.ac.uk</a>

## **Appendix 3 Timetable**

### **REVIEW OF THE NERC DIRECTED PROGRAMME RAPID**

**To be held on 17<sup>th</sup> and 18<sup>th</sup> March 2005 at Polaris House, Swindon.**

#### **AGENDA**

#### **Thursday 17<sup>th</sup> March**

- 17.00 Members of Review Team to gather at Polaris House, Swindon  
Briefing meeting to be held in Pipistrelle Room (with Jim Clipson, Linda Moore)
- 18.00 Review Team, JC and LM to transfer to De Vere Hotel, Swindon
- 19.00 Meet in hotel bar
- 19.30 Private dinner in Compton Suite

#### **Friday 18<sup>th</sup> March**

- 08.30 Members of Review Team to transfer from hotel to Polaris House  
Room D1/D2 - Coffee available
- 09.00 Private session for Review Team
- 09.15 Review Team to meet Dr Lloyd Keigwin, Chair of RAPID Steering  
Committee (Dr Phil Newton, Dr Meric Srokosz and Dr Christine  
Gommenginger to attend)
- 09.30 Overview talk given by Dr Meric Srokosz, Science Coordinator and  
Dr Christine Gommenginger, Deputy Science Coordinator  
30 minutes for talk, 15 - 20 minutes for Questions and Answers
- 10.20 Professor Harry Bryden  
“Monitoring the Atlantic meridional overturning circulation at  
26°N”  
20 minutes for talk, 10 - 15 minutes Q&A
- 10.55 Coffee, tea, biscuits
- 11.15 Professor David Marshall

“Monitoring and attribution of climate change signals  
along the western margin of the Atlantic”  
20 minutes for talk, 10 – 15 minutes Q&A

11. 50 Private session for Review Team

12.45 Buffet Lunch

A chance to study the posters provided by the Principal Investigators and to talk informally with Mr John Hansford (Director Swindon Office), Dr Phil Newton (Marine Science Manager), Dr Mike Webb (Marine Science Programmes Officer), Dr Andy Parsons (Science Programmes Officer), the Science Coordinators and RAPID PIs

13.45 Dr Peter Challenor

“Towards the probability of rapid climate change”  
20 minutes for talk, 10 – 15 minutes Q&A

14.20 Professor Alayne Street-Perrott

20 minutes for talk, 10 – 15 minutes Q&A

14.55 Tea, coffee, biscuits

15.10 Private session for Review Team

16.30 Feedback to Science Coordinators

**CLOSE 17:00**