

# AFCAP

Africa Community  
Access Partnership



## ERA/RRC Priority Projects for AFCAP Funding

Final Report – AFCAP/EthRRC/02



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## Executive Summary

This report is submitted as an agreed output of the overall Scoping Project (SC14002) and provides a final list of projects agreed with the Ethiopian Roads Authority for Ethiopia based on the following:

- A visit to Ethiopia from 2 – 14 November 2014 for detailed discussions with the Director, Research and Development who will have responsibility for managing all future research projects on behalf of ERA through the RRC; other relevant staff of ERA; and external stakeholders including other funding agencies;
- Production of a draft scoping report for presentation at a stakeholder meeting of 24 March 2015;
- Agreement on the final list of projects following the stakeholder meeting of 24 March 2015.

This report outlines the project priorities agreed with ERA through the Directorate for Research and Development as a result of the stakeholder meeting of 24 March 2015. Details of the ten (10) priority projects listed in Table 2 are provided along with Terms of Reference or Project Proposals in the Appendices to assist the AFCAP PMU in the procurement of services to undertake the identified projects whether new or ongoing

## Key words

Roads and Transport Research; Project scoping report;

## **AFRICA COMMUNITY ACCESS PARTNERSHIP (AFCAP)**

### **Providing solutions for safe and sustainable rural access across Africa**

AFCAP is a research programme, funded by UK Aid, with the aim of promoting safe and sustainable rural access for all people in Africa and Asia. The AFCAP partnership supports knowledge sharing between participating countries in order to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources. The AFCAP programme is managed by Cardno Emerging Markets (UK) Ltd.

**See [www.afcap.org](http://www.afcap.org)**

## Acknowledgements

The priority projects for Ethiopia identified for funding by AFCAP were identified in association with top management of the Ethiopian Roads Authority (ERA) and agreed at a stakeholder meeting of 24 March 2015.

## Acronyms

AFCAP	Africa Community Access Partnership
AfDB	African Development Bank
APT	Accelerated Pavement Testing
ASCAP	Asia Community Access Partnership
CBR	California Bearing Ratio
CSIR	Council for Scientific and Industrial Research
DCP	Dynamic Cone Penetrometer
ERA	Ethiopian Roads Authority
EU	European Union
HVS	Heavy Vehicle Simulator
JICA	Japan International Cooperation Agency
LTPP	Long Term Pavement Performance
LVR	Low Volume Roads
LVRP	Low Volume Rural Roads
MLS	Mobile Load Simulator
MMLS	Model Mobile Load Simulator
PMU	Programme Management Unit
RRC	Road Research Centre
TA	Technical Assistance
TRL	Transport Research Laboratory
TS	Transport Services
UK	United Kingdom (of Great Britain and Northern Ireland)
UKAid	United Kingdom Aid (Department for International Development, UK)
URRAP	Universal Rural Road Access Programme

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## **1 Introduction**

As part of the second phase of the Africa Community Access Partnership (AFCAP), project scoping exercises were instigated in current AFCAP member countries to identify and prioritise projects that could potentially be supported by AFCAP.

The assignment has the following main objectives:

- To review existing plans and the strategy for the RRC produced by consultants to date;
- To produce, in collaboration with the RRC, an update of the current Business Plans for presentation to the ERA Research Management Committee and the Research Steering Committee of stakeholders constituted under AFCAP 1; with subsequent approval after commenting;
- To map out agreed priority research projects and concepts based on the above, and on preferences indicated at the Research Managers Meeting at TRL in September 2014, to enable detailed TORs to be produced. This should include potential funding from a range of Development Partners.
- To rank the importance of identified plans and projects towards the AFCAP Research Strategy (being developed) and to the Logical Framework.
- Produce TORs for selected priority projects for approval by ERA/RRC and AFCAP and/or identify individuals who would be suitable to prepare TORs for specific projects.

This report is submitted as an agreed output of the overall Scoping Project (SC14002) and provides a final list of projects agreed with the Ethiopian Roads Authority for Ethiopia based on the following:

- A visit to Ethiopia from 2 – 14 November 2014 for detailed discussions with the Director, Research and Development who will have responsibility for managing all future research projects on behalf of ERA through the RRC; other relevant staff of ERA; and external stakeholders including other funding agencies;
- Production of a draft scoping report for presentation at a stakeholder meeting of 24 March 2015;
- Agreement on the final list of projects following the stakeholder meeting of 24 March 2015.

The following final deliverables were agreed at the stakeholder meeting:

1. The draft scoping report would be updated and retained for background and as a record of the status of development of the RRC as at November 2014;
2. A separate report outlining the project priorities agreed with ERA/RRC as a result of the stakeholder meeting of 24 March 2015 would be produced (AFCAP/EthRRC/02). This report would also provide Terms of Reference or Project Proposals to assist the AFCAP PMU in the procurement of services to undertake the identified projects whether new or ongoing.
3. An updated 2015 version of the RRC business plan (RRC/15/01) for ongoing use in the management of the RRC.

This report satisfies deliverable 2.

Detailed Term of Reference (ToR) or project proposals (as required) are also included to allow AFCAP to take further actions in procuring services to implement the identified projects.

## 2 Priority Projects

A draft list of priority projects for AFCAP support was produced as part of the overall scoping report (AFCAP/EthRRC/01) and is shown in Table 1.

Following discussions at the stakeholder meeting, the following was agreed related to the priority projects in Table 1:

1. The Standard Specifications have been completed along with the standard drawings submitted by ERA for change. This project is essentially completed based on the original scope of works. However, the service providers have now been informed that unchanged drawings from the 2002 series now to be edited and upgraded to be of a similar quality to the drawings submitted for change. This is an additional 56 drawings that were not included in the original scope of works and ToR.
2. The National Database for Road Construction Materials is an ongoing project being funded by ERA through the RRC and previously received technical assistance from TRL up to November 2014. The project staff of the RRC require support for ongoing technical assistance for 3 years to finalise the project.
3. The draft Low Volume Roads Design Manual has been in practice since its launch in 2011. An independent review of the use of the manual has highlighted several revisions and structural changes that need to be considered in the finalisation of the manual. This will need discussion at the Manuals Dissemination Workshop of 15/16 April 2015 and further consideration by ERA related to the structure of the manual and the inclusion of DCP design procedures.
4. It was agreed that the “Guideline for the Standard Specifications” should be put on hold for a period of at least 2 years and the revised 2013 Standard Specifications should be used in practice. A decision on whether a guideline manual is required will be considered after two years based on the comments and problem that are identified in the use of the specifications. This project should be removed from the priority list.
5. The Material Testing Manual to complement the Standard Specifications remains a priority project and should be started as soon as possible.
6. The project for the “Development of a Sustainable Framework for LVRs” was subdivided into six manageable components where the following was agreed and identified three projects for AFCAP support:
  - a. Location of all low volume roads in a GIS-based database to be funded by ERA through the RRC. No support is required from AFCAP
  - b. Development of deterioration models for gravel roads to enable the application of more appropriate maintenance policies and strategies for LVRs to be supported by AFCAP. An analysis of URRAP roads should be included in the ToR for this project.
  - c. Risk-based ranking of LVRs based on their susceptibility to damage. This should be included as part of the regional AFCAP projects related to Climate Resilience and Maintenance.
  - d. Assessment of climatic and environmental impacts on LVRs to be included in the regional AFCAP project.
  - e. Assessment of the impact of dust and vehicle emissions on health and safety of those who live by the roadside. TA for a desk study will be funded by AFCAP to identify gaps specific to Ethiopia that would merit further investigation.
  - f. Determination of the appropriate modes of transport services based on location and level of traffic expected on specific roads. It was agreed that this could be funded by AFCAP and P Starkey, Transport Services specialist of the AFCAP PMU should be tasked to formulate the ToR.

<b>Table 1</b>					
<b>Summary of Projects Proposed for AFCAP Funding and presented to the Stakeholder Meeting of 24 March 2015</b>					
<b>Priority</b>	<b>Project Title</b>	<b>Status</b>	<b>Length (months)</b>	<b>Start Date</b>	<b>Comments</b>
1	Final review of the Standard Specifications & Drawings	Ongoing from AFCAP 1	2	Dec '14	Proposal submitted to AFCAP and project approved.
2	Development of a National Database of Road Construction Materials	Ongoing RRC project	12	Jan'14	Capacity Building with RRC. Supported by TRL as part of TA in 2014
3	Finalisation of the Low Volume Roads manual (including workshops)	Ongoing from AFCAP 1	8	Feb '15	To be finalised by original development team as agreed with ERA during AFCAP 1
4	Guideline for the use of the Standard Specifications	Ongoing from AFCAP 1	3	Feb '15	To be written by team who updated and reviewed the Specs (L Sampson/Bekele Jebessa/R Geddes)
5	Materials Testing Manual to complement the Standard Specifications	Ongoing from AFCAP 1	2	Feb '15	To be written by team who updated and reviewed the Specs (L Sampson/Bekele Jebessa/R Geddes)
6	Development of a Sustainable Framework for LVRs with consideration for climate and environmental factors	New RRC project	36	Mar '15	Capacity Building with RRC for 3 years. Possible TRL/CSIR joint support
7	Cinder Gravels investigation	New RRC project	18	July '15	General mentorship of Researcher(s) for undertaking a research project from inception
8	Monitoring of Demonstration Sections	Ongoing from AFCAP 1	2 weeks twice/year	May '15	Cost for 6 years. Previously supported by TRL (A Otto/T Greening)
9	APT testing of demonstration sections	New RRC project	12	Aug '15	Only some capacity building & training from AFCAP. Detailed justification in preparation for consideration by ERA, AFCAP and possibly other donors for joint support

7. Monitoring of demonstration section will continue to be done by the RRC with technical assistance provided by AFCAP for quality control and assistance in analysing results.
8. It was agreed Accelerated Pavement Testing (APT) was important to obtain performance data on all roads. ERA is seriously considering the purchase of an APT facility and a programme of testing would be developed as part of this initiative. Testing related to the improved performance of asphalt concrete was seen as a priority for APT but testing of LVR demonstration projects could also be considered once an APT facility has been commissioned and establish. However, it is likely that the purchase and commissioning of a facility of this nature will take at least 12 months. Once a commitment has been made to establish an APT facility, the testing of sealed LVR will considered as part of the programme and support of these projects will be discussed with AFCAP at that time.

## **2.1 Final List of Priority Projects**

Based on the agreements at the stakeholder meeting the revised list of priority projects is shown in Table 2 with the status, actions and linkage to the AFCAP Logical Framework.

Project summaries are provided in the subsequent sections.

### *2.1.1 Final Review of the Standard Specifications and Drawings*

Following meetings with ERA management during the visit of 3-14 November 2014 to identify priority project for funding through AFCAP 2, it was agreed that there was an urgent need for a final executive review of the Standard Specification (finalised and submitted at the end of July 2014 as part of AFCAP 1); and that the Standard Drawings, including the Bridge Drawings produced by JICA still needed review and, in many cases, redrawing to improve their quality.

Based on the comments from ERA, a proposal was approved by AFCAP for the final review and completion of the Standard Specification and Drawings for ERA. The objectives of the assignment are:

- Final Review of the Standard Specifications and Drawing with changes and edits made based on the comments from the Reviewers.
- Redraw and improve the existing Drawing supplied by ERA. This will also include the editing and inclusion of the bridge drawing produced by JICA.
- Produce print-ready files of the Standard Specifications and Drawings for printing and distribution by ERA.

Project details are:

- **Service providers:** L Sampson (compiler of the specifications); Bekele Jebessa and Rob Geddes (Final Reviewers) and a CAD technician;
- **Cost of Project:** £20 000;
- **Status:** The specifications and Drawings submitted to the project team by ERA were reviewed and completed in March 2015. ERA have now requested that 56 additional Drawings from the 2002 Standard Drawings that were not given to the project team for change and review are now upgraded to the same quality as the Drawing already changed. This will require an additional 20 days of time from the CAD technician. The contract is ongoing

AFCAP Priority Projects for Ethiopia

Table 2: Final Agreed List of Priority Projects for AFCAP Funding (with actions)							
Priority	Project Title	Status	Length (months)	Start Date	Budget (£)	Proposed Actions Required by AFCAP	Linkage to Logical Frameworks
1	Final review of the Standard Specifications & Drawings	Ongoing from AFCAP 1	2	Dec '14	20 000	<ul style="list-style-type: none"> <li>Project started mid-January 2015 due to unforeseen delays.</li> <li>Specifications and Drawings submitted for change by ERA are complete</li> <li>An additional 56 Drawings identified for change by ERA</li> </ul>	<ul style="list-style-type: none"> <li>Outcome indicator 1</li> <li>Outcome indicator 4</li> <li>Output indicator 1.1</li> </ul>
2	ERA 2013 Design Manuals & Specs Dissemination Workshop	New AFCAP/ ERA	0.5	Apr '15	22 000	<ul style="list-style-type: none"> <li>2 day stakeholder workshop to disseminate the contents and changes in the 2013 series of ERA design manuals and Specifications</li> <li>ERA to fund the venue and any other local costs</li> <li>Proposal in Appendix 1.</li> <li>AFCAP to finalise contracts with service providers.</li> </ul>	<ul style="list-style-type: none"> <li>Outcome indicator 1</li> <li>Outcome indicator 3</li> <li>Output indicator 1.1</li> </ul>
3	Development of a National Database of Road Construction Materials	Ongoing RRC project	12	Jan'14	150 000 up to December 2017	<ul style="list-style-type: none"> <li>Project has been ongoing since November 2013 as part of TRL TA to the RRC. Original proposal in Appendix 2.</li> <li>Possible framework agreement to be developed between AFCAP and TRL for capacity building of this nature.</li> <li>ToRs for this project are shown in Appendix 3.</li> </ul>	<ul style="list-style-type: none"> <li>Outcome indicator 1</li> <li>Outcome indicator 3</li> <li>Output indicator 1.1</li> <li>Output indicator 2.1</li> </ul>
4	Finalisation of the Low Volume Roads manual (including workshops)	Ongoing from AFCAP 1	8	May '15	115 000 in two stages	<ul style="list-style-type: none"> <li>Ongoing project from AFCAP 1.</li> <li>Revision to be carried out by the original team based on the independent review of the manual in October 2013 (phase 1 with ToR shown in Appendix 4).</li> <li>Project proposal prepared and attached in Appendix 5 for phase 2.</li> <li>Manuals Dissemination workshop of 15/16 April 2015 to be used to engage stakeholders on possible changes</li> <li>ERA to make final decision of possible restructuring of the manual</li> <li>AFCAP PMU to develop ToRs based on the project proposal and contract the original project team</li> </ul>	<ul style="list-style-type: none"> <li>Outcome indicator 1</li> <li>Outcome indicator 4</li> <li>Output indicator 1.1</li> </ul>
5	Materials Testing Manual	Ongoing from AFCAP 1	2	Jun '15	20 000	<ul style="list-style-type: none"> <li>AFCAP PMU to develop ToRs based on the project proposal in Appendix 6.</li> </ul>	<ul style="list-style-type: none"> <li>Outcome indicator 1</li> <li>Output indicator 1.1</li> </ul>

**Table 2: Final Agreed List of Priority Projects for AFCAP Funding (with actions)**

Priority	Project Title	Status	Length (months)	Start Date	Budget (£)	Proposed Actions Required by AFCAP	Linkage to Logical Frameworks
6	Deterioration models for Ethiopian gravel roads	New RRC/ AFCAP	36	Jun '15	80 000 per year for 3 years	<ul style="list-style-type: none"> <li>AFCAP to provide technical assistance and capacity building to RRC staff</li> <li>Previous work by TRL and CSIR to be included</li> <li>P Paige-Green and K Mukura identified for possible TA</li> <li>ToR in Appendix 7</li> </ul>	<ul style="list-style-type: none"> <li>Outcome indicator 1</li> <li>Outcome indicator 3</li> <li>Outcome indicator 4</li> <li>Output indicator 2.1</li> </ul>
7	Assessment of the impact of dust and vehicle emissions on health and safety	New RRC/ AFCAP	6	Jun '15	20 000	<ul style="list-style-type: none"> <li>Desk Study of current status of research and gap analysis</li> <li>TA from AFCAP to support RRC staff</li> <li>ToR in Appendix 8</li> </ul>	<ul style="list-style-type: none"> <li>Outcome indicator 1</li> <li>Outcome indicator 3</li> <li>Outcome indicator 4</li> <li>Output indicator 2.1</li> </ul>
8	Determination of appropriate modes of transport services for specific roads based on location and traffic levels	New RRC/ AFCAP	TBA	Jun '15	TBA	<ul style="list-style-type: none"> <li>Identification of types of transport services appropriate to specific regions</li> <li>P Starkey of the PMU to develop the ToR with ERA</li> </ul>	<ul style="list-style-type: none"> <li>Outcome indicator 2</li> <li>Outcome indicator 3</li> <li>Output indicator 1.1</li> <li>Output indicator 2.1</li> </ul>
9	Cinder Gravels investigation	New RRC/ AFCAP	18	July'15	110 000	<ul style="list-style-type: none"> <li>TA to support RRC staff</li> <li>ToRs prepared in Appendix 9.</li> <li>Project to be let by AFCAP on open tender</li> </ul>	<ul style="list-style-type: none"> <li>Outcome indicator 1</li> <li>Output indicator 1.1</li> <li>Output indicator 2.1</li> </ul>
10	Monitoring of Demonstration Sections	Ongoing from AFCAP 1	3 weeks twice/yr	May'15	25 000 per monitoring	<ul style="list-style-type: none"> <li>Ongoing project from AFCAP 1 in support of the RRC.</li> <li>Recommend that TRL continue for one monitoring before May 2015 to be agreed with ERA.</li> <li>Should be included in a framework agreement for capacity building support to the RRC.</li> <li>Review after two years as staff of the RRC should be ultimately trained to undertake the monitoring and analysis without TA.</li> </ul>	<ul style="list-style-type: none"> <li>Outcome indicator 1</li> <li>Output indicator 1.1</li> <li>Output indicator 2.1</li> </ul>

Table 2: Final Agreed List of Priority Projects for AFCAP Funding (with actions)							
Priority	Project Title	Status	Length (months)	Start Date	Budget (£)	Proposed Actions Required by AFCAP	Linkage to Logical Frameworks
11	APT testing of demonstration sections	New RRC project with AFCAP support on a project basis	12	Mar '16	To be agreed	<ul style="list-style-type: none"> <li>• Further detailed discussions required between ERA, AFCAP and other potential partners.</li> <li>• AFCAP would not be involved in any purchase or hire agreements for an APT facility.</li> <li>• ERA would negotiate the purchase or hire of a facility with an equipment supplier.</li> <li>• Should an APT facility be available to ERA, AFCAP could consider supporting capacity building and the testing of the demonstration sections to obtain accelerated performance result to compare with the LTPP currently being monitored under priority 9 above.</li> <li>• Needs to be part of a coordinated programme for APT testing for all roads in Ethiopia.</li> </ul>	<ul style="list-style-type: none"> <li>• Outcome indicator 1</li> <li>• Outcome indicator 3</li> <li>• Outcome indicator 4</li> <li>• Output indicator 1</li> <li>• Output indicator 2.1</li> </ul>

### 2.1.2 Dissemination Workshop for the 2013 Design Manuals and Specifications

Following a request by ERA management on 24 February 2015 to AFCAP and a subsequent meeting between AFCAP (Nkululeko Leta), ERA (Alemayehu Ayele) and the Project Director of the ERA Manuals project (Les Sampson), it was agreed that now that all the documentation for the project has been completed and being used by Ethiopian practitioners, it is important to disseminate the contents of the new and revised documentation and highlight the changes from the previous 2002 versions.

The dates for the 2-day Dissemination Workshop were set for 15-16 April 2015 and AFCAP agreed to support the workshop through the provision of presenters at the workshop. At a meeting of 24 March 2015 between AFCAP and ERA, it was agreed that ERA would cover all venue costs and any other costs incurred in Ethiopia related to the workshop.

The proposal submitted to AFCAP in response to the ERA request for the Manuals Dissemination Workshop is shown in Appendix 1.

Project details are:

- **Proposed service providers:**
  - **Les Sampson** who was the AFCAP Project Director responsible for management and development of all the manuals in the 2013 series and was directly responsible for the compilation and editing of the final draft of the Standard Specifications; and edited and restructured the Site Investigation and Bridge Design manuals.
  - **John Rolt** who was one of the Lead Authors for the Low Volume Roads Manual development and responsible for the revisions of the Geometric Design Manual, Pavement Design Manuals (Flexible and Rigid) and the Rehabilitation and Overlay Design Manual.
  - **Gareth Hearn** who edited the new Geotechnical Design Manual and authored the Route Selection Manual.
  - **Manaye Ewunetu** who was responsible for the revision of the Drainage Design Manual.
- **Cost of Project:** £22 000.
- **Status:** Arranged for 15/16 April 2015. AFCAP to finalise contracts with service providers

### 2.1.3 Development of a National Database for Road Construction Materials

This project is an ongoing project that was identified as part of the original business planning process in 2012 and had a detailed project proposal written (shown in Appendix 2). The project was approved by the RMC and started in 2013. It was intended that the project would be undertaken by RRC staff and funded by ERA. Technical assistance for capacity building and mentorship was provided by TRL during 2014 as part of their contract extension.

Sampling and testing of materials has started. It is understood that the materials database has been created and is being populated. However, based on discussions with other ERA staff, it is important that there is coordination between this project and the GIS-based project being initiated in the Planning and ICT Department to provide a detailed map of the Ethiopian road network. The location and properties of locally available materials from the materials database should be plotted on the map using the coordinates of the materials sources.

ERA has requested that support for this important project be continued through AFCAP as a capacity building intervention. For continuity, ERA has requested that TRL (through A Otto) be considered for this project.

ToRs for this project are provided in Appendix 3 and are based on the following assumptions:

- Support will be provided for 3 years starting in the first quarter of 2015;
- Two week visits should be scheduled for four (4) times per year (ie 12 visit in total);
- Time should be allocated in the home office for communication and support to the RRC staff (2 day per month).

Project details are:

- **Proposed service providers:** TRL UK Ltd for the services of A Otto;
- **Cost of Project:** £50 000 per year for three years. It is proposed that TRL are appointed on an annual basis with a review at the end of each year to facilitate the procurement process. It may be necessary to award an initial contract for £25 000 to TRL for two visits up the June 2015 until a framework agreement for capacity building of this nature is in place.
- **Status:** Urgent and awaiting approval to start in early 2015. TOR shown in Appendix 3.

#### *2.1.4 Finalisation of the Low Volume Roads Design Manual*

As part of the development process for a Design Manual for Low Volume Roads funded during AFCAP 1; and based on the inputs from five stakeholder workshops and the peer review groups, it was agreed that the LVR manual would be published as a draft for use by the industry for the first 2 to 3 years. The intention was to allow practitioners and stakeholders to become more familiar with the design philosophy and practice recommended in the manual; and to allow further discussion and debate with stakeholders based on its use before finalisation.

The Ethiopian Low Volume Roads Manual was published in draft form in May 2011 and was supplemented by an extensive training programme by ERA in the use and application of the manual. To date the manual has been mainly use on the Universal Rural Road Access Programme (URRAP) but now needs to be expanded to be used in the design of all low volume roads in the country at all government levels of authority for roads.

In August 2013, it was agreed with AFCAP that the finalisation of the manual should be done in two phases:

- **Phase 1** would include an independent review of the manual and its usage in Ethiopia, including any problems and recommended changes for the manual.
- **Phase 2** would be the revision and finalisation of the manual by the original team that authored and developed the manual, based on the independent review and other comments that have been received during the period the manual has been in use. Subsequent to the publishing of the ERA LVR manual, other national LVR manuals have or are now being developed with AFCAP funds and relevant comments from these developments will also be included.

Phase 1 of the updating of the manual (the independent review) was undertaken by IT Transport and the final report submitted in October 2013. As the first phase of AFCAP was coming to an end it was agreed that, based on initial cost estimates for phase 2, this project should be postponed until the second phase of AFCAP was in place. The ToRs for phase 1 are shown in Appendix 4 for background and will not be repeated in the proposal in Appendix 5.

This is now seen as an urgent need by ERA to update and finalise the manual before ERA undertakes a new training initiative to support the use of the manual for all low volume roads.

Project details are:

- **Proposed service providers:**
  - L Sampson - Project Director, compiler and technical editor of the manual;
  - J Rolt - Lead author, Geometrics and Drainage with inputs into Pavement Design and Materials);
  - M Pinard - Lead author Pavement Design and Materials;

- R Petts - Lead author, Part G Road maintenance manual and Part D, Design of small structures;
- P Bosman; Logistics and editorial manager who would also manage the services of the CAD technician and DTP specialist.
- **Cost of Project:** £75 000 assuming a restructuring of the manual
- **Status:** Urgent. Project proposal provided in Appendix 5 and awaiting approval to start.

#### *2.1.5 Materials Testing Manual to complement the Standard Specifications*

It has been agreed with ERA that complementary manual to the Standard Specifications is required to provide the specific test method to be used with the specifications in assessing suitability of materials and quality control. In some instances there is confusion and differences in specific test methods depending on whether they are British Standards, American standards or South African standards which are the main methods referenced in the specifications.

This project would provide an Ethiopian manual of the actual test method that should be used related to the specific requirements in the Standard Specifications.

A proposal is shown in Appendix 6 for consideration by AFCAP.

Project details are:

- **Proposed service providers:** L Sampson (compiler of the specifications);
- **Cost of Project:** £19 460.
- **Status:** Project could begin in June 2015.

#### *2.1.6 Deterioration models for Ethiopian gravel roads*

The reality is that gravel roads will form a major part of the total Ethiopian road network for the foreseeable future. This project is part of the broader project on the sustainability of LVRs shown as priority 6 in Table 1 and sub-divided under item 6 of Section 2 and will investigate how the construction, maintenance and management of gravel (unpaved) roads in Ethiopia can be improved.

There have been two major investigations that impact on the performance of gravel roads and the deterioration models in terms of roughness and gravel loss for management systems. The first study was undertaken by Paige-Green at the CSIR in South Africa and has developed deterioration models and specification limits that are commonly used in some African countries. A similar regional study has been undertaken by TRL in some southern and eastern African countries, including Ethiopia, and has developed regional and country specific deterioration models for gravel roads. The models from these studies are in addition to the traditional models used in road management tools such as HDM 4.

This project will look at existing knowledge and information available for improved performance of gravel roads and provide a consolidated investigation of the most suitable deterioration models for gravel roads in Ethiopia to enable more cost-effective management of these roads.

The project will also include a performance analysis of generally DC1 and DC2 roads constructed as part of the Universal Rural Roads Access Programme (URRAP).

The project will be undertaken by staff of the RRC with technical assistance, capacity building and mentorship provided through AFCAP support. It is anticipated that the support would be provided through a framework agreement for managing AFCAP capacity building interventions.

- **Proposed service providers:** P Paige-Green and K Mukura as part of a framework agreement for capacity building
- **Cost of Project:** £80 000 per year for three years. It is proposed that the service providers are appointed on an annual basis through a broader capacity building framework agreement with a review at the end of each year to facilitate the procurement process..

- **Status:** ToR is shown in Appendix 7. The project could begin in June 2015.

### *2.1.7 Assessment of the impact of dust and vehicle emissions on health and safety*

This project is part of the broader project shown as priority 6 in Table 1 and sub-divided under item 6 of Section 2.

A vast majority of the rural population of Ethiopia live in close proximity to roads which are generally unpaved. The consequence is that, in many cases, people are exposed to excessive dust and vehicle emission that could have serious implications in terms of health and safety. It is noted that several investigations of this nature have been carried out in other African countries and the finding of these investigations need to be investigated in terms of their applicability to Ethiopian conditions.

It is therefore proposed that a desk study be undertaken through AFCAP technical assistance in association with a counterpart researcher from the RRC. The study should identify existing studies that could be implemented in Ethiopia to alleviate dust and vehicle emissions and identify gaps in the knowledge base that would require further investigation to reduce the impact of dust and vehicle emissions on the health and safety of communities in Ethiopia.

- **Proposed service providers:** For open tender
- **Cost of Project:** £20 000.
- **Status:** ToR is shown in Appendix 8. The project could begin in June 2015.

### *2.1.8 Determination of appropriate modes of transport services for specific roads based on location and traffic levels*

This project is part of the broader project shown as priority 6 in Table 1 and sub-divided under item 6 of Section 2

The road network in Ethiopia is being significantly increased through programmes such as URRAP to improve all weather access in predominantly rural areas. The road development programme is being implemented in vastly differing climatic and topographic conditions but without the provision of associated appropriate transport services the benefit of improved infrastructure is greatly reduced.

This project has been identified by ERA to identify the most appropriate transport services based on location and expected traffic.

- **Proposed service providers:** For open tender
- **Cost of Project:** To be agreed based on ToR
- **Status:** Detailed ToR to be developed by the Transport Services specialist of the PMU.

### *2.1.9 Investigation of the classification and use of Cinder Gravels in Road Construction*

ERA through the RRC has identified a project to investigate the suitability of locally available cinder gravels for road construction, especially for use in lower volume roads. The project will be undertaken by staff of the recently established RRC and ERA has requested that AFCAP provide an experienced researcher for technical assistance to support and mentor the RRC researcher(s) on the project. The project provides an ideal opportunity for staff of the RRC to be trained and mentored by an experienced road researcher from the inception and planning of the project; through the investigatory and analysis phase; leading to the final reports and recommendations for use.

There are various types of cinder gravel abundantly available in mainly the central part Ethiopia, ranging from very weak material that can be crushed under foot to very strong material with high resistance to crushing. Should a suitable classification system and specification limits be established for use of these locally available gravels in road construction, they could significantly reduce the

construction costs of some roads through the reduction in haulage costs to bring in materials from a longer distance to meet the current specifications.

The project is intended to build on the work of TRL in the 1970's to classify these materials and the Terms of Reference to procure TA services for the project are provided in Appendix 9.

Project details are:

- **Proposed service providers:** To be procured through open tender;
- **Budget Estimate:** £110 000
- **Status:** ToRs provided in Appendix 9.

#### *2.1.10 Monitoring of the Demonstration Projects*

This is an ongoing project to obtain long-term performance data on the demonstration sections constructed during AFCAP 1. The sections are currently being monitored by staff of the RRC with support from TRL (A Otto and A Greening).

The monitoring is schedule for twice a year for four sections over a period of two to three weeks per monitoring. Each monitoring is estimated to cost £25k.

It is recommended that a contract is placed with TRL for a value up to £25k to cover the monitoring that should be done in the first quarter of 2015. Further monitoring support should be included in a capacity building framework agreement for support of this nature.

#### *2.1.11 APT testing of demonstration sections*

The use of Accelerated Pavement Testing (APT) to obtain performance data based on the ability of low volume road pavement structures to withstand the environmental impacts and loading damage over its design life (typically longer than 15 years) has been discussed on several occasions. While it is accepted that APT can provide valuable performance data in less than six months of testing, it is often difficult to justify the cost of an APT facility and the subsequent testing for low volume roads because of the capital investment required to purchase a testing machine.

However, should a country such as Ethiopia have other priority needs that include performance data for higher volume roads, there may be options for APT on low volume roads as part of a consolidated national programme for all roads. In addition, statements on the cost-effectiveness of APT for low volume roads are often very negative and subjective, based on the up-front cost the equipment (estimated to be in the order of \$3 million that would include purchase of the machine, commissioning, technology transfer and training interventions).

As a consequence, AFCAP requested CSIR to produce a review of pavement performance monitoring techniques and methods to help make a more rational decision on whether APT would be appropriate for evaluating some of the demonstration projects constructed with AFCAP funds. The report was submitted to AFCAP in November 2014 and summarises the main advantages and limitation of the methods and tools investigated; and provides information on the use of the various tools to enhance knowledge and the ability to design cost effective roads which should last their design lives. The information provided in the report applies to all types of pavements whether they are high, medium or low volume surfaced roads. The only difference is that the damage on higher volume (and loading) roads are mainly due to the repetitive loading and to a lesser extent due to the environment. In lightly trafficked low volume roads the environment tends to play a bigger role in the overall damage accumulation as opposed to loading alone.

Based on information in the CSIR report and experience of assisting in managing and technology development programme for the Gauteng Provincial Roads Authority that included APT, the following comments and recommendations are made related to Ethiopia:

- APT would provide valuable performance data on all roads in Ethiopia to evaluate the influence of traffic loads and the environment;
- An APT programme should be established to include all roads. Based on current discussion the following priorities are identified for APT testing:
  - Low Volume road demonstration projects;
  - Evaluation of the performance asphalt concrete mixes and the introduction of performance-based mix designs;
  - Comparison of the cost-effectiveness of rigid and flexible pavements.
- Options should be investigated by ERA related to the purchase or rental of an APT facility. Only the Heavy Vehicle Simulator (HVS), Mobile Load Simulator (MLS) and/or the Model Mobile Load Simulator (MMLS) are considered suitable.
- Should ERA obtain an APT facility, a project could be developed to test the demonstration sections for comparison with the LTPP monitoring of these sections. A project of this nature could potentially be considered for funding by AFCAP.
- Investigation of the performance of asphalt concrete could be possibly motivated through funding from the EU capacity building support to the RRC as described in 5.3.1.
- APT testing would lend itself to the development of a partnership between ERA and relevant funding agencies and programmes to evaluate the expected performance of specific design and material under specific environmental and traffic loading conditions for both high and low volume surface roads. Typical partners for specific relevant projects would be DFID through AFCAP and possibly other transport-related initiatives funded by DFID-Ethiopia, EU, the African Development Bank (AfDB) and possibly the World Bank.
- AFCAP should not be involved in the purchase or hire of APT facilities but could finance specific projects related to the design and performance of low volume surfaced roads, especially related to the demonstration projects constructed as part of AFCAP 1. Capacity building, technology transfer and training related to APT on specific LVR projects could also be considered.

### **3 Regional AFCAP Projects**

Apart from the projects identified as priority projects specific for Ethiopia and proposed to AFCAP for funding, ERA, through the RRC, would have the following other AFCAP projects that they would need to be involved in:

- Pavement designs based on the DCP method either using the DCP/DN methods or the DCP/CBR methods. This would include involvement in all training and capacity building interventions related to the use of the DCP.
- All regional initiatives related to climate resilience and change (see section 6.6).
- All regional initiatives related to maintenance (see section 6.6).
- Any general projects related to transport services and the feedback or replication of transport services initiatives from Tanzania into Ethiopia.

## Appendix 1: Proposal for the ERA 2013 Design Manuals & Specifications Dissemination Workshop

### Background

The Africa Community Access Programme (AFCAP) is a programme of research and knowledge dissemination funded by the UK government through the Department for International Development (DFID). AFCAP is promoting safe and sustainable rural access in Africa through research and knowledge sharing between participating countries and the wider community. The first phase of AFCAP commenced in June 2008 and ended in July 2014. The second phase, which will also run for 6 years, commenced on the 1<sup>st</sup> August 2014. The management of AFCAP 2 is contracted by DFID to Cardno UK.

As part of AFCAP 1, support was provided to Ethiopia through the Ethiopian Road Administration (ERA). The support included the following:

- Preparation of new design manuals, specifications, standard drawings and bidding documents for Low Volume Roads (LVRs);
- The updating of their existing 2002 series of road design manuals which included:
  - The Geometric Design Manual;
  - Pavement Design Manual (Flexible and Rigid);
  - Rehabilitation Design Manual;
  - Site Investigation Manual;
  - Drainage Design Manual; and
  - Bridge Design Manual (in association with JICA).
- Development of new manuals:
  - Geotechnical Design Manual; and
  - Route Selection Manual.
- Updating and revision of the 2002 version of the Standard Specifications and Drawings.

Up to the end of March 2015, the status was as follows:

- The Design Manual for LVRs was completed in draft in May 2011 and distributed for use for a period of 2 to 3 years as agreed with ERA. An independent review was undertaken in October 2013 following which the draft manual was scheduled for updating as part of AFCAP 2.
- The bidding documents are completed and in use.
- All the 2002 manuals have been revised and published as 2013 versions, including the editing and formatting of the Bridge Design Manual produced by JICA to make it consistent with the other manuals in the Series.
- The two new manuals have been completed and published.
- The Standard Specifications have been subject to final review and have been completed in March 2015.
- A draft version of the Standard Drawings was completed under a separate contract but on request from ERA the changed drawings required further updating and revision. In addition, the bridge drawing produced by JICA need to be consistent with the other standard drawings and included as one set of Drawings. The Drawings submitted to AFCAP for improvement have been completed. ERA have now requested that an additional 56 Drawing not given to the AFCAP project team during the original upgrading of the Drawings are brought to a similar standard and quality.

Following a request by ERA management on 24 February 2015 to AFCAP and a subsequent meeting between AFCAP (Nkululeko Leta), ERA (Alemayehu Ayele) and the Project Director of the ERA Manuals project (Les Sampson), it was agreed that now that all the documentation for the project has been completed and are being used by Ethiopian practitioners, it is important

to disseminated the contents of the new and revised documentation and highlight the changes from the previous 2002 versions.

The dates for the 2-day Dissemination Workshop were set for 15-16 April 2015 and AFCAP agreed to support the workshop through the provision of presenters at the workshop. At a meeting of 24 March 2015 between AFCAP and ERA, it was agreed that ERA would cover all venue costs and any other costs incurred in Ethiopia related to the workshop.

This proposal is submitted to AFCAP in response to the ERA request for the Manuals Dissemination Workshop.

### **Objectives**

The objectives of the assignment are:

- To provide feedback to major stakeholders in the Ethiopian road construction industry on the contents and changes to the 2013 series of Manuals, Specifications and Bidding Documents that have been revised and developed through AFCAP support. This includes revisions of existing 2002 documentation to make them consistent with the new draft Low Volume Roads Manual that was published in 2011 for use over a 3 year period prior to finalisation.
- Provide feedback on the proposed revisions to the Low Volume Roads Manual prior to finalisation.
- To provide logistical support in the organisation of the Workshop.

### **Project team**

The proposed Project Team is as follows:

- Les Sampson (LS) who was the AFCAP Project Director responsible for management and development of all the manuals in the 2013 series and was directly responsible for the compilation and editing of the final draft of the Standard Specifications; and edited and restructured the Site Investigation and Bridge Design manuals.
- John Rolt (JR) who was one of the Lead Authors for the Low Volume Roads Manual development and responsible for the revisions of the Geometric Design Manual, Pavement Design Manuals (Flexible and Rigid) and the Rehabilitation and Overlay Design Manual.
- Gareth Hearn (GH) who edited the new Geotechnical Design Manual and authored the Route Selection Manual.
- Manaye Ewunetu (ME) who was responsible for the revision of the Drainage Design Manual.

### **Scope of the Services**

The Project Team will be responsible for the following tasks:

1. Preparation of Powerpoint presentation on the changes/content of the new and revised manuals. (Assume 1 day per document for a presentation)
2. Attendance of the workshop In Addis Ababa. (Assume 3 days, 2 days for workshop and 1 day for a pre workshop meeting)
3. Assistance with the logistics of the workshop. (LS only)
4. Preparation of a workshop report (LS to compile with inputs from the project team)

**Facilities, services and resources**

It is anticipated that the preparation of presentations would be carried out in the home offices of the Consultants with one visit to Ethiopia for the workshop arriving 13 or 14 April and departing 17 April 2015.

**Assignment management, inputs and administration**

Each Consultant will be appointed individually to undertake the project.

**Timing of project**

It is anticipated that the project can be completed by 24 April 2015 with the submission of the workshop report.

**Workshop Programme**

The proposed draft programme for the workshop is shown in Annexure 1.

**Project Team Inputs**

The project Team inputs are shown Table 1 based on the workshop programme, estimated preparation time, inputs in the preparation of the workshop and preparation of a final workshop report.

<b>Table 1: Project Team Estimated Inputs</b>		
<b>Name</b>	<b>Task</b>	<b>Man Days</b>
Les Sampson	Preparation of seven presentations	6
	Attendance of workshop and preparation in Ethiopia	3
	Assisting ERA with logistical arrangements	1
	Writing Final report	1
John Rolt	Preparation of three presentations	3
	Attendance of workshop and preparation in Ethiopia	3
	Input into Final report	1
Gareth Hearn	Preparation of two presentations	2
	Attendance of workshop and preparation in Ethiopia	3
	Input into Final report	1
Manaye Ewunetu	Preparation of one presentation	1
	Attendance of workshop and preparation in Ethiopia	2
	Input into Final report	1
<b>Total Man days for Professional Fees</b>		<b>28</b>

**Deliverables**

1. A report on the proceedings of the workshop
2. Copies of the Powerpoint presentations (pdf versions) for posting on the AFCAP web site.

**Budget estimate**

Table 2 shows the estimate budget for the project assuming the following:

- Professional inputs of 28 days:
- 3 return economy airfares from the UK and 1 return economy airfare from South Africa;
- Per diem for international experts to cover accommodation and incidentals for 4 nights;
- Venue costs at an estimated rate for a hotel venue in Addis Ababa based on previous experience;
- No travel or per diems will be paid to Ethiopian attendees of the workshop.

<b>Table 2: Budget Estimates</b>			
<b>Item</b>	<b>Number</b>	<b>Rate (£/day)</b>	<b>Total (£)</b>
Professional fees	28	618	15 450
<b>Running Costs</b>			
Airfares from UK	3	700	2 100
Airfares from South Africa	1	650	650
Per diems – International experts	12	140	1 680
<b>Sub-total</b>			<b>19 880</b>
Contingency			2 120
<b>Estimated Project Budget</b>			<b>22 000</b>

## Annexure 1



**ERA 2013 Manuals and Specifications Dissemination Workshop**  
**15 & 16 April 2015**  
**Addis Ababa**  
**Draft Programme**

<b>Day 1: Wednesday, 15 April 2015</b>		
09:00 – 09:15	Welcome	ERA
09:15 – 09:45	Introduction and Overview of the development of the 2013 Manuals, Specifications and Bidding Documents	Les Sampson
09:45 – 10:30	Feedback on the Bidding Documents (Including discussions)	Les Sampson
10:30 – 11:00	<i>Tea/Coffee break</i>	
11:00 – 12:00	Feedback on changes to the Geometric Design Manuals (including discussions)	John Rolt
12:00 – 13:00	Overview of the Geotechnical Design Manuals (including discussions)	Gareth Hearn
13:00 – 14:00	<i>Lunch Break</i>	
14:00 – 15:00	Feedback on changes to the Pavement Design Manuals Vol 1 & 2, Flexible and Rigid (including discussions)	Joh Rolt
15:00 – 16:00	Feedback on changes to the Drainage Design Manual (including discussions)	Manaye Ewunetu
16:00 – 16:30	<i>Tea/Coffee break</i>	
16:30 – 17:30	Feedback on changes to the Site Investigation Manual (including discussions)	Les Sampson

<b>Day 2: Thursday, 16 April 2015</b>		
09:00 – 10:00	Feedback on changes to the Rehabilitation and Overlay Manual (including discussions)	John Rolt
10:00 – 10:30	Overview of changes to the Bridge Design Manual	Les Sampson
10:30 – 11:00	<i>Tea/Coffee break</i>	
11:00 – 12:00	Overview of Route Selection Manual	Gareth Hearn
12:00 – 13:00	Proposed changes to the LVR design manual and discussion	Les Sampson
13:00 – 14:00	<i>Lunch Break</i>	
14:00 – 15:30	Feedback to the changes to the Standard Specifications and Drawings – Series 0000 to 5000 (including discussions)	Les Sampson
15:30 – 16:00	<i>Tea/Coffee break</i>	
16:00 – 17:15	Feedback to the changes to the Standard Specifications and Drawings – Series 6000 to 10000 (including discussions)	Les Sampson
16:45 – 17:00	Summary and Closure of meeting	Les Sampson

**Appendix 2: Original Proposal for the Development of a Materials Database  
Approved by ERA**

**Project Proposal Number: RRC/MG&SI/2012/01**

Version 01

**24<sup>th</sup> May 2012**



**Development of a National Database of Natural  
Road Construction Materials in Terms of Quality,  
Quantity, Location and Cost**

Submitted by:

**Highway Design Team**

Contact Persons:

Name	Organisation	Telephone No.	Facsimile No.	E-mail Address

Submitted to:

ERA, Research Management Committee

## **1 Background**

There is an increasing awareness of the cost-effectiveness of including natural resource management as part of the planning for infrastructure development. The performance of a road depends on a whole range of factors that cumulatively can be described as the "road environment" within which construction material is a key factor over which road practitioners have some limited control within the context of natural availability. This control is maximised when the road designer has access to materials resource information, thus allowing him to match the most appropriate materials with the road task and its environment:

There is a demonstrable need to move away from a narrow project-related, and frequently superficial collection of materials information, to a much wider strategic knowledge base of materials data. A database of local material sources and engineering characteristics provides rural road practitioners with a powerful tool in selecting road surfacing options appropriate to the local road environment; and hence a vital adjunct to the potential achievements of project tasks such as pavement upgrading and maintenance.

The requirements for road construction materials are generally focussed on the higher quality and higher cost; needs of the pavement layers; and for concrete structures. There are also, however, requirements for locally available sub-grade and earthwork materials. General naturally occurring road material requirements may be summarised as follows;

- Common fill;
- Select fill;
- Capping layer or imported sub-grade;
- Filter and drainage aggregate;
- Concrete aggregate;
- Sub-base;
- Base;
- Surfacing aggregate.

## **2 Problem Statement**

The planning, design, construction and maintenance of road projects in an effective and economic manner depends on reliable information being available to the engineer in an easily recognisable and accessible format, at an appropriate level of accuracy. Ethiopian infrastructure projects can present serious materials information problems because they can cover large areas in remote terrain, with very variable geology and soils.

It follows from the above that prior knowledge of the location, quantity and quality of available materials would be of great advantage to national, provincial and district authorities in the planning and appropriate design of road projects.

The materials used in road construction and maintenance are an important and expensive resource that are not limitless and are largely non-renewable. This, together with the need for the management of scarce financial resources, means that widespread use of local materials is particularly essential for Rural Roads. Where reserves are limited or of marginal quality (when evaluated against current often inappropriate specifications), as they are in certain rural areas of Ethiopia, their relevant usage becomes a necessity. It is therefore important to use materials

appropriate to their role in the road that is to ensure that they are neither sub-standard nor wastefully above the standards demanded by their engineering task.

### **3 Project Objectives**

The overall project objective is the development and roll out a national database of road construction materials through the assembly of a pilot system undertaken in one province. To be fully effective a materials database for Ethiopia needs to address the diverse requirements of all of potential users and stakeholders:

- The data should be hosted by a single “owner” and in a compact standard format and, at the same time, be capable of dissemination and use down to province and district levels in more than one ministry.
- The system should be simple to understand and provide information required by road engineers and planners.
- The database should be capable of manipulation to provide answers to specific enquiries.
- The data sets should be capable of being updated when necessary without difficulty and used in conjunction with other relevant data sets and GIS systems.

Initially the database will concentrate on identifying the location, quantity quality and costs of existing sources although this may logically include potential resources of known material types.

An additional objective is a review of the suitability of expanding the database into a materials information system which includes as-used materials performance data.

It is important to appreciate that a materials inventory is not just a computerised data storage system, but also involves issues of data management. Management procedures and the availability of suitably trained staff need to be in place to enable the system to be updated, managed, maintained and used properly.

No matter how the data is acquired, its effective storage, collation and overall management lie at the heart of an effective materials database. Reliable and relevant materials information forms the core of any practical database system. The solution to the problem of providing easily accessible materials information must take on board a number of basic questions, namely:

- What materials are available?
- What is their nature?
- Where are they located?
- How much do they cost?

Table 1 lists key information sets and summarises their importance with respect to construction materials.

**Table 1. Materials Information Sets**

<b>Information Set</b>	<b>Description of Potential Information Sets</b>	<b>Key Applications</b>
Location	Location of materials sources by co-ordinates, by road chainage or by representation on maps.	Identification of resources; distances for material haulage; mass haul calculations.
Quantities of material	Amounts of potentially available material.	Reviewed in conjunction with volumes required and stockpiled quantities achievable and wastage. Requirements for further materials exploration or investigation
Geological nature	Classification: rock types, sand and gravel; duricrust etc. Morphology of the source. Amounts of weathering or overburden.	Material options identified for design. Potential problem identification. Overburden ratio calculations. Outline methods of extraction and processing.
Geotechnical character	Index or behaviour properties, either from tests on in situ, processed material or in service road performance.	Material quality identified. Appropriate methods of processing or use. Also, the identification of possible problems associated with these activities.
Project specifications	Engineering requirements will generally be readily available for sub-grade and pavement materials and probably also for fill and filter media.	Appropriate use of materials. Influence on design modifications required. Requirements for material processing or stabilisation. Possible impacts on construction plant selection and construction methodologies.
Economic factors	Costs of material processing; of haulage; and of any required modification.	Mass-haul cost calculations. Project costing.
Environmental impact factors	Impacts on the environment: pollution - dust, noise etc; Health – water borne disease; Loss of productive land etc.	Methods of source extraction, material processing and rehabilitation. Limits imposed by groundwater levels.

#### **4 Expected Benefits**

A key objective in sustainable road construction is to best match the available construction material to its function in the road within its local environment. The effective use of natural resources enables a better and more sustainable development of infrastructure within realistic budgets. Cost-effective road designs that incorporate appropriate materials allow more kilometres per unit cost of access to be built, rehabilitated and maintained. Particularly for rural roads the benefits of utilising locally available materials arise from a reduction in haulage costs and less damage to existing pavements from extended haul as well as enabling ongoing maintenance to be more locally centred. Benefits also stem from the better management of local resources that can steer new road construction towards the more environmentally aware use of natural resources

A full understanding of the capabilities of local materials is a necessary prerequisite to adopting and proposals for amended or relaxed specifications.

In road construction the location of natural materials has generally been regarded as a specific task and incorporated into the costs for each project. In the case where there is a lack of reliable information and a degree of uncertainty regarding the location of acceptable materials, contractors usually quote a premium price. However, if an accurate database of material resources was available it would greatly facilitate the planning and more accurate costing of construction projects. Materials appropriate to the road tasks could be more easily selected or shortfalls identified. Material costs could be better forecasted.

A systematic approach to the development and use of road construction sources enables a greater control to be kept on any potentially detrimental environment impacts, both in terms of quarry or borrow pit excavation and their eventual reinstatement.

The cost-effectiveness of materials databases may be summarised as follows:

- At a national planning level the information supplied by the database can be used to estimate the materials cost component of road building activities.
- At a local planning level the information could be used in the preparation of feasibility studies.
- Local engineers can use the system to identify suitable sources of material for construction and maintenance activities.
- The availability of materials can be assessed at a regional level and used as justification for increasing capacity through the establishment of new quarries or processing plants.

There are additional internal benefits for the RRC in terms of using this project as a training vehicle for research personnel associated with other materials-related projects.

## **5 Methodology**

Four key tasks are seen as the basis for the successful completion of the project; these are:

1. Database Design - A study will be conducted of previous regional and international experience in the development of materials databases together with the identification and collation of existing materials data in Ethiopia. Following on from this a structure and associated methodology for assembling the proposed pilot database will be designed; including appropriate GIS based database software.
2. Data Collection - The database procedures will be trialled in pilot studies within 1 province by collecting material information and taking samples for subsequent laboratory testing. It will be crucial that the collected information should be reasonably representative of the data sets likely to be encountered in a full scale national database. Data collection will be undertaken by a Field Data Collection Team from RCC and key laboratory tests assigned, Table 2.
3. Review and Upgrade. The pilot study database activities and outputs will be reviewed and where necessary the procedures will be refined. The whole system upgraded to provide a framework into which the National Database information can be progressively entered. Drafting of clear guidelines on the operation and use of the database. Identification of the Institutional Owner of the database (ERA).

4. Supervised Roll-out. The completion of the Ethiopian Materials database is likely to be a long process (2-3 years) and is not a role for this project. This project will be concerned with:
- planning the Roll-Out programme;
  - Ensuring that the adequate training and demonstration is undertaken for the organisation(s) that undertaken the data collection and collation;
  - Supervising the initial phases of the Roll-Out and acting as advisors and proving technical support
  - Undertaking initial Quality Audits on the Roll-Out activities.

**Table 2. Key Material Characteristics**

Material Characteristic	Description of the Material Property
1 Particle Size Grading	The relative proportions of each size fraction from gravel to clay size. Implications for compactability and permeability
2 Plasticity of Fine Fraction	The characteristics of the particles smaller than 0.425mm to behave as a plastic/ cohesive material at different moisture contents
3 Load bearing capacity of compacted material	The capacity of the compacted materials to support imposed loads under saturated conditions
4 Volume Stability	Volumetric response of the compacted material to swell on soaking. Indicator of moisture susceptibility of fines.
5 Particle Strength and Durability	The existing strength of individual particles and the ability of the particles to maintain this strength during the life of the road.
6 Particle Shape	The angularity and flakiness of the aggregate particles and their ability to interlock together

## 6 Deliverables

The key deliverables are:

- A working GIS-based database system containing comprehensive data from one trial province.
- Clear guidelines on the operation and use of the database.
- A logical plan for the Roll-out of the National Database programme.
- Key personnel trained in the collection of data and the inputting and reporting systems.
- Key personnel trained on dissemination of information from the database to clients and customers and in response to queries.
- Technical papers for national and international audiences on the formation and use of the Ethiopian materials database.
- Recommendation son the possible expansion of the database into a comprehensive National Construction Materials Information System.

## 7 Implementation of Findings

Key to the success and development of the project will be to deliver a system capable of satisfying the needs of the relevant stakeholders. Table 3 summarises local stakeholder expectations based on the experienced gained with setting up other systems.

**Table 3 - Stakeholder Expectations**

Stakeholders	Expectations
Provinces	Better planning of local extractions for construction and maintenance, more effective safeguards on environmental damage, advance warning on potential overloading and deterioration of local roads.
Ministries	Data available on the location, properties and costs of materials; more accurate cost planning; more effective use of diminishing resources, greater control on quality and cost of materials items within contracts.
ERA/RRC	Transfer of technology on the procedures for materials location and practical data management. Institutional strengthening.
AFCAP	Development of methodologies for international adaptation.
Donors	Better information for the assessment of road schemes and more accurate cost estimates.

## **8 Project Plan**

### **8.1 Programme**

The project programme and staffing for each activity is shown in Table 4.

AFCAP Priority Projects for Ethiopia

Table 4 – Project Gantt Chart

					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 Activities	Review of database procedures and materials information				█																	
	Set-up and initially test data collection procedures				█		█															
	Set-up and test a GIS-based database framework				█		▨															
	Interim guidelines and Technical Report				█			☆														
1 Staffing	Team Leader	Office	10d	Field	5d	▨		▨														
	Senior Researcher		70d		10d	█		█														
	Researcher		50d		10d	█		█														
	Researcher (IT)		30		0	█		▨														
	Junior Researcher		70		10	█		█														
2 Activities	Initiation of programme and training				█																	
	Fieldwork and lab testing form Pilot Study				█		█															
	Data collation and input in framework				█		█															
	Technical Report				█			☆														
2 Staffing	Team leader	Office	20d	Field	5d	▨		▨														
	Senior Researcher		20d		20d	▨		▨														
	Researcher		10d		50d	█		█														
	Researcher (IT)		15d		0	█		▨														
	Junior Researcher		30d		50d	█		█														
	Laboratory Staff (2)		50d		0	█		█														
3 Activities	Review of Pilot Study				█																	
	Amend and upgrade data collection and testing procedures				█		█															
	Amend and upgrade IT components of system				█		▨															
	Comprehensive guidelines and Technical Paper				█			☆														
3 Staffing	Team Leader	Office	10d	Field	0	▨		▨														
	Senior Researcher		45d		0	█		█														
	Researcher		50d		0	█		█														
	Researcher (IT)		25d		0	█		▨														
4 Activities	Planning of Roll-Out				█																	
	Training of Roll-Out personnel				█		█															
	Supervision of initial roll out				█		█															
	Technical Paper				█			☆														
4 Staffing	Team leader	Office	25d	Field	5d	▨		▨														
	Senior Researcher		90d		20d	█		█														
	Researcher		60d		50d	█		█														
	Researcher (IT)		25d			█		▨														

## 8.2 Project Costs

The manpower costs of the project will be funded through the normal ERA budget for RRC staff.

The estimated running expenses are shown in Table 5.

Table 5: Project Running Expenses					
Item No	Description	Unit	Rate	Quantity	Amount (ETB)
<b>1</b>	<b>Allowance and Fees for staff</b>				
1.1	Team Leader (1)	Pd	105	15	1,575
1.2	Project leader/Senior Researcher (1)	Pd	105	50	5,250
1.3	Researcher (Materials)	Pd	105	110	11,550
1.4	Researcher (IT)	Pd	105	0	
1.5	Junior Researcher	Pd	105	60	6,300
1.6	Driver	Pd	85	40	4,200
<b>2</b>	<b>Transport</b>				
2.1	Vehicle + fuel + service	Day	1000	150	150,000
<b>3</b>	<b>Reporting</b>				
3.1	Printing	Page	2	5000	10 000
3.2	Copying	Page	1	5000	5 000
3.3	Binding	Doc	50	30	1 000
<b>4</b>	<b>Information Gathering &amp; Dissemination Workshops (2)</b>				
4.1	Venue	No	2000	2	4 000
4.2	Lunch & refreshments	No	350	60	21 000
4.3	Participant costs	Pd	100	60	6 000
<b>Sub-total</b>					178,875
<b>10% Contingency</b>					17,875
<b>Total</b>					196,762

## 8.3 Project Team/Personnel

- **Team Leader:** Project direction and overall budget control
- **Senior Researcher:** Technical responsibility and research activity planning – the Database Manager
- **Researchers:** Research and training task responsibilities
- **Junior Researcher:** Support to research activities specific responsibility for sampling and laboratory liaison.
- **Laboratory Staff:** Undertaking and reporting assigned laboratory testing programme

In addition to the above core staff, the attachment of additional RRC staff to the team should be considered for the purposes hands-on training and getting research experience.

**8.4 Payment Schedule**

No payment schedule.

The project will be funded through the ERA/RRC budget and will be managed against progress reports and interim and final deliverables.

Any overspending or deviation from the approved budget should be motivated through the RRC management group for approval by the ERA Research Management Committee

**9 Approval of the Project**

I .....hereby accept the content of the proposal

**"[Click here & insert Proposal Number]"**

on behalf of

the RMC of ERA (or external CLIENT)

Signed at .....on this ..... day of .....  
20.....

As witness: (if necessary)

1) .....

2) .....

I ..... hereby undertake on behalf of  
"[RRC or Team Name]" to complete the work set out in the proposal

**"[Click here & insert Proposal Name]"**

under the conditions of contract

Signed at .....on this ..... day of .....  
20.....

As witness: (if necessary)

1) .....

2) .....

## **Appendix 3 Terms of Reference for Capacity Building and Mentorship of the RRC Staff involved in the Development of a Materials Database**

### **Background**

The Africa Community Access Programme (AFCAP) is a programme of research and knowledge dissemination funded by the UK government through the Department for International Development (DFID). AFCAP is promoting safe and sustainable rural access in Africa through research and knowledge sharing between participating countries and the wider community. The first phase of AFCAP commenced in June 2008 and ended in July 2014. The second phase, which will also run for 6 years, commenced on the 1<sup>st</sup> August 2014. The management of AFCAP 2 is contracted by DFID to Cardno Emerging Markets, UK.

The detailed project proposal for the “Development of a National Database of Natural Road Construction Materials in Terms of Quality, Quantity, Location and Cost” was prepared in May 2012 and approved by the Research Management Committee (RMC) of the Ethiopian Roads Authority (ERA) for the project to be undertaken by Road Research Centre (RRC) staff with ERA funding. As part of the extension to the TRL project for the “Establishment of the RRC” funded with World Bank funds to provide Technical Assistance to the RRC for one year (November 2013 to November 2014), capacity building and mentorship was provided for this project.

With the completion of the TRL project in November 2014, ERA has requested that AFCAP provide ongoing Technical Assistance to this project. For continuity this would ideally be provided by staff of TRL, UK Ltd who have been involved with the project during 2014.

### **Objectives and Scope of Services**

The objective of this assignment is to establish a Technical Assistance call-off arrangement in order to support the Department of Research and Development of ERA through the RRC for a three year period to support the development, establishment and population of a road materials database for Ethiopia.

As part of the project, it is important that initiatives being undertaken by other departments of ERA are considered during the tenure of this project. In this regard, the development of a GIS-based map of the complete Ethiopian road network would be of particular relevance.

### **Minimum Experience requirements**

The project will be carried out by an international consultant who has demonstrable experience of Road and Transport Research, and has experience in Ethiopia particularly related to the RRC.

The Consultant is expected to provide a suitably qualified individual (Minimum MSc or equivalent with 10 years road research experience).

### **Consultant’s Inputs**

The Consultant will provide for four (4) visits to Ethiopia in a one year period for twelve (12) continuous working days per visit and shall provide for two (2) days per month for home office support and mentorship of RRC staff working on the project.

A total of 48 working days per years shall be undertaken in-country and 24 day per year in the home office for a period of three years depending on the performance of the Consultant. Travel, accommodation and subsistence costs will be provided for the four in-country visits per year

Performance reviews will be undertaken by ERA in association with the AFCAP PMU at the end of each year of the service before continuation for subsequent years is approved.

## **Reporting Outputs**

The outputs from this project will be measured against deliverables from the project proposal.

The key deliverables for the project are:

- A working GIS-based database system containing comprehensive data from one trial Region.
- Clear guidelines on the operation and use of the database.
- A logical plan for the Roll-out of the National Database programme.
- Key personnel trained in the collection of data and the inputting and reporting systems.
- Key personnel trained on dissemination of information from the database to clients and customers and in response to queries.
- Technical papers for national and international audiences on the formation and use of the Ethiopian materials database.
- Recommendations on the possible expansion of the database into a comprehensive National Construction Materials Information System.

A report shall be prepared by the consultant after 12, 24 and 36 months from the start of the project and will highlight, but not be restricted to, the following:

- Progress against the overall project plan and schedule;
- Status of database development;
- Status of the roll-out plan;
- Number of sites sampled and tested for input into the database;
- Key personnel trained;
  - Collection and input of data;
  - Dissemination of information
- Reports, papers and presentations related to the project;
- Any constraints to development;
- Updated plans for the subsequent year.

## **Assignment management and administration**

The consultant will report to the Director, Research and Development of ERA for the day-to-day management and support, in association with the AFCAP Technical Services Manager for technical aspects and delivery of milestones for the assignment.

For contractual and administrative matters the consultant will report to the AFCAP Project Manager in UK.

## Appendix 4 Terms of Reference for Phase 1 of the Finalisation of the ERA Design Manual for Low Volume Roads (from AFCAP 1)

The Africa Community Access Programme<sup>1</sup> (AFCAP) is a research programme funded by the UK government's Department for International Development (DFID). AFCAP is assisting the Ethiopian Road Authority (ERA) to update and expand the existing suite of road design manuals, standard specifications and bidding documents.

### **Background**

The overall objective of the project is to review, update and expand the existing series of ERA design manuals, standards specifications and bidding documents. This includes greater recognition of the specific requirements of low volume roads. The purpose of the design manuals, specifications and standard bidding documents is to promote rational, appropriate and affordable implementation of projects for all roads in Ethiopia that make appropriate use of local resources and are cost-effective and sustainable.

Local ownership of the documents is imperative and the methodology adopted in preparation of the documents has been a key element of this process. The process involves the full participation of local experts in the preparation of new chapters or thematic areas, or the revision of existing documents. This participation is being guided and supplemented through inputs by regional and international experts. The documents are all subject to high level quality assurance and endorsement by appropriate authorities at both regional and federal government. The project is being overseen by the Research Steering Group, which is chaired by the Ethiopian Roads Authority (ERA).

The project is being managed by the AFCAP Core Management Group (CMG). The CMG is providing the following services:

1. Assist ERA to organise Research Steering Group Meetings.
2. Identify, appoint and supervise a Technical Director with oversight for the production of the manual and bidding documents.
3. Identify, appoint and supervise specialist lead authors and works contracts experts for the various component chapters of the manual and bidding documents.
4. Identify, appoint and supervise other specialist contributors as required.
5. Assist ERA and Regional Road Authorities to organise technical thematic workshops and peer review meetings for the manual and bidding documents.
6. Organise the distribution of drafts of documents to stakeholders for comment and review.
7. Organise final printing and distribution.
8. Assist ERA with the preparation of publicity and other dissemination materials.

A key output of the project is a new series of manuals for the design and maintenance of low volume roads. This series of manuals was published by the Ethiopia Roads Authority in 2011. The manuals are accompanied by standard bidding documents including standard technical specifications for labour based construction of wereda roads, and standard drawings. These documents are now in use on the Universal Rural Roads Access Programme (URRAP) and other low volume roads improvement projects implemented by ERA. They were published in draft form with the intention of updating them after a period in use.

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<sup>1</sup> AFCAP is a DFID funded programme of research, knowledge dissemination and training, designed to address the challenges of providing safe and sustainable access to poor communities in Africa. The management of AFCAP has been contracted by DFID to Crown Agents.

## **Scope of the Services: Review of Design Standards and Maintenance Guidelines for Low Volume Roads**

The review and updating of the LVR documents will follow a two phase process. The first phase will examine the extent to which the documents are in use in Ethiopia, identify any specific barriers to their use, and provide recommendations for the updating process. The second phase, which will include implementation of the recommendations of the first phase, will be carried out by the original authors of the documents.

The Consultant for Phase 1 will review the use of the ERA LVR design manuals under URRAP and other programmes in Ethiopia and identify specific areas for update, improvement, training and dissemination. The study will consider how recent innovations and lessons learned under AFCAP research projects in Ethiopia and elsewhere in the region could be better reflected in the Ethiopia documents.

At the start of the assignment the Consultants shall receive a briefing from ERA management, the AFCAP Technical Services Manager, and the AFCAP Technical Director for the Ethiopia manuals project.

The Consultants shall:

1. Familiarise themselves with the 2011 ERA LVR documents in particular:
  - Road Design manuals (Parts A, B and D)
  - Complimentary Interventions Manual (Part C)
  - Structures Manual (Part E)
  - Trail Bridge Design Manual (Part F)
  - Maintenance manual (Part G)
  - Standard Specifications for Labour Based Construction of Wereda Roads
  - Standard Drawings
  - Standard Bidding Documents.
2. Conduct an overview of research projects carried out under AFCAP in Ethiopia and other countries in the region that may be relevant to the updating process.
3. Undertake visits to a selection of regions and weredas where URRAP or other relevant programmes are being implemented; inspect road works being carried out and solicit the views of local communities and road users on the standards and approaches adopted.
4. Conduct interviews with road experts, consultants and contractors in the selected study areas to obtain feedback on the use of the manuals and bidding documents and to identify any barriers to the implementation of the guidelines.
5. Conduct interviews with ERA staff engaged in the implementation of URRAP and other LVR projects.
6. Discuss findings and initial recommendations with senior ERA officials, AFCAP management, and the AFCAP Technical Director for the LVR manuals project.
7. Prepare a draft report including: i) an assessment of the extent to which the new documents and standards are being used in Ethiopia ii) recommendations for improvements to the documents and standards iii) recommendations for further training and dissemination.
8. Prepare a final report taking into account any comments in the draft report from ERA and AFCAP management.

The Consultant is not required to analyse or review the principles of Low Volume Road design that form the basis for the LVR documentation. These principles are now well established in Ethiopia. It is expected that the assignment will focus more on the implementation and roll-out of the LVR design approach than the technical details of the design approach and the road design standards that have been established.

All reports shall be submitted in electronic form.

**Minimum Experience requirements**

The assignment will be carried out by a team of two experts. Both members of the team shall have an appropriate university degree at masters' level or equivalent and a minimum of 15 years' experience in the road sector and rural development. Prior experience in Ethiopia by at least one of the team members is essential, including relevant work in rural areas. Preference will be given to proposals that include an Ethiopian national on the team. None of the experts shall have participated directly in the original preparation of the LVR documents.

The team must be able to demonstrate the following specific areas of skills and experience:

- Rural roads engineering (paved and unpaved roads)
- Maintenance of rural roads
- Use of labour based technology and intermediate equipment
- Small contractor development
- Decentralised road sector management
- Contract management and administration
- Community development
- Rural transport services
- Social and environmental impacts of road works.

**Facilities, services and resources to be provided by the Consultant**

The Consultants are expected to make one visit to Ethiopia of up to three weeks for purposes of the assignment. The consultants shall visit a minimum of six weredas in three regions where URRAP is being implemented. If possible these field trips should include visits to a selection of non-URRAP sites where LVR standards are being implemented, e.g. ERA/AFCAP Otta Seal demonstration sites. The Consultants will be accompanied by ERA or Regional Road Authority staff at all times during the field visits.

The Consultants are responsible for providing their own transport (road and air), accommodation and subsistence at their home base and in Ethiopia, as well as telephone communications, notebook computer and internet access.

The Consultants are not required to provide subsistence costs or airfares for government staff but should be prepared to share road transport.

ERA will provide the Consultant with one hard copy of the LVR Design Manuals (Part A to G) and the Standard Drawings, as well as electronic versions of all relevant documents.

**Assignment management, inputs and administration**

The total anticipated time input of the Consultants is 45 days, shared approximately equally between the two experts.

The Consultants will liaise with the ERA Deputy Director General (Planning) or his representative for all day-to-day aspects of the implementation of the assignment in Ethiopia. All correspondence and reports shall be copied to the AFCAP Technical Services Manager. For contractual issues the Consultants are required to report to the Procurement Manager of AFCAP, who is based in Sutton, UK.

## Appendix 5 Project Proposal for the Finalisation of the ERA Design Manual for Low Volume Roads – Phase 2

### **Background**

The Africa Community Access Programme (AFCAP) is a programme of research and knowledge dissemination funded by the UK government through the Department for International Development (DFID). AFCAP is promoting safe and sustainable rural access in Africa through research and knowledge sharing between participating countries and the wider community. AFCAP 1 commenced in June 2008 and ended in July 2014. The second phase, which will also run for 6 years, commenced on the 1<sup>st</sup> August 2014. The management of AFCAP 2 is contracted by DFID to Cardno Emerging Markets, UK.

As part of AFCAP 1, support was provided to Ethiopia through the Ethiopian Road Administration (ERA). The support included the following:

- Preparation of new design manuals, specifications, standard drawings and bidding documents for Low Volume Roads (LVRs);
- The updating of their existing 2002 series of road design manuals which included:
  - The Geometric Design Manual;
  - Pavement Design Manual (Flexible and Rigid);
  - Rehabilitation Design Manual;
  - Site Investigation Manual;
  - Drainage Design Manual; and
  - Bridge Design Manual (in association with JICA).
- Development of new manuals:
  - Geotechnical Design Manual; and
  - Route Selection Manual.
- Updating and revision of the 2002 version of the Standard Specifications and Drawings.

Up to the end of AFCAP 1 on 31 July 2014, the status was as follows:

- The Design Manual for LVRs was completed in draft in May 2011 and distributed for use for a period of 2 to 3 years as agreed with ERA before finalisation.
- The bidding documents are completed and in use.
- All the existing 2002 manuals have been revised and published as 2013 versions, including the editing and formatting of the Bridge Design Manual produced by JICA to make it consistent with the other manuals in the Series.
- The two new manuals have been completed and published.
- The Standard Specifications have been completed in final draft and were submitted as part of AFCAP 1 at the end of July 2014.
- A draft version of the Standard Drawings was completed under a separate contract but requires updating and revision. In addition the bridge drawing produced by JICA need to be consistent with the other standard drawings and included as one set of Drawings.

In August 2013, it was agreed with AFCAP that the finalisation of the draft 2011 version of the LVR manual should be done in two phases:

- **Phase 1** would include an independent review of the manual and its usage in Ethiopia, including any problems and recommended changes for the manual.
- **Phase 2** would be the revision and finalisation of the manual by the original team that authored and developed the manual, based on the independent review and other comment that have been received during the period the manual has been in use. Subsequent to the

publishing of the ERA LVR manual, other national LVR manuals have or are now being developed and relevant comments from these developments will also be included.

Phase 1 of the updating of the manual (the independent review) was undertaken by IT Transport and the final report submitted in October 2013. However, as the first phase of AFCAP was coming to an end it was agreed that, based on initial cost estimates for phase 2, this project should be postponed until the second phase of AFCAP was finalised and in place.

Following meetings with ERA management during a project scoping visit of 3-14 November 2014 to identify priority project for funding through AFCAP 2, it was agreed that there was an urgent need to start phase 2 of the project to update and finalise the draft 2011 version of the Design Manual for Low Volume Roads.

This proposal is submitted to AFCAP for the revision, updating and finalisation of the LVR Design Manual with the production of a print-ready master document for publication by ERA.

### **Objectives**

The objectives of the assignment are:

- To feedback the recommendations of the Independent review and other issues and concerns that have been raised during the use of the draft manual since May 2011 to ERA and other stakeholder.
- To agree changes to the structure and content of the final manual with ERA.
- To prepare a final print-ready master document of the ERA Design Manual for Low Volume Roads that has been approved by ERA and representative stakeholder peer groups.

### **Project team**

The proposed Project Team is as follows:

- Project Director (L R Sampson) who was responsible for management and development of all the draft Design Manual for Low Volume Roads and was directly responsible for the compilation and editing of the final draft. The Project Director would have overall responsibility for managing the finalisation of the Manual and production of a print-ready master for publication.
- Lead Authors who were involved in the writing of the Parts and Chapters for the original draft manual:
  - Lead Author 1 – John Rolt who was responsible for the geometric and drainage chapters and was intimately involved in providing inputs to the materials and pavement design sections and general review of the manual.
  - Lead Author 2 – Mike Pinard who was responsible for materials and pavement design.
  - Lead author 3 – Rob Petts who was responsible for compiling the Maintenance Booklet (Part G of the manual) and provided the extensive inputs to Part E, Explanatory notes and Design Standards for Small Structures and the section on alternative surfacings.
- Editorial Manager (P Bosman), DTP and CAD expert. The final draft was laid out in a desk top publishing package which will need to be used to edit the final manual. As part of the feedback it was also pointed out that the manual would benefit from the redrawing of several figures and section that will require attention.

### **Scope of the Services**

The Project Team will be responsible for the following tasks:

1. Review of the recommendations and comments from the independent review and other issues identified during the use of the manual.
2. Finalise the structure and contents of the manual based on the agreements with ERA and other stakeholders.
3. Attend a Peer Group meeting to feedback and discuss changes to the final manual.
4. Effect changes and submit the final draft document to ERA for final executive review and approval.
5. Make changes based on the executive review and submit a final print-ready copy to ERA for publication.

In terms of finalising the structure and contents of the manual, it is intended that the proposed changes from the independent review be presented to the Dissemination Workshop of the 2013 Design Manuals and Specifications to be held on 15/16 April 2015 and covered under a separate contract.

A final agreement will then be obtained from ERA related to the proposed revised structure of the manual.

The proposal is developed based on the following assumptions:

- Parts B and D of the draft manual will be combined under Part B of the document (Design Standards) and the document will be edited and renumbered accordingly with incorporation of agreed technical changes by the lead authors (still to be agreed with ERA);
- Part D will become a section on DCP design incorporating the DN design method and the DCP/CBR method (still to be agreed with ERA).
- Part G (Maintenance Manual) will be simplified and made more pictorial for use by communities and district authorities. The project will not include translation to Amharic which if required will be funded by ERA.
- Part E will remain as the guideline for small drainage structures for LVRs with agreed technical changes and editing.
- All figures will be reviewed and redrawn to a standardised quality.
- An MS Word and DTP version of the final Manual will be produced for printing as with the original manual.
- Part F for the Trail Bridges will remain unchanged.

### **Facilities, services and resources**

It is anticipated that the work would be carried out in Ethiopia and at the consultants' home offices.

There would be a need for all the Team to attend a Review Group meeting in Ethiopia for review of the revised manual and discussions related to the changes. A visit is also included for the Project Director to attend a final Executive Review group meeting appointed by ERA and present the final document.

All drafting, editing and redrawing of figures will be done from the consultants' home offices and coordinated by the Project Director who will be responsible for the final editing of the various Parts of the manual.

The Project Team will provide their own computer and software for effecting the changes and additions to the Manual. This would include suitable DTP and CAD software for reading the existing manual and drawings/figures, and effecting the required changes.

**Assignment management, inputs and administration**

The Project Director and Lead Authors will be contracted individually by the AFCAP PMU.

The Project Director's contract will include provision for support required in editing the text; restructuring and formatting the document; and redrawing figures and sections.

A lump sum contract for this type of work would be inappropriate as the extent of the changes is uncertain and will be subject to ERA requirements and ongoing review and possible modification. It is recommended that service providers are contracted at a negotiated rate for a maximum number of days. Time sheets and progress reports should be submitted on a monthly basis to effect invoice payments up to the maximum number of days allocated. Any increase to the number of days would be on approval of the AFCAP technical manager and covered by contract amendments.

It is expected that ERA will cover all meeting costs related to the Review Group and all printing costs of the final manual similar to previous partnership agreements with AFCAP.

**Timing of project**

It is anticipated that the project can be completed in eight months.

Table 1 shows the proposed timing and inputs from the Project Team.

AFCAP Priority Projects for Ethiopia

Table 1: Project Schedule										
Task	Resource	Man-Days	Month							
			1	2	3	4	5	6	7	8
Finalise the scope of the project based on discussions at the Manuals Dissemination workshops and agreements with ERA	L Sampson	2	xx							
Conversion of the final DTP version of the draft manual to MS Word for editing	P Bosman	10	xxxx							
Review of recommendations from the independent review and other comments with proposed solutions to the issues including revision of text	L Sampson	5		xxxx						
	J Rolt	7		xxxx						
	M Pinard	7		xxxx						
	R Petts	7		xxx						
Review and simplification of Part G ( Maintenance Manual) including improvement to drawings and figures	R Petts	10		xxxx	xxxxx					
	CAD technician	10			xxxx					
Editing, restructuring and modification of the manual based on agreements with ERA and lead author contributions (including all figures) and submission to Review group for comments	L Sampson	20			xxxxx	xxxxx	xxxxx	xxxxx		
	P Bosman	20			xxxxx	xxxxx	xxxxx	xxxxx		
	CAD technician	30			xxxxx	xxxxx	xxxxx	xxxxx		
	DTP specialist	20				xxxxx	xxxxx	xxxxx		
Attendance of Review Group meeting and effecting any changes	L Sampson	3							xxxx	
	J Rolt	3							xxxx	
	M Pinard	3							xxxx	
	R Petts	3							xxxx	
Finalisation of the manual and submission of a print-ready master of the final manual	L Sampson	5								xxxx
	P Bosman	5								xxxx
	CAD technician	3								xxxx
	DTP specialist	3								xxxx

### **Cost estimate**

The final scope and more accurate costs for finalisation of the manual will be dependent on the final agreement with ERA based on comments from the Dissemination Workshop of ERA manuals in April 2015.

Issues having significant implications to the cost and also outlined in the assumption for the scope of works are:

- If the recommendations from the independent review that Parts B and D of the manual are combined into one Part of the manual are approved by ERA, the current manual will need significant editing to ensure the numbering and cross-references to other sections are correct.
- If the above recommendation is agreed by ERA, to minimise the impact on other Parts of the manual, it has been recommended that Part D of the manual is replaced by the DCP/DN and DCP/CBR methods. This Part will however require editing and formatting to be consistent with the rest of the manual.
- Another recommendation from the independent review was that a more simplified maintenance manual (Part G) should be considered for use by the Weredas and Communities for maintenance activities. It was recommended that there should be more simple illustrations and pictures of acceptable practice and that the simplified manual should be translated into Amharic. Depending on the agreements at the stakeholder workshop, it may be more cost effective to retain the current maintenance booklet and develop a new maintenance manual for DC 1 and DC 2 roads as Part H on the LVR manual.
- It has been pointed out that some of the drawing, figures and sections need to be redrawn to improve the quality and ensure they are all consistent. A full assessment of the figures that need attention will be required as part of the proposal for stage 2.

Table 2 shows a detailed breakdown of the estimated costs and assumes one visit to Ethiopia by the technical team for a Review Group meeting. An additional visit of the Project Director is included for submission and presentation of the final manual to ERA.

Should the current structure of the manual be retained by ERA, the costs for finalisation will be significantly reduced.

<b>Table 2: Estimated Budget</b>			
<b>Professional Fees</b>			
<b>Resource</b>	<b>Total Man-days</b>	<b>Rate (£)</b>	<b>Cost (£)</b>
L Sampson	35	618	21 630
J Rolt	10	618	6 180
M Pinard	10	618	6 180
R Petts	20	618	12 360
P Bosman	35	280	9 800
CAD Technician	43	150	6 450
DTP specialist	23	150	3 450
<b>Sub-total</b>			<b>66 050</b>
<b>Reimbursables</b>			
<b>Item</b>	<b>Number</b>	<b>Rate (£)</b>	<b>Cost (£)</b>
Airfares from the UK	2	750	1 500
Airfares from South Africa	2	650	1 300
Airfare from Botswana	1	700	700
Per Diem	20	140	2 800
<b>Sub-total</b>			<b>6 300</b>
Contingency			2 650
<b>Estimated budget</b>			<b>75 000</b>

## **Appendix 6: Project Proposal for the Development of a Material Testing Manual to complement the Standard Specifications**

### **Background**

The Africa Community Access Programme (AFCAP) is a programme of research and knowledge dissemination funded by the UK government through the Department for International Development (DFID). AFCAP is promoting safe and sustainable rural access in Africa through research and knowledge sharing between participating countries and the wider community. The first phase of AFCAP commenced in June 2008 and ended in July 2014. The second phase, which will also run for 6 years, commenced on the 1<sup>st</sup> August 2014. The management of AFCAP 2 is contracted by DFID to Cardno UK.

As part of AFCAP 1, support was provided to Ethiopia through the Ethiopian Road Administration (ERA). The support included the following:

- Preparation of new design manuals, specifications, standard drawings and bidding documents for Low Volume Roads (LVRs);
- The updating of their existing 2002 series of road design manuals which included:
  - The Geometric Design Manual;
  - Pavement Design Manual (Flexible and Rigid);
  - Rehabilitation Design Manual;
  - Site Investigation Manual;
  - Drainage Design Manual; and
  - Bridge Design Manual (in association with JICA).
- Development of new manuals:
  - Geotechnical Design Manual; and
  - Route Selection Manual.
- Updating and revision of the 2002 version of the Standard Specifications and Drawings.

Up to the end of AFCAP 1 on 31 July 31, the status was as follows:

- The Design Manual for LVRs was completed in draft in May 2011 and distributed for use for a period of 2 to 3 years as agreed with ERA. An independent review was undertaken in October 2013 following which the draft manual was scheduled for updating as part of AFCAP 2.
- The bidding documents are completed and in use.
- All the existing 2002 manuals have been revised and published as 2013 versions, including the editing and formatting of the Bridge Design Manual produced by JICA to make it consistent with the other manuals in the Series.
- The two new manuals have been completed and published.
- The Standard Specifications have been completed in final draft and were submitted as part of AFCAP 1 at the end of July 2014.
- A draft version of the Standard Drawings was completed under a separate contract but requires updating and revision. In addition the bridge drawing produced by JICA need to be consistent with the other standard drawings and included as one set of Drawings.

Following meetings with ERA management during a project scoping visit of 3-14 November 2014 to identify priority project for funding through AFCAP 2, it was agreed that there was an urgent need for a Materials Testing Manual to complement the Standard Specification.

Based on the request from ERA, this proposal is submitted to AFCAP for the development of a Materials Testing Manual to complement the Standard Specification.

**Objectives**

The objectives of the assignment are:

- To develop a Materials Testing Manual to complement the Standard Specifications.

**Project team**

The proposed Project Team is as follows:

- L R Sampson who was responsible for management and development of all the manuals in the 2013 series and was directly responsible for the compilation and editing of the Standard Specifications. Editorial and formatting support would be provided by Pat Bosman.

**Scope of the Services**

The Project Team will be responsible for the following tasks:

1. Compile a manual of Test Methods specified in the Standard Specifications;
2. Attend a Peer Review Group meeting and revise the Manual as agreed;
3. Submit a print-ready master of the Manual for publication by ERA.

**Facilities, services and resources**

It is anticipated that the work would be carried out mainly in the home offices of the Consultants with one visit to Ethiopia for a Peer Group meeting to present the draft manual and discuss comments on the draft guideline.

**Assignment management, inputs and administration**

The Consultant including editorial support will be appointed to undertake the whole project.

**Timing of project**

It is anticipated that the project can be completed in three months.

It is anticipated the project could be started in February 2015 after the final review of the Standard Specifications and Drawings are complete.

This project could be undertaken in parallel with the development of a guideline document for the specification and Peer Group meeting could be scheduled to take place at the same time as the Guideline meeting. The cost for attending a Peer Group meeting is covered in the proposal to prepare a Guideline document for the Standard Specifications submitted under separate cover.

**Cost estimate**

Table 1 shows the estimate of costs for the project.

<b>Table 1: Cost Estimates</b>			
<b>Resource</b>	<b>Man-days</b>	<b>Rate (£/day)</b>	<b>Total (£)</b>
Les Sampson	25	618	15 450
Pat Bosman	10	280	2 800
Airfare	1	650	650
Per Diem	4	140	560
<b>Total Project Costs</b>			<b>19 460</b>

## Appendix 7: Terms of Reference for Technical Assistance to the RRC for the Development of Deterioration Models and Specifications for Gravel Roads in Ethiopia

### Background

The Africa Community Access Programme (AFCAP) is a programme of research and knowledge dissemination funded by the UK government through the Department for International Development (DFID). AFCAP is promoting safe and sustainable rural access in Africa through research and knowledge sharing between participating countries and the wider community. The first phase of AFCAP commenced in June 2008 and ended in July 2014. The second phase, which will also run for 6 years, commenced on the 1<sup>st</sup> August 2014. The management of AFCAP 2 is contracted by DFID to Cardno Emerging Markets, UK.

As part of a larger project identified by the Ethiopian Roads Authority through their Directorate, Research and Development for the “Development of a Sustainable Framework for LVRs with consideration for climate and environmental factors” a sub-project related to improving the construction, maintenance and management of gravel roads was identified.

While emphasis is being placed on the cost-effectiveness of surfacing low volume roads where possible, the reality is that gravel roads will remain an integral part of the Ethiopian road network for the foreseeable future, especially with the expansion of the mainly DC 1 and DC 2 category road network at Wereda level to improve all weather access for rural communities through URRAP.

The revised requirements for gravel roads both in the draft Low Volume Roads Design Manual (2011) and in the 2013 version of the Standard Specifications are those developed in South Africa on Africa-specific materials and currently used in several African countries.

Following a workshop in Ethiopia in July 2014 and reported in the final workshop report (Contract Ref no. AFCAP/Eth/005/AL-5) the following was noted:

- Two alternative methods for the design of unpaved (gravel) roads are available:
  - The South African method included in TRH 20, *The Structural Design Construction and Maintenance of Unpaved Roads* developed and presented by Phil Paige-Green.
  - The method developed by TRL and shown in a 2008, unpublished report (UUPR/III/028/08) funded by the UK Department of International Development (DFID) entitled “Performance Criteria and Life-Cycle Costing for Unpaved Roads - Ethiopia Country Component” presented by Kenneth Mukura.
- The performance models developed for “roughness” and “gravel loss” are not valid for roads that have been designed and constructed to current specifications such as TRH 20 or those developed by TRL. Further investigation of performance models for roads constructed to TRH 20 and TRL requirements is required.
- Both design options have merit but are not comparable due to the non-standardisation of the grading and plasticity parameters. It was agreed that both methods should be included in design guidelines to provide the design engineer with comparative tools on which to base the final surfacing selection and design. The selection of surfacing option should be based on a life cycle cost analysis of alternative competing surfacing options compared with the gravel option.
- The specifications should encourage innovation and not be too restrictive to the use of locally available materials.
- Two options for gravel road specifications were discussed:
  1. To retain a strict specification such as the TRH 20 specifications currently in the revised ERA Standard Technical Specifications and allow relaxation through the Project Specifications based on an investigation of locally available material.

2. To only specify three parameters in the Standard Specifications in terms of aggregate hardness, density and maximum aggregate size and allow more specific requirements to be added to the project specifications based on the locally available material should a gravel surfacing be the chosen surfacing option as part of the site investigation and design process.
- The general consensus was that the current specifications should be retained for consistency. These are based on option 1 that are also included in the ERA draft Low Volume Roads manual and in use as part of URRAP through the Standard Specifications and Methods of Measurement for Labour-based Construction of Wereda Roads.
  - It was noted that for unpaved roads in the DC1 and DC2 category, aggregate hardness should not be specified as it could restrict the use of otherwise suitable materials.
  - It was agreed that as part of the Road Research Centre (RRC), a project should be developed to further monitor gravel roads in Ethiopia and judge their performance against the current design option shown above. The objective would be to provide a consolidated design method with consistent specifications for gravel roads in Ethiopia. This project should be developed and undertaken by staff of the RRC with mentorship from Phil Paige-Green and Kenneth Mukura. The project was identified for possible funding as part of AFCAP 2.

Based on the outcomes of the workshop, this project is identified as a priority project in Ethiopia for funding by AFCAP through the provision of technical assistance to staff of the RRC to formulate and undertake the projects from inception. This will include support in the development of a project proposal for submission and acceptance by the Research Management Committee (RMC) of ERA and mentorship and support during the execution of the project.

### **Objectives and Scope of Services**

The objective of this assignment is to establish a Technical Assistance call-off arrangement in order to support the Department of Research and Development of ERA through the RRC for an initial three year period to support an evaluation of the performance of gravel roads in Ethiopia. The main outcomes of the project would be improved specifications for gravel roads in Ethiopia and improved deterioration models of Ethiopian materials for use management systems.

The scope of services would include support and mentorship to RRC project staff for (but not be restricted to):

- The preparation of a detailed proposal for submission to and approval by the RMC of ERA;
- Desk study of currently available knowledge and information
- Development of a research matrix, methodology and testing programme;
- Training in monitoring, evaluation and sampling of gravel roads;
- Analysis of results;
- Support in presentation of results through project reports, conference papers and Powerpoint presentation

### **Minimum Experience requirements**

The project will be carried out by a team of international consultants who has demonstrable experience of Road and Transport Research, and has extensive experience in the monitoring and evaluation of the performance of gravel roads, especially related to Ethiopia materials.

Minimum qualifications would be an MSc or equivalent and 15 years' experience if road and transport research.

The specialist nature of the project may dictate that individuals such as P Paige-Green and K Makura should be sole source for the project as part of a broader capacity building framework agreement. It

is also important that Consultants have detailed knowledge of the previous work carried out in southern Africa and by TRL in Ethiopia.

### **Consultant's Inputs**

The Consultants will provide for three (3) visits to Ethiopia in a one year period for twelve (12) continuous working days per visit and shall provide for two (2) days per month for home office support and mentorship of RRC staff working on the project.

A total of 36 working days per years per Consultant shall be undertaken in-country and 24 day per year per Consultant in the home office for a period of three years depending on the performance of the Consultant. Travel, accommodation and subsistence costs will be provided for the three in-country visits per year.

Performance reviews will be undertaken by ERA in association with the AFCAP PMU at the end of each year of the service before continuation for subsequent years is approved.

### **Reporting Outputs**

The outputs from this project will be measured against quarterly progress reports and the achievements against deliverable and milestones that will be outlined in the detailed project proposal submitted and approved by the RMC.

A quarterly progress reports shall be prepared by the Consultants from the start of the project and will highlight, but not be restricted to, the following:

- Progress against the overall project plan and schedule approved by the RMC;
- Number of sites sampled and tested;
- Key personnel trained;
  - Monitoring of gravel roads;
  - Sampling and testing on materials;
  - Dissemination of information.
- Reports, papers and presentations related to the project;
- Any constraints to development;
- Updated plans as required for approval by the RMC based on progress.

### **Assignment management and administration**

The Consultants will report to the Director, Research and Development of ERA for the day-to-day management and support, in association with the AFCAP Technical Services Manager for technical aspects and delivery of milestones for the assignment.

For contractual and administrative matters the consultant will report to the AFCAP Project Manager in the UK.

## **Appendix 8: Terms of Reference for Technical Assistance to the RRC for the Assessment of the Impact of Dust and Vehicle Emissions on Health and Safety**

### **Background**

The Africa Community Access Programme (AFCAP) is a programme of research and knowledge dissemination funded by the UK government through the Department for International Development (DFID). AFCAP is promoting safe and sustainable rural access in Africa through research and knowledge sharing between participating countries and the wider community. The first phase of AFCAP commenced in June 2008 and ended in July 2014. The second phase, which will also run for 6 years, commenced on the 1<sup>st</sup> August 2014. The management of AFCAP 2 is contracted by DFID to Cardno Emerging Markets, UK.

As part of a larger project identified by the Ethiopian Roads Authority through their Directorate, Research and Development for the “Development of a Sustainable Framework for LVRs with consideration for climate and environmental factors” a sub-project relating to an assessment of the impact of dust from unpaved roads and vehicle emissions on the health and safety of those communities living in close proximity to the road reserve has been identified for funding support by AFCAP.

The project will be in the form of technical assistance to the Ethiopian Road Research Centre (RRC) under the management of the Director, Research and Development.

It is recognised that significant research and information has already been carried out related to the impact of dust and vehicle emissions. It has therefore been agreed with ERA/RRC that this project will be structured as a desk study to be undertaken by a researcher in the RRC with technical assistance from an international expert.

### **Objectives and Scope of Services**

The objective of this assignment is to establish a Technical Assistance call-off arrangement in order to support the Department of Research and Development of ERA through the RRC for a desk study to identify research and information on the impact of dust and vehicle emissions on health and safety and provide recommendations of how to improve the health and safety of people living close to the road reserve.

It is anticipated that a major output from the project will be the identifications of gaps for further research specific to conditions in Ethiopia and the development of detailed project proposals for approval by the RMC of ERA. Further technical assistance may be required from AFCAP once the gaps have been identified and project proposals developed.

### **Minimum Experience requirements**

The technical assistance will be provided by an expert who has demonstrable experience of Road and Transport Research, and has extensive experience in health and safety issues, especially related to rural communities..

Minimum qualifications would be an MSc or equivalent and 10 years’ experience in relevant road and transport research.

The specialist nature of the project may dictate that an individual could be sole source for the project as part of a broader capacity building framework agreement.

### **Consultant's Inputs**

The desk study is expected to last for 3 months and the Consultant will provide for two (2) visits to Ethiopia for five (5) continuous working days per visit and shall provide for five (5) days per month for home office support and mentorship of RRC staff working on the project.

A total of 10 working days shall be undertaken in-country and 15 day in the home office for a period of three months. Travel, accommodation and subsistence costs will be provided for the two in-country visits.

The Consultant will be expected to provide training and mentorship in undertaking a desk study; writing an project output report; and preparing detailed project proposals for future work based on the gaps identified during the study.

Performance reviews will be undertaken by ERA in association with the AFCAP PMU.

### **Reporting Outputs**

The outputs from this project will be:

- A co-authored report detailing the desk study and the findings and recommendations from the study;
- A detailed project proposal for submission to the RMC should further research be identified as part of the outcomes of the desk study.

### **Assignment management and administration**

The Consultants will report to the Director, Research and Development of ERA for the day-to-day management and support, in association with the AFCAP Technical Services Manager for technical aspects and delivery of milestones for the assignment.

For contractual and administrative matters the consultant will report to the AFCAP Project Manager in the UK.

## **Appendix 9: Terms of Reference for Technical Assistance to the ERA/RRC project to develop Guidelines for the use of Cinder Gravels in Road Construction**

### **Background**

The Africa Community Access Programme (AFCAP) is a programme of research and knowledge dissemination funded by the UK government through the Department for International Development (DFID). AFCAP is promoting safe and sustainable rural access in Africa through research and knowledge sharing between participating countries and the wider community. The first phase of AFCAP commenced in June 2008 and ended in July 2014. The second phase, which will also run for 6 years, commenced on the 1<sup>st</sup> August 2014. The management of AFCAP2 is contracted by DFID to Cardno UK.

The Ethiopian Roads Authority (ERA) through their Road Research Centre (RRC) under the responsibility of the Director, Research and Development has identified a project to investigate the suitability of locally available cinder gravels for road construction, especially for use in lower volume roads. The project will be undertaken by staff of the recently established RRC and ERA has requested that AFCAP provide an experienced researcher to support and mentor the RRC researcher(s) on the project. The project provides an ideal opportunity for staff of the RRC to be trained and mentored by an experienced road researcher from the inception and planning of the project; through the investigatory and analysis phase; leading to the final reports and recommendations for use.

There are various types of cinder gravel abundantly available in mainly the central part Ethiopia, ranging from very weak material that can be crushed under foot to very strong material with high resistance to crushing. Should a suitable classification system and specification limits be established for use of these locally available gravels in road construction, they could significantly reduce the construction costs of some roads through the reduction in haulage costs to bring in materials from a longer distance to meet the current specifications.

The project is intended to build on the work of TRL in the 1970's to classify these materials.

### **Objectives and Scope of Services**

The objective of this assignment is to establish a Technical Assistance call-off arrangement in order to support and mentor the RRC staff for an eighteen (18) month period as part of the project to investigate the use of cinder gravels for road construction in Ethiopia.

The objectives are:

- To train and mentor RRC staff in undertaking research projects in terms of, but not restricted to:
  - Proposal preparation for submission to the ERA Research Management Committee (RMC) for approval;
  - Planning and experimental design;
  - Developing the methodology for sampling and testing;
  - Analysis of results;
  - Reporting of results, including report writing and presentation of the results to peer groups.
- To develop a classification system and recommendations for use of cinder gravels in road construction in Ethiopia.

### **Minimum Experience requirements**

The project will be carried out by an international consultant who has demonstrable experience of Road and Transport Research particularly related to material and the latest developments in low

volume technology. Experience in Ethiopia particularly related to the RRC would be an added recommendation.

The Consultant is expected to provide a suitably qualified individual with a minimum qualification of MSc or equivalent and with at least 15 years road research experience.

### **Consultant's Inputs**

It is anticipated that the TA would be required to visit Ethiopia for eight (8) visits of two (2) weeks duration during the 18 months of the project with time being made available in the home office for conference calls, email communications and general support. Two (2) days per month has been assumed for this purpose.

The first visit should be scheduled at the start of the project and subsequent visits will be scheduled on agreement with the Director, Research and Development as part of the proposal preparation and planning phase.

All travel, accommodation and subsistence of the Consultant will be covered by AFCAP for the visits to Ethiopia.

The Consultant will provide his own computer and will be expected to work from an office at the RRC.

All transport to the RRC and for site visits will be provided by ERA through the RRC.

### **Reporting Outputs**

The outputs from the project should be in line with the outputs of the proposal approved by the RMC. Typical outputs would be:

- Detailed project proposal approved by the RMC of ERA outlining the methodology, project outputs and time-line;
- The drafting and approval of all reports required as part of the project proposal in association with the project staff of the RRC;
- A progress report to AFCAP and the Director Research and Development of ERA after each in-country visit. The progress report should highlight:
  - Progress and achievements against the approved proposal;
  - Training capacity building and mentorship interventions;
  - Interim findings related to the analysis of results;
  - Constraints to progress;
  - Modifications to the original methodology.
- Final project report

### **Assignment management and administration**

The consultant will report to the Director, Research and Development of ERA for the day-to-day management and support, in association with the AFCAP Technical Services Manager for technical aspects and delivery of milestones for the assignment.

For contractual and administrative matters the consultant will report to the AFCAP Project Manager in UK.