TERMS OF REFERENCE

FOR

FEASIBILITY – ENVIRONMENTAL AND SOCIAL ASSESSMENT STUDIES - DETAIL DESIGN - AND SUPERVISION OF WORKS

FOR

CHIMUARA TO NICOADALA ROAD

IN

ZAMBEZIA PROVINCE

OF

MOZAMBIQUE

Terms of Reference

1 INTRODUCTION AND BACKGROUND

1.1 General

The N1 forms part of the 2,800 km long South – North axis, going more or less along the coast from the capital city Maputo to Metoro6 (N1) and then to Mocimboa da Praia (N380) and the border with Tanzania (R762). The N1 connects important towns and cities, such as Maputo, Zai Xai (Gaza), Maxixe (Inhambane), Beira and Machipanda (via Inchope), Nampula, Pemba (via Metoro). The N1 is one of the main roads of the Mozambican primary road network and, as such, minimum geometric standards have to be satisfied.

The Government of the Republic of Mozambique (GOM) has received a grant from the Millennium Challenge Corporation (MCC), an innovative United States established foreign assistance program designed to reduce poverty by promoting sustainable economic growth. MCC operates on the principle that aid is most effective in countries that promote good governance, economic freedom and investments in people. The GOM, through MCA-Mozambique (Millennium Challenge Account-Mozambique, a public institution to be created by the GOM) and its National Roads Administration (ANE) organ, intends to use a portion of the proceeds of this grant, to carry out feasibility studies, environmental and social assessments, detailed design and supervision of works relating to the rehabilitation of the following roads:-

Road	Route No.	Length (km)	Province	Description
Rio Lúrio - Metoro	N1	74	Cabo Delgado	Existing +/- 6.3m wide surfaced road
Namialo – Rio Lúrio	N1	148	Nampula	Existing +/- 6.3m wide surfaced road
Nampula – Rio Ligonha	N1	102	Nampula	Existing +/- 7m wide surfaced road
Nicoadala - Chimuara	N1	167	Zambézia	Existing +/- 7m wide surfaced road
Total Length	491 km			

1.2 National Context

Situated on the Indian Ocean coast of southern Africa, Mozambique is the 16th largest country in Africa in geographical and regional terms. It borders South Africa and Swaziland in the south, Zimbabwe and Zambia in the west, and Malawi and Tanzania in the north. It has over 2,750 kilometers of coastline. At 799,380 km^2, Mozambique's total population is just over 19 million,

nearly 70% of which is living in rural areas. Despite a growing trend of urbanization, Mozambique remains one of the less densely populated nations in Africa, with 24.3 inhabitants per km^2.

The topography is dominated by flat rolling areas along the coast and further inland. There are several very large rivers such as the Zambezi, the Limpopo and the Save which are surrounded by wide sedimentary valleys. Near the coast the Limpopo and Zambezi rivers form deltas, subject to seasonal flooding. Other rivers form estuaries with widespread swamp-land. The western parts of the country are hilly, with the highest mountains rising to nearly 2,500 m. The predominant soils are fine grained, generally sands and silts, although clays are found in the river valleys. In areas where the landscape is more rolling the finer soils can be interspersed with coarser materials such as gravel.

The country lies in the region affected by the monsoon and receives most of its rainfall between October and April. The annual precipitation differs between localities. In high-lying areas of Zambezia Province the maximum annual rainfall is more than 3000 mm, while in the south of the country the minimum is about 450 mm. The wettest month is January with an average rainfall of 130 mm; the driest month is July averaging only 13 mm. Temperatures follow a similar pattern. The extremes occur in February and July with average daily temperatures of between 22-31 °C and 13-24 °C, respectively.

The country has great economic potential in agriculture, tourism, fishing and mining, which has largely been untapped due in part to the prolonged period of civil conflict. Mozambique's economy is largely agricultural in nature: shrimp, prawns, cotton, cashew nuts, sugar cane, and copra make up 45% of the nation's GDP (which has grown in recent years at an annual rate of roughly 8% (1996-2004 average). Subsistence farmers produce cassava, corn, and rice. The Mozambican industrial sector fell to a near stand-still due to the civil war. Encouraging economic growth in this sector is a Mozambican priority. Tourism is another sector with great development potential. Prior to independence from Portugal, Mozambique was one of southern Africa's most popular tourist destinations, hosting millions of foreign travelers who enjoyed Mozambique's unspoiled beaches and offshore islands. The industry was crippled by the civil war, but is slowly growing again.

The GOM has demonstrated its commitment to promoting the welfare of its people by formulating and adopting a second national Poverty Reduction Strategy Paper (PARPA II) covering 2006-2009. The PARPA II builds on the basic framework for the strategic vision of national development in Mozambique, as outlined in the first PARPA. The paper contains a range of social programs that are aimed at achieving sustainable improvements in the quality of life of the population and defining targets in relation to the Millennium Development Goals (MDG) for Mozambique. The PARPA II's policy and priorities focus on governance, human capital development (including health, education, water and sanitation), and economic development (including improving the business environment, investment climate and rural development).

Transport services are crucial for poverty alleviation, social and economic development. Access is a prerequisite for poverty alleviation. At present many areas are cut off from the outside world during the rainy seasons, hampering economic development by lack of infrastructure and non-availability of public transport. Access is crucial to delivery of social services and to support economic growth. Road transport is the only mode of transport that reaches the most remote areas of the country and that serves the widest variety of users. Improved roads will enhance the effectiveness of health services such as immunization campaigns, HIV testing and prevention and

access to hospitals, and make a significant contribution to increased economic activity and poverty reduction.

With a view to restoring the country's infrastructure to acceptable standards and providing accessibility especially in the rural areas, the Government of Mozambique (GOM), the World Bank and other donors have been systematically tackling this problem since 1992 through the Roads and Coastal Shipping projects (ROCS I & II), the Roads III project, and more recently through the Roads and Bridges Management and Maintenance Project (RBMMP). Under the RBMMP, a revised road sector strategy has been prepared that defines priorities for the sector, together with a detailed implementation plan covering the period 2007 – 2009 (PRISE Implementation Plan (PIP)). Among the main Government objectives are improving regional and port access as well as improving access to markets by providing all-weather roads to areas with significant economic activity (or potential there for). The goal will be to bring activities and services closer to under-served or neglected communities.

1.3 Road Sector Legal and Institutional Framework

In April 1999, the Government of Mozambique (GOM) adopted legislation introducing far-reaching reforms in the road sector. The Decree No. 14/99 sets out the main components of the institutional framework making up the road administration system "Sistema de Administracão de Estradas" (SAE). Decree 15/99 established the "Administração Nacional de Estradas" (ANE) or National Road Administration, which effectively replaced the previous road department known as DNEP (Direcção Nacional de Estradas e Pontes). ANE has responsibility for the management and maintenance of the road network. The Minister of Public Works and Housing, whose Ministry is responsible for setting policy for roads, in July 1999 approved nomination for the President / Chief Executive Officer (CEO) and ten other board members of ANE, including four representatives of the private sector. The Board, or Administration Council as it is known, has three committees dealing with technical, financial and training matters.

Responsibility for road management is vested in various executive bodies of ANE, the latter having undergone a recent (2007) restructuring established under Decree 12/2007 and 13/2007, dated May 30. The road administration organ comprises the Roads Board, the CEO and four (4) directorates, namely; the Directorate of Projects (DIPRO), Directorate of Planning (DIPLA), Directorate of Maintenance (DIMAN) and the Directorate of Administration and Finance (DIAFI). DIPRO, further divided into three (3) departments (Department of Projects, Department of Contract Administration and Department of Monitoring), is responsible for the design and construction supervision of all road projects. At the provincial tier ANE is represented by a Provincial Delegate who is responsible for all road related matters at this level. The Delegate also interacts with the Provincial Directorate of Public Works and Housing. On the financing side, responsibility has been given to the Road Fund (FE) in respect to revenue collection and to DIAFI in respect to expenditure by the various directorates.

1.4 Environmental, Legal, Regulatory and Institutional Context

The Government of Mozambique (GOM) envisions that the use of natural resources fulfills the basic needs of the people and development of the nation in equilibrium with economic growth, technology development, environmental protection and social equity. The main environmental framework and social legislation and regulation relevant to the MCA-Mozambique roads projects funded under the Compact are:

- Environmental Framework Nº 20/97;

- EIA Regulation Decree Nº 76/98;
- Environmental Impact Assessment (EIA) Decree Nº 45/2004;
- Land Law, Nº 19/1997;
- Land Law Regulations Decree Nº 66/98;
- Municipal Framework Nº 2/97; and
- A new labor law approved in May of 2007
- MCC Environmental Guidelines;
- World Bank's Operation Policy on Involuntary Resettlement (O.P. 4.12);
- MCC Gender Policy, and
- World Bank "Roads and The Environment Handbook".and
- MCC Gender Policy.

In addition to the above, the roads sector has developed environmental guidance documents. ANE has recently updated its "Environmental Guidelines for Road Work in Mozambique" (December 2006).

Under Mozambican law, no project may be undertaken without a license issued by the Ministry for Coordination of Environmental Activity (MICOA). As defined in MICOA's directives and ministerial diplomas, key steps in the environmental licensing process are:

- A pre-assessment determination by MICOA of project environmental category and the subsequent procedures that must be followed;
- Establishment of a Technical Assessment Commission, composed of specialists from within and outside MICOA to review environmental impact assessments and related documentation;
- Public consultation in accordance with MICOA's Ministerial Diploma 130/2006; and
- Review of the environmental report by the Technical Assessment Commission and decision on the license and any attached terms and conditions.

Useful guidance is given in 'Legal Framework for Environmental Licensing in Mozambique' Direccao Provincial para Coordenação de Acção Ambiental Sofala (December 2007)

There are no requirements within the GoM regulatory framework for an assessment of public health and safety impacts to be included in Environmental Impact Reports. However the potentially negative health and safety impacts of road sector development, particularly with respect to the spread of HIV/AIDS, are well recognized. Given the importance of the these issues, it is recommended to include Health and Safety Impact Statements in Environmental and Social

Assessment Reports, based upon standards set by the MCC Environmental Guidelines and the World Bank document "Roads and The Environment Handbook".

1.5 The MCA-Mozambique Program

The overall objective of the MCA-Mozambique Program is to contribute to economic growth and poverty reduction in the Provinces of Cabo Delgado, Niassa, Nampula, and Zambézia. This goal will be achieved by promoting business and employment generation and improving the welfare of the population. The program addresses major impediments to economic growth and poverty reduction. Among the identified constraints are:

- degraded infrastructure which limits access and integration of the rural population and access to markets; and
- lack of investment in the agriculture and tourist sectors, which inhibits sustainable employment and economic opportunity.

In meeting its overall objective the program will also:

- promote socio-economic development;
- improve regional accessibility; and
- create a sustainable, reliable and cost-effective road transport infrastructure.

Overall implementation management of the Roads Rehabilitation Program will be the responsibility of MCA-Mozambique, with day-to-day operations being handled by ANE.(see Section 1.6) The MCA-Mozambique Program will carry out feasibility studies, environmental and social assessments (ESA), detailed design, construction supervision and civil works

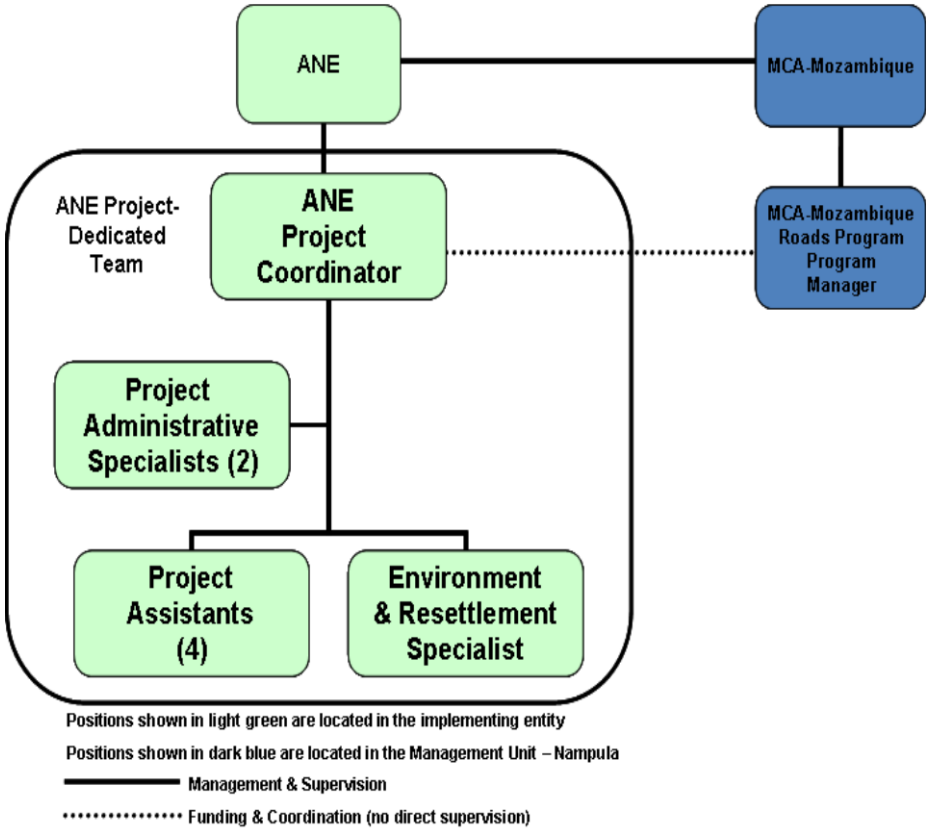
1.6 The Implementing Entity

Under the Implementing Entity Agreement between MCA-Mozambique and ANE, the MCA-Mozambique is the Accountable Entity and is responsible for providing the financial resources for the roads projects described in the Compact.

MCA-Mozambique will make available to ANE resources required to provide proper oversight of these activities. These will include resources required to staff a dedicated team, the MCA-Mozambique Project-Dedicated Team, within ANE. ANE will use its own resources as well as the resources of the dedicated team to implement the projects. ANE will thus be responsible for overseeing the implementation of the projects in a timely and cost effective manner whereas MCA-Mozambique will be responsible for reviewing ANE's implementation progress, overall financial management and maintaining donor relations. The primary point of contact at MCA-Mozambique will be a Roads Program Manager specifically dedicated to the MCA-Mozambique funded projects that are implemented by ANE.

The ANE Project-Dedicated Team will comprise of a Project Coordinator, four Project Assistants (one for each road section), an Environmental and Resettlement Specialist, and Project Administrative Specialists.. The Consultant's primary point of contact is the Project Coordinator who will work closely with the MCA-Mozambique Roads Program Manager in all phases of the project.

The Consultant will work directly with ANE and in close coordination with the MCA-Mozambique Environment and Social Impact Director (ESI) in all environment and social assessment activities. The Roads Program Implementation Structure depicting the manner in which the ANE Project-Dedicated Team interacts with the MCA-Mozambique is shown below.



2. DESCRIPTION OF THE PROPOSED PROJECT

Under the MCA-Mozambique Roads Rehabilitation Program feasibility study, environmental impact assessment, detailed design and supervision will be combined into three contracts, one for each of the following segments:

- Namialo – Rio Lurio – Metoro (222 Kms)
- Chimuara – Nicoadala (167 Kms)
- Rio Ligonha – Nampula (102 Kms)

The three contracts will contain similar requirements and shall be carried out simultaneously.

The present TOR is for 167 kms road Section of Chimuara to Nicoadala and is one of three covering the list shown above.

A brief description of the project road section:

The Chimuara - Nicoadala section, with (167kms) is located in the Zambézia Province. Starting at Chimuara it runs east for some 70km and then bears south west for approximately 90 km to Nicoadala, on the northern banks of the Zambeze River.

The road is some 7m wide, is surfaced and is the sole remaining portion of the N1 in the Zambézia Province which has not been upgraded.

There are a total of 10 concrete bridge structures along the route which are all in need of repair and upgrading.

N1 has been classified as a primary road and as such, it should be of acceptable geometric standards. Therefore the project will provide for the upgrading of the existing facility by

- widening the road carriageway to 9.8m
- strengthening the pavement structure to provide a 15-year traffic carrying capacity.
- having a surfaced road of minimum desirable standards for an analysis period of 20 years (according to the Draft ANE´s standards for surfaced road, 2005)
- having a rehabilitated pavement that is durable, economically feasible and suitable to withstand the traffic loading during the structural design period of 15 years under prevailing climatic, traffic and routine maintenance capability conditions.
- having major and minor drainage structures that are compatible with the upgraded road geometry, hydraulic requirements and prevailing heavy vehicle traffic loading conditions.
- having road signage and road-marking in accordance with SADC standards. The provision of road studs is also required. The type and frequency of road studs will be dictated by the traffic volumes, the design speed, their position on the road and the durability of the reflectivity (initial reflectivity to comply with minimum reflectivity standards) of the lenses.

- having suitable infrastructure at the correct location/s for the control of heavy vehicle overloading.

- maximizing the social benefits to the local communities within the impact area of the road during the civil works period as well during the design life of the road

2.1 The existing road

The existing road is surfaced to a width of 7m. The general road condition is poor with extensive pothole patching currently underway. The shear failure of the existing base is evident at many locations. Roads edge break up is widespread too. Binder condition of the existing surfacing is poor, resulting in extensive surfacing failure, stone loss, cracking and potholling. Widespread pavement failure may be the result of the compounded effect of surfacing defects and fatigue failure of base and subbase.

2.2 Minimum Standards for future road

The minimum desirable geometric standards for primary, secondary and tertiary roads in Mozambique is in the Draft ANE´s design standards, 2005. All sections that in terms of the minimum ANE standards require re-alignment will be listed and individually discussed with ANE Project dedicated team Project Coordinator. All pros and cons for each case will be evaluated (including cost implications).

The overall road width will be 10,8 m, and the surfaced road width will be 9,8 m: consisting of two 3.4 m surfaced lanes and two 1.5 m surfaced shoulders and two 0.5 m unpaved shoulders.

Existing bridges will need to have a minimum surfaced carriageway width of 6.8 meters. **If the carriageway width is narrower than 6.8 meters, the bridge will require widening.**

3. OBJECTIVES AND OUTCOMES OF THE CONSULTANCY

The objective of the assignment is to carry out the Feasibility Study, Environmental and Social Impact Assessment Studies (ESIA), Detailed Design and Supervision of Works for Chimuara to Nicoadala Road in Zambezia. The feasibility study and ESIA shall determine the technical and economic feasibility of rehabilitating the road, taking into account environmental and social aspects. Iterative design should be adopted for all schemes. Following proper environmental and social scoping, but before detailed environmental impact assessment (EIA), iterative design must be carried out jointly by the project environmentalist and engineer in a collaborative fashion. In this way adverse impact, such as resettlement impacts due to a widened carriageway, are anticipated and addressed as early as possible in the design phase, thus minimizing mitigation at a later stage. During detailed design the Consultant shall analyse in detail the rehabilitation and upgrading intervention recommended in the feasibility study and ESIA. The Consultant shall produce a full set of construction drawings and prepare the detailed Resettlement Action Plans (RAPs). Supervision of works shall involve overseeing the quality of the proposed

rehabilitation/upgrade works and attendance during the Defects Liability Period.

3.1 **Consultant Services**

The Consultant shall be required to carry out its assignment in three (3) distinctive phases:

Phase 1 – Feasibility Study and EIA (Base Period) shall require the completion of a feasibility study and an environmental and social impact assessment, including a resettlement scoping study. Phase 1 will serve as the Base Period for the contract. Based on the Consultant's performance during Phase 1 MCA-Mozambique may decide to exercise the option for **Phase 2, Detailed Design and RAP** as the first option period.

Phase 2- Detailed Design and RAP (First option period) will provide for the detailed design of the rehabilitation/upgrading measures and the development of the resettlement action plan (RAP) based on the results of Phase 1. It will call for the production of complete detailed design and construction documentation. Prior to the completion of Phase 2 MCA-Mozambique shall notify the Consultant if it chooses to exercise the option for Phase 3.

Phase 3 – Supervision (Second option period) will provide for the supervision of the civil works contract.

The three Phases entail the following activities:

- **Phase 1 (Base Period):** Feasibility Study and Environmental and Social Impact Assessment (including resettlement scoping study)

  The feasibility study is intended to justify the project's viability from a financial, technical, economic, environmental and social standpoint.

  There are three (3) primary objectives to this economic feasibility study:

  a) the determination of the economic and financial feasibility of the project when measured against a predetermined threshold economic internal rate of return;

  b) assessment of likely environmental, social, and resettlement impacts;

  c) a recommendation of the most favorable alternative from a range of options taking into consideration environmental and social impacts and associated measures to minimize or mitigate impacts.

  As described in Section 2 there will be three feasibility study, EIA, detailed design and construction supervision contracts covering the road segments included in the program. The Consultant shall carry out a roughness survey for all road segments in the MCA-Mozambique Roads Program during Phase 1. The Consultant is required to provide the results of the International Roughness Index to the Consultants who are carrying out the feasibility study of the Namialo – Metoro and Rio Ligonha – Nampula road projects. The longitudinal

profile must be measured in accordance with the Class 1 precision and has specifications defined in ASTM E-950.

With regards to the assessment of environmental and social impacts, the Consultant shall support ANE in preparing environmental and social studies, including a preliminary scoping of resettlement impacts, and supporting materials, in conducting public consultations (that accommodates for equal participation of men and women and socially excluded and vulnerable populations), and in obtaining regulatory approvals for the road sector development, as required to meet the MCC Guidelines for Environment and Social Assessments and laws and requirements of Mozambique at the national, provincial, district and local levels. This shall include environmental and social assessments for the Chimuara-Nicoadala Road Section and preparing a draft Environmental Impact Report as required by environmental regulatory authorities. Together with the EIR should also contain the draft of the EMP

- **Phase 2 (First Option Period)**: Detailed Design and Resettlement Action Plan (RAP) of the Road Section

  Based on the Consultant's performance and sole discretion of MCA-Mozambique, the term may be extended to include Phase 2 as the first option period. This phase will include the detail design of the rehabilitation and upgrading intervention recommended in phase 1 and full set of construction drawings. MCA-Mozambique shall provide a written notice to the Consultant of its intention to extend prior to the end of Phase 1. During Phase 2, the Consultant will also prepare detailed Resettlement Action Plans (RAPs) in accordance with the requirements of OP 4.12 and based on the final horizontal alignment of the Right of Way (ROW).

  The Consultant shall assist MCA-Mozambique/ANE with the implementation of RAPs during the period between the execution of Phases 2 and 3, if requested through a contract amendment. See Section 6.5.2.

  The detail design also includes:

  - the pavement rehabilitation design,
  - the pavement design of the widened and re-aligned sections,
  - the geometric design of the improved road alignment (where necessary),
  - the hydraulic and structural design of the stormwater minor drainage structures to be upgraded or rehabilitated,
  - the design of ancillary infrastructure,
  - the maintenance, rehabilitation or widening of bridge and major culvert structures.

  For the detail design the consultant shall take in considerations the recommendations of the environmental studies included in the EMP.

- **Phase 3 (Second Option Period):** Supervision of Construction of the works

  This phase will comprise the supervision of the civil works, which will be awarded on the discretion of MCA-Mozambique/ANE, as part of phase II, based on good performance of the Consultant. The Consultant will be responsible for the supervision of the proposed rehabilitation/ upgrade works, and attendance during the defects liability period.

4 SCOPE OF SERVICES: PHASE 1 (Base Period) – Feasibility Study and Environmental and Social Impact Assessment (including resettlement scoping study

The Consultant shall be required to carry out such feasibility studies as are necessary to satisfy the project objectives stated in Section 3 above.

a) Review Existing Studies

The Consultant shall collect and review the existing relevant engineering, environmental and social studies prepared for, or by the GOM, ANE, and MCA-Mozambique. This review shall include plans, specifications, work quantities computations, and budgets. This review will enable the Consultant and the MCA-Mozambique to have an overall knowledge of the road sections for which studies have been made, and determine which sections require a more complete field survey and data collection.

Sub-Task Deliverable: Prepare a narrative description of the findings of the review of the relevant engineering, environmental and social studies.

b) Consult with ANE and MCA-Mozambique

The Consultants and MCA-Mozambique in conjunction with ANE shall jointly define the individual project limits and update the Scope of Work to be performed. In accordance with the ANE "Road Sector Strategy, 2007 - 2011" (Dec. 2006) document, the following aspects are the priorities for rehabilitation of the roads:

1. Access

2. Service level - Roughness

3. Service level - Speed of Transitability

4. Durability - Maintenance

Sub-Task Deliverable: Prepare a narrative description of agreed revisions to project limits and Scope of Work.

The studies shall include also:

4.1 Development of Alternatives for Improving the Road Section

Based on the field information collected, the Consultant shall develop recommended likely alternatives for the improvement of the road section. Alternatives should take into consideration design elements that would impact resettlement needs, environmental assets, and road safety as well as cost. The Consultant shall discuss these recommended alternatives with MCA-Mozambique/ANE and jointly develop a list of the MCA-Mozambique/ANE approved improvement alternatives to be followed up with the more detailed Preliminary Design for the road section. .

Sub-Task Deliverable: Prepare a narrative description of the MCA-Mozambique and ANE approved improvement alternative to be followed up with the more detailed Preliminary Design for the Road Section.

4.2 Preliminary Design

Undertake the Preliminary Design for approved Road Section, according to the dictates below.

Sub-Task Deliverable: Any recommended design standards will be discussed with MCA-Mozambique and ANE and mutually agreed upon, in writing, prior to use.

a) Design standards and criteria

- Classification of Roads

  - Traffic volume and composition of vehicles anticipated to use the road ten years after its construction; and

  - The economic factors of construction costs, which are influenced by the type of terrain (flat, rolling or mountainous).

b) Project Design Standards

Project Design Standards shall be according to the SATCC standards. This suite of documents is comprised of the following:-

- Draft Code of Practice for the Design of Road Bridges and Culverts, September 1998 (Reprinted 2001)

- Draft Code of Practice for the Geometric Design of Trunk Roads, September 1998 (Reprinted 2001)

- Draft Code of Practice for the Design of Road Pavements, September 1998 (Reprinted 2001)

- Draft Code of Practice for the Rehabilitation of Road Pavements, September 1998 (Reprinted 2001).

In addition to the above the Consultant will also consult ANE's internally promulgated document termed "Draft ANE's Design Standards, 2005" and agree

where different design parameters are proposed from those stated in the ANE design standards before proceeding further with the study.

The geometric design shall be performed at a preliminary level, based on data developed by topographic, hydrologic and hydraulic studies in accordance with the design standards. The geometric design includes:

- Definition of project design speed and typical cross sections, in accordance with the road classification and traffic volume;
- Special project features, including measures to avoid or mitigate environmental and social impact;
- Safety features; and
- Intersections

c) Horizontal and Vertical Alignments

The Consultant shall carry out a topographical survey to the extent that it is necessary to establish the feasibility or otherwise of the project. To this end and as a minimum the Consultant shall:

1 Take detailed cross-sections, referenced to a local datum, every 500m;

2 Carry out a Differential Global Positioning System (DGPS) survey to HP (High Performance) level of service positioning. This survey shall therefore be carried out to tolerances of +/- 0.1m and +/-0.2m in the horizontal and vertical directions, respectively. The DGPS measurements shall be made at intervals of 20m on straights and 10m on curves;

3 Record, as part of the DGPS survey, the positions of all drainage elements along the route.

The survey data shall be used to derive best fit horizontal and vertical alignments and to produce longitudinal sections and layout plans for the project road.

The above data shall be used to assess the horizontal and vertical alignments of the existing road and to establish whether any particular section of road requires geometric improvement.

The new surfaced road width will be 9.8 metres. The lane configuration will consist of a single carriageway with 2 x 3.4 m surfaced lanes, 2 x 1.5 m surfaced shoulders and 2 x 0.5m unpaved shoulders.

d) Environmental Considerations

Iterative design should be adopted for all schemes. These principles of good integrated design and mitigation shall consider the following:

- Land take, especially from agriculture and settlements, shall be minimized in relation to new or diverted roads, pipe lines and all other infrastructure. Where the land is

under a seasonal or rotated crop such as cassava, work shall be scheduled whenever possible during the dry season when the crop is not grown;

- Borrow pits or quarries created or modified to provide construction materials shall be designed and located to maximize habitat creation and minimize disturbance. Measures shall also be taken to minimize malaria risk to adjacent settlements and sedimentation from runoff by installing appropriate drainage structures. Borrow pits and quarries should be reinstated[2] so as to not create ponds thereby avoiding future malaria risks;

- Haul roads and temporary access roads should be carefully designed. If existing roads are improved to facilitate transport of engineering equipment or construction materials in areas of miombo woodland, awareness and education for construction crews, institutional strengthening and other controls shall be implemented to minimize woodland felling;

- Where steep slopes are exposed, modified or created as a result of road projects, borrow pits, quarries, and the installation of other infrastructure, erosion shall not be increased and where possible improved through adequate drainage design. This may involve the establishment of vegetation such as vetiver grass, *Waldsteinia ternata,* grasses such as *Imperata cylindrica* and appropriate locally collected and propagated wild species;

- Where roads involve river crossings, steps shall be taken to ensure that local water intakes are temporarily installed upstream of areas of turbidity during construction and no hydro-carbons are spilled into the watercourse;

- Where possible and appropriate along road schemes, tree planting shall be carried out to provide shade trees for schools and communities. Planting shall be carried out and maintained with the close involvement of the community; and

Sound environmental management of construction operations should include, among others: appropriate selection of construction sites, bunding of operations - which could create groundwater pollution, firebreaks surrounding construction sites, and where possible employment of local labor. These together with other principles of best practice shall be covered in the Environmental Management Plan of the Environmental Impact Report

e) Traffic Surveys

The Design Consultant shall conduct a 16 - hours, 5-day classified traffic count and a 24-hour, 2-day traffic classified traffic count on each of the traffic sections included in the portion of Road N1 under investigation.

Past classified traffic data for a number of years can be obtained from the ANE.

Traffic forecasts for a 20-year design period shall be based on available traffic data and on expected economic growth and on increased transport demand within the project area of influence. The traffic forecast shall be fully justified and shall optimistic, realistic and pessimistic scenarios.

A comparison shall also be done to assess the consequences and/or impacts of reduced carriageway width, narrower paved shoulders, lack of paved shoulders on the road level of service and vehicle operating costs.

The traffic forecasts shall be conducted for the total traffic as well as for the different vehicle classes.

f) Traffic Safety Study

The Consultant shall identify all possible accident black spots, and incorporate within their design measures to improve any identified dangerous locations. Such measures include improved layout and visibility at junctions, proper separation of pedestrians and cyclists from the vehicular traffic, traffic calming measures to reduce vehicle speeds through villages and provision of pedestrian crossings, bus bays, and parking areas. Other measures to be considered include widening of shoulders in towns /villages, introduction of improved foot/cycle paths, and provision of climbing lanes on steep grades.

Sub-Task Deliverable: A detailed traffic engineering analysis shall be prepared to specify the design of necessary traffic control features. The Consultant shall determine the location of signs, guardrails, rumble strips, speed bumps, pavement markings, facilities for pedestrians and non-motorized traffic around populated areas.

g) Soils and Material Studies

The extent of the soils and materials studies should primarily be carried out to estimate the construction cost of the project and pavement. The tasks to be performed by the Consultant are as follows:

The Consultant shall review existing sources of supplies of construction water, and shall identify additional sources as necessary. The Consultant shall provide information on quantities and quality of water required and available for construction. It should be noted that water to be used for the implementation of the project shall not be provided from a public source, or at public expense. Where construction water is not readily available from sources other than public sources, the Consultant shall propose sources of construction water such as boreholes or shallow ponds, and identify costs and environmental protection measures associated with the extraction of water resources.

The Consultant shall review existing sources of supplies of fuels, including firewood and charcoal requirements, and shall identify additional sources as necessary. The Consultant shall provide information on quantities and quality of fuel required and available for construction. It should be noted that forestry reserves to be used for the implementation of the project shall not be provided from a source that cannot guarantee replanting, or at public expense. Where firewood or charcoal is not readily available from sources other than public sources, the Consultant shall propose alternative fuel sources and identify associated costs.

The Consultant shall review all existing relevant data and perform his/her own testing to verify, update and supplement the available information. Emphasis shall be put on identification of suitable and sufficient materials for construction of bituminous asphalt wearing course, chip and spray surfacing seals, stabilized and graded crushed stone base

course, and sub-base within economic hauling distance. At a minimum the Consultant's own testing regime shall be at the frequency indicated in the attached Annex A. In general, the following shall be undertaken:

Where major embankments are to be constructed, sampling and geotechnical testing must be undertaken so as to support foundation design, stability analysis, and assessment of settlements of embankments;

- Verification of quantity and quality of existing borrow pits and quarries, and identification of potential supplementary suitable sources as necessary to obtain sufficient quantities within economic hauling distance. A "suitable source" shall include the consideration of environmental impacts on the natural aquatic and forest resources located within and around the identified source areas, as well as health and social impacts on neighboring or downstream settlements;
- Analysis and testing of alignment soils and potential construction materials shall be carried out to determine their suitability for the works; and
- Testing of dimensionally unstable soils (expansive and collapsing soils).

Analysis and testing of construction materials shall be carried out to determine their suitability for the Works. Tests to be included shall not be less than those as indicated below:

- Grading;
- Atterberg Limits;
- Moisture / density relationship (AASHTO T180);
- Californian Bearing Ratio CBR (3 point) and swell after 4 days soaking for each typical soil type identified.

Special attention shall be given to identification of sections where soils exhibit dimensional instability (swelling and collapse).

Potential gravel sources shall be tested for not less than:

- Grading;
- Atterberg Limits;
- Moisture / density relationship (AASHTO T180) (Natural and stabilized);
- Californian Bearing Ratio CBR (3 point) and swell after 4 days soaking for each typical soil type identified;
- Unconfined Compressive Strength;
- Indirect Tensile Strength; and
- Wet/Dry Durability

Potential sources of crushed aggregates shall be tested for:

- Aggregate Crushing Value ACV;
- 10% FACT;
- Sodium Sulphate Soundness;
- Specific gravity;

- Water absorption;
- Bitumen Affinity; and
- Specific gravity and water absorption

The Consultant shall identify suitable and sufficient sources of rock, gravel and sand materials for use in asphalt layers, unbound pavement layers and concrete works.

Sub-Task Deliverable: A detailed report of the Soils and Materials Study efforts shall be prepared documenting the field investigation activities performed and the results of the efforts (site location maps, site photos, field data collected and laboratory testing-analysis results) to identify suitable and sufficient sources of rock, gravel and sand materials for use in asphalt layers, chip and spray surface treatment, unbound and bound pavement layers and concrete works as well as water and fuel. .

h) Pavement Investigations and Design

The Consultant shall assess the residual life of the existing pavement by means of response and component methods of estimation. Deflection measurements are to be carried out with a Falling Weight Deflectometer (FWD) while the Dynamic Cone Penetrometer (DCP) may be used to measure the in-situ strength profile of the pavement structure. FWD measurements shall be made at maximum intervals of 200m in each lane.

The thickness of the existing pavement layers on the carriageway and shoulders shall be determined from the trial pits excavated at maximum intervals of 5,000 meters[1]. The trial pits shall be excavated in the shoulders at the edge of the carriageway and shall extend approximately 0.2 m into the carriageway pavement. The interval shall be reduced where there is excessive variance in the test results.

Additional trial pits shall be excavated at local areas showing excessive distress (rutting, structural depression, cracking etc.). The reason for the distress shall be determined and any need for remedial measures identified.

The Consultant shall arrange for reinstatement of the pavement as soon as possible after testing and shall ensure that no open trial pits present a traffic hazard at any time. The total pavement surface shall be inspected in order to assess the types, quantities and cost of required pre-overlay repairs.

The traffic volumes on the project roads are, in general, low. The design of the pavement structure shall be carried out using response and component design methods. The pavement shall be designed to carry the traffic expected over a 15-year design life.

On the strength of the quality and characteristics of in-situ and available soils and materials the Consultant shall compare the economics of various pavement design alternatives (e.g. stabilized versus granular layers, asphalt versus chip and spray, and/or

[1] The pavement design on these roads is known to be uniform as are the typical forms of distress manifestation. The interval can and should however be selectively altered (increased / decreased) to suit observed differences in structural performance. The test pitting interval at detailed design stage will be reduced to +/- 1 km and non-destructive (deflection) testing will be introduced at 100m - 200m intervals. This information will be used to carry out the final design of the pavement.

others resulting from prototype trials being undertaken by ANE).

Shoulder pavement design shall take into consideration the likely maximum load on the structure, and the possible requirement for edge support at the embankment slope. Measures to prevent or delay cracking between the paved roadway and the shoulder shall be considered. The feasibility of paving the shoulders shall be studied.

Sub-Task Deliverable: A detailed report of the Pavement Investigation Study efforts shall be prepared for each Road Section documenting the field investigation activities performed and the results of the efforts (site location maps, site photos, field data collected, and related laboratory testing-analysis results).

i) Hydrological and Hydraulic Studies

The Consultant shall review pertinent data and historic rainfall data to determine various risk scenarios for failure of drainage structures.

Flood Return periods for the design of pipes, culverts and bridges shall be in accordance to ANE´s design standards. This would include the determination of sections or structures prone to flooding or damage during rainy spells.

Wherever the risk of floods justify the re-design of structures, the Consultant shall undertake the hydraulic evaluation of the river crossing structure by conducting hydrological estimates, a waterway hydraulic study, the determination of sediment transport and scour as well as the assessment of the bridge waterway openings.

In this regard the consequences of severe wet spells such as those encountered during historical floods or extreme rainfalls must be outlined.

The Consultant shall identify the drainage and sub-drainage areas locations require attention because of water during rain seasons

Regarding to the Hydraulic Studies, once the flow computations are completed, the conceptual hydraulic design of drainage structures shall be performed, taking into consideration both entrance control and outlet control. Special attention shall be given to the design velocities that could cause structure and channel erosion. Erosion control features such as energy dissipaters, paved channels, grass and rock protection, etc., should thus be considered in the design.

j) Structural Design

The Consultant shall compile a detail inventory of drainage infrastructure and ancillary road works along the existing road alignment;

Where visible storm water drainage inadequacies where reported or observed (overtopping, structural failure, washaways, extensive erosion), the major structures (bridges, box culverts) will be hydraulically evaluated and where required, improved or supplemented.

The Consultant shall review the structural condition of the existing structures, and propose appropriate remedial or replacement works in respect of the following:

- Urban Drainage Structures;
- Minor Drainage Structures;
- Major Drainage Structures;
- Bridges

Wherever visible stormwater drainage inadequacies are observed (overtopping, structural failure, washaways, extensive erosion), the Consultant shall undertake the hydraulic evaluation of major structures (bridges, box culvets).

(i) Urban Drainage Structures

Conceptual designs should include provision of such surface water drainage elements as catch basins, manholes, kerb and channel, collectors, and sub-collectors.

(ii) Minor Drainage Structures

For the purpose of these Terms of Reference (ToR), all pipe culverts with a diameter equal to or smaller than 1.50 m, and concrete box culverts or section consisting of masonry stone walls and reinforced concrete slab of equivalent size, shall be considered as a Minor Drainage Structures. The decision about the type of structure to be used, (for example concrete or metal pipes, box culverts) shall be made based on a comparative cost analysis, as well as an evaluation of advantages and disadvantages, useful life, and maintainability.

(iii) Major Drainage Structures

Pipe culverts having diameter larger than 1.50 m., or equivalent size structures excluding bridges, shall be considered a Major Drainage Structures. The following types of structures could be considered:

- reinforced concrete pipes
- corrugated metal pipes or pipe arches
- reinforced concrete box culverts, single or multiple spans
- reinforced or simple concrete arch
- reinforced concrete arch connected by a bottom slab

Decisions concerning the type of structure to be specified shall be based on comparative cost analysis, as well as an evaluation of advantages and disadvantages, useful life, maintainability, and other factors as appropriate.

(iv) Bridges

The bridges of this section of N1 shall be evaluated in terms of:

- Their structural adequacy,
- The condition of all bridge elements,
- The adequacy of the waterway openings.

The structural adequacy will be evaluated by conducting a detailed visual assessment and, where necessary, diagnostic testing. The as-built drawings, where available and

required (depending on the detailed assessment), shall be reviewed, to determine whether the structural capacity of the bridge is adequate for the present and forecasted conditions. The Consultant shall undertake the detail visual assessment and inventory of all major culverts and all bridges. The visual assessment output data shall be presented in the format required by ANE.

Where bridge structures are concerned, the Consultant shall carry out the tasks listed below:

- Geological Studies

  At the anticipated location of bridges geological studies shall be performed for the abutments and piers. They will include type of rock and soils, stratigraphy, and erosive processes that could affect the abutment and piers and other elements.

- Geotechnical Studies

  The Consultant shall make recommendations about the number and location of bore holes to be carried out during detailed design and make recommendations about the borehole log and testing information to be gathered. These shall be drilled in sufficient number and shall be consistent with the magnitude of the structure and the geological characteristics of the area. As a minimum one bore hole shall be drilled at each one of the abutments or pier(s).

- Bridge Design

  Conceptual bridge designs shall be carried out according to the requirements of the SATCC Draft Code of Practice for the Design of Road Bridges and Culverts, September 1998 (Reprinted 2001). Where appropriate, and for each bridge, alternative conceptual repair or replacement works shall be designed and costed. For each bridge, alternative designs with respect to such elements of the bridge as span length and x-sectional geometry should be considered.

  The decision as to which alternative should be adopted will be made on the basis of economics and an evaluation of advantages and disadvantages of adopting the proposed form of construction including buildability and maintainability.

  Sub-Task Deliverable: A detailed report of the Hydrological Studies efforts shall be prepared for each Road Section documenting the office and field investigation activities performed and the results of the efforts (site location maps, site photos, field data collected and related office analysis results) and detailed report of the Structural Condition and Geological evaluation efforts shall be prepared for each Bridge Site documenting the field investigation and laboratory activities performed and the results of the efforts (site location maps, site photos, field data collected and related laboratory testing-analysis results).

4.3 Economic and Financial Assessment

The economic and financial assessments will be based on the traffic surveys conducted for the study, which together with other economic data, will be used to forecast demand on the project roads for a 20 year period from start of construction. The economic assessment, to be conducted using the HDM model, will establish the contribution of the

investment to the economy of Mozambique whilst the financial assessment will establish the impacts of the project on Mozambique's limited funding sources.

4.4 Assessment of Traffic Demand

The following tasks will have to be completed to produce the estimates of traffic demand needed for the economic and financial assessments:

- Establish current year (2008) AADT traffic volumes for the road section identified and classified by vehicle type.

- Establish background traffic growth rates (e.g. traffic growth that would be expected due to general economic development) for passenger and goods vehicles separately for a 20 year period from start of construction using accepted methodologies based on selected industrial production indicators, estimated economic conditions, and observed historical patterns, as appropriate.

- Assess additional traffic growth on each road section that would occur due to the road improvements. This will include separate consideration of traffic diverting from other roads and new vehicle trips generated due to reduced transport costs (induced or generated traffic). Special attention should be given to the impact of opening of new bridges over the Zambeze and Rovuma Rivers and the completion of works on other routes, all of which will affect current patterns of accessibility in the north.

- Produce central AADT traffic forecasts by vehicle type for the road section for each year of analysis for a Base Case (without road improvements) and Project Case (with road improvements).

- Produce optimistic and pessimistic forecasts of traffic demand based on alternative economic, institutional, political, and environmental criteria affecting traffic demand.

Sub-Task Deliverable. Traffic Forecast Report summarizing current traffic and future traffic volumes on the project road sections with explanation of assumptions behind traffic forecasts.

4.5 Economic Assessment

The economic evaluation of the proposed upgrade/ rehabilitation options shall be done using the HDM model and based on standard input data for maintenance options, vehicle description and utilization. The analysis shall also clearly indicate the sensitivity of the recommended rehabilitation and widening options to:

- Firstly, the traffic scenarios developed as described in section 4.2 f) as well as changes in the assumed annual growth in traffic and,
- Secondly, the increase and decrease of the rehabilitation cost by 20 %, and,
- Thirdly, the risk when providing a narrow carriageway with limited or no surfaced shoulders.

The Net Present Value and Economic Internal Rate of Return (EIRR) for the recommended rehabilitation option shall be calculated using discount rates of 0 %, 8.76 % .
The Consultant shall evaluate the possible alternatives by comparing them with the reference or

"without" project" alternative. Likewise, the HDM vehicle fleet input data will be supplied by ANE.

The Consultants and ANE shall agree on the factors for the calculation of vehicle operating costs.

Only transportation impacts will be monetarily quantified in the HDM assessment; social and wider economic impacts will not be monetarily quantified, but will be considered separately. The following tasks will have to be performed to complete the economic assessment:

- Level 1 Calibration of HDM to local conditions to include adaptation and calibration of road user cost and road deterioration and works effects sub-models. This will be based on previous research conducted by ANE supplemented by additional data as required and updated to current year values. The resultant updated set of road user costs, road works and maintenance costs, economic and other parameters (to include shadow price factors) will be agreed with ANE prior to assessment.

- Agree Base Case and Project Case maintenance scenarios for all road sections with ANE.

- Agree a range of Project Case investment alternatives and costs for each section (e.g. different cross-sectional standards and pavement construction options) with ANE.

- Run the HDM model for the agreed alternatives for central, pessimistic and optimistic traffic growth scenarios. The economic results shall be presented for the proposed section in terms of Economic Internal Rate of Return (EIRR) and Net Present Value (NPV) using the 8.76% MCC hurdle rate used during compact development.

- Run the HDM model for a number of agreed sensitivity tests to include variations in capital and maintenance costs.

- Qualitative assessment of wider economic and distributional impacts of the projects on the regions economy.

  Sub-Task Deliverable: Economic assessment report to include calibration details of HDM, input values, and the results of the full range of alternatives with recommendations for the preferred option for each road section. Cash flow tables and key indicator reports (annual road condition, vehicle speeds etc.) to be included as an Appendix to this report. All analyses shall be accompanied with excel spreadsheets that have cells unlocked.

4.6 Financial Assessment

The financial assessment will focus on the financial implications of the project on the GOM's investment and maintenance budget and whether the road maintenance is sustainable. The following tasks will have to be completed:

- Evaluate the impact of the proposed road program on Government revenues and expenditures to include revenue losses or gains derived from valued added taxes, excise taxes, duties, licenses and permits during implementation of the program;

- Determine the extent to which the Road Fund's revenues arising from fuel levies, tolls and transit fees are adequate to sustain the long term program of operations and maintenance of the roads;

- Estimate any additional funding needed to finance the operations and maintenance of roads to ensure the sustainability of the program and assess the prospects of having an assured source of operations and road maintenance funds for routine and periodic maintenance of the road and propose a mechanism and/or facility to reserve such funds;

- Investigate the extent to which vehicle overloading will impose additional damage on the roads and estimate the incremental increase in the cost of road maintenance that would result from overloaded vehicles; and

Sub-Task Deliverable: Financial Assessment Report.

4.7 Environmental and Social Impact Scoping and Associated Licensing Requirements

The environmental licensing process begins with a pre-assessment. This assessment determines, or confirms (based on the category into which the activity falls) the type of assessment that will be required prior to a license being issued. The Consultant's environmental and social scoping work is intended to provide all the information required for the development a pre-assessment application, and other GOM requirements, while also ensuring that MCA-Mozambique and MCC environmental requirements are met. The Consultant will have the primary responsibility for environmental and social scoping and for preparing the pre-assessment application for the categorization of the project, the Environmental Pre-Feasibility Report and Scoping Study (EPDA), which will serve as the basis for the development of the Environmental Impact Report (EIR) (see Task 4.8 below). The following scoping deliverables will not necessarily be completed sequentially but will rather run concurrently and contribute to reinforce each other.

4.7.1 Pre-assessment/Categorization Application

This task involves preparing the pre-assessment application in the form specified in GOM Decree Number 45/2004, so as to provide sufficient information for MICOA, the GoM environmental regulatory authority, to categorize the project. The Consultant shall prepare the pre-assessment application and assist MCA-Mozambique and ANE in its engagements with the environmental regulatory authority and in responding to additional information as required.

Sub-Task Deliverable: Pre-assessment application in Portuguese that is compliant with Decree Number 45/2004, General Directive Numbers 129/2006 and 130/2006 of the Government of Mozambique (GOM).

4.7.2 Scoping Sessions/Public Consultations

The Consultant shall identify stakeholders to invite to two (2) Scoping Sessions/Public Consultations, (1) in Nampula and one (1) in Cabo Delgado. Stakeholder identification shall

require consultation with MCA-Mozambique and ANE on the selection criteria used to identify stakeholders. MCA-Mozambique shall approve the stakeholder list. It will be important to ensure the involvement of Provincial and District Health Departments, extension workers and NGOs active in the health sector, particularly those working to combat HIV/AIDS in the road sector. The District Departments of Planning and Infrastructure should also be consulted as well as the GOM departments and agencies responsible for promoting road safety.

The Scoping Sessions/Public Consultations shall inform stakeholders of the overall parameters of the proposed project and public participation plan (see Section 5.4 below), and solicit comment on the associated environmental and social impacts. The Consultant shall prepare a detailed agenda and presentation materials for the Scoping Sessions, convene the Scoping Sessions, facilitate the sessions, and prepare a report summarizing the results of the sessions, for ANE review and MCA-Mozambique approval.

The Consultant shall take care to ensure that women and vulnerable groups are clearly represented and participate throughout the entire environmental/social impact scoping process, including public consultation and preliminary efforts to identify impacts and develop appropriate mitigation measures.

Sub-Task Deliverable: The Consultant shall provide a summary of the scoping sessions (including a log of comments from public consultations with necessary follow-up steps) in the Environmental Pre-feasibility Report/Scoping Document (see below).

4.7.3 Environmental Pre-Feasibility Report and Scoping Study (EPDA)

It is likely that MICOA will decide that the upgrade of the road comprises a Category A project as defined in Mozambique environmental law. For Category 'A' projects the next step in the process of applying for an environmental permit is the development and submission of an environmental pre-feasibility and scoping study, also know as an EPDA. Based on the results of the Scoping Sessions (which include Public Consultations), the Consultant shall prepare an EPDA that summarizes plans for preparing the Environmental Impact Report (EIR)**,** The Consultant will prepare the EPDA in the form specified in GOM Decree Number 45/2004, so that sufficient information is provided for the environmental regulatory authority to make final decisions regarding the appropriate level of environmental assessment and other studies required for the road. The Consultant shall assist ANE in its engagements with the environmental regulatory authority and in responding to additional information as required. The EPDA/Scoping Document will include, at a minimum:

- Definition of the project;
- Alternatives to the project;
- General description of the ecosystems, plants and animals affected; the location and size of the area affected; the duration and intensity of the impact; and the direct, indirect, potential, overall and cumulative effects of the impact; and the reversibility or otherwise of the impact.

- Physical, environmental and socioeconomic factors to be assessed in accordance with GOM Ministerial Diploma 130/2006, MCC Environmental Guidelines, and MCC Gender Policy;

- Detailed schedule of all environmental and social impact assessment tasks to be performed, showing how they will be integrated into the feasibility and design aspects of the project to maximize environmental sustainability; and

- Stakeholder engagement and public consultation participation plan. Stakeholder engagement should accommodate for equal participation by men, women, and socially excluded and vulnerable populations by considering location, distance, time of day and week, length of meeting, language and literacy, group dynamics, etc.

- Detailed Terms of Reference for the development of the Environmental Impact Study (See Task 4.8 below) based on categorization from MICOA, results from the scoping sessions and public consultations.

  Sub-Task Deliverable: EPDA in English and Portuguese that is compliant with Decree Number 45/2004, General Directive Numbers 129/2006 and 130/2006 of the Government of Mozambique (GOM) approved by MICOA.

4.8 Environmental Impact Report (EIR)

Based on the results of the Scoping Sessions, MICOA's categorization of the project, and the EPDA, the Consultant will develop an EIR for the road that is in accordance with applicable requirements of the GOM, provincial, district and local authorities.and the MCC Environmental Guidelines. The EIR shall be in both Portuguese and English languages, and shall include annexes (also in both languages) providing all road-specific studies prepared in support of the EIR. It is important that the EIR have a proper conclusion and that each component be assessed according to a sliding scale of impact intensity, ranging from "major adverse", "moderate adverse", "neutral", "moderate beneficial" and "major beneficial" impacts. These assessments should be based on a clear comparison between the existing baseline and the new proposals and also on well defined and robust criteria relating to each component.

The Consultant shall be responsible for providing information to all concerned and affected parties on the project, for consulting with the parties on a regular basis throughout the period of preparation of the EIR, for providing an opportunity for public review and comment on the draft EIR, and for preparing a report for submittal to the environmental regulatory authority that summarizes all comments. The Consultant shall take care to ensure that women and vulnerable groups are clearly represented and participate throughout the entire environmental/social impact assessment process, including public consultation, , impact assessment and development of mitigation measures.

At a minimum, the EIR shall:

- Identify changes resulting from road improvements both during and after construction that could affect the physical and natural environment within the Chimuara-Nicoadala

area of influence, and the socio-cultural, public health and safety conditions of its population;

- Develop measures to be incorporated in the final engineering design of the road that will not only prevent or mitigate any adverse effects of the road construction but will be of benefit to vegetation and fauna and to hydro-geomorphologic processes;

- Identify possible changes in the use patterns and availability of natural resources (soil, water, forests, etc.) and in the patterns of human settlement with regard in particular to relocation of residents and farms, as a consequence of improvements within the areas of influence. Particular attention will be given to changes in forest cover, inappropriate land usage, changes in drainage patterns, impacts on animal migration, water and air contamination, and/or to possible risks imposed on fragile ecosystems, within or outside protected areas;

- Identify possible impacts in the public health status of local populations as a result of contact between previously disparate areas and the increased transmission of disease (e.g.HIV/AIDS), and the impacts of increased mobility on injuries, deaths and damage to property. Particular attention will be given to the issues and impacts associated with the influx of migrant workers, the camp followers and the pressures brought about by estrangement from family life. Coordination efforts will be made with workers in any local HIV/AIDS programs and national Aids program so that mitigation measures consider a prevention and treatment strategy to address sexually transmitted infection issues;

- If adverse indirect negative environmental effects occur along the road section, formulate recommendations to prevent, mitigate or correct such effects and establish a system for monitoring and controlling the free access or/and indiscriminate use of the natural resources that should be protected; and

- Include the following:

  i) *Project description*. A description of the project with an emphasis on those activities that could impact, directly or indirectly, on the environment, both in the construction phase and during operation of the improved highways. Include maps delineating main areas impacted by road construction, primary communities impacted, and nearby sensitive or protected areas. Maps should also identify zones of land use in affected areas, and the different livelihoods that these land uses support.

  ii) Physical, environmental, and socio-economic conditions. A diagnostic description of the physical, environmental, and socio-economic environment of the area of influence of the project prior to the execution of the project, with special emphasis on those environmental aspects that could be affected by the project.

  iii) Environmental impacts. Identification, description and analysis of the environmental impacts of each project alternative, separating out the positive and negative and the direct, indirect, cumulative, and induced effects, including an analysis of the importance,

size and intensity of the impacts. The description of the impacts should, as far as possible, be accompanied by schematic diagrams and charts indicating their location on maps, showing where the major impacts would be likely to occur and indicating their extent, volume, area affected, and other technical characteristics of the project.

The analysis of the impacts should be presented concisely in terms of location, expected time of occurrence and quantitative importance. Impacts (positive and negative) shall be assessed in the areas identified below, at a minimum. Note that the likely significance of each of these potential impacts can be expected to vary widely from road to road. Therefore, in planning the technical approach and allocation of technical resources for the road section , the Consultant shall consider the results of studies prepared by ANE to date, including the pre-feasibility study of the Chimuara-Nicoadala. Analysis of impacts shall include the consideration of the following:

Ecological Impacts:
• Protected areas;
• Fisheries and aquatic ecology;
• Wetlands;
• Forests;
• Rare, endangered species;
• Animal migration; and
• Natural industry.

Physical Impacts:
• Erosion and/or siltation;
• Local flooding;
• Stream channel regime changes;
• Landslides;
• Dust/air pollution; and
• Noise.

iv) *Social Impact Assessment*. Identification, description and analysis of the socio-economic impacts of each project alternative, separating out the positive and negative and the direct, indirect, cumulative, and induced effects, including an analysis of the importance, size and intensity of the impacts against the vulnerability of the social receptors to impoverishment risks. Social receptors to be identified include individuals, households, businesses, social groups, economic networks, and communities. The description of the socio-economic impacts should, as far as possible, be accompanied by maps indicating where the major impacts would be likely to occur. The analysis of the impacts should be presented concisely in terms of location, expected time and duration of occurrence, quantitative (number of people or businesses) and qualitative (their vulnerability status) importance. Impacts (positive and negative) shall be assessed in the areas identified below, at a minimum:

• Population changes;
• Income and amenities;
• Economic and supply chain effects;
• Taking of lands/trees/crops;
• Vulnerable groups;
• Regional effects;
• Cultural resources;

• Urbanization problems;
• Health, including HIV/AIDS;
• Recreation;
• Public facilities (schools, hospitals, water facilities, etc.); and
• Public safety.

The Social Impact Assessment will focus on:

- Providing a general description of the major communities affected and land use activities along construction routes;
- Presenting high-level maps delineating main areas impacted by road construction, and identification of main communities affected;
- Providing a description of key community structures for the main communities including official leadership structures, social networks, NGOs and CSOs present and their main activities, and other institutions that are important to the community;
- Presenting maps identifying zones of land use in affected areas, and the different livelihoods that these land uses support;
- Presenting maps and a description of important cultural sites and activities;
- Identifying groups that are particularly vulnerable to impacts during construction and provides a description of who they are, where they live and what makes them vulnerable;
- Identifying construction and operation effects that could contribute to social conflict and animosity;
- Identifying economic and livelihood activities that will be negatively affected during road construction;
- Describing how HIV/AIDS and sexually transmitted infection issues can be addressed to reduce the risk for both indigenous and migrant workers involved in the construction works and along the road corridor as an operational entity. The consultant shall develop requirements for social impact awareness campaigns related to HIV/AIDS and other sexually transmitted diseases and other related mitigation measures; and
- Describing the potential impact of the temporary access roads.

The Consultant shall also carry out a detailed gender assessment of the project to identify gender-based constraints and opportunities related to the development and implementation of the project. Gender-based constraints to participation and gender specific impacts shall identified along. Based on this assessment, the Consultant shall develop appropriate measures to increase opportunities for participation and propose measures to eliminate or minimize negative effects, as well as measures to enhance the positive impacts. Gender disaggregated data should be provided and the EIA should consider individual beneficiary target groups. The Consultant shall also identify opportunities/approaches to ensure that construction contracts include provision for hiring women to meet the minimum of 25% of the totally unskilled locally hired labor as described in ANE's Contract Specifications.

v) *Public consultation summary*. A summary of comments received during the public consultation process and the Consultant's response to the comments as a separate report accompanying the draft EIR.

vi) *Environmental Management Plan (EMP).*

The Consultant shall compile a detailed Environmental Management Plan (EMP) that will be primarily implemented by the Contractor hired to build the road. The Consultant shall develop the EMP based on the findings and recommendations of the Environmental Impact Report (EIR), and any comments received from MICOA, MCA-Moz, ANE and MCC. As such, the EMP shall describe the required preventative, corrective or mitigating measures to minimize or eliminate negative impacts and to enhance the positive impacts on both the natural and human environments. The Consultant shall also formulate and include in the EMP specific language and contractual clauses for inclusion in the tender documents for Works that relate to the Contractor's environmental/social mitigation responsibilities during construction of the road.

The EMP should address mitigation measures for all the entire project and include, at a minimum, the following:

a. a description and estimate of the costs of the specific mitigation actions;

b. indication of primary entity responsible for implementing each mitigative measure (e.g., MCA-Mozambique, Supervisor, Works contractor, GOM, etc.)

c. an approximate timetable for the implementation of each mitigative measure. These recommendations shall be integrated into the technical design phase of the project as well as the feasibility studies of possible alternatives early enough to be able to influence design and decision-making regarding alternatives. The recommendations for the prevention, correction or mitigation of negative impacts or for the reinforcement of positive impacts should be specific and detailed in order to facilitate the execution and supervision of the construction work, including preparation of Terms of Reference suitable for inclusion in construction works procurement documents; and

d. a risk and emergency control plan, a maintenance action plan, and an environmental education program.

vii) *Monitoring and Evaluation Plan*. Development of a Monitoring and Evaluation Plan to be followed during the construction and operational phases of the project. Environmental and social monitoring should be designed to track impacts and project performance on specific beneficiary groups including women, youth and HIV affected households.

Sub-Task Deliverable: A complete draft EIR in Portuguese and English that is appropriate for submission to environmental authorities and is compliant with Decree Number 45/2004, General Directive Numbers 129/2006 and 130/2006 of the Government of Mozambique (GOM) and MCC Guidelines for Environment and Social Assessment.

Sub-Task Deliverable: Based on comments received on the draft EIR from MICOA, ANE, MCA-Mozambique, and MCC, the Consultant shall update the draft and submit a final EIR for official MICOA, approval.

4.9 Resettlement Scoping Study

Some aspects of this project, such as the widening of the carriageway, may involve either physical or economic resettlement Resettlement may involve one or more of the following: a) land acquisition; b) other asset acquisition (e.g., homes or other physical structures, trees, crops); c) physical relocation; and d) loss of access to resources (e.g.

grazing lands, pastures, etc. MCC requires the use of best international practice in resettlement and thus typically requires that MCA-Mozambique entities apply the World Bank's Operational Policy (OP) 4.12 on Involuntary Resettlement to all activities under a Compact. A fundamental requirement of resettlement activities based on OP 4.12 is to restore, at least, standards of living and preferably improve the livelihoods of those households, families, extended families and individuals who are losing land, assets or access to resources due to the implementation of a project. Compensation for lost assets can be monetary, in-kind (e.g., new land, housing and social infrastructure, work places or other replacement for lost assets) or a combination of both. Compensation to address economic rehabilitation can be in the form of restoration of conditions for pursuit of economic activities or training for new vocations where the original source of livelihood cannot be restored.

During the feasibility stage the Consultant will identify the extent of resettlement and available means of minimizing or avoiding resettlement for this project. The results of this work will be presented in a Resettlement Scoping Study. The Consultant will carry out the resettlement scoping in compliance with the World Bank Operational Policy on Involuntary Resettlement (OP 4.12) and GOM applicable laws and regulation. This Resettlement scoping will provide useful background information, namely the project's legal framework, the socio-economic baseline and an identification of potential affected parties, that will be used during the development of a detailed Resettlement Action Plan in Phase 2. The resettlement principles for this project that must be reflected in resettlement scoping are:

- involuntary resettlement will be avoided where feasible, or minimized, by exploring all viable alternative project designs;

- where it is not feasible to avoid resettlement, resettlement activities will be designed and executed as sustainable development projects, by providing sufficient investment resources to enable the persons displaced by the project to share in project benefits;

- displaced persons will be meaningfully consulted and have opportunities to participate in planning and implementing resettlement programs; and

- displaced persons will be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

4.9.1 Identify Potential Resettlement Impacts

The Consultant shall identify project components or activities that give rise to resettlement and evaluate their zone of impact. Design alternatives shall be discussed with the engineering team to consider how to avoid or minimize resettlement, especially relocation. Where resettlement is still necessary, scoping of land ownership and use shall be carried out. The number of people likely to be affected shall be estimated using an unobtrusive house count and other supplementary sources as needed, desktop review

of studies, aerial photos, and consultation with local leaders of affected communities (including communities to be displaced, as well as any communities that might be affected by the development of resettlement areas). Women, who may be disadvantaged by traditional ownership practices, and vulnerable groups shall be clearly reflected in the identification of impacts.

Sub-Task Deliverable: A Resettlement Scoping Study that outline the scope of potential resettlement impacts including estimates of the number and location of parties potentially affected by resettlement, a map of areas where resettlement will be required, information on land ownership, etc. The Scoping Study shall also describe efforts to minimize resettlement during project implementation.

4.9.2 Analysis of the Legal Framework for Compensation and Relocation Plan

In 2006, ANE developed a draft Resettlement Policy Framework (RPF) and Legal Framework for Compensation and Relocation for implementing the Roads and Bridges Management and Maintenance Program (RBMMP) . Based on information provided in this draft RPF, the Consultant shall assess the legal framework for resettlement and compensation activities for the Chimuara - Nicoadala road project This analysis should cover the scope of the power of eminent domain, or and the nature of compensation associated with it, in terms of both the valuation methodology and the timing of payment, etc.; the process, laws, and customs that govern resettlement, takings, and compensation determination, including identification of the roles and responsibilities of all entities at all levels of government (national, provincial, district, local) that play a role; and any gaps between relevant laws and customs and OP 4.12, and measures needed to fill these gaps.

Sub-Task Deliverables: A chapter in the Resettlement Scoping Study that presents the legal framework that will govern the development and implementation of the Chimuara - Nicoadala RAP, including procedure manual.

4.9.3 Socio-economic baseline

Based on data gathered during the development of the EPDA and EIR (see Tasks 4.7 and 4.8 above), the Consultant shall prepare a baseline description of socio-economic, cultural and historical elements related to land use in the affected area prior to project implementation as part of the Resettlement Scoping Study. It will use the data and information collected in the feasibility study. It shall describe the following:

- Land tenure and transfer systems, non-title-based systems governed by local recognized land allocation mechanisms, and any issues raised by different tenure systems in the project area;

- Public infrastructure and social services that will be affected; and

- Social and cultural characteristics of the displaced communities, including a high level description of formal and informal institutions (e.g., community organizations, ritual groups, nongovernmental organizations (NGOs)) that may be relevant to the consultation strategy and to designing and implementing the resettlement activities.

Gender disaggregated data and differences among beneficiary target groups shall be highlighted.

Sub-Task Deliverable: A chapter in the Resettlement Scoping Study that describes land use and social and cultural characteristics in the Chimuara-Nicoadala affected area.

4.9.4 Scope of Work for producing the Chimuara - Nicoadala RAP during Phase 2

The Consultant shall prepare a detailed Scope of Work, including a workplan, for the production of a RAP that addresses the resettlement impacts of the Namialo-Metoro road project. This Scope of Work and workplan will be used as the basis for the development of a RAP during the design period (Phase 2). It is important that resettlement impacts addressed by the RAP are handled in a timely and targeted manner (i.e. PAP satisfaction and minimal grievances), so that construction activities are not delayed. The TORs need to include the undertaking of a census survey which is required for the preparation of the RAP. It should be noted that the Booz Allen Report produced a TOR that include components for both the census survey and RAP, which is a very useful base document. The TORs should provide explicit detail on measures to ensure that the resulting RAP will be fully compliant with the World Bank's Operational Policy for Involuntary Resettlement (OP 4.12) and the ANE RPF and other Legal Framework documents governing resettlement and compensation.

Sub-Task Deliverables: A chapter in the Resettlement Scoping Study that presents a detailed Scope of Work and workplan for the development of a RAP during the Design Phase. The RAP must be compliant with WB OP 4.12, the ANE RPF and other Legal Framework documents governing resettlement and compensation, the Mozambican *Lei de Terras* No. 19 (1997) and its Regulation (Decree 66, 1998) and other relevant GOM laws

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5. Composition of the Consultant Team

The professional staff to be provided by the Consultant is estimated at 35 man months for the road section .

The services are anticipated to be completed within five (5) months of the Contract Award. The profiles and duties/responsibilities of the key staff, each of whom must be fluent in written and spoken English, are as indicated below:

(1) Senior Highway Engineer (Team Leader)

The Team Leader shall be responsible for the proper conduct of the entire study and shall be the principal contact person between the Design team and the Client. The Team Leader shall be a Registered or Chartered Civil Engineer preferably with a relevant postgraduate training. He/She must have not less than twelve (12) years of cumulative experience related to road/bridges studies and designs. The Team Leader must have had, in the last ten (10) years, specific experience of managing consultancy teams working on feasibility studies and detailed engineering design in at least two (2) road projects of similar size and complexity. At least one of these projects should have been in sub-Saharan Africa. He/She should be conversant with MCC procurement guidelines and procedures.

(2) Highway Engineer

The Highway Engineer shall be responsible for the design of the geometrical aspects of the road using the SATCC design standards, preparing designs using appropriate highway design software, quantifying volumes and preparing plans and profile drawings. He/She shall also assist the materials engineer in the design of the road pavement. The Highway Engineer shall be a registered or Chartered Civil Engineer. He/She must have not less than eight (8) years of cumulative experience related to road/bridges design and construction. He/She must have specific experience of working as roads design and construction supervision engineer on at least two (2) projects of similar nature and complexity of which at least one must be from sub-Saharan Africa. Postgraduate qualifications in Highway Engineering will be an added advantage.

(3) Traffic Engineer

The Traffic Engineer shall be responsible for the traffic field surveys, processing and analyzing the collected data and making traffic assignments and forecasts. The Traffic Engineer shall be a registered or Chartered Civil Engineer. He/She must have not less than ten (10) years of cumulative experience related to traffic studies. He/She must have specific experience of working on traffic studies on at least two (2) projects of similar nature and complexity of which at least one must be from sub-Saharan Africa. Postgraduate qualifications in Traffic Engineering will be an added advantage.

(4) Transport Economist

The Transport Economist shall conduct the economic analysis for the entire project. He/She shall be responsible for the conduct of the economic evaluation of the project when final construction costs are known from the preliminary engineering design to re-confirm the economic justification of the project. He/She shall be a qualified, graduate in economics or equivalent with at least ten (10) years of cumulative experience in the design and analysis of public investment projects in developing countries. He/She must have served on similar position in at least two (2) road investment studies of similar nature and magnitude within the past five (5) years. Proven knowledge and experience in use of HDM-4 and RED models are essential.

(5) Materials Engineer

The Materials Engineer shall be responsible for conducting and supervising the materials investigation with a view to achieving optimal design and construction strategy. The Materials Engineer shall give support the Pavement Engineer to carry out the pavement design and should be conversant with current practice in material testing and pavement construction strategies in developing countries. The Materials Engineer shall be a registered or chartered graduate Civil Engineer. He/She must have not less than ten (10) years of cumulative experience related to pavement evaluation, materials testing, soils investigation. He/She must have specific experience of working as Materials Engineer on at least four (4) projects of similar magnitude and complexity. Relevant postgraduate qualifications and experience of working in tropical countries is an added advantage.

(6) Topographical Surveyor

The Topographical Surveyor shall be responsible for conducting the survey, supervising the survey team and preparing field survey information in a digital format suitable for use in highway design software. He/She will be responsible for planning of the fieldwork, selecting known survey reference points, and determining the precise location of

important features in the survey area. He/she shall be responsible for researching legal records, looking for evidence of previous boundaries, analyzing the data to determine the location of boundary lines, recording the results of the survey, verifying the accuracy of data, and preparing maps and reports. The Topographical Surveyor shall be a holder of a Degree or Advanced Diploma in Land Surveying. He/She must have not less than eight (8) years of cumulative experience related to Land Surveying activities. He/She must have specific experience of working as Topographical Surveyor on at least two (2) projects within the last ten years involving feasibility study and detailed engineering design. Relevant Postgraduate qualifications and experience of working in tropical countries is an added advantage.

(7) Bridge/Drainage Engineer

The Bridge/Drainage Engineer shall be responsible for the assessment of existing bridges and design of culverts and other drainage structures along the project road. The Bridge/Drainage Engineer shall be a Registered or Chartered Engineer with a degree in Civil Engineering/Structural or equivalent qualification. He/She must have not less than eight (8) years of cumulative experience related to design of bridges/drainage structures. He/She must have served as a bridge Design Engineer on at least two (2) road projects of similar magnitude and complexity within the last five (5) years. Experience in the design of bridges in tropical countries will be an added advantage.

(8) Hydraulicist /Hydrologist

The Hydrologist shall be responsible for estimating and assessing the relationship between rainfall, surface-runoff and soils and rock features of the catchments along the project area with focus on surface water, including rivers and dams. He/She shall study and update the available hydrological data by computer models or any other means in order to maintain and develop successful flood water management strategies. He/She shall provide advice and information to the Bridge/Drainage Engineer on hydraulic characteristics of the catchments along the project area. The Hydrologist shall be a holder of a degree in Applied Science or Civil Engineering with not less than eight (8) years working experience related to water/flood management schemes. He/She shall have served as a Hydrologist on at least two (2) roads projects of similar magnitude and complexity within the last ten (10) years of which at least one must be from sub-Saharan Africa. The ability to use appropriate flood design models is essential.

(9) Geotechnical Engineer

The Geotechnical Engineer shall provide specialist foundation engineering advice to the Bridge/Drainage and Highway Engineers. He/She shall hold a degree in Civil Engineering with not less than fifteen (15) years working experience related to geotechnical engineering. He/She shall have served as a geotechnical engineer on at least five (5) roads projects of similar complexity within the last ten (10) years of which at least three (3) must be from sub-Saharan Africa.

(10) Environmental Specialist

The Environmental Specialist shall be responsible for leading the team carrying out the environmental and social impact assessment. He/she shall hold a University Degree with 10 years experience in EIA and the development of mitigation measures associated with roads projects. He/she must also have work experience in Africa and be fully cognizant of the MCC approach to ESA and gender-related issues. Experience in health impact assessment would be an advantage. Must be fluent in Portuguese and English.

According to the Mozambican legislation, to carry out the environmental studies, the Consultant firm or the Environmental Specialist must be registered with the GOM Environmental authority.

(11) Resettlement/Sociologist

The Resettlement/Sociologist shall be responsible for carrying out the resettlement scoping.. He/she shall hold a University Degree with 10 years experience in community development addressing resettlement issues and social impact assessment, including preparation of resettlement action plans, and stakeholder consultation associated with new infrastructure projects. He/she must also have work experience in Africa and be fully cognizant of the MCA-Mozambique approach to ESA and gender-related issues, including the application of OP 4.12.. Must be fluent in Portuguese and English. .

(12) Support Staff

The consultant can provide support staff to assist the above key experts in their activities. The costs of support staff must be included in the fee rates of the experts.

(13) Other Experts

The Consultant shall select and hire other experts as required according to the profiles identified in the Organization & Methodology. These profiles must indicate whether they are to be regarded as long-term/short-term; international/local and senior/junior so that it is clear which fee rate in the budget breakdown will apply to each profile. For the purposes of this contract, international experts are considered to be those whose permanent residence is outside the beneficiary country while local experts are considered to be those whose permanent residence is in the beneficiary country.

The Consultant shall pay attention to the need to ensure the active participation of local professional skills where available, and to also maintain a suitable mix of international and local staff in the project teams. All experts must be independent and free from conflicts of interest in the responsibilities accorded to them.

The selection procedures used by the Consultant to select these other experts shall be transparent, and shall be based on pre-defined criteria, including professional qualifications, language skills and work experience. The findings of the selection panel shall be recorded. The selection of experts shall be subject to approval by the Contracting Authority.

5.1 Program and Description of Deliverables for Phase 1

From the date of the signature of the Contract (M), the Consultant shall have two weeks to mobilize and deploy its team. The following time/schedule (in months/days) (M/D) shall be adhered to in carrying out the study. As such, the Consultant shall submit not later than the dates shown in the Table 5.1.1. – Feasibility and Environmental Study Deliverables.

Table 5.1.1. – Feasibility and Environmental Study Deliverables

Nr.	Deliverables Required	Timing (months)	Quantity of Reports
1	Signing/Effective Date of Contract	M	N/A
2	Inception report	M+0.7	5 copies in English + 2 CDs
3	Pre-assessment/Categorization application	M+0.7	5 copies in Portuguese + 1CD and 1 copy in English + 1CD
4	EPDA and TORs for EIR for MICOA approval	M+3	5 copies in Portuguese + 1CD and 1 copy in English + 1CD
5	Report on the evaluation of International Roughness Index (IRI)	M+3.5	5 copies in English + 3 CD
6	Draft Feasibility Study Report	M+4	5 copies in English + 3CDs
7	Draft Environmental Impact Report	M+4.5	5 copies in Portuguese + 1CD and 1 copy in English + 1CD
8	Draft Resettlement Scoping Study	M+4.5	5 copies in Portuguese + 1CD and 1 copy in English + 1CD
9	Final Feasibility Study report	M+5	5 copies in English + 3CDs
10	Final Environmental Impact Report Required for Permitting	M+6	5 copies in Portuguese + 3CDs
11	Final Resettlement Scoping Study	M+6	5 copies in Portuguese + 1CD and 5 copies in English + 1CD
12	Progress reports (Monthly thereafter)	M + 2	5 copies in English + 1CDs

The submission of poor quality or incomplete reports will be considered as a "non submission).

a) Inception report

The inception report will summarize the initial findings and provide defined proposals covering the methodologies of the data collection, analysis and presentation. This report will also serve as the basic document for the consultant's detailed work plan and timetable to be followed in light of the consultant's initial findings after the commencement of the services or other factors. The proposed work plan shall address separately each component of the TOR together with the specific outputs to be produced, each shown in sufficient detail to enable monitoring of completion against the timetable. It may also contain particular notes of the required revisions of the methodology proposed in the consultant's technical proposal, or action to be taken by other parties to enable the consultant to execute the services. The report may also include proposals on possible modifications of the format of the reports and their appendices and should give an update of the feasibility study budget. The report shall also record the mobilization status of the consultant's personnel. The report shall be brief and concise shall be submitted within twenty (20) days of contract award. To that end, it shall not exceed 10 pages (excluding annexes). The Inception Report shall include at least the following:

- Methodology (including the details of the Public Participation Program)
- Scoping. A statement defining the proposed limits of the study, including:
- a clear definition of the area to be subjected to the feasibility and environmental studies;
- an accurate estimation of the time they will take to complete;
- methods and parameters;
- any changes to the composition of the Consultant's team and specialists needed;
- agencies and government departments which would need to be involved; and methods of consultation with the local authorities and population.
- Detailed Program of Work, including engineering and environmental and resettlement field surveys, FS and environmental/social/resettlement studies, showing time, duration and personnel as well as the inter-relationship between activities

b) Draft Report

The draft document shall be submitted 4 months after the Contract Award and shall be presented by the Consultant's Team Leader and key members of the team at a meeting in Nampula, with MCA-Mozambique, ANE and other parties as may be required.

The Consultant shall propose, for approval by MCA-Mozambique, the date and agenda for the presentation of the draft document and for all other meetings. The Consultant shall also prepare and forward minutes from that meeting to all the concerned parties.

The Draft Report, including the Consultant's recommendations, will set out the various options in sufficient detail to enable an informed decision to be made on the preferred option to be studied in the detailed design phase.

The report may be accompanied, as may be required, by a document updating or revising the methodologies, timetable, staff mobilization and other pertinent issues which have been addressed in the inception report, based on the findings and experience gained during this phase. The report shall incorporate all sub-task deliverables identified above.

The suggested layout of the draft and final report is: -

I. Executive Summary
II. Background
III. Traffic Studies and Projections
IV. Engineering Studies and Construction Costs
V. Financial Evaluation, Priorities and Construction Schedule
VI. Recommendations and Conclusions
Appendix A – Statistical Information about the economy in the influence area
Appendix B – Road Network
Appendix C – Vehicle Operating Costs
Appendix D – Road Maintenance Costs
Appendix E – HDM Model results
Appendix F – Engineering data including topographical and materials surveys
Other Appendices
Engineering Drawings

The Draft Feasibility Study report should be presented as two A4 size volume (executive summary and main report) accompanied by separate volumes of Appendices together with a set of A2 size drawings.

The executive summary of the** feasibility Study report **shall be in Portuguese and in English**. **The output of the consultancy should be also presented in a consultative meeting.

c) Minutes of the consultative meeting

The Consultant shall forward to the concerned parties the minutes of the meeting including comments on the report, the final decisions and reasons for the preferred options.

d) Final report

The final report will incorporate all comments made during the consultative meeting and shall be submitted within five (5) months of contract award.

The Consultant shall submit digital/electronic copies of the final version of all documents on CDs (PC compatible) with the final documents. Reports, analyses, calculations and other similar documents shall be submitted in MS Office 2007 to 2003 format (MS Windows), and as collated documents in PDF file format. All sketches shall be submitted in. PDF file format. All drawings shall be submitted in .DWG file format.

Analyses, calculations and designs carried out on a PC with special programs (for example the World Bank's HDM model), structural drawings or computer aided drawings shall also be submitted with the final documents, with sufficient documentation (including all input data files for the models, with a detailed list of files and explanatory notes as appropriate) to enable MCA-Mozambique and ANE to rerun the special programs.

The Consultant shall submit 5 copies of the Final Report plus 3 copies on CD's in English. ***The executive summary shall be in Portuguese and in English.***

(e) Environmental Reports Required for Permitting

The Consultant shall provide MCA-Moz and ANE with five copies of the EIR reports in Portuguese to be submitted to MICOA . The numbers of copies shall be in accordance with the legislation. The environmental reports required for permitting are:

- Pre-assessment application documentation
- Environmental Pre-Feasibility Report and Scope Definition and Terms of Reference
- Draft Environmental Impact Report including Environmental Management Plan (EMP). The final Environmental Impact Report will be completed after the public consultative meetings.

(f) Monthly Progress Reports

The Consultant will provide monthly progress reports, reporting on the ongoing and planned activities of the study team and issues to be addressed with MCA-Mozambique and ANE.

5.1.1 Documentation Inventory and Handling

The Consultant shall establish and maintain a comprehensive inventory, both hard copy and electronic, of all relevant documents made available and collected. **E**lectronic versions shall be uploaded to a FTP site provided and maintained by the Consultant. The Consultant shall provide access to the FTP site to MCA-Mozambique, ANE and the MCC. All documents, which are considered confidential, will be compiled in usable form and delivered in an organized fashion to MCA-Mozambique at the end of Phase 1. If MCA-Mozambique chooses to extend the contract to include Phases 2 and 3 the Consultant shall be required to follow the same document management **during these Phases**

5.1.2 RELEVANT DOCUMENTS AND INFORMATION

The following documents and information are available to the Consultant:

- SATCC Design Standards "September 1998"
- Draft ANE's Design Standards, 2005;
- Traffic Records, years 2004 to 2007, ANE;
- International Manual for Road Maintenance, (Manual Internacional de Conservacao Rodoviaria); prepared under the supervision of Transport Research Laboratory of United Kingdom, with the cooperation of France, Germany and United Kingdom governments, October 1982;
- Proposal for Road Sector Investments in the North – Final Report : Prepared for the Millennium Challenge Corporation;
- PRISE (Programa Integrado do Sector de Estradas) Implementation Plan (PIP);
- Environmental Legal Framework in Mozambique' www.legisambiente.org.mz or www.acisofala.com
- MCC Environmental Guidelines and MCC Gender Policy

- World Bank Policy on Involuntary Resettlement (OP 4.12)
- ANE's Resettlement Policy Framework for implementing the Roads and Bridges Management and Maintenance Program
- Pre-feasibility Study (prepared by Booz Allen, 2007)

6 SCOPE OF SERVICES : Phase 2 (First Option Period): Detailed Design and Resettlement Action Plan (RAP) of the Road Section

6.1 General

Based on the Consultant's performance and sole discretion of the MCA-Mozambique, MCA-Mozambique may extend the term of the contract to include Phase 2- Detailed Design and development of RAP. MCA-Mozambique shall provide a written notice to the Consultant of its intent to extend prior to the end of Phase 1.

The Consultant shall be required to carry out such field investigations and design studies as are necessary to satisfy the project objectives, including

- The evaluation of the road alignment for a 20-year analysis period for which the Consultant shall compare the existing alignment with the minimum ANE requirements in terms of the Mozambican rural road classification and the set minimum standards for the N1.
- The evaluation of the structural and functional conditions of the existing pavements in terms of the traffic loading demands for the structural design period of 15 years and for an analysis period of 20 years (analysis period is to be used for the economic evaluation with HDM);
- The evaluation of the condition and adequacy of the existing drainage and ancillary elements;
- The evaluation of the structural capacity of existing bridges that are visibly structurally inadequate to carry the prevailing traffic loads;
- The evaluation of the general condition of bridge and culvert structures based on visual assessment.
- The evaluation of the adequacy of the waterway openings of the existing bridges on locations where overtopping and/or washaways were reported or visibly observed;
- The formulation and evaluation of technically and economically feasible pavement designs, and the recommendations thereof;
- The detail design of the maintenance, the rehabilitation or the widening of structures (from visual assessment, historic data, diagnostic testing) or the detail design of the reconstruction or strengthening of bridges (from visual assessment, historic data, load test, evaluation of codes). However, the final scope of works will be determined during the detail design phase or even during the civil works phase, if load tests are required.

- Prepare technical specifications, construction cost estimation and drawings for the Road.

- The development a Resettlement Action Plan (RAP) covering all aspects of the Namialo – Rio Lurio – Metoro Road project that is consistent with OP 4.12, ANE's draft Resettlement Policy Framework, and national legislation, including the Mozambican Lei de Terras No. 19 (1997) and its Regulation (Decree 66, 1998). The RAP will build upon the information gathered during feasibility and presented in the Resettlement Scoping Study. The RAP will also include technical specifications, construction cost estimation and drawings for any structures to be built during RAP implementation

The Services shall be carried out in accordance with generally accepted international standards of professional practice, following recognized engineering and management principles and practices and applying the ANE accepted design standards and the standard specifications. The consultant is referred to SATCC 1998 design guidelines and Standard Specifications, to the SADC Road Signs Manuals and to ANE's Design Standards. The Consultant's scope of work is understood to cover all activities necessary to accomplish the stated objectives of these services, while adhering to the aforementioned principles and practices, whether or not a specific activity is cited in this TORs..

In order to carry out the Scope of Services for Phase 2, the consultant shall, at a minimum consider the following field and/or desk studies:

- Review the existing traffic survey data;

- Review of pavement rehabilitation and maintenance history,

- Review the traffic study done during the feasibility study

- Conduct detailed topographic surveys on the entire project road;

- Prepare survey cross sections necessary for the detail design and for setting out the construction works;

- Conduct detailed condition survey of existing bridges and other cross-drainage structures, including the checking and commenting on their structural and hydraulic adequacy and sufficiency;

- Visually assess the condition of the existing expansion joints, ballustrades, approaches, foundations, protection against erosion, soundness of structural elements (cracks, spalling, reinforcement corrosion, etc), etc.

- Undertake material and subgrade investigations together with the identification of suitable concrete and road building material sources;

- Design the road section and all related structures and services, based upon a clear technical and economic rationale, and compare them in terms of costs and economic rate of return, as well as a set of construction drawings;

- Identify alternative pavement rehabilitation design solutions based on prevailing conditions.

- Identify potentially problematic subgrade materials and recommend alternative treatments;

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- Review the Environmental Impact Report, Environmental Management Plans, and Resettlement Scoping Study prepared in Phase 1 and incorporate the reports' recommendations for addressing environmental and social issues in the designs and specifications

6.2 Principal duties and responsibilities

The specific scope of services for Phase II will be comprised of the following desk-top and field studies:

- Gather additional historical information on the project road: year of construction and different maintenance and rehabilitation interventions, as-built data, material availability, performance of the various maintenance and rehabilitation interventions under prevailing traffic loading condition, overtopping and/or wash-aways, traffic data, etc.

- Undertake detailed topographical surveys of existing road, main features and borrow pits.

- Conduct detailed pavement condition assessment, which will include, where required, a visual, an instrument and test pit surveys.

- Conduct a detail inventory of existing ancillary infrastructure: i) road crossings, ii) bridges and major culverts, iii) minor box, pipe and other culverts, iv) beginning and end of villages, v) major services. The km distances will be measured with GPS (and not from oedometer readings).

- Conduct a detailed inventory and visual assessment of existing drainage structures which may include, where required, diagnostic testing. The detailed inventory of the major structures will include: i) km distances for start and end of structure, ii) structure type, iii) number of spans or cells, iv) dimension of spans or cells, v) year of construction, vi) condition, vii) proposed repairs, rehabilitation, strengthening, upgrading.

- Conduct a detailed inventory and condition assessment of cross-drainage elements. All drainage elements will be tabulated including i) km-distances (km-distances from oedometer readings will not be allowed, minimum requirements: GPS readings), ii) deflection angle with road center line, iii) dimensions, iv) condition of element, v) condition of inlet and outlet structures, vi) Remarks on perceived hydraulic capacity, vii) proposed maintenance, repairs, rehabilitation or upgrading. All existing stormwater drainage elements will be indicated in the layout and longitudinal section drawings.

- Undertake 7-day 24 hour classified traffic counts.

- Identify potentially problematic subgrade materials and recommend alternative treatments;

- The structural assessment of bridges suspected to be structurally inadequate from historic data or from the detailed visual assessment. The Consultant shall propose diagnostic testing where required. The detail design of the strengthening or reconstruction of structurally inadequate structures will form part of the Consultant's scope of services.

- The detail design of the maintenance or the rehabilitation of structurally sound bridge and major culvert structures to address defects that were visually observed during the detail assessment such as cracking and spalling on concrete elements, damaged steel or concrete balustrades, damaged expansion joints, damaged bearings, erosion and scour, settlement of foundations, etc.

- The structural design of bridges which are to be widened, strengthened or reconstructed, where required.

- Conduct field studies, censuses, and public information/consultation meetings to gather information needed for the development of the RAP

6.3 Engineering design studies

6.3.1 Topographical Surveys:

The Consultant shall carry out a detailed strip survey of the project road. A Digital Terrain Model (DTM) shall be created from the strip survey with contours at intervals of 0.5m for the purpose of designing and constructing the road. The strip survey will include details of the location and extent of bridges, culverts or other structures and services that could influence the design or construction of the road.

The Consultant will provide the survey data in electronic format suitable for use with Model Maker and Road Maker design software.

Control Network

The Consultant shall establish a control network along the length of the road which shall be fixed horizontally (YX) by GPS and be based on the WGS84 Datum and the UTM coordinate system. To establish this network beacons at 5km intervals shall first be fixed along the length of the road using the Static Mode Method of fixing. Secondary inter-visible beacons spaced at no more than 500m intervals along the road shall then be fixed by the RTK method. The vertical (Z) fixing of the control network beacons shall be done by spirit leveling. It shall be carried out in accordance with the methods laid down in TMH 11(Technical Method for Highways published by the South African Roads Board) and shall conform to the accuracies specified in the same document.

All survey stations shall be referenced in the field in permanent materials (12mm diameter x 300mm long steel bar, concreted into a 250mm diameter x 300 mm deep hole in the ground).

Centre Line Survey and Horizontal Alignment

The Consultant will survey (YX) the centre line of the road with a GPS using the RTK method. The survey interval shall be 20m on straights and 10m on curves. The survey data shall be provided in a form which is suitable for use with Model Maker and Road Maker design software and shall be used to derive a best fit horizontal alignment. The horizontal alignment which best fits the measured centre line coordinates shall be computed so that it does not deviate by more than 0.2m when tested against any of the surveyed points. The horizontal alignment will be staked and marked at 20m intervals along the existing road. The centre line survey and staking and marking of the best fit alignment shall be carried out ahead of the strip survey.

Strip Survey and Digital Terrain Model (DTM)

The Consultant will be required to generate a DTM with a contour interval of 0.5m from a strip survey. The strip survey will require the taking of cross sections at 20m intervals at the staked and marked horizontal alignment referred to above. The survey shall extend beyond all planned construction work by a distance of not less than 15m.

The survey data shall be provided in a form which is suitable for use with Model Maker and Road Maker design software and shall be used to derive a best fit vertical alignment. The vertical alignment which best fits the existing centre line shall be derived so that it does not deviate by more than 0.03m when tested against any of the surveyed points.

The tolerances for this work shall conform to those specified in the table below:

Tolerance for Detailed Survey Points			
Feature	Tolerance (m)		
	X and Y	Z	Any point to straight line fit between points X, Y and Z
Structures, Buildings and Paved Roads etc.	± 0.050	± 0.025	± 0.050
Gravel Pavements	± 0.100	± 0.050	± 0.100
All Other Areas	± 0.200	± 0.150	± 0.200

Optional Survey Methods for Conducting the Strip Survey

GPS method - RTK

The GPS - RTK method may be used to carry out the strip survey. The vector lengths between the base and the rover may not exceed 500m and the staked and marked horizontal centre line points (the best fit horizontal alignment) will be levelled by means of spirit levelling. The data will be used to test, and if necessary adjust, the levels obtained from GPS readings on centre line.

Total Station

As an alternative to the GPS method described above the strip survey may be carried out with a Total Station. When additional intermediate control points are required and these are established with the Total Station, they must be fixed horizontally (YX) by means of the GPS – RTK method and vertically by spirit levelling. Free fix positions may not be used with the Total Station. Distance measurements with a Total Station must not exceed 250m.

6.3.2 Pavement Condition Assessment:

The Consultant shall carry out a detailed pavement condition assessment of the road. The exercise shall be carried out in accordance with the dictates of the SATCC Code of Practice for the Rehabilitation of Road Pavements.

Data collection must be appropriate to ensure accurate economic modelling and evaluation based on HDM IV inputs. It must, furthermore, be noted that data collection should be

compatible with ANE – HNMS requirements and formats which are expected to be of lesser degree of detail than the pavement condition data sheets that the Consultant shall produce.

Even though the Consultant shall report the pavement condition in HNMS format, he shall also report the data in sufficient detail so as to clearly show the distress types, degree and extent as well as proposed repair measures for each segment length.

6.3.3 Soils and Materials Investigations and experimentation

The Consultant shall conduct detailed investigations on the in-situ material throughout the project, and at potential borrow sites, sufficient to permit dimensioning and reliable cost comparison of alternative design options. Such investigations shall include, inter-alia, the following:

- Identification of predominant soil types underlying and alongside the road to be widened or on the centre-line of the new alignment as well and testing to establish their principal material characteristics;
- Identification and limited studies of possible problem soils;
- Sampling and standard laboratory testing of possible sources of suitable construction materials, including:
  - The evaluation of existing quarries and other known sources of aggregates;
  - The investigation of possible new aggregate sources within a reasonable haul distance; and evaluation of local sands and sandy materials for possible use in the proposed pavement solutions.

The Consultant shall present tables and graphs summarising the principal findings of its soils and materials investigations in sufficient detail to support its recommended pavement design alternatives (See 7.6.1: Minimum Drawing Requirements). Location of recommended sources of aggregates and other road-building materials shall be clearly identified, with an indication of average haul distance and available quantities of usable materials.

The Consultant shall as a minimum carry out investigations in accordance with the frequency prescribed in the table of materials and geotechnical investigation in Annex B

All sampling and testing shall be performed in accordance with SATCC and ANE standards. All testing will be subject to MCA-Mozambique/ANE written approval.

6.3.4 Traffic Survey and Traffic Studies

In this phase, traffic survey data of phase I should be reviewed in order to ensure that the results obtained in the previous phase are suitable to be used for pavement rehabilitation design.

6.3.5 Drainage, hydrology and hydraulic studies

The Consultant shall undertake hydraulic evaluation of the river crossing structure already

identified by conducting hydrological estimates, a waterway hydraulic study, determination of sediment transport and scour as well as the assessment of the bridge waterway openings

6.3.6 Economic evaluation

The Consultant shall revaluate the proposed upgrade or rehabilitation options of the road section in order to have comfortable results.

6.3.7 Evaluation of bridges:

The Consultant shall undertake the following tasks:

- Detail design of bridges that need to be widened, lengthened, strengthened or reconstructed to accommodate the new road cross-section and/or to satisfy hydraulic demands,

The preparation of the specifications, the bill of quantities and typical detail drawings/sketches for the maintenance of bridges covering activities such as:

- Surface and structural repairs of concrete members,
- Repair of bearings, parapets and drainage for structures,
- Protective painting of concrete and metallic bridge members as well as ancillary bridge elements,
- Repair of expansion joints,
- Repairs, protection or replacement of ancillary bridge elements,
- Reinstatement of protection against scour and erosion,
- Diagnostic testing where non-visible defects are suspected (cover, corrosion, etc)

6.3.8 Quantities and Cost

The Consultant shall prepare Bills of Quantities (BoQs) based on the various items of work to be executed in accordance with the Drawings and the Technical Specifications. The items in the BoQ shall correspond to the work (pay) items specified in the Technical Specifications, including those related to environmental and social mitigation measures.

The Consultant shall develop a Confidential Unit Price Analysis for each work item and a Confidential Cost Estimate, for each work item, work category and contract package as a whole. Unit prices shall be classified into direct costs (labor, materials and equipment) indirect costs (mobilization, on-site and general overheads, contractor's contingencies and profit) and taxes. The Consultant's Confidential Cost Estimate shall break out separately all taxes for ease of identification.

In preparing the quantity and cost estimates, the Consultant shall take into account the MCC restriction on the use of program funds. This includes the procurement of equipment supplies, personnel or other inputs from any country that is subject to sanction or restriction by United States law or policy. As of the date hereof, this list includes Cuba, Iran, North Korea, Sudan and Syria.

6.4 Assistance During Tendering Process

The Consultant shall assist MCA-Mozambique with documentation and technical support during the

tendering process and preparation of construction contracts. This item shall include the following activities:

- Assist in the development of evaluation criteria for award of contracts;
- Support MCA-Mozambique/ANE in site inspection meetings for tenderers, including orientation, site visits and Bidders Meetings with follow-up written responses to tenderer's enquiries as addenda to the tenders;
- Support MCA-Mozambique in providing any clarification that may be required by tenderers during the period of tender preparation. Assist in the issuing of addenda for transmittal to the tenderers covering any design changes or other modifications of the Tender Documents subsequent to the call for tenders;

6.5 Development of a Resettlement Action Plan

During the design phase, the Consultant shall develop a Resettlement Action Plan (RAP) covering all aspects of the project and that is based upon the project's final Right of Way. The RAP shall be fully compliant with OP 4.12 and national legislation, including the Mozambican Lei de Terras No. 19 (1997) and its Regulation (Decree 66, 1998). Information on resettlement developed during Phase I and as presented in the Resettlement Scoping Study shall inform the Consultants work in developing the RAP. If the Consultant determines a fewer than 200 people will be subject to physical or economic displacement or if all affected people lose less than 10 percent of their productive assets, an abbreviated RAP as described in Annex A of Op 4.12 may be developed in lieu of a full Resettlement Action Plan. The decision to develop an Abbreviated Resettlement Action Plan instead of a full Resettlement Action Plan must be approved by MCA-Mozambique-Mozambique and MCC prior to the Consultant initiating development of such plan.

A fundamental requirement of resettlement activities based on OP 4.12 is to restore, at least, standards of living and preferably improve the livelihoods of those households, families, extended families and individuals who are losing land, assets or access to resources due to the implementation of a project. Compensation for lost assets can be monetary, in-kind (e.g., new land, housing and social infrastructure, work places or other replacement for lost assets) or a combination of both. Compensation to address economic rehabilitation can be in the form of restoration of conditions for pursuit of economic activities or training for new vocations where the original source of livelihood cannot be restored.

Several additional important principles of resettlement activities based on OP 4.12 relate to consultation and the form of compensation payments. Project-affected persons (PAPs) are to be: (i) informed about their options and rights pertaining to resettlement; (ii) consulted on, offered choices among, and provided with technically and economically feasible resettlement alternatives; and (iii) provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project. When land taken is the primary source of income and livelihood, PAPs should be provided with land ("land for land") for which a combination of productive potential, locational advantages, and other factors is at least equivalent to the advantages of the land taken. In some situations, moving assistance or allowances and compensation for lost income during the move and the cost of re-establishing a livelihood (for example, at a new work place or prior to planting a new crop) will be provided. When new housing or work places are more distant from each other than prior to resettlement,

transportation allowances may be required in order to avoid loss of income. The RAP will describe the entire compensation package as applicable to the various situations of PAPs and will include a grievance process that includes informal as well as formal or administrative measures to deal with disputes when they arise. The RAP will also include a detailed budget and description of the particular mechanisms for any monetary compensation.

Affected parties that have formal title or ownership rights (formal, over the land or asset subject to taking for implementation of a project are entitled to compensation (at replacement cost) for the land and any improvements upon that land. Those who are living on or using land for which they do not have a recognizable legal right or claim (for example, "squatters" on public land within an existing right of way or tenant farmers) are entitled to resettlement assistance, such as compensation for the improvements upon that land (homes, market stalls, crops, etc.), but not for the land itself. In areas where customary titles or land use rights are common, entitlements must be carefully analyzed in order to ensure fair and equitable treatment of affected parties.

6.5.1 Development of RAP

The RAP must cover all relevant aspects of the project (including, as applicable, potential borrow pit sites, dumps sites, quarries, works camps, etc) and based on the final, accepted horizontal alignment and ROW for the Project (developed during Feasibility Study Phase 1). The RAP must consist of at least the following information:

1) Description of the project and potential resettlement impacts.

2) Description of measures taken to ensure that the project is implemented to minimize displacement;

3) Results of census survey, assets inventory, and socioeconomic survey including, at a minimum:

    a) Categories of impacts, people affected, and the magnitude of expected loss;

    b) Information on vulnerable groups including women

    c) Standard characteristics of the affected people including a description of their sources of income and living standards

4) Description of the consultation strategy, summary of views expressed, how these views were taken into account, and how the proposed RAP was shared with affected people (e.g., community meetings, notice boards, and an information pamphlet for all affected households).

5) Description of the proposed monitoring and evaluation system, such as census updates, resource assessments, socioeconomic surveys, etc.

6) Description of grievance procedures.

7) Estimate of the case-by case cost of relocation and compensation. A detailed cost schedule shall be prepared that includes, at a minimum:

a) Replacement lands commensurate with lands to be displaced;

b) Detailed, case-by-case information related to the nature and amount of compensation to be offered to PAPs for the replacement of existing structures (partially or fully);

c) Detailed, case-by-case information related to the nature and amount of compensation to be offered to PAPs for lost crops, trees, and other productive assets;

d) Costs for economic rehabilitation;

e) Transitional allowances to offset loss for income resulting from relocation or temporary loss of productive assets;

f) Allowances to defray the cost of moving;

g) Administrative costs; and

h) Contingency budget (with detailed explanation of contingencies).

i) Analysis of the GOM legal framework for resettlement and compensation, as applied to the Road Project including, at a minimum:

j) Identification of all relevant laws and customs at the national, provincial, and local levels;

k) Gaps between relevant laws and OP 4.12, and measures needed to fill these gaps;

l) Description of entitlement policies and eligibility criteria for each category of impact; and

m) Description of method of valuation used to identify value of affected structures, land, trees, crops and other assets; and

n) Entitlement matrix.

8) Definition of specific tasks and implementation schedules for conducting and completing the relocation process including resettlement site selection and preparation, which reflects experience in Mozambique in conducting similar relocation activities.

9) Description of measures to replace any lost housing, community infrastructure and social services.

10) Standards for ensuring that PAPs are relocated to environmental situations similar to those at their current sites.

11) A description of organizational responsibilities for implementing resettlement including identification of responsible agencies and any necessary measures to strengthen capacity to implement the RAP.

12) Documentation of preliminary agreements with each of the PAPs with regard to the amount and nature of the compensation to be provided.

13) Technical specifications, construction cost estimation and drawings for any structures to be built as compensation during RAP implementation

14) Workplan, estimated budget, and responsibilities matrix for a timely implementation of the RAP, taking into account project timelines and proposed construction dates

The sub-task deliverable comprises a Resettlement Action Plan in Portuguese and English that is compliant with WB OP 4.12 and GOM national legislation. This RAP is subject to approval by MCA-Mozambique-Mozambique, relevant GOM authorities, and MCC.

6.5.2 Option for RAP Implementation Services

Following completion and MCA-Mozambique/ANE/MCC acceptance of the RAP, the Consultant may be requested to assist MCA-Mozambique/ANE with implementation of the RAP. This task will be the subject of a contract amendment, based on the extent of RAP requirements. At this time, the Consultant shall not include in its Financial Proposal any price for RAP implementation services. If the Consultant is requested to assist with RAP implementation, a scope of work will be provided by MCA-Mozambique/ANE for these services. The Consultant shall not address or include RAP Implementation in its Technical Proposal.

6.6 Duration of Consultancy Services

It is estimated that the consultancy services shall be for a period of 6 months counted from the day of receiving MCA-Mozambique letter of award of Phase 2 Contract, services allocating approximately 46 man-months.

6.7 Qualification and experience required

The selected Consulting firm will have significant experience in the field of detail design of rehabilitation of roads in general and in the rehabilitation of roads in developing countries in particular, preferably in the SADC area.

The team shall consist of a team leader with extensive experience in the detail design of rehabilitation or maintenance of roads, preferably in developing countries.

The remainder of the team should furthermore have extensive experience in the design of maintenance of roads involving periodic maintenance, rehabilitation and/or upgrading of

existing roads, design of drainage, pavement and materials design, rehabilitation and/or upgrading of structures, developing RAPs according to OP 4.12, and management of environmental and social impacts (including gender and HIV/AIDs)

The Consultant may propose one expert to fulfill more than one expertise requirement. Such experts will be evaluated based on the each expertise requirement.

The profiles and duties/responsibilities of the key staff, each of whom must be fluent in written and spoken English, are as indicated below.

(1) Senior Highway Engineer (Team Leader)

The Team Leader shall be responsible for the proper conduct of the entire study and shall be the principal contact person between the Design team and the Client. The Team Leader shall be a Registered or Chartered Civil Engineer preferably with a relevant postgraduate training. He/She must have not less than twelve (12) years of cumulative experience related to road/bridges studies and designs. The Team Leader must have had, in the last ten (10) years, specific experience of managing consultancy teams working on feasibility studies and detailed engineering design in at least two (2) road projects of similar size and complexity. At least one of these projects should have been in sub-Saharan Africa. He/She should be conversant with MCC procurement guidelines and procedures.

(2) Geometric Design Engineer

The Geometric Design Engineer shall be responsible for the design of the geometrical aspects of the road using the SATCC design standards, preparing designs using appropriate Geometric design software, quantifying volumes and preparing plans and profile drawings. He/She shall also assist the Pavement engineer in the design of the road pavement. The Geometric Design Engineer shall be a registered or Chartered Civil Engineer. He/She must have not less than eight (8) years of cumulative experience related to road/bridges design and construction. He/She must have specific experience of working as roads Geometric design and construction supervision engineer on at least two (2) projects of similar nature and complexity of which at least one must be from sub-Saharan Africa. Postgraduate qualifications in Highway Engineering will be an added advantage.

(3) Materials Engineer

The Materials Engineer shall be responsible for conducting and supervising the materials investigation with a view to achieving optimal design and construction strategy. The Materials Engineer shall give support the Pavement Engineer to carry out the pavement design and should be conversant with current practice in material testing and pavement construction strategies in developing countries. The Materials Engineer shall be a registered or chartered graduate Civil Engineer. He/She must have not less than ten (10) years of cumulative experience related to pavement evaluation, materials testing, soils investigation. He/She must have specific experience of working as Materials Engineer on at least four (4) projects of similar magnitude and complexity. Relevant postgraduate qualifications and experience of working in tropical countries is an added advantage.

(4) Pavement Engineer

The Pavement Engineer shall be responsible for conducting the Pavement Design for different alternatives with a view to achieving optimal design and construction strategy. The Pavement Engineer shall be a registered or chartered graduate Civil Engineer. He/She must have not less than ten (10) years of cumulative experience related to pavement evaluation and design. He/She must have specific experience of working as Pavement Engineer on at least five (5) projects of similar magnitude and complexity. Relevant postgraduate qualifications and experience of working in tropical countries is an added advantage.

(5) Topographical Surveyor

The Topographical Surveyor shall be responsible for conducting the survey, supervising the survey team and preparing field survey information in a digital format suitable for use in highway design software. He/She will be responsible for planning of the fieldwork, selecting known survey reference points, and determining the precise location of important features in the survey area. He/she shall be responsible for researching legal records, looking for evidence of previous boundaries, analyzing the data to determine the location of boundary lines, recording the results of the survey, verifying the accuracy of data, and preparing maps and reports. The Topographical Surveyor shall be a holder of a Degree or Advanced Diploma in Land Surveying. He/She must have not less than eight (8) years of cumulative experience related to Land Surveying activities. He/She must have specific experience of working as Topographical Surveyor on at least two (2) projects within the last ten years involving feasibility study and detailed engineering design. Relevant Postgraduate qualifications and experience of working in tropical countries is an added advantage.

(6) Bridge/Drainage Engineer

The Bridge/Drainage Engineer shall be responsible for the assessment of existing bridges and design of culverts and other drainage structures along the project road. The Bridge/Drainage Engineer shall be a Registered or Chartered Engineer with a degree in Civil Engineering/Structural or equivalent qualification. He/She must have not less than eight (8) years of cumulative experience related to design of bridges/drainage structures. He/She must have served as a bridge Design Engineer on at least two (2) road projects of similar magnitude and complexity within the last five (5) years. Experience in the design of bridges in tropical countries will be an added advantage.

(7) Hydraulicist/Hydrologist

The Hydrologist shall be responsible for estimating and assessing the relationship between rainfall, surface-runoff and soils and rock features of the catchments along the project area with focus on surface water, including rivers and dams. He/She shall study and update the available hydrological data by computer models or any other means in order to maintain and develop successful flood water management strategies. He/She shall provide advice and information to the Bridge/Drainage Engineer on hydraulic characteristics of the catchments along the project area. The Hydrologist shall be a holder of a degree in Applied Science or Civil Engineering with not less than eight (8) years working experience related to water/flood management schemes. He/She shall have served as a Hydrologist on at least two (2) roads projects of similar magnitude and complexity within the last ten (10) years of which at least one must be from sub-Saharan Africa. The ability to use appropriate flood design models is essential.

(8) Geotechnical Engineer

The Geotechnical Engineer shall provide specialist foundation engineering advice to the Bridge/Drainage and Highway Engineers. He/She shall hold a degree in Civil Engineering with not less than fifteen (15) years working experience related to geotechnical engineering. He/She shall have served as a geotechnical engineer on at least five (5) roads projects of similar complexity within the last ten (10) years of which at least three (3) must be from sub-Saharan Africa.

(9) Environmental Specialist

The Environmental Specialist shall be responsible for ensuring that the recommendations from the EIR and EMP are properly reflected in the final designs, specifications, and tender documents. He/shall hold a University Degree with 10 years experience in EIA and the development of mitigation measures associated with roads projects. He/she must also have work experience in Africa and be fully cognizant of the MCC approach to ESA and gender-related issues. Experience in health impact assessment would be an advantage. Must be fluent in Portuguese and English..

(10) Resettlement Specialist

The Resettlement/Specialist shall be responsible for leading the team that will develop the Resettlement Action Plan. Responsibilities will include leading a team of non-key personnel in the execution of the various tasks related to developing the RAP, including the census of affected population, valuation of affected properties and assets, identification of compensation alternatives, preliminary negotiations, design of replacement structures (as needed), etc. He/She shall pay particular attention to gender-differentiated and vulnerable group impacts, and work with the MCA-Mozambique and ANE to plan and carry out a transparent public consultation strategy.

He/she shall be a qualified professional with 10 years experience in community development addressing resettlement issues and social impact assessment, including preparation of resettlement action plans, stakeholder consultation associated with new infrastructure projects. Familiarity with resettlement according to OP 4.12 is required. He/she must also have work experience as a Social Scientist and preparing resettlement action plans on at least two (2) roads projects of similar magnitude and complexity, and experience in Sub-Saharan Africa. He/She must also be fully cognizant of the MCC approach to ESA and gender-related issues. Must be fluent in Portuguese and English

6.8 Program and Description of Deliverables for Phase 2

The following time/schedule (in months) (M) shall be adhered to in carrying out the study. As such, The Consultant shall submit in English/Portuguese not later than the dates shown in Table 6.8.1 below.

Table 6..8.1 – Deliverables Report and dates

Nr.	Deliverables Reports	Timing (months)	Quantity of Reports in English
1	Signing/Effective Date of Contract	M	N/A
2	Inception report	M+1	5 copies + 2 CDs
3	Preliminary design notes	M+2.5	4 copies
4	Progress reports (Monthly thereafter)	M + 2	5 copies
5	Draft final detail design report	M + 4.5	5 copies
6	Draft Resettlement Action Plan	M + 4.5	6 copies + 2 CDs
7	Final detail design report	M + 5.5	5 copies
8	Final Resettlement Action Plan	M + 6	6 copies + 2 CDs
9	Draft tender documents Technical information and Specifications, BoQ, Cost Estimation and Construction Drawings)	M + 5	N/A
10	Final tender documents (Technical information and Specifications, BoQ, Cost Estimation and Construction Drawings) and RAP implementation	M + 6	6 copies + 2 CDs

The submission of poor quality or incomplete reports will be considered as a "non submission)

6.8.1 Inception report

Within one month of the date of the effective date of the contract, the Consultant shall submit, to the MCA-Mozambique/ANE, an inception report summarising field investigations to be undertaken (type and frequency of testing), the preliminary analysis and design approaches to be utilized. This would include a preliminary cost estimate of the investigations to be undertaken. The Inception Report shall also describe approach, timeline, and staffing for the development of the RAP..

6.8.2 Preliminary design notes

Within 10 weeks of the date of the Notice to Proceed, the Consultant shall submit to MCA-Mozambique/ANE an overview of the findings from the field investigations and desk top studies, a summary of the design approaches to be followed, the design criteria, a detailed programme and details of any other topic that is relevant to the design phase.

6.8.3 Progress Reports

The Consultant shall submit monthly progress reports summarizing the activities executed during the month and the revised programme for the remaining activities. These reports shall also include information on findings from investigations of desk-top studies carried out as well as recommendations towards the successful completion of the assignment. These progress reports shall also include the financial information.

6.8.4 Draft final and final detail design reports

Within 18 weeks of the date of MCA-Mozambique letter of award of Phase 2 Contract, the Consultant shall submit for review of MCA-Mozambique/ANE, a Draft Detail Design Report as well as a set of draft construction drawings.

Within 2 weeks after any required modifications or additions suggested by ANE, the *final detail design reports* and final drawings shall be present for MCA-Mozambique/ANE final approval.

The *Draft final and final detail design* study report shall be presented as two A4 size volumes (executive summary and main report) accompanied by separate volumes of Appendices together with a set of A2 size drawings.

The executive summary shall be in Portuguese and in English. The output of the consultancy should be also presented in a consultative meeting in Maputo.

6.8.5 Draft RAP and Final RAP

Within 18 weeks of MCA-Mozambique letter of award of Phase 2 Contract, the Consultant shall submit for review of MCA-Mozambique/ANE and MCC the draft RAP including cost estimates for implementation. Within 6 weeks after any required modifications or additions required by MCA-Mozambique/ANE and/or MCC, the completed Final RAP shall be submitted to MCA-Mozambique/ANE/MCC for final approval

6.8.6 Draft tender and Final tender documents

Within 20 weeks of the MCA-Mozambique letter of award for the Phase 2 contract, the Consultant shall submit for review by MCA-Mozambique/ANE a complete set of draft tender documents. These shall, inter alia, include Special Specifications, Particular Conditions of Contract (including those related to environmental and social mitigation measures), Bills of Quantities, Construction Drawings, and Instructions to Bidders, Technical Information and Cost Estimates.

The Consultant shall submit a final set of tender documents to MCA-Mozambique/ANE for approval within 2 weeks of being notified of any modifications or additions required of the draft

documents by MCA-Mozambique/ANE .

6.9 **Drawings**

The construction drawings shall consist of at least the following:

- Locality map and list of design plans,
- Key Plans;
- Layout plans;
- Longitudinal sections;
- Typical cross-sections;
- Shifting of services plans;
- Road sign plans;
- Road-marking plans;
- Specific detail drawings as required;
- Typical detail drawings as required;
- Layout Plans depicting maintenance and rehabilitation activities to the pavement and ancillary works;
- Pavement Design Sheets;
- Borrow pit plans.

The layout, longitudinal alignment and shifting of services plans can be combined into one plan on condition that necessary details do not get obscured.

For each bridge structure to be reconstructed, rehabilitated or strengthened, some or all of the following drawings shall be required, depending on the intervention type:

- General arrangement drawing,
- Elevation of the bridge,
- Longitudinal Section through the bridge,
- Plan of the bridge,
- Cross Section of the Deck,
- Foundation Layout,
- Concrete drawing,
- Reinforcement Detail Drawing,
- Pre-stressing detail drawing,
- Balustrade drawings,
- Miscellaneous detail drawing,
- Steel Bending schedules,
- Standard plans.

The Consultant shall also prepare detailed design of replacement structures (e.g., houses, markets etc.) that will be built as part of the implementation of the RAP

6.9.1 Minimum drawing requirements

This section indicates the minimum requirements for the drawings listed above.

Locality map

- Suitable scale (1:250 000);

- Complete list of the design plans indicating Plan No. and title;
- North direction;
- Existing and proposed route where applicable;
- Town names;
- Major road names/numbers;
- Province;
- Railway lines;
- Rivers;
- Limits of construction.

Key plans

- Scale 1:10 000 to 1:20 000;
- Coordinate grid;
- Proposed route at realigned sections;
- All existing roads;
- Road numbers and/or street names;
- Destinations;
- Roads to be closed or deviated;
- Kilometre distances;
- Rivers and their names;
- Position of structures (Bridge number, km distance, coordinates);
- Railway lines;
- Limits of construction;
- North direction;
- Scale, title block and drawn scale with legend and units;
- Major cadastral information;
- Legends (patterns, symbols and abbreviations).

Layout plans

- Scale 1: 1 000 or 1: 2 000;
- Proposed sections for minor realignment;
- All existing roads and/or streets with their numbers and/or names;
- All existing and proposed additional drainage structures, with a clear distinction between existing and new structures;
- Services (telephone, water, sewer, fuel, gas, electricity, etc);
- Existing irrigation channels or furrows;
- Clear indication of where drainage pipe and box culverts daylight;
- Existing and proposed berms and Mitre banks;
- Lined and unlined side drains (indication of type of lining material);
- Destinations;
- Roads to be closed or deviated;
- Cadastral data (property boundaries, names and numbers);
- Existing road reserve;
- Proposed road reserve;
- Service Servitudes;
- Proposed areas to be expropriated,
- Names of rivers, streams or dams;
- Railway lines;
- Limits of construction,

- North point,
- Scale, title block and drawn scale with legend and units;
- Guard-rails;
- Proposed rest areas and bus stops;
- Culverts, drainpipes, mitre banks, catch water berms and Mitre banks, sub-soil drains and flow direction with suitable legend or symbol. Number, type and size of the culverts. Distinction must be made between existing and new culverts;
- Road signs and their reference numbers;
- Legends (Patterns, symbols and abbreviations).

The remainder of the required information is required when a new road is constructed or where there is a diversion from the existing horizontal or vertical alignment. This will include

- Radii of horizontal curves,
- Tabulated values of the radius, length, deflection angles, tangent length, transition length and maximum super-elevation,
- Tabulated values of the radius, length, deflection angles, tangent length, transition length and maximum super-elevation,
- Positions of points of intersection and co-ordinate values,
- Beginning and end of horizontal curves and the co-ordinate values,
- Extent of the cuts and fills.

Schematic layout drawings showing rehabilitation and maintenance repairs to pavements and other ancillary works

If several maintenance and rehabilitation actions are envisaged, the pavement rehabilitation and maintenance activities shall be shown in schematic layout drawings or any alternative means proposed by the consultant. Guardrail and fence lengths to be repaired, replaced or constructed shall also be included. These drawings shall include the following information:

- Suitable scales. Distortion between scales in the longitudinal and transverse directions are usually recommended for clarity reasons,
- Route distances,
- Limits of construction,
- Direction indicators (North arrow, nearest city, etc),
- Road features, i.e. interchanges, bridges, etc,
- Clear description of materials and remedial actions with appropriate references to specifications and typical cross section drawings,
- Position of execution of remedial work (lanes, shoulders, etc.),
- Ancillary works that have to be replaced, repaired or provided: guardrails, side drains, subsoil drains, signs ,etc,
- Legends (patterns, symbols and abbreviations).

Longitudinal sections

- Horizontal scale the same as the layout plans and the vertical scale 1/10 of the horizontal scale, e.g. horizontal scale 1:1 000 and vertical scale 1:100,
- Existing and proposed road levels,

- Datum level,
- Kilometre distance,
- Grades (%),
- Destinations,
- Lengths of curves and K-values or radius of curves,
- Design speed associated with K-values,
- Vertical points of intersection,
- Beginnings and ends of vertical and horizontal curves if the layout and longitudinal plans are not on the same drawing,
- Details of super-elevation,
- Reduced levels of existing road or staked line, when on a new alignment, and the reduced levels of the new road,
- Kilometre distance, type and size of culverts,
- Scale, title block and drawn scale with legend and units.

Typical cross-section

- Centre-line,
- Distance between carriages (dual carriageways),
- Median widths (dual carriageways),
- Side slopes,
- Side drains,
- Formation width,
- Lane and shoulder widths,
- Kerb widths,
- All dimensions,
- Proposed pavement showing material and compaction specifications,
- Cross-fall (%) of roadway and shoulders,
- Position of sub-soil drains,
- Position of berms and banks,
- Retaining walls,
- Terraces,
- Top of fills,
- Scale, title block and drawn scale with legend and units,
- Any other detail that will indicate the proposed action/s required.

Shifting of services plans

These plans can be combined with the layout plans if the number of services affected by the works are such that the combination of the plans will not obscure any information.

All services affected by the works must be indicated as well as the proposed action to be taken to protect the service and all the information required for the layout plans. The minimum information required shall be:

- Existing services,
- Deviation to services,
- Future services,
- Schedule of services with the following information: item number, service, position, owner, when removal must take place, who is going to do the removal, comments on what has to be done (this schedule may be on a separate sheet).

Road-sign and road-marking plans

These plans must show the position and reference number of all road signs used and indicate the road markings in sufficient detail. The minimum required is as follows:

- Solid lines, stop and yield lines shown with dimensions and position,
- Channelling marks on the cross road with dimensions and positions,
- One-way arrows with dimensions and positions,
- The position of road signs with km-distances,
- Road signs schedule giving the following information: Number of signs, quantity, letter sizes, reflectorization, background colour, sketch of the signs. It must be stated that all road signs must be manufactured according to the latest edition of the Roads Signs Manual being used by the ANE,
- Gantry and cantilever sign structures which support the signs over the roadway must be numbered,
- In case that the project involves the maintenance of repair of existing signs, a schedule indicating type of sign, area and repair action needed will be included

Specific detail drawings

Drawings required for specific details, e.g. protection of services or culvert details, must be prepared as and when required.

Typical drainage details

Typical detail drawings for drainage elements are required for elements of the works that are repetitive and for which standard items can be used.

- A suitable scale to be chosen and indicated on the drawings,
- Distortion of vertical to horizontal scale to be indicated,
- Plan of culvert inlet/outlet structures,
- Longitudinal section of inlet/outlet structures,
- Elevation of inlet/outlet structures,
- Position of weep-holes,
- Protection against erosion: reno-mattresses, gabions, rip-rap, etc,
- Pipe installation method and bedding class. Indicate maximum and minimum cover,
- Reinforcement details for inlet and outlet structures (plan and elevation),
- Schedule of culverts (it may be in separate drawings) with the following information: item no., type, position, quantity, size of each, length, outlet type, flood in relation to return period, capacity and flow speed through the structure,
- Asphalt berms,
- Drain detail with filter material specifications,
- Filter blanket with specifications,
- Retaining walls,
- Details of down chutes (long section, plant and elevation),
- Subsoil drain outlets,
- Mitre banks and berms: plant, elevation and long section,
- Legends (patterns, symbols and abbreviations) to be included,
- Reference to specifications and other drawings.

Typical detail drawings for guardrails

- A suitable scale to be chosen and indicated on the drawings,
- Distortion of vertical to horizontal scale to be indicated,
- Placing at culverts, bridges, road signs, columns, etc
- Details of beginning and end of guardrail ,
- Reference to other drawings, specifically to cross sections showing guardrails,
- Reference to specifications,

- Legends (patterns, symbols and abbreviations) to be included.

Typical detail drawings for fences

- Type of fence,
- Posts,
- Dimension details at agricultural culverts and drainage culverts.

Other typical detail drawings

Other typical drawings that may be required should also form part of the drawings. An example of this may be typical details for kerbing, bus lay bays, traffic calming measures, etc. These drawings shall contain all the necessary information for the contractor to accomplish all the required construction activities.

Pavement design plans

Where the existing road is to be upgraded: widened or re-aligned, the following information shall be required:

- Route with distances;
- Scale (where applicable);
- Limits of construction;
- Road features, such as bridges, intersections, etc;
- Legends (patterns and symbols);
- Layer position;
- Layer thickness;
- Layer compaction, including road bed preparation and fill;
- Material type and specification with appropriate reference to specifications where applicable;
- Ground level and final ground level, (cut and fill);
- Test pit positions;
- Soil profiles at test pit positions with clear description of materials encountered and test results (Road indicators: Atterberg limits and sieve analysis as well as strength: CBR);
- Special treatment on problem soils: rock fill, pioneer layers, stabilization, pre-wetting, excavation, etc).

Borrow pit plans

The borrow pits plans shall indicate at least the following:

- Route with distances,
- Location of the borrow pit in relation to the road centre-line,
- Position of the trial pits,
- Extend of the borrow pit,
- Suitability of the material, i.e. for which layer will the material be suitable. This will include the type and content of stabilizing agent to be used,
- The estimated quantity of material available for each pavement layer,
- The quality of the material in terms of the normal criteria, e.g. CBR, Atterberg limits, etc,
- Reinstatement and restoration of borrow pits must be outlined and detailed in line with the ANE Environmental requirements and mitigation measures.

This information shall also be provided for all quarries to be used to provide crushed stone for pavement layers and stone for concrete works.

The minimum information contained in some of the drawings for bridges include:

General Arrangement Drawing

This drawing shall include:

- General design notes: description of bridge, design method, type of deck, etc,
- Design loadings:

  - Live load and dead load,
  - Earth pressure and internal angle of friction of the backfill material,
  - In situ density,
  - Balustrade design information,
  - Concrete cover,
  - Chamfering of visible corners,
  - Calculated deflections,
  - Proposed positions of future deck lifting pads to replace bridge bearings;

- Hydraulic information

  - Effective catchment area in km^2,
  - Design flood recurrence interval in years
  - Design flood in cumec
  - Regional Maximum Flood (RMF) in cumec
  - Average slope of stream at the structure in m/m over distance exceeding 200 – 300 m upstream and downstream,
  - Natural Design Flood level (i.e. without the bridge) in metres,
  - Highest Flood Level known in metres with the date of occurrence,
  - Natural Design Flood Depth,
  - Natural Design Flow Velocity in metres/sec,
  - Backwater caused by the bridge in metres,
  - Design High Flood Level in metres with bridge,
  - Design Flow Velocity through bridge in metres/sec,
  - Required minimum freeboard in metres,
  - Design freeboard in metres,
  - Freeboard to the shoulder breakpoint in metres,
  - State if: the freeboard at bridge is dictated by the road geometry,
  - State: influence of any dams up/downstream on the design high flood level.

Longitudinal Section of the bridge

- Adequate scale (1:100 or 1:200 vertical). Distortion vertical to horizontal: 1:10,
- Design speed for the road,
- Centre line of the bridge and Peg km distances,
- The structure in position with outlines of sub/superstructure,
- 300 m on both sides of the bridge,
- Road numbers or names,
- Road destinations,
- Road final levels,
- Grades,
- Beginning and end of vertical curves,
- Lengths and rates of superelevation,
- Vertical clearances,
- Beginning and end of horizontal curves,
- Original ground line levels,
- Position of structures including road drainage pipes and services,
- Founding material conditions, rock and natural ground lines.

Cross section through the bridge deck

- Adequate scale (1:50),
- Leading dimensions with minimum details,
- Lane configuration and sidewalk width,
- Balustrade dimensioned,
- Super-elevation and camber or cross fall,
- Service ducts,
- Beam/void spacing,
- Thickness of deck,

Plan of the structure

- Scale 1:100 or 1:200,
- The North direction,
- Road destinations and direction of traffic flow,
- Position of boundary fences and road reserves,
- Position of permanent bench marks,
- Chainage must increase from left to right,
- Road formation width, lane, median and footway configuration,
- Kilometre distance along the road with peg levels,
- Length of tapers,
- Angle of intersection, road curvature,
- Position of foundations, coordinates of left and right headwalls on structure centre line,
- Wingwall layout,
- Test holes positions and numbers,
- Guardrails,
- Wheepholes and drainage,
- Blinding layer,
- Rock line and estimated founding level,
- Borehole position with summary of material profile under the floor slab,
- Limits of fill foundation,
- Lane configuration,
- Embankment, slopes and protection,

Foundation Layout Plan

- Adequate scale,
- Road numbers,
- North direction,
- Road destinations,
- Stake line and peg km distances,
- The relevant position of the setting out line in relation to the bridge centre line,
- Offset between centreline of bases and stake line,
- Adequate dimensions and setting out triangles for the setting out of footings,
- A list of coordinates for the foundation layout,
- Bridge and road centre line coordinates,
- Extent of any foundation fill and type, e.g. rockfill),
- Test hole and borehole positions and numbers,
- Position of piles/caissons with identification numbers,
- Rakes on piles,
- Location of any tension piles,
- Schedule of design load combinations, method of analysis and parameters used in the design of the piles/caissons.

Foundation Test Hole Data

In cases where foundations conditions are complicated, a separate sheet shall be necessary including:

- Vertical scales of 1:25, 1:50 or 1:100,
- Same scale for logs on a particular structure
- Number of each borehole or trialhole,
- Ground levels at each test hole position,
- Log of each trial/borehole showing each horizon of different material type,
- Comprehensive description of each type of material occurring within horizons,
- Nature of material and bearing capacity at each possible founding depth,
- Recommended founding level,
- Allowable net bearing pressure,
- Position of the water table after 24 hours and available data on inflow,
- SPT test results (indicate position, type and number of blows),
- Position where samples for testing have been taken,
- Extent of foundation fill, level of founding, and permissible bearing value,
- References with regard to the soil and rock hardness classification,
- Anticipated depth of scour,
- Any other information pertinent to the foundation conditions on site,
- Legend or nomenclature of symbols used.

Concrete and Reinforcement Details on Piers and Abutments

- Scale 1:50,
- Elevation,
- Plan,
- Section of the piers showing all concrete dimensions, as well as reduced levels,
- Estimated length of piles and caissons,
- Expansion joints,
- The concrete class,
- Type of finish,
- Position of bearings or bearing pads,
- Detail of drainage pipes,
- Cross references to other relevant plans,
- Reinforcement details: all reinforcement steel to be detailed with item number, quantity, type, diameter, spacing, position and description where relevant,
- High tensile mats to be detailed,
- Reinforcement and lap lengths,
- Cover to reinforcement,
- Drainage pipes and strips,
- Wheepoles,
- No fines concrete.

Concrete and Reinforcement Details of the Deck

- Scale 1:50 or 1:100,
- All dimensions,
- Final reduced concrete levels,
- North point,
- A cross sections with balustrade showing all dimensions,
- A longitudinal section with dimensions,
- Deck drainage,
- Detail of construction joints,
- Detail of expansion joints and movement gap at certain degrees Celsius,
- The concrete class,

- Type of finish,
- Stages for casting the deck,
- A diagramatic sketch of the pre-camber,
- Cross section reference to other relevant plans,
- Note required: deck drainage pipes to be open after construction,
- Reinforcement detail: all reinforcing steel must be detailed with item number, quantity, type, diameter, spacing, position and description where relevant,
- Reinforcement & Lap lengths,
- High tensile mats to be detailed with type & reference number,
- Cover to reinforcement.

Prestressing Detail Drawing

- Cable profiles in the longitudinal and transverse direction of the deck,
- An elevation, plan and section of the precast beams showing the cable layout,
- A cross section of the deck or beam showing the cable layout,
- Information of the design prestress system as follows:

  - The type of prestressing system used in the design,
  - The diameter and type of cables used
  - The UTS,
  - The friction factor, u,
  - The wobble factor, k,
  - The prestressing force before losses,
  - Total losses,
  - Minimum cube strength before cables are stressed,
  - The method of stressing the cables,
  - Stressing sequence of the cables,
  - The amount of slip of the cables,
  - Note: The contractor shall be responsible for the saddles to support the cables,
  - The consultant shall design the bursting reinforcement and submit approved,
  - Note: The contractor shall supply vent pipes at every crest and sag in the cable

Balustrade Detail Drawing

An elevation, section and general layout of the balustrade showing:

- Reinforcement detail as above,
- Service ducts,
- Lamp posts with fixing details,
- Balustrade fixing details,
- Joint detail.

Steel Bending Schedules

- The structural member where the bar is fixed,
- The item number, type, diameter, quantity and length of each bar,
- The bending of each bar or the shape code,
- The total length and mass for each diameter bar,
- The total mass of each type of steel,
- High Tensile Mat Schedule showing: member, type, reference number, mass, size, area and total mass,

7 SCOPE OF SERVICES : PHASE 3 (Second Option Period) Supervision of Works

7.1 General

Towards the end of Phase 2, MCA-Mozambique may extend the term of the contract to include Phase 3, as a second option period. During Phase 3 the Consultant shall supervise the work such that high quality construction is achieved and that all work is carried out in full compliance with the engineering design, technical specifications, environmental and social requirements and other contract documents**.**

The scope of services includes, but is not restricted to, the following:

- Set up supervision procedures including a Quality Assurance Plan (QAP)
- Supervise the rehabilitation/upgrade works
- Manage the construction works contracts and ensure quality of works and goods through a Quality Assurance Plan
- Control the fulfilment of civil works in strict compliance with project documents and specifications. Perform or oversee all laboratory and field testing of Contractor's work, materials and products required in accordance to Annex C to ensure that the quality as specified in the Contract is attained. Review all certificates of inspections, tests and approvals.
- Upon completion of construction, the Consultant shall conduct a roughness survey for all road sections of the MCA-Mozambique road program (Chimuara-Nicoadala, Rio Ligonha-Nampula and Namialo- Metoro). The Consultant shall measure the roughness of the road sections after rehabilitation and report the roughness measurement data in International Roughness Index (IRI) units. The longitudinal profile must be measured in accordance with the Class 1 precision and has specifications defined in ASTM E-950.

All supervisory services shall be carried out in accordance with generally accepted international standards of professional practice, following recognized engineering and management principles and practices and applying the ANE design standards and standard specifications. The Consultant's scope of work is understood to cover all activities necessary to accomplish the stated objectives of these services, while adhering to the aforementioned principles and practices, whether or not a specific activity is cited in this TOR.

7.2 Principal duties and responsibilities

The Consultant shall perform the following tasks during Phase 3:

(1) The Consultant, in consultation with the Contractors representative, shall prepare a Quality Assurance Plan incorporating:

- A combined organization chart covering the Supervision Consultants, Contractor´s Team and MCA-Mozambique/ANE Project Assistants. Each member's key responsibilities must be clearly defined

- A flow diagram must be drawn up outlining the control procedures to be implemented. This must be based on the Quality Assurance and control criteria defined in the SATCC (1998) specifications. This will encompass the following:

  The Scope of testing that will incorporate the required tests that must be catered for. This will be based on the scope of work and the approval criteria defined in the specifications;

  The program for setting up and commissioning of the Contractors laboratory;

  The location and layout of the laboratory facilities.

  - Outline of the proposed mitigation actions related to the environmental impact of the proposed works. This will be formulated in terms of, National Environmental Legislation, MCC Environmental Guidelines and include, the ANE standard Environmental Guidelines.

  - Location and summary of the type of road building materials encountered within the project area.

- A complete set of the relevant specifications prepared and available on site. This will include a test checklist for each item of construction. It will be based on the guidelines within the Specifications and in consultation with the Contractor

- The Resident Engineer will be responsible for preparing the laboratory summary reports and must submit the procedures he intends implementing. The Supervision team will be responsible for keeping records of all laboratory reports and records Contractors plus control tests). This will form a part of the Supervision Quality Assurance but the Contractor will remain responsible for the ongoing site Quality Control.

- The Resident engineer and Site Agent must exchange letters outlining their respective authority and team structure

- A program for the provision and commissioning of testing facilities to the approval of the Consultant, Contractor and the MCA-Mozambique/ANE Project Coordinator head office laboratory staff must be prepared.

The Resident engineer shall ensure that a copy of the Standard ANE Handing over procedures is included within the QAP.

(2) To assist MCA-Mozambique/ANE to conduct a site visit and pre-bid meeting and the preparation of the minutes of the site visit and pre-bid meeting as well as the preparation of any amendment to the tender, if required;

(3) To answer questions raised by the bidders during the tendering process for construction works and assist MCA-Mozambique/ANE in the proposals evaluation.

(4) To supervise the rehabilitation works which shall include the following tasks:

- To perform detailed inspection and testing of the works to ensure compliance with technical specifications and contract requirement;

- To advise MCA-Mozambique/ANE of any matter requiring special attention that may result in risks for the successful completion of the project.

- To monitor construction methodologies implemented by the Contractor and to assist the Contractor in resolving production or quality shortcomings, without contractually binding the Employer to matters of the sole responsibility of the Contractor;

- To identify potential problem areas in terms of quality and cost matters as well as Contractor's potential claims and to inform and advise the Employer in writing soon enough for the Employer to minimize the negative effects.

- To prepare variation orders, if required, for approval of ANE/MCA-Mozambique.

- To certify satisfactory completion of the works, after any necessary corrective work has been performed;

- To supervise any required repairs of the works by the Contractor during the defects liability period;

- To review and recommend action on any claims presented by the contractor;

- To recommend final acceptance of the works to MCA-Mozambique/ANE, upon satisfactory completion of the specified maintenance period; and

- To prepare a final report as well as record drawings (as-built drawings) at the end of the defects liability period;

- To implement the standard MCC contract guidelines.

- To perform such other tasks as may reasonably be required by ANE Project Coordinator in order to adequately achieve the objectives of these consulting services.

(5) To oversee the Contractor's environmental and social impact management activities during construction and verify Project compliance with EMPs, Resettlement Action Plans (RAPs), and other applicable environmental requirements of the GoM and MCC. This shall include, at a minimum, the following activities:

- Provide ANE/MCA-Mozambique with regular reports that update the status of the Contractor's environmental and social impact management activities and verify Project compliance with EMPs, Resettlement Action Plans (RAPs), and other applicable environmental requirements of MCC and the GoM. The proposed frequency, format, and content of these reports shall be described in the methodology of the Technical Proposal and reconfirmed by the selected Contractor in the Inception Report for this Phase.

- Monitor and ensure that the Works Contractor prepares and submits an EMP implementation plan (also referred to as a Contractor EMP) for Consultant/ANE/MCA-Mozambique approval, and—following the approval—that the construction contract activities are in strict compliance with EMPs, in accordance with the corresponding EMP implementation plans. The Consultant shall propose measures to resolve all environmental/social issues to ensure proper project schedule implementation, thereby averting work delays and related contractor's claims.

- Ensure that all necessary environmental permits have been obtained prior to commencement of Project activities at a given location. These include, but are not limited to, the permits required for work camps, waste disposal sites, borrow pits, and blasting activities.

- Ensure that prior to commencing construction works for any given section, that the RAP has been implemented and the Right of Way is clear for the Contractor to proceed with construction.

- Coordinate with ANE/MCA-Mozambique specialists and any other consultant hired by MCA-Mozambique regarding all technical issues associated with ROW acquisition and RAP implementation.

- Assess the adequacy of all inputs such as materials and labor provided by the Contractor and his methods of work in relation to the required quality, Environmental Impact Report (EIR) and EMP specifications and management plan, rate of progress and, when required, take appropriate action to expedite progress; maintain a site diary, daily log sheets and other records in accordance with generally accepted practices; keep and regularly update a list of the Contractor's equipment (and its condition) to ensure compliance with the list of equipment and operation procedures to meet environmental specifications (protecting vegetation and natural fauna, controlling erosion, drainage blockage, noise, air quality, soil and water contamination, disposal of toxic and non-toxic materials, highway safety of motorized and non-motorized traffic, etc.) The environmental inspectors will also evaluate the success of re-vegetation and soil stabilization measures taken along the road reserve, and borrow pits and dumpsites as pertinent. This shall include the results of visual inspection and documentation of the vegetation used, and the systems applied to stabilize slopes, as well as the natural recovery of native flora in areas disturbed by the works. The inspectors will alert the Team Leader and the MCA/ANE on deviations from accepted plans and shall supervise the implementation of recommended rectifying actions.

- Inspect and evaluate all Contractor installations and operations of offices, housing, camps, quarries, and deposit sites, shops, warehouses and other accommodations to ensure compliance with the terms and conditions of the Contract Documents. Monitor permanently the conduct of workers towards neighboring communities and the quality of the environmental work carried out by the Contractor in line with the specifications provided by the EMP, including monitoring and supervision schedules and objectives. Also investigate and solve issues raised by communities related to abuses, violations and conflicts caused by the behavior of workers and other construction activity (e.g. traffic, accidents with victims, hunting, dust property damage, conflicts with communities, etc.) The environmental inspectors shall inform

the communities along the highway where and how they may be contacted. Specifically, the Consultant shall take responsibility in the supervision and control of all measures referring to the traffic security during construction, including required signs and traffic regulation.

- Review and approve the safety plan as proposed and submitted by the Contractor and inform the MCA/ANE and the Contractor as to its adequacy and acceptability. The safety plan shall include, inter alia, all temporary staging and formwork, and all relevant calculations/details submitted by the Contractor.

- Compile systematic records of the environmental inspector's findings and what actions have been implemented by the Contractor to comply with the EMP specifications and requirements.

- Review measures taken to ensure the safety of road users and construction workers. Also review environmental protection measures to ensure that every reasonable action has been taken to protect life, environment and property, and monitor that traffic circulation is maintained properly by the Contractor, according to the approved traffic management plan, at all times. Report problems encountered or anticipated relating to unforeseen direct environmental impact of construction activities at borrow sites, concrete or asphalt plants, highway sections and construction camps and immediately advise the Contractor on measures that should be taken to mitigate impacts. Support or participate in public outreach and consultation programs, as requested by MCA.

- Monitor and evaluate the Contractor’s efforts to implement relevant HIV/AIDS awareness and prevention activities.

- Support or participate in public outreach and consultation programs, as requested by MCA-Mozambique.

- Support or participate in third party environmental audits, as requested by MCA-Mozambique.

(6). The Consultant shall perform any and all other items of works not specifically mentioned above, but which are essential to successfully supervise and control the construction activities in accordance with the plans, specifications and terms of contract. The Consultant's responsibility for the site supervision of the works shall continue until the contractor has completed all outstanding works to the satisfaction of the MCA/ANE.

7.3 Duration of the Consultancy Services

The consultancy services shall be for a period of 38 months counted from the day of receiving the MCAMCA-Mozambique letter to proceed with Phase 3 and covering, 2 months civil works tender period, a 24 - months civil works period and 12 months defects liability. The services are estimated at allocating approximately 167.5 man-months.

7.4 Qualification and experience required

The selected consultant will have significant experience in the field of supervision of the construction/rehabilitation of roads in developing countries, particularly in the SADC areas.

Please note that one individual may gather one or more of the required expertise types. An individual with one or more expertise type will be evaluated in terms of each expertise requirement.

7.4.1 Duties and Qualifications of the Consultants Staff

- The Project Leader should be a qualified and competent chartered civil engineer with a degree in civil engineering or equivalent qualification and with not less than 15 years experience on road design and construction and 10 year experience as Project Leader on multi-discipline civil engineering projects and 5 year-experience as a Project Leader on multi-discipline road and bridge construction or rehabilitation projects of similar nature, preferably in sub-tropical Countries. He should also have a general knowledge in the various road and bridge construction or rehabilitation disciplines and specific knowledge in the administration of civil works contracts.

  He should have proven ability to manage and administer a project of this nature. He shall be the nexus between the site and the design office, should design alterations are required. This position will have the responsibility of the Engineer in terms of the civil works contract. Fluency in both written and spoken English and ability to communicate ideas freely and easily is essential.

- The Resident Engineer should be a qualified and competent chartered civil engineer with a degree in civil engineering or equivalent qualification and with not less than 15 years experience on road design and construction and 10 year experience as site engineer on road-building construction. Of this not less than 5 years should have been at Resident Engineer or Deputy Resident Engineer level on road construction project of similar nature, preferably in sub-tropical Countries. He should also have a specialized knowledge and experience in pavement construction, control and management of field pavement material testing laboratory.

  The Resident Engineers should have proven ability to manage and administer a project of this nature. The Resident Engineers will be required to train the MCA-Mozambique project-dedicated assistant assigned to the site. Fluency in English and Portuguese is required.

- The Deputy Resident Engineer (Soils/Materials Engineer) should have a degree in civil engineering or equivalent with specialization in road construction materials, geotechnical surveys and testing. He should have a minimum of 10 years experience in the field of materials and soil mechanics in connection with road construction, particularly in sub-tropical countries. He should have at least 3 years experience in charge of field laboratory responsible for routine testing of all road construction materials, quality and performance tests. He should be able to initiate all necessary tests for materials and exercise quality control of the workmanship in accordance with the Contract Technical Specifications. He

should be able to work independently as regards all field testing. Experience in soil stabilization and design and construction of asphalt layers is required, given the expected scope of the civil works. Fluency in both written and spoken English is essential. Knowledge of Portuguese language is desirable but not essential.

- The Deputy Resident Engineer (Structural Engineer) should have a degree in civil engineering or equivalent with specialization in structural design in general and bridge design in particular. He should have a minimum of 10 year- experience in civil engineering, 8-year experience in the design and supervision of bridge construction and rehabilitation and 5-year experience as Deputy resident engineer on similar assignments. The candidate should be able to work independently as regards the structural evaluation (visually and testing) of structures and the detail design of repair or rehabilitation measures. The Deputy resident Engineer (Structures), however, is not allowed to modify designs on side but he can certainly put forward proposals to the design team. Fluency in both written and spoken English is essential. Knowledge of Portuguese language is desirable but not essential.

- Senior Inspector of Works (IOWs). This post requires not less than 10-year practical experience in civil engineering projects, 8-year experience in supervision of civil works and 5-year experience as an Inspector of Works on similar road rehabilitation projects. (IOWs) must have experience in testing of materials used in road construction and road construction methodologies, especially on cement stabilized and asphalt layers. He should have gained experience at supervisory level in similar road works. He will assist the Resident Engineer and advise him on all aspects of road construction works including quality control and monitoring routine construction work. He should be fluent with written and spoken English.

- Two (2) Inspector of Works. This post requires not less than 10-year practical experience in the supervision of civil engineering projects and 5-year experience as Inspector of Works on road construction or road rehabilitation projects. One of the three Inspectors shall have primary responsibility for overseeing the Contractor's environmental, safety, and social impact management activities, and thus should have a background in environmental and social issues. All inspectors should be fluent with written and spoken English..

- Topographic Surveyor. This post requires a 10-year experience in topographic surveying, with not less than 6-year experience in topographic surveying on road construction or rehabilitation projects.

- Resettlement/Sociologist

  The Resettlement/Sociologist shall be responsible to oversee the Contractor's implementation of Resettlement Action Plans (RAPs), during construction and any applicable environmental requirements of the GoM and MCC. He/she shall hold a University Degree with 10 years experience in community development addressing resettlement issues and social impact assessment, including preparation of resettlement action plans, and stakeholder consultation associated with new infrastructure projects. He/she must also have work experience in Africa and be fully cognizant of the MCA-Mozambique approach to ESA and gender-related issues, including the application of OP 4.12.. Must be fluent in Portuguese and English

Support Staff:

Specialists in different fields, preferably those involved during the detail design phase, as well as a contract administration specialist will be part of the supervisory team and will be on duty as and when required.

Besides the input on detail design and environmental and socio-economic aspects, pavement, materials, geometric, drainage, environmental specialist, socio-economic specialist, etc., the input of a Contract Administration Specialist will be required.

The requirements for the Contract Administration Specialist are the following:

- Contract Specialist: The candidate should hold a civil engineering degree and preferably another degree in contract law or Civil works contract administration). He should have a 10-year experience in contract administration of civil works and at least 8-year experience in contract administration of road construction or rehabilitation projects. The candidate should be fully conversant with FIDIC conditions of contract, including the 2005 version of the harmonized FIDIC conditions. He/She should also be conversant with the World Bank conditions of particular applications for large work contracts.

7.5 Program and Schedule of Deliverables for Phase 3

The following time/schedule (in months/days) (M/D) shall be adhered to in carrying out the study. As such, The Consultant shall submit in English/Portuguese not later than the dates shown in the Table 7.5.1 below.

Table 7.5.1 – Deliverables Reports

Nr.	Report requirements and deliverables	Timing (months/days)	Quantity of Reports in English
1	After receive the MCA-Mozambique letter to proceed with phase 3	**M**	N/A
2	Inception report	M + 1	6
3	Detailed minutes of the pre-bid meeting;	5 days after site visit	6
4	Brief report on the site visit	5 days after site visit	6
5	Monthly progress reports;	By 10th of the following month	6
6	Quarterly report	By 10th of the first month of the following quarter	6
7	Completion report of final civil works contract	1 month after completion of works	6
8	Completion of International Roughness Index report	2.5 months after completion of works	5 in English + 1CD
9	Final report at the end of the defects liability period.	1.5 months after Defects Liability Period	6

7.5.1 Within 4 weeks of the date of the Notice to Proceed, the Consultant shall submit to the MCA-Mozambique/ANE an inception report summarising preparation for the works and any possible changes to the design and the works program. The Inception Report is also to include a Draft Quality Assurance Plan (QAP)

7.5.2 Within 5 days after the site visit and pre-bid meeting, the consultant shall submit to MCA-Mozambique/ANE the minutes of the site visit and pre-bid meeting as well as any addenda to the tender that may be required.

7.5.3 Within one (1) month after completion of the works the Consultant shall submit to MCA-Mozambique/ANE a final report of Civil Works Contract.

7.5.4 During the construction period, the consultant must prepare a progress report (6 copies) on a monthly basis and by not later than the 10th day of the following month, according to the standard format used by ANE. These reports shall include progress data (planned versus achieved), quality related matters, remedial works, mix designs, payment of certificates, financial status, Contractor's claims, etc. These should furthermore clearly address Contractor progress with implementing environmental, safety, and social mitigation and management issues and make

recommendations for any corrective actions.

7.5.5 In addition to the monthly detailed progress reports, the Consultant shall submit to MCA-Mozambique/ANE an electronic copy of a summarized progress reports of a maximum of 6 pages (Times Roman 12 Font, A4 page). The report shall be submitted to a list of personnel designated by ANE. ANE will furnish the Consultant with the required format of the summarized progress report.

7.5.6 For the materials utilization and control measures all variations to the approved and tender design must be clearly defined with relevant amended and MCA-Mozambique/ANE approved design changes being clearly outlined. Ongoing reporting must include test summaries and clear definition of non-conformances to the specifications. Again this must be accompanied by results of investigations into failures, solutions adopted, and appropriate prior approval of MCA-Mozambique/ANE.

7.5.7 Prepare an annual work plan, detailed financial plan, indicator performance plan, audit plan and procurement plan, each relating to Chimuara-Nicoadala road Project. In addition the Consultant shall prepare **monthly, quarterly and annual progress reports relating to the implementation of the Defined Project. The number of copies to be submitted to** MCA-Mozambique/ANE **should be six (6).**

7.5.8 At the end of the construction period the consultant shall prepare a completion report as well as record drawings and submit MCA-Mozambique/ANE (6) copies. .

7.5.9 The Project Completion Report shall comprise, but not necessarily be limited to, the following:

- The rationale for undertaking the project
- A description of the project and its location
- Details of the parties involved in the project
- Details of the Funding Agencies
- Comments on the general progress of the works
- Comments on problems encountered in the implementation of the project
- Details of solutions to problems encountered
- Comments on the project design
- Details of all design changes with the rationale therefore
- Description and detailing of the accomplishment of the EMP
- Description and detailing of HIV/AIDS mitigation measures and awareness campaigns, recommendations for further improvements
- Accomplishment of the RAP and description of the real situation of the settlers, claims, solutions, etc.
- Maintenance requirements and additional work required
- Financial Statement

7.5.10 The As-Built drawings shall comprise, but not necessarily be limited to, the following:

- All drawings, sketches, schedules, notes etc., used to describe the works undertaken, duly amended to reflect the actual positions, dimensions, numbers, materials etc. utilized and constructed.

- All Contractors drawings (if applicable) in accordance with the Construction Contract.

7.5.11 One set of As-Built drawings shall be provided in the same size and material as required for the original drawings. In addition 1 copy of the drawings shall be supplied with each copy of the Project Completion Report.

7.5.12 On completion of the Defects Liability Period(s) the Consultant shall submit a final consolidated version of the Project Completion Report(s), in 10 copies, containing all information in its finalized form. This report shall include, but not necessarily be limited to, the following:

- All finalized Project Completion Report details
- Details of the Consultants Staff
- Details of the Consultants Supervision Contract
- Problems encountered by the Consultant in Supervising the Contract
- Comments on the Contract
- Financial details of the Consultants Contract

7.5.13 All drawings, documents and reports produced by the Consultant and paid for under this study shall become the property of the GOM upon completion of the Consultant's services. The language of drawings and documents shall be English, and reports shall be in English.

7.6 Consultant's Obligations

7.6.1 Transportation Requirements

For the duration of the works period, site transport will be provided under the works contract, by the Contractor to the Consultant staff including maintenance.

7.6.2 Staff Housing

Under the terms and conditions of the civil works contract, from the date of commencement of the civil works to the end of the construction period, the Consultant shall be provided in Mozambique with his own site offices and laboratory facilities, site accommodation, site transport and other site facilities, office equipment, utilities and consumables necessary for the complete execution of the services.

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7.6.3 Offices for engineer's personnel

Provision is made in the Works Contracts for an office on site.

7.7 Logistical Support

7.7.1 Liaison Officer

All requests for information, guidance and assistance should be addressed to ANE. All reasonable assistance will be provided, including liaison with other Government departments and access to any relevant data that is not classified as restricted. Other personnel provided will be as agreed during negotiations.

7.7.2 ANE shall provide the Consultant, without charge, the following:

Assistance in obtaining any required customs clearances, visas and any other official permits, as

may reasonably be required.

Annex A

MATERIALS AND GEOTECHNICAL INVESTIGATION : TESTING REQUIREMENTS : FEASIBILITY				
Item	**Description**	**Unit**	**Qty**	**Comment**
1	**CENTRE LINE INVESTIGATION**			
1.2	**Sampling & Laboratory Testing : 1 Test Pit / 5km**			Alternate left & right
1.2.1	Fixing of test position by GPS	No.	1/Test Pit	
1.2.2	Logging / Photographing 0.8 x 0.8 x 1.0m test pit	No.	1/Test Pit	
1.2.3	In-situ density	No.	2/Test Pit	
1.2.4	Natural moisture content	No.	2/Test Pit	
1.2.5	Indicators (sieve analysis & Atterberg Limits)	No.	2/Test Pit	
1.2.6	Maximum Dry Density (MDD)	No.	2/Test Pit	
1.2.7	CBR (3 point) including swell	No.	2/Test Pit	
1.2.8	Free Swell	No.		If indicated
1.2.9	DCP	No.	1/Test Pit	
1.2.10	Undisturbed sample for triaxial/odeometer	No.	5	Only where slope or dimensional
				instability (swell/collapse) in evidence
2	**SHOULDER INVESTIGATION**			
2.1	**Sampling & Laboratory Testing : 1 Test Pit / 5km**			Alternate left & right
2.1.1	Fixing of test position by GPS	No.	1/Test Pit	
2.1.2	Logging / Photographing 0.8 x 0.8 x 1.0m test pit	No.	1/Test Pit	
2.1.3	In-situ density	No.	2/Test Pit	
2.1.4	Natural moisture content	No.	2/Test Pit	
2.1.5	Indicators (sieve analysis & Atterberg Limits)	No.	2/Test Pit	
2.1.6	Maximum Dry Density (MDD)	No.	2/Test Pit	
2.1.7	CBR (3 point) including swell	No.	2/Test Pit	
2.1.8	Free Swell	No.		If indicated
2.1.9	DCP	No.	1/Test Pit	
3	**POTENTIAL SOURCES OF MATERIAL**			
3.1	**Materials for embankment, selected subgrade,**			
	and stabilized base and subase			
	Sampling & Laboratory Testing : 1 Source / 10km			
3.1.1	Identify, describe and estimate quantity			
	in available source	No.	1/Source	
3.1.3	Fixing of test position by GPS	No.	1/Source	Centroid of source
3.1.4	Logging / Photographing 0.8 x 0.8 x 1.0m test pit	No.	1/Source	1 test pit per source
3.1.5	Indicators (sieve analysis & Atterberg Limits)	No.	2/Test Pit	
3.1.7	CBR (3 point) including swell	No.	2/Test Pit	
3.1.8	MDD Stabilized	No.	2/Test Pit	
3.1.9	UCS	No.	1/Test Pit	May need to increase to 2
3.1.10	ITS	No.	1/Test Pit	depending on stratification
3.1.11	Wet/Dry Durability	No.	1/Source	
3.2	**Hard rock materials for use in concrete,**			
	base course and surface dressing : 3 Sources			
	Sampling & Laboratory Testing			
3.2.1	Identify, describe and estimate quantity			
	in available sources	No.	1/Source	
3.2.2	10% FACT	No.	1/Source	
3.2.3	Aggregate Crushing Value (ACV)	No.	1/Source	
3.2.4	Sodium sulphate soundness	No.	1/Source	
3.2.5	Specific Gravity	No.	1/Source	
3.2.6	Water absorption	No.	1/Source	
3.2.7	Bitumen absortion	No.	1/Source	
3.3	**Sand for concrete : 3 sources**			
	Sampling & Laboratory Testing			
3.3.1	Identify, describe and estimate quantity			
	in available sources	No.	1/Source	
3.3.2	Sieve Analysis	No.	1/Source	
3.3.3	Sand Equivalent (Concrete fine aggregate)	No.	1/Source	
3.3.4	Soluble deleterious impurities (ditto above)	No.	1/Source	

AnnexB

MATERIALS AND GEOTECHNICAL INVESTIGATION : TESTING REQUIREMENTS : DETAILED DESIGN				
Item	**Description**	**Unit**	**Qty**	**Comment**
1	**CENTRE LINE INVESTIGATION (In wheel path)**			
1.2	**Sampling & Laboratory Testing : 1 Test Pit / 1km**			Alternate left & right
1.2.1	Fixing of test position by GPS	No.	1/Test Pit	
1.2.2	Logging / Photographing 0.8 x 0.8 x 1.0m test pit	No.	1/Test Pit	
1.2.3	In-situ density	No.	2/Test Pit	
1.2.4	Natural moisture content	No.	2/Test Pit	
1.2.5	Indicators (sieve analysis & Atterberg Limits)	No.	2/Test Pit	
1.2.6	Maximum Dry Density (MDD)	No.	2/Test Pit	
1.2.7	CBR (3 point) including swell	No.	2/Test Pit	
1.2.8	Free Swell	No.		Only if indicated
1.2.9	DCP	No.	1/Test Pit	
1.2.10	Undisturbed sample for triaxial/odeometer	No.	5	Only where slope or dimensional
				instability (swell/collapse) in evidence
2	**SHOULDER INVESTIGATION**			
2.1	**Sampling & Laboratory Testing : 1 Test Pit / 1km**			Alternate left & right
2.1.1	Fixing of test position by GPS	No.	1/Test Pit	
2.1.2	Logging / Photographing 0.8 x 0.8 x 1.0m test pit	No.	1/Test Pit	
2.1.3	In-situ density	No.	2/Test Pit	
2.1.4	Natural moisture content	No.	2/Test Pit	
2.1.5	Indicators (sieve analysis & Atterberg Limits)	No.	2/Test Pit	
2.1.6	Maximum Dry Density (MDD)	No.	2/Test Pit	
2.1.7	CBR (3 point) including swell	No.	2/Test Pit	
2.1.8	Free Swell	No.		If indicated
2.1.9	DCP	No.	1/Test Pit	
3	**POTENTIAL SOURCES OF MATERIAL**			
3.1	**Materials for embankment, selected subgrade,**			
	and stabilized base and subase			
	Sampling & Laboratory Testing : 1 Source / 10km			
3.1.1	Identify, describe and estimate quantity			
	in available source	No.	1/Source	
3.1.3	Fixing of test position by GPS	No.	1/Source	Centroid of source
3.1.4	Logging / Photographing 0.8 x 0.8 x 1.0m test pit	No.	3/Source	3 test pits per source
3.1.5	Indicators (sieve analysis & Atterberg Limits)	No.	2/Test Pit	
3.1.6	CBR (3 point) including swell	No.	2/Test Pit	
3.1.7	MDD Stabilized	No.	1/Test Pit	
3.1.8	UCS	No.	1/Test Pit	
3.1.9	ITS	No.	1/Test Pit	
3.1.10	Wet/Dry Durability	No.	1/Source	
3.2	**Hard rock materials for use in concrete,**			
	base course and surface dressing : 3 Sources			
	Sampling & Laboratory Testing			
3.2.1	Identify, describe and estimate quantity			
	in available sources	No.	3/Source	
3.2.2	10% FACT (Wet & Dry)	No.	3/Source	
3.2.3	Aggregate Crushing Value (ACV)	No.	3/Source	
3.2.4	Sodium sulphate soundness	No.	1/Source	
3.2.5	Specific Gravity	No.	1/Source	
3.2.6	Water absorption	No.	1/Source	
3.2.7	Bitumen absortion	No.	1/Source	
3.3	**Sand for concrete : 3 sources**			
	Sampling & Laboratory Testing			
3.3.1	Identify, describe and estimate quantity			
	in available sources	No.	1/Source	
3.3.2	Sieve Analysis	No.	3/Source	
3.3.3	Sand Equivalent (Concrete fine aggregate)	No.	1/Source	
3.3.4	Soluble deleterious impurities (ditto above)	No.	1/Source	

Annex C

The Consultant should, in particular, supervise the work of the Contractor on laboratory tests and measurements, including but not limited to:

1. Laboratory tests on control of grain density of stone material.
2. Laboratory tests for determination of granulometric analysis of mineral materials.
3. Laboratory tests on control of grain form coefficient of stone material.
4. Laboratory tests on control of binding material and grain content of a/c mixture.
5. Laboratory tests on control of mixture compaction on bituminous base material.
6. Laboratory tests on control of maximum density of pavement materials.
7. Laboratory tests on control of a/c mixture specific gravity by testing dried samples.
8. Laboratory tests on determination of bitumen penetration.
9. Laboratory tests on control of humidity-density relationship for a/c mixture.
10. Laboratory tests on control of bitumen softening.
11. Laboratory tests on control of soil density.
12. Laboratory tests on control of stone material wear resistance.
13. Control on proper selection and use of crushed stone, gravel, sand and mineral powder for preparation of a/c mixture.
14. Control on scope of implemented works.
15. Control on proper technology of work arrangement, including review of the contractor's method statements.
16. Control on surface smoothness after final rolling of a/c mixture by rollers (by use of metal straightedge of length 2 m and 5 m accordingly in the direction of cross slope and parallel to the central axis) and others.