PAPUA NEW GUINEA ROAD MAINTENANCE AND REHABILITATION PROJECT II ADDITIONAL FINANCING ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN for
ALOTAU – EAST CAPE ROAD
(MILNE BAY PROVINCE)

For
GOVERNMENT OF PAPUA NEW GUINEA
AND THE WORLD BANK

October 2013
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Cover photo: Road section at the start of the East Cape road with sign board showing the upgrade of 3.2km funded under local Member of Parliament.
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<td>Additional Financing</td>
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<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
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<td>AusAID</td>
<td>Australian Agency for International Development</td>
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<td>BP</td>
<td>World Bank Policy</td>
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<td>Double Bituminous Surface Treatment</td>
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<td>DEC</td>
<td>Department of Environment and Conservation</td>
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1: Executive Summary

This environmental and social management plan (ESMP) has been prepared for the 54 km Alotau to East Cape Road in the Milne Bay Province which is the first project to be implemented under the Papua New Guinea Road Maintenance and Rehabilitation Project Additional Financing (RMRP II AF AF). In order to fulfill environmental assessment requirements of the World Bank and the Government of Papua New Guinea, this ESMP has been prepared as part of the Appraisal of the Additional Financing of RMRP II. The purpose of this environmental and social management plan (ESMP) is to assess the potential impacts, negative and positive, associated with this proposed road package of the Road Maintenance and Rehabilitation Project (RMRP II AF) and to make recommendations on appropriate mitigation measures to reduce these impacts. This ESMP is volume 3 of the Environment and Social Management Framework (ESMF) for the RMRP II AF.

The RMRP II AF is classified as World Bank category B for the purposes of the requirements of OP/BP 4.01. No new road construction is involved and it is expected that all work will be carried out within the existing right-of-way (ROW). In this ESMP, the focus will be on 54 km of the Alotau to East Cape Road, Milne Bay Province.

The East Cape Road runs between Alotau, the provincial capital of Milne Bay Province, and East Cape Point, the most easterly point of the PNG mainland. The road provides a vital link for the populations of the archipelago of islands to the east and north, which make up three out of the four districts in the Milne Bay Province. Inhabitants of these islands regularly travel by sea to and from East Cape Point and the north coast, and then by road to Alotau for its produce market, shops, and services. The road would be rehabilitated in two separate sections:

The first 3km of the road section between Alotau to East Cape is currently being upgraded to gravel standard under the Transport Sector Support Project (TSSP) and funding through local members of Parliament. Projects for the following years under RMRP II AF would focus on the eight provinces in RMRP II. This section is thus not be covered under the project nor the ESMP apply to this particular section.

Goilinai Bridge to Golani Bridge (approximately 17 km): This section starts three km east of Alotau and continues eastward as far as the junction with the North Coast Road. The road is generally flat, low lying and less than a kilometer from the coastline. The road crosses several watercourses with bridges at river crossings and low-level causeways across seasonal streams. The road was reportedly sealed a decade ago, but the seal has failed leaving a gravel surface which is under routine maintenance by DoWI. This section of the road carries substantial traffic volumes, mostly public motor vehicles travelling between Alotau and both the North Coast and East Cape. The project would upgrade the section from gravel to a bitumen sealed surface, with gravel shoulders and improved longitudinal and cross drainage to meet DoWI highway design standards. The existing horizontal and vertical road alignment would be unchanged,
except for short sections lying very close to the coastline where increased climate resilience may require the level of the road surface to be raised.

**Golani Bridge to East Cape Point (approximately 34km):** This section runs further east from the junction with North Coast Road along a peninsula to the East Cape Point. Although the road follows the coastline for most of its length, the topography is more varied with some moderate gradients in places. While this section is less trafficked than the other, it is, nevertheless, important as the only land transport route between East Cape Point and Alotau for islanders wishing to shop or trade there. The project would provide a new gravel surface with improved longitudinal and cross drainage along the existing road alignment.

The project assessment concludes that with appropriate mitigation strategies described in the present EMP, and the positive social, economic, and environmental benefits which flow from the project, that the impact linked to the road maintenance related activities can be managed within acceptable levels. There are no significant environmental impacts needing in-depth assessment. A Land Acquisition and Resettlement Framework has also been prepared for the project with guidance for addressing any land or resettlement issues. All potential and associated impacts can be addressed through proper implementation of the mitigation measures proposed in the EMP. Provisions will be made in the Project Budget to cover the environmental and social mitigation as well as monitoring costs.

**2. Statutory Requirements, Standards and Guidelines**

This ESMP is in accordance with the Environmental and Social Management Framework (ESMF) of the Project and with the PNG Environment Act 2000 that came into force on 1st January 2004, PNG Environment (Amendment) Act 2002 and related Regulations 2002.

Furthermore, the ESMP is developed in accordance with the measures contained in the Environmental Code for Vehicles Machinery Workshops and Petroleum Storage/Resale/Usage Sites (Dec, 1997), as well as the related measures contained in the Environmental Guidelines for Roads and Bridges (Dec, 1997). The Government of PNG through the Department of Works and the World Bank are both bound by the above guidelines and the World Bank Operational Policy 4.01, Annex C, which outlines the requirements for an Environmental Management Plan.

**3. Project Description**

**The Executing Agency**

The Department of Works is the Executing Agency for the RMRP II AF and has provincial offices in the twenty one provinces around Papua New Guinea. These offices have civil engineers together with field supervisory teams and will provide adequate project backstopping for the sub projects that will be undertaken in the ten provinces around Papua New Guinea.
Project Rationale

The aim of this Environmental and Social Management Plan (ESMP) is to specify the environment and social management measures required to be implemented in 54 km of the Alotau to East Cape Road, in the Milne Bay Province so as to avoid or mitigate potential adverse environmental impacts and provide benefits where possible. These management measures cover potential adverse impacts and benefits within the right of way (ROW) for the Alotau to East Cape road (54 km), Milne Bay province. This ESMP provides instructions on the practical implementation of the environmental and social management measures to be adopted for the specified works. This ESMP will form part of the contractual obligations of the winning contractor.

The ESMP will also be used by the Project Engineer to monitor and verify the contractor’s safeguards management activities and any actual impacts of the Works during construction up to the completion of the road works. In addition, officers from the Environmental Management Unit (EMU) in the Department of Works will conduct compliance monitoring to ensure the contractor’s compliance with the ESMP.

Project Objectives. Under the Additional Financing (AF), the Project Development Objective (PDO) would be modified to include a third PDO to address the new component on enhanced economic opportunities for women. As such, the development objectives of the AF would be to: (i) improve road transport to project areas through providing satisfactory physical condition and safety in selected roads; (ii) strengthen institutional arrangements for road maintenance, including the participation of the private sector and local communities; and (iii) enhance road-related economic opportunities for women.

Project Components. With the exception of the additional sub-component on economic opportunities for women, the components under RMRP II would remain the same under the AF.

Component 1: Rehabilitate, Upgrade and Maintain Roads and Bridges (est. US$142.85 million). Funding would be used to rehabilitate, upgrade and/or maintain existing roads and bridges in some of the ten provinces eligible for funding under the AF. The ten provinces eligible under AF are Central, East New Britain, Gulf, Madang, Manus, Milne Bay, Morobe, Oro, Western, and West New Britain.

The DoWI has identified a long list of priority roads for upgrade under the AF and the Task Team has assessed them for suitability, through field visits and desk reviews. A matrix of possible investments for inclusion in the AF and the Task Team’s views on each is included in the project files. The cost includes an estimated US$142.05 million for works and about US$0.80 million for specialized design and supervision activities. Efforts will be made to carry out consultations with communities and women’s groups to obtain their views and concerns prior to rehabilitation and upgrading of roads and bridges.

Component 2: Technical Assistance (est. US$4.00 million). Technical Assistance would be provided to relevant sector entities to continue the capacity strengthening measures launched under RMRP.
II to help DoWI and NRA to more effectively manage and maintain road sector assets. It is expected that funds would be utilized to: (i) pilot an integrated maintenance regime for the Hiritano and/or Magi Highways; (ii) pilot performance-based contracting through initial repairs to roads followed by a maintenance period; (iii) update design/construction standards and specifications for national roads and bridges, and for axle load limits; (iv) increase DoWI and NRA’s capacity to manage road and bridge assets through capacity building initiatives, and train small- and medium-sized contractors in eligible provinces in preparing tenders and managing contracts.

Component 3: Enhancing Economic Opportunities for Women (est. US$2.65 million). A component would be added to help enhance economic opportunities for women related to improvements in road assets. This would include: (i) non-technical routine roadside and bridge maintenance employment for community and women’s groups; (ii) technical support to help implement the community-based maintenance activities; (iii) capacity building initiatives to elevate awareness of gender issues among stakeholders, as well as targeted training on routine road maintenance activities and life skills for communities and women; and (iv) socio-economic and gender surveys at the beginning, mid-term, and end of the AF to understand the impact of this component and to help reduce the gap in gender data.

Component 4: Project Implementation (est. US$14.50 million). Resources would be utilized to support project implementation. In an effort to avoid another long delay in approving a second EPM, the current EPM for RMRP II will implement the AF up to the end of the RMRP II through a variation order, and DoWI will tender for a new EPM to take over until the AF closes in mid-2021.

As part of its responsibilities, the EPM will define, organize and carry out a program to develop and encourage young engineers enrolled in university by offering internships and other temporary activities to enable the students to work on project sites throughout the country. It is anticipated that these activities would occur during school breaks. Reasonable and necessary incremental operating costs would also be financed under this component, such as maintenance and operation of vehicles and equipment, travel costs and per diems for DoWI and NRA staff, and communications and printing charges associated with the AF.

Figure 1: Location of the Alotau to East Cape Road, Milne Bay Province

Scope of works:
In the first 12 to 18 months, the RMRP II AF will focus on the rehabilitation, maintenance and sealing of up to RMRP II roads along Hiritano Highway together with that in Milne Bay province (this ESMP) (Figure 1) and that of the Madang province as stated in 1.

The Scope of Work for the Alotau to East Cape road (54 km) will consist of Items 01 – 10 as follows;

01. Clearing and Grubbing and Disposal of Vegetation

02. Construction of Road Formation

03. Various drainage works including removal of damaged existing culverts and headwalls, clearing of existing drainage structures and installation of new culverts and head walls

04. Removal and replacement of unsuitable materials in the sub grade as directed by the Project Engineer

05. Preparation of the sub grade surface

06. Placement of sub base correction materials in the sub grade as directed by the Project Engineer

07. Construct sub base 200 mm thick (minimum) and base course 150 mm (minimum)

08. Pavement construction, surface preparation and application of prime coat and 19 mm aggregate seal coat

09. Reseal coat of 14 mm aggregate over existing seal and new seal

10. Installation of road furniture including application of pavement markings, installation of guide posts (at culverts) and road signs

All these works shall be carried out in accordance with the requirements of the Department of Works Specification for the Road and Bridges Works August 1995 except as otherwise stated.

Along sections of the sub projects are already lined drains placed and hence the sealing will be done within the confines of the road up to the lined drains. As for possible culverts, there may be a couple and this will be confirmed with DoW later, while the bridge at Gopai will need to be strengthen with abutments put in to hold up the bridge.

Some work may also be done on the causeways to allow free flowing of creeks to flow through although this will be decided within the scope of the sub project activities.

**Description of the environment**

This section includes background on the physical, biological, and socio-economic environment of the project geographical areas.
4. Socio–Economic Environment of Year 1 East Cape Road – Milne Bay Province

The Alotau to East Cape road (sub project) comes under the Alotau district with its headquarters in Alotau and Rabaraba. Alotau is also the provincial headquarter for Milne Bay province. Seven Local Level Governments (Makamaka Rural, Daga Rural, Weraura Rural, Maramatana Rural, Huhu Rural, Suau Rural and Alotau Urban) make up the Alotau district and Huhu and Maramatanas LLGs cover the sub project area.

Alotau District stretches from the mountains at the end of the Owen Stanley Ranges to the coastal areas of the south eastern end of the mainland and the sub project runs along the shoreline and onto the southernmost tip of the country. The coastal areas are dominated by narrow plains and inland hills, while the interior of the district is mountainous. Average annual rainfall ranges from 1800 mm around Cape Vogel, to 3000 mm near East Cape. There is a long dry season in the northwest of the district from the Oro Province border to Wedau. Altitude varies from sea level to 2900 m on Mt Dayman. Most people live near sea level, but there is agriculture up to 1200 m in the Agaun area¹.

Total population was 74644 in 2010 with a total household of 13063². These are for the whole Alotau district hence for the sub project the households would only be a fraction maybe a couple of hundred. Land potential is high in the south of the province, while the north experiences a long dry season and occasional droughts. Businesses in Alotau and oil palm enterprises provide some income-earning opportunities, as well as markets for the sale of fresh food, betel nut and coconut.

Literacy levels are high at 81.1 %, and school and other facilities are reasonable although not as adequate. Villages along the sub project area have shared aid posts and the major diseases are referred to Alotau General Hospital for treatment.

The road access along the sub project is good and this will be better as the sub project commences. This road caters for the North Cape bound passengers and also islanders from Normanby and Esa’ala who use this road to get into Alotau because it reduced the travelling time by boat from the East Cape. Hence the benefits of this sub project will provide for a large number of those islanders together with those on the mainland. Public Motor Vehicles (PMV), travel to and from Alotau till the early hours of the morning to cater for the increased commuters and market persons.

The main cash crops and business activities noted along the sub project area are coconuts (copra), betel nuts, food crops fishing and livestock. The Bubuleta Agriculture Station provides agriculture and livestock advice to the villages in sourcing alternate income opportunities such as growing vanilla, cocoa and coffee. There is also the herding of goats. The running of PMVs, small trade stores and road side markets added to the generation of income into the community. These are also the tourists where guides are organized to the Lalalagana lockouts and linkages with the Tawali Resort to the North Cape area.

People on the north coast from Wabara Point to East Cape have very low incomes. Overall, people in Alotau District are seriously disadvantaged relative to people in other districts of PNG. There is some agricultural pressure, land potential is moderate, access to services is poor and incomes are low. Child malnutrition is of concern.

In terms of organization, the United Church together with other Pentecostal are well organized in arranging training for the women folk as well as men groups. A number of interventions have been introduced along the sub project area such as from UN Women, UNDP together with PNG Micro Finance and there is still a need for these activities to be fully up taken by the community. These require constant mentoring and training until capacity and skills are developed.

4.1 Goilanai Bridge – Bubuleta Agricultural Station 22.3 km

This road section commenced after the Goilana Bailey Bridge and runs to Bubuleta Agricultural Centre totaling 22.3 km, run along in a south east direction. This stretch of road runs adjacent to the coast and the distance from the road to the sea front ranges from about twenty meters to hundred meters. The first three kilometres is currently being upgraded with funding from the local Parliamentarian where it stops at Aioma village (Figure 2). From here the road crossed seven bailey bridges, two timber bridges and three causeways crossings. This runs through villages of Aioma, Lelehoa, Lelehudi, Gopai, Balagun, Nigila, Watunoi and Lalalagana. It then climbs up a gradient of the eastern most tip of the Owen Stanley Ranges and at 19.2 km, is the junction to the North Coast road. The road then returns to the coastline for two kilometres to reach Bubuleta Agriculture Station.

In respect of education and religious services, two villages share a community school together with church for a number of denominations such as the United Church, Kwato, and Pentecostals. This pattern is noted along the sub project routes where in places there could be a dominant church group while in the others are a splinter of groups worshipping under their own doctrine. Similarly community schools along the sub project area go up to the eight grade before the students are sent to the secondary schools in Alotau, or Dogura.

3 Notes from Mari Clarke February 2013
This total length of road runs through unconsolidated clay, silt sand and gravel beds. These form the topography of gently undulating alluvial and colluvial fans forming from the rivers and draining from the right most tip of the Owen Stanley ranges trending from generally west to east direction.

**FIGURE 2: STRETCH OF ROAD AT AIOMA WITH SEA WALL TO THE RIGHT OF PICTURE**

This road section is generally in a fair condition and there are only a few pot holes from the recent rainfall. Along the shoreline at the start of this road sections are sea walls constructed to safeguard against the on shore waves. These sea walls are not continuous along this stretch of coastline (Figure 2).

Vegetation along this stretch of road is consistent with those of coastal swamp forest and secondary regrowth forest where remnants of swamp forest vegetation (*Campnosperma, Ipomoea, Spinfex*) with rosewood (*pterocarpus indicus*) and the exotic species (*Spathodea campanulata*) or African tulip are present together with sago (*Metroxylon sagu*) and pandanus (*Pandanaceae sp*) . Along the villages are cleared areas where small patches of cocoa (*Theobroma cacao*) trees are planted together with coconut and breadfruit trees (*artocarpus altitis*). In areas, there are sparse rattan (*calameae*) with ferns (*Christella* and *Sphaerostephanos*) and kunai grass (*imperia cylindrica*) and common grass (*Thermada australias*).

Most of the primary forest would have been cut down by the community for their daily needs such as for housings and firewood. The forests are part of the main land of Papua New Guinea and will contain fauna which are endemic and also introduced and some of these would be the common bush wallaby (*Dorcopsis luctuosa*), wild pig (*Sus scrofa*), flying foxes such as the common blossom bat (*Syconycteris australis*), reptiles such as the Papuan python (*Liasis papuana*), frogs and birds such as Raggiana Bird of Paradise (*Paradisaea raggiana*). Most of these would be in the inner parts of the forest as daily foraging will force them further into undisturbed forest habitats. There is no protected area or wildlife management area in the vicinity of the road section.
4.2. Bubuleta village - Wailalou – 20.5 km

This stretch of the road runs similar along the shoreline and passes through the villages of Divanai where a proposed diversion of the road has been proposed to avoid the current road that is in close proximity to houses and then to Boe, Lelequaqua, Lelehudi and then to Wailalou. DOW confirms that there will be no diversion at this stage and hence the road upgrade will follow existing road corridor (Figure 3). This stretch of road continues in close proximity to the shoreline and cliffs of volcanic intrusions are exposed on the left side of the road. A lot of limestone from the East Cape quarry has been layered along this stretch of the road where the basement is not as firm as the previous section. These road works are being undertaken through TSSP. Two bailey bridges and two causeway areas were noted along this stretch of the road.

![Figure 3: Road section at Divanai](image-url)

Note the closeness of the house on the left.

4.3 Wailalou – East Cape – 11.2 km

From here the road increased its elevation to climb over the eastern tip of the Owen Stanley Ranges again and two and a half kilometres from here is the turnoff to the Tawali Resort. The vegetation then changes into low land forest with deciduous trees such as *Campnosperma, Syzygium and Mitragyne* besides pandanus strand. After this stretch is kunai and thick grassland passing the turn off to the only quarry used at this stage and a contractor’s camp through undulating hills before it descends down to the edge of the road at the shoreline of East Cape.

From here it traverses through grass land with sporadic hamlets before it arrives at East Cape villages and continues for 200 metres before getting to the end of the road at the East Cape Community School and Market (Figure 4). Three spoon drains along the East Cape village and is a traffic hazard when trucks travel at increased speeds to the end of the road. There is no protected area or wildlife management area in the immediate project area.

![Figure 3: Road section at Divanai](image-url)

Note the closeness of the house on the left.
5. Environmental and Social Impact Assessment

As with other road construction activities, road maintenance and rehabilitation activities can contribute to soil erosion, disturbance of water flows, chemical pollution, traffic disruption, noise, and other impacts on surrounding communities and natural life.

Environmental Impacts

Some impacts linked to the road maintenance and rehabilitation activities can include:

- **Soil erosion and deforestation**
  
  Routine maintenance activities such as grading, grass cutting, drain clearing, and pothole patching can upset the often delicate soil balance and lead to soil erosion. In addition, the clearing of ROWs in particular, which have not been cleared for many years may lead to a significant loss of vegetation along the roadside as a result of the clearing exercise. Siltation also occurs as a secondary effect of soil erosion resulting from road improvements.

- **Degradation of water quality and hydrology**
  
  The rehabilitation or upgrading of existing roads can create materials from drain clearing, pavement reconstruction, and other activities which may find their way into waterways. Adverse impacts on water quality may also be associated with poor management of fuel and lubricants at road camps, vehicle maintenance depots and fueling areas.

- **Earthworks**
  
  Earthworks can involve the clearing and grubbing of soil and debris that may slide into roadside drains and creeks and community areas. Sedimentation of small creeks during construction and earth movement activities can also have an impact on hydrology. Such is the case close to the...
villages from Aioma, Nigila, Leledui and Watenoi villages under the TSSP or local members
funding and care where dust could get into the creeks that are used for washing and cooking and
springs from these serve as drinking water. Likewise, Pavement Works will involve the correction
of the road base and sub base material and as such as these materials mostly in stockpiles would
likely end up in the drains.

❖ Adverse effects on quantities of water

Water is often needed to help prepare and compact the road surface during road construction and
maintenance. Although this demand for water is temporary, it may significantly affect local water
supplies. Drawing water for road improvements may harm aquatic species and farm production, especially
if the water is taken during dry seasons.

❖ Pollution and damage to valuable ecosystems and habitats

Bitumen Works will be for the full 54 km where spillages from bitumen heating kettles and poorly stored
bitumen and fuel drums provide the opportunity for leakages. The transportation of the sealing aggregate
and bitumen drums over this long distance does pose a risk of spillage of this large quantity. The
rehabilitation of existing roads may also disrupt the integrity of plant and animal populations and
permanently alter sensitive ecosystems.

❖ Air Quality and Dust

Dust creation from the exposed and unsealed road surface is a concern as well as exhaust fumes from
construction machines.

❖ Noise

Noise mainly affects urban areas, villages, hospitals, schools etc. along the roads.

❖ Road materials

Along the sub project route from Bubuleta to East Cape, only limestone material from the single quarry is
being used as sub base and road base material. River gravel is not suitable because there is no clay within
the material that bonds well onto the road material. Hence, it is likely to be loose and moved off the road
surface when the surface becomes dry.

At the moment, the East Cape quarry (Figure 5) is the only quarry providing road base material for the
sections of the road under the TSSP. No additional sites have been assessed as potential source of material
for road upgrading.

The quarry site is situated about 200 meters off the left side of the East Cape Road. Limestone scree
material is gathered by shovels which load onto trucks that deliver along the required road sections. There
is no crusher to crush the bigger boulders > 1 meter and only loose material is being used as sub base and
road base material for the TSSP sections.
FIGURE 5: QUARRY PIT OFF THE EAST CAPE ROAD

These will be no impact on the side walls of the quarry in relation to the main road and at this stage; there is no large excavation and hole here. At this stage the estimated area of the quarry is ~30 square meters. There is a possible demand for these limestone deposits to be used on the sub projects; however detailed design and material listing was not sighted.

There are no creeks in the vicinity of the quarry and therefore there is no potential for run off to drain into these creeks. Given the nature of this limestone, water will dissipate through the limestone scree and may link into sink holes or into the aquifers.

The Department of Works notes it as the only quarry currently used and there has not been a search for additional quarry or borrow pit areas. Most of this material will be used for sub base and road base material while the chip aggregates for sealing will come from outside of Alotau if not available at a crusher site in the Milne Bay province. At this stage, DOW has a responsibility to oversee the quarry operations. The Department of Environment and Conservation do not oversee this quarry as there is no provincial representative or office here.

In addition, the creeks and rivers close to Aioma and Lehehoa villages do have considerable river gravel and some of these materials may be used on the sub project however, it is too early to confirm that as the planning for this has not eventuated as yet.

Erosion protection ensures that all materials within the right of way and through all the earthworks, drainage works and bitumen works are well maintained as to clearing out sediment build up and to allow for natural vegetation to contain exposed surfaces.

Campsite Management involves good housekeeping managements in the beginning, mobilization of personnel and equipment starts. This then progresses to the setting up of the camp site and then its
operation. Wastes and rubbish must then be disposed at assigned sites. The potential of fuel and oil drums not in a proper bund would mean the potential for spillage into the soil and into the creeks if in close proximity. The issue of waste management cannot be avoided here and therefore unmanaged wastes resulting from the construction activities have the potential to pollute the natural environment.

6. Social Impact Assessment

Besides the bio physical environmental impacts that will arise from the RMRP II AF, there can be some social impacts. The length of activities along a sub project will at the most take from six to twelve months or 18 months. Hence, these impacts will occur during that period but is possible for those concerns to linger in the community’s mind if there are issues that affect the community when the contractor is undertaking the prescribed works in the sub project area.

The positive social impacts will be an improved sealed road which will remove the occurrence of dust along the road. An improved sealed road will provide the opportunity for villagers to take their goods to the markets. Some could even venture into owning public motor vehicles (PMV) for the purpose of providing commuter and market runs. Commuters will see that the travelling times to and from the towns will be reduced and may opt to buy their own vehicles. This may mean increased speeding as the roads are better which raises road safety issues.

As for the possibilities of issues associated with work on the exiting Right of Way (ROW), a Land Acquisition and Resettlement Framework (LARF) provides guidelines about how to mitigate any impact that may result from the acquisition and loss of land and assets as well as resettling of project beneficiaries. The RMRP II AF also has a component for economic opportunities for women and this will be developed further when the sub project begins. A situation analysis of the sub project will be undertaken to determine the socio economic status of both men and women. The main objectives are to increase the participation of women in road works and to enhance their economic opportunities.

At the sub-project level construction activities will be mainly limited to the preparation of road materials, bridge abutment approaches, concrete mixing and casting. In addition there may be a need to drive piles into river banks. Standard levels of care will need to be taken to ensure that these activities do not adversely impact on community drinking water supplies and food gardens.

- Impact on local economy

Use of construction materials. Currently there is only a single limestone quarry and material has been used on the sub project. Such is the case elsewhere in Papua New Guinea, all quarry owners are paid on the agreed government rate. In most cases, the resources owners do benefit as initially it was only a limestone hill but now it is a resources that is on demand. These quarry owners use the proceeds from the quarry to improve their livelihood by erecting a permanent house or run a trade store in the village or use that for customary obligations such as for bride price. Camps holding up to 15 men will be required at some sites. Interaction between workers and local villagers will take place.

The quality of the interaction is likely to vary widely from province to province. Nevertheless an HIV/AIDs and STD education program will need to be provided by the National Aids Council through a Non-Government Organization or appropriate persons to the contractors and their employees. Traditions
and cultures differ from province to province and the employees must also be made aware of these through the Local Level Governments in the sub project area. These will ensure that traditions and cultures are respected during the duration of the sub projects.

Based on the foregoing, the potential social impacts are in the following areas:

- **Campsite Management**
  Previous and current campsites for work has been at Divinai and at East Cape and these camp sites will be decided by approved contractors where haulage of road base and sub base material will need to be considered. Campsite will also have the potential of interaction between the local community and the contractors’ camp. Besides that is the issue of creation of household and camp waste that need to be disposed of at designated sites.

- **Human health and safety**
  Contractor to implements its Occupational Health and Safety plan so as to reduce incidents of accidents at the work place or along road works.  
  Health risks: Potential health risks would be the spreading of HIV/AIDS within and in the sub project camp sites between employees and the community
    
    i. HIV/AIDS awareness to be undertaken by the contractor for its employees and also in communities along sub projects. This must be done at the beginning, half way and towards the end of the sub project.
    
    ii. Vector borne diseases. There is the risk of increase malaria if camp area is not properly drained. The ponded water allows for the breeding of mosquitos which transmit malaria parasites. Camp management of draining out water and areas where potential breeding areas for mosquito must be eliminated.

Roads and quarries or “borrow pits” may also create artificial ponds and lakes (impoundments) that breed mosquitoes or harbor water-borne diseases. Road builders may create such ponds inadvertently, by damming gullies or other small catchment areas or streams, or intentionally, by constructing retention basins and settling ponds to minimize erosion and sedimentation.

- **Changes to local culture and society**
  The introduction of contractors from a different part of PNG or from overseas will ultimately see an introduction of a change of lifestyle which may be taken on by the local community. This will break down the traditional moral and ethnic attributes of the community and society.

- **Road safety**
  iii. Public safety/ Accidents: Possible road accidents from traffic which frequent road surfaces during construction For workers and community residents
iv. Unhappy villagers along the route of the sub project

v. Waste management: This is both a physical and social impact and requires appropriate mitigation measures.

vi. Contractor to provide employment opportunities to qualified and unskilled workers from villages along sub project routes. This provides good public relationship between the community and contractor. After the all Works have been completed, the contractor shall ensure that unauthorized occupants in the work area, because of their participation in the works, return to their original place of residence.

vii. Appropriate waste management strategies for camp site and along construction areas to dispose of waste in designated areas.

viii. Water quality. Drinking water sources should be protected etc.

Apart from these, additional, livelihood (economic) opportunities for women and community groups will be created as part of the project and women and groups will be engaged in these activities.
7. Environmental Management, Mitigation and Monitoring Plan

7.1 Implementation of Recommended Mitigation Measures

As indicated in section 1, all the roads are within existing right of way and the impacts are known and these are stated here in this ESMP.

The Environmental Assessment for projects following on from those identified for the first 12 to 18 months will have similar activities, and the anticipated environmental and social impacts will also be similar and it is therefore not necessary to prepare separate environmental assessments for each sub-project. Rather, the ESMP will cover all of the sub-projects.

This following is a list (with descriptions) of the main activities involved in the physical project works and identifies the expected impacts as a result of these activities. These are detailed in Annex 2 as Environmental Management Guides (EMG). It follows on from the scope of work and Environmental Impact Assessment. The EMG is based on the activities listed in the preceding section, associated anticipated environmental impacts and recommended mitigation measures. The anticipated impacts are based on experiences on other projects of a similar nature, particularly those encountered during RMRP and RMRP II.

For each of the mitigation measures presented, a method of implementation is proposed. Timing is extremely important with respect to effective implementation because some of the recommendations involve additional cost to the contractor and can affect the project budget. The recommended methods of implementation include the following:

As a design guideline or recommendation

This means that the mitigation measure should be included in the initial design of the project. Often, on road maintenance projects where anticipated environmental impacts are minimal, effective mitigation is simply a matter of ensuring that the roads are designed properly to control negative effects. In general, if the design is properly done (as should be the case on this project), there will be minimal impacts. In a few cases, slight changes to design will eliminate the potential for impacts. Of particular concern in the design stage is the location of material sources. These should be clearly identified and located on maps in order to ensure that no problems ensue once construction starts.

As a suggested clause in the contract

This suggests that there should be a clause in the contract document referring to this particular mitigation measure. There are a number of ways of addressing this. A common method is to simply refer, in the contract, to the Environmental Management Guidelines in existence, detailing any specific aspects not already in the guidelines. The main problem with this is that it assumes that both the DOW and contractors are familiar with and understand how to implement these guidelines. This is not the case at this time in Papua New Guinea. Therefore the option of providing very specific clauses in the contract detailing measures and actions required on the part of the contractor is probably the best way to proceed.
To be included in the Bill of Quantities (and usually also in the contract)

This means that the recommended mitigation measure should be included as an item in the Bill of Quantities. This will ensure that the item has been budgeted for and will be implemented as required.

There are two approaches to deal with the incorporation of environmental management costs into the bids prepared. One is to request that the contractors include these costs in their rates. Although this works well in some instances, in many cases the contractors, in the interests of remaining competitive, will not adequately reflect the real cost of environmental mitigation in their bids. The second approach, recommended above, presents the mitigation measure as a line item in the Bill of Quantities. There is an identified extra payment in the contract to ensure that the work is carried out by the contractor as specified. An example of clauses that could be included in the Bill of Quantities is as follows:

- the definition of exactly how many cubic meters of spoil and excess material must be disposed of
- a definition of how many hectares in total of replanting or revegetation must be undertaken and cost per hectare (or m²)
- cost of recommended erosion control structures (if over and above those that would normally be constructed as part of normal engineering design)

In order to achieve this in practice, it is recommended that the draft contracts be reviewed by an environmental specialist to ensure that the appropriate clauses have been incorporated. The specific mitigation measures should also be assigned estimated costs and included in the bidding documents. This could be undertaken by the staff of the EMU in DOW. The potential impacts identified in the Environmental Impact Assessment are then addressed through mitigation measures in the Environmental Management Guidelines (EMG).

Acquisition of ROW for Widening or Realignments

There will not be any land acquisition for widening or realignment requirements and all road activities will be within the ROW. If however, should there be a few occasions where some land may have to be acquired then a Land Acquisition and Resettlement Framework (LARF) will address these issues. A LARF can be found in volume two of the Environmental and Social Management Framework (ESMF).

Earthworks

Clearing of ROW

Where it is necessary to remove large trees and other desirable vegetation local landowners should be consulted and the cleared material made available to them for disposal. If any stakeholders experience loss of crops or fruits trees, they will be appropriately compensated based on the LARF.

Operation of Existing Quarry Sites (Terrestrial)

This refers to the on-going operation of quarry sites, which have been established prior to the commencement of present construction activities. The activities associated with this include blasting and the resultant noise and dust pollution. Handling of explosives is an activity to be carried out by licensed persons. Abandonment of the quarry after material extraction can have impacts of not properly managed.

Establishment and Operation of Stone Crushing Plants
This can be part of the asphalt plant or separate and involves the crushing of stones using large and very noisy equipment. The activity generates substantial amounts of dust and can be very disturbing to nearby settlements.

Earth Movements Relating to Cut and Fill Activities in Flat Areas

This activity consists of minor cutting and filling activities and could include the removal of roadside vegetation. The main environmental impacts would relate to possible increased sedimentation and erosion.

Earth Movements in the Vicinity of Settlements along the Roadside

This could disturb local market activities and affect pedestrian walkways. Even though the earthworks would be undertaken within the ROW, there is the possibility that illegal structures have been constructed, which could be affected. If so, users and owners of these structures would need to be compensated.

**Pavement Work**

Construction of Base or Sub-Base Course, Regravelling

This involves the use of heavy, noisy equipment and can cause noise and air pollution disturbances.

Material Transport

This includes the transport of all construction materials such as rock, gravel, bitumen, concrete or other material as well as the transport of equipment or machinery. Again, minor environmental impacts would include noise and dust pollution.

**Drainage Work**

Drainage Works

This includes all drainage works such as culverts and drainage ditches. The main anticipated impacts are the possible effects of increased sedimentation in surrounding water bodies as a result of inappropriate deposition of excavated materials and associated disturbances.

**Bitumen Works**

Establishment and Operation of Asphalt Plants or Asphalt Preparation Areas

This refers to the activities associated with the preparation of the concrete or asphalt and could involve a large production plant with conveyors, oil fired aggregate heaters and dryers and batch mixers, or it could simply involve the heating of bitumen over wood fires and hand mixing. Some of the potential environmental problems include spills or improper handling of bitumen and contamination of nearby water sources may also result in air pollution, particularly dust and smell.

Bitumen Overlay

This includes the laying down of the various bitumen sealing or resealing surfaces such as single bituminous surface treatment (SBST), double bituminous surface treatment (DBST) or asphaltic concrete.
Erosion Protection - see Earth Works

Pollution and waste management

Proper care in the usage of heated bitumen and any paint material on the road surface for sealing and or for road marking respectively will prevent pollution from hazardous materials.

Campsite Management

Equipment Mobilisation

Includes the delivery of materials, plant and equipment to the site and involves large transport vehicles which cause air and noise pollution. May also result in traffic and safety problems and damage to vegetation where separate haul roads are provided.

Mobilisation of the Labour Force

Refers to the arrival of an outside labour force for construction activities. These newcomers may be culturally or ethnically different from people in the area and in Papua New Guinea this can have significant impacts. Potential health impacts such as HIV/AIDS are also possible.

Within camp management, draining out of water and areas where potential breeding areas for mosquito are essential

The provision of employment opportunities to qualified and unskilled workers from villages along sub project routes is desirable.

Appropriate waste management strategies for camp site and along construction areas to dispose of waste in designated areas.

Establishment and Operation of Labour Camps

This refers to the camp established to house the non-resident workforce. The major problems with the labour camps are the pollution caused by waste and sewage disposal and the potential use of local resources in an unsustainable manner (for instance, fuelwood for cooking, hunting and fishing activities).

Establishment and Operation of Base Camps

The project base camps are where the equipment and machinery is stored when not in use, and where fuels, oils and other materials are stockpiled. The project office may be located here, and sometimes the stone crushing plant or batching plant is on the same location. Occasionally the labour camp and the base camp are one and the same, but they have been examined separately for the purpose of this ESMP. The main potential problems here include contamination of water through spills of oils and fuels or improper storage.

Water Availability

This refers to the care taken to ensure if water sources are available closer to base camp then every care should be taken to ensure that this does not contaminate water sources.
Safety of Quarry Surroundings

Quarries if used must be planned to ensure that there is controlled excavation and there is no caving in of materials from the sides and then the cliffs are at a gentle gradient.

Increased Traffic and Operating Speeds

This can result in increased traffic accidents, especially involving children. Increased traffic can also result in some pollution in surrounding water bodies as a result of runoff.

7.2 Environmental Management Guides (EMG)

The scope of work and activities within RMRP II AF is focused on the upgrading and sealing of national highways and national roads in the ten provinces with segments of the Hiritano Highway in Central and Gulf province, and Milne Bay and Madang provinces being recipients of the first year of activities. In the corresponding three years, rehabilitation work will be in the remaining eight provinces. The scope of work would mean the need for quarry or borrow pits to be sourced for sub base and road base material, and then followed by the treatment of bitumen sealing. There is also the possibility of having work camps on traditional land and hence the mitigation measures for this are stated here.

Besides these areas and their mitigation measures, there is also the need for environmental mitigation measures that are not part of the engineering design and will assist in ameliorating impacts. These would be such tasks as having water carts on the road to suppress dust during construction, the removal of camps and infrastructure after completion of work. In the latter task, it may be included in the mobilisation costs that contractors submit within their bid; hence it may not be considered an issue. However, some costs were obtained for these items and are in the specific EMGs. The following EMGs are listed here which are specific to the activities as identified in Section 4 and 5 of this ESMP.

To guide the user, Table1 provides a list a summary of the ESMP where the environmental impacts from the RMRP II AF and its mitigation measures are stated.

**Earthworks**

EMG 1: Land Acquisition, Clearing of Right of Way, Resettlement and Social Issues

EMG 2: Earth Movements Relating to Cut and Fill Activities in Flat Areas

EMG 3: Earth Movements Relating to Cut and Fill Activities in Steep, Hilly or Unstable Areas

EMG 4: Earth Movements in the Vicinity of Settlements along the Roadside (refer to EMG 2)

EMG 5: Borrow Pits

EMG 6: Dust and Noise Control

EMG 7: Operation of Existing Quarry Sites (Terrestrial and River)

EMG 8: Establishment and Operation of Stone Crushing Plants (refer to EMG 6 & 7)

**Pavement Works**

EMG 9: Construction of Base or Sub – Base Course, Regravelling (refer to EMG 6)
Drainage Works

EMG 10: Drainage Works (refer to EMG 2)

Bitumen Works

EMG 11: Establishment and Operations of Asphalt Plants or Asphalt Preparation Areas
EMG 12: Bitumen Overlay (refer to EMG 11)

Erosion Protection

ESMP 13: Protection of Natural Areas and Sensitive Ecological Sites

Campsite Management

EMG 14: Equipment Mobilisation (refer to EMG 6)
EMG 15: Mobilisation of the Labour Force (refer to EMG 16)
EMG 16: Establishment and Operation of Labour Camps
EMG 17: Establishment and Operations of Base (Construction) Camps
EMG 18: Material Transport (refer to EMG 6)
ESMP 19: Increased Traffic and Operating Speeds (refer to EMG 13)
EMG 20: Explosives, Combustibles and Toxic Materials Management
Table 1: ESMP Summary Showing Activities, Potential Impacts, Mitigation Measures and EMG

<table>
<thead>
<tr>
<th>Activities</th>
<th>Potential Impacts</th>
<th>Mitigation Measures</th>
<th>EMG</th>
<th>Estimated Costs (PNGK)</th>
</tr>
</thead>
</table>
| Land Acquisition, ROW Clearing, Resettlement & Social Issues | • Disturbances on part of affected community  
• Disturbance from construction activities  
• Safety problems and issues  
• Cultural and archeological areas uncovered | Community consultation and participation; early surveys; use LARF | EMG1 | At cost |
| 1. Earthworks  
a. Cut & Fill Material in Flat Areas  
b. Cut & Fill in Steep, Hilly and Unstable Areas  
c. Earth movements close to settlements/villages  
d. Borrow Pits  
e. Dust and Noise Control  
f. Quarry Operation  
g. Stone Crushing Plants | • Scouring of valley slopes resulting in landslide; Damage to and removal of trees, vegetation and topsoil; Disruption to natural drainage systems; Surface water pollution and increased sedimentation  
• Disruption of natural land contours and vegetation leading to erosion; Disturbance in natural drainage patterns; ponding, water logging and water pollution. Removal of vegetation cover.  
• Vibrations, noise and dust generation, traffic and safety problems and damage to roadside vegetation.  
• Disturbance of natural land contours; Accelerated erosion and sedimentation; landslides and slope instability; noise vibration and dust; accidents | a. Limit spoils, not into sensitive areas, stockpiles to be secured to be stable. See EMG1.  
b. Use conventional civil engineering structures to contain fill material eroding, clear drainage  
c. Refer to b; Spoil to be discarded after consultation with community; Bare areas to be vegetated  
d. Use of sand bags or sediment traps to prevent the siltation of rivers and small streams.  
e. Area to be drained, and vegetation to be encouraged after ceasing of activities; consultation with communities.  
f. Regular dust suppression on roads and on quarry area; Equipment with mufflers and activity, only during normal working hours  
g. Site to be stable with proper drainage of rainwater, order of activities to avoid traffic accidents | EMG1 | EMG 2 | EMG 2 | EMG 5 | EMG 6 | EMG 7 | 5,000.00 | 5,000.00 | 2,000.00/wk | At cost | At cost | At cost |
2. **Pavement Works**
   - **a. Base and Sub Base Construction & Regravelling**
     - Vibrations, noise and dust generation, traffic and safety problems and damage to roadside vegetation.
     - Similar measures as in 1e; Stockpiles to be covered and used immediately; avoid huge storage so as to minimise run off into creeks and rivers.
     - EMG 6 2,000.00/wk

3. **Drainage Works**
   - Scouring of valley slopes resulting in landslide; Damage to and removal of trees, vegetation and topsoil; Disruption to natural drainage systems; Surface water pollution and increased sedimentation.
   - Measures to be that of ensuring less spoil to be in the way of drains, properly constructed and allows for water to flow and flushed out sediments. Similar measures as in 1 b.
   - EMG 2 5,000.00

4. **Bitumen Works**
   - **a. Asphalt Plants and Preparation Area**
   - **b. Bitumen overlay**
     - Release of bitumen into the environment and runoff of bitumen into surface water causing water pollution; deforestation resulting from the use of fuel wood to heat bitumen; air pollution, smell
     - Improper use of bitumen drums e.g. as drinking water storage containers. Adverse health impacts of solvents and chemicals
     - a. Proper siting of plant away from settlement or village, use asphalt only on fine days; bitumen drums in bunded area; clean up of areas after activity.
     - b. Similar to a: Ensure proper preparation for gravel layout and application for bitumen
     - c. Educate the users of old bitumen drums about the dangers of using these as drinking water storage drums.
     - EMG 11 2,000.00
     - EMG 11 2,000.00

5. **Erosion Protection**
   - Unplanned settlements and hamlets along road corridor; uncontrolled exploitation of natural resources in the new project areas; increased traffic speeds along the road with likely accidents
   - Ensure all roadwork are contained and spoil carted to designated area, not close to creeks or wetlands; issues discussed with authorities on illegal hamlets and settlements.
   - EMG13 At cost

5. **Campsite Management**
   - **a. Equipment Mobilisation**
   - **b. Labour Force Mobilisation**
   - **c. Labour camps**
   - **d. Base (Construction) camps**
     - a. Vibrations, noise and dust generation, traffic and safety problems and damage to roadside vegetation.
     - b – d) External labour force with different attitudes; introduced STD and HIV; Deforestation, use of fuelwood; competition for scarce natural resources; pollution of surface and ground water from unsanitary waste disposal practices; illegal hunting and fishing by camp residences.
     - a. Similar to 1c; Equipment (including aggregates, spoils, fill materials) to be well contained on transport so as not to be an hazard to people and the environment
     - b. Maximise local labour, provide appropriate training and familiarisation for outsiders; rules and regulations enforced.
     - c. Similar to b: Camps away from villages; not impact on local drinking water; good waste management practices.
     - EMG 6 2,000.00/wk
     - EMG 16 5,000.00
     - EMG 16 10,000.00 (lump sum to remove camp)
<table>
<thead>
<tr>
<th>e. Material transport</th>
<th>e. Vibrations, noise and dust generation, traffic and safety problems and damage to roadside vegetation.</th>
<th>d. Good waste management practices; buildings properly constructed with well contained storage areas; removal of waste at the end of activity and clear up area.</th>
</tr>
</thead>
<tbody>
<tr>
<td>f. Increased Traffic and Operating Speeds</td>
<td>f. Increased traffic speeds along the road with likely accidents</td>
<td>e. Similar to 1 a: Material could mean aggregates or chemicals or other equipments, that must be well contained so as not to impact on the environment.</td>
</tr>
<tr>
<td>g. Explosives, Combustibles and Toxic Material</td>
<td>g. Fire and explosive hazard; ground and surface water pollution from pollution runoff; infiltration from spills and/or leaks; improperly discarded oils and lubricants</td>
<td>f. Measures outlined in 1e; 2a; 5a and 5e. Road improvement will mean reduced driving times and appropriate signs and speed humps to be in place during construction phase.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>g. Management of storing hazardous materials in marked areas to avoid possible impacts within the camp and to humans.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d. Good waste management practices; buildings properly constructed with well contained storage areas; removal of waste at the end of activity and clear up area.</td>
</tr>
</tbody>
</table>

| EMG 13 | At cost |
| EMG 6 | 2000.00/wk |
| EMG 13 | At cost |
| EMG 20 | 3,000.00 for 10m X 10m area bunded |
7.3. Supervision of Environmental Mitigation

The main objective of environmental supervision is to ensure that the recommended mitigation measures are implemented as required by the contractor. In road rehabilitation projects, environmental supervision is often part of the standard construction supervision. Figure 6 presents an environmental management structure for RMRP II AF. This is based on the current arrangements under the RMRP II and similar supervision is anticipated to continue.

The Project Director (World Bank) is responsible for the overall administration of the project. He coordinates with the Employer Project Manager (EPM) at the DoW Headquarters. In the provinces, the Provincial Works Manager will oversee with responsibilities directed to the Project Engineer who will liaise with the contractor. The Project Engineer is responsible for the day to day supervision, quality control, contract management, management meetings and certifying payments for sub projects. Any environmental queries or concerns can be addressed to the Project Director who will liaise with the Environmental Manager to attend to them. The project engineer will communicate with the Environmental Manager who with the two officers, will undertake quarterly or six monthly inspections. For the social and land acquisition associated concerns, this will be undertaken by the contractors Public Relations Officer who will liaise with the project engineer and the LARF will be followed.

The EMGs in Table 1 and Annex 2 of the ESMP provides detailed monitoring and supervision recommendations for the engineer in charge of supervision. By including clauses into a contract document and specific items in the Bill of Quantities forming part of the contract, monitoring and supervision of the application of mitigation measures is automatically included in the normal engineering supervision of the contract on a day-to-day basis. Also in Table 1 are estimated costs for some of the

![FIGURE 6: RMRP II AF COORDINATION STRUCTURE - DOW](image-url)
EMGs and not all have estimates attached. At this stage, this is only a guide in determining the mitigation costs within the sub project.

7.4 Environmental Monitoring

A very important aspect of environmental management is environmental monitoring. Monitoring has two aspects. The first and simplest is compliance monitoring, which basically ensures that mitigation measures are properly implemented, while the second is impact monitoring. Here in this ESMP, there will be only compliance monitoring. A field monitoring checklist is in Annex 1.

This is part of the supervisory activities discussed above and is generally the one that most monitoring programs focus on. Detailed monitoring recommendations are included in Annex 2, including suggested parameters and indicators. It is envisaged that the RMRP II AF will feature compliance monitoring and upon the completion of work activities, there will be minimal monitoring required in comparison with other projects such as mining, which require constant compliance monitoring.

7.5 Public Consultation

Public consultations will be carried out for each of the road projects under RMRP II AF. These consultations will be documented properly and submitted to the World Bank for disclosure. Copies of this report will also be made available to DOW Provincial Civil Engineers and the environmental manager. Sufficient copies will be made available so that a copy can be supplied to the relevant Provincial and Local Level Government (LLG) authorities. For the Milne Bay and Madang provinces, public consultation was carried out from 2 – 5/10/13 and this is being documented to be attached to the LARF. A separate report on the consultation will be available of the World Bank Info shop. Overall, the communities are happy that they will have a sealed road but note safety concerns regarding speeding vehicles. Issues of crop disturbances if any will be done in line with the LARF.

Consultations will take place with local stakeholders to inform them of the project and get their inputs and concerns. Two weeks’ notice is given to the stakeholders prior to the Public Consultation. Stakeholders will be able to access this document in English at the LLG offices and a one-page project brochure in English and Pidgin. Ongoing consultations will also take place throughout the implementation of the project.

7.6 Grievance Mechanism

The RMRP II AF will not require the acquiring of additional land and the sub project will be within the Right Of Way (ROW). However, there is always the possibility of issues that may arise from the implementation of these sub projects. If these issues arise, then a Grievance Mechanism has been set up and is outlined in the Land Acquisition and Resettlement Framework (LARF). Copies of these will be made available to the stakeholders.

The DoW Provincial Unit will receive and document issues and concerns that the project beneficiaries and communities living near the project area and key areas may report in relation to the project and its...
implementation. Resolution of the issues and concerns will be undertaken expeditiously so as to minimize any impacts that may affect the project implementation. In the Milne Bay province, contact for any grievance can be directed to:

- Mr. Paul Sarr – Provincial Works Manager or Mr. Amayang Wintowe – Provincial Civil Engineer Ph: 6410629 Mob: 73124932

The following process will be followed to address the issues and concerns.

- A formal notice/complaint by the affected person/community is filed. For minor complaints such as excessive dust, noise, safety violation, the person assigned to supervise environment and social aspects by the Supervising Engineer will respond within 24 hours of lodging the complaint and a resolution will be conveyed to the AP within 48 hours. For more substantial complaints about land occupation, damage by contractor’s equipment, drainage issues, etc. the Supervision Engineer will respond within 24 hours and set up further discussion/meetings with the complainant to reach a satisfactory resolution acceptable to all parties within seven days. For land issues, the timeframe may be longer.

- The DoW Project Unit (PU) will maintain a register where all complaints are logged by: date, name and contact address and details of the complaint. A duplicate copy of the register entry will be given to the AP for their record. The AP may, if so desired, discuss the complaint directly with DoW PU or its representative at a mutually convenient time and location. If the complaint of the AP is dismissed, the AP will be informed of his/her rights in taking the complaint to the next step. However, every effort will be made to resolve the issue to the mutual satisfaction of both the parties.

- Should the AP be not satisfied with the decision of the DoW PU, the AP may file a written complaint with the Local Level Government or the Provincial Lands Officer if the issue relates to land and compensation for crops and trees. The duration for the investigation and resolution of the complaint will vary and is dependent on the investigating officer of the Local Level Government or Provincial Lands Office.

- Should the AP still be not satisfied with the decision of the Local Level Government or Provincial Lands Office, the AP may then take the grievance to the PNG Judicial System. This will be at the AP’s cost, but if the court shows that the Local Level Government or Provincial Lands Office has been negligent in making their determination, the AP may seek costs.
Annex 1: Checklist of Possible Impacts For Road and Bridge Projects and Other Infrastructure

These checklists will guide the selection of impacts for road and bridge projects on the biophysical and social environments.

Evaluate the likely impact of the project on the following:

- Landscape
- Local ecosystems
- Natural resources (food and other)
- Archaeological or other cultural sites
- Local water sources, groundwater
- Describe what action has been taken by the PNG Government regarding land acquisition and compensation, and crop compensation for this project. Comment on any impact these issues have on the project.

Evaluate what the impact of the project will be on:

- Present land use
- Present access/transport in the area
- Local income generation
- Land/ sea tenure and use
- Access by outsiders to the area, and by local communities in and out of the area
- Population and population change
- Existing services (schools, medical aid posts, transport, water supplies, waste disposal facilities)

Evaluate the off-site impacts the project will have (on rivers or areas downstream, and on quarries or other materials extraction areas, and on the need for waste disposal areas).

- Will traditional cultural (men's or women's) or archaeological sites be affected by the project? (Note: If the area is culturally or archaeologically sensitive, as outlined in
the guidelines, you may need a survey carried out to locate such sites before you start work). If so what steps will be taken to protect or salvage information from the sites?

Note in addition:

For projects in forested areas:

- Is the local vegetation mainly lowland forest, montane forest, mangrove forest?
- Will primary forest resources be destroyed⁴?
- Are there important species, habitats or ecosystems in the area to be affected (immediately or 'off site')? or is the area ecologically sensitive or fragile? [Note information in the guidelines, and check at a broad scale PNGRIS, CNA maps, or with DEC for WMAs]
- Are any unmodified forested areas locally important hunting or tambu areas?
- Will you remove any vegetation? or leave any surface bare? If so, what will be the impact of clearance, and how will you prevent sediment from burying vegetation, entering streams or reaching the shoreline?
- Can construction areas be placed to avoid disturbing local habitats?
- Will the forest landscape be altered (e.g. by rock or soil removal, spoil dumping, timber removal)?

For projects in coastal areas or on small islands

- Will the project affect beaches, coral reefs, seagrass beds, mangroves, wetlands or swamps (immediately, or through its 'downstream' effects)? Will mangrove regeneration be necessary?
- Will the project affect wading bird habitats (or other habitats protected by CITES or other treaties)?
- Will the project involve discharge of nutrients or other effluents to the coastal zone, or to coastal streams?
- Are there seasonal patterns of sand movement in the area? How will you ensure your project activities will not restrict that movement, and cause coastal erosion?

⁴ The ADB’s Policy on Forestry, March 1995, does not permit lending where primary forest will be cleared.
Does the project involve the use of coastal bores? If so how will you protect the water source from over-use and saline intrusion?

Will proposed structures be within 50m of the shoreline? Have you taken into account potential sea level rise, and how it may affect your project?

Will construction activities all occur beyond the inland limit of any coastal wetlands or mobile coastal landforms?

Will the project require the use of pesticides or fertilisers? Will petrol or oil or other hazardous chemicals be used? If so how will you prevent them entering the coastal zone?

Will the project involve the extraction of materials from the near-shore area? or disturbance of the near-shore area?

Will the project involve activities which may damage the sea bed?

Will the project affect marine species? fisheries resources? fisheries habitat?

**Impacts on water and air quality (contaminants and pollution controls)**

- Will the project generate waste products (including increased sewage or solid wastes)? Will waste products be disposed of locally? How will sewage be treated? How will solid waste be treated? How will rock or soil waste or chemically contaminated soil be treated?

- Do you have site-specific erosion and sediment control plans for each sector of the project area?

- Will the project or its waste disposal affect the quality of local streams or of the groundwater? What steps are being planned to minimise sedimentation in streams? and contamination of groundwater?

- Will toxic chemicals (including herbicides, tar, oils, paints, other industrial chemicals) be used or disposed of in the project area?

- Will hazardous substances (including large quantities of fuels) be used or stored in the project area? What plans are there to contain these substances? How will fuel, oil, or other hazardous chemicals be delivered, transferred and stored to prevent any leakage into the soil, streams, limestone karst areas or into the coastal zone?

- Will heavy machinery create dust or noise problems, or reduce safety for pedestrians, including children and old people? What plans are there to separate heavy machinery from residential areas? Or to minimise these impacts?
• How will batching areas (for concrete or bitumen) and other construction sites be contained while in use? and cleaned and rehabilitated after use?

Environmental health and natural and construction hazards

• Will there be a need to repair environmental damage (especially after the project ceases) or providing environmental protection? If so has the cost of that work been built into the project?
  o Will there be ponding of water at the site? What steps will you take for disease vector (especially mosquito) control?

• Is the environment naturally unstable (prone to coastal erosion, within the zone which would be affected by any rise in sea level, in an area of known earthquake or landslip activity, cyclones or severe storms, floods or droughts)? What plans are there to protect the development against these natural hazards? Will the presence of the development cause increased environmental damage should natural hazardous events occur? If so what environmental protection measure will you implement?

• Will any used machinery be brought to the site from other regions, or from another country? If so how will it be cleaned? How will the washing water be disposed of? What steps are being taken to avoid the entry of noxious organisms?

• Are safety measures are in place to protect the workforce? Is the necessary safety clothing/equipment available for all workers? Have they been trained in its use?

• Is there a contingency plan to deal with spills of hazardous chemicals (including oil products) in the project area?

• Are fire-fighting materials, and spill clean-up chemicals (water, sand, detergents, acid, and alkali) available for use at the site?

Special Planning for Bridge Infrastructure Projects

In addition to the impacts which are associated with other infrastructure projects, there are special issues to consider for bridges, wharves and jetties.

For single span no-pile bridges:

• Note all disturbances which will occur, bank vegetation, gardens, levee or straight bank edge. Identify bed and bank sediments clearly as predominantly clayey, sandy or gravelly. Note possibilities for erosion and collapse.

• Identify potential for sediment to enter streams, and methods for control.
• Identify access road requirements and the need for temporary diversions. Consider the physical impacts of these, and proposed methods of rehabilitation.

• Design methods to ensure runoff does not drain onto garden land, cause flooding of garden land, or that containment structures do not block existing watercourses to garden land.

• If there is a need for temporary constructions in, or diversions of rivers, all possible impacts in terms of bank erosion and sediment accumulation later dispersal should be considered.

• In alluvial landscapes, it is likely that archaeological materials will occur on levees or old terrace remnants, and their management should be considered.

Additionally for longer bridges:

• The impact of piles on turbulence, sediment movement and deposition, and consequent bank and stream bed erosion should be taken into account in planning.

• If drilling in river beds, methods are needed to control suspended sediments, ensure there are no damage to water tables, and no leakage of saline or acid sulphide/sulphate subsoil materials.

• For piles near river banks, there should be controls on bank stability, and an assessment of the upstream and downstream impacts of any proposed river training structures.

• Determine whether any temporary construction works are required in the river for drilling and pile-driving works. If so what will be the impact of these works on flows, on potential erosion, and what steps will be taken to rehabilitate the river section when the works are completed?

As for roads:

Sources of fill and concrete aggregate should be assessed as for road materials. Issues of noise, safe pedestrian access across the bridge, and along the bank, nature and slopes of batters, revegetation of batters and bank access routes should be considered as in road projects. In limestone karst areas, designs should avoid any contaminants entering sinkholes, as sub-surface hydrologic systems are generally unknown.

For construction areas there should be control and containment methods for all wastes, including sewage, and subsequent removal of solid waste to an appropriate disposal site, and rehabilitation of the site. Methods of dealing with any hazardous chemicals, including fuel and oils, the management of cement
batching plants including their location, and methods to control noise, dust, and runoff should be addressed.

**Around the bridge and streams**

- Evaluate the stream channel (clayey, sandy, gravelly):
  - If sandy or gravelly, describe methods which will be used to stabilise the bank at the construction site.
  - If clayey, explain the methods which will be used to prevent bank erosion, and consequent downstream changes, and minimise sediment induced turbidity.
  - What are the requirements for gravel or aggregate? What quarry sources will be used? [A quarry management plan may be needed].

- Evaluate methods which will be used to contain, and dispose of wastes at the construction site.

- Describe the vegetation at the bridge site.

- What animals are known to occur in the area? Include fish and other aquatic organisms, and migratory birds.

- Are there habitat corridors along the river bank which need to be protected? What methods will be used to protect these ecosystems or habitats?

- What is the land/water use in the immediate area? What resources of local or traditional importance will be affected by the construction? What arrangements have been made/will be made with local communities to manage the impacts on these resources?
Annex 2: Detailed Environmental Management Guide
EMG 1: LAND ACQUISITION, CLEARING OF RIGHT OF WAY, RESETTLEMENT AND SOCIAL ISSUES

Activities: Acquisition of and clearing of the right-of-way (ROW), road operation

Potential Impacts:
- Dissatisfaction on the part of affected communities with indemnities offered
- Disturbances from construction activities,
- Safety problems
- Areas of historical or archaeological significance could be discovered and affected
- Other cultural areas (cemeteries) affected

Environmental Mitigation:

Recommended Measures:
- Advise the local community of project plans in advance and wherever possible involve them in planning. The road should be designed so as to minimise affected properties. All land acquisition and other activities within EMG1 should be guided by the LARF.

Surveys shall be conducted as early as possible during feasibility in order to ensure that all affected people are identified and that negotiations commence.

Surveys shall identify any other infrastructure, such as water supplies, schools, and other infrastructure that will be affected or lost as a result of the project.

Adequate compensation shall be provided to all affected landowners according to standardised procedures and agreed-upon prices, in accordance with the accepted practice of the government and LLG and LARF.

If possible, identify suitable land for resettlement if this is necessary.

Identify culturally sensitive areas. If a historical or archaeological site is discovered during construction, all activity shall stop until the appropriate authorities have been notified.

All required safety measures shall be implemented. This includes occupational health and safety requirements on construction sites and in work camps.

Maximise the opportunities for local people on the project. This could include hiring of day labour for gravel crushing, maintenance of revegetation areas, and any other activities.

Communities and landowners shall always be consulted on the disposal areas, removal of trees and other vegetation, and stockpiles for spoil material.
Inform communities of grievance mechanisms available so that they can voice any concerns that they have. Grievances should be dealt with expediently.

Implementation:

Project Design: The road shall be designed so as to minimise the need for property acquisition and resettlement. Widening on only one side shall be undertaken where appropriate to minimise affected properties.

The road shall be designed with all required measures to ensure a safe environment. This shall include the appropriate road signs, pull-off bays for buses and pedestrian crossings.

Contract Clause: The contractor shall comply with the environmental mitigation measures specified in this ESMP and the Environmental Impact Assessment Guidelines for Papua New Guinea.

Bill of Quantities: The cost of compliance with the above requirements shall be at the contractor’s own expense and shall be included in the contractor’s rate for supplying materials.

Supervision Note:

Monitoring: The engineer in liaison with the DOW PMU and the Provincial Lands Office shall monitor the following parameters:

Parameters: Indicators:

The process of land acquisition and compensation: Ensure that affected parties are satisfied and receive payments promptly (before commencement of works)

Legal requirements: Ensure that legal requirements are being fulfilled.

Grievances Ensure grievances are dealt with promptly.
EMG 2: EARTH MOVEMENTS RELATING TO CUT AND FILL ACTIVITIES IN FLAT AREA

Activities: Movement and disposal of surplus construction material, cut material, drainage cleaning debris and landslide mass

Potential Impacts: Scouring of valley slopes resulting in landslides
Damage to and removal of trees, vegetation and topsoil
Increased erosion and slope instability
Destruction of private property, crops and irrigation systems
Disruption to natural drainage systems
Surface water pollution and increased sedimentation
Carelessly dumped spoil is aesthetically displeasing
Disruption to pedestrian walkways and local market areas

Environmental Mitigation:

Recommended Measures: The first priority shall be to use excess material in the construction works. Discarded materials that cannot be used in construction and fill may, if suitable, be used for bio-engineering measures. All other excess material shall be disposed of in locations or landfills that will not promote instability and result in destruction of property, vegetation, irrigation and drinking water supply systems. Where possible, spoil should be used to backfill quarries or waste disposal pits before they are revegetated. Care shall be taken to avoid disposal near wetlands or in areas that will inconvenience or deprive local residents of their livelihood. Acidic and saline spoil shall not be spread on agricultural land. Spoil can be disposed of in designated areas locally after discussions with landowners or community groups. If so a clear level site must be prepared on which the spoil can be dumped. Close to market areas, discussions must be held with the local community and pedestrian walkways should not be blocked off.

Ground disturbance shall be phased so that it is limited to areas of a workable size.

Construction should be phased so that large areas of soil are not laid bare during the wet season. If the spoil heap or stockpile containing fine sediments is to remain bare for long in a high rainfall area, it should be covered to prevent erosion and sediment runoff. Exposed areas shall be planted with suitable vegetation at the earliest opportunity in order to minimise the time surfaces remain bare.

Spoil material may be discharged to a landfill that is constructed using a series of small spoil benches to prevent slope overloading. If feasible, spoil material shall be disposed of in an abandoned quarry or borrow pit as a means of restoring the natural contour. The stockpile or spoil heap location should be chosen to avoid
blocking surface runoff or drainage lines. If this is not a ridge crest or flat plain site, the base should be levelled and contained. The stockpiles or spoil heaps must be subject to stability calculations to safeguard against major slips occurring.

**Implementation:**

**Project Design:** Mass balance techniques shall be employed in designing cut and fill along the road alignment. Safe tipping areas for surplus mass shall be identified in the project design specifications and plan drawings.

**Contract Clause:** The contractor shall comply with the environmental mitigation measures specified in this ESMP and the Environmental Impact Assessment Guidelines for Papua New Guinea.

**Bill of Quantities:** A separate line item shall be included for excavation and environmentally safe disposal of xx m³ of spoil and excess material resulting from excavation of new earthen drains and filled up existing drains and culverts, cleared landslide debris and other estimates of excess materials. For any revegetation activities, the Bill of Quantities shall include a clause for partial payment of 50% to the contractor when planting is complete. The remaining 50% shall be paid once the seedlings have taken root or for two growing seasons. Supervision Note: The engineer shall identify environmentally sound tipping areas in addition to those specified in the project design specifications. The engineer shall consult with local residents when identifying new tipping areas. The engineer shall also ensure that the contractor and construction work force are aware of and comply with the disposal restrictions.

**Monitoring:** The engineer shall monitor the following parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability of spoil area:</td>
<td>Presence of slides, scouring, erosion or destruction of property in valleys, disruption of water supply systems and irrigation systems, complaints from local residents.</td>
</tr>
<tr>
<td>Vegetative cover is maintained.</td>
<td>Survival rate of plants. Watchman on site.</td>
</tr>
</tbody>
</table>
EMG 3: EARTH MOVEMENTS RELATING TO CUT AND FILL ACTIVITIES IN STEEP, HILLY OR UNSTABLE AREAS

Activities: Cut and fill operations in steep, hilly or unstable areas

Potential Impacts:
- Accelerated erosion and sedimentation
- Slope instability and landslides
- Destruction of vegetation and property
- Siltation of surface waters
- Water pollution

Environmental Mitigation:

Recommended Measures: Exposed slopes shall be protected using conventional civil engineering structures in conjunction with bio-engineering techniques. Slopes shall be planted with appropriate vegetation as soon as possible using previously stockpiled topsoil. The planting on slopes shall follow recommendations made in standard bio-engineering references.

In the short term, all areas susceptible to erosion shall be protected by either temporary or permanent drainage works. Measures shall be taken to prevent ponding of surface water and scouring of slopes. Newly eroded channels shall be backfilled and restored to natural contours. Drains and culverts shall be designed to remove all runoff water without scour. On steep slopes culverts may need to be stepped using rock slabs or gravel gabion baskets. Site plans should include all drainage plans suggested for construction sites.

Control structures shall be installed at the onset of construction. This may need to include silt traps along the flow lines.

If the road is on loose or unstable rock, the batters will need to slope gently, and high batters will need steps or horizontal benches. Revegetation will be necessary.

During construction, vehicles should be kept on defined tracks.

Major earth movement operations shall be limited to the dry season.
Implementation:

Project Design: Exposed slopes shall be stabilised using bio-engineering techniques specified in the design specifications and plan drawings.

Contract Clause: The contractor shall comply with the environmental mitigation measures specified in this ESMP and the Environmental Impact Assessment Guidelines for Papua New Guinea.

Bill of Quantities: The surface area (xx m²) of exposed slopes to be stabilised and the types of vegetation to be planted shall be listed. It shall be stated that the plantations shall be maintained for a period of 12 months including watering. For any revegetation activities, the Bill of Quantities shall include a clause for partial payment of 50% to the contractor when planting is complete. The remaining 50% shall be paid once the seedlings have taken root or for two growing seasons.

The contract for replanting and maintaining the trees or vegetation can be awarded to local people or an NGO if at all possible.

Estimated costs for environmental mitigation measures is K5,000.00

Supervision Note:

Monitoring: The engineer shall monitor the following parameters:

Parameters: Indicators:

Vegetative cover is maintained: Survival rate of plants

EMG 4: EARTH MOVEMENTS IN THE VICINITY OF SETTLEMENTS ALONG THE ROADSIDE (SEE EMG2)
EMG 5: BORROW PITS

Activities: Identification, operation and closure of sites for the extraction of loose material other than stone

Potential Impacts: Disruption of natural land contours and vegetation resulting in accelerated erosion

Disturbance in natural drainage patterns, ponding and water logging and water pollution

Environmental Mitigation:

Recommended Measures: Materials location shown in design documents are provided as a guide only. It is the contractor’s responsibility to verify the suitability of all material sources and to obtain the approval of the engineer. Pits shall not be located in natural areas or drainage areas.

The surface of borrow pits shall be minimised. The clearing of trees and vegetation shall be discouraged. Stripped material shall be stored so as not to disrupt natural drainage and shall be protected so as not to erode into surface waters. Topsoil shall be stored in specific piles and the utilisation of excess topsoil shall be discussed with local residents. The ponding of surface waters shall be prevented through adequate drainage.

The site is to be restored after construction activities have ceased. The site shall be left in a stable condition without steep slopes. Stripped materials shall be spread to pre-extraction contours to promote natural percolation, re-growth of natural vegetation and natural drainage. In very steep areas, used borrow areas shall be restored with adequate slope and cross drains at regular intervals to facilitate drainage.

The contractor shall prepare a site revegetation plan. Where possible the plan should involve local groups to provide materials and for implementation. The plan should include the names of contact landowners and/or community groups, summarised discussions of and decisions on what will be planted, a list of seedlings/stock to be provided and by whom, an agreed price and an agreement on planting and tending.

All compacted ground surfaces shall be raked or loosened. Site restoration work shall be conducted before equipment is allowed to leave the site. The engineer shall report in writing that the necessary environmental restoration work has been adequately performed before acceptance of the works.

If trees and vegetation has to be removed, then the cost of replanting and maintenance for a 12-month period shall be indicated in the Bill of Quantities. Contracting for replanting and maintaining of the trees and vegetation can be awarded to local people.
Implementation:

Project Design: Using the site criteria specified under the requirements above, the consultant shall specify borrow pit locations in the design specifications and on plan drawings. If additional borrow pits are required after construction is started, the contractor shall use the above criteria to select new pits, with the written approval of the engineer.

Contract Clause: The contractor shall comply with the environmental mitigation measures specified in this ESMP and the Environmental Impact Assessment Guidelines for Papua New Guinea.

Bill of Quantities: The cost of compliance with the above requirements shall be included in the contractor’s rate for supplying materials or priced in a separate item for ‘Environmental Management and Restoration of Borrow Pits’ line. For this line item, the consultant will prepare technical specifications for which the contractor will include a cost estimate. For any revegetation activities, the Bill of Quantities shall include a clause for partial payment of 50% to the contractor when planting is complete. The remaining 50% shall be paid once the seedlings have taken root or for two growing seasons.

Supervision Note: The engineer shall make sure that the borrow pits are operated and closed according to the requirements. The engineer shall ensure that local residents are consulted if material is extracted in areas where local people own land or have activities.

Monitoring: The engineer shall monitor the following parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper site location</td>
<td>Review location to ensure that the quarry is properly located and that material removal is being done in approved areas only</td>
</tr>
<tr>
<td>Implementation of erosion control</td>
<td>No presence of fresh gullies or increased turbidity, no other evidence of erosion</td>
</tr>
<tr>
<td>Proper site closure</td>
<td>Natural contours and vegetation restored.</td>
</tr>
</tbody>
</table>

**EMG 6: DUST AND NOISE CONTROL**

Activities: Earth movements, construction of base and sub-base course, regravelling, material transport, equipment mobilisation, establishment and operation of stone-crushing plants

Potential Impacts: Vibrations, noise and dust generation, traffic and safety problems and damage to roadside vegetation.

Environmental Mitigation:
Recommended Measures: The contractor shall ensure that road surfaces and work areas are sprayed with water during construction in dry and windy periods to control dust generation. Wind breaks or fences shall be installed around cement-batching plants and stone-crushing plants as deemed necessary, and quarry loads or load fill loads being carried in open trucks shall be sprayed with water.

Equipment used shall be as modern and well-maintained as possible (with mufflers where appropriate) to control noise pollution. Noise-generating activities shall be carried out during normal working hours. Local residents shall be advised of any planned blasting or other unusual noisy activities.

Mobilisation of equipment shall be well coordinated during transportation to site and authorities and local residents be advised by way of prior announcement and by using escort vehicles with indicator lights.

Implementation:

Project Design:

Contract Clause: The contractor shall comply with the environmental mitigation measures specified in this ESMP and the Environmental Impact Assessment Guidelines for Papua New Guinea.

Bill of Quantities: The cost of compliance with the above requirements shall be at the contractor’s own expense and shall be included in the contractor’s rate for supplying materials.

Current Rates for Dust Control:

For the 54 km section; 2hrs per day and 4 times a week plus fill time; PNGK 2000 per week

Supervision Note:

The engineer shall monitor the following parameters:

Parameters: Indicators:
Compliance with requirements: Noise and dust control procedures implemented.

No visible dust generation during construction phase and acceptable noise levels

EMG 7: OPERATION OF EXISTING QUARRY SITES (TERRESTRIAL AND RIVER)

Activities: Identification, operation and closure of sites for the extraction of stone and aggregate

Potential Impacts: Disruption of natural land contour and vegetation

Accelerated erosion and sedimentation

Landslides and slope instability
Disruption to natural drainage patterns
Noise, vibration and dust generation
Increased accidents
Impact on local economy

Environmental Mitigation:

**Recommended Measures:** Quarry site locations identified in the design should only be used as a guide. The contractor is responsible to ensure the suitability of the sites proposed and to obtain approval from the engineer.

Sites should be located away from population centres, drinking water intakes and streams and cultivated land. They should be located in structurally stable areas regardless of distance from the construction site.

Vegetation clearing should be minimised. Stripped material should be kept for site rehabilitation. Ditches should be dug to facilitate the runoff of water and control erosion. Ponding should be controlled by temporary drains released into natural drainage networks. The contractor should clearly state the methods which will be used for containment of sediment-loaded runoff and contaminants.

The contractor should initiate and undertake activities in the quarry during the day.

Measures should be taken to reduce dust emission from the loads, to avoid possible loss of loads and to control any accidents as a result of the more frequent traffic of heavy vehicles in the vicinity of the quarry site.

The contractor shall ensure that surrounding areas are cleared of people well before any blasting and that a warning siren is used.

The quarry site should be restored after project completion. It should be left in a stable condition without steep slopes. Previously stored stripped material should be spread to approximate natural contours to promote natural revegetation. The quarry should be drained and no stagnant water should remain.

Use of aggregate materials should be priced at favorable market rate and payment to local community owners should be made promptly.
Environmental Mitigation:

Recommended Measures: The contractor shall prepare a site revegetation plan. Where possible the plan should involve local groups to provide materials and for implementation. The plan should include the names of contact landowners and/or community groups, summarised discussions of and decisions on what will be planted, a list of seedlings/stock to be provided and by whom, an agreed price and an agreement on planting and tending.

In limestone areas, steps should be taken to avoid contamination of underground drainage systems. In case of the presence of burial sites, there should be a plan developed to facilitate the recovery and re-burial of human remains.

River bed extraction sites and quarry site access roads shall also be restored. Exposed areas shall be planted with suitable vegetation at the earliest opportunity. Areas to be quarried and the removal sequence shall be identified. The channel and bank stability at the site shall be ensured. Methods which will be used to protect the channel banks, to avoid discontinuity in the riverbeds, and to minimise erosion impacts and sediment loading shall be described.

Extraction of rocks, gravel and sand from small rivers and streams shall be discouraged. If necessary, extraction points shall be spread out along the length of the river to minimise disruption in river flow and to prevent instability. The depth of material removal at any one location shall be limited and extraction areas shall be selected where there is little or no fine material. Local residents and water users shall be consulted to ensure that irrigation intakes, domestic use and local fishing are not disrupted.

Implementation:

Project Design: Using siting criteria specified under the requirements above, the consultant shall designate quarry locations in the design specifications and on plan drawings. If additional quarries are required after the construction is started, then the contractor shall use the above criteria to select new quarry sites, with written approval of the engineer.

Contract Clause: The contractor shall comply with the environmental mitigation measures specified in this ESMP and the Environmental Impact Assessment Guidelines for Papua New Guinea.

Bill of Quantities: The cost of compliance with the above requirements shall be included in the contractor’s rate for supplying materials or priced in a separate item for ‘Environmental Management and Restoration of Quarry Sites’ line. For this line item, the consultant will prepare technical specifications for which the contractor
will include a cost estimate. For any revegetation activities, the Bill of Quantities shall include a clause for partial payment of 50% to the contractor when planting is complete. The remaining 50% shall be paid once the seedlings have taken root or for two growing seasons.

Estimated costs for environmental mitigation measures is K1000 per month.

Supervision Note: The engineer shall make sure that the quarries are operated and closed according to the requirements. The engineer shall ensure that local residents are consulted if material is extracted from riverbeds.

Monitoring: The engineer shall monitor the following parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Proper site location</td>
<td>Review location to ensure that the quarry is properly located and that material removal is being done in approved areas only</td>
</tr>
<tr>
<td>Implementation of erosion control</td>
<td>No presence of fresh gullies or increased turbidity, no other evidence of erosion.</td>
</tr>
<tr>
<td>Proper site closure</td>
<td>Natural contours and vegetation restored.</td>
</tr>
<tr>
<td>Safety</td>
<td>During blasting, ensure that adequate warning signals are being used.</td>
</tr>
</tbody>
</table>

**EMG 8: ESTABLISHMENT AND OPERATION OF STONE CRUSHING PLANTS** (refer to EMG 6 & 7)

**EMG 9: CONSTRUCTION OF BASE OR SUB – BASE COURSE, REGRAVELLING** (refer to EMG 6)

**EMG 10: DRAINAGE WORKS** (refer to EMG 2)
EMG 11: ESTABLISHMENT AND OPERATION OF ASPHALT PLANTS OR ASPHALT PREPARATION AREAS

Activities: Location, Preparation and application of bitumen compound to road surfaces

Potential Impacts: Release of bitumen into the environment and runoff of bitumen into surface waters causing water pollution

Deforestation resulting from the use of fuel wood to heat bitumen

Air pollution, smell

Environmental Mitigation:

Recommended Measures: The contractor shall use bitumen emulsion. Fuel wood shall not be used for heating bitumen.

Asphalt batching plants shall be located at least 300-500m downwind of any settlements or inhabited areas and at least 150 m from any water bodies, streams or rivers.

Bitumen shall not be applied during strong winds and rains. No bituminous materials shall be discharged into side drains, nearby trees, vegetation and private property shall be protected during bitumen spraying work.

Oil and bituminous products should be stored at a contained location away from natural drainage areas.

Bitumen drums shall be stored in designated locations and not scattered along the road. After construction, the contractor shall ensure that the bitumen preparation area is properly cleaned up and that all wastes are properly disposed (see environmental mitigation requirements for Base Camps relating to wastes). During site clean-up, the contractor shall burn all spilled fuel oils.

Implementation:

Project Design:

Contract Clause: The contractor shall comply with the environmental mitigation measures specified in this ESMP and the Environmental Impact Assessment Guidelines for Papua New Guinea.

Bill of Quantities: Bitumen emulsion shall be specified in the materials to be supplied by the contractor.

Estimated costs for the bunding and fencing of bitumen drums is K2,000.

Supervision Note:

Monitoring: The engineer shall monitor the following parameters:
Parameters: Compliance with requirements: No use of fuelwood, proper management of site.

**EMG 12: BITUMEN OVERLAY (refer to EMG 11)**

**EMG 13: PROTECTION OF NATURAL AREAS AND SENSITIVE ECOLOGICAL SITES**

Activities: Increased access as a result of new road operation, increased traffic and operating speeds

Potential Impacts: Unplanned urbanisation and settlements

Uncontrolled exploitation of natural resources in the new project area

Increased traffic speeds along the road with likely accidents

Environmental Mitigation:

Recommended Measures: Identify natural areas, particularly environmentally sensitive or fragile areas, locate optional construction sites away from them. Ensure that project personnel are aware of sensitive areas location and are kept away from them. If the project must encroach onto, or pass close to these areas, construct temporary fences or permanent bunds or trenches to confine machines and activities. Use geotextiles or matting to minimise mechanical construction activities in wetlands.

For roads approaching or encroaching on mangrove areas or other wetland areas, ensure that adequate care is taken during construction to minimise sedimentation. This includes proper spoil disposal (see recommendations on erosion control) and careful construction of drainage structures. The road should be far enough away from the wetland area to ensure that there will be no changes to the surrounding water table. If it is expected that the road may have an effect on the water table, the existing alignment shall be altered accordingly in order to minimise this effect.

For roads approaching legally-protected areas, ensure that the issues have been discussed with the appropriate government agency and that they are aware of the potential long-term impacts.

Appropriate road signs with speed limits should be placed along roads and awareness exercise should be carried out in the communities along the road side.

Implementation:

Project Design: The design shall ensure that the road alignment does not traverse sensitive areas.
Contract Clause: The contractor shall comply with the environmental mitigation measures specified in this ESMP and the Environmental Impact Assessment Guidelines for Papua New Guinea.

Bill of Quantities: The cost of compliance with the above requirements shall be at the contractor’s own expense and shall be included in the contractor’s rate for supplying materials.

Supervision Note:

Monitoring: The engineer shall monitor the following parameters:

<table>
<thead>
<tr>
<th>Parameters:</th>
<th>Indicators:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance with requirements:</td>
<td>Sensitive areas avoided or measures taken to avoid impacts</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Baseline water quality to be established prior to commencement of works. This will be undertaken in all major rivers and tributary crossings to ensure that there is no compensation claim for water impacts from the project.</td>
</tr>
</tbody>
</table>

CAMPSITE MANAGEMENT

EMG 14: EQUIPMENT MOBILISATION (refer to EMG 6)

EMG 15: MOBILISATION OF THE LABOUR FORCE (refer to EMG 16)

EMG 16: ESTABLISHMENT AND OPERATIONS OF LABOUR CAMPS

Activities: Location, management, operation and closure of labour camps

Potential Impacts: Introduction of external labour force with different attitudes resulting in social conflicts

Introduced health problems such as STDs and HIV

Deforestation, excessive use of fuelwood

Competition for scarce natural resources and food supplies

Pollution of surface and groundwater supplies from unsanitary waste disposal practices

Development of temporary camp into a permanent settlement

Illegal hunting or fishing by camp residents in the vicinity surrounding the camp site
Environmental Mitigation:

Recommended Measures: Camps shall not be located near settlements or near drinking water supply intakes. They shall not negatively impact local residents access to drinking water. Camps shall not be located in the vicinity of landslides and floodplains.

The camp shall be operated within a self-sufficient infrastructure. No trees shall be cut for fuelwood, and removal of vegetation shall be minimised. To prevent local inflation and the use of local fuelwood supplies, critical food items and alternate fuel for cooking shall be provided by the contractor. Local people shall be given the option to sell surplus food and fuelwood to the contractor if these items are in surplus and if the extraction of these resources is sustainable during the period of the project. The contractor shall prohibit employees from poaching wildlife and cutting trees. The contractor shall be responsible for the action of their workers.

Water and sanitation facilities shall be provided for employees. In water deficient areas, the contractor shall haul water from a source outside the area. Solid waste shall be managed according to the following preference hierarchy: recycling, burial or burning. Green or organic wastes shall be composted or used as animal food.

Water and pit latrines or septic tanks shall be provided for employees. Use above-water pit latrines or composting toilets or septic tanks at residential construction sites.

Sewage shall be disposed of into hygienic pit latrines or into a septic tank system. In low-lying areas the latrine areas shall be elevated and constructed on a mound of sandy sediment to control seepage into the local groundwater.

The contractor shall recruit, to the maximum extent possible, local persons for the labour force, and shall provide appropriate training where necessary.

The contractor shall inform all new employees on site about the rules and regulations in relation to the camps and the community at large.

Environmental Mitigation: Estimated costs for environmental mitigation measures are K5000.00 to cover transportation and removal of structures and wrecks.

Recommended Measures: At the conclusion of work, all wreckage, rubbish, or temporary works shall be removed or donated to local residents. All temporary structures, including sleeping quarters, cooking and food storage structures and latrines shall be removed to prevent encroachment within the right-of-way. The natural contours of the site shall be restored. The engineer shall report in writing that the camp has been vacated and restored to pre-project conditions.
Implementation:

Project Design:

Contract Clause: The contractor shall comply with the environmental mitigation measures specified in this ESMP and the Site Containment Bund and Site Containment trench requirements in the standard specifications.

Bill of Quantities: The cost of complying with the above requirements shall be at the contractor’s own expense and should be included in the day work rates for labour, or priced in a separate Environmental Management and Restoration (Labour Camp) line item. For this line item, the consultant will prepare technical specifications for which the contractor will include a cost estimate.

Supervision Note: The engineer shall ensure that good relations are maintained between workers and local residents, and shall mediate disputes.

Monitoring: The engineer shall monitor the following parameters:

<table>
<thead>
<tr>
<th>Parameters:</th>
<th>Indicators:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camp is self sufficient in food, water and fuel:</td>
<td>No complaints from residents, local prices remain stable</td>
</tr>
<tr>
<td>Provision of water and sanitation facilities:</td>
<td>Latrines constructed, no disruption in local water supplies.</td>
</tr>
<tr>
<td>Waste disposal:</td>
<td>Upon completion, camp site is neat and clean and no rubbish and materials remain.</td>
</tr>
</tbody>
</table>
EMG 17: ESTABLISHMENT AND OPERATIONS OF BASE (CONSTRUCTION) CAMPS

Activities: Location, operation and closure of base camps.

Potential Impacts: Temporary air and noise pollution from machine operation

Water pollution from storage and use of fuel, oils, solvents and lubricants

Disturbances to local residents

Transmission of vector borne diseases such as malaria

Transmission of HIV/AIDS

Local water usage

Environmental Mitigation:

Recommended Measures: The contractor shall consult with the engineer before locating project offices, sheds and construction plants. Camps shall not be located near settlements or near drinking water supply intakes. If there is unavoidable then alternate water supply to the community should be provided.

No trees shall be cut and removal of vegetation shall be minimised. Construction camp sites should be placed on flat ground.

Water and pit latrines shall be provided for employees. Use above-water pit latrines or composting toilets at residential construction sites.

Sewage shall be disposed of into hygienic pit latrines or into a septic tank system. In low-lying areas the latrine areas shall be elevated and constructed on a mound of sandy sediment to control seepage into the local groundwater.

Construction plant, workshop and storage areas shall be contained using a bund or trench, or isolated from other surface runoff, and cleaned and rehabilitated when construction is complete.

Used oil and lubricants shall be recovered and reused or removed from the site by the contractor. Explosives, oil, petrol and grease shall be managed according to the Hazardous Materials Management of this ESMP. Solid waste should be managed according to the following hierarchy: recycling, burial or burned. This includes paper used in bitumen spraying. All stores within the construction site shall be properly contained. When feasible, local residents shall be encouraged to scavenger non-hazardous solid wastes that are no longer useful to the project.
Within the camp, all waste and empty containers should be emptied to discourage the possible breeding of mosquito larvae.

Within the camp and surrounding community, HIV/AIDS awareness to be given so that this disease is avoided at all costs. Alongside with that is the community awareness given together with the contractor’s public relations officer.

At the conclusion of the project, all wreckage, rubbish or temporary works that are no longer required shall be removed or given to local residents. All temporary structures, including office buildings, shelters and latrines shall be removed to prevent encroachment within the road right-of-way. The natural contours of the site shall be restored. All disabled machinery shall be removed from the project area. Exposed areas shall be planted with suitable vegetation. The engineer shall report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of the works.

Implementation:

Project Design:

Contract Clause: The contractor shall comply with the environmental mitigation measures specified in this ESMP and the Environmental Impact Assessment Guidelines for Papua New Guinea.

Bill of Quantities: The cost of compliance with the above requirements shall be at the contractor’s own expense and shall be included in the day work rates for labour, or priced in a separate ‘Environmental Management and Restoration (Base Camps) line item. For this line item, the consultant shall prepare technical specifications for which the contractor will include a cost estimate.

Cost estimates for removing temporary Camp and facilities:

- Pump out septic tank and dispose sludge, backfill and clean-up: PNG K 1000.00
- Remove containers from site (allowed for two sea containers): PNG K 4000.00
- Demolish/dismantle and remove/dispose buildings: PNG K 5000.00
  Total to remove camp: PNG K 10,000.00 (lump sum)

Supervision Note: The engineer shall ensure that good relations are maintained between workers and local residents and shall mediate disputes. The engineer shall ensure that the contractor removes all installations and surplus materials, leaves the work site in a clean condition and restores areas damaged by asphalt mixing.

Monitoring: The engineer shall monitor the following parameters:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Indicators</th>
</tr>
</thead>
</table>

East Cape Road  ESMP Oct 2013 RMRP II AF Final 24 10 13
| Provision of water and sanitation facilities: | Latrines constructed, no disruptions in local water supplies |
| Proper site closure: | Natural contours and site appearances restored. Engineer’s report testifying to the restoration of the site. |
**EMG 18:** MATERIAL TRANSPORT (REFER TO EMG 6)

**EMG 19:** INCREASED TRAFFIC AND OPERATING SPEEDS (refer to EMG 13)

**EMG 20:** EXPLOSIVES, COMBUSTIBLES AND TOXIC MATERIAL MANAGEMENT

**Activities:** Storage of explosives, petrol, diesel, oil and lubricants, bitumen and solvents; disposal of used oil, lubricants and solvents

**Potential Impacts:** Fire and explosion hazards

Ground and surface water pollution as a result of polluted runoff and infiltration from spills and/or leaks and improperly discarded oils and lubricants

**Environmental Mitigation:**

**Recommended Measures:** Hazardous material shall not be stored near surface waters or other drainage areas. All used lubricants and oils shall be collected and recycled or disposed off site. Plastic sheeting shall be placed under hazardous material storage areas to collect and retain leaks and spills. Contaminated runoff from storage areas shall be captured in ditches and ponds with an oil trap at the outlet. Contaminated and worn plastic sheeting shall be packed into drums and disposed off site. All fuel drums should be contained in an earthen bund which will contain the potential spillages within the bund area for later disposal in designated areas.

**Implementation:**

**Project Design:**

**Contract Clause:** The contractor shall comply with the environmental mitigation measures specified in this ESMP and the Environmental Impact Assessment Guidelines for Papua New Guinea.

**Bill of Quantities:** The cost of compliance with the above requirements shall be at the contractor’s own expense and shall be included in the contractor’s rate for supplying materials.

**Cost of Constructing an Earthen Bund Wall for drum-fuel storage and fencing around that including royalty payment to landowners for suitable material in the area:** K 3,000 (lump sum for a 10m x 10m area bunded)

**Supervision Note:**

**Monitoring:** The engineer shall monitor the following parameters:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance with requirements</td>
<td>Hazardous materials management procedures implemented. No visible puddles of oil or oil contaminated soil</td>
</tr>
</tbody>
</table>