

Environmental Management Plan

July 2016

CAM: Rural Roads Improvement Project II

Contract Package CW 6A: Improve 2 roads, 46.5 km

Prepared by the Ministry of Rural Development, the Royal Government of Cambodia for the Asian Development Bank. This is an updated version of the environmental management plan included in the initial environmental examination originally posted on August 2014 available on <https://www.adb.org/sites/default/files/linked-documents/42334-014-ieeab.pdf>.

NOTE

In this report, "\$" refers to US dollars unless otherwise stated.

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**KINGDOM OF CAMBODIA
NATION RELIGION KING**



**MINISTRY OF RURAL DEVELOPMENT
PROJECT MANAGEMENT UNIT**

PROCUREMENT OF CIVIL WORKS

**PROJECT: RURAL ROADS IMPROVEMENT PROJECT II
ADB Loan 3151-CAM/AFD Loan CKH 1152 01 K/Grant 0402-CAM**

CONTRACT: PACKAGE CW 6A – IMPROVE 2 ROADS 46.5 KM

VOLUME I BIDDING DOCUMENT - Without Prequalification-

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1. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

1.1 OVERVIEW

An Initial Environmental Examination (IEE) in compliance to the requirements of the Asian Development Bank – Safeguards Policy Statement, 2009 has been undertaken to assess the environmental impacts of the proposed Rural Roads Improvement Project -II (RRIP II) which concludes that the construction impacts will be manageable if the mitigation measures are implemented thoroughly. The EMP is based on the type, extent and duration of the identified environmental impacts. The EMP has been prepared by close reference to best practices and in line with ADB's Safeguard Policy Statement, 2009 and Environmental Assessment Guidelines. The effective implementation of the EMP, based on the implementation arrangements stipulated in the IEE for the Project, will be audited as part of the conditions of the Contract.

The findings and proposed mitigation measures have been compiled into a Matrix and is presented in Annex A. It summarizes all the anticipated environmental impacts and its applied mitigation measures during the construction and operation phase. Moreover, it makes reference to the approximate location, timeframe, mitigation costs, and the responsibility for its implementation and supervision. It should also be noted that many mitigation measures are assumed to be already part of standard design and construction methodology and practices.

1.2 PRE-CONSTRUCTION PHASE

Clearance of Unexploded Ordnance: Although the activities related to the project will only involve execution of works within the existing alignment and with no widening required, the risk of land mines or unexploded ordnance are always present including the provinces where the subject roads are to be upgraded. Considering the risks involved in the implementation of the works, the detailed design and implementation supervision consultant (DDIS) will engage a UXO specialist to determine the level of risk in each of all project roads and advise on the need for clearance. Any clearance that is required will be undertaken through the civil works contracts, by the engagement of qualified local UXO clearance firms. The Environmental Specialist (ES) of the Project Management Unit-Social and Environmental Office (PMU-SEO) with the assistance of the International Specialist (IES) and National Environmental Specialist (NES) of the Detailed Design and Implementation Supervision Consultants (DDIS) will provide the requisite recommendation to the Engineer for the areas where the Contractor can commence works on the basis of the recommendation of the UXO Clearance Company. The Contractor will only be allowed to commence works on the site(s) after the appropriate certification by the qualified UXO Clearance Company are provided.

Contractor prepares CEMP: Following the award of the contract and before commencing work the Contractor will be required to prepare a Contractor's Environmental Management Plan (CEMP) that addresses all the conditions of the construction EMP that has been attached to the Bid and Contract Documents. The CEMP will amplify how the Contractor will address the activities in the construction section of the EMP. The Contractor will submit the CEMP to the Engineer within a month after the contract is awarded and the IES and NES of the DDIS will review and evaluate the CEMP and make the necessary recommendation to the PMU-SEO through the Engineer for the ultimate approval of the CEMP by the PMU and the ADB before commencement of any civil works. During construction, the Contractor will work according to the requirements of the CEMP as was prepared by him. Supervision and monitoring of the CEMP activities will be undertaken as follows:

- The Contractor has the initial responsibility for supervising and monitoring of the CEMP as provided for in the supervision of the works contract.
- The ES of the PMU-SEO with the assistance of the IES and the NES of the DDIS will direct the Contractor with regard to compliance with the CEMP.

- The PMU-SEO will carry out independent monitoring of the work and can issue Defect Notices to the Engineer who will transmit these to the Contractor for the appropriate corrective action(s).
- The Contractor will have his own representative on site for the duration of the contract the designated Environmental Officer (EO) who will be responsible for implementing the CEMP and complying with the environmental laws and regulations of the Kingdom of Cambodia and the Safeguards requirements of the Asian Development Bank (ADB) as stipulated in the Safeguards Policy Statement, SPS 2009.

Induction of Contractor to Site: Following the selection of the Contractor and the approval of the CEMP, the Contractor together with his EO will meet the ES of the PMU-SEO, the IES and NES of the DDIS on-site where the CEMP conditions will be confirmed with the Contractor. When the ES of the PMU-SEO, the IES and NES of the DDIS are confident that the Contractor understands and can comply with the CEMP, they will advise the Engineer and the PMU that the Contractor can commence work.

Establishment of the Grievance Redress Mechanism: During the course of the project it is possible that people will have, concerns with the project's environmental performance including the implementation of the EMP. Issues may occur during construction and again during operation. Any concerns will need to be addressed quickly and transparently, and without retribution to the AP. A grievance redress mechanism (GRM) will be established by the Contractor before the start of construction to address this based on existing frameworks of the Asian Development Bank as stipulated in the Safeguards Policy Statement (SPS) of June 2009 and the appropriate environmental and cultural laws and guidelines of the Kingdom of Cambodia as being enforced by the Angkor Protected Landscape (APL), the Authority for Protection and Management of Angkor and the Region of Siem Reap (APSARA) and the Ministry of Environment (MoE).

1.3 CONSTRUCTION PHASE

Preparation of Site and Establishment of Contractor's Facilities: This applies to all of the Contractor's facilities, storage areas, workshops, labor camps (when needed), concrete batching areas etc. The location and development of Contractor's facilities are to be approved by the Engineer and the ES of the PMU-SEO with the assistance of the IES and NES of the DDIS will be responsible for the supervision and monitoring of the Contractor. The sites are to be selected so that:

- Construction camps, asphalt mixing plants, material storage sites and other project facilities.
- They do not interfere with the welfare of surrounding communities in terms of noise, dust and vibration from construction activities and their social well-being from their proximity to Contractor's facilities.
- Sizes of Contractor's facilities are limited to reduce unnecessary clearing of vegetation or encroaching community's land.
- Sanitary waste and grey water is not to be released untreated into surface water systems or to watercourses/bodies.
- Drainage will be provided to facilitate the rapid removal of surface water from all areas and prevent flooding and accumulation of stagnant water.
- Fuel storage areas are not to be located within 500m of a water course/body.
- The Contractor's facilities are to be contained within an adequate security fence.

- Adequate housing for all workers at the construction camps and clean canteen/eating and cooking areas will be provided by the Contractor.
- Portable lavatories (or at least pit latrines in remote areas) will be installed and open defecation will be prohibited and prevented by cleaning lavatories daily and by keeping lavatory facilities clean at all times.
- The Contractor will provide separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers.
- Wastewater from Contractors' workshops and equipment washing yards will be passed through gravel/sand beds and all oil/grease contaminants will be removed before it is discharged. Oil and grease residues will be stored in tightly covered drums. Such wastes will be disposed consistent with national and local regulations.
- Construction/workers camps will be cleaned up after use to the satisfaction of the Engineer, PMU-SEO, IES and NES of the DDIS and the MRD and local community. All waste materials will be removed and disposed to sites approved by local authorities.
- Land utilized for campsites will be restored to the original condition as far as practicable and the area will be planted with appropriate trees/shrubs as soon as practicable after it is vacated and cleaned.

Clearing of Sites and Removal and Disposal of Vegetation: This applies to the work areas and the Contractor's site facilities. The Contractor will establish the listed below measures to address the projected impacts of the activity with the ES of the PMU-SEO with the assistance of the IES and NES of the DDIS will be responsible for the supervision and monitoring of the Contractor.

- Wherever possible, limit area to be cleared and avoid excessive machine disturbance of the topsoil.
- The area to be cleared will be defined by a clearly established boundary.
- 50m wide buffer zones are to be established at places abutted with watercourses/bodies.
- Cleared material will be pushed into manageable sized heaps according to disposal or re-use requirements.
- Spoils and all types of wastes will not be dumped into forested areas, agricultural land, densely vegetated areas, and water courses.
- Workers will be prohibited from collecting firewood and construction materials from surrounding forests, and from hunting wild animals.
- As the project will not require road widening, ensure that construction works are carried out without unnecessary clearing of roadside vegetation.
- Construction vehicles will operate within the corridor of impact, i.e., approximately within ROW, to avoid damaging soil and vegetation. It will be most important to avoid soil compaction around trees. Generally the rule will be to avoid driving heavy equipment or trucks anywhere into the 'drip-line' of a tree (defined as imaginary line around a tree where rainwater falls freely to ground unimpeded by the tree's foliage).
- The Contractor will not use or permit the use of wood as a fuel for the execution of any part of the Works, including but not limited to the heating of bitumen and bitumen mixtures, and to the extent practicable will ensure that fuels other than wood are used for cooking, and water heating in all his camps and living accommodations.
- Contractor will not buy or use wood from the illegal sources (that come from the illegal logging)

- Construction camps, asphalt mixing plants, material storage sites and other project facilities will not be located in the forest areas and other densely vegetated sites.
- Contractor will take all precautions necessary to ensure that damage to vegetation is avoided due to fires resulting from execution of the works. The Contractor will immediately suppress the fire, if it occurs, and will undertake replanting to replace damaged vegetation.

Encroachment/Damage to Culturally Significant Areas: The Project will involve improvements to existing roads by paving with DBST without widening or realignment. In the event of any construction work uncovering or revealing archaeological relics these will be deemed a “chance find” and reported as such to the Ministry of Culture and Fine Arts or APSARA. All work on the site must stop until MoCFA or APSARA issue a statement that work may be resumed. To ensure that site works and other project-related activities will not adversely affect culturally significant sites, the Contractor will establish the below listed measures and the ES of the PMU-SEO with the assistance of the IES and NES of the DDIS will be responsible for the supervision and monitoring of the Contractor.

- All project-related activities will be implemented consistent with the policies, rules and regulations governing APL
- The contractor will ensure that project activities will not cause damage to any archaeological relics within APL.

Bridge Works: The upgrading works will require major works on the existing bridges that may result to adverse impacts to the water courses. The Contractor will establish the listed below measures to address the projected impacts of the execution of the bridge works to protect water quality and river/stream flow. The ES of the PMU-SEO with the assistance of the IES and NES of the DDIS will be responsible for the supervision and monitoring of the Contractor.

- Rocks, stones, soil and other materials will not be dumped onto rivers and streams.
- Ensure bridge works will not cause obstruction of river flow and flooding of adjacent area.
- At bridge repair and demolition sites, the bridge structure will not be dropped into the river but alternative means will be used to avoid "dropping the bridge" into rivers/streams. This will be done by "sawing" appropriate sections of the bridge and using cranes to lift these sections away or alternatively by construction of a platform onto which the bridge could be lowered.
- Cofferdams, silt fences, sediment barriers or other devices will be used as appropriate based on the design to prevent migration of silt during excavation and boring operations within streams. If cofferdams are used, these will be dewatered and cleaned to prevent siltation by pumping from cofferdams to a settling basin or a containment unit.
- Exposed surfaces will be provided with native grasses and creepers to reduce runoff as early as possible in construction.

Prevention of Soil Erosion on Construction Site: The contractor will be responsible for ensuring that the erosion is contained by appropriate soil conservation protection methods. The ES of the PMU-SEO with the assistance of the IES and NES of the DDIS will be responsible for the supervision and monitoring of the Contractor. The following are recommended to be undertaken to mitigate potential soil erosion in the work sites:

- Limit the extent of excavation to reduce soil erosion potential.

- Install control structures or apply soil conservation protection methodology to susceptible areas to avoid storm water runoff carrying eroded materials either, off-site to susceptible areas or onto already finished work areas.
- Schedule construction so that large areas of soil are not laid bare during wet season and avoid excavating areas and operating machinery in wet ground conditions.
- When needed (particularly work area abutted with watercourses/bodies), contain construction areas using a bund or trench, or isolate them from other surface run-off, and clean and rehabilitate them when construction is complete.
- Avoid discharging water to watercourses/bodies.
- On hill slopes and other potentially erodible places along the roadside, appropriate native vegetation that retards erosion will be planted.
- As much as possible, construction activities in hilly areas are to be undertaken during dry season only.
- Road embankments and slopes will be monitored during construction for signs of erosion, vegetative cover will be provided on slopes by planting native grass and creepers on erosion prone sections.
- Long-term material stockpiles will be covered with native species of grass or other suitable materials to prevent wind erosion.
- Upon completion of works, the Contractor will ensure that all excavated areas are properly stabilized. This includes the rehabilitation of all disturbed areas by the most appropriate and effective method.

Water Quality and Drainage. Bridge works, stockpiling of construction materials and spoils, use of hazardous materials and earthworks if not properly managed are likely to cause deterioration of surface water quality, flooding and flow obstruction of watercourses. These impacts will be minimized through implementation by the Contractor of the following measures and the ES of the PMU-SEO with the assistance of the IES and NES of the DDIS will be responsible for the supervision and monitoring of the Contractor:

- Firmly consolidate river banks using stones, concrete and other suitable retaining measures at each bridge construction site and ensure that water courses (rivers, canals, etc.) will be kept free of excavation spoil and construction debris, floating and submerged.
- Spoils, construction wastes and construction materials stockpile area will be located away from water bodies and under no circumstances will these materials be dumped into watercourses.
- Do not fill up canals and creeks at the construction site. In case filling of local drainage system is necessary, consultation with local authorities will be undertaken and their permission obtained beforehand. An alternative drainage will be established before the existing canal is filled-up.
- Prohibit placement of construction materials, waste storage areas or equipment in or near drainage channels and water courses.
- Discharge of oily wastewater, fuel, hazardous substances and wastes, and untreated sewage to watercourses/canals and on ground/soil is prohibited.
- Provide adequate drainage at the construction sites and other project areas to avoid flooding of surrounding areas and minimize flow obstruction of existing watercourses.
- Regularly inspect/maintain all drainage channels to keep free of obstructions.

- Slope stabilization measures (e.g., planting of fast growing native species of grass and shrubs, etc.) will be implemented on exposed surfaces along river embankments to reduce material wash-away.
- Construct retaining structures such as gabion baskets, rip-rap, etc. for river bank protection.

Controlling Storm Water: The Contractor is to control storm water to minimize the impact of contaminated run-off water and prevent migration of the runoff into the surrounding areas. Implementation of proper mitigation measures will accordingly ensure that impacts can be minimized to acceptable levels. Further, the Contractor will undertake regular measurements of water quality (Physico-Chemical Parameters) in selected sampling stations as identified and stipulated in the IEE and as incorporated in the EMP. Measures to achieve the objective are:

- Pass storm water run-off from construction areas through a gross pollutant trap (to filter plastics, cans, etc.) and to remove petroleum-based organic pollutants before disposal.
- Design drains and culverts to remove all run-off water without scour.
- Store oil and petroleum products at a contained location away from drainage lines in an appropriate manner.

Management of Spoil Heaps and Excavation Spoils: The Contractor will ensure that the impacts of erosion and sediment run-off, and dust are minimized, spoil heaps and are properly managed properly. This will ensure that the adverse impacts of improper spoils disposal that could cause deterioration of water quality and flow obstruction of water courses can be minimized and will only be temporary. The Contractor will establish the listed below measures to address this impact. The ES of the PMU-SEO with the assistance of the IES and NES of the DDIS will be responsible for the supervision and monitoring of the Contractor.

- Choose the location for spoil heaps to avoid blocking surface run-off or drainage lines.
- If the spoil heap containing fine sediments is to remain bare for an extended period in a high rainfall area, this should be appropriately covered to prevent erosion and sediment run-off.
- The Contractor will discuss with local landowners or community groups plans to utilize spoil locally. A clear and level site must be prepared on which the spoil can be finally disposed.
- The Contractor will provide grass cover and other suitable slope stabilization measures on road embankment slopes and on long term stockpile of spoils.
- The Contractor will ensure that spoil disposal will not cause sedimentation and obstruction of flow of watercourses, damage to agricultural land and densely vegetated areas. As several of the roads pass very close to rice paddies and in fact the road shoulder is contiguous with the rice fields, excess spoil will not be dumped on rice production land, either temporarily or permanently. If temporary storage space is needed then work will take place alternately on opposite traffic lanes.
- The spoils disposal site will be located at least 50 m from surface water courses and will be protected from erosion by avoiding formation of steep slopes, provisions of adequate drainage and grassing.
- Spoils will only be disposed in areas approved by local authority.
- Water courses (rivers, canals, etc.) will be kept free of excavation spoils and construction debris, floating and submerged.

- Spoils will not be stored on roadsides for long periods. They should be transferred immediately to the approved disposal sites.
- Spoil and construction materials stockpile area will be located away from water stagnation and under no circumstances will these materials be dumped into watercourses.
- Dredged and excavated materials will be reused or provided to local residents as soon as possible, if they require such materials, for land reclamation. The remaining spoils can be disposed into low elevation sites for road construction.

Management of Aggregates and other Construction Materials: Large quantity of aggregates for the construction will be required. The aggregates/materials will be temporarily stored in suitable areas in the work sites. The Contractor is responsible for the proper management of these materials during sourcing and hauling/transport of aggregates from the source to the sites. The Contractor will be responsible for the establishment of the following measures to address the potential impacts of this activity while the PMU-SEO will be responsible for the supervision and monitoring of the Contractor with the assistance of the IES and NES of the DDIS.

- The sourcing of aggregates and other materials and subsequent transport to the sites will be clearly planned.
- Safety measures will be employed to avoid any loss of load from trucks during transportation.
- Although the ancillary facilities will be sited a good distance from settlement areas, methods will be employed to reduce dust emission during loading and unloading, including water spraying.
- It will be ensured that ancillary facilities will be maintained in good condition to reduce emission so as to protect workers and the public and the environment.
- Timing of haul truck trips to the work areas will be selected as much as possible and practicable during low traffic hours.
- Safety procedures will be put in place to reduce the potential for accidents in village or urban areas.
- Safety measures will be employed to ensure the stability of exposed faces or overburden stockpiles.

Use of Hazardous Materials: The use of hazardous substances can cause significant impacts if uncontrolled or if waste is not disposed correctly. Care will need to be taken should any hazardous chemical (HAZCHEM) materials be required during construction. It is recommended that the Contractor use the HAZCHEM system, which is based on the UN classification system. The Contractor will prepare a list of all materials that are proposed to be brought to site together with their HAZCHEM rating. The ES PMU-SEO with the assistance of the IES and NES of the DDIS will verify the HAZCHEM rating and approve the use of any HAZCHEM rated chemicals. The Contractor will establish the succeeding measures to mitigate the impact of the utilization of Hazardous Materials:

- Ensure that safe storage of fuel, other hazardous substances.
- Hydrocarbon, toxic material and explosives (if required) will be stored in adequately protected sites consistent with national and local regulations to prevent soil and water contamination.
- Equipment/vehicle maintenance and re-fuelling areas will be confined to areas in construction sites designed to contain spilled lubricants and fuels. Such areas will be

provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency.

- Fuel and other hazardous substances will be stored in areas provided with roof, impervious flooring and bund/containment wall to protect these from the elements and to readily contain spilled fuel/lubricant.
- Segregate hazardous wastes (oily wastes, used batteries, fuel drums) and ensure that storage, transport and disposal will not cause pollution and will be undertaken consistent with national and local regulations.
- Ensure all storage containers are in good condition with proper labelling.
- Regularly check containers for leakage and undertake necessary repair or replacement.
- Store hazardous materials above flood level;
- Discharge of oil contaminated water will be prohibited;
- Used oil and other residual toxic and hazardous materials will not be poured on the ground;
- Used oil and other residual toxic and hazardous materials will be disposed of in an authorized facility off-site;
- Adequate precautions will be taken to prevent oil/ lubricant/ hydrocarbon contamination of river channels;
- Ensure availability of spill clean-up materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored;
- Spillage, if any, will be immediately cleared with utmost caution to leave no traces;
- Spillage waste will be disposed at approved disposal sites;
- All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities to combat emergency situations complying with all the applicable statutory stipulation;
- The Contractor will be required to display safety information in all work areas and to train workers in the handling and safe use of these materials, including the provision of protective equipment for handling these substances.
- The Contractors will identify named personnel in-charge of storage sites for hazardous materials and ensure they are properly trained to control access to these areas and entry will be allowed only under authorization.
- Bitumen will not be allowed to enter either running or dry streambeds and nor will be disposed of in ditches or small waste disposal sites prepared by the Contractor.
- Bitumen storage and mixing areas as well as storage areas for other petroleum products used in the preparation of the bitumen mixture will be protected against spills and all contaminated soil must be properly handled according to national and local regulations. As a minimum, these areas must be provided with concrete flooring and surrounded by an embankment to readily contain and clean-up spills.
- Adequate precaution will be taken to prevent oil/lubricant/hydrocarbon contamination of channel beds.

Storage and Handling of other Construction Materials, Fuel and Lubricants: Other construction materials will include sand, gravel and cement for concrete manufacture, reinforcing rods and steel mesh, wood and other construction materials, fuel and lubricants. The PMU-SEO will be responsible

for the supervision and monitoring of the Contractor with the assistance of the IES and NES of the DDIS. The following measures will be established by the Contractor to mitigate projected adverse impacts:

Areas will need to be prepared for storing these materials. Fuel and oil will need will be stored in dedicated areas at least 50m away from the water courses/bodies. Where >5000 litres of fuel is stored on site, the fuel must be stored in sealed tanks that are provided with a concrete base that is banded to hold 110% of the tank capacity.

- All workshops with significant activities will be provided with oil and water separators.
- Vehicles and machinery are not to be refuelled within 500m of the nearest water course/body.
- The Contractor will have trained personnel who are competent in fuel handling procedures and for cleaning up accidental spills.
- Any major spill in the vicinity will immediately be reported by the Contractor to the Engineer and PMU.
- All waste oil, oil and fuel filters are will be collected and disposed of in safe and secure disposal facilities.
- At the closure of the site all contaminated soil will be excavated, removed and replaced with fresh topsoil.

Noise Control and Vibration: This applies to all machinery, vehicles and construction sites where noise and vibration may affect susceptible receptors. The Contractor will be responsible for ensuring that noise and vibration does not affect the surrounding communities. The Contractor must be prepared to curtail work to daylight hours (0700hrs - 1700hrs) should the community find that any night time operation becomes a nuisance. Further, the Contractor will undertake monthly measurements of ambient noise levels in selected sampling stations as identified and stipulated in the Environmental Monitoring Plan. The PMU-SEO will be responsible for the supervision and monitoring of the Contractor with the assistance of the IES and NES of the DDIS. Suggested measures to achieve this objective will also include:

- No noisy construction-related activities (e.g., transport of materials along residential areas and other sensitive receptors, piling, use of jackhammer, etc.) will be carried out from (2100 hrs to 0600 hrs) along residential areas, hospitals and other sensitive receptors.
- Noisy construction activities will be avoided during religious or cultural events in close proximity to the roadside such as Friday prayers attended by Muslim Cham, when ethnic Khmer are attending temple festivals or holding weddings, etc.
- All construction equipment and vehicles will be well maintained, regularly inspected for noise emissions, and will be fitted with effective muffler and other appropriate noise suppression equipment consistent with applicable national and local regulations.
- Use only vehicles and equipment that are registered and have necessary permits.
- Truck drivers and equipment operators will avoid, as much as possible, the use of horns in densely populated areas and where there other sensitive receptors are found such as schools, temples, hospital, etc. are located.
- Impose speed limits on construction vehicles to minimize noise emission along areas where sensitive receptors are located (houses, schools, temples, hospitals, etc.).

- Provide temporary noise barriers (3-5 meter high barrier can reduce 5-10 dB(A)), as necessary, if site works will generate high noise levels that could disturb nearby households, hospital, school and other sensitive receptors.
- Avoid noisy construction activities in vicinity of sensitive receivers during night time or other sensitive periods (e.g. during school hours in vicinity of schools).

Worker Safety, Health, and Hazard: Before commencing work, the Contractor will be required to identify hazards and prepare an emergency response plan to address serious accidents and nominate a person who is to be immediately contacted should an accident occur. The emergency response plan is to be submitted to the Engineer for approval one week prior to commencement of works. The PMU-SEO will be responsible for the supervision and monitoring of the Contractor with the assistance of the IES and NES of the DDIS.

- The Contractor will be required to keep the site free of drugs and alcohol.
- The Contractor will be required to provide a safe work environment and provide safety measures and protective equipment for all workers including; hand, head, eye and ear protection and safety footwear.
- The Contractor is also to provide first aid facilities on-site and employ a competent person trained in first aid.
- Conduct orientation for construction workers regarding emergency response procedures and equipment in case of accidents (e.g., head injury from falling, burns from hot bitumen, spills of hazardous substances, etc.), fire, etc.; health and safety measures, such as on the use of hot bitumen products for paving of project roads, etc.; prevention of HIV/AIDS, malaria, diarrhea, and other related diseases. A copy of the emergency response plan should be submitted to Engineer and displayed in easily accessible place.
- Introduction to health and safety issues in construction sites and on construction sites including main areas of risk to workers and others;
- Education on basic hygiene practices to minimize spread of typical tropical diseases;
- HIV/AIDS and STD awareness, including information on methods of transmission and protection measures;
- Ensure all occupational health and safety requirements are in place on construction sites and in work camps,
- Provide drainage at construction sites and workers camps to prevent water logging/accumulation of stagnant water and formation of breeding sites for mosquitoes.
- Provide fire extinguish equipment and appropriate emergency response equipment (based on on-going construction activities) at the work areas and at construction and workers camps.
- At the workers camps, provide adequate housing for all workers at the construction camps, provide reliable supply of potable water, install separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers and establish clean eating areas and kitchen.
- Provide workers with appropriate safety equipment/devices (such as dust mask, safety helmets, safety shoes or boots, goggles, ear plugs, etc.) and strictly require them to use these as necessary.
- Install sign boards, lighting system at the construction sites, borrow pits, or places which may cause accidents for vehicle, people and workers

- Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, pagodas, hospitals, and other populated areas are located.
- Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances and other construction materials by providing covers over transporting dump trucks.
- Barriers (e.g., temporary fence) will be installed at construction areas to deter pedestrian access to these areas except at designated crossing points.
- Sufficient lighting at night as well as warning signs will be provided in the periphery of the construction site.
- The general public/local residents will not be allowed in high-risk areas, e.g., excavation sites and areas where heavy equipment is in operation.
- Ensure proper collection and disposal of solid wastes within the construction camps consistent with local regulations.
- Provide fencing on all areas of excavation greater than 2 m deep.
- Ensure reversing signals are installed on all construction vehicles.
- Measures to prevent malaria will be implemented (e.g., provision of insecticide treated mosquito nets to workers, spraying of insecticides, installation of proper drainage to avoid formation of stagnant water, etc.).
- Discharge of untreated sewage will be prohibited.
- Penalties for violation of rules and regulations.

Air Quality and Dust Control: These apply to all of the construction sites and haul roads. Work that is carried out during the drier time of the year and especially when wind speeds increase may create localized dusty conditions. The Contractor will establish the measures listed below to mitigate the projected adverse impacts as a result of the execution of works and the PMU-SEO will be responsible for the supervision and monitoring of the Contractor with the assistance of the IES and NES of the DDIS.

- During construction when dust may be generated the Contractor is to monitor the worksite conditions and apply dust control measures which includes reducing traffic movements and spraying water on exposed areas.
- The Contractor will ensure community safety from increased vehicle movements: this applies to all vehicles and in particular haul trucks that have to pass through villages.
- The Contractor will ensure that all vehicles that may be required to pass through villages and transport equipment and materials are operated safely without endangering these communities.
- The Contractor will ensure that heavy equipment, haul trucks and other vehicles are maintained in a safe operating condition, that all drivers and machinery operators act responsibly, that all loads are to be secured and all loads with fugitive materials (e.g., excavated soil and sand) are to be covered with tarpaulins, immediate repairs of any malfunctioning construction vehicles and equipment will be undertaken and that any drivers that ignore any of the community safety requirements will be removed.
- The Contractor will undertake regular measurements of ambient air quality (Total Suspended Particulates, SO_x and NO_x) in selected sampling stations as identified and stipulated in the IEE and EMP.
- Equipment and vehicles not in use will be switched off.

- Machinery and vehicles causing excessive pollution (e.g., visible smoke) will be banned from construction sites.
- All construction equipment and vehicles will have valid certifications indicating compliance to vehicle emission standards.
- Siting of bitumen plants, concrete mixing plants, crushing plants and other facilities that cause high dust and/or gaseous emissions should be at least 500m from settlements and other sensitive receptors (schools, hospitals, etc.)
- Necessary environmental clearance/approval from the MOE and its instrumentalities will be obtained prior to establishment and operation of asphalt mixing plants, crushing plants and other facilities.
- On rainless day undertake watering, at least twice per day, on dusty and exposed areas at construction yards, materials stockpile, construction sites, access roads, quarry areas, borrow sites and other project areas where residential sites and other sensitive receptors are located nearby.
- Impose speed limits on construction vehicles to minimize dust emission along areas where sensitive receptors are located (houses, schools, hospitals, temples, etc.).
- Position any stationary emission sources (e.g., portable diesel generators, compressors, etc.) as far as is practicable from sensitive receptors;
- Burning of wastes generated at the construction sites, work camps and other project related activities will be strictly prohibited.
- Provide temporary covers (e.g., tarpaulins, grass, etc.) on long term materials and spoils stockpiles.
- Clean road surfaces of debris/spills from construction equipment and vehicles.
- Install temporary fencing or barriers around particularly dusty activities in vicinity of sensitive receivers.
- Locations for stockpiling spoils, fill and other materials with high dust content will be at least 500 m from the nearest residential areas and other sensitive receivers.

Quarry and Borrow Pits: Material sources will need to be established by the Contractor for the requisite aggregates necessary for the execution of works. The Contractor will establish the measures listed below at quarry and borrow sites to minimize impacts on water quality, reduce dust emission during transport, minimize erosion and siltation of nearby water courses and avoid damage to productive land and ecologically sensitive areas. The PMU-SEO will be responsible for the supervision and monitoring of the Contractor with the assistance of the IES and NES of the DDIS..

- Sourcing of quarry and borrow materials from existing sites will be preferred over establishment of new sites, as much as possible.
- Quarries and borrow pits will not be established in national, provincial, district and village conservation forests and other ecologically sensitive and protected areas.
- Borrow/quarry sites will not be located in productive land.
- In case the Project will involve new quarry/borrow sites, necessary approvals from environmental authorities will be obtained prior to operation of such sites. Such sites will be located over 500m away from residential, school, hospital and other sensitive receptors.
- Prior to extraction, topsoil (about 15 cm) will be stockpiled, preserved and then refilled after completion of quarry/borrow pit operation for rehabilitation purposes after excavation is over.

- Dust control during excavation and transport (e.g., water spraying on access roads and provision of truck cover) will be undertaken in areas where there are sensitive receptors such as residential areas, school, hospital, etc.
- Long-term material stockpiles will be covered to prevent wind erosion.
- During quarry and borrow site operation, provide adequate drainage to avoid accumulation of stagnant water.
- The use of river bed sources will be avoided, as much as possible, however if this is unavoidable the Contractor will minimize use of river bed for construction materials and sources of fill and quarry materials lying on small rivers and streams will be avoided. Alluvial terraces or alluvial deposits which lie on the river beds but not covered by water in normal hydrological conditions will be preferred. Protect and reinstate river banks if unexpected erosion occurs.
- Confine winning river bed materials to less than 20% of river width in any location and keep away from river banks.
- Quarry and borrow sites must be selected amongst those offering the highest ratio between extractive capacity (both in terms of quality) and loss of natural state.
- Quarry and borrow sites lying close to the alignment, with a high level of accessibility and with a low hill gradient, are preferred.
- Upon completion of extraction activities, re-contour borrow/quarry pit wall or fill-up when there are available and suitable materials such as excavation spoils, replace topsoil, and re-vegetate with native species such as grasses and fast-growing shrubs and trees.
- Upon completion of extraction activities, borrow pits will be dewatered and fences will be installed, as appropriate, to minimize health and safety risks.
- In quarries in mountainous or hilly areas, or wherever slopes are important, terraces will be cut after extraction, drainage system and vegetation cover will be provided for rehabilitation to enhance slope stability.
- Implement compensatory planting (at least one is to one ratio) if trees will have to be removed at quarry and borrow sites.
- Borrow pits will be left in a tidy state with stable side slopes and proper drainage in order to minimize soil erosion, siltation of nearby bodies of water and to avoid creation of water bodies favorable for mosquito breeding.
- To avoid drowning when pits become water-filled, fences will be provided.
- It is possible that villagers may request borrow pits to be left excavated so that they may be used as water reservoirs or fishponds. If this were to be agreed between the contractors and the villagers, all the full safety measures detailed above must be observed. Such agreements would be formalized in writing between the contractors and the villagers after full discussion with all concerned parties.

Prohibited Activities: The Contractor will be aware of the activities shown in Appendix 5 of the Safeguard Policy Statement of the ADB (SPS June 2009), prohibited Investment Activities List. Any listed Appendix 5 activities are prohibited. The PMU-SEO with the assistance of the IES and NES of the DDIS need to verify that the Contractor is aware of the Appendix 5 requirements and that none of these activities will be sanctioned during construction. The PMU-SEO will be responsible for the supervision and monitoring of the Contractor with the assistance of the IES and NES of the DDIS. The following do not qualify for Asian Development Bank financing as per the ADB Prohibited Investment Activities List:

- Production or activities involving harmful or exploitative forms of forced labor¹ or child labor².
- Production of or trade in any product or activity deemed illegal under host country laws or regulations or international conventions and agreements or subject to international phase outs or bans, such as (a) pharmaceuticals³, pesticides, and herbicides⁴, (b) ozone-depleting substances⁵, (c) polychlorinated biphenyls⁶ and other hazardous chemicals⁷, (d) wildlife or wildlife products regulated under the Convention on International Trade in Endangered Species of Wild Fauna and Flora⁸, and (e) trans-boundary trade in waste or waste products⁹.
- Production of or trade in weapons and munitions, including paramilitary materials.
- Production of or trade in alcoholic beverages, excluding beer and wine¹⁰.
- Production of or trade in tobacco¹¹.
- Gambling, casinos, and equivalent enterprises¹².
- Production of or trade in radioactive materials¹³, including nuclear reactors and components thereof.
- Production of, trade in, or use of un-bonded asbestos fibres.¹⁴
- Commercial logging operations or the purchase of logging equipment for use in primary tropical moist forests or old-growth forests.
- Marine and coastal fishing practices, such as large-scale pelagic drift net fishing and fine mesh net fishing, harmful to vulnerable and protected species in large numbers and damaging to marine biodiversity and habitats.

Disposal of Waste Materials: The execution of works and the establishment and operation of the ancillary facilities necessary for the implementation of the civil works will result in the generation of solid waste. Improper waste management could result to odor and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the receiving environment. The Contractor will submit a Solid Waste Management Plan (SWMP) to address this concern one (1) month upon his arrival on site. This will be submitted to the Engineer for approval. The ES of the PMU-SEO with the assistance of the IES and NES of the DDIS will review and evaluate the SWMP for appropriate recommendation for approval by the Engineer. The PMU-SEO will be responsible for the supervision and monitoring of the Contractor with the assistance of the IES and NES of the DDIS. Further, the Contractor will establish the following measures:

¹ Forced labor means all work or services not voluntarily performed, that is, extracted from individuals under threat of force or penalty.

² Child labor means the employment of children whose age is below the host country's statutory minimum age of employment or employment of children in contravention of International Labor Organization Convention No. 138 "Minimum Age Convention" (www.ilo.org).

³ A list of pharmaceutical products subject to phase outs or bans is available at <http://www.who.int>.

⁴ A list of pesticides and herbicides subject to phase-out's or bans is available at <http://www.pic.int>.

⁵ A list of the chemical compounds that react with and deplete stratospheric ozone resulting in the widely publicized ozone holes is listed in the Montreal Protocol, together with target reduction and phase-out dates. Information is available at <http://www.unep.org/ozone/montreal.shtml>.

⁶ A group of highly toxic chemicals, polychlorinated biphenyls are likely to be found in oil-filled electrical transformers, capacitors, and switchgear dating from 1950 to 1985.

⁷ A list of hazardous chemicals is available at <http://www.pic.int>.

⁸ A list is available at <http://www.cites.org>.

⁹ As defined by the Basel Convention; see <http://www.basel.int>.

¹⁰ This does not apply to project sponsors who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to a project sponsor's primary operations.

¹¹ This does not apply to project sponsors who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to a project sponsor's primary operations.

¹² This does not apply to project sponsors who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to a project sponsor's primary operations.

¹³ This does not apply to the purchase of medical equipment, quality control (measurement) equipment, and any equipment for which ADB considers the radioactive source to be trivial and adequately shielded.

¹⁴ This does not apply to the purchase and use of bonded asbestos cement sheeting where the asbestos content is less than 20%.

- All construction waste materials including drums, timber off-cuts, sand and gravel, cement bags, etc., are to be suitably disposed of. If these cannot be recovered for scrap value these materials will be taken to approved landfill sites and properly disposed.
- The Contractor will contain all waste within construction sites; properly dispose all used fuel and lubricant oils in environmentally sound manner, either recycle or for other use.
- Segregate and regularly collect wastes at worker camps and offices.
- Construction/workers' camps will be provided with garbage bins.
- Prohibit disposal of solid wastes into canals, rivers, other watercourses, agricultural field and public areas.
- There will be no site-specific landfills established by the Contractors. All solid waste will be regularly collected and removed from the work camps and disposed to areas approved by local authorities.
- Burning of construction and domestic wastes are strictly prohibited.
- Recyclables will be recovered and sold to recyclers.
- Residual and hazardous wastes will be disposed of in disposal sites approved by local authorities.
- Ensure that wastes are not haphazardly dumped within the project site and adjacent areas.

Damage to Community Facilities: Transport of materials and spoils, operation of construction equipment and various construction activities may damage community utilities. The Contractor will implement the following measures to address this impact and the ES of the PMU-SEO will be responsible for the supervision and monitoring of the Contractor with the assistance of the IES and NES of the DDIS.

- The Contractor will not allow overloading of trucks used for all project-related activities.
- The Contractor will immediately repair any damage caused by the Project to community facilities such as water supply, power supply, irrigation canals, drainage and the like. Adequate and just compensation will be paid to affected parties, as necessary.
- Access roads damaged during transport of construction materials and other project related activities will be reinstated upon completion of construction works.

Traffic Disruption and Access Obstruction: Road construction works are expected to cause traffic disruption and congestion and obstruction of access to roadside properties and establishments. Lack of proper traffic warning signs and other safety measures (e.g., sufficient lighting at night at construction sites, etc.) could cause accidents. The following measures will be implemented by the Contractor to minimize such impacts with the ES of the PMU-SEO will be responsible for the supervision and monitoring of the Contractor with the assistance of the IES and NES of the DDIS.

- In cooperation with the local traffic authorities, properly organize transport of materials for the project to avoid congestion.
- Set up clear traffic signal boards and traffic advisory signs at the roads going in and out the road and bridge construction sites to minimize traffic build-up.
- Regularly monitor traffic conditions along access and Project roads to ensure that project vehicles are not causing congestion.

- Provide sufficient lighting at night within and in the vicinity of construction sites.
- Implement suitable safety measures to minimize risk of adverse interactions between construction works and traffic flows through provision of temporary signals or flag controls, adequate lighting, fencing, signage and road diversions.
- Provide temporary accesses to properties and establishments affected by disruption to their permanent accesses.
- Reinstate good quality permanent accesses following completion of construction.
- Provide safe vehicle and pedestrian access around construction areas and adequate signage, barriers and flag persons for traffic control.
- If necessary, traffic will be diverted for safe and smooth movement of vehicles to ensure smooth traffic flow and minimize accidents, traffic hold ups and congestion.
- The diversion signs would be bold and clearly visible particularly at night.
- Temporary bypasses will be constructed and maintained (including dust control) during the construction period particularly at bridge crossings. Location of temporary bypasses will be agreed with local authorities and such sites will be reinstated upon completion of works.

Social Conflicts: The presence of workers could cause conflicts with local communities. These will be avoided by implementing the following measures:

- Regularly inform in advance the local officials and local residents on the location and schedule of construction activities which may cause impacts on the environment and life of people (e.g., road sections to be constructed; roads used for transport, locations of worker camps etc.)
- Locate construction camps away from communities (at least 500 m away) in order to avoid social conflict in using resources and basic amenities such as water supply.
- Maximize number of local people employed in construction works and Maximize goods and services sourced from local commercial enterprises.

Site De-commissioning – Clearance and Rehabilitation of Construction Sites and Removal of Contractor's Facilities: It is the responsibility of the Contractor to address site clean up. This includes the removal all waste materials, machinery and any contaminated soil. The Contractor will establish the listed measures. The PMU-SEO will be responsible for the supervision/monitoring of the Contractor with assistance from the IES and NES of the DDIS.

- All construction sites and work areas will be rehabilitated so that these can be returned as close as possible to their previous use. This includes the stabilization and landscaping of all of the construction sites.
- No waste will remain behind after work is completed that will not naturally and safely decompose. Should wastes not be removed, the Owner is entitled to withhold payment and arrange the clean up and deduct the cost of the clean-up from the final payment amount less an additional 10% for arranging the task.

2. ENVIRONMENTAL MONITORING PLAN

A general Environmental Monitoring Plan to cover the program is presented in Annex B. The Monitoring Plan focuses only on impacts of the project that are likely to need attention. A baseline survey will be conducted prior to commencement of works to establish the benchmark levels of the environmental parameters. The main components of the monitoring plan include for each project stage the:

- Environmental issue to be monitored and ways for verification.
- Specific areas and locations to be monitored; parameter to be monitored;
- Applicable standards and criteria.
- Duration and frequency and estimated monitoring costs.
- Institutional responsibilities for monitoring and supervision.

Furthermore, the Contractor is mandated to establish a Complaints database, which would contain all the information on complaints received by the communities or other stakeholders. This would preferably include: the type of complaint, location, time, actions to address these complaints, and final outcome.

ANNEXES

**ANNEX A :
MATRIX OF THE ENVIRONMENTAL MANAGEMENT PLAN**

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
PRE-CONSTRUCTION PHASE						
LOCATION OF PROJECT ROADS	Safety risks due to presence of unexploded ordnance (UXO)	The detailed design and implementation supervision consultant (DDIS) shall engage a UXO specialist to determine the level of risk of the project roads and advise on the need for clearance.	All project roads	Part of project cost	DDIS	MRD/PMU
		Any clearance that is required will be undertaken through the civil works contracts, by the engagement of qualified local UXO clearance firms.	All project roads	Part of project cost	Contractor	DDIS, MRD/PMU/SEO
		The contractor shall only commence site works after the UXO clearance firm has certified that areas are already cleared.	All project roads	Part of project cost	Contractor	DDIS, MRD/PMU/SEO
	Lack of mechanism to address environmental complaints	Establish a grievance redress mechanism (GRM), as described in Chapter VII.	All project roads	No additional cost	MRD/PMU	DDIS
		Make public the existence of the GRM through public awareness campaigns.	All project roads	No additional cost	MRD/PMU	DDIS
		Ensure that names and contact numbers of representatives of MRD and contractors are placed on the notice boards outside the construction site and at local government offices (e.g., provincial and commune levels)	All project roads	No additional cost	MRD/PMU	DDIS
LOCATION OF QUARRY AND BORROW AREAS	Siting of quarry and borrow areas could cause damage to ecologically sensitive sites, productive land and nuisance to sensitive receptors (residential areas, schools, etc.)	Sourcing of quarry and borrow materials from existing sites shall be preferred over establishment of new sites, as much as possible.	Quarry and borrow sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Quarries and borrow pits shall not be established in national, provincial, district and village conservation forests and other ecologically sensitive and protected areas.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		Borrow/quarry sites shall not be located in productive land.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		In case the Project will involve new quarry/borrow sites, necessary approvals from environmental authorities shall be obtained prior to operation of such sites. Such sites shall be located over 500 m away from residential, school, hospital and other sensitive receptors.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
LOCATION OF CONSTRUCTION CAMPS/WORKERS CAMPS AND OTHER PROJECT FACILITIES	Siting of various project facilities could adversely affect sensitive receptors (residential areas, etc.) due to dust emission, wastewater generation, etc.	Workers camp location and facilities shall be located at least 500 m from settlements and agreed with local communities and local officials.	All project roads	No additional cost	Contractor	DDIS, PMU/SEO
		Siting of asphalt plants, concrete mixing plants, crushing plants and other facilities that cause high dust and/or gaseous emissions will be at least 500 m from settlements and other sensitive receptors (schools, hospitals, etc.)	All project roads	No additional cost	Contractor	DDIS, PMU/SEO
		Necessary environmental clearance/approval shall be obtained prior to establishment and operation of asphalt mixing plants, crushing plants and other facilities.	All project roads	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
PROJECT DESIGN	Climate change and hydrological impacts forecasting.	Incorporate in the project design the measures that have been developed under the Climate Change Adaptation Component of the Project (e.g., ecosystem-based adaptation measures).	All project roads	Part of project cost	DDIS	MRD/PMU
		Provide for appropriate design of roadside and cross drainage systems, where necessary, to avoid flooding on project roads as well as in areas surrounding the project roads, especially at	All project roads	Part of project cost	DDIS	MRD/PMU

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
		sections where road embankments will be raised to prevent flooding of roadways.				
		The road embankment, bridges and drainage facilities shall be designed based on the historical flood data and flood	All project roads	Part of project cost	DDIS	MRD/PMU
		Erosion control and slope stabilization measures shall be included in the design, as appropriate, such as side ditches and berms, rock lining and slope walls along the road, shrub buffer strips sites in areas of high erosion risk, cross drainage to accommodate floodwater/run-off in case road sections are on elevated fills that will obstruct natural drainage.	All project roads	Part of project cost	DDIS	MRD/PMU
SITE PREPARATION	Disruption to community utilities	Prior to commencement of site works, relocate or re-provision water supply pipelines, irrigation canals and other facilities that may be affected by construction works This will be done in agreement with the local community and the utility company.	All project roads	Part of contractor's bid cost	Contractor	DDIS, MRD/PMU
CONSTRUCTION PHASE						
OPERATION OF CONSTRUCTION EQUIPMENT EXCAVATION WORKS, SPOILS AND WASTE DISPOSAL, TRANSPORT OF CONSTRUCTION MATERIALS	Encroachment/ damage to historically/culturally significant areas such as Angkor Protected Landscape (APL), and other areas.	All project-related activities shall be implemented consistent with the policies, rules and regulations governing APL.	Roads SR2, SR 7	No additional cost	Contractor	DDIS, PMU/SEO, APSARA, MCFA
		The contractor shall ensure that Project activities shall not cause damage to any archaeological relics. In the event of any construction work uncovering or revealing archaeological relics these shall be deemed a "chance find" and reported as such to the Ministry of Culture and Fine Arts or APSARA.	ditto	No additional cost	Contractor	DDIS, PMU/SEO, APSARA, MCFA
		The following 'chance-find' principles will be implemented by the contractor for all Project roads to account for any undiscovered items identified during construction: a. In coordination with APSARA and MCFA, workers will be provided orientation in the location of cultural/heritage zones within the construction area and in the identification of potential items of cultural/heritage significance. b. Upon discovery of any objects of possible archaeological significance that may be uncovered during construction, the site supervisor shall immediately suspend construction activities affecting the area and shall alert APSARA, MCFA or its provincial or district offices to inspect the site. c. Work will remain suspended until a site assessment has been made by the concerned authority (APSARA, MCFA, etc.), an agreement has been reached as to any required mitigation measures (which may include excavation and recovery of the item), and the contractor has been given permission by the concerned authority to proceed with the construction activities.	All project roads	No additional cost	Contractor	DDIS, PMU/SEO, APSARA, MCFA
EARTHWORKS, EXCAVATION ACTIVITIES, TRANSPORT OF MATERIALS, OPERATION OF CONSTRUCTION	Air pollution due to elevated levels of dust and gaseous emissions	Construction equipment will be maintained to a good standard. Immediate repairs of any malfunctioning construction vehicles and equipment shall be undertaken.	All project roads	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Equipment and vehicles not in use shall be switched off.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		Machinery and vehicles causing excessive pollution (e.g., visible smoke) will be banned from construction sites.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
EQUIPMENT,		All construction equipment and vehicles shall have valid certifications indicating compliance to vehicle emission standards.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
EARTHWORKS, TRANSPORT OF MATERIALS, OPERATION OF CONSTRUCTION EQUIPMENT AND VEHICLES	Elevated noise and vibration levels that could cause nuisance and damage to properties	No noisy construction-related activities (e.g., transport of materials along residential areas and other sensitive receptors, piling, use of jackhammer, etc.) will be carried out from 2100 hrs to 0600 hrs along residential areas, hospitals and other sensitive receptors.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO
		Noisy construction activities will be avoided during religious or cultural events in close proximity to the roadside such as Friday prayers attended by Muslim Cham, when ethnic Khmer are attending temple festivals or holding weddings, etc.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		All construction equipment and vehicles shall be well maintained, regularly inspected for noise emissions, and shall be fitted with effective muffler and other appropriate noise suppression equipment consistent with applicable national and local regulations.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Use only vehicles and equipment that are registered and have necessary permits.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		Truck drivers and equipment operators shall avoid, as much as possible, the use of horns in densely populated areas and where there other sensitive receptors are found such as schools, temples, hospital, etc. are located.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		Impose speed limits on construction vehicles to minimize noise emission along areas where sensitive receptors are located (houses, schools, temples, hospitals, etc.).	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		Provide temporary noise barriers, as necessary, if site works will generate high noise levels that could disturb nearby households, hospital, school and other sensitive receptors	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Avoid noisy construction activities in vicinity of sensitive receivers during night time or other sensitive periods (e.g. during school hours in vicinity of schools)	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		Truck drivers and equipment operators shall avoid, the use of horns	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		Segregate and regularly collect wastes at worker camps and offices.	Construction and workers camps	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Construction/workers' camps shall be provided with garbage bins.	Construction and workers camps	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
VARIOUS CONSTRUCTION ACTIVITIES, OPERATION OF CONSTRUCTION AND WORKERS CAMPS	Improper handling and disposal of wastes could cause odor and vermin problems, pollution and flow obstruction of nearby watercourses and	Prohibit disposal of solid wastes into canals, rivers, other watercourses, agricultural field and public areas.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		There will be no site-specific landfills established by the contractors. All solid waste will be regularly collected and removed from the work camps and disposed to areas approved by local authorities.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Prohibit burning of construction and domestic wastes.	ditto	No additional	Contractor	DDIS, PMU/SEO

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
	could negatively impact the landscape.			cost		MOE/PDE
		Recyclables shall be recovered and sold to recyclers.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Residual and hazardous wastes shall be disposed of in disposal sites approved by local authorities.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Ensure that wastes are not haphazardly dumped within the project site and adjacent areas	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
ESTABLISHMENT AND OPERATION OF CONSTRUCTION AND WORKERS CAMPS	Operation of these facilities will generate solid and liquid wastes and if improperly handled, these could cause health problems and pollution.	Drainage shall be provided to facilitate the rapid removal of surface water from all areas and prevent flooding and accumulation of stagnant water.	Construction/Workers camps	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Portable lavatories (or at least pit latrines in remote areas) shall be installed and open defecation shall be prohibited; lavatory facilities will be kept clean at all times.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Provide separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Wastewater effluents from contractors' workshops and equipment washing- yards will be passed through gravel/sand beds and all oil/grease contaminants will be removed before wastewater is discharged. Oil and grease residues shall be stored in tightly covered drums. Such wastes shall be disposed consistent with national and local regulations.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Construction/workers camps shall be cleaned up after use to the satisfaction of MRD/SEO/DDIS and local community. All waste materials shall be removed and disposed to disposal sites approved by local authorities.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Land used for campsites shall be restored to the original condition as far as practicable and the area shall be planted with appropriate trees/shrubs as soon as practicable after it is vacated and cleaned.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
QUARRY AND BORROW SITE OPERATION	Operation of quarry and borrow sites could cause adverse impacts to surface water quality, elevated dust emission during excavation siltation of nearby water courses, damage to productive land and ecologically sensitive areas and pose health and safety risks.	Prior to extraction, topsoil (about 15 cm) shall be stockpiled, preserved and then refilled after completion of quarry/borrow pit operation for rehabilitation purposes after excavation is over.	All quarries and borrow areas operated for the project	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Dust control during transport (e.g., water spraying on access roads and provision of truck cover) and excavation shall be undertaken in areas where there are sensitive receptors such as residential areas, school, hospital, etc.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Long-term material stockpiles shall be covered to prevent wind erosion.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		During quarry and borrow site operation, provide adequate drainage to avoid accumulation of stagnant water.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		The use of river bed sources shall be avoided, as much as	ditto	No additional	Contractor	DDIS, PMU/SEO

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
		possible, however if this is unavoidable the contractor shall minimize use of river bed for construction materials and sources of fill and quarry materials lying on small rivers and streams shall be avoided. Alluvial terraces or alluvial deposits which lie on the river beds but not covered by water in normal hydrological conditions shall be preferred.		cost		MOE/PDE
		Confine winning river bed materials to less than 20% of river width in any location and keep away from river banks.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Protect and reinstate river banks if unexpected erosion occurs.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Quarry and borrow sites must be selected amongst those offering the highest ratio between extractive capacity (both in terms of quality) and loss of natural state.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Quarry and borrow sites lying close to the alignment, with a high level of accessibility and with a low hill gradient, are preferred.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Upon completion of extraction activities, re-contour borrow/quarry pit wall or fill-up when there are available and suitable materials such as excavation spoils, replace topsoil, and re-vegetate with native species such as grasses and fast-growing shrubs and trees.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Upon completion of extraction activities, borrow pits shall be dewatered and fences shall be installed, as appropriate, to minimize health and safety risks.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		In quarries in mountainous or hilly areas, or wherever slopes are important, terraces shall be cut after extraction, drainage system and vegetation cover shall be provided for rehabilitation to enhance slope stability	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Implement compensatory planting (at least one is to one ratio) if trees will have to be removed at quarry and borrow sites.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Borrow pits will be left in a tidy state with stable side slopes and proper drainage in order to minimize soil erosion, siltation of nearby bodies of water and to avoid creation of water bodies favourable for mosquito breeding.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		To avoid drowning when pits become water-filled, measures such as fencing, providing flotation devices such as a buoy tied to a rope, etc. shall be implemented.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		It is possible that villagers may request borrow pits to be left excavated so that they may be used as water reservoirs or fishponds. If this were to be agreed between the contractors and the villagers, all the full safety measures detailed above must be observed. Such agreements would be formalized in writing between the contractors and the villagers after full discussion with all concerned parties.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
USE OF	Pollution and safety risks due to use of	Store fuel and hazardous substances and wastes in paved areas with roof and embankment. If spills or leaks do occur, undertake	Throughout project sites	Part of contractor's bid	Contractor	DDIS, PMU/SEO

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
HAZARDOUS SUBSTANCES SUCH AS FUEL, OIL, BITUMEN, ETC.	hazardous materials and disposal of hazardous wastes	immediate clean up.		cost		
		Train relevant construction personnel in handling of fuels and other hazardous substances as well as spill control procedures.	All project roads	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Ensure availability of spill clean up materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Segregate hazardous wastes (oily wastes, used batteries, fuel drums) and ensure that storage, transport and disposal shall not cause pollution and shall be undertaken consistent with national and local regulations.	Designated storage sites	No additional cost	Contractor	DDIS, PMU/SEO
		Store waste oil, lubricant and other hazardous materials and wastes in tightly sealed containers to avoid contamination of soil and water resources.	Designated storage sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Ensure all storage containers of hazardous substances and wastes are in good condition with proper labelling.	Designated storage sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Regularly check containers for leakage and undertake necessary repair or replacement.	Designated storage sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Store hazardous materials above flood level.	Designated storage sites	No additional cost	Contractor	DDIS, PMU/SEO
		Storage areas for fuel, oil, lubricant, bitumen and other hazardous substance will be located at least 100 m away from any watercourses.	Designated storage sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Storage areas will be bunded and provided with interceptor traps so that accidental spills do not contaminate the environment.	Designated storage sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Storage, transport and disposal of hazardous wastes, including spill wastes, shall be consistent with national and local regulations.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Wherever possible, refuelling will be carried out at a fuel storage area.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO
		Refuelling shall not be permitted within or adjacent to watercourses.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO
		Where significant amount of oily wastewater or spill/leakage of oil and grease may occur (e.g., equipment maintenance areas), drainage leading to an oil-water separator shall be provided for treatment of wastewater. The oil- water separator shall be regularly skimmed of oil and maintained to ensure efficiency. Discharge of oil-contaminated wastewater into water courses will be strictly prohibited	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Vehicle maintenance and refuelling will be confined to areas in construction sites designed to contain spilled lubricants and fuel.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
Bitumen shall not be allowed to enter either running or dry streambeds and nor will be disposed of in ditches or small waste	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO		

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
		disposal sites prepared by the contractor.				
		Bitumen storage and mixing areas as well as storage areas for other petroleum products used in the preparation of the bitumen mixture shall be protected against spills and all contaminated soil must be properly handled according to national and local regulations. As a minimum, these areas must be provided with concrete flooring and surrounded by an embankment to readily contain and clean-up spills.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Adequate precaution will be taken to prevent oil/lubricant/hydrocarbon contamination of channel beds. Spillage if any will be immediately cleared with utmost caution to leave no traces.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO
		All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities (e.g., fire fighting equipment, sorbent pads, etc.) to combat emergency situations complying with all the applicable statutory stipulation.	Designated storage sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
BLASTING	Safety risks to workers and the public	Blasting will be carried out only with permission of the concerned authority, using a pre-established schedule.	All areas where blasting will occur	No additional cost	Contractor	DDIS, PMU/SEO
		All the statutory laws, regulation, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives	Throughout project sites	Part of contractor's	Contractor	DDIS, PMU/SEO
		The timing will be made available to the local people within 500 m of the blasting site in all directions, depending on the total charge used.	All areas where blasting will be undertaken	No additional cost	Contractor	DDIS, PMU/SEO
		Blasting will be held only during day time and shall be carried out not using high powered explosives. Under no circumstance will blasting be undertaken at night.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		Where possible blasting mats will be used to reduce noise levels when blasting is carried out to reduce flying rock.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		No blasting will take place without condition survey of the buildings within 500 m and permission and monitoring by the DDIS	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		People living near blasting sites will be informed of blasting times prior to the blasting.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		Warning sirens will be sounded before blasting.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		Pre-splitting shall be undertaken.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Where the vibration from blasting is exceeding the maximum permissible level, or damage occurs to local property information from the blasting shall be used to modify blasting patterns and calculate a reduced charge for future blasts	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		Blasting shall be under careful and strict management/ supervision of properly trained and licensed personnel. Workers at blasting	ditto	No additional cost	Contractor	DDIS, PMU/SEO

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
		sites will be trained prior to blast operations and provided with safety equipment and earplugs.				
		Observe proper warning and precautionary measures to ensure safety of residents, pedestrians, motorists and structures during blasting.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		All expenses/costs to address injuries, damage to properties, accidents, etc. due to blasting shall be shouldered by the contractor.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
EARTHWORKS/ EXCAVATION	Improper spoils disposal could cause deterioration of water quality, damage to productive land and flow obstruction of water courses.	Provide grass cover and other suitable slope stabilization measures on road embankment slopes and on long term stockpile of spoils.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Spoil disposal shall not cause sedimentation and obstruction of flow of watercourses, damage to agricultural land and densely vegetated areas. (ii) Spoil disposal shall not cause sedimentation and obstruction of flow of watercourses, damage to agricultural land and densely vegetated areas. As several of the roads pass very close to rice paddies, and in fact the road shoulder is contiguous with the rice fields, excess spoil shall not be dumped on rice production land, either temporarily or permanently. If temporary storage space is needed then work should take place alternately on opposite traffic lanes.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		The spoils disposal site shall be located at least 50 m from surface water courses and shall be protected from erosion by avoiding formation of steep slopes, provisions of adequate drainage and grassing.	ditto	Part of	Contractor	DDIS, PMU/SEO MOE/PDE
		Spoils shall only be disposed to areas approved by local authority.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Water courses (rivers, canals, etc.) shall be kept free of excavation spoil and construction debris, floating and submerged.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Spoil and construction materials stockpile area shall be located away from water bodies and under no circumstances will these materials be dumped into watercourses.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Dredged and excavated materials shall be reused or provided to local residents as soon as possible, if they require such materials, for land reclamation. The remaining spoils can be disposed into low elevation sites for road construction.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
BRIDGE WORKS	Bridge repair and replacement could cause obstruction of river flow and deterioration of water quality due to siltation	Rocks, stones, soil and other materials shall not be dumped onto rivers and streams.	All bridge repair and replacement sites	No additional cost	Contractor	DDIS, PMU/SEO/PDRD
		Ensure bridge works shall not cause obstruction of river flow and flooding of adjacent area.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		At bridge repair and demolition sites, the bridge structure will not be dropped into the river but alternative means will be used to avoid "dropping the bridge" into rivers/streams. This shall be done by "sawing" appropriate sections of the bridge and using cranes to lift these sections away or alternatively by construction of a	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
		platform onto which the bridge could be lowered.				
		Cofferdams, silt fences, sediment barriers or other devices will be used as appropriate based on the design to prevent migration of silt during excavation and boring operations within streams. If cofferdams are used, these will be dewatered and cleaned to prevent siltation by pumping from cofferdams to a settling basin or a containment unit.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Exposed surfaces shall be provided with native grasses and creepers to reduce runoff as early as possible in construction.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
TRANSPORT OF MATERIALS AND SPOILS, OPERATION OF CONSTRUCTION EQUIPMENT AND VARIOUS CONSTRUCTION ACTIVITIES	Damage to community utilities such as water supply pipes, irrigation canals, drainage, etc. may occur during construction activities.	The contractor shall not allow overloading of trucks used for all project- related activities.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO
		The contractor shall immediately repair any damage caused by the Project to community facilities such as water supply, power supply, irrigation canals, drainage and the like. Adequate compensation shall be paid to affected parties, as necessary.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Access roads damaged during transport of construction materials and other project-related activities shall be reinstated upon completion of construction works.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
BRIDGE WORKS, STOCKPILING OF CONSTRUCTION MATERIALS AND SPOILS, USE OF HAZARDOUS MATERIALS AND EARTHWORKS	Deterioration of surface water quality, flooding and flow obstruction of watercourses	Firmly consolidate river banks using stones, concrete and other suitable retaining measures at each bridge construction site and ensure that water courses (rivers, canals, etc.) shall be kept free of excavation spoil and construction debris, floating and submerged.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Spoils, construction wastes and construction materials stockpile area shall be located away from water bodies and under no circumstances will these materials be dumped into watercourses.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO
		Do not fill up canals and creeks at the construction site. In case filling of local drainage system is extremely necessary, consultation with local authorities shall be undertaken and their permission obtained beforehand. An alternative drainage shall be established before the existing canal is filled-up.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO
		Prohibit placement of construction materials, waste storage areas or equipment in or near drainage channels and water courses.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO
		Discharge of oily wastewater, fuel, hazardous substances and wastes, and untreated sewage to watercourses/canals and on the ground/soil shall be prohibited.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO
		Provide adequate drainage at the construction sites and other project areas to avoid flooding of surrounding areas and minimize flow obstruction of existing watercourses.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Regularly inspect and maintain all drainage channels to keep these free of obstructions.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO
		Slope stabilization measures (e.g., planting of fast growing native species of grass and shrubs, etc.) shall be implemented on exposed surfaces along river embankments to reduce material wash-away.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Construct retaining structures such as gabion baskets, rip-rap, etc. for river bank protection.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
ROAD AND BRIDGE WORKS	Traffic disruption and obstruction of access to roadside properties	In cooperation with the local traffic authorities, properly organize transport of materials for the project to avoid congestion.	All project roads and access roads	No additional cost	Contractor	DDIS, PMU/SEO
		Set up clear traffic signal boards and traffic advisory signs at the roads going in and out the road and bridge construction sites to minimize traffic build-up.	Throughout project sites, where appropriate	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Regularly monitor traffic conditions along access and Project roads to ensure that project vehicles are not causing congestion.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO
		Provide sufficient lighting at night within and in the vicinity of construction sites.	Throughout project sites, where appropriate	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Implement suitable safety measures to minimize risk of adverse interactions between construction works and traffic flows through provision of temporary signals or flag controls, adequate lighting, fencing, signage and road diversions, as necessary.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Provide safe temporary accesses to properties and establishments affected by disruption to their permanent accesses.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Reinstate good quality permanent accesses following completion of construction.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Provide safe vehicle and pedestrian access around construction areas.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Provide adequate signage, barriers and flag persons for traffic control.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		If necessary, traffic will be diverted for safe and smooth movement of vehicles to ensure smooth traffic flow and minimize accidents, traffic hold ups and congestion.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		The diversion signs would be bold and clearly visible particularly at night.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Temporary bypasses will be constructed and maintained (including dust control) during the construction period particularly at bridge crossings. Location of temporary bypasses shall be agreed with local authorities and such sites shall reinstate upon completion of works.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
EARTHWORKS, STOCKPILING AND ROAD WORKS	Soil erosion	On hill slopes and other potentially erodible places along the roadside, appropriate native vegetation that retards erosion will be planted.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		As much as possible, construction activities in hilly areas are to be undertaken during dry season only.	ditto	No additional cost	Contractor	DDIS, PMU/SEO

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
		Road embankments and slopes shall be monitored during construction for signs of erosion, vegetative cover shall be provided on slopes by planting native grass and creepers on erosion prone sections.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
		Long-term material stockpiles will be covered with native species of grass or other suitable materials to prevent wind erosion.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO
OPERATION OF CONSTRUCTION EQUIPMENT AND VEHICLES, SITE WORKS, SPOILS DISPOSAL AND PRESENCE OF WORKERS	Impacts to flora and fauna	Spoils and all types of wastes shall not be dumped into forested areas, agricultural land, densely vegetated areas and waterbodies.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Workers shall be prohibited from collecting firewood and construction materials from surrounding forests, and from hunting wild animals.	ditto	No additional cost	Contractor	DDIS, PMU/SEO
		As the project will not require road widening, ensure that construction works are carried out without unnecessary clearing of roadside vegetation.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		The contractor shall prohibit cutting of trees for firewood and for use in for construction-related activities	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Construction vehicles will operate within the corridor of impact, i.e., approximately within ROW, to avoid damaging soil and vegetation. It will be most important to avoid soil compaction around trees. Generally the rule will be to avoid driving heavy equipment or trucks anywhere into the 'drip-line' of a tree (defined as imaginary line around a tree where rainwater falls freely to ground unimpeded by the tree's foliage)	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		The contractor will not use or permit the use of wood as a fuel for the execution of any part of the Works, including but not limited to the heating of bitumen and bitumen mixtures, and to the extent practicable shall ensure that fuels other than wood are used for cooking, and water heating in all his camps and living accommodations.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Contractor shall not buy or use wood from the illegal sources (that come from the illegal logging)	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Construction camps, asphalt mixing plants, material storage sites and other project facilities shall not be located in the forest areas and other densely vegetated sites.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Contractor will take all precautions necessary to ensure that damage to vegetation is avoided due to fires resulting from execution of the works.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		The Contractor will immediately suppress the fire, if it occurs, and shall undertake replanting to replace damaged vegetation.	ditto	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		As much as possible, bridge works will be scheduled in dry season to minimize adverse impacts to fishery, river water quality and other aquatic resources.	ditto	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
CONSTRUCTION WORKS,	Health and safety risks to workers and the public	Conduct orientation for construction workers regarding emergency response procedures and equipment in case of accidents (e.g., burns from hot bitumen,	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
OPERATION OF WORKERS CAMPS		spills of hazardous substances, etc.), fire, etc.; health and safety measures, such as on the use of hot bitumen products for paving of Project roads, etc.; prevention of HIV/AIDS, malaria, diarrhea, and other related diseases.				
		Provide drainage at construction sites and workers camps to prevent water logging/ accumulation of stagnant water and formation of breeding sites for mosquitoes.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Provide fire fighting equipment and appropriate emergency response equipment (based on on-going construction activities) at the work areas and at construction and workers camps.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Provide first aid facilities that are readily accessible by workers.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		At the workers camps, provide adequate housing for all workers at the construction camps, provide reliable supply of potable water, install separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers and establish clean eating areas and kitchen.	Workers camps	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Provide workers with appropriate safety equipment/devices (such as dust mask, hard hats, safety shoes, goggles, ear plugs, etc.) and strictly require them to use these as necessary.	Throughout project sites	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Install sign boards, lighting system at the construction sites, borrow pits, or places which may cause accidents for people and workers	Throughout project sites, where appropriate	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, hospitals, and other populated areas are located.	Throughout project sites, where appropriate	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances and other construction materials during transport.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Barriers (e.g., temporary fence) shall be installed at construction areas to deter pedestrian access to these areas except at designated crossing points.	Throughout project sites, where appropriate	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Sufficient lighting at night as well as warning signs shall be provided in the periphery of the construction site.	Throughout project sites, where appropriate	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		The general public/local residents shall not be allowed in high – risk areas, e.g., excavation sites and areas where heavy equipment is in operation.	Throughout project sites, where appropriate	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Ensure proper collection and disposal of solid wastes within the construction camps consistent with local regulations.	Construction/ workers camps	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS/CONCERN	PROPOSED MITIGATION MEASURES	LOCATION	ESTIMATED COST	RESPONSIBILITY	
					IMPLEMENTATION	MONITORING
		Provide fencing on all areas of excavation greater than 2 m deep.	Throughout project sites, where appropriate	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Ensure reversing signals are installed on all construction vehicles.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Measures to prevent malaria shall be implemented (e.g., provision of insecticide treated mosquito nets to workers, spraying of insecticides, installation of proper drainage to avoid formation of stagnant water, etc.).	Construction/ workers camps	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Discharge of untreated sewage shall be prohibited.	Construction/ workers camps	Part of contractor's bid cost	Contractor	DDIS, PMU/SEO MOE/PDE
OPERATION OF CONSTRUCTION/ WORKERS CAMPS	Social Conflicts	Regularly inform in advance the local officials and local residents on the location and schedule of construction activities which may cause impacts on the environment and life of people (e.g., road sections to be constructed; roads used for transport, locations of worker camps etc.). The contractor will be encouraged to establish discussions with the village representatives before works commence and maintain these discussions as an ongoing activity through the life of the project.	Throughout project sites	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Locate construction camps away from communities (at least 500 m away) in order to avoid social conflict in using resources and basic amenities such as water supply.	Construction/ workers camps	No additional cost	Contractor	DDIS, PMU/SEO MOE/PDE
		Maximize number of local people employed in construction works.	Throughout project sites		Contractor	DDIS, PMU/SEO MOE/PDE
		Maximize goods and services sourced from local commercial enterprises.	Throughout project sites		Contractor	DDIS, PMU/SEO MOE/PDE

**ANNEX B:
ENVIRONMENTAL MONITORING PLAN**

ASPECTS/PARAMETERS TO BE MONITORED AND APPLICABLE STANDARDS	LOCATION	MEANS OF MONITORING	SCHEDULE/FREQUENCY	RESPONSIBLE TO UNDERTAKE MONITORING
PRE-CONSTRUCTION PHASE				
1. COMPLETION OF DETAILED DESIGN IN ACCORDANCE WITH EMP REQUIREMENTS TO ADDRESS CLIMATE CHANGE AND HYDROLOGICAL IMPACTS (SEE IEE TABLE VIII.1)	Phnom Penh	Review of detailed design documentation	Prior to approval of detailed design	MRD/PMU
2. IMPLEMENTATION OF ALL MITIGATION MEASURES SPECIFIED IN IEE TABLE VIII.1 ON THE FOLLOWING:				
a. UXO CLEARING	All project roads	Confirm UXO removal certified by authorized UXO clearing firm	Prior to start of site works	DDIS, MRD/PMU
b. ESTABLISHMENT OF GRIEVANCE REDRESS MECHANISM (GRM)	All project roads	Confirm GRM is established and disclosed to the public	Prior to start of site works	DDIS / SEO / PMU/ MRD
c. SITING OF QUARRY AND BORROW AREAS CONSISTENT WITH EMP	All project roads	Check contractor's construction materials plans, site visit	Prior to establishment of quarry and borrow areas	DDIS, MRD/PMU
d. SITING OF VARIOUS PROJECT FACILITIES (WORKERS / CONSTRUCTION CAMPS, CRUSHING PLANTS, BITUMEN PLANTS, ETC.) CONSISTENT WITH EMP	All project roads	Check contractor's facilities location plans, site visit	Prior to establishment of contractor's facilities	DDIS, MRD/PMU
e. RELOCATION OF COMMUNITY FACILITIES (E.G., WATER SUPPLY PIPELINES, IRRIGATION CANAL, ETC.)	All project roads	Site visit, confirm with local officials	Prior to start of site works	DDIS, MRD/PMU
3. AMBIENT SURFACE WATER QUALITY (FECAL COLIFORM, DISSOLVED OXYGEN, PH, OIL AND GREASE, SUSPENDED SOLIDS, BIOLOGICAL OXYGEN DEMAND – 5 DAYS OR BOD5) TO BE COMPARED TO STANDARDS SPECIFIED IN SUB DECREE ON WATER POLLUTION CONTROL, 1999 (No. 27 ANK.BK)	All project roads - on rivers or streams close to proposed sites for construction/workers camps	Field sampling	Once, prior to establishment of workers/ construction camps	DDIS
CONSTRUCTION PHASE				
4. IMPLEMENTATION OF CONSTRUCTION PHASE ENVIRONMENTAL MITIGATION MEASURES SPECIFIED IN IEE TABLE VIII.1	Locations indicated in IEE Table VIII.1 for specific mitigation measures	Site visit, interviews with local residents, coordination with concerned agencies (e.g., local traffic authorities, etc.)	Quarterly (on a regular basis) Random checks and to validate complaints	DDIS, MRD/PMU/SE U, PDRDs/MOE-PDE

ASPECTS/PARAMETERS TO BE MONITORED AND APPLICABLE STANDARDS	LOCATION	MEANS OF MONITORING	SCHEDULE/FREQUENCY	RESPONSIBLE TO UNDERTAKE MONITORING
5. NOISE IN DB(A) AND VIBRATION COMPARED TO STANDARDS SPECIFIED IN SUB DECREE ON THE CONTROL OF AIR POLLUTION AND NOISE DISTURBANCE, 2000 (No. 42 ANK.BK)	All project roads and other areas where project-related activities are undertaken	Noise and vibration measurement	In response to complaints and quarterly	DDIS
6. TOTAL SUSPENDED PARTICULATE/ DUST COMPARED TO STANDARD SPECIFIED IN SUB DECREE ON THE CONTROL OF AIR POLLUTION AND NOISE DISTURBANCE, 2000 (No. 42 ANK.BK)	All project roads and other areas where project-related activities are undertaken	Field sampling	In response to complaints and quarterly	DDIS
7. AMBIENT SURFACE WATER QUALITY (FECAL COLIFORM, DISSOLVED OXYGEN, PH, OIL AND GREASE, BOD5)	Upstream, midstream and downstream of rivers and stream close to construction/ workers camps	Field sampling	Quarterly and in response to complaints / to validate and verify pollution events	DDIS
8. OTHER PARAMETERS TO BE AMPLED, AS APPROPRIATE, TO VALIDATE COMPLAINTS AND POLLUTION EVENT(S) DUE TO PROJECT ACTIVITIES	Other locations to validate complaints or where pollution occurred due to the project (e.g., fuel spill)			

**ANNEX C:
CHECK LIST OF EMP IMPLEMENTATION**

Contract Package : _____ **Inspector's Name** : _____
Inspection Date : _____ **Position** : _____

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
1. Community Facilities (power lines, irrigation canals, etc.)						
Interruption of utility services are minimized by laying out new lines prior to transfer						
Replacement structure are constructed prior to demolition of existing structure						
Temporary facilities to maintain adequate services are in place						
Coordination with local company or local offices						
Affected parties are informed in advance						
2. Air Quality (Dust and Gaseous Emissions)						
Vehicles and equipment are well maintained and in good condition.						
Borrow areas, casting yard and other project facilities are duly licensed and have all the necessary environmental approvals						
All construction vehicles and equipment are tested for compliance with relevant emission standard and properly licensed						
Parked vehicles on the site works have their engines turned off. Unnecessary engine idling of vehicles and equipment is prohibited.						
Water spraying of roadways, working areas and other construction-related facilities near sensitive receptors and handling of all raw sand and aggregates, and other similar materials						
Dust barriers are installed as necessary						
Storage areas of construction materials such as						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
sand, gravel, cement, etc., have provisions that prevent them from being blown away towards sensitive receptors						
Trucks transporting construction materials (i.e. sand, soil, cement, gravel, etc) are tightly covered						
Roadways are regularly cleaned of tracked in mud, cement, etc. from construction works						
Stockpiling of spoils near sensitive receptors is prohibited						
Construction vehicles have speed limits (typically 25 km/hour or less) along areas where sensitive receptors are located						
Areas where there is a regular movement of vehicles have an acceptable hard surface and are clear of loose surface material						
Cement and other fine-grained materials delivered in bulk are stored in closed containers						
Conveyor belts are fitted with wind-boards, and conveyor transfer points and hopper discharge areas are enclosed						
Weigh hoppers are vented with a suitable filter						
Wheel washers are used to clean delivery/ haul trucks of mud and dirt as they exit the work area						
Smoke belching vehicles and equipment are not used for the project						
Construction vehicle trips and travel distances for material deliveries are minimized (e.g., by using local materials and labor sources).						
Construction access roads are temporarily paved or sealed						
3. Noise Levels						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
Prior notification to the community on construction schedule						
Vehicle and equipment are fitted with emission control and silencers to meet national noise standard						
Vehicles and equipment are well-maintained and checked by the contractor every 6 months						
Only vehicles and equipment that are registered and have necessary permits are used						
Noisy equipment are completely enclosed whenever possible						
Stationary equipment that produce high noise level are positioned as far as is practical from sensitive receptors.						
Noisy construction activities within 200m of a settlement are only during daytime						
Suitable noise control barriers are used in the vicinity of house, school, temples, medical facilities and other sensitive receptors						
Noisy construction activities are avoided near school during examination period and coordinated with school administration						
Noisy construction activities are avoided in the vicinity of sensitive receivers						
Suitable noise level reduction measures are installed by the contractor if construction activities are disruptive						
Speed limits on construction vehicles are imposed						
Construction traffic routes are defined in cooperation with local communities and traffic police						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
Asphalt concrete batching plants and crushing plant are located at least 500 m away from inhabited areas and other sensitive receptors						
4. Vibration Levels						
Fully loaded trucks are rerouted away from roadways that go through heavily built areas						
Heavy equipment are operated away from vibration-sensitive areas						
Simultaneous activities like demolition, ground impacting and earthmoving are avoided						
Alternative equipment is used						
Use of vibrating rollers near vibration- sensitive structures are avoided						
5. Erosion and Sedimentation						
Suitable soil erosion control measures are implemented prior to excavation of the bridge pier foundation and construction activities at waterways						
Silted water carried with the spoils during excavation and construction of bridge foundation are properly treated						
Spoils (excavated soil, rocks, removed asphalt, etc.) stockpiles are located at least 50 m from watercourses						
A bund is placed around the spoils stockpile area						
Spoil disposal does not cause sedimentation and obstruction of water flow, damage to agricultural land and densely vegetated areas						
Grading is avoided or minimized during the rainy						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
season particularly in areas of steep topography and/or adjacent to water courses						
Phased grading schedule is implemented to limit the area subject to erosion at any given time						
Appropriate erosion control and stabilizing measures (such as geotextiles, mats, fiber rolls, soil binders that are not toxic to the environment, or vegetation measures/temporary landscaping) are used in disturbed areas and on graded slopes						
Construction works (for bridges, culverts, drainage, etc.) on or near watercourses do not cause obstruction of channel flow						
Slopes along water channels are stabilized						
Dumping of soil, rocks, construction materials and debris onto watercourses is prohibited						
When construction works cause obstruction of watercourses, the obstruction is immediately cleared to restore channel flow						
6. Spoils Disposal						
Spoils (excavated soil and rocks, cut vegetation, removed pavement such as asphalt, etc.) are immediately transported to disposal sites approved by local authorities						
Temporary spoils stockpiles near paddy fields have bund or silt fence around them						
Temporary spoils stockpile that are planned to be used longer than six months are sodded.						
Height of spoils stockpile are limited to minimize windblown dust						
7. Soil and Groundwater Contamination						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
Maintenance shops, fuel and oil depot have impermeable flooring with sump						
Refueling and servicing of equipment are carried out only in adequately equipped areas						
Only minimal chemicals, hazardous substances and fuel are stored on site works, within an enclosed and covered secure area that has an impervious floor and impervious bund around it						
Storage area for chemicals, hazardous substances and fuel are located away from watercourses, flood-prone areas, work camps, and danger areas						
Oil-stained refuse such as oily rags, spent oil filters and used oil are collected and disposed of through recyclers/authorized waste handlers and disposed in authorized waste facilities						
Availability of spill clean-up materials specifically designed for petroleum products and other hazardous substances						
Immediate cleanup of spills or leaks of petroleum products and/or hazardous substances						
Training of relevant construction personnel in handling of fuels/hazardous substances and spill control procedures						
At least weekly check for leakage in containers and immediate repair or replacement when necessary						
Equipment maintenance and fuel storage areas are provided with drainage to an oil-water separator that is regularly skimmed of oil and maintained						
Discharge of oil-contaminated water into the						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
environment is prohibited						
Waste oil, used lubricant and other hazardous wastes are stored in tightly sealed containers with proper labeling						
Removal and treatment or proper disposal of oil contaminated soils is included in work sites restoration						
8. Water Availability						
Temporary canals /irrigation channels to prevent disruption of water supply to farmlands.						
9. Water Quality						
Suitable settling/retention ponds are constructed prior to operation of asphaltic concrete batching plants and casting yards						
Settling/retention ponds are properly operated and maintained to ensure effluent quality meets applicable effluent standards						
Bentonite slurry and sludge, mud and other materials and wastes from drilling are collected and processed to avoid pollution of surface water						
Bentonite slurry and sludge, mud and other materials and wastes from drilling are not discharged into watercourses						
Drilling solutions (e.g., bentonite slurry) for bridge construction, abutment construction, piling, etc. are processed in a closed system						
Proper disposal of bentonite-containing spoils as fill material in appropriate sites						
Spilled bentonite mud in agricultural land is						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
cleaned immediately before it cakes and hardens						
Water from bridge foundation dewatering is not discharged directly into a water body						
Total suspended solids content of discharges into water bodies comply with applicable standards						
Sanitation facilities with sufficient capacity are provided to handle and treat sewage generated by workers						
Equipment service and maintenance yards are provided with impermeable flooring and collection sump						
All equipment maintenance shops are provided with water-tight receptacles for waste oil, oily rags, spent oil filters, solvents and oily containers						
Disposal of all waste oil, oily rags, spent oil filters, solvents and oily containers are through authorized waste handlers and recyclers						
Paving operations are restricted during wet weather						
Use of sediment control devices downstream of paving activities						
Use of mobile fueling/maintenance units for construction equipment whenever feasible						
Accurate and up-to-date written inventories and labels for all stored hazardous materials						
Use of berms, ditches, and/or impervious liners, etc. in material storage, vehicle/equipment maintenance and fueling areas						
Material storage, maintenance and fueling areas and septic systems are at least 30 m from storm drains and surface waters						
Facilities for solid and domestic liquid waste						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
management are used and maintained						
10. Solid Waste						
Garbage bins and temporary storage facilities for construction wastes, domestic solid wastes and segregated wastes are provided within the project site						
Waste segregation (hazardous, non-hazardous, reusable) is practiced						
Regular collection and disposal of wastes (by contractor or authorized third party) to sites approved by local authorities						
Wastes are not dumped into watercourses, agricultural land and surrounding areas						
11. Borrow Pits						
Borrow areas are not located in productive land, forested areas and near water courses such as rivers, streams, etc.						
Topsoil are properly removed, stockpiled and preserved for later use during site restoration and provision of vegetation cover to minimize erosion						
Stable side slopes are provided during excavation of the borrow pits						
Quarry sites lying on small rivers and streams are avoided						
Quarry sections located on the river bed are avoided or reduced if unavoidable						
Borrow pits are left in a tidy state with stable side slopes and proper drainage						
Quarry sites and borrow pits are restored and						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
rehabilitated after use						
12. Traffic Management and Local Access						
Signs advising that construction is in progress are provided, particularly where the alignment crosses existing roads and where construction related-facilities are located						
Flag persons are employed to regulate traffic especially in potentially hazardous areas						
Traffic advisory signs (to minimize traffic build-up) are posted in coordination with local authorities						
Sufficient lighting at night within and in the vicinity of construction sites are provided						
Regular monitoring of traffic conditions along access roads to ensure that project vehicles are not causing congestion						
Schedules are observed for different types of construction traffic trips (e.g., transport of pre-cast sections, haulage of spoils, delivery of construction materials, etc.)						
Delivery of construction materials and equipment and transport of spoils are during non-peak hours						
Interactions between construction works, traffic flows and pedestrians are minimized by the following safety measures: <ul style="list-style-type: none"> • Temporary signals or flag controls • Adequate lighting • Fencing • Signage • Road diversion • Traffic cones 						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
• Barricades						
Use of escort vehicles and warning signs/lights to increase public awareness of potential hazards						
Construction activities and schedules are coordinated in advance with local agencies, community representatives, businesses, schools						
Existing access routes are maintained (whenever feasible)						
Provision of alternative access and/or parking when impacts to principal access routes and parking areas cannot be avoided						
Adequate informational and directional signage to improve alternative access function						
Construction operations are scheduled to avoid or minimize conflicts with local uses/activities						
At least one safe through lane is maintained at all times in construction areas						
13. Damage to Properties and Community Facilities						
Local roads used by the project are upgraded prior to use						
Local and access roads used by the project are repaired and maintained regularly and fully restored at the end of the project						
Contractor immediately repairs and/or compensates for any damage to properties						
14. Accidental Discovery of Artefacts						
Immediate stoppage of operations on road section where artifacts/ archaeological finds are unearthed; contractor informs the DDIS and CIPM						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
CIPM notifies Ministry of Culture and Information (MCI) to obtain advice regarding the next steps						
Work is resumed only after MCI has provided official notification						
15. Occupational Health and Safety						
Orientation for construction workers regarding health and safety measures, emergency response and prevention of HIV/AIDS and other diseases						
Workers at the bridge site are provided with life vests/buoyancy devices at all times						
Stable footpaths/access with sturdy guardrails to the bridge work sites shall be provided						
Preparation and implementation of a waterway safety plan, approved by the agencies in charge						
Contractor complies with the waterway traffic safety during construction						
First aid facilities that are readily accessible to workers						
Fire-fighting equipment at construction camps and work areas, as appropriate						
Adequate drainage in workers' camps						
Adequate and clean housing and sanitation facilities for all workers at the workers'/ construction camps						
Separate sleeping quarters for male and female workers						
Reliable supply of water for drinking, cooking and washing purposes at the workers' camps						
Separate hygienic sanitation facilities/toilets and						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
bathing areas with sufficient water supply for male and female workers						
All wastewater from workers' and construction camps and project-related activities/ facilities are treated consistent with national regulations						
Proper collection and disposal of solid wastes within the workers'/construction camps						
Sturdy fencing on all excavation areas greater than 2 m deep						
Workers are provided and use appropriate and complete safety equipment such as safety boots, protective clothes, breathing mask, ear protection, helmets, gloves, etc.						
Reversing signals are installed on all construction vehicles						
Fall prevention and protection measures whenever a worker is exposed to the hazard of falling more than two meters, falling into operating machinery or through an opening						
16. Public Safety						
Signage are installed at the periphery of the construction site to warn and direct traffic and pedestrians						
Security personnel are deployed in hazardous areas to restrict public access						
Speed limits are imposed on construction vehicles along residential and other sensitive areas (typically 25 km per hour)						
Drivers are taught safe driving practices to minimize accidents and prevent spill of hazardous and other construction materials						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
during transport						
Safe access to properties and establishments affected by construction works						
Safe passageways for pedestrians crossing the construction site						
Excavated areas are immediately backfilled, covered (e.g., with metal plates) and/or repaved						
All construction vehicles and equipment are secured during non-working periods to prevent unauthorized access or use						
Appropriate safety barriers and warning signs are installed in areas that pose safety risks such as open excavations, cut slopes, erosion-prone slopes, manufactured slopes, drainages, etc.						
17. Flora and Fauna						
Vegetation removal is coordinated with forest authority						
Tree-cutting permit is secured, as necessary						
Tree planting and landscaping plan that includes: <ul style="list-style-type: none"> • Inventory of the number of species of trees proposed for removal • Identifying and documenting quantity, variety, and location of replacement trees • Replanting at the outer portions of the ROW and in other locations agreed with local authorities • Monitoring and maintenance program to ensure effectiveness of the plan • Adopting remedial measures where appropriate (e.g., replacing dead or damaged 						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
replanted trees)						
Clearing of trees is limited to areas that are only necessary based on the project design and as approved by the forestry department						
Cutting of trees for firewood and for use in project is prohibited						
New alien plant species are not used for replanting/revegetation without an existing regulatory framework						
Invasive species are not introduced into new environments						
Workers are prohibited from hunting wild animals and collecting forest products						
Bridge works are scheduled in dry season to minimize adverse impacts to aquatic resources						
Contractors do not buy or use wood from illegal sources (illegal logging)						
No construction camps, asphalt mixing plants, material storage sites and other construction facilities are located in protected areas						
Construction camps, asphalt mixing plants, material storage sites and other construction facilities are located at least 1 km from the boundaries of national parks and class 1A and 1B watershed designated areas						
Precautions are adopted to ensure that damage to vegetation is avoided should fires resulting from execution of the works occur						
Road improvement works are restricted to the existing ROW boundaries						
Grading methods and facilities i.e., rounding, benching, terracing and retaining walls are used						

EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations/Corrective Action	Deadline
	Yes	No	Partially			
to reduce earthwork and related topographic alteration/vegetation removal						
Suitable wildlife crossing structures are installed at locations agreed with the park management boards and National Environmental Board						