

## **CHAPTER 9**

### **MITIGATION AND ABATEMENT MEASURES**

#### **9.1 INTRODUCTION**

The previous chapter has identified and provided assessment for the potentially significant environmental impacts that are perceived from the project activities incurred within the respective project stages of the proposed Project. This chapter deals with measures that can be practically incorporated as an integral part of the Project developments which will in turn, serves to reduce the extent and severity of the impacts anticipated.

Mitigation of impacts is to determine the possible preventive, remedial or compensatory measures for each of the adverse impacts evaluated to be significant. It is an interactive process. The linkages between project activities, expected impacts and the appropriate measures necessary to mitigate the impacts must be established. Thus, best management practices (BMP) is highly recommended for this logging project. BMP is practical guidelines that can be used to lessen the environmental impact of forestry activities such as construction of access road, skid trail and hauling track, operation of felling and site clearing. Moreover, it is designed to be low cost, practical and easily applicable to all forestry operations.

#### **9.2 SOIL EROSION AND SEDIMENTATION PREVENTION AND CONTROL**

In so far as logging activities are concerned, mitigation measures should necessarily focus on erosion prevention. These preventive measures in place will also reduce maintenance liabilities associated to such entrapment facilities. Implementation of the measures for erosion prevention and sediment entrapment, governed largely by topography aspect would mitigate against most of the adverse impacts on erosion and siltation which are anticipated in the course of earthworks.

##### **9.2.1 Site Felling Works Planning and Road Construction**

Phasing of the project development into two zones that are Zone A and Zone B with approximately 30 hectares each zone will reduce the area exposed to erosive forces.

The development of the smaller areas will be undertaken more rapidly, therefore the duration of exposure is also reduced.

Proper planning and timing of work must be established. Sites that have already been cleared for logging trail including temporary excavation must not be left for too long before the next activity are carried out. During period of high rainfall, logging and other high-disturbance activities should be stopped temporarily to minimize erosion or loss of soil from surface runoff. Logging activity conducted during wet or rainy season will encourage soil erosion.

The control of surface runoff is an important element in reducing the erosion hazard. Runoff from the site sub-catchment should be diverted away from the area of logging and operations by means of drains and ditches. By minimizing the flow passing over the site, the potential for erosive sediment entrainment is limited to the flow generated upon the clearing itself. Runoff generated on-site should be directed down the cut batters over a stable substrate, U-shaped drain or culvert pipes. Suitable energy dispersion devices should be utilized to attenuate flow velocity at the drainage exit points. This drainage network should be planned.

Proper location of forest roads is the most important factor in preventing water pollution caused by forestry operations. For this reason, road location should be carefully planned before construction of the road begins. Topography, boundary lines and economic limits on skidding and hauling timber will dictate the desired location and extent of the road system by:

- i. Locate roads as high above and far away from streams as possible. Locating roads near crests of ridges on side slopes will provide adequate side drainage.
- ii. Fit the road construction to the topography by following natural contours.
- iii. Use existing road where practical unless use such of roads would cause or aggravate an erosion problem.
- iv. Minimize the number of stream crossings and choose stable crossing sites. Provide an adequate streamside management zone to trap sediment and prevent its entry into the stream.
- v. Construct new roads several weeks in advance of logging or other activity. This will allow the soil to settle and minimize rutting.

- vi. When clearing right of ways, push trees, logs and other debris to the downhill side. This material will serve as a filter for trapping soil and other material which may be washed from the road surface.

### **9.2.2 Silt Trap and Sedimentation Control**

Silt trap usually installed in area that particularly has high silt run-off. Similar arrangements shall be made for all earthworks including excavations for drainage. In this project, installation of silt trap is not mandatory because the activity for selective logging is different with agriculture. If silt trap is installed in this project, it will damage the project area greatly.

### **9.2.3 Cover Cropping**

Cover cropping shall be established over cleared land in order to prevent erosion rather than controls it. It is imperative that re-vegetation is established as soon as possible with indigenous tree species in order to reduce soil erosion risk.

### **9.2.4 Vegetation Buffer**

Vegetation buffer or natural buffer zones shall be retained uniformly on both sides of the stream in the area covered by the project as shown in Table 9.1 as recommended by Drainage and Irrigation Department (DID). Such buffer, which acts as a filter strip will minimize sediment loading in the river system.

**Table 9.1: Recommended Vegetation Buffer Zones**

<b>WIDTH OF RIVER / STREAM BETWEEN BANKS (METERS)</b>	<b>WIDTH OF RESERVE IN EACH BANK (METERS)</b>
> 40	50
20 – 40	40
10 – 20	20
5 – 10	10
< 5	5

The width of stream in the area covered by the project is 12 - 15 meters. Thus, the buffer zones needed in the project is 20 meters for both sides of the stream. By preserving the 20 meters natural buffer zone area stretching along all the river banks within the proposed area, the sediment movement into the river will be minimize.

Maintaining a buffer strip along streams or streamside management zone can minimize the negative effects of timber harvesting. However, although standing timber is maintained in streamside management zones, timber can be selectively harvested using low impact harvesting methods outlined above. The long-term return from establishing streamside management zones including enhancing wildlife habitat, soil and water protection, and other associated values counters the potential costs of maintaining these areas.

Other benefits are also derived from using buffer strips. Establishing filter strips of trees along stream banks can control soil and bank erosion by slowing runoff into the stream and increase water quality by filtering out potential pollutants.

#### **9.2.5 Provision of Road Drainage**

The project proponent shall provide temporary earth drains for the efficient drainage of the area in order that the logging works will not be interrupted. Project proponent must ensure good road drainage with a combination of properly constructed and spaced wing ditches, broad-based dips, rolling dips, culverts, and bridges. Wing ditches should be constructed so water will be dispersed and not cut channels across the buffer zone. All drains shall be diverted to the nearest water outlet or stream. In order to trap the sediment from the drains, vegetation buffer should be preserved along the river banks so that the sediment movement into the river will be minimize.

Vegetation waste that generated during clearing right of ways to the downhill side will serve as a filter for trapping soil and other material which may be washed from the road surface.

### **9.3 WATER POLLUTION PREVENTION AND CONTROL**

Several measures to mitigate such potentialities are outlined below:

#### **9.3.1 Provision of Hygienic Sanitary System**

Provision of hygienic sanitary system is essential to minimize any impacts and must be provided on-site throughout the logging period. The sewage disposal system

should conform to the requirements of the Local Authority or the Public Health Ordinance. This is to ensure that sewage is properly treated before being discharged into the existing watercourses in compliance with Standard B of the Environmental Quality (Sewage) Regulation 2009.

### **9.3.2 Proper Disposal of Municipal Solid Waste**

Batu Hitam Enterprise provides workers base camp nearby plantation guard post or inside the plantation workers housing area of Felda Aring 5. These accommodations located not so close to the river and the settlements of the logging workers are already been equipped with basic utilities such as electricity, tap water and proper toilet facilities.

The base camp has provided with rubbish/garbage bins to ensure proper disposal of solid waste. Arrangement for regular collection and disposal of the waste material at the designated dumping site is very much recommended.

Resulting impacts from indiscriminate solid waste disposal such as odor can be minimized through proper management of solid waste disposal and sewage system on base camp. Solid waste will be dumped onto a designated area, so that there will be systematic and orderly dumping system to facilitate management of the base camp.

### **9.3.3 Disposal of Scheduled Wastes**

The possibilities of oil spill during logging stage are mainly generated from the maintenance and service of machineries including heavy vehicles such as lorries, bulldozer and excavator.

Several measures to mitigate such potentialities are outlined below:

- i. The Project Proponent need to ensure that all mobile machinery is well maintained and in good operating condition.
- ii. The project proponent shall refrain from disposing of used oil and grease from equipment and machinery into streams, drains, or vegetation in the area. No indiscriminate dumping of any waste material direct into the watercourses is allowed.

- iii. The project proponent shall provide proper equipment for the prompt removal of oil and grease spillage from sub-Contractor's vehicles and equipment resulting from his work or carelessness in the execution of the works.
- iv. The project proponent shall take necessary measures to collect and store used oil and grease from vehicles and machinery in a manner deemed proper. Such measures will prevent pollution to the adjacent watercourses and groundwater. Used oil is categorized as a scheduled waste and their handling, storage, transportation and disposal are governed by Environmental Quality (Scheduled Wastes) Regulations, 2005.
- v. Immobile machinery such as generators usually leaks some amount of oil, often proportional to their age. It has been found that approximately 1-2% of overall oil consumption will leak from older generators. Such equipment must be placed on a cement pad, bunded by a small retaining wall to confine any leakage before collection. No leakage should be allowed to spill onto the surrounding soils.
- vi. Skid tanks and other fuel container must be placed far from watercourse and should be contained properly.

## **9.4 AIR POLLUTION PREVENTION AND CONTROL**

### **9.4.1 Exhaust Emission Control**

- i. Proper maintenance of vehicles and machineries.

Vehicle or equipment exhaust discharges shall be visually inspected to ensure no excessive emission of black smoke. All machineries included diesel powered bulldozers and lorries used should be well maintained. Poor maintained machineries and vehicles may emit black smoke that could be potentially detrimental to the air quality. Operation of all vehicles and machineries must be strictly complying with relevant laws and legislation.

- ii. Compliance with DOE's Regulation

The project proponent must ensure that all vehicles and machineries being used comply with the Environmental Quality Regulations (Diesel Engine Emission

Control) 1996, Environmental Quality Act 1974 such that all vehicles and machineries do not emit exhaust smoke beyond the allowed limit.

iii. Law Enforcement

It is recommended that relevant laws with respect to exhaust emission to all vehicles used should be strictly enforced. This would include regular check by the enforcement authority to curb potential offenders.

#### **9.4.2 Dust Control**

Movement and operation of heavy earth-moving plant and machinery would exert dust dispersion impact. Several measures as outlined below are essential in order to mitigate such potentialities:

i. Dust Masks

Workers exposed to dusty working area must be provided with proper dust masks to reduce excessive dust inhalation.

ii. Controlled Vehicle Speed

Dust impact is more severe for vehicles moving on unpaved road. The Contractor must ensure that lorry drivers control the speed of their vehicles in order to minimize dispersion of dust into the atmosphere. Set speed limit of 20 km/hr within proposed site as to reduce the chances of dust generated due to movement of vehicles.

iii. Prohibition of Open Burning

Open burning is strictly prohibited. Tree trunks removed from site project should be left to rot naturally. Tree trunks from the felled vegetation also can be sold to saw millers and the rest to charcoal manufacturers.

## **9.5 NOISE PREVENTION AND CONTROL**

### **9.5.1 Hearing Protector**

Noise is also identified as a source of residual impact from the plant operation and thus periodic maintenance and noise measurement should be done to determine the effectiveness of the noise abatement measures. Hearing protection devices such as ear muffs or ear plugs shall be made compulsory for employees working in area of high noise level.

The hearing protection must be used for personnel exposed to noise levels above 85 dBA and the project proponent must comply with OSHA standard of permissible exposure noise level which is 90 dBA in exposure duration of 8 hours.

### **9.5.2 Control High Noise Level Generated by the Logging Machinery**

Several measures can be adopted to control high noise level generated during the logging stage. Silencers or mufflers on equipment shall be utilized and properly maintained during the operation. Proper and regular maintenance of operating machineries and hauling truck should be done.

### **9.5.3 Natural Noise Control**

Natural vegetation should be maintained as much as possible to act as natural barrier that could disperse and absorb the noise.

### **9.5.4 Noise Monitoring**

- Continual monitoring of noise level within proposed project site in an interval of every 3 months.
- Submit an environmental quality monitoring (EQM) report to Department of Environment (DOE) Kelantan State every three months for inspection and documentation purposes.



## **9.6 MITIGATING MEASURES ON FLORA, FAUNA AND FISHERIES**

Proper and detailed planning and practical implementation of all operations within the project area should be the basic principle for minimizing impacts within the forest ecosystem. At all stages of operations, field managers should safeguard the integrity of both land and forest through thoughtful planning and sensitive implementation of forestry operations. Maximum care must be taken to reduce soil erosion. It would be necessary that effective precautionary be implemented to minimize damage to the areas:

- Provision of migrating route for existing fauna to move to surrounding habitat.
- Provision adequate opportunity for the wildlife to escape and seek refuge in the nearby undisturbed area.
- Provision appropriate signs/ notices to warn others particularly local population about specific location/ route taken by wildlife species.
- Practice principle of conservation, only cut flora that is necessary for demand of any logging activities.
- Loggers must be trained and disciplined. The loggers should not intrude into the forest areas for various kinds of illegal activities such as cutting for firewood, burning and hunting.
- All necessary measures in accordance to the existing guidelines for development projects in hill forest must be strictly adhered to in order to minimize adverse impacts to the forests. This includes strict implementation of road construction in compliance with the last Road Specification Guidelines of the Forestry Department, Peninsular Malaysia. Vehicles movement should be restricted to the predetermined access roads and not meander beyond them.
- Supervision must also be enforced to ensure that no unnecessary logging is done in areas outside the logging blocks and only designated tagged tree are removed.
- Skid trails shall be re-vegetated with appropriate species, mainly indigenous tree species.
- Oils, metals and other chemicals which are brought into the forest must be carefully-handled and controlled. Their disposal should also be monitored to prevent mishaps that can adversely affect vegetation.
- Logging operations should not cause avoidable ponding or water-logging.
- The logging activity should be undertaken during the drier months in order to minimize soil erosion and siltation at the downstream of Sg. Ghuan.

In logging activities, there might be conflicts between human and wildlife. Wildlife can enter human areas and cause damage to property and agriculture near project site. To avoid this conflict, the following mitigation measures can be adopted:

- Shouting and make some noise to scare the animal, so that they can elope to the forest.
- Gather collective effort to chase the wildlife rather than individual.
- Informed Department of Wildlife and National Parks immediately once the wildlife is sighted.
- Involve Department of Wildlife and National Parks and various nature conservation group and NGOs to help in the management of wildlife species.

## **9.7 SOCIO- ECONOMIC MITIGATION**

When the logging operation is at almost end, the cessation input via salaries and project related spending on goods and services will impact household incomes of contacted workers and on the local economy, respectively. Staff communications shall ensure the workforce is aware of project progress and completion dates and staff will be provided with financial planning advice to encourage them to make provision for after the logging period.

## **9.8 MITIGATION FOR TRANSPORTATION OF LOGS**

The mitigating measures are as per below:

- Proper signage at the entry/exit points from the site to public road.
- Long trailer carrying the logs must be equipped with safety facilities.
- Speed of transporting truck must be at minimal at entry/exit point.
- Security guard or flag man at the entry/ exit points off road.
- The access road shall be constructed and maintained in accordance with *Spesifikasi Jalan Hutan (Jalan Tuju and Lorong Penarik) untuk Semenanjung Malaysia 1999*.
- The signage, 'AWAS-LORI BALAK KELUAR' will be placed at about 200, 100 and 50 meters away respectively. It will be placed on the both sides of road.
- Signage 'Beri Laluan' will be placed at the exit point so that lorry driver can safely exit to public road from logging site.
- All the signage will be large enough and light reflected so that both lorry driver and on-coming vehicles can clearly see and read.

## **9.9 SAFETY AND HEALTH IMPACT MANAGEMENT**

The impact management practices are as such:

- Briefing by Health and Safety Supervisor every day before work starts to ensure workers aware of occupational safety procedures.
- Continual monitoring by Health and Safety Supervisor.
- Personal protective equipments such as heavy duty shoes, helmet and emergency medical kits will be provided for the workforce.
- Prepare Emergency Respond Plan (ERP). Formulation of comprehensive ERP will be undertaken involving Local Police, Bomba, site manager and workers to ensure safety of the workers.
- Remind workers of emergency escape route and assembly point.
- Demarcation of hazardous areas and provision of guidelines for storage and handling of hazardous materials, so that workers alert and not causing any unwanted accident.
- Establish warning system for keeping employees safety away from falling trees.
- Hire only local people to prevent possible various kinds of infectious illness.

## **9.10 SOLID AND HAZARDOUS WASTE MANAGEMENT**

The mitigating measures are as per below:

- Solid waste from worker camp shall be stored at designated places before disposed.
- Biomass such as cut vegetation shall be reused as protection layer for soil erosion from rain eroding agent and the rest shall deposited at designated area before disposed.
- Scheduled waste should keep within a concrete bunded area or tray with shelter on top of it.
- The design capacity of bunded volume for skid tank storage shall 110% of the volume of skid tank.
- Minimize the generation of solid waste by proper planning and reusing whenever it is possible.

## **9.11 AESTHETIC AND LAND USE**

No specific mitigating measures shall be adopted as the impact is minimal, localized and insignificant. The most commonly adopted approach to mitigate visual impact is to conceal the offending elements from view. In the case under study, this can be achieved by

maintaining remaining forest vegetation surrounding the project area. For the land use impact, there will be no mitigating measure and communities have to accept as prior to this the project was granted approval from concerning authorities.

## **9.12 PROJECT CLOSING (POST FELLING PHASE)**

### **9.12.1 Introduction**

If unfortunately the proposed project is not materialized due to unforeseen circumstances beyond the proponent's control, the potential impacts are all manageable. There will be some minor impacts predicted on the project site and its immediate surrounding environment.

### **9.12.2 Demolition of Batau, Storage Yards and Workers Base Camp**

The impacts will be minor because of the scale of the proposed project which is small. These facilities can be easily dismantled and important items can be safety taken without any difficulties. The cleanliness of the project area should be maintained. All inorganic materials should be taken out of the area and placed in a suitable dumpsite. Rubbish dumping areas must be fully covered and restored. It would be a good practice to replant the project site if necessary.

### **9.12.3 Removal of Machinery, Vehicles and Logging Wastes**

Machineries, vehicles and logging wastes shall be moved out of the project site as the logging tracts and roads are all in place, there will be no difficulties of doing this. Logging wastes, such as, abandoned equipments and other discarded materials will be dumped in the landfill. Waste oil which is classified as scheduled waste is to be transferred to licensed scheduled waste contractors for safe disposal. The impacts will be insignificant and minimal.

### **9.12.4 Rehabilitation**

The rehabilitation of the skid trails and the Batau areas will have positive impacts as they will enrich the secondary forest with valuable commercial species that will have potential to become future crop trees. The re-vegetation will also prevent soil erosion and promote regeneration of other species.

**Table 9.2: Summary of Impact and Mitigation Measures**

NO	POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS	ACTIVITY	PROPOSE MITIGATION MEASURES
1.	Soil erosion risk and sedimentation	<ul style="list-style-type: none"> <li>▪ Site clearance</li> <li>▪ Construction of logging road and skid trail.</li> <li>▪ Forest inventory survey</li> <li>▪ Felling</li> </ul>	<ul style="list-style-type: none"> <li>i. Implementation of stage by stage land clearing process <ul style="list-style-type: none"> <li>▪ Pre-plan the sequence of compartment of land to be cleared.</li> <li>▪ Preserve existing vegetation on areas that are not affected by current activities. It shall reduce the size of area exposed to erosion.</li> <li>▪ Avoid working on rainy season.</li> </ul> </li> <li>ii. Use cut biomass (branches, leaves and roots) as protection barrier to protect bared soil from erosion agent.</li> <li>iii. Minimize disturbance towards existing environment. <ul style="list-style-type: none"> <li>▪ Use existing roads, unless use of such roads would cause aggravate erosion problem.</li> <li>▪ Avoid working (site clearing and felling) during raining periods unless it is necessary and reasonable.</li> </ul> </li> <li>iv. Vegetation cover is to be retained for the entire site apart from the designated access paths.</li> <li>v. Exposed surfaces must be turf with grass seed to stabilized soil.</li> <li>vi. When clearing for right of ways, push trees, logs and other debris to the downhill side. This material will serve as a filter for trapping soil and other material which may wash away from existing road surface.</li> <li>vii. Buffer zones must be clearly demarcated as 20 m width on each side of water course. Strictly no logging is permitted in buffer strips.</li> <li>viii. More erosion prone activities should be scheduled for drier period.</li> <li>ix. Avoidance of using inappropriate machineries particularly in wet conditions.</li> </ul>
2.	Water quality degradation	<ul style="list-style-type: none"> <li>▪ Site clearance</li> </ul>	<ul style="list-style-type: none"> <li>i. Provision of good housekeeping practices.</li> </ul>

NO	POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS	ACTIVITY	PROPOSE MITIGATION MEASURES
		<ul style="list-style-type: none"> <li>▪ Leakage of scheduled waste such as diesel and engine oil.</li> <li>▪ Illegal sewage and sullage discharge from worker camp.</li> <li>▪ Illegal disposal of solid waste into river.</li> </ul>	<ul style="list-style-type: none"> <li>ii. Locate roads as high above and far away from streams as possible.</li> <li>iii. Minimize number of stream crossing and choose stable crossing sites.</li> <li>iv. Locate all log landings above away from streams.</li> <li>v. Provide adequate buffer for the riverbanks of Sg. Ghuan and other tributes to reduce erosion at the areas concerned as well as control eroded soil being washed into the rivers.</li> <li>vi. Buffer zones must be clearly demarcated as 20 m width on each side of water course. Strictly no logging is permitted in buffer strips.</li> <li>vii. Cease logging operation during rainy season.</li> <li>viii. Monthly water monitoring of Total Suspended Solid (TSS) for the final discharge point is proposed. TSS concentrations tested shall be complied with Standard B (100 mg/l) or Class III of the Proposed Interim National Water Quality Standard (INWQS).</li> <li>ix. Construct water bars on unused logging trails after the logging activity is completed.</li> </ul>
3.	Air quality degradation	<ul style="list-style-type: none"> <li>▪ Movement of heavy vehicles</li> <li>▪ Felling operation</li> </ul>	<ul style="list-style-type: none"> <li>i. Maintain the existing vegetation as purification for dust and as filter to block dust dispersion.</li> <li>ii. Minimize the area of bared soil to reduce amount of dust generated on soil surface due to wind agent.</li> <li>iii. Set speed limit of 20 km/hr within proposed site as to reduce the chances of dust generated due to movement of vehicles.</li> <li>iv. Visual inspection shall be conducted on regular basis to identify significant dust entrainment and as mean of assessing effectiveness or requirement for additional mitigation measures.</li> </ul>

NO	POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS	ACTIVITY	PROPOSE MITIGATION MEASURES
			<p>v. If any complaints received, it shall be investigated promptly with remedial measures implemented as appropriate. Complaints, investigation and corrective action shall be documented.</p> <p>vi. Vehicle or equipment exhaust discharges shall be visually inspected to ensure no excessive emission of black smoke.</p> <p>vii. Burning of tree trunks, leaves and branches are strictly prohibited.</p> <p>viii. No open burning for biomass and construction waste in or outside the project area.</p>
4.	Noise pollution	<ul style="list-style-type: none"> <li>▪ Movement of vehicles</li> <li>▪ Operation of equipment/machinery</li> </ul>	<p>i. Proper and regular maintenance of operating maintenance of operating machineries and hauling truck.</p> <p>ii. Use of hearing protection for personnel exposed to noise levels above 85 dBA.</p> <p>iii. Continual monitoring of noise level within proposed project site in an interval of every 3 months.</p> <p>iv. Submit an environmental quality monitoring (EQM) report to Department of Environment (DOE) Kelantan every three months for inspection and documentation purposes.</p> <p>v. Comply with OSHA standard of permissible exposure noise level which is 90 dBA in exposure duration of 8 hours.</p> <p>vi. Educate workers associated with logging operation with awareness of harmful effect of noise.</p> <p>vii. Natural vegetation should be maintained as much as possible to act as natural barrier that could disperses and absorbs the noise.</p>
5.	Ecological impact on Aquatic and Terrestrial habitat and species.	<ul style="list-style-type: none"> <li>▪ Site clearance</li> <li>▪ Construction of logging road and skid trail</li> <li>▪ Operation of machinery</li> </ul>	<p>i. Provision of migrating route for existing fauna to move to surrounding habitat.</p> <p>ii. Loggers must be trained and disciplined. The loggers should not intrude into the forest areas for various kinds of illegal</p>

NO	POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS	ACTIVITY	PROPOSE MITIGATION MEASURES
		<ul style="list-style-type: none"> <li>▪ Water and air quality degradation</li> <li>▪ Felling of timber</li> </ul>	<p>activities such as cutting for firewood, burning and hunting.</p> <p>ii. All necessary measures in accordance to the existing guidelines for development projects in hill forest must be strictly adhered to in order to minimize adverse impacts to the forests. This includes strict implementation of road construction in compliance with the last Road Specifications Guidelines of the Forestry Department, Peninsular Malaysia. Drainage of roads must be addressed properly to minimize soil erosion and siltation. Stream crossing of roads should also be minimized.</p> <p>iii. Supervision must also be enforced to ensure that no unnecessary logging is done in areas outside the logging blocks and only more than 30.1 cm dbh trees are removed.</p> <p>iv. Skid trails shall be re-vegetated with appropriate species, mainly indigenous tree species.</p> <p>v. Oils, metals and other chemicals which are brought into the forest must be carefully-handled and controlled.</p> <p>vi. The logging activity should be undertaken during the drier months in order to minimize soil erosion and siltation at the downstream of Sg. Ghuan.</p> <p>vii. Forest operations should not cause avoidable ponding or water-logging.</p> <p>viii. Provide appropriate signs/ notices to warn others particularly local population about specific location/ route taken by wildlife species.</p> <p>ix. To impose a “No Hunting” policy throughout the project site. Signboard shall be made and installed at strategic location within the project site.</p> <p>x. Provide adequate opportunity for the wildlife to escape and seek refuge in the nearby undisturbed area.</p>



NO	POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS	ACTIVITY	PROPOSE MITIGATION MEASURES
			xi. Shouting and make some noise to scare the wildlife once they are sighted entering human areas.
6.	Impact due to transportation of logs	<ul style="list-style-type: none"> <li>▪ Transportation of logs</li> </ul>	i. Proper signage at the entry/exit points from the site to road. ii. Long trailer or heavy duty truck carrying the logs must be equipped with safety facilities iii. Speed of transporting truck must be at minimal at entry/exit point. iv. Security guard or flag man at the entry/exit points off. v. The access road shall be constructed and maintained in accordance with Spesifikasi Jalan Hutan (Jalan Tuju and Lorong Penarik) untuk Semenanjung Malaysia 1999. vi. The signage, 'AWAS-LORI BALAK KELUAR' will be placed at about 100 and 50 meters away respectively. It will be placed on the both sides of road. vii. Signage 'Beri Laluan' will be placed at the exit point so that lorry driver can safety exit to public road from logging site.
7.	Socio-economic impact	<ul style="list-style-type: none"> <li>▪ Logging operation</li> </ul>	i. Staff communications shall ensure the workforce is aware of project progress and completion dates and staff will be provided with financial planning advice to encourage them to make provision for after the logging period.
8.	Safety and health impact	Logging operation <ul style="list-style-type: none"> <li>▪ Operation of machineries</li> <li>▪ Felling operation</li> </ul>	i. Briefing by Health and Safety Supervisor every morning before work starts to ensure workers aware of occupational safety procedures. ii. Safety equipments/system or personal protective equipments such as heavy duty shoes, helmet, protective clothes and emergency medical kits will be provided for the workforce. iii. Continual monitoring by Health and Safety Supervisor. iv. Other utilities, such as, adequate cooking and drinking facilities, water and medicines will be in place to facilitate the

NO	POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS	ACTIVITY	PROPOSE MITIGATION MEASURES
			<p>logging operation.</p> <p>v. Prepare Emergency Respond Plan (ERP). Formulation of comprehensive ERP will be undertaken involving Local Police, Bomba, project management, site manager and main and sub-contractors to ensure safety of the workers.</p> <p>vi. Remind workers of emergency escape route and assembly point.</p> <p>vii. Demarcation of hazardous areas and provision of guidelines for storage and handling of hazardous materials, so that workers aware of it and not causing any unwanted accident.</p> <p>viii. Hire local people to avoid various kinds of infectious illness.</p>
9.	Solid and hazardous waste impact	<ul style="list-style-type: none"> <li>▪ Base camp</li> <li>▪ Accidental oil spillage due to vehicle operation</li> <li>▪ Cut vegetation</li> </ul>	<p>i. Solid waste from worker camp shall be stored at designated places before disposing it.</p> <p>ii. Biomass such as cut vegetation shall be reused as protection layer for soil erosion from rain eroding agent and the rest shall deposited at designated area before disposing.</p> <p>iii. Scheduled waste should keep within a concrete bonded area with shelter on top of it.</p> <p>iv. The design capacity of bunded volume for skid tank storage shall 110% of the volume of skid tank.</p> <p>v. Minimize the generation of solid waste by proper planning and reusing whenever it is possible.</p>
10.	Aesthetic and land use	<ul style="list-style-type: none"> <li>▪ Logging operation</li> <li>▪ Perhaps plantation of oil palm.</li> </ul>	No specific mitigating measures shall be adopted as the impact is minimal, localized and insignificant.
11.	Post Closing (Post Felling)		

NO	POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS	ACTIVITY	PROPOSE MITIGATION MEASURES
11.1	Decommissioning - Demolition of workers base camp, quarters, storage yard - Removal of all machinery and vehicles, oil drums and waste	Waste arising giving rise to ▪ Poor aesthetics ▪ Fire hazards ▪ Surface water pollution - Spills and leaks - Dust/air	i. Disposal of all solid waste materials ii. Ensure safe work procedures prepared and conducted iii. Ensure area is nearly rehabilitated as originally iv. Ensure safe work procedures prepared and conducted v. Ensure no vehicles/machinery left in the concession area vi. Remove all drums, material from site vii. Bury any unscheduled biodegradable waste
11.2	Reforestation and Conservation	▪ Rehabilitation of track, log yards, disturbed areas	Plant selected species on tracks, log yards and disturbed areas in accordance to Guidelines
11.3	Post-closure Environmental Monitoring and Audit	▪ Minimal impact	Minimal, no mitigation necessary