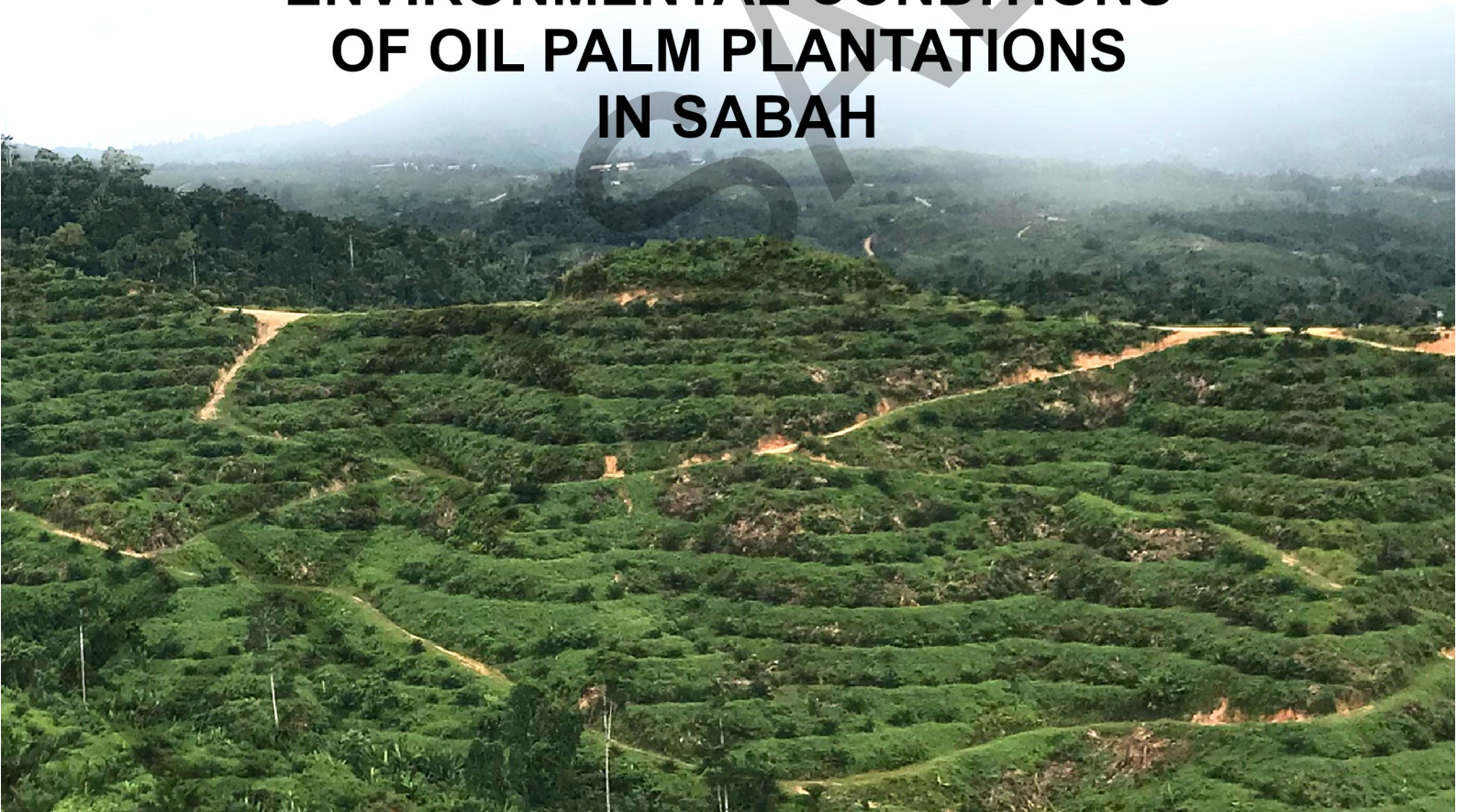




ENVIRONMENT PROTECTION DEPARTMENT

MINISTRY OF TOURISM, CULTURE AND
ENVIRONMENT SABAH

STANDARD OPERATING PROCEDURES (SOPs) FOR COMPLIANCE WITH ENVIRONMENTAL CONDITIONS OF OIL PALM PLANTATIONS IN SABAH



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Environment Protection Department (EPD)

Tingkat 1 – 3, Wisma Budaya

Jalan Tunku Abdul Rahman

Beg Berkunci No. 2078

88999 KOTA KINABALU, SABAH

Tel. No. : +60 (088) – 251 290 / 251 291/ 267 572/ 268 572

Fax No. : +60 (088) – 238 120/ 238 390

Email : jpas@sabah.gov.my

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FOREWORD

As part of the Environment Protection Department's continuous efforts to enhance environmental management in Sabah, we have published a guideline on how to minimise impacts of oil palm plantations and mills on river quality and Environmental Impact Assessment (EIA) guideline for oil palm plantations. These guidelines outline environmental issues related to oil palm plantations and how negative impacts can be addressed through effective mitigation measures.

With the increasing number of approved EIA and Proposal for Mitigation Measures (PMM) reports processed by our Department, a mechanism is now introduced to provide guidance to project proponents to facilitate compliance to environmental conditions in a more effective manner.

These Standard Operating Procedures (SOPs) provide a clear, practical and comprehensive guidance for project proponents to comply with the conditions as stipulated in the legally-binding Agreement of Environmental Conditions (AEC). The Environmental Self-Regulation (ESR) guideline, which is published in a separate handbook, is to be used together with the SOPs to further strengthen the compliance of environmental conditions.

I greatly acknowledge all government agencies, organisations and individuals who provided valuable comments, feedback and input into the development and publication of these SOPs guideline. I sincerely hope these SOPs will be utilised meaningfully by project proponents for a more sustainable environment in Sabah.

Director
Environment Protection Department, Sabah

Table of Contents

TABLE OF CONTENTS.....	i
LIST OF ANNEX.....	ii
LIST OF PLATES.....	iii
LIST OF FIGURES.....	iv
ABBREVIATION AND ACRONYMS	iv
INTRODUCTION.....	1
1 ENVIRONMENTAL CONDITION: CONTROL OF DEVELOPMENT AREA	3
1.1 Project Survey Plan	3
1.2 Site Demarcation and Marking Maintenance (Project boundary)	3
1.3 Sensitive Area (water gravity, water catchment area, Sabah Parks and gazetted area <i>i.e. Tanah Simpanan Bumiputera</i> , Archaeology, Historical, burial site).....	4
2 ENVIRONMENTAL CONDITION: PROTECTION OF RIPARIAN BUFFER	6
2.1 Riparian Buffer Boundary	6
2.2 Oil Palms Planted within Riparian Buffers.....	9
2.3 Approval and Notification.....	9
3 ENVIRONMENTAL CONDITION: PROTECTION OF FOREST RESERVE	10
3.1 Provision of Forest Reserve Buffer	10
3.2 Oil Palms Planted within the Forest Reserve Buffer.....	11
4 ENVIRONMENTAL CONDITION: CONTROL OF STEEP AREA.....	13
5 ENVIRONMENTAL CONDITION: PROTECTION OF WILDLIFE CORRIDORS ...	15
6 ENVIRONMENTAL CONDITION: PROVISION OF ROADSIDE BUFFER ZONES FOR EXISTING FOREST HIGHWAYS	17
7 ENVIRONMENTAL CONDITION: ROAD DEVELOPMENT	18
7.1 Road Construction.....	18
7.2 Drainage System	18
7.3 Excess Soil Management	19
8 ENVIRONMENTAL CONDITION: DEVELOPMENT OF SITE FACILITIES / INFRASTRUCTURE.....	20

8.1	Preparation of Site Facilities / Infrastructure (Worker’s Quarters, Base Camp, Workshop and Nursery)	20
8.2	Drainage System	20
8.3	Location of site facilities	23
9	ENVIRONMENTAL CONDITION: PHASED DEVELOPMENT OF OIL PALM PLANTATIONS	26
9.1	Development by Phases	26
10	ENVIRONMENTAL CONDITION: CONTROL OF SURFACE RUN-OFF	27
10.1	Development Stage	27
10.2	Operational Stage	28
11	ENVIRONMENTAL CONDITION: CONTROL OF WATER SOURCE QUALITY ...	30
11.1	Alternative Water Source	30
11.2	Management of Agro-Chemicals	31
12	ENVIRONMENTAL CONDITION: FIRE CONTROL	36
12.1	Open Burning	36
12.2	Fire Prevention / Fire Mitigation / Fire Safety Management Plan	36
13	ENVIRONMENTAL CONDITION: OIL MATERIAL MANAGEMENT	39
14	ENVIRONMENTAL CONDITION: SCHEDULED WASTE MANAGEMENT	42
15	ENVIRONMENTAL CONDITION: SOLID WASTE MANAGEMENT	45
16	ENVIRONMENTAL CONDITION: BIOMASS MANAGEMENT	48
17	ENVIRONMENTAL CONDITION: CONTROL OF SEWAGE	49
18	ENVIRONMENTAL CONDITION: CLOSURE AND ABANDONMENT	51
19	COMPLIANCE AND IMPACT MONITORING	52
20	GLOSSARY	53

LIST OF ANNEX

Annex 1.0: General Steps In Using A Clinometer To Measure Slope Gradient

LIST OF PLATES

Plate 2.1: Example of 30 metres riparian buffer signage.....	7
Plate 2.2: Example of prohibition signboards to carry out any development and operation within the riparian buffer.	8
Plate 2.3: Example of prohibition signboards to carry out any maintenance activities within the riparian buffer.	9
Plate 3.1: Example of forest reserve buffer signage.	10
Plate 3.2: Example of warning signages at forest reserve buffer zone area.....	11
Plate 3.3: Ring red paint on trunk as indicator for oil palms planted within forest reserve buffer.....	12
Plate 4.1: Example of steep area field demarcation.....	14
Plate 5.1: Example of electrical fencing.	15
Plate 5.2: Example of signboards prohibiting any activities within the wildlife corridor buffer.....	16
Plate 7.1: Example of earth drain provided along the road side.....	19
Plate 8.1: Provision of drainage system at workers quarters.	21
Plate 8.2: Example of workshop with concrete floor and roof.....	21
Plate 8.3: Example of concrete drain for workshop.....	22
Plate 8.4: Example of oil trap for workshop.....	22
Plate 8.5: Example of earth drain and sump pit provided at nursery area.	23
Plate 8.6: Nursery.....	24
Plate 8.7: Workshop compound.....	25
Plate 10.1: Terracing and establishment of leguminous cover crops (LCC).	28
Plate 10.2: Example of silt pit constructed within the oil palm plantation.....	29
Plate 11.1: Provision of riparian buffer (pointed) along the natural waterway located within the OPP.....	31
Plate 11.2: Planting of beneficial plants such as <i>Antigonon leptopus</i> to provide shelter and supplementary food such as nectar and encourage the population growth of predators and parasites.	32
Plate 11.3: Provision of pesticides measuring and mixing area.	34
Plate 11.4: Example of chemical store.....	35
Plate 11.5: Example of a well organised fertiliser store.....	35
Plate 12.1: Fire tower as early warning system.....	38
Plate 13.1: Example of permanent diesel tank with roof and bund.....	40
Plate 13.2: Example of oil and grease trap.	41
Plate 14.1: Segregation of scheduled waste.....	42

Plate 14.2: Storage of scheduled waste (SW 102).....	43
Plate 15.1: Re-using old tyres for landscaping purposes.	45
Plate 15.2: Example of waste segregation on site.	46
Plate 17.1: Manhole for an installed septic tank.....	49

LIST OF FIGURES

Figure 1.1: Illustration of OPP Located within FR Class II.....	4
Figure 2.1: Illustration of riparian buffer within FR Class II.....	7
Figure 2.2: Width of the riparian buffer is measured in horizontal distance from the top of the riverbank.....	8
Figure 7.1: Example of road camber design.	19
Figure 8.1: Illustration of measuring in horizontal distance of workers' quarters from the top of the riverbank.....	24
Figure 13.1: Reference on construction of a typical oil trap.	41
Figure 15.1: Example of open trench method for disposal of solid waste on site.	47
Figure 17.1: Typical Pre-Fabricated Septic Tank for < 600 mm depth.	50
Figure 20.1: Composite view.	55
Figure 20.2: Sighting pole marked at eye level.	56
Figure 20.3: Person as a target zero point.....	57

ABBREVIATIONS AND ACRONYMS

3R	Reduce, Re-use and Recycle
AEC	Agreement of Environmental Conditions
BMP	Best Management Practice
DID	Department of Irrigation and Drainage
DO	District Office
DOA	Department of Agriculture
DOE	Department of Environment
DOSH	Department of Occupational Safety and Health
DP	Development Plan
<i>E.coli</i>	<i>Escherichia coli</i>
ECR	Environmental Compliance Report
EIA	Environmental Impact Assessment
EO	Environment Officer

EPD	Environment Protection Department
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESR	Environmental Self-Regulation
FR	Forest Reserve
GAPs	Good Agricultural Practices
IFSAR	Interferometric synthetic-aperture radar
LCC	Leguminous Cover Crops
LiDAR	Light Detection and Ranging
LSD	Lands and Surveys Department
MD	Mitigation Declaration
MPKK	<i>Majlis Pengurusan Komuniti Kampung</i>
MPOB	Malaysia Palm Oil Board
OP	Occupation Permit
OPP	Oil Palm Plantation
PMM	Proposal for Mitigation Measures
R.S.O.	Rectified Skew Orthomorphic
SOPs	Standard Operating Procedures
SFD	Sabah Forestry Department
SWD	Sabah Wildlife Department
SDS	Safety Data Sheet

INTRODUCTION

In Sabah, the listed Oil Palm Plantations (OPPs) activities below are categorised as “prescribed activities” under the First and Second Schedule of the Environment Protection (Prescribed Activities) (Environmental Impact Assessment) Order 2005.

First Schedule:

- ◁ Establishment or replanting of OPPs covering an area of 100 hectares or more but less than 500 hectares;
- ◁ Development of OPPs involving change in types of crops covering an area of 100 hectares or more but less than 500 hectares; or
- ◁ Conversion of wetland forests into OPPs covering an area of 20 hectares or more but less than 50 hectares.

Second Schedule:

- ◁ Development of OPPs covering an area of 500 hectares or more;
- ◁ Development of OPPs involving change in type of crops covering an area of 500 hectares or more;
- ◁ Conversion of wetland forests into OPPs covering an area of 50 hectares or more; or
- ◁ OPPs programmes involving the settlement of 100 families or more.

This requirement obliges the project proponent to appoint an environmental consultant registered under the Environment Protection Department (EPD) to prepare and submit an Environmental Impact Assessment (EIA) (for prescribed activities under the Second Schedule) or Proposal for Mitigation Measures (PMM) (for prescribed activities under the First Schedule) for approval prior to project commencement.

The EIA or PMM report will describe all potential environmental impacts derived from project activities such as water pollution, soil erosion, waste handling, etc. and will propose mitigation measures to minimise impacts. EPD will then produce the Agreement of Environmental Conditions (AEC) which is to be agreed upon between the project proponent and EPD. Throughout the development and operation of the OPP, the project proponent must continuously comply with all environmental conditions stated in the AEC.

This Standard Operating Procedures (SOPs) is prepared to provide a clear guidance to the project proponent in implementing environmental conditions commonly imposed for OPP development and operation by EPD. In addition, the SOPs shall be used together with the EIA or PMM since some of the requirements in the SOPs that need to be implemented are contained in the report.

Associated with this SOPs is the monitoring system where consultants registered under EPD must be engaged to monitor compliance to AECs and to assess the magnitude of any residual impact (refer to **Item 19** in this handbook). Environmental Compliance Reports (ECR) shall be submitted to EPD for their review.

Other government agencies imposing environmental related regulations on OPP development and operation are Department of Irrigation and Drainage (DID), Sabah Forestry Department (SFD), Department of Environment (DOE), Department of Agriculture of Sabah (DOA Sabah), Pesticide Board (Department of Agriculture Malaysia), Sabah Wildlife Department (SWD), Malaysia Palm Oil Board (MPOB) and District Office (DO). In cases where regulations made by different departments contradict or overlap, or appear to contradict or overlap, the project proponent must follow the more stringent requirement.

EPD SABAH

1 ENVIRONMENTAL CONDITION: CONTROL OF DEVELOPMENT AREA

Encroachment of development into areas beyond the approved boundaries or required reserve areas in accordance to the AEC/MD would lead to unnecessary land and social issues. Demarcation of the development area should be implemented accordingly during both OPP development and operation phases.

Apart from the project boundary, any sensitive areas within or bordering the project boundary identified during the EIA/PMM study must be excluded from the OPP development and operation to protect these valuable areas.

Target	OPP development and operation within the approved Project boundary.
Standard Operating Procedures	<p>1.1 Project Survey Plan</p> <p>1.1.1 Appoint licensed surveyor (registered surveyor licensed under Surveyors Ordinance, 1960) to survey the boundary of the approved OPP project area. The survey shall be finalised in terms of R.S.O. system of rectangular co-ordinates. Boundaries shall be permanently marked. The standard of survey required is Class II or better.</p> <p>1.1.2 The survey plan shall be prepared and certified by a licensed surveyor. Except under unusual circumstances, the survey plan shall be plotted at the following scales – 1:500 / 1:1,000 / 1:2,500 / 1:12,500 / 1:25,000. If measurements or details are illegible or difficult to interpret on any part of the plan, a diagram on a larger scale than the plan, or not to scale, may be added as an insert.</p> <p>1.1.3 Submit a copy of the certified survey plan to EPD on the first submission of the ECR.</p> <p>1.2 Site Demarcation and Marking Maintenance (Project boundary)</p> <p>1.2.1 The boundary for OPPs located within Forest Reserves (FRs) should be marked with red paint or based on any colour schemes specified by SFD in Occupation Permit (OP).</p>

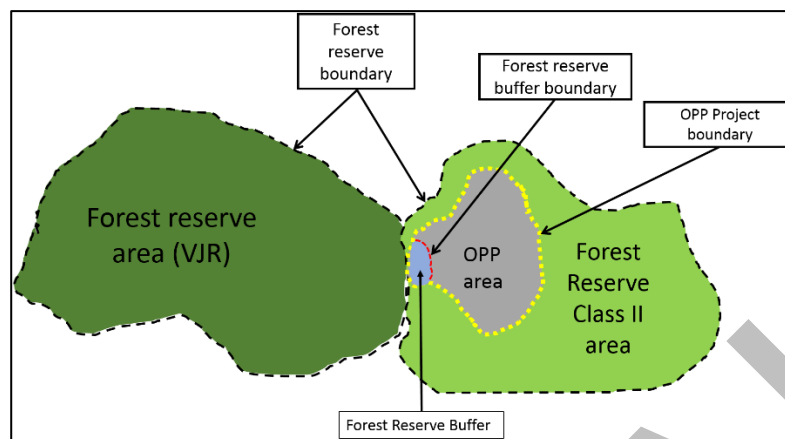


Figure 1.1: Illustration of OPP Located within FR Class II.

1.2.2 For OPPs located outside FRs, the Project boundary should be marked using pickets, wooden stakes or signboards with boundary coordinates at every dominant corner or along the boundary at visible locations.

1.2.3 EO to conduct monitoring activity on the boundary markers to ensure no damage, disturbance or blockage.

1.2.4 OPP development activity should not be conducted outside the Project boundary.

1.3 Sensitive Area (water gravity, water catchment area, Sabah Parks and gazetted area] " Y'U b U \ ' G] a 6 i a] d i hAYchaleology, Historical, burial site)

1.3.1 Identify, document and map all sensitive areas within the project boundary. Ensure that local communities, indigenous peoples, academicians and other experts are adequately consulted during the process for identifying sensitive areas and their input incorporated.

1.3.2 Mark the sensitive area boundary or buffer boundary with signboard and red painted wooden peg or stake at visible locations.

1.3.3 Sensitive area should be excluded from the OPP development.

1.3.4 EO to conduct monitoring activity at sensitive area. Record any disturbance identified during monitoring activity.

1.3.5 Provide minimum 50 metres buffer or any buffer width greater than 50 metres as proposed in the EIA/PMM, for OPPs located bordering Sabah Parks protection areas.

1.3.6 OPP developers to notify Sabah Museums of newly discovered sensitive areas such as archaeological, historical and burial sites

with historical value found within the Project site during the development stage.

1.3.7 For local graveyards, OPP developers should refer to the Native Court.

1.3.8 Appointed Environmental Consultant should submit a written notification to EPD on the newly discovered sensitive area during the aforementioned development stage.

EPD

SABAH

2 ENVIRONMENTAL CONDITION: PROTECTION OF RIPARIAN BUFFER

Protection of riparian buffers is crucial since buffer zones are important habitats for biodiversity and ecosystems, which are vital for the well-being of the human population. The role of riparian buffers is:

- ◁ Water quality improvement – Riparian areas serve as buffers to intercept and filter non-point sources of pollution from fertilisers, herbicides and pesticides by minimising the amount of these pollutants entering the rivers.
- ◁ Flood mitigation – Riparian vegetation increases surface and channel roughness, which will slow down surface water that enters rivers and reduce flow rates within the river.
- ◁ Riverbank stabilisation – Riparian vegetation protects the riverbanks from erosion caused by rain, water flow, etc. Erosion caused by removal of riparian vegetation results in sedimentation of the river and reduces the river capacity.
- ◁ Wildlife habitat – Riparian vegetation is unique and proximity to the water makes riparian zones excellent habitats for many species of animals. From the upland headwaters to the floodplains in the lowland, riparian zones are natural corridors that link landscapes across regions.

Target Protection of river water quality, minimise erosion and no encroachment into the riparian buffer.

Standard Operating Procedures **2.1 Riparian Buffer Boundary**

2.1.1 Provide riparian buffer width as decided based on findings in the EIA / PMM.

2.1.2 For OPPs located within FRs, mark the riparian buffer on field with blue paint marks on trees or stakes in accordance with the requirements of SFD and installed with signboards.

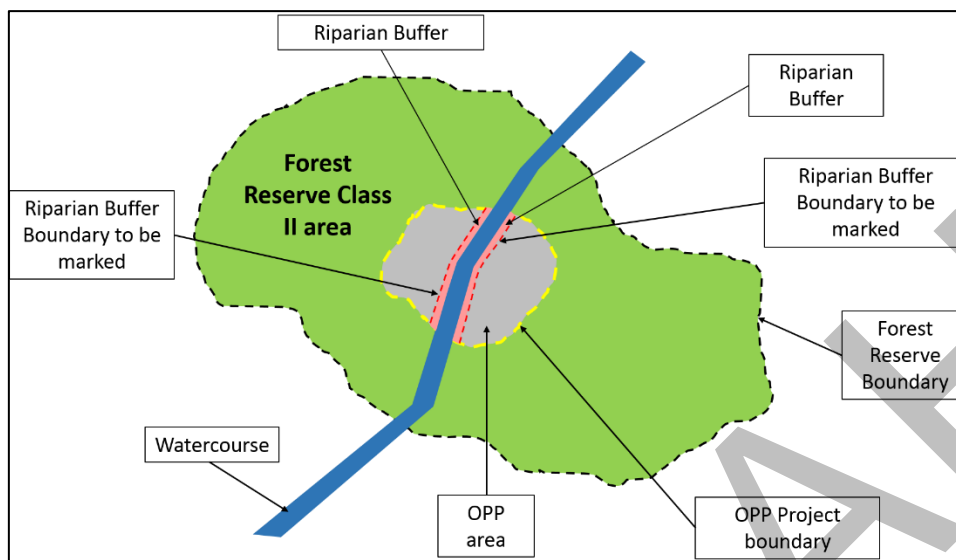


Figure 2.1: Illustration of riparian buffer within FR Class II.

- 2.1.3 For OPPs located outside of FRs, mark riparian buffer boundary on field with red paint on trees or stakes and installed with signboards.



Plate 2.1: Example of 30 metres riparian buffer signage.

- 2.1.4 Prepare survey plan for riparian buffer which is plotted at the following scales – 1:500 / 1:1,000 / 1:2,500 / 1:12,500 / 1:25,000. If on any part of the plan, measurements or details would otherwise be illegible or difficult of interpretation, a diagram on a larger scale than that of the plan, or not to scale, may be added as an insert. The standard of survey is Class II or better.
- 2.1.5 Submit a copy of the survey plan to EPD on the first submission of ECR.

2.1.6 The width of the riparian buffer is measured in horizontal distance from the top of the riverbank.

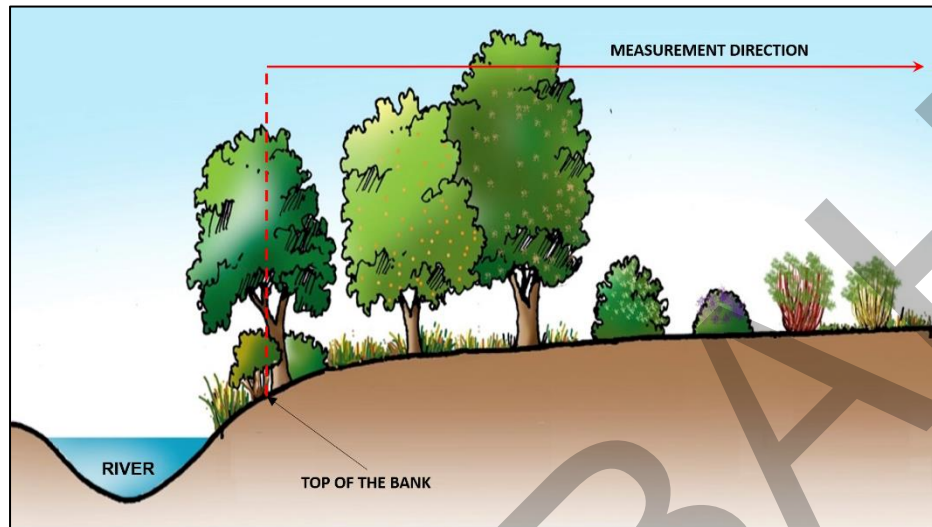


Figure 2.2: Width of the riparian buffer is measured in horizontal distance from the top of the riverbank.

2.1.7 No OPP development and operation activity within the set aside riparian buffer zones.



Plate 2.2: Example of prohibition signboards to carry out any development and operation within the riparian buffer.

2.2 Oil Palms Planted within Riparian Buffers

2.2.1 For oil palms planted within riparian buffers, a plan with a timetable for restoration shall be established and implemented.



Plate 2.3: Example of prohibition signboards to carry out any maintenance activities within the riparian buffer.

2.3 Approval and Notification

2.3.1 OPPs Within Forest Reserve

2.3.1.1 Obtain OP and approval from SFD and EPD respectively for installation of facilities (e.g.: jetty or water pump etc.) and OPP activities within the riparian buffer.

2.3.1.2 Notify SFD and EPD immediately if the set aside riparian buffer is encroached by a third party.

2.3.2 OPPs Located Outside Forest Reserve

2.3.2.1 Obtain approval from DID and EPD prior to the construction of any structures or any OPP activities within the riparian buffer.

2.3.2.2 Notify DID and EPD immediately if the set aside riparian buffer is encroached by a third party.

3 ENVIRONMENTAL CONDITION: PROTECTION OF FOREST RESERVE

Forest Reserves contain high value species of flora and fauna and are important to be protected for the next generation. Allocation of forest reserve buffers shall prevent encroachment into reserve areas, which can cause loss of protected forest habitat and disturb the ecosystems within. The buffer area also serves as wildlife corridors for fauna species that migrate between fragmented habitats. For OPP development and operation located within Class II forest reserves, buffers are required to mitigate any boundary cross-overs to the immediate forest reserve.

Target	Protection of the nearest forest reserve as well as valuable species of flora and fauna.
Standard Operating Procedures	3.1 Provision of Forest Reserve Buffer 3.1.1 Provide forest reserve buffer with a minimum width of 50 metres. 3.1.2 The boundary of the forest reserve buffer should be marked with red paint on trees or stakes and marked with signboards in visible areas. However, the project proponent must follow any other colour scheme specified in the OP.



Plate 3.1: Example of forest reserve buffer signage.

- 3.1.3 Prepare survey plan for forest reserve buffer at the following scales – 1:500 / 1:1,000 / 1:2,500 / 1:12,500 / 1:25,000. If measurements or details are illegible or difficult to interpret on any part of the plan, a diagram on a larger scale than that of the plan, or not to scale, may be added as an insert. The standard of the survey required is Class II

or better.

3.1.4 Submit a copy of the forest reserve buffer survey plan to EPD on the first submission of ECR.

3.1.5 No OPP development and operation within the forest reserve buffer.



Plate 3.2: Example of warning signages at forest reserve buffer zone area.

3.2 Oil Palms Planted within the Forest Reserve Buffer

3.2.1 For oil palms planted within the forest reserve buffer, a plan with a timetable for restoration shall be established and implemented. Oil palms planted within forest reserve buffers can be indicated by marking these palms with paint.



Plate 3.3: Ring red paint on trunk as indicator for oil palms planted within forest reserve buffer.

4 ENVIRONMENTAL CONDITION: CONTROL OF STEEP AREA

Erosion is prone to occur on steep areas when the land is cleared for OPP development. Exclusion of steep areas with high erodibility of soil i.e. areas with more than 25° gradient, is required to limit erosion rate and minimise sedimentation in receiving waterbodies. Based on information and reference obtained from DOA Sabah and MPOB, OPP development and operation must be limited to areas with less than 25° slopes.

Steep areas mapped during the EIA stage may not be accurate since the map was developed based on large scale topographical maps. Site verification is necessary to identify locations with steep slopes (>25°) to avoid OPP development and operation on those areas.

Target Conservation of steep areas and exclusion of steep areas from OPP developments and operations.

Standard Operating Procedures 4.1 Conduct verification of steep areas using methods suggested by LSD. These methods include, but are not limited to, IFSAR / LIDAR / survey plan, ^ c & Field verification for steep areas can be made by a simple clinometer (refer **Annex 1.0** for steps in using clinometer to measure slope gradient) or similar instrument. Gradient measurements must be carried out on individual slopes, and not on the overall slope.

Areas with slopes exceeding 25 degrees are considered high risk areas.

Once field verification is done, the OPP developer should update EPD on the location of steep areas.

4.2 OPP development activity should not be conducted within the steep area.

4.3 Demarcate steep areas with slopes exceeding 25 degrees at visible locations with paint on trees or stakes and signboards. Include coordinates of steep area boundaries on signboards.



Plate 4.1: Example of steep area field demarcation.

- 4.4 Maintain steep area markers.
- 4.5 Obtain approved Development Plan (DP) from LSD Sabah before commencing OPP development.
- 4.6 For steep areas that have been planted with oil palms, a plan with a timetable for restoration shall be established and implemented. Oil palms planted within steep areas can be indicated by marking these palms with paint.
- 4.7 Prepare survey plan for steep area at the following scales – 1:500 / 1:1,000 / 1:2,500 / 1:12,500 / 1:25,000. If measurements or details are illegible or difficult to interpret on any part of the plan, a diagram on a larger scale than that of the plan, or not to scale, may be added as an insert. The standard of survey required is Class II or better.
- 4.8 Submit a copy of the steep area survey plan to EPD on the first submission of ECR.

5 ENVIRONMENTAL CONDITION: PROTECTION OF WILDLIFE CORRIDORS

Allocation of wildlife corridors allow mammal species to migrate between fragmented habitats and prevent human-fauna conflict. Before the commencement of OPP development and operation, determination of wildlife corridor boundaries should be carried out. In addition, avoid any activities that may be harmful to wildlife such as disposal/runoff of chemicals or pesticides into the river.

Adherence to Sabah Wildlife Department Enactment must be practiced ensuring wildlife and its habitats are continuously protected.

Target Protection of wildlife and their habitat throughout the OPP development and operation.

Standard Operating Procedures 5.1 Mark wildlife corridor buffer boundaries with red paint on trees or stakes and signboards. Maintain the markers.

5.2 Where necessary, install and maintain electrical fencing and install trenches along wildlife corridor buffer boundaries.



Plate 5.1: Example of electrical fencing.

5.3 Signboards should emphasize prohibition of hunting, installation of any structures and disposal of oil, chemicals or other hazardous waste and installed at visible locations along the wildlife corridor buffer boundary. This message should be strongly communicated to all levels of personnel.



Plate 5.2: Example of signboards prohibiting any activities within the wildlife corridor buffer.

- 5.4 Conduct monitoring activities along the wildlife corridor buffer boundary to check any illegal hunting, encroachment and other activities.
- 5.5 Guard every main access to the site by placing security guards to prevent entry of illegal hunters.
- 5.6 Notify wildlife authorities immediately if a situation warrants wildlife rescue operations such as when animals are found abandoned or isolated without the ability to move into safer areas or intrusion of wild animals into the OPP area.
- 5.7 Encourage OPP workers to become Honorary Wildlife Wardens by urging them to attend training programmes organised by SWD.
- 5.8 Patrolling personnel should flee from the site at any sign of wildlife-related danger and call for help.

6 ENVIRONMENTAL CONDITION: PROVISION OF ROADSIDE BUFFER ZONES FOR EXISTING FOREST HIGHWAYS

This SOPs is only applicable where roadside buffer zones are required by Sabah Forestry Department for existing forest highways roads located within or bordering to OPPs developed within forest reserves.

Target Provision of roadside buffer zones for existing forest highways located within or bordering to OPPs developed within forest reserves.

Standard Operating Procedures

- 6.1 Provide 100 metres buffer width on both sides of the forest highway based on requirements by SFD through the Occupation Permit (OP).
- 6.2 Mark roadside buffer zone boundaries at visible areas before the commencement of OPP development. Markers include signboards and red paint on stakes.
- 6.3 Conduct monitoring activities along the roadside buffer boundary.

7 ENVIRONMENTAL CONDITION: ROAD DEVELOPMENT

Roads are a basic facility to connect each blocks or areas within the OPP site. During the road development phase, earthwork activity is required, and this can create soil erosion. Effective drainage along road shoulders must be provided to control run-off from the road surface and prevent runoff from directly entering the river. Presence of unpaved estate roads are a main source of sediment in OPPs. Points where roads cross any watercourses ã Estreãms or rivers that are not protected against erosion, will release large volumes of sediment from the road surface on hill slopes or on the trail surface. In steep terrain, roads aligned across slopes can also disrupt downslope soil drainage and be instrumental in causing landslides. Road surfaces, harvesting pathways and its associated drainage systems should be maintained for operational efficiency and prevention of erosion.

Target Road construction with minimal exposed area to control surface run-off.

Standard Operating Procedures 7.1 Road Construction

- 7.1.1 Minimise construction of new main roads by utilising existing road tracks. The main road is the overall access road to the OPP project site, which is connected to the public road network. The construction of new roads must be carried out in a way that does not cause water logging at nearby public areas.
- 7.1.2 For OPPs located within or bordering FRs, obtain permission from SFD to utilise existing tracks, which are located within forest reserve buffers.
- 7.1.3 Implement water harvesting practices (e.g. direct water from roadside drains and store in conservation terraces and various natural receptacles).

7.2 Drainage System

- 7.2.1 Provide drainage system along road shoulders, especially for flat areas.



Plate 7.1: Example of earth drain provided along the road side.

- 7.2.2 Other options such as road camber designs or earth bunds along the road sides can be constructed in a manner that minimises the transportation of eroded soil into watercourses.

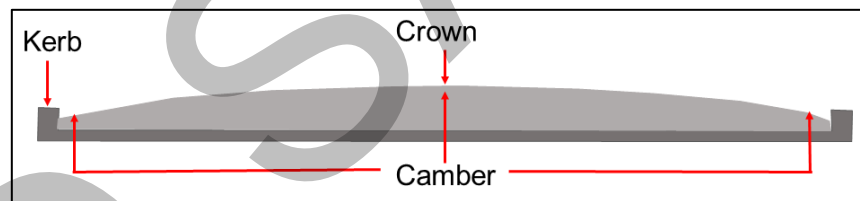


Figure 7.1: Example of road camber design.

7.3 Excess Soil Management

- 7.3.1 Establish road maintenance programme.
- 7.3.2 Carry out maintenance of access and plantation roads during the dry season to minimise soil erosion.
- 7.3.3 Prohibit the disposal of excess soil into drains, rivers and natural watercourses.
- 7.3.4 Compact excess soil generated during the road development and maintenance stage and leave the area for natural revegetation to minimise erosion and sedimentation into watercourses.

8 ENVIRONMENTAL CONDITION: DEVELOPMENT OF SITE FACILITIES / INFRASTRUCTURE

Site facilities / infrastructure (workers quarters, base camp, workshop and nursery) are required to be established within the site to ensure the smooth development of OPPs. Development of these facilities require site preparation activities like conducting site clearing and earthwork that could trigger soil erosion, if there is no proper planning.

Selection of the locations of facilities should be carried out before the construction phase by referring to the AEC to avoid disturbance to riparian buffers. In addition, requirements from DID and SFD should be complied with before the development of site facilities.

Target Well-planned site facilities to minimise impacts on the environment.

Standard Operating Procedures **8.1 Preparation of Site Facilities / Infrastructure (Worker's Quarters, Base Camp, Workshop and Nursery)**

- 8.1.1 Provide topographic information adequate to guide the planning and establishment of site facilities.
- 8.1.2 Conduct minimal site clearing and earthwork on sites designated for the establishment of site facilities.
- 8.1.3 Obtain OP from SFD prior to site clearing work for facilities establishment.

8.2 Drainage System

- 8.2.1 Worker's Quarters and Base Camp
 - 8.2.1.1 Provide an effective drainage system that diverts surface run-off and greywater or sullage into vegetation areas prior to discharge into the nearest watercourse, except if final discharge is specified in the AEC.
 - 8.2.1.2 Conduct regular maintenance to ensure no blockages in the drainage system.



Plate 8.1: Provision of drainage system at workers quarters.

8.2.2 Workshop

8.2.2.1 Construct workshop with concrete floor, concrete perimeter drains, oil trap and roof.



Plate 8.2: Example of workshop with concrete floor and roof.



Plate 8.3: Example of concrete drain for workshop.



Plate 8.4: Example of oil trap for workshop.

- 8.2.2.2 Conduct maintenance on drainage system and oil trap.
Record the date of oil trap maintenance.

8.2.3 Nursery

8.2.3.1 For OPP area located outside FRs, obtain approval from DID prior to extracting water from any waterbodies for nursery purposes.

8.2.3.2 For OPP located within FRs, obtain OP from SFD for extracting water from waterbodies for nursery purposes.

8.2.3.3 Construct earth drain in nursery area and divert the earth drain into the nearest vegetation area.



Plate 8.5: Example of earth drain and sump pit provided at nursery area.

8.2.3.4 Conduct regular maintenance on the earth drain to ensure no blockage.

8.3 Location of site facilities

8.3.1 Workers' Quarters and Base Camp

8.3.1.1 Establish workers' quarters or base camp at a minimum horizontal distance of 30 metres away from the top of the bank of the nearest river or watercourse.

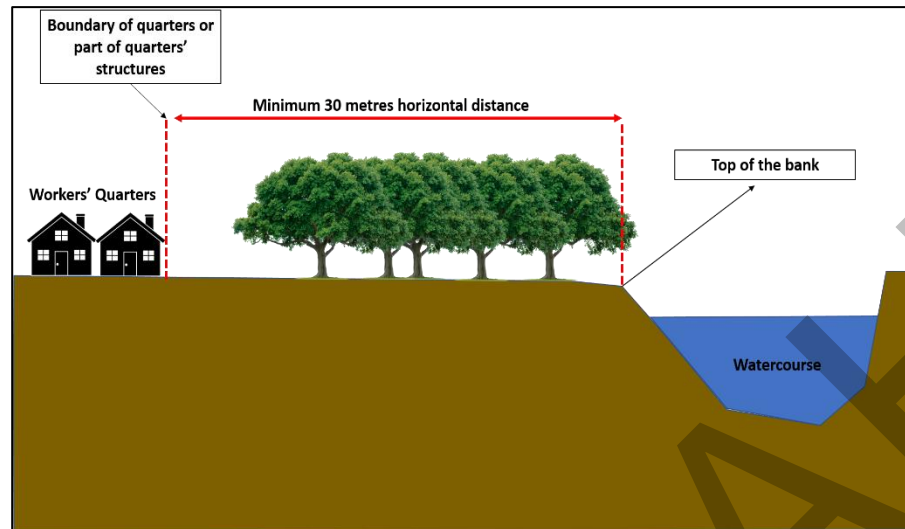


Figure 8.1: Illustration of measuring horizontal distance of workers' quarters from the top of the riverbank.

8.3.2 Workshop and Nursery

8.3.2.1 Establish workshop and nursery at a minimum horizontal distance of 50 metres away from the top of the bank of the nearest river or watercourse.



Plate 8.6: Nursery.



Plate 8.7: Workshop compound.

9 ENVIRONMENTAL CONDITION: PHASED DEVELOPMENT OF OIL PALM PLANTATIONS

OPP development and operation must be carefully planned. All OPP activities must be carried out in stages to minimise environmental impacts.

Uncontrolled or unplanned OPP activities may result in environmental degradation, which will affect not only communities but also the overall ecosystem.

Target Planned OPP development and operation that minimises impacts to the environment.

Standard Operating Procedures 9.1 Development by Phases

- 9.1.1 For new OPP development, notify EPD and SWD within 30 days before the commencement date of any physical work on the proposed OPP areas.
- 9.1.2 For new OPP development located within or bordering FRs, notify EPD, SFD and SWD within 30 days before the commencement date of any physical work on the proposed OPP areas.
- 9.1.3 Refer to the approved $\hat{U} \wedge | \text{æ} \} \acute{A} \acute{U} \wedge \{ \grave{a} \text{æ} \} *$ by DOA in the preparation of the Phased Development Plan.
- 9.1.4 Submit the Phased Development Plan to EPD.
- 9.1.5 Notify EPD on any changes to the Phased Development Plan.

10 ENVIRONMENTAL CONDITION: CONTROL OF SURFACE RUN-OFF

Erosion rates will be higher when soil surfaces are exposed to surface run-off. Soil erosion contributes to sedimentation and siltation, leading to various impacts such as:

- ◁ Reduced depth and width of the waterway, which causes potential localised floods;
- ◁ Increased turbidity and total suspended solids, which leads to water pollution of receiving waterbodies; and
- ◁ Disruption to downstream water users i.e. high sediment concentrations will increase the cost of treating water for non-potable use.

Proper runoff management will aid the diversion of surface runoff from flowing over exposed soil surfaces, which contain sediment and agro-chemical substances.

The “Urban Stormwater Management Manual for Malaysia, 2nd Edition by DID” may be referred to as a guideline for planning, selection, installation, and maintenance of erosion, run-off and sedimentation Best Management Practices (BMPs). Run-off from disturbed area shall be collected by a temporary (or permanent) drainage system and treated (using available sediment control BMPs) before being released (complying with Department of Environment (DOE) Malaysia environmental regulations) into natural watercourses.

- Target**
- ◁ Protection of river quality by minimising erosion and sedimentation.
 - ◁ Compliance with parameter levels specified in the National Water Quality Standard of Malaysia.

Standard Operating Procedures

10.1 Development Stage

- 10.1.1 Exclude areas with high erosion risk from OPP development. This includes areas with slopes exceeding 25°.
- 10.1.2 Prepare a schedule and phasing plan for OPP development prior to commencement of OPP development.
- 10.1.3 Utilise existing tracks within the plantation area to reduce the area of disturbed land/sites.
- 10.1.4 Apply Best Management Practices (BMPs), which have been incorporated in the EIA / PMM to control erosion and sedimentation during land clearing, earthwork and planting / re-planting stages. Examples of erosion and sedimentation control BMPs include provision of terraces, sedimentation ponds, earth drains, establishment of leguminous cover crops (LCC), ^ c &



Plate 10.1: Terracing and establishment of leguminous cover crops (LCC).

- 10.1.5 Prepare and implement a maintenance programme, including plans for the removal and disposal of unwanted sediments and the repair of damage to erosion and sedimentation control structures. Conduct inspections and maintenance at regular intervals – weekly or monthly with increased frequency after each rain event.
- 10.1.6 Prohibit disposal of sediment into seasonal or permanent water bodies such as lakes, drains, ditches, ponds, watercourses or riparian buffers.
- 10.1.7 Maintain the application of BMPs in good working order until disturbed areas have been permanently stabilised and there is no longer a risk of erosion and sedimentation.

10.2 Operational Stage

- 10.2.1 Provide earth drains connected to silt pits or silt traps within the plantation area prior to discharge into the nearest watercourse. No construction of earth drain, silt pit and silt trap are allowed within the riparian buffer.



Plate 10.2: Example of silt pit constructed within the oil palm plantation.

10.2.2 Conduct maintenance of earth drains and silt pits or silt traps at regular intervals.

11 ENVIRONMENTAL CONDITION: CONTROL OF WATER SOURCE QUALITY

Deterioration in water quality of waterways within plantations may occur due to sedimentation and infiltration of chemicals following the excessive usage and untimely application of fertilisers and agro-chemicals such as pesticides and herbicides. Proper management of water sources and usage of agro-chemicals in the OPP is important to minimise the effects of water pollution on downstream water users.

Matters pertaining to water supply that have not been properly planned and implemented will result in possible conflicts between the Project Proponent and affected stakeholders.

Target To protect the water source utilised by surrounding community within the project vicinity from any pollution derived from OPP development and operation.

Standard Operating Procedures

11.1 Alternative Water Source

11.1.1 Exclude water catchments and water gravity intake reserve areas from OPP development. OPP developer should refer to the Health Department and local *Tæb | ã • Á Ú ^ } * ~ ! ~ • æ} (MPKIK)* for matters pertaining to water gravity intake.

11.1.2 Demarcate the water catchments and water gravity intake reserve areas based on AEC by using red paint on trees or stakes and installed with signboard at visible area.

11.1.3 Provide riparian buffers along the seasonal or permanent waterway crossing within the project site as stipulated in the AEC.



Plate 11.1: Provision of riparian buffer (pointed) along the natural waterway located within the OPP.

11.1.4 Conduct dialogue sessions with surrounding communities as and when necessary, noting any feedback, comments or grievances raised by them. Submit the findings from these sessions to EPD.

11.1.5 Consider alternative water sources such as water gravity tankers and water pipelines given that water supplies to affected human settlements or communities are often interrupted due to OPP development.

11.2 Management of Agro-Chemicals

11.2.1 Usage of fertilisers should be in accordance with Good Agricultural Practices (GAPs) and best management practices.

11.2.2 Use only agro-chemicals approved by the Pesticides Board of Malaysia.

11.2.3 Apply Integrated Pest Management (IPM) techniques such as biological pest control and manual weeding to reduce the use of chemical pesticides.



Plate 11.2: Planting of beneficial plants such *Ug* ' 5 b h] [c b c to ' provide shelter and supplementary food such as nectar and encourage the population growth of predators and parasites.

11.2.4 Monitor manuring and weeding activities conducted by field workers.

11.2.5 Reference for Storage of Agro-Chemicals to be based on "Guidelines on Storage of Hazardous Chemicals: A Guide for Safe Warehousing of Packaged Hazardous Chemicals, 2005" by DOSH Malaysia and "Kod Amalan Baik Tapak Semaian untuk Tapak Semaian Sawit" by MPOB. These include, but are not limited to:

11.2.5.1 Pesticide storage area should be located not less than 7 metres distance from residence.

11.2.5.2 Storage areas should be covered, dry, water-proof, bright, well ventilated and able to contain spillage.

11.2.5.3 Storage areas should be located away from water sources, and the area should not be prone to flooding to prevent contamination of water sources.

11.2.5.4 Storage areas must be locked / secured and the entrance to the storage area should be limited to certain personnel only.

11.2.5.5 Pesticides in powder form must be segregated, placed on a higher location or kept on a different rack from liquid pesticides.

11.2.5.6 Pesticides should be kept / stored in its original packaging

with labels.

- 11.2.5.7 First aid kit facilities should be located just outside storage areas.
- 11.2.5.8 Signboard showing “DANGER” with Toxic Symbol should be displayed at the entrance or in a visible place at pesticide store.
- 11.2.5.9 Safety Data Sheet – SDS must be displayed in visible areas.
- 11.2.5.10 Pesticide store inventories must be made available for inspection.
- 11.2.5.11 Firefighting equipment such as fire extinguishers, sand and water must be made available.
- 11.2.5.12 Racks used to keep pesticides must be made from materials impervious to spillage so that any spillages can be contained and prevented.
- 11.2.5.13 Pesticides should be segregated from fertilisers.
- 11.2.5.14 Facilities to measure and mix pesticides must be made available.
- 11.2.5.15 There must be a clean water source nearby the mixing area.



Plate 11.3: Provision of pesticides measuring and mixing area.

- 11.2.6 Prohibit the disposal of fertilisers and pesticides in seasonal or permanent water bodies such as lakes, drains, ditches, ponds, or watercourses or within riparian buffers.
- 11.2.7 Disposal of used pesticides containers must be based on Environmental Quality (Scheduled Wastes) Regulations 2005.
- 11.2.8 Appointed Environmental Consultant to collect and analyse water samples at locations that are determined in the EIA and agreed by EPD to monitor impacts on water quality. Submit monitoring results to EPD as per the AEC.



Plate 11.4: Example of chemical store.



Plate 11.5: Example of a well organised fertiliser store.

12 ENVIRONMENTAL CONDITION: FIRE CONTROL

Fire hazard may cause loss of forest and wildlife habitat, resulting in direct and indirect impacts on populations located nearby the impact area. Good fire management is necessary to minimise the risk of fire hazards in OPPs during its long crop life.

Target Protection of air quality by minimising air pollution and fire hazards.

Standard Operating Procedures **12.1 Open Burning**

12.1.1 Adhere to a zero-burning policy.

12.1.2 Seek special approval from DOE Sabah in areas where the crop is highly diseased and where there is a significant risk of disease spread or continuation into the next crop. Where controlled burning is allowed, it shall be carried out as prescribed by the Environmental Quality (Declared Activities) (Open Burning) Order 2003 or other applicable laws.

12.1.3 Take measures to contain fires from spreading further into nearby lands if fire outbreaks start from the OPP area.

12.1.4 Notify DOE, EPD, Police Department and Fire and Rescue Department of Malaysia immediately on any sighting of open burning activities done by third parties.

12.2 Fire Prevention / Fire Mitigation / Fire Safety Management Plan

12.2.1 For OPPs located within or bordering FRs, developers should consult with and obtain approval from the SFD in their Fire Prevention / Fire Mitigation / Fire Safety Management Plan. The plan must take into consideration both fire outbreaks occurring within and near the Project area.

12.2.2 For OPPs located outside of FRs, developers should consult with the Fire and Rescue Department in the respective area for the preparation of a Fire Prevention / Fire Mitigation / Fire Safety Management Plan.

12.2.3 The Fire Prevention / Fire Mitigation / Fire Safety Management Plan should include, but is not limited to, the following requirements:

12.2.3.1 Erect fire danger rating signs and educational posters for fire detection, prevention and combat at prominent places. Organise awareness programmes for all personnel.

12.2.3.2 Fire Prevention

- ⟨ Prohibition of open burning.
- ⟨ Proper storage of flammable material / substances.
- ⟨ Prohibition of smoking near fuel depots and other places where fuels or easily ignitable materials are used.
- ⟨ Availability of fire-fighting equipment, including personal safety equipment for fire-fighting personnel at work sites and transportation / vehicles.
- ⟨ Establishment of an Emergency Response Team (ERT).
- ⟨ Provision of logistics.
- ⟨ Provision of staff training at regular drills.
- ⟨ Provision of artificial ponds or reservoirs at strategic places as a water reserve for fire suppression.

12.2.3.3 Fire Detection

- ⟨ Implement early warning systems, including construction of fire towers and fire breaks, particularly in plantation areas.
- ⟨ Establish permanent controls and patrols at areas where fire risk is deemed highest.
- ⟨ Inform authorities such as SFD, Fire and Rescue Department of Malaysia, DOE and EPD in case of fire outbreaks within or near to the Project area.

12.2.3.4 Fire Suppression

- ⟨ Mobilisation of fire suppression team.
- ⟨ All incidents of fire must be recorded.



Plate 12.1: Fire tower as early warning system.

12.2.4 Forward one copy of the Fire Prevention / Fire Mitigation / Fire Safety Management Plan, which has been reviewed by SFD or Fire and Rescue Department of Malaysia, to EPD.

13 ENVIRONMENTAL CONDITION: OIL MATERIAL MANAGEMENT

The use and storage of oil material may be a potential pollution source to surface water, ground water quality and soil.

Target A safe and accident-free working and living environment, which does not contaminate soil and watercourses with oils or fuels.

This procedure addresses the proper storage of oil material and fuels. For disposal of spent oil and fuels, refer to Environmental Condition: Scheduled Waste Management, as spent oil and fuels is categorised as scheduled waste.

Standard Operating Procedures

- 13.1 Refer to “Guidelines on Storage of Hazardous Chemicals: A Guide for Safe Warehousing of Packaged Hazardous Chemicals, 2005” by DOSH Malaysia” for guidance on oil storage. This includes, but is not limited to:
- 13.1.1 Use impervious, heat and water-resistant material to construct the storage area.
 - 13.1.2 Provide separate drainage systems to collect rainwater from roof and outside storage areas.
 - 13.1.3 Install impervious bund (secondary containment system) to contain spillages. This should enclose a volume which is at least 110% of the capacity of the largest container.
 - 13.1.4 Provide a roof for permanent oil and fuel storage areas, which can keep out rain water and the roof design should allow for the ventilation of fumes and heat in the event of fire.

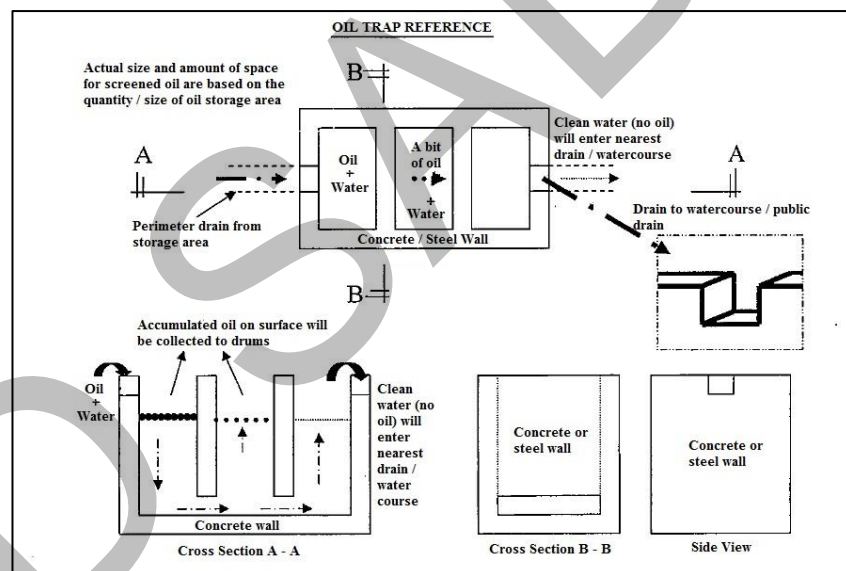


Plate 13.1: Example of permanent diesel tank with roof and bund.

- 13.1.5 Maintain the sump or oil trap at regular intervals. Date of maintenance must be recorded. Oil and grease confined within the sump or oil trap should be disposed as scheduled waste.
- 13.1.6 Containers and tanks for oil and fuel must be rigid and labelled with information on volume, contents as well as include safety instructions.
- 13.1.6 Fire-fighting equipment such as fire extinguisher, sand and water must be fully functional and made available.
- 13.1.7 For oil or fuel tanks, the bunded area must be controlled by a valve. The valve must ensure that the spillage contained within the bund is directed into a sump or oil and grease trap to prevent direct discharges of wastewater (mixture of rainwater and oil) into the open environment.



Plate 13.2: Example of oil and grease trap.



Source: Department of Environment Malaysia

Figure 13.1: Reference on construction of a typical oil trap.

- 13.2 Place mobile and non-permanent oil and fuel containers on firm and dry spill trays.
- 13.3 Locate oil and fuel storage at a minimum distance of 50 metres away from any watercourse or water body.

14 ENVIRONMENTAL CONDITION: SCHEDULED WASTE MANAGEMENT

Scheduled Waste is any waste falling within the categories of waste listed in the First Schedule of the Environmental Quality (Scheduled Wastes) Regulations 2005. Mishandling of scheduled wastes can be a potential pollution source to surface and underground water as well as soil.

Target A safe and accident-free working and living environment, which does not contaminate soil, watercourses or water bodies with scheduled waste.

Standard Operating Procedures 14.1 Handling of Scheduled Waste must be based on:

- a. Environmental Quality (Scheduled Wastes) Regulations 2005, and
- b. Guidelines for Packaging, Labelling and Storage of Scheduled Wastes in Malaysia, 2014.

These include, but are not limited to:

14.1.1 Store all scheduled waste (e.g.: spent oil and grease) in containers which are durable and able to prevent spillage or leakage into the environment. Label containers clearly in accordance with the Third Schedule of the Environmental Quality (Scheduled Wastes) Regulations 2005.



Plate 14.1: Segregation of scheduled waste.



Plate 14.2: Storage of scheduled waste (SW 102).

- 14.1.2 Cover the floor of the storage area, loading and unloading area with concrete or any other suitable lining material, free of cracks and gaps.
- 14.1.3 The storage area must be sheltered or roofed or covered with suitable covering material.
- 14.1.4 The entire storage area to be surrounded with a concrete dike or other equivalent structure designed to contain any spillage of waste under worst case scenarios. The capacity of the containment should be 110% of the largest container stored in the storage area.
- 14.1.5 The dike area must be graded to a sump.
- 14.1.6 Manage the storage area properly to prevent rain water or surface water from entering the area.
- 14.2 The scheduled waste generated on-site, regardless of its volume or quantity, must be collected by contractor licensed under the Department of Environment.
- 14.3 Submit a written application to the Department of Environment for re-use of scheduled waste on site.
- 14.4 Locate scheduled wastes storage areas at least 50 metres away from any watercourse or water body.
- 14.5 Prohibit disposal of scheduled waste in seasonal or permanent water bodies such as lakes, drains, ditches, ponds, or watercourses

or within riparian buffers.

14.6 For transferring scheduled waste from a different location to a centralised collection centre, the OPP developer must apply for approval from DOE Sabah. The application must include:

- ⟨ SOP and ERP from different scheduled waste locations;
- ⟨ Map and locations (including the distance to the centralised collection centre);
- ⟨ Transfer mechanism from the different scheduled waste locations to the centralised collection centre; and
- ⟨ Any other information as per DOE Sabah requirements.

EPD

SABAH

15 ENVIRONMENTAL CONDITION: SOLID WASTE MANAGEMENT

The generation and subsequent indiscriminate disposal of solid waste could lead to the spread of disease and other disease vectors, creating a potential health hazard to residents and other downstream settlements.

Target An environment with appropriate disposal of waste material that does not pose health risks.

Standard Operating Procedures

- 15.1 Prohibit burning and indiscriminate dumping of solid waste.
- 15.2 Continuous awareness and practice 3R – Reduce, Re-use and Recycle.



Plate 15.1: Re-using old tyres for landscaping purposes.

- 15.3 Provide collection facility or station for recyclable waste. If there is no local contractor available within the Project vicinity to collect recyclable waste, initiate the development of a system or procedure to collect all recyclable waste produced by workers and send the waste to a private recycling station.



Plate 15.2: Example of waste segregation on site.

- 15.4 After adopting waste minimisation and 3R concepts, the remaining bio-degradable waste can be disposed into a dumping pit using a mini landfill concept. This procedure is applicable only for OPPs with difficulties sending waste to public disposal systems due to the remoteness of their location.
- 15.5 Final disposal of solid waste shall be implemented by excavating a pit of 2 – 3 metres in depth. The pits must be covered by 20 cm of compacted soil each time a disposal is carried out.
- 15.6 Ditches must be built on the perimeter of dumpsites to collect and divert run-off into the nearest drainage system or vegetation area.
- 15.7 Stagnant water in waste disposal sites must be drained to prevent breeding of mosquitoes and other disease vectors.
- 15.8 The pit shall be permanently covered when the deposited waste almost reaches the ground level. Subsequently pits shall be spaced sufficiently far apart that they do not collapse towards each other. The spacing will depend on soil conditions and depth of the pits.
- 15.9 Locate all solid waste collection facilities or stations and dumping pit sites a minimum 30 metres away from any watercourse or water body.

15.10 Pits for waste disposal should not be constructed on steep slopes, where there is a risk, the pit will later cause a slope failure.

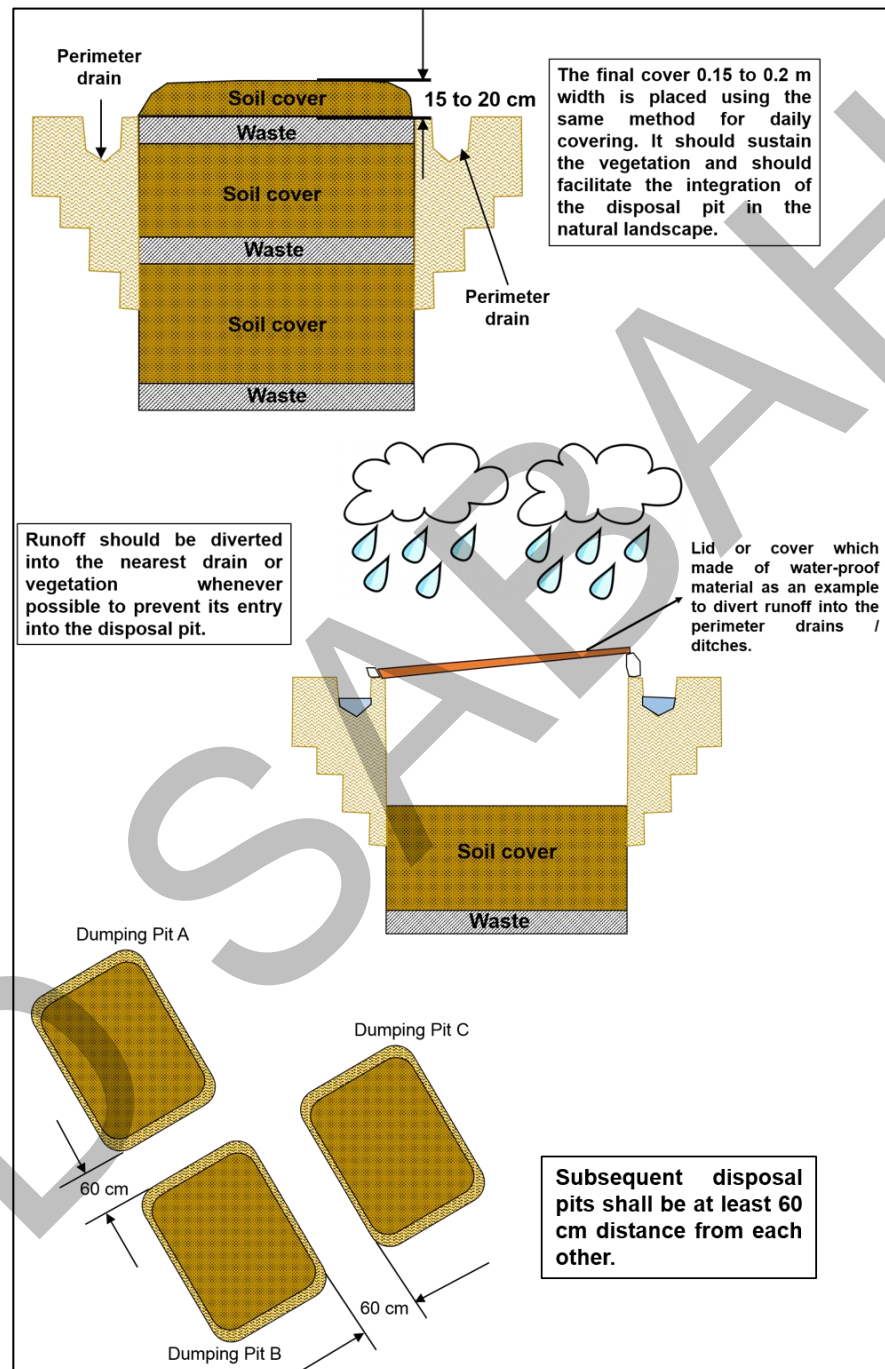


Figure 15.1: Example of open trench method for disposal of solid waste on site.

15.11 Prohibit disposal of solid waste in seasonal or permanent water bodies such as lakes, drains, ditches, ponds, or watercourses or within riparian buffers.

16 ENVIRONMENTAL CONDITION: BIOMASS MANAGEMENT

Biomass waste is usually generated during site preparation, maintenance, harvesting and replanting stages of OPP development. This includes biomass in the form of re-useable / marketable timber and vegetative wastes from pruning. Improper biomass disposal such as pushing biomass into streams and rivers will block/pollute rivers and thereby impact downstream settlements. Burning of biomass can also trigger fire hazards that lead to air pollution and jeopardizes the lives of surrounding human and fauna populations.

Target	To minimise air pollution, water pollution and blockage of watercourses throughout OPP development and operation.
Standard Operating Procedures	<p>16.1 Reduce the amount of biomass to be disposed of by sorting / recovering useable biomass (for example, segregation of useable timber from vegetative wastes during site clearing stage).</p> <p>16.2 Allow biomass generated during site preparation, maintenance, harvesting and replanting stages to be reused and recycled as much as possible. The reuse and recycle of biomass should be controlled to ensure no part of the remaining biomass contributes to air or water pollution or blockages of watercourses.</p> <p>16.3 Adhere to a zero-burning policy.</p> <p>16.4 Prohibit disposal of biomass in seasonal or permanent water bodies such as lakes, drains, ditches, ponds, or watercourses or within riparian buffers.</p>

17 ENVIRONMENTAL CONDITION: CONTROL OF SEWAGE

The establishment of a base camp or quarters and estate office within the project site throughout the development stages will generate sewage. Sewage must be treated before discharge into natural or public waterways. If untreated or not properly treated sewage discharges into the streams or waterways, Biochemical Oxygen Demand, Faecal Coliform (CFU & l^{-1}) and Ammoniacal Nitrogen levels will increase and pollute the river. Thus, downstream water users will be affected.

Target	To minimise soil and water pollution, and to prevent communicable diseases transmitted through water and soil.
Standard Operating Procedures	<p>17.1 Prohibit direct discharge of untreated sewage into any watercourse or water body.</p> <p>17.2 Provide toilet with sewage treatment systems such as septic tanks at the permanent site office and workers' quarters.</p>



Plate 17.1: Manhole for an installed septic tank.



Source: National Water Services Commission Malaysia

Figure 17.1: Typical Pre-Fabricated Septic Tank for < 600 mm depth.

- 17.3 As a minimum, provide temporary base camps with pit latrines or other suitable facilities. Daily coverage with lime and soil must be applied for maintenance.
- 17.4 Inspect and monitor the sewage treatment system regularly and conduct de-sludging when required. De-sludging work must be conducted by appointed contractors.
- 17.5 Locate all toilet facilities equipped with treatment systems at a minimum distance of 30 metres away from any watercourse or water body.
- 17.6 No establishment of toilet facility or sewage treatment system is allowed within the riparian buffer, forest buffer, wildlife corridor or any other buffer zones stipulated in the AEC.

18 ENVIRONMENTAL CONDITION: CLOSURE AND ABANDONMENT

After completion of the OPP productive life span (20 to 25 years), a decision will be made to either replant or abandon the oil palm plantation. The procedures listed below aim to prevent environmental deterioration resulting from abandoned infrastructure or exposed sites being left disregarded.

Target	Infrastructure and equipment in a closed or abandoned oil palm plantation area pose no significant impact to the environment or public health.
Standard Operating Procedures	<ol style="list-style-type: none">18.1 Remove all structures or parts of structures, which are not degradable and pose an environmental risk. This include septic tanks that need to be emptied by appointed contractors or suppliers.18.2 Remove all machinery, vehicles and their parts used during the development of OPPs.18.3 Remove any non-degradable, hazardous and scheduled wastes materials.18.4 Extract and clean or dispose of, by legal means, all soil that is contaminated by oil, hazardous substances or scheduled waste.18.5 Clear all debris originating from OPP activities that may block watercourses.18.6 Unclog all drainage that may cause water ponding.18.7 Fill any holes or pits to existing ground level.18.8 Rehabilitate all exposed areas or cut slopes, which may cause further erosion or landslides, by re-vegetation these areas with cover crops, proper terracing and drainage.18.9 Submit a notification of closure or abandonment of the OPP to SFD / SWD and EPD, SFD, SWD, DOE, DO, Police Department and chief village at least 2 months prior to the actual closure or abandonment.18.10 Prepare an Environmental Compliance Audit and Monitoring Closing Report to EPD not later than one calendar month after the date of closure or abandonment indicating how the unused infrastructures and exposed sites have been rehabilitated.

19 COMPLIANCE AND IMPACT MONITORING

Compliance Monitoring

This handbook provides instructions on how to comply with the requirements for environmental conditions as agreed with EPD in the AEC. It is a requirement that compliance to AEC is monitored regularly. A monitoring system has therefore been formulated by EPD where the project proponent is required to submit an ECR to EPD at a fixed frequency specified in the AEC. The ECR must be prepared by appointed environmental consultant. The usual issues to be monitored are included in this handbook while some issues may not be part of the standard monitoring and reporting routine. This however, does not waive the project proponent's duty to comply. Compliance to the environmental conditions as agreed in the AEC shall be audited by the appointed environmental consultant. During audit, the compliance status for each environmental condition shall be stated based on observation made during field visit with representatives from the project proponent specifically EO.

Compliance monitoring results submitted to EPD through ECR will be used as a performance level indicator for the project proponent and will be entered into EPD's database. The database will also provide government planners with an understanding of environmental issues in the OPP sector.

Impact Monitoring

The requirements for impact monitoring i.e. water quality, will be included in the AEC. The AEC will specify several specific monitoring locations and parameters to be monitored. Sampling of parameters for analysis (for example, water quality) must be conducted by appointed environmental consultant and analyses must be conducted by an accredited laboratory.

Sampling results will be used as an indicator of whether the mitigation measures implemented by the project proponent are sufficient to control environmental impacts arising from the project development. Additional requirements for environmental management may be imposed if the impact is found to be beyond any related standard limit.

20 GLOSSARY

Bank: The bank is where the watercourse normally reaches during high water levels. It is normally characterized by the boundary between signs of erosion and presence of permanent vegetation.

Best Management Practice (BMP): Methods or techniques found to be the most effective and practical means in achieving an objective such as preventing or minimising pollution while making the optimum use of resources.

Bio-degradable: Capable of being decomposed by bacteria or other living organisms without causing harm to the environment.

Biomass Waste: The vegetative waste after harvest, de-barking and in particular, land clearing.

Camber: A transverse slope provided to the road surface for the drainage of the rainwater for the better performance of the road.

Clinometer: A hand instrument to measure slope angles (gradients).

Greywater: All wastewater generated in households or office buildings from rivers without fecal contamination, i.e. all rivers except for the wastewater from toilets. Sources of greywater include, sinks, showers, baths, clothes washing machines or dish washers.

Oil and Grease Trap / Oil Trap: A device or structure designed to intercept most oil, greases, and solids before they enter a wastewater disposal system or discharged out into the environment.

Pollution: Any direct or indirect alteration of the physical, thermal, chemical, or biological properties of any part of the environment by discharging, emitting, or depositing wastes so as to affect any beneficial use adversely, to cause a condition which is hazardous or potentially hazardous to public health, safety or welfare, or to animals, birds, fish or aquatic life, or to plants.

Residual Impact: The potential environment impact remaining after mitigating measures have been adopted into a project plan.

Riparian Buffer: Areas along the bank of watercourses designated for protection for environmental, ecological or legal reasons, and which shall remain undisturbed.

R.S.O. (Rectified Skew Orthomorphic): A projection for coordinate system in Malaysia for topographic mapping and Cassini Soldner for cadastral map or land lot.

Quarters: Include workers' quarters, staff quarters and any other facility used for permanent or semi-permanent accommodation.

Scheduled Waste: Any waste falling within the categories of waste listed in the First Schedule of the Environmental Quality (Scheduled Wastes) Regulations 2005.

Sedimentation Pond: A settling hole or basin that prevents water-borne soil from entering a pond or drainage system.

Sewage: Any liquid waste or wastewater discharge containing human, animal, domestic or putrescible matter in suspension or solution, and includes liquids containing chemicals in solution either in the raw, treated or partially treated form.

Sewage Treatment System: Any facility designed and constructed for the purpose of reducing the potential of the sewage to cause pollution.

Silt Pit: A hole, trench or ditch constructed in different sizes and shapes across the hill slopes to reduce the length of slope; thereby decreases the volume and velocity of runoff and to collect runoff water and eroded sediment containing nutrients which would otherwise be lost from the field. The collected water and nutrients are then redistributed into the soil of plant root zone around the pits after rainfall events.

Silt Trap: A small temporary ponding area, usually with a gravel outlet, formed by excavation and construction of earthen embankment. The purpose of the trap is to detain runoff from disturbed areas for a long enough period to allow the majority of coarser suspended soil particles in the runoff to settle out.

Solid Waste: Unwanted solid by-products of an operation, which need to be disposed of by the developer or estate owner.

Water Body: Includes river, estuary, lake, lagoon, swamp, marsh or other wetland.

Water Catchment: An area draining flow to a particular location or site. It may frequently include the area surrounding tributaries and flow paths in addition to main rivers.

Watercourse: Includes rivers, streams and waterway of any sizes, width or capacity. The term does not include man-made drains or ponds.

Water Gravity: Source of water that utilises earth's gravity to move water from a natural waterbody to a collection structure and distributed to consumers, usually by a pipeline.

Annex 1.0: General Steps In Using A Clinometer To Measure Slope Gradient

Introduction

A clinometer/ inclinometer generally has two scales, a scale to measure the degree of the slope and a scale to measure the percentage (%) of the slope. Both scales have a positive (+) section for measuring uphill slopes and a negative (-) section for downhill slopes.

- i. As a percentage: number of metres of change in elevation over a horizontal distance of 100 m.
- ii. In degrees: the measurement of a vertical angle made by the slope and horizontal plane.

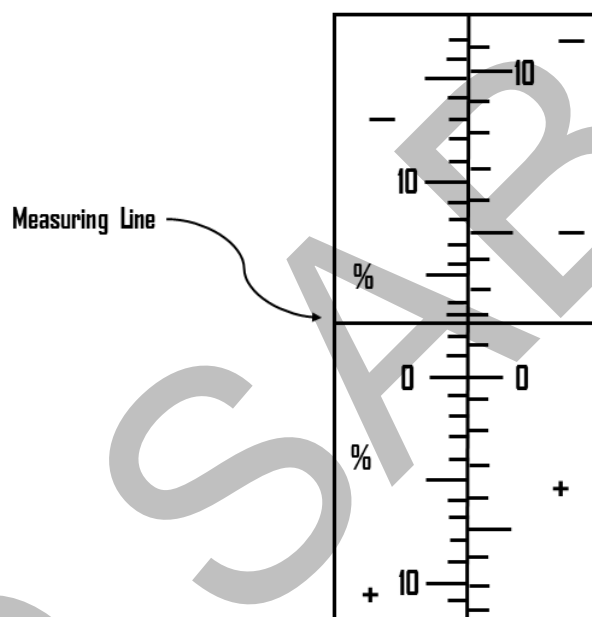


Figure 20.1: Composite view.

General Steps in Using A Clinometer

STEP 1: Locate “zero point”.

(A) With a range pole:

1. Place range pole upright on the ground. Stand tall, facing the range pole with the pole up against your face. With your hand, locate your eye height on the pole, and then, with coloured tape mark your eye height onto the pole to make it easily visible from a distance. The coloured tape mark is the target ('zero point'), that you will line the clinometer with, to measure the gradient.

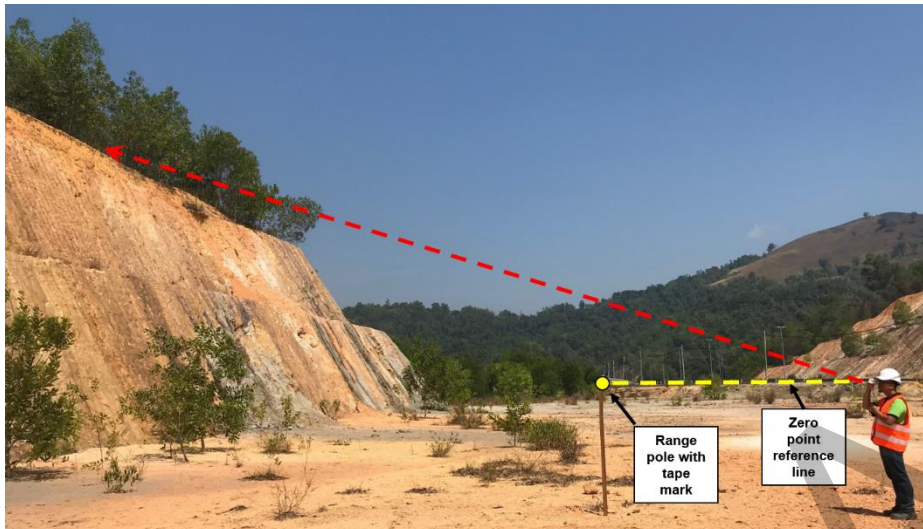


Figure 20.2: Sighting pole marked at eye level.

(B) With a person:

- ◁ Using another person, preferably of the same height, stand 10 to 20 metres apart on level ground. Face the person and hold the clinometer to your dominant eye with your opposite eye closed. Find the 0s, line them up with the horizontal line, and open your other eye. Binocular vision will superimpose the line across the person's face. The point where the horizontal line intersects the person's face is your target ('zero point'). This is the spot you will be focusing on to measure a gradient.
- ◁ If you are the same height as the person, the target ('zero point') will fall across their eyes. If you are taller, the line will be above their eyes. Don't forget where the target ('zero point') is and remember to always stand tall when reading gradients.



Figure 20.3: Person as a target zero point.

STEP 2: Measure the slope gradient.

Keeping both eyes open, sight with one eye through the optical clinometer, moving it until the cross-hair lines up with the level you wish to measure (target pole/ person). With the clinometer lined up in this position, read the graduation at the cross-hair.

Note: When working on forested slopes, estimate eye level on a tree that you can see clearly, and take a reading on that point. When determining the average slope on a long hillside, try to pick a point as far down or up the hill as possible, to even out the slight dips and bumps on the ground.