EXECUTIVE SUMMARY

Environmental Impact Assessment (EIA) Disposal Area (96.19 Hectares) for Sediment Waste Dredged Materials at Lot PT2689 Rezab Tanah Bukit Mukim Ringlet, 39000 Cameron Highlands, Pahang Darul Makmur

Project Proponent

Tenaga Nasional Berhad

EIA Consultant

TNB Research Sdn. Bhd.

EIA Consultant

UniSZA Consultancy Sdn. Bhd.

INTRODUCTION

Disposal Area (96.19 hectare)
for the containment of
Dredged Sediment
from Ringlet Reservoir,
Cameron Highlands

The development of disposal area involves the construction of embankments, new connecting routes and site operational activities covering dredging, decantation, transportation and disposal of dredged sediment.

PROJECT BOUNDARY

- Planning Block No. 2(BP-2) of the RTDCH2030
- From the project site:
  - 1.07 km to the north: The Lake House
  - 2.68 km to the south: SMK Ringlet
  - 3.50 km to the south: Ringlet Town
- Project site's boundary points:

Points	Latitude	Longitude
1	4°26'08.450" N	101°22'36.655" E
2	4°26'07.751" N	101°23'04.436" E
3	4°25'37.571" N	101°23'14.662" E
4	4°25'32.284" N	101°22'46.783" E

- Area of new disposal cells: **96.19 hectare**
- Featured by:
  - Fragmented forest reserves
  - Fragmented secondary-logged over forests
  - Fully occupied "older" disposal cells

LEGAL REQUIREMENT

- Subsection 34A(1) Environmental Quality Act 1974 [Act 127] Environmental Quality (Prescribed Activities) Environmental Impact Assessment) Order 2015:
- First Schedule:

  15(b): Disposal of waste dredged materials

  13: Development or land clearing less than 50 percent of an area with slope greater than or equal to 25° but lesser than 35°.
- Second Schedule:

  5(b)(i): Logging or conversion of forest to other land use within a catchment area of reservoirs used for municipal water supply, irrigation or hydro-power

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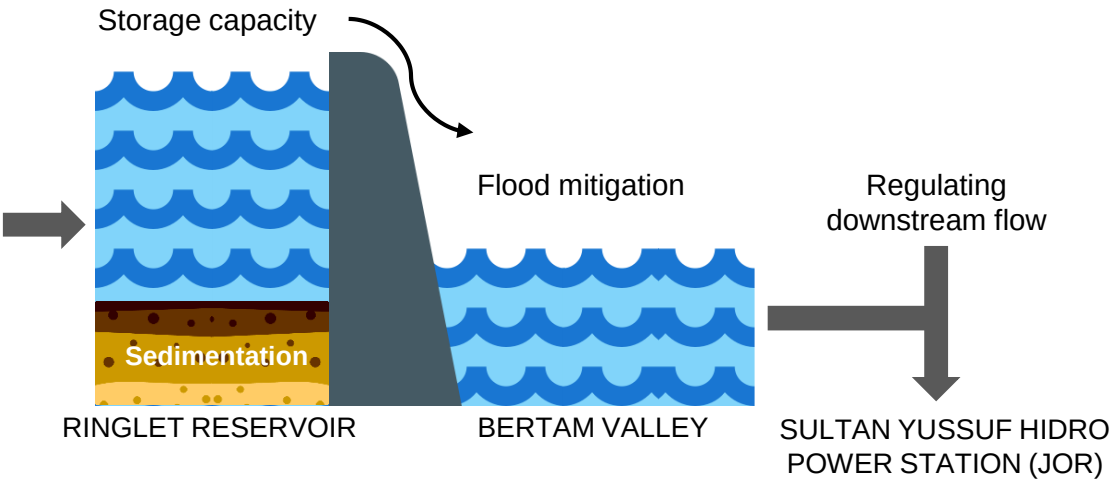
STATEMENT OF NEED



The development of new disposal cells are imperative to cater the sediment volumes that will be dredged and relocated from the Ringlet Reservoir's current bed level, from Yr. 2021 to Yr. 2027.

Targeted volume of the dredged sediment: 1,000,000 m^3 for Yr. 2012 – Yr. 2027 dredging campaign.

Unattended sedimentation will cause;

- Reduced water storage capacity – flood risk
- Reduced flow regulating efficiency for the downstream's hydrological and ecological functions
- Reduced the capability of the water regime to self-purify against receiving pollutants

Therefore, the purpose of the Project is **conformed** with:

KD1.3 – Empowering Water Security & Sustainability

- Strategy DU1-S1 — **Flood Mitigation**
- Strategy DU1-S2 — **Maintenance of the Drainage Systems**
- Strategy DU1-S3 — **Management of water quality and water catchment areas**
- Strategy DE1-S4 — **Pollution Monitoring at Dam or Reservoirs**

Categoty: Infrastructure/Utility

H2(a): reservoir's water supply

H3(b): irrigation & drainage of retention ponds

H5(e): waste management/others

Zone H

BP2 Ringlet-Habu

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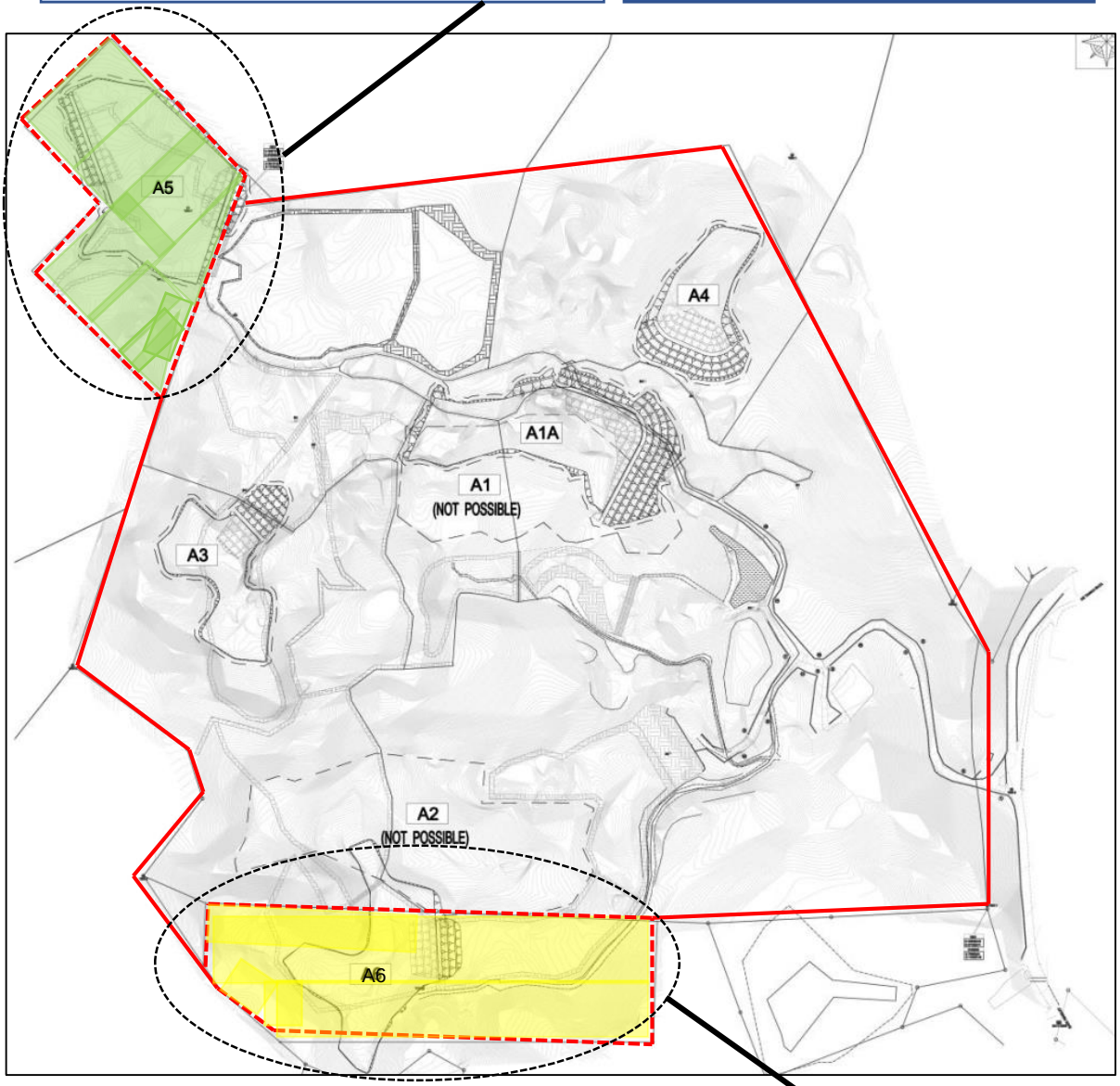
DISPOSAL CELLS OUT OF TNB's LAND BOUNDARY

Area of ~7 hectare, occupying the Ringlet Forest Reserves (Ringlet FR) at the fringe

Owner: Forestry Department of Pahang



Owner: Cameron Highlands District Council

Area of ~7 hectare, in vicinity to farming site

TNB will acquire the land in accordance to the gazetting procedures clarified under Section 8 of the Land Acquisition Act 1960

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PROJECT'S ACTIVITIES

PRE-CONSTRUCTION PHASE

- Land Survey / Site Recognisance
- Existing Drainage Survey & Inventory
- Existing Tributary Inventory
- Assessment of existing underground culverts
- Soil Investigation

CONSTRUCTION PHASE

- Site Preparation
- Biomass Removal
- Earth Cutting and Fill
- Tributary Diversion
- Installation of Surface Drainage
- Embankment
- New (inter-cell) Connecting Roads

OPERATIONAL PHASE

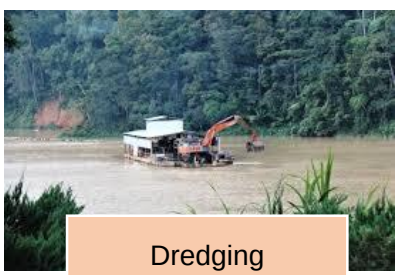
- Dredging
- Decantation
- Disposal
- Route Network
- Maintenance of Drainage Systems
- Embankment Monitoring and Slope Stability

POST-OPERATIONAL PHASE

- Embankment Monitoring and Slope Stability
- Maintenance of Drainage Systems
- Site Rehabilitation
- Revegetation

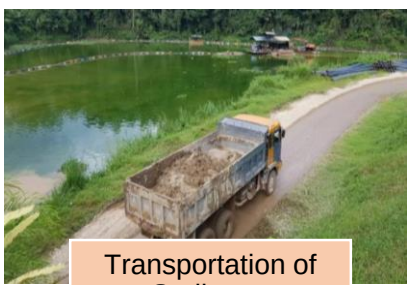
Surface Drainage

Embankment



Dredging

Decantation



Transportation of Sediment

Disposal of Sediment

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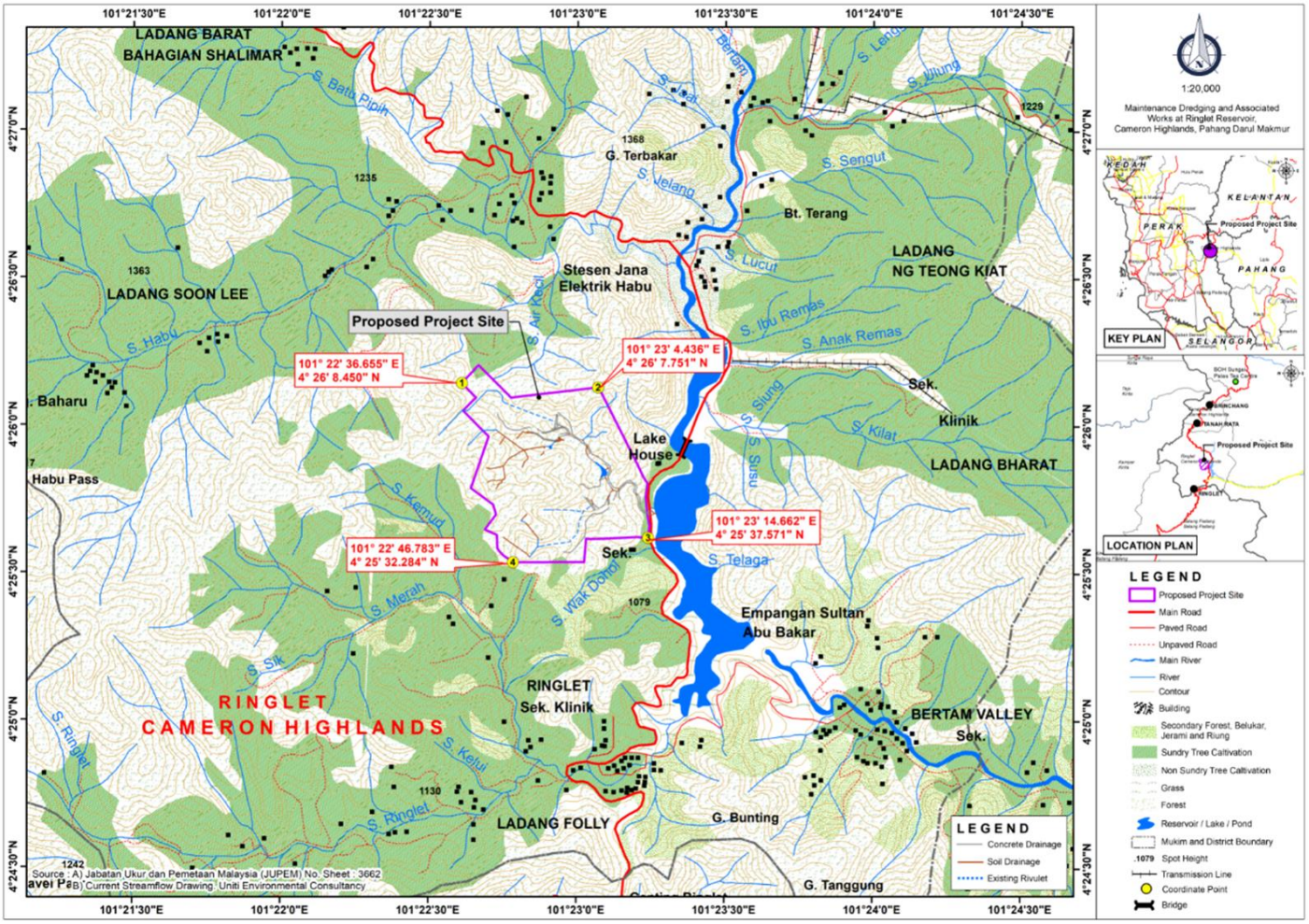
PROJECT LOCATION



Accessibility via Federal Route 59 (Tapah – Brinchang)

1.07 km from The Lake House Resort

2.68 km from SMK Ringlet

3.5 km from Ringlet Town.

- Situated in Lot PT2689, Mukim Ringlet, Cameron Highlands
- TNB already entitled for 81 hectares of land (200 acres)
- Previously opened and used for disposal activities amounted approximately 20.19 hectares (49.89 acres)
- Area occupied by the existing haulage road (reinforced concrete, RC) is 0.28 hectares (0.70 acres)

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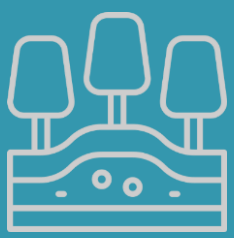
PHYSICAL ENVIRONMENT

TOPOGRAPHY

The topography of the project site is featured as hilly, some depressions with valleys and also flat areas. Steep slopes of 25° – 35° and > 35 accounted for 36.72%. Flat areas au contraire, comprised about 22.0%. The highest point is located on northwest at 1241 MSL while the lowest point is on the site entrance, elevated at 1070 MSL.

GEOLOGY & MINERAL

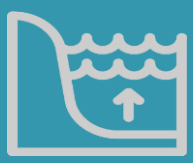


The project site is formed mainly by intrusive igneous rock (biotite granite) and metamorphic rock (schist). Outcropping of these rocks at the exposed slopes are severely weathered except in Geosj01.

LAND USE

Existing land use is of mixed land use comprising of Ringlet Forest Reserves, secondary forest and anthropological attributes (floriculture farms, residential, school, shop houses)

HYDROLOGY



The project site is drained by two tributaries which have been modified and diverted using U-concrete drain and underground culverts. Flow rate from both drainages ranged from 0.01 to 0.13 m3/s, indicating low retention capability. Both drainages have formed two water catchment areas for Ringlet Reservoir.

GROUNDWATER QUALITY

Several parameters viz. BOD, COD, AN, Mn, Fe, As, Pb and Total Coliform have their values exceed the permissible standards outlined by NGWQI. Plausible factors are due to land use changes, diversion and modification of drainage system and, anthropogenic influences.

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PHYSICAL ENVIRONMENT

CLIMATE & METEOROLOGY

Rainfall Distribution
Maximum average : 354.0 mm (November)
Minimum average : 81.2 mm (February)

Atmospheric Temperature
Maximum average : 19.1°C (May)
Minimum average : 17.6°C (January)

Relative Humidity
Maximum average : 91.6% (May)
Minimum average : 86.6% (February)

Wind Direction / Wind Speed
Prevailing Wind: East (21%), West (22.2%)
Percentage of calm days: 4.7%
Mean wind speed: 1.9 m/s
Maximum: 10.7 m/s (Northwest)
Minimum: 0.3 m/s (North)

WATER QUALITY

Water Quality Index (WQI): All stations exhibited as Class II (Clean) except for J7,J8,J10 & J11 (Class III, Slightly Polluted)

All reservoir's stations were within the limit of Category D, for NLWQS.

AIR QUALITY

PM10 and PM2.5 for all stations are within the permissible limits as per MAAQS 2020 except in A3 & A4.

No gaseous pollutants (SO2, NO2, & O3) being detected. CO present in trace concentration.

SOIL PARTICLE DISTRIBUTION

Principal composition of soils at the following sites are as follow:

Bund materials: silt-sandy / sandy-silt (+ clay)

Disposed materials: silt-sandy / sandy-silt (+/- clay)

Ringlet Reservoir: silty-sandy-clay / silty sand

NOISE LEVEL

Laeq on daytime, all stations within the limit 60 dBA except in NM4.

LAeq on nighttime, 3 stations exceed the limit 55 dBA viz. NM1,NM2 & NM4.

Human activities are deemed the main source of noise, other than the sounds emitted from nature's environment .

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BIOLOGICAL ENVIRONMENT

TERRESTRIAL FLORA

125 Plant species

comprised of 96 genera dan 98 families

2 Near threatened

- Meranti Bukit
- Resak Gunung

NT Dipterocarpaceae

- 41 species of ferns and fern allies were also able to be identified.
- Total biomass: 507.48 tan/ha
- Carbon content: 253.74 Mg C/ha
- Existing ecological function is of a disturbed ecosystem thus, the conservation values were deemed low.

TERRESTRIAL FAUNA

5 Species: big & medium-sized mammals

4 ORDER | 5 FAMILIES

5 Species: non-volant small mammals

2 ORDER | 3 FAMILIES

3 Species: volant small mammals

2 FAMILIES

Wildlife Conservation Act 2010 (Act 716)

Totally Protected: Sumatran serow, pangolin, dusky leaf monkey & masked palm civet

IUCN Red List **VU**

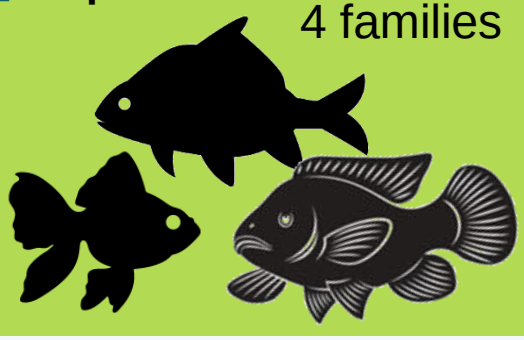
Vulnerable: Whitehead's Sundaic Maxomys, Lesser Gymnure

1 Species potentially to cause conflict

AQUATIC LIFE

7 Fish species

4 families



- Dominant species: Tengas Daun > Tilapia
- No protected and endemic species were recorded during the sampling events.
- Most of the recorded species are of common and well distributed in Malaysia, given similar ecosystem settings.
- There are some concerns on the presene of alien species such as tilapia, African catfish dan lee koh which may able to displace local species.

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HUMAN ENVIRONMENT

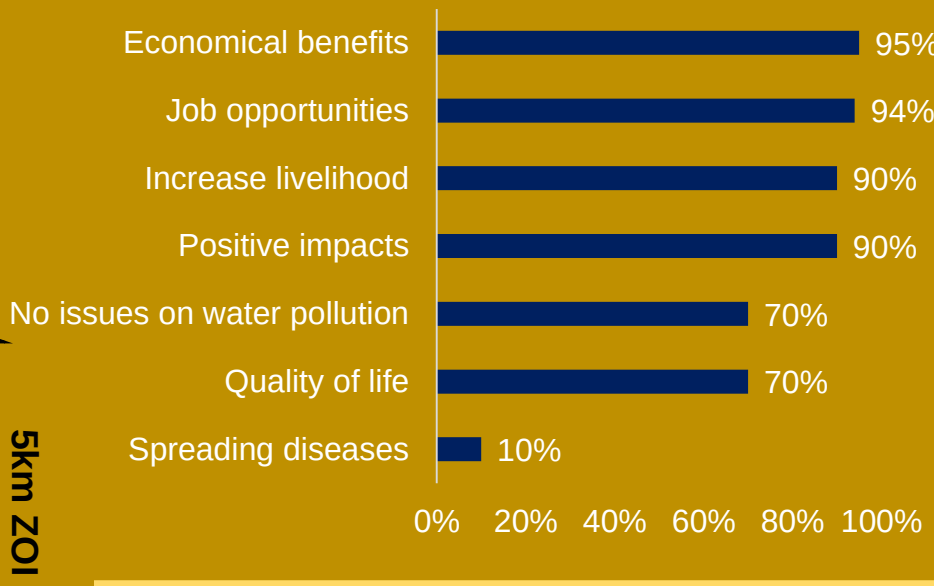
SOCIO-ECONOMY

200 RESPONDENTS

TOTAL

- Habu Heights
- Bertam Valley
- Taman Ringlet
- The Lake House
- Lavender Park

5km ZOI



Overall Perception: Positive with the proposed Project
Negative Perception: Wastes from project site is concerned to spread diseases if not properly managed.

TRAFFIC

MAIN ACCESS

Federal Route 59

2 main junctions

- Tanah Rata-Ringlet-Bertam Valley — **TC1**
- Tanah Rata-Ringlet-Jalan Felicia — **TC2**

Level of Service (LOS)

TC1	A → A → C → A	B & C both during operational phase
TC2	A → A → B → A	

EVALUATION OF IMPACTS

PRE-CONSTRUCTION PHASE

Significant Potential Impacts	Magnitude of Significant Impact
TOPOGRAPHY	
Soil investigation through rotary boring machine will only produce a low localized impact thus deemed insignificant.	Negligible
LAND USE	
Impacts of land acquisition from Forestry Department and District Council for the new disposal cells are significant since the status of the land usage will be changed.	Negligible
GEOLOGY	
Mobilization and activity of rotary boring machine would not exert potentially adverse impact if it is deployed at an exposed and steep slope.	Negligible
HYDROGEOLOGY	
No impacts on hydrogeological aspects (groundwater quality) as no major activities conducted during this stage.	Negligible
SURFACE WATER QUALITY	
Drilling of soil during soil investigation using rotary boring machine will generate loose soil particles and potentially to be carried to the nearby drainage system via surface run-offs, resulting in increasing total suspended solids and turbidity.	Negligible
AMBIENT AIR QUALITY	
Source of air emission might only be from the exhaust of the rotary boring machine and its mobilization from one point to another (non-exhaust emissions) for soil investigation purposes. However, the emissions are considered not significant to affect the ambient air quality since the scale of activity is small and localized.	Negligible
NOISE LEVEL	
Induced noise at the proposed Project site might only be from the rotary boring machine and its mobilization from one point to another for soil investigation purposes. Also, the conducted land surveying activities may not generate significant noise levels. Other than natural noises from the surroundings, noise pollution is very unlikely at this stage.	Negligible

EVALUATION OF IMPACTS

PRE-CONSTRUCTION PHASE

Significant Potential Impacts	Magnitude of Significant Impact
TERRESTRIAL FLORA	
Slight vegetation removal e.g. small bushes and undergrowth might be required for the mobilization of soil investigation equipment. In addition, the main route for soil investigation works would be using the existing access roads thus, no issues on floral disturbances are anticipated.	Negligible
TERRESTRIAL FAUNA	
Land surveys and soil investigation will not impose any impacts on the existing faunal composition at the project site.	Negligible
AQUATIC LIFE	
Land surveys and soil investigation will not impose any impacts on the existing aquatic life at the Project site.	Negligible
SOIL CONDITION	
Land surveys and soil investigation will not impose any impacts on the waste generation at Project site.	Negligible
SOCIO-ECONOMY	
Hiring of local people in assisting land surveys and point recognisance for soil investigation may impose beneficial impact in terms of providing temporary job opportunities and domestic side income for the locals.	Beneficial
TRAFFIC CONDITION	
During survey and site investigation for data collection (site visit, soil investigation, surveys and baseline data), expected light vehicle (4WD) movement will occurred in temporary period and at certain location (access road only). No impact is expected to the current traffic flow on the main road since the existing level of service (LOS) on both main point of access are rated as “A” or free flow, except during peak hours on weekends.	Negligible
WASTE GENERATION	
Land surveys and soil investigation will not impose any impacts on the waste generation at Project site.	Negligible
HYDROLOGY	
No impacts on hydrological aspects as no major activities conducted during this stage. The existing hydrological features are due to past alteration to cater the older disposal cells.	Negligible

EVALUATION OF IMPACTS

CONSTRUCTION PHASE

Significant Potential Impacts	Magnitude of Significant Impact
TOPOGRAPHY	
• Earth cutting and filling is the key earthwork activities during construction phase. These in turn will permanently alter the existing geomorphology of the proposed Project site.	Potentially Adverse/High Significance
GEOLOGY	
• Since earth cutting and filling is the key activities during construction phase, construction of new access road at steeper angle can lead to surface run off velocity and will loosed the soil strength and causing more slope failure.	Potentially Adverse/High Significance
HYDROGEOLOGY	
• Intersection of the construction of new access road's alignment with the slopping hillside aquifers may causes groundwater contamination plus, jeopardizing the road structure's integrity. • Spillage, improper handling, storage and application of hazardous materials (e.g.; engine oil, hydraulic oil etc.) during construction may also affect the groundwater quality. • Tributary diversion and concreted surface drainage may alter and reduce the groundwater recharge. Ineffective recharge will be resulted in lower groundwater levels.	Potentially Adverse/High Significance
SURFACE WATER QUALITY	
• Potentially to be affected mainly by soil erosion. Improper embankment for access road and disposal cells, may release these easily weathered loose materials (soil particles) in which they are transported as sediment load to the nearby drainage systems. The resultant scenarios would be a shallower drain, due to high deposition of sediment.	Adverse/High Significance
AMBIENT AIR QUALITY	
• Potential impacts can be contributed both from exhaust emissions and non-exhaust emissions.	Potentially Adverse/High Significance
HYDROLOGY	
• Site clearing and earthworks cut and fill during construction phase will tend to alleviate surface soil erosion which results in increasing total suspended solids (TSS) and turbidity in the water courses.	Potentially Adverse/High Significance

EVALUATION OF IMPACTS

CONSTRUCTION PHASE

Significant Potential Impacts	Magnitude of Significant Impact
NOISE LEVEL	
• Potential impacts can be contributed from the motorization of major construction equipment. The impacts however are temporary and confined in the project area.	Potentially Adverse/Moderate Significance
TERRESTRIAL FLORA	
• Habitat degradation due to the vegetation clearing will result in habitat loss. • Permanent loss of habitat – residual impact	Potentially Adverse/Low Significance
TERRESTRIAL FAUNA	
• Habitat degradation due to the vegetation clearing for the construction of embankment for disposal site, will result in habitat loss. • Sounds generated from the construction activities through vehicular movements, interactions between materials and human crowd will normally cast the wildlife away from the construction perimeter.	Potentially Adverse/Low Significance
SOCIO-ECONOMY	
• Business opportunities will be created in terms of supplying the everyday needs and activities during the construction period. This in turn increasing the local cash flow. • Create job opportunities to the local people	Beneficial/High Significance
WASTE GENERATION	
• Generated wastes are to be contributed from the cleared biomasses or vegetation, scheduled wastes of SW305, SW306, SW408, SW409, SW410, SW421 and SW422, solid/domestic wastes (e.g. food packaging, plastics, containers, wrappers, cigarette etc..) and construction wastes (leftover rubble or spilled aggregates, worn out tyres, pipes, gloves etc..). These are potentially to be concentrated at construction site.	Potentially Adverse/Low Significance
TRAFFIC	
• Mobilization of major construction equipment into the Project site from the main federal route 59 (public route) may slow down the traffic flow or lead to traffic congestion. Traffic collision may also potentially to occur.	Potentially Adverse/High Significance

EVALUATION OF IMPACTS

OPERATIONAL PHASE

Significant Potential Impacts	Magnitude of Significant Impact
TOPOGRAPHY AND LANDUSE	
No significant impact of land use is anticipated during all activities.	Negligible
GEOLOGY	
• Dredging Regulated dredging helps to improved hydrodynamics and sediment regimes of the reservoir.	Beneficial/High Significance
• Decantation No impacts anticipated from decantation activities.	Negligible
• Transportation No impacts anticipated from transportation activities	Negligible
• Disposal This might be sourced from embankment stability of the disposal cells with probability of cell break due to overburden or miscalculation of the design work capacity. These, despite of potentially adverse, they are of low degree of significance as the occurrence is very unlikely.	Potentially Adverse/Low Significance
HYDROGEOLOGY	
• Dredging Dredging will not impose an impact towards the groundwater quality since the reservoir or lake itself is the recipient body of the groundwater inflow.	Beneficial/High Significance
• Decantation Improper management of the decantation activities may affect groundwater quality through infiltration and seepage.	Potentially Adverse/Moderate Significance
• Transportation No impacts anticipated from transportation activities	Negligible
• Disposal Residual fluids from the dredged materials or spoils, will potentially seep through the porous rocks of the embankment and get infiltrated into the groundwater regimes.	Potentially Adverse/Moderate Significance

EVALUATION OF IMPACTS

OPERATIONAL PHASE

Significant Potential Impacts	Magnitude of Significant Impact
SURFACE WATER QUALITY	
• Dredging Dredging will gradually increase the lake's carrying capacity.	Beneficial/High Significance
• Decantation Untreated decanted water from the decantation area, might contain suspended residuals of the sediment thus in turn, may re-affect the surface water quality.	Potentially Adverse/Moderate Significance
• Transportation Relocation of sediment generally would not impose considerable impacts unless, sediment is accidentally spilled during transport and the spillage is left unattended.	Negligible
• Disposal Disposal activities will potentially affecting surface water quality through seepage of the remaining liquids in the disposed sediment through porous rocks of the embankment wall.	Potentially Adverse/Low Significance
AIR QUALITY MONITORING	
• Dredging Air quality is potentially to be produced from the exhaust emissions from dredging equipment.	Potentially Adverse/Low Significance
• Decantation Air quality is potentially to be produced from the exhaust emissions from excavator.	Potentially Adverse/Low Significance
• Transportation Air quality is potentially to be produced from the exhaust emissions from lorries delivering dredged materials to the disposal site	Potentially Adverse/Moderate Significance
• Disposal Source of air pollution from the exhaust emission of machinery and fugitive dust from the exposed area.	Potentially Adverse/Moderate Significance

EVALUATION OF IMPACTS

OPERATIONAL PHASE

Significant Potential Impacts	Magnitude of Significant Impact
TERRESTRIAL FLORA	
• No anticipated impacts can be drawn towards terrestrial flora during the operational phase as dredging, decantation, transportation of dredged materials and disposal of sediment will have no engagement with the remaining floral patches. Therefore, the impact at this stage can be deemed negligible. Permanent loss of habitat or forest resources-residual impact.	Negligible
TERRESTRIAL FAUNA	
• The impacts on fauna during operation phase only applicable at disposal area only. Noises and sounds from operational activities may kept the wildlife away from the Project site during daytime but nocturnal animals will tend to enter the project site at night to forage upon new shoots at some areas. Human-wildlife conflicts are much more manageable at this phase. • Therefore, operational phase will only produce residual impacts with low degree of significance towards terrestrial fauna due to permanent loss of habitat.	Potentially Adverse/Low Significance
AQUATIC ECOLOGY	
• Dredging The movement of dredging vessels and the action of the operating dredge drill bit underwater may produce noise and turbulences thus, may causes the aquatic communities especially the fishes to escape and seek refuge at safer reaches of the ecosystem. Dredging would cause the resuspension of sediment which may be positively affect to the aquatic life.	Beneficial/High Significance
• Decantation Discharge water from the sediment pond at the decantation basins will re-introduce a considerable amount of TSS and turbidity into the lake thus, may impose the effect to aquatic life (the fishes) as mentioned in the construction phase.	Potentially Adverse/Low Significance
• Transportation There are no impacts to the aquatic life caused by this activity.	Negligible
• Disposal Improper waste management and spillage/leakage of chemicals (fuels, hydraulic oils, lubricants and etc..) from operating sites may enter the streams via surface runoffs as toxic constituents which are harmful to aquatic life.	Negligible

EVALUATION OF IMPACTS

OPERATIONAL PHASE

Significant Potential Impacts	Magnitude of Significant Impact
SOCIO-ECONOMY	
No significant impact of socio-economy anticipated during all activities.	Beneficial/High Significance
WASTE GENERATION	
• Wastes are expected to be generated at all operational activities. • Scheduled wastes (SWs) are anticipated to be generated during operational phase (dredging, decantation, transportation of dredged materials and disposal of decanted sediment).	Potentially Adverse/Moderate Significance
TRAFFIC	
• The impacts on traffic during operation phase only applicable during transportation of waste dredged materials to the disposal site only.	Potentially Adverse/Low Significance
HYDROLOGY	
• Dredging The problem of re-suspension of the sediment during dredging activities can be neglected since the lake or the reservoir is already in the state of being heavily silted. Moreover, dredging is crucial to be executed to regain the lake's live storage capacity for power generation and overall flood control.	Negligible
• Decantation Unregulated release of the water from decantation ponds might re-introduce considerable amount of total suspended solids and turbidity into the reservoir's system. However, this can be unlikely since decantation will let to take place for 6 days and the remaining water will not be discharged directly into the lake as it will be drained into a sediment pond first.	Potentially Adverse/Low Significance
• Transportation No impacts on hydrology are anticipated during relocation or transportation of the dewatered sediment to the disposal cells.	Negligible
• Disposal No impacts on hydrology are anticipated during disposal activities at the disposal cells.	Negligible

EVALUATION OF IMPACTS

POST-OPERATIONAL PHASE

Significant Potential Impacts	Magnitude of Significant Impact
TOPOGRAPHY	
• The site has been fully utilized and decommissioned. Rehabilitation (re-vegetation) of the used-up disposal site will help in increasing the aesthetic value of the proposed Project.	High/Beneficial
GEOLOGY	
• Decommissioning of the project will enhance beneficial impacts on the proposed Project by means of natural and induced colonization and succession of vegetation. This helps to maintain and fortify the slopes from geological risks.	High/Beneficial
HYDROGEOLOGY	
• Beneficial (positive) impacts are anticipated from the Project's decommissioning since the groundwater quality is no more to be affected by the anthropogenic stressors from the surface. • The reservoir will received a well-regulated discharge (inflow) from the groundwater thus restoring the system's hydrodynamic balance.	High/Beneficial
SURFACE WATER QUALITY	
• Fully established and stabilised slopes with vegetation covers will help in preventing soil loss through erosion thus in turn, lowering the load and rate of sedimentation. Therefore, post-operation phase will only impose residual impacts to the surface water quality.	High/Beneficial
AMBIENT AIR QUALITY	
• None to very minimal machineries and/or vehicular movements, restricted only for monitoring, rehabilitation and maintenance works.	Negligible
NOISE LEVEL	
• There will be none to very minimal machineries and/or vehicular movements, restricted only for monitoring, rehabilitation and maintenance works.	Negligible
TERRESTRIAL FLORA	
• Stabilized disposal site will permit vegetation of pioneer categories to flourish and their rooting networks will allow for soil rehabilitation through natural course of ecological colonization and succession. • Re-vegetation activities and plans may also speed-up the aforementioned ecological processes and at the same time assist to restore floral composition at the proposed Project site.	Negligible

EVALUATION OF IMPACTS

POST-OPERATIONAL PHASE

Significant Potential Impacts	Magnitude of Significant Impact
TERRESTRIAL FAUNA	
• Re-vegetation of the project site will promote new ecological niches for the wildlife, which can be a beneficial impact with high degree of significance. No impacts from monitoring, inspection and maintenance activities are anticipated but human (personnel) encountering with wildlife will be remained as residual impact until the site is fully and permanently closed.	Negligible
AQUATIC LIFE	
• Life and water-storage capacity of the lake is restored. As an indirect impact, a well-regulated flow will enhance the growth of aquatic lives at downstream reaches of the reservoir.	High/Beneficial
SOCIO-ECONOMY	
• The proposed Project in general will tend to alter the existing economical landscape, especially in the general public attractions and investors' confidence to this part of sub-districts, and the associated escalation of property prices and rentals of residential units. It is possible that with the continued trend, those sub-districts will become more develop, mushrooming with the business and economic activities which can attract all walks of life to settle in the area.	High/Beneficial
WASTE GENERATION	
• Waste generation at this phase can be treated as residual impacts, as long as the rehabilitation and maintenance works are still running.	Negligible
TRAFFIC CONDITION	
• The site only caters for monitoring, site inspection, maintenance and rehabilitation works. These activities are only conducted in a periodic intervals. Therefore, the level of service (LOS) will restore to normal.	Negligible
HYDROLOGY	
• Inspection and maintenance work in post-operation phase will not impose any impacts on hydrology.	Negligible

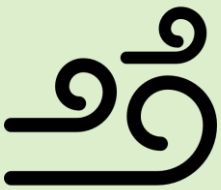
EXECUTIVE SUMMARY

Environmental Impact Assessment (EIA) Disposal Area (96.19 Hectares) for Sediment Waste Dredged Materials at Lot PT2689 Rezab Tanah Bukit Mukim Ringlet, 39000 Cameron Highlands, Pahang Darul Makmur

MITIGATION MEASURES

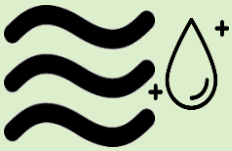
NOISE

- All vehicles and machineries must be properly serviced and maintained to ensure good working conditions thereby reducing noise emissions.
- Application of specially quieted equipment such as mufflers at the engines shall be implemented to minimize noise generation.
- Noisy operations shall be combined in the same time period. The total noise level produced shall not be significantly greater than the level produced if the operation were performed separately.
- Working period shall be restricted during daytime only.



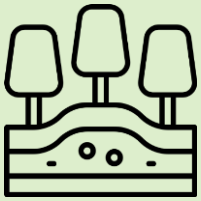
AIR QUALITY

- The use of effective dust suppression technique such as on-site watering or wash trough shall be implemented at the entrance and exit point.
- The access road in the project site shall be paved with gravel or laterite to prevent erosions of the earth surface in particular during the dry season.
- All vehicles and machineries must be properly serviced and maintained to ensure good working conditions thereby reducing undesirable emissions
- Scheduling of the vehicular and machineries movement shall be implemented to control exhaust and non-exhaust emissions.



WATER QUALITY

- LDP2M2 control measures shall be implemented at the early stage of the project before the commencement of earthworks.
- LDP2M2 control measures shall be inspected and maintained regularly so that they are able to function effectively.
- Any earthworks in vicinity to waterways or water regimes shall have *a priori* installation of silt fence and silt trap to ensure slurry water is not being directly discharged.
- Best management practices (BMPs) shall be implemented before, during and after the project's development to ensure no excess of sediment transport being able to enter the waterways.



GEOLOGY

- Any construction and operational works must be conducted within the work boundary as per approval from relevant authority(-ies).
- Any intended earth cutting and filling works shall consider the steepness of slopes to minimize the risk of slope failure, soil erosion and landslide.
- Exposed slopes must be properly covered with organic materials e.g. plant's straws or chipped biomasses and/or HDPE lining.

EXECUTIVE SUMMARY

Environmental Impact Assessment (EIA) Disposal Area (96.19 Hectares) for Sediment Waste Dredged Materials at Lot PT2689 Rezab Tanah Bukit Mukim Ringlet, 39000 Cameron Highlands, Pahang Darul Makmur

MITIGATION MEASURES

TRAFFIC

- Scheduling of the in-out vehicular and machineries movement shall be implemented to avoid traffic congestion especially on the public road. Mobilization during peak hours an weekend shall be avoided at all cost.
- Even during normal hours on regular weekdays, mobilization of equipment must be assured not to cause traffic congestion or any undesired incidences.
- Provide adequate temporary road signage and markings as recommended by JKR Guidelines [*Arahan Teknik (Jalan)* 2A-85 (*Pindaan* 2014) Standard Traffic Sign and ATJ 2C-85 (*Pindaan* 2017) Temporary Signs and Work Zone Control].

HYDROLOGY

- Any channel or tributary diversion shall be conducted as per approved specifications by the Department of Irrigation and Drainage (DID).
- Construction and placement of surface drainage shall be in accordance to the approved ARI designs by DID to adequately cater surface run-offs and increase the time of concentration (Tc).
- Any earthworks in vicinity to waterways or water regimes shall have *a priori* installation of silt fence and silt trap to ensure slurry water is not being directly discharged.
- Best management practices (BMPs) shall be implemented before, during and after the project's development to ensure no excess of sediment transport being able to enter the waterways.

SOIL EROSION

- LDP2M2 control measures shall be implemented at the early stage of the project before the commencement of earthworks.
- All LDP2M2 control measures shall be inspected and maintained regularly so that they are able to function effectively.
- Any earthworks in vicinity to waterways or water regimes shall have *a priori* installation of silt fence and silt trap to ensure slurry water is not being directly discharged.
- Best management practices (BMPs) shall be implemented before, during and after the project's development to ensure no excess of sediment transport being able to enter the waterways.

EXECUTIVE SUMMARY

Environmental Impact Assessment (EIA) Disposal Area (96.19 Hectares) for Sediment Waste Dredged Materials at Lot PT2689 Rezab Tanah Bukit Mukim Ringlet, 39000 Cameron Highlands, Pahang Darul Makmur

MITIGATION MEASURES

AQUATIC LIFE

- Cleared biomasses shall not be let to enter the water bodies through any means to prevent the release of H2S from the decomposition activities which the resultant effect could be detrimental due to sudden rise in BOD.
- Water quality monitoring shall be performed periodically according to the guidelines provided by DOE (WQI), DID (JRI) and NAHRIM (NLWQS).

TERRESTRIAL FLORA

- Any activities with the tendency to cause further habitat loss, modification and fragmentation shall be limited.
- Clearing works shall be limited within the demarcated project's boundary.
- Remaining vegetated area and pristine habitat in the hills and ridges shall not be disturbed to serve as refuging habitat and ecological corridors.
- Continuous control measures shall be implemented to conserve the ecological corridors formed through the residual course by the project development.
- Revegetation is recommended after the decommissioning of the project which can be appropriately attained through flora rehabilitation plan.

TERRESTRIAL FAUNA

- Site clearings and any earthworks shall be implemented in sequence or phasing to minimize the exposed area.
- Any encountering or sightings of the endangered and protected species in forest reserves or in vicinity to the project area shall re reported immediately to PERHILITAN.
- Any arising conflicts with the wildlife shall be informed immediately to PERHILITAN. Any actions of trapping, injuring and handling of the wildlife is prohibited.
- Activities in the project site shall be limited on daytime only.

EXECUTIVE SUMMARY

Environmental Impact Assessment (EIA) Disposal Area (96.19 Hectares) for Sediment Waste Dredged Materials at Lot PT2689 Rezab Tanah Bukit Mukim Ringlet, 39000 Cameron Highlands, Pahang Darul Makmur

MITIGATION MEASURES

WASTE MANAGEMENT

- Open burning of waste is strictly prohibited.
- Cleared biomass e.g. trunks and branches shall be subjected to cuttings to shorter lengths to facilitate stacking to serve as natural biomass filter for sediment.
- Generated solid waste shall be collected and disposed as per state and local requirement viz. provision of garbage bins, segregation of solid waste types, recycling campaign and prohibition to discharge the waste into any water bodies.
- All scheduled wastes must be handled and managed in accordance to Environmental Quality (Scheduled Waste) Regulations 2005.

GROUNDWATER QUALITY

- Monitoring on groundwater quality shall be performed periodically to assure the selected parameters are in the condition of below the permissible limits, as outlined in NGWQI.
- Boreholes or groundwater wells and their access roads shall be maintained and cleaned regularly to facilitate monitoring works in particular if the wells are situated in remote areas.
- Any developments shall have strict considerations on the location of any groundwater channels to prevent disturbance during foundation works and integrity of the erected structure on top can be assured.
- Any maintenance works shall be handled according to the approved standard operational procedures to prevent accidental spillage of scheduled wastes thus, infiltration of hazardous substances into the groundwater reservoir can be avoided.

SOCIO-ECONOMY

- In light of supporting domestic economy, contractors shall have the provision to employ local residences in supplying construction materials, food and other goods deemed in need by the site's personnel, also in terms of non-professional positions such as driver, document controller, admin/finance clerk and security officer, which the employment can be opened to the locals as priority.
- Best management practices and good housekeeping shall be implemented in any activities undertaken during construction and operational phase to minimize undesired physical and human impacts

EXECUTIVE SUMMARY

Environmental Impact Assessment (EIA) Disposal Area (96.19 Hectares) for Sediment Waste Dredged Materials at Lot PT2689 Rezab Tanah Bukit Mukim Ringlet, 39000 Cameron Highlands, Pahang Darul Makmur

IMPACT MONITORING

Air Quality

PARAMETER

PM_{10}, $PM_{2.5}$,

STANDARD

New Malaysia Ambient Air Quality Standard 2020

FREQUENCY

Quarterly

NO. OF STATIONS

5

Noise Level

PARAMETER

L_{aeq}, L_{10}, L_{50}, L_{90}, L_{min}, , L_{max}, L_{10}

STANDARD

Guidelines for Environmental Noise Limit & Control, 2019

FREQUENCY

Quarterly

NO. OF STATIONS

5

Water Quality

PARAMETER

Physical

Temperature, Conductivity, Turbidity, DO, TSS, pH

Chemical/Anion

Ammoniacal nitrogen, phosphate, sulfate, chloride, fluoride, nitrite, nitrate

Heavy Metal

As, Cd, Pb, Hg, Ni

Chemical/Organic

BOD, COD, O&G

Microbiology

Chlorophyll-a, Faecal coliform, Total coliform

STANDARD

National Water Quality Standards (NWQS),National Lake Water Quality, (NLWQS)

FREQUENCY

Monthly and weekly for TSS parameter in disposal site

NO. OF STATIONS

11

Groundwater Quality

STANDARD

National Groundwater Quality Index (NGWQI)

FREQUENCY

Monthly

NO. OF STATIONS

3

PARAMETER

Physico-Chemical

Turbidity, TDS, pH, Colour, Hardness, Ammoniacal Nitrogen, Phenol, Nitrate, BOD, COD

Heavy Metal / Pesticide

As, Pb, Hg, Fe, DDT, HCB, Endosulfan

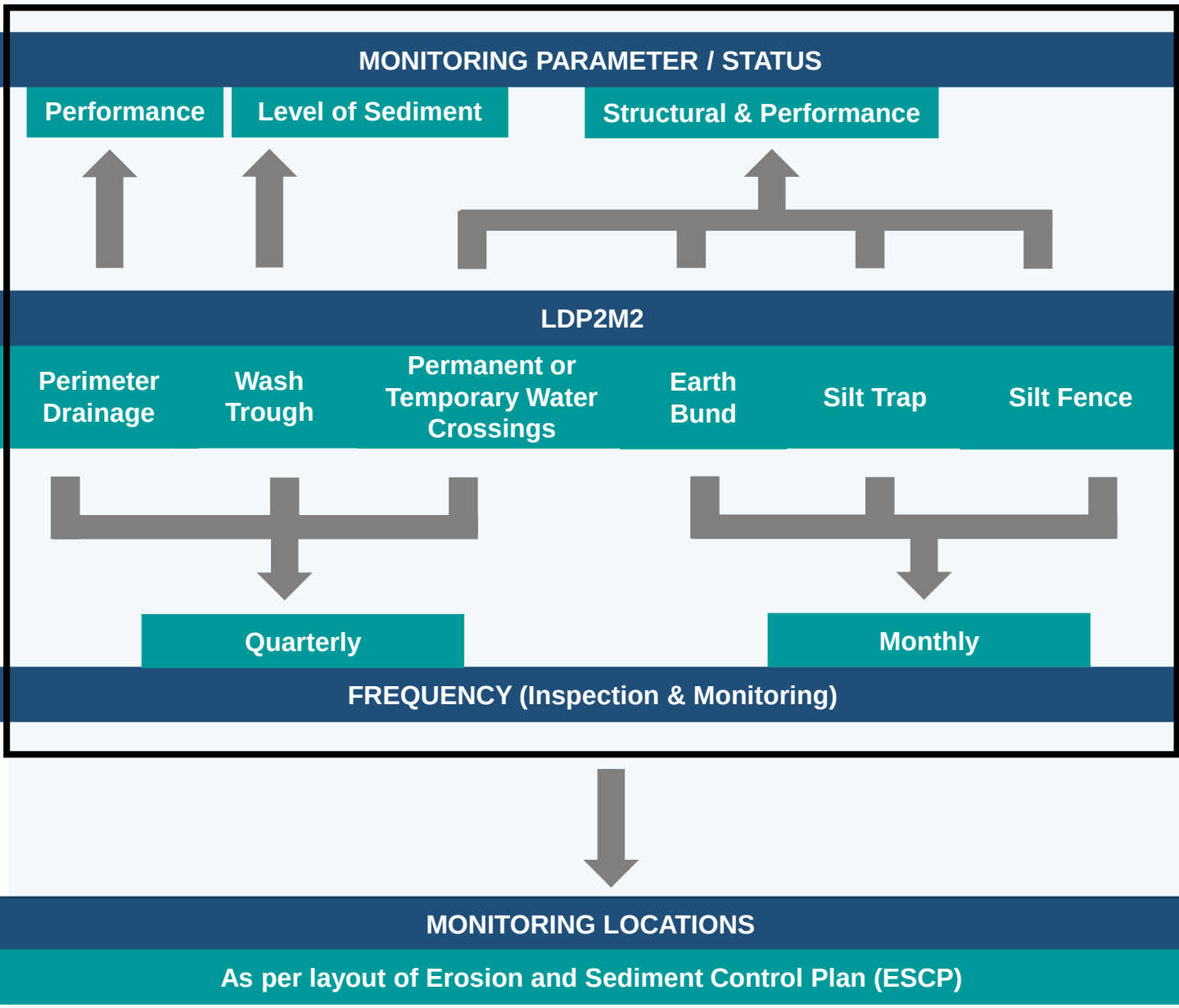
Microbiology

E. coli

COMPLIANCE MONITORING

Component	Law / Regulation / Standard	Frequency
Soil Erosion	(i) Guidelines for Prevention and Control of Soil Erosion and Siltation in Malaysia, DOE, 2008. (ii) Guidelines for Erosion and Sediment Control in Malaysia, DID, 2010. (iii) Urban Stormwater Management Manual for Malaysia, 2nd Edition (MSMA-2), DID, 2012. (iv) DOE EIA Approval Conditions.	Monthly to Quarterly (depend on the applied LDP2M2)
Air Pollution	(i) Environmental Quality (Clean Air) Regulations 2014. (ii) Environmental Quality (Control of Emission from Diesel Engines) Regulations 1996. (iii) Environmental Quality (Control of Emission from Petrol Engines) Regulations 1996. (iv) Environmental Quality (Declared Activities) (Open Burning) Order 2003. (v) Malaysia Ambient Air Quality Guidelines (MAAQG) (2014) (New Ambient Air Quality Standards 2020). (vi) DOE EIA Approval Conditions.	Quarterly
Water Pollution	(i) Environmental Quality (Sewage) Regulations 2009. (ii) Environmental Quality (Scheduled Wastes) Regulations 2005. (iii) National Water Quality Standards for Malaysia (NWQS). (iv) National Lake Water Quality Criteria and Standards, NAHRIM, 2015. (v) National Groundwater Quality Standards for Malaysia (NGWQS). (vi) DOE EIA Approval Conditions.	Monthly and weekly for TSS parameter in disposal site
Noise Pollution	(i) Environmental Quality (Motor Vehicle Noise) Regulations 1987. (ii) Occupational Safety and Health Act (OSHA) 1994 (Act 514) (incorporating amendments up to 1 January 2006). (iii) Factories and Machinery (Noise Exposure) Regulations 1989: Part II – Permissible Exposure Limits. (iv) The Planning Guidelines for Environmental Noise Limits and Control (DOE, 2007). (v) DOE EIA Approval Conditions.	Quarterly

PERFORMANCE MONITORING



MONITORING LOCATIONS

As per layout of Erosion and Sediment Control Plan (ESCP)