Rehabilitation / Reconstruction / Improvement, Operation and Maintenance of the Kennon Road Project

Project Description for Scoping

August 2021

Submitted on behalf of:
Department of Public Works and Highways, Government of Republic of Philippines
Central Office – Bonifacio Drive, Port Area, Manila

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1.1 Introduction

Kennon Road is a two-way major access road leading to Benguet Province. Most of the existing road is only 2-lanes (1 lane per direction). It has a total length of 33.7 km which starts at Rosario, La Union and ends at a roundabout connected to Marcos Highway and Governor Pack Road in Baguio City. It is classified as a primary national road under the jurisdiction of La Union 2nd, Benguet 1st and Baguio City District Engineering Offices (DEOs). It is connected to three existing roads located in the provinces of La Union and Pangasinan. It is linked primarily to Manila North Road (N2) through a triangular junction (Rosario Junction) in Barangay Camp One, Rosario, La Union. Vehicles from Metro Manila may also use the recently opened Tarlac-Pangasinan-La Union Expressway (TPLEX) to reach Kennon Road, shortening the travel time from Metro Manila to Baguio City. The connection to TPLEX can be found west of Rosario Junction.

A new road (Agat-Dungon Rd.) was constructed forming an alternate connection from Kennon Rd. to Manila North Rd. in Sison, Pangasinan (before Bued Viaduct) bypassing the normally congested Rosario Junction. The route follows the eastern riverbank of Bued River until it reaches Barangay Camp One in Tuba, Benguet. The Kennon Road terminates at the rotunda in front of Baguio General Hospital (BGH) connecting to major areas in Baguio City, Benguet.

Aside from being one of the preferred routes of motorists coming from Metro Manila going to Baguio City, Kennon Road also serves local communities in the towns of Rosario and Pugo in La Union, and Tuba and Baguio City in Benguet. This indicate that attention will have to be given in the formulation of a Minimum Performance Standards and Specifications (MPSS) in terms of protection systems required for motorists.

1.2 Need for the Project

Kennon Road's major risk element is its exposure to natural events causing regular damage and road safety hazards. About 98% of Kennon Road passes along the valley of Bued River. It intersects several water tributaries which can cause flash floods, siltation and debris flows. Aside from its steep slopes and sharp curves, Kennon Road is one of the most hazardous roads in the Philippines during rainy seasons. Road slope disasters such as soil collapse, rock fall, road slip, landslide and river erosion have been observed in the past years. Since 2013, Kennon Road has recorded around thirty-one (31) road closures due to slope disasters brought about by typhoons. Sixteen (16) deaths were recorded from vehicular accidents since 2014.

The Project involves the rehabilitation/reconstruction/improvement, operation and maintenance of the Kennon Road as a toll road.8 The goal of the Project is to prevent and mitigate the road slope disasters (such as rock slope collapse, road slip, and river erosion) that frequently occur along the Kennon Road. DPWH would like to tap the private sector expertise in finding long term solutions to effectively prevent slope disasters along the Road, maintain its quality and structural integrity, and minimize if not totally prevent road closures.

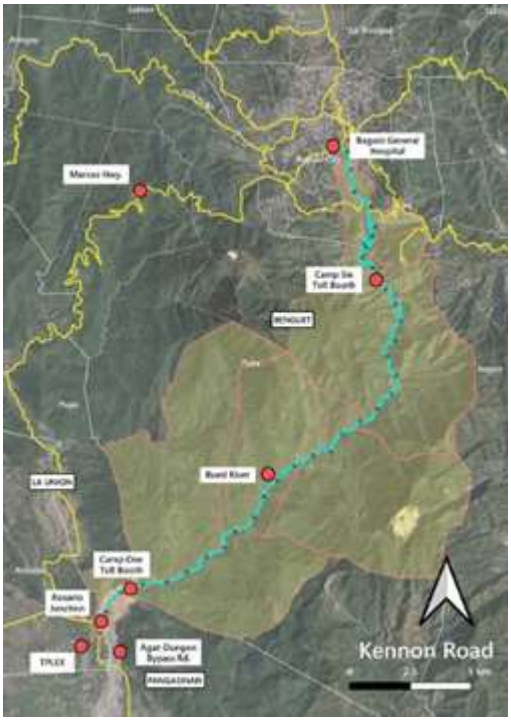
Among the project impacts are reduced travel time and availability of a reliable alternate route to Baguio City that could effectively resolve traffic congestion and insufficient road network system in the region.

Ultimately, the Project is expected to contribute to the growth of the area's tourism industry and related business activities, including their expansion to remote communities near the project area.

1.3 Alternatives considered

The project team identified and assessed five (5) alternative options for this project as follows:

1. **Option 1: Maintain existing alignments and sections.** the existing alignment and sections will be maintained with minimal shoulder widening. Existing slope protection measures by DPWH will be maintained while appropriate slope protection measures will be identified and implemented on anticipated disaster spots currently not covered by existing slope protection measures. This option will include the following:



    1) Maintenance of existing alignment and sections (3.5m travelled way and 0.6m shoulder)
    2) Widening of shoulder only where possible
    3) Maintenance of existing / on-going and new slope protection structures
    4) Identification of anticipated disaster spots where landslide type failures have occurred or likely to occur and implement appropriate slope protection measures
    5) Consider all high priority sections identified by DPWH
    6) Identify existing bridges for reconstruction/rehabilitation/retrofitting (new bridges will not be reconstructed so long as compliant with latest codes)
    7) Rehabilitate, reconstruct or improve existing pavement as required
    8) Improve drainage system

    This option is designed for the following performance standards

    - Operating Speed: 35 kph
    - Lane Width: 3.5m
    - Shoulder Width: 0.6m
    - Maximum Grade: 14%
    - Lay-by or Turn Out: Absent
    - Expected Road Closure due to Slope Failures: Frequent

2. **Option 2: Maintain existing alignments and sections, with minimum shoulder of 1.0 m.** the existing alignment and sections will be maintained with a minimum of 1.0 meter shoulder widening where possible. Existing slope protection measures by DPWH will be considered. However, replacement will be recommended where necessary. Appropriate slope protection measures will be identified and implemented on anticipated disaster spots currently not covered by existing slope protection measures. This option will include the following:

    1) Maintenance of existing alignment and sections (3.5m travelled way and 1m shoulder)

2) Widening of shoulder to minimum of 1.00m (where possible)
3) Maintenance of existing and ongoing slope protection construction
4) Recommend replacement to the existing slope protection structure where necessary
5) Identification of anticipated disaster spots where landslide type failures have occurred or likely to occur and recommend appropriate slope protection
6) Consider all high priority sections identified by DPWH
7) Identify existing bridges for reconstruction/rehabilitation/retrofitting (new bridges will not be reconstructed so long as compliant with latest codes)
8) Rehabilitate, reconstruct or improve existing pavement, as required
9) Improve drainage system

This option is designed for the following performance standards

- Operating Speed: 35 kph
- Lane Width: 3.5m
- Shoulder Width: 1.0m
- Maximum Grade: 14%
- Lay-by or Turn Out: Absent
- Expected Road Closure due to Slope Failures: Occasional

3. **Option 3: Widening of shoulders (minimum of 1.5 m, and wider for sharp turns), split alignment in certain sections.** this option will consider a more extensive approach for the rehabilitation, reconstruction and improvement of the road. Realignment of the route in anticipated disaster spots, construction of new bridges, retrofitting of new bridges and construction of tunnels will be considered. Shoulder will be widened to a minimum of 1.5m. This option will include the following:

1) Provision of minimum 1.5 m shoulder on both sides with 3.5 m each travelled way
2) Widening on sharp horizontal curves
3) Provision of passing lane or climbing lane on sections where vertical gradient is more than 6% without realignment of the existing road
4) Splitting the alignment for sections with long steep vertical alignment

5) Identify existing bridges for reconstruction/rehabilitation/retrofitting (new bridges will not be reconstructed so long as compliant with latest codes)
6) Identify anticipated disaster spots where landslide type failures have occurred or likely to occur and recommend appropriate slope protection
7) Consider all high priority sections identified by DPWH.
8) Rehabilitate, reconstruct or improve existing pavement as required
9) Improvement of drainage
10) Provision of lay-by or turn out where possible
11) Provision of traffic control devices

This option is designed for the following performance standards

- Operating Speed: 60 kph
- Lane Width: 3.5m with passing lanes
- Shoulder Width: 1.5m
- Maximum Grade: 12% or less
- Lay-by or Turn Out: Present
- Expected Road Closure due to Slope Failures: Rare

4. **Option 4: Widening of shoulders and realignment using viaducts.** this option will also consider long-term solutions for the reconstruction, rehabilitation, and improvement of Kennon Road. However, instead of realignment via construction of tunnels, viaducts will be constructed in areas with dangerous curves and high-risk disaster spots. Construction/retrofitting of bridges will be considered as well. This option shall have the following characteristics:

    1) Construction of viaducts in areas with sharp horizontal curves and disaster-prone areas.
    2) Identify existing bridge for reconstruction, rehabilitation or retrofitting existing as required.
    3) Identify anticipated disaster spots where landslide type failures have occurred or likely to occur and recommend appropriate slope protection
    4) Consider all high priority sections identified by DPWH.
    5) Rehabilitate, reconstruct or improve existing pavement as required
    6) Improvement of drainage
    7) Use of controlled blasting
    8) Provision of lay-by or turn out where possible
    9) Provision of traffic control devices

    This option is designed for the following performance standards

    - Operating Speed: 50 kph
    - Lane Width: 3.5m with passing lanes
    - Shoulder Width: 1.5m
    - Maximum Grade: 12%
    - Lay-by or Turn Out: Present
    - Expected Road Closure due to Slope Failures: Rare

An extensive multi-criteria analysis (MCA) was undertaken to select the preferred alignment from among the alternatives presented above. The following table lists the parameters considered and their relative weightages

Table 1: Parameters considered for MCA and weightages

Criteria	Weight
Travel Time	**9%**
Functionality	**30%**
Risk rating in terms of rockfall/rockslide/landslide hazard	*15%*
Number of hazardous horizontal curves	*7.50%*

Criteria	Weight
Number of hazardous vertical curves	*7.50%*
Life Cycle Cost	**25%**
Estimated CapEx	*12.50%*
Expected level of Maintenance cost	*12.50%*
Level of Right-of-Way Acquisition (ROWA)	**18%**
Level of Environment Impact	**18%**

The output of the MCA is presented in the following table

Table 2: MCA Results and aggregate scores

Criteria	Weight	Option 1	Option 2	Option 3	Option 4
Travel Time	**9.00%**	2	2	5	4
Functionality / level of accident-proneness	**30.00%**				
Rockfall hazard risk rating	15.00%	1	3	5	5
Horizontal curve	7.50%	2	2	3	3
Vertical gradient	7.50%	2	3	5	4
Life Cycle Cost	**25.00%**				
CAPEX	12.50%	5	4	2	3
Maintenance Cost	12.50%	1	3	5	5
Level of ROWA	**18.00%**	5	5	2	3
Level of impact on the environment	**18.00%**	4	3	1	2
TOTAL	**100.00%**	**3.00**	**3.32**	**3.22**	**3.54**

Among all the options, Option 4 yielded the highest score at 3.54. This option considers a balanced approach which fulfils an acceptable level of safety and driving comfort for users with a relatively manageable level of lifecycle cost, required ROW and environmental impact.

1.4 Project Components

The focus of the study is on the current alignment of Kennon Road with options for its rehabilitation / reconstruction / improvement. The alignment options were developed based on two main considerations:

- All-Weather Road (defined as a graded road that is passable by vehicles under both wet and dry weather conditions – level of wet condition to be confirmed during the design proper)
- Scenic Road (as relayed by the Client during the Kick-off Meeting)

The preferred option considers long-term solutions for the reconstruction, rehabilitation, and improvement of Kennon Road with viaducts to be constructed in areas with dangerous curves and high risk disaster spots. Construction/retrofitting of bridges will be considered as well. This preferred alternative shall have the following characteristics:

1. Provision of minimum 1.5 m shoulder on both sides with 3.5 m each travelled way
2. Construction of viaducts in areas with sharp horizontal curves and disaster-prone areas.

3. Identify existing bridge for reconstruction, rehabilitation or retrofitting existing as required.
4. Identify anticipated disaster spots where landslide type failures have occurred or likely to occur and recommend appropriate slope protection
5. Consider all high priority sections identified by DPWH.
6. Rehabilitate, reconstruct or improve existing pavement as required
7. Improvement of drainage
8. Use of controlled blasting
9. Provision of lay-by or turn out where possible
10. Provision of traffic control devices

1.4.1 Initial performance standards

The project concept design is targeted towards achievement of the following fundamental performance standards. These performance standards will be further defined and included in the PPP Agreement as MPSS that the selected private sector entity will need to commit to as part of its implementation of the PPP Agreement.

1. Operating Speed: 50 kph
2. Lane Width: 3.5m
3. Shoulder Width: 1.5m
4. Maximum Grade: 12%
5. Lay-by or Turn Out: Present
6. Expected Road Closure due to Slope Failures: only in exceptional circumstances

1.4.2 Slope Protection Measures

The key objective of the project is to protect the road from rock falls and other similar incidents. Hence the slope protection measures are a key functional component of the project. The following slope protection measures are considered in the improvement of the existing Kennon Road, among others:

1. Rock scaling
2. Controlled blasting and excavation
3. Reinforced shotcrete with rock bolts & weep holes
4. RC catch wall
5. Rockfall net barrier
6. Rockfall mesh with dowels
7. Rockfall mesh with bolts
8. Rock Anchor
9. Tied-back structure

1.5 Project Cost

The following table provides an overview of the estimated project cost. Please note that the following project cost is subject to change during the Feasibility Study process as the scope, concept design and key components of the project are finalized.

Table 1: Estimated Project Cost

Component	% if total cost	Amount PPH Bn
Road (carriageway)	55%	6.05
Slope protection	25%	2.75
Bridges and viaducts	15%	1.65
Drainage and retaining walls	5%	0.55
Total	**100%**	**11.00**

1.6 Indicative phasing of the project

The following table provides an overview of the phase-wise indicative timeline for the project. Please note that this is subject to change depending on multiple factors including time taken for conduct of the FS, impact of COVID-19 on the FS, time taken for review and various required approvals.

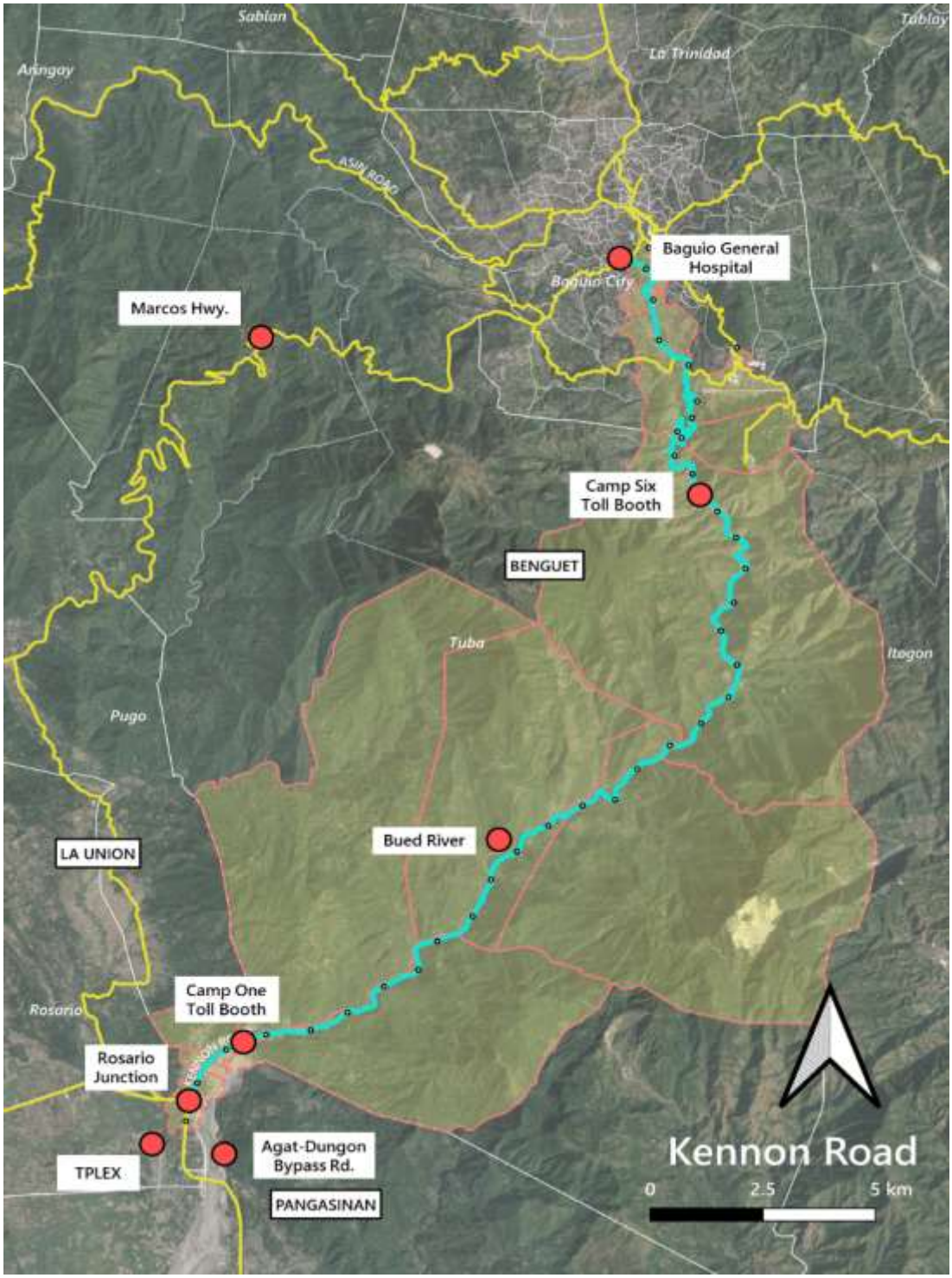
Table 2: Indicative timelines for implementation of the Project

Phase	Indicative timeline
Project preparation (Feasibility Study)	February 2021 – November 2021
Procurement process (for the private developer)	December 2021 – July 2022
Contract signing	August – September 2022
Detailed engineering design (preconstruction phase)	September 2022- February 2023
Construction phase	2023 – 2025
Operations and maintenance phase	2025 – to be determined

1.7 Map showing the project site and the proposed EIA study area

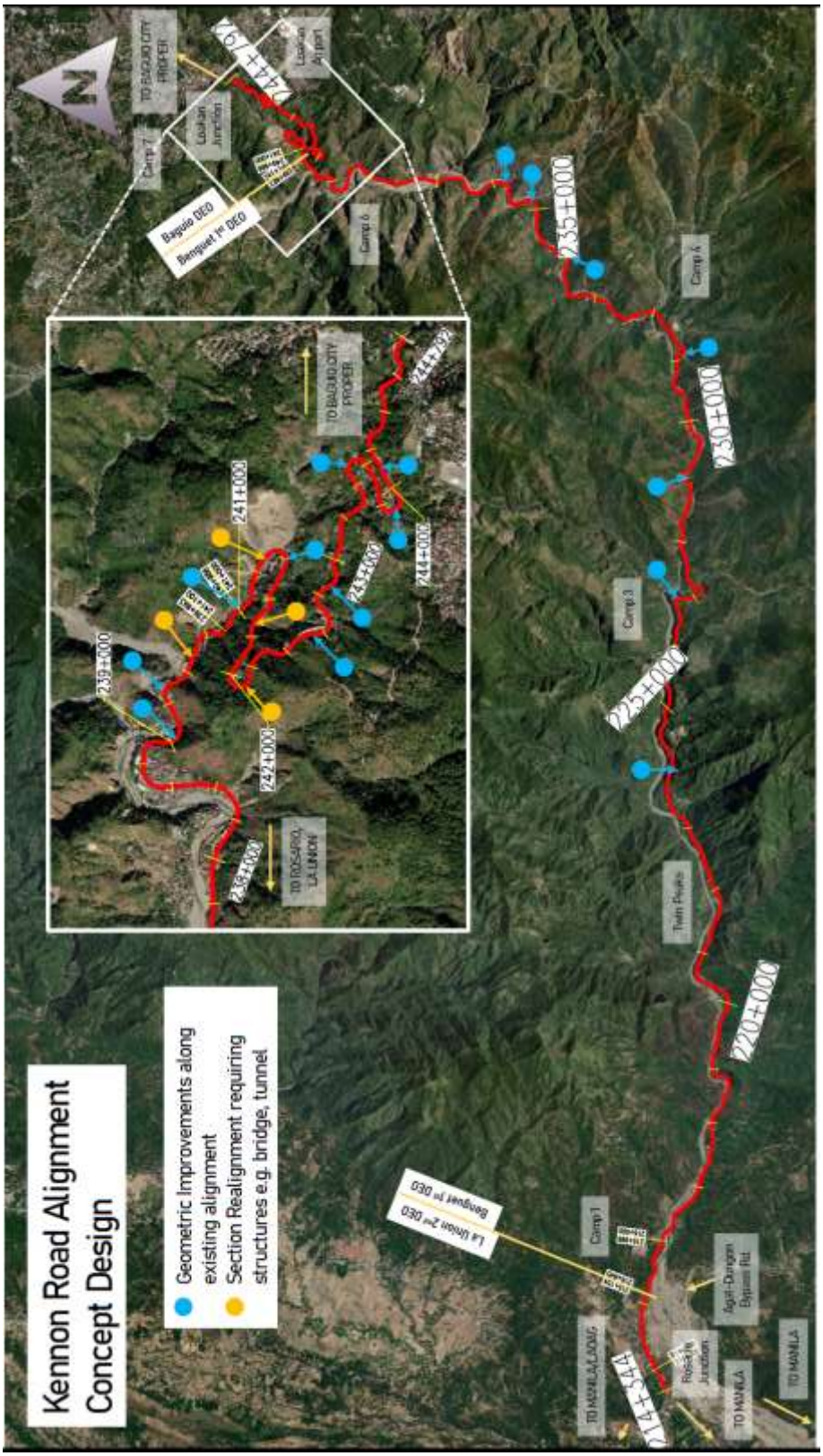
The proposed project site and the subject of the EIA study is shown in the following Map:

Figure 1: Proposed project site and coverage of the EIA study



1.8 Conceptual project design

Figure 2: Conceptual design of the Project



Please note that the concept design presented above is subject to change during the FS process as various factors are considered for the purpose of development of the concept design.

1.9 Project Proponent

Proponent Name	Department of Public Works and Highways (DPWH)
Address	Bonifacio Drive, Port Area Port Area, Manila
Authorized Signatory/ Representative	**MARK A. VILLAR** Secretary
Contact Details	**Email Address: villar.mark@dpwh.gov.ph** Phone Number: +632-5304-3300
Attention	Undersecretary Maria Catalina Cabral, Ph.D., CESO 1 Planning, PPP and Information Management Service, Email Address: cabral.ma_catalina@dpwh.gov.ph Phone Number: +632-5304-3319

1.10 Preliminary Identified Environmental Aspects for the Preferred Alternative

The identified preliminary environmental impacts for the preferred alternative described above are summarized as follows:

Land. The potential indicative key impacts under this component includes but not necessarily limited to the following:

- Tenurial or land issues especially with the indigenous peoples' domain claims
- Change in surface landform, topography, terrain and slope due to earthworks and excavation works for slope protection and viaduct construction
- Change in sub-surface underground geomorphology due to the controlled blasting requirements in selected sections
- Exposure of the project improvement works to geological hazards
- Soil erosion and loss of topsoil and overburden during the controlled blasting, excavation and earthmoving works for the project components such as in slope protection works, bridge approaches, and viaducts, etc.
- Removal of vegetation and trees along the alignment
- Disposal of excess materials from earthworks and controlled blasting works, etc.

Water. The potential indicative key impacts under this component includes but not necessarily limited to the following:

- Change in drainage morphology due to the presence of cross-drainage and bridgeworks requirements
- Incremental degradation of surface water quality of the Bued River due to effluents from construction works and workers' accommodation
- Incremental siltation of the Bued River resulting from materials carried to the waterbody from the excavation and earthworks during rainy periods

Air. The potential indicative key impacts under this component includes but not necessarily limited to the following:

- Degradation of air quality due to dust generation and resuspension during the construction activities
- Elevated noise levels in populated areas along the alignment brought about by heavy equipment operation

People. The potential indicative key impacts under this component includes but not necessarily limited to the following:

- Labor and employment opportunities
- Business opportunities for goods and services in the local government units
- Involuntary displacement of affected persons and households
- Disturbance and compensation of properties and businesses
- Right of way acquisition and compensation
- Threat to public health due to the presence of migrant workers
- Community safety due to the presence of vehicular and equipment traffic in work areas most especially in the populated areas along the alignment
- Traffic congestion during construction works