Initial Environmental Examination

June 2018

SRI: SASEC Port Access Elevated Highway

Prepared by Road Development Authority, Democratic Socialist Republic of Sri Lanka for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 24 April 2018)

Currency unit	–	Sri Lankan rupee (LKR/Rs)
LKR1.00	=	$ 0.00638
$1.00	=	156.83

ABBREVIATIONS

ADB	-	Asian Development Bank
BIQ	-	Basic Information Questionnaire
CKE	-	Colombo Katunayake Expressway
CMC	-	Colombo Municipal Council
DSC	-	Divisional Secretariat of Colombo
EIA	-	Environmental Impact Assessment
EMP	-	environmental management plan
EMOP	-	environmental monitoring plan
EA	-	executing agency
FGD	-	Focus group discussions
GN	-	Grama Niladhari
GRC	-	Grievance Redress Committee
GRM	-	grievance redress mechanism
GOSL	-	Government of Sri Lanka
IEE	-	initial environmental examination
JCT	-	Jaya Container Terminal
NEA	-	National Environmental Act
OCH	-	Outer Circular Highway
PAEH	-	Port Access Elevated Highway
PMU	-	Project Management Unit
REA	-	Rapid Environmental Assessment
RDA	-	Road Development Authority
SLPA	-	Sri Lanka Port Authority
TOR	-	terms of reference .

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EXECUTIVE SUMMARY

1. The Road Development Authority (RDA), the premier highway authority in the country has conducted the Feasibility Study and Preliminary Design of Southern Highway Extension towards Colombo and completed in April 2014. Within the Study, Port Access Elevated Highway (PAEH) was identified as an important part of the entire road network for the purpose of to provide access to improve the overall transport efficiency to address the increasing volume of traffic entering Colombo City along CKE via New Bridge over the Kelani River. RDA has stepped in to initiate actions to carry out a detail designing and prepare the PAEH project ready for investment and implementation with necessary documentation. This study is focused on an effective designing by evaluating the potential environmental and social impacts suggesting appropriate mitigation measures in order to avoid and/or minimize such impacts, thereby making the project environmentally sound and sustainable.

2. The primary objective of the construction of PAEH is to relieve traffic congestion, substantially reducing travel time from Colombo to other regions of the country, by by-passing the local traffic at grade-level and providing effective linkages to other trunk roads by linking it up with the traffic from southern part of the country through the Interchange New bridge over the Kelani River of Colombo Katunayake Expressway (CKE), for A001 and traffic towards the administrative Centre, Battaramulla.

3. This elevated highway project was selected after considering the possible alternative route options along the existing road corridors and also the road tunnel alternatives. The route selection process has taken great care to avoid areas heavily congested with existing services and to avoid narrow roads. It is considered that this attempt will minimize the potential for road closures and allow the proposed highway to be constructed in a short timeframe.

4. The subproject will be facilitated by the Asian Development Bank (ADB) under the transport project preparatory financing facility for detail design from 2017 to 2018. The legal framework and principles adopted for addressing environmental issues in the proposed subproject have been guided by the existing legislation and policies of the Government of Sri Lanka, and the ADB Safeguard Policy Statement (SPS) require that environmental impacts of development projects are identified and assessed as part of the planning and design process, and that action is taken to reduce those impacts to acceptable levels. However, the proposed Port Access Elevated Highway construction project is not fall within the category of “Prescribed Projects” listed in Gazette Extra-Ordinary No. 772/22 of 24th June 1993 and subsequent amendments, which needs to go through an Environmental Impact Assessment (EIA) process and subsequent conditional approval from CEA.

5. The project includes civil works, capacity building activities, and project management and implementation. The project area is located in the Colombo District and falls within the administrative division of Colombo, and the extent of the proposed development falls within the limits of the Colombo Municipal Council. The Port Access Road elevated highway alignment is basically through the Colombo port. The environmental impacts of the project have been identified and assessed using ADB’s Rapid Environmental Assessment (REA) Checklist for Highway Projects as part of the planning and design process. Results of the assessment indicate the project is unlikely to cause significant adverse impacts thus this initial environmental examination (IEE) has been prepared to meet ADB SPS requirements for environment category B. This draft IEE is based on the findings of the initial detailed design stage to reflect any changes and latest project designs.

6. The route will be 5.27-km in length from Ingurukade junction to port City and it is comprised of a dual carriageway, in each direction and an outer shoulder with 30m width at grade level. The elevated highway shall be of reinforced concrete and pre-stressed concrete construction, supported on pile foundations. The road alignment trace has been designed to minimize land property acquisition while the utility disruptions by proposing two types of piers. The span between the two pier locations may be vary due to the existing utility and for the avoidance of negative construction effects near the Archaeological buildings and related sensitive areas.

7. The executing agency (EA) for the project is The Road Development Authority under the Ministry of Highways and Road Development. Project Management Unit (PMU) will be established within the implementing agency. A team of senior technical, administrative and financial officials, including safeguard specialists, will assist the PMU in managing and monitoring implementation activities. Consultant team's responsibility for (i) check of the contractor's detailed engineering design, safeguards facilitation and monitoring; (ii) project management and support; and (iii) assistance in supervising construction; (iv) conducting studies/surveys.

8. The subproject site is located in the built-up area of Colombo National Harbor within the land which belongs to the Sri Lanka Port Authority (SLPA) and no land acquisition is required. The subproject site is characterized as fragmented with high volumes of traffic, pedestrians, and commercial activities competing for limited space. The subproject site is not located in areas prone to water-logging and flash flood and is not located or adjacent to on ecologically and culturally protected areas.

9. An environmental management plan (EMP) is included as part of this IEE, which includes (i) mitigation measures for environmental impacts during implementation; (ii) an environmental monitoring program, and the responsible entities for mitigating, monitoring, and reporting; (iii) public consultation and information disclosure; and (iv) a grievance redress mechanism. A number of impacts and their significance have already been reduced by amending the designs. The EMP will be included in civil work bidding and contract documents.

10. Locations and siting of the proposed project were considered to further reduce impacts such as avoiding in utility destruction/ disturbance of historical and cultural places/values. Also, appropriate designing of the highway alignment and the structural design will follow applicable national and international guidelines and environmental considerations and specifications will be incorporated in the final technical design.

11. During the construction phase, the anticipated impacts on the physical and biological environment are temporary, localized and can be easily avoided or minimized with the implementation of mitigation and monitoring measures which are detailed in the environmental mitigation plan (EMP) and environmental monitoring plan (EMoP), respectively. The following are the anticipated impacts and corresponding mitigation measures during the construction phase of the project: (i) air pollution from dust emissions during on-site excavation, movement of earth materials and emission from movement of heavy equipment and construction vehicles which will be mitigated by good construction practices such as water spraying on road surface and work areas, covering all materials during transportation, and proper maintenance of construction vehicles and equipment; (ii) water pollution from run-off or soil erosion from stockpiled construction materials and wastewater from domestic sewage of construction workers and accidental spillage of oil and other lubricants from washing of construction equipment, which will be mitigated by covering exposed soils, construction of temporary silt traps, and provision of adequate and on-site sanitation facilities; (iii) noise pollution from the construction activities resulting to nuisance to the community, which will be mitigated with iii continuous consultation

with the community on the schedule and time of construction activities and the use of noise suppression on construction equipment; (iv) generation of construction wastes, which will be mitigated by the provision of waste bins in the construction site and the proper segregation, collection and disposal of solid wastes will be strictly observed; (v) occupational health and safety in the construction site causing harm and danger to the lives and welfare of workers, which will be mitigated with the implementation of occupational and health safety plan including the provision of personal protective equipment to all workers; and (vi) community health and safety such as the disruption of normal traffic patterns, damage or degradation of national roads from the transport of materials and risks from unauthorized entry to the construction areas resulting to accidents. This will be mitigated with the implementation of community health and safety plan which will includes the provision of fence to enclose the area of civil works and posting warning signs and information in the construction area.

12. In the operational phase of the project, road and its infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period.

13. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation phases of the project to ensure that all measures in the EMP are implemented and to determine whether the environment is protected as intended. This will include observations on-and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the RDA PMU.

14. The stakeholders were involved in developing the IEE through face-to-face discussions on site and public meeting held in, after which views expressed were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations in the city and will be disclosed to a wider audience via the ADB website. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. This IEE will be updated, if necessary upon completion and finalization of the technical design of the Project.

15. Based on this initial environmental examination, the project is unlikely to cause significant adverse impacts. Negative impacts during the construction activities are short-term, localized, and in relatively small area, which can be minimized with the implementation of the mitigation measures in the environmental management plan. The positive impacts of the project are (i) the development of the road network of the Southern Transport Expansion Project may result to an improvement of better transport facilities while reducing the traffic congestion within the CMC area and improving traffic safety and comfort. (ii). the project will be a development opportunity for the people as it will generate employment for various categories during construction period. Especially for skilled labor. (iii). purchase of goods and services during construction may generate some local employment opportunities, mainly in nearby divisions (iv). With the growth of the infra structure facilities the economy of the area will be improved triggering a better socio-economic impact on the population. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. Based on the findings of the IEE, the classification of the Project as Category B is confirmed, and no further special study or detailed Environmental Impact Assessment (EIA) needs to be undertaken to comply with ADB's SPS (2009).

I. INTRODUCTION

A. Background and justification of the proposed project

1. The proposed Port Access Elevated Highway is a part of the national highway construction network carried out by the Road Development Authority (RDA) under the Ministry of Highways and Road Development. The Executive Agency is the Ministry of Highways and Road Development and the Project Implementing Unit/Agency (PIU) is RDA. Project Management Unit (PMU) is Port Access Elevated Highway Project unit comprising RDA officials. There will be a supervision consultant team appointed by the implementation agency for assisting the PMU. The proposed road starts from Ingurukade junction, traverses through the six Grama Niladhari (GN) divisions, ends at Galle face, and has a length of 5.27 km. It is expected to link with the project, New Bridge over the Kelani River and to lead towards Colombo city along the existing port access road via Ingurukade Junction and Port premises. The Galle Face end is linked to merge the expected traffic through Marine Drive and the A002 road. Therefore, this proposed Port Access Elevated Highway will carry a significant amount of Colombo Katunayaka Expressway bound traffic from the south to the economic, administrative and transport hubs in Colombo.

2. Therefore, the proposed elevated highway is identified as an important part of the entire road transportation network which will help to streamline the traffic flow from the south to joint with the local traffic within Colombo area improving the long-term traffic management. It is further expected to have the benefits of positive impacts to port traffic such like improving internal cargo clearance and overall road network by significantly reducing the travel time from Colombo to other regions with minimizing number of vehicles passing through the area and reduction of traffic congestion, while controlling of accidents and potential conflicts also satisfying the future development needs with having better access to and from the main cities.

B. Extent and Scope of the study

3. The present study incorporates detailed engineering for developing 4-lane divided carriageway, to provide access to improve the overall transport efficiency to address the increasing volume of traffic entering Colombo City along CKE via New Bridge over the Kelani River. The project road passes through the populated buildup area which belongs to the Sri Lanka Ports Authority (SLPA) with having alongside residents, religious places, houses, tourist hotels, markets, institutional areas and archaeological buildings. About 80 percent of the road has ROW of 15m at both sides (total 30m), the balance 19 percent of road has ROW between 22m at both sides (total 44m) near ramp areas and nearly 1 percent of the road has ROW of 16m at both sides (total 32m) near the area where the road has curves.

4. The scope of this IEE includes collection and scrutinizing of data related to physical, biological and socio-economic environment of the project area and to prepare the baseline environmental profile. It also aims at the identification, prediction and evaluation of the possible environment al impacts of the proposed Project on its immediate surroundings on both short and long-term basis. Based on the nature and levels of those impacts, appropriate mitigation measures along with the cost have been incorporated in this IEE Report.

5. For the construction phase environmental assessment, the proposed ROW was divided in to three main linear units with similar environmental, traffic and geological characteristics. An elevated highway of length 5.27 km along the Port Access Road with alignment; the Port Access Road from Ingurukade Junction (from Ch 0+000) to Cyril C. Perera Mawatha Bridge (Ch1+460), close to the boundary wall of the SLPA and generally parallel to the Port Access Road from Cyril

C. Perera Mawatha Bridge to the SLPA Administration Building (Ch4+540), with the ROW of the elevated highway within the SLPA premises, with adjustment to this trace near the St Anthony's Shrine Kochchikade along the Port Access Road from the SLPA Administration Building to the Chaithiya Road (Ch5+270).

6. Specific area so influence for certain receptors have been identified and the impacts being considered that will be created due to the actions and the activities which are a necessary part of the development will be taken in to account in the assessment under the aspects of cumulative impacts. In each case, it includes all areas within which significant impacts are likely to occur and takes into account the following considerations:

- For environmental impacts, the area of influence is defined as a 200m corridor at both sides along the proposed project centerline and100m from the boundary of proposed construction camps, 500m radius from the batching and asphalt plant locations. This area is considered sufficient to encompass the area physically affected by Project activities and most off-site environmental impacts (e.g. noise, vibration and air quality impacts).
- For socioeconomic impacts, Settlements within this area will not be potentially affected by direct impacts that may occur from changes to land use, disruption to infrastructure and reduced environmental quality.
- For cultural heritage impacts, the area of influence is defined as a 50m corridor from the boundary line of the ROW at both sides along the trace.

C. Objectives of the IEE report

7. IEE is the systematic process of identifying and assessing the potential effects on the socioeconomic, biophysical and cultural environment as a consequence of a project or development. As a planning tool, the IEE aims to ensure that environmental, social and cultural issues throughout the entire project life cycle are anticipated and considered by the project proponent, in this case PAEH. It also serves as a framework for establishing project controls to reduce or prevent adverse environmental or social impacts.

8. The overall objective of this IEE is to carry out a detailed environmental assessment including all potential impacts caused by the different activities of the proposed project against the respective national legislation and the ADB safeguard policy statement and to address measures to mitigate such environmental impacts arising from the execution of the proposed project.

9. The purpose of the IEE Report are:

- To identify the environmental legal framework applicable to the Project;
- To describe the principal Project features and technical specifications;
- To summarize the approach used for design of the PAEH and assessment of alternatives for the Project;
- To describe the social and environmental baseline of the Project in terms of key sensitivities and potential constraints on the construction, operation and maintenance of the project;
- To assess the potential impacts of the Project and Project related activities on the environment (including biophysical and socioeconomic resources); and
- To design measures to maintain or enhance positive impacts and avoid, remove or reduce negative impacts and risks on the receiving environment (Environmental Management Plan (EMP) and the Environmental Monitoring Plan (EMoP) for the project will be prepared and incorporated with the Report).

D. Methodologies adopted in IEE preparation

10. The approach in conducting the IEE report is based on the GOSL and ADB safeguard policies and will generally encompass but not be limited to the following tasks;

- Collection of available data sources
- Conduct baseline surveys to obtain data to describe existing environment covering the direct and indirect impact areas on either side of the road sections
- Carry out stakeholder and community consultation
- Identification of possible impacts on all environmental components (physical, biological and socio-economic)
- Evaluation of alternatives
- Prepare interim traffic management plan describing traffic management strategy during the construction phase to minimize the traffic impact
- Preparation of Environmental Management Plan (EMP) & Environmental Monitoring Plan (EMoP) including possible mitigate measures.

11. Data for this study has been primarily collected through comprehensive literature survey, discussion with stakeholder agencies, field visits to the proposed subproject sites and laboratory analysis. The literature survey broadly covered the following:

- Project details, reports, maps, and other documents available with the KEI Consultant team of the on-going ADB-funded teams
- Discussions with Feasibility Study team
- Secondary data from previous project reports and published articles and
- Literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and environmental planning documents collected from Government of Sri Lanka agencies and websites.

12. Impacts have been identified and assessed for all phases of Project development from initial site preparation, including any advance works, through construction, and operation. As part of the IEE process, Identification of environmental and social issues of the indigenous population and possible impacts as a result of the project. The stakeholder engagement was undertaken to comply with the requirements of ADB Policy Statement (2009).

II. DESCRIPTION OF THE PROJECT

A. Location of the project

13. The proposed elevated highway along the Port Access Road is located in the Colombo District and falls within the administrative division of Colombo, and the extent of the proposed development falls within the limits of the Colombo Municipal Council. It starts at Ingurukade Junction and terminates at Galle face while the total length is about 5.27km.

14. The Port Access Elevated highway alignment is basically runs through the Colombo port which is located on the country's west coast and is a harbor at the mouth of the Kelani River with a long history as a port on ancient east-west trade routes, ruled successively by the Portuguese, Dutch and British. The total trace is designed to construct as an above ground structure parallel to the existing port access road. The trace crosses Cyril C. Perera Mawatha and the Aluth Mawatha which are already being crossed the port access road in an under pass and over pass respectively.

15. Out of the total length of the proposed highway, approximately 1.5km from the start will pass the area previously existed as a marsh which has currently been reclaimed and developed as a residential area. The Bloomandhal canal is the main surface water source of this area. From the Ch 1+600 to Ch 5+000 the proposed trace is located completely inside the port premises and the route crosses the Beira lake canal within this section. Finally, from the Ch4+600 to 5+270km, the route lies within the coastal area.

Figure 1: The project area of the proposed project

16. A clear map for the project location of the Port Access Road is attached in the Annex 1.

B. Category of the project

17. The proposed project is categorized as a “B” category project according to the Rapid Environmental Assessment) (REA) checklist (Annexure (2), ADB’s Safeguard Policy Statement (2009). Therefore, upon successfully completion the IEE serves as the final environmental Assessment for the implementation of the Port Access elevated Highway project.

C. Necessity for the project

18. The existing transport records revealed that the total passenger flow at Colombo Municipal Council (CMC) boundary was recorded as 2.1 million per day in both directions of which 58% use public transport while 42 % use private modes (MoT, 2013). The major reasons identified for the increase of private transport mode that has resulted in heavy traffic congestion within the CMC area are due to the inadequate services of the public transport facilities and the opening of Southern Highway in 2012, and the road traffic that move towards Colombo city as it is linked up with the Kottawa Interchange of Outer Circular Highway (OCH), New Kelani bridge Interchange of Colombo Katunayake Expressway (CKE) for A001 and the administrative Centre, Battaramulla.

19. However, it is realized that a strategic need to increase the public transportation facilities within the CMC area with improving the adequate services including user satisfaction and safety. The Government of Sri Lanka along with the Road Development Authority has taken steps to extend the Southern Highway to the economic, administrative and transport hubs in Colombo area to improve the overall transport efficiency of the entire road network of the area. Hence as an alternative option, the Government relies on the elevated urban highways along the existing major arterial roads instead of widening existing roads which is not feasible due to potentially large-scale land acquisition and resettlement requirements.

20. Accordingly, this Port Access Elevated Highway will be designed finally to link up with the Colombo Katunayake Expressway (CKE) and A001 road through the project, New Bridge over the Kelani river and is expected to relieve traffic congestion effectively by reducing travel time from Colombo to other regions of the country, by by-passing the local traffic at grade level and providing effective linkages to other trunk roads.

D. Alternatives of the project

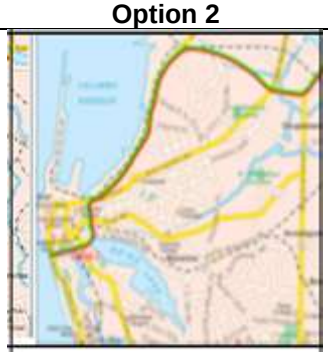
21. Mitigation by Avoidance and Design. A number of potential impacts of the proposed highway have been avoided through route selection and the overall design of the scheme. This is known as mitigation by avoidance and it applies to a number of environmental topics including the human environment, roads, traffic and transportation, flora and fauna, surface water quality and drainage, landscape and visual. Rather than repeating this information under each environmental topic, a summary of these measures is provided below.

- Route Selection – the route selection process has taken great care to avoid areas heavily congested with existing services and to avoid narrow roads. This will minimize the potential for road closures and allow the proposed highway to be constructed in a short time frame.
- To minimize impacts of potentially large-scale land acquisition and resettlement requirements, the road is designed to be elevated of its entire length.
- Construction Methodology – the road section will be constructed using techniques which means that the potential environmental impact is either greatly reduced or removed altogether
- The proposed route has been designed in accordance with the avoidance of direct

impacts on the archaeological sites and the utility network of the area.

- The route has been selected to pass through areas of highly restricted due the high security zone of SLPA which require an entry permission will control third party interference.

Table 1: Alternatives of proposed project

	Option 1	Option 2	Option 3
Route/image			
Alignment	Elevated structure along the port area and seashore alignment	Elevated structure along Beira canal	Same alignment of Option 2, Tunnel structure plan
Length	5.43km	5.64km	5.64km
Construction Cost	Cheapest among three options	More expensive than Option 1	Most expensive plan Operation & maintenance cost of tunnel is expensive
Land Acquisition	No land acquisition	Principally no land acquisition	No land acquisition
Constructability	Easy to construct	Difficult to construct due to using canal	Difficult to construct tunnel technically
Environment	Minimum environmental effect	Piers in canal may be affected natural environment Badly affected to aesthetic view	Construction of tunnel may be affected natural environment
Comment	Possible to coordinate with Port City project	Possible to coordinate with Port City Project	Possible to coordinate with Port City Project Flood problem
Recommendation	Recommended	Not recommended	Not recommended

22. This elevated highway project was selected after considering the possible alternative route options along the existing road corridors and also the road tunnel alternatives (Please refer the table 1). In accordance to the significant traffic flow of the area, all the road segments shall require two additional lanes on each side. In the case of road widening, the cost of acquisition, relocation and resettlement and related issues, along any selected alignment through this area shall be an enormously expensive exercise with significant social impacts. Therefore, the existing Port access road and the Chaittya road from Bandaranayke Roundabout to Chaithiya Road in Galle Face is considered as a solution with also considering the Sri Lanka Port Authority (SLPA) requirement and their program to widen the existing port Access Road for minimizing the traffic at port.

23. In the case of construction of tunnels, i.e., two tunnels of two lane capacity each, at a depth of around 30 m was estimated to cost approximately LKR 32.5 billion (USD 250 million) per km. In comparison, the cost for the proposed elevated highway alternative was LKR 6.174 billion

(USD 47.2 million) per km, alternative for road tunnel option was rejected.

E. Design criteria of the project

24. The elevated highway alternative for the Port Access Road was designed to satisfy the following requirements of the Government of Sri Lanka;

- Access to the Colombo Port by on/Off Ramps located suitably
- Direct access to the Fort and the planned Port City in deciding a suitable alignment, the following options were considered:
- Elevated highway along the port area and close to the shoreline
- The main considerations when designing the elevated highway with connecting the existing socio – economic and cultural heritage conditions discussing the road safety, drainage and aesthetic improvements.

25. The elevated highway alternative envisages the construction of a highway with minimum clear cover of 5.2m and a 2 lane roadway in each direction and an outer shoulder. This minimum clear cover has to be maintained during the construction stage. After allowing for height of scaffolding and support structures, the clear cover at the construction stage being 5.2 m, the clear cover during the operational stage shall be around 5.2 m outside the Port and 10.0m inside the Port. The elevated highway shall be of reinforced concrete and pre-stressed concrete construction, supported on pile foundations. The road alignment trace has been designed to minimize land property acquisition.

26. Port Access Elevated Highway's proposed structures accommodated within available existing ROW and horizontal alignment was basically controlled by existing structures in port premises. The horizontal alignment was considered without damaging any port properties. As the road trace is passing through the Bloomendal Road Bridge, Aluthmawatha Bridge and the Archeological Buildings when designing the vertical alignment of the highway, it is considered as a three-dimensional structure which should not only be safe, functional and economical but also aesthetically pleasing. It will include also:

- the comfort factors which considered for a smooth passage from one grade to another;
- safety factors which ensured to have a safe sight distance over the full length of the vertical curve;
- required heights for central piers and portal piers
- Vertical alignment kept smooth grade line with gradual changes consistent with the type of highway and character.
- Vertical alignment coordinated with utilities and drainage structures.
- Vertical grade has been maintained gentle slope evaluating substantial of grades for effect on traffic operation.
- Moderate grade maintained throughout intersection to facilitate backing and turning moment.

27. In order to confirm the road safety and the driver's safety, the limiting values of super elevation such as the super elevation of the highway cross-section and the side-friction factor are established in the design of horizontal curves based on the operational characteristics of facility. The super elevation is given in terms of the super elevation rate, which is the rise in the roadway surface elevation as the vehicle moves from inside edge to the outside edge of the road.

28. The road center line will differ from the alignment above at certain locations due to road curve design. Proper coordination of Horizontal and Vertical Alignments has been done since

these subjects are mutually interrelated and what may be said about one generally is applicable to other. The physical controls or influences that act singularly or combination of alignment are.

- The character of highway justified by traffic volume Surface condition
- Existing highway and cultural development
- Future development
- Suitable location for intersections and interchanges

29. Excellence in their design and coordination increase the highway's utility and safety, encourages uniform speed and can greatly improve highway appearance. Two types of piers are proposed such as center piers and portal piers (refer Annexure (02)). The center piers are the dominant for the most of the locations while the portal piers may be located where it is needed to avoid the existing utility. The span between the two pier locations may be vary due to the existing utility and for the avoidance of negative construction effects near the Archaeological buildings and related sensitive areas.

F. Key Components of the Project

30. The Table 2 describes the details of the main components of the project.

Table 2: Main components of the project

Project component	Description
Rehabilitation of existing port access road	
Road length	1.36km
Location (Start to end)	Ch 0+000 -Ch 1+362
Road width	30.3m
No of lanes	6 (3 for one side)
Construction components of 4 lane elevated expressway.	
Length (km)	5.27 km
North end	Ingurukade Junction
South end	Galle face
Road width	23.4m
Height of the elevated structures (m)	10m head clearance – inside the port 5.2m head clearance – outside the port
Row width at grade level	60m (30m for one side)
Structure width (m)	3.00m
Number of lanes	Two lanes each side (4 lanes)
Number of interchangers/Ramps	Four ramps (including Ingurukade junction ramp)
Toll Gate	8 toll gates at 4 on/off ramps
Toll functioning/traffic safety	Manual/ Electric toll collection system as 8 toll gates Intelligent traffic system

G. Methodology of Construction

31. The route is planned to start from ingurukade Junction at Ch 0+000 location near the on/off ramp connected to the project of new bridge over the Kelani River. This highway section continues up to Cyril C. Perera Mawatha Bridge (Ch 1+600) and passes the commercial establishments which include shops, industrial establishments, schools, religious places, offices (government and private), and residences within the corridor of 200m from the centerline on both sides of the existing road. Within this section, around Ch 0+800, the project has designed an on/off ramp for the vehicles of SLPA which need access to the dry dock activities maintained at adjacent areas. It is decided to improve the port access road width upto six lanes within the existing corridor prior to

commence the highway activities in order to avoid unnecessary traffic congestions that would be created due to the highway construction. This six-lane facility improvement within this section will be done under the commitment of the RDA as a part of this highway project and will leave for the better access providing of the future developments of the Port.

32. Then the road section from Cyril C. Perera Mawatha to Port Admin Building (ch 4+550), the route passes completely within the Authority Area of Sri Lanka Port Authority (SLPA). Within the 200m corridor at both sides there are commercial establishments which include shops, industrial establishments, religious places, offices (government and private), Tourist Hotels, important Archaeological structures while no residencies found within the area. Inside the port premises, several structures to be demolished due to the proposed development requirements of the Port activities including traffic improvements.

33. The necessary six lane facility will be provided by the SLPA in parallel to the proposed highway project and the necessary widening will be done before starting the highway construction activities with providing extra lanes reserving four lanes for port traffic accordingly. Two on/off ramps are designed to be provided access to the transport hub at Fort area through Malwatta Road but under Port Access Elevated highway project only the provision for hub ramp will be constructed. The other ramp is near around the Ch 4+600 to provide access for the harbor, accommodating for the Port Authority requirements. This area consists with a complex network of utility servicers. All the construction activities will be done under Port Access Elevated highway Project.

34. The final road section is from the Port Administration building towards the Galle face at ch 5+270. The route passes completely within the Authority Area of Sri Lanka Port Authority (SLPA). Within the 200m corridor there are commercial establishments which include customs activities, industrial establishments, religious places, offices (government and private), Archaeological structures mostly at the left-hand side (LHS) of the route while the harbor activities are functioning at the right-hand side (RHS) of the route. The route crosses the Beira Lake near Ch 4+600.Railway track crosses the existing port access road within this section and several crossing points give evidence about the pedestrian road users.

35. The construction of the elevated highway will use a pile/well foundation, framed substructure and precast, and re-stressed superstructure with a view to minimize the collateral damage to the existing archaeological buildings/bridges on both sides of the flyover, and a framed substructure to minimize use of concrete. It will have entry and exit ramps at appropriate sections as well as both ends to merging and diverging traffic.

36. Precast, superstructure will help in taking the construction activity to uninhabited areas, thus providing relief to inhabited areas on both sides of the flyover. For road safety, footpaths, tape barricading, and an adequate number of sign posts will be provided as per the coder provisions. Entry and exit ramps at appropriate locations help in integration of traffic along the sides and also at the ends of the flyover.

H. Major Construction Activities

37. This Section describes the different components involved in the pre-construction and construction phases.

38. The construction of the elevated highway will have the following major construction activities:

1. Preconstruction phase

(i) Site Investigation and conformation
(ii) Demolishing & relocating of existing buildings.
(iii) Removal of trees.
(iv) Traffic Planning - Grading and provision of four lanes during the construction as required by SLPA
(v) Erection of temporary facilities – Construction camps and their associated facilities

2. Construction phase

(i) Site safety and barricading
(ii) Earthwork and topsoil removing
(iii) Removal of the excavated unsuitable materials and demolished materials.
(iv) Mobilization of construction staff, machines and equipment.
(v) Board Piling
(vi) Girder Erection
(vii) Base course and asphalting
(viii) Utility management
(ix) Storage sites and lay down areas
(x) Selected material and borrow site maintenance
(xi) Strom water and Surface drainage
(xii) Waste Disposal and Management
(xiii) Handling of hazardous materials
(xiv) Control of generating excessive Noise and vibration
(xv) Air quality and dust suppression
(xvi) Environmental Management and monitoring
(xvii) Repairs and reinstating existing roads
(xviii) Street lighting, guard rails and landscaping

3. Preconstruction phase

39. **Site investigation and conformation.** At the current stage of project development, a detailed construction concept is not yet available. First, the exact equipment needs, sites, and physical characteristics of the work areas cannot be known until the design has further progressed; and second, the successful bidders for construction contracts will have some leeway to select the work methods and equipment that they will use, based on their own preferences as well as price and availability at the time the contract is let.

40. The contractor shall review all the design reports carefully and identify the nature of the project and the existing condition of safe and functional against the natural site including, utility, meteorology, hydrology, geology and archaeological condition also specially drawing attention on the Port Operations and the related activities and the traffic and socio- economic activities at the site. The site-specific action plans shall be prepared to satisfy all the specifications, conditions and standards with proposing alternative design schemes where necessary to avoid creating major issues.

41. The following design concepts were adopted by the consultant:

- The proper Standards and Specifications were established to be economical and

to satisfy the required functions under the given conditions

- The facilities were designed to be durable, safe and functional against the natural site conditions such as meteorology, hydrology, geology and archaeology
- The facilities were designed to satisfy the traffic and socio-economic activities at the site
- The facilities were designed minimal or maintenance free, and
- The optimum designs were selected from the alternative design schemes.

42. All works within the restricted areas of the port will require to obtain permission according to the security procedure of Sri Lanka Port Authority (SLPA) which will be applied for construction work. This permission may specify the permitted hours/days of construction for each person and equipment etc. It is anticipated that the majority of construction works will be carried out during daytime hours, however evening and weekend working will also be required at some locations. In addition, the exact alignment of the route within Port Authority and their owned lands will be agreed and all works will be conducted under a Permit to Work from the Authority. The contractor should draw the attention on the license should get prior to commence the activities and the entry permits for the workers who will be engaged in the construction within the restricted areas of port authority premises accordingly.

43. **Demolishing & relocating of existing buildings.** Physical structures within the area of 25m either side of the centerline of the proposed route will have to be removed. Since all the structures belongs to SLPA and most of the structures are in a dilapidated condition, relocating these structures and their functions is programmed and will be undertaken by the RDA with concern of SLPA. Two suitable sites have been selected within the SLPA premises to construct multi storied buildings with providing all the facilities and adequate spacing as an alternative. Within the future ROW (safety zone) of 50 m(25 m each side), high rising physical structures will be restricted and the existing palm oil storage tanks at Ch 1+750 will be reduced their height so as to maintain the minimum clearance of 5.2m according to the National Highway Construction Guidelines of RDA 2017. There are no such residential buildings in critical distance to the centerline.

44. Undermentioned buildings have been earmarked for demolition. Photos will describe the nature of the buildings. Photos attached in Annexure 3.

Table 3: Demolishing of buildings due to Port Access Elevated Highway

No	Location (Chainage)	Description of the building.
1	Gate 7 at Ingurukade Junction- 0+140	First Check Point. Temporary shed.
2	1+180-	Check Point. - Container Box and small building.
3.	1+700- 1+800	Sport Complex and Indoor Stadium.
4	1+750- 1+850	One ring of two oil tanks will be removed.
5	2+400- 3+500	Existing Railway line will be shifted to left hand side.
6	3+400- 1+600	Work-shop and store rooms of Chief work supervisor's
7	3+600	Workshops and welfare buildings rest rooms.
8	3+900	Steel fabricating unit, Rest Room and welfare building for security section, welfare building for mechanical section.
9	4+860	Part of Chairman's building will be removed.

45. **Removal of trees.** The proposed project alignment does not pass through any reserved forest area, national park or protected area. The area along the project route is mostly built up and the road has trees and plantations on roadsides. Widening and maintenance activities can

cause severe impact on these trees and plantations by removing them. This will also lead induced impact on local fauna and ecology. The loss of trees is also important for road users as these trees provide shade to the road users. Loss of the trees also can have such direct impact on local community. The impact will depend on the number, density, and type of species of trees on each road. There are number of well grown banyan trees were identified to be removed at roadside areas. Considering their age and value, it is suggested to relocate them in a suitable new site by using the route bolding method instead of cutting.

46. Also, compensatory plantation and plantation along the total road will be carried out as detailed in the Environmental management plan on mitigation measures (please refer the annexure 7). With the proposed mitigation measures, three times of trees that were removed from the site is proposed to be replanted by the completion of the project.

Table 4: Types of Trees to be affected

Type of the tree		Value
Common name	**Scientific name**	
Pinus	*PinusSabiniana*	Shady /extracts pine oil
Acacia	*Acacia dealbata*	Shady/landscape use
kottamba	*Terminaliacatappa*	Ayurvedic /shady/landscape use
Rambutan	*NepheliumLappaceum*	fruit
Masan	*Zizyphus Jujube*	Fruit/ Ayurvedic/ shady
Pihimbiya	*FiliciumDecipiens*	Timber/landscape use/ shady
Attikka	*Ficusracemosa*	Medicinal/food/ shady
Nuga	*Ficusbenghalensis*	Ayurvedi /shady/landscape use
Kos	*Artocarpusheteropyllus*	Food/timber/shady
Araliya	*plumeria*	Flowering plant
Una - bata	*Labeobata*	Land scape use
Maadan	*Syzygiumcumini*	Ayurvedic/fruit
kumbuk	*TerminaliaArjuna*	Timber/Ayurvedic/shady
Amba	*Mangiferaindica*	Fruit/shady
Anoda	*Anonamuricata*	Fruit/Ayurvedic
papol	*Carica papaya*	Fruit/ Ayurvedic
kesel	*Musa acuminata*	Fruit
Oil Palm	*Elaeisguineensis*	Food (oil is a food ingredient)
Madatiya	*AdenantheraPavonina*	Ayurvedic
kohomba	*AzadirachtaIndica*	Ayurvedic/timber/shady
karapincha	*Murrayakoenigi*	Ayurvedic/curry taster

47. **Traffic Planning.** The project route will be accessible via existing roads and some accesses for some special areas which would be established temporarily for construction. Along the proposed route probably, some existing road, railway track or trails sections will be upgraded for construction in order to allow the passage of vehicles and retained for operational demands. All roads follow mainly existing tracks and trails which will be barricaded a working strip in order to allow the passage of construction sites and the vehicles. The other area will remain open for public use during the construction period.

48. To reduce or minimize the potential impacts on traffic and transportation a site-specific detail traffic control and management plan shall be developed. It will discuss the specific actions and migratory measures such as night time work with focusing on implementing construction activities while ensuring the safety of road users and minimum disruption to traffic. The traffic management alternatives for the construction stage at identified critical places are described in

the Annexure 4.

49. These will be prepared by suitably qualified personnel of the contractor in accordance with the provisions of the local legislations such as, CMC traffic control methodologies & schedules, motor Traffic Act, Road Work Safety Manual (guideline of ICTAD), the Criminal Act as well as the conditions in the consent letter of SLPA.

50. **Erection of temporary facilities – Construction camps and their associated facilities.** Construction camps will be developed as a part of the Project before commencing the construction activities of the project. There may, however, be a requirement for some small-scale and temporary accommodation in the areas outside of the worksite during the pre-construction phase. Camps will be located close to the highway route at more or less regular distances, so that long transport time for staff to the work place can be avoided. If possible, camps will be located close to main roads with good connection to city limits, allowing easy transport of personnel, food, utilities etc. to the camp.

51. The site clearances shall be obtained from the related authorities before constructing camps. Then the Primary Contractor will make its own arrangements for supplying of domestic water and drinking water, meal services, medical services, electrical supply, sanitary facility as well as facilities for waste water and garbage treatment. All camps shall be fenced, lighted and guarded. All installations are of temporary character and will be removed completely (including foundations) after the construction period. The entire area will be vegetated after demobilization of infrastructure.

4. Construction Phase

52. **Site safety.** Site specific work place safety measures shall be implemented to manage the construction safety hazards. In addition, for the safety of the proposed project there are many design measures have incorporated and additional mitigation measures are suggested. Those are in the areas of;

- Construction safety and protection of existing utilities
- Measures apply to ensure the overall safety of the project including traffic signs and barricading.
- Confirm the workers safety with conducting frequent awareness sessions

53. Safety of all personnel associated with the construction works shall be enforced by the Site Safety Engineer and the directions will be described in Safety management plan given under Chapter 5 of this report

54. **Earthwork and top soil removing.** For constructing roads on new alignments and/or for new borrow pits or quarries, it is a normal practice to strip off the fertile surface layers of soil, if present, and to store this material until construction is complete. This "top fertile layer" is then used to help restore borrow pit areas. The storing this fertile material shall be done in areas where it will be carefully selected to avoid erosion, possible collapsing, blocking of drainages and precautions (i.e., constant spraying of water to this layer) shall be taken to avoid the material's drying out and being blown away.

55. **Removal of the excavated unsuitable materials and demolished materials etc.** The excavated material during construction shall be removed from site and disposed in approved disposal areas in consultation with the Colombo Municipal Council at their debris disposing sites or in a new site with the prior approval of CMC or directing the demolished materials to the persons

through the CMC who have foundation filling requirements of approved building sites by the UDA planning committee. However, the demolishing process has already been started by the SLPA and such materials are used to fill their new sites is in progress and also filling for their future Construction of Custom Bonding yard near the Ingurukade Area.

56. The volume of excavated soil or debris for disposal is estimated are shown in the Table5 below. This soil material shall be disposed in disposal areas which are approved by the CEA, local government authorities, SLLRDC and other relevant agencies. (Please refer annexure 5 for identified locations). The construction Contractor shall be responsible for identifying the areas that are suitable for unsuitable disposing if necessary. The construction site shall be kept clean and disposing such materials shall be carried out daily. The roads in the area shall be kept clean and the wheels of the disposal trucks shall be cleaned before leaving site.

57. Construction and demolishing or surface clearing waste arising from excavation and site formation works shall be removed from the site at the same time to an approved waste disposing site while the reusable materials shall be forwarded to a specific stock pile area.

Table 5:. Estimated quantities for debris of disposal

	Type of the material	Quantity (m^3)
1	Removal of existing concrete structures	1,317
2	Removal of existing building floor area	3,292
3	Excavation of unsuitable materials	12,800
Total		17,409
4	Total Area where the mix waste will be generated from grubbing and clearing	16,530 m^2

58. **Board Piling and foundations.** The foundations or sub structure will basically be cast in situ bored piles and pile caps. The construction shall be of reinforced concrete. The bored piles shall be of 1.8m, 2m. and 1.5m. diameter and in single pile or in pile groups of 4 and 6 numbers. The pile caps shall be of heights in the range 1.8m. to 2.0m. The piles shall extend to depths of around 30 m maximum from the ground surface. Due to local constraints at some locations the foundation shall be single pile or two pile group.

59. During the construction stage the construction site layout and the construction of site office and facilities, storing of materials, the movement and parking of equipment, trucks and concrete transit trucks etc., shall be planned allowing traffic movement with minimum interruption. Therefore, concreting is planned for the night hours;

60. With the completion of the pile foundation the excavation for the pile cap construction will be carried out. The excavations shall be supported by a suitable cofferdam system where it is necessary. On completion of the excavation, a lean concrete layer shall be constructed to form the working platform. Water seepage into the excavation shall be removed using a suitable pumping /de watering system and the excavation kept dry at all times. Piles shall be hacked to cut off level. The pile cap shall be of conventional reinforcing concrete construction. After the construction of the reinforced steel cage concrete placement will be carried out during the night period. The excavations shall be backfilled and the coffer dam removed.

61. **Girder Erection.** The box girder type beam shall be erected using a specially designed erection girder. The erection girder shall be a truss type structure, designed to facilitate the movement of a gantry crane on top. The box girders (weighing 40 tons), shall be transported from the precast yard. The low bed trailer with load shall be positioned for lifting by the crane on the

erecting girder. The crane shall lift the box girder component, to the required height and position and using cables suspended from the erection girder sustain the weight of the box girder. The box girder erection procedure shall be sequenced to ensure that all structural components such as the Capping Beam and column, subjected to eccentric loading are structurally safe. (Annexure (06) explains the box girder erection.

62. **Base course and asphalting.** Suitable material shall be carried from the local designated and approved borrow pits along the selected roads with minimum effect to the public road traffic and safety. There are crushing plants, good quality material for sub base, base and aggregates for concrete and asphalt is easily available. Crusher plants and the base materials are available is listed in the Annexure (9) according to the Geological Survey and Mines Bureau.

63. **Utility Management.** The utility service providers such as the SLPA, CMC, NWSDB, CEB, SLT, Dialog, etc., shall be requested to identify and implemented required measures for the end users to be served uninterrupted. The utilities impacted as identified are given in the section 4, Table (34) and the summary of the comments of the related requirements made by the utility organizations is attached in the Annexure (15). This shall be updated at the site in the construction stage in coordination with the relevant authorized officer with more specific data on the location of foundations.

64. According to the final decision of the Stakeholder consultation meeting had with all the utility agencies during the detail designing stage, the project is instructed to coordinate with all the utility organizations to identify the exact utility network at the construction site prior to the excavation and to take action to protect it with providing a site specific suitable alternative path confirming its continuity of supplying the service and the workers safety until the construction work is completed. Then after completion of the construction activities at the location, it will be reinstated as it was or providing a permanent duct with confirming its continuity.

65. **Storage sites and lay down areas.** The option of locating large storage and precast yards in the port itself is pending due to a lack of available space identified and the safety concerns. Therefore, the precast materials and the large quantities of materials shall be distributed from intermediate storage yards to the site along the selected roads. The locations of the intermediate storage of materials shall be selected in the close vicinity (with a minimum distance) and close to main roads near the project route to provide easy access for long trucks. All methods of storing materials shall be designed to prevent any damage on steel and/or any coating material due to corrosion or environmental damages due to erosion at any stage. Availability of land inside of Port need to be negotiate with Port Authority.

66. Delivery of the materials to the material yards shall be in accordance with the construction time schedule. The concept will be optimized in order to avoid long storage times or supply short falls on the other hand. Transport of precast girder sections shall be limited to daylight hours, as much as practicable. The material yards shall feature enough capacity to serve as a buffer in case of construction delays. During storage steel/iron bars will be protected against corrosion and other degradation.

67. The main camps shall not be combined with major precast yards and bending areas. Mass transport of construction materials and other precast items produce a large quantity of dust and noise; therefore, these areas should be separated from accommodations and offices. The same concept applies for the protection of residential areas. Major material yards and bending areas will be located away from these areas as much as practical.

68. Measures shall be taken to prevent erosion, sliding and ensure stability of the material stock piles and control of runoff to the adjacent environments. All material yards shall be fenced, lighted and guarded. All installations are of temporary character and shall be removed completely (including foundations) after the construction period. The entire area shall be vegetated after demobilization of infrastructure.

69. **Selected material and borrow site maintenance.** Since the highway construction is based on an elevated structure, the earthwork and the quantity of selected material required is very low. Therefore, such material shall be obtained from local designated and approved borrow sites. All the sites shall be monitored timely to confirm the status of compliance of environmental conditions such as dust generation, soil erosion and sedimentation, maintaining of slope gradient, surface drainage facilities, safety and material transportation etc. according to the related approvals.

70. **Surface drainage and erosion control.** There would be less earthwork, potential for erosional processes to be triggered as a result of the removal of natural vegetation since no grubbing and clearing required. Action shall be taken to remove the construction and demolishing or surface clearing waste arising from excavation and site formation works from the site at the same time to an approved waste disposing site while the reusable materials forwarding to a specific stock pile area by ensuring the good housekeeping at site. When the construction works to be carried out during the rainy periods, there is the potential for contaminated surface water run-off to arise during the construction phase, particularly in the areas of open excavation or soil heaps stock piled along the project corridor close to the lower elevated areas and streams where uncontrolled silt laden water has the potential to be discharged.

71. Best practice measures shall be implemented along with applying site specific measures to mitigate any potential impacts on water quality including removal of excavated soil directly onto awaiting trucks and removed for recovery/disposal at an appropriate facility (in agreement with the local authorities). After the construction completion, the highway structures will be facilitated with proper drainage system including with the;

- Rain water precipitated on the elevated road surface between two pier supports spaced at 40.0 m in general is collected by longitudinal pipes designed to cater for this flow.
- Flows from the two Nos. longitudinal pipes from both sides of the road are directed to a vertical pipe and a man-hole located at the pier support.
- Flow into this man-hole shall be discharged to the existing drainage system appropriately through pipes laid under the pavement of the existing roadway with the provision of man- holes.

72. **Liquid and Solid Waste Disposal and Management Waste Generated During Construction.** Waste generation of the construction process may be varied according to the associated activities. The waste generation due to demolishing of existing structures is already discussed in the paragraph 50 of this report. The offices and administration buildings associated with the worksites (as well as the construction camps) will generate amounts of ‘domestic’ types of waste (i.e., food waste, paper and packaging etc.). This will be transported to a controlled municipal waste disposal site. Oily and Hazardous wastes associated with vehicle maintenance (waste oil, material collected from waste water interceptors etc.); unused or waste chemicals, paints and solvents; materials excavated from contaminated sites (if any); and, any other wastes, sludge or debris that are unsuitable for disposal in a municipal type landfill. Such wastes will be segregated for collection and disposal by specialist contractors at sites that are equipped and approved for such wastes. Liquid waste including “Black” and “grey” water from construction

camps shall be disposed in a suitable soakage pit or collected in septic tanks and finally shall remove and disposed in a municipal sewer disposing area (Sea outfall station at Mattakkuliya / Modara).

73. The waste management shall be carried out closely in line with the legal framework and under consideration of international best practice principles. All waste materials shall be collected, stored and transported separately in appropriate and approved bins and containers. This process shall be closely coordinated with the responsible Local Authority of the area. In order of priority these involve;

- Avoidance
- Minimization
- Reuse and recycle
- Treatment and disposal

74. **Handling of hazardous waste.** Waste bitumen, used fuels, lubricants, solvents, and other hazardous waste may be the possible hazardous waste in this project. Bitumen has relatively low levels of polycyclic aromatic hydrocarbons (PAHs) and is largely inert. However, certain other potentially hazardous chemical may be added to the bitumen or to the aggregate during the construction process in order to render the compound more workable. The objective is to use the least hazardous chemicals available and to locate asphalt plants, aggregate stockpiles, and mixing areas where they do not pose a significant environmental risk. However, disposing of bituminous waste materials shall be disposed in an approved (CEA) abandon quarry site to avoid the ground water contamination. (Please refer the annexure 5 for suitable locations).

75. **Control of generating excessive noise and vibration.** Typical noise emissions generated by heavy construction equipment at the working site and the associated facilities areas such as camps, yards and material excavation sites, traffic movement etc. To minimize potential noise impacts during the construction stage of the proposed project, good site management practices shall be implemented and the suitable measures are documented in the EMP of this report at Annexure 7.

76. Vibration impacts may also occur during certain aspects of the construction phase which has the potential to impact on the local community as well as buildings and structures. These interactions were therefore considered as part of the EMP of this report at Annexure 7 and the Mitigation measures have been carefully designed in order to minimize these impacts.

77. **Air quality and dust suppression.** Air Emissions During the construction activities, earth dust particles from soil movement, and pollutants from the exhausts of heavy equipment and vessels will be emitted. The earth dust will be produced during the excavation and backfilling activities and the earthworks related to the worksites. Other sources of dust emission will be the traffic movements, on the working corridor, of trucks, minivans and heavy equipment. The dust generation at the work site will be suppressed by regular wetting of the surface.

78. The main pollutants produced by heavy equipment and vessels due to the fuel combustion in their engines, will be NOX, CO, dust and SOX. These interactions were therefore considered as part of the EMP of this report, with suitable mitigation measures.

79. **Environmental Management and monitoring.** The construction management team will include an Environment Officer / Manager, with dedicated responsibility for compliance with environmental regulations in construction and related activities. The team will carry out the

environmental monitoring at site including daily monitoring, baseline location /schedule monitoring, compliance monitoring and complaint base monitoring to identify the impacts with timely management.

80. **Repairs and reinstating existing roads.** As the work progresses the roads and walkways damaged during construction shall be repaired by contractor and reinstated to accepted standards by SLPA.

81. **Street lighting, guard rails and landscaping.** The construction works related street lighting, and guard walls shall be carried out.

82. **Materials usage, labor force and machinery required**. The materials used in construction of this highway would include cement, sand, soil, aggregates for road base, aggregates for road pavement, asphalt reinforcement etc. Generally, the concrete will be supplied as ready-mix concrete from the available batching plants by the Contractors or from ready mix concrete suppliers. The soil, sand and aggregate that shall be locally sourced which impacts the local environment at its source and the road network at delivery:

Table 6: Material requirement of the project

No	Description	Unit	Quantity
1	Cement	Bag	2,256.782.00
2	Sand	Cubic meter	137,484.60
3	Metal	Cubic meter	208,494.00
4	Soil	Cubic meter	9,240.00
5	Aggregate road base	Cubic meter	23,520.00
6	Asphalt concrete in pavement	tonne	27,046.00
7	Steel	tonne	22,926.00

83. Sand and aggregate shall be obtained from local designated and approved quarries. To locate Material sources such as soil & sand within haulage of 25km from the Project site were considered. Soil borrow Pits are been rapidly consumed by Ongoing projects by the Time this Project to scheduled commence in 2018. According to the current demand it has been created a competition for supplying aggregate and due to the over exploitation and noncompliance of the conditions of the licensee procedure, the related authorities has taken action to issue the permits only for limited period (three months). Therefore, the new soil borrow areas in Colombo District within 50km should be identified when project started. The suppliers who exist for long period with compiling the environmental conditions and environmentally sound supplying conformed are listed in the Annexure 9.

84. **Sand.** There are Two Types of sand available in the open market. They are;

- **Sea Sand** - Main supplier is Sri Lanka Land Reclamation & Development Board at No 3, Sri Jayawardanapura Road, Welikada, Rajagiriya. Their Sea Sand Storage at Kerawalapitiya about 8km away from Ingurukade junction.
- **River Sand** – It is estimated that the Project required more than100000m3, of sand. The closest large-scale river sand deposit is at Deduru Oya River in Puttalum District. According to Geological Survey and Mines Bureau the quality of river sand at Deduru Oya is found free of clay & organic matter etc. The sand obtain could be used in concrete work without any primary cleaning. The distance from Ingurukade junction to the sand harvesting area is about 150km.

85. **Ready Mix concrete (Cement, Sand, Metal).** The project required more than 170,000 cu m of Ready Mixed concrete within a period of two years in which more than 82000 cu m of concrete required at casting yards. It is estimated that 30 Acers of land required for casting yards for casting and stocking of construction material. The contactor could either purchase Ready Mix Concrete or install his own concrete Mixing Plants inside their casting yard. If the Contractor wishes to purchase required quantity of concrete from Ready Mix Concrete there are 15 nos of plants belongs to the members of Lanka Ready Mix Association. List and the location map are attached in the Annexure 9.

86. **Cement.** It is estimated that more than 80,000MT of Cement will be required for the project within 20 Months for the completion of project. More than 2,000,000 MT/ year Normal Portland Cement are produced in Sri Lanka by Three Manufactures. The main Cement Manufactures, who produced cement comply with B.S./S.L.S. are;

- Holcim [Lanka]
- Ultra-Tec Cement Company
- Tokyo Cement Company.

87. There are some cements both local and imported have failed to meet the standards required. The Contractor should check the quality of all batches of cement brought to site prior to incorporation in the work.

88. **Fuel & Water Usage**. Heavy equipment and motor engine driven equipment used during the construction phase will be fueled with diesel. Diesel fuel shall be delivered via approved fuel road tankers to the construction sites. The foreseen water consumption during construction phase is related primarily to the watering of the construction sites to reduce dust emissions due earthmoving activities and for civilian uses.

89. **Labor Force.** It is estimated that the Contractor shall supply following minimum work force for the Project

Table 7:- Work force for the Project

Job Status	Nos
Project Manager	1
Construction Manager	6
Project Engineers	4
Site Engineers	4
Technical Officers	20
Surveyors	2
Quantity Surveyors	1
Assistant QS	2
Forman	26
Environmental Manager	1
Environmental Officer (Technical)	1
Social Safeguards Officer	1
Utility Coordinator	1
Draughtsman	4
Structural Engineer	1
Material Engineer	1
Lab Technicians	3
Assistant lab technicians	3
Highway Engineer	1
Skilled labor	
Un skilled labor	

90. **Machinery Requirement.** Following is a summary of type of equipment and machinery required

Table 8: Equipment and Machinery required

Description
Bulldozer
Bulldozer with Blade or Ripper
Motor Grader
Wheel Loader
Backhoe
Dump Truck
Dump Truck
Cargo Truck with Crane
Agriculture Tractor and Trailer
Concrete Pump
Vibrating Roller -
Macadam Roller -
Tire Roller
Tamping Roller
Asphalt Sprayer
Asphalt Paver
Crawler Crane
Mobile Crane
Concrete Vibrator
Water Bowser
Generator Set
Jack Hammer
Water Pump
Air Compressor
Boring machine

5. Investment and funding sources

91. The total cost of the proposed Project is estimated to be Rs. 34,365 Million. The total project has two main requirements to be fulfilled and they are the rehabilitation and traffic improvements upto six lanes of the existing port access road from the Ch0+000 to 1+362 and the construction of four lane Expressway including 2 lane Duel carriage way for 5.27km and related facilities from Ingurukade junction to Galle face end. The project is envisaged to be implemented in two different sections within one program. The road rehabilitation of existing port access road should give priority to improve transport facilities to avoid construction traffic. Then the construction of proposed highway will be started.

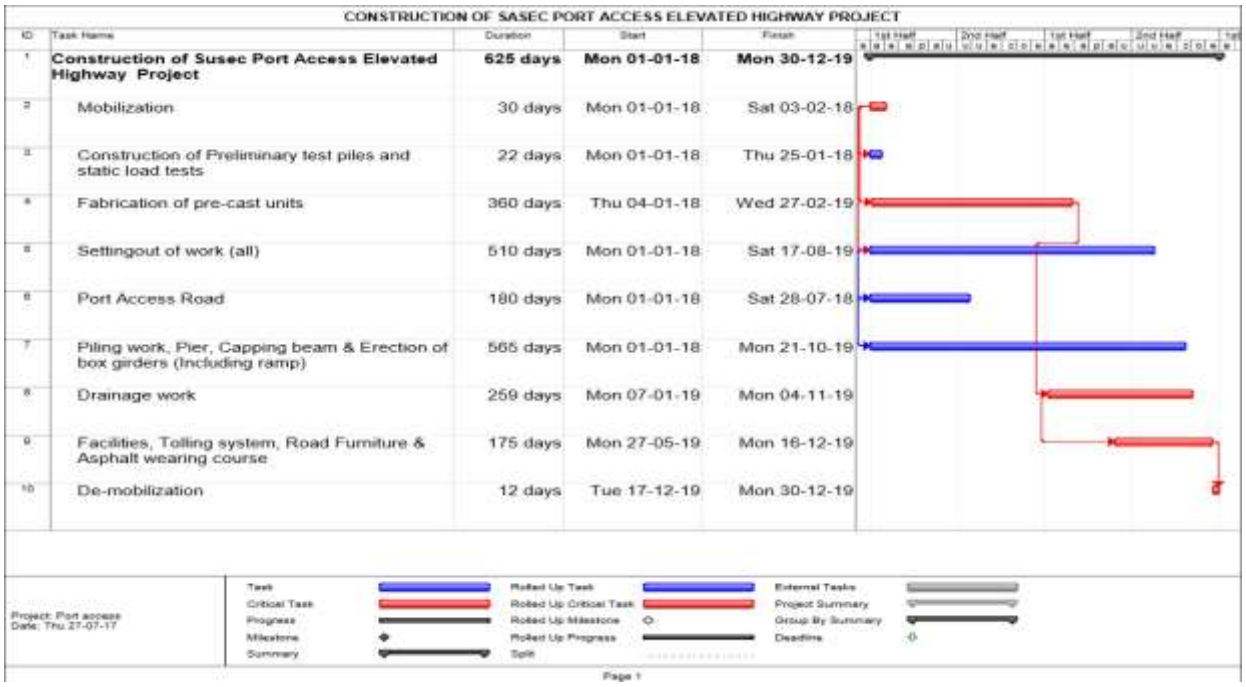
I. Cost for the rehabilitation activities - Rs. 217,819,839.55 of the existing port access road.

II. Cost for the construction of four lane Expressway - Rs. 46,905,897,579.45 (2 lane Duel carriageway) from Ingurukade junction to Galle face end.

92. The Proposed project will be financed by the Asian Development Bank under the Transport Project Preparatory Facility.

6. Schedule of implementation

93. The implementation of the Project shall take 24 months. Accordingly, it would be started by the January 2018 and the completion would be by the December 2019. The road will be opened for traffic in 2020.



III. POLICIES, LEGAL AND ADMINISTRATIVE FRAMEWORK

94. This section provides an overview of the policy framework and national legislation that applies to the proposed project. The project is expected to comply with all national legislation relating to environment in Sri Lanka, and to obtain all the regulatory clearances required.

A. National Law

95. The implementation of the projects will be governed by the Government of Sri Lanka (GoSL) and the rules, regulations, and standards stipulated in the National Environmental Act (NEA) and the related laws. These regulations impose restrictions on the activities to minimize and mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to ensure the projects are consistent with the legal framework, whether national, state, or municipal / local. Compliance is required in all stages of the subproject including design, construction, and operation and maintenance.

96. The National Environmental Act (NEA) No.47 is the main National legal framework which administer through CEA of Ministry of Mahaweli Development and Environment. NEA No. 47 was enacted in 1980 and NEA amendment Act No.56 of 1988 stipulated the regulation of obtaining environmental clearance for regulating environmental impacts in a timely and systematic manner. The NEA process implements through the designated Project Approving Agency (PAA) as prescribed by the Minister under section 23 Y of the NEA. The procedure that should be followed for obtaining environmental clearance is described under section 23CC and 32 of the NEA.

1. EIA Requirement

97. If any project falls within the category of “Prescribed Projects” listed in Gazette Extra-Ordinary No.772/22 of 24th June 1993, requires environmental assessment, and the CEA establishes a scoping committee to decide on the level of study (EIA or IEE) and prepare terms of reference (TOR). Alternatively, if the project lies wholly within the jurisdiction of a single government agency, CEA may refer the project to this authority (as the project approving agency) to administer the EIA process. A technical review committee reviews the completed EIA or IEE report and recommends whether environmental clearance shall be granted; the final decision is made by CEA.

98. However, the proposed Port Access Elevated Highway construction project is not fall within the category of “Prescribed Projects” listed in Gazette Extra-Ordinary No.772/22 of 24th June 1993 and subsequent amendments, which needs to go through an Environmental Impact Assessment (EIA) process and subsequent conditional approval from CEA. The environmental approval process has been completed already according to the completed Basic Information Questionnaire (BIQ) submitted to CEA by the RDA. Since the project is not on the list of prescribed projects in the EIA regulations, is not in or near a sensitive area, has not been the subject of public protest, and it was cleared that the project will have no significant environmental impacts. Therefore, the environmental approval has been granted by the CEA with conditions to carry out the activities of the port access elevated highway project. (Please refer the Annexure.10).

2. Clearance from Coastal Conservation Department

99. The CCD has a mandate to conserve and manage the coastal zone, defined in the Coast Conservation Act of 1981 as the area lying within a limit of 300 m landward of the Mean High Water Line (MHWL) and a limit of 2 km seaward of the Mean Low Water Line (MLWL); in the case

of rivers, streams, lagoons, or any other body of water connected to the sea either permanently or periodically, the landward boundary extends to a limit of 2 km measured perpendicular to the straight base line drawn between the natural entrance points thereof and includes the waters of such rivers, streams and lagoons or any other body of water so connected to the sea. All beaches in Sri Lanka are public property in accordance with the Coast Conservation Act. The location of the proposed elevated highway from Ch4+900 to Ch5+270 is within the coastal area defined by CCA, therefore CCD permit needed

100. RDA PMU will ensure that the CCD permit will be obtained prior to the commence construction.

3. Archaeological Impact Assessment

101. An Archaeological Impact Assessment (AIA) is required to be carried out for development projects which utilize land plots located in the close proximity to any archeological reserves. Written permission from the Department of Archaeology must be obtained if the development project use, encroach or submerge of the any land prescribed and within the land in which the archaeological structure or monument is located as described in the inventory that has been prepared under the Antiquities Ordinance before conduct of excavations. The purpose of the AIA is to examine whether or not there are antiquities in the land in which the development project is proposed to be carried out and if there are antiquities in the land, to identify the impact of the proposed project on the antiquities and to report alternative measures to be taken. Archaeological Department is the authorized approving agency under the Act. The proposed area from Ch1+800 to Ch5+270 is located within the area close proximity to several archaeological monuments, therefore AIA is required.

102. RDA PMU has taken action to coordinate with Department of Archaeology. A written approval has been granted by the Archaeological Department. (Please refer the annexure 17).

103. In addition to the NEA, following GoSL laws and regulations need to be considered by RDA of Ministry of Highways and Road Development, which needs to be complying with construction and operation phases of the project.

Table 9: Laws and regulations need to be complied

	Legislation	Relevance and main content	Authorizing institution
1.	Coast Conservation Act No. 57 of 1981	This act regulates any unauthorized construction within the coastal zone, by making it mandatory to obtain permits for any Development activity falling within the coastal zone This need to consider under the Port access road project as part of the project area lies within the coastal zone	Coast Conservation and coastal resources management department
2.	National environmental protection and quality regulations under Extraordinary gazette notification No. 1534/18 and No. 1533/16 of 2008 under NEA section 32 & 23A, 23B	This regulate any discharge, deposit or waste emission into the environment and waste management related to the project activities and describe the license requirements. Environmental Protection License(EPL) from CEA, in particular prescribed activities in gazette No. 1533/16 of 2008 (i.e. Asphalt processing plant, concrete batching plants, treatment plants, sewerage networks, mechanized mining activities etc.) is required during construction period and license need to be obtained to collect, transport, store, recover, recycle or dispose waste or establish any site or facility for the disposal of any	CEA

	Legislation	Relevance and main content	Authorizing institution
		waste during the construction and operation period.	
3.	National Environmental (Protection and Quality) Regulation No. 1 of 1990 published in Gazette Extraordinary No. 595/16 of February, 1990	Provides standards for discharging effluents into inland surface water during proposed project activities.	CEA
4.	National Environmental (Ambient Air Quality) Regulations, 1994, published in Gazette Extraordinary, No. 850/4 of December, 1994 and amendment gazette No. 1562/22 of 2008	Provides standards for emissions to the air during proposed project activities.	CEA
5.	National Environmental (Noise Control) Regulations, No.1 of 1996 and its amendments	Regulates maximum allowable noise levels for construction activities during proposed project activities	CEA
6.	National Environmental (Vehicle Horns) Regulations, No. 1 of 2011	Regulate maximum allowable noise emanating from vehicular horns on a highway or road any motor vehicle use during project construction activities	CEA
7.	National Environmental (Municipal Solid Waste) Regulations, No. 1 of 2009	Regulate dumping municipal solid waste along sides of any national highway or at any place other than places designated for such purpose by the relevant local authority during proposed project activities	CEA
8	Felling of Trees Control Act No. 9 of 1951 as Amended through Act No. 30 of 1953	This Act sought to prohibit and control felling of specified trees (mainly intended to stop indiscriminate felling of specified trees) in the country.	Department of forest conservation
9	Water Resources Board Act, No. 29 of 1964 and (Amendment) Act, No. 42 of 1999	The act control, regulation and development (including conservation and utilization) of water resources; prevention of pollution of rivers, streams and other water resources; formulation of national policies relating to control and use of water resources.	Ministry of irrigation and water resources management
10	Soil Conservation Act, No. 25 of 1951 and Amended No. 24 of 1996	This Act to make provision for the enhancement and substance of productive capacity of the Soil; to restore degraded land for the prevention and mitigation of soil erosion; for the Conservation of soil resources and protection of land against damage by floods, salinity, alkalinity water logging. brought; and to provide for matters connected therewith or incidental thereto	Department of Agriculture
11	Municipal Councils Ordinance No. 29 of 1947, the Urban Councils Ordinance No. 61 of 1939 and the Pradeshiya Sabha Act No. 15 of 1987 as amended in 2010	Regulates and control actions pertaining to socioeconomic development such as roads, culverts, bridges, ferries, waterways and other means of local transport and related site clearance for constructing worker camps, site office etc and methods taking place within the command area relevant to government laws and regulations.	Ministry of Local Government And Provincial Council
12	Flood Protection Ordinance No. 04 of 1924, No 22 of 1955	An ordinance for protection of areas subjected to damage from floods. This includes declaration of flood areas, preparation of schemes for flood protection and other rules and regulations regarding flood in the country	Irrigation Department

	Legislation	Relevance and main content	Authorizing institution
13	Crown Land Ordinance Act No. 1947	An ordinance to make provision for the grant and disposition of crown lands in Sri Lanka; for the management and control of such lands and the foreshore; for the regulation of the use of the water of lakes and public streams; and for other matters incidental to or connected with the matters related to proposed project	Land Commissioners Department
14	Land development statuette No. 7 of 2002 the western province provincial council, amendment No. 1287/26 of 2003	A statute for regularizing utilization of state lands situated within the western province either by state or the provincial council, for regulating the distributing of the aforesaid lands and lands in possession of the provincial council, for augmenting productivity of lands and for matters connected with or incidental to them this statute is in compliance with the crown lands ordinance no. 08 of 1947 (chapter454) and the land development ordinance no.19 of 1935 chapter 464 as amended by land development (amendment) acts, no.16 of 1969 no.27 of 1981, no 22 of1998, no, 22 of 1995 1996. Of divesting of state lands, no. 07 of 1979	Governor – Western Province Provincial Council and Land Commissioners Department
15	National Thoroughfares Act, No. 40 of 2008	This act is known as RDA act which provide for planning, design construction, development, maintenance and administration an integrated public road network in Sri Lanka.	Ministry of port and highway
16	Urban Development Authority Law No 41 of 1978 and Urban Development Projects (Special Provisions) Act No 2 of 1980	UDA Law to provide for the establishment of an Urban Development Authority (UDA) to promote integrated planning and implementation of economic, social and physical development of certain areas as may be declared by the minister to be urban development areas and for matters connected with the relevant project activities. Urban Development Projects (Special Provisions) Act No 2 of 1980 is an act to provide for the declaration of lands urgently required for carrying out urban development projects and to provide for matters connected there with relevant project activities.	Urban Development Authority (UDA) under the ministry of Urban Development and Defense
17	Colombo District (Low Lying Areas) Reclamation & Development Board Act No. 15 of 1968 as amended by Law No. 27 of 1976, Act No. 52 of 1982 and Act. No. 35 of 2006	An Act to provide for the establishment of a Board to be known as the Colombo District (low-lying areas) Reclamation and Development Board for the reclamation and development of such areas as may be declared by Order of the Ministers that such areas may be rendered suitable for building purposes and for matters connected or incidental thereto.	Sri Lanka Land Reclamation & Development Corporation (SLLR&DC)
18	Town and country planning ordinance No. 13 of 1946 and The Town & Country Planning (Amendment) Act, No. 49 of 2000	This regulate the National Physical Plan which includes transport as main aspect and the proposed project related activities should be included for the purposes of this Ordinance	National Physical Planning Department (NPPD) under the Ministry of Urban Development and defense
19	Buddhist Temporalities Ordinance No. 19 of 1931	This act Provides necessary assistance to administer and protect the property of Viharas, Intervention to settle disputes that arise regarding property of Viharas and making recommendation to release money to be paid as compensation in respect of property of Vihara acquired by government for any similar development like the	Department of Buddhist Affairs

	Legislation	Relevance and main content	Authorizing institution
		Proposed project.	
20	Antiquities Ordinance No.9 of 1940 and amendments	The act regulates the subprojects located in close proximity to any archeological reserves	Department of Archaeology
21	Mines and Mineral Act No. 33 of 1992	Mining and exploitation for minerals, including sand, must be licensed Under the Mines and Mineral Act No.33 of 1992 by the Geological Survey and Mines Bureau. Permit is required for earth and quarry material for construction of buildings etc., either directly or through contractors. Alternatively, project contractors can procure the material from the open market, but they will have to make sure that such sources/traders are operating with valid licenses	Geological Survey and Mines Bureau

B. ADB Policy

104. Asian Development Bank has a strong and meaningful Safeguard Policy which caters for people and environment. The Safeguard Policy of the Asian Development Bank (ADB) is grounded in ADB's Poverty Reduction Strategy and long-term strategic framework. The Poverty Reduction Strategy recognizes that environmental sustainability is a prerequisite for pro-poor economic growth and efforts to reduce poverty. Environmental sustainability is also one of three crosscutting themes of the long-term strategic framework. ADB's Safeguard Policy contains five main elements:

- Promotingenvironmentandnaturalresourcemanagementinterventionstoreducepoverty directly,
- Assisting developing member countries (DMCs) to mainstream environmental considerations in economic growth,
- Helping maintain global and regional life support systems that underpin future development prospects,
- Building partnerships to maximize the impact of ADB lending and non-lending activities, and
- Integrating environmental considerations across all ADB operations.

105. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, loans involving financial intermediaries, and private sector loans.

C. Screening and categorization

106. According to ADB Safeguard Policy Statement (2009), the process of determining a project's Environment category is to prepare a Rapid Environmental Assessment (REA). REA requires the completion of the environmental categorization form prior to the Project initiation. REA uses sector specific screening checklist, taking into account the type, size, and location of the proposed project; sensitivity and vulnerability of environmental resources in project area; and the potential for the Project to cause significant adverse environmental impacts. A project is classified as one of the four environmental categories (A, B, C, or FI) based on the most environmentally sensitive component. Categories are as follows:

(i) **Category A.** Projects could have significant adverse environmental impacts. An

EIA is required to address significant impacts.

(ii) **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

(iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.

(iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all projects will result in insignificant impacts.

107. Accordingly, it is suggested that the project be considered as Category “B” and an IEE report will be required accordingly. The REA check list for the proposed port access elevated highway is attached in the annexure2.

1. Public disclosure

108. ADB will post the safeguard documents on its website as well as disclose relevant information in accessible manner in local communities:

- for environmental category A projects, draft EIA report at least 120 days before Board consideration;
- final or updated EIA and/or IEE upon receipt, and
- Environmental monitoring reports submitted by the Project Management Unit (PMU) during project implementation upon receipt.

2. Environmental management plan (EMP)

109. An EMP shall be prepared, which addresses the potential impacts and risks of the project identified by the environmental assessment also describing the related control measures and actions.

IV. DESCRIPTIONS OF THE ENVIRONMENT

110. Baseline condition of the Physical, ecological, cultural and socio-economic environmental aspects have been studied around the proposed project. A good understanding of the baseline information is key to understanding the nature and significance of Project impacts and in feeding back to project design and routing / siting decisions. There for the technical study and field verification need to be performed to identify the baseline condition of the specific parameters quantitatively prior to construction.

111. The description of the baseline has the main objectives of identifying the key environmental, socio economic conditions and cultural heritage in areas potentially affected by the Project and highlight those that may be vulnerable to aspects of the Project and then by implementing the routine basis measurements of the same parameters near the same locations during the construction period, it will be checked the effectiveness of the proposed precautionary measures applied for on- site impact mitigation. And if not adequately addressed it can be readily detected and timely action to be taken to rectify the situation.

A. Physical Environment

112. The project site is located in the built-up area along the most economical path utilizing the existing developed low lands including residential units within the several areas. In addition, the proposed path traverses through public sensitive areas such as temples, churches, archeological sites etc.

113. The Colombo district which incorporates the project area falls into lowest pen plain (first pen plain) of Sri Lanka. This coastal pen plain rises to a maximum elevation of 125m from sea coast. However, maximum elevation of the proposed project area is about 15m. The proposed project area is more or less plain to undulating terrain and most of the elevated terrain of the project area is as a result of surface undulations exist, which result in the development of natural canals (fluvial systems) with flow gradients. The littoral geomorphology in the canal outfall areas represents both alluvial deposits from Kelani River and beach deposits of sands from the sea of quaternary age.

114. The general land use of the study area is commercial and mixed residential while the 80% of the area covers buildup areas. the main canal called bloumandhal canal crosses the proposed trace at two places at ch 0+380m and Ch 1+130mre and the Beira canal crosses the trace at 4+600 m. Further, as mentioned earlier chainage from 4+900 m to 5+348 m falls within coastal zone of Port access road.

1. Geology & Soil

115. Geological formation in the proposed project area is of the Precambrian age, of the metamorphic type and belongs to the Wanni Complex of Sri Lanka (Fig. 3) The Wanni Complex is mainly characterized by thick sequences of ortho gneisses comprised of amphibolite grade, migmatitic, granitic and granodioritic gneisses. Undifferentiated Proterozoicgneiss, Sandy lateritic gravel, Beach sand are main geological strata types in and around the project area.

116. The metamorphic rock in the project area mostly comprise hornblende bearing gneiss, overlain by quaternary deposits in the form of alluvium, beach rock, dune sands, marsh and lagoon deposits, coral and old/beach /shore line deposits. The coastal and offshore zone between Colombo and the Kelani Ganga show sandstone deposits sub parallel to the shoreline. River

alluvium is present in substantial amounts in the flood plain of the Kelani river in the extent where the river form same and a ring belt of around 3km. width. The marsh and lake alluvium is found in the fringes of the coastal lowland, often bounded by low lateritic hills.

Figure 2: Geological Map of Sri Lanka

117. According to the origin, strata formation, soil description and distribution of sub-soils of the project area, borehole investigation results, the sub surface has been grouped into 06 layers as;

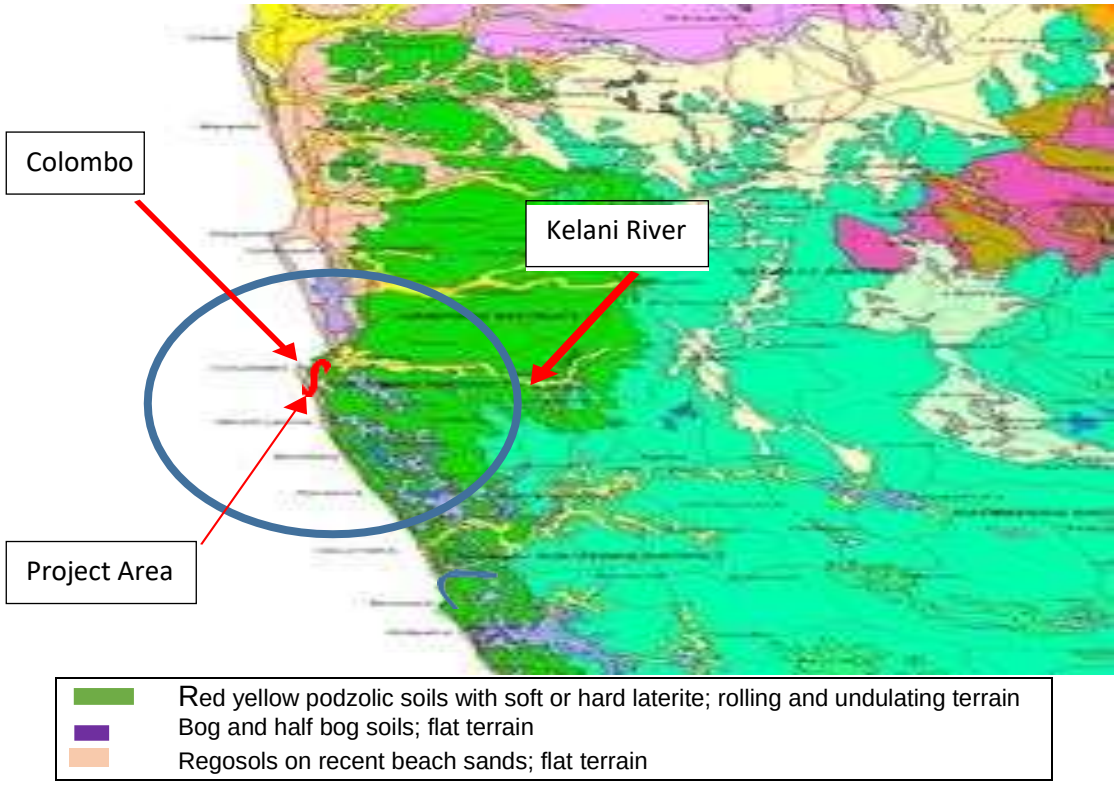
- Filling material,
- organic soil with peat,
- clayey sand,
- sandy clay,
- completely weathered rock and
- Hard rock.
- The top surface of the entire elevated highway stretch consists of 2m fill which consists of clayey gravel. Main rock types of the area are identified as Biotitegneiss and granite biotitegneiss.

118. The texture of the soil is identified inside the boreholes with reference to the thickness of the formations overlaying natural soil levels on the field investigations. Accordingly, the top surface of the entire elevated highway stretches up to 2m is a fill which consists of clayey gravel. Along the trace from start to end there are different types of soil strata found. The geotechnical information within the specific areas of the proposed trace describes the varying of soil formation and is described in the table below.

Table 10: Formation of soil at different areas along the proposed trace.

#	Location/area	Soil types	Depth from the surface (m)
1	Pier No.001-030	Sandy clay Organic Completely weathered rock Hard Rock	2-5 3-8 9-15 10-20
2	Pier No.030-055	Lateritic clay Hard Rock	5-10 6-15
3	Pier No.055-075	Sandy clay with some rock boulders Completely weathered rock Hard Rock	2-3 10-15 15-22
4	Pier No.075-110	Manmade backfill Clayey sand Peat layer (in some areas) Hard Rock	2-3 5-10 6-7 Below 20
5	Pier No.110-119	Coarse sand/ sea sand with rock boulders. Hard Rock	Top layer 5-10

Figure 3: Soil map of the project area.



2. Climate and Meteorology Rainfall

119. Sri Lanka is situated within the north-equatorial tropical zone. The climate is tropical with high humidity and temperature which vary with altitude. Rainfall, temperature and other climatic factors are basically governed by the monsoons. Seasons are not determined by change of temperature, but by the rainfall distribution influenced by convectional precipitation and two monsoons. The northeast monsoon in November – February is locally called “Maha season” and

the south-west monsoon from May – September “Yala season”.

120. Topography plays a major role in the pattern of rainfall distribution. While the northeast monsoon rains are island wide, the mountains intercept the southwest monsoon. As the proposed project area is located in the South-Western quarter of the island, which is classified as wet zone. The annual climate in the area is therefore mainly governed by the Southwest Monsoon which is expected from May to September and Northeast Monsoon which is expected from November to February.

121. Within the wet-zone, total annual rainfall is ranging between 1400-2500 mm while the Colombo metrological data reveals that the annual rainfall of the project area is ranging from 2400 – 2450mm. About 75% of the annual precipitation at Colombo area is experienced during the monsoon periods. The balance 25% precipitation is due to inter monsoonal rains and localized convectional precipitation. Highest rainfall occurs in the months of May-July, and October-December are the two wet periods while February – March and during August are comparatively dry.

122. Twelve-year average precipitation data from the rain gage station at Colombo of Meteorological Department Sri Lanka is given in Table. 11 below. The highest average monthly rainfall is experienced during November and December and the minimum is expected during the months of February and March (Fig.4).

Table 11: Monthly Average Rainfall in Colombo / December 2005 to April 2017

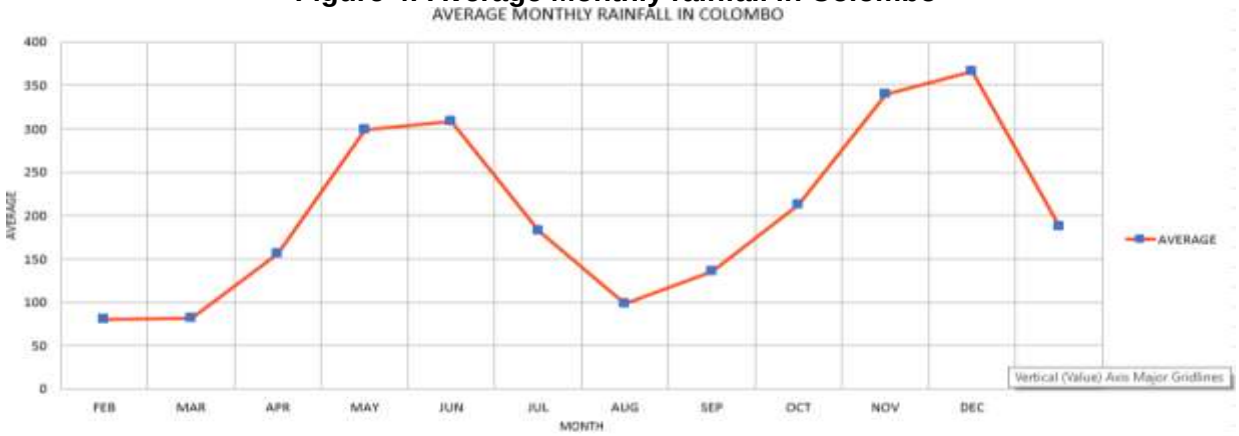
Monthly Rainfall in Colombo

December 2005 to April 2017

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2005												262.6
2006	126.9	156.9	266.6	103.4	193.1	183.1	96.8	270.6	129.0	619.9	524.7	51.9
2007	91.1	9.9	60.5	374.1	432.4	79.9	106.6	260.5	129.3	292.1	128.8	119.6
2008	30.6	118.5	293.7	435.9	170.6	250.5	185.8	140.1	155.2	491.6	140.9	208.7
2009	117.9	4.9	209.1	359.5	103.5	156.7	113.6	92.5	172.3	206.6	448.4	149.4
2010	21.0	4.5	72.3	482.9	727.8	200.4	117.8	14.7	306.6	158.3	971.5	292.1
2011	61.7	33.7	149.5	354.3	197.8	178.6	98.2	148.6	76.2	242.0	188.3	45.3
2012	158.7	140.1	122.0	532.3	152.0	88.6	41.1	200.3	180.0	507.3	207.4	134.8
2013	90.9	164.3	108.3	148.1	404.5	260.4	198.2	21.8	216.8	140.3	204.7	32.3
2014	85.6	19.5	144.8	254.7	83.5	238.7	35.2	255.4	312.7	449.6	278.8	476.5
2015	32.7	122.5	220.9	267.7	169.2	237.8	37.3	90.7	631.4	253.4	525.8	376.6
2016	65.3	106.7	91.3	185.9	752.4	132.3	49.2	1.1	29.0	374.0	404.8	165.1
2017	82.7	92.3	133.8	81.2								
AVERAGE	80.425	81.150	156.067	298.333	307.891	182.455	98.164	136.027	212.591	339.555	365.827	186.573

Unit in millimeter Tr-Trace (less than 0.1mm)

Figure 4: Average Monthly rainfall in Colombo



3. Temperature

123. Temperature readings are available from the meteorological station at Colombo, and twelve-year average are presented in Tables below. There appears to be variation of annual temperature throughout the year, is being range from minimum of 22.150^{0}C to the maximum of 31.863^0 C. The highest day time temperature is recorded during the months of March and April and the minimum temperature is recorded during the month of January.

Table 12: Monthly Maximum Temperature in Colombo / December 2005 to April 2017

Monthly Maximum Temperature in Colombo												
December 2005 to April 2017												
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2005												30.1
2006	30.6	31.6	31.3	31.6	31.2	30.6	30	30.2	30.4	30.4	30.6	30.8
2007	31.8	31.2	31.8	31.7	31.4	30.7	30	30.1	30.4	29.5	30.8	30.4
2008	30.8	30.8	30.7	30.9	31.2	30.2	29.8	29.8	30.6	30.5	30.8	31.0
2009	31.1	31.2	31.4	31.6	31.5	30.3	30.1	30.3	30.2	30.6	30.3	31.0
2010	31.9	32.4	32.5	32.0	31.2	30.7	30	29.7	30.0	30.1	29.8	29.3
2011	29.9	30.0	31.7	31.0	31.3	30.8	30.2	30.2	30.5	31.0	30.8	30.5
2012	30.8	31.7	31.5	31.3	31.7	30.8	30.6	30.7	30.4	30.8	31.0	30.7
2013	31.2	31.5	31.9	32.4	31.1	30.0	29.9	30.1	30.0	30.5	30.9	31.1
2014	31.4	31.6	32.3	32.2	31.6	31.0	30.9	30.2	30.6	30.4	30.1	29.6
2015	31.5	31.1	31.5	31.9	31.9	31.3	31.2	31.3	30.6	30.8	30.9	31.4
2016	32.4	32.5	32.9	33.3	31.6	31.1	30.7	31.0	30.6	31.1	30.7	31.4
2017	31.2	31.4	31.3	32.5								
AVERAGE	31.215	31.418	31.736	31.863	31.431	30.683	30.309	30.330	30.394	30.514	30.606	30.616

Figure 5: Average Monthly Maximum Temperature in Colombo

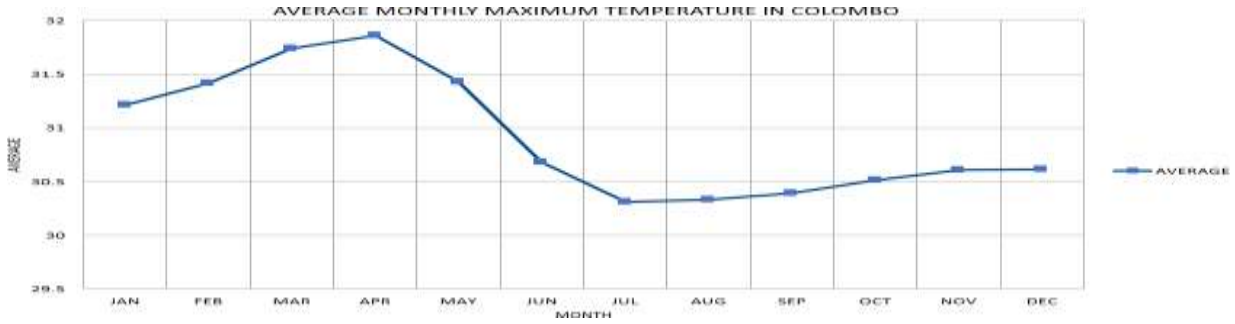
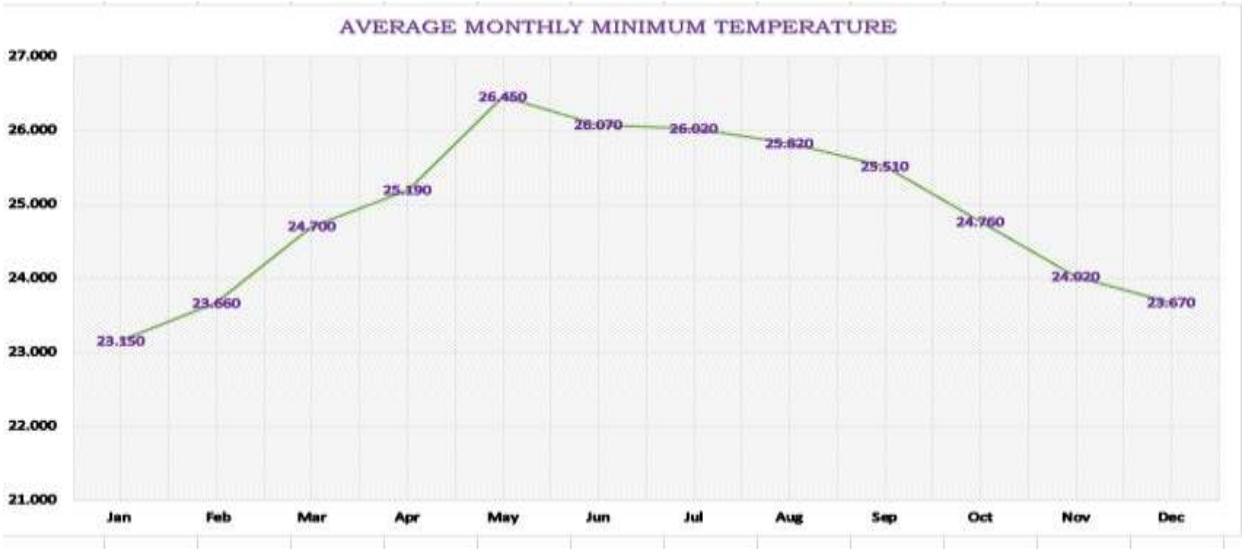


Table 13: Monthly Minimum Temperature in Colombo / December 2005 to April 2017

Monthly Minimum Temperature in Colombo
December 2005 to April 2017

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2005												23.4
2006	22.8	23.8	24.1	26.0	25.7	25.6	26.0	25.0	25.5	24.3	23.8	23.7
2007	22.9	23.5	24.8	24.7	26.4	26.1	25.7	25.6	25.4	24.3	23.5	23.3
2008	22.9	23.3	24.0	24.2	26.2	25.5	25.1	25.3	25	24.0	23.8	23.3
2009	22.9	22.8	24.4	25.5	27.0	25.7	25.8	26.2	25.9	24.9	23.9	24.2
2010	23.6	24.8	25.5	25.5	26.0	26.4	25.6	26.4	25.8	25.6	24.2	23.7
2011	23.2	24.0	24.7	24.9	26.7	26.4	26.2	26.2	26.1	25.2	24.3	23.6
2012	22.8	23.4	24.9	24.5	26.7	26.5	26.5	25.5	25.6	24.5	24	23.9
2013	23.3	23.8	25.1	26.4	26.8	25.5	25.5	25.9	25.3	25.5	24.3	23.8
2014	23.7	23.6	24.8	25.3	26.6	27.1	26.8	25.5	25.3	24.6	24	23.8
2015	23.4	23.6	24.7	24.9	26.4	25.9	26.9	26.6	25.2	24.7	24.4	
2016												
2017												
AVERAGE												

Figure 6: Average Monthly Minimum Temperature in Colombo



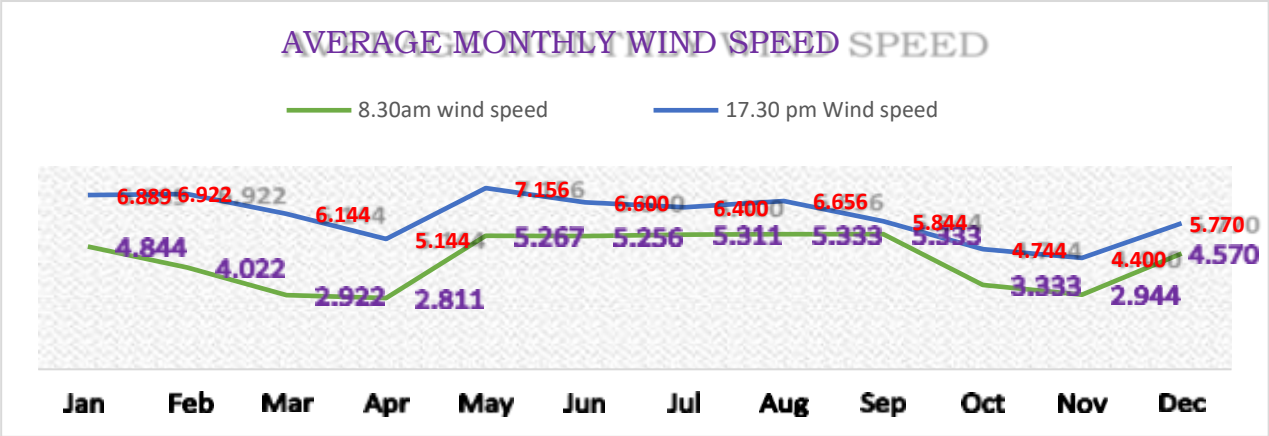
4. Wind

124. Wind direction is dependent on the monsoons, with south westerly winds during the May-September period and north-easterly winds during the November-February period. Direction is variable during the March-April period

Table 14: Monthly Average Wind Speed in Colombo / / December 2005 to April 2017

Monthly Average Wind Speed in Colombo / December 2005 to April 2017																								
	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
YEAR	8.30 a.m	5.30 p.m	8.30 a.m	5.30 p.m	8.30 a.m	5.30 p.m	8.30 a.m	5.30 p.m	8.30 a.m	5.30 p.m	8.30 a.m	5.30 p.m	8.30 a.m	5.30 p.m	8.30 a.m	5.30 p.m	8.30 a.m	5.30 p.m	8.30 a.m	5.30 p.m	8.30 a.m	5.30 p.m	8.30 a.m	5.30 p.m
2005																							3.6	5.0
2006	4.6	7.2	4.1	7.5	2.3	5.8	2.4	4.1	3.7	6.0	4.6	5.5	4.9	5.2	2.8	5.5	3.5	5.2	2.6	2.7	2.1	2.4	5.6	4.2
2007	5.7	6.0	3.4	6.3	2.9	5.8	1.9	5.0	4.3	6.3	4.9	5.8	4.7	5.9	5.1	6.2	4.5	6.4	2.8	3.9	2.4	5.3	3.1	5.8
2008	4.7	5.8	3.4	5.5	3.0	4.9	4.0	5.8	7.0	8.3	4.2	7.3	5.6	6.8	5.6	6.7	4.4	5.4	2.6	4.7	3.3	6.1	4.6	6.8
2009	4.3	6.4	4.2	7.8	2.3	6.1	4.5	6.2	6.1	7.8	5.4	6.6	4.5	5.5	4.9	7.4	6.3	6.3	3.8	5.4	1.7	2.8	4.3	4.5
2010	4.6	7.3	4.2	7.5	2.5	6.1	1.5	3.5	4.2	6.8	4.9	6.9	4.3	5.8	6.6	6.6	4.5	5.0	4.8	5.5	3.0	3.9	4.4	5.3
2011	4.8	6.5	5.3	7.9	3.7	7.8	2.3	5.6	5.3	7.3	5.8	7.0	7.0	6.9	7.0	8.1	5.5	6.0	3.5	5.3	3.3	4.1	4.8	5.6
2012	3.6	7.1	3.8	6.1	2.5	6.4	2.8	5.5	5.6	7.5	4.5	5.5	4.9	6.2	4.8	6.1	4.5	5.7	2.7	5.1	4.2	4.9	5.3	6.0
2013	5.9	8.1	4.3	6.8	3.8	5.9	3.3	5.8	6.7	7.3	5.9	7.6	5.8	6.6	6.3	6.9	5.3	6.0	4.5	5.1	3.4	5.2	5.7	7.8
2014	5.4	7.6	3.5	6.9	3.3	6.5	2.6	4.8	4.5	7.1	7.1	7.4	6.1	8.7	4.9	6.4	4.5	6.6	2.7	5.0	3.1	4.9	4.3	6.7
2015	4.9	7.7	4.1	7.9	3.2	5.8	2.8	5.1	5.1	6.7	4.3	6.4	5.7	7.5	6.6	6.8	3.4	4.2	3.9	4.9	3.5	4.6	3.4	5.0
2016	5.6	7.2	3.8	5.8	3.3	6.3	2.9	6.3	4.8	7.0	6.8	6.3	6.0	7.2	8.0	8.6	7.0	7.1	4.1	6.9	4.0	5.3	4.7	7.0
2017	5.4	8.3	4.7	6.6	3.7	6.4	4.0	6.7																
AVERAGE	4.96	7.10	4.07	6.88	3.04	6.15	2.92	5.37	5.21	7.10	5.31	6.57	5.41	6.57	5.69	6.85	4.85	5.81	3.45	4.95	3.09	4.50	4.48	5.81

Figure 7: Average Monthly wind speed in Colombo



125. **Possible impacts of changes in rainfall regimes.** Floods are the most common hazardous experience caused by heavy rain, received during the two monsoon seasons in Sri Lanka. Increased intensity of rainfall in the Wet Zone due to climate change is expected to increase the propensity for flooding of flood prone rivers with prolonged and heavy rains in this region.

5. Floods in Kelani River basin

126. Kelani River basin is located in between Northern latitudes 6° 47' to 7° 05' and Eastern longitudes 79°52' to 80°13' with basin area of 2230 km2. The upper part of the basin (up to Hanwella – about 26km away from the project area towards the eastern part of the Kelani river) is mountainous while the lower part (below Hanwella), has plain features. The basin receives about 2400mm of average annual rainfall and the river carries a peak flow of about 800-1500 m 3 /s to the ocean during monsoon periods. The flood level gauge at Nagalagam Street (Colombo) defines the severity of the flood as; minor floods (level between 5 ft / 1.5 m and 7 ft / 2.1 m), major floods (level is between 7 ft / 2.1 m and 9 ft/ 2.7 m), and severe flood (level exceeds 9 ft / 2.7 m).

127. However, since the project area is located within the lower part of the Kelani river basin in a considerable distance away from the hazardous zone and no flood is recorded within the project area (refer the attached map).

Figure 8: Flood affected areas of Kelani River Basin in 2016.

Prepared with using flood map (Kml) of the Survey department of Sri Lanka.

6. Sea level rise:

128. Sea level rise, storm surges, and coastal erosion are greatest in the west, south-west, and southern coastal belt where about 50% of Sri Lanka's population lives. The frequency and intensity of these hazards are expected to increase with the outcomes of climate change such as coastal flooding. The wave data recorded for the Colombo Port Expansion project (CPEP) provides most of the basic information of the wave data which had been measured at a location of Galbokka Point in 15m water depth. This data was transposed to obtain a deeper water wave climate with various significant wave heights for different return periods. The findings are summarized below.

Table 15: Wave heights for different return periods

Return Period (Years)	Wave height Hs (m)
200	6.4
100	5.8
50	5.3
10	4.2
1	2.7

Recorded Wave data in the EIA report of Colombo Port Expansion Project (CPEP)

129. **Vulnerability to natural hazards of the Kelani river basin.** Recent records of the Disaster Management Centre (DMC), indicate that Sri Lanka has experienced large scale flooding in every 2 to 3 years and on average about 200,000 people were affected in every year. There are records on flood events occurred in the basin during recent past in November 2005, April 2008, May 2008, May 2010, January 2011, December 2012, January 2013, June 2013, October 2014, May 2016 and also the recent flood on May 2017. The existing records revealed that more than 38,000 families living in flood plains of Kelani River were affected during the 2008 flood, while more than 78,000 families were affected during the 2010 flood. Moreover, Irrigation

Department records show that there were two consecutive severe floods which occurred during the year 2008 due to the rain from 24th April to 2nd May and the rain from 31st May to 6th June 2008.

130. In 2016, during 15 - 22 May 2016, Sri Lanka was hit by a severe tropical storm that caused widespread flooding as a result of Tropical Storm Roanu and as a result of heavy rains, several major reservoirs over flowed and flood gates were fully opened to avoid a dam breach, causing flooding downstream areas south of the capital city Colombo, the Kelani River. Nearly 237,240 people were displaced from their homes. The majority of these displaced people were in Colombo and Gampaha districts in the western region of the country. Again in 29th May 2017 strong winds and heavy rain, 177 people have been killed, 109 have been injured, 109 people have gone missing, more than 557505 people have been displaced and relocated in 336 safe locations and 5 711 houses have been damaged due to heavy floods and landslides within the provinces of Western, Sabaragamuwa, Southern, Northwestern and Central. (Sources: DMCS, Meteor Sri Lanka, local media.)

7. Geological hazard

131. In Sri Lanka, land slide is the most common geological hazard. Although Sri Lanka is not located near a major earthquake prone fault line, earthquakes have been reported in and off the coast of the island Earthquakes of low to moderate magnitude have been recorded over the past 400 years in Sri Lanka with very limited damage but no accurate data is available. Although tsunamis are rare, past experience has shown that it could bring catastrophic consequences. In 2004, almost two-thirds of the Sri Lankan coast was affected by the Indian Ocean tsunami highlighting the country's vulnerability to low-frequency but high impact events.

8. Ambient air quality (AAQ)

132. The 80% of the road area passes through a populated and commercial built up area inside the SLPA, and a few areas of the remaining part have urban housing complexes and temporary settlements. The main air quality issue expected is the suspended particulate matter. To a certain extent, the high level of particulate matter is a natural consequence of the dry atmosphere, lack of vegetation cover, and winds. Nevertheless, this condition is improved by such human activities as vehicles driving on unpaved shoulders or poorly maintained roads. Moreover, many trucks, and passenger vehicles are diesel fueled and some use a cheaper fuel mix and in exhaust smoke that is high inPM10. The two main emissions sources associated with the proposed project area are industrial emissions and vehicle emissions. The significant industrial emissions within the study area include stationary source emissions from the Kelanithissa Thermal Power Plants; two power plants (GT7 and CCGT) belong to Ceylon Electricity Board and AES power plant (CCGT). Since the proposed elevated road follows the route of existing base line road, vehicle movements and traffic are relatively high. Therefore, vehicular emissions from the existing baseline road have considerable effect on existing air quality

133. During the study period, ambient Air quality is monitored at three identified locations near the areas that are expected to be affected with excessive dust or other air pollutants by the project activities. The Air quality monitoring results at selected locations are described in the attached report submitted by the industrial Technology Institute (ITI) in the Annexure11. Summary of the report on measured air quality are described in the tables below.

a. Location – 1

Table 16: Summary of Air Quality Monitoring Data at the open space in front of Agamathi Vidyalaya at Blumendal Road

	$PM_{2.5}$	PM_{10}	O_3	CO	CO_2	NO_2	SO_2
NEAAR	50	100	NA	NA	-	0.05	0.03
WHO (Guide Line)	50	100	-	-	-	-	50
Minimum	3	12	0.001	0.070	398	0.003	0.006
Max	32	109	0.012	1.354	447	0.020	0.015
Average	12	47	0.006	0.539	409	0.011	0.011

b. Location – 2

Table 17: Summary of Air Quality Monitoring Data in front of the St. Anthony's Church Kochchikade

	$PM_{2.5}$	PM_{10}	O_3	CO	CO_2	NO_2	SO_2
NEAAR	50	100	NA	NA	-	0.05	0.03
WHO (Guide Line)	50	100	-	-	-	-	50
Minimum	4	7	0.000	0.096	400	0.007	0.009
Max	157	201	0.007	0.829	463	0.019	0.019
Average	20	40	0.002	0.402	426	0.011	0.015

c. Location – 3

Table 18: Summary of Air Quality Monitoring Data near the Sambhodhi Chaithya

	$PM_{2.5}$	PM_{10}	O_3	CO	CO_2	NO_2	SO_2
NEAAR	50	100	NA	NA	-	0.05	0.03
WHO (Guide Line)	50	100	-	-	-	-	50
Minimum	5	9	0.005	0.039	394	0.002	0.001
Max	24	86	0.015	0.302	414	0.01	0.009
Average	14	32	0.009	0.161	405	0.005	0.004

NEAAR – National Environmental (Ambient Air Quality) Regulations; WHO – World Health Organization; NA – Not Available

134. Ambient air quality standards and ambient air quality levels established and published through national legislative and regulatory processes, and ambient quality guidelines refer to ambient quality levels primarily developed through clinical, toxicological, and epidemiological evidence (such as those published by the World Health Organization (WHO)). The acceptable emission estimation and dispersion modeling approaches for point and fugitive sources of National Air Quality Standards are considered as the value of Interim target 2 of the WHO guidelines. It can be seen from the Tables (16), (17) and (18) that out of three locations of air monitoring all the average concentrations of parameters monitored were found within the permissible limits of National Air Quality Standards and the available values of the WHO guidelines for all the locations. Overall the air quality in the project area is not an issue.

9. Ambient Noise and Vibration

135. Noise along the existing Port Access road particularly between Ingurukade junction and port City area is primarily influenced by sound from traffic. Noise in this area is expected to higher during day time and during night time. Existing traffic noise in this area is anticipated to significantly contribute during day time and night time measurements. In addition, community noise also expected as significant affected to the area. During construction, these values are likely to increase due to operations of earth moving equipment / machinery. The noise level is directly proportional to traffic, therefore during the operational phase with the increase of traffic, the noise

level is also likely to increase. Background noise at sensitive receptors and significant pollution sources/ activities within the study area were recorded during field surveys to identify baseline noise and vibration at 3 places related to the three assessment time periods. The ITI report on detailed baseline Noise and Vibration monitoring results of daytime, evening and night time is attached in the annexure12. The summary of noise measurement results are given in Table 19 below.

Table 19: Summary of Noise Level Results of 24 hrs. Measurements

#	location	Assessment Time- DAY	Assessment Time- Evening	Assessment Time- Night
		ENL dB(A)	ENL dB(A)	ENL dB(A)
N1	Near the UDA Housing scheme LHS 0+040 - 0+016	70	69	74
N2	Near the UDA housing scheme RHS 0+200 - 0+250	71	72	68
N3	Near St. Anthony's Shrine LHS 4+950 - 4+980	74	75	70

ENL-Existing Noise level

136. It can be seen from the Table (19) that at locations (N1, 2 & 3) along proposed alignment, the average day time noise level varies from 69dB(A) to 75dB(A), whereas average night time noise level ranges from 68dB(A) to 74dB(A). In general, considering the National Environmental standards on noise quality, Noise levels at all the locations are not within the desirable limits. It is also found that the recorded noise level is higher than the permissible limits for residential area prescribed by World Bank EHS standards of 55 dB(A) and 45 dB(A) for day time and night time respectively.

10. Existing Vibration Levels in the project areas

137. Construction activities and vehicle movement traffic introduced by CEA with effect from 1st August, 2002; maximum peak value (in velocity mode) stipulated for continuous Type 3 structure category is 1.0 mm/sec for 0-10 frequency range and 2.0 mm/sec for 10-50 frequency range. The required standards and their limits have been stipulated in the NEA, standards and regulations is attached in the Annexure 14. Baseline Vibration levels which were measured in the identified six locations are within the desirable limits.

Table 20: I hour vibration level measurement results within day time period.

#	Maximum peak levels (mm/sec) within the different frequency ranges (Hz)			
	0-15 min	15-30 min	30-45 min	45-60 min
V1	0.12	0.13	0.10	0.20
V2	0.11	0.11	0.11	0.22
V3	0.28	0.20	0.28	0.21
V4	0.24	0.24	0.20	0.28
V5	0.18	0.14	0.23	0.15
V6	0.27	0.23	0.19	0.17

11. Hydrology

138. Two lock gates, the St Sebastian and McCallum, allow management of the water level and give connections to the Kelani River and the Harbor, respectively. In the past St Sebastian Canal was the link between Beira Lake and an extensive network of canals and waterways

developed by the Dutch which served to transport both goods and people and was part of the City's drainage system. No longer used for commercial transport, this network is now fragmented and in a state of disrepair.

12. Drainage Pattern around the Proposed Trace

139. Some of the cross drains through the Port Access Road will be crossed by the proposed elevated highway. Most of these drains are underground drains. There are many such underground cross drains within the port premises which should be carefully considered.

140. Many of the waterways to which the storm water discharge of the Elevated Highway will be the usual roadside drains. As the surface area of the elevated highway which will serve as the storm water catchment is comparatively smaller the generated discharge will be relatively smaller. There is no greater necessity to enlarge the roadside drains to take up the water collected from the Elevated Highway as the overall catchment areas or runoff coefficients for the roadside drain catchment will not change because of the Elevated Highway.

13. Surface drain out and the flood inundation along the lower Kelani River Basin.

141. The proposed project falls within the canal network in Metro Colombo basin area which discharges the flood water to the Indian ocean through Mutwal Tunnel canal having the discharge capacity of 44 m3 from the west side and to the Kelani River from northern side through St Sebastian north canal outlet (Please refer the Fig; 9). The Metro Colombo Basin is laid in the Western wet zone of the country and it receives mean annual rainfall of 2,300mm with the frequencies of high intensity precipitation with their inundation extents in the Colombo area is subjected to frequent floods during south-west monsoon when it coincides with localized depressions. Since considering the narrowness of the existing canals and the large amount of water generated by large upstream catchments and as a solution SLLRDC has proposed two canal diversions called New Mutwal Tunnel and St Sebastian South Diversion under Metro Colombo Urban Improvement Project.

142. The main surface drainage of the elevated highway trace is the Canal leading to Mutwal Tunnel Canal which crosses the Port Access Elevated Highway is (at 1+000km of the Port Access road). As per to a Flood Inundation Analysis done for the Metro Colombo Area by a senior engineer of Land reclamation and development Corporation (SLLRDC), Sri Lanka, some areas in Hanwella, Kaduwela, Kolonnawa, Biyagama, Kelaniya and Colombo DS divisions are identified as vulnerable areas for inundation under rainfalls of 50-year return period while Kalaniya inundation under rainfalls of 100-year return period. There is no any past experience of inundations were reported within the area along the proposed elevated access highway.

Figure 9: Layout map of Metro Colombo canal basin

Map prepared with using the survey data of SLLRDC

14. Water quality and sources of water pollution Existing water sources

143. St Sebastian Canal and its sub canals including Bloomendhal canal are the major water sources within the area of ingurukade junction end whereas Beira Lake is the main source of surface water for the area of Port city end. The proposed elevated road will cross two surface water bodies namely; Bloomedhal Ela and Beira Lake (spill).

144. The bulk of run-off into the Beira Lake is provided by rainfall, which is highly variable due to monsoonal effects. During the dry seasons, the lake water level falls and produces conditions favorable to increased microbial and chemical activity, resulting in anaerobic gas production and unpleasant smells. The turbulence resulting from this gas production occasionally causes the re-suspension of the dark, bottom muds which results in portions of the lake turning black. In addition, released hydrogen sulfide adds to the stench emanating from its polluted waters.

145. Indiscriminate dumping of municipal solid waste (MSW) into these water bodies are common sights. Discharge of waste water and dumping of MSW has degraded the water quality of the canals depleting the DO level creating an environment devoid of DO. The emanating of bad odors of some of the channels is the result of this scenario. Based on the domestic and industrial discharges and dilution from storm water, high fluctuation of pollution levels (indicated by COD and BOD) can be expected with time at sampling location of each canal.

146. Baseline water quality samples were collected and the selected parameters were measured to determine the influences on water quality over the period of construction is ongoing. In order to evaluate the water quality, water samples from the identified locations of Blooemandhal canal and the Beira Lake both at upstream and downstream areas where the proposed highway

crosses them as described in the report annexure13.The analytical results of the water samples are indicated very high E-coli count and high BOD levels. High level of COD is indicated in the upstream water of the Bloomandhal canal. It is clear that the water quality of the channels are not fit for drinking.

Table 21: Summary of the quality tests of the water samples

Sample no.	Parameter	Units	Concentrations				Quality standards of tolerance limits for inland surface water (NEA)
			Bloomandhal		Beira lake		
			Down stream	Up stream	Up stream	Down stream	
01	Electrical conductivity at 25^0 C	µs/cm	1225	640	27700	32200	-
02	Salinity		0.6	0.2	17.0	20.0	-
03	Turbidity	NTU	9.6	12.3	8.5	4.4	-
04	pH		6.41	6.37	6.83	6.82	6.0-8.5
05	Dissolved Oxygen	mg/L,max	0.6	0.6	0.2	0.4	-
06	Total Suspended Solids	mg/L,max	15	35	40	45	50
07	Total Dissolved Solids	mg/L,max	550	280	17780	19500	-
08	BOD	mg/L,max	53	101	36	41	30
09	COD	mg/L,max	115	1100	100	75	250
10	Oil & grease	mg/L,max	5	4	3	3	10
Summary of microbial levels of the water samples							
01	*E coli/*100mL (MPN)		170	$4.3x10^5$	$5.4x10^5$	More than $1.6x10^6$	40

15. Ground Water quality

147. Metro Colombo basin hydrology indicates that there is a fair amount of groundwater potential both in the alluvial aquifers and bedrock. The alluvial sand/ gravel aquifers in the basin are recharged by rainfall and seepage from the St Sebastian canal and the Beira Lake. The water table was measured inside the borehole with reference to the natural soil level (NSL) on the day of field investigations and was encountered at a relatively shallow depth at all boring locations. The depth of the water table along the expressway corridor/flyover is reported to be between 2-3m with expected potential seasonal variations. In view of this, there is a prospect for seepage water to intrude on working areas during any open excavation below NSL.

148. Public water supply is the major source of potable water for the settlements and the other consumers throughout the subproject area. No tube wells fall in the corridor of impact of the sub project. There are no reported data related to the recent ground water quality status of the project area. An important information is given by the recent statement of the CMC Chief Medical Officer Dr. Ruwan Wijayamuni to the Sunday Times on Sunday the 21st May 2017 (reported by Kasun Warakapitiya). He has clearly stated that the Colombo ground water should not be used even for bathing or washing clothes as this can lead to skin rashes, eczema, allergic reactions and eye infections and they banned the sinking and use of tube wells within City limits due to the excessive pollution of water.

149. Further, the CMC Analyst R.M.G.B Rajanayake said that the Colombo water table was contaminated due to industrial and commercial activity. He said that when the water was tested at the CMC laboratory they found Ammonia, Nitrates and Nitric components and the water was heavily mixed with sewage and garbage which had seeped underground.

16. Ecological Resources

150. **Existing Vegetation /Habitats.** Biogeographically, the proposed Port access elevated highway lies within the Wet Zone of the country and floristically it is under the Northern Wet Lowlands Floristic Zone and Coastal and Marine Belt Floristic Zone. Tropical Wet Evergreen Forests is the typical natural vegetation formations in the Northern Wet Lowlands Floristic Zone and Marine Mangroves, Salt Marshes, Sand Dunes and Strand Vegetation are typical natural vegetation formations in the Coastal and Marine Belt Floristic Zone.

151. However, no such natural vegetation (Tropical Wet Evergreen Forests, Marine Mangroves, Salt Marshes, Sand Dunes and Strand Vegetation) in the proposed highway area as the area is highly human modified. No natural vegetation or habitats found in and around the proposed highway area. The predominant land use type is developed or buildup area with commercial and residential units. Approximately in 80 % of the project area, the original or natural habitat has been converted and built up. In other words, the habitat has been modified. Therefore, gardens (home gardens and other gardens, temples, churches etc.) and avenues are main existing habitat types in the area. In addition to gardens and avenues, the main canal named Bloomandal canal flows along the trace from the area 0+250 towards 1+ 600 area and crosses the trace at 0+ 380 m. and 1+300m.The Beira Lake crosses the trace near 4+300 m. Further, the chain age from 4+900 m to 5+348 m the trace falls within the coastal zone.

152. **Flora.** Most of the associated flora species in the road alignment, gardens and avenues along and around the proposed trace are cultivated and exotic species.

Table 22: Common Fruit Trees in Project Area

#	Common Name	Scientific name
1	Amba(mango)	*Mangiferaindica*
2	Kassel(Banana)	*Musa x paradisiaca*
3	Jam	*Muntingiacalabura*
4	Rambutan	*Nephileumlappaceum*
5	Gaslabu(Papaya)	*Carica papaya*
6	Anoda	*Annonamurikata*
7	Massan	*Zizyphus jujube*

Table 23: Common Non-Fruit Trees (Forest Trees) in Project

#	Common Name	Scientific name
1	Acasia	*Auriculiformis*
2	Kottamba	*Terminaliacatappa*
3	Kohomba	*Terminaliacatappa*
4	Pol	*Cocosnucifera*
5	Pihibiya	*Filiciumdecipiens*
6	Attikka	*Ficusracemosa*
7	Nuga	*Ficusbenghalensis*
8	Kos	*Artocarpusheterophyllus*
9	Una Bata	*Bambusa vulgaris*
10	Kumbuk	*Terminaliaarjuna*
11	Bo	*FicusReligiosa*
12	Madatiya	*pavonina*
13	Araliya	*Plumeriaobtusa*
14	WatuSudda	*Tabernaemontanadivaricata*

Figure 10: View of Floral Species present in the Project Area




153. The fauna species found in the proposed highway area during the ecological study are common species or species that have ability to living with man modified habitats. The common faunal species inhabit in the area are listed in the tables below.

Table 24: Mammals

#	Common Name	Scientific name
1	Palm Squirrel / Lena	*Funambuluspalmarum*

Table 25: Reptiles

#	Common Name	Scientific name
1	Katussa (Common Garden Lizard)	*Calotesversicolor*
2	Land Monitor / Talagoya	*Varanusbengalensis*
Aquatic associate species – Canals		
3	Water Monitor / Kabaragoya	*Varanussalvator*

Table 26: Birds

#	Common Name	Scientific name
1	House Crow	*Corvussplendens*
2	Oriental Magpie Robin	*Copsychussaularis*
3	Shikra	*Accipiter badius*
4	Red-vented Bulbul	*Pycnonotuscafer*

#	Common Name	Scientific name
5	Spotted Dove	*Streptopeliachinensis*
6	White-bellied Drongo	*Dicruruscaerulescens*
7	Rock Pigeon	*Columba livia*
8	Brahminy Kite	*Haliasturindus*
Aquatic associate species - Canals		
9	Indian Pond Heron	*Ardeolagrayii*
10	Great Egret	*Egrettagarzetta*
11	Little Egret	*Egrettagarzetta*
12	Little Cormorant	*Phalacrocoraxniger*
13	White-breasted Waterhen	*Amaurornisphoenicurus*
14	Spot-billed Pelican	*Pelecanusphilippensis*
15	White-throated Kingfisher	*Halcyon smyrnensis*

Table 27: Butterflies/Insects

#	Common Name	Scientific name
1	Psyche	*Leptosianina*
2	Common Grass Yellow	*Euremahecabe*
3	Lesser Albatross	*Appiaspaulina*
4	Dragonflies	
5	Blue Percher	*Diplacodestrivialis*
6	Green Skimmer	*Orthetrumsabina*

Table 28: Endemic species

#	Common Name	Scientific name
1	Lesser Albatross	*Appiaspaulina*

Table 29: Common Fish species associated with canals

#	Common Name	Scientific name
1	Tillapia	*Oreochromismossambicus*
2	Gourami	*Trichogastersp*
3	Sucker mouth cat fish	*Pterygoplichthysmultiradiatus*

Table 30: Common invertebrate species within the area

#	Common Name	Scientific name
1	Golden Apple Snail	*Pomaceacanaliculata*

B. Socioeconomic structure

154. The subproject will not impact directly to any household or commercial establishments, because this stretch of road and land is the property of the Port Authority. No any human settlement in this road stretch. However, two residential flats which give shelter to about 924 families have been constructed just about 40 meters from the boundary of this road. Large number of low income group's human settlements are scattered along the road side (beyond the limits of Port Authority) this area is coming under the Bloomendal GN Division in Colombo Divisional secretariat area.

155. Most interesting characteristic of these GN divisions is the large population live in a relatively small land area. Reason for the less population in Pettah and Fort GN Divisions is these areas are not residential areas. Business establishments occupy majority of buildings and this is

the commercial hub of the country. Number of families live in Pettah and Fort is very small because these areas are not residential areas. From the colonial, period these areas have been the hub of business activities in the country.

Table 31: Demography in the Colombo DS area. 2012

S/Number.	Description	Figures.
1	Number of GN Division	35
2	Population (Sinhala)	79468
3	Population (SL Moor)	126345
4	Population (SL Tamil)	97960
5	Population (Indian Tamil)	8635
6	Other	5910
7	Total	318048

Source: Census and Statistic. 2012

Table 32: Total population in the six GN Divisions

N.	GN Division.	Families.	Male.	Female.	Total
1	Bloomendal	4521	6915	7277	14222
2	Lunupokuna.	1218	6545	6256	12801
3	Kotahena W.	2402	4757	4937	9695
4	Kochchikade. W.	3587	5157	4466	9623
5	Petah.	202	1910	72	1982
6	Fort.	86.	1097	421	1518
		12016	167748	165335	333383

Source: Resource Profile. Colombo DS Secretariat. 2015

156. Age wise distribution of population data explain the future picture of the area. Figures in the table shows the explosion of the future population in the area. Number of person in the age group below 20 years is 14406. Number of person above 50 years is 11405. Number of person in reproduction age is 23931. They will contribute to the explosion of population bomb in the next 10 to 15 years and those who live in age group between 15 to 20 will add to next step of population increase.

157. The government in Sri Lanka has contributed a lot to upgrade the living standard of this community. Specially living areas has been upgraded through construction of drainage system and improving the housing condition. Three large living apartments have been constructed to replace the living areas identified as Low- income settlements. Number of families residing in these apartments is as follows.

Table 33: Families residing in the adjacent apartments

Housing scheme	No of families
Sirimuthu Uyana- (Constructed by UDA)	528
Sirisanda Sewana. (Constructed by UDA)	396
Jayamanga Sewana (Constructed by government)	165
VTV Court (Constructed by private Sector)	300

158. In addition to these upgraded settlements there are number of law income group human settlements in above mentioned GN Divisions.

1. Employment status

159. Majority of the community live in these GN Divisions area belong to the lowest income group and they are engaged in temporary and informal employments such as cleaning workers

in CMC, waiters in small restaurants and hotels, daily paid cleaning workers in business companies. According to the Resource Profile (Sampath Pathikada) in Colombo DS Office. the percentage of this category is about 48%. 15% of this population is engaged in self-employment mainly in preparation of food items for local market and selling of various items in streets and buses. 25% of the working population work in semi-permanent employment in private sector while 12% are employed in the government sector. About 70% of the women in working age is engaged in some kind of income earning activity.

160. This project will not have a direct impact over the poverty level of the community. Because road improvement will not have direct contribution to improvement of employment or earning capacity of communities living around the project affected area. There may be some opportunities for workers during the construction period. However overall development of the society will bring new economic opportunities to the lives of communities living in the area.

2. Major economic activities of the area

161. Colombo Pettah and Fort play and important role in the economic development of the country. Important government departments including the presidential secretariat and treasury/ Ministry of finance Central Bank are located in Fort area. Majority of the main offices of commercial companies and business establishments are also located in Fort. World Center is like an icon in Colombo city landscape. High rise apartments and five-star hotels have added value to the City of Colombo. Colombo Port city is being build up to be the financial hub for the South Asian countries. All these new developments along with the Elevated Expressway road projects will contribute to improve the national economy and earning capacity of the citizen of Sri Lanka.

162. Colombo Pettah and Fort are the areas where majority of visitors to Colombo has to pass through. The main bus stand and railway station provide the transport facility to go to any place in the country. Daily millions of people come to Colombo city to attend various purpose, business, official and private. All these people bring money and value to the Colombo city and the people who provide various services to these visitors

3. Health facilities

163. There is a well-developed health service system managed by the ministry of health. Two MOH offices namely Grand pass MOH Division and Jinthupitiya MOH Division provide the basic health care services to the community living in this six GN Divisions. Basically, these institutions conduct regular maternal and child care clinics and dispensary services. PHI conduct community awareness programs on communicable deceases and normal health habits. Conduct regular cleaning sessions and fogging spraying sessions as a measure of mosquito control against dengue and filaria.

164. Health authorities maintain a health volunteer system for easy communication in the event of breaking up of epidemic situation. Practicing favorable and satisfactory habits by community members depend on the personal character of the person. However, the PHIs mentioned that present young generation is interested in maintaining a favorable health practices and habits for health. According to the information from health authority, community awareness spreading HIV/ Aids is satisfactory. Younger generation is more concern about their health habits and personal life objectives. However, during the construction period steps should be taken to create awareness among contractors/ staff and workers in relation to human behavior and risk of spreading HIV/Aids.

4. Public services

165. The government has provided all the utility services to this community. All get water connection from National Water Supply and Drainage Board (NWSDB) supply line. All the houses get electricity connection. According to the information available in the Colombo DS office, about 70% of the households have their own toilets while another 18% uses family toilets. About 12% uses common toilets. However, sanitary condition in the area is in a satisfactory level.

Table 34: Utility Service Lines along Port Access Road

Chainage		Water	Electricity		Telephone		Drainage	Sewer	Rail Track	Oil line
From	To		CEB	SLPA	SLT	SLPA				
0+000	0+400									
0+400	0+800			x						
0+800	1+200			x						
1+200	1+600			x						
1+600	2+000		x				x	x	x	x
2+000	2+400	x	x	x			x	x	x	x
2+400	2+800		x					x	x	
2+800	3+200			x	x		x	x	x	
3+200	3+600	x			x		x	x	x	
3+600	4+000	x	x	x		x	x	x	x	
4+000	4+400	x	x	x		x	x	x	x	
4+400	4+800	x	x	x		x	x	x		
4+800	5+210	x	x					x		

5. Social activities

166. Divisional Secretaries office also conduct several programs targeting women, youth and elders to disseminate various type of awareness and knowledge to upgrade their living standard. Discussions with health and community service in DS office officials reveal that the position of women are comparatively satisfactory with the overall development of the societies. During the past ten to fifteen years, government as well as non-governmental organizations have implemented comprehensive programs to create awareness among all community members on gender issues and women's role in family and social life.

167. Electronic Medea has created strong influence over the violence against women focusing several incidences took place in various parts of the country. All these have contributed to create the public opinion over the status of the women.

6. Gender participation and income generation

168. According to the information revealed by officers in DS Office, involvement of women in income earning process and updating the general awareness on community life have contributed to reduce violence against women. Country's normal law ensures equal salary for equal work irrespective of male/ female differences. Labor laws are active in order to prevent using child labor. Contractors should be facilitated to follow rules and regulations in employing people from the area for construction work.

7. Religious culture

169. Although this community consist of different ethnicity and religious beliefs they live in harmoniously in the social life. Some community members mentioned that the economic struggle is more important and heavier than thinking of the ethnic and religious differences. Normally they

celebrate all national and cultural festivals celebrating in the country irrespective of their ethnic or religious attachments. This is an important characteristic of the low-income groups in anywhere in the country. As they all undergo the same hardship in the life struggle and share common value system, they have been accustomed to respect the teachings of all religious leaders and follow all accepted social values in the social system.

8. Education

170. With the overall development of the socio-economic situation in the country all the parents pay special attention towards the education of the children. The government also has contributed towards this positive trend by improving the physical infrastructure in schools and provide school uniforms text books. There are thirteen (13) government schools and 2 private schools in these GN Divisions. About 85% of the children in the school going age attend schools.

9. Transport

171. Transport in the country has been taken a huge turnaround during the last ten years. Impact of this change is visible in this area too. Although congested with roads and human settlements, roads and Trans port has been developed to a satisfactory level. There is a continuous bus service to all parts of the city. About 12% dwellers have their own cars/ vans while about 80% of the community own three wheelers and motor bicycles.

10. Archeologically sensitive areas

172. Previous feasibility study has identified places with archeological value. Following table provide necessary information on identified archeological places.

Table 35: Archeologically Important Locations

	Archeologically Important Locations -Port Access Road		
1.	Regu Mandeeraya	4+860	The Elevated Highway is proposed to be constructed above this building within the minimum clearance of 5.2m.
2.	The Grand Oriental Hotel	4+625	50m from proposed Centre pier (LHS)
3.	Walkers Building	4+550	30m from proposed Centre pier (LHS)
4.	Mackinnon Mackenzie Building	4+575	45m from proposed Centre pier (LHS)
5.	Clifan Burg House: At Sri Lanka Navy Head Quarters	Ramp	50-60m from proposed Centre pier (LHS)
Other Buildings *			
6.	Port Commission Building	4+600	25m (Elevated Highway to be constructed above the Bridge attached to this building)
7.	Maritime Museum: Old building opposite to Regu Mandeeraya	4+910	4m (Elevated Highway to be constructed abovethisbuildingAbout6msectionofthe building will be under the proposed Road.)
8.	Galbokka Lighthouse (1952): In front of Navy Headquarters	0+220 (Ramp)	34m from proposed Centre pier (LHS)
9.	Khan Clock Tower (1923)	4+140	45m from proposed Centre pier (LHS)

*Old buildings not listed as Protected Monuments by Department of Archaeology

173. Although there is no direct connection with the proposed Elevated Expressway, attention was paid towards the community that live in immediate vicinity of the Elevated Expressway because, the community in this area may have some impact during the construction process of the road and usage of this road will change the living style of this community in the long run.

11. Colombo port and its functions

174. Sri Lanka Port Authority was established in 1980. Land area of the Colombo Port is 4.8Km2 (1200 Acres). Depth of the present harbor 15km. It has capacity of 5.7 million of TEU while it handles annual cargo up to the value of 30.9 million tons. At present, the Colombo Port is equipped with:

- 4 Feeder Berths.
- 7 Container Berths
- 14 Quay Cranes
- 12 Super post Panamax Cranes
- 2 Twin Lift Super-post Panamax Crane
- 4 Wall – mounted Gantries
- 78 Rubber –tyred Gantries
- 285 terminal tractors and trailers

175. The following passage explain the operational efficiency of the Colombo Port

176. Sri Lanka's Jaya Container Terminal sets record by docking three large-scale container ships simultaneously.

177. Sri Lanka's Jaya Container Terminal (JCT) at the Colombo Port has set a record by simultaneously anchoring three large-scale container ships of over 300 meters in length. The three container ships – MSC Jovanna, Ever Lenient and MSC Toronto – berthed Wednesday early morning. The 337-meter long MSC Joanna has a total container capacity of 9,178 TEUs and the UK-flagged Ever Lenient is 335 meters in length with a total container capacity of 8,500 TEUs. The MSC Toronto is a 325-meter long ship with a total capacity of 8,089 TEUs. Although large ships have been docked at the JCT previously, this is the first time three such ships have been anchored at the same time. The JCT, which is operated under the Sri Lanka Port Authority (SLPA) has four container main berths. (Source: Colombo Page) In addition to the cargo transportation Colombo port is famous among the passenger ship craft that bring tourists from various parts of the world. Large passenger ships have become a common scenario in the Colombo port.

178. The proposed Port Access Elevated Highway provide access to the Colombo port. it is appropriate to give a summary of the contribution it make towards the development of the country. Strategic location of Sri Lanka in naval route between Malacca straights and Suez Canal which links the Asia with Europe has been a boon to the Colombo port since early stage. 36000 ships including 4500 oil tankers travers through route annually. Colombo (kolomthota) harbor has been the main center in import and export process in the country during the historic period. In 8th century Muslim venders has used this port for their import and export business.

C. Description of Traffic Forecast

179. The traffic projection for the project

Table 36: One Day Traffic Data along main road corridors to Colombo

Survey Station	Number of vehicle per day
A-1 at Kadawatha	41528
A-2 at Katubedda	70333
A-3 at Welisara	56205
A-4 at Kottawa	36037
B-214 at Waturupotha	14814
AB-10 at Kaduwela	22019
B-240 at Malabe	41818

Survey Station	Number of vehicle per day
B-84 at Piliyandala	39008
Total 24-Hour Traffic	321,762

Source: SHETC traffic survey- 2013.

180. In the project area, from Ingurukade junction to port city (chaithya Road) area, a traffic survey is being carried out at selected intersections, and traffic survey data will be analyzed accordingly. The existing port access road from Ingurukade junction to port city (Chaithya Road) has varying carriageway configurations based on the existing space or right of way (RoW) available. The road widening at most of the places has been done upto extreme ends of the RoW. The road carriageway varies from a two-lane divided road to a four and six lane divided facility at different locations. Roadside and on-street parking reduces the capacity of roads at different locations.

181. The fast-moving passenger vehicles including cars, vans, taxis, mini buses, and three-wheelers are not running through the road while goods vehicles, containers and slow-moving vehicles are the predominant modes of transport. Following table gives a clear picture of the number of vehicles entering in to the city to create the traffic congestion and explain clearly the volume of traffic towards Colombo port in bringing in and taking out material for the development of the country.

Table 37: Domestic Logistic Network (Traffic Survey results)

Facility	Date	All goods vehicles (Flat beds, trucks and lories.)	All passenger vehicle	Total vehicle movement.
Colombo Fort	24January 2017	7254	11119	18373
	25	7675	11748	19423
	26 January 2017	7317	10477	17794
Bandaranayake International Airport.	31 January	1095	949	2044
	1 February	1012	1113	2125
	2 February	885	1015	1900

Source: Master Hallie's Engineering Consultants (PVT) Ltd. Traffic Survey 2017

D. Sensitive environmental receptors

182. The sensitive environmental receptors existing along the alignment of proposed subproject include religious places, educational institutions, commercial structures, hotels, very old buildings with archaeological value, State and private office buildings including banks community property resources, and others. The details of the existing sensitive environmental receptors are given in Table 38. During finalization of design, all the sensitive receptors are saved judiciously. The impact may be temporary, only during construction phase, due to air, noise & vibration pollution.

Table 38: Sensitive environmental receptors identified within the areas beyond the ROW at both sides potentially affected by the project activities

#	Chainages	LHS/ RHS	Distance (m)	Affected structures
1	0+000 – 0+160	LHS	0- 50	Sirimuthu Uyana - UDA multistoried housing complex
2	0 + 200 – 0+320	RHS	0 - 75	Settlement area
3	0+740 – 0+920	RHS	0 - 75	Settlement area/ Temple
4	0+950 – 1+100	RHS	0 - 75	Sirisanda Sewana Bluemandhal flats
5	1+900 – 2 +100	LHS	0 - 100	Christ Church/Sampath Bank/Nations Trust

#	Chainages	LHS/ RHS	Distance (m)	Affected structures
				Bank/Commercial Bank/settlements
6	2+700 – 3+150	LHS	0-100	St. Anthony's Church/Sri Ponnambalameshvara Kovil/Pilleir Kovil/Water Tank/SrimathUkraveera MahaKaliamman Kovil
7	3+480 – 3+800	LHS	0 -100	Colombo Gold Centre/other commercial buildings
			0-300	Dutch bell tower at Kiman Gate
8	3+980 – 4+300	LHS	0-250	Khan Clock Tower/Fort Railway Station/Dutch Meusium/shops and commercial buildings
9	4+400 – 4+650	LHS	0+200	Commercial area/Grand Oriental Hotel/Standard Charted Building
		RHS		Port Authority Admin Building/Harbour
10	4+600 – 5+270	LHS	0+250	Presidents House/Commercial area/ Port maritime Museum/Sambodhi Chaithya/Light House Gallary/Navy head Quarters

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

183. The proposed project will have some negative and positive impacts on the surrounding environment. Most of these negative impacts are however of temporary nature and the negative impacts are easily mitigated with the adoption of appropriate measures. The direct positive impact of the highway project is mainly the benefit of growing economy through transportation including increase travel safety, a reduction in travel time, increase in travel convenience while the indirect positive impacts will be the job growth and the reduction of air pollution emission etc.

184. This chapter assesses the nature, type and magnitude of the potential negative impacts on the various relevant physical, biological and socioeconomic/human environmental components along the project corridor. For the assessment of impacts, the baseline information has been supplemented by the field visits and the primary surveys of the various environmental components carried out during the study.

185. Project affected corridor which has direct or indirect impact will be depend on the severity of the project activities and their construction limits. Direct impacts may cause by relocation of structures and the indirect impacts will be of noise, dust emissions, location of camp sites, and source of construction material construction material storage areas etc.

186. The present Section presents the measures to avoid, mitigate or offset adverse impacts and to minimize and manage risks on the environment, workforce and local population from Project activities that may cause harm or nuisance. A scoping exercise on the proposed project indicates the potential major impacts of the project and their potential significance as given below:

A-	:	Significant Negative Impact Expected
A+	:	Significant Positive Impact Expected
B-	:	Some negative impact expected
B+	:	Some Positive Impact Expected
C	:	Unknown impact
D	:	Negligible Impact or no impact is expected
Short term (ST)		Impact dominating temporarily during construction
Long Term (LT)		Impacts will be residual and potential to exist beyond the life of the road if not controlled
Temporary (TE)		Impacts will be anticipated and obligatory. But reversal within a short period

Table 39: Impact Screening Matrix

Potential impact resources/receptors	Significance and duration of Impact		Sources of Impacts/risk
	Construction stage	Operation stage	
Physical Environment			
Climate and ambient Air quality			
Impact on Residential population living near the construction site, workers and local vegetation due to Air quality dust emission	A-**(ST)**	B-(**LT**)	Temporary dust emissions from earthworks, excavation, vehicle movement, stockpiles, unpaved surfaces, etc. along the working strip, access roads, yards and camps during Project construction. Temporary emissions of exhaust gases in to the atmosphere from vehicles

Potential impact resources/receptors	Significance and duration of Impact		Sources of Impacts/risk
	Construction stage	**Operation stage**	
			involved in Project construction. This could be a major impact during the construction stage, unless it's mitigated
Acoustics Environment/ Noise & vibration			
Impact on any nearby structures, settlements and households. Fauna present in the locality of construction site	A-**(ST)**	B-(**LT**)	Excessive noise and vibration will be generated from equipment and machinery. Construction of piers (incl. board piling hammering/ blasting), piling). Construction of temporary facilities (working sites). This could be a major impact during the construction stage, unless it's mitigated
Water resources (Surface and ground water)			
Impacton Freshwater resources: surface water and groundwater	A-(**ST**)	D	Site preparation, Working strip preparation and earthwork, construction and operation of temporary facilities (construction camps, yards, garages), water network etc. by uncontrolled discharge of wastewater and drainage water from construction sites during rainy periods in particular. Dewatering at work site; Soil erosion and sedimentation; Construction waste management and storage and handling of fuels and chemicals This could be a major impact during the construction stage, unless it's mitigated.
Impact on marine water	B-(**ST**)	D	Site preparation, Working strip preparation, earthwork and construction of proposed road within the coastal zone water network etc. by uncontrolled discharge of wastewater and drainage water from construction sites during rainy periods in particular. Dewatering at work site; Soil erosion and sedimentation; Construction waste management and storage and handling of fuels and chemicals This could be a minor impact during the construction stage, with no discharging points exists to the coastal water near the area.
Subsurface and soil			
Effects on the geomorphology due to erosion Effects on the soil quality	B-(**ST**)	C	Preparation of the working strip (topsoil removal), site preparation of temporary facilities (construction camps, yards and associated infrastructure); Movement of vehicles, equipment and personnel; Production and disposal of solid and liquid wastes; Storage and handling of fuels and chemicals; Temporary construction camp operations; Backfilling and reinstatement of temporarily disturbed land from construction;

Potential impact resources/receptors	Significance and duration of Impact		Sources of Impacts/risk
	Construction stage	Operation stage	
Landscape and visual amenity			
Effects on Landscape and visual receptors (local inhabitants, commuters, by-passers, tourists, etc.)	A-(**TE**)	A+(**LT**)	Physical changes to the landscape general unity (fragmentation) due to construction works, signs etc. Impacts to landscape and visual amenity from construction works in elevated areas, especially earthworks. Disturbance of the landscape habitats' features continuity such as the mature trees (cut of trees) or watercourses Changes in the view shed and aesthetic value to commuters, by-passers, tourists, etc.). The landscape will be improved after the construction period is over, as planned construction will be carried out.
Biological Environment			
Terrestrial Ecology (fauna and Flora)			
Impacts on Flora, fauna and other sensitive habitats.	A-(**ST)**	D	Movement of Vehicles, Equipment, and Personnel; Upgrade of existing roads for access; Preparation of the Working Strip (topsoil removal, vegetation clearance); Backfilling and reinstatement of temporarily disturbed land from construction; River crossings; Construction of temporary facilities (camps and yards), This could be a major impact during the construction stage, unless it's mitigated
Protected areas and conservation sites (forest reserves, wild life conservation areas)			
Impacts on Flora, fauna and other sensitive habitats within the conservation area	D	D	The project area along the route and the area within a radius of 1km it doesn't identified any wild life conservation area or forest reserve is exist.
Socioeconomic/Human Environment			
Economy Employment and Income			
Impacts on the business and workforce in the study area. Settlements along the proposed route, in particular those located near construction camps.	B^+	D	Negative and positive impacts due to the generation of Temporary direct and indirect employment opportunities, Long- term benefits of capacity enhancement. Worker hiring and procurement of materials. construction camps will be self- contained but workers will have some access to local markets
Land and livelihood			
Impacts on the Owners and users of land affected by temporary land take and local communities	B--(**ST**)	D	Negative impacts due to Temporary land-acquisition, construction camps, stockyard areas, Block of access roads and the severity of activities.
Infrastructure and public services			
Impacts on the business and workforce in the adjacent areas. Settlements near construction sites or along	A-(**ST**)	D	Negative impacts due to construction and operation of temporary facilities (construction camps, yards, garages, water network etc.);

Potential impact resources/receptors	Significance and duration of Impact		Sources of Impacts/risk
	Construction stage	Operation stage	
access roads, Households reliant on local services and infrastructure (i.e. electricity, piped water, sanitation). Local utilities companies in charge of supply of electricity, water, tele-communication, fuel and waste related services, Different types of local drainage systems including supply canals, under and above ground distribution pipe systems. Road users of the roads crossed by the proposed route and near construction site			Set-up of temporary construction facilities (construction camps, pipe yards, water network and associated infrastructure) development of existing roads and railway tracks for construction access Temporary disruption of roads, rails and other infrastructure and hindrance of utility services during construction and access road upgrades This could be a major impact during the construction stage, unless it's mitigated.
Workers management and rights			
Impacts on the Workers directly engaged by the Project, Workers engaged through third parties, Workers engaged by the Project primary suppliers of goods and services	B-(**ST**)	D	Negative impacts due to use of contractors and subcontractors and their management practices of workers including the matters related to the Implementation of the facilities, a health and safety management systems, terms and conditions of their employment and their legal rights like suffering due to high noise levels from construction equipment and due to excessive dust emissions from construction sites, Batching Plants, Hot Mix Plants and Crusher plants.
Community health and safety			
Impacts on the Communities along the proposed route, Settlements close to Yards and construction camps.	B-(**ST**)	D	Negative impacts due to Presence of the construction workforce of people sourced nationally and internationally who through interactions with communities may lead to increased disease transmission. Community members could be involved in accidents leading to injuries and even fatalities if they enter areas where construction activities are being undertaken. Changes to the environment due to increased noise and vibration, decreased air quality and changes to the visual environment as a result of the Project may affect health and wellbeing.
Traffic and transport			
Impacts on road users (vehicle users, pedestrians and cyclists), Local population along the road corridors, potential impacts to air quality, acoustic environment and habitats	B-(**ST**)	D	Negative impacts due to construction vehicles, heavy plant, transportation of materials and goods to yards and worksites and transporting workers to/from camps.

Potential impact resources/receptors	Significance and duration of Impact		Sources of Impacts/risk
	Construction stage	Operation stage	
Cultural heritage			
Impacts on the Archaeological sites and Monuments	A-(**TE)**	B-(**LT**)	Negative impacts due to the activities of generating high noise, vibration and dust such as ground-disturbing activities, including land-clearing and site preparation activities associated with Project facilities, excavation at the pier locations, renovation of roads; construction of temporary facilities such as camps and yards; pollution (mainly dust) and vibration from blasting, hammering, and the movement of vehicles and equipment.

187. Significance of the residual impacts and risks is assessed taking the implementation of mitigation measures into account. These are either built-in to the project design, i.e. basically by the routing and siting efforts to avoid or minimize conflicts with the physical, biological and socioeconomic (including cultural heritage) environments, and using best available techniques as a facility design reference or are in addition identified as part of the assessment. The latter measures will need to be detailed and implemented in the final design of the Project.

A. Potential Impact and their Mitigation during Construction

1. Climate and Ambient Air Quality Impact

188. During Project construction, the potential impacts on local air quality are related to the following activities:

- Temporary dust emissions from earthworks, excavation, vehicle movement, stockpiles, unpaved surfaces, etc. along the working corridor, access roads and worksites;
- Temporary emissions of exhaust gases into the atmosphere from vehicles (i.e. excavators, bulldozers, side booms, trucks, cars).

189. Air quality effects from the construction camps/Plants would be limited to the immediate vicinity of the camps and would be consistent with other typical residential air emissions. Sources of fugitive dust related to the construction phase which include

- Materials handling (excavation of borrow sources and construction activities),
- Vehicle traffic (construction and operations phases),
- Open area wind erosion and
- Storage pile wind erosion

190. Impact on air quality is considered as significant of this assessment because it has links to human health and the aesthetic quality of the Project as the proposed elevated highway is proposed within a highly urban area with residencies, schools and other public and private entities with commercial, public and personnel uses.

191. **Mitigation Measures.** Construction-related dust and emissions are expected to be localized, short- term, intermittent and transient in nature. It is highly unlikely that the emissions will have any measurable effect on ambient air quality since traffic will not be stationary but travelling along the existing road. Effective mitigation measures and sound environmental

management practices will be specified in the contracts to ensure minimum air pollution. There are few areas of human settlements near the Project alignment. The residual impacts on these communities would be very little.

192. Spraying with water and covering the stockpiles are efficient means of controlling dust. Water is eventually to be added to fill material during construction of the road base. Watering of road surface under construction and compaction of other soil surfaces, and particularly in the vicinity of villages along the haul roads, shall be undertaken regularly.

193. Other precautions to reduce impacts on air quality include to

- properly cover trucks carrying spoil or construction materials to prevent spills and materials being blown away;
- fit stone crushers, asphalt mix plants, and diesel generators with dust suppression equipment or emission control devices;
- locate stone crushers, asphalt mix plants, and diesel generators away from residential areas; and
- The existing air quality of the Project Road alignment will only be disturbed during construction phase; once construction is completing the generation of dust due to project activities is stopped.

2. Acoustic Environment - Impacts due to Noise & vibration

194. During construction sources of impact are related to machinery noise emissions that will prevalently affect the area adjacent to the working corridor/ site. Noise sources in this phase will be temporary in nature and depend on the number and type of machinery used for each activity. The noisiest activities during construction will predominantly be concentrated at the piling areas that require any heavy ground works (i.e. hammering and blasting, and piling foundations for permanent structures) also have the potential to generate vibrations. Depending on the soil characteristics and on the distance to the nearest settlement, these activities could produce critical vibrations for houses in the vicinity, especially if built with wooden beam floors and ceilings or historic building structures with archaeological value.

195. Based on the present knowledge of sub surface and geological condition of the proposed project area, no section requires rock blasting where the hammering is expected to occur. However, blasting noise levels are intermittent and high within a short distance. Therefore, no significant impact is expected from blasting and associated noise and vibration.

196. The proposed project is associated with few residential areas near Ingurukade junction and commercial areas from Aluth Mawatha bridge towards the Galle Face. The baseline noise measurements at the selected locations along the port access road are higher than the permissible noise levels due to existing heavy traffic conditions. This condition will trigger during the construction phase due to the heavy machinery use and increase of traffic congestion in the area compared to the operation stage.

3. Impact

197. Since the Project area is a commercial / industrial and mostly consistent with sensitive structures including archeologically sensitive buildings located in Port access road with few human settlements. Therefore, the noise and vibration will have significant negative impacts.

198. Noise generated during the construction phase will be intermittent and temporary. During

construction, most noise sources are related directly to construction activities like site clearing (ex: demolition of structures), excavation, construction material transportation, loading, unloading and storage, construction and fixing of elevated structures, and piling can have impacts to the natural environment in and around the project area. Even though, exact construction methods are not known at this stage pilling methods, use of mechanical and electrical tools as well as heavy machinery (i.e. heavy equipment, trucks, generators, hand tools etc.) and aggregate borrow activities (i.e. blasting material during excavation), operation of concrete batching plants, asphalt plants, quarry areas, generators etc and other manual activities could generate high noise level during construction phase.

199. **Mitigation Measures.** Following measures are recommended to reduce, regulate and limit acoustic impacts from the construction of the proposed Project:

- Ensure that work to establish construction camps and yards, and construction activity occurs between the hours that is recommended with conditions in the construction site clearance or the approval.
- Critical construction activities with potential to generate excessive noise must occur during the recommended hours with on-site noise monitoring at the nearest noise sensitive locations.
- Ensure that all construction activity incorporates with the techniques for the control of noise.
- If work is to be conducted in a residential area or other noise-sensitive location, use the lowest-noise work practices and equipment that meet the requirements of the job.
- All mechanical equipment's are to be silenced by using the best practical methods.
- Mechanical equipment, including noise-suppression devices, should be maintained to the manufacturer's specifications. Internal combustion engines are to be fitted with a suitable muffler in good repair.
- Fit all pneumatic tools operated near a residential area with an effective silencer on their air exhaust port.
- Install less noisy movement/ reversing warning systems for equipment and vehicles that will operate for extended periods, during sensitive times or in close proximity to sensitive sites.
- Turn off equipment, including vehicles, when not being used.
- All vehicular movements to and from the site to only occur during the scheduled normal working hours, unless approval has been granted by the relevant authority. Where possible, no truck to be left standing with its engine operating in a street adjacent to a residential area.
- Where possible, no truck associated with the work shall be left standing with its engine idling in a street adjacent to any residential area.
- Notification/ engagement of stakeholders regarding scheduling of blasting or hammering activities near sensitive areas. Additional noise monitoring, during blasting or hammering activities near sensitive receptors, should be applied if required.

200. According to the National Environmental (Noise Control) Regulations No.1 of 1996 (Gov Notification No. 924/12) the maximum permissible levels at the boundaries of the given area for General activities (Schedule I) and Constructional Activities (Schedule III) are applicable in deciding anticipated impacts for the proposed project during construction period. The appropriate levels are given in Table 22, Table 23. The Table 23 describes the applicable guideline for noise values provided by the CEA for Elevated Urban Highways and it is expected that the project shall be implemented the guidelines with complying the conditions as follows. (Please refer the Annex

(14) for clarifications).

- Noise levels shall not exceed 70 dB (A) as L Aeq 1h during 06.00 hours to 22.00 hours at the point 5m away from the ROW or where the affected party is located. The measurement shall be carried out during the period of the measurement in which the highest noise level is recorded.
- Noise levels shall not exceed 65 dB (A) as L Aeq 1h during 22.00 hours to 06.00 hours at the point 5m away from the ROW or where the affected party is located. The measurement shall be carried out during the period of the measurement in which the highest noise level is recorded.
- Noise levels shall not exceed 60 dB (A) as L Aeq 1h during 06.00 hours to 22.00 hours at inside the buildings of hospitals and schools. The measurement shall be carried out during the period of the measurement in which the highest noise level is recorded.
- Noise levels shall not exceed 55 dB (A) as L Aeq 1h during 22.00 hours to 06.00 hours at inside the buildings of hospitals and schools. The measurement shall be carried out during the period of the measurement in which the highest noise level is recorded.
- Further the Noise level Guide lines stipulated in Environmental Health Safeguards (EHS) guidelines of World Bank are presented in Table 42 for the comparison.

Table 40: Maximum Permissible Noise levels at boundaries in LAeqT

(Below noise levels should be maintained inside the boundary of the land,in which the source is located.)

Activity	Area	$L_{Aeq}T$	
		Day time (6 am - 6 pm)	**Night time (6pm - 6 am)**
General Activities	Low noise Areas (within Pradeshiya Sabha)	55 dB(A)	45 dB(A)
	Medium Noise areas (within Municipal Councils or Urban Councils)	63 dB(A)[1]	50 dB(A)
	High Noise areas (within Export Processing Zones or Industrial Estates)	70 dB(A)	60 dB(A)
	Silent zones (100 meters from the boundary of a courthouse, hospital, public library, school. Zoo, sacred area and areas set apart for recreation or environment)	50 dB(A)	45 dB(A)
Construction activities	Any	Daytime (6am - 9pm)	Night time (9pm - 6 am)
		75 dB(A)	50 dB(A)

Source: GoSL Regulations No.1 of 1996 (Gov Notification No. 924/12)

Table 41: Guide lines for Urban Elevated Highway provided by CEA

	Daytime 06.00 – 22.00	**Nighttime 22.00 – 06.00**
Noise level at the point 5m away from ROW	70dB(A)	65dB(A)
Noise level inside the buildings of hospitals and School	60dB(A)	55 dB(A)

Table 42: Noise level Guidelines stipulated in Environmental Health Safeguards (EHS) guidelines of World Bank

Noise Level Guidelines		
	One Hour LAeq (dBA)	
Receptor	Daytime 07:00	22:00 Nighttime 22:00
Residential; institutional; educational[5]	55	45
Industrial; commercial	**70**	**70**

Source: General EHS Guidelines [Complete version] at: www.ifc.org/ehsguidelines

4. Impacts due to Vibration

201. There is a significant impact due to usage of heavy machinery at the vicinity of the archeological buildings located near the proposed elevated highway site from Ingurukade Junction to Galle Face via Port. It was noted that the all types of the high rising buildings exist within the project area of 100 m boundaries from the proposed road alignment and hence the impact due to vibration during construction activities such as piling, construction of pile foundation, operation of batching plants, concrete mixers and crushers, compaction and handling, movements of precast concrete and metal structures to build the elevated highway Vibration may be caused by tire-road interaction of heavy vehicles. Traffic vibration is an issue where accessibility routes are in close proximity to sensitive and high rising buildings including archaeologically valuable buildings.Vibration can also result in damage to buildings and to wellbeing of neighboring population.

202. **Mitigation Measures.** Following measures are recommended to reduce or manage the vibration impacts that will be created due to the construction activities

- If previously unidentified structures are within proximity to the working strip/ site (area will be identified according to the site conditions) a Pre-Construction Conditions Assessment of the structure (including the photographic evidence of existing cracks etc.) will be undertaken in order to be able to objectively assess if actual damage has resulted from construction.
- Continuous vibration monitoring will be carried out while ongoing of heavy construction activities which would have a potential to create excessive vibration effect.

5. Impacts to port buildings

203. As mentioned in the section 2.6 above, buildings belonged to SLPA will be demolished due to construction of the elevated highway within the SLPA premises and widening the existing internal road to six lanes facility.

204. In order to compensate the loss of these buildings to SLPA, RDA has agreed to construct a new head office building at Lotus Road, Colombo 01 in a land owned by SLPA.

6. Impacts on cultural heritage (Archaeological Buildings)

205. There are a number of locations which are to be protected and conserved close to the proposed project affected area named by the Dept. of Archaeology. Relevant important building locations at Port access road are less than 50m close to the construction area. The ‘ReguMandiraya’ (Custom Building), The Grand Oriental Hotel, Walkers Building, Mackinnon Meckency Building, Clifen Burg House, Port Commission Building, Maritime Museum, Galbokka Light House and Khan Clock Tower which are situated in Fort GND and close to proposed Port Access road and these locations and structures have been listed as conservation sites by the Department of Archaeology. No AIA (Archaeological Impact Assessment) will be required and the construction activities will be implemented with clear agreement to following the conditions stipulated in the clearance granted by the Archaeological Department (please refer at Annexure 15.) and under the direct supervision of the related officials to minimize any indirect impacts such locations. As the archaeological important buildings along the construction area of the Port access road are not far from the construction area, the noise and vibration impacts to those buildings during construction phase will be significant.

206. **Mitigation Measures**

- Conducting pre-construction conditions assessment of all buildings near the project site including archaeological buildings with photographic evidence of existing cracks before construction works begin.
- The project shall not use, encroach or submerge of the any land prescribed and within the land in which the archaeological structure or monument is located as described in the inventory that has been prepared under the Antiquities Ordinance,
- Prior to re-routing, Cultural heritage sites shall be identified by the contractor by joint investigations with the authority officer of the archaeological department including producing maps and information carried out within the route corridor.
- Prior to the commencement of construction, all staff need to know what possible archaeological or historical objects of value may look like and their locations.
- Excavations should be implemented only within the given project site.
- Contractor shall allow the authorized officer of archaeological department to examine any excavations or construction activity at any time if requested.
- Alternative low impact and vibration minimizing construction techniques shall be used when doing heavy construction activities with anticipated excessive vibration (bored piling/hammering/sheet piling etc), continuous vibration monitoring shall be carried out at site to identify the magnitude of the risk.
- The Department of Archaeology will be contacted if any heritage resources or objects, defined in the act, be discovered by the workman of the contractor on the site, and all activities will be ceased until further notice.
- Vibration monitoring shall be carried out at the locations where the heavy equipped activities being in progress.

7. Impacts on Water resources and Water Quality Constructional impacts on water quality

207. Potential impacts to surface waters may result from the project activities (outside the watercourse), due to the following.

- Topsoil and other earth materials will be stripped from the construction working area and stored aside. These may become entrained by rainwater during heavy rainfall, and subsequently increase the turbidity of neighboring streams and eventually the major watercourses along the route corridor. Without the implementation of good practice mitigation measures, during times of heavy rainfall, depending on the vicinity to a watercourse (with flow) potential impacts of moderate significance could occur to surface water quality. This is judged based on the relatively localized nature of the impact, but considering the significant degree of change that sediment will make to a surface water body and the potential secondary impacts that this will have to aquatic life.
- In some wet areas or areas of high water table, it will be necessary to dewater the working pits. During dewatering, the ground water table is lowered. The groundwater removed will then be discharged into available ditches, channels, watercourses, (sloping away from dewatering area) or to pre-agreed areas of land with permission of the relevant Authority.

208. Drawdown of groundwater is expected to be localized and levels will normalize rapidly on cessation of pumping. The consequences of the dewatering to groundwater availability are dependent on the type of the aquifer and its hydraulic property. However, due to the existing quality status of the ground water table, the impacts are considered minimal. Dewatering will also have minimal consequences to groundwater quality. Therefore, the significance of the impact to groundwater is considered minor.

209. **Mitigation Measures**

- Water management and monitoring Plan will be established to identify and manage groundwater pumping needs and to manage surface run-off.
- Discharged waters from dewatering activities, if returned to streams or drains will be discharged in a way that will minimize physical impacts to channel morphology, i.e. without any turbulent flows and with sediment levels below receiving waters.
- Careful management and control of the groundwater table via monitoring holes will be implemented in cases where dewatering is necessary to ensure the required water
- Measures will be employed to intercept run-off from the working corridor, by using sandbags and settlement tanks or lagoons, to reduce the suspended sediment load of the water prior to its discharge into watercourses. Alternatively, the water may be filtered through a suitable membrane such as a geotextile material to clean the water prior to discharge. In order to trap any sediment that is released in to the watercourse, filter separation methods and other applicable low-cost silt and site specific methods will be positioned around dewatering points to act as a filter.
- Full reinstatement will take place of land drainage features disturbed during construction.
- Discharges will not be made without prior agreement and appropriate consents and approvals from the authorities.
- Where appropriate, prior to construction, header drains will be installed to connect in all existing viable field drains on the high side of the working width. This will ensure continuity in the functioning of the existing field drainage. General Field drains present along the route.
- Cut off ditches will be employed to prevent water from entering excavations.
- A condition survey will be carried out to assess field drains within the working strip. This will enable an assessment to be made of any damage created during construction and for reinstatement (such as additional or replacement field drains) to be targeted appropriately

8. Construction Sites and Temporary Facilities

210. Liquid wastewater generated during construction phase includes sewage, effluent generated from cleaning of concrete batching equipment's and vehicle service. However, adverse long term environmental impacts due to these wastewater sources will not be likely as it is expected to carry out the construction work within a limited period of time.

211. Constructionsitesandtemporaryfacilitiesaretypicallyareaswheremachineryisstored and where oil residues, sanitary effluents and solid waste may be generated. Improper management of such waste streams may be associated with impacts of major significance if they find their way in surface waters or ground water.

212. Construction sites have the potential for uncontrolled site run-off and accidental spills of fuels, lubricants and other water polluting substances. Such potential sources of impact can be largely avoided by site run-off management, wastewater treatment, waste management, proper storage and storage of water endangering substances, i.e. good housekeeping practice construction management by the contractor. A Spill Contingency Plan to respond to any spill or unintentional discharge of untreated waste water or waste will be set-up. Special caution to prevent silting or spills will be required near locations where the shallow aquifer or surface water is used for local water supplies.

213. **Mitigation Measures**

- Development of a Waste Management Plan to avoid solid or liquid waste discharges to water bodies; and
- Development of a Hazardous Materials Management Procedure in order to detail procedures for working with chemical products.
- All areas for which there is a risk of leaks or spills during plant and vehicle storage, maintenance or refueling, and areas where materials with polluting potential will be stored will be bunded.
- Action shall be taken to implement necessary precautions on site run-off management, wastewater treatment, waste management, proper storage and storage of water endangering substances, i.e. good housekeeping practice construction management by the contractor.
- Frequent monitoring of spills or leaks.
- Sound engineering practices at the construction sites with prompt installation of erosion control and reinstatement.

9. Pollution of Water Resources by Solid and Liquid Wastes

214. Accidental pollution of water resources by solid, liquid wastes and accidental spill of hydrocarbon /fuels, can occur through the following construction activities:

- Production and disposal of solid and liquid wastes. Wastes generated during construction are classified into the following four categories:
  i. Waste water generated due to construction plant operations.
  ii. domestic (to be transported to a controlled municipal waste disposal site),
  iii. oily and hazardous (to be segregated for collection and disposal by specialist contractors),
  iv. and liquids ("Sewage water" from construction and operation camps, rainwater from sealed surfaces and roofs);
- Storage and handling of fuels and chemicals, to be used for construction machinery. Accidental spills from vehicles, storage tanks and chemical stores, metalworking and welding can pollute water resources

10. Sewage waters

215. During construction period, considerable number of temporary workers will be working in and around the road construction sites. Hence, the generation of sewage and grey water can be expected. This wastewater mainly comprised of biodegradable organic compounds and its contamination would be high in terms of BOD, organic nutrients and fecal pathogenic organisms. If this wastewater is disposed to the environment (directly to the canals in the area or through contaminated storm water) without any treatment, biodegradation of the organic pollutants might adversely affect the receiving waters by depleting DO in water, releasing foul smelling gases. However, it is not intended to maintain labor camps inside the port premises and the generation of sewage water is expected to be minimum within the site. During construction period of the project, temporary toilet facilities will be provided within the site for the construction workers. Within the Greater Colombo Area now most of the Urban Dwellers have facilities to access the public sewer drainage system which is maintained by the CMC to drain out the sewer. There is isolated SLPA land at CH 5+000 (RHS) that Contractor can be accommodate under the approval by SLPA or shall be find location outside the port premises. Wastewater will be treated with appropriate methods as agreed with the Engineer before disposed to the open environment and Contractor will be instructed to produce a method statement for solid waste management within

worker camps. The method statement will specify the way of reducing generation of solid waste, separation of solid waste, collection of solid waste such as garbage bins etc… Implementation of the methodology will be monitored regularly.

11. Waste water generation from cleaning of concrete batching equipment's:

216. If on-site concrete batching plant is operated, it will generate liquid effluents specially during cleaning activities. The waste water generated from cleaning of concrete batching equipment is highly turbid and alkaline and with high level of suspended solids. The high levels of suspended solids in concrete batching wastewater includes sand, silt and cement particles and these might sediments on the top soil by reducing the soil permeability, while altering the soil texture. In addition, significant number of suspended solids may release to the water channels during construction. Although suspended particles are not considered as a direct hazard, it can lead to undesirable or turbid water quality conditions due to cloudy or "muddy" appearance that reduce slight penetration in to the water. Since the canals in the area are out of aquatic life, there is no major impact in this regard. The waste water generated from cleaning of concrete batching equipment will be collected separately to a tank in a manner that does not contaminate with the storm water and will be subsequently treated in batches before disposed to the environment. The treatment system will include gravity sedimentation and chemical coagulation, sludge drying devise and a collection tank for treated waste water storage.

217. Construction activities shall be scheduled by avoiding heavy rain periods as much as possible to reduce runoff flows, temporary silt traps, sediment barriers or basins, screens and catch pits would be used where required to reduce washout of fines, causing siltation and water degradation in the downstream.

12. Consumption of Freshwater Resources

218. Freshwater will be required during construction activities, for reducing dust emissions (mitigation measure), vehicle servicing and drinking purpose water is for the consumption of construction staff etc. Drinking purpose water will be obtained by the public water supply. Water for the damping purposes and other washing purposes shall be obtained from the suitable water sources which is located at adjacent areas. Water for the reducing Dust shall be obtained by the registered supplier from Relevant Government Authorities and Pradeshiya Saba. where the available source at Kalani River near Thotalaga Area and Diyawanna River near Battaramulla.

13. Strom water pollution:

219. Storm water get contamination from soil and sediments, fuel spills from construction vehicles in operations, demolished waste and other construction material stored in construction sites which can come into contact with storm water; such as concrete compounds, asphalt compounds, petroleum products, paints and solvents, plaster or related products, adhesives, asbestos and curing compounds. Storm water pollution can also result from the release of pollutants already in the soil, e.g., excavation of sub grade materials that may already be contaminated by various chemicals. However, adverse long term environmental impacts due to contaminated storm water from road construction will also be insignificant as such issues are easily be managed by performing the related activities carefully and due to limited frequency of happening.

220. **Mitigation Measures**

- All wastewater to meet the defined standard (e.g. water quality standards

according to the National Environmental Act), prior to disposal to a watercourse.

- Work to be supervised by a qualified officer.
- Implementation of Pollution Prevention methods with including an Erosion and Sediments Management measures as to be included within the Environmental Management Action Plan.
- Implementation of Emergency Spill Response Plan where it is necessary.
- Utilize sandbags or other suitable method to create dry open-cut trench. (earth or other sediment rich material is not recommended)
- Use of sediment ponds where run-off occurs.
- Implement controls on works areas within the vicinity of watercourses
- Flooding and erosion control measures to be implemented , and effectiveness will be monitored periodically or after heavy rain periods.
- Wherever possible vehicles and machinery will avoid contact with surface waters.
- Silt screens must be constructed such that any run off water is retained, settled and filtered.

14. Impacts on subsurface and Soil

221. The project area is located in a low-lying land the major soil types within the project area are mainly Low Humic Gley & Regosol soils. These geological features characterize softunstablesoillayerswhichwillcreatesignificantimpactofsedimentationinadjacent water ways during construction phase as the proposed elevated highway construction activities will involve large scale piling activities with piles extending to hard rock layer piercing the ground water table. In general the construction activities include; setting up and operation of worker camps, unloading ,loading and storage of construction material, drilling for geotechnical investigation both along the alignment and in the quarry and borrow sources, piling, stripping of organic material from borrow sources, removal of material from borrow sources, hauling and placing of borrow material, quarry operations for concrete and asphalt aggregates, installation of drainage pipes, reinstatement of roads damaged during construction which has been described in detail in previous Chapter 02.

222. All of these activities require travel across the ground (as described by the terrain, geology, soils) along the alignment and to quarry/borrow sources or working in quarries and open cut in a borrow source. Extraction of construction materials from borrow sites requires removal of the organic layer and deeper excavation.

223. Excavations quarry and borrow site operations expose unstable soil layers contributing to increased soil erosion and localized unstable slopes. Further improper drainage systems will create water logged areas. This will create significant social impacts i.e., breeding sites for mosquitoes (malaria, filarial, dengue diseases.), nuisance smelling stagnant water, road accidents due to water ponding within the project area, which is located in the heart of Colombo city with high residential and commercial movements and in the quarry/borrow area localities.

224. Existing buildings and structures within the site will have to be demolished and this demolished material need to be temporary disposed within the site and loaded to transport vehicles, trucks to unload at the approved disposal sites. Temporary as well as the permanent disposal of theses material will contaminate and deteriorate soil quality, if such material will be not be disposed in environmentally friendly manner.

225. **Mitigation measures**

- The work, permanent or temporary shall consist of measures as per design or as directed by the engineer to control soil erosion, sedimentation and water pollution

to the satisfaction of the engineer. Typical measures include the use of dikes, sediment basins, fiber mats, mulches, grasses, slope drains and other devices. All sedimentation and pollution control works and maintenance thereof are deemed,

- Quarries and borrow pits operated with a valid approval shall be used for the project and above impacts could be mitigated by adhering to conditions laid down by licensing agencies for such quarries and borrow sites such as Geological Survey and Mines Bureau (GSMB) and CEA under their approval. Material suppliers who are operated with required licenses will only be selected if material are to be purchased.
- Exposed slopes such as embankment slopes shall not be unduly exposed to erosive forces. These exposed slopes shall be graded and covered by grass as per the specifications. All borrow pits/areas should be rehabilitated at the end of their use in accordance with the requirements/guidelines issued by the CEA and the respective local authority.
- All fills, back fills and slopes should be compacted immediately to reach the specified degree of compaction. Uncompacted earth surfaces/embankment slopes and cut areas should be covered with proper mulch.
- Demolished material shall be disposed only at locations approved by the relevant Local Authority (LA) and SLLRDC (if required by the LA) with adhering to the conditions stipulated by the relevant authority.

15. Impact on drainage and Hydrology

226. The proposed development is situated within an existing built-up area where road infrastructure already exists. No wetlands, or low line areas occur within the subproject location. Due to the nature and locality of the subproject, there is unlikely to any significant impacts on water resources within the immediate area.

227. **Impacts**

- The natural streams and channels may become silted by borrow material (earth) in the run off from construction areas and material excavation areas, workshops and equipment washing yards.
- Highway project construction tend to block of existing storm water drainages and culverts of the area due to haphazard disposal of waste materials and demolished materials causing the land on either side of the construction corridor to flood in case of heavy rains.
- Surface run-off from impervious surface of carriageway can further aggravate the flooding of the area.

228. **Mitigation Measures**

- Existing culverts and drainage structures should be adequately maintained otherwise, water channels tend to choke with debris and corroded soil, adversely affecting adjacent private lands.
- New storm water drainages to be provided at appropriate locations at rehabilitation of existing road and highway construction sites and material sites, intersecting culverts, natural streams and canals to protect nearby lands and settlements from flooding.
- Hillock areas and their slops to be protected through either stone pitching or vegetation.
- Median drains with outlets leading into either natural streambeds or open areas when no natural stream beds are available nearby.

- Contractor shall avoid storage of construction materials and disposal of debris in and around drainage paths and approved disposal sites should be used to dump all demolished material and unsuitable matter. Location specific mitigation measures as recommended by the Engineer will be implemented in order to minimize soil erosion and disturbance to natural drainage pattern if material is to be stored near to such locations.

16. Rainfall Intensities

229. Rainfall frequency analysis is usually based on annual maximum series at a site or from several sites. Rainfall data are usually published at fixed time intervals such as clock hours; they may not always yield the true maximum amount for a specified duration. IDF curves are commonly used to estimate the average design rainfall intensity for a given recurrence interval (T) over a range of durations (t). IDF curves have been derived by Irrigation Department and are available for many regions in Sri Lanka. With these IDF curves rainfall Hyetographs can be constructed. The time distribution of precipitation or a hyetograph is needed in many design problems. This information is also essential in using rainfall-runoff models. In the design of drainage systems, the time of occurrence of the maximum intensity rainfall from the beginning of storms may be of significance.

17. Health and safety impacts

230. With the construction and operation of offices, yards and use of heavy equipment at operated various construction sites much waste is generated. In this stage, various health issues can result such as:

1) Inferior Living Environment
   - Due to improper preparation of accommodation facility for construction workers, such as uncomfortable bed room, unclean eating place, unsanitary cesspit toilet, bath without shower, uncontrolled garbage dump and so on can damage the physical/ mental health of workers
2) Inferior Working Environment
   - Due to improper management of the working site such with muddy ground surface without proper drainage control, no protection guard from hazardous equipment/ deep excavation, smelling of leaked oil/ bitumen/ chemical from storage, soil particle suspended in the air/blown from uncovered stockpile of fine aggregate can cause some discomfort/ displeasure, not only to the workers but also surrounding locals.
3) Air Pollution
   - Due to the operation of heavy equipment and congested traffic caused by the tentative closure of traffic lanes, amount of exhausted gases from them may be increased and number of cases of diseases related to air pollution can be increased in the future, such as lung/ oral cancers etc.
4) Unclean Water
   - Due to the possible increase of water contamination caused by liquid waste effluents from camp into drinking water source, number of case of water transmitted communicable diseases such as Diarrheal or Hepatitis, Typhoid, Dysentery can be increased.
5) Communicable Disease
   - Due to the possible presence of standing water on the ground/ pits in camp or at the site because of improper drainage control, number of cases of Dengue fever through mosquito can be increased

6) Severe Weather

- Due to the high humidity and high temperature, case of heat illness for construction works can be increased.

18. Safety

231. Based on the Environmental, Health and Safety (EHS) Guidelines, the following occupational risks by the construction work are considered:

19. Impacts due to solid waste disposal during construction phase

232. Solid and liquid waste disposal from Construction Workers' Camps and other related facilities (e.g. domestic and other biologically degradable wastes) during the construction phase will produce leachates that demand high amounts of oxygen or undergo anaerobic decomposition. Such wastes can contaminate shallow groundwater, but the conditions will not be long lasting. Seepage from solid waste containing dissolved solids can be attenuated by the soil through precipitation, adsorption and iron exchange mechanisms. Under favorable hydraulic conditions, contaminated seepage (leachate) from solid waste can pass through the unsaturated soil beneath the solid waste deposit and enter to the groundwater causing pollution.

233. However, possibility of pollution of groundwater with potentially harmful substances including petroleum products, chemicals, and oils due to spillages, leaks and disposal of wastewater from storage facilities, and maintenance areas during accidents/natural hazards are low as the water table is of 2.0 m depth from the ground surface and most of the ground surface will be paved and covered by buildings in the project area. However, certain wastewater could dissolve specific minerals in the soil phase and could in turn result in changes in groundwater quality, when surface water infiltrates into the soil layers during wet weather.

- If solid waste, sewage and wastewater generated during the construction phase are disposed in the adjacent canals or stream will block the drainage and cause heavy floods. If untreated sewage is disposed in to these areas where mixing of water does not
- properly take place, dissolved oxygen content in the water will be decreased due to increased eutrophication and high biochemical oxygen demand. This will adversely affect the disease spreading organisms to the surrounding area and also will attract other predators such as stray dogs, cats, crows etc. which will disturb the living condition and the hygiene of the community in the area.

234. **Mitigation Measures**

- Implementation of the Environmental Management and Monitoring Plan and topical sub-plans according to international best practice;
- All the solid waste generated at site and the facility areas including camps, yards and plant operation shall be source separated and collected in the separate bins bags before removing them from the site.
- The collected solid waste shall be finally disposed to a disposal site with prior approval from the related local authority or shall be removed in coordination with the local authority of the related area.
- Solid waste shall not be burnet at open area.
- Solid waste should not have directed to any water course or any open dumping in a haphazard manner.

20. Impacts to Traffic Congestion & Flow

235. Construction within the existing road network would result in short term dispersions to traffic. Construction of the highway project will require a large-scale transport option in order to deliver various kinds of materials and precast structures to the work site and associated construction activities. The following impacts are identified.

236. Existing port access road and the supported road network is usually congested with the workers, employees and goods transportation vehicles of the Sri Lanka Ports Authority. This supplies the main access for the office premises and buildings of the Sri Lanka Ports Authority. The traffic within the existing road will be disturbed by the construction activities of the new road therefore, traffic congestions will get worsen.

237. Highway construction would block traffic lanes, causing traffic congestion and a potential increase in traffic accidents. The construction activities would restrict to access to businesses and road users along the ROW and Local population along the road corridors within the connected road network.

238. There is a potential for increases in road accidents Due to the increase in construction traffic. Construction heavy vehicles may need to use also narrow local roads outside of the main road network. The use of the road network by heavy vehicles can lead to wear and damage of the roadway surface, and pavements as well as the increased Levels of Noise, Vibration and Air Pollution will cause due to such traffic movements. The key determinants of these traffic emissions related impacts are

- Traffic volume,
- Vehicle types,
- Operating speeds as well as proximity to receptors.

239. When considering the alternative traffic routes to overcome the problem of increasing road congestions resulting in lane closures due to the construction activities taking the following factors into account:

240. **Mitigation Measures**

- A Traffic Management Plan will be developed and implemented by the RDA with coordination of SLPA for the construction stage of the project. Moreover, construction works will be conducted in compliance to a schedule prepared by the RDA with coordination of SLPA. As per the schedule, normal construction works will be from 9 pm to 9 am, but works with less disturbance to the daily port activities can be carried out during day time.
- Detailed mitigation measures will be adopted in the project Traffic Management Plan and will include:
    - Strict speed limits;
    - Precautions will be taken by the Contractor to avoid damage to the public;
    - advance warning will be given of any proposed road diversions and closures;
    - drivers of Project vehicles will be trained/briefed about safe driving with respect to other drivers, non-motorized traffic such as pedestrians, cyclists. Clear signs, flagmen and signals will be set up where necessary;
    - all Project vehicles will be regularly maintained;
    - assignmentofheavyvehicleconstructiontraffictosuitablerout

estoandfromtheworking area;

- education on traffic safety will be provided by the safety Officers incorporation with the area traffic police to the site staff and the communities (including the drivers and the people. who use the port access road) not normally subjected to high traffic loads;
- provision shall be given for the continuation of normal traffic during open-cut road crossings; and maintained in good condition.

21. Impacts on relocation of utility

241. The proposed route passes through a congested built up environment at the most areas within a network of various utilities and infrastructure facilities and services such as roads, telecommunication lines, power lines, and various pipelines within the vicinity of the subproject and is likely to have temporary disruption of infrastructure and services during the construction of the proposed flyover.

242. It is recognized the importance of ensuring that disruption to any utility service is avoided, and this will be achieved through final route proofing and which will be carried out Prior to commence the activities and also during the construction of the highway. Where services are identified and cannot be avoided, the path will be re-routed within the proposed road corridor where possible or different structure patterns will be implemented (different types of Piers such as portal piers and center piers).

243. Accordingly, the utilities along the alignment that are operated by public utility companies and authorities have been assessed. Consultation has taken place with all relevant utility companies and authorities to identify the exact locations and the areas where the relevant lines have been laid and the distances. The third-party underground utility supply lines, will also be crossed by establishing construction methods. Thus, short term interruptions of typically a few hours might occur (similar to repair works of ruptures of public water supply lines) and the affected stakeholders and local population will be informed ahead of construction by local announcements accordingly.

244. **Mitigation Measures.** The available utility drawings might have discrepancies with actual layouts. Therefore, an Infrastructure and Utilities Management Plan will be developed by the contractor prior to implementing works along with an action committee in coordination with all the utility organizations and the SLPA and sound communication process shall be maintained. Further, during the utility assessment, due consideration will be given to the situation of settlements and industry close or in the vicinity of the construction camps and pipe yards and other associated facilities to ensure no reduction in services available to local settlements occurs.

- Utility shifting will be undertaken prior to commencing construction of the flyover.
- Keep construction-related disturbances to a minimum
- Consultwithaffectedserviceprovidersregardingimpactsonaccesstoinfrastructurean d services and alternatives
- Consult with affected communities or businesses prior to foreseeable disruptions, for example notifying residents of a temporary interruption of water supply.
- Provide backup or alternative services during construction-related disruptions, for example by providing generators for power supply.
- Provide access points to infrastructure and services.

- Monitor complaints by the public.
- The available utility drawings might have discrepancies.

22. Impacts on socio economic status

245. The proposed construction project is consisting with the components of

- Constructionofapproximately5.27kmofelevatedhighwaybetweenIngurukadejunction and the Chaithya road near Port City.
- Set-up of temporary construction facilities (construction camps, plants and yards, water network and associated infrastructure) along the construction route,
- It is identified that the possible construction impacts may include loss of access and temporary diversions to pedestrian/traffic flows, nuisance (such as noise and vibration) and the visual impact of construction works. The construction phase will lead to temporary pedestrian/traffic diversions, which may decrease foot fall in some areas close to the construction works. And also, the Impacts to infrastructure will occur during highway construction mainly as a result from piling and construction of pile foundations along the existing proposed working strip and other infrastructure and utility lines.

246. Baseline conditions that will be affected by the project activities

- Residents (including elderly, disabled or sick) and the buildings in the commercial areas near the close vicinity of the construction sites (at both sides of the selected route near Blumendal area).
- Utility services and infrastructure (i.e. electricity, piped water, sanitation, telecommunication etc, as well as the existing roads railway tracks)
- Different types of local drainage systems including supply canals, storm water/flood canals under the Road users on roads crossed by the pipeline and near construction sites.
- People come from different areas (other parts of the country) in searching employments at Harbor or for their personal requirements (especially for freight and custom clearings).
- Old structures with Archaeological value.

247. **Mitigation Measures**. The social responsibility of the project contains the commitment to avoid, minimize, mitigate, offset and/or compensate all adverse impacts resulting from project development.

- Community liaison officers will be present at work fronts to ensure that impacts from planned disruptions are minimized and that any unplanned disruptions are properly managed.
- A public complaint resolving mechanism(GRM) to be in places that affected stakeholder concerns are addressed promptly and effectively, using an understandable and transparent process that is culturally appropriate and readily accessible to all segments of the affected
- parties at no cost and without retribution. Access of affected stakeholders to a compensation process in case any unplanned disruption results in loss of livelihoods is also part of that complaint resolving mechanism.
- After the activities are completed, all damage to public or private roads will be repaired and the conditions prior to highway construction will be reinstated in agreement with local authorities and infrastructure owners.
- Precautionary measures will be implemented to minimize impacts on utilities such as documented agreements with utility companies and local authorities and private

owners will be made by contractors prior to construction.

- Engagement with local authorities and utilities companies to ensure continuity of utility supply to communities. Only short term 'planned' disruption to drinking water or electricity services, limited to the extent possible.
- The Project will work with local utilities companies to ensure coordinated and rapid response to unplanned events such as damage to electric lines and waterpipes.

23. Visual impacts

248. Aesthetics refer to the visual quality of an area as imparted by the physical properties of an area, such as scale, color, texture, landform, level of enclosure, and in particular, the land use occurring within an area. Landscape character refers to an area's natural attraction and is not only dependent on its visual quality, but rather on its specific situation as determined by the following: its level of accessibility or remoteness, level of naturalness, lack of disturbance, current and potential use, rarity, cultural or historic importance, and potential value to people.

249. The landscape character determines the extent of visual compatibility of the road development with its immediate surroundings. Impacts are not restricted to the road reserve, but the entire viewshed (area from where the road development will be visible). The spirit, or sense of place, can be defined as the extent to which a person can recognize or recall a place as being distinct from other places and as having a vivid, unique, or at least a recognizable character. It is indicating the intrinsic value that a community places on the aesthetic, therapeutic, or emotional qualities and character of an area. Aesthetics, landscape character, and sense of place are all subjective concepts that are often influenced by individuals' perceptions.

250. **Mitigation Measures.** The proposed project is considered to be compatible with the surrounding landscape and is not likely to impact negatively the existing visual quality or landscape character of the area; rather, it is expected to improve the general environment through improved use of the area. The subproject will be similar in construction and design to existing roads and bridges in the area. There will be some additional urban design features (e.g. lighting) to enhance the aesthetics of the structure and its placement in the area.

251. Compatible with the proposed projects of the area under the Mega Polis development plan of central Business District & Inner Core Area it has been proposed to develop the area along the Beira lake as one of the main land mark in Colombo down town including entertainment district at either side of the Beira Lake, Cruise Center at the Old Port linking the new shopping district and also Fort heritage district and the Pettah Bazar district. Aesthetics, landscape character, and sense of place or area will be more attractive and therapeutic with the green connectors that will allow pedestrians to move seamlessly between the Beira Lake, Cruise Center, Pettah, Fort, Galle Face and the Port City.

252. Therefore, the temporarily and short term visual impacts are anticipated during construction phase, but the operation phase will be positively impact by improving the aestheticandpleasingvisualeffectoftheprojectareaduetothenewelevatedhighway and also by reducing existing traffic in the area.

24. Impacts on Biological Environment

253. There will be minimum significant impact associated with the Baseline Road and Port Access Road elevated highway as the area has no ecological sensitive areas. The aquatic water ways (streams/ canals) in the areas are already polluted and the water quality data of Chapter 3

reveals the condition in quantitatively. Therefore, no any anticipated significant impact on the species living in the habitats. Few areas identified as the trees required to be removed. Please refer annexure 16 for action plan.

254. **Mitigation Measures.** Further it is recommended to implement the tree planting program to replant the native species along the road sides and where it is suitable. Contractor shall be responsible to submit an action plan on his program and schedule of re planting trees and the monitoring including permitted locations for planting tree for prior approval of the RDA as well as the SLPA. A general guideline for replanting activity is attached in the Annexure (16). Number of trees to be replanted is 3 times of the total number of trees removed. The number of trees related to each species is listed below.

▪ Banian (Nuga) Trees	4
▪ Accasia	34
▪ Coconut	6
▪ King Coconut	4
▪ Mango	1
▪ Kottan	2
▪ Araliya (floral)	1
▪ Mix (small saplings)	18
Total No of Trees	70

25. Impacts due to shifting/closure of rail track

255. Proposed new road crosses the existing railway line which has been used for the transportation of goods from the Colombo port. Due to proposed construction, approximately 600m lengthier section of railway track located intermitted from 2+000 to 4+420 will have to be shifted without disturbing railway transportation within the particular section of the railway.

256. **Mitigation measures.** RDA shall have a proper coordination with the Department of Railway and shall acknowledge the DOR about the proposed development. Prior consent shall be obtained from the DOR for the construction activities. Further RDA shall prepare a schedule with the DOR to shift the railway lines using a minimum time period, without disturbing the locomotive movements of the Railway.

B. Potential Impact and their Mitigation during Operation

1. Impact on Air quality/dust

257. In addition to emissions from vehicle exhaust, road dust kicked up by vehicles can also have major impacts on roadside air quality. However, this would be much significant in the case of unpaved roads in less-developed regions, thus not considerable in the proposed elevated highway.

258. Air pollutants can be inhaled directly from the air, or ingested from touching surfaces or objects where pollutants have settled. Air pollution may increase over time due to gradual increases in traffic volumes on the road. The impacts of air quality on sensitive receptors may improve as a result of the subproject, since there will be a separation of traffic through the area.

259. **Mitigation Measures**

- Ensure compliance with emission standards applicable to the area through which

the road is aligned.

- Enforce speed limits and regulate roadworthiness of vehicles during operation of the road.
- Monitoring of air pollution levels in potential problem areas will be undertake

2. Impact due to Noise and vibration

260. Vehicle movement produces noises that have impact on roadside users. The extent of noise depends upon traffic flow, road condition, speed of vehicle, use of horn etc. Slow movement of vehicles and specifically driving on first gear cause higher noise level. Traffic congestion and pedestrian interferences increase the use of horns. The higher vehicle speed, free traffic flow can reduce the noise level after widening of the road. Therefore, it can be concluded that the elevated highway of Port Access road is a little contribution to increase the noises. Noise pollution caused by existing road traffic, and additional traffic with the new flyover. Expected increase in noise due to increased traffic is not expected to impact significantly on the current ambient noise levels.

261. Mitigation measures. Vibrations are much less likely to because of disturbance than noise levels, but they may become a problem when vehicles, especially heavy vehicles, travel over irregular road surfaces in close proximity to Such increasing noise levels caused by the elevated highway can be controlled by implementation of following measures:-

- Encourage vehicles to travel at a constant, efficient cruising speed.
- Ensure appropriate road surface design and regular maintenance to minimize frictional road noise and vibrations, especially for heavily used roads near sensitive receptors.
- Regulate roadworthiness of vehicles. Monitor noise levels in potential problem areas.
- Noise barriers to be installed at around sensitive areas such as religious structures, Residential high-rise buildings, schools and work places, hospitals etc.
- Advance vehicle technology and good maintenance will be reduced the noise& vibration levels.

3. Impacts on surface drainage

262. As the proposed alignment of the elevated expressway follows almost the existing port access Road which is on high ground and the catchment area intercepted by the expressway is relatively small it will not have a significant impact on the drainage pattern of the area. Drainage water collected on the elevated highway surface will irregularly fall on ground at various places. After the construction completion, the highway structures will be facilitated with proper drainage system including with the;

- Rainwater precipitated on the elevated road surface between two pier supports spaced at 40.0 m in general is collected by longitudinal pipes designed to cater for this flow.
- Flows from the two Nos. longitudinal pipes from both sides of the road are directed to a vertical pipe and a man-hole located at the pier support.
- Flowintothisman-holeshallbedischargedtotheexistingdrainagesystemappropriately through pipes laid under the pavement of the existing roadway with the provision of man-holes.

4. Impacts during Floods and Blockage of Drainage Pathways

263. There are many underground drains in Port Access Road leading to the main outfall inside

the port. These drains also will get similarly intercepted by the columns of the Elevated Highway. The columns of the Elevated Highway may have to be located within stream sections, such columns could hinder flood flow and it could create a marginal backwater impact on the canal system. Various construction items such as concrete beams, material stockpiles if stored in flood prone areas could aggravate flooding as it will block flood flows.

264. Care shall be taken to avoid these impacts while designing the road columns with necessary precautions.

VI. CLIMATE CHANGE IMPACTS AND RISKS

A. Climate Change Mitigation

265. It is expected that the Green House Gas (GHG) emissions will be reduced by the increase in overall network performance in terms of improvement in travel times/speeds due to the use of elevated highway. The chapter 8 of the traffic survey report done for the Port Access Elevated highway reveals that the 79% of current traffic is willing to use the proposed elevated highway link, who are currently using the urban network of roads to reach the Colombo North Area. The current ADT who expressed to divert to this link is estimated to be 46,450 vehicles. Considering the current average length trip of network 16km's may reduce to 5.2 km at lower volume capacity ratio, which implies less congestion cost. There is savings in fuel consumption and 1:3 reduction of noise pollution. The reduction is 501,660vkm from the network at the opening year of traffic 2020.

266. Hence, it can be seen that all these savings are possible due to the elevated highway. This save 26.157 million liters of fuel which reduces the metric tons of following pollutants at base year 2020, which is the year of opening for traffic {1}. Table 43 shows the base year emission reduction as a result of proposed Port Access Elevated Highway.

Table 43: Emission reduction in '000 MT 2020

Vehicle type	CO	HC	NO_x	PPM
Dual Purpose /vans (Diesel)	31,128	46,485	77,836	95,215
Trucks (Diesel)	21,973	51,691	196,136	140,992
Three wheelers (petrol)	509,034	1,344,180	59,443	446,778
Busses (Diesel)	25,635	71,333	336,669	91,553
Cars (Petrol)	254,517	129,298	121,531	51,270
Motor Cycles (Petrol)	1,334,842	981,448	59,443	386,353
Cars (Diesel)	346,070	111,244	180,273	62,256
Dual purpose/ Vans (petrol)	104,370	65,827	78,250	86,060

HC = Hydrocarbon - in PPM
Nox = in PPM
CO = Carbon Monoxide-PPM PM = PPM
{1}. *Base pollution factors used from the Clean Air Asia and UNEP study, 2016*

267. Clean Air Asia was established by the Asian Development Bank, World Bank and USAID in 2001 to promote better air quality and livable cities by translating knowledge to policies and actions that reduce air pollution and greenhouse gas emissions from transport, energy and other sectors.

B. Climate Change Adaptation

1. Background

268. In terms of road infrastructure, there is no denying the fact that Sri Lanka has already in the past dealt with extreme events that has caused interruptions, economic losses and loss of lives, whether stemming from natural hazards or human impacts. However, climate change is occurring throughout the world and some of the observed changes have established records in recent years. If such impacts are not anticipated in future transport infrastructure design and maintenance, those changing weather conditions could, in some regions of Sri Lanka, accelerate their deterioration, increase severe damages risks, traffic interruption and accidents which could,

on their turn, affect economic activities.

269. The Climate Risk and Vulnerability Assessment (CRVA) aims to document risks associated with climate change vulnerability with the objective of highlighting the perceived negative impacts under an uncertain future climate and the adaptation responses made in the design of the highway. Such a risk assessment approach is particularly vital for infrastructure systems and components that have long service lives such as this elevated road project.

270. The baseline study[1] conducted around the proposed project shows the project corridor to be located along the most economical path utilizing the existing developed low lands of more or less plain to undulating terrain (first pen plain as is called and where the maximum elevation is about 15 m amsl). The general land use along the project corridor is commercial inter-mixed with residential neighborhoods; some 80% of the project corridor comprise of built-up areas. The baseline study informs that floods are the most common hazardous experience caused by heavy rain received during the two monsoon seasons in Sri Lanka. It notes that increased intensity of rainfall due to climate change is expected to increase the propensity for flooding with prolonged and heavy rains in the region. In terms of over-bank flooding by the Kelani River that flows through Colombo, the study reports of no such incidence in the project area as being situated a considerable distance from the flood hazard zone of the said river. However, the west coastal regions of Sri Lanka wherein the project area lies are generally prone to tropical storms, the associated storm surges and coastal erosion and the envisaged climate change is expected to intensify storm surges and inland flooding under sea level rise.

2. Appraisal of Climate Change Risks based on Review of Literature

271. Sri Lanka has a tropical maritime climate with two monsoon seasons. Mean annual temperature reached 27°C in the lowlands and 15°C in the central highlands. Rainfall varies considerably, which ranged from 1,000 mm in the northwestern and southwestern lowlands, and the highest, at 5,000 mm, occur in the central highlands.

272. The National Adaptation Plan for Climate Change Impacts for Sri Lanka for 2016 - 2025 (2016) adopted three modelling approaches to project climate change in Sri Lanka – general circulation models (GCM), regional climatic models (RCM) and statistically downscaled GCM models. The general consensus of these models includes (i) mean annual temperature will increase by more than 3°C; (ii) increased precipitation by 2050; (iii) increased precipitation extremes related to monsoons; and (iv) warmer ocean.

273. Regional climate model projections likewise indicate consistent increases in both temperature and precipitation for Sri Lanka. The model predicts an increase of about 2.0°C–3.0°C by the end of the 21st century. This is consistent with the increase of about 0.0272 °C per year in Hambantota from 1961-1990[2]. Likewise, in terms of precipitation, the model predicts an increase in precipitation of of 3.6%–11.0% in 2030, 15.8%–25% in 2050, and 31.3%–39.6% in 2080.

274. Although there were only 11 cyclonic storms and 8 severe storms that crossed Sri Lanka from 1881-2011, the country faces highly destructive wind actions during the North Indian cyclone season and the monsoon seasons annually. Because of the small size of the island, most of its

[1] Initial Environmental Examination, Sri Lanka: SASEC Port Access Elevated Highway, April, 2018.
[2] Vulnerability to climate change: Adaptation Strategies and Layers of Resilience, Research Program, The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, funded by ADB, February 2013.

parts and in particular the western coastline falls into danger of impacts by adverse effects of cyclones, and corresponding storm surges.

275. Rising sea levels are very likely to have major impacts on coastal and low-lying communities in Sri Lanka as SLR scenarios for Sri Lanka suggest a shoreline retreat of about 10m by 2050. At the moment, the most conservative climate change scenarios predict a rise in sea level of 40cm by the end of this century.

276. Based on the CRVA, key climate change risks identified were: i) increase in temperature; ii) increased frequency and intensity of rainfall and related flooding triggered by precipitation; and iii) storm surge.

3. Climate Change Adaptation Considerations in the Design of PAEH

277. The following measures have been incorporated in the design of SASEC Port Access Elevated Highway in consideration of the identified climate risks:

1. Increase in pier height and volume from standard of 5.2 m from ground level to minimum of 10 m;
2. Increase in ramp length because of higher clearance of the main line; and
3. Construction of new canals to help drain water from increasing rainfall levels at the ground level port access road.

278. The total cost of climate adaptation measures for SASEC Port Access Elevated Highway is $7.65 million, representing 2.55% of ADB's financing ($300 million) and 2.13% of total project cost of $ 360.0 million.

Adaptation components	Total Adaptation Cost ($ million)
Pier	3.83
Ramp	3.34
Canal	0.48
Total	7.65

Details of Adaptation for Pier Component	Total Adaptation Cost ($ million)	Percentage
Additional concrete	1.42	37
Steel reinforcement	0.86	23
Prestressing with strand tendons	0.68	18
Formwork	0.52	13
Pier launching	0.34	9
Total	3.83	100

VII. PUBLIC CONSULTATION & INFORMATION DISCLOSURE

279. Consultation, participation and disclosure will ensure information is provided and feedback on proposed project design as early as during the project preparation phase, so that views, preferences of stakeholders including potential beneficiaries and affected people can be adequately considered in the project design, and continue at each stage of project preparation, processing, and implementation. It will also provide adequate opportunities for consultation/participation to all stakeholders in the project process. Relevant information about any major changes to project scope shall be shared with beneficiaries, affected persons, vulnerable groups, and other stakeholders.

280. The public participation process included

(i) identifying interested and affected parties(stakeholders);
(ii) informing and providing the stakeholders with sufficient background and technical information regarding the proposed development;
(iii) creating opportunities and mechanisms whereby they can participate and raise their viewpoints (issues, comments, and concerns) with regard to the proposed development;
(iv) giving the stakeholders feedback on process findings and recommendations; and
(v) ensuring compliance to process requirements with regards to the environmental and related legislation.

A. Consultation of Potential Interested and Affected Parties.

281. Different techniques of consultation with stakeholders had been used during the feasibility study stage of the project (interviews, public meetings, group discussions, etc.). Apart from that, a series of public consultation meetings were conducted in corporation with the officials such as Grama Neladharis (GN) of the related GN divisions and the representative groups and the community leaders of general public of the area during the subproject preparation and detail designing. Various matters (consultation through ad hoc discussions onsite) were discussed including the impacts which can be created due to the construction activities of the subproject and involve the community in explaining their ideas on identifying the social requirements and the applicable measures to be considered and applied to the subproject design and mitigation measures.

282. Consultation, participation, and disclosure will ensure that information is provided and feedback on proposed project design is sought early, right from the project preparation phase ,so that the views /preferences of stakeholders including potential beneficiaries and affected people can be adequately considered in project design, and continue at each stage of project preparation, processing, and implementation.

283. Affected persons (APs) will be consulted at various stages in the project cycle to ensure:
(i) incorporation of views/concerns of APs on compensation/resettlement assistance and environmental impacts and mitigation measures;
(ii) inclusion of vulnerable groups in project benefits;
(iii) identification of help required by APs during rehabilitation, if any; and
(iv) avoidance of potential conflicts for smooth project implementation. It will also provide adequate opportunities for consultation and participation to all stakeholders and inclusion of the poor, vulnerable, marginalized, and project-

affected persons in the project process. Relevant information about any major changes to project scope will be shared with beneficiaries, affected persons, vulnerable groups, and other stakeholders.

284. Focus group discussions (FGD) were held with affected persons and other stakeholders to hear their views and concerns, in order to address in subproject design wherever necessary. Since the area is very much a lined with the activities of SLPA, the customs and their security functioning regular updates on the environmental component of the subproject was done in coordination with the PMU office of RDA.

285. Since the total length of the project corridor is only 5.27 km only, and most of the area traverses along the existing port access road which runs through the highly buildup area of SLPA premises, mass information dissemination about the consultations were not necessary. However, the interested and affected parties were further identified during the course of this Initial Environmental Examination. Key methods employed included individual interviews, field level observations, community consultations and discussions, and interviews through a pre-drafted interview schedule. Key respondents included project-affected persons and stakeholders of the project area in addition to a number of informal consultations conducted regularly in the project corridor.

286. Katahira and Engineers with the project consultants conducted information dissemination sessions at Divisional Secretariat of Colombo (DSC) with covering all six GN divisions and solicit the help of the local community leaders and prominent citizens to encourage the participation of the people to discuss various environmental issues.

287. A total of 34 interested and affected people, selected on a stratified basis to ensure diversified representation, were formally interviewed with the help of an interview scheduleon17 May 2017. Issues discussed and feedback received along with details of date, time, location, and list of participants are given in Appendix13. Since no people are directly impacted by the sub project, on issues relating to their compensation entitlements and rehabilitation, focused group discussions were organized. Minutes of meetings conducted on 15May 2017,17 May2017, with lists of participants are given in Appendix 13.

288. The issues raised by community members and other stakeholders can been broadly categorized into the following areas.

B. Loss of livelihoods and compensations.

289. Impacts to land-based livelihoods and the compensation that landowners might receive were a key area of concern. Issues such as depreciation of land and restrictions to building were raised. Many participants were also concerned about fair compensation in highly productive areas and expressed their previous experiences with land compensation from other major infrastructure projects.

C. Other impacts and their management.

290. There was a discussion regarding the management of potential impacts and a number of questions were raised in this regard. Examples include, disruption to access routes, land reinstatement, soil quality, water discharge, potential contamination of water resources, noise and disturbance, interaction with local development areas and the cultural heritage.

D. Project benefits

291. Many stakeholders asked questions regarding benefits that they might receive from the Project, in particular they expressed a wish that a percentage of the budget that transferred directly to the local community as a community investment by the project.

E. Employment

292. Given the current economic climate in Sri Lanka, many stakeholders were interested in job opportunities available to the local community.

F. Government Role

293. A small percentage of stakeholders expressed concern about the capacity of the government to regulate the Project effectively to ensure that standards are upheld and that the employment process is transparent. Stakeholders were also interested in how revenues levied from the Project would be shared at the local level. Communication with interested and affected parties (I&APs) was by telephone and direct discussion, in order to obtain the necessary background information to compile this report.

G. Consultation during Construction

294. During EMP implementation, Contractor, Engineer, and PMU shall organize public meetings and will apprise the communities on the progress on the implementation of EMP in the subproject works. Smaller-scale meetings will be held to discuss and plan construction work with utility organizations identified related to the total project area to reduce disturbance and other impacts, and to provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation.

H. Disclosure of information

295. A communications strategy is of vital importance in terms of accommodating traffic during road closure. Local communities shall be continuously consulted regarding location of construction camps, access and hauling routes, and other likely disturbances during construction. The road closure, together with the proposed detours, will be communicated via road signage. Public disclosure meetings at key project stages will inform the public of progress and future plans.

296. The public consultation and disclosure program will remain a continuous process throughout the subproject implementation, and shall include the following steps,

(i). Consultation during detailed design:

- Focus-group discussions with local public and other stakeholders (including women's groups, NGOs and community-based organizations) to hear their views and concerns, so that these can be addressed in subproject design when necessary; and
- Structured consultation meetings with the institutional stakeholders (government and private utility organizations, SLPA, customs security, Archaeology department and other related organizations) to discuss and approve key aspects of the project;

(jj) Consultation during construction:

- Public meetings to discuss and plan work programs and allow issues to be raised and addressed once construction has started; and
- Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation;

(iii) Project disclosure:

- Public disclosure meetings in coordination with the relevant officers of the Divisional Secretariat at key project stages will inform the public of progress and future plans.
- Formal disclosure of Electronic versions of the completed IEE report approved by ADB will be on the official websites of the ERA and of ADB.
- The PIU will issue notification on the starting date of the subproject in the locality. The notice will be issued by the PIU in local newspapers one month ahead of the implementation work. Copies of the IEE will be kept in the PMU/PIU office, and will be distributed to any person willing to consult the IEE.

297. For category B: Disclosure based on ADB requirements, the following will be posted on ADB website:

(i) this IEE upon receipt;
(ii) new or updated IEE;
(iii) corrective action plan prepared during Project implementation to address unanticipated environmental impacts and to resolve non-compliance to EMP provisions; and
(iv) Environmental monitoring reports, upon receipt.

VIII. GRIEVANCE REDRESS MECHANISMS

298. A project-specific grievance redress mechanism (GRM) will be established to receive, evaluate, and facilitate the resolution of AP's concerns, complaints, and grievances about the social and environmental performance at the level of the project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project.

299. Therefore, an efficient grievance redress mechanism will be kept in place to assist the affected persons in resolving queries and complaints. The grievance redress mechanism will follow the following approach:

A. Grievance Redress Process

300. Grievances from the affected people on social and environmental issues during project implementation will be addressed mainly through the existing local administrative system. Depending on the nature and significance of the grievances or complaints, grievances will be addressed at three levels. The first will be at the grass roots level where complaints will be directly received and addressed by the contractor, PMU representative on site. Grievances which are simple but still cannot be addressed at the grass roots level will be addressed at the Divisional Secretariat (DS) level. More complex grievances which cannot be addressed at the GN level will be addressed at the District Secretariat(DS)level. There will be a Grievance Redress Committee (GRC) at the GN and DS levels.

B. Composition of GRC and PSC

301. The Grievance Redress Committee (GRC) for the project will have the following as members:

1. DS level GRC members will be

1)	Divisional Secretary of the area	Chairman
2)	Representative of PMU	Secretary
3)	Representative from SLPA	Member
4)	Representative of Supervision Consultant	Member
5)	Representative of Contractor	Member
6)	Representative of NGO/Social Organization/CBO	Member
7)	A Community member/Religious Leader	Member
8)	Woman Representative from the local community	Member

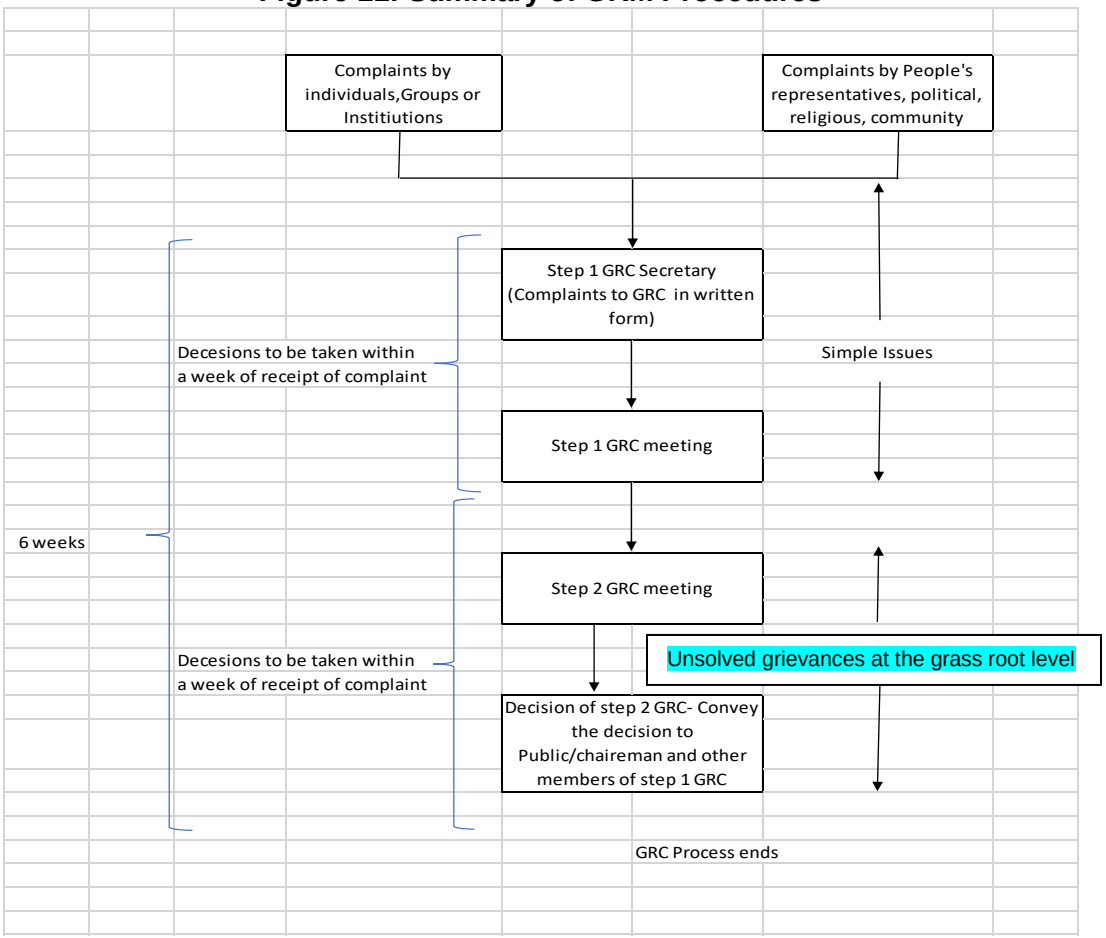
2. District Level GRC members will be:

1)	District Secretary of the area	Chairman
2)	Representative of the PMU	Member
3)	Representative of the SLPA	Member
4)	Representative of the supervision consultant	Member
5)	Representative of the contractor	Member
6)	A community member/Religious leader	Member
7)	Representative from CBO/NGO	Member
8)	Women Representative from the community	Member.

302. To make the GRM process gender responsive the GRC will include one-woman member to represent the local community women. Further when grievances or complaints are submitted to the GRC, both women and men complainants will be treated equally and necessary measures will be taken to address the grievance in the best way possible.

303. Recommended steps with timeline on the operation of the GRM is provided in Figure 8. Road Development Authority (RDA) which is functioning under the Ministry of Highways and Road Development is the main agency authorized to manage and maintain all Highways and Expressways in Sri Lanka. RDA is facilitating the present Elevated Highway project through the Project Management Unit (PMU) created especially for the purpose. Presently, PMU is equipped with experienced manpower to perform effectively and efficiently in facilitating the completion of detail design for the project. Environmental and Social Development Division (ESDD) is the environmental and social monitoring arm of the RDA. Main role of the ESDD is to ensure compliance for environmental and social safeguard policies and regulation in project implementation process. A Director and a Deputy Director are monitoring and guiding the facilitative as well as management function of the ESDD. The ESDD facilitate the preparation of Environmental and Social safeguard reports to ensure the compliance with the safeguard regulations and policies in implementation of development projects. ESDD has been strengthened with 8 Environmental Safeguard officers and 16 Social Safeguard officers to fulfill the responsibilities in an effective manner.

Figure 11: Summary of GRM Procedures



Note: Step 1 and 2 of the above figure denote the level 1 and level 2 of GRM respectively

304. Records will be kept by the PMU of all grievances received including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were affected and final outcome. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the offices of the PMU, Divisional Secretariat and web, as well as reported in monitoring reports submitted to ADB on annual basis.

305. Under the GRM, project affected people may resort to legal redress at any stage and the legal redress can run parallel to the GRM. Project-affected people can also submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-financed projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures

IX. INSTITUTIONAL ARRANGEMENT & ENVIRONMENTAL MANAGEMENT PLAN

306. Environmental Management Plan (EMP) will guide the environmentally sound construction of the subproject and ensure efficient lines of communication between the supervision consultant (engineer), contractors, and PMU/RDA. The EMP identifies the three phases of development as site establishment and preliminary activities, construction phase and post- construction/operational phase.

307. The purpose of the EMP is to ensure that the activities are undertaken in a responsible, non- detrimental manner with the objectives of providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on site by taking all measures and precautions to avoid any nuisance or disturbance arising from the execution of the Work. This shall include, all the necessary implementation of findings and recommendations of the environmental assessment conducted for the subproject detailing specific actions deemed necessary to assist in mitigating the environmental impact of the subproject while ensuring that safety recommendations are complied with.

308. Accordingly, the Contractor shall take all necessary measures and precautions and other wise ensure that the execution of the Works and all associated operations on the Work Sites or off- site are carried out in conformity with statutory and regulatory environmental requirements of GOSL including those established by local government authorities. The Contractor will also be required to compensate for any damage, loss, spoilage, or disturbance of the properties and health of the project affected people during construction that is within his control and responsibility. A copy of the EMP must be kept at site during the construction period at all times.

309. The EMP and the Environmental Monitoring Plan (EMoP) should necessarily form part of the Bid Documents and should be taken into consideration along with the specifications. The mitigation measures indicated in the EMP should be made mandatory and contractually binding on the contractors/s. While the contractor will be primarily responsible for implementation of the EMP, sub-contractors should also be made aware of the requirements in the EMP. The EMP will be made binding on all contractors operating on the site and will be included in the contractual clauses.

310. Noncompliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance. In conformance with these Specifications of which the environmental provisions are a part, the Employer reserves the right to withhold payments and/or stop construction in the event of serious or repeated violations of the conditions stipulated herein. If the provisions of the approved environmental plan are not followed, the Supervising Consultant may interrupt the Contractor's work and refuse to allow the resumption of work until full compliance with the requirements of the EMoP has been achieved.

A. Responsibilities for Implementation of EMP.

311. During the bidding process, contractors are expected to take into consideration the requirements in the EMP during the construction stage. The measures included in the EMP are an integral part of the construction process and the cost of implementation of the measures should be taken into account during Bid preparation. The cost of implementation of the mitigation measures suggested in the EMP should therefore be included under each item of work.

B. Environmental Management Action Plan (EMAP)

312. The contractor will prepare Environmental Management Action Plan (EMAP) based on the EMP and the EMoP. The Environmental Management Action Plan provides the framework for the implementation of the mitigating measures and the specific management plan for the environmental and social impacts during the Pre-construction and construction phases of the proposed project. The project management Unit (PMU) of the RDA and the contractor will execute the EMP with proper planning, coordinating and management of all recommended environmental protection measures and activities in accordance with the contract.

313. The contractor should maintain records of the progress of implementation of the measures suggested in the EMP. A dedicated Environmental specialist, a technical officer and a social compliance officer should be available with the contractor in order to ensure the timely and proper implementation of the EMP and the EM0P. The contractor should regularly report progress on implementation of the EMP to the RDA and also immediately rectify any shortcomings in implementation of the EMP as informed to him by the RDA.

314. The RDA should require the contractor to report on a regular basis the status of implementation of theEMPandshouldverifycompliancethroughregularinspections.Therefore, the contractor will,

- Carryout compliance monitoring,
- Day-Today inspection on compliance of mitigation measures,
- Public complaint resolving actions,
- Prepare environmental monitoring reports.

C. Institutional Arrangement

315. Road Development Authority which is functioning under the Ministry of Highways and Road Development is the main agency authorized to manage and maintain all Highways and Expressways in Sri Lanka. The Road Development Authority is performing this responsibility since 1983, It has performed successfully in planning and constructing and operating expressways, including Southern Highway and widening and improving all the A and B grade roads in the country. RDA is facilitating the present Elevated Highway project through the Project Management Unit(PMU) created especially for the purpose.

316. Present PMU is equipped with experienced manpower to perform effectively and efficiently in facilitating the completion of the project.

317. Environmental and Social Development Division (ESDD) has been stabilized as the environmental and social monitoring arm of the RDA. Main role of the ESDD is to ensure the compliancy for environmental and social safe guard policies and regulation in project implementation process. A Director and a Deputy Director are monitoring and guiding the facilitative as well as management function of the ESDD. The ESDD facilitate the preparation of Environmental and Social Safe Guard reports to ensure the compliance with the safe guard regulations and policies in implementation of development projects. ESDD has been strengthen with 8 environmental Safe Guard officers and 16 Social Safe Guard officers to full fill the responsibilities in an effective manner.

318. Following functionaries will be involved in the implementation of EMP:

- PMU of RDA;
- Environmental Specialist (ES) of Supervision Consultant(SC);
- Environmental Specialist of Contractor.

319. The duties/responsibilities of the functionaries are discussed below:

320. The Environmental and Social Development Division(ESDD) of RDA with the PMU will monitor the implementation of environmental compliance with the assistance of the engineer (SC) and the contractor. The PMU of the RDA has a role of supervising each and every construction activities and their implementation procedures in terms of the management of environmental and social impacts.

321. RDA shall be responsible for ensuring compliance to environmental requirements of the ADB as well as governments, and reporting the same to ADB. The supervision and implementation of the EMP shall be the responsibility of the Supervision Consultants with RDA as monitoring agency. All the statutory environmental clearances (at national, state, and local levels) if required (by RDA or by the civil works contractor) for the implementation of the subproject would be obtained incompliance with the national, provincial and local laws and regulations and in accordance with ADB's environmental policy and guidelines.

322. RDA (PMU and ESDD):

(i) complies with all applicable legislation and is conversant with the requirements of the EMP;
(ii) assesses all activities requiring special attention as specified and/or requested by the engineer and/or safeguards unit of RDA for the duration of the contract;
(iii) ensures that the contractor conducts all activities in a manner that minimizes disturbance to directly affected residents and the public in general, as advised by the engineer and/or safeguards unit of RDA; and
(iv) may, on the recommendation of the engineer and/or safeguards unit of RDA, through the executing agency, order the contractor to suspend any or all works onsite if the contractor or his subcontractor/supplier fails to comply with the said environmental specifications.

323. Supervision Consultant(SC):

(i) Environment Specialist under SC is responsible for full time monitoring the implementation of EMP on site and recommends requisite measures in case of noncompliance with RDA; and
(ii) complies with all applicable legislation and is conversant with the requirements of the EMP;
(iii) arranges information meetings for and consults with interested and affected parties about the impending construction activities;
(iv) Maintains a register of complaints and queries by members of the public at the site office. This register is forwarded to the project director of the PMU on a weekly basis;
(v) enforces and monitors compliance with the requirements of the EMP onsite;
(vi) assesses the contractor's environmental performance in consultation with the environmental specialist of SC; and
(vii) Documents, in conjunction with the contractor the state of the site prior to commencing construction activities.

324. The Contractor:

(i) Complies with all applicable legislation, is conversant with the requirements of the EMP, and briefs staff about the requirements of same;
(ii) Ensuresanysubcontractors/supplierswhoareutilizedwithinthecontextofthe

contract comply with the environmental requirements of the EMP. The contractor will be held responsible for noncompliance on their behalf

(iii) supplies method statements for all activities requiring special attention as specified and/or requested by the engineer or environmental expert (of engineer) for duration of the contract;
(iv) provides environmental awareness training to staff;
(v) bears the costs of any damages/compensation resulting from non-adherence to the EMP or written site instructions;
(vi) conducts all activities in a manner that minimizes disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment;
(vii) ensures that the engineer is informed in a timely manner of any foreseeable activities that will require input from the environmental expert (of engineer);
(viii) Appoints one full-time environmental safeguard officer for implementation of EMP, community liaison, reporting, and grievance redress on a day-to-day basis.
(ix) Receives complaints/grievances from the public, immediately implements the remedial measures, and reports to the engineer (DSC) within 48hours.

D. Reporting Procedures

325. Environmental Specialist (ES) of the contractor shall prepare and submit the environmental compliance monthly report as a chapter of the report of total project progress and the report analyzing the status of environmental management compliance of the project bi-annually to the Supervision Consultant (SC). ES of SC after reviewing, the contractor's monthly and bi- annual reports will submit to the project coordinator PMU, RDA. The project coordinator will submit the reports to ESD/RDA and ADB. PMU/RDA shall inform the ADB on any major environmental issues at any time, independently from the schedule of regular reporting. After project completion, PMU/RDA will be in charge of the operation of the project and is responsible for compliance of monitoring plan during operation. At the completion of the project, ES of SC will prepare the project completion report based on the periodical progress reports and will submit it to the RDA.

326. Feedback and adjustment will be carried out in two tiers. Upon request for EMP modification by the Contractor, PMU/RDA will review the proposals in detail and consider their acceptance or rejection. Only those modifications will be considered, which do not contradict to the Conditions in the Environmental Recommendation (ER) issued by the Central Environmental Authority and will consider comments and suggestions from SC and ADB. Appropriate responses and revisions in the EMP will be implemented, if necessary. The contractor and the PMU/RDA will then implement the modifications.

E. Communications with Sub-Contractors

327. The Plan shall specify the means by which environmental management, health, safety and traffic control matters and requirements will be communicated to Subcontractors at all levels and their due compliance with the conditions of applicable clearances and license and all relevant statutory regulations is ensured. Subcontractors shall be supplied with copies of the said licenses and clearances and the method by which the procedures and practices proposed by subcontractors will be reviewed for compliance. Additional activities may include attendance at training programs, circulation of newsletters and other means as specified by the Plan. This could

include, for example, the inclusion of environmental and safety criteria as a part of daily and/or weekly Site inspections.

F. Capacity Building and awareness

328. Training and orientation programs shall be organized by the environmental experts of engineer (SC), and RDA for the contractors, laborers, and technical and office staff of the contractors, site engineers, and the relevant staff of the PMU for building their capacity with regards to principles and procedures of environmental management, pollution abatement measures, public consultation and participation, health and safety measures, grievance redress mechanism, and implementation of EMP.

G. Site Specific Environmental Management Plan

329. Table 27 of Annexure (7) summarizes anticipated environment impacts and mitigation measures during Pre-Construction, Construction and Operation phases.

330. Standards and Regulations to be complied with the Contractor/Sub Contractors and Project Proponent (RDA) during Project Construction and Operational Stage

- National Environmental (Noise Control) Regulations Gazette No 924/12 of 23.05.1996
- Hazardous Waste Management Regulation Gazette No 924/13 dated 23.05.1996 and its subsequent amendment by the CEA under the National Environmental Act
- National Environmental (Protection & Quality) Regulations (EPL) Gazette No 595/16 dated 02.02,1990 and its subsequent amendment in 2000.
- Vehicle Emission Control Regulations-Gazette numbers 817/6 of03.05.1994,
- National Environmental (Air Emissions, Fuel & Vehicle Importation standards) Regulations 2000, Gazette no 1137/35 of23.06.2000
- National Environmental (Air Emissions, Fuel & Vehicle Importation standards) Amended Regulations, Gazette no 1295/11 of 30.06.2003
- Guidelines for the limits of Noise and vibration standards that was recommended by the CEA please Refer to Annexure (15)

H. Environmental monitoring plan

331. The objectives of the monitoring are to

- monitor changes in the environment during various stages of the project life cycle with respect to baseline conditions; and
- Manage environmental issues arising from construction works through closely monitoring the environmental compliances.
- A monitoring mechanism is developed for each identified impact and it includes:
- Location of the monitoring (near the project activity, sensitive receptors or within the project influence area).
- Means of monitoring, i.e. parameters of monitoring and methods of monitoring (visual inspection, consultations, interviews, surveys, field measurements, or sampling and analysis)
- Frequency of monitoring (daily, weekly, monthly, seasonally, annually or during implementation of a particular activity)

332. The monitoring program will also include regular monitoring of construction activities for their compliance with the environmental requirements as per relevant standards, specifications

and EMP. The environmental parameters that may be qualitatively and quantitatively measured and compared are selected as 'Baseline indicators' and recommended for monitoring during project implementation and operation stages. These monitoring indicators will be continuously monitored to ensure compliance with the national standards and comparison with the baseline conditions established during design stage. The specific locations, list of indicators and their applicable standards to ensure compliance are discussed below:

I. Schedule monitoring and baseline data monitoring of the project

333. An Environmental Monitoring Plan (EMoP) will be based on the project cycle to monitor the implementation of Environmental Management Plan (EMP) by measuring environmental parameters. During the preconstruction phase baseline data on air, water quality, ground vibration and noise levels will need to be collected. This data will provide baseline information on the existing conditions which could be used to compare the changes in quality levels during construction and operational phases. Such a comparison will reflect how effective the EMP is and help to revise it to rectify any shortcomings that will cause any adverse impacts.

334. Monitoring and mitigation responsibilities during the works and operational stage will be divided into two categories;

- Direct impact of the Works due to the Contractor's activities
- Unavoidable impacts as a result of the execution of the Project

335. The Environmental Management Plan (EMP) put into place shall include measures and targets for the control of air quality (dust), water, noise and vibration. This approach will be necessary to minimize the impacts of created dust, noise, vibration and depletion of water quality to the nearest environment during the development phase and to ensure that the said issues from development activities shall not affect operations in the neighborhood or affect to the nearest occupied buildings. The monitoring plan for the project is attached in the Annexure (07).

Figure 12: Air Quality Monitoring locations

 Location 1: Open space in front of Agamethi Vidyalaya and Siri Saranankara Viharaya off Blumendal Road. Access along the road in front of Police Station Blumendal. This area belongs to Sri Lanka Ports Authority.	 Location 2: Open space in Transit Depot of Supply division of Port Authority	 Location 3: Sambodhy Chithya of Ports Authority

J. Air quality monitoring

336. Objective of monitoring base line air quality is to ensure there is no health risk or loss of amenity due to depletion of air quality and the emission of dust to the environment. The aim of establishing bas e line air quality levels at the proposed development site to obtain data that can

be used to form basis for planning the control measures to eliminate or minimize human and environment exposure from air negative impact from the proposed development activities. The locations selected for monitoring are based on the target air quality levels at key receptors/ locations where the dust and other exhaust gas levels are expected to rise during construction.

Figure 13: Air Quality Monitoring location map

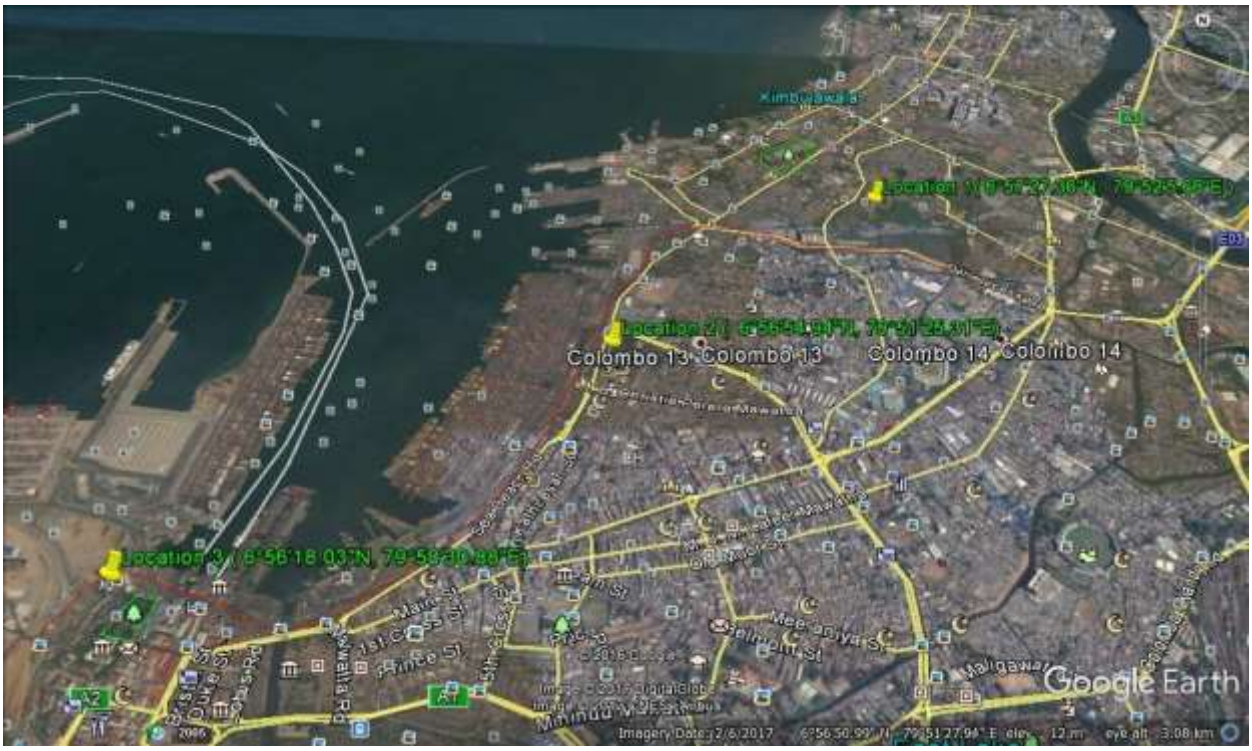


Table 44: Baseline monitoring locations for Air Quality

No	Locations	Type
1	UDA housing areas at Ch 0+040 - 0+250 LHS/RHS	24 hr average and 1hr average
2	St. Anthony's Shrine at Ch 2+ 800 LHS	
3	Near Sambhodi Chaithya at Ch 4+950 – 4+980 LHS	

K. Noise level monitoring

337. Objective of monitoring baseline noise levels is to ensure nuisance from noise does not occur. The baseline noise level data obtained shall form the basis for comparison and control when mitigating the noise emission from the proposed development. Predictions of noise during development phase shows that the target noise levels shall be met and will not impact negatively to the environment and neighbors. The noise that will be generated during operation phase is not expected to impact negatively to the environment. The locations selected for monitoring are based on the target noise levels at key receptors/ locations where the noise levels are expected to rise during construction/ the noise emissions are expected increase above the current ambient levels within the site after completion of construction.

Table 45: Monitoring Locations for Noise Quality

No	Locations	Type
1	UDA housing area at Ch 0+040 - 0+016 LHS	Day & Night 24hrs
2	UDA housing area at Ch 0+200 - 0+250 RHS	

No	Locations	Type
3	St. Anthony's Shrine at Ch 2+ 800 LHS	
4	Near Sambhodi Chaithya at Ch 4+950 – 4+980 LHS	Day time 2hrs and Night time 1hr.

L. Vibration level monitoring

338. On road constructions, impact pile-driving may be used to establish a base for foundations. These operations can give rise to high levels of ground vibrations. The magnitude of the nuisance created by vibrations depends on the nature of soils transmitting the vibration and the distance to the nearest building. As per the existing knowledge and by perusing the previous records have found that nuisance from ground vibration and building damage is unlikely to occur if the operation is conducted at distances greater than 50 meters.

339. Objective of monitoring baseline vibration levels is to minimize and/or avoid ground vibration and ensure nuisance from vibration does not occur. And conduct a study on the impact of ground vibration from construction activities, where these operations occur within 50 meters of a building and take appropriate action. The locations selected for monitoring are based on the target excessive vibration at key receptors specially the households and the ancient buildings.

Table 46: Monitoring locations for Vibration

No	Locations	Type
1	Ground vibration based on the existing Rd at Ch 0+040 - 0+016 LHS	Day time 1hr
2	UDA housing area at Ch 0+200 - 0+250 RHS	
3	St. Anthony's Shrine at Ch 2+ 800 LHS	
4	Port Authority/port bridge	
5	Grand Oriental hotel	
6	Near Sambhodi Chaithya at Ch 4+950 – 4+980 LHS	

M. Surface water quality monitoring

340. Soil eroded during land disturbance can wash away and contaminate storm water. If contaminated storm water enters a drainage line or storm water drainage system, it will eventually discharge into an adjacent waterway and pollute it. The type of sediment controls suitable for a particular situation depend on the nature of the site, in terms of such factors as rainfall patterns, soil type and topography. These factors need to be taken into account when selecting appropriate controls and ensuring that designs are adequate.

341. Objective of monitoring baseline surface water quality is to minimize the generation of contaminated storm water on receiving waters by construction and related activities as accidental oil spills, disposal of solid waste, spoil, construction materials and domestic waste. The locations selected for monitoring are based on the existing surface water bodies and the existing water quality of the upstream and downstream at crossing points by the proposed trace.

Table 47: Monitoring locations for surface water quality

No	Locations	Type
1	Upstream and downstream at Beire Lake	Grab samples
2		
3	Upstream and downstream at Bloumendhal Ela	
4		

X. CONCLUSION AND RECOMMENDATIONS

342. When evaluating the overall environmental and social impacts of the project, it is clear that most of the impacts will be of a temporary nature due to the construction activities associated with the project such as excavation and piling. Since the highway route will be along the existing roadway, the potential environmental and social impacts will be minimal as no new areas will be disturbed for construction activities of the highway. Impacts on air quality due to dust emissions is expected to be high. However, dust emissions could be minimized through the use of appropriate mitigation measures as suggested in the report.

343. The other potential impact is due to noise and vibration arising from heavy ground work such as hammering and blasting if necessary and piling foundations for permanent structures have the potential to generate vibrations. During the construction period vibration levels will be monitored particularly at sensitive locations in order to ensure that no adverse impacts will occur.

344. Noise and vibration could be minimized further by using appropriate methods such as using noise reduction measures as well as proper maintenance of equipment and machinery, and by limiting working hours to day time. The noisy activities would be similar to those associated with typical construction sites and will have temporary impacts at site.

345. The impacts of the project on ecology and the biological environment will be minimal, as no new areas are to be opened up for the project. There are no any environmentally sensitive areas such as ecologically important areas, forest reserves or the sensitive water courses along the route. The main impact of the project on water bodies is through siltation, erosion and surface water runoff, which could have potential adverse impacts on aquatic ecology. Adequate precautionary measures have been proposed in order to prevent surface run off and siltation of water bodies along the route. Adoption of these precautionary measures will ensure that there will be no adverse impacts on existing water bodies.

346. During the construction phase, there could be impacts on the local road network due to increased traffic flows associated with the movement of construction vehicles, transportation of materials and goods to construction yards and worksites. Other temporary impacts include emissions from construction vehicles, noise, vibration and dust generation from construction vehicles. A traffic management plan will be prepared in order to ensure that ensure that impacts on traffic will be minimal.

347. There could be potential impacts on surface and ground water due to construction activities unless adequate precautionary measures are adopted. There is the potential for contaminated surface water runoff especially in areas of open excavation close to streams and drains where silt laden water has the potential to be discharged. Other potential construction impacts on water quality include the storage and disposal of waste material arising from excavation and construction activities and soil heaps stockpiled along the construction corridor. The uncontrolled discharge of water in dewatering of the piling areas during construction also has the potential to affect surface water sources. Mitigation measures have been proposed for all of the above-mentioned impacts which should be strictly followed in order to minimize adverse impacts.

348. Potential impacts on ground water could be both qualitative and quantitative. Qualitative impacts are due to possible ground water depletion while quantitative impacts may be caused due to ground water contamination. The contamination of ground water resources is not expected to be significant since all the ground water of the project area is highly polluted already. Other potential impacts associated with spills and leaks are not expected to be of major significance as

mitigation and prevention measures will be adopted in order to minimize the risk of spills and leaks.

349. In conclusion, it could be said that the potential impacts during both the construction and operational stages will be minimal if the precautionary measures suggested in the report are adopted by the contractor and closely monitored by the Road development authority and by the ADB with the supervision consultant.

350. In order to ensure that the proposed mitigation measures are adopted by the contractor these measures should be included as a part of the contractual agreement between the Road Development Authority and the contractor. Continuous monitoring of the project has to be carried out by the RDA along with sound monitoring by the independent organization in order to ensure that no violations of the conditions of stipulated in the CEA approval takes place during the construction period in particular.

REFERENCES

(i) Feasibility Study and Preliminary Design of Southern Highway Extension towards to Colombo

(ii) - Draft Final report for Baseline Elevated Highway Project, Kathahira and Engineers International, Bangladesh Consultants LTD, and Engineering Consultants LTD - August 2014,

(iii) ADB Environmental Assessment Guidelines, Asian development Bank, December2003

(iv) EIA report of Colombo port Expansion Project

(v) EIA report of Colombo port City Project

(vi) Colombogroundwatercrisis-SundayTimesonSundaythe21stMay2017(reportedbyKasunWarakapitiya)

(vii) The Hazard profile of Sri Lanka – National Disaster Management Center

ANNEXURE 1: LOCATION MAP OF THE PORT ACCESS ELEVATED HIGHWAY SPECIAL FEATURES FROM INGURUKADE JUNCTION (START) TO GALLE FACE (END)

ANNEXURE 2: REA CHECKLIST AND CLIMATE CHANGE RISK ASSESSMENT

RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

Country/Project Title:	Construction Project of SASEC Port Access Elevated Highway
Sector Division:	Roads and Highways
Project Location:	Ingurukade junction to Galle Face via port access road (5.27km)

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Cultural heritage site	√		Desk top survey included collection and analysis of relevant data from the database of the Archaeological department & satellite imaginary indicated the types of cultural heritage sites in the project area are **archaeological sites** which are defined as areas of ancient/historic surface Artifacts or structure remains. And the **monuments** defined as above structures of public interest and or historic significance including sites that reflects the spiritual or cultural lives of modern populations such as road side shrines and places of worship together with custom, traditions and beliefs that make a people or a region distinctive and especially cohesive.
▪ Protected Area		√	The road trace of the proposed elevated highway traverses within the area above the six GN divisions areas. Within the GN areas of Kochchi kade and Fort it is identified sightings of several **Archaeological sites** and **monuments** at a distance of very close proximity (0-50m according to the proposed alignment) from the boundary of proposed ROW. • Port Authority building • Ancient light house • Port Maritime Museum - 0 – 5m • Oriental Hotel Building – 0 – 15m • Sambhodhi chaithya - 0-5m • St. Anthony's Church – 0-10m Since the project will not use, encroach or submerge of the any land prescribed and within the land in which the archaeological structure or monument is located as described in the inventory that has been prepared under the Antiquities Ordinance, the Road Development Authority (RDA) is been communicated with Department of Archeology (DOA) in this regard and by confirming the potential effects due to the construction activities to these sensitive receptors, they will issue the consent with proposing necessary conditions and measures over the proposed development.
▪ Wetland		√	
▪ Mangrove		√	
▪ Estuarine		√	
▪ Buffer zone of protected area		√	
▪ Special area for protecting biodiversity		√	
B. Potential Environmental Impacts Will the Project cause…			
▪ Encroachment on historical/cultural areas;		√	Encroachments will not be anticipated to any of the historical areas or in other adjacent areas as mentioned above due to

disfiguration of landscape by road embankments, cuts, fills, and quarries?			construction activities of the Elevated Highway. However, construction activities will be implemented with clear agreement to following the conditions stipulated in the clearance granted by the Archaeological Department and under the direct supervision of the related officials to minimize any indirect impacts such locations. The landscape and the physical features will not be changed or disturbed within the entire trace due to the construction activities except at pier locations. The conditions will be applied when deciding the pier locations.
▪ Encroachment on precious ecology (e.g. sensitive or protected areas)?		√	
▪ Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?	√		The proposed highway route crosses the Beira lake at one location within the area of port authority premises and with adjacent to the existing canals and their crossings at several locations. No any modification of watercourse morphology is required resulting increasing flooding and disturbing drainage networks due to the project activities.Effects on surface water is anticipated from • sediment plumes caused by dewatering activities at the locations of pier construction. • Soil erosion and surface runoff at the stockpile areas • Accidental pollution of freshwater resources by solid, liquid wastes, and hydrocarbon/ fuels Action will be taken to manage the negative impacts with applying the following measures. Discharged waters from dewatering activities, if returned to streams or rivers will be discharged in a way that will minimize physical impacts to channel morphology, i.e. without any turbulent flows and with sediment levels below receiving waters. Measures will be employed to intercept run-off from the working corridor, by using sandbags and settlement tanks or lagoons, to reduce the suspended sediment load of the water prior to its discharge into watercourses. Alternatively, the water may be filtered through a suitable membrane such as a geotextile material to clean the water prior to discharge. In order to trap any sediment that is released into the watercourse.
▪ Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	√		surface run-off and sanitary waste from worker based camps and construction sites and their potential spillages will generally be of small quantities and localized in nature, therefore the magnitude of such potential impacts is considered small and this will be a temporary impact during the construction phase. A number of mitigation measures will apply during the project construction to avoid or minimize impacts to the surface water quality: Storing all material and chemicals required for construction in well secured and managed sites, installing silt traps near all water bodies prior to construction activities, disposing all waste soil and other debris to approved locations, locating labor camps at approved locations with prior approval, providing proper sanitary facilities and solid waste

			management practices to worker camps and creating awareness on sanitation for workers will mitigate these impacts.
▪ Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	√		During Project construction, temporary impacts on local air quality mainly at the pier locations related to the earthworks, excavation, vehicle movement and their emissions, stockpiles, unpaved surfaces etc. The residual impact will be not significant and will mitigated by applying good engineering practices in the construction sites, including spraying of working areas and access roads with water, and washing of vehicles and limiting vehicle speed. Cover of material in construction sites in order to minimize entrainment by wind.
▪ Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation during project construction and operation?	√		Heavy worker base will be allocated to different activities associated with the project construction and hence a significant impact is anticipated in relation to occupational health & safety. All employees of the project including employees of contractors and subcontractors will undergo employment screening after employment contracts are signed and the consent of the employee is provided, all according with the Labor Department Act regulations and in compliance with provisions made in it. However, it is proposed to prepare a separate health and safety plan to be implemented during construction and operation phases, and a regular monitoring schedule to be proposed under close supervision and coordination of a professional Occupational Health & Safety Officer of the Project Implementation Consultant.
▪ Noise and vibration due to blasting and other civil works?	√		Based on the present knowledge of subsurface and geotechnical conditions, blasting activities during the construction phase will be not anticipated, however if required, such activity will not take place during the evening or at night, and potentially exposed populations will be informed of the activities in advance. No significant impact is expected from blasting and associated noise and vibration. Most of the project area is adjacent to the land belongs to Port Authority and it's functioning except at several locations. Suitable mitigation will be used at the few locations where households have been identified in proximity to these activities. Standard mitigation measures, such as limiting construction activities to daytime hours, will also be applied in general. Further the following measures will be reduced, regulate and limit acoustic and vibration impacts from the construction of the proposed Project: • All construction activity and vehicle movement to occur between the hours of 06.00 and 22.00 (no activities will be done on public holidays), unless a further environmental noise assessment is undertaken. • Noise-reduction technologies in the equipment and machinery (i.e. silencer) including good maintenance.

			• Turn off equipment and vehicles when not being used. And where possible, no truck to be left standing with its engine operating in a street adjacent to a residential area.
▪ Dislocation or involuntary resettlement of people?		√	
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	
▪ Other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?		√	
▪ Hazardous driving conditions where construction interferes with pre-existing roads?	√		This impact is observed during construction period if construction activities are going to interfere the existing roads and sub roads. Adequate awareness will be made among the construction staff including drivers and they will be educated in order to minimize hazardous driving conditions along such roads. Contractor will be advised to use alternative roads to the best possible to avoid roads which are heavily used by the public.
▪ Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?	√		During the construction phase. Using local labor to the extent possible, briefing the workers on sanitation, communicable diseases, providing proper sanitary facilities and providing proper waste disposal system at worker camps are measures to mitigate this impact. Site specific environmental management action plans will be necessary in order to mitigate specific impacts to such labor camps.
▪ Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?	√		Significance of impacts to health hazards due to water stagnation and mosquito breeding habitats during construction period will be minor by applying all below mentioned mitigation measures Implementation of approved drainage management plan will minimize the stagnation of storm water unnecessarily and frequent monitoring on such possible places and evacuation will minimize the impact.
▪ Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials?	√		Contractor along with the employer will undertake a program of stakeholder engagement and consultation to educate local communities of the risks of trespassing onto sites, the meaning of signs, the dangers of playing on or near equipment or entering fenced areas. Using sign boards, barricades and other safety arrangements at the correct location, informing the public on possible hazards in advance and using PPE at all the time during construction will minimize this impact. All toxic material should be stored in well secured containers with labels and necessary first aid facilities should be available at every site.
▪ Increased noise and air pollution resulting from traffic volume?	√		Adaptation of speed limits for construction vehicles and timely servicing and maintaining them up to the given standards will reduce the volume of emissions and noise levels to the surrounding. Frequent monitoring of noise levels and air quality will support to review the effectiveness of the

			mitigation measures.
▪ Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?	√		Solid and liquid wastes generated by the project including oil, grease and fuel spills can accidentally pollute water resources, affecting resource quality. All areas for which there is a risk of leaks or spills during plant and vehicle storage, maintenance or refueling, an approval will be obtained prior from the Central Environmental authority (CEA) and areas where materials with polluting potential will be stored will be bunded according to the conditions described in the approval. Avoid entering any spill of water or such contaminated water to the fresh water body through ditches, canals or pipes without prior approval of CEA. The implementation of the above-mentioned mitigation measures as well as of sound engineering practices at the construction sites will reduce the significance of potential impacts be of **Minor** significance.
▪ Social conflicts if workers from other regions or countries are hired?	√		Impact will be minor and temporary in nature. The applicable mitigation measures are: • Awareness programs will be conducted for both labor force and local community in order to minimize possible conflicts. • Frequent monitoring of sites, labor camps and other accommodations including the night time as well will minimize possible impacts.
▪ Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	√		Separate sanitary facilities and water should be adequately supplied to the labor force so as not to be interfered with the facilities available for the public.
▪ Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	√		Potential impacts will be of Minor significant and the risk will be reduced by, • Raise awareness among the drivers and the related persons who are handling such hazardous materials and disposing their empty containers. • Educate communities on risk to health of explosives, fuel and other hazardous materials. • Display warning signs as necessary for the people that are engaging for work at the recent risk areas.
▪ Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning.	✓		It is proposed to conduct a risk assessment study to identify such safety issues and complete health and safety plan to be developed during construction and operation phases, and a regular monitoring schedule to be proposed under close management of a professional Occupational Health & Safety officer.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: Construction Project of SASEC Port Access Elevated Highway

Sector: Roads & Highways

Subsector: Roads & Highways

Division/Department: Environmental

Screening Questions		Score	Remarks[3]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	The project area is not identified as susceptible to landslides or any area where landslides already occurred. But the project structure is consisting with the bridges (elevated) the project design may need to consider hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	During the project is designing the hydro-meteorological parameters specially the flood levels and the reliable water levels and sea level will be considered. And no any parameter is anticipated as likely affect the selection of project inputs over the life of project outputs.
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	
Performance of project outputs	Would weather/climate conditions and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

[3] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high-risk project.

Result of Initial Screening: Medium

ANNEXURE 3: BUILDINGS TO BE DEMOLISHED

Demolishing Buildings due to Construction of Elevated Road.

Opening Gate at Ingurukade Junction-Ch- 0+ 140

Check Point. Ch-1+180

Sport Complex Ch- 1+700-1+800

SLPA Indoor Stadium- Ch 1+700-1+800

Oil Tanks to be pruned (Removing of two Rings)

Parapet Wall and Railway Line to be shifted. Ch-2+400 to 3+500

Rest Rooms for Workers. -Ch- 3+400 – 3+800

Store rooms Ch 3+500 – 3 +600

Store room ch 3+500 – 3 + 600

Stores room from ch 3+500 – 3+600

Steel fabrication Workshop Ch 3+600 – 3 + 700

Workshop-3+700-3+900

Security section Building

Stores building Ch 3+700-3+900

Machine Workshop- Ch 3+700-3+900

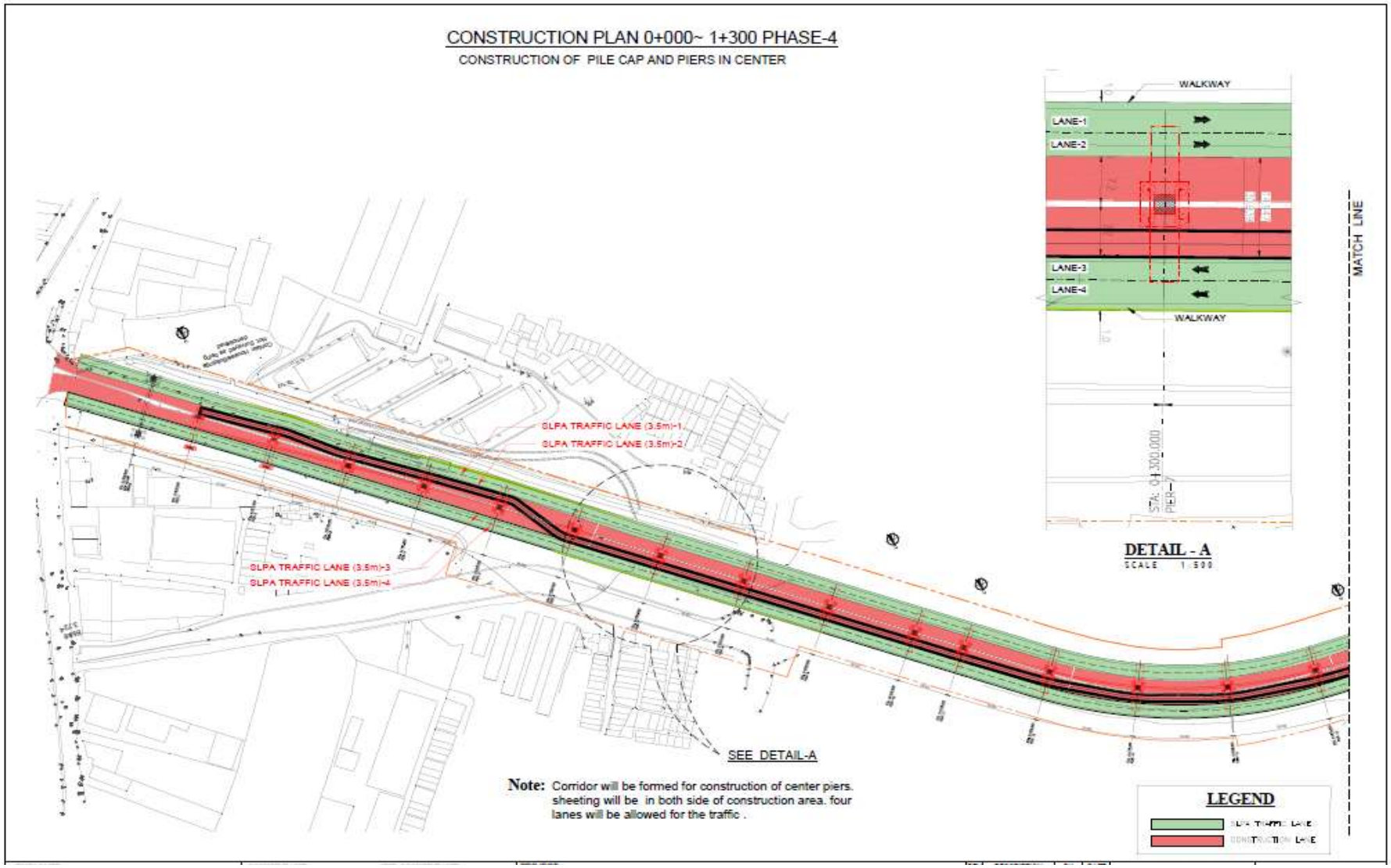
Inside of the Workshop- Ch 3+700-3+900

Workshop Building. - Ch 3+700-3+900

Rest Room Ch 3+700-3+900

Partially demolishing building. Ch- 4+600-4+900

ANNEXURE 4: TRAFFIC MANAGEMENT ALTERNATIVES WHEN PROGRESSING CONSTRUCTION ACTIVITIES AT CRITICAL LOCATIONS

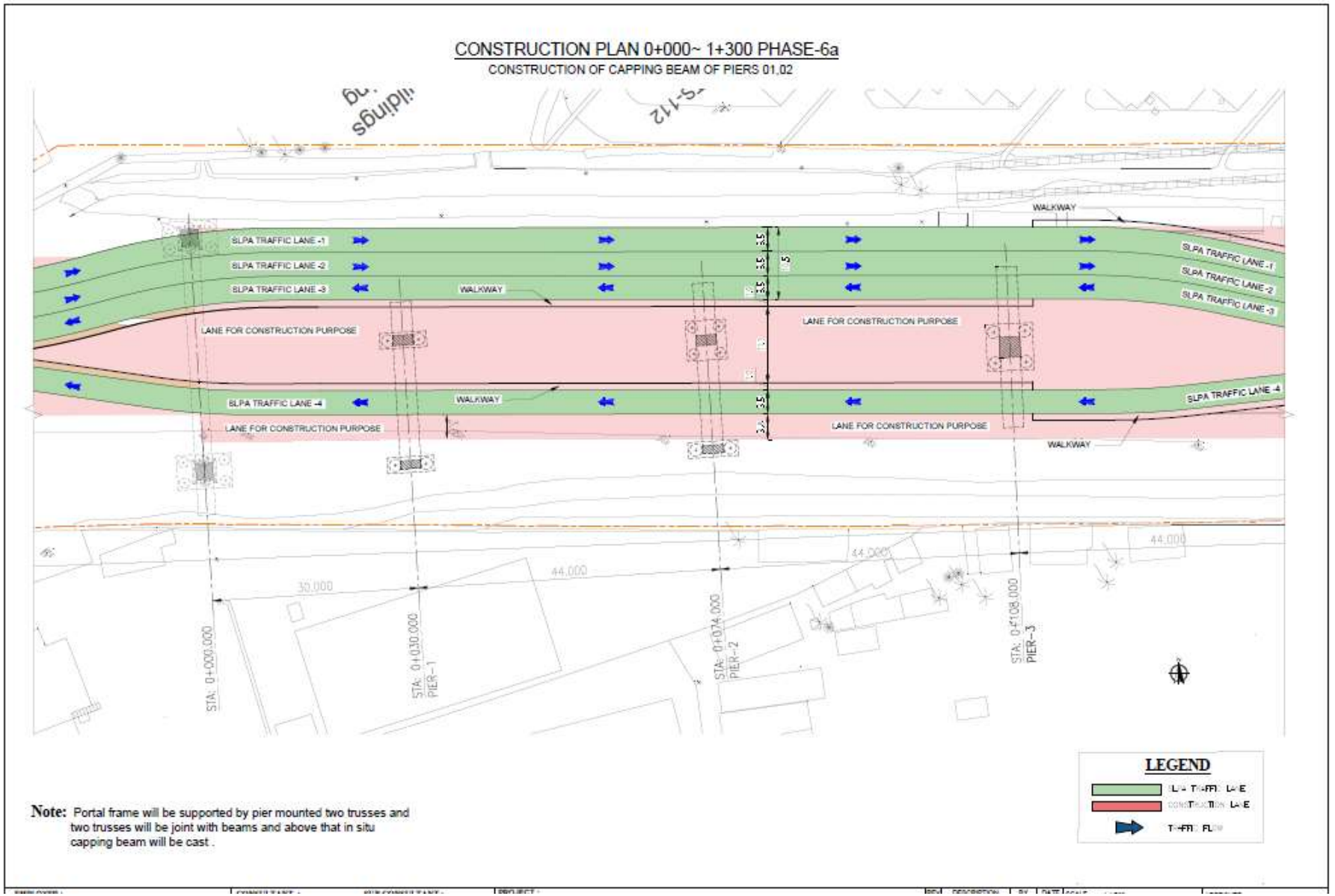


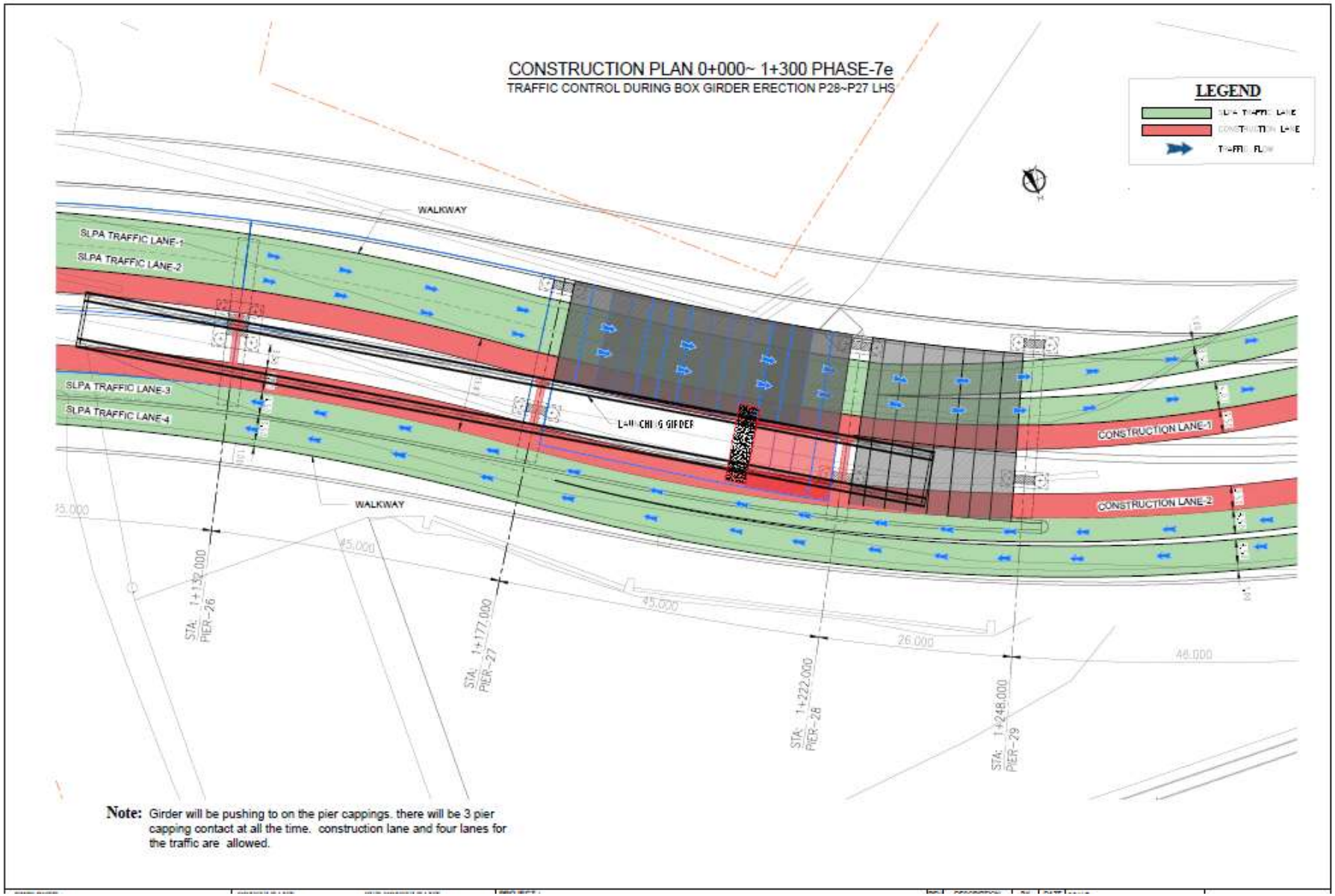
CONSTRUCTION PLAN 0+000~ 1+300 PHASE-4

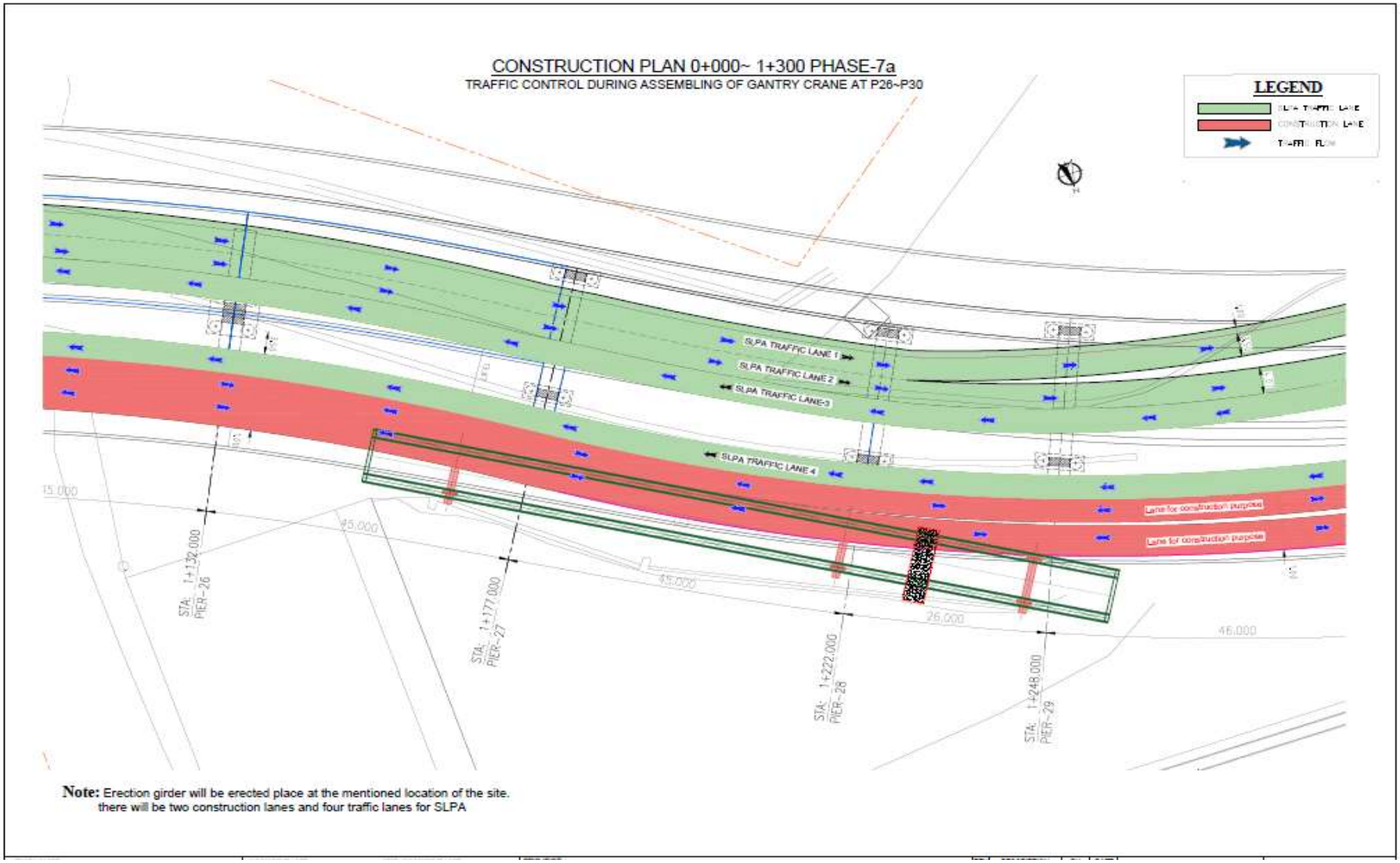
CONSTRUCTION OF PILE CAP AND PIERS IN CENTER

Note: Corridor will be formed for construction of center piers. sheeting will be in both side of construction area. four lanes will be allowed for the traffic .

LEGEND

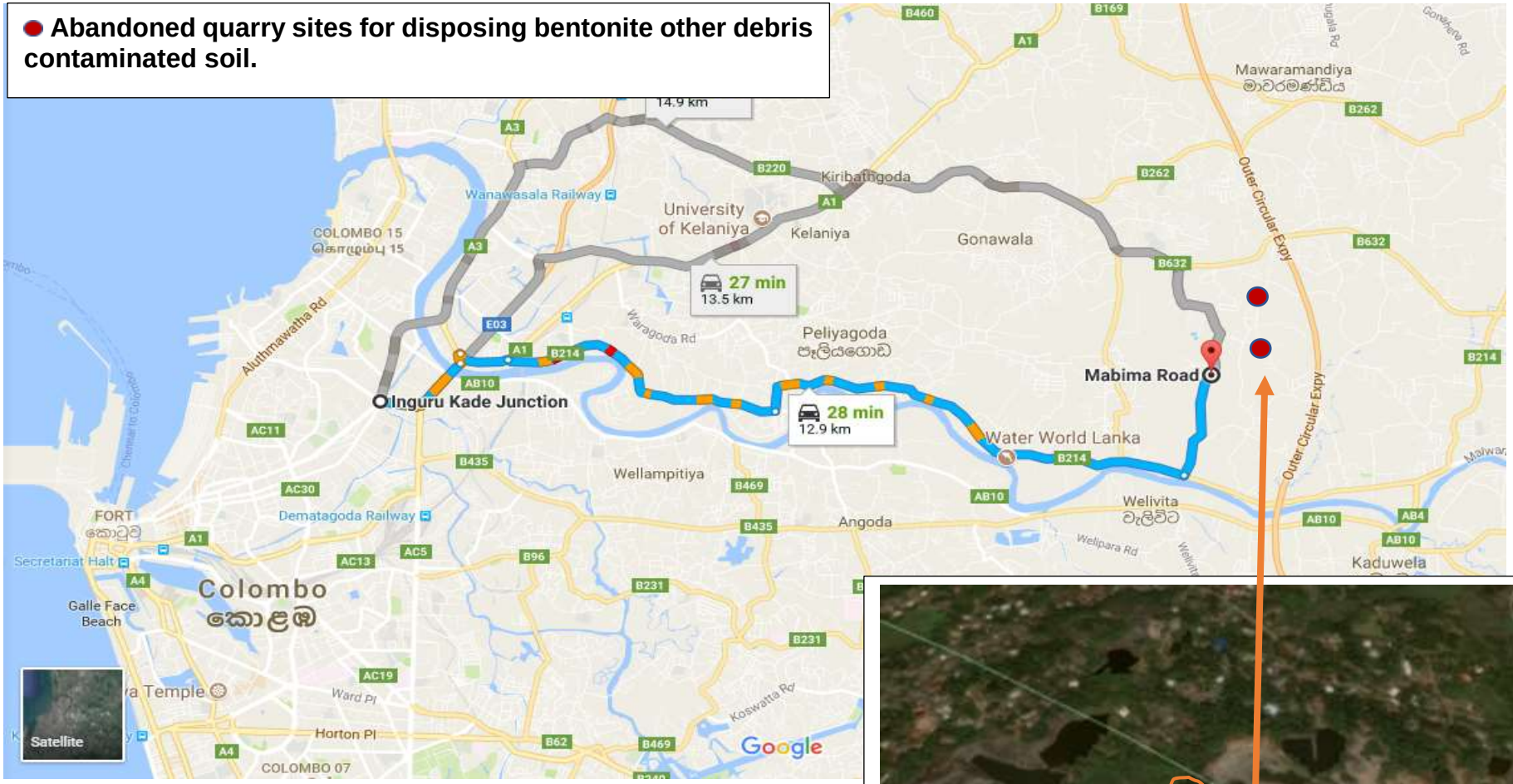

CONSTRUCTION PLAN 0+000~ 1+300 PHASE-6a
CONSTRUCTION OF CAPPING BEAM OF PIERS 01,02
SLPA TRAFFIC LANE -1
SLPA TRAFFIC LANE -2
SLPA TRAFFIC LANE -3
SLPA TRAFFIC LANE -4
WALKWAY
LANE FOR CONSTRUCTION PURPOSE
3.5
5
30.000
44.000
STA: 0+000.000
STA: 0+030.000 PIER-1
STA: 0+074.000 PIER-2
STA: 0+108.000 PIER-3
LEGEND
Note: Portal frame will be supported by pier mounted two trusses and two trusses will be joint with beams and above that in situ capping beam will be cast .


CONSTRUCTION PLAN 0+000~ 1+300 PHASE-7e
TRAFFIC CONTROL DURING BOX GIRDER ERECTION P28~P27 LHS
LEGEND
WALKWAY
SLPA TRAFFIC LANE-1
SLPA TRAFFIC LANE-2
SLPA TRAFFIC LANE-3
SLPA TRAFFIC LANE-4
LAUNCHING GIRDER
CONSTRUCTION LANE-1
CONSTRUCTION LANE-2
WALKWAY
STA. 1+132.000 PIER-26
STA. 1+177.000 PIER-27
STA. 1+222.000 PIER-28
STA. 1+248.000 PIER-29
45.000
45.000
45.000
26.000
46.000
Note: Girder will be pushing to on the pier cappings. there will be 3 pier capping contact at all the time. construction lane and four lanes for the traffic are allowed.


CONSTRUCTION PLAN 0+000~ 1+300 PHASE-7a
TRAFFIC CONTROL DURING ASSEMBLING OF GANTRY CRANE AT P26~P30
LEGEND
SLPA TRAFFIC LANE 1
SLPA TRAFFIC LANE 2
SLPA TRAFFIC LANE-3
SLPA TRAFFIC LANE 4
Lane for construction purpose
Lane for construction purpose
15.000
45.000
45.000
26.000
46.000
STA. 1+132.000 PIER-26
STA. 1+177.000 PIER-27
STA. 1+222.000 PIER-28
STA. 1+248.000 PIER-29
Note: Erection girder will be erected place at the mentioned location of the site.
there will be two construction lanes and four traffic lanes for SLPA

ANNEXURE 5: SELECTED AREAS FOR DISPOSAL SITES

● Abandoned quarry sites for disposing bentonite other debris contaminated soil.



ANNEXURE 6: CONSTRUCTION METHODOLOGY AND TYPICAL CROSS-SECTIONS

CONSTRUCTION METHOD

Superstructure

Erection of Precast Segment PC Box Girder

- Span by Span Method and Balanced Cantilever

Substructure

Capping Beam Construction

- Rotation Method, System Scaffolding, Unit Rebar

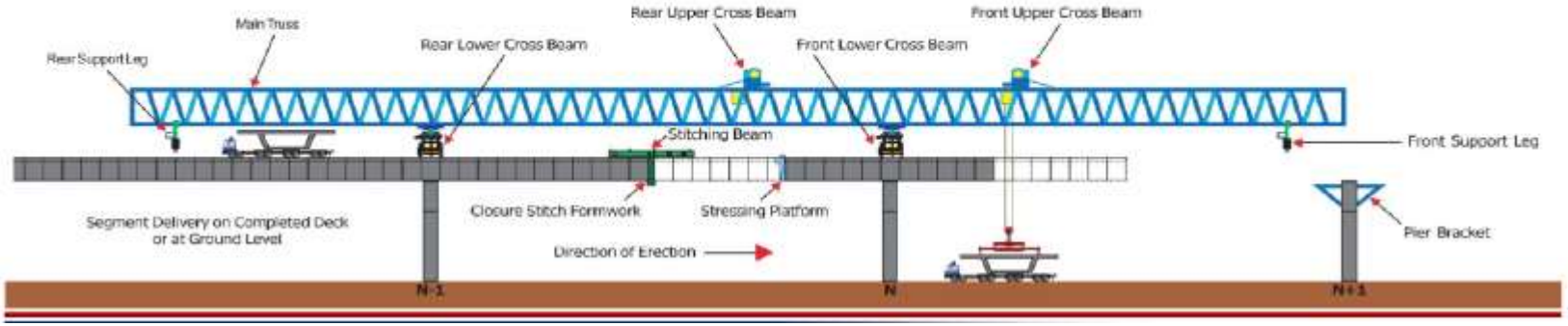
Pier Column Construction

- Precast Segment PC Pier Column
- Pile Column Portal Pier (Omission of Pile Cap)

Precast Segmental – Cantilever

Erection with Launching Gantry

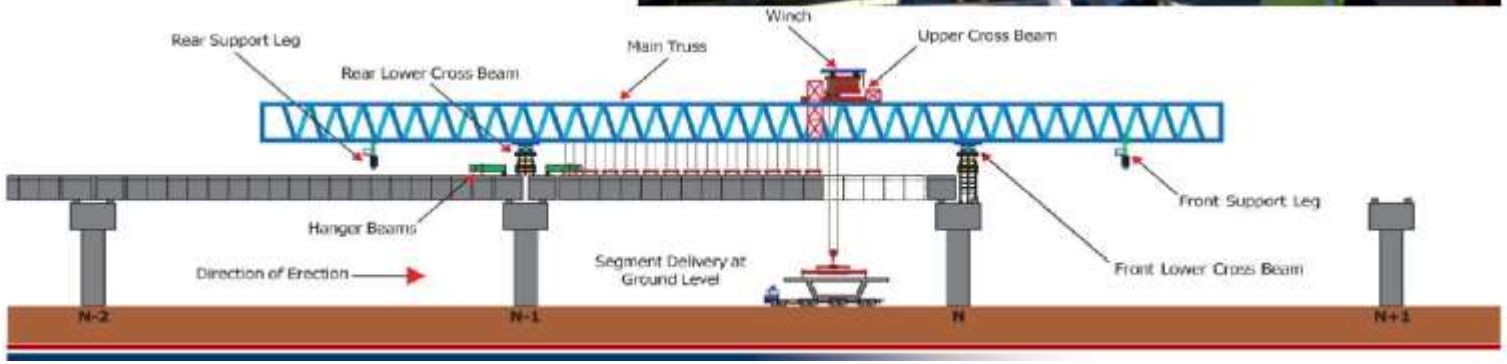
- Span up to 350 ft±
- Speed of Erection (up to 6 pairs of segments)
- Delivery from behind or below
- Overhead Construction
- Self Launching – min. crane support
- Parallel Structures Simultaneously
- Temp loads directly into Piers
- Limited horizontal curvature



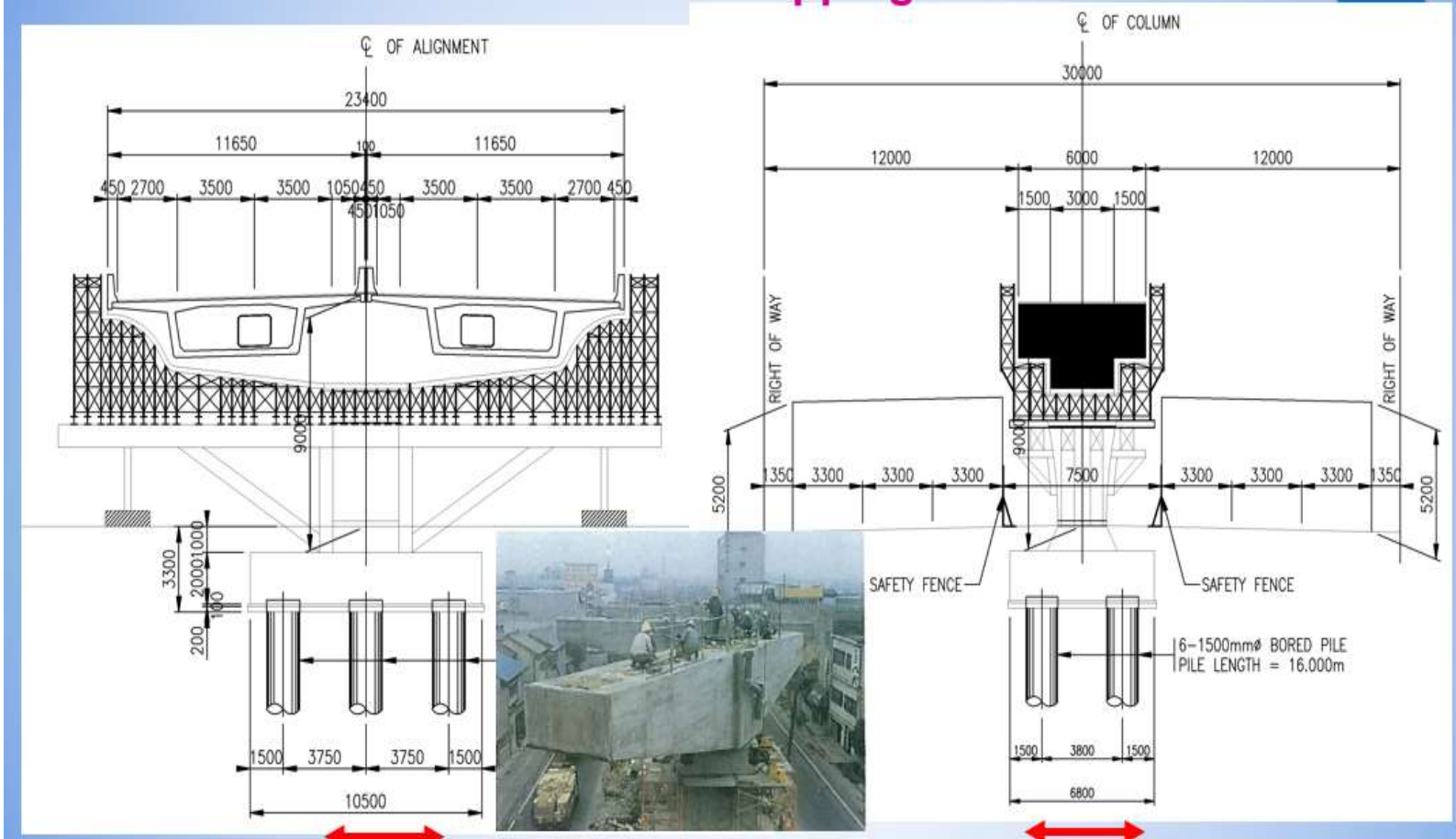
Precast Segmental – Span-by-Span

Erection with Launching Gantry (Overhead or Underslung)

- Spans typically < 170 ft
- Speed of Erection (1 span per day possible)
- Small Crew
- Delivery from behind or below
- Temp load directly into Piers

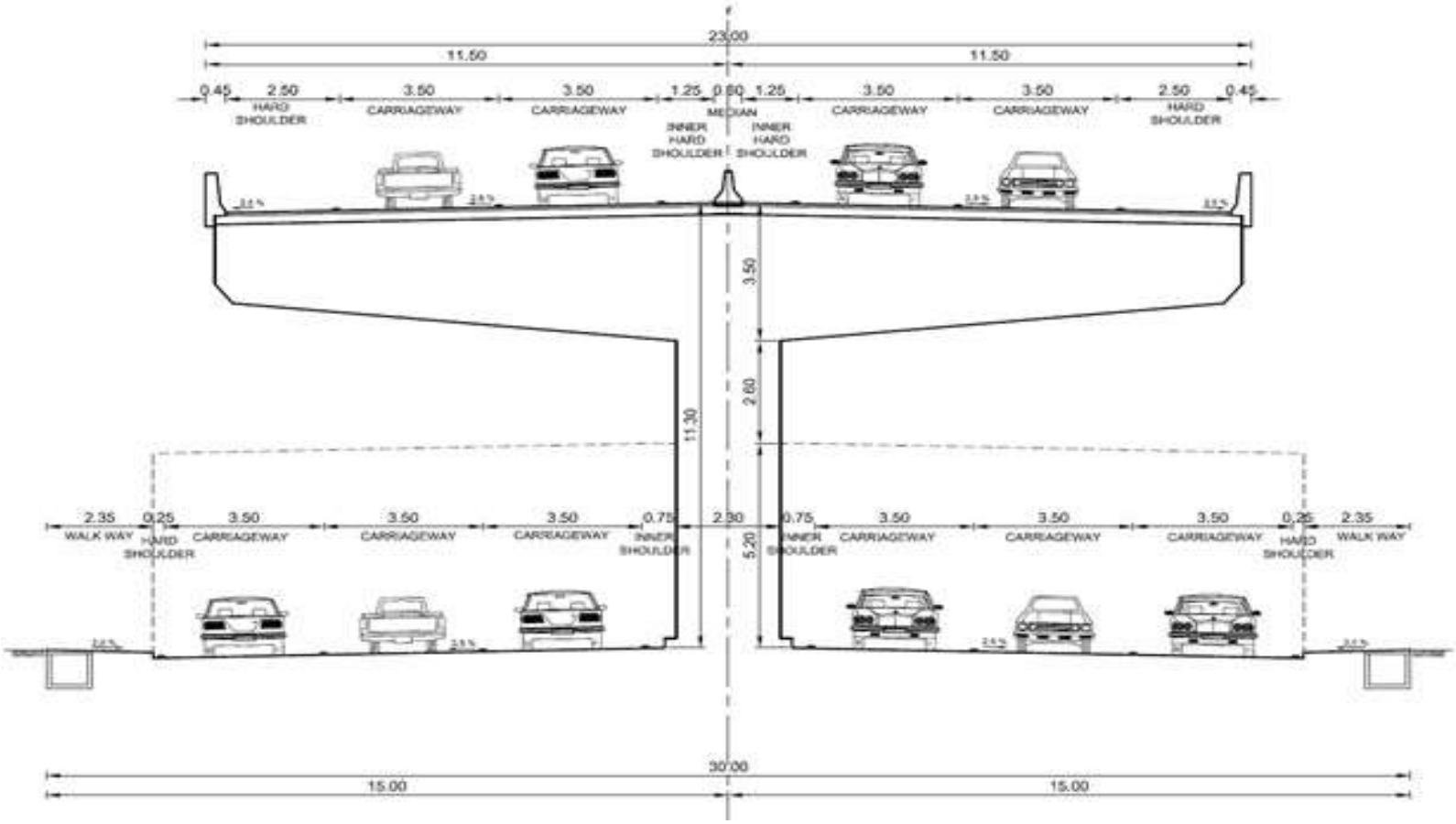


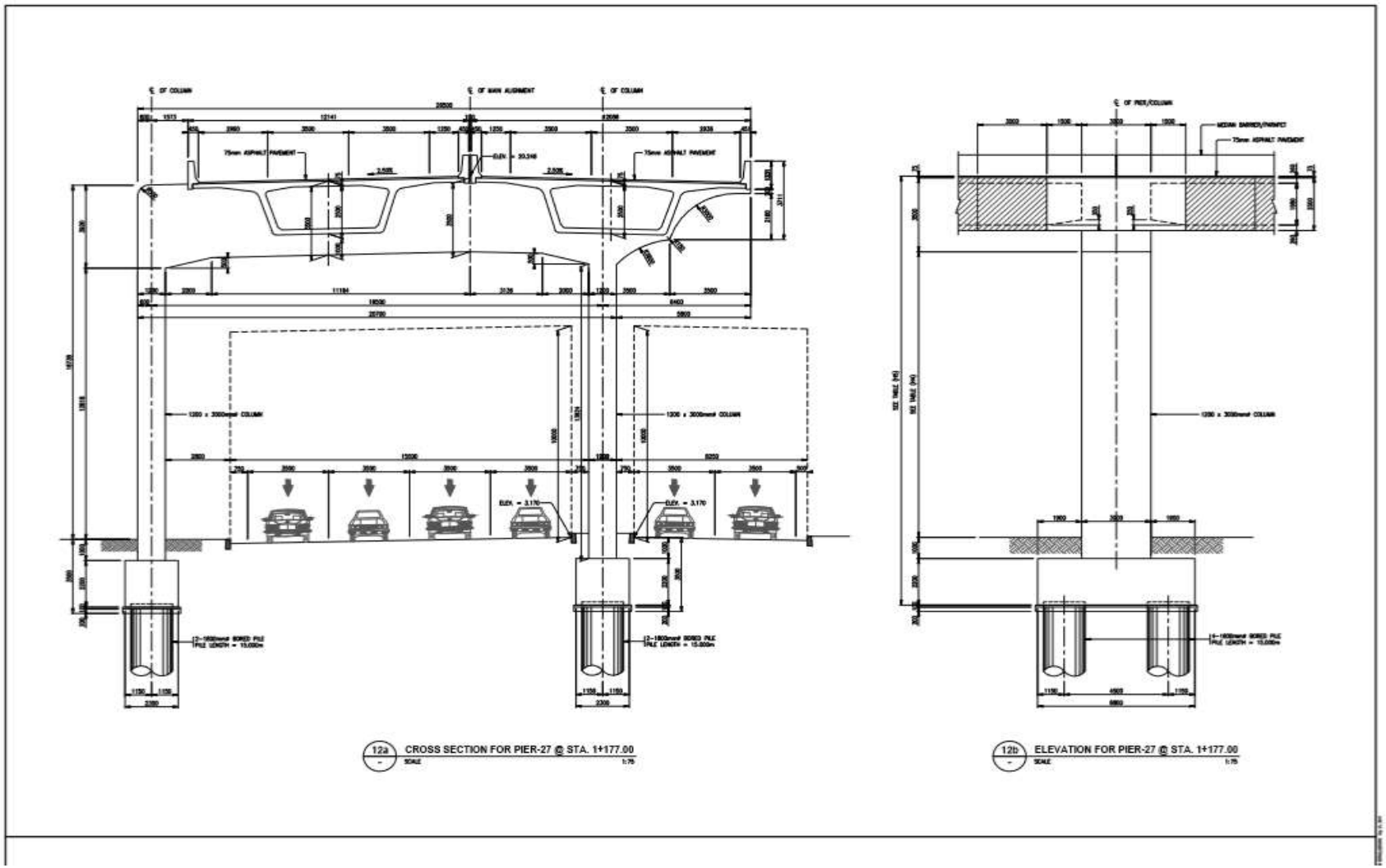
Rotation Method of Capping Beam



Recommended Optimum Typical Cross Section

Total width of 23.0m was recommended by consultant with reducing the median width from 2.0m to 0.6m in accordance with AASHTO, and then it has been approved by RDA.



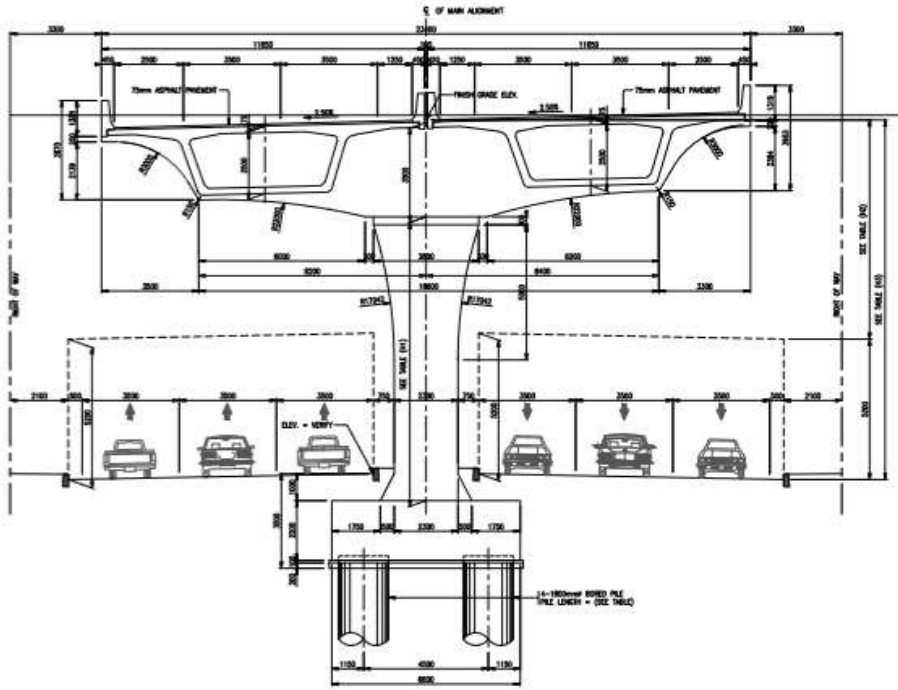


12a CROSS SECTION FOR PIER-27 @ STA. 1+177.00
SCALE 1:75

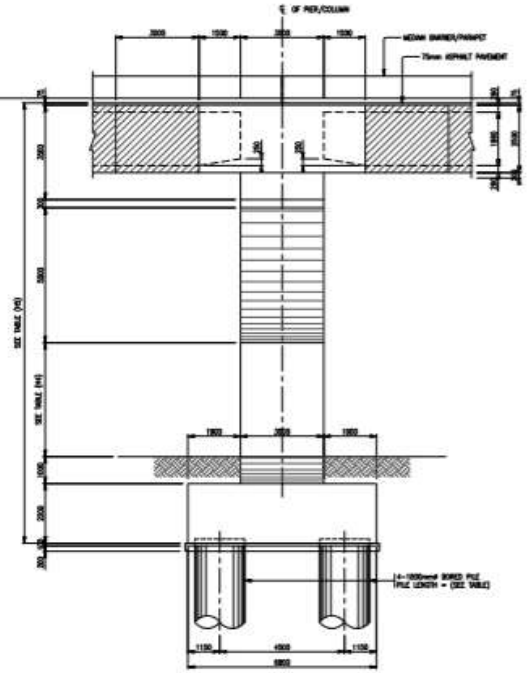
12b ELEVATION FOR PIER-27 @ STA. 1+177.00
SCALE 1:75

T-SHAPE PIERS SCHEDULE

LOCATION	STATIONS	FINISH GRADE ELEVEVATION (m)	EXISTING GROUND ELEV. (m)	COLUMN HEIGHT (H) (m)	HEIGHT (H2) (m)	HEIGHT (H3) (m)	HEIGHT (H4) (m)	HEIGHT (H5) (m)	BORED PILE PILE LENGTH (mm)	BORED PILE DIAMETER (mm)
PIER-11	9+470.00	16.827	3.077	10.374	7.989	13.189	4.073	16.148	19000	1800
PIER-12	9+500.00	16.391	2.953	10.653	8.498	13.698	4.653	16.676	19000	1800
PIER-13	9+576.00	16.735	2.356	11.804	9.386	14.586	5.804	17.876	19000	1800
PIER-14	9+626.00	17.059	2.344	12.171	9.766	14.966	5.871	17.948	19000	1800
PIER-15	9+676.00	17.444	2.686	11.663	9.576	14.776	5.663	17.756	19000	1800



7a TYPICAL CROSS SECTION FOR PIER-11 TO PIER-15
SCALE 1:75



7b TYPICAL ELEVATION FOR PIER-11 TO PIER-15
SCALE 1:75

ANNEXURE 7: ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE PORT ACCESS ELEVATED HIGHWAY

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
Pre-construction phase								
Grubbing and clearing and Removal of trees	• Loss of vegetation and climate change • The nature and intensity of rainfall events in an area have implications for storm water management. • Dust could be blown offsite from ground activities. Also, could be wider spread on windy days, especially.	• Seasonal climatic variations shall be considered during scheduling of construction activities in the area. • Excavations and other clearing activities shall only be done during agreed working times and permitted weather conditions. • Storm water control during construction phase as per the method approved by the engineer • Seeding of topsoil and subsoil to prevent wind and water erosion of soil surfaces. • Dust suppression measures such as water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads, earthworks, stockpiles.	Throughout the subproject and other Residential population living near the construction site, workers and local vegetation	Design costs	RDA/ Design consultant	RDA/ESD / Engineer	As specified in the Landscaping program	Green concept and the improvement of biodiversity and aesthetic value.
	Impacts on Ecological Aspects	• All efforts shall be taken to avoid tree cutting wherever possible. • The floral species shall not be affected by the construction activities and siting of the route to be done	Areas where tree cutting grubbing and clearing to be done.	Design costs.	RDA/ Design consultants	RDA/ESD /Engineer	As specified in the Landscaping program. As specified.	Green concept and the improvement of biodiversity and aesthetic

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implement ation	Supervision	Standards/ clearances	
		mainly within the built area of port authority premises, and action shall be taken to relocate the trees (Banyan) existing within the pedestrian way of the existing road which are not matured to other suitable areas. • Since only the scrubs, herbs and other small vegetation are removed in this road section the action shall be taken to be planted suitable floral species just after construction along with the landscaping process. • Vegetation shall be allowed to re-establish after construction works are completed along the construction strip. The construction strip will be reinstated to its former condition as much as possible. • If road side space for replanting is not available, other possible locations such as schools and public areas will be explored • with the help of DS and CBOs of the area.	LHS & RHS from the area Ch 0+100 – Ch3+900.				At least 3 trees for each tree removed.	value.
	Effect on private properties	Contractor shall be prior identified the weak and dilapidated Structures and be recorded their condition with identifying the existing cracks and/or other damages	Where the areas identified with the old and week structures existed along the trace. From Ch. 0+000 – Ch 1+700	Environmental budget estimated .	Contractor through RDA/ESD/ Engineer/Divisional Secretory	RDA/ESD/Engineer/ Divisional Secretory	RDA/ADB temporary relocation and compensation procedure.	Rectifying social impacts of the project and continuing the project progress

:

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implement ation	Supervision	Standards/ clearances	
		• If any safety precautions is needed for the dwellers, the contractor shall take prior actions to relocate the residents or the people who use the • structure as per the instructions of the Engineer. • Compensatory measures shall be determined with the affected community.						
	Impacts on hydrology and drainage	• Area shall be observed carefully to identify the existing drainage condition. • The site surface has been engineered and shaped in such a way that rapid and efficient evacuation of runoff is achieved. • If possible the construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. • Topsoil, sub soils and any parent material removed will be separately stripped, handled, stored and replaced • Prompt installation of erosion control measures to intercept and treat run-off from the construction working area and reinstatement • Special attention should be paid for possible inundation prone areas.	Near all drainage crossings, culvert and other storm water drain outs and streams. LHS and RHS areas from Ch 0+000 – Ch 1+460 And the area Ch 4+250 – Ch 4+300	Project cost	Contractor	RDA/ESD / Engineer	As per the technical specification of detail designing and the hydrological investigations	Water quality standards
Mobilization of	• Impacts on traffic and	• It is proposed to discuss with the Department of Railways and the	Places where the activities	Project mobilizati	Contractor	RDA/ESD / Engineer	As per the technical	Air, Noise and water quality

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
equipment, vehicle and the workers at site	Road Safety Including existing public transport facilities and operations will be affected by the road closure and detours. • Transport operations, and several structures belongs to SLPA are located within the area of construction and will therefore need to be relocated. • This may impact livelihoods. • There will be disruptions to health services,	SLPA, customs etc for providing adequate safety measures at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both sides of the railway crossing. • Identify the areas where temporary traffic diversion may be required. • Accordingly, a Proper traffic management plan shall be established. • Installation of traffic warning signs, temporary traffic lights or flagmen at the construction sites • Monitor and record road crashes during construction and maintenance stages and take appropriate remedial actions. • Awareness raising for workers with respect to safe and considerate driving. • Advance warning shall be given of any proposed road diversions and closures. • Education on traffic safety will be provided by the Community Liaison Officers (CLOs) to communities. • Access and site roads will be maintained in good condition. • Drivers of Project vehicles will be trained/briefed about safe driving. • Strict speed limits. • Regular maintenance of vehicles	to be located	on cost			specification of detail designing and the Port authority regulations.	standards.

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
	education services, local businesses, transport services, and pedestrian movements due to traffic and construction related noise, visual, and air pollution.							
	Impacts due to deploying workers at site	• Implementation of a health and • safety management system covering all contractors and subcontractors including identification and provision of PPE, training and monitoring, as well as ongoing safety checks and safety audits. • Facilities and operations will be developed, planned and maintained such that appropriate barriers are in place to prevent accidents. • Ensure that all employees have contracts which clearly state the terms and conditions of their employment and their legal rights. • Ensure primary health care is available and will provide first aid at construction camp sites. • Actions shall be taken to control	Places where the activities to be located at site and where the areas the site office and camps are established.	Project mobilization cost/ engineering cost	Contractor	RDA/ESD / Engineer	As per the technical specification of detail designing and the Port authority regulations	Air, Noise and water quality standards and the conditions of the labor law of Sri Lanka including safety and occupational health standards.

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		Potential increase of transmission of communicable diseases among the project groups. • Care shall be taken to protect the workers due to the issues and the inconvenience created by the Construction activities with poor environmental management conditions. • Fence camps and storage facilities including stock yards to avoid trespass and related injuries.						
	Temporary disturbance of existing utility services at site	• All the existing drawings and the information shall be gathered and a stakeholder (related utility agencies) meeting shall be called. • Utility coordinating Committee for in case of Emergency breakdown of the utility network shall be established in coordination with the appointed responsible officers of the related utility organizations. • A utility coordinating plan shall be proposed and implemented at site. And all the contractors and the sub- contractors site supervisors and engineers shall be made aware about the utility coordination plan. • Care shall be taken to maintain the existing utility services in order to supply the related public services uninterrupted.	Areas where the utility lines are existed and further identifications also shall be done at site. Along the trace from Ch 0+400- Ch 5+210.	Cost estimated by the RDA with the line agencies	Line agencies	RDA/ESD / Engineer	Based on RDA/Line agency conditions	none
Locating and	Impacts on site selection	• When selecting places for the contractor's camps, it shall be	Places where the labor	Project mobilizat	Contractor	RDA/ESD /Engineer/	Site clearances,	Air quality/noise

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
construction of temporary facilities (camps, yards and plants)	and location.	carefully considered whether the area is located within any residents, businesses, and existing land uses, including flood zones and slip/ unstable zones. • Construction camp sites and storage areas shall be located away from any public sensitive areas such as schools, hospitals and religious places, water bodies and forested areas (minimum 200 m away). • Provision of proper infrastructure facilities including water supply, solid waste disposal, sanitation and sewerage facilities (septic tank/ soak pits) of adequate capacity so that it can function properly for the entire duration of its use. • Cut-and-fill un stable areas as well as week structures which are not suitable for dwelling must be avoided where possible during the set-up of the construction camps. • A site plan and the structure including the waste disposing methodologies shall be approved by the local authority/UDA and the Environmental Protection License to be obtained according to the magnitude of the facility. • The camp must be properly fenced off and secured	camps to be located	ion cost/ engineering cost		Local Authority/ CEA	building plan approval, Waste disposing facilities from the Local Authority/ approval of CEA	and solid and liquid waste disposing parameters and standards are included.
	Production and disposal	• The contractor shall make adequate provision to provide toilets for the	Places, where such waste is	Contractors cost	contractor	RDA/ESD / Engineer/	Waste disposing	Solid and liquid waste

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
	of solid and liquid waste	use of their employees during the construction phase. • Such facilities, which shall comply with local authority regulations, shall be maintained in a clean and hygienic condition. Their use shall be strictly enforced. • Any kind of waste water should not be directed to the road side drains and also care shall be taken to treat such water to the quality standards as stipulated in the National Environmental Act under regulations before discharging them to the environment. • If any treatment system is needed contractor shall be obliged to provide such facility with adequate capacity according to the prior approval of the related authority. • Bins and/or bags shall be provided at convenient intervals for disposal of waste within the construction camps. • Degradable, no degradable or Recycling materials shall be source separated and such separated waste shall be disposed in a different type of waste disposing site with the permission of local authority shall be maintained.	generating along the trace and the locations at outside areas where the camps, yards and plants will be located.			Local Authority/ CEA	facilities from the Local Authority/ approval of CEA	disposing parameters and standards are included.
	Storage and handling of fuels and chemicals	• Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals, and any hazardous materials to be used must be provided to prevent the migration of	Places where the waste generating activities are located along	Contractors cost	contractor	RDA/ESD / Engineer	Chemical safety procedures and licenses for storage	Water quality standards and other related

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		spillage into the ground and groundwater regime around the temporary storage areas. • These pollution prevention measures for storage shall include a bund wall which is high enough to contain any stored volume. • The contractor shall submit a method statement to the engineer for approval.	the trace and outside areas.				of Hazardous materials.	clearances under NEA and safety and occupational regulations in the labor act etc.
	Material excavation and storage	• Locations to be selected considering minimum loss of productive land and redevelopment • Prior approvals such as land owners consent, GS&MB license, Environmental protection license, Report from National Building Research Organization and the permits for vehicle transportation shall be obtained. • Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from unstable landslide pronging areas and low line areas. • Stone aggregate shall be sourced from existing licensed quarries. • Construction materials should not exceed the carrying capacity of the trucks. • Storage of cement, bitumen, oil	Places where the Material excavation and storage activities are located along the trace and outside areas.	Engineering cost	Contractor	RDA/ESD / Engineer	Licenses from GSMB/CEA /DS/UDA/ NBRO and Archaeological Department	Air quality, dust, noise and the related standards

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		and other chemicals shall be on an impervious surface above ground level and should be enclosed ensuring that no storm water flows in to the structure.						
	Temporary emission of dust due to stock piles and unpaved areas.	• Storage of sand, rubble, metal, bitumen and cement in covered areas to ensure protection from dust, emissions. • Provision of adequate ventilation to avoid accumulation of fumes and offensive odor to storage yards.		Contractor's cost	Contractor	RDA/ESD / Engineer	As per the technical specifications	Air quality, dust, noise and the related standards
	Impacts on cultural heritage	• Conducting pre-construction conditions assessment of all buildings near the project site including archaeological buildings with photographic evidence of existing cracks before construction works begin.	All buildings near the project site	Contractor's cost	Contractor	RDA/ESD / Engineer	As per the technical specifications	Presence of existing cracks
	Impacts on workers and affected stakeholders	• Monitoring of noise and vibration levels		Contractor's cost	Contractor	RDA/ESD / Engineer	Noise and vibration levels standards	Noise and vibration levels
Construction phase								
Demolishing of existing structures, Earth work, topsoil removal,	Impacts on geology and soil	• Conform the design of the site drainage system is adequate to control runoff from the subproject site in line with topographical features of the site. • No any structure demolishing waste (debris) shall be disposed at site so as to affect to the storm water drainage system of the area.		Contractor's cost	contractor	RDA/ESD / Engineer	As per the technical specifications	Air quality, dust, noise, water quality and the related standards

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		All the reusable materials shall be safe stored and shall be used for the reconstruction purposes.						
Vehicle movement, maintaining of construction facilities (camps, plants & yards, material stock piling)		• Rehabilitate all sites during construction, including construction camps, stockpile area, and temporary access and hauling routes as soon as possible after any type of spillage, leak or contamination has occurred. • Strict care shall be taken in the disposal of construction waste, with proof of disposal at an approved site. • Contaminated water shall be disposed of only after treating according to the appropriate standards of water quality regulations standards stipulated in the National Environmental Act of Sri Lanka. • Fuel handling, especially bulk storage, shall take place in secure bunted areas. • Similar conditions shall apply to lubricant oils, chemicals and liquid wastes. If a spill occur, polluted soils shall be cleaned up or removed for appropriate disposal. • Waste water generate from the plants of Cement, concrete or asphalt shall be treated according to the standards as discussed above before discharging to the environment. • No vehicle maintenance to be allowed on site.	Strong water flows into open excavations may occur, causing sidewall collapse. Contamination through use of toilet facilities other than provided facilities Contamination from spillage of petroleum products, spent engine oil, and oil leaks from construction vehicle maintenance taking place on site					

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		• Temporary toilet facilities shall be provided on site and maintained in corporation with the local authority (CMC). • Topsoil and subsoil shall be stockpiled separately and protected from contamination and erosion. • The productive land shall be reclaimed after construction activity and the subsoil shall be returned for backfilling in the correct soil horizon order.						
	Impacts on Air Quality and dust	• Demolishing of structures shall be done with adequate coverage to control dust at site and suitable wetting system shall be implemented where necessary. • Vehicles traveling to and from the construction site must adhere to speed limits so as to avoid producing excessive dust. • Access and other cleared surfaces must be dampened whenever possible, especially in dry and windy conditions, to avoid excessive dust. • Washing of vehicles and the tires before entering to the public roads from the site to avoid mud entering to the outside public roads. • Vehicles and machinery are to be kept in good working order to meet manufacturers' specifications for safety, fuel consumption, etc • Should excessive emissions be	Along the trace and Borrow, disposal and plant sites outside the trace.	Contractor's cost	contractor	RDA/ESD / Engineer	CEA clearance, Occupational health and safety regulations in the labor ordinance.	Air quality standards of NEA

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		observed, the contractor is to have the equipment seen to as soon as possible. • Removal of dust and mud collected on road surface to avoid dust emanation. • Cover of material in construction sites in order to minimize entrainment by wind. • Good engineering practices and timely schedules including environmental management • Installation of dust barriers if levels are found to exceed standards. • No fires are allowed onsite except for the burning of firebreaks						
	Impacts due to noise and vibration	• Construction layouts shall be carefully designed in order to avoid as much as technically possible noise and vibration impacts to nearby archaeological structures. • All construction activity shall be occurred between the hours of 0600 and 2200 (7 days per week), unless a further environmental noise assessment is undertaken. • Noise-reduction technologies shall be applied in the equipment and machinery (i.e. silencer) • Lowest noise work practices and equipment with good	Along the trace and Borrow, disposal and plant sites outside the trace.	Contractor's cost	contractor	RDA/ESD / Engineer	CEA clearance, Occupational health and safety regulations in the labor ordinance.	Noise quality standards of NEA

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		maintenance practices shall be used whenever possible. • Turn off equipment and vehicles when not being used. • All vehicular movements to and from the site to only occur during the scheduled normal working hours. • Where possible, no truck to be left standing with its engine operating in a street adjacent to a residential area.						
	Impacts on drainage and Hydrology	• Sound engineering practices shall be implemented at the construction sites. • Specific techniques shall be used for dewatering the seepage water in the piling areas (like filter press methods to control contaminated silt to storm water drainages and blocking them. • Storm water management practices and control measures shall be applied to avoid soil erosion and sedimentation. • Every effort shall be made to ensure that any chemicals or hazardous substances do not contaminate the soil or ground water on site. • Action shall be taken to control accidental pollution of freshwater resources by solid, liquid wastes, and hydrocarbon/ fuels. • All areas for which there is a risk of leaks or spills during plant and	Along the trace and camps, yards, Borrow, disposal and plant sites outside the trace.	Contractor's cost	contractor	RDA/ESD / Engineer	As per the technical specifications and the conditions in the drainage plans	Water quality standards of NEA

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		vehicle storage, maintenance or refueling, and areas where materials with polluting potential shall be stored will be bunted. • Care must be taken to ensure that runoff from vehicle or plant washing does not enter the ground water. Wash water must be passed through a three-chamber oil-grease trap prior to being discharged as effluent to a regular water cause with at least eight times dilution. • Development of a Waste Management Plan to avoid solid or liquid waste discharges to water bodies; • All discharges shall be intercepted and treated to meet the standards prior to entering a watercourse.						
	Impact due to soil erosion and sedimentation	• Management measures shall be adopted to minimize the quantity of uncontaminated storm water entering cleared areas. • Care shall be taken to establish cut-off or intercept drains to redirect storm water away from cleared areas and slopes to stable (vegetated) areas or effective treatment installations. • Reduce water velocities and Prompt installation shall be done to erosion control measures to intercept and treat run-off from the construction	Along the trace, Borrow, disposal and plant sites outside the trace.	Contractor's cost	contractor	RDA/ESD /Engineer	As per the conditions of technical specifications	Water quality standards of NEA

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		working area. • Adequate controls shall be placed on all drainage lines. Silt loads should be treated as close to their source as possible using effective sediment traps such as geotextile fences and other site specific measures. • Soil storage time and the height of the soil stock piles shall be minimized to avoid potential impacts by the erosion to surface watercourses from run-off • from the construction working corridor.						
	Impact on Biodiversity, fauna and flora	• Few areas identified as the trees required to be removed. Further it is recommended to implement the tree planting program to replant the native species along the road sides and where it is suitable. • Contractor shall be responsible to submit a report on his program and schedule of re planting trees including identified locations for prior approval of the employer. • All the land selection for camps and yards shall be done with creating the minimum effect to the biodiversity of the area. • Works areas shall be maintained free of dust and mud as far as reasonably practicable.	No such impact areas of Faunal habitats are identified. Few areas from Ch1+000–2+600 approximately 75 numbers of trees identified to be removed. Refer the paragraph 228 of the IEE report.	Costs for tree removal Costs for Compensatory tree replanting	contractor	RDA/ESD / Engineer	As per the conditions of technical specifications	Biodiversity improvements of the area. Number of trees to be replanted is 3 times of the total number of trees removed.

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
	Impact due to Land uses	• Clear and timely information shall be provided to land owners on the exact timing of construction works, so that landowners are fully aware of the time of start and the period of duration of construction • Care shall be taken to reinstate the temporary used sites such as camps, yards, plants and material excavation areas etc to the satisfaction of the owner according to the post requirement of the land use. • Compensation at replacement values for lost assets • Quick actions shall be taken to provide proper access for the affected parties. • Monitor implementation of mitigation measures and management planning to ensure that stakeholders are kept informed and not unduly affected by the process.	Areas where the temporary acquisition is done.	Contractor's cost	contractor	RDA/ESD / Engineer	As per the conditions of technical specifications	none
	Impact on Infrastructure and services	• Shall be taken necessary actions to adhere to the conditions stipulated in the agreements of Road and Railway Crossing with timely schedules. • Infrastructures and Utilities Management Plan and a committee in coordination with the responsible officers of related authorities for	Areas where the utility network is functioning along the trace/ scenic	Contractor's cost.	contractor	RDA/ESD / Engineer	As per the conditions of technical specifications	none

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		emergency requirements shall be created. • During construction and Engagement with local authorities and utilities companies to ensure continuity of utility supply to communities. • Utility coordinating officer shall be present at work fronts to ensure that impacts from planned disruptions are minimized and that any unplanned • disruptions are properly managed						
	Impact on occupational Health, safety and security.	• Implement good housekeeping practices at the construction camp. • Strict health and safety measures to be implemented and audited on a regular basis • Contractor shall arrange all safety measures for workers as per the Factories Ordinance. • Ensure all workers including contractors and subcontractors receive education around transmission routes and symptoms of communicable diseases of concern. • All workers employed shall be provided with personnel protective equipment. • Ensure primary health care is available and shall provide first aid at construction camp sites.	All the working groups Communities along the proposed route. Settlements close to Yards and construction camps.	Contractor's cost.	contractor	RDA/ESD / Engineer	Labor rules and regulations of labor act.	none

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		Equipped first aid stations shall be easily accessible • throughout the site. • Provide medical insurance coverage for workers. • Provide clean eating areas where workers are not exposed to hazardous or noxious substances. • Ensure that signs are put up around work fronts and construction sites advising people of the risks associated with trespassing. • Camps and storage facilities including stock yards areas shall be properly fenced. • Actions shall be taken to fenced to avoid trespass and related injuries. • Shall undertake stakeholder engagement with affected communities and other stakeholders on a range of issues including changes to the visual environment, noise, dust and social concerns. • Lighting onsite shall be set up to provide maximum security and to enable easier policing of the site, without creating a visual nuisance to local residents or businesses. • All interested and affected parties shall be notified in advance of any known potential risks associated with the construction site and the activities on it.						

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		Examples are: stringing of power lines						
	Impacts to construction debris and waste disposing	• Concrete debris of demolished structures shall be disposed in an approved site of the CMC or shall be supplied for foundation filling under supervision and approval of CMC. • Provision shall be made for domestic solid waste disposal in an acceptable manner and in consultation with the local Authorities. • Excavated materials from roadways, shoulders, verges, will be used for suitable backfilling, filling pits, and landscaping. • Unusable debris material and removed pavements of roads should be suitably disposed of at pre-designated disposal locations, with approval of the concerned Local authority. • Consider the quarry sites for excess spoil disposal and subsequent rehabilitation. • In establishing disposal sites, unproductive/ wastelands shall be selected with the help of the leaders of CBO s of the area and the villagers. The dumping site should be of adequate capacity. It should be located away from public sensitive area and without causing nuisance to residential areas. • Dumping sites should also be	Construction sites along the trace and the workers are deployed for the activities and their resting areas and camps	Contractor's cost.	Contractor	RDA/ESD / Engineer	As per the conditions of technical specifications.	Water quality standards

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		away from water bodies, paddy fields etc. To prevent any contamination of these bodies. A buffer zone should also be established around the dump site.						
	Impacts on Aesthetics, landscape character and visual amenity	• All areas used for construction will be fully restored to their pre-construction state. • Physical terrain, soils and vegetation will be reinstated as closely to their original condition as it is practically possible, undertaken in accordance with a Landscape Management Plan. • The use of existing boundary areas and landscape features (roads, fence rows, property lines,) will be sought in order to minimize visual impacts. • Materials and machinery will be stored tidily during the works. • Earth roads providing access to site compounds and works areas will be maintained free of dust and mud as far as reasonably practicable. • Building structures will be designed to fit within existing topography to the extent possible	Along the trace	Contractor's cost.	Contractor	RDA/ESD / Engineer	As per the conditions of technical specifications /Archaeological clearance	none
	Impacts on Archaeological and cultural characteristic	• Prior to re-routing, Cultural heritage sites shall be identified by the contractor by joint investigations with the authority officer of the archaeological	Areas near the Archaeological sites and Monuments	Design cost/ Contractor's cost.	Contractor	RDA/ESD / Engineer/ authority officer of	As per the conditions of technical specifications /Archaeology	Noise/ vibration standards

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
	s	department including producing maps and information carried out within the route corridor. • Prior to the commencement of construction, all staff need to know what possible archaeological or historical objects of value may look like and their locations. • Excavations should be implemented only within the given project site. • Contractor shall allow the authorized officer of archaeological department to examine any excavations or construction activity at any time if requested. • Alternative low impact and vibration minimizing construction techniques shall be used when doing heavy construction activities with anticipated excessive vibration (bored piling/hammering/sheet piling etc), continuous vibration monitoring shall be carried out at site to identify the magnitude of the risk. • The movement of vehicles, equipment and personnel shall be managed. • If any fossils, coins or article of value of antiquity and structures and other remaining or things of geological or archaeological interest etc is discovered by the				Archaeology department	clearance	

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		workman of the contractor on the site, immediately stop excavation or related activity and shall be informed to the engineer and get instructions. • The contractor shall obtain instructions from the Archaeology Department through the Engineer on conservation prior to the recommencement of the activities within the area.						
	Impacts on Socio cultural and economy	• Attempt shall be taken to Identify and work with local organizations and community leaders to develop explicit strategies to ensure that all members of the community can access information on employment opportunities. This includes young people and low-income and low-skilled families. • The Project will consider female employment opportunities where possible. • Contractor's activities and movement of staff shall be restricted to designated construction areas. • Machinery and vehicles are to be kept in good working order for the duration of the project to minimize noise nuisance to neighbors. • Noisy activities must be restricted to the times given in the project specification	Local communities, Owners and users of land affected by temporary land take.	Contractor's cost.	Contractor	RDA/ESD / Engineer	As per the conditions of technical specifications	none

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		or general conditions of the contract. • Queries and complaints are to be handled by: (i) documenting details of such communications; (ii) submitting these for inclusion in complaints register; (iii) bringing issues to engineer's attention immediately; and (iv) taking remedial action as per engineer's instruction. • Selected staff are to be made available for formal consultation with the interested and affected parties in order to explain construction process and answer questions.						
Post construction activities								
Construction camps/ yards and plants		• All structures comprising the construction camp shall be removed from site. • All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and regressed using the guidelines set out in the vegetation specification that forms part of this document. • The contractor must arrange the cancellation of all temporary services	All the sites used by the contractor for their camping, site office, yards and plants etc.	Contractor's cost.	contractor	RDA/ESD / Engineer	As per stated in the technical specification	none

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		• The area that previously housed the construction camp shall be checked for spills of substances such as oil, paint, etc., and these shall be cleaned up.						
Materials and infrastructure		• Fences, barriers, and demarcations associated with the construction phase shall be removed from the site unless otherwise stipulated by the engineer. • All residual stockpiles shall be removed to spoil or spread onsite as directed by the engineer. • All leftover building materials shall be returned to the depot or removed from the site. • The contractor must repair any damage that the construction work has caused on neighboring properties.	Along the trace and at all the sites used by the contractor for their camping, site office, yards and plants etc.	Contractor's cost.	contractor	RDA/ESD / Engineer	As per stated in the technical specification	none
Land rehabilitation		• All surfaces hardened due to construction activities shall be ripped and imported materials removed. • All rubble shall be removed from the site to an approved disposal site in corporation with the relevant Local Authority. Burying of rubble onsite is prohibited. The site shall be cleared of all litter. • Surfaces are to be checked for waste products from activities such as concreting or asphalting, and cleared in a manner approved	Along the trace and at all the sites used by the contractor for their camping, site office, yards and plants etc.	Contractor's cost.	contractor	RDA/ESD / Engineer	As per stated in the technical specification	none

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		by the engineer. • All remaining land areas shall be trimmed, shaped, and replanted to the satisfaction of the engineer. • Borrow pits are to be closed and rehabilitated in accordance with the preapproved management plan for each borrow pit. The contractor shall liaise with the engineer regarding these requirements. • The contractor is to check that all watercourses are free from building rubble, spoil materials, and waste materials.						
General	Vegetation	• All areas that have been disturbed by construction activities (including the construction camp area) shall be cleared of unnecessary types of vegetation including alien types. • Open areas shall be replanted as per the re vegetation specification. • The contractor is to water and maintain all planted vegetation until the end of the defects liability period, and is to submit a method statement regarding this to the engineer. A meeting is to be held onsite among the engineer, Employer and contractor to approve all remediation activities and to ensure that the site has been restored to a condition approved	Along the trace and at all the areas where the construction activities were completed.	Design cost/ Contractor's cost.	contractor	RDA/ESD / Engineer	As per stated in the technical specification/ Proposed Landscape improvements	none

Project activity	Impact identified	Mitigatory Measures	Approximate Location	Mitigation Cost	Institutional responsibility			Environmental Parameters to be reflected in the EMoP
					Implementation	Supervision	Standards/ clearances	
		by the engineer. • All areas where temporary services were installed are to be rehabilitated to the satisfaction of the engineer • Temporary roads shall be closed, and access across these blocked						

Environmental Monitoring Plan (EMOP)

Environmental component	Project stage	Parameter s to be monitored	Location	Frequency	Standards	Rate (Rs.)	Approximate Cost (SLRs)	Implementation Agency	Supervision
Air Quality	Pre-Construction stage	TSPM, PM10, NOx, CO, SOx	• Near the UDA housing scheme at Ch0+040-0+250 LHS. • Near St. Anthony's Shrine at Ch2+800 LHS. • Near sambhod Chaithya at Ch4+950-4+980 LHS	(24 hrs) once in at each location	NAAQS of Sri Lanka	Rs 75,000 per location	225,000.00	Contractor through approved monitoring agency	Engineer/ RDA/ESDD
	Construction Stage	TSPM, PM10, NOx, CO, SOx, Pb		(24 hrs) Once in six months each location	NAAQS of Sri Lanka	-do-	450,000.00	-do-	-do-
	Operation Stage	TSPM, PM10, NOx, CO, SOx, Pb		(24 hrs) once at each location	NAAQS of Sri Lanka	-do-	225,000.00	RDA/ESD	-do-
Water Quality	Pre-Construction stage	EC, pH, DO, TSS, BOD, Oil and grease, Lead, E. Coli	• Upstream area of the Beira lake. • Downstream area of the Beira lake • Upstream area of the Bloumendha l Ela. • Downstream area of the Bloumendhal Ela.	Once at each Location before commencing construction	Water quality regulations in National Environme nta l Act.	Rs 13,75 0 per location	55,000.00	Contractor through approved monitoring agency	Engineer/ RDA/ESDD
	Construction Stage	EC, pH, DO, TSS, BOD, Oil and grease, Lead, E. Coli		Once at each location While the construction is ongoing based on the engineer's request	-do-	-do-	55,000.00	-do-	Engineer/ RDA/ESDD
	Operation Stage	EC, pH, DO, TSS, BOD, Oil and grease,	• Same locations as at pre-construction	Once at each Location after	-do-	-do-	55,000.00	RDA/ESD	-do-

Environmental component	Project stage	Parameter s to be monitored	Location	Frequency	Standards	Rate (Rs.)	Approximate Cost (SLRs)	Implementation Agency	Supervision
		Lead, E. Coli	stage.	completion of activities					
Noise	Pre-Construction stage	(Noise levels) dB levels	• Near the UDA housing scheme at Ch0+040-0+250 LHS. • Near the UDA housing scheme at Ch0+200-0+250 LHS. Near St. Anthony's Shrine at Ch2+800 LHS. • Near sambhodi Chaithya at Ch4+950-4+980 LHS	Once at each location	National Environmental (Noise Control) Regulations,	Rs (32,500x3 + 8,500x1)	106,000.00	Contractor through approved Monitoring agency	Engineer/ RDA/ESDD
	Construction Stage								
		-do-		Once in six months/ each location	-do-	-do-	212,000.00	-do-	-do-
		-do-	For 10 short points based on **complaint monitoring**	10 locations per year	do	Rs 8,500	85,000.00	-do-	-do-
	Operation Stage	-do-	Same locations as at pre-construction stage.	Once at each location	-do-	-do-	106,000.00	RDA/ESD	-do-
Vibration	Pre-Construction	1hr Ground Vibration	• At the Ch 0+040-0+016.	Once at each location	Interim standards	Rs. 12,500	75,000	Contractor through approved	Engineer/ RDA/ESDD

Environmental component	Project stage	Parameter s to be monitored	Location	Frequency	Standards	Rate (Rs.)	Approximate Cost (SLRs)	Implementation Agency	Supervision
	stage	(mm/sec)			of vibration CEA.			Monitoring agency	
	Construction Stage	do	• At the UDA housing area Ch 0+200-0+250 RHS. • At St. Anthony's Church. • At Port authority/ port Building. • At Grand oriental hotel. • Near sambhodhi chaithya ch4+950-4+980 LHS.	Once during construction at each location with prior approval of the Engineer.	do	Rs. 12,500	75,000	do	-do-
		do	1hr, 10 locations based on **complaint monitoring**	During construction based on the Engineers	do	Rs. 12,500	120,000.00	D0	Engineer/ RDA/ESDD
	Operation Stage	do	Same locations as at pre-construction stage.	Once at each location	do	Rs. 12,500	75,000	RDA/ESD	-do-

ANNEXURE 8: PUBLIC CONSULTATION MEETINGS

Name of the project: Construction Project of the Port Access Elevated HighwayStake Holder Analysis.

Present project, SASEP Port Access Elevated Highway can be considered as a final result of the Development process started with the comprehensive feasibility study conducted in 2014 for the Southern Highway Extension towards Colombo (SHETC) Project. During this study, the team has paid attention to conduct a comprehensive socio-economic and environmental study on construction of Elevated Highway over three major roads namely 1) Kirulapana to Kadawatha 2) Colombo Fort to Kottawa and 3) Colombo Fort to New Kelani Bridge Interchange. This proposal came as a practical solution to the problem of ever increasing traffic congestion that has become a common phenomenon in the daily life of the commenters in Colombo city.

Several Public Consultative meetings has been conducted with the participation of various interest groups including organizations that maintain utility services in project affected areas.

Community Consultative Meeting

Issues discussed:

- Awareness and extent of knowledge about the subproject;
- Benefits and the importance of the subproject in terms of economic and environmental enhancement;
- Information on the negative impacts of the proposed subproject and their mitigation and management during execution in terms of increase in traffic congestion, air and noise pollution, etc.
- Presence of any historical/cultural site in the vicinity;
- Information on trees to be cut and measures to be taken for compensatory plantation;
- Information on economic development in terms of rapid transit of goods and generation of direct employment during the execution of the subproject.
- Information about the Utility locations and the possible measures would be taken to protect them.
- About the SLPA restrictions on entering to their premises without passes.

Session 1
Date and time of consultation; 17 May 2017 at 11 a.m**.**
Venue: at Divisional Secretariat- Colombo
Participants:

1. A.D.Sriyakanthi- Administrative Grama Niladhari- DS Office. Colombo
2. M.A.S.Kanchana- Assistant Divisional Secretariat. DS Office. Colombo
3. Abeyratne Attanayake – Social and Resettlement Specialist- Katahira Engineering.
4. Asela Bandara- Engineer Katahira Engineers Internationals.

And 34 Participants.

Meeting was started at 10.00Am with opening remarks by Miss. M.A.S. Kanchana. She welcomed the participants and mentioned the construction of an Expressway will be very useful in facing the challenges in road transport. She further cited the example of constructing of

Southern expressway and how it has contributed to reduce the travel time from Mathara to Colombo.

Mr. Abeyratne Attanayake explained that the proposed elevated Expressway will be constructed over the existing Port Access Road and further explained that there will be no land acquisition or relocation of any structures.

One participant raised a question and explained that, although there is no direct connection to road construction work there will be opportunities where the dwellers in the vicinity of the work site will be disturbed by vibration and noise of machines working in the site.

Mr. Asela bandara Engineer explained that the construction work will be implemented with most modern machines which will have minimal impact over the natural surroundings. Noise and vibration management plan will be implemented where necessary.

Social and Resettlement Specialist explained that the project will establish the GRM mechanism to pay attention to all kinds of complains and grievances submit by the community.

Community consultative committee was formed with the aim of making arrangements to maintain smooth coordination during the construction period.

N.	**Name.**	**GN Division**	**Telephone number.**
1	Niluka Anthoni	Nelumpokuna.	0112520671
2	Saju Dias kumara Pathirana	Fort.	0726866220
3	Dayaratne	Kochchikade- North	0710150150
4	Dhammika Malkanthi	Kotahena West	0725978911
5	Kamlani Nirosha	Kochchikade- North	0774578447
6	A.A. Surammya.	Kochchikade- North	0112451087
7	Duminda Asela	Fort	0711313390
8	Thuwan Nur	Fort	0718663090

Some participants questioned about job opportunities for the people in the area during construction period. Social specialist explained that contractor will be instructed to give priority to see the possibility of recruiting suitable workers from the area.

After the vote of thank by Miss. Sriyakanthi of DS office the meeting was concluded.


17 05 2017


17 05 2017

Session 2
Title: Meeting with SLPA / RDA / KEI [Traffic Safety, Social & Environment
Date: 2017-05-15 (Monday)
Time: 09.30 AM
Venue: SLPA Administrative office, Library conformance Hall.
Attendee:

SLPA / RDA Teams	Consultant (KEI-NKI JV, GTC & PMAI)
Mr. C L Dassanayaka [Chief Engineer]	Mr. Banu Palla [Road Safety]
Mr. K M T B Ganegoda [SCE]	Mr.Don Jayaweera [Transport Economist]
Mr. P L Dahanayake [Port Engineer]	Mr A M Abeyrathna [Social Specialist]
Mr K P N S Nimalasena	Mrs. Kokila Jayasinghe [Environment Specialist]
	Mr. Sarath Peiris

Subject Discussed as follows:

1. Road Safety / Transport Economist
2. Social
3. Environment
4. Others

Comments as follows:

1. Road Safety / Transport Economics

- SLPA Senior Engineer, confirmed that JICA recently has started some traffic counts and analysis for PORT traffic, of which counts are currently available and analysis is still being done. Also, similar count was done around 8-10 years back.
- SLPA suggested making a formal request, Officially through RDA, for any traffic and accident data.
- KEI stated that availability of South Harbor Development Plan.
- SLPA is going to check on other General Development/Vision Plan for the whole Colombo Port, which will be provided after they receive formal request through RDA.
- KEI stated SLPA and RDA Entry and Exit Ramps to serve Port Traffic exclusively will be located at the South Harbour Entry Point.
- KEI stated as per SLPA plan, the existing security check point will be moved westwards on Port Access Road, farther from Ingurukade Junction, in future for the project.
- SLPA said currently looking at new Technology Scanners which can considerably reduce time and cost associated with security post operations.
- KEI stated that relating to Oversized Cargo,
- SLPA confirmed that there exist an Alternate Surface Route and Gate to take care of Over Sized Vehicles, apart from the preferred Water Route.
- SLPA would like to have 4-lanes (2 in each direction) open all the time for Port Traffic during the time of construction. Especially, to coordinate regularly with New Kelania Bridge Project Team to ensure 4-lanes at the proposed on-off ramp interchange west of Ingurukade Junction.
- RDA said that going to check on the CoMTrans Report Traffic Data, and provide us a copy.
- KEI stated that our Project Scope does not include any ON or OFF Ramps at Pettah Market Area, as the ramps are proposed in future as part of the new

Transportation Hub, that is still in initial stages of consideration. It will take more time to materialize.

- RDA was informed about the Optimum Traffic Projection Methodology, given the Time and Schedule Constraints, that will be undertaken as follows:
  - Growth Trend will be derived from available relevant factors, such as GDP, Vehicle Ownership, Fuel Consumption…etc.
  - Proposed Future Developments, as obtained from CMC, will be used to generate trips, and added to the traffic according to timeline of development.
  - Port Development Plans and Traffic, as obtained from SLPA, will be used to derive Port Traffic, which will be added per the timeline schedule.
  - Port City Development traffic will be added in phases I & II per proposed time line schedule.
  - Finally, Traffic Growth Data will be combined with traffic from developments to derive timeline traffic on PEAH.

2. Social

- KEI stated are there any demolishing building due to Project implementation.
- SLPA said the demolishing buildings are there that list given to RDA and SLPA proposed to RDA to establish new building which damage due to construction and under same loan. According to the information from RDA design already start.
- RDA said that is internal matter of SLPA and RDA. It should done by SLPA prior to start construction.
- KEI stated what are the Utility going underground and how relocate is or temporally move during construction.
- SLPA said utility drawings handed over to RDA what are available. But SLPA not guaranty the path shown in drawing. SLPA proposed having meeting with those utility parties.
- RDA said KEI should submit official request letter what are the organization required for the discussion then RDA will arrange according.
- KEI stated is there any agreement between SLPA & RDA because land own by SLPA and project construct by RDA.
- SLPA said already sent letter to RDA with condition.
- KEI request copy from RDA.

3. Environment

- KEI stated Stakeholder Identification/affected parties within the port premised.
- SLPA said that the petroleum line also crossing the road trace which is direct from Kolonnawa. And there are 225KVA underground power line to power barge.
- KEI stated discussed about the utility network within the port premises including the information about the fuel transmission lines and railway
- SLPA said existing rail line may be damaged during construction. Therefore, have to discuss the alternatives with the railway authority to provide service uninterrupted.
- KEI stated how coordination with the related parties is when a Utilities are damaged during the construction on going.
- SLPA said contractor should appointed a permanent officer for that purpose and when it is needed during project time. Coordinating committee which is participated by all the responsible officers of the related organization is to be set up. We also should take action to create such committee through the RDA and before

commencement of land preparation the areas to be checked and identified by the said committee to avoid the possible damages to the said utility lines.

- KEI stated Removing of trees.
- SLPA said that very few un matured banyan trees are there and they hope that most of the trees will be not affected and others may protect only by removing leaves and branches. Further they said if there's a necessity to cut the trees can be done and agreed to replant trees at the suitable places within the port authority premises.
- KEI stated Conditions and restrictions when doing night time work.
- SLPA said since the port access road is functioning as the same in day times and the night times all the four lanes should be functioned without any congestion. Contractor should get traffic plan approved by the related department of the Port Authority. And all the working groups should take prior approval to enter to the port authority area.
- KEI stated new alignment and the safety of the historical buildings.
- SLPA requested to carryout existing vibration condition where necessary so as for the future comparisons and the impact identification and specially mentioned about the need of an effective engineering methods to prevent the buildings form excessive vibration.
- KEI stated situation of flood condition.
- Flood condition when heavy rain periods - some areas identified as water logging (1-2fts) for several hours (2-3hrs) during rainy periods (after 3-5 hrs. rain). But it is not an issue so far. No dug wells maintained within the port premises and the water is not consumable. SLPA using pipe bourn water.
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4. Others

- KEI stated that SLPA not issue free entry pass for the subcontractors. and letter handed over which sent RDA
- SLPA said they will write to MD of SLPA base on RDA letter and solve the matter immediately

Identified key Issues and Planned Actions Related to Stakeholder Organizations

Service	Utility Service Agency	General Assistance Required	Special Issues / Concerns	Remedial Measures / Comments
Telecom	SLPA	Shifting underground cables etc. where necessary.	Drawings are not drawn to a scale and the positioned path of cables is not straight from Manhole.	Before the time of construction, the trial pits must be dug with the Telecom Section of Port Authority to identify the cable's path locations to avoid unnecessary damages.
	SLT	Shifting of service Lines etc. where necessary.	Drawings are not drawn to a scale and the positioned paths of cables are not straight from Manhole.	Before the time of construction, the trial pits must be dug with the relevant authority to identify the cable's path locations, if necessary relocation of the service line to be done in advance of construction work.
Electricity	CEB	Identifying &	There are about 17	Use instruments with CEB to

		Shifting of Electrical underground High or Low Voltage cables etc. where necessary.	locations where high or low voltage underground power lines are either crossing or along proposed alignment (Including supply cables from floating barge of bulk power supplier's).	identify cable path before stating excavation work.
	SLPA	Identifying & Shifting of Electrical underground High or Low Voltage cables etc. where necessary.	There are about 17 locations where high or low voltage underground power lines are either crossing or along proposed alignment.	Use instruments to identify cable path before stating excavation work.
Water	NWS & DB	Identification & shifting of pipe lines where necessary.	In about 22 locations water supply pipe line may be obstructed by construction of elevated Highway Bridge Pile Caps and drilling of Bored Pile works.	Use instruments with NWS&DB to identify their pipe line route before stating excavation work. If necessary elevated Highway Bridge spans to be changed
	SLPA	Identification & shifting of internal pipe lines where necessary.	In about 13 locations water supply pipe line may be obstructed by construction of elevated Highway Bridge Pile Caps and drilling of Bored Pile works.	Use instruments to identify pipe line route before stating excavation work with assistance of the SLPA.
ver	CMC /SLPA	Identification & / or Shifting of Sewer lines where necessary.	In 4 locations, between ch 2+545 to 3+615 force main lines are crossing the road pile cap locations. Gravity sewer lines are crossing or overlapping with Elevated highway center line of Fort Access road in about 33 locations	It is necessary to construct new sewer force line along a new path instead of existing Force main pipe line before starting of bored piling works or to change bridge column structure from the centre of the road. It should be considered to lay new gravity sewer line or pile cap location to be shifted along the trace.
Drainage	CMC /SLPA	Shifting of drainage lines where necessary.	There are total 14 cross drains, between chanages 2+426 to 4+995 & out of that 10 is under CMC & 4 is under SLPA.	Sifting of those drains to be avoided when pile caps are positioning on the trace
Street Light	SLPA	Relocation of street lights		New street lights can be both underside edges of the new elevated highway
Railway track	SLPA	Shifting and / or Relocation of utility services	Elevated highway center line is crossing or along with existing	Relocation of railway line or shifting of pile cap from those crossing locations.

		within port premises.	railway line at 4 locations (2 crossings).	
Traffic Control	Traffic Police	Managing traffic during construction and operation	Traffic diversion will be needed. Access roads, entrances to buildings will be blocked during construction	Traffic controlling according to joint plan with RDA.
Archeologically important buildings	Dept. of Archaeology	Protecting relevant buildings	Important buildings close to changes 0+220,0+740,3+620,4+140,4+860,4+625,4+550,4+575,4+600, 4+910.of the Port Access road.	Joint Planning by RDA and Dept. of Archaeology for protecting buildings and maintaining existing conditions of buildings

ANNEXURE 9: MATERIAL SURVEY INFORMATION OF THE PAEH PROJECT

A Materials Survey was conducted to investigate possible sources of construction Material such as Aggregate, cement, sand, Soil etc likely to satisfy the Specifications under review.

The material Survey included available sources of supply of ready mix concrete, normal reinforcement steel and Asphalt concrete which could be used in 2018.The design Drawings of Elevated Highway are not finalized and Preliminary Draft B.O.Q.is available at end of May 2017. The details of Quality by personal discussions with production personal over the Telephone.

To locate Material sources such as soil & sand within haulage of 25km from the Project site were considered. Soil borrow Pits are been rapidly consumed by Ongoing projects by the Time this Project to scheduled commence in 2018. According to the current demand it has been created a competition for supplying aggregate and due to the over exploitation and noncompliance of the conditions of the licensee procedure, the related authorities has taken action to issue the permits only for limited period (three months). Therefore, the new soil borrow areas in Colombo District within 50km should be identified when project started.

The suppliers who exist for long period with compiling the environmental conditions and environmentally sound suppling conformed are listed below.

BORROW SOIL SUPPLIERS WITH NECESSARY APPROVALS OF THE COLOMBO DISTRICT.

Aggrade suppliers with necessary approvals of the Colombo District.

#	Name and the address
1	E. K. D. P. Ravindra, kahahena, waga
2	L. T. D. Nisoshana, Belmon Estate, Angampitiya, paduka.
3	M. G. Sunil, Thummodara Rd, puwakpitiya.
4	Sisira Kumara, malagala rd, Kahawala, paduka.
5	H. Jagath, pushpakumara, Veralupitiya Estate, waga.
6	R.A.D.Manuja Krishantha, Morakale Estate.

Records From CEA

#	Name and the address
1	Boulder Mix (Pvt) Ltd, Meepe padukka
2	L.H. piyasena (Pvt0ltd, Meepe Padukka.
3	Nayana Prabashini Rajapaksha, Diddeniya, Hanwella.
4	A. S, J, Rodrigo, Tennapitahena, Diddeniya.
5	N.G. Nawagamuwa, Kahahena, waga.
6	A.K.Samantha, Neluwaththuduwa, waga.
7	Lalith Hettiarachchi, Kakadamulla, Diddeniya.
8	W.K.K.Engineering,(pvt)ltd, Mawathagama, Paduka.
9	D.L.S. Palihena, Kahahena, Waga.
10	W.V.A.P.Rodrigo, kahahena, waga.
11	K.A.M.Manoja Kumari, Diddeniya, hanwella.
12	Pushpa Premajeewa, Wewalpanawa, Padukka.

Ready Mix concrete -The project required more than 170,000 cu m of Ready Mixed concrete within a period of two years in which more than 82000 cu m of concrete required at casting yards. It is estimated that 30 Acers of land required for casting yards for casting and stocking of construction material. The contactor could either purchase Ready Mix Concrete or install his own

concrete Mixing Plants inside their casting yard.

If the Contractor wishes to purchase required quantity of concrete from Ready Mix Concrete there are 15 nos of plants belongs to the members of Lanka Ready Mix Association.

READY MIXED CONCRETE SUPPLIERS IN SRI LANK

	Name and address	Plant manager/Contact person	Tel: /Fax	email
1	Sanken Construction (Pvt)Ltd, 295, Madampitiya Rd, Colombo 14.	Vajira Jayasuriya	0718234370, 0112522939, 0112522942 - Fax	Readymix2@sanken.lk
2	Maga Engineering (Pvt)Ltd, 66, Ratnapura Road, Ambatale.	Tissa Mallawarachchi	0773148188 0112414530 0112414531	bpa@maga.lk
3	L H Piyasena Concrete (Pvt) Ltd, 30/53, Jasmine Gardens, Narahenpita Road, Nawala	Gamunu Piyasena	0777722811 0112580524 112500819	jagathlh@sltnet.lk
4	ELS Construction (Pvt) Ltd, 62/3, Neelammahara Road, Katuwawala, Boralesgamuwa.	Anura Vithanage	0112517365 0112509806	anura@elslanka.com
5	Tudawe Brothers (Pvt) Ltd, 505/2 Elvitigala Mawatha, Colombo 5		0 112 368494 0 112 501922	tblinfo@tudawe.com
6	Sierra Readymix, Templeberg Industrial Zone, Plot No. W, Stage II, Panagoda.	Lal C Weerasinghe	0714306775 0112752181 0112752999	dgmreadymix@sltnet.lk
7	Informex Concreting (Pvt) Ltd. Kovil Veediya, Colombo 10.	N M Jeremy Adams	0112686571 0112689154	nmjeremy@yahoo.com
8	Sathuta Ready-mix (Pvt) Ltd, 71, Negombo Road, Kurunegala	Nirodha Karunaratne	0372221836 0372221839	nirodha@sathuta.net
9	Tokyo Supermix, 77B, New Nuge Road, Peliyagoda.	Janaka Perera	0112945865 0112945866	janaka@tokyocement.lk
10	RN Readymix (Pvt) Ltd, 532/1, Kaduwela Road, Thalahena, Battaramulla	Rohitha Senarath	0112791160 0112789014	rohitha@rncons.lk
11	Sunbee Readymix Ltd. 18, St. Anthony's Mawatha (Suncity Building), Colombo 03	Neela Fernando	0114715467 0114712999	sunbeereadymix@bandusena.com

Asphalt Plants - As the total Asphalt requirement is less than 3000 tons it is recommended to purchase Asphalt from suitable Asphalt plant in Colombo District. There are three Asphalt plants operated by reputed leading contractors. They are;

- WKK Asphalt Plant located within 30km from Ingurukade junction thru Kelaniya-Mudungoda Rd.
- Maga Asphalt Plant located within 20km from Ingurukade junction alone CRWB road located nearly 3km away from Kottawa junction towards Rukmalgama.

- I.C.C. Asphalt plant at Thudugala in Kalutara District

SAND -There are Two Types sand available in Open Market

(i) **Sea Sand-**Main supplier is Sri Lanka Land Reclamation & Development Board at No3, Sri Jayawardana Pura Road,Welikada ,Rajagiriya. Their Sea Sand Storage at Kerawalapitiya about 8km away from Ingurukade junction.

(ii) **River Sand** -It is estimated that the Project required more than 100000 m3, of sand. The closest large-scale river sand deposit is at Deduru Oya River in Puttalum District. According to Geological Survey and Mines Bureau the quality of river sand at Deduru Oya is found free of clay & organic matter etc. The sand obtain could be used in concrete work without any primary cleaning. The distance from Ingurukade junction to the sand harvesting area is about 150km.

CEMENT – It is estimated that more than 80,000 M.T.of Cement will be required for the project within 20 Months for the completion of project. More than 2,000,000 M.T./year Normal Portland Cement are produced in Sri Lanka by Three Manufactures. The main Cement Manufactures, who produced cement comply with B.S./S.L.S.are

- Holcim [Lanka]
- Ultra-Tec Cement Company
- Tokyo Cement Company.

There are some cements both local and imported have failed to meet the standards required. The Contractor should check the quality of all batches of cement brought to site prior to incorporation in the work.

STEEL -Steel produced by Lanka Steel corporation[pvt] Ltd, Oruwala, Athurugiriya, Sri Lanka, comply with BS4449 & SLS375, but some imported steel does not conform to the BS/SLS standards. It is therefore recommended that the samples of steel collected at site should be tested before use in the work.

High Tensile steel-

High Tensile Steel wires & strands are not produced locally & it is recommended to use internationally accepted branded products for post-tension & pre- tension work.

Bitumen

The Ceylon Petroleum Corporation produces 60/70 Bitumen at their Refinery at Sapugaskanda. The leading importers of Bitumen & Bitumen Products are;

- Industrial Asphalt[Ceylon] Plc ,28/1 New Nuge Road,Peliyagoda.
- Bitumix [Pvt] ltd,Panagoda,Homagama.
- Oremix Asphalt[pvt] ltd,Nawala,Rajagiriya.

Metal Crushers Available in Colombo district are listed below.

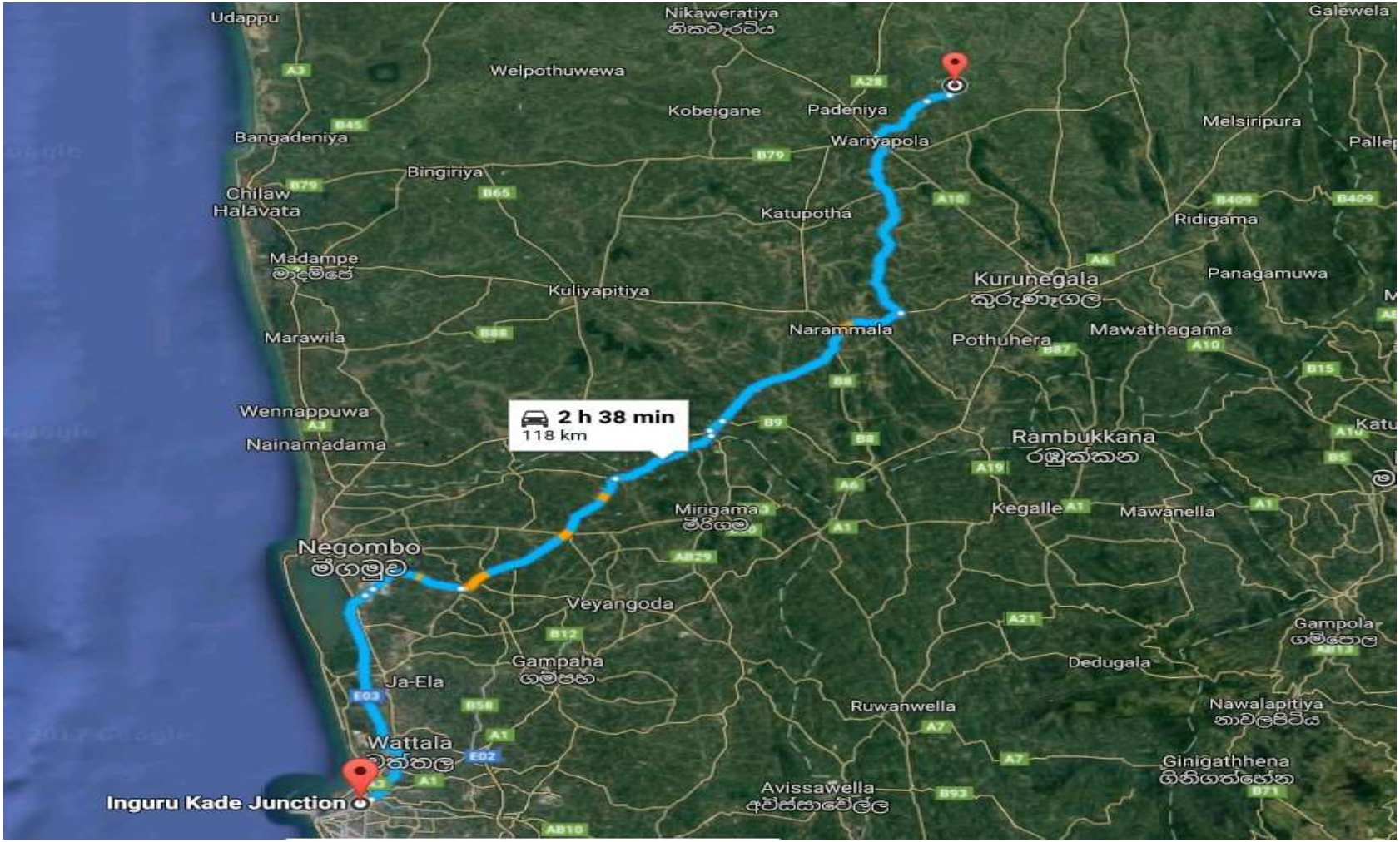
No	District	DS Division	GN Division	Local authority	Industry	Name of the Owner	Address	Faxed	Mobile	Activity	Category	Category No	Sector code
1	Colombo	Hanwella		Seethawakapura(Avissawella) U.C.	Diddeniya estate	Radesh Radella	Diddeniya, Hanwella			Metal Crusher	A	56	MP
2	Colombo	Hanwella		Seethawaka P.S.	Metal crusher	W.K.K.Engineering (Pvt) Ltd	Mawathugama, Padukka			Metal Crusher	A	56	MP
3	Colombo	Hanwella		Seethawaka P.S.	Metal crusher	N.M.Jusin Wijetunga	Hendirik watta, Diddeniya, Hanwella			Metal crusher	A	56	MP
4	Colombo	Homagama		Homagama P.S.	Gunawardana Metal Crusher	Gunawardana MetalCrusher	No:765/23,habanhena			Metal Crusher	A	56	MP
5	Colombo	Homagama	Homagama South	Homagama P.S.	Keangham Crusher Plant	Mr.S.S.Sea (Director)	96,Habanhenawaththa,Walgama,Athurugiriya	0114443357		Metal Crusher	A	56	MP
6	Colombo	Homagama		Homagama P.S.	Laxman Metal crusher (Pvt) Ltd	Mr.Gunasena Mallawarachi	Gulshana Alli			Metal crusher	A	56	MP
7	Colombo	Homagama	Galwala	Homagama P.S.	Metal crusher	M.D.Jayathilaka	No.286/1,Horagala,Kiriwaththuduwa.			Metal Crusher	A	56	MP
8	Colombo	Homagama		Homagama P.S.	Prema Metal Crusher (pvt) ltd	D.A.P.Premajeewa	No.55/35, Habanhenawatta, Walgama,Athurugiriya.			Metal crusher	A	56	MP
9	Colombo	Homagama	Panagoda East	Homagama P.S.	W A Perera & Company	Mr.W.A.Perera (Chairman)	Lenagalawatta, Welipillawa, Dedigamauwa	0114933539/0112561		Metal Crusher	A	56	MP
10	Colombo	Homagama		Homagama P.S.	Metal crusher	Kalpa Kulatissa Pathirage	No.742/2, Gamunu mw, Homagama			Metal Crusher	A	56	MP
11	Colombo	Homagama	Homagama South	Homagama P.S.	Buddhi Metal Crushers	Mr.S.D.Balasooriya	765/31,Habanahenawaththa,Homagama		0779994748	Metal Crusher	A	56	MP
12	Colombo	Homagama	Meegoda South	Homagama P.S.	Lal Metal Crushers	Mr.M.U.L.Kumara	454/6,Daham Mw,Meegoda	0112895047	0777758408	Metal Crusher	A	56	MP
13	Colombo	Homagama	Meegasmulla	Homagama P.S.	Noel metal crusher	Mr.N.S.Diyas	413/4, Leyland road, Panagoda,Homagama	0112744278	0777780527/0777231151	Metal crusher	A	56	MP
14	Colombo	Homagama	Kithulavila	Homagama P.S.	Metal crusher		Lot B Plan No.9064, Leenawatta, Liyanwala, Padukka			Metal crusher	A	56	MP
15	Colombo	Homagama		Homagama P.S.	Yaranyamida Metal Crusher	M.S.D.Perera	No.302/3, Temple road, Artigala, Hanwella			Metal crusher	A	56	MP

No	District	DS Division	GN Division	Local authority	Industry	Name of the Owner	Address	Faxed	Mobile	Activity	Category	Category No	Sector code
16	Colombo	Homagama		Homagama P.S.	Metal crusher	M.R.S.Priyantha	123/2, Dampe road, Madulawa, Padukka			Metal crusher	A	56	MP
17	Colombo	Homagama		Homagama P.S.	Metal crusher	Pathmasiri wijesundara	No.268C, Lenagalawatta, Welipillewa, Dedigamuwa			Metal crusher	A	56	MP
18	Colombo	Homagama		Homagama P.S.	Jayasiri Metal Crusher	Metal crusher	No.300/8, Temple road, Artigala, Hanwella			Metal crusher	A	56	MP
19	Colombo	Kaduwela	Arangala	Kaduwela M.C.	Sanjeewa Metal Crusher	Mr.S.A.D.R.Sanjeewa	No 435/D, CV Rd, Arangala, Hokandara	0117417880		Metal Crusher	A	56	MP
20	Colombo	Kaduwela	Arangala	Kaduwela M.C.	W.A.Perera & Company	Mr.W.A.Perera	No.180, Hokandara North, Hokandara	0112561239		Metal crusher	A	56	MP
21	Colombo	Kaduwela	Kaduwela	Kaduwela M.C.	Suranga Metal Crusher	Mr.H.L.P.Fernando	No 643/6, Wele Handiya, Kaduwela	0114403723		Metal Crusher	A	56	MP
22	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Sandares Metal Crusher	Mr.H.A.G.Perera	No 438, Pahala Bomiriya, Kaduwela		0773173460	Metal Crusher	A	56	MP
23	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Isuru Metal Crusher	Mr.K.M.Nandasara	No 382, Pahala Bomiriya, Kaduwela		0724322336	Metal Crusher	A	56	MP
24	Colombo	Kaduwela	Thalangama North	Kaduwela M.C.	Madushani Metal Crusher	Mr.A.S.Santha	No 1104/1, Thalangama	0112561751		Metal Crusher	A	56	MP
25	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Piyadasa Metal Crusher	Mr.T.P.V.Dias	No 661/C, Athurugiriya Rd,		0777342369	Metal Crusher	A	56	MP
26	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Sewmini Metal Crusher	Mr.W.L.D.Sanjeewa	No 410/0, Pahala Bomiriya, Kaduwela		0714445944	Metal Crusher	A	56	MP
27	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Jayabima Metal Crusher	Mr.G.L.C.Jayalal	No 435 A, Welehindha, Kaduwela		0714102562	Metal Crusher	A	56	MP
28	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Jayantha Metal Crusher	Mr.H.M.S.Perera	No 435, Pahala Bomiriya, Kaduwela		0714952298	Metal Crusher	A	56	MP
29	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Priyantha Metal Crusher	Mr.K.A.P.Munasingha	No 438/1, Pahala Bomiriya, Kaduwela	0114923549		Metal Crusher	A	56	MP
30	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Waruna Metal Crusher	Mr.W.Dias	No 437/B, Metal Crusher,		0724443169	Metal Crusher	A	56	MP

No	District	DS Division	GN Division	Local authority	Industry	Name of the Owner	Address	Faxed	Mobile	Activity	Category	Category No	Sector code
31	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Hiran enterprises	Mr.R.A.C.Perera	No 661/A, Athurugiriya road, Kaduwela		0785663327	Metal Crusher	A	56	MP
32	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Pasindu Metal Crusher	Mr.H.W.Anil Chandra	No 410/H, Pahala Bomiriya, Kaduwela		0779768560	Metal Crusher	A	56	MP
33	Colombo	Kaduwela		Kaduwela M.C.	Pasindu Metal Crusher	Mr.H.W.A.Chandra	No 410/F, Pahala Bomiriya, Kaduwela		0779768560	Metal Crusher	A	56	MP
34	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	W.L.D.Metal Crusher Sripathi Metal Crusher	Mr.W.L.D.Wichitra	No 410F, Pahala Bomiriya, Kaduwela	0113106716		Metal Crusher	A	56	MP
35	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Sripathi Metal Crusher	Mrs.S.N.Gulawita	No 410I, Pahala Bomiriya, Kaduwela	0112539676		Metal Crusher	A	56	MP
36	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Pushpa Kumara Metal Crusher (Pvt) Ltd	Mr.P.D.J.Pushpa Kumara	No 410D, Pahala Bomiriya, Kaduwela	0112539673		Metal Crusher	A	56	MP
37	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Wijethunga Metal Crusher	Mr.W.L.D.Kalyangarathna	No 410C, Pahala Bomiriya,	0114961842		Metal Crusher	A	56	MP
38	Colombo	Kaduwela	Welihindha	Kaduwela M.C.	Sanjeewa Metal Crusher	S.P.K.Mabulage	No 582/4, Welihindha, Kaduwela		0777361120	Metal Crusher	A	56	MP
39	Colombo	Kaduwela	Welihindha	Kaduwela M.C.	Manidu Metal Crusher	Mr.N.A.R.Chinthaka	No 582/3, Welihindha, Kaduwela		0713259324	Metal Crusher	A	56	MP
40	Colombo	Kaduwela	Welihindha	Kaduwela M.C.	Karunajeewa Metal Crusher	Mr.P.D.N.Karunajeewa	No 582/2, Welihindha,		0777421195	Metal Crusher	A	56	MP
41	Colombo	Kaduwela	Arangala	Kaduwela M.C.	Ediriweera Metal Crusher	Mr.S.R.S.Ediriweera	No 436/5, Hokandara Rd, Arangala, Hokandara	0112561788		Metal Crusher	A	56	MP
42	Colombo	Kaduwela		Kaduwela M.C.	Chinthaka Metal Crusher	C.C.O.Sirimanna	No.541/2/A, Thaldiyawala Rd,Athurugiriya			Metal crusher	A	56	MP
43	Colombo	Kaduwela		Kaduwela M.C.	Siluna metal crusher	K.J.P.Sarath Kumara	No.541/5, Bruklandwatta, Thaldiyawala road, Athurugiriya			Metal crusher	A	56	MP
44	Colombo	Kaduwela		Kaduwela M.C.	Punhara metal crusher		No.174, Hokandara North,			Metal crusher	A	56	MP
45	Colombo	Kaduwela		Kaduwela M.C.	Chandranayaka & company		Pansalwatta, Walgama,			Metal crusher	A	56	MP

No	District	DS Division	GN Division	Local authority	Industry	Name of the Owner	Address	Faxed	Mobile	Activity	Category	Category No	Sector code
46	Colombo	Kaduwela		Kaduwela M.C.	Mithun Metal crusher	R.A.Alan Keerthisinghe	No.582/5, Bomaluwa road, Welihinda, Kaduwela			Metal crusher	A	56	MP
47	Colombo	Kaduwela		Kaduwela M.C.	Gamini metal crusher		No.410/R, Pahala Bomiriya, Kaduwela			Metal crusher	A	56	MP
48	Colombo	Kaduwela		Kaduwela M.C.	Wijaya Metal crusher	P.W.A.D.Lakmal	No.410 M, Pahala Bomoriya, Kaduwela			Metal crusher	A	56	MP
49	Colombo	Kaduwela	Arangala	Kaduwela M.C.	Priyantha Metal Crusher	Mr.K.A.P.Munasingha	No 436/7, Aangala, Hokandhara North, Hokandara	0114923477		Metal Crusher	A	56	MP
50	Colombo	Kaduwela	Malabe West	Kaduwela M.C.	Samsan Metal Crusher	Mr.S.Dias	No 608, Athurugiriya Rd, Malabe	0112762629		Metal Crusher	A	56	MP
51	Colombo	Kaduwela	Pahala Bomiriya	Kaduwela M.C.	Jayakamala Metal Crusher	Mr.A.J.Malaviarachchi	No 247/1, Weikkiyawattha Rd,Pahala Bomiriya, Kaduwela		0718239871	Metal Crusher	A	56	ME
52	Colombo	Kaduwela		Kaduwela M.C.	W.A.Perera & Company	Mr.W.A.Perera	No.180, Hokandara North, Hokandara			Metal crusher	A	56	TR
53	Colombo	Kaduwela		Kaduwela M.C.	Gimhana Metal Crusher	D.D.Anura Kumara	No.582/1, Walihinda, Kaduwela			Metal crusher	A	56	MP
54	Colombo	Kaduwela		Kaduwela M.C.	Metal Crusher	R.G.Aberathna	No.582/6, Welihinda, Kaduwela			Metal crusher	A	56	MP
55	Colombo	Kaduwela		Kaduwela M.C.	K.K.Suppliers	K.K.Perera	No.410P, Pahala bomiriya, Kaduwela			Metal crusher	A	56	MP
56	Colombo	Kaduwela		Kaduwela M.C.	Dreams Metal Crusher	K.M.T.Udayanga	No.410N, Pahala Bomiriya, Kaduwela			Metal crusher	A	56	MP
57	Colombo	Kaduwela		Kaduwela M.C.	Lakshan Aggregates (pvt) Ltd		No.608A, 10th mile post,			Metal crsuher	A	56	MP
58	Colombo	Kaduwela		Kaduwela M.C.	Sanjla Enterprises	R.M.L.Jayasiri	No.710/3, Ranala, Nawagamuwa			Metal crusher	A	56	MP
59	Colombo	Kaduwela		Kaduwela M.C.	Metal Crusher	Mr. A.H.N.S. Diyas	No 611, 10th Mile Post, Malabe.			Metal crusher	A	56	MP
60	Colombo	Kaduwela	Hokandara North	Kaduwela M.C.	Metal Crusher	Mr.W.C.Perera	No 209/A, Arangala, Malabe	0112560287		Metal Crusher	A	56	MP

Sand from Daduru Oya basin.



Borrow soil suppliers with necessary approvals of the Colombo District.

Aggregate suppliers with necessary approvals of the Colombo District.